11 00 039 Check compression of all cylinders

PRELIMINARY WORK

1 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

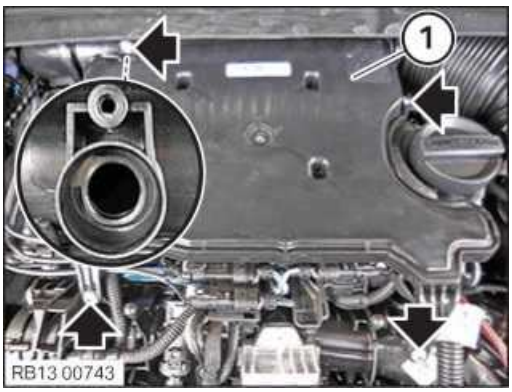
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

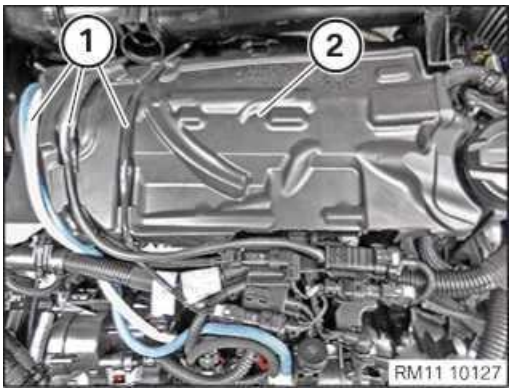
- Unclip the acoustic cover from the marked areas towards the top.

2 – Remove resonator



- Remove screws (arrows).
- Guide out and remove the resonator (1).

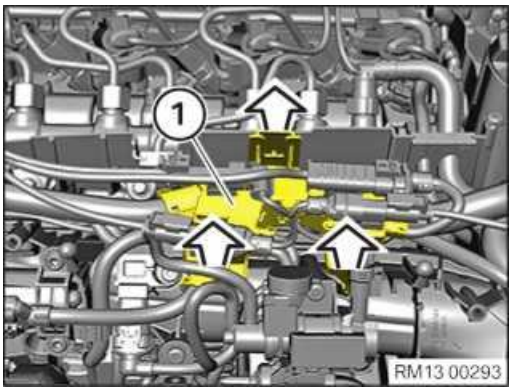
3 – Remove the acoustic cover for the injectors



- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

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4 – Removing the cable clips from the intake plenum



- Detach the cable clip (1) in the direction of the arrow.
- Guide out the cable clip (1) in direction of arrow and set it aside.

5 – Removing glow elements

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Damage to the glow elements.

Excessive force may damage the glow elements and they may then have to be renewed.

- Handle glow elements with care and do not drop.
- Do not rest the cylinder head on glow elements. Glow elements protrude from the sealing surface of the cylinder head.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

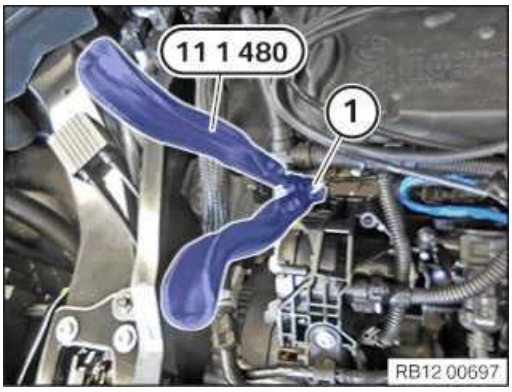
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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect plug connection (1) using special tool **0 490 796 (11 1 480)**.

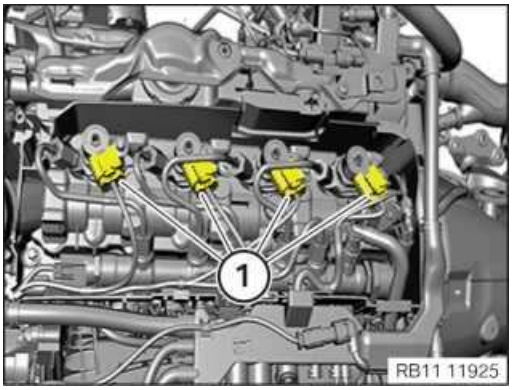


- Release the glow elements with the special tool or conventional tools.
- Feed out preheating elements and remove.

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MAIN WORK

6 – Check compression



- Unlock all connectors (1) and disconnect them from the injectors.

  This prevents injection.



- Screw special tools **0 496 146 (11 8 880)** and **0 493 129 (11 0 235)** into the bore holes of the individual cylinders.
- Connect an approved battery charger.

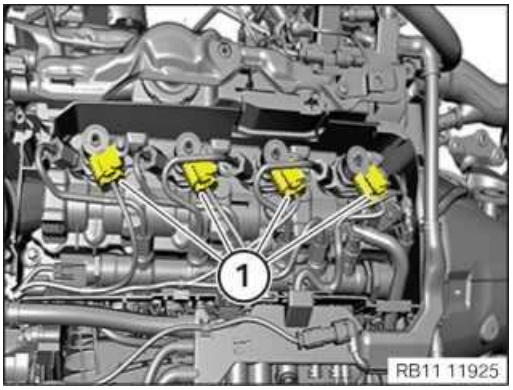
  The charger ensures constant battery voltage.
- With vehicles with manual gearbox: Ensure that no gear is engaged.
- Start engine.
- Check compression pressure and compare with the setpoint value.

  The number of engine revolutions for the compression check must be identical at each cylinder.

Compression pressure setpoint value

	min. 16 bar

- Remove special tools **0 496 146 (11 8 880)** and **0 493 129 (11 0 235)**.



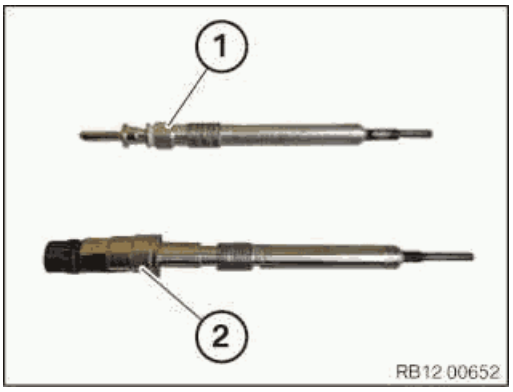
- Attach all connectors to the injectors.

  The connectors must lock audibly.

POSTPROCESSES

7 – Install glow elements

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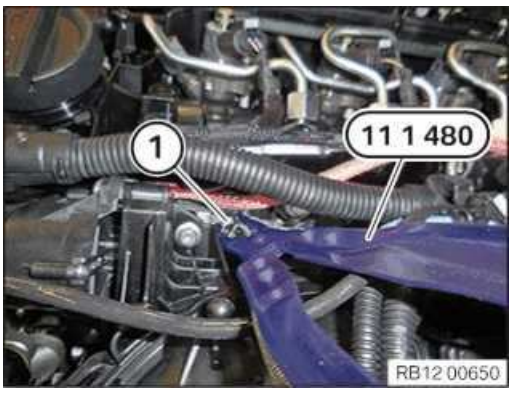
- Install glow elements (1) in cylinders 1, 2, 3 and 4.
- If fitted: Glow element (2) with the **combustion chamber pressure sensor** must be installed in cylinder **2**.



- Tighten the glow element with the special tool or conventional tools.

Glow elements to cylinder head

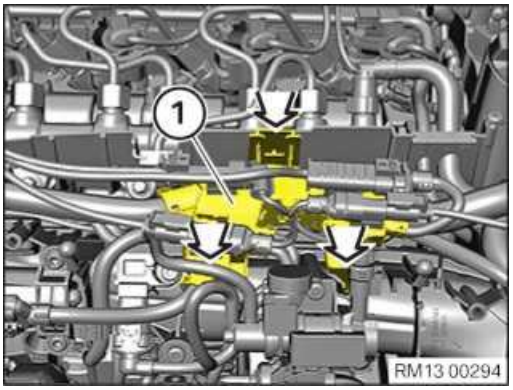
Glow element		Tightening torque	13 Nm



- Connect connectors (1) and lock.

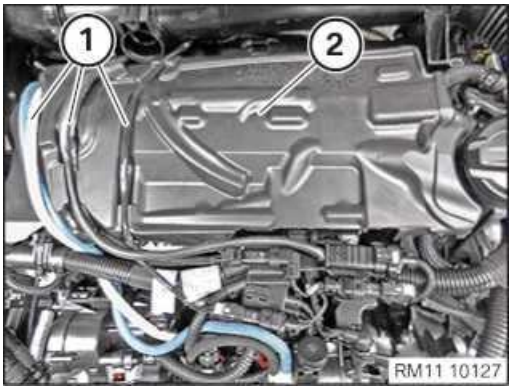
  The connector (1) must engage audibly.

8 – Installing the cable clip for the intake plenum



- Insert and install the cable clip (1) in the direction of the arrow.
- Make sure the cable clip (1) is fitted correctly.

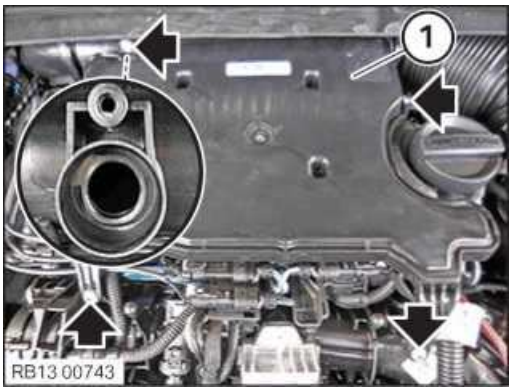
9 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the vehicle wiring harness (1) in the brackets.

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10 – Install resonator



- Insert and install the resonator (1).
- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

11 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Check for correct installation of all rubber mounts in the acoustic cover (1).



- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

Additional Information

Overview of Tightening Torques

Glow elements to cylinder head Used in step 7

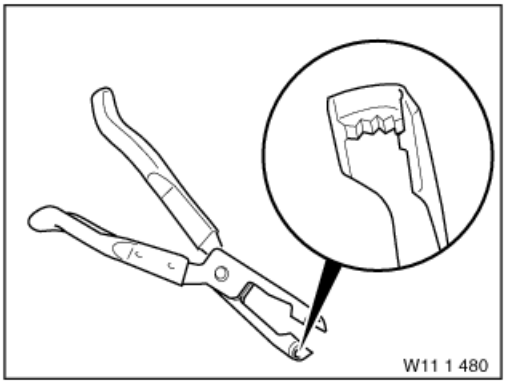
Glow element		Tightening torque	13 Nm

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Resonator to manifold and clean air pipe			Used in step 10
Screw TS6	Renew screw.	Tightening torque	5 Nm

Overview of Special Tools

0 490 796 (11 1 480) Pliers



Common	Used in step 5
Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

0 496 146 (11 8 880) Adapter



Common	Used in step 6
Usage	For compression testing.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 493 129 (11 0 235) Sensor



Common	Used in step 6
Usage	(Test probe, screw-in) For measuring "absolute compression" at all cylinders, engine: S14, S38, S50B30, S50B32, S50US, S52US, S54, S85
Included in the tool or work	0 490 613
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Compression pressure setpoint value	Used in step 6
	min. 16 bar

Links

Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	5

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11 00 039 Checking compression of all cylinders (B47)

Special tools required:

- 11 8 880
- 11 0 235

Necessary preliminary tasks:

- Remove all glow elements.

Warning!

On vehicles with manual gearbox:

There must be no drive position engaged during the starting operation.

Important!

To prevent the injectors from injecting, it is necessary to disconnect the injector plug connections.



Screw in special tools 11 8 880 and 11 0 235 .*Note:*
The compression check on all cylinders must have a constant battery voltage. If necessary, connect an auxiliary battery or charger.

The number of engine revolutions for the compression check must be identical for each cylinder. (The measuring result could be falsified.)

Technical data.

Required follow-up work:

- Install glow elements
- Check function of DDE, erase fault memory if necessary

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00 Danger of injury if oil comes into contact with eyes and skin



Danger of injury!

Contact with eyes or skin may result in injury!

Possible symptoms are:

- Impaired sight
- Irritation of the eyes
- Reddening of the skin
- Rough and cracked skin



Protective measures/rules of conduct:

- Wear safety goggles.
- Wear oil-resistant protective gloves.
- Observe country-specific safety regulations.



First aid measures:

- Eye contact: Immediately flush eyes with lots of water for at least 15 minutes. In the case that it is available, use an eye wash bottle. If eye irritation persists, consult a doctor.
- Skin contact: Wash off with soap and water immediately. If irritation persists, consult a doctor.

  Note: Do not use solvents/thinners.

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00 Danger of poisoning if oil is ingested/absorbed through the skin



Danger of poisoning!

Ingesting oil or absorbing through the skin may cause poisoning!

Possible symptoms are:

- Headaches
- Dizziness
- Stomach aches
- Vomiting
- Diarrhoea
- Cramps/fits
- Unconsciousness



Protective measures/rules of conduct:

- Fill oil in appropriately marked containers only.
- Do not fill oil in containers meant for drinking out of. (bottles for beverages, glasses or cups)
- Observe country-specific safety regulations.



First aid measures:

- Do not induce vomiting.

  If the person affected is still conscious, he/she must rinse out their mouth with water, drink plenty of water and consult a doctor immediately.

  Do not administer anything to an unconscious person via their mouth; place them in a stable position on their side. Call the emergency doctor immediately.

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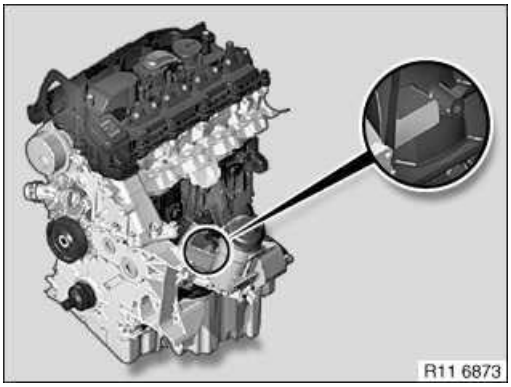
Engine identification

Engine number at the marked surface.

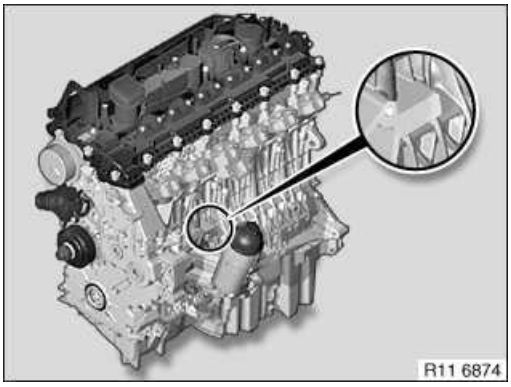
Replacement drives are already assigned a number containing the identification and engine number at the factory.

The old drive number must be imprinted for replacement crankcases.

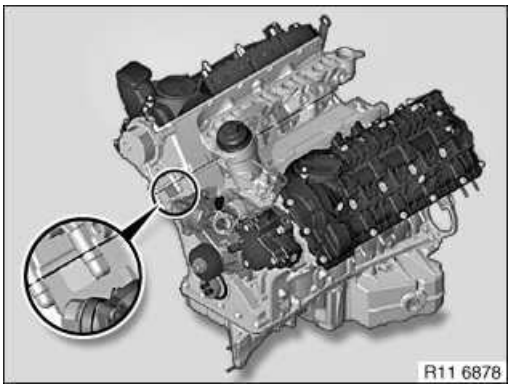
Magnesium crank cases feature a label, the engine number does not need to be embossed.



M47 / M47TU / M47T2

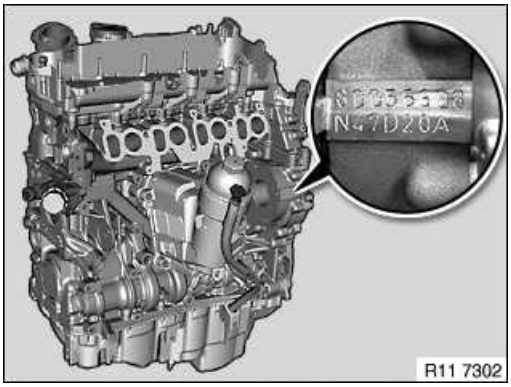


M57 / M57TU / M57T2

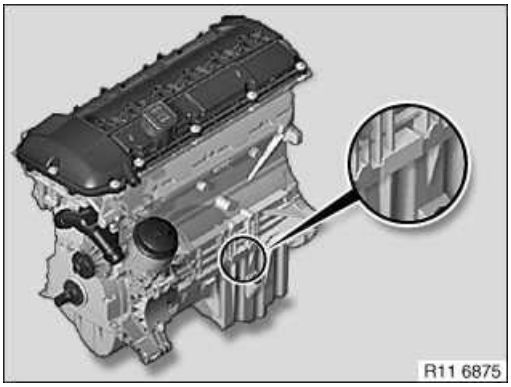


M67 / M67TU

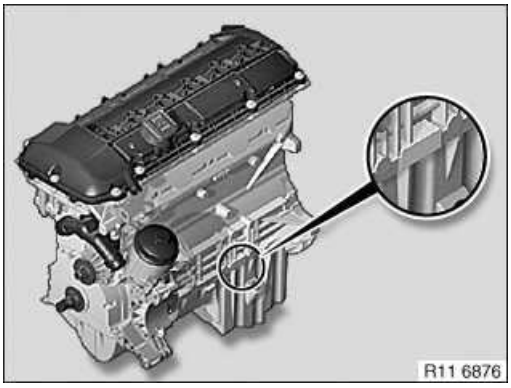
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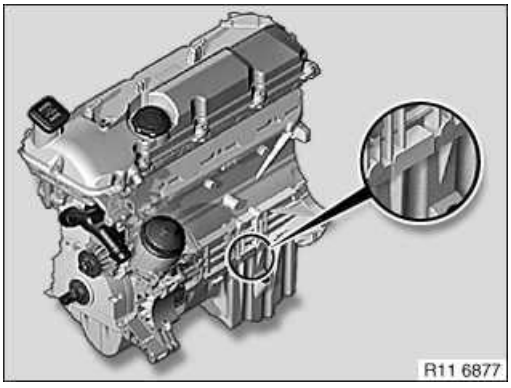
N47 / N47S / N47C / N47T / N57 / N57S / N57T



M52 / M52TU

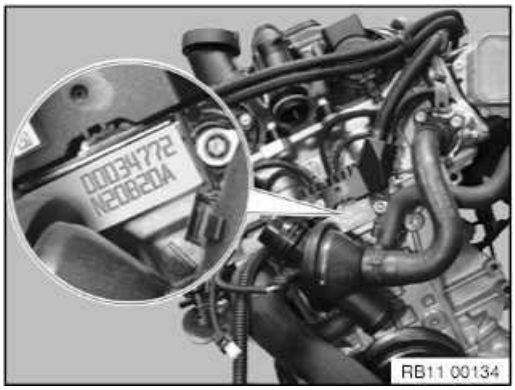


M54

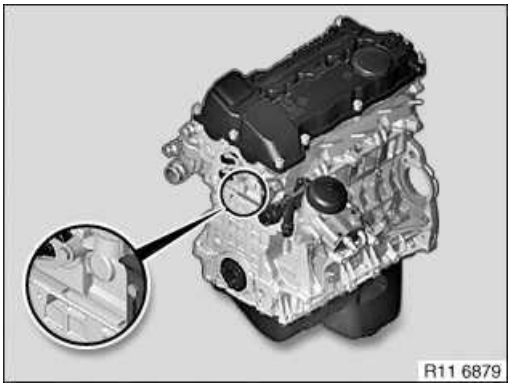


M56

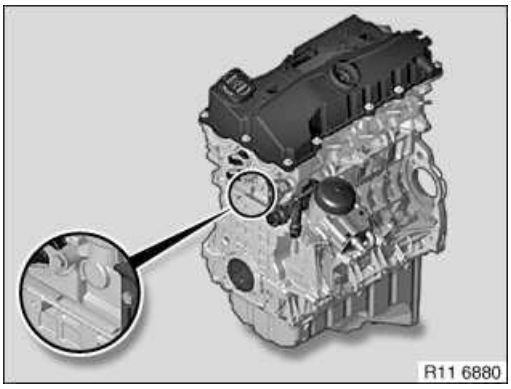
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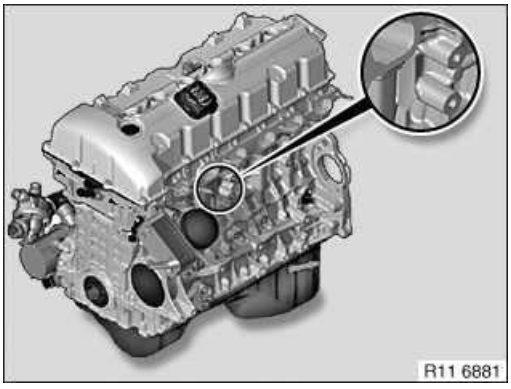
N20 / N26



N40 / N45 / N45T / N43

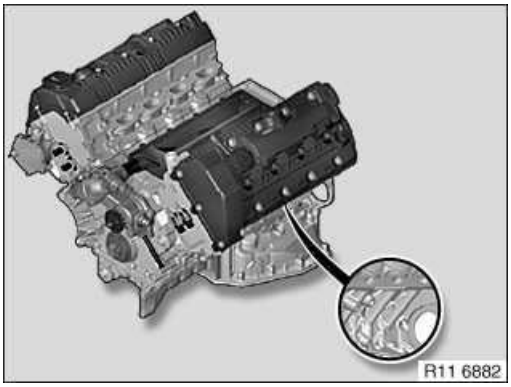


N42 / N46 / N46T

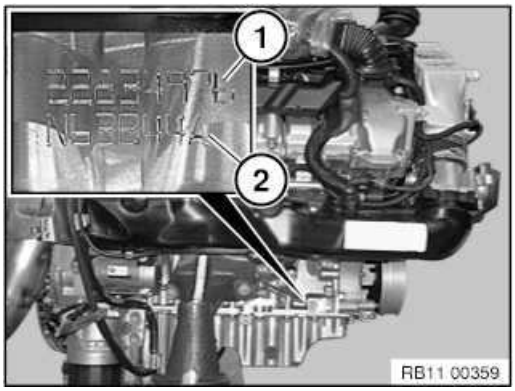


N51 / N52 / N52K / N52T / N53 / N54 / N55

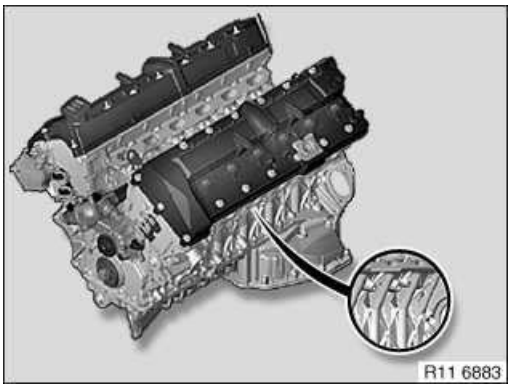
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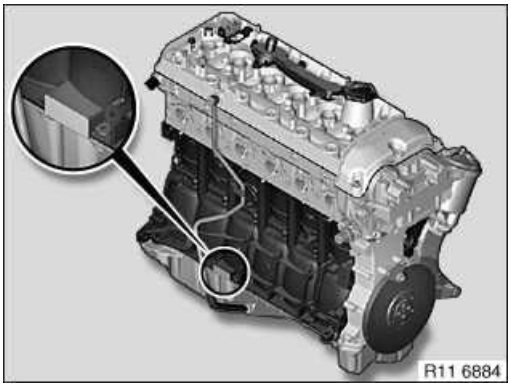
N62 / N62TU



Position (1) engine number.
PositionÂ (2) engine code letters.
N63, N63O1. N63O2
S63
N74, N74O1,
S63T0 to engine number 2001 0052 on right side cyl. 1-4.
S63T0 from engine number 2001 0053 on left side cyl.l 5-8.
E72 Vehicles must be imprinted on the left side cyl. 5-8.

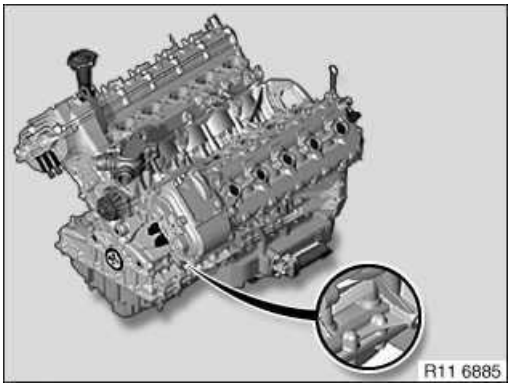


N73



S54

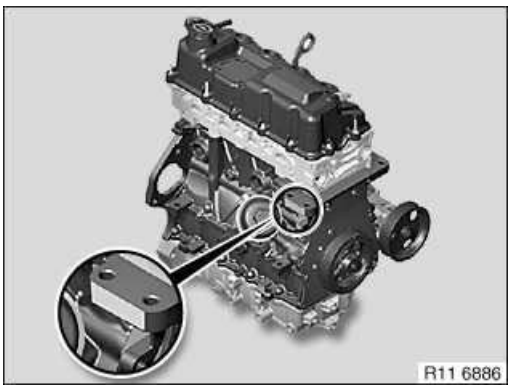
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S85 / S65



S55

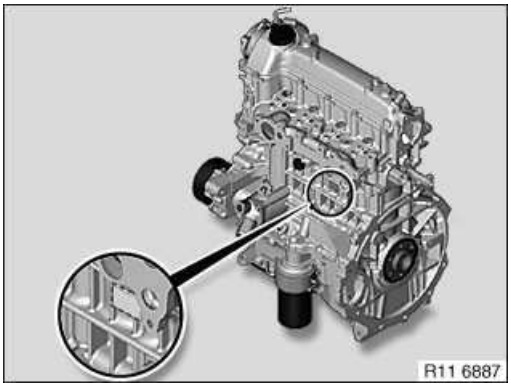


W10 / W11



W16

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W17



W20

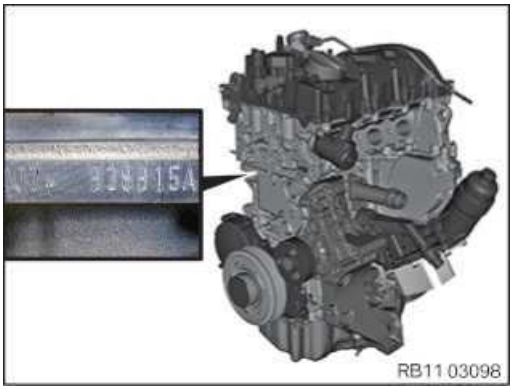


N12 / N13 / N14 / N16 / N18

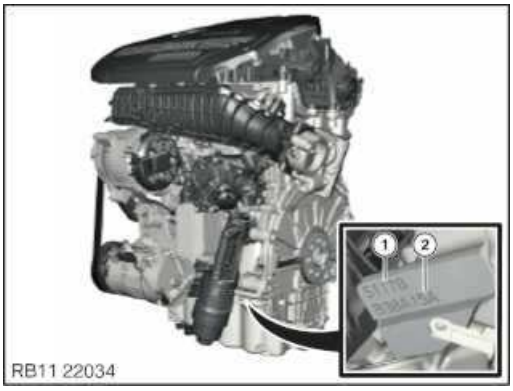


B37 / B38**A** / B47 / B48**A**
in the area of the oil sump

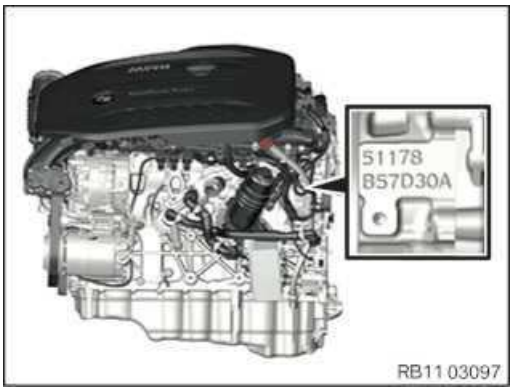
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B38**B** / B48**B**



B38



B57



B58

Assemble engine.

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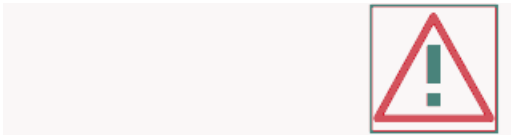
11 00 ... Engine oil change (B47)



Warning!

Risk of scalding!

Carry out work on the vehicle only when wearing oil- and heat-resistant protective gloves incl. forearm protection, face guard and protective apron.



Attention!

Carry out engine oil service only when the engine is at operating temperature.

Observe the exact engine oil filling capacity.

Overfilling the engine with engine oil will result in **engine damage**.

Attention!

Risk of damage!

When working on the engine oil, coolant or fuel circuit, it is essential always to protect the alternator against dirt contamination.

Cover alternator with suitable materials.



Recycling:

Catch and dispose of drained engine oil in a suitable collecting vessel.

Observe country-specific waste disposal regulations.

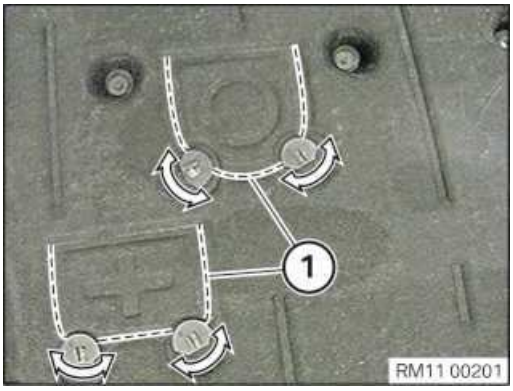


Necessary preliminary tasks:

- Opening the oil filler cap

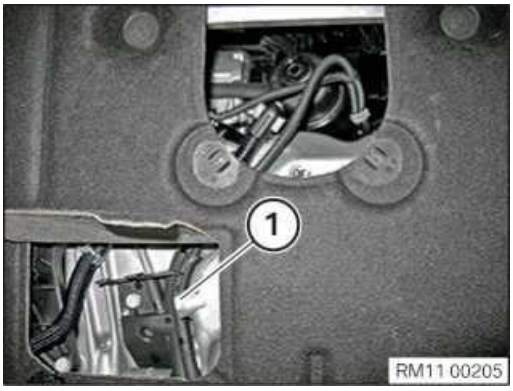


Removal:

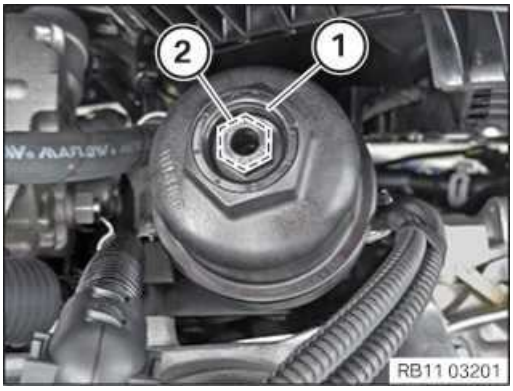


Open service flaps (1) in front underbody protection.

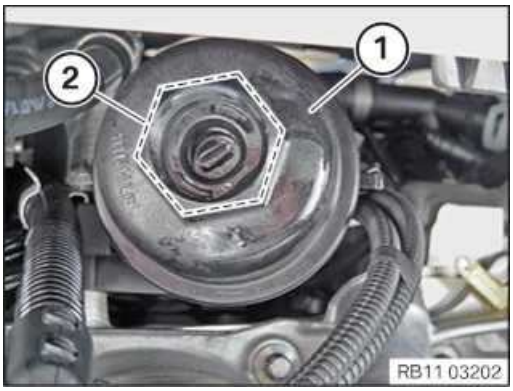
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Remove oil drain plug (1).
Drain the engine oil.

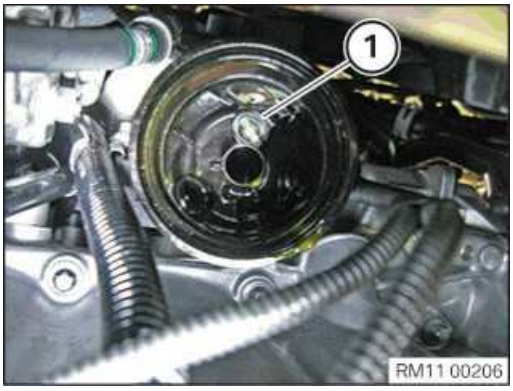


Undo oil drain plug (1) at hexagon head (2).
Drain the engine oil.



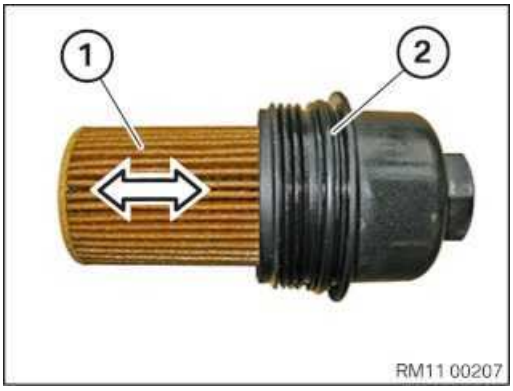
Undo oil filter cover (1) at hexagon head (2).

Installation:



Check the freedom of movement of the non-return valve (1).

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Renew oil filter (1).

Parts: Oil filter (1).

Ensure that the oil filter (1) engages audibly.

Renew O-ring (2) and coat with engine oil.

Parts: O-ring (2).



Replace screw with O-ring (1)

Parts: Screw with O-ring (1).

Wet the O-ring (1) with engine oil.



The thread (1) must be cleaned before installation without fail with original BMW brake cleaner (part number: 83 19 2 365 214).

The thread must be completely free of engine oil!

Attention!

Risk of damage!

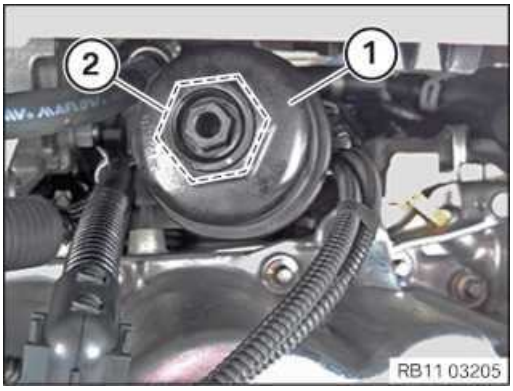
Elastomers (O-rings) may not touch brake cleaner!

Let the brake cleaner dry completely, if necessary blow dry with compressed air.

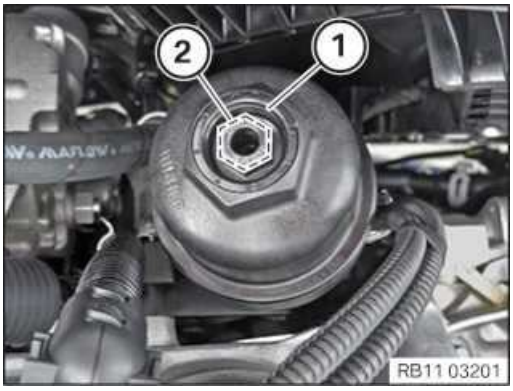


Oil drain plug (1).

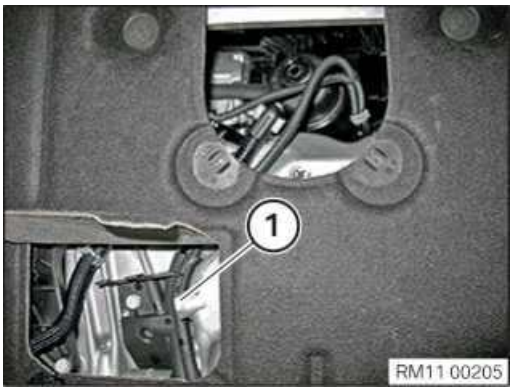
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Install oil filter cover (1) and tighten at hexagon head (2).
Tightening torque: 11 42 1AZ.



Tighten oil drain plug (1) at hexagon head (2).
Tightening torque 11 42 6AZ.



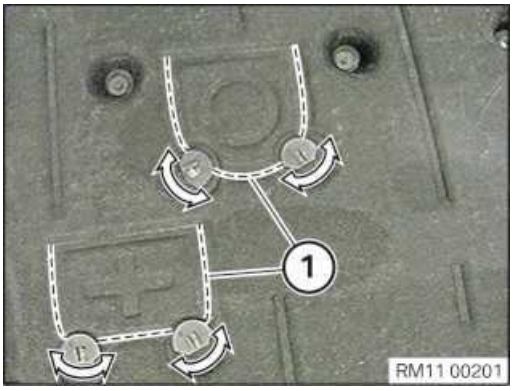
Renew the sealing ring.
Parts: Sealing ring.
Tighten oil drain plug (1).
Tightening torque: 11 13 1AZ.

Pour in engine oil.
Close oil filler cap .
Checking oil level:

- Vehicle horizontal
- Start engine and run at idle until oil pressure indicator light goes out
- Switch off the engine
- Check engine oil level using the oil dipstick

Check oil filter cover and oil drain plug of the oil sump for tightness.

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Close service flaps (1) in front underbody protection.

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11 00 300 Engine oil consumption measurement

Attention!

This procedure for measuring oil consumption may not be used for the S 85 due to the oil pan design.

Many complaints about oil consumption are caused by the oil level being measured using the wrong method.

The oil consumption should be measured after a distance of 7,500 km at the earliest, as the process of running in the engine will not have been essentially completed and the engine oil consumption stabilised until this distance has been covered.

Engine oil consumption that may occur in an engine can only be determined by the customer on the basis of the refilled engine oil quantity. As soon as the engine oil level falls below the MAX mark on the dipstick, many customers top up the engine oil without paying attention to a number of basic rules, such as the vehicle must be standing on level ground, a certain period of time must be left to allow the oil to flow back to the sump. In such cases, the available container sizes (e. g. 1-litre can) make it easy to top up above the MAX mark. Too much added engine oil is damaging to the engine and is consumed more quickly due to the splash effect.

It is therefore recommended to allow the engine oil level to the MIN mark and only then to add the required engine oil quantity. The distance between the marks is equivalent to approx. 1.0 to 1.5 litres.

The procedure for checking the oil level is given in the Owner's Handbook for the vehicle concerned.

The service delegates will only deal with claims made under warranty if exact measurements by weighing are available (see below).

Measuring oil consumption by weighing:

To assess a warranty or goodwill claim, only the following oil consumption measurement method by weighing can be accepted (this must have been carried out by a BMW contractual partner):

Note:

The engine must not leak any oil.

Engine oil may only be drained off when the engine is at its normal operating temperature. The engine oil temperature must be at least 90 °C and read off on the diagnosis system.

Preparation:

1. Eliminate any leaks and traces of oil before measuring the engine oil consumption.
2. Allow the engine to run at idling speed for 5 minutes, during which the engine oil temperature must not drop below 90 °C.
3. Unscrew the main flow oil filter cover (the engine oil will flow back into the oil sump from the oil filter housing).
4. Unscrew the oil drain plug.
5. Allow the engine oil to drain off for 15 minutes.
   If necessary, remove the fan/fan cowl.
6. Turn the engine once through 360 degrees by the vibration damper.
7. Allow the engine oil to drain off for 15 minutes.
8. Retighten the primary flow oil filter.
9. Pour in the specified engine oil quantity for the engine type in question (with filter change).
10. Drive the vehicle for a distance of at least 1,000 km/500 miles. Increasing the mileage will produce significantly better measuring results.
    Measurement procedure:
11. Check the engine for leaks; if the engine is not tight, the examination will not be meaningful.
12. Prepare the measuring container to be able to capture the oil quantity.
13. Allow the engine to run at idling speed for 5 minutes, during which the engine oil temperature must not drop below 90 °C.
14. Unscrew the main flow oil filter cover (the engine oil will flow back into the oil sump from the oil filter housing).

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15. Unscrew the oil drain plug.
16. Allow the engine oil to drain off for 15 minutes.
    If necessary, remove the fan/fan cowl.
17. Turn the engine once through 360 degrees by the vibration damper.
18. Allow the engine oil to drain off for 15 minutes.
19. Weight the **amount of drained engine oil**. (Engine oil has a density of about 0.86 g/cm³ at room temperature.)

$$\text{Engine oil consumption} = \frac{\text{Amount of oil added (cm³) - amount of oil drained off (g): 0.86 g/cm³}}{\text{mileage reading when draining - mileage reading when adding engine oil}}$$

Example:

Volume of oil added at mileage reading 44,800: 4.000 cm³

Weight of oil added at mileage reading 45,900: 2.700 g

$$\text{Engine oil consumption} = \frac{\text{4.000 cm3 - 2.700 g : 0.86 g/cm³}}{\text{45,900 km - 44,800 km}} = 0.78 \text{ cm³/km}$$

0.78 cm³/km = 0.78 l/1,000 km

Test certificate for engine oil consumption:

Vehicle data: _____

BMW (type): _____

Chassis number: _____

Added oil quantity (in ccm):	_____ ccm	at kilometre reading:_____
less drained off oil quantity (in g) : 0.86 (g/ccm)	_____ ccm	at kilometre reading:_____
=> oil consumption:	_____ ccm	=> mileage: _____ km

Oil consumption [l/1000 km] =

_____ *[ccm] oil consumption* _____ [km] mileage

Oil consumption after balancing out: _____ l/1000 km

Oil grade: _____

Oil grade: _____

Viscosity: _____

Cause of damage: _____

_____ _____

Dealer address Signature

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11 00 ... Engine oil consumption measurement



Procedure for engine oil consumption measurement, see following documents:

- Engine oil consumption measurement (all without S85)
- Engine oil consumption measurement (only S85 with one oil drain plug)
- Engine oil consumption measurement (only S85 with two oil drain plugs)
- Record on oil consumption measurement

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11 . . . . . Equipment recoding special tool number of the transverse member for fixing the engine in the installation location

Equipment recoding from 00 0 200 to 00 6 0 000

Designation	Special tool new	Special tool previous
Cross-member, previous	---	00 0 200
Cross-member, new	00 6 000	---
Mounting bridge	00 6 001	00 0 201
Spindle with hook	00 6 002	00 0 202
Extension	00 6 003	00 0 203
Adapter support	00 6 004	00 0 204
Extension	00 6 005	00 0 205
Chain with hook	00 6 006	00 0 209
Set of supports	00 6 010	00 0 206
Set of supports	00 6 020	00 0 207
Set of supports	00 6 030	00 0 208
Connector	00 6 031	---
Profile strip (2 x)	00 6 032	---
Supports (4 x)	00 6 033	---
Set of supports	00 6 040	---
Profile strip	00 6 041	00 0 451
Supports (2 x)	00 6 042	00 0 452
Supports, short (2 x)	00 6 043	---
Set of supports	00 6 050	---
Profile strip (2 x)	00 6 051	---
Supports, short (2 x)	00 6 052	---
Supports, long (2 x)	00 6 053	---
Support, long	00 6 060	---
Supports (2 x)	00 6 070	---

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11 00 ... Handling components after flood damage

Flood damage can occur if the permissible fording depth of a vehicle is exceeded. Ingress of water can cause damage to the engine (water shock) or components.

Because dirt particles generally enter into the component with the water (e.g. starter motor, wiring harness), the components need to be thoroughly inspected.

Residual moisture in the components leads to corrosion (increased contact resistance in the component), which can lead to a component failure at a later time.

If water ingress into the electrical components cannot be ruled out, it is recommended to replace the component to ensure correct functioning through the vehicle lifetime.

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11 00 590 Installing the exchange engine (B47)

Special tools required:

- 11 8 030
- 2 288 380

Attention!

Do not remove transportation retainer (adapter) of high pressure pump without special tool.

Risk of damage to timing chain drive.

Necessary preliminary work:

- Remove engine with gearbox.
- Remove transmission.
- Remove high pressure pump.
- Remount flywheel.



Attention!

Do not remove transportation retainer (1) without special tool 11 8 030 .



Remove protective cap (1) on oil sump.

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Attention!

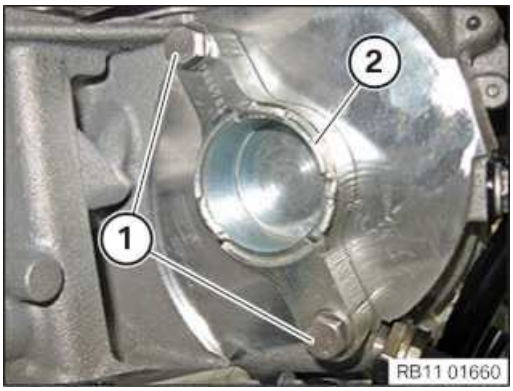
On vehicles with manual gearbox, an additional bore hole that can be confused with dowel hole is located in front of dowel hole.

The special tool 2 288 380 must be able to be pushed into the oil sump up to the offset.

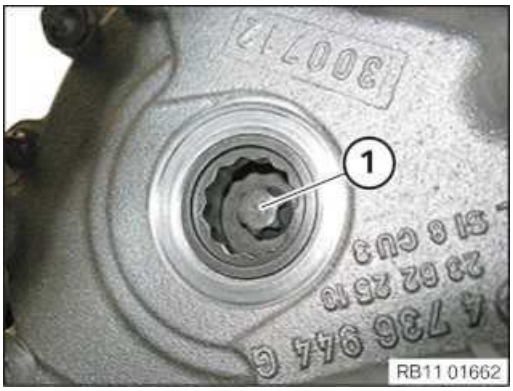
Disconnect crankshaft with special tool 2 288 380 .



Screw in special tool 11 8 030 .



Release screws (1) from the transportation retainer (2).



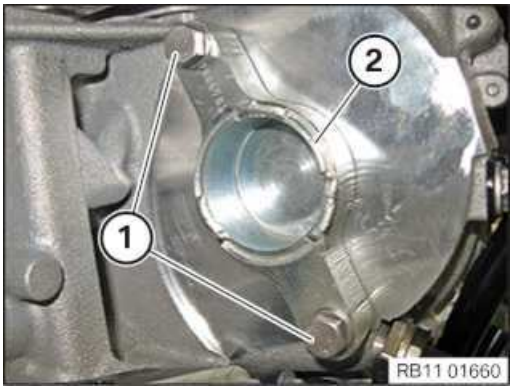
Attention!

The special tool 11 8 030 remains in the timing case.

Central bolt (1) remains in camshaft sprocket.

Remove central bolt (1).*Note:*
The central bolt (1) is supported on special tool 11 8 030 until the transportation retainer is pressed out.

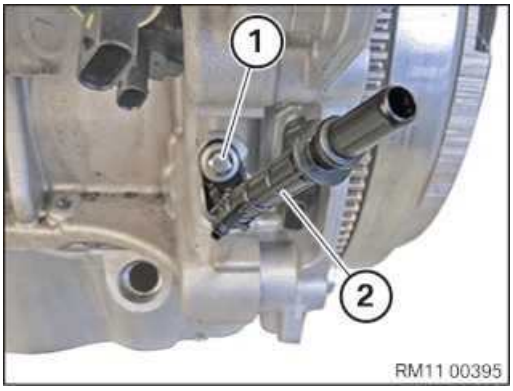
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Remove transportation retainer (2).

Install high pressure pump.

Remount transportation retainer (1).



Attention!

Risk of damage!

Non-compliance may cause the brake servo to fail!

Do not dismantle non-return valve (2) into separate components!

Before installing non-return valve (2), check if the installation opening in the crankcase is clear and clean.

Release screw (1).

Remount non-return valve (2).

Parts: Replace O-ring.

Tighten screw (1).

Tightening torque: 11 00 2AZ.

Required follow-up work:

- Remount all assemblies and sensors
- Position exchange engine on table lift with workshop crane
- Fit transmission.
- Install engine with transmission.

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Mounting engine on assembly stand (B47)

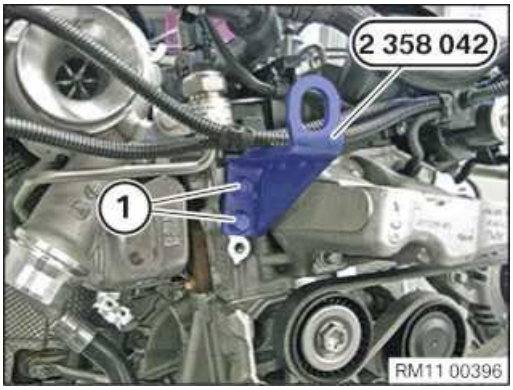
Special tools required:

- 2 358 042
- 00 2 300
- 00 2 320
- 2 288 357
- 11 9 030
- 11 0 070

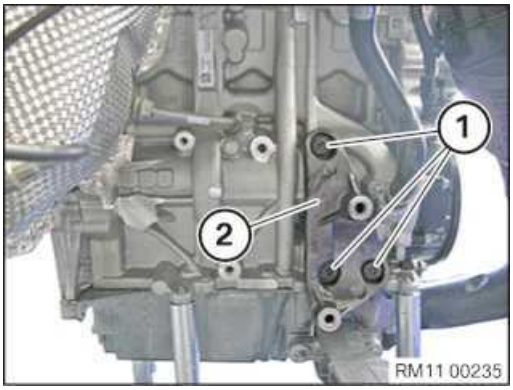
Important!
Follow manufacturer's instructions.

Necessary preliminary tasks:

- Remove engine with transmission.
- Remove transmission.

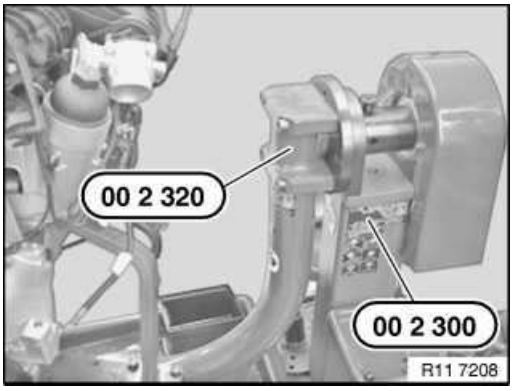


The securing eye 2 358 042 is to be fastened with the screws (1).
Tightening torque: 11 11 4AZ.

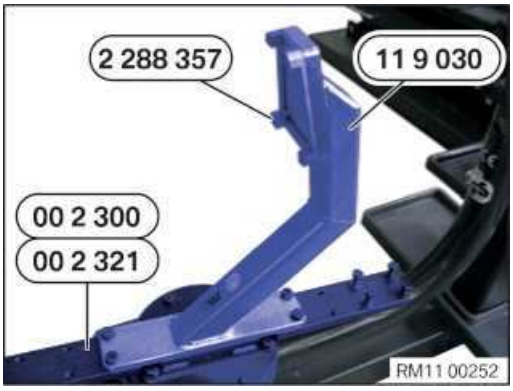


Release screws (1).
Remove adapter plate (2).
Installation note:
Tightening torque: 11 00 4AZ.

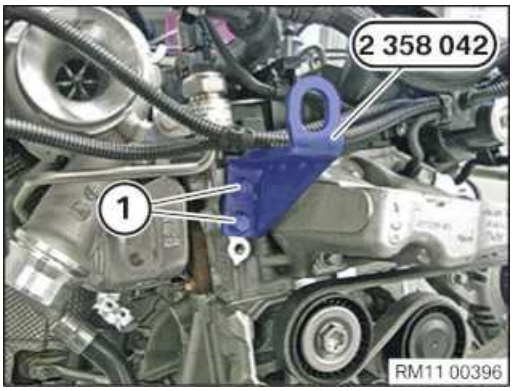
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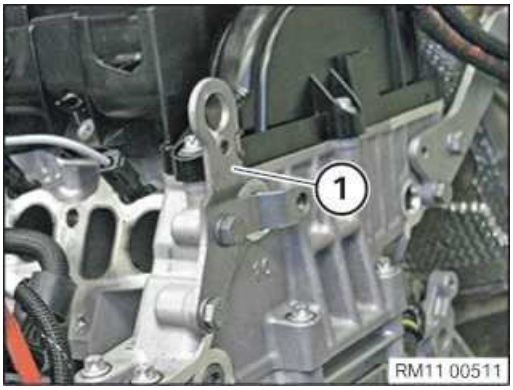
Prepare special tool 00 2 300 together with special tool 00 2 320 (00 2 321).



Prepare special tool 2 288 357 together with special tool 11 9 030 .

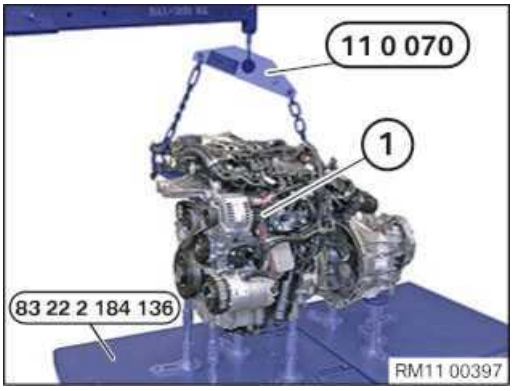


Note:
Attach engine lifter to securing eye 2 358 042 .



Note:
Attach engine lifter to the available securing eye (1).

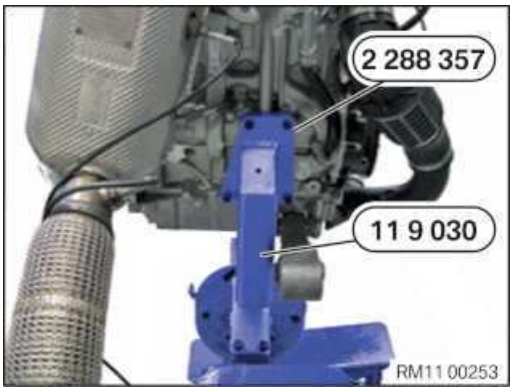
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Lift engine (1) with workshop crane and special tool 11 0 070 from table lift (83 22 2 184 136).



Lift engine with workshop crane onto assembly stand.



Bolt special tools 11 9 030 and 2 288 357 to engine.
Tightening torque: 11 11 4AZ.
Fix special tool 11 9 030 to assembly stand 00 2 300 .
Tightening torque: 11 11 5AZ.

Required follow-up work:

- Suspend engine from workshop crane
- Remove engine from assembly stand
- Use workshop crane to place engine on table lift
- Attach transmission.
- Install engine with transmission.

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11 00 ... Overview of consumables (Electronic Parts Catalogue)

1.0 Sealing compound for **injection**.

	Repair instructions (engine)	Designation, Electronic Parts Catalogue	Part number, Electronic Parts Catalogue	Application examples
1.1	S55, S65, S85	Loctite 171000 primer	83 19 7 515 683	For hardening Loctite 193140 sealing compound
1.2	S55, S65, S85	Loctite 193140 liquid sealing compound	83 19 0 439 030	Sealing between crankcase upper and lower halves
1.7	W20	Dow Corning liquid sealing compound	07 58 0 397 777	Sealing between crankcase upper and lower halves Sealing of oil sump

2.0 Sealing compound for **application**.

	Designation in repair instructions	Designation, Electronic Parts Catalogue	Part number, Electronic Parts Catalogue	Application examples
2.1	M41, M47, M47TU, M47T2, M50, M51, M52, M52TU, M54, M57, M57TU, M57T2, M60, M62 N12, N14, N16, N18 N20, N26 N40, N42, N45, N45N, N46, N46N, N43, N47, N47top, N47C N47D1 N51, N52, N52N, N53, N54, N55, N57, N57T, N62, N62TU, N63, N63O1 N73, N73H, N74 S14, S38, S50, S52, S54, S62, S65, S85	Drei Bond 1209 liquid sealing compound	07 58 9 062 376	For sealing junction points on crankcase
2.2	N12, N13, N14, N16, N18, N20, N26, N40, N42,N43, N45, N46, N51, N52, N53, N54, N55 W10, W11, W16,	Loctite 5970 liquid sealing compound	83 19 0 404 517	Sealing between crankcase upper and lower sections.
2.2	N47top, N47D1, N47C1 N57D1 N57S1, B32 ,B36 ,B37 ,B38 ,B42 ,B46 ,B47 ,B48 ,B57 ,B58	Loctite 5970 liquid sealing compound	83 19 0 404 517	Timing case cover sealing, oil sump, coolant pump, component carrier.
2.3	N12, N14, N16, N18 W16	Loctite 648 liquid sealing compound	07 58 9 067 732	Sealing between the seal plug and crankcase
2.4	N12, N13, N14, N16, N18 W16	Loctite 121078 liquid sealing compound	83 19 2 223 765	Sealing between cover sleeve and crankcase

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3.0 **Cleaning agent**.

	Designation in repair instructions	Designation, Electronic Parts Catalogue	Part number, Electronic Parts Catalogue	Application examples
3.1	N12, N13, N14, N18, N20, N26, N45, N46, N45T, N46T, N43, N51, N52, N52Kp, N52TU, N53, N55, N63, N63S, N63 Hybrid, N63O1, N63O2 N73, N74 B37, B38 B47, B48, B58	Cold cleaner (chlorine free)	83 19 0 026 956	Cleaning assemblies, washing engine
3.2	M47, M47T1 M47T2, M57 M57T1, M57T2 N47 K/U/O/T 0/1 N47C	Universal cleaner	83 19 2 360 981	Clean intake pipe.
3.3	All	Brake cleaner	83 19 2 365 214	Clean.

4.0 Lubricant for **application**.

	Designation in repair instructions	Designation, Electronic Parts Catalogue	Part number, Electronic Parts Catalogue	Application examples
4.1	N12, N13, N18, N20, N26, N42, N46, N46TU, N51, N52, N52KP, N52TU, N55, N62, N62TU, N63O0, N63O1, N63O2, N73 S55, S63T0 B38, B48, B58	Lubricating grease Longtime PD1	83 19 2 160 340	For greasing the splined shaft on actuator drive/gearing of intermediate shaft.
4.2	M47, M47TU, M47T2, M57, M57TU, M57T2,	High-temperature assembly paste	83 23 0 309 003	For greasing the thread on the exhaust turbocharger.
4.3	N12, N13, N14, N16, N18 N20, N26, N40, N42, N45, N45TU N46, N46TU, N43. N51, N52, N52Kp, N52TU, N53, N54, N55. N62, N62TU, N63O0, N63O1, N63O2 N73, N73H, N74. S63T1, S65, S85. B38, B48, B58	High temperature paste	83 19 2 158 851 83 19 2 158 852	For greasing the threads on the oxygen sensors.

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4.4	N47, N47O1 N47C1, N47T N47D1 N57 N57D1 N63O0, N63O1, N63O2 S63, S63T0	Copper paste	81 22 9 400 794	For greasing the double hex head bolt on the exhaust turbocharger. For greasing the central bolt on the VANOS gear.
4.5	M47, M47TU, M47T2 M57, M57TU, M57T2 N47, N47O1 N47C1, N47T N47D1 N57 N57D1	High-temperature grease (UrethynE2).	83 23 0 441 070	For greasing the injectors or injector shafts. Solenoid valve and piezo injector.
4.6	N47T0, N47T1 N57T0, N57T1, N57S1 B47T0,	Assembly paste	83 29 9 407 778	For lubricating the O-rings of the pressure pipes. Multistage turbocharging assembly.
4.7	W20	Assembly paste, grease	No longer greased.	For greasing the torsion splined shaft.
4.8	N63O1, N63O2	Assembly paste, grease	83 23 9 407 778	For greasing the central bolt on the crankshaft.
4.9	W20	Assembly paste, grease	83 23 9 407 778	Grease O-ring on alternator.

5.0 lubricant for **filling**

	Designation in repair instructions	**Designation, Electronic Parts Catalogue**	**Part number, Electronic Parts Catalogue**	**Application examples**
5.1	M47, M57	Exhaust turbocharger additive	83 19 2 362 168	For filling the exhaust turbocharger after the renewal.
5.2	B32, B36, B37, B38, B42, B46, B47, B48, B58	Exhaust turbocharger additive, petrol MSP	83 19 2 457 276	For filling the exhaust turbocharger after the renewal.

6.0 Lubricants to loosen locked **screw connections.**

	Designation in repair instructions	**Designation, Electronic Parts Catalogue**	**Part number, Electronic Parts Catalogue**	**Application examples**
6.1	M47, M47TU, M47TU2, M57, M57TU, M57TU2. N47, N47C, N47D1, N57, N57D1, N57S1 W16, W17, B37, B47, B57	Brunox lubricating grease	83 23 0 418 567	For releasing the glow elements.
6.2	E89 F10, F11.	Brunox lubricating grease	83 23 0 418 567	For releasing and tightening the screw connection of the rubber mounts.

7.0 **Leak detection spray and contact spray**

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	Designation in repair instructions	Designation, Electronic Parts Catalogue	Part number, Electronic Parts Catalogue	Application examples
7.1	Petrol: N13, N20, N26, N54, N55 B38, B48, B58 Diesel fuel: M47, M47TU, M47TU2, M57, M57TU, M57TU2. N47, N47C, N47D1, N57, N57D1, B37, B47	Leak detection spray	83 19 9 407 861	Check charge air path for tightness. Example: leakage on charge air hose or charge air cooler.
7.2	S55	Contact spray	81 22 9 400 208	For cleaning and protecting of electrical plug connections.

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11 00 050 Removing and installing engine

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

WARNING

Motor vehicle may slip off the vehicle hoist if the weight is distributed unevenly.

Danger! Life-threatening injuries!

- Ensure there is a specific weight compensation on the motor vehicle.

WARNING

Motor vehicle may slip off the vehicle hoist where components are supported.

Danger! Life-threatening injuries!

- Secure the vehicle hoist against lowering and lifting.

WARNING

Vehicle may slip off the vehicle hoist if the vehicle hoist is handled incorrectly.

Danger! Life-threatening injuries!

- Observe safety information on raising the vehicle using a vehicle hoist.
- For additional information see: 00 ... Raising the vehicle using a vehicle hoist.

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

RISK OF DAMAGE



Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.

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for any return shipments. Always package removed components straight away.

- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

Follow notes for repair work on the cooling system.

For additional information see:

Main group 17

17 00 ... Notes for working on the cooling system

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

TECHNICAL INFORMATION

Filling **without** the vacuum filler device (watering can filling) is **not permitted**.

Non-compliance will result in danger of component damage and/or engine damage.

Filling specification **absolutely must** be adhered to.

The operation of the vehicle is not permitted unless the filling procedure has been completed. Otherwise, functional limitations (degradation) and/or overheating may occur.

A bleeding procedure is required after a part has been exchanged in the cooling system and/or after refilling the cooling system.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.

PRELIMINARY WORK

1 – Drawing off the air conditioning

- See additional information.

2 – Removing the acoustic cover

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

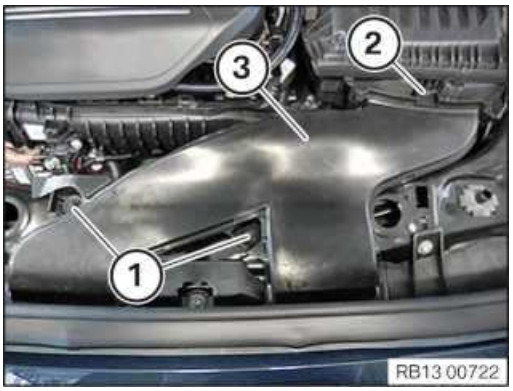
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

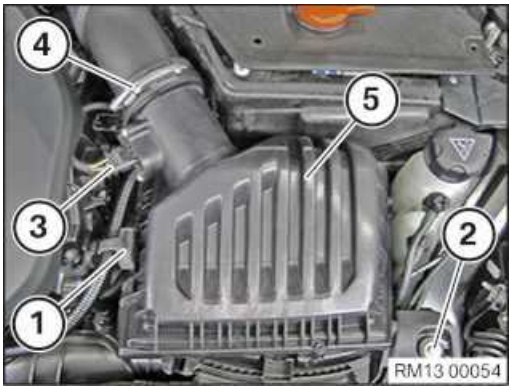
- Unclip the acoustic cover from the marked areas towards the top.

3 – Remove the intake neck for intake silencer housing



- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

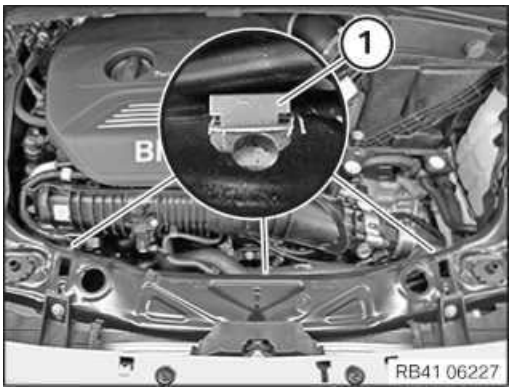
4 – Removing intake silencer housing



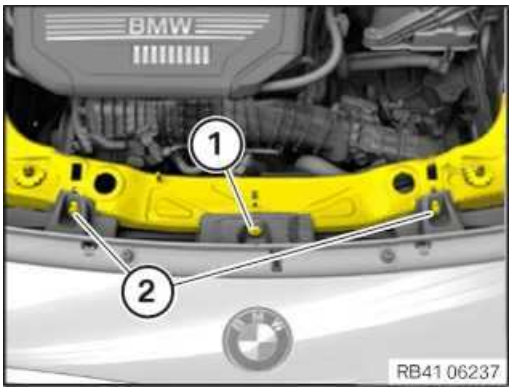
- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

5 – Remove front cross connection

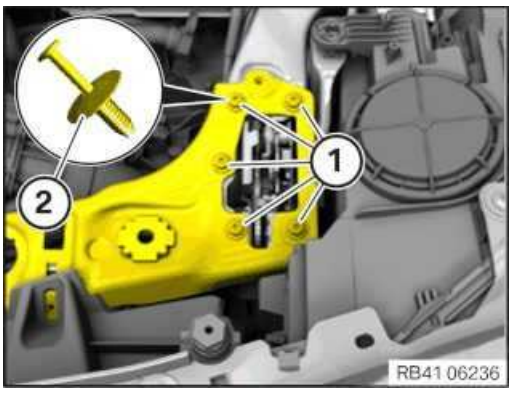
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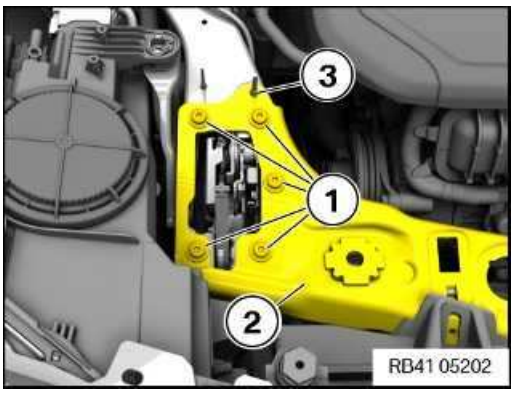
- Detach the clamps (1) for the Bowden cable of the bonnet locks from the cross connection.



- Loosen screw (1).
- Loosen screws (2).



- Loosen screws (1).
- Lever out expanding rivet (2).



- Loosen screws (1).
- Unclip the front cross connection (2) from the rubber retainer (3) and remove it upward.

6 – Removing the fan cowl with electric fan

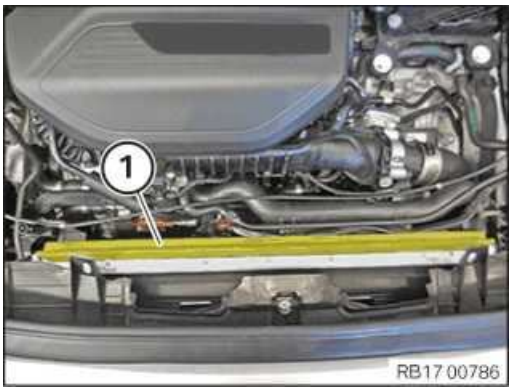
WARNING

Hot surfaces.

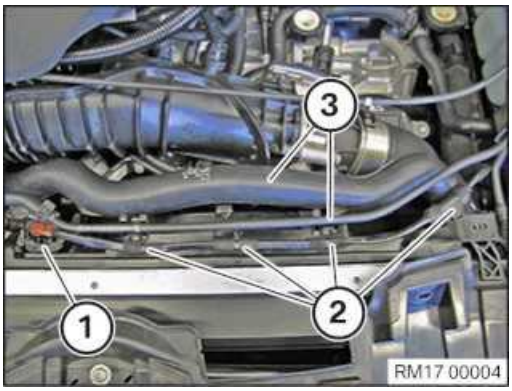
Risk of burning!

- Perform all work only on components that have cooled down.

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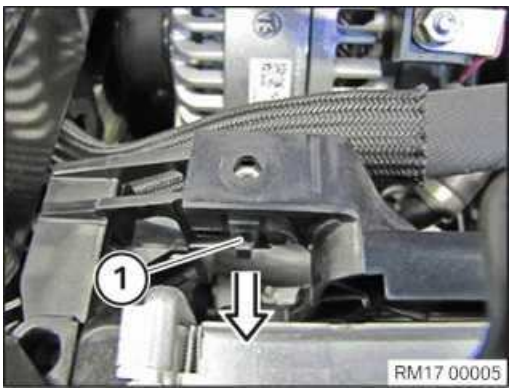
- Feed out and remove the sealing (1) from the radiator.



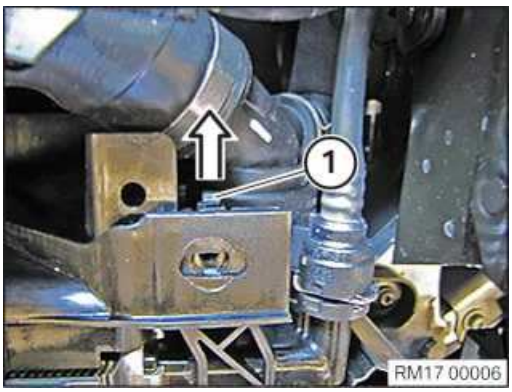
- Unlock plug connection (1) and disconnect.
- Unlock and loosen the clamps (2).
- Feed out connector (1) and place to one side.
- Thread off coolant line (3) and place to the side.



- Loosen screws (1).

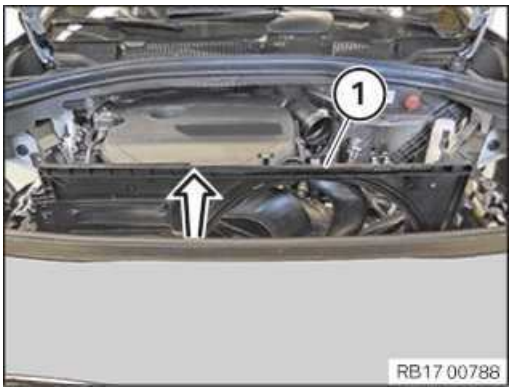


- Unlock the right lock (1) on the fan cowl in the direction of the arrow.



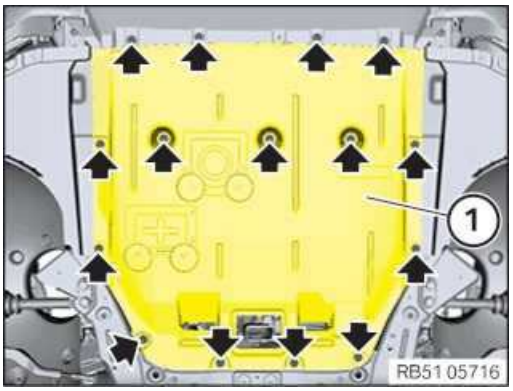
- Unlock the left lock (1) on the fan cowl in the direction of the arrow.

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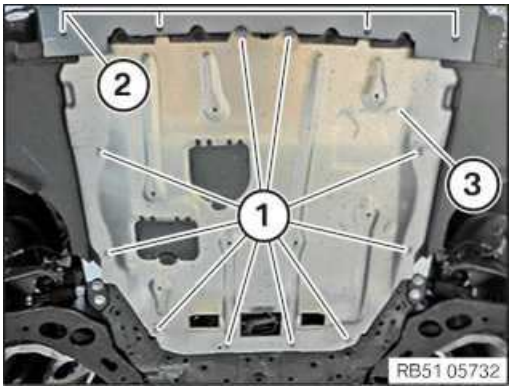


- Guide out fan cowl (1) in direction of arrow and remove.

7 – Removing the front underbody protection

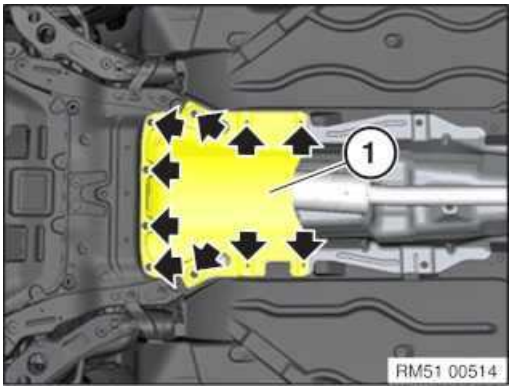


- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.



- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

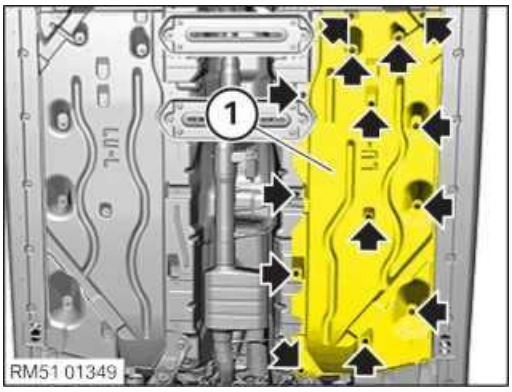
8 – If installed: Removing rear underbody protection



- Remove screws (arrows).
- Remove the rear underbody protection (1).

9 – Removing right underbody panelling

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- Unscrew all bolts and nuts (arrows).
- Remove the underbody panelling (1).

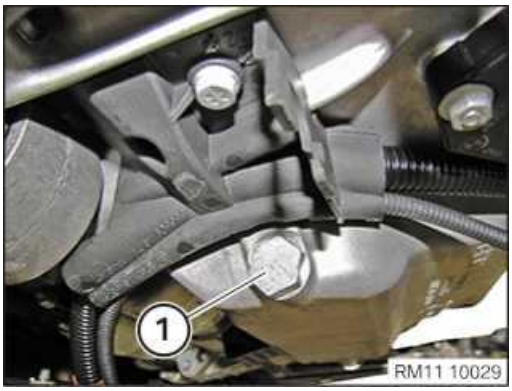
10 – Releasing the oil drain plug

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

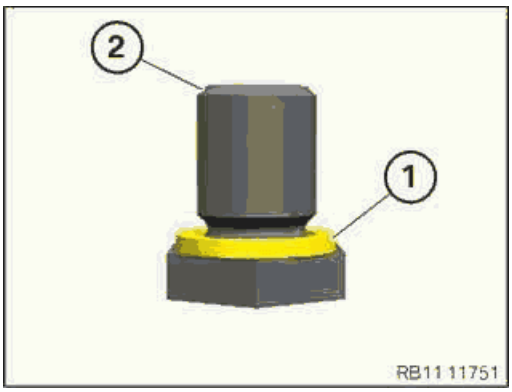


TECHNICAL INFORMATION

Catch and dispose of drained engine oil in a suitable collecting vessel. Observe country-specific waste disposal regulations.

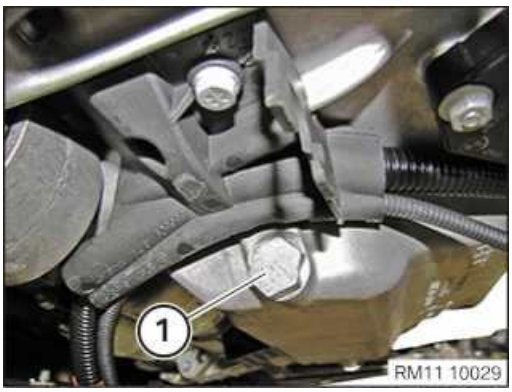
- Release oil drain plug (1).
- Drain engine oil.

11 – Tightening the oil drain plug



- Renew sealing ring (1) on the oil drain plug (2).

  Parts: Sealing ring
- Guide in the sealing ring (1) on the oil drain plug (2) and install.



- Renew the sealing ring.

  Parts: Sealing ring
- Position oil drain plug (1) on the oil sump and tighten.

Oil drain plug on oil sump

M12x1.5	Renew the sealing ring.	Tightening torque	25 Nm

12 – Draining coolant

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WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

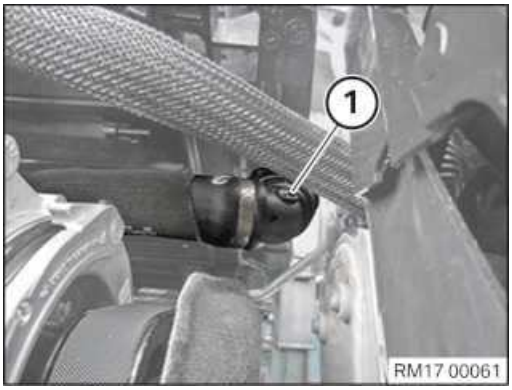
In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

TECHNICAL INFORMATION

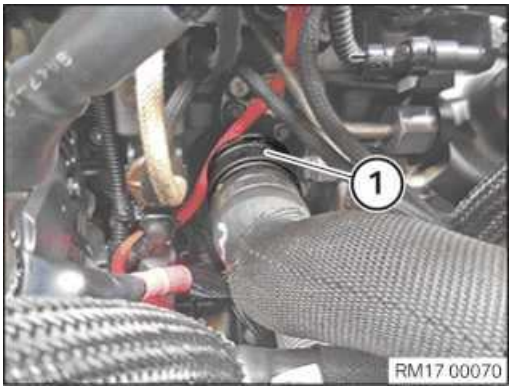
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Loosen sealing cap (1).



- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.



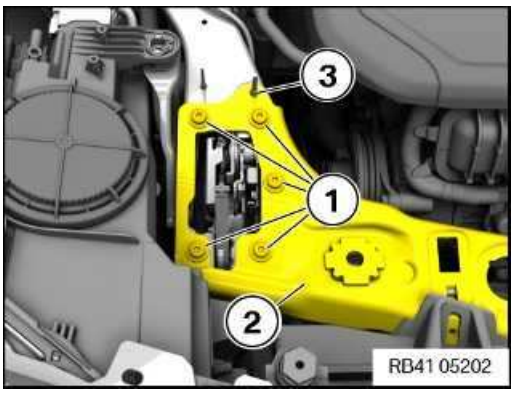
- Unlock the coolant line (1) and pull it off the connecting branch.
- Catch and dispose of escaping coolant.

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13 – Install front cross connection



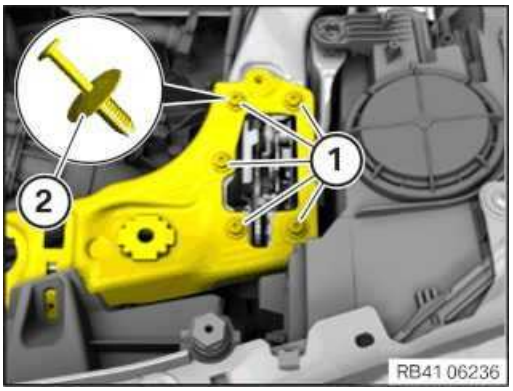
- Right side of vehicle only: Secure spray guard (1) on the cross connection (2) as pictured.



- Position front cross connection (2) and clip front cross connection (2) into the rubber retainer (3) at the same time.
- Tighten the screws (1).

Cross connection to carrier support

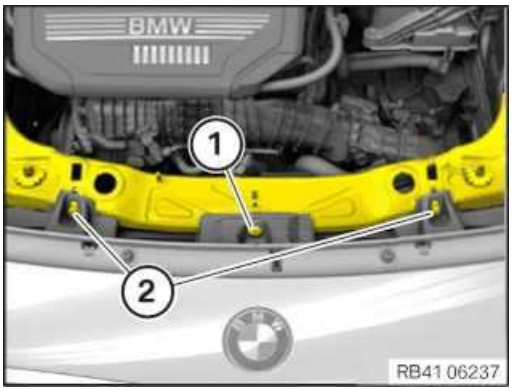
Screws M6x20		Tightening torque	11,8 Nm



- Tighten the screws (1).

Cross connection to carrier support

Screws M6x20		Tightening torque	11,8 Nm



- Position screws (3) on the rubber mounts for the radiator and tighten.

Screw connection for rubber mount of coolant radiator to coolant radiator

Bolt to rubber mount		Tightening torque	8 Nm

- Tighten down screws (2).

Air duct to upper connection

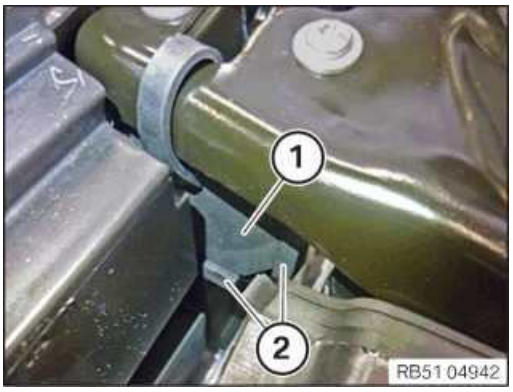
M6x20 screw		Tightening torque	11,8 Nm

- Tighten down screw (1).

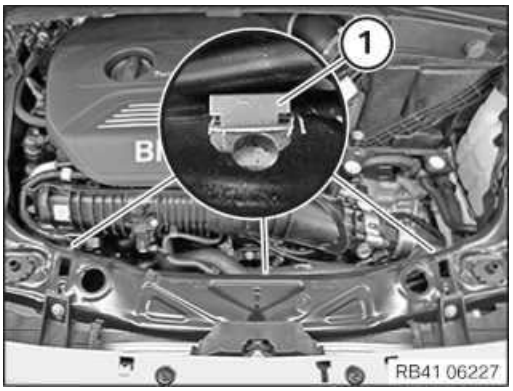
Bracing strut to upper connection

M8x20 screw		Tightening torque	28 Nm

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- Right side of vehicle only: Properly mount spray guard (1) to prevent corrosion.
- Secure spray guard (1) to the bridge with retaining tabs (2).

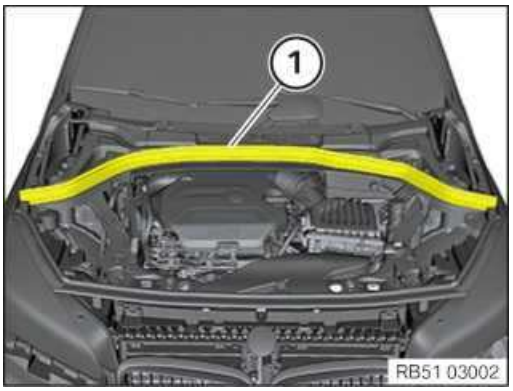


- Fasten the clamps (1) from the Bowden cable of the bonnet lock on the cross connection.

14 – Remove the seal for the rear bonnet

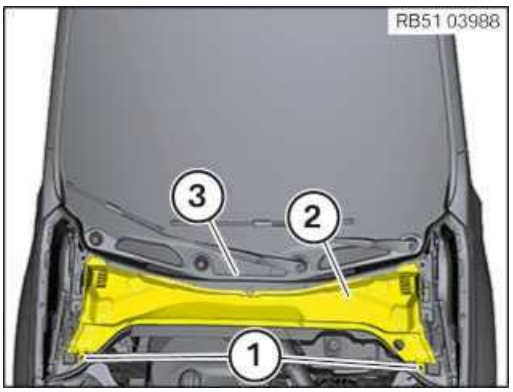
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Pull off rear bonnet seal (1) towards the top and remove.

15 – Removing front cowl panel cover



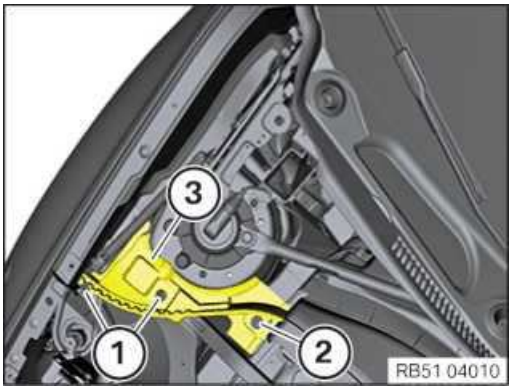
- Loosen the expanding rivet (1).
- Feed out and remove front cowl panel cover (2) from the rear cowl panel cover(3).

16 – Remove suspension cross-brace

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TECHNICAL INFORMATION

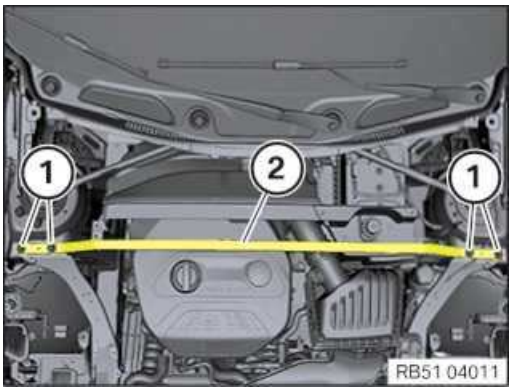
Driving without the strut brace/front end or tension strut is not permitted.



NOTICE

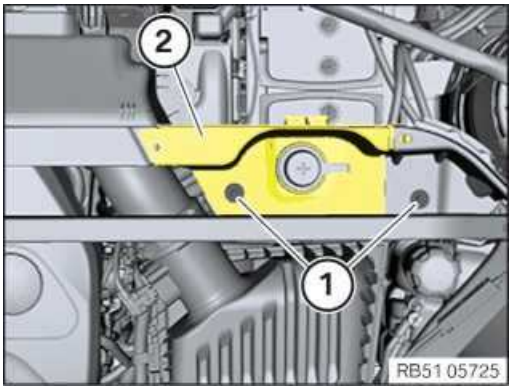
Description is for right component only. The procedure on the left side is identical.

- Loosen expanding rivet (1).
- Loosen screw (2).
- Remove the cover (3).

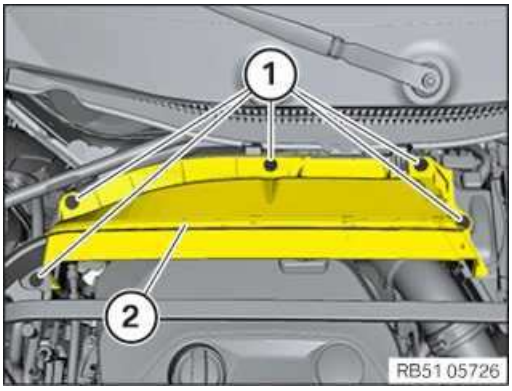


- Loosen screws (1).
- Remove strut brace (2).

17 – Removing the upper bulkhead cover



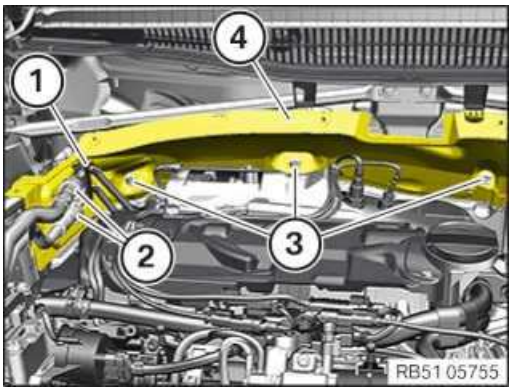
- Loosen screws (1).
- Guide out and remove the cover (2).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

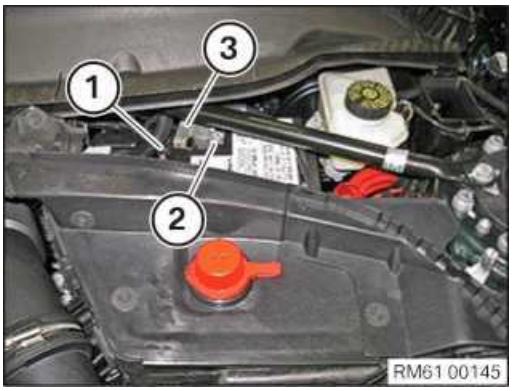
18 – Remove the rear bulkhead upper part

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- Unlock the holder (1) and disconnect.
- Guide out and remove the fuel lines (2).
- Loosen screws (3).
- Guide out the rear bulkhead upper part (4) and remove.

19 – Disconnecting the battery earth lead



- Unlock plug connection (1) and disconnect.
- Unfasten nut (2).
- Remove the battery earth lead (3) and secure to one side.

20 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

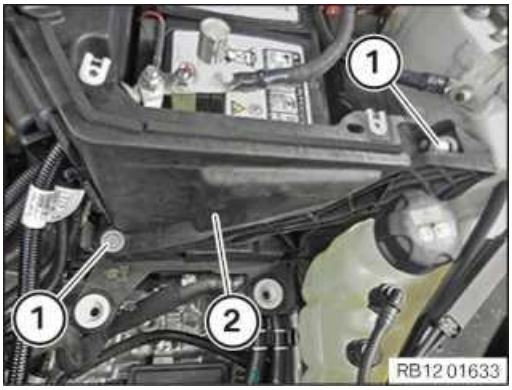
TECHNICAL INFORMATION

Follow instructions for removing and installing control units.
For additional information see: 12 00 ... Notes on removal and installation of control units

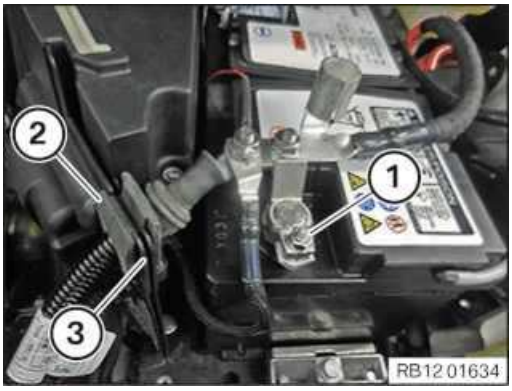
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TECHNICAL INFORMATION

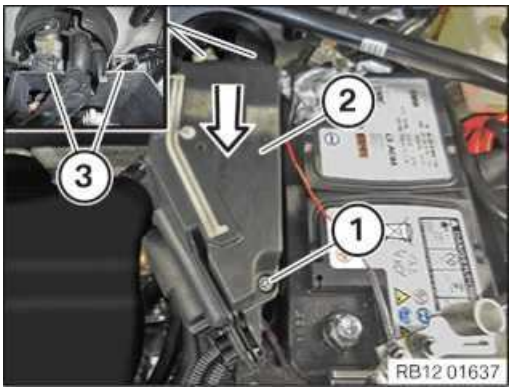
Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.



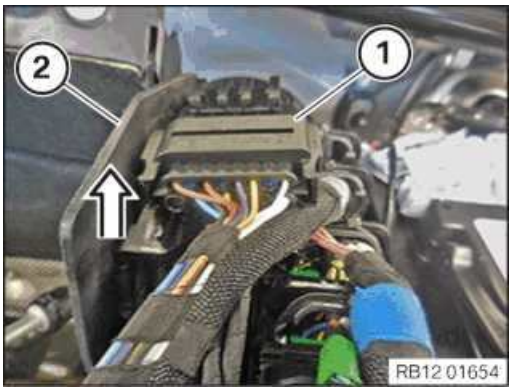
- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.



- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

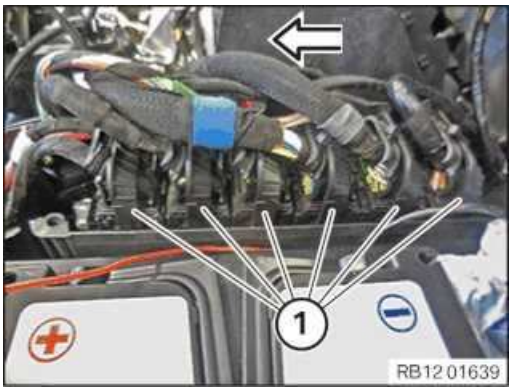


- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.

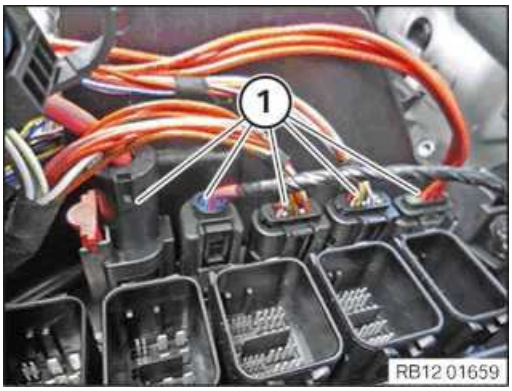


- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).

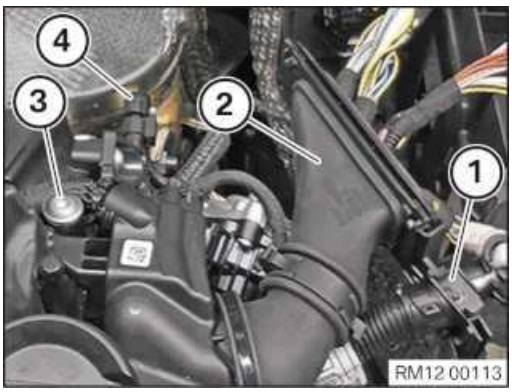
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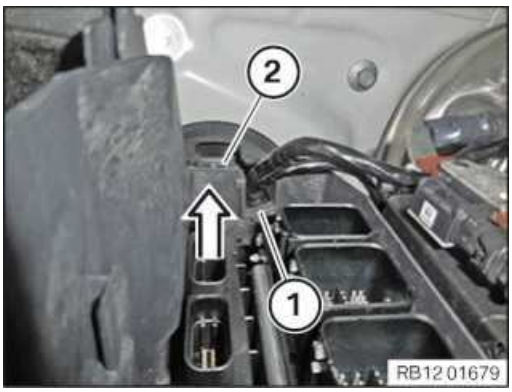
- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



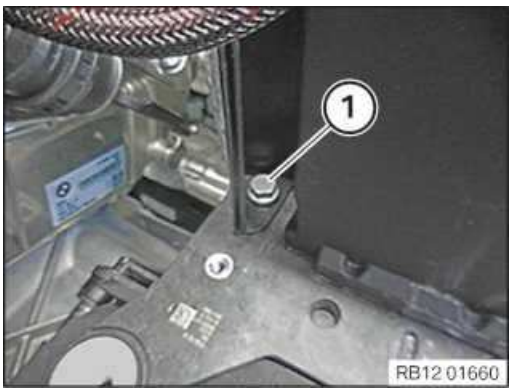
- Unlock and loosen connector (1).



- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.

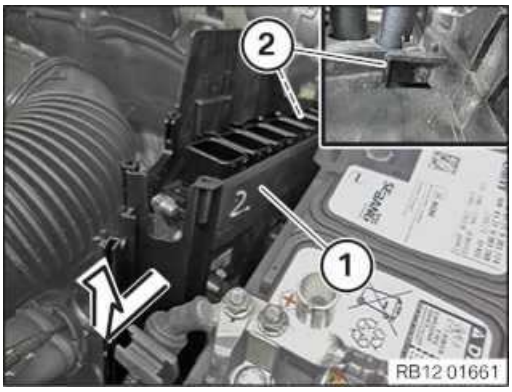


- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.



- Loosen screw (1).

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- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

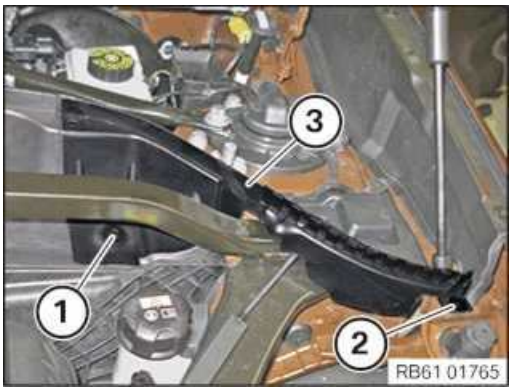
21 – Remove vehicle battery

WARNING

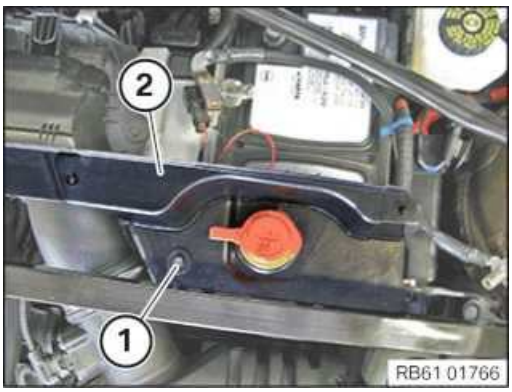
Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

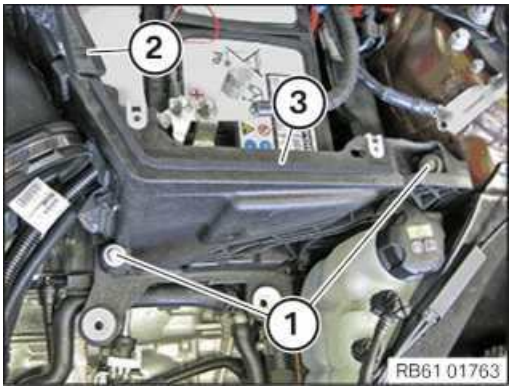
- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.



- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

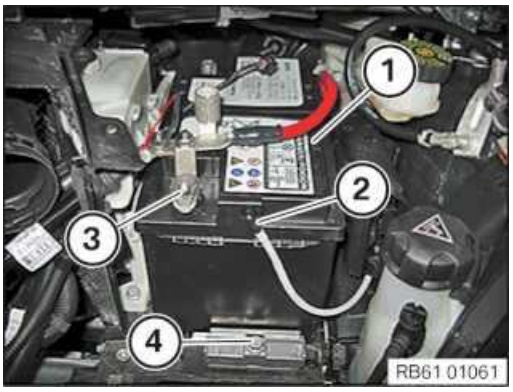


- Loosen screw (1).
- Remove the cover (2).



- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.

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- Pull off the vent hose (2).
- Slacken the nut (3) on the positive battery terminal and remove the positive battery terminal.

WARNING

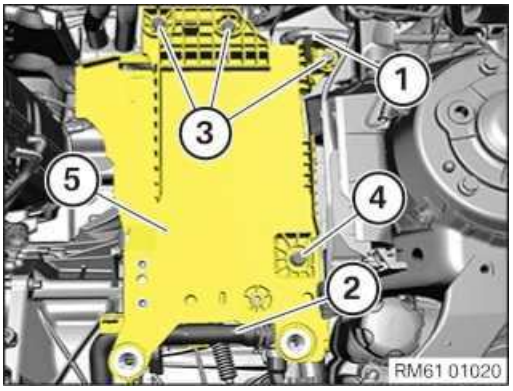
Unprotected battery terminals.

Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

22 – Remove battery holder



- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

23 – Removing both front wheels



▸ **Removing the wheel**

- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Unscrew the wheel bolts (arrows) and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

24 – Removing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

▸ **Remove the front wheel arch trim**

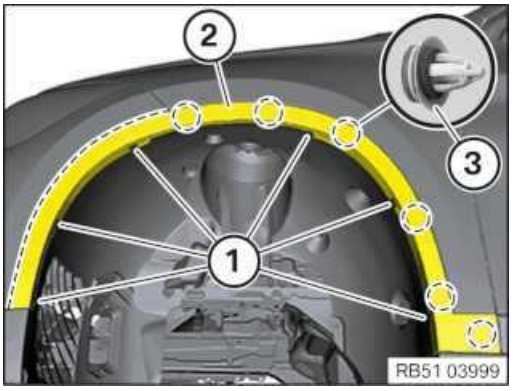
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NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

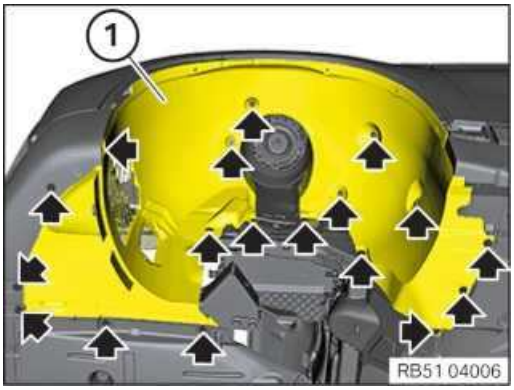
NOTICE

Description is for left component only. Procedure on the right side is identical.



- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.

▶ **Remove front wheel arch cover**



- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

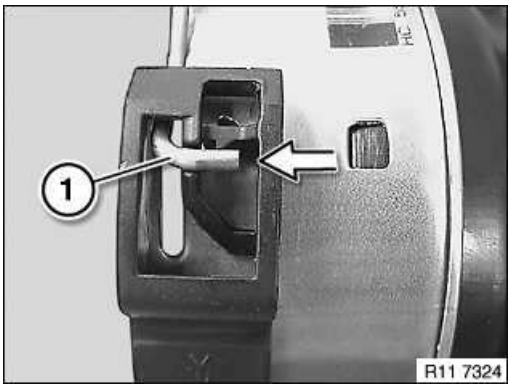
25 – Remove the pressure pipe between the throttle body and the charge air cooler

WARNING

Hot surfaces.

Risk of burning!

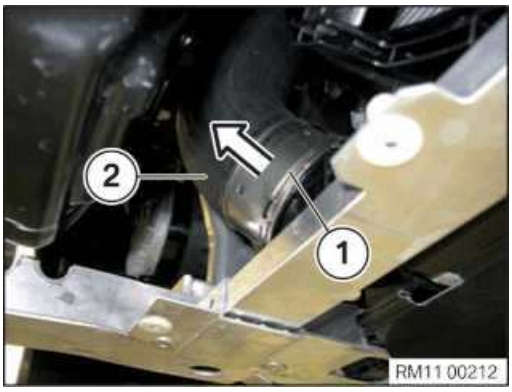
- Perform all work only on components that have cooled down.



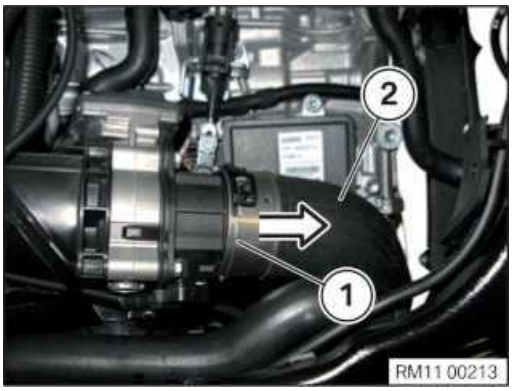
- Unlock the lock (1).

  The lock (1) must engage in the bracket (arrow).

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- Unlock and detach the locks (1) on both sides.
- Guide out the pressure pipe (2) in the direction of the arrow and set it aside.



- Unlock and detach the locks (1) on both sides.
- Guide out the pressure pipe (2) in the direction of the arrow and set it aside.



- Remove the pressure pipe (1) in the direction of the arrow.

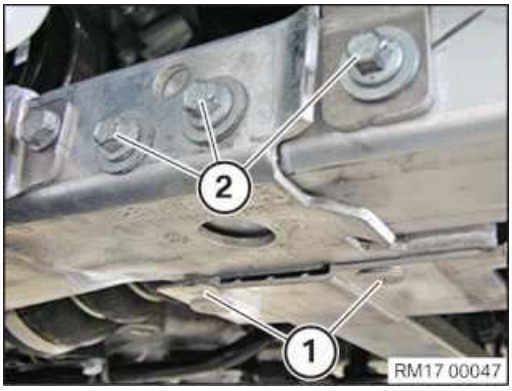
26 – Removing the right charge air duct between the exhaust turbocharger and the charge air cooler

WARNING

Hot surfaces.

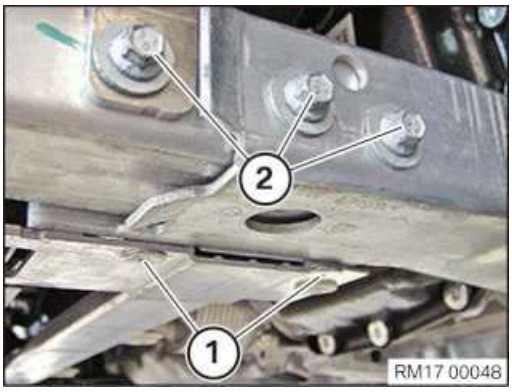
Risk of burning!

- Perform all work only on components that have cooled down.

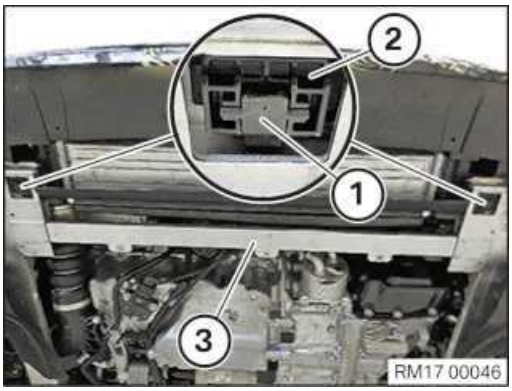


- Undo screws (2) at front left.
- Drill out blind rivets (1) at front left.

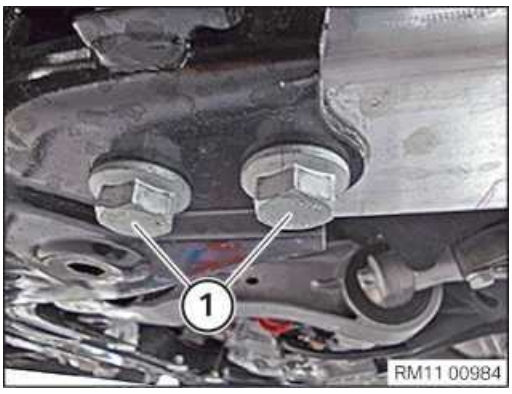
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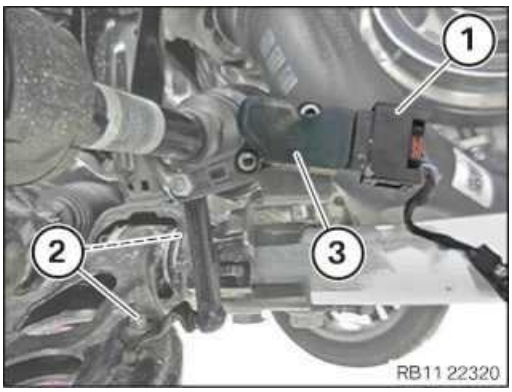
- Undo screws (2) at front right.
- Drill out blind rivets (1) at front right.



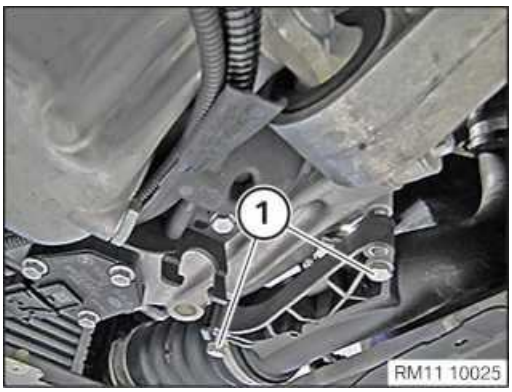
- Unlock locking pins (1).
- Thread out and remove locks (2).
- Thread out and remove cross connection (3).



- Release the screws (1) on the right front axle support.

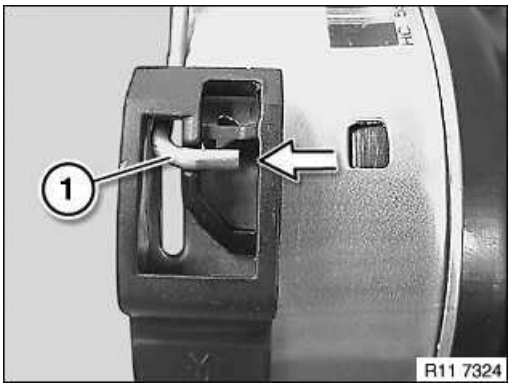


- **If installed:**
- Unlock and release plug connection (1).
- Loosen screws (2).
- Feed out the ride height sensor (3) and remove.



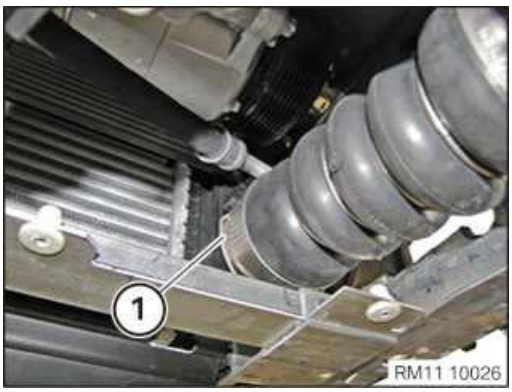
- Release screws (1) of charge air duct on right oil sump.

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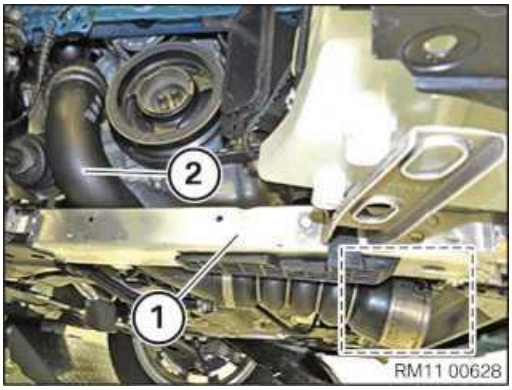


- Unlock lock (1).

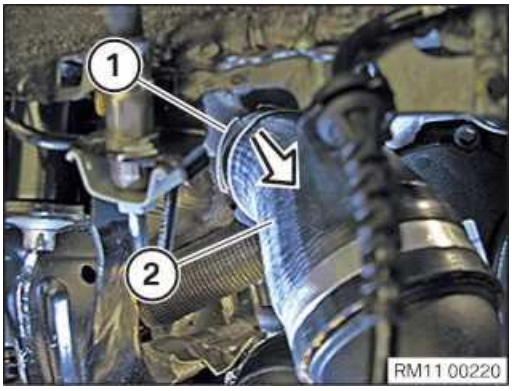
  The lock (1) must engage in the bracket during unlocking (arrow).



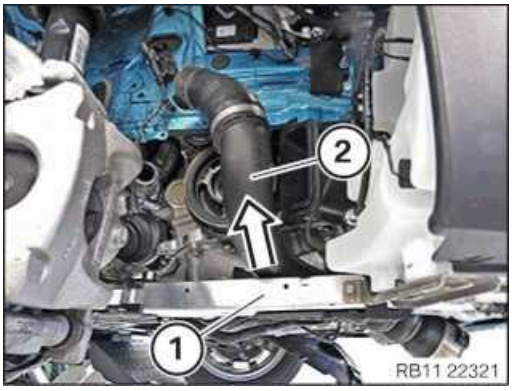
- Unlock and release the charge air duct (1) on the charge air cooler.



- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed out the charge air duct (2) in the **marked** area towards the bottom and set it aside.



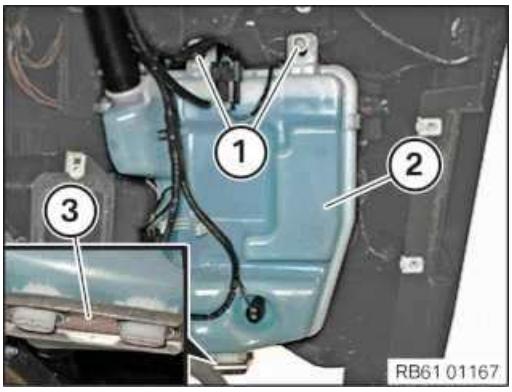
- Unlock and detach the locks (1) on both sides.
- Feed out the charge air duct (2) on the exhaust turbocharger in the direction of the arrow and set it aside.



- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed out the charge air duct (1) in the direction of arrow between the side member and the deformation element and remove.

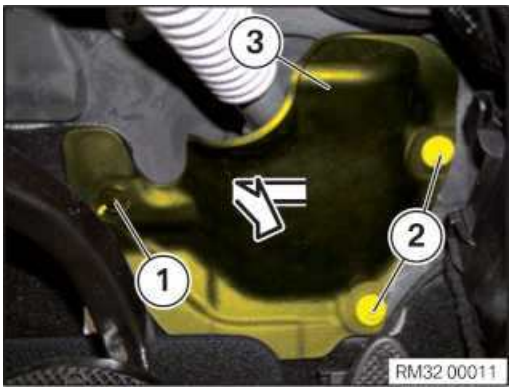
27 – Remove the washer fluid reservoir from the fixture

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- Loosen screws (1).
- Guide the washer fluid reservoir (2) up and out of the fixture (3) and set it aside.

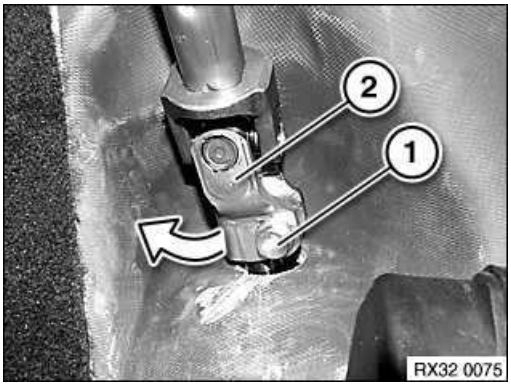
28 – Releasing lower steering shaft from steering gear



- **If installed:**
- Unfasten nut (1).
- Unscrew the nuts (2) by 1 rotation.

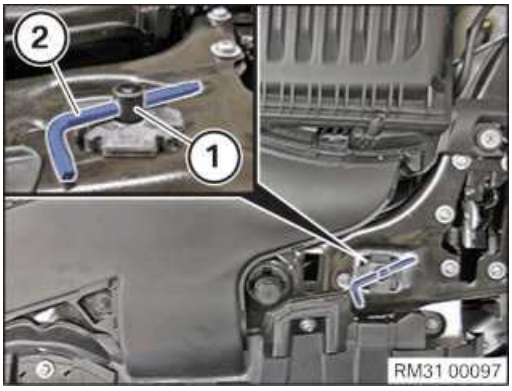
  Do not remove the nuts (2) !
- Remove the cover (3) on the steering column in the direction of the arrow.

  The side footwell trim must not be disassembled!



- Loosen screw (1).
- Swivel out the universal joint (2) of the bottom steering shaft from the steering gear in the direction of the arrow.

29 – Securing radiator on left and right



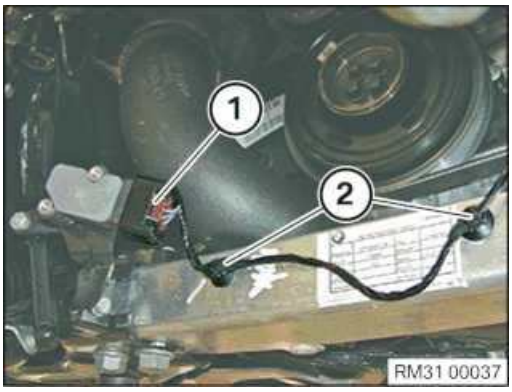
NOTICE

Perform the operations on the left and right side.

- Fasten radiator at centring pin (1) with suitable tool (2).

30 – With right installation: Detaching ride height sensor cable

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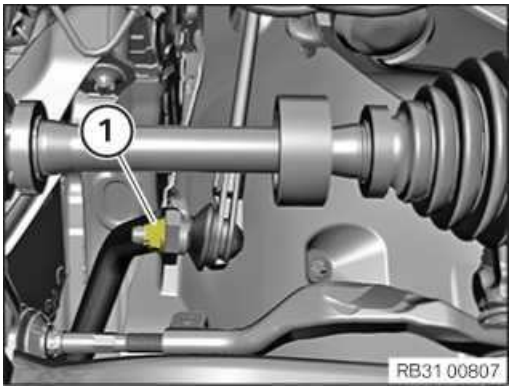
- Unlock plug connection (1) and disconnect.
- Release cable clip (2) from deformation element adapter.

31 – Releasing anti-roll bar on left and right from anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▸ **Detach the anti-roll bar from the anti-roll bar link**

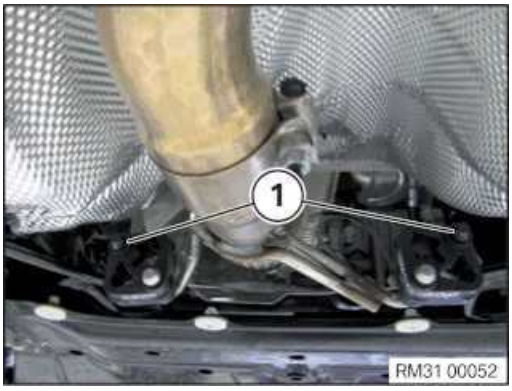


- Unfasten nut (1).

Note: Use the Torx socket for counter support.

- Loosen the anti-roll bar link from the anti-roll bar .

32 – Detaching rubber mount from front axle support

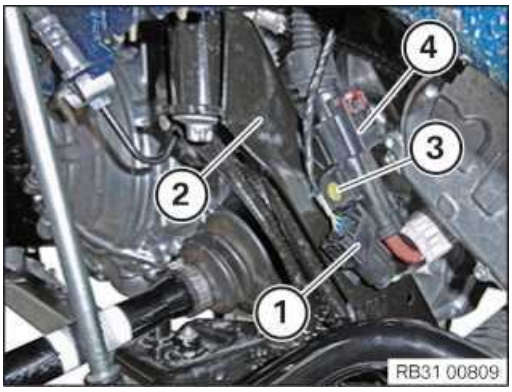


- Spray rubber mount (1) with lubricant and release from holder on front axle support.

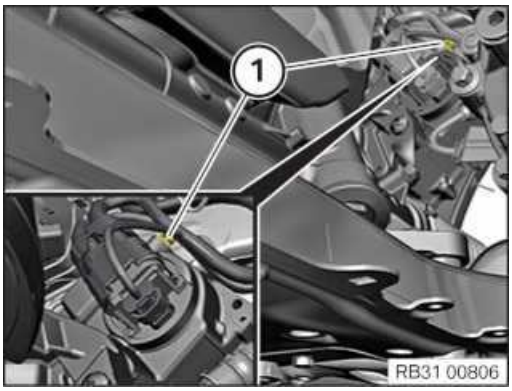
33 – Disconnecting plug connections from steering gear

▸ **If installed: Detach connectors from the front axle carrier**

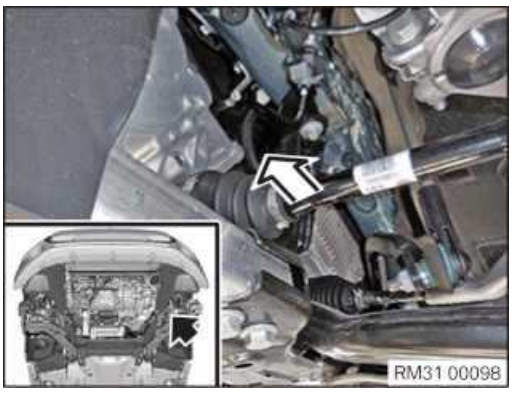
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- Release the plug connection (1) from the front axle support (2).
- Loosen screw (3).
- Release the plug connection (4) from the front axle support (2).

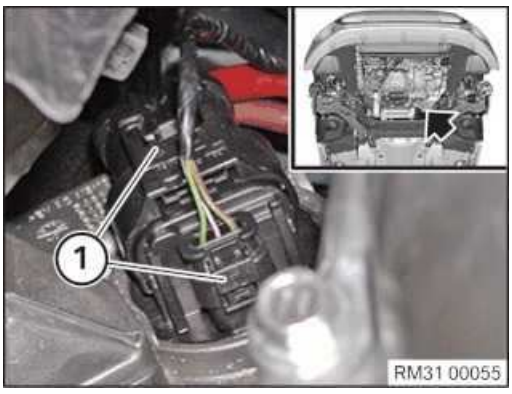


- Disconnect wiring harness (1) from steering gear.



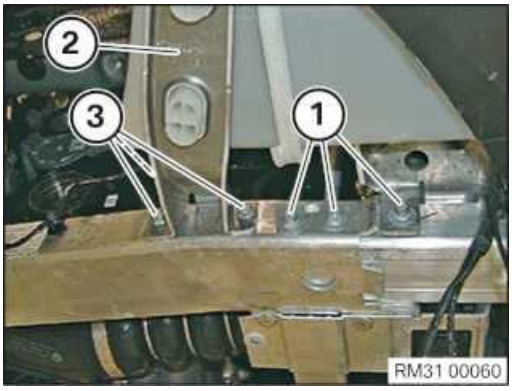
- To unlock the plug connections (see the following work step): unlock plug connections (arrow) with the right hand.

  The plug connections can be reached via the left-hand output shaft.



- Unlock plug connections (arrow) (1)and disconnect from the steering gear.
- Make sure when lowering the front axle that the cables are not damaged!

34 – Releasing the mounted part from the front axle support



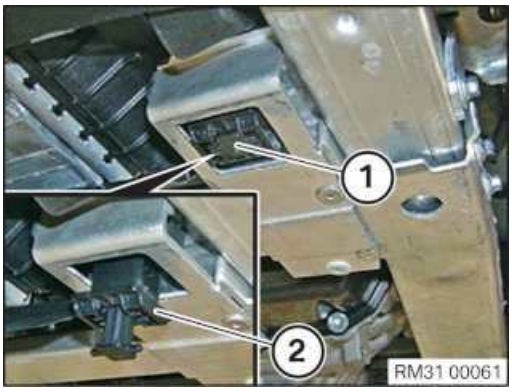
- **Only on right side:** Loosen screws (3) and remove holder for washer fluid reservoir (2).

NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

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NOTICE

Perform the operations on the left and right side.

- Unlock safety catch (1) of the lock (2) from the holder for the charge air cooler.
- Completely remove locks (2).



- Loosen screw (2) of the engine support (3) on the front axle (1).

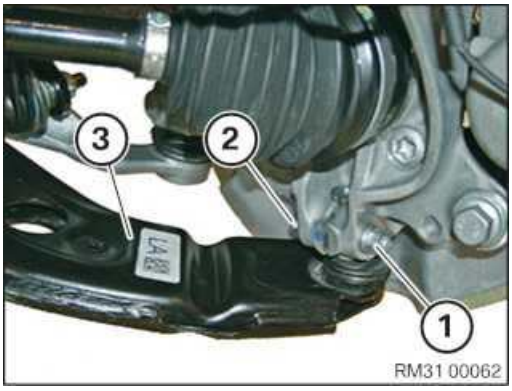


NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

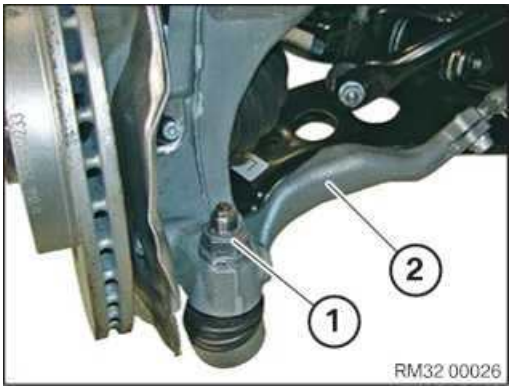
35 – Detaching and removing front axle completely



NOTICE

Perform the operations on the left and right side.

- Unfasten nut (1).
- (2)Pull out screw.
- Detach the wishbone (3) from the swivel bearing .

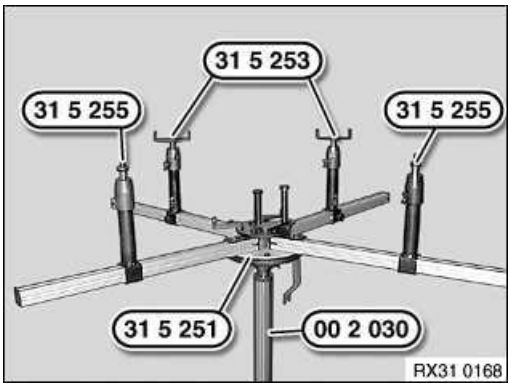


NOTICE

Perform the operations on the left and right side.

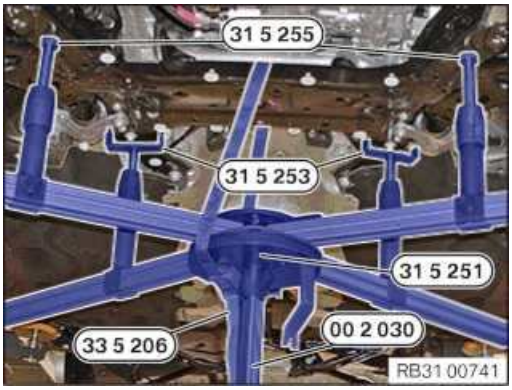
- Unfasten nut (1).
- Detach the track rod (2) from the swivel bearing.

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- Fit the special tool completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools in telescopic supports of a profile rail pair.
- Insert special tools in telescopic supports of other profile rail pair.

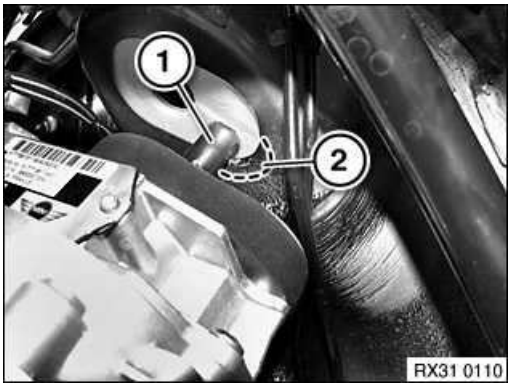
Note: In a profile rail pair, two profile rails are connected to one another by gearing.



- Align special tools and to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool to special tool .

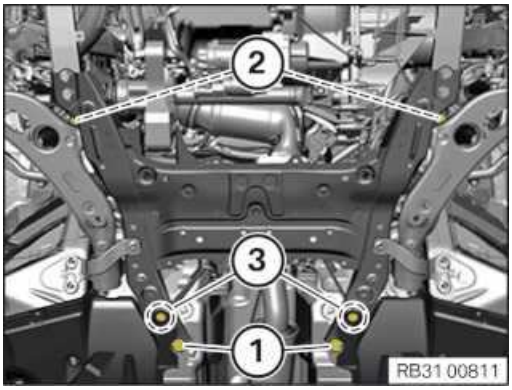


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and remove the front axle.

TECHNICAL INFORMATION

Note the information on thread repairs using Helicoil thread inserts.
For more information see: 41 00 ... Notes on repairing threads

- Check threads for damage; if necessary, repair with Helicoil thread inserts.

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and loosen connector (1).
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).



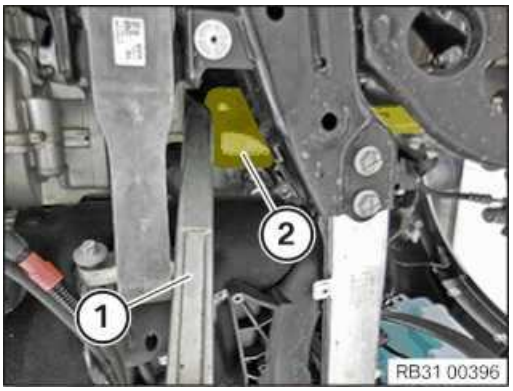
- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.

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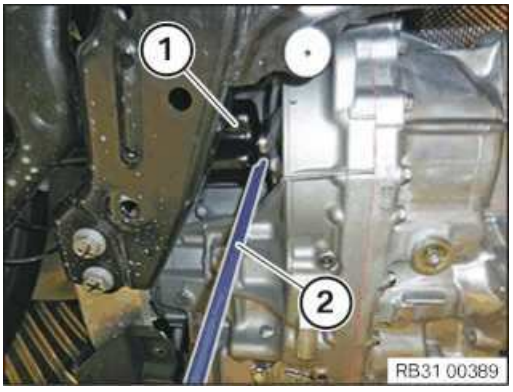
- Loosen screws (1).
- Feed out starter motor and remove.

37 – Partially removing right output shaft



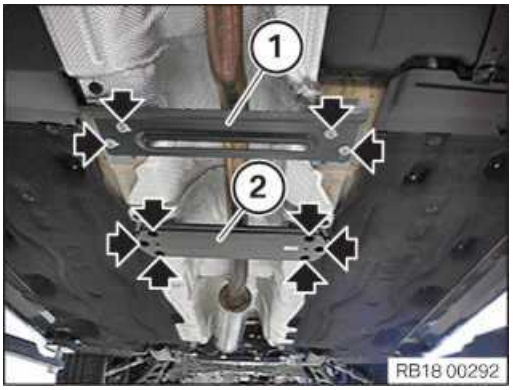
- Lever out the output shaft (2) with a mounting lever (1).
- Tie up output shaft (1).

38 – Partially removing the left output shaft



- Protect the output shaft (1) from falling.
- Lever out the output shaft (1) with a mounting lever (2) from the transmission.
- Tie up output shaft (1).

39 – Removing the connecting support from the tunnel in front and back



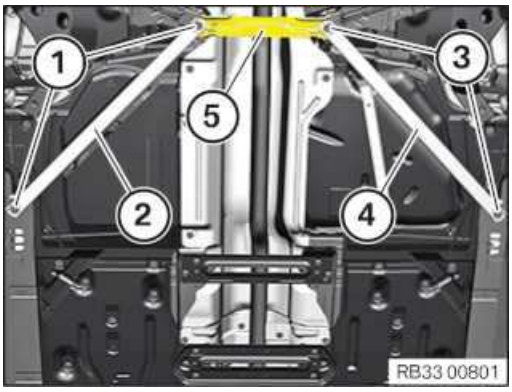
- Unscrew the bolts (arrows) from the connecting support (1).
- Feed out and remove the crossbeam (1).
- Unscrew the bolts (arrows) from the connecting support (2).
- Feed out and remove the crossbeam (2).

40 – Remove the cross strut with the torsion strut

TECHNICAL INFORMATION

Driving without a torsion strut is not permitted.

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- Loosen screws (1).
- Thread out torsion strut (2) at left and remove.
- Loosen screws (3).
- Thread out torsion strut (4) at right and remove.
- Feed out and remove the cross-member (5).

41 – Remove the exhaust temperature sensor on the catalytic converter

WARNING

Hot surfaces.

Risk of burning!

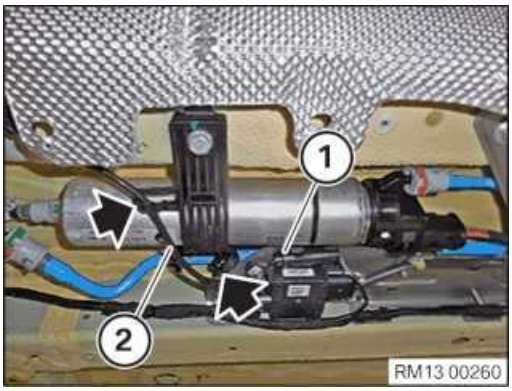
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

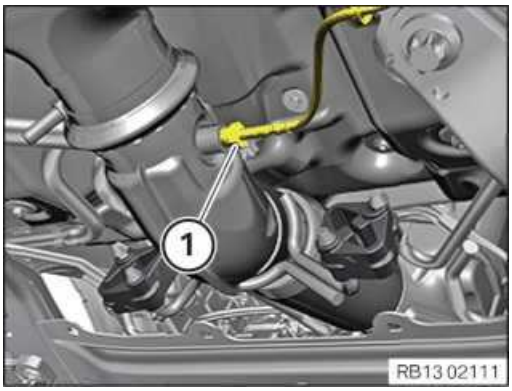


- Unlock and loosen connector (1).
- Feed out the cable (2) of the exhaust temperature sensor from the clamps (arrows) and remove.

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- Loosen the cable clip (1).



- Loosen exhaust temperature sensor (1).
- Feed out and remove exhaust temperature sensor (1).

42 – Remove exhaust system

WARNING

Hot surfaces.

Risk of burning!

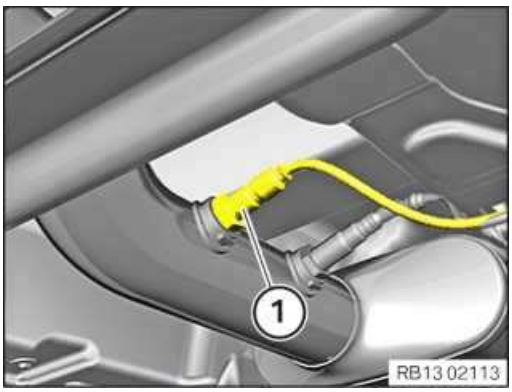
- Perform all work only on components that have cooled down.

CAUTION

Heavy component.

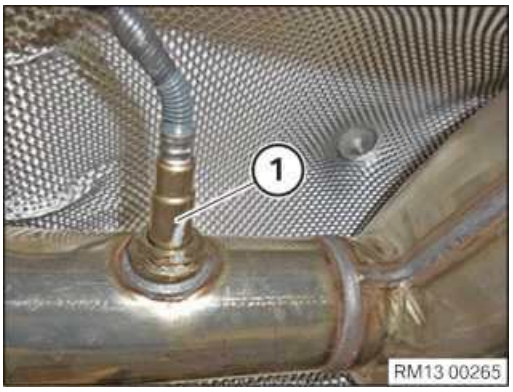
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

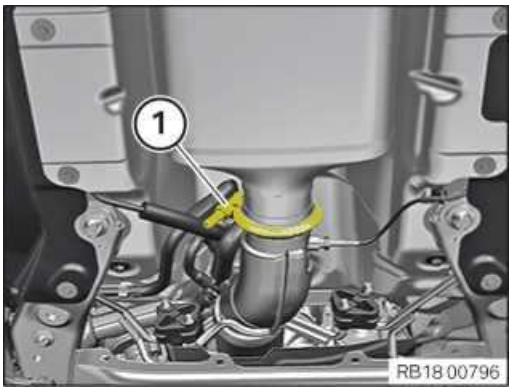


- Release the nitrogen oxide sensor (1) downstream of the SCR catalytic converter, guide it out and set it aside.

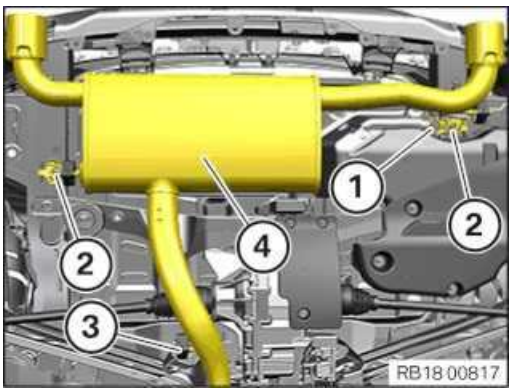
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- Release the diesel particulate sensor (1), guide it out and set it aside.



- Loosen V-band clamp (1).



- Loosen screw (1).
- Loosen nuts (2).
- Release the rubber mount (3) of the exhaust system (4).
- Lower and guide out the exhaust system (4) with assistance of a second person and remove it.

43 – Remove the SCR metering module

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

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TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

After repair work, clean the working area thoroughly with water.
Clean special tools with water after every use.

TECHNICAL INFORMATION

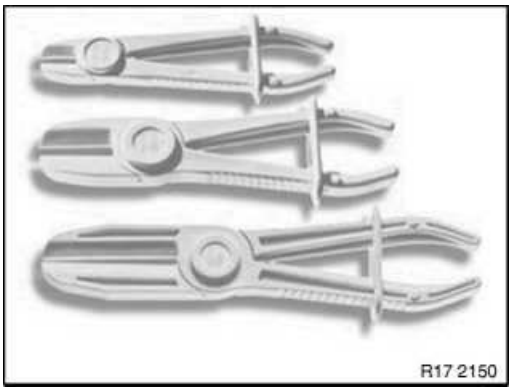
Use only lint-free cloths for cleaning the SCR system: WAYPALL cleaning cloths L20 - see BMW Group Parts.

TECHNICAL INFORMATION

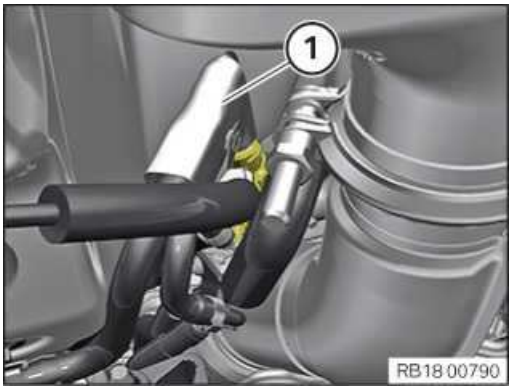
Notes on work at the cooling system form the basis of these repair instructions and must be complied with at all times.
For additional information see: 17 00 ... Instructions for repair work on cooling system

TECHNICAL INFORMATION

Do not unintentionally swap the coolant hoses and coolant lines. If necessary, mark before removal.

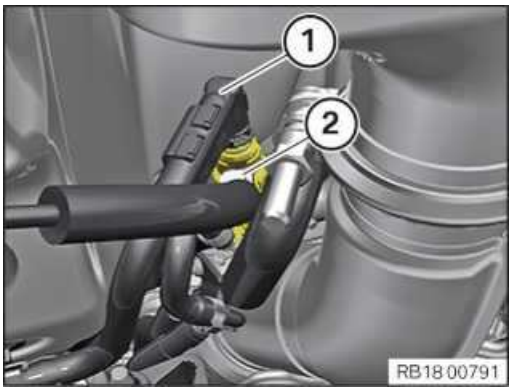


- Use commercially available pinch-off tools to pinch off the coolant hoses.



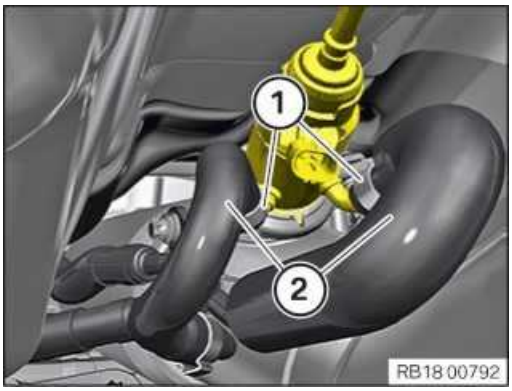
- Guide the heat protection cap (1) out and remove.

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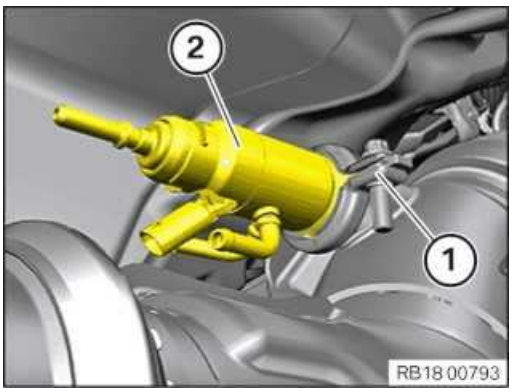


- When releasing the metering line, make sure that **no lateral forces** act on the metering line and the connection.

  The SCR metering module connection can be damaged by lateral forces.
- Unlock and disconnect the metering line (1).
- Unlock and disconnect connector (2).

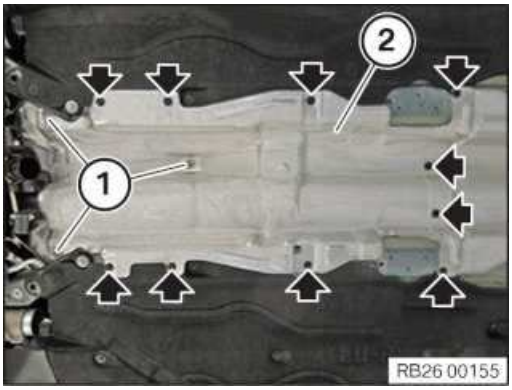


- Loosen clamps (1).
- Disconnect coolant lines (2).



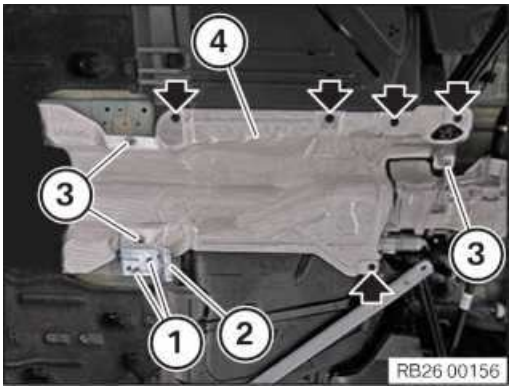
- Loosen V-band clamp (1).
- Guide out and remove the SCR metering module (2).

44 – Remove front heat shield



- Remove screws (arrows).
- Loosen nuts (1).
- Guide the heat shield (2) out and remove it.

45 – Remove heat shield at rear.



- Loosen screws (1).
- Guide out and remove holder (2).
- Remove screws (arrows).
- Loosen nuts (3).
- Guide the heat shield (4) out and remove it.

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46 – Remove propeller shaft

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

RISK OF DAMAGE

Damage to propeller shaft during removal.

Non-observance of the removal guidelines for the propeller shaft on the rear axle differential may cause severe damage.

- Do not disassemble the three-hole flange, flexible disc and propeller shaft. The three-hole flange to the rear axle differential is balanced with the flexible disc and propeller shaft.
- Loosen the recessed nut against the direction of travel in clockwise direction. The propeller shaft must be loosened on the recessed nut only and exclusively in the direction of rotation otherwise the anti-twist lock of the bi-hexagonal flange nut is damaged.
- In the event of a damaged anti-twist lock on the bi-hexagonal flange nut: Replace the rear axle differential.

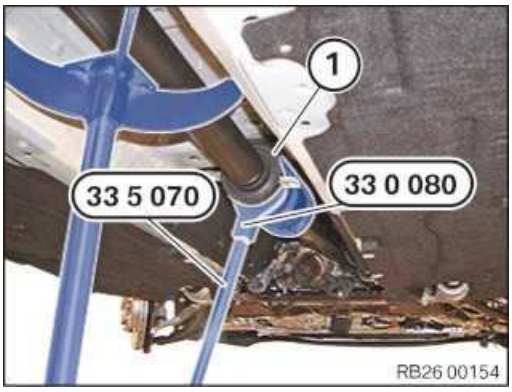


- Install the special too l between the front and rear propeller shaft.
- Make sure that the arrows on the special tool point forward in the direction of travel.

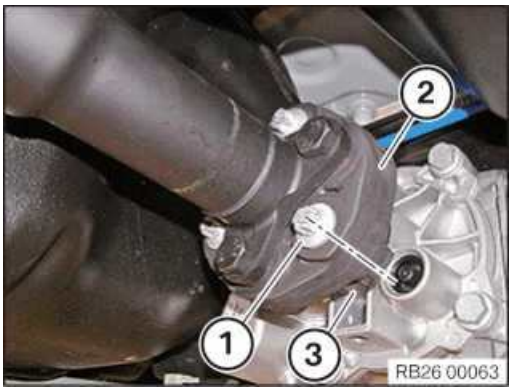


- Always support the propeller shaft (1) with a conventional jack.

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- Protect the propeller shaft (1) with the special tools **0 495 554 (33 5 070)** and from twisting.



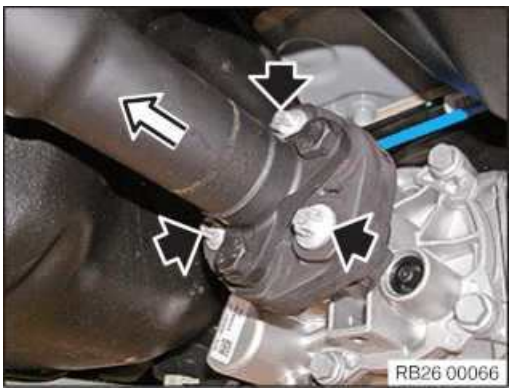
TECHNICAL INFORMATION

Compliance with the following instructions is required to avoid a humming noise from the propeller shaft after refitting the propeller shaft.

- Mark the installation position of the screw connection (1), the flexible disc (2) and the three-hole flange (3) on the same level.
- Loosen the screw connection (1).

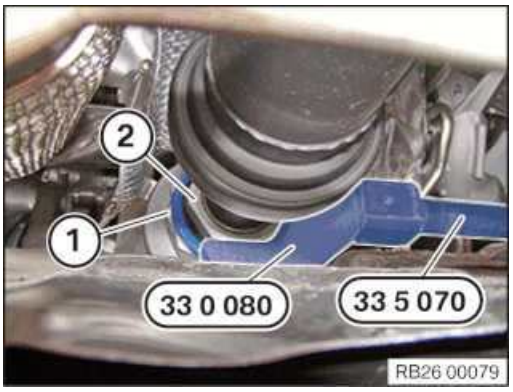


- Loosen screws (1).



- Remove screws (arrows).
- Guide the propeller shaft out in the direction of the arrow and set it aside.

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RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.

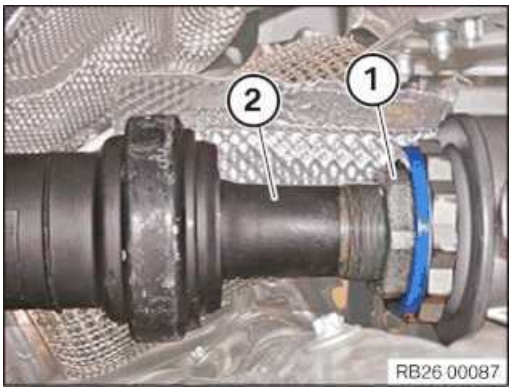
- Protect the recessed nut (2) on the transfer box from twisting with the special tools **0 495 554 (33 5 070)** and .

  The recessed nut (2) on the transfer box must **not** be used to detach the propeller shaft.

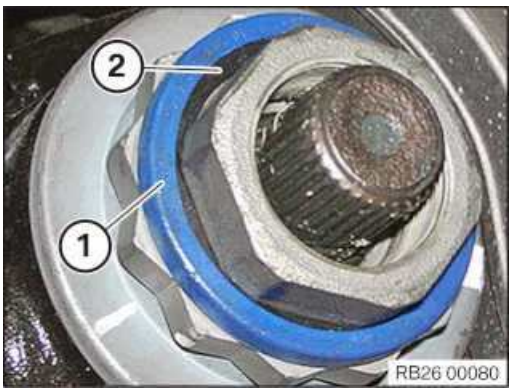
  The double hexagon flange nut (1) must **not** be used for counter support.



- Release the front propeller shaft with the special tools **0 495 554 (33 5 070)** and in the direction of the arrow.

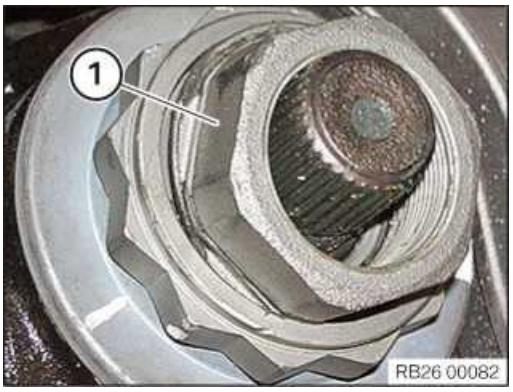


- Thread the propeller shaft (2) out of the recessed nut (1) and remove.



- Thread the retaining clip (1) and the seal (2) out and remove.

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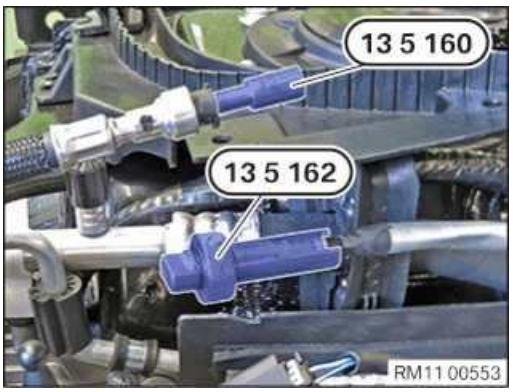
- Thread out and remove the recessed nut (1).

MAIN WORK

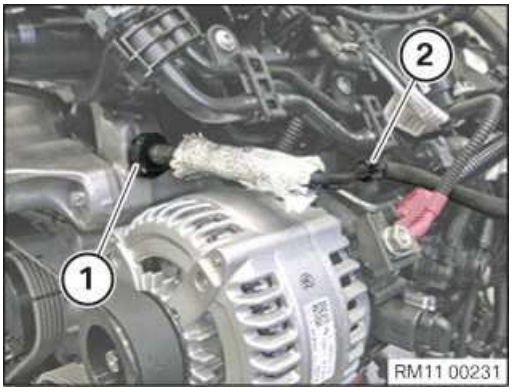
47 – Remove the engine (Automatic)



- Unlock and pull off the fuel lines (1).

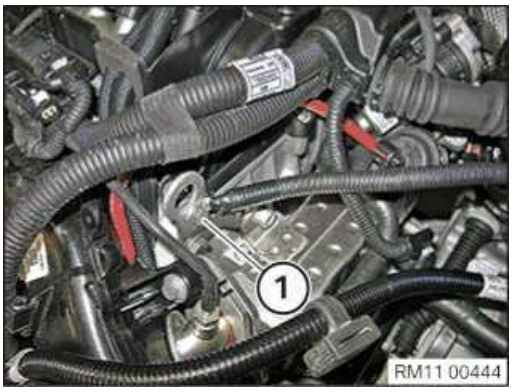


- Seal fuel lines with special tools and .

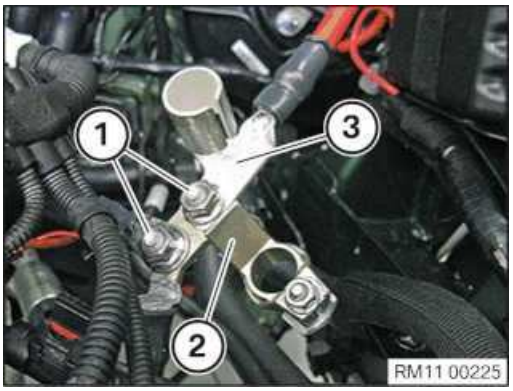


- Unlock the clamp (1).
- Pull off the coolant line (2) from the cylinder head.

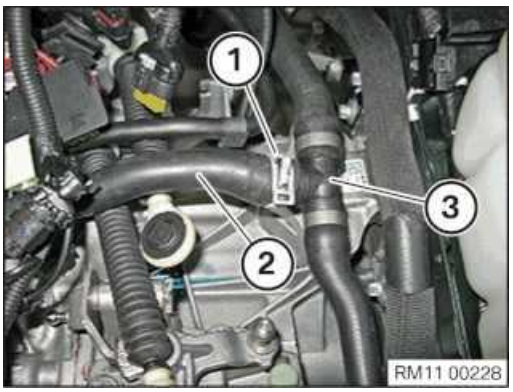
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- Unscrew the bolt (1) and set the ground strap aside.



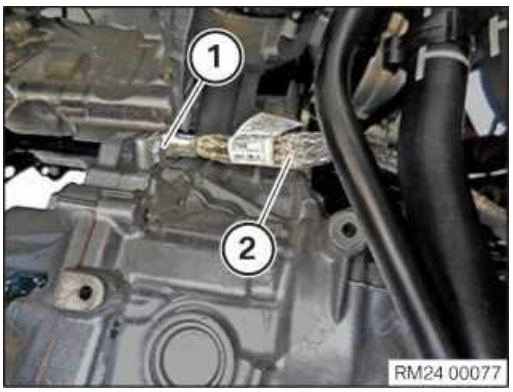
- Loosen nuts (1).
- Feed out the positive battery terminal (2) and the remote positive terminal (3) and set aside.



- Detach the clamping collar (1).
- Detach the coolant hose (2) from the coolant line (3).
- Catch and dispose of escaping coolant.

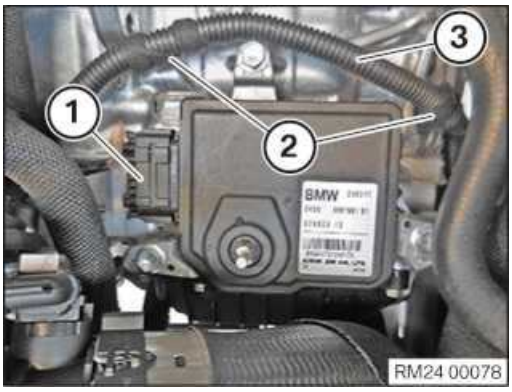


- Unlock and disconnect the vacuum line (1).

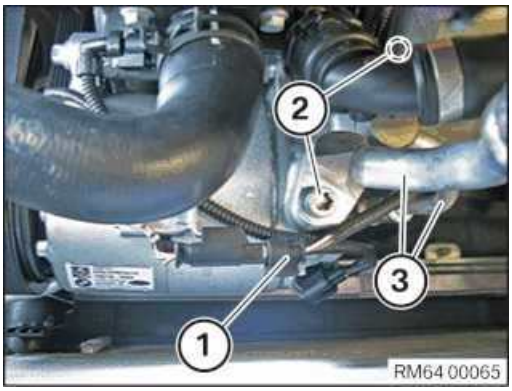


- Loosen screw (1).
- Feed out ground cable (2) and set it aside.

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- Unlock plug connection (1) and disconnect.
- Detach the clamps (2) with the wiring harness (3) from the transmission and set it aside.



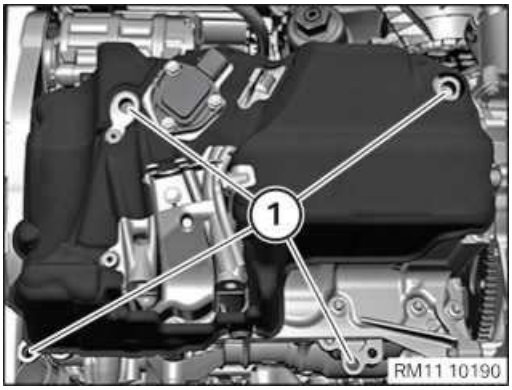
CAUTION

Residual pressure in the air conditioning.

Danger of injury!

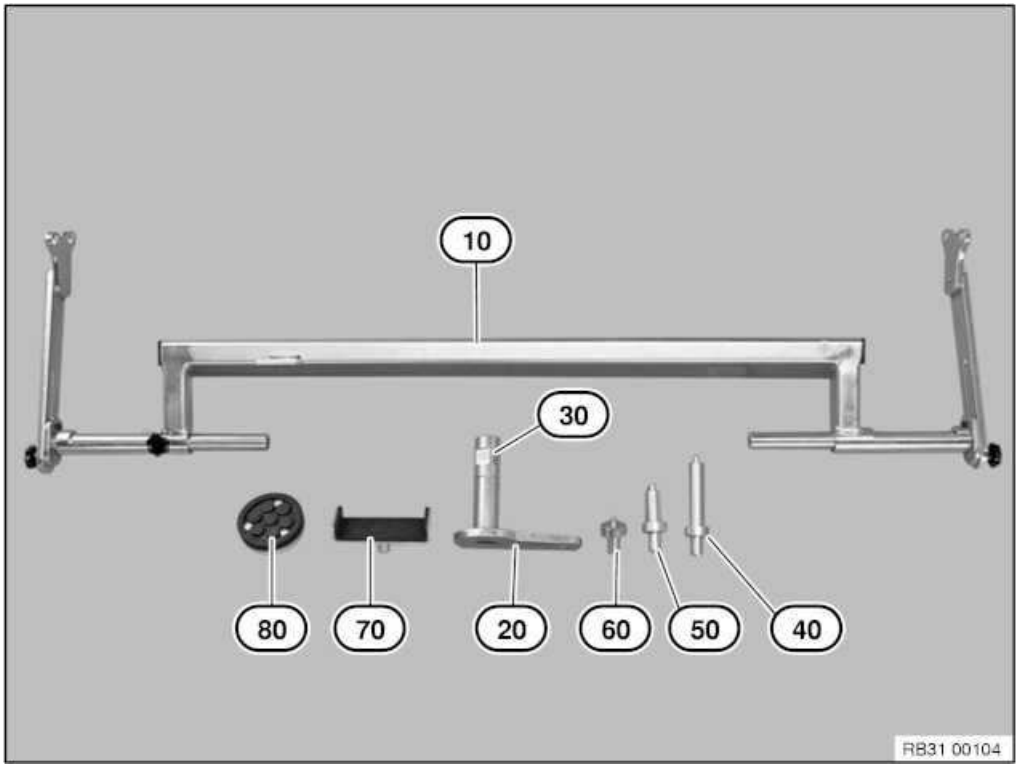
- Wear safety goggles and protective gloves when disconnecting the refrigerant line.
- Seal refrigerant lines with seal plugs.

- Unlock plug connection (1) and disconnect.
- Loosen screws (2).
- Feed out the refrigerant lines (3) and set them aside.
- Close the openings on the refrigerant lines (3) and the air conditioning compressor with standard tools.



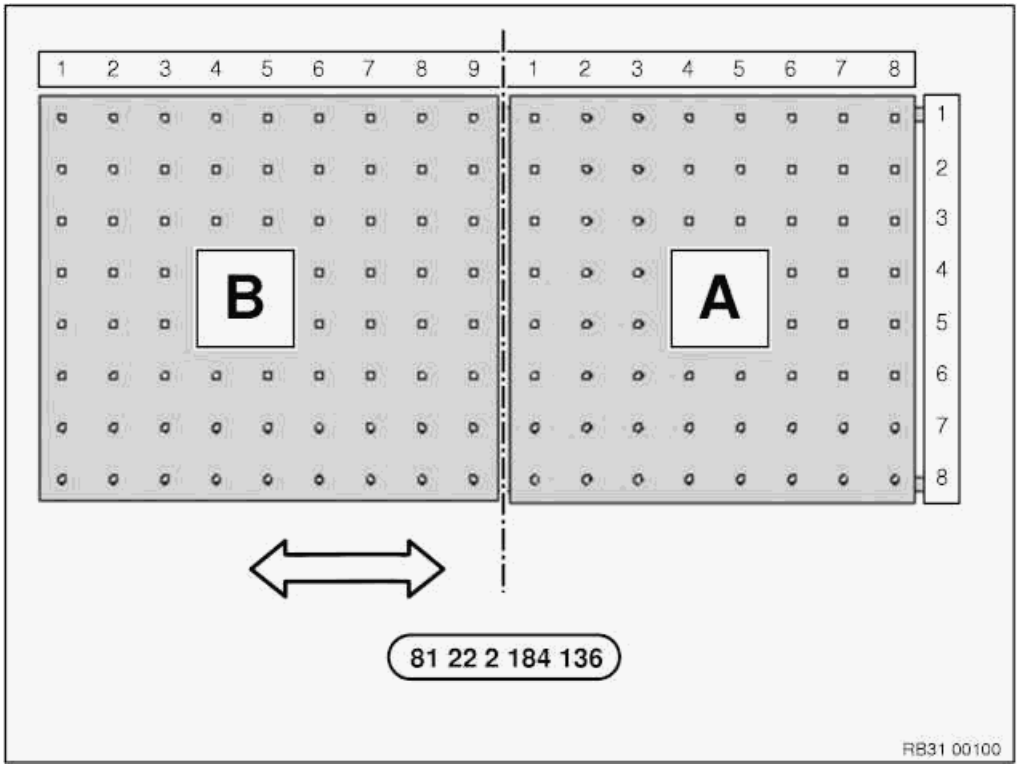
- Make sure that the spacer pins **40/50** of the table top **A** of the mobile lifting table are installed in the mounting point (1) of the oil sump.

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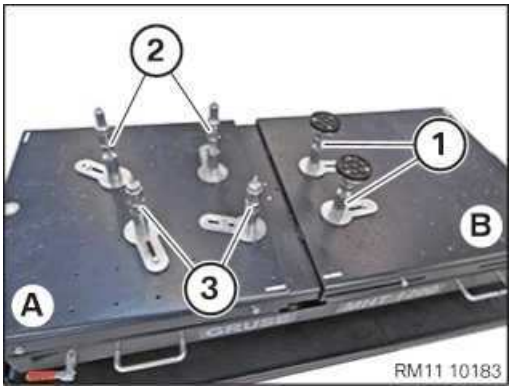
- Overview of the set of special tools **2 305 379**:

Number	Description
10	For mounting the swivel bearing including brake disc
20	Retaining element for adjustable fixture
30	Adjustable fixture
40	Distance pin 40 x 160 mm
50	Distance pin 40 x 110 mm
60	Distance pin 40 x 60 mm
70	Fixture with U-profile
80	Plate mounting 100 mm



- Overview of special tools **2 184 136**:

Letter	Description
A	Table top for engine with coordinates
B	Table top for transmission with coordinates



- Position adjustable fixture (30) with distance pin (50) for the engine block on table top (A) at coordinates **6/6** and **2/6** (2).
- Position adjustable fixture (30) with the spacer pin (50) for the engine oil sump on the table top (A) at coordinates **4/2** and **2/3**.
- Position adjustable fixture (30) with distance pin (80) for the transmission housing on table top (B) at coordinates **7/3** and **7/5** (1).

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- Position the lifting table below the engine.
- Abut all fixtures and screw them to the lifting table.



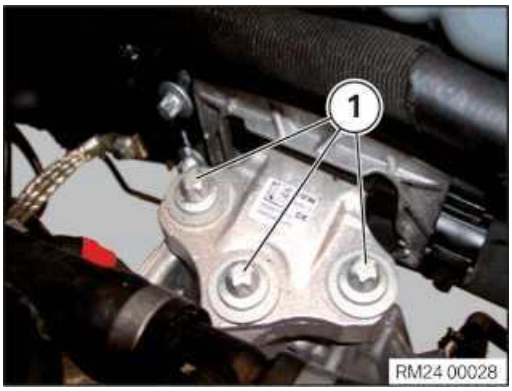
WARNING

Motor vehicle may slip off the vehicle hoist if the weight is distributed unevenly.

Danger! Life-threatening injuries!

- Ensure there is a specific weight compensation on the motor vehicle.

- Position the weight compensation (1) on the vehicle.



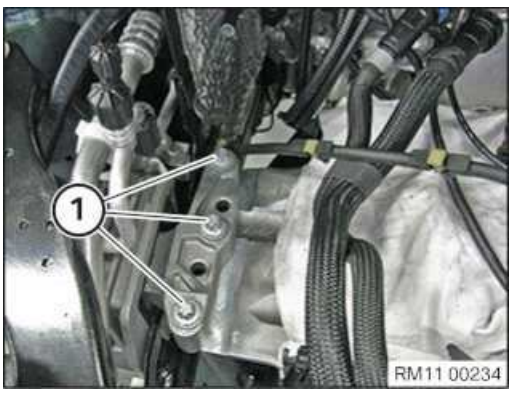
WARNING

Motor vehicle may slip off the vehicle hoist if the weight is distributed unevenly.

Danger! Life-threatening injuries!

- Ensure there is a specific weight compensation on the motor vehicle.

- Loosen screws (1).



WARNING

Vehicle may slip off the vehicle hoist if the vehicle hoist is handled incorrectly.

Danger! Life-threatening injuries!

- Observe safety information on raising the vehicle using a vehicle hoist.
- For additional information see: 00 ... Raising the vehicle using a vehicle hoist.

- Loosen screws (1).
- Raise the vehicle **carefully**.

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WARNING

Motor vehicle may slip off the vehicle hoist if the weight is distributed unevenly.

Danger! Life-threatening injuries!

- Ensure there is a specific weight compensation on the motor vehicle.

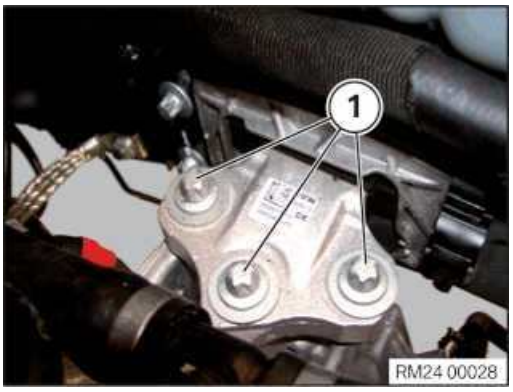
WARNING

Vehicle may slip off the vehicle hoist if the vehicle hoist is handled incorrectly.

Danger! Life-threatening injuries!

- Observe safety information on raising the vehicle using a vehicle hoist.
- For additional information see: 00 ... Raising the vehicle using a vehicle hoist.

- Position the lifting table and the engine under the vehicle.
- **Carefully** lower the vehicle and, if necessary, position the lifting table **correctly** for the vehicle.

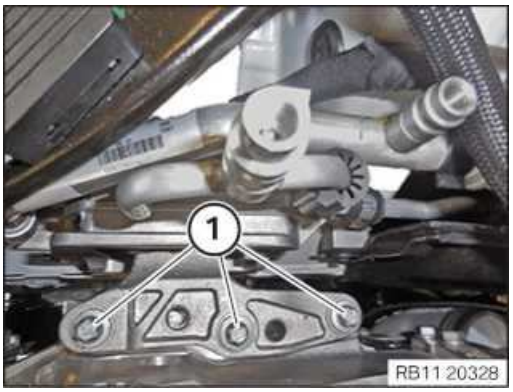


- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Transmission mounting

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °



- Renew screws (1).

  Parts: screws.
- Tighten the screws (1).

Right engine mount to cylinder head

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

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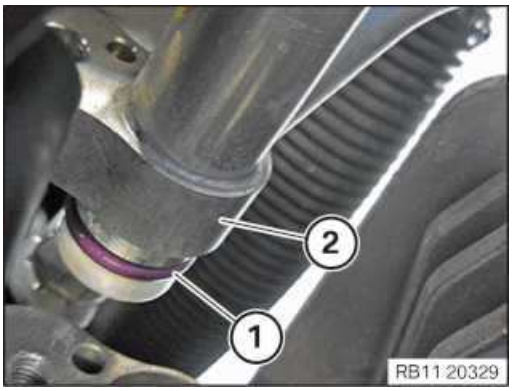
WARNING

Motor vehicle may slip off the vehicle hoist if the weight is distributed unevenly.

Danger! Life-threatening injuries!

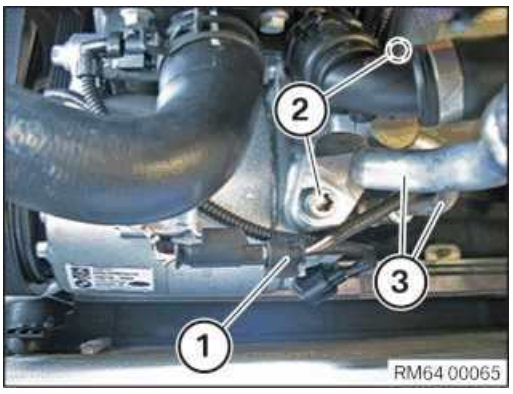
- Ensure there is a specific weight compensation on the motor vehicle.

- Remove weight compensation (1) from the vehicle.
- Lower lifting table(2) and put to one side.



- Renew sealing ring (1) of the refrigerant lines (2).

  Parts: Sealing ring

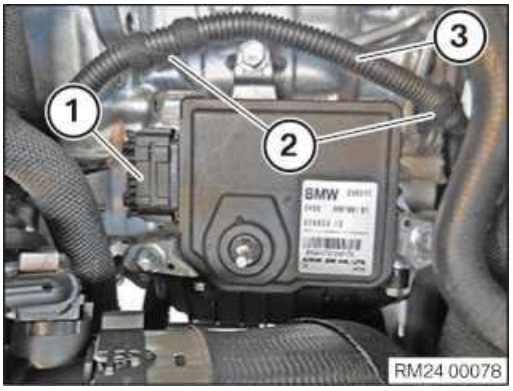


- Feed in and install the refrigerant lines (3).
- Tighten down screws (2).

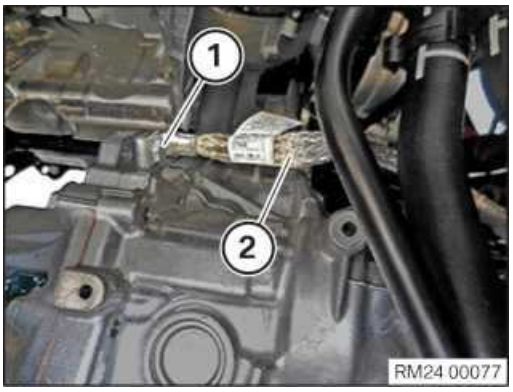
Refrigerant line on air conditioning compressor

M8		Tightening torque	19 Nm

- Connect connectors (1) and lock.
- Make sure the connector (1) engages audibly.



- Position wiring harness (3) and secure to the gearbox using clamps (2) .
- Connect the connector (1) and audibly lock it.



- Insert ground strap (2) and tighten screw (1) .

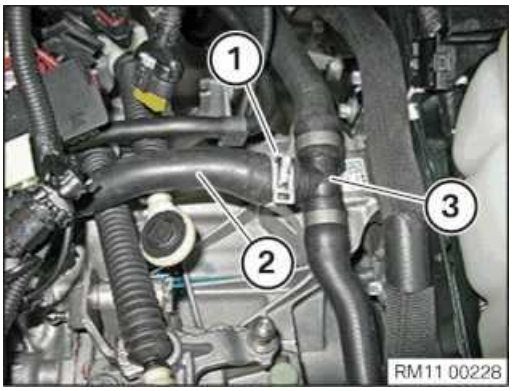
Standard screw connection M8

M8		Tightening torque	19 Nm

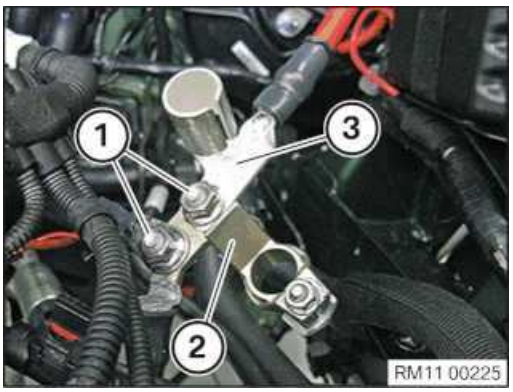
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- Connect the vacuum line (1) and lock.
- Make sure you can hear the vacuum line (1) engage.



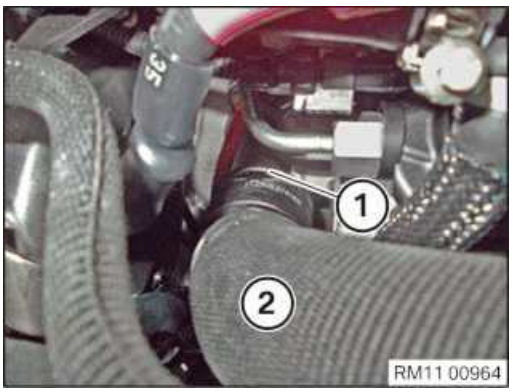
- Insert and install the coolant hose (2) on the coolant line (3).
- Fasten the clamping collar (1).



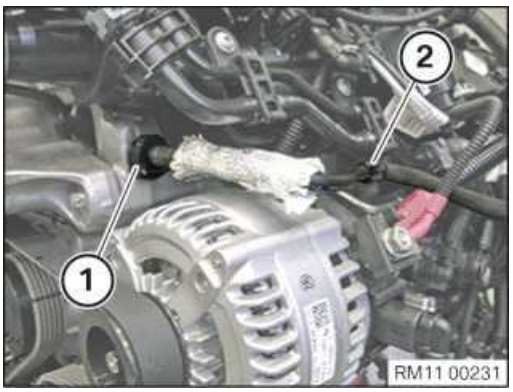
- Insert and install the positive battery terminal (2) and the remote positive terminal (3).
- Tighten nuts (1).

Positive battery cable to positive battery terminal

M8		Tightening torque	15 Nm

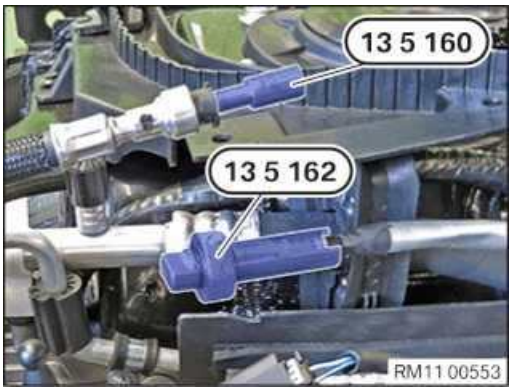


- Connect and lock the coolant lines (2).
- Ensure that the lock (1)engages audibly.



- Connect the coolant line (2).
- Lock clamp (1).

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- Thread out special tools and and remove.



- Route and connect fuel lines (1).
- Ensure that the locks engage audibly.

POSTPROCESSES

49 – Install propeller shaft.

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

RISK OF DAMAGE

Damage to the propeller shaft during installation.

Non-observance of the installation guidelines for the propeller shaft on the rear axle differential may cause severe damage.

- Always renew the recessed nut on the rear axle differential. Screw locking must be available.
- Strictly observe a minimum hardening time of two hours after having screwed in the recessed nut. The hardening time may be longer at lower temperatures.

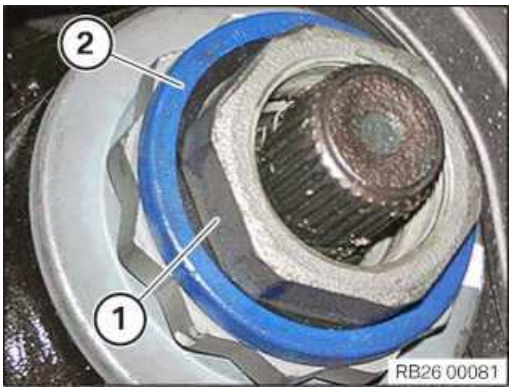
RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.

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- Renew recessed nut (1).

  Parts: Insert nut
- Renew the retaining clip (2) and the seal.

  Parts: Retaining clip, seal
- Insert the seal with the recessed nut (1) and install.
- Insert the retaining clip (2) and install.
- Make sure that recessed nut (1) is screwed in within 5 min.
- Make sure that the hardening time of **minimum** 2 h for the recessed nut is observed.

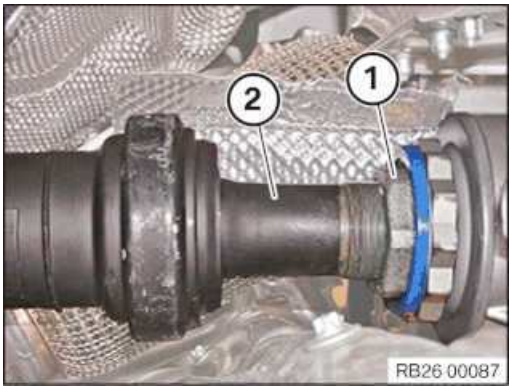
  The hardening time must be extended at lower temperatures.



- Insert the propeller shaft (1) and install.
- Always support the propeller shaft (1) with a conventional jack.

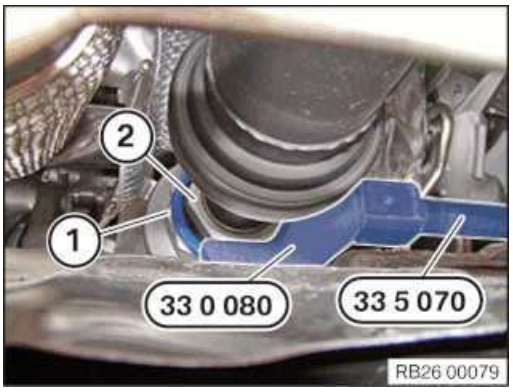


- Hand-tighten the bolts (1).



- Push the propeller shaft (2) against the recessed nut (1) up to the limit position.
- Screw the propeller shaft (2) at least 2 thread starts onto the recessed nut (1) by hand.

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RISK OF DAMAGE

Damage to the transfer box.

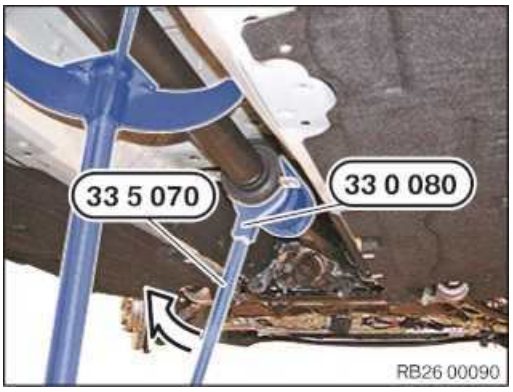
Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.

- Protect the recessed nut (2) on the transfer box from twisting with the special tools **0 495 554 (33 5 070)** and .

  The recessed nut (2) on the transfer box must **not** be used to tighten the propeller shaft.

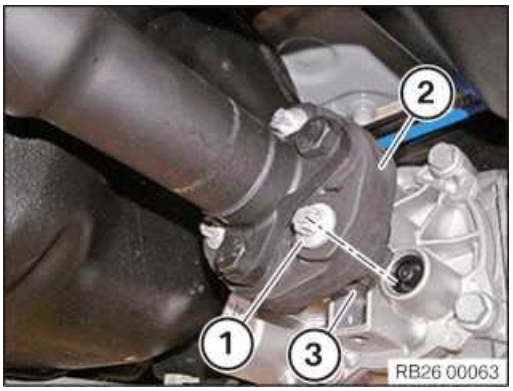
  The double hexagon flange nut (1) must **not** be used for counter support.



- Tighten the front propeller shaft with the special tools **0 495 554 (33 5 070)** and in the direction of the arrow.

Propeller shaft to transfer box

		Tightening torque	80 Nm

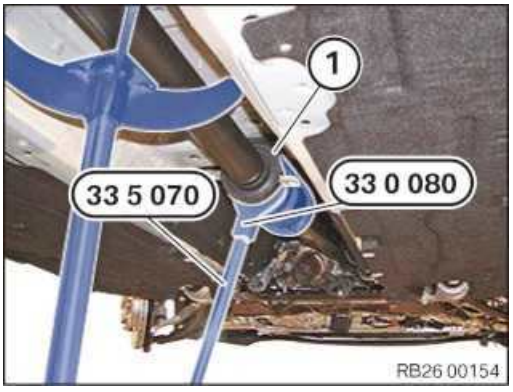


TECHNICAL INFORMATION

Compliance with the following instructions is required to avoid a humming noise from the propeller shaft after refitting the propeller shaft.

- Assemble the screw connection (1) of the flexible disc (2) and the three-hole flange (3) according to the mark.
- Renew screws (1).

  Parts: Bolts
- Hand-tighten the bolts (1).



- Protect the propeller shaft (1) with the special tools **0 495 554 (33 5 070)** and from twisting.

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- Tighten the bolts with the special tools **0 490 504 (00 9 120)** and .

Flexible disc to rear axle final drive

M12x1.5	Renew screws.	Tightening torque	55 Nm 90 °



- Tighten the screws (1).

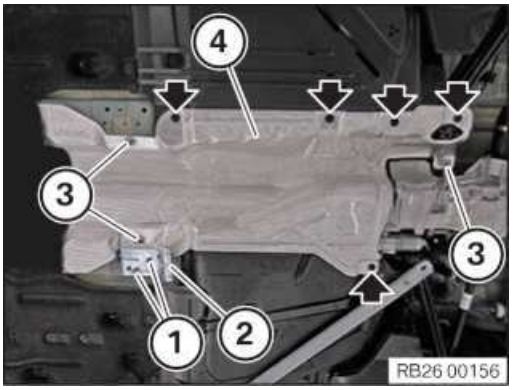
Centre mount to body

M8		Tightening torque	19 Nm



- Guide the special too l out between the front and rear propeller shaft and remove.

50 – Installing the rear heat shield



- Insert and install the heat shield (4).
- Tighten screws (arrows).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

- Tighten nuts (3).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

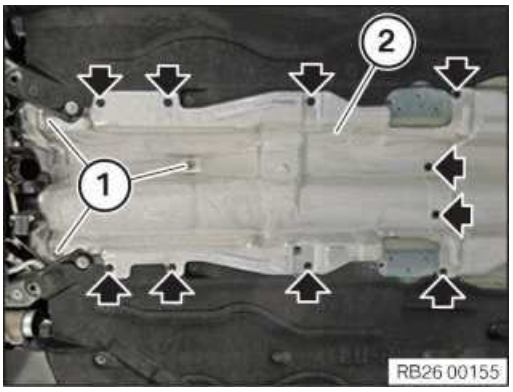
- Insert and install the holder (2).
- Tighten the screws (1).

Bracket to body

M8		Tightening torque	21 Nm

51 – Install the front heat shield

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- Insert and install the heat shield (2).
- Tighten screws (arrows).

Heat shield to body

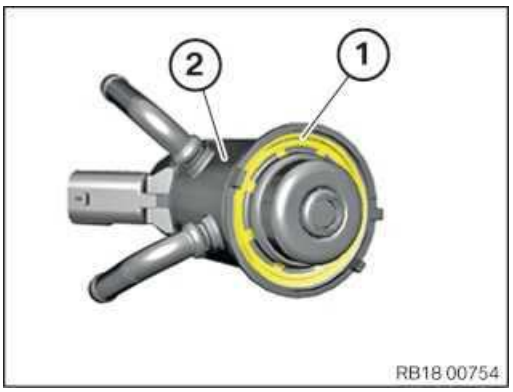
Bolts/nut		Tightening torque	3 Nm

- Tighten nuts (1).

Heat shield to body

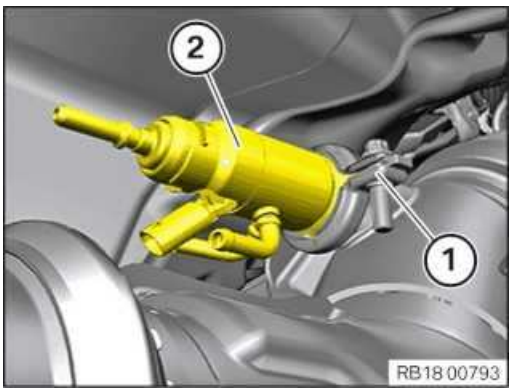
Bolts/nut		Tightening torque	3 Nm

52 – Install the SCR metering module



- Renew the seal (1) of the SCR metering module (2).

  Parts: Sealing ring

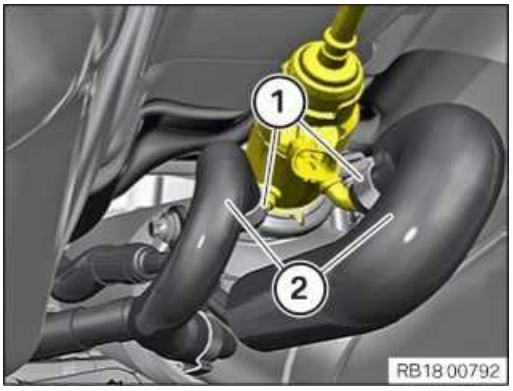


- Insert and install the SCR metering module (2).
- Renew the V-clip (1).

  Parts: V-band clamp
- Tighten V-band clamp (1).

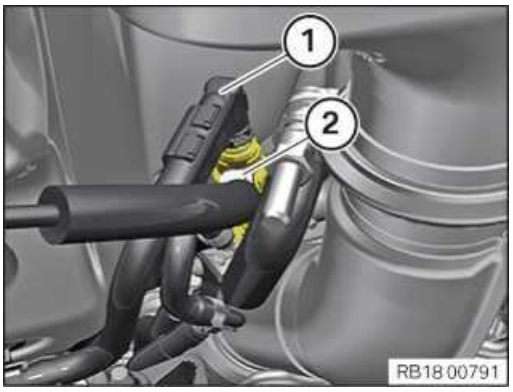
SCR metering module V-clip to exhaust system

V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm



- Connect the coolant lines (2).
- Renew the clamps (1).

  Parts: Clamps
- Fasten the clamps (1).

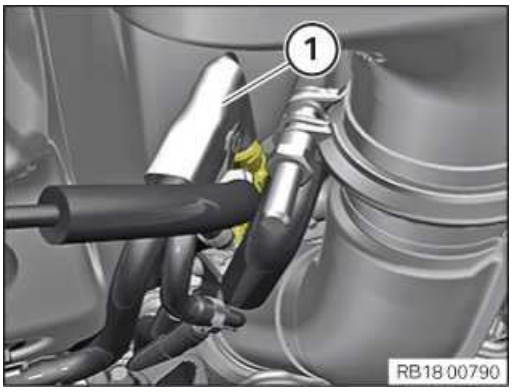


- Connect connectors (2) and lock.

  The connector (2) must engage audibly.
- Connect and lock the metering line (1).

  Metering line (1) must engage audibly.

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- Insert and install the heat protection cap (1).

53 – Install exhaust system

CAUTION

Component with heavy weight.

Danger of injury!

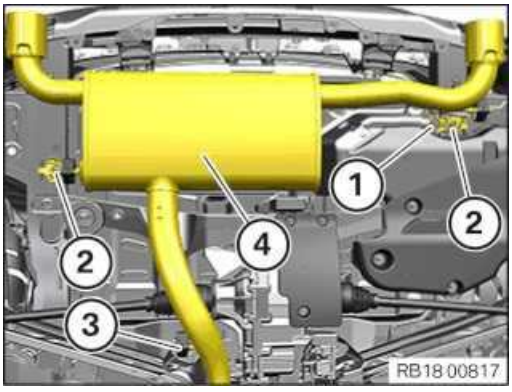
- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Feed in and install the exhaust system (4) with a second person.
- Renew nuts (2).

  Parts: Nuts
- Tighten nuts (2).

Exhaust system to body

M8	Replace nuts.	Tightening torque	19 Nm

- Tighten down screw (1).

Exhaust bracket on body

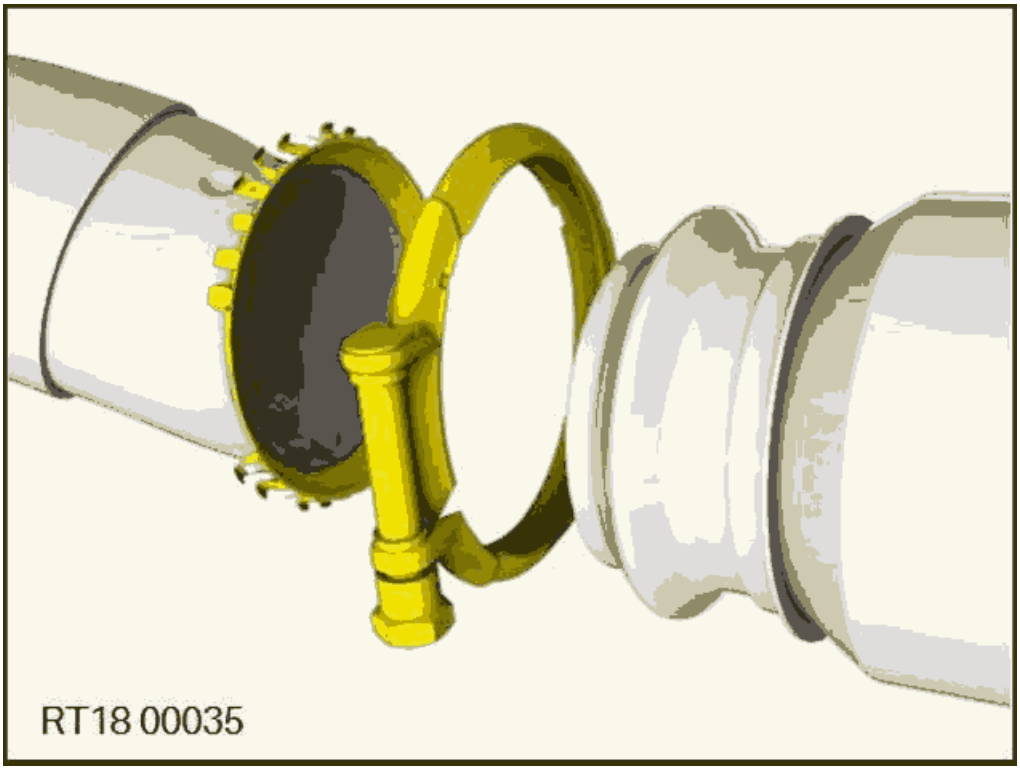
Hexagon screw M8x30		Tightening torque	19 Nm

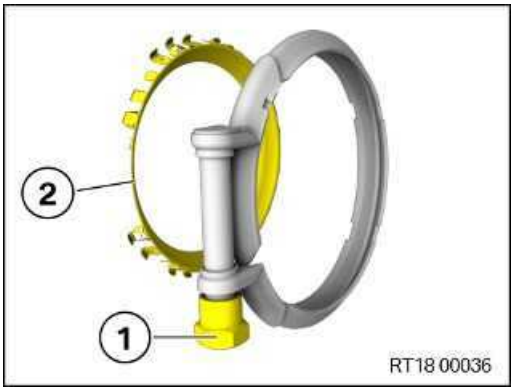
- Check the rubber mount (3) for damage and renew as needed.
- Mount rubber mount (3) on the exhaust system (4).

▸ **Install the V-clip**

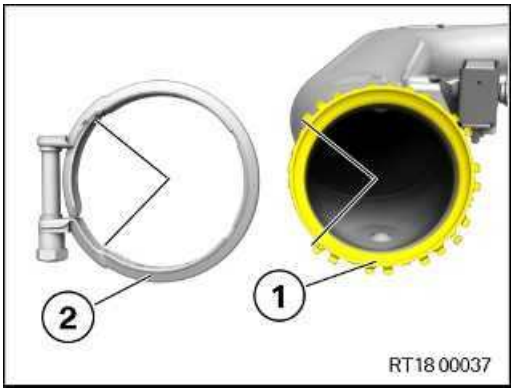
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V-band clamp



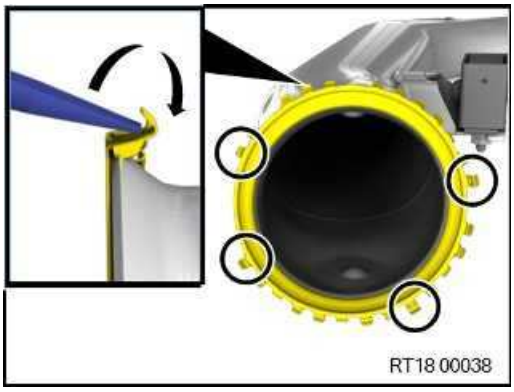


- Unscrew the nut (1) and remove the sealing ring (2).



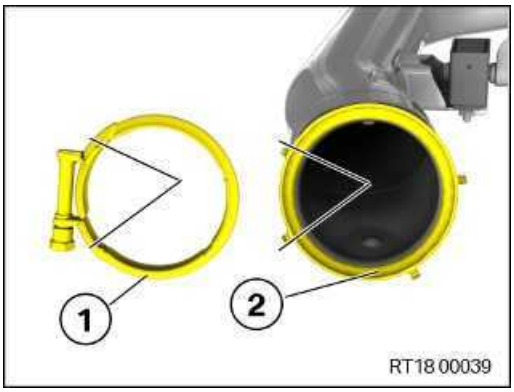
- Renew the V-clip (2).

  Parts: V-band clamp
- Mount the sealing ring (1) on the exhaust system.
- Ensure that the sealing ring (1) for the V-clip (2) is positioned correctly.



- Bend all sheet metal tabs over with a suitable tool, except those in the marked areas.

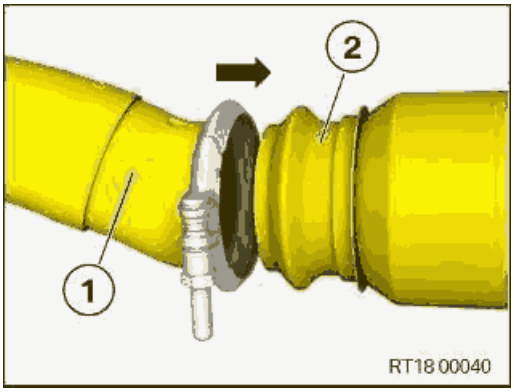
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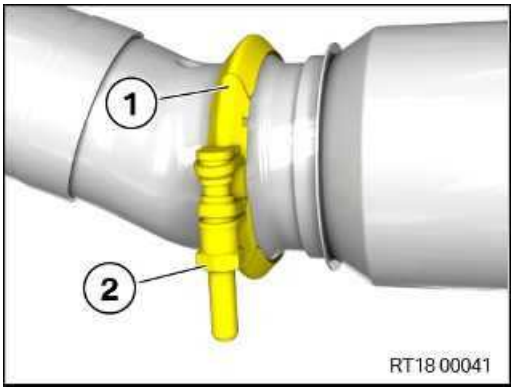
- Mount the V-clip (1) on the sealing ring (2).
- Make sure that the V-clip (1) is positioned correctly on the sealing ring (2).



- Make sure that the V-clip rests against the sheet metal tabs after mounting (marks).



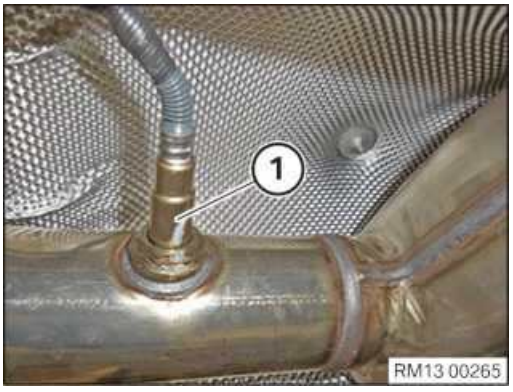
- Connect the exhaust system (1) with the catalytic converter (2) and position correctly.



- Make sure that V-clip (1) is fitted correctly.
- Tighten down screw (2).

V-clip to catalytic converter

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

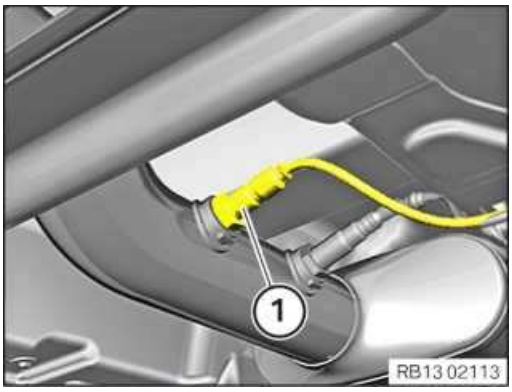


- Feed in, install and tighten diesel particulate sensor (1).

Diesel particulate sensor to exhaust system

Sensor		Tightening torque	50 Nm

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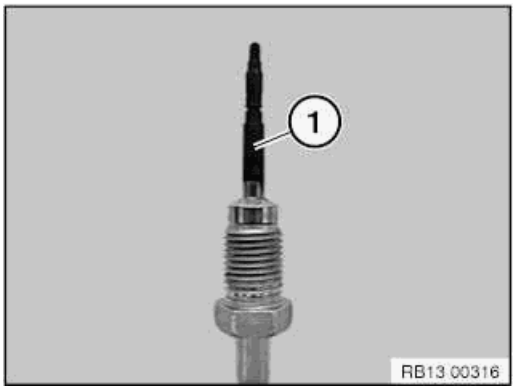


- Feed in, install and tighten nitrogen oxide sensor (1).

Nitrogen oxide sensor downstream of SCR catalytic converter

Sensor		Tightening torque	50 Nm

54 – Installing exhaust temperature sensor on catalytic converter

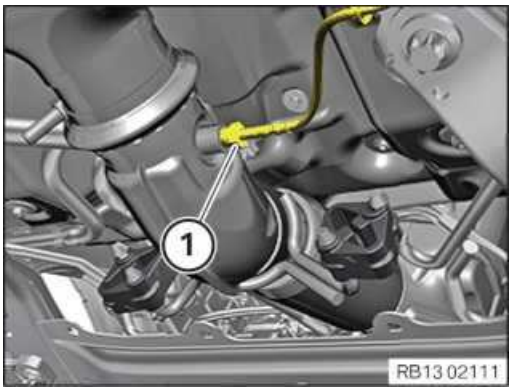


RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.
- Check the gauge tip (1) for damage and replace the exhaust temperature sensor as needed.



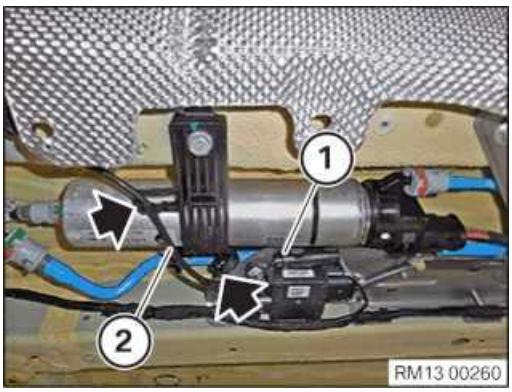
- Feed in and install the exhaust temperature sensor (1).
- Tighten the exhaust temperature sensor (1).

Exhaust-gas temperature sensor to exhaust system

Exhaust-gas temperature sensor		Tightening torque	28 Nm



- Secure the cable clips (1).

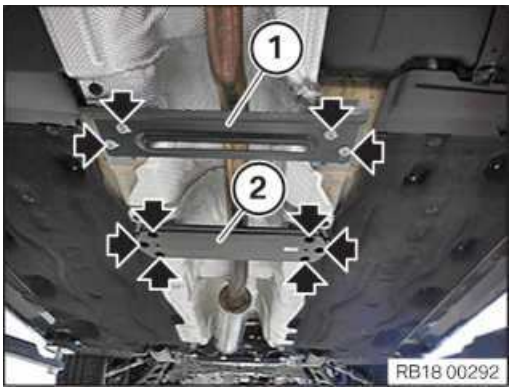


- Feed cable (2) from exhaust temperature sensor into the clamps (arrows) and install.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

55 – Install the connecting support on the tunnel in front and back

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- Insert and install connecting supports (2).
- Tighten the screws (arrows) from the connecting support (2).

Front connection carrier to body

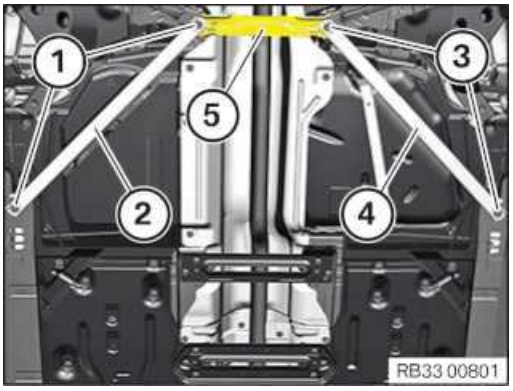
M10x18		Tightening torque	56 Nm

- Insert and install connecting supports (1).
- Tighten the screws (arrows) from the connecting support (1).

Rear connection carrier to body

M8x18		Tightening torque	28 Nm

56 – Install the cross-member with torsion struts



- Insert and install the cross-member (5).
- Thread in torsion strut (4) at right and install.
- Renew screws (3).

  Parts: Bolts
- Tighten down screws (3).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

- Guide in and install the left torsion strut (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

57 – Installing right output shaft partially



- Renew the circlip (1).

  Parts: Circlip
- Slide output shaft into the transmission as far as the limit position.
- Check for secure seat by levering.

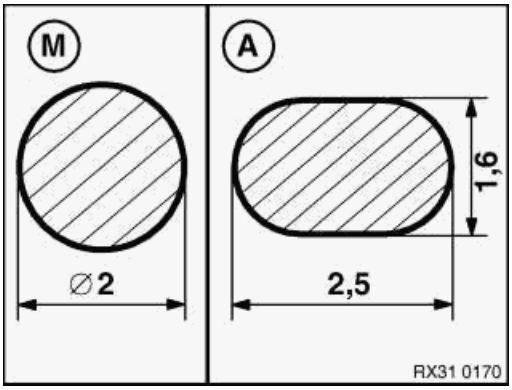
58 – Partially installing the left output shaft

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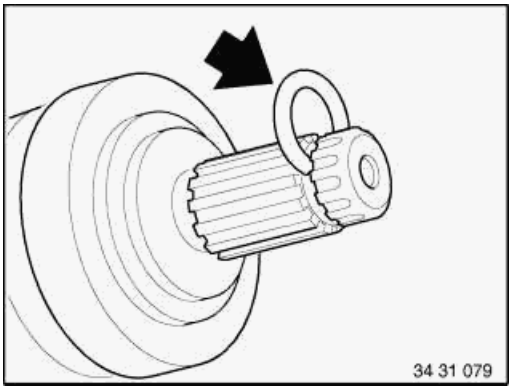
- **With automatic transmission only:**
- Lever out O-ring (1).
- Renew O-ring (1).

  Parts: O-ring
- Insert new O-ring (1).

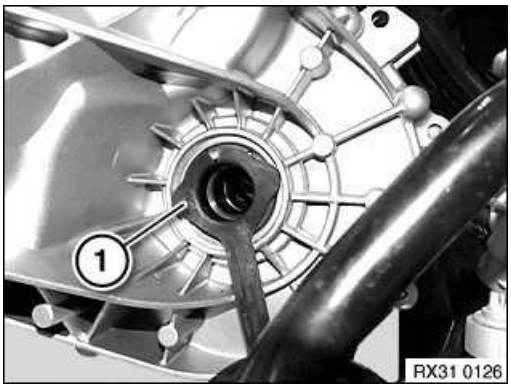


- Do not mix up circlips.

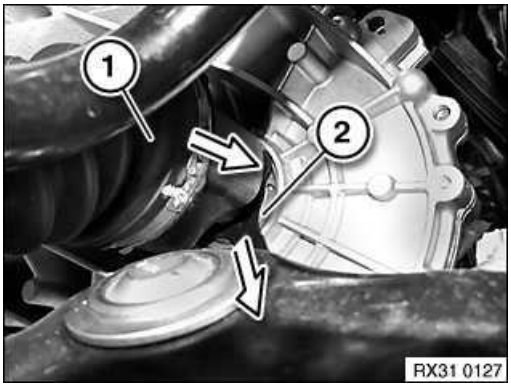
  Different types of output shafts fitted:
  - M: Manual transmission
  - A: Automatic transmission



- Renew circlip (arrow).



- Insert installation protection ring (1) into the radial shaft seal.
- Make sure the tool fits over the lip of the radial shaft seal so there is no damage to sealing ring when the output shaft is inserted.



- Insert output shaft (1) into transmission.
- **Manual gearbox only:** Pull on the handle to remove the installation protection ring (2) and dispose of it.
- Slide output shaft (1) into the transmission as far as the limit position.

  The output shaft (1) must engage audibly.
- Check for secure seat by levering.

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CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.



- Insert and install the starter motor .
- Tighten the screws (1).

Starter motor to transmission

M8x45		Tightening torque	19 Nm



- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

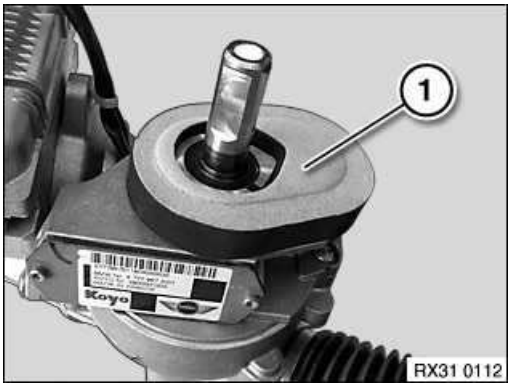
Battery positive lead to starter

M8		Tightening torque	13,5 Nm



- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.

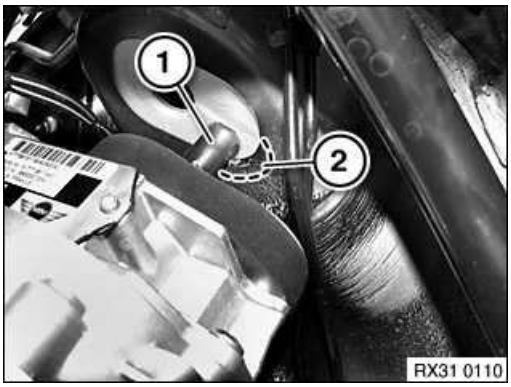
60 – Mount and secure the complete front axle



- Remove the seal (1).
- Clean surface on steering gear.
- Renew gasket (1).

  Parts: Gasket
- Position the seal (1) and glue it on.

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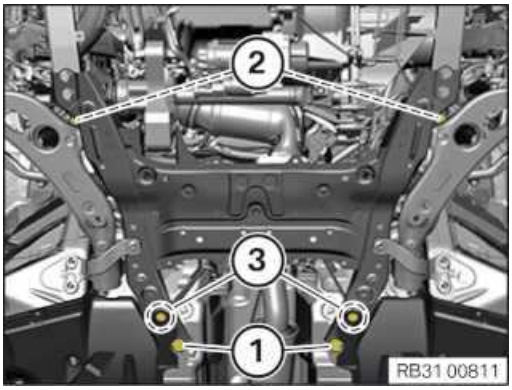


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- Position front axle support.
- Bend underbody panellings in the areas (3) to one side.
- Raise front axle support.
- When raising, insert charge air cooler into the rubber mount of the charge air cooler on cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

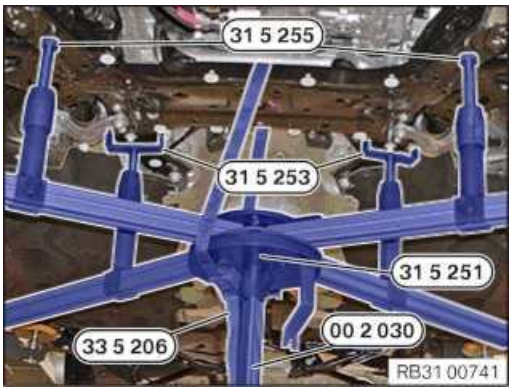
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

- If necessary, tighten the screws in the areas (3).

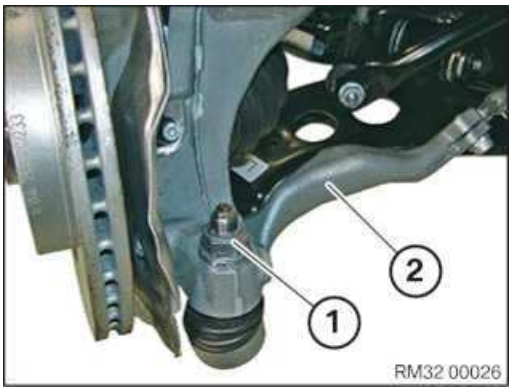
Underbody protection to body

Screw		Tightening torque	3 Nm



- Remove special tool from special tool .
- Lower universal jack **0 490 133 (00 2 030)** with the special tool and place it to the side.

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NOTICE

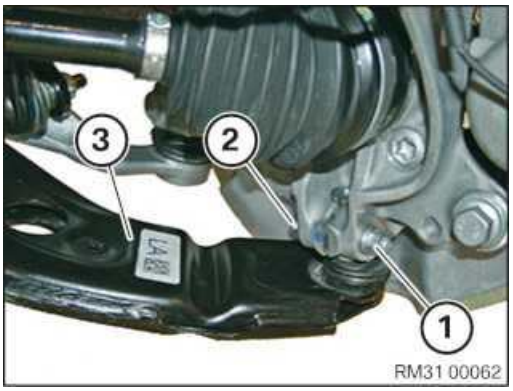
Perform the operations on the left and right side.

- Position the track rod (2) on the swivel bearing .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Track rod end to swivel bearing

M14	Renew nut.	Tightening torque	175 Nm



NOTICE

Perform the operations on the left and right side.

- Position the wishbone (3) on the swivel bearing .
- Renew the bolt (2) and the nut (1).

  Parts: Bolt, nut
- Insert screw (2).
- Tighten nut (1).

Wishbone to swivel bearing

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

61 – Install the mounted parts on the front axle support



NOTICE

Perform the operations on the left and right side.

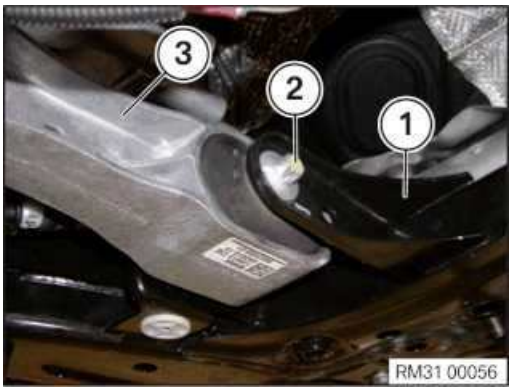
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Holder, wishbone rubber mount, to body

M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °

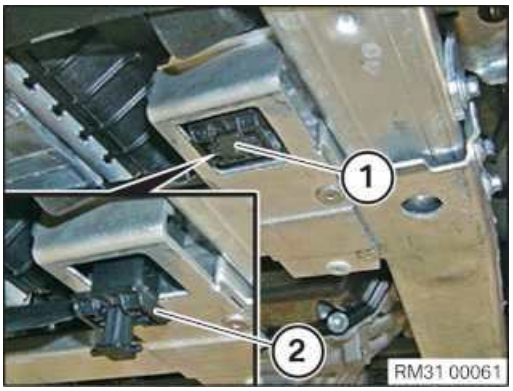
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- Position the engine support (3) on the front axle support (1).
- Tighten down screw (2).

Holder with rubber mount to front axle support

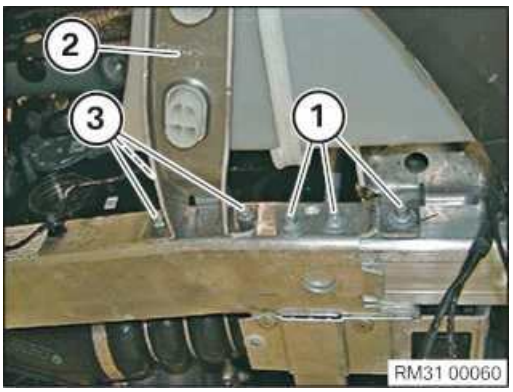
M12 screw		100 Nm



NOTICE

Perform the operations on the left and right side.

- Position the lock (2).
- Lock the bracket (1) of the lock (2) of the holder for the charge air cooler.



- **Only on right side:** Position the holder for the washer fluid reservoir (2).
- Tighten down screws (3).

Washer fluid reservoir holder to front axle support adapter plate

		Tightening torque	10 Nm

NOTICE

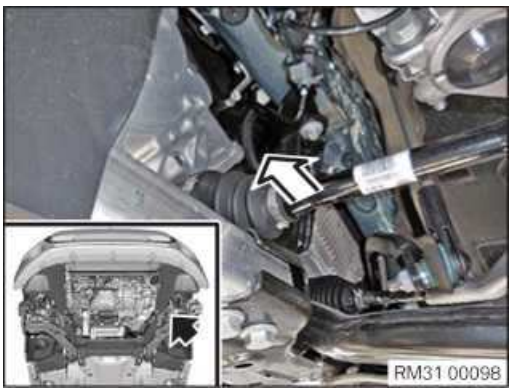
Perform the operations on the left and right side.

- Tighten the screws (1).

Deformation element, bottom, to adapter plate, front axle carrier

		Tightening torque	11,8 Nm

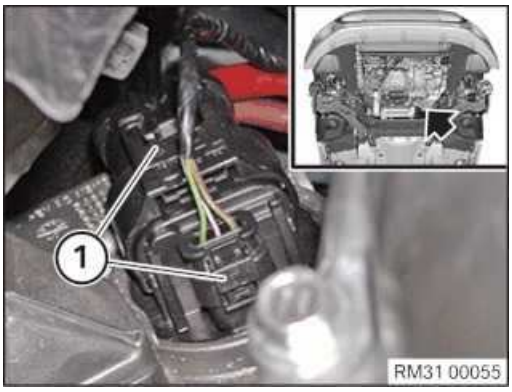
62 – Attaching connector at steering gear



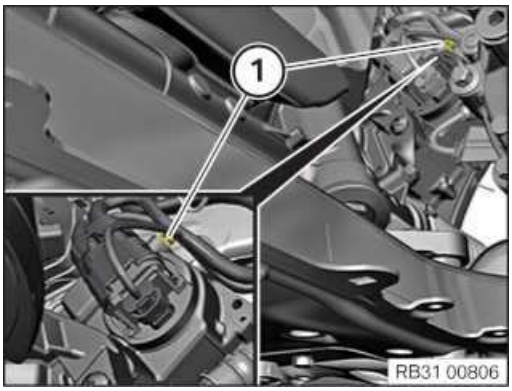
- To connect the connector (see the following step): Connect the connector with the right hand.

  The connectors can be accessed via the left output shaft.

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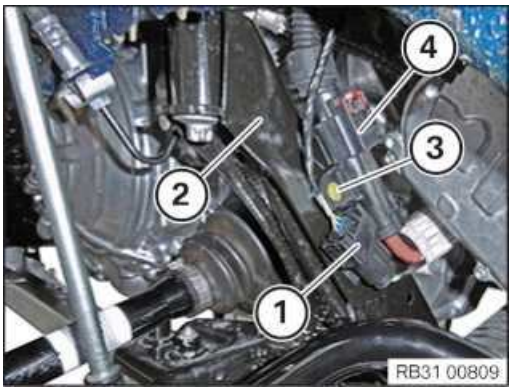


- Connect and lock connector (arrow) (1) with the steering gear.



- Fasten the wiring harness (1) on the steering gear.

▸ **If installed: Fasten the plug connections at the front axle support**



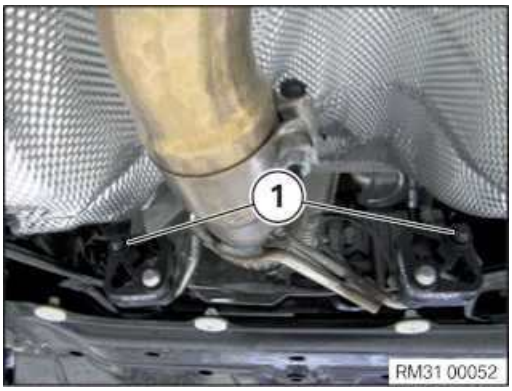
- Position the plug connection (4) at the front axle support (2).
- Tighten down screw (3).

Holder to front axle support

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

- Fasten the plug connection (1) at the front axle support (2).

63 – Securing rubber mount on front axle support



- Check rubber mount (1), replace if necessary.

  Parts: Rubber mount

- Spray rubber mount (1) with lubricant and slide onto holder on front axle support.

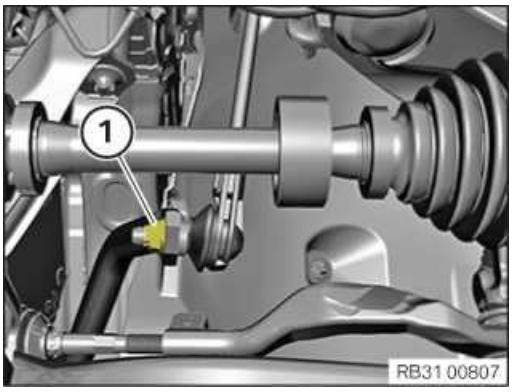
64 – Securing anti-roll bar on left and right on the anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▸ **Fastening anti-roll bar on the anti-roll bar link**

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- Position the anti-roll bar link on the anti-roll bar .
- Renew nut (1).

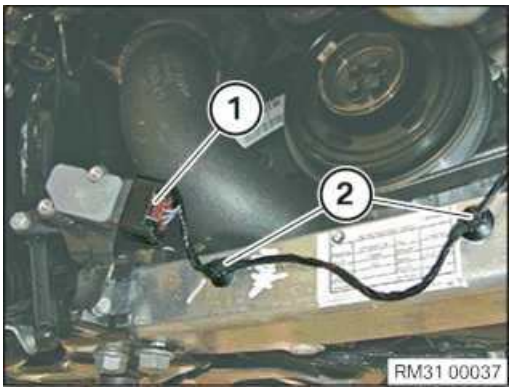
  Parts: Nut
- Tighten nut (1).

Note: Use the Torx socket for counter support.

Anti-roll bar link to anti-roll bar

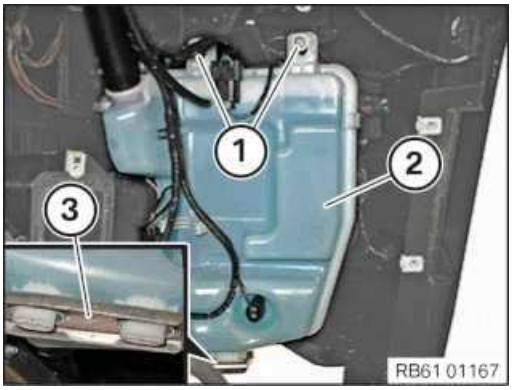
M10	Renew nut.	Tightening torque	56 Nm

65 – With right installation: Securing the cable for the ride height sensor



- Secure the cable clip (2) on the adapter of the deformation element.
- Connect connectors (1) and lock.

66 – Install the washer fluid reservoir in the fixture



- Feed washer fluid reservoir (2) into the mounting (3) and install.
- Tighten the screws (1).

Washer fluid reservoir to body

M6x20		Tightening torque	8 Nm

67 – Installing pressure pipe between throttle body and charge air cooler

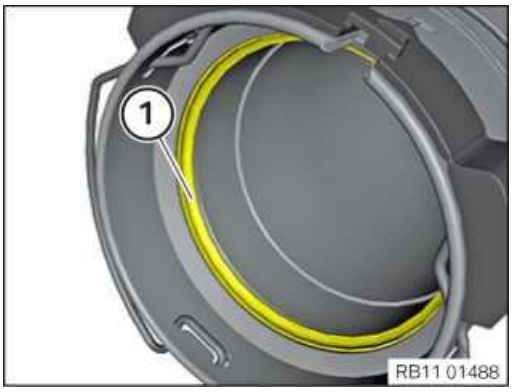
RISK OF DAMAGE

Damage to the exhaust turbocharger.

A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.

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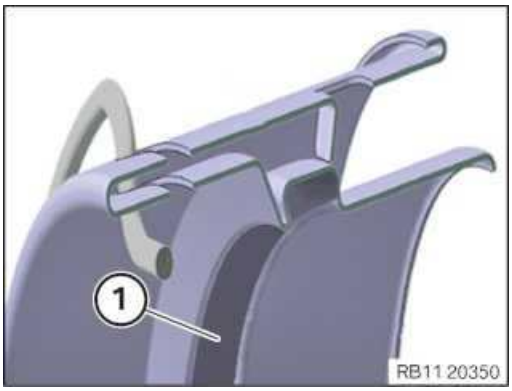
- Check seal (1) for damage and renew seal (1) as needed.

  Parts: Gasket

▶ **Replace damaged gasket**

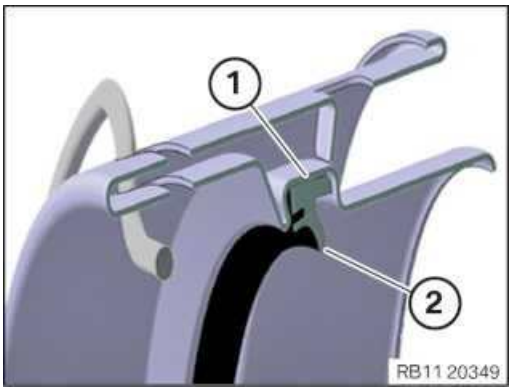
TECHNICAL INFORMATION

Do not use pointed or sharp-edged tools for the installation and/or removal.



- Remove damaged seal.
- Clean gasket groove (1) with a dry towel.

  The gasket groove (1) must be clean.



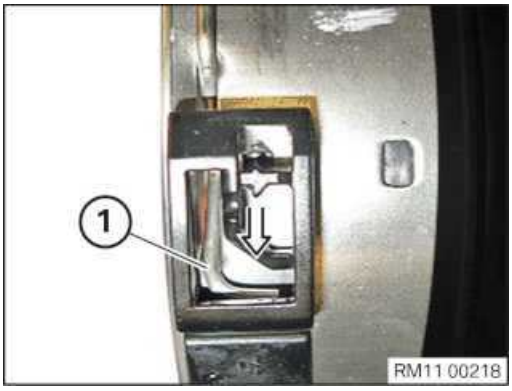
- Renew gasket.

  Parts: Gasket
- Install seal dry without lubricant or mounting agent.

TECHNICAL INFORMATION

Incorrect assembly is possible. Ensure correct installation position.

- Feed in and install the seal.
- Make sure the seal is correctly installed in the gasket groove (1).
- Make sure that the sealing lip (2) is pointing downwards (see figure).

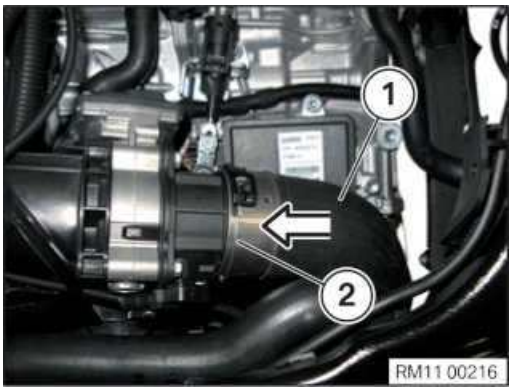


- Detach the locks (1) in the direction of the arrow from the brackets.

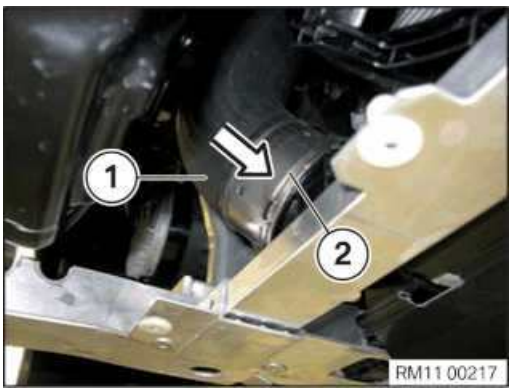
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- Insert and install the pressure pipe (1) in the direction of the arrow.



- Insert and install the pressure pipe (1) in the direction of the arrow.
- Ensure that the locks (1) engage audibly.



- Insert and install the pressure pipe (1) in the direction of the arrow.
- Ensure that the locks (2)engage audibly.

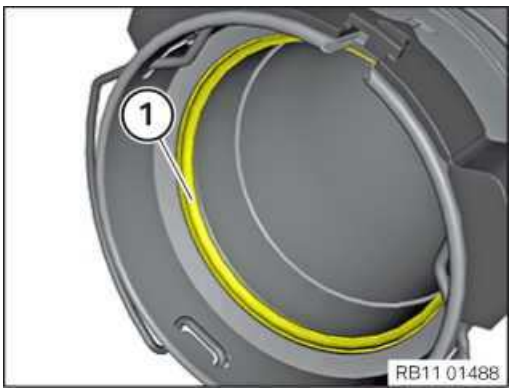
68 – Installing the right charge air duct between the exhaust turbocharger and the charge air cooler

RISK OF DAMAGE

Damage to the exhaust turbocharger.

A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.



- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

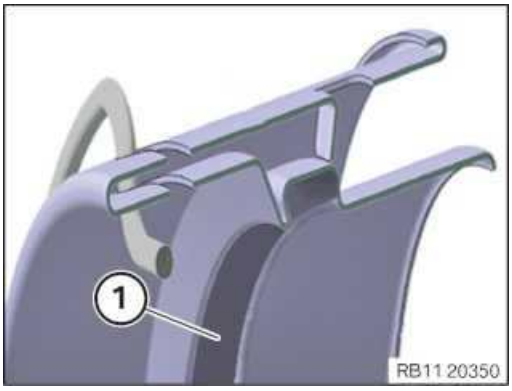
  Parts: Gasket

▸ **Replace damaged gasket**

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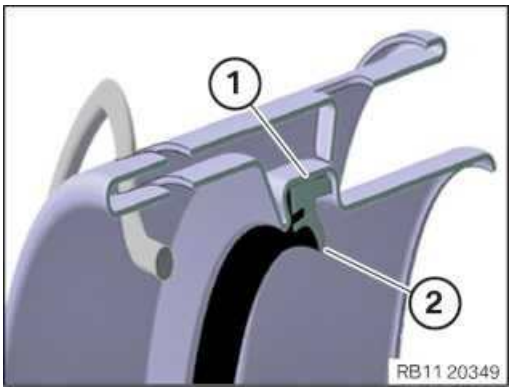
TECHNICAL INFORMATION

Do not use pointed or sharp-edged tools for the installation and/or removal.



- Remove damaged seal.
- Clean gasket groove (1) with a dry towel.

  The gasket groove (1) must be clean.



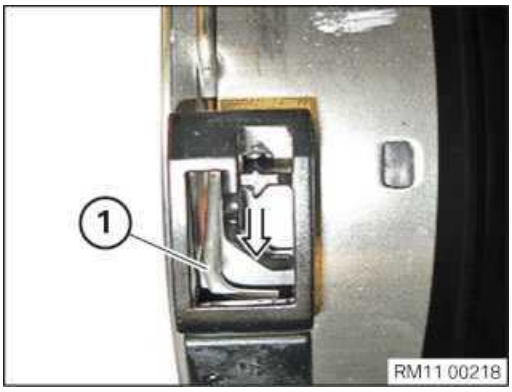
- Renew gasket.

  Parts: Gasket
- Install seal dry without lubricant or mounting agent.

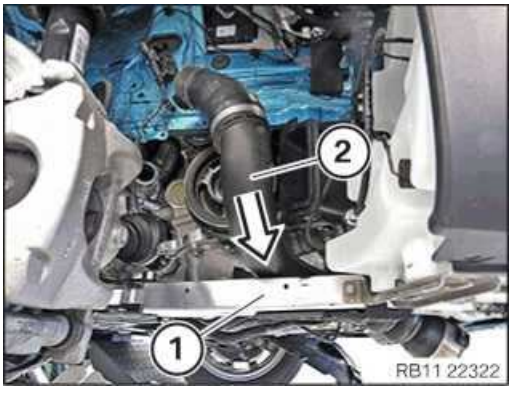
TECHNICAL INFORMATION

Incorrect assembly is possible. Ensure correct installation position.

- Feed in and install the seal.
- Make sure the seal is correctly installed in the gasket groove (1).
- Make sure that the sealing lip (2) is pointing downwards (see figure).

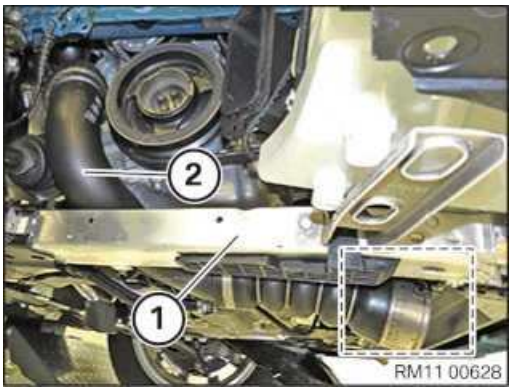


- Detach the locks (1) in the direction of the arrow from the brackets.
- Ensure that the locks (1) engage audibly.

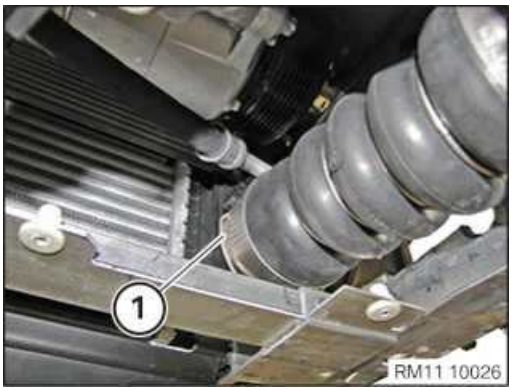


- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed in the charge air duct (1) in the **direction** of arrow between the side member and the deformation element and position.

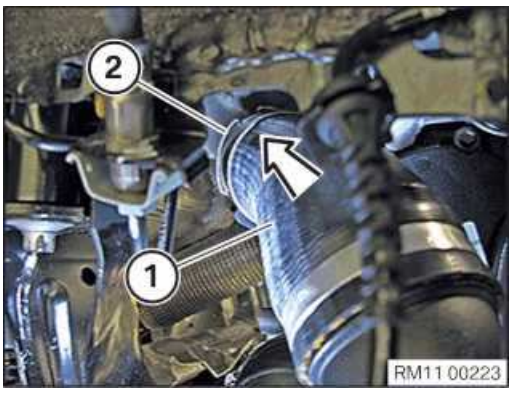
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- Pull the adapter of the front axle support (1) downwards to the front right.
- Position the charge air duct (2) in **marked** area on the charge air cooler.

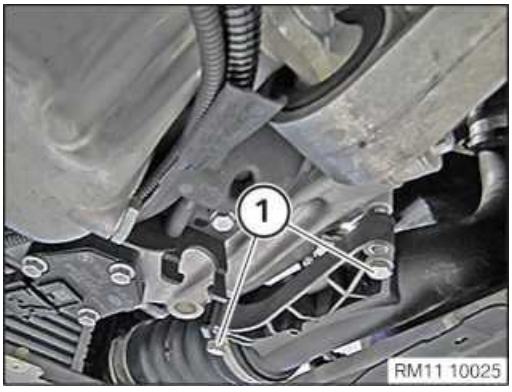


- Feed in and install the charge air duct (1) on the charge air cooler .
- Make sure the charge air duct (1) engages audibly on the charge air cooler.



- Feed in and install charge air duct (1) in the **direction** of the arrow on exhaust turbocharger.

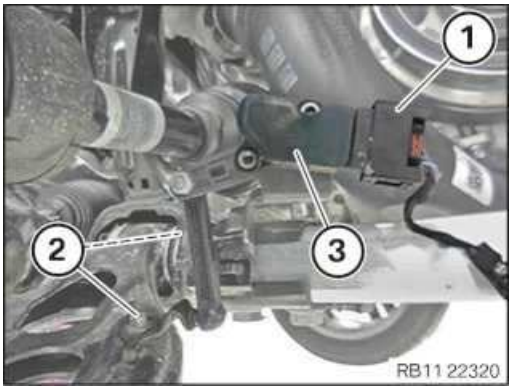
  The locks (2) must engage audibly.



- Tighten the screws (1).

Charge air duct to oil sump

M6		Tightening torque	8 Nm



- **If installed:**
- Feed in and install the ride height sensor (3).
- Tighten the screws (2).

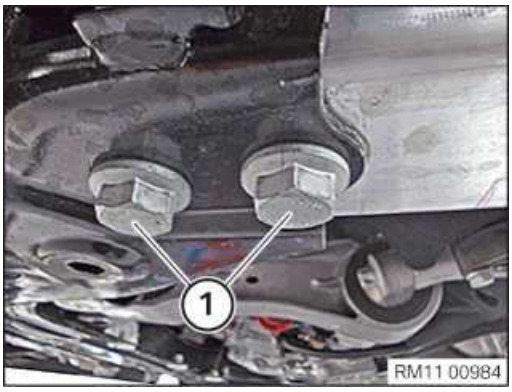
Ride height sensor holder to front axle support

M6		Tightening torque	8 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

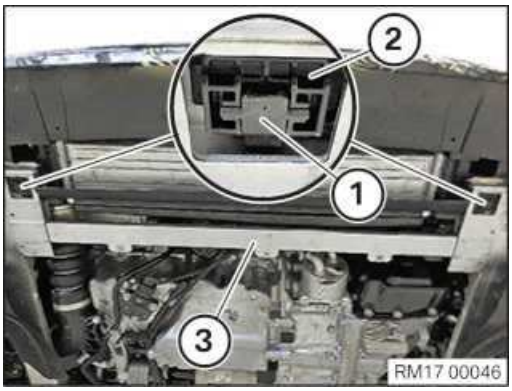
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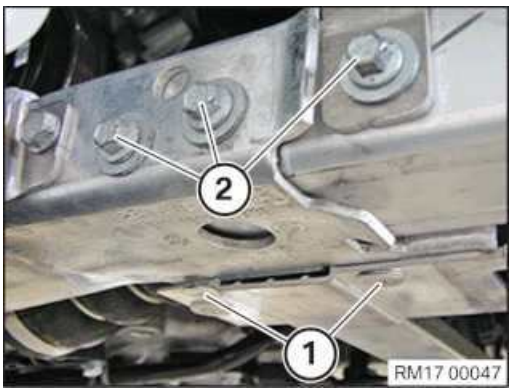
- Tighten the screws (1) on the adapter of the front axle support.

Adapter, front axle support to front axle support

		Tightening torque	100 Nm



- Guide in cross connection (3) and install.
- Guide in locks (2) and install.
- Lock the locking pins (1).
- Ensure that the locking pins (1) audibly engage.



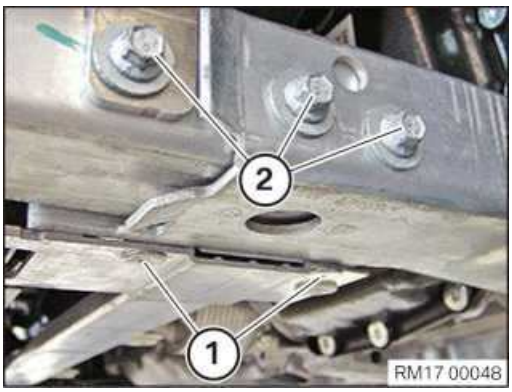
- Tighten the bolts (2) at the front left.

Cross connection to front axle support

M6		Tightening torque	12 Nm

- Renew the blind rivet (1).

  Parts: Blind rivet
- Mount the blind rivets (1) at the front left.



- Tighten the bolts (2) at the front right.

Cross connection to front axle support

M6		Tightening torque	12 Nm

- Renew the blind rivet (1).

  Parts: Blind rivet
- Mount the blind rivets (1) at the front right.

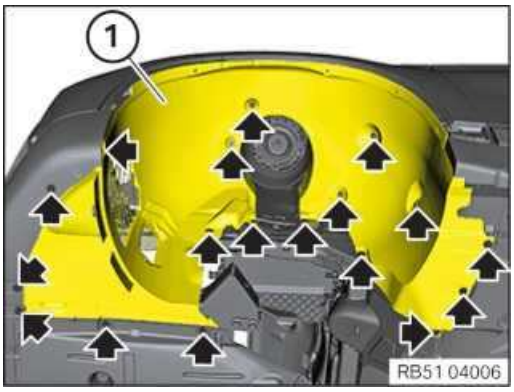
69 – Installing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

▸ **Installing the front wheel arch cover**

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- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Plastic nut		Tightening torque	2,6 Nm
Screw		Tightening torque	2,6 Nm

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

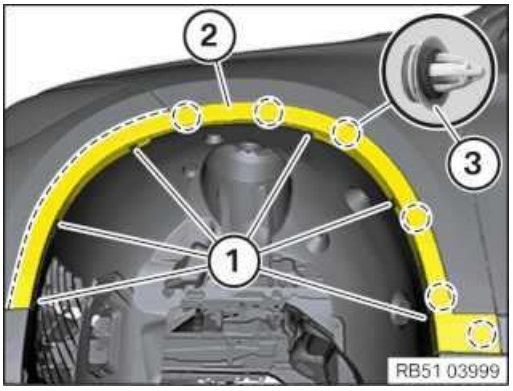
▸ **Installing front wheel arch trim**

NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

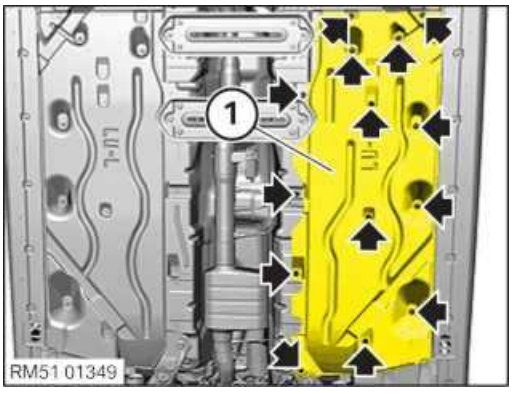
Description is for left component only. Procedure on the right side is identical.



- Check the clips (3) for damage and renew where required.

  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

70 – Installing underbody panelling , right



- Correctly position the underbody panelling (1).
- Tighten all bolts and nuts (arrows).

Underbody panelling, side

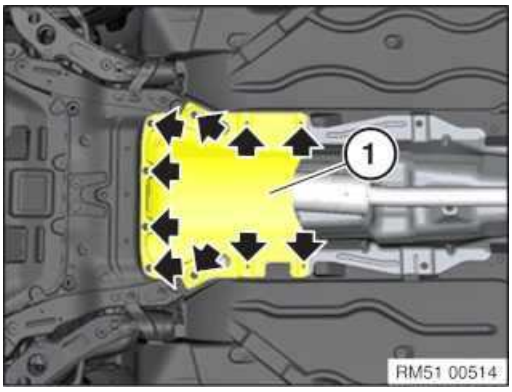
Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side

Plastic nut		Tightening torque	2,6 Nm

71 – If installed: Installing underbody protection at rear

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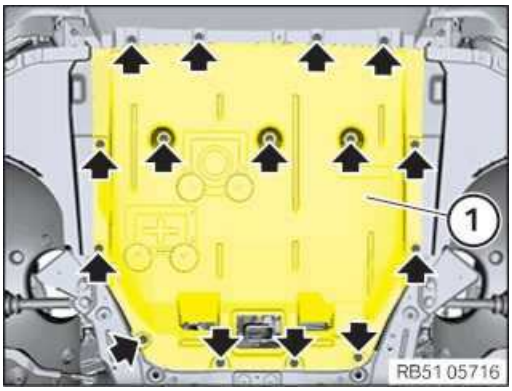


- Position rear underbody protection (1).
- Tighten screws (arrows).

Underbody protection to body

Screw		Tightening torque	3 Nm

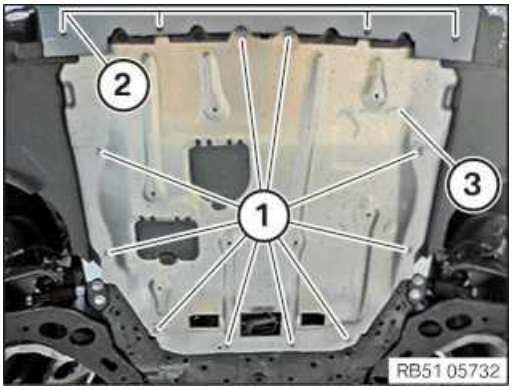
72 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm



- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

73 – Installing both front wheels

▶ **Mounting the wheel**

▷ **Clean the contact surfaces between the brake disc and the wheel rim**



TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

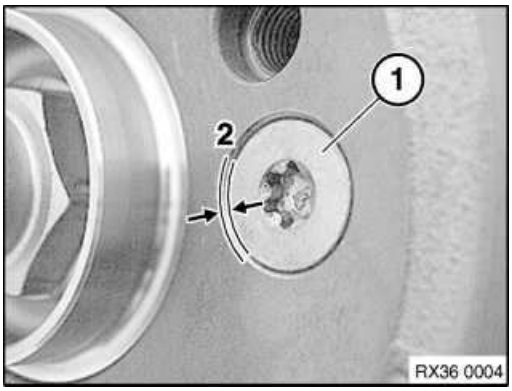
  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue in the area of the wheel bolt holes, remove and clean the brake disc.

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- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).



- Renew mounting bolt (1).

  Parts: Mounting bolt
- Check that the mounting bolt (1) for the brake disc is securely seated.

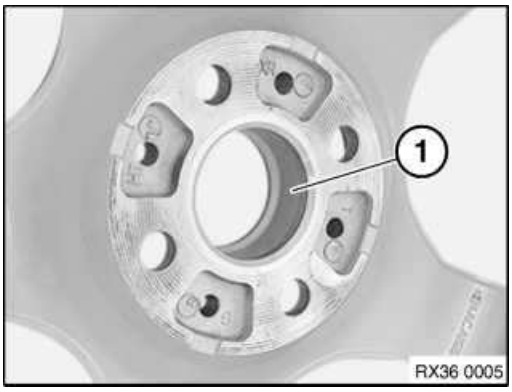
  The mounting bolt (1) for the brake disc may not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to rear wheel hub

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub

M8	Renew screw.	Tightening torque	16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring (1).

◁

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

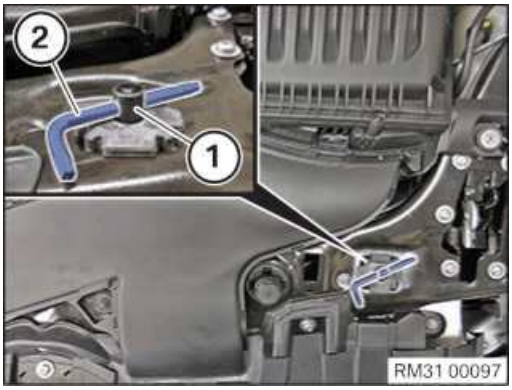
- Renew corroded wheel bolts.

  Parts: Wheel bolts
- Clean the wheel bolts.
- Check the wheel bolts and threads for damage, renew the wheel bolts if necessary.
- Join and tighten the wheel bolts (arrows).

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

74 – Removing fastener for left and right radiator



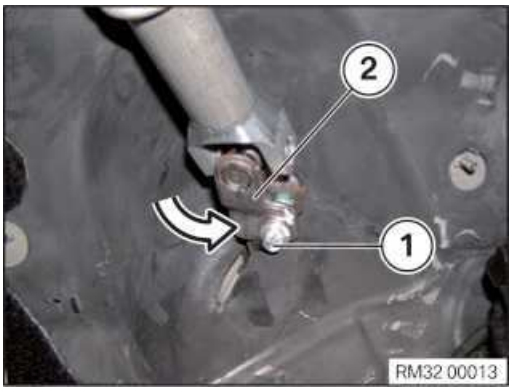
NOTICE

Perform the operations on the left and right side.

- Remove suitable tool (2) from the centering pin (1).

75 – Secure the steering shaft at the bottom on the steering gear

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- Clean the screw lock residue from the screw thread in the universal joint (2).
- Pivot the universal joint (2) in the direction of the arrow to the steering gear.
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Lower steering shaft to steering gear

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

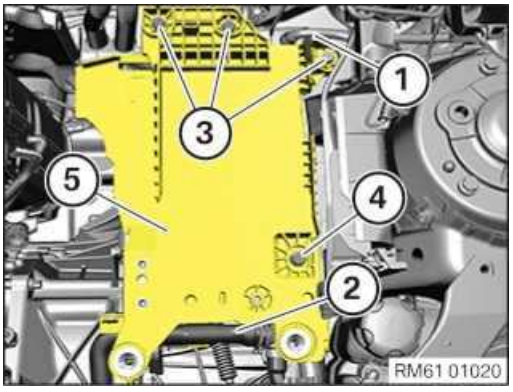


- **If installed:**
- Position the cover on the steering column (2).
- Tighten nuts (1).

Steering column cover to bulkhead

Plastic nut		Tightening torque	3 Nm

76 – Install the battery holder



- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

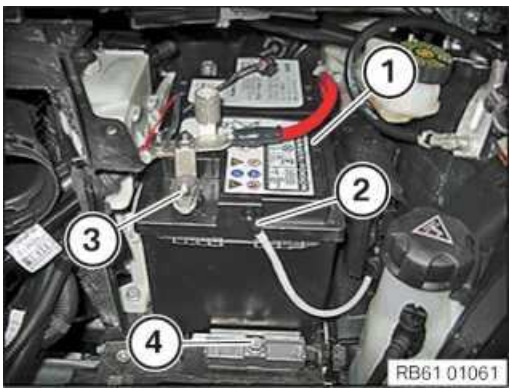
- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

77 – Install vehicle battery



- Install vehicle battery (1).
- Position the bracket and tighten with the screw (4) .

Battery terminal rail to battery tray

M8		19 Nm

- Position the vent hose (2) and clip it in.
- Position the positive battery terminal and tighten with the nut (3) .

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

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▸ **Check the vent holes of the battery**

WARNING

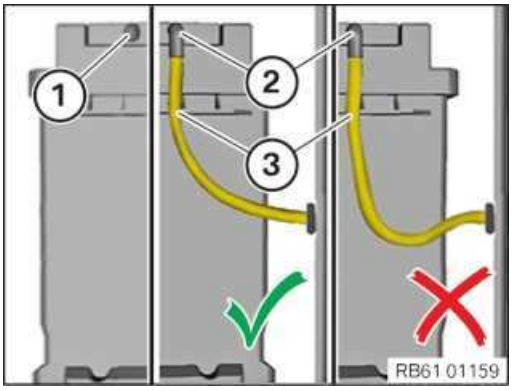
Gas emission.

Danger of injury! Danger of explosion!

- Assign the vent holes correctly.
- Route the vent hose correctly.

TECHNICAL INFORMATION

The battery has two vent holes, opposite:
One vent hole (1) must be closed correctly with a dummy plug.
The vent hose (3) must be correctly connected and routed at the other vent hole (2).



Check

- Check if the vent hole (1) is correctly closed with a dummy plug.

Result

» No dummy plug.

Measure

- Close the vent hole (1) correctly with a dummy plug.

Check

- Check if the vent hole (2) has a correctly connected vent hose (3).

Result

» The vent hose (3) is not correctly connected.

Measure

- At the vent hole (2), connect the vent hose (3) correctly.

Check

- Check if the vent hose (3) is routed to the outside with a downhill gradient (**no siphon formation!**).

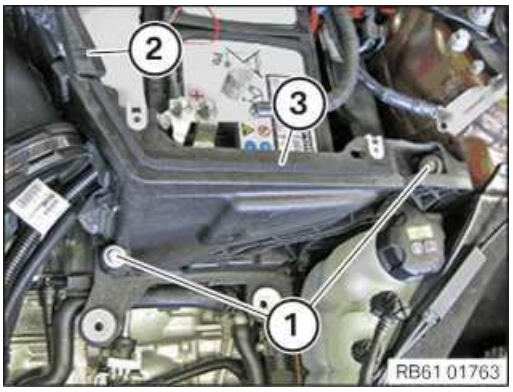
Result

» The vent hose (3) is not correctly routed as shown in the image on the right.

Measure

- Route the vent hose (3) correctly as shown in the centre image.

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- Insert tension strut (3) and tighten with screws (1).

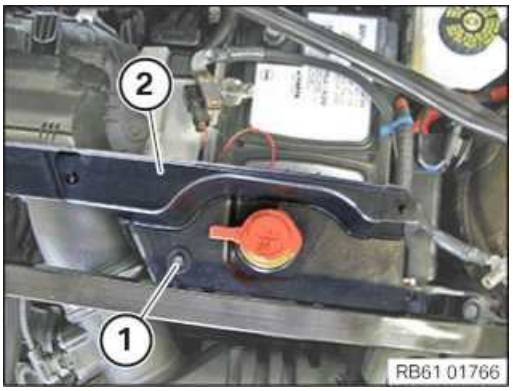
Trailing link

M8		Tightening torque	19 Nm

- Tighten down screw (2).

Battery cover

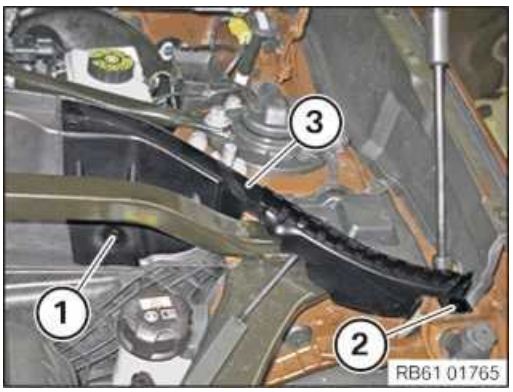
M8		2,8 Nm



- Position the cover (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm

78 – Install electronics box

Prerequisite

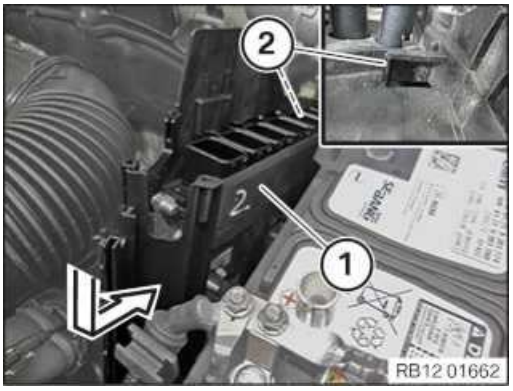
Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.

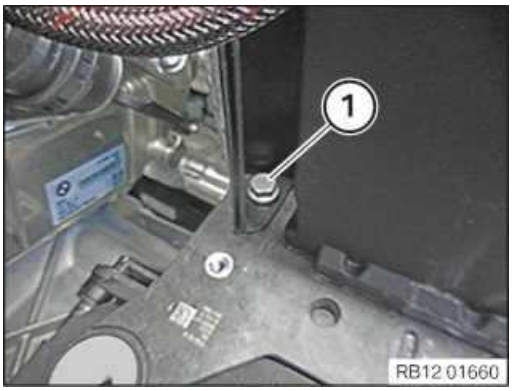


- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.

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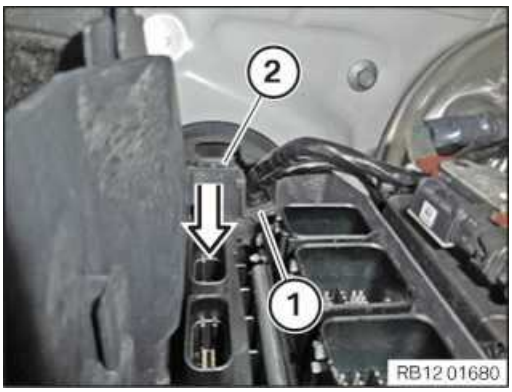
- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).



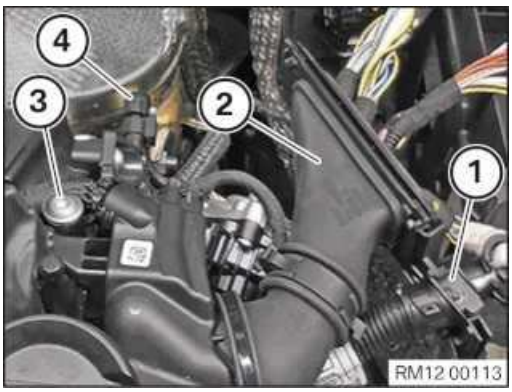
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.

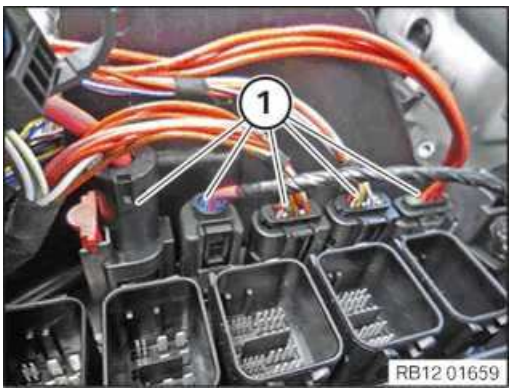


- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

Wiring harness to cylinder head cover

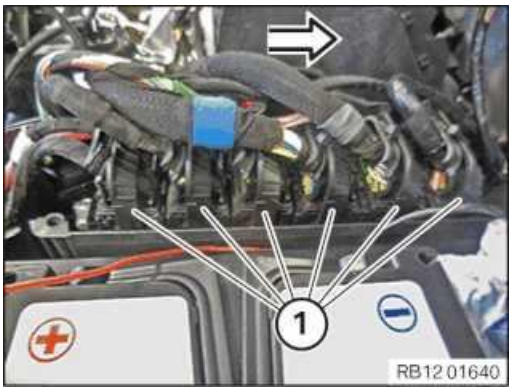
TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.

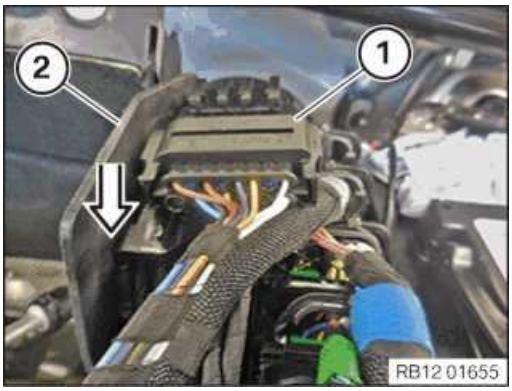


- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.

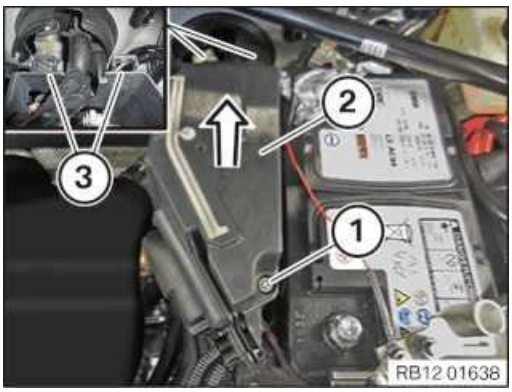
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- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



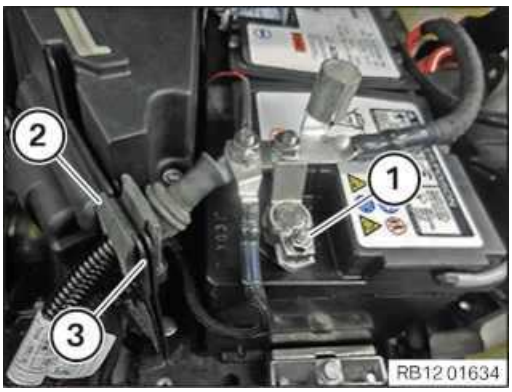
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

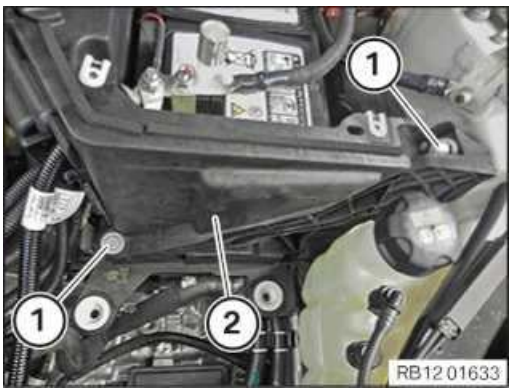
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm



- Feed in and install tension strut (2).
- Tighten the screws (1).

Tension strut to spring strut dome/battery tray

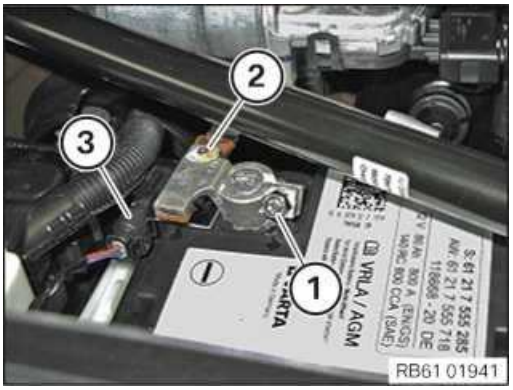
M8		Tightening torque	19 Nm

79 – Connecting the battery earth lead

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TECHNICAL INFORMATION

For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)



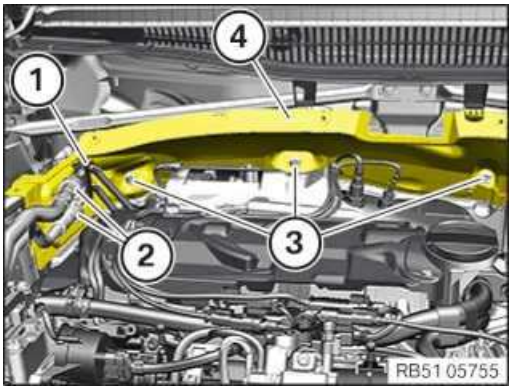
- Remove the protective cover of the positive battery terminal.
- Position the battery earth lead (2).
- Tighten nut (1).

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

- If required, connect the connector (3).

80 – Installing rear bulkhead upper part



- Feed in and install the rear bulkhead upper part (4).
- Tighten down screws (3).

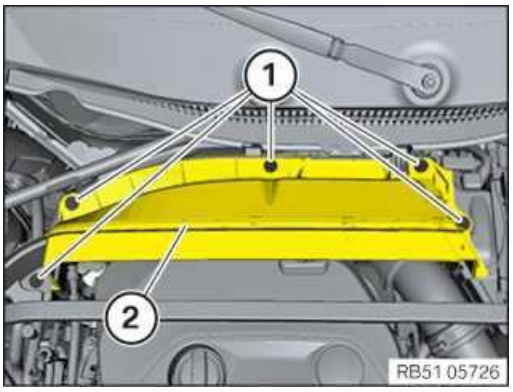
Rear bulkhead upper part to lower section of bulkhead

Oval-head screw		Tightening torque	5 Nm

- Feed the fuel line (2) into the holder (1) and install.
- Connect and lock the holder (1).

  The holder (1) must engage audibly.

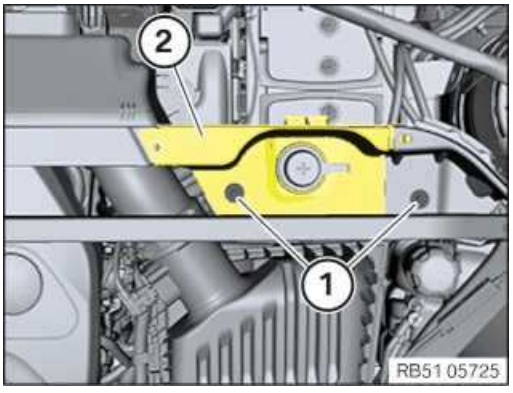
81 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Cover of top bulkhead

Screw		Tightening torque	2,6 Nm



- Guide in and install cover (2).
- Tighten down screw (1).

Cover of remote positive terminal

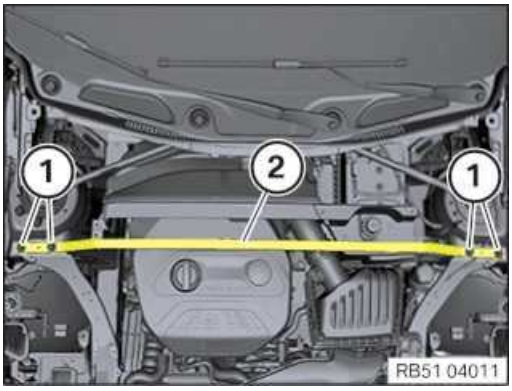
Screw		Tightening torque	2,6 Nm

82 – Install strut brace

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TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.

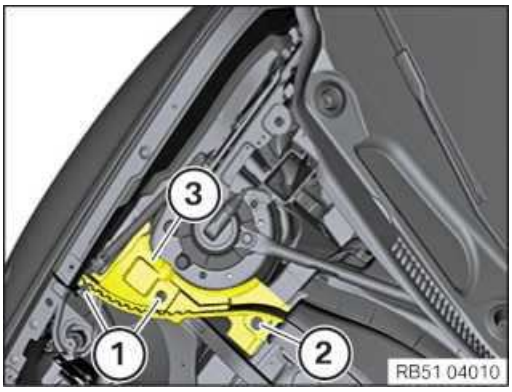


- Install the strut brace (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-brace to spring strut dome

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °



NOTICE

Description is for right component only. The procedure on the left side is identical.

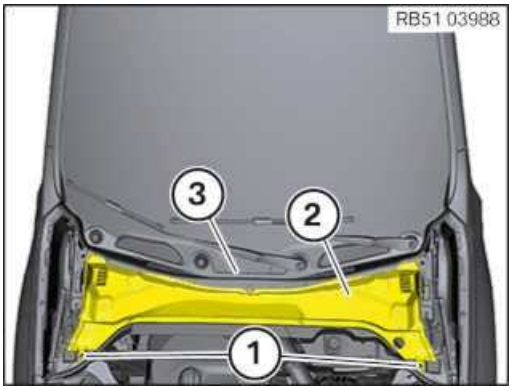
- Install the cover (3).
- Tighten down screw (2).

Cover on body

Hexagon screw		Tightening torque	3 Nm

- Install the expanding rivet (1).

83 – Installing front cowl panel cover



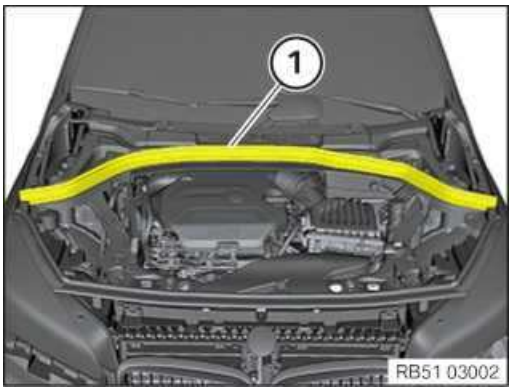
- Insert and install cowl panel cover at front (2) into cowl panel cover at rear (3).
- Check cowl panel cover at front is correctly seated (2).
- Secure expanding rivet (1).

84 – Install the seal for the bonnet

NOTICE

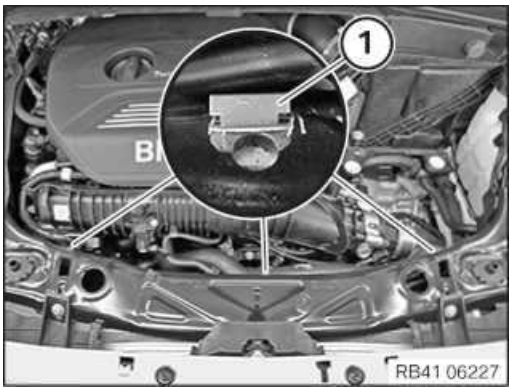
Schematic diagram is for example purposes. Some parts may differ in certain details.

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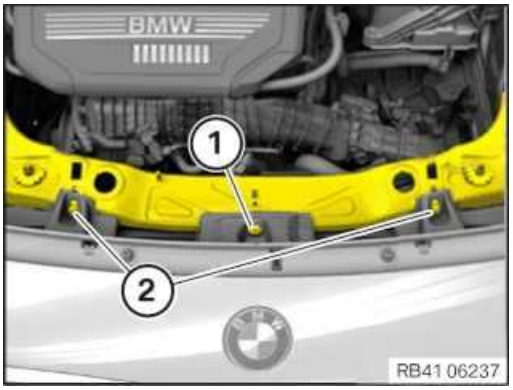


- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

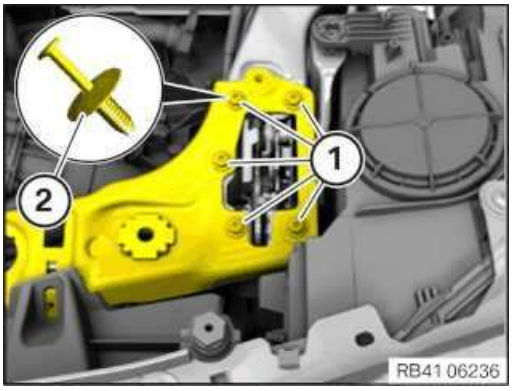
85 – Remove front cross connection



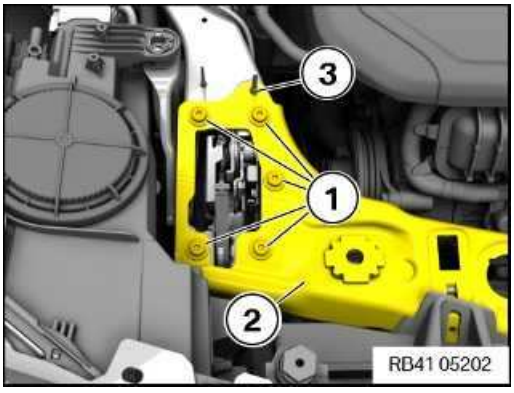
- Detach the clamps (1) for the Bowden cable of the bonnet locks from the cross connection.



- Loosen screw (1).
- Loosen screws (2).



- Loosen screws (1).
- Lever out expanding rivet (2).



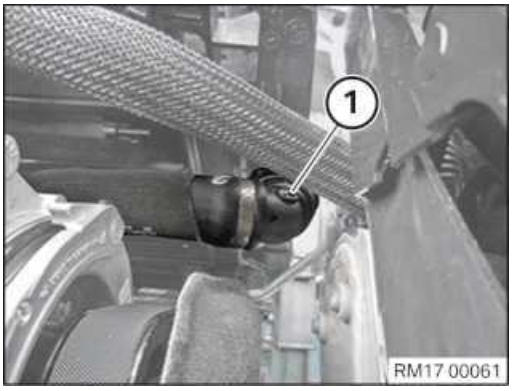
- Loosen screws (1).
- Unclip the front cross connection (2) from the rubber retainer (3) and remove it upward.

86 – Connect the coolant line

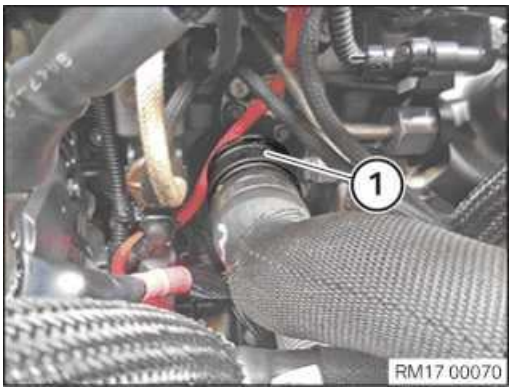
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TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Connect the right coolant line (1) to the radiator and lock audibly.

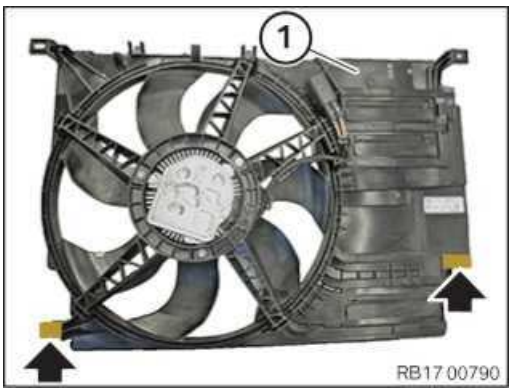


- Connect the coolant line (1) to the connecting branch and lock audibly.

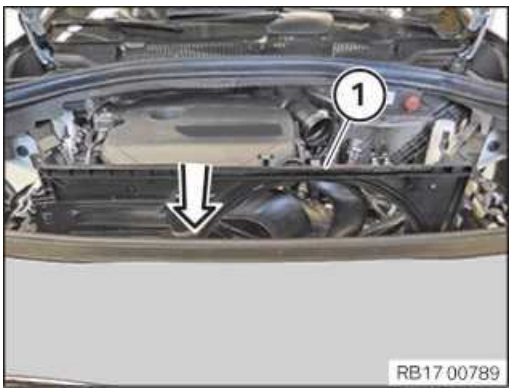
87 – Installing fan cowl with electric fan

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Feed the guides (arrows) of the fan cowl (1) into the charge air cooler.

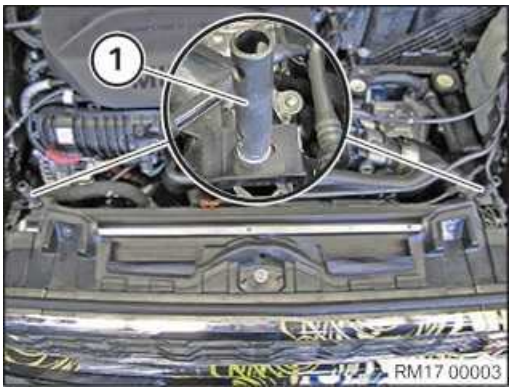


- Feed in and install the fan cowl (1) in the direction of the arrow.

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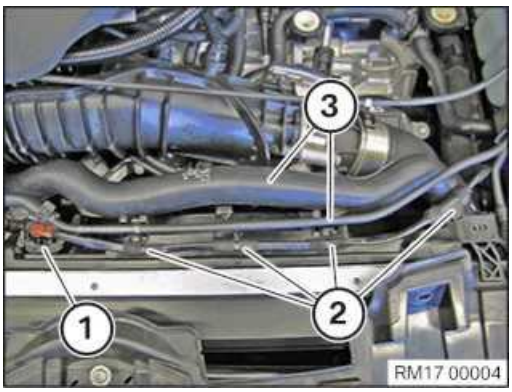
- Lock the left and right locks (arrows).



- Tighten the screws (1).

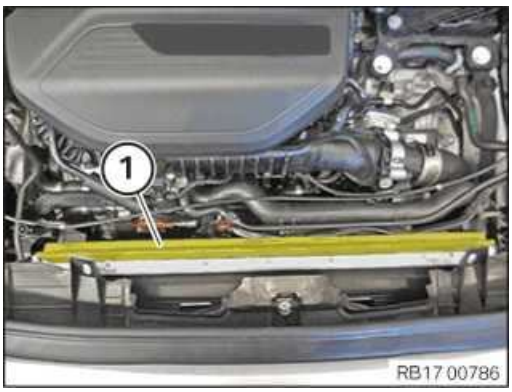
Fan cowl on radiator

M6X12		Tightening torque	6 Nm



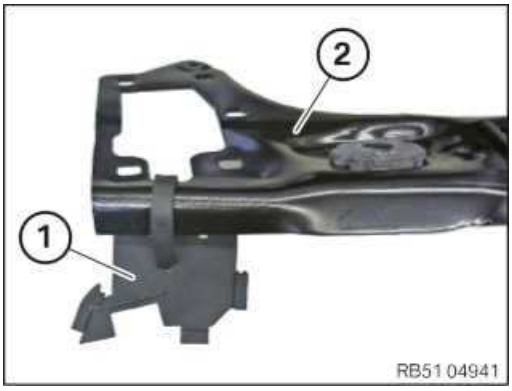
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.
- Secure clamps (2).
- Thread in and install coolant line (3).



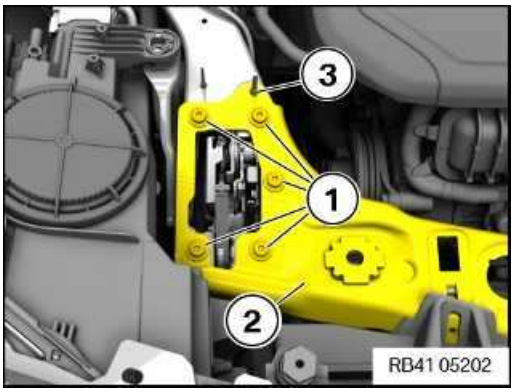
- Guide the sealing (1) on the radiator in and install it.

88 – Install front cross connection



- Right side of vehicle only: Secure spray guard (1) on the cross connection (2) as pictured.

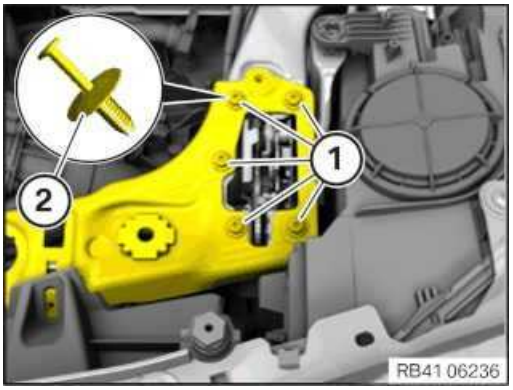
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- Position front cross connection (2) and clip front cross connection (2) into the rubber retainer (3) at the same time.
- Tighten the screws (1).

Cross connection to carrier support

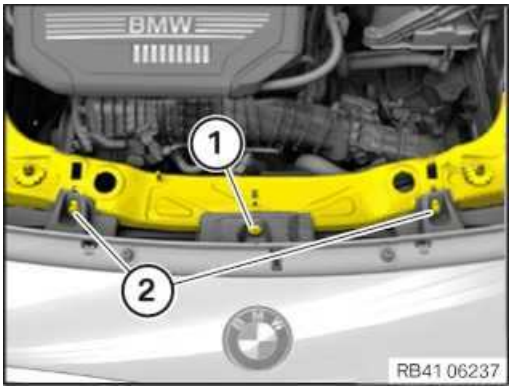
Screws M6x20		Tightening torque	11,8 Nm



- Tighten the screws (1).

Cross connection to carrier support

Screws M6x20		Tightening torque	11,8 Nm



- Position screws (3) on the rubber mounts for the radiator and tighten.

Screw connection for rubber mount of coolant radiator to coolant radiator

Bolt to rubber mount		Tightening torque	8 Nm

- Tighten down screws (2).

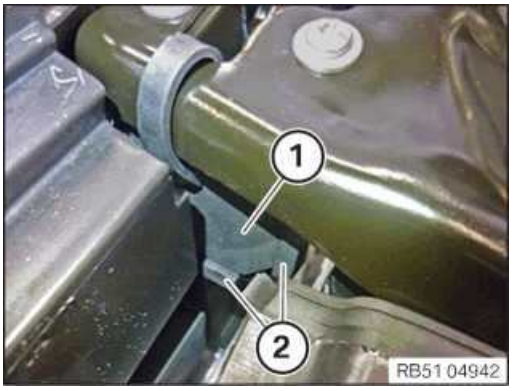
Air duct to upper connection

M6x20 screw		Tightening torque	11,8 Nm

- Tighten down screw (1).

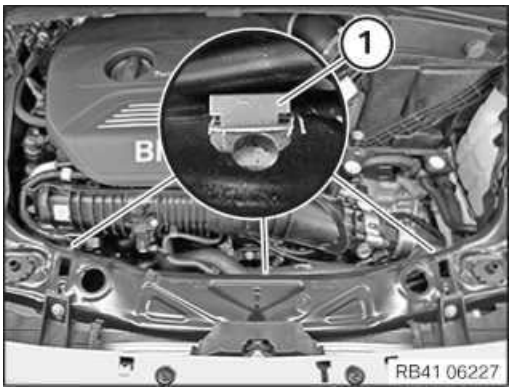
Bracing strut to upper connection

M8x20 screw		Tightening torque	28 Nm



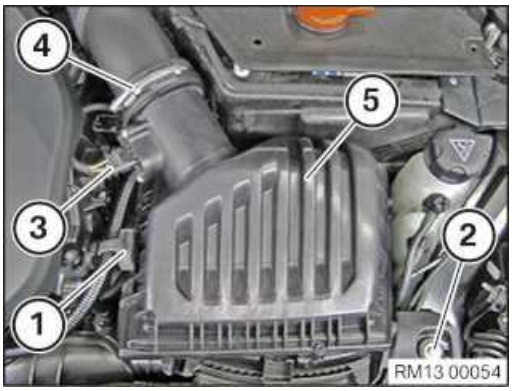
- Right side of vehicle only: Properly mount spray guard (1) to prevent corrosion.
- Secure spray guard (1) to the bridge with retaining tabs (2).

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- Fasten the clamps (1) from the Bowden cable of the bonnet lock on the cross connection.

89 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.

  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

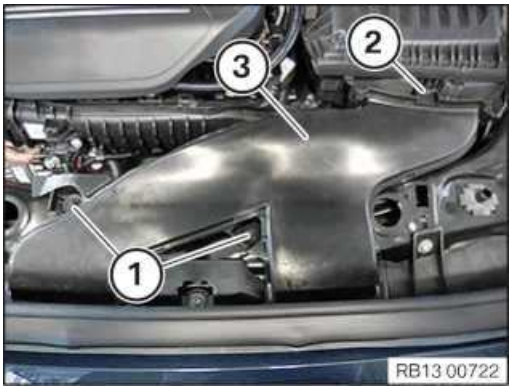
Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Insert and install the holder (1).

90 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

91 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

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- Check for correct installation of all rubber mounts in the acoustic cover (1).



- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

92 – Removing the oil filler cap



- Open oil filler cap (1).

93 – Topping up the engine oil

RISK OF DAMAGE

Damage to the petrol particulate filter.

Vehicles equipped with a petrol particulate filter must be operated with low-ash engine oil only.

- Use BMW Longlife-04 , BMW Longlife-12 FE or BMW Longlife-17 FE+ engine oils or engine oils approved by BMW matching the same specifications only.
- For additional information see: Overview of approved engine oils for BMW Group engines.

RISK OF DAMAGE

Engine damage caused by excessively filling the engine with engine oil.

Filling an excessive quantity of engine oil may cause engine damage.

- Observe the exact engine oil filling capacity.
- Drain the engine oil.

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- Pour in engine oil.

Engine oilB47TÜ1

Capacity of engine oil	5,5 l
Engine oil: Technically suitable engine oils for BMW Group engines	

94 – Installing the oil filler cap



- Close oil filler cap (1).

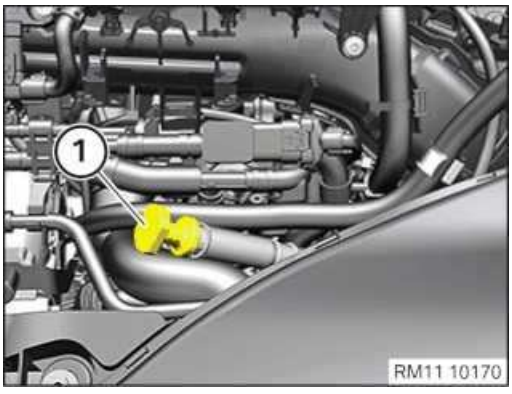
95 – Check engine oil level

- Park vehicle on a horizontal surface.
- In the case of automatic transmission, shift to selector lever position N or P.
- Accelerator pedal is not pressed.
- Engine is running and is at operating temperature.
- Read off the engine oil level in the instrument cluster (KOMBI) or on the control display.
- Top up engine oil if necessary.

▸ **Check engine oil level**

TECHNICAL INFORMATION

Always check the engine oil level when the engine is at operating temperature (engine oil temperature > 70°C).



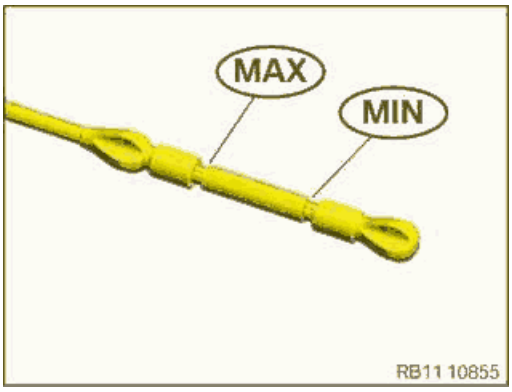
- Park vehicle on a horizontal surface.
- Stop the engine and wait for 5 minutes.
- Pull out the oil dipstick (1) and wipe off using a lint-free cloth.

TECHNICAL INFORMATION

Do not pull out or insert the oil dipstick into the guide tube too quickly or slowly.

- Push the oil dipstick (1) into the guide tube up to the limit position and pull it out again.

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96 – Fill and bleed the coolant circuit

TECHNICAL INFORMATION

The engine oil level must be between the minimum mark and the maximum mark of the oil dipstick.

- Read the engine oil level on the oil dipstick.
- Top up engine oil if necessary.

▶ **Filling and bleed the high-temperature coolant circuit**



97 – Evacuate and fill air conditioning

- See additional information.

- See additional information.

Additional Information

Overview of Tightening Torques

Oil drain plug on oil sump — Used in step 11

M12x1.5	Renew the sealing ring.	Tightening torque	25 Nm

Cross connection to carrier support — Used in step 13 88

Screws M6x20		Tightening torque	11,8 Nm

Screw connection for rubber mount of coolant radiator to coolant radiator — Used in step 13 88

Bolt to rubber mount		Tightening torque	8 Nm

Air duct to upper connection — Used in step 13 88

M6x20 screw		Tightening torque	11,8 Nm

Bracing strut to upper connection — Used in step 13 88

M8x20 screw		Tightening torque	28 Nm

Transmission mounting — Used in step 48

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

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Right engine mount to cylinder head

Used in step 48

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

Refrigerant line on air conditioning compressor

Used in step 48

M8		Tightening torque	19 Nm

Standard screw connection M8

Used in step 48

M8		Tightening torque	19 Nm

Positive battery cable to positive battery terminal

Used in step 48

M8		Tightening torque	15 Nm

Propeller shaft to transfer box

Used in step 49

		Tightening torque	80 Nm

Flexible disc to rear axle final drive

Used in step 49

M12x1.5	Renew screws.	Tightening torque	55 Nm
			90 °

Centre mount to body

Used in step 49

M8		Tightening torque	19 Nm

Heat shield to body

Used in step 50 51

Bolts/nut		Tightening torque	3 Nm

Bracket to body

Used in step 50

M8		Tightening torque	21 Nm

SCR metering module V-clip to exhaust system

Used in step 52

V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm

Exhaust system to body

Used in step 53

M8	Replace nuts.	Tightening torque	19 Nm

Exhaust bracket on body

Used in step 53

Hexagon screw M8x30		Tightening torque	19 Nm

V-clip to catalytic converter

Used in step 53

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

Diesel particulate sensor to exhaust system

Used in step 53

Sensor		Tightening torque	50 Nm

Nitrogen oxide sensor downstream of SCR catalytic converter

Used in step 53

Sensor		Tightening torque	50 Nm

Exhaust-gas temperature sensor to exhaust system

Used in step 54

Exhaust-gas temperature sensor		Tightening torque	28 Nm

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Front connection carrier to body

Used in step 55

M10x18		Tightening torque	56 Nm

Rear connection carrier to body

Used in step 55

M8x18		Tightening torque	28 Nm

Cross-member/torsion strut to axle support and mounting

Used in step 56

M12x48	Renew screws.	Jointing torque Angle of rotation	100 Nm 90 °

Starter motor to transmission

Used in step 59

M8x45		Tightening torque	19 Nm

Battery positive lead to starter

Used in step 59

M8		Tightening torque	13,5 Nm

Rear end of front axle support to body

Used in step 60

M14 screw	Renew screw.	Tightening torque	175 Nm

Front axle support, front to body

Used in step 60

M12 screw	Renew screw.	Tightening torque	108 Nm

Underbody protection to body

Used in step 60 71

Screw		Tightening torque	3 Nm

Track rod end to swivel bearing

Used in step 60

M14	Renew nut.	Tightening torque	175 Nm

Wishbone to swivel bearing

Used in step 60

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

Holder, wishbone rubber mount, to body

Used in step 61

M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °

Holder with rubber mount to front axle support

Used in step 61

M12 screw			100 Nm

Washer fluid reservoir holder to front axle support adapter plate

Used in step 61

		Tightening torque	10 Nm

Deformation element, bottom, to adapter plate, front axle carrier

Used in step 61

		Tightening torque	11,8 Nm

Holder to front axle support

Used in step 62

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

Anti-roll bar link to anti-roll bar

Used in step 64

M10	Renew nut.	Tightening torque	56 Nm

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Washer fluid reservoir to body

Used in step 66

M6x20		Tightening torque	8 Nm

Charge air duct to oil sump

Used in step 68

M6		Tightening torque	8 Nm

Ride height sensor holder to front axle support

Used in step 68

M6		Tightening torque	8 Nm

Adapter, front axle support to front axle support

Used in step 68

		Tightening torque	100 Nm

Cross connection to front axle support

Used in step 68

M6		Tightening torque	12 Nm

Wheel arch cover to body

Used in step 69

Plastic nut		Tightening torque	2,6 Nm
Screw		Tightening torque	2,6 Nm

Wheel arch cover to body

Used in step 69

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Used in step 69

Plastic nut		Tightening torque	3 Nm

Underbody panelling, side

Used in step 70

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side

Used in step 70

Plastic nut		Tightening torque	2,6 Nm

Underbody protection front

Used in step 72

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Brake disc to rear wheel hub

Used in step 73

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub

Used in step 73

M8	Renew screw.	Tightening torque	16 Nm

Wheel bolts

Used in step 73

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

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Lower steering shaft to steering gear — Used in step 75

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

Steering column cover to bulkhead — Used in step 75

Plastic nut		Tightening torque	3 Nm

Battery holder to engine support — Used in step 76

Hexagon screw M8x30		Tightening torque	19 Nm

Battery terminal rail to battery tray — Used in step 77

M8			19 Nm

Battery terminal with IBS positive battery terminal / negative battery terminal — Used in step 77 79

NutM6			5 Nm

Trailing link — Used in step 77

M8		Tightening torque	19 Nm

Battery cover — Used in step 77

M8			2,8 Nm

Electronics box to battery tray — Used in step 78

M8X16		Tightening torque	15 Nm

Wiring harness to cylinder head cover — Used in step 78

TS5x20		Tightening torque	3,5 Nm

Cover to electronics box — Used in step 78

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery — Used in step 78

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray — Used in step 78

M8		Tightening torque	19 Nm

Rear bulkhead upper part to lower section of bulkhead — Used in step 80

Oval-head screw		Tightening torque	5 Nm

Cover of top bulkhead — Used in step 81

Screw		Tightening torque	2,6 Nm

Cover of remote positive terminal — Used in step 81

Screw		Tightening torque	2,6 Nm

Cross-brace to spring strut dome — Used in step 82

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

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Cover on body — Used in step 82

Hexagon screw		Tightening torque	3 Nm

Fan cowl on radiator — Used in step 87

M6X12		Tightening torque	6 Nm

Intake silencer housing to lock bridge — Used in step 89

M6X30		Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 89

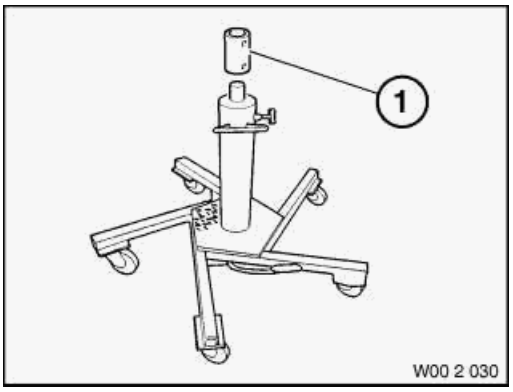
Clamp		Tightening torque	3 Nm

Intake neck to cross connection — Used in step 90

M6		Tightening torque	8 Nm

Overview of Special Tools

0 490 133 (00 2 030) Device



Common — Used in step 35 60

Usage	(universal hydraulic lifter base unit) Chassis and hydraulic lifter - For removing and installing rear axle supports and gearboxes. Also for soft top mounts. Is replaced by 81 22 2 219 012
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 90 (207)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 490 134 (00 2 031)		**Adapter** (adapter for gearbox holder) Model series: E30, E31, E32, E34, E36	

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0 495 554 (33 5 070) Extension



Common

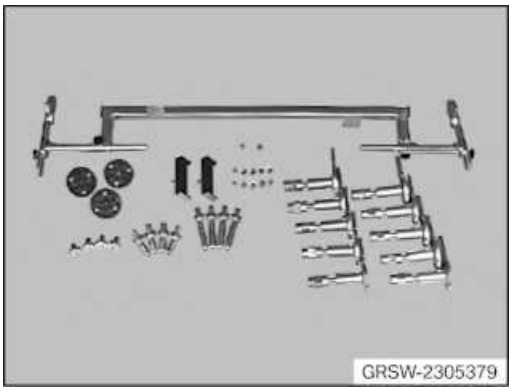
Used in step 46 49

Usage	Pull-out extension for 33 5 040, 33 5 050, 33 5 060.
Included in the tool or work	
Storage location	A18
Replaced by	
In connection with	
SI-Number	01 21 06 (300)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 592 (33 5 071)		**Extension** (Extension (1 item)) discontinued, can only be ordered using complete tool	

2 305 379 Accessories



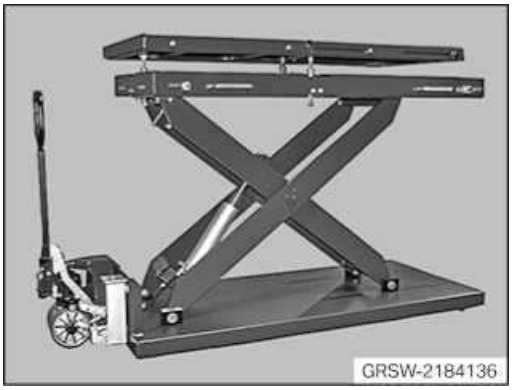
Common

Used in step 47

Usage	Attachment set for unit table lift MHT 1200.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	Mobile major assembly table lift MHT 1200 81222184136
SI-Number	06 01 10 (649)

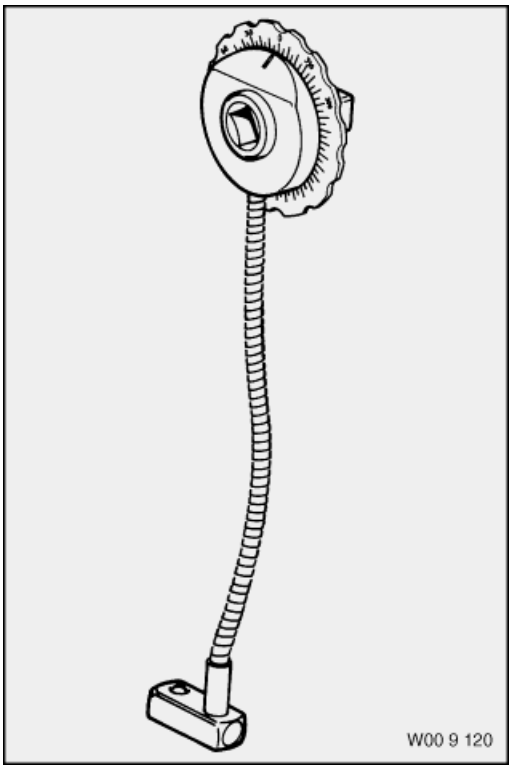
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2 184 136 Mobile equipment table lift



Common	Used in step 47
Usage	Table lift MHT 1200
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	06 01 10 (649)

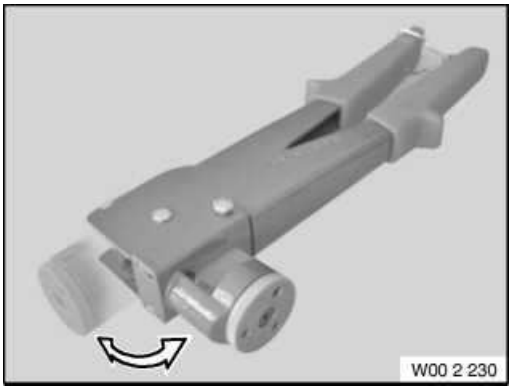
0 490 504 (00 9 120) Torque angle measuring dial



Common	Used in step 49
Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

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0 496 521 (00 2 230) Pliers



Common	Used in step 69
Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

2 344 011 Tool



Common	Used in step 73
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

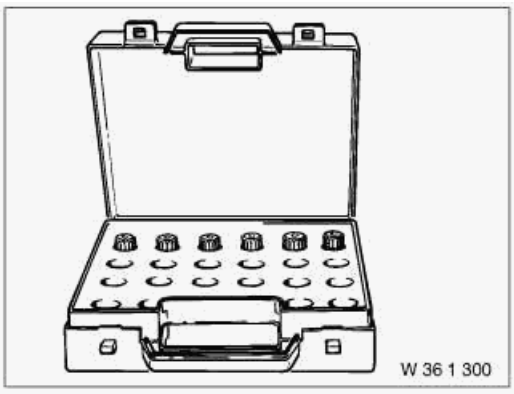
0 495 221 (36 1 323) Wheel stud



Common	Used in step 23
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

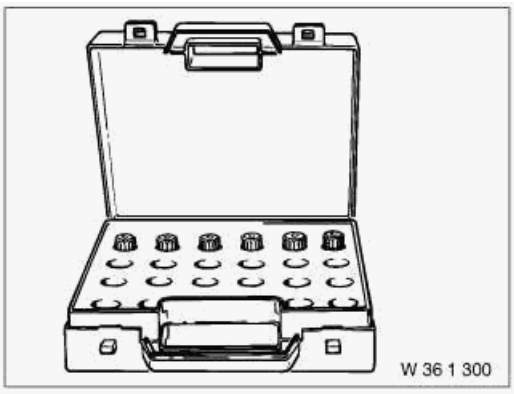
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0 495 224 (36 1 326) Wheel stud



Common	Used in step 23
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud



Common	Used in step 23
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

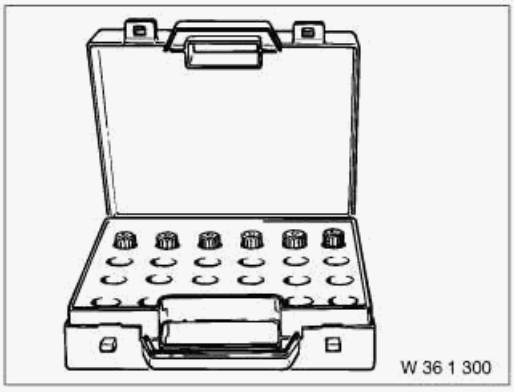
0 495 226 (36 1 328) Wheel stud



Common	Used in step 23
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 227 (36 1 329) Wheel stud



Common	Used in step 23
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud



Common	Used in step 23
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

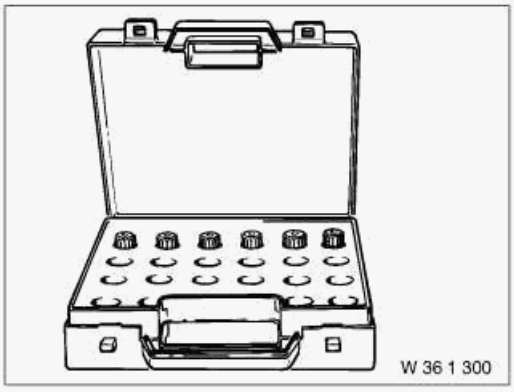
0 495 229 (36 1 332) Wheel stud



Common	Used in step 23
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 230 (36 1 333) Wheel stud



Common	Used in step 23
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Engine oilB47TÜ1	Used in step 93
Capacity of engine oil	5,5 l

Engine oil: Technically suitable engine oils for BMW Group engines

Links

General repair instructions	Used in step
61 20 ... Notes on AGM battery	79
61 12 ... Notes on intelligent battery sensor (IBS)	79
61 00 ... Notes for disconnecting and connecting battery	79

Repair instructions	Used in step
64 50 010 Extract, evacuate and fill air conditioning system	1 97
64 50 010 Drawing off, evacuating and filling air conditioning (R134a)	1 97
64 50 010 Drawing off, evacuating and filling air conditioning (R134a)	1 97
64 50 ... Notes on repairs to air conditioning	1 97
64 50 010 Drawing off, evacuating and filling air conditioning (R1234yf)	1 97
64 50 ... Safety information for handling refrigerant R1234yf	1 97
64 50 ... Safety information for handling tetrafluorethane refrigerant R134a	1 97
64 50 ... Safety informations for handling refrigerant oil	1 97
61 35 ... Notes on ESD protection (Electro Static Discharge)	20 41
17 00 ... Instructions for repair work on cooling system	43
17 00 008 Draining and topping up coolant for high-temperature circuit	96
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17 00 008 Draining and topping up coolant for high-temperature circuit	96
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	96

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17 00 039 Bleed the cooling system and check it for watertightness with the special tool	96
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17 00 039 Bleed the cooling system and check it for watertightness with the special tool	96
17 00 039 Bleed the cooling system and check for watertightness with the special tool (coolant circuit for low temperature)	96
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	96
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	96
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	96
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	96
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	96
17 00 039 Bleeding the cooling system (B36, B38, B46, B48)	96
17 00 039 Bleeding cooling system (B37, B47)	96
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	96
17 00 039 Filling and bleeding the high-temperature cooling system vacuum filler device (B48)	96
17 00 008 Draining and topping up the high-temperature coolant circuit	96
17 00 008 Draining and topping up the high-temperature coolant circuit	96
17 00 016 Draining and topping up coolant circuit for Range Extender \PREMIUM	96
17 00 008 Draining and topping up the high-temperature coolant circuit	96
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	96
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	96
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	96
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	96
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	96

Operating materials	Used in step

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2.0 Grease for wheel centring 73

3.0 Technically appropriate engine oils for BMW Group engines 93

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11 00 050 Removing and installing engine

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

WARNING

Motor vehicle may slip off the vehicle hoist if the weight is distributed unevenly.

Danger! Life-threatening injuries!

- Ensure there is a specific weight compensation on the motor vehicle.

WARNING

Motor vehicle may slip off the vehicle hoist where components are supported.

Danger! Life-threatening injuries!

- Secure the vehicle hoist against lowering and lifting.

WARNING

Vehicle may slip off the vehicle hoist if the vehicle hoist is handled incorrectly.

Danger! Life-threatening injuries!

- Observe safety information on raising the vehicle using a vehicle hoist.
- For additional information see: 00 ... Raising the vehicle using a vehicle hoist.

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

RISK OF DAMAGE



Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.

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for any return shipments. Always package removed components straight away.

- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

Follow notes for repair work on the cooling system.

For additional information see:

Main group 17

17 00 ... Notes for working on the cooling system

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

TECHNICAL INFORMATION

Filling **without** the vacuum filler device (watering can filling) is **not permitted**.

Non-compliance will result in danger of component damage and/or engine damage.

Filling specification **absolutely must** be adhered to.

The operation of the vehicle is not permitted unless the filling procedure has been completed. Otherwise, functional limitations (degradation) and/or overheating may occur.

A bleeding procedure is required after a part has been exchanged in the cooling system and/or after refilling the cooling system.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.

PRELIMINARY WORK

1 – Drawing off the air conditioning

- See additional information.

2 – Removing the acoustic cover

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

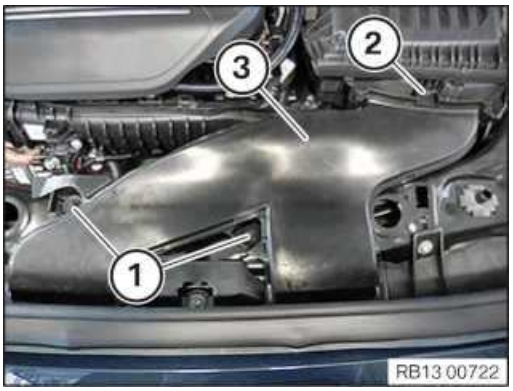
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

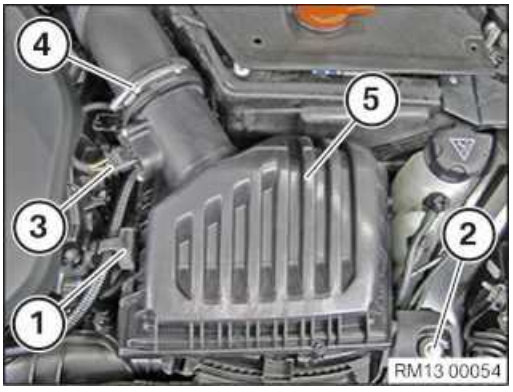
- Unclip the acoustic cover from the marked areas towards the top.

3 – Remove the intake neck for intake silencer housing



- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

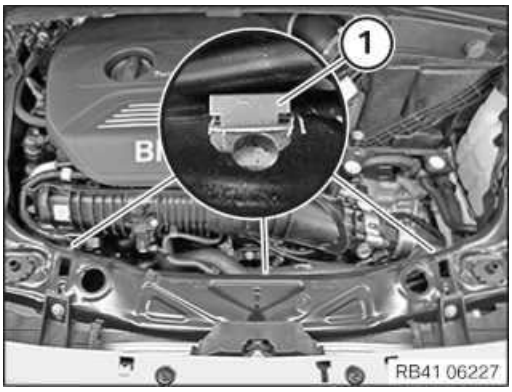
4 – Removing intake silencer housing



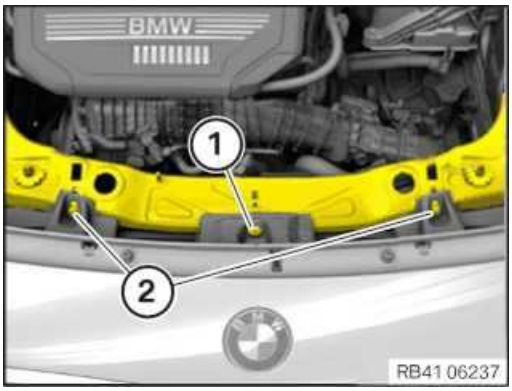
- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

5 – Remove front cross connection

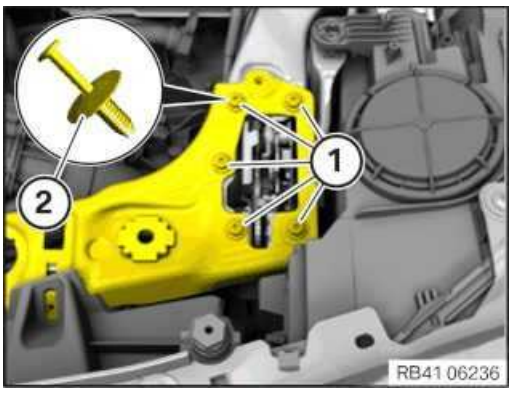
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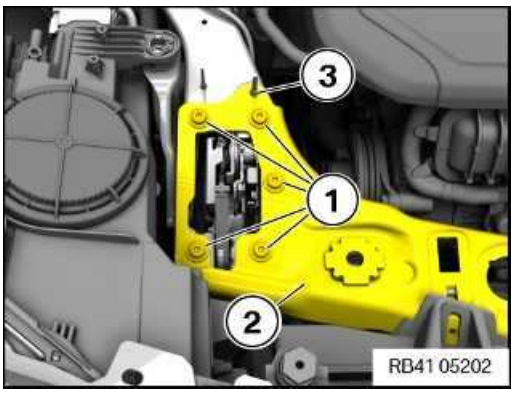
- Detach the clamps (1) for the Bowden cable of the bonnet locks from the cross connection.



- Loosen screw (1).
- Loosen screws (2).



- Loosen screws (1).
- Lever out expanding rivet (2).



- Loosen screws (1).
- Unclip the front cross connection (2) from the rubber retainer (3) and remove it upward.

6 – Removing the fan cowl with electric fan

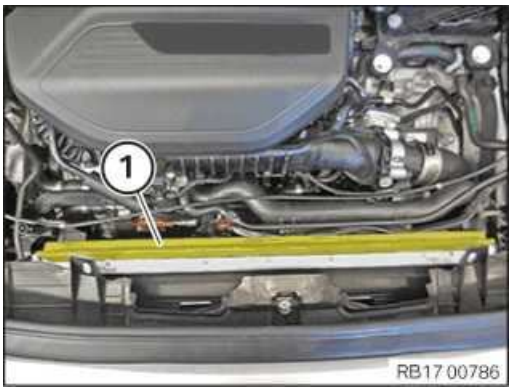
WARNING

Hot surfaces.

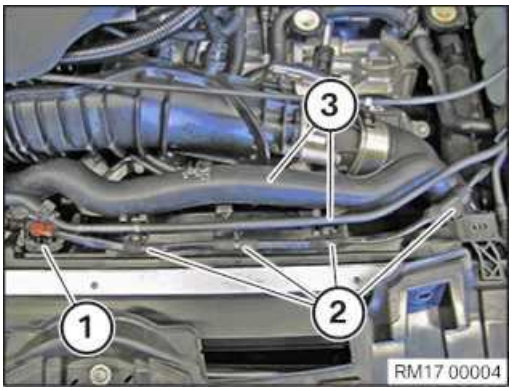
Risk of burning!

- Perform all work only on components that have cooled down.

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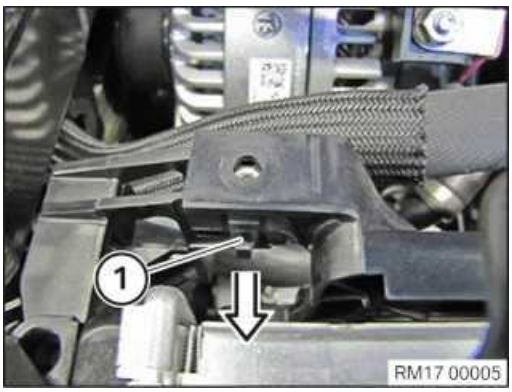
- Feed out and remove the sealing (1) from the radiator.



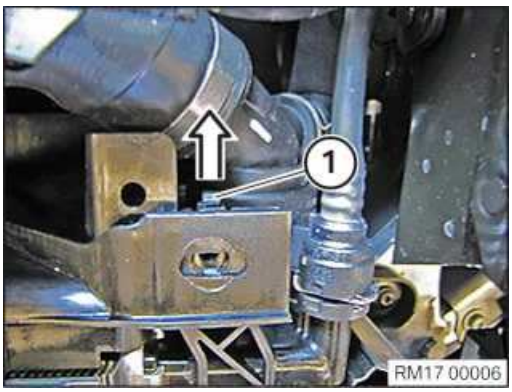
- Unlock plug connection (1) and disconnect.
- Unlock and loosen the clamps (2).
- Feed out connector (1) and place to one side.
- Thread off coolant line (3) and place to the side.



- Loosen screws (1).

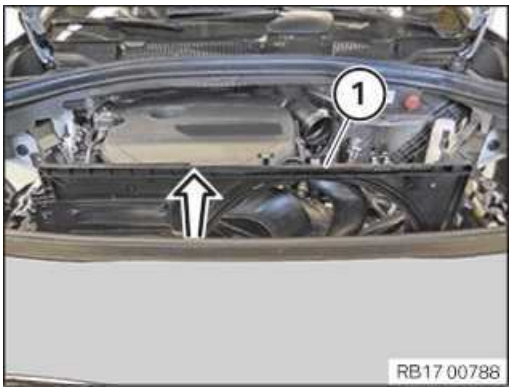


- Unlock the right lock (1) on the fan cowl in the direction of the arrow.



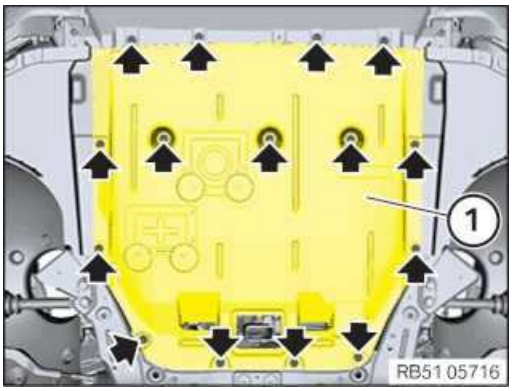
- Unlock the left lock (1) on the fan cowl in the direction of the arrow.

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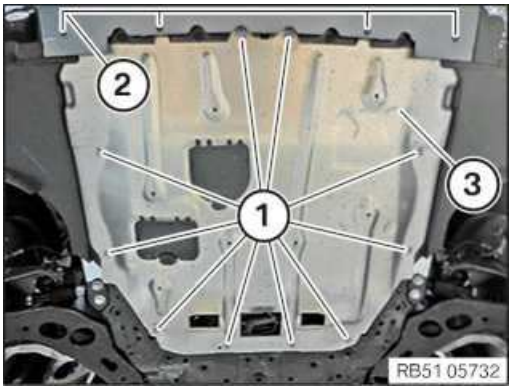


- Guide out fan cowl (1) in direction of arrow and remove.

7 – Removing the front underbody protection

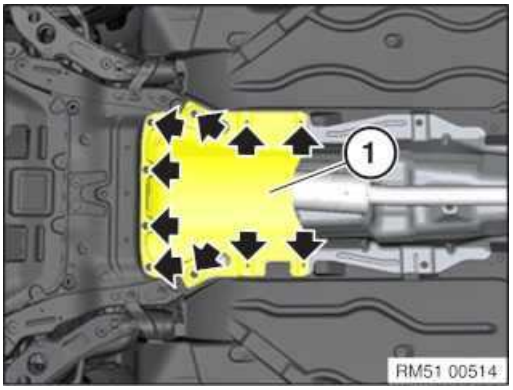


- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.



- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

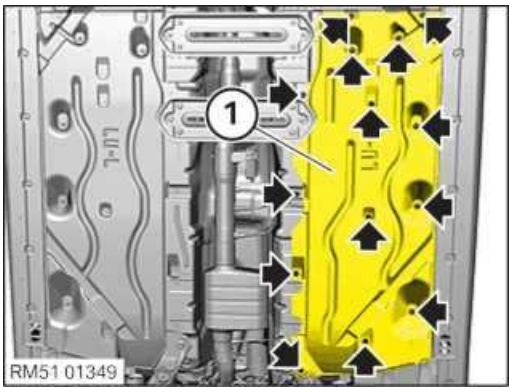
8 – If installed: Removing rear underbody protection



- Remove screws (arrows).
- Remove the rear underbody protection (1).

9 – Removing right underbody panelling

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- Unscrew all bolts and nuts (arrows).
- Remove the underbody panelling (1).

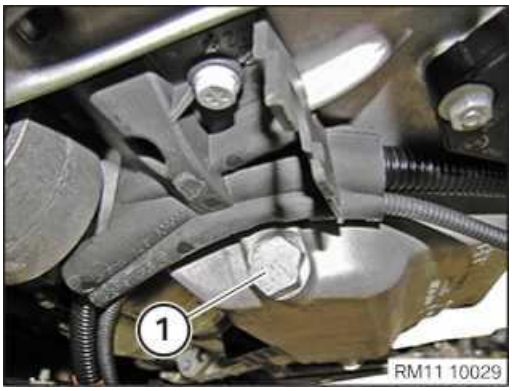
10 – Releasing the oil drain plug

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

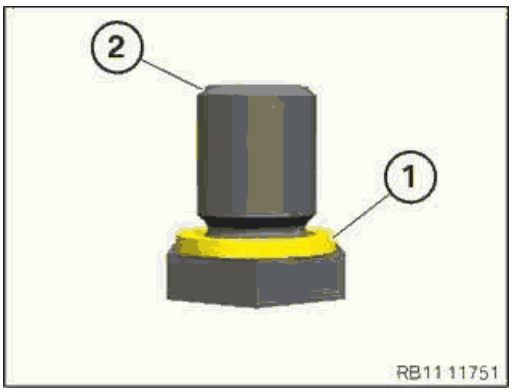


TECHNICAL INFORMATION

Catch and dispose of drained engine oil in a suitable collecting vessel. Observe country-specific waste disposal regulations.

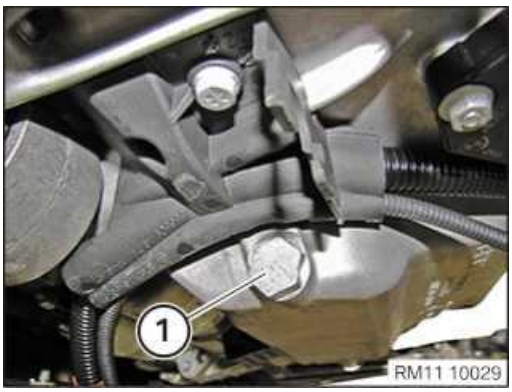
- Release oil drain plug (1).
- Drain engine oil.

11 – Tightening the oil drain plug



- Renew sealing ring (1) on the oil drain plug (2).

  Parts: Sealing ring
- Guide in the sealing ring (1) on the oil drain plug (2) and install.



- Renew the sealing ring.

  Parts: Sealing ring
- Position oil drain plug (1) on the oil sump and tighten.

Oil drain plug on oil sump

M12x1.5	Renew the sealing ring.	Tightening torque	25 Nm

12 – Draining coolant

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WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

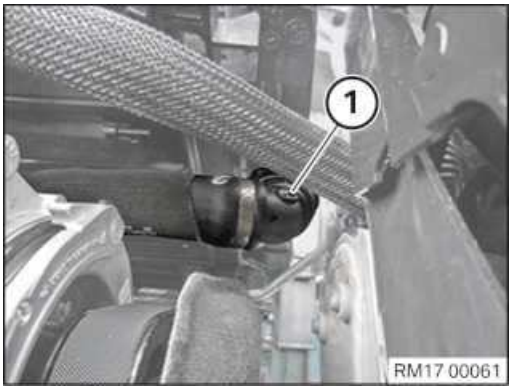
In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

TECHNICAL INFORMATION

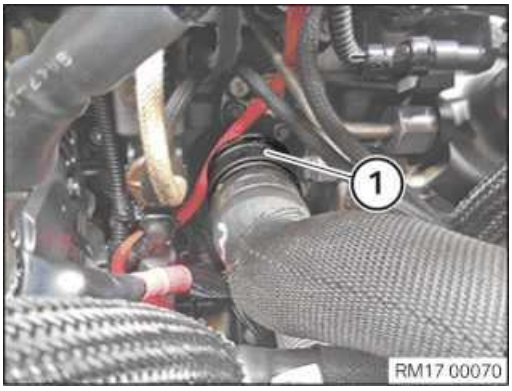
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Loosen sealing cap (1).



- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.



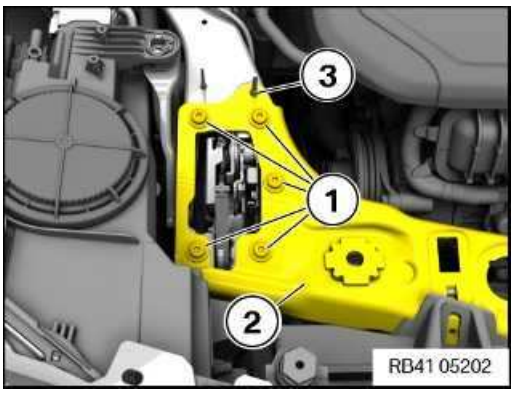
- Unlock the coolant line (1) and pull it off the connecting branch.
- Catch and dispose of escaping coolant.

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13 – Install front cross connection



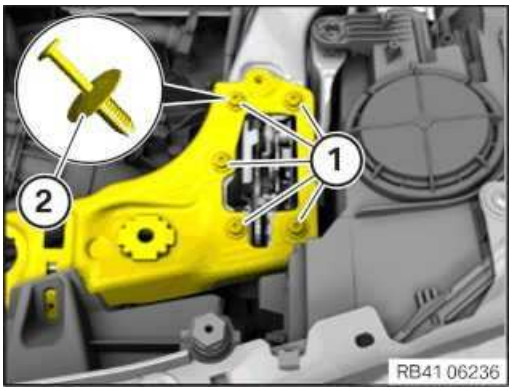
- Right side of vehicle only: Secure spray guard (1) on the cross connection (2) as pictured.



- Position front cross connection (2) and clip front cross connection (2) into the rubber retainer (3) at the same time.
- Tighten the screws (1).

Cross connection to carrier support

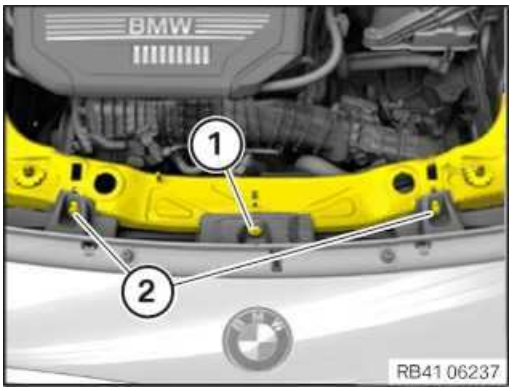
Screws M6x20		Tightening torque	11,8 Nm



- Tighten the screws (1).

Cross connection to carrier support

Screws M6x20		Tightening torque	11,8 Nm



- Position screws (3) on the rubber mounts for the radiator and tighten.

Screw connection for rubber mount of coolant radiator to coolant radiator

Bolt to rubber mount		Tightening torque	8 Nm

- Tighten down screws (2).

Air duct to upper connection

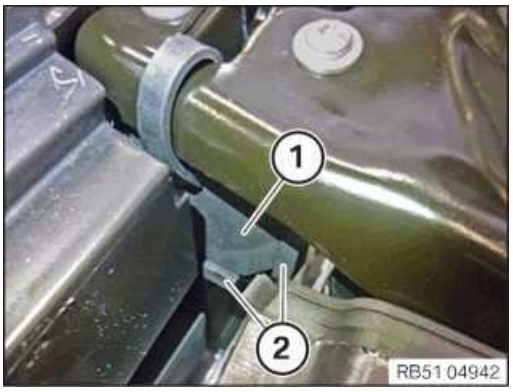
M6x20 screw		Tightening torque	11,8 Nm

- Tighten down screw (1).

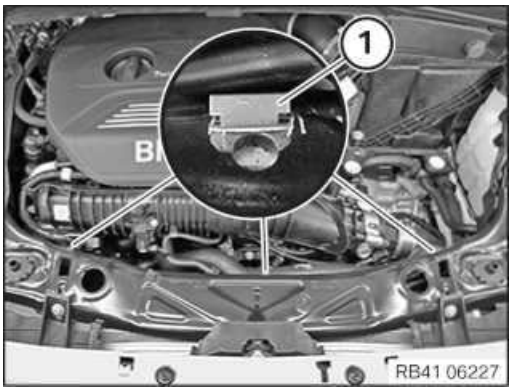
Bracing strut to upper connection

M8x20 screw		Tightening torque	28 Nm

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- Right side of vehicle only: Properly mount spray guard (1) to prevent corrosion.
- Secure spray guard (1) to the bridge with retaining tabs (2).

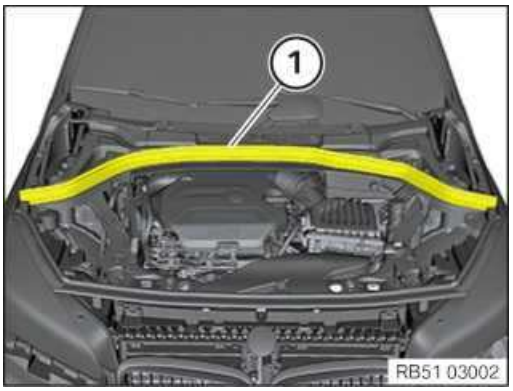


- Fasten the clamps (1) from the Bowden cable of the bonnet lock on the cross connection.

14 – Remove the seal for the rear bonnet

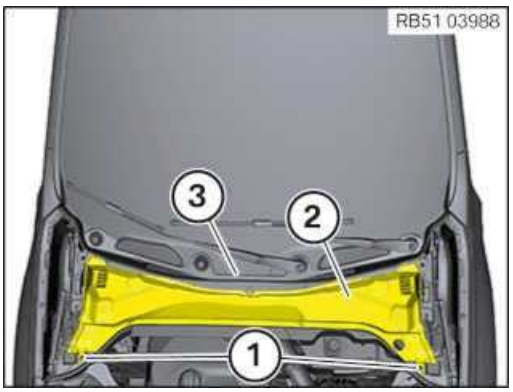
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Pull off rear bonnet seal (1) towards the top and remove.

15 – Removing front cowl panel cover



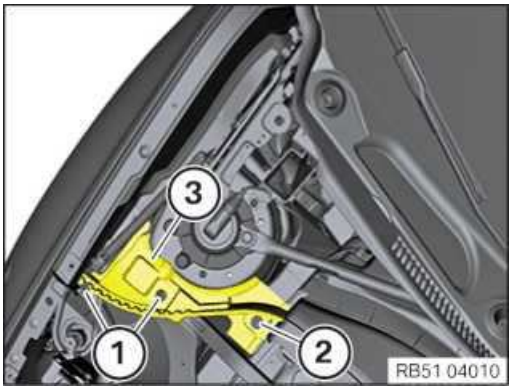
- Loosen the expanding rivet (1).
- Feed out and remove front cowl panel cover (2) from the rear cowl panel cover(3).

16 – Remove suspension cross-brace

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TECHNICAL INFORMATION

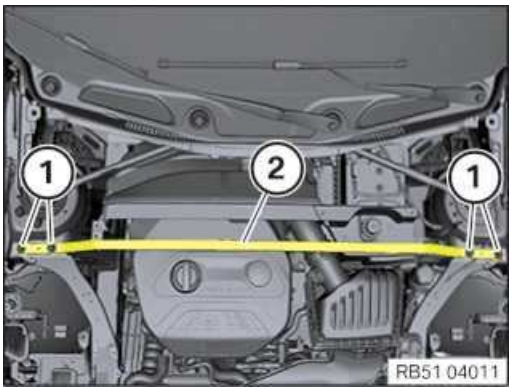
Driving without the strut brace/front end or tension strut is not permitted.



NOTICE

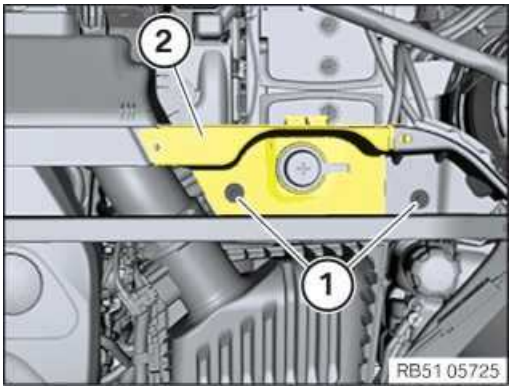
Description is for right component only. The procedure on the left side is identical.

- Loosen expanding rivet (1).
- Loosen screw (2).
- Remove the cover (3).

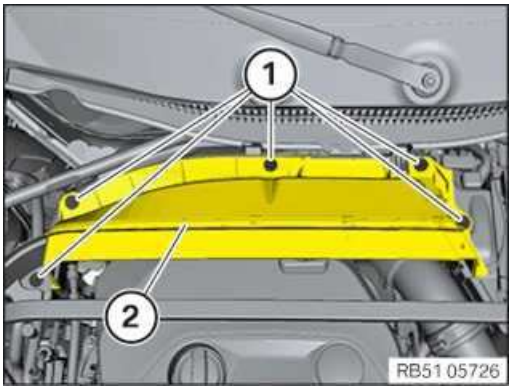


- Loosen screws (1).
- Remove strut brace (2).

17 – Removing the upper bulkhead cover



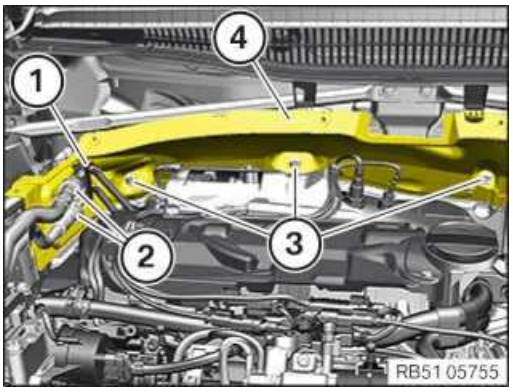
- Loosen screws (1).
- Guide out and remove the cover (2).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

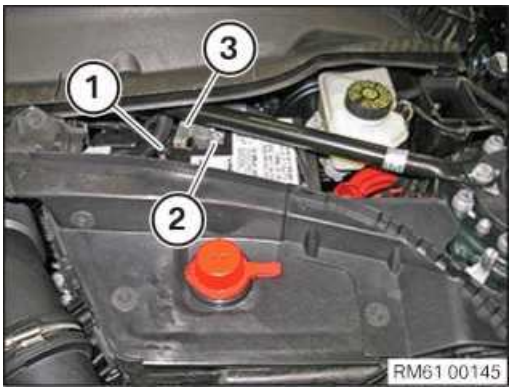
18 – Remove the rear bulkhead upper part

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- Unlock the holder (1) and disconnect.
- Guide out and remove the fuel lines (2).
- Loosen screws (3).
- Guide out the rear bulkhead upper part (4) and remove.

19 – Disconnecting the battery earth lead



- Unlock plug connection (1) and disconnect.
- Unfasten nut (2).
- Remove the battery earth lead (3) and secure to one side.

20 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

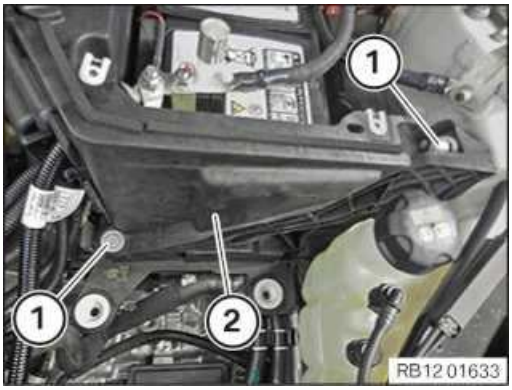
TECHNICAL INFORMATION

Follow instructions for removing and installing control units.
For additional information see: 12 00 ... Notes on removal and installation of control units

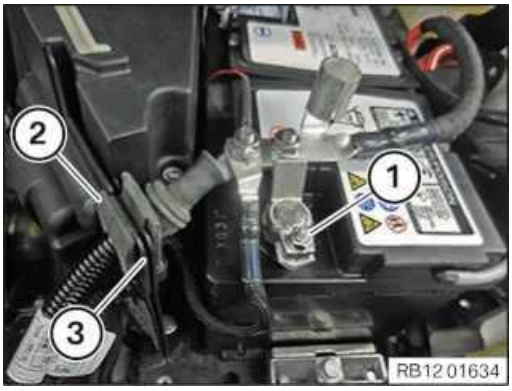
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TECHNICAL INFORMATION

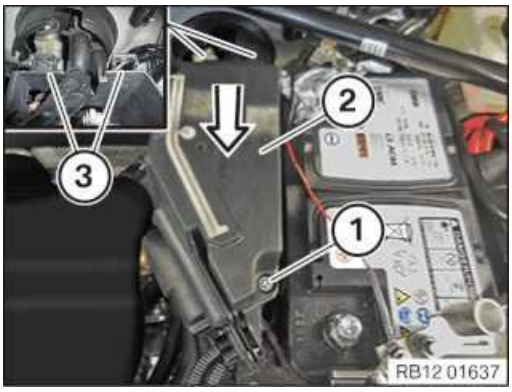
Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.



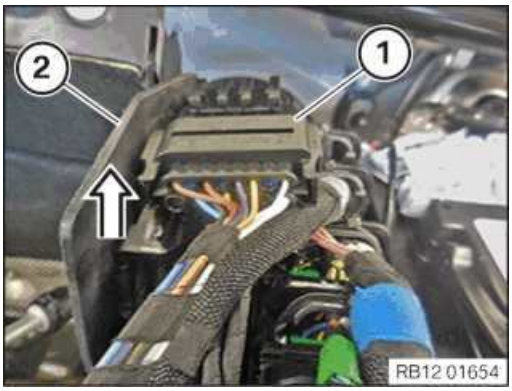
- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.



- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

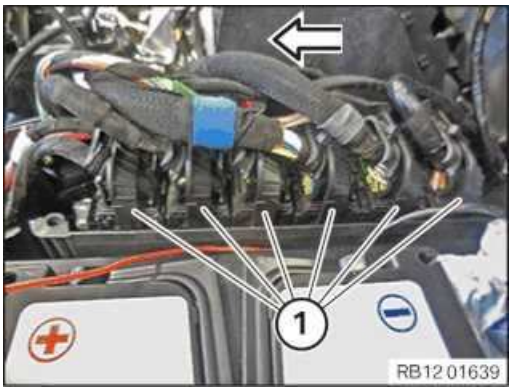


- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.

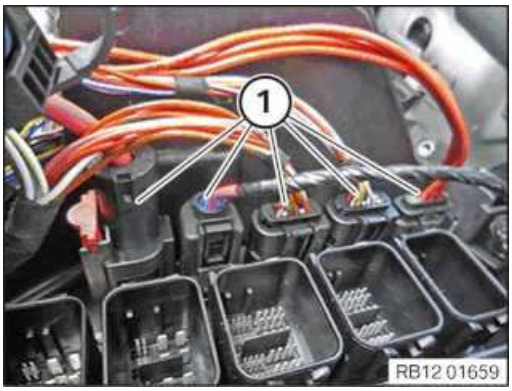


- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).

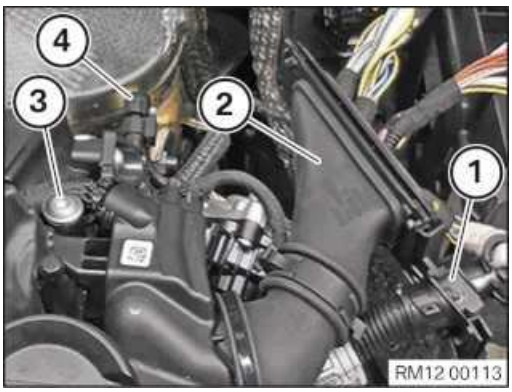
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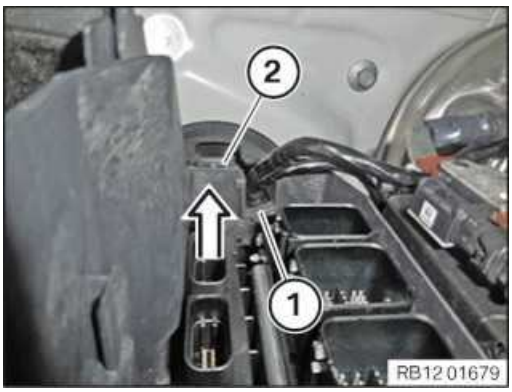
- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



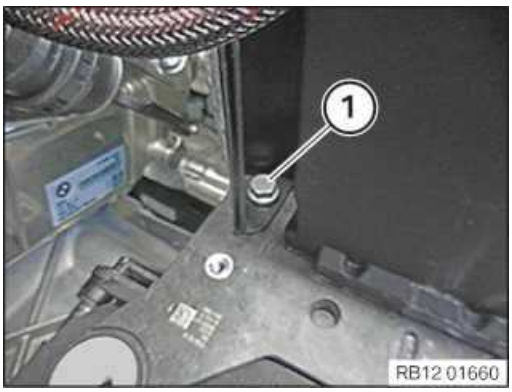
- Unlock and loosen connector (1).



- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.

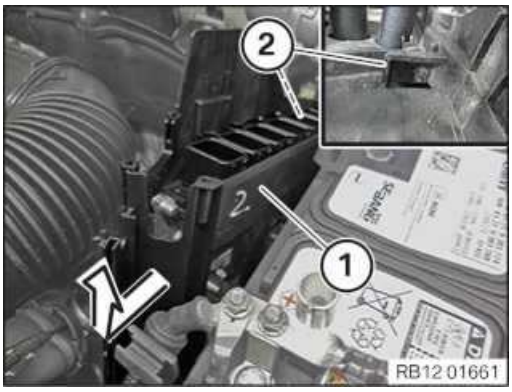


- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.



- Loosen screw (1).

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- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

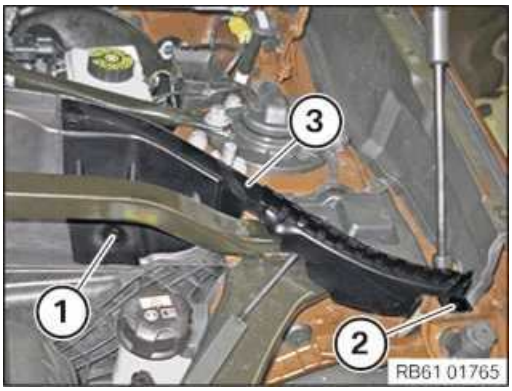
21 – Remove vehicle battery

WARNING

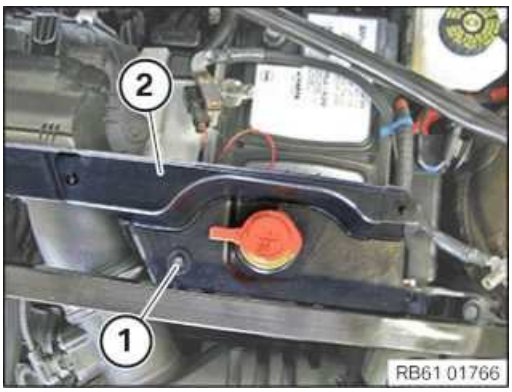
Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

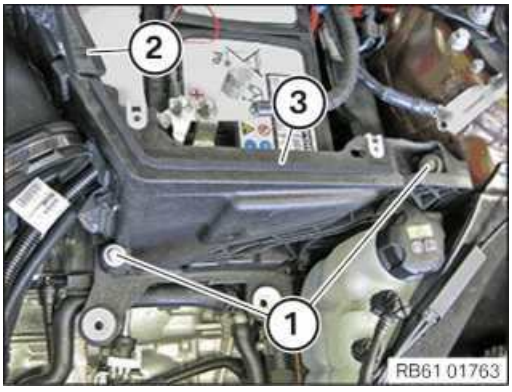
- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.



- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

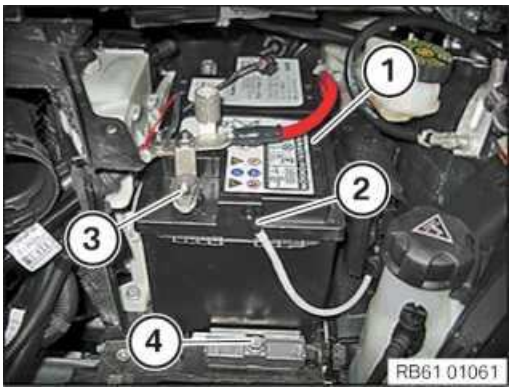


- Loosen screw (1).
- Remove the cover (2).



- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.

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- Pull off the vent hose (2).
- Slacken the nut (3) on the positive battery terminal and remove the positive battery terminal.

WARNING

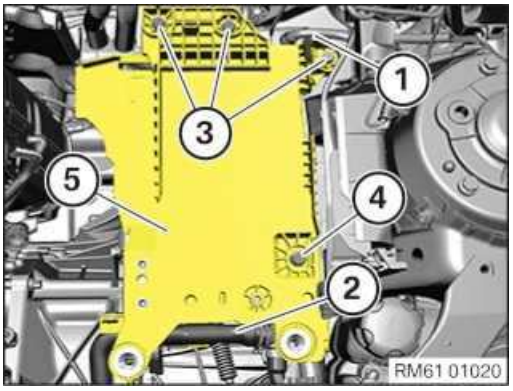
Unprotected battery terminals.

Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

22 – Remove battery holder



- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

23 – Removing both front wheels



▸ **Removing the wheel**

- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Unscrew the wheel bolts (arrows) and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

24 – Removing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

▸ **Remove the front wheel arch trim**

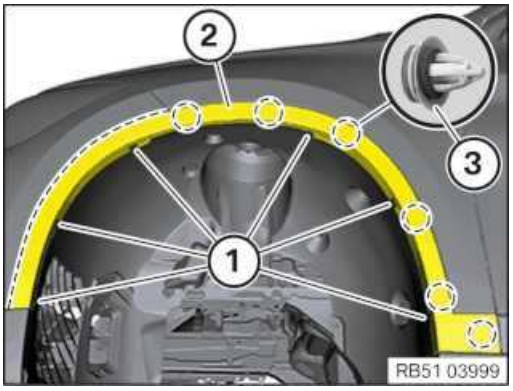
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NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

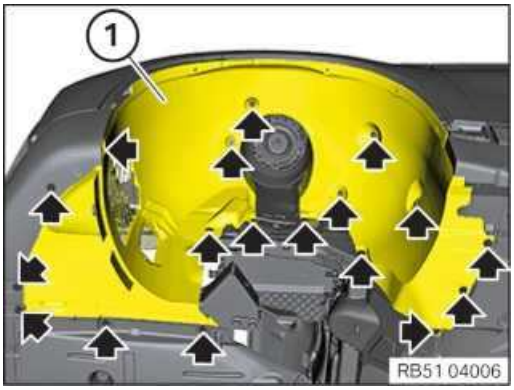
NOTICE

Description is for left component only. Procedure on the right side is identical.



- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.

▶ **Remove front wheel arch cover**



- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

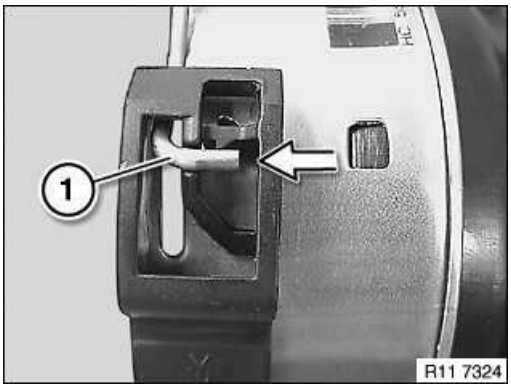
25 – Remove the pressure pipe between the throttle body and the charge air cooler

WARNING

Hot surfaces.

Risk of burning!

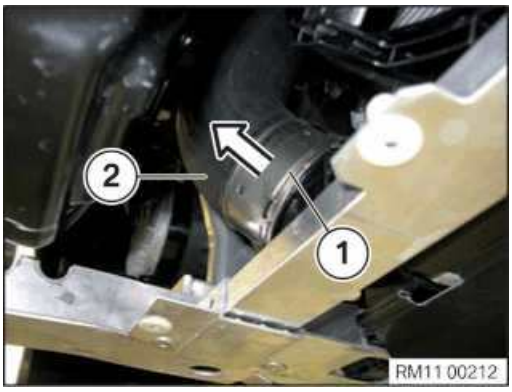
- Perform all work only on components that have cooled down.



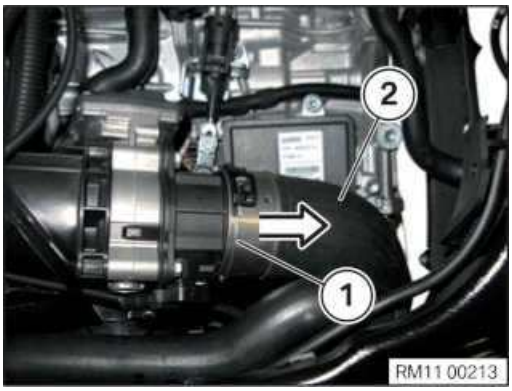
- Unlock the lock (1).

  The lock (1) must engage in the bracket (arrow).

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- Unlock and detach the locks (1) on both sides.
- Guide out the pressure pipe (2) in the direction of the arrow and set it aside.



- Unlock and detach the locks (1) on both sides.
- Guide out the pressure pipe (2) in the direction of the arrow and set it aside.



- Remove the pressure pipe (1) in the direction of the arrow.

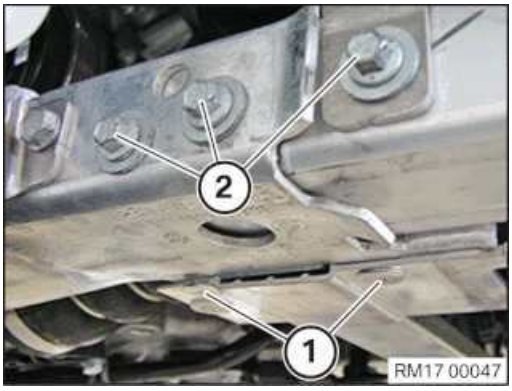
26 – Removing the right charge air duct between the exhaust turbocharger and the charge air cooler

WARNING

Hot surfaces.

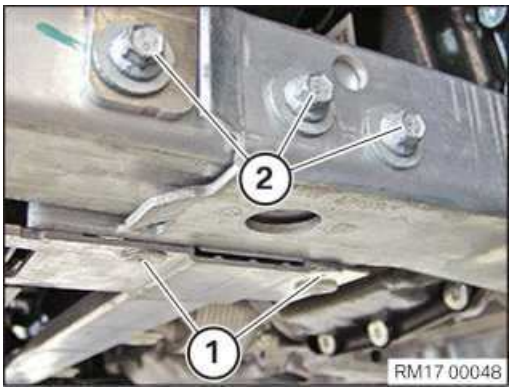
Risk of burning!

- Perform all work only on components that have cooled down.

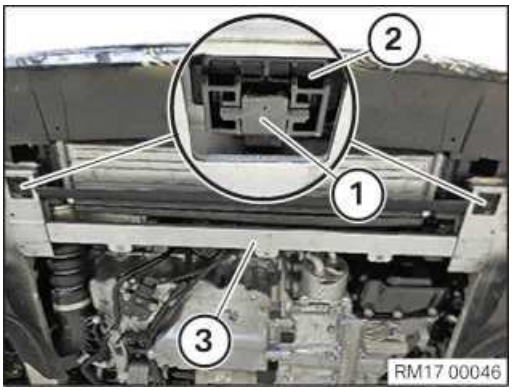


- Undo screws (2) at front left.
- Drill out blind rivets (1) at front left.

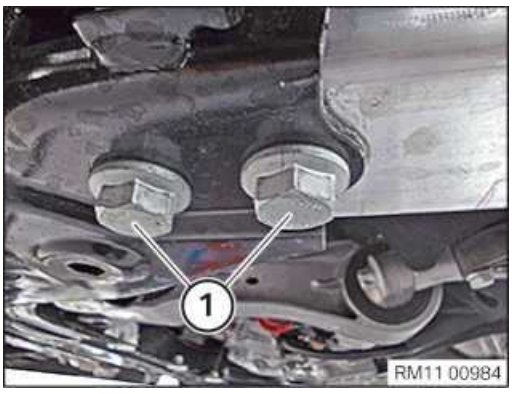
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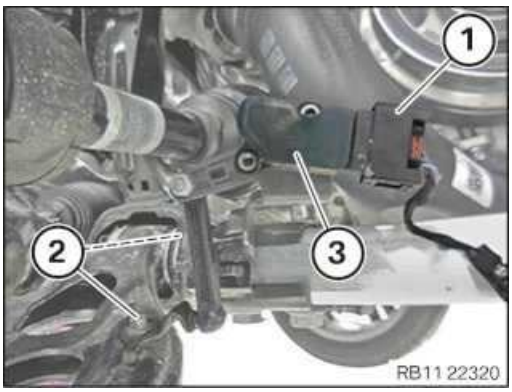
- Undo screws (2) at front right.
- Drill out blind rivets (1) at front right.



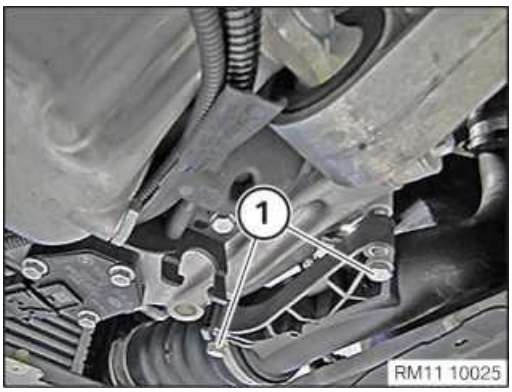
- Unlock locking pins (1).
- Thread out and remove locks (2).
- Thread out and remove cross connection (3).



- Release the screws (1) on the right front axle support.

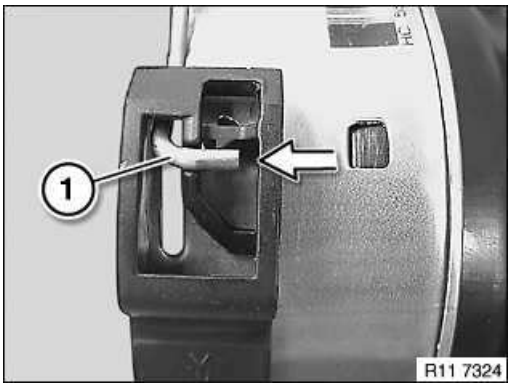


- **If installed:**
- Unlock and release plug connection (1).
- Loosen screws (2).
- Feed out the ride height sensor (3) and remove.



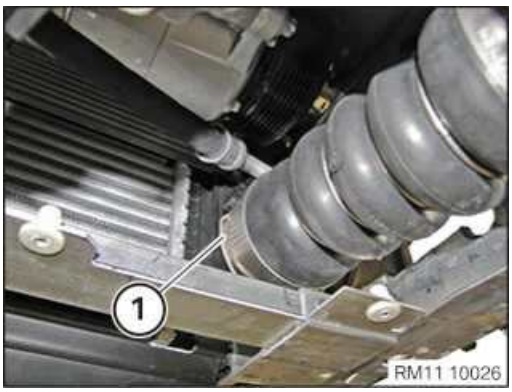
- Release screws (1) of charge air duct on right oil sump.

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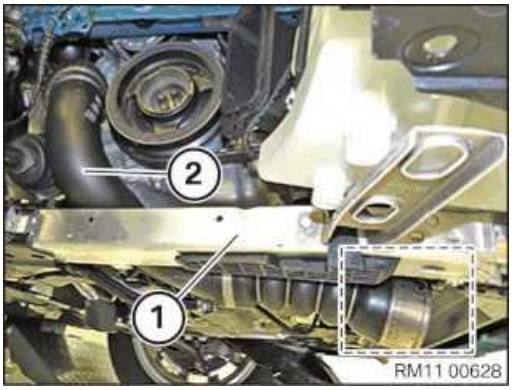


- Unlock lock (1).

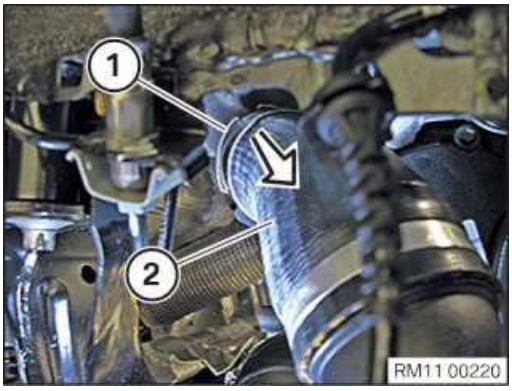
  The lock (1) must engage in the bracket during unlocking (arrow).



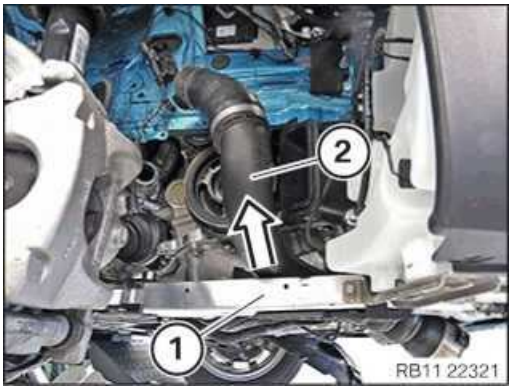
- Unlock and release the charge air duct (1) on the charge air cooler.



- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed out the charge air duct (2) in the **marked** area towards the bottom and set it aside.



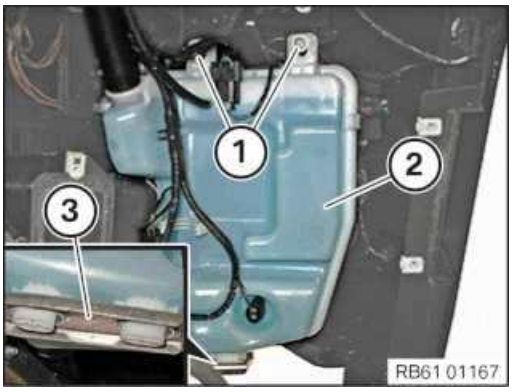
- Unlock and detach the locks (1) on both sides.
- Feed out the charge air duct (2) on the exhaust turbocharger in the direction of the arrow and set it aside.



- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed out the charge air duct (1) in the direction of arrow between the side member and the deformation element and remove.

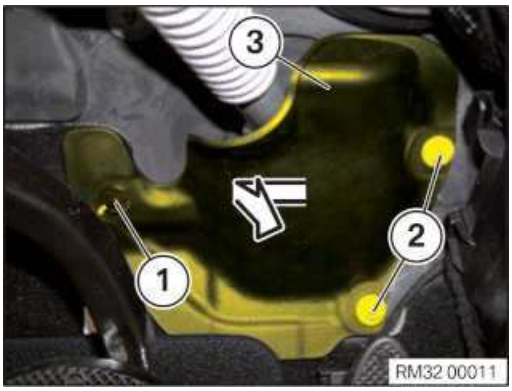
27 – Remove the washer fluid reservoir from the fixture

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- Loosen screws (1).
- Guide the washer fluid reservoir (2) up and out of the fixture (3) and set it aside.

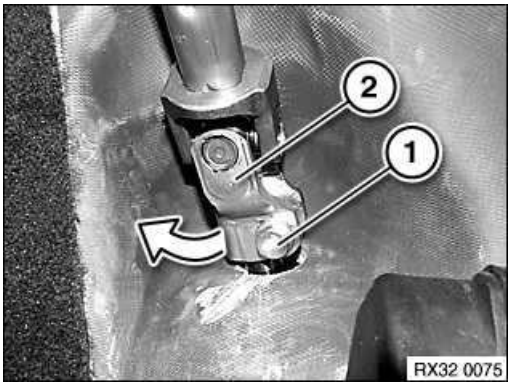
28 – Releasing lower steering shaft from steering gear



- **If installed:**
- Unfasten nut (1).
- Unscrew the nuts (2) by 1 rotation.

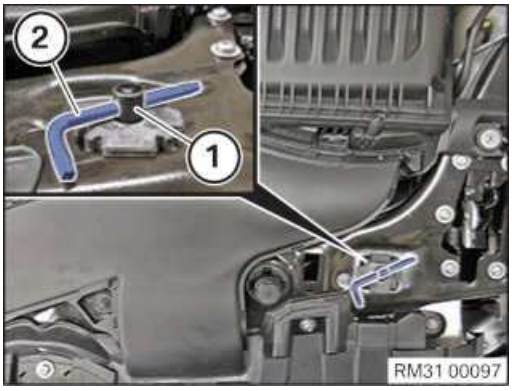
  Do not remove the nuts (2) !
- Remove the cover (3) on the steering column in the direction of the arrow.

  The side footwell trim must not be disassembled!



- Loosen screw (1).
- Swivel out the universal joint (2) of the bottom steering shaft from the steering gear in the direction of the arrow.

29 – Securing radiator on left and right



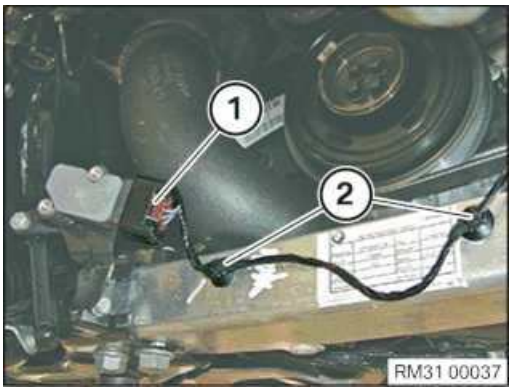
NOTICE

Perform the operations on the left and right side.

- Fasten radiator at centring pin (1) with suitable tool (2).

30 – With right installation: Detaching ride height sensor cable

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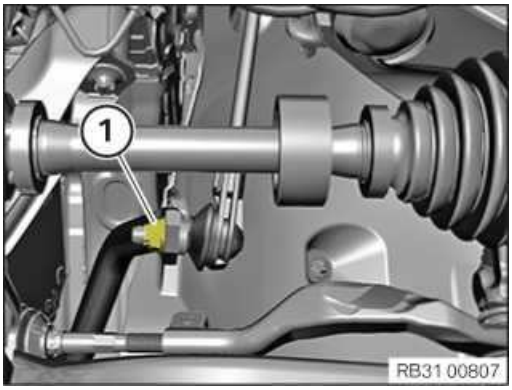
- Unlock plug connection (1) and disconnect.
- Release cable clip (2) from deformation element adapter.

31 – Releasing anti-roll bar on left and right from anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▸ **Detach the anti-roll bar from the anti-roll bar link**

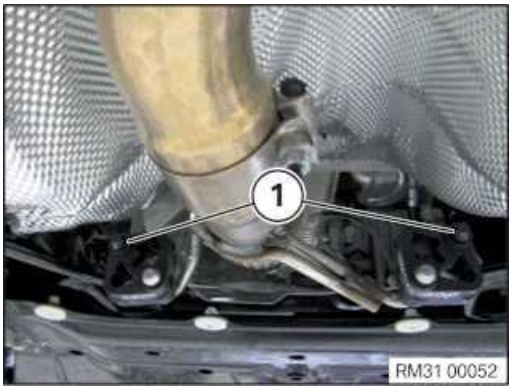


- Unfasten nut (1).

Note: Use the Torx socket for counter support.

- Loosen the anti-roll bar link from the anti-roll bar .

32 – Detaching rubber mount from front axle support

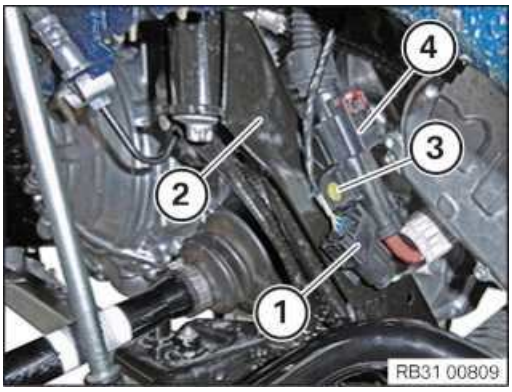


- Spray rubber mount (1) with lubricant and release from holder on front axle support.

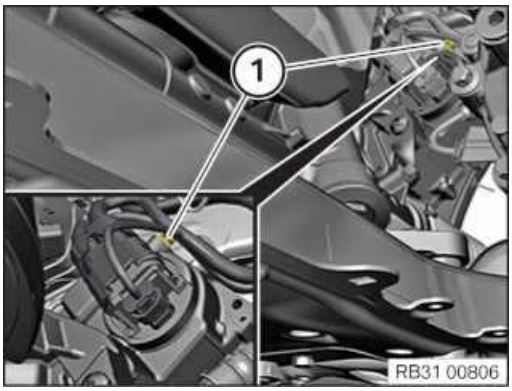
33 – Disconnecting plug connections from steering gear

▸ **If installed: Detach connectors from the front axle carrier**

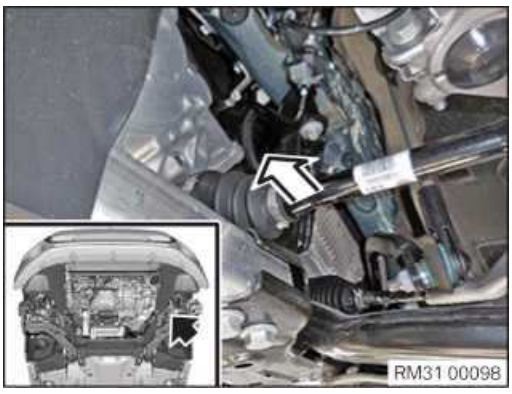
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- Release the plug connection (1) from the front axle support (2).
- Loosen screw (3).
- Release the plug connection (4) from the front axle support (2).

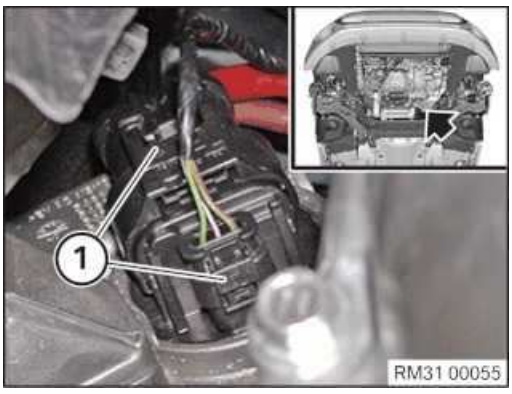


- Disconnect wiring harness (1) from steering gear.



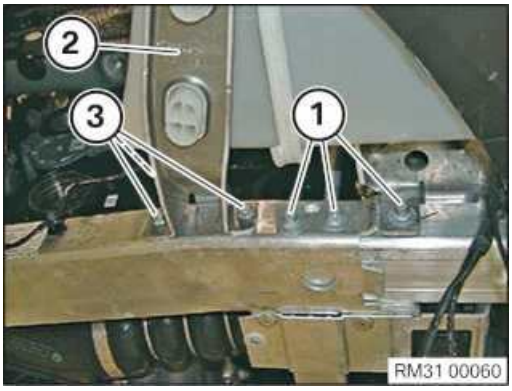
- To unlock the plug connections (see the following work step): unlock plug connections (arrow) with the right hand.

  The plug connections can be reached via the left-hand output shaft.



- Unlock plug connections (arrow) (1)and disconnect from the steering gear.
- Make sure when lowering the front axle that the cables are not damaged!

34 – Releasing the mounted part from the front axle support



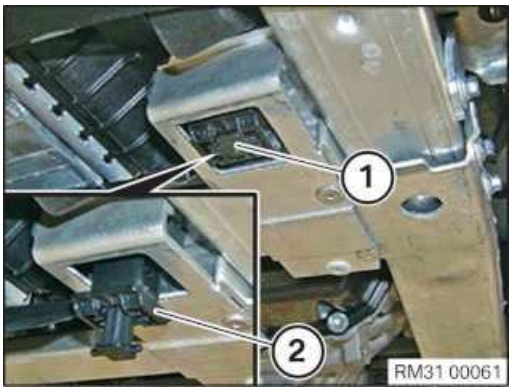
- **Only on right side:** Loosen screws (3) and remove holder for washer fluid reservoir (2).

NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

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NOTICE

Perform the operations on the left and right side.

- Unlock safety catch (1) of the lock (2) from the holder for the charge air cooler.
- Completely remove locks (2).



- Loosen screw (2) of the engine support (3) on the front axle (1).

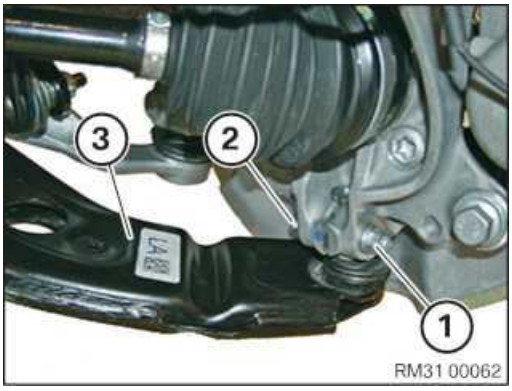


NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

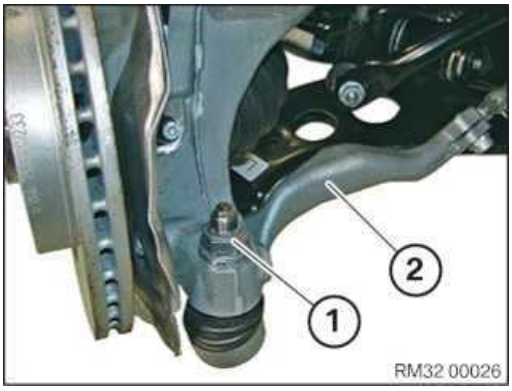
35 – Detaching and removing front axle completely



NOTICE

Perform the operations on the left and right side.

- Unfasten nut (1).
- (2)Pull out screw.
- Detach the wishbone (3) from the swivel bearing .

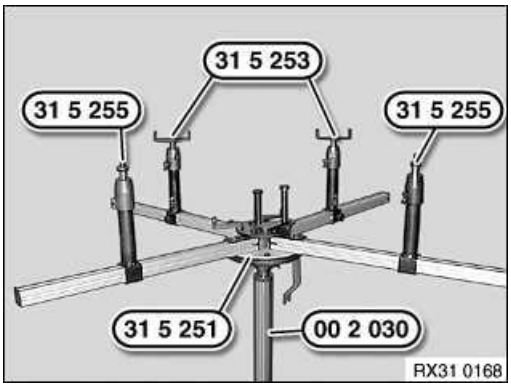


NOTICE

Perform the operations on the left and right side.

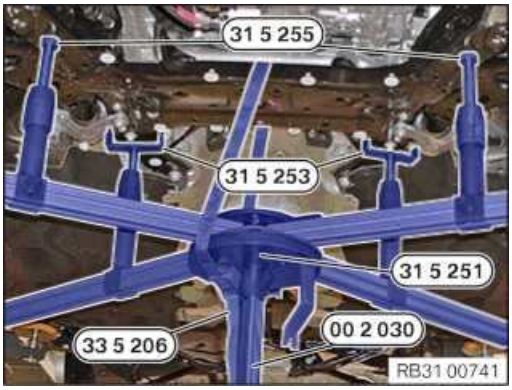
- Unfasten nut (1).
- Detach the track rod (2) from the swivel bearing.

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- Fit the special tool completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools in telescopic supports of a profile rail pair.
- Insert special tools in telescopic supports of other profile rail pair.

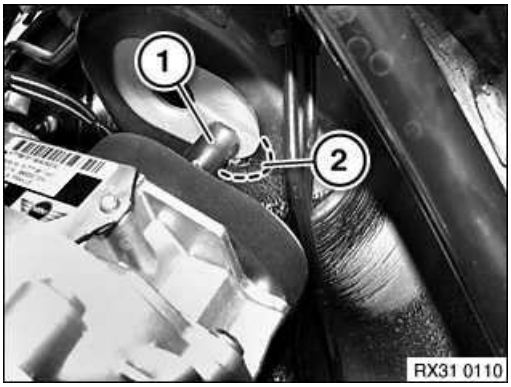
Note: In a profile rail pair, two profile rails are connected to one another by gearing.



- Align special tools and to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool to special tool .

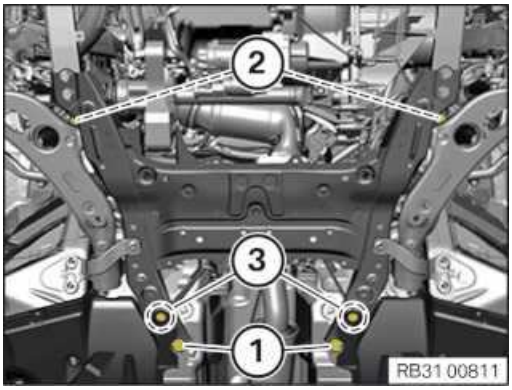


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and remove the front axle.

TECHNICAL INFORMATION

Note the information on thread repairs using Helicoil thread inserts.
For more information see: 41 00 ... Notes on repairing threads

- Check threads for damage; if necessary, repair with Helicoil thread inserts.

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and loosen connector (1).
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).



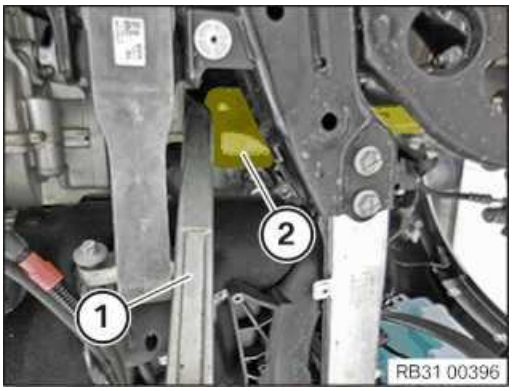
- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.

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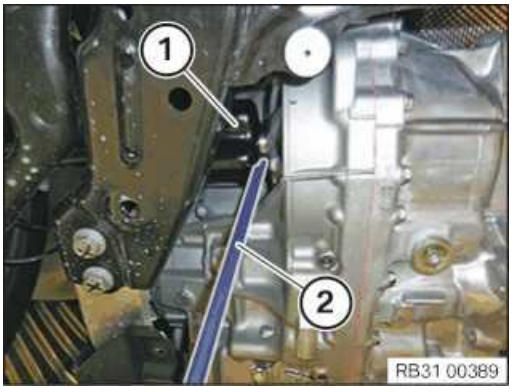
- Loosen screws (1).
- Feed out starter motor and remove.

37 – Partially removing right output shaft



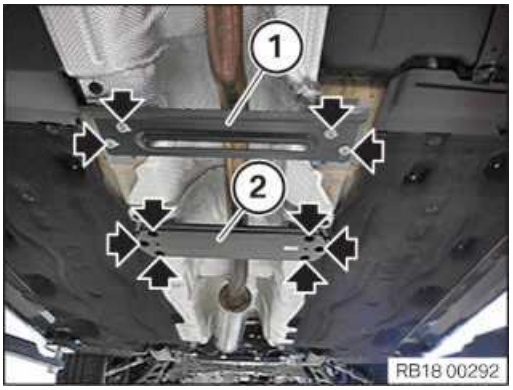
- Lever out the output shaft (2) with a mounting lever (1).
- Tie up output shaft (1).

38 – Partially removing the left output shaft



- Protect the output shaft (1) from falling.
- Lever out the output shaft (1) with a mounting lever (2) from the transmission.
- Tie up output shaft (1).

39 – Removing the connecting support from the tunnel in front and back



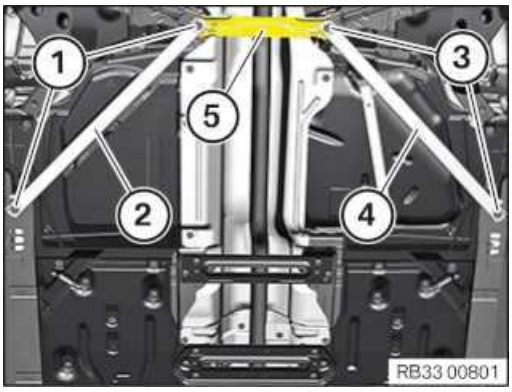
- Unscrew the bolts (arrows) from the connecting support (1).
- Feed out and remove the crossbeam (1).
- Unscrew the bolts (arrows) from the connecting support (2).
- Feed out and remove the crossbeam (2).

40 – Remove the cross strut with the torsion strut

TECHNICAL INFORMATION

Driving without a torsion strut is not permitted.

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- Loosen screws (1).
- Thread out torsion strut (2) at left and remove.
- Loosen screws (3).
- Thread out torsion strut (4) at right and remove.
- Feed out and remove the cross-member (5).

41 – Remove the exhaust temperature sensor on the catalytic converter

WARNING

Hot surfaces.

Risk of burning!

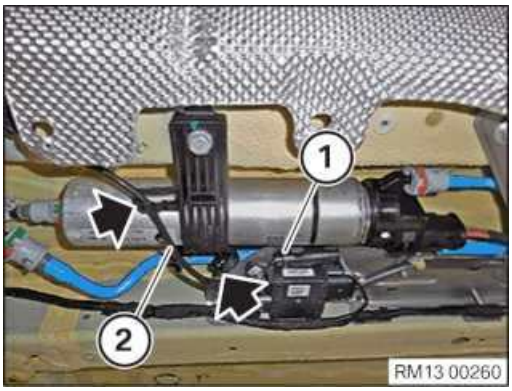
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

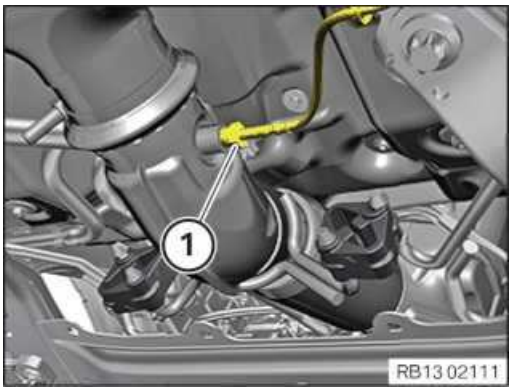


- Unlock and loosen connector (1).
- Feed out the cable (2) of the exhaust temperature sensor from the clamps (arrows) and remove.

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- Loosen the cable clip (1).



- Loosen exhaust temperature sensor (1).
- Feed out and remove exhaust temperature sensor (1).

42 – Remove exhaust system

WARNING

Hot surfaces.

Risk of burning!

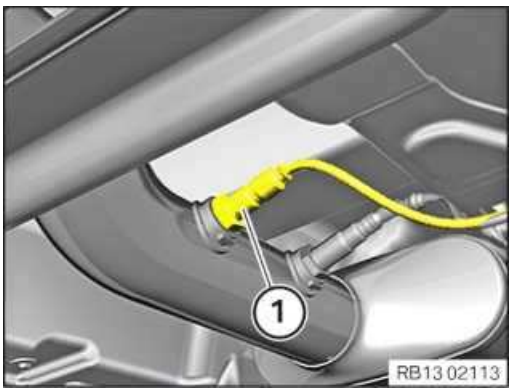
- Perform all work only on components that have cooled down.

CAUTION

Heavy component.

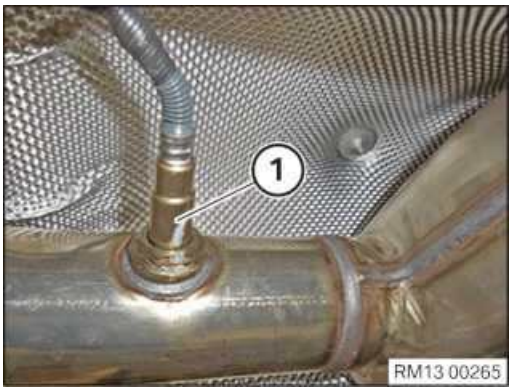
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

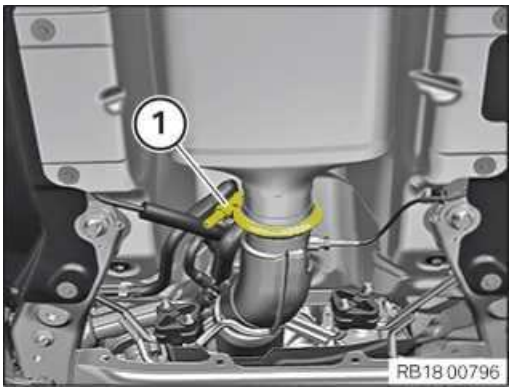


- Release the nitrogen oxide sensor (1) downstream of the SCR catalytic converter, guide it out and set it aside.

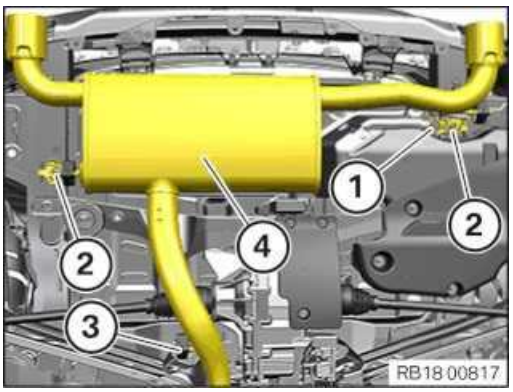
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- Release the diesel particulate sensor (1), guide it out and set it aside.



- Loosen V-band clamp (1).



- Loosen screw (1).
- Loosen nuts (2).
- Release the rubber mount (3) of the exhaust system (4).
- Lower and guide out the exhaust system (4) with assistance of a second person and remove it.

43 – Remove the SCR metering module

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

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TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

After repair work, clean the working area thoroughly with water.
Clean special tools with water after every use.

TECHNICAL INFORMATION

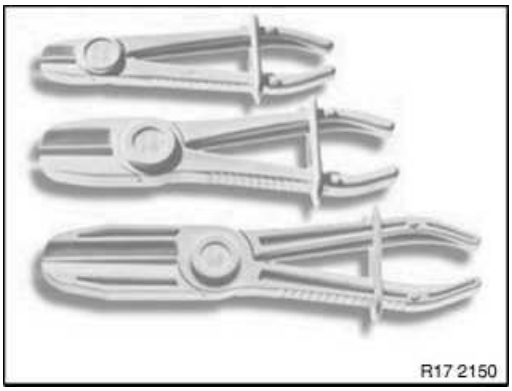
Use only lint-free cloths for cleaning the SCR system: WAYPALL cleaning cloths L20 - see BMW Group Parts.

TECHNICAL INFORMATION

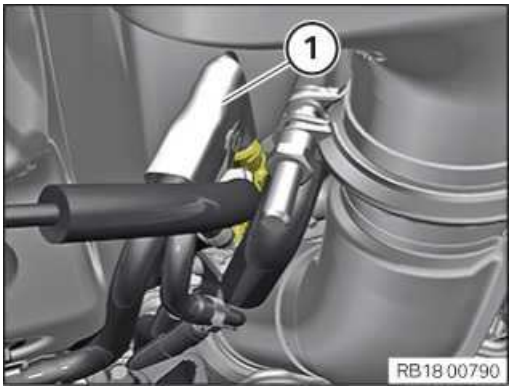
Notes on work at the cooling system form the basis of these repair instructions and must be complied with at all times.
For additional information see: 17 00 ... Instructions for repair work on cooling system

TECHNICAL INFORMATION

Do not unintentionally swap the coolant hoses and coolant lines. If necessary, mark before removal.

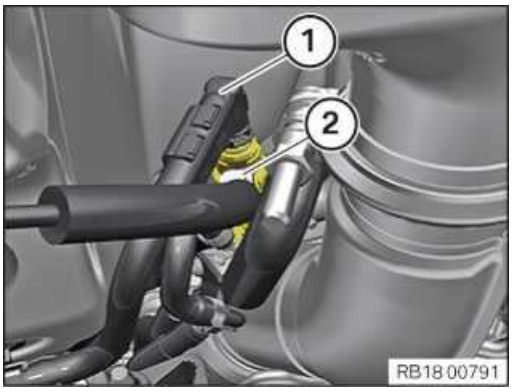


- Use commercially available pinch-off tools to pinch off the coolant hoses.



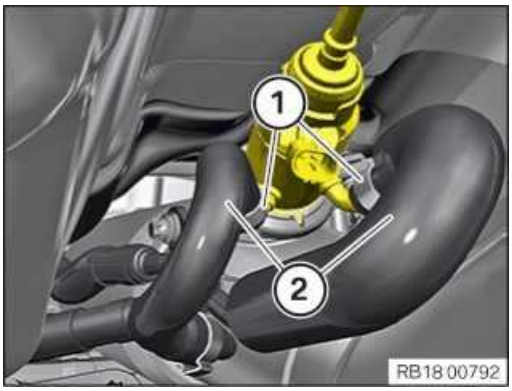
- Guide the heat protection cap (1) out and remove.

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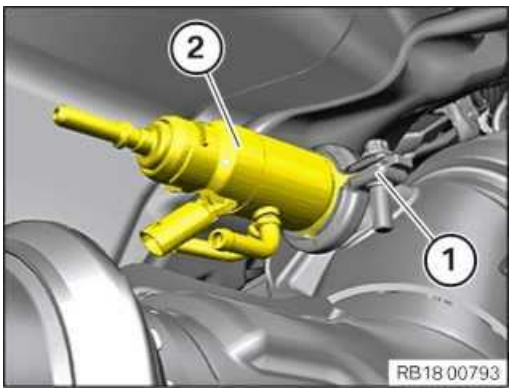


- When releasing the metering line, make sure that **no lateral forces** act on the metering line and the connection.

  The SCR metering module connection can be damaged by lateral forces.
- Unlock and disconnect the metering line (1).
- Unlock and disconnect connector (2).

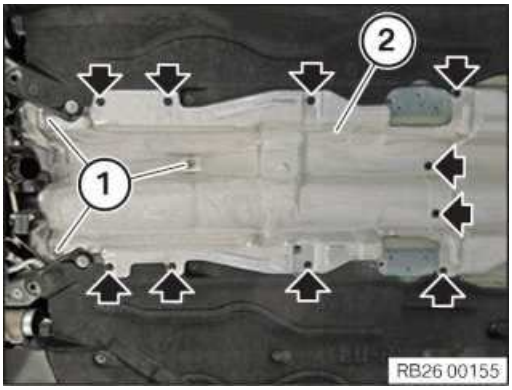


- Loosen clamps (1).
- Disconnect coolant lines (2).



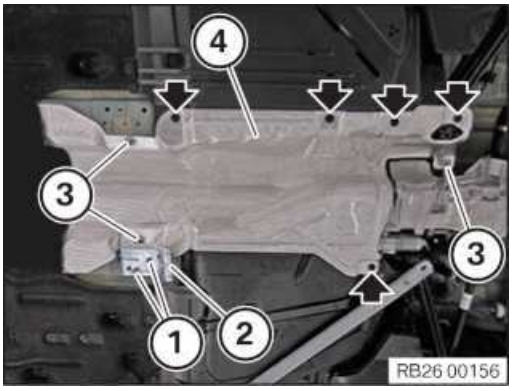
- Loosen V-band clamp (1).
- Guide out and remove the SCR metering module (2).

44 – Remove front heat shield



- Remove screws (arrows).
- Loosen nuts (1).
- Guide the heat shield (2) out and remove it.

45 – Remove heat shield at rear.



- Loosen screws (1).
- Guide out and remove holder (2).
- Remove screws (arrows).
- Loosen nuts (3).
- Guide the heat shield (4) out and remove it.

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46 – Remove propeller shaft

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

RISK OF DAMAGE

Damage to propeller shaft during removal.

Non-observance of the removal guidelines for the propeller shaft on the rear axle differential may cause severe damage.

- Do not disassemble the three-hole flange, flexible disc and propeller shaft. The three-hole flange to the rear axle differential is balanced with the flexible disc and propeller shaft.
- Loosen the recessed nut against the direction of travel in clockwise direction. The propeller shaft must be loosened on the recessed nut only and exclusively in the direction of rotation otherwise the anti-twist lock of the bi-hexagonal flange nut is damaged.
- In the event of a damaged anti-twist lock on the bi-hexagonal flange nut: Replace the rear axle differential.

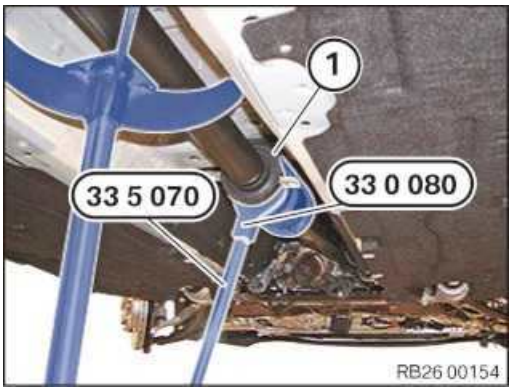


- Install the special too l between the front and rear propeller shaft.
- Make sure that the arrows on the special tool point forward in the direction of travel.

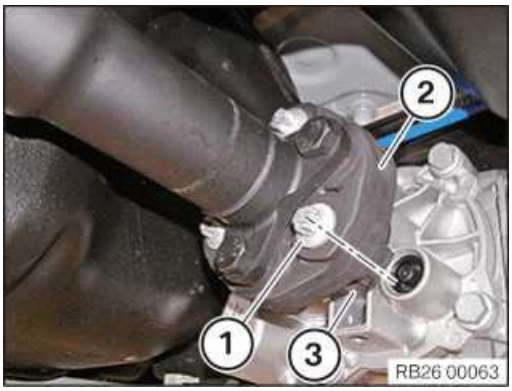


- Always support the propeller shaft (1) with a conventional jack.

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- Protect the propeller shaft (1) with the special tools **0 495 554 (33 5 070)** and from twisting.



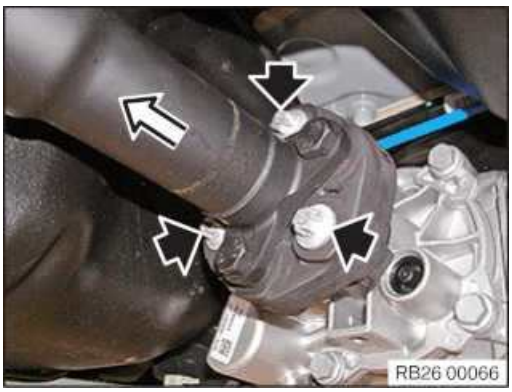
TECHNICAL INFORMATION

Compliance with the following instructions is required to avoid a humming noise from the propeller shaft after refitting the propeller shaft.

- Mark the installation position of the screw connection (1), the flexible disc (2) and the three-hole flange (3) on the same level.
- Loosen the screw connection (1).

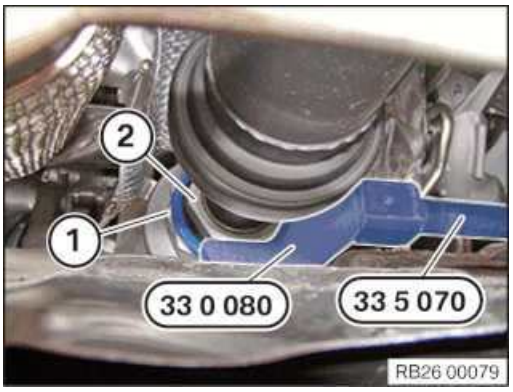


- Loosen screws (1).



- Remove screws (arrows).
- Guide the propeller shaft out in the direction of the arrow and set it aside.

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RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.

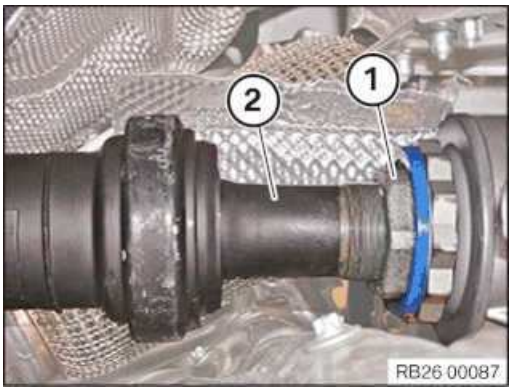
- Protect the recessed nut (2) on the transfer box from twisting with the special tools **0 495 554 (33 5 070)** and .

  The recessed nut (2) on the transfer box must **not** be used to detach the propeller shaft.

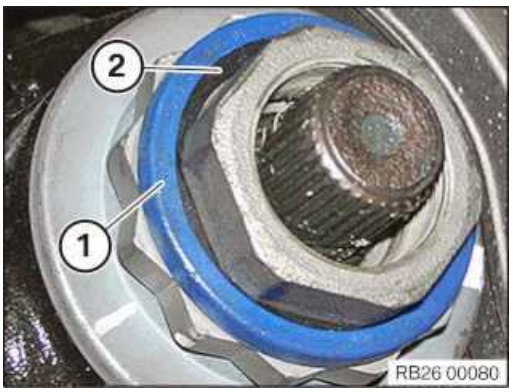
  The double hexagon flange nut (1) must **not** be used for counter support.



- Release the front propeller shaft with the special tools **0 495 554 (33 5 070)** and in the direction of the arrow.

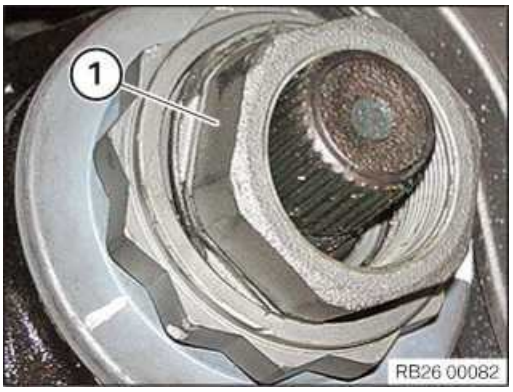


- Thread the propeller shaft (2) out of the recessed nut (1) and remove.



- Thread the retaining clip (1) and the seal (2) out and remove.

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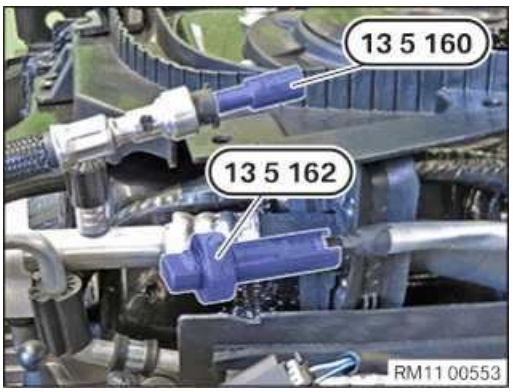
- Thread out and remove the recessed nut (1).

MAIN WORK

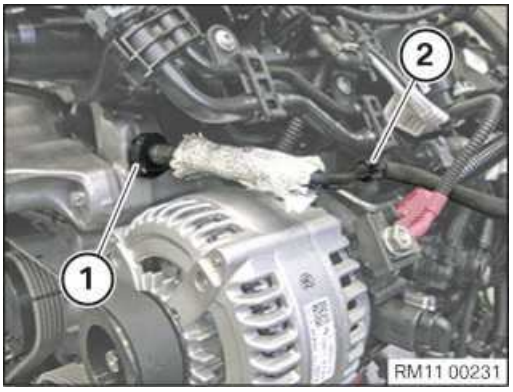
47 – Removing engine



- Unlock and pull off the fuel lines (1).

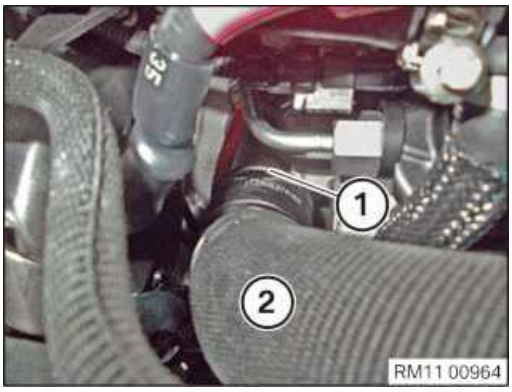


- Seal fuel lines with special tools and .

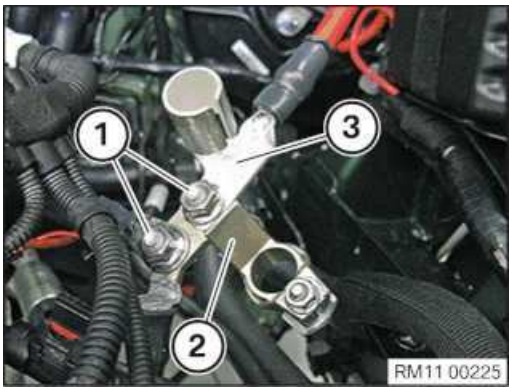


- Unlock the clamp (1).
- Pull off the coolant line (2) from the cylinder head.

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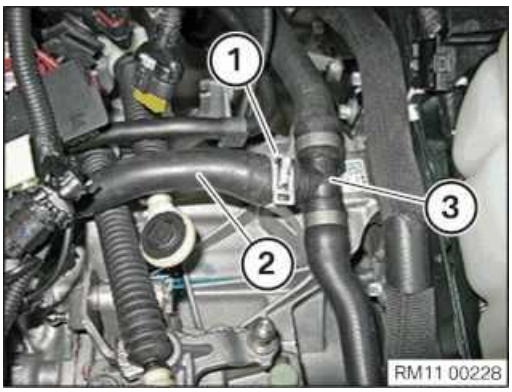
- Unlock lock (1) upwards and pull off coolant hose (2).
- Catch and dispose of escaping coolant.



- Loosen nuts (1).
- Feed out the positive battery terminal (2) and the remote positive terminal (3) and set aside.



- Unscrew the bolt (1) and set the ground strap aside.

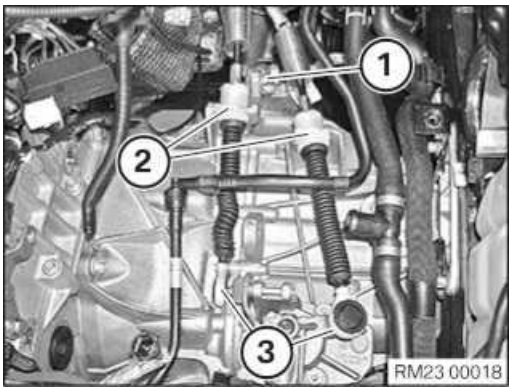


- Detach the clamping collar (1).
- Detach the coolant hose (2) from the coolant line (3).
- Catch and dispose of escaping coolant.

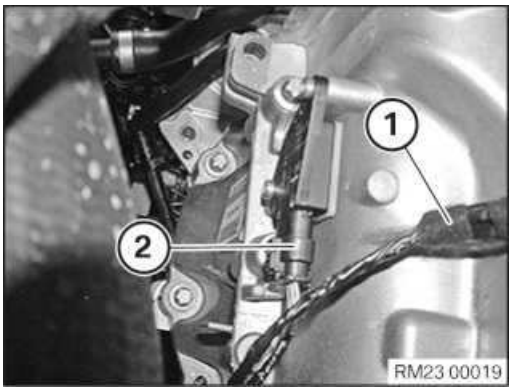


- Unlock and disconnect the vacuum line (1).

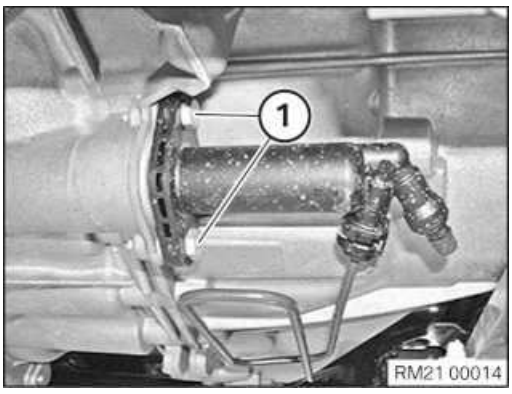
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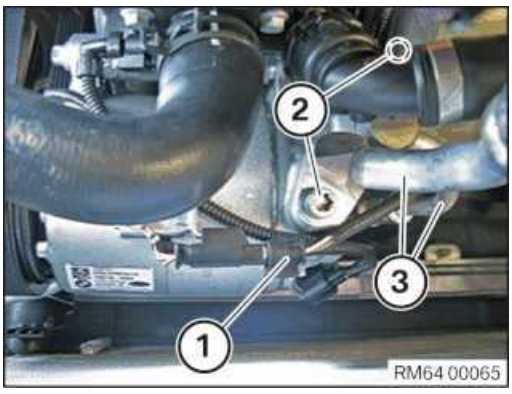
- Release screw (1) and guide out the ground strap and set it aside.
- Unlock safeguards (2) on the holders of the gear selector cables and remove.
- Lever fixtures (3) of the gear selector cables with an AF 13 open-end spanner off the ball joints.



- Unlock plug connection (2) and disconnect.
- Release cable (1) with the holder from the transmission.



- **Ensure that the clutch slave cylinder remains connected to the pressure line.**
- Loosen screws (1).
- **Slowly** release clutch slave cylinder and remove.



CAUTION

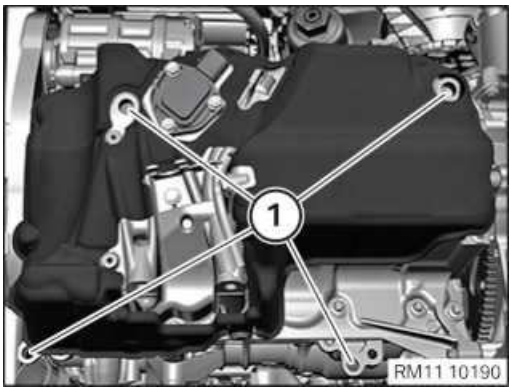
Residual pressure in the air conditioning.

Danger of injury!

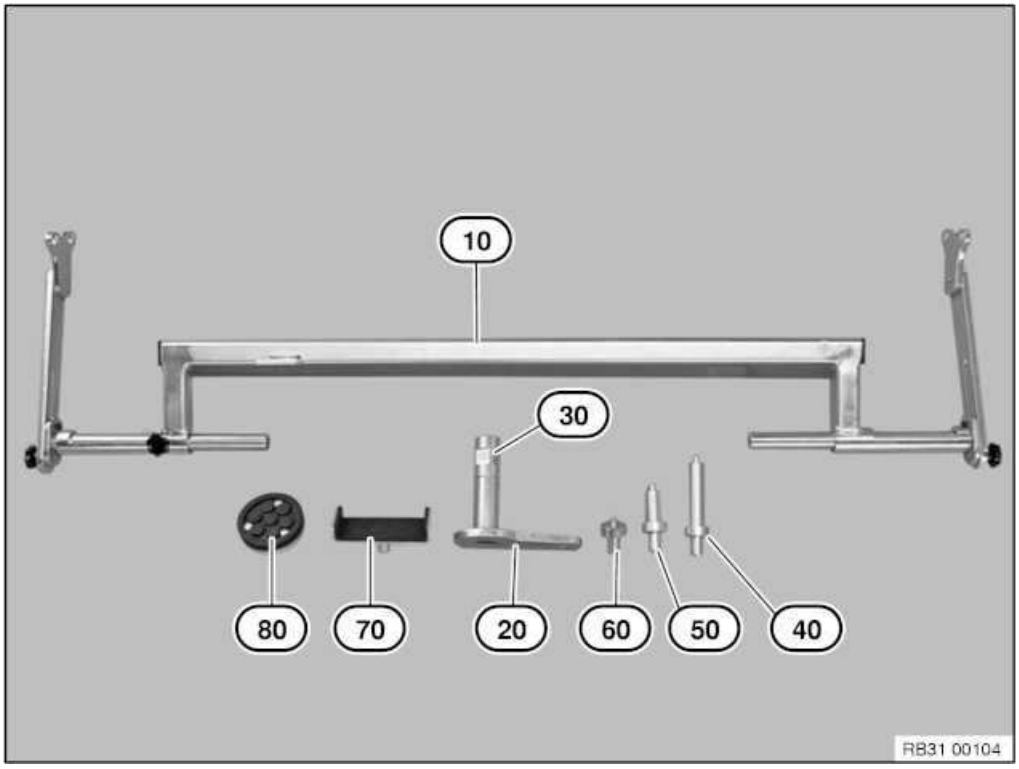
- Wear safety goggles and protective gloves when disconnecting the refrigerant line.
- Seal refrigerant lines with seal plugs.

- Unlock plug connection (1) and disconnect.
- Loosen screws (2).
- Feed out the refrigerant lines (3) and set them aside.
- Close the openings on the refrigerant lines (3) and the air conditioning compressor with standard tools.

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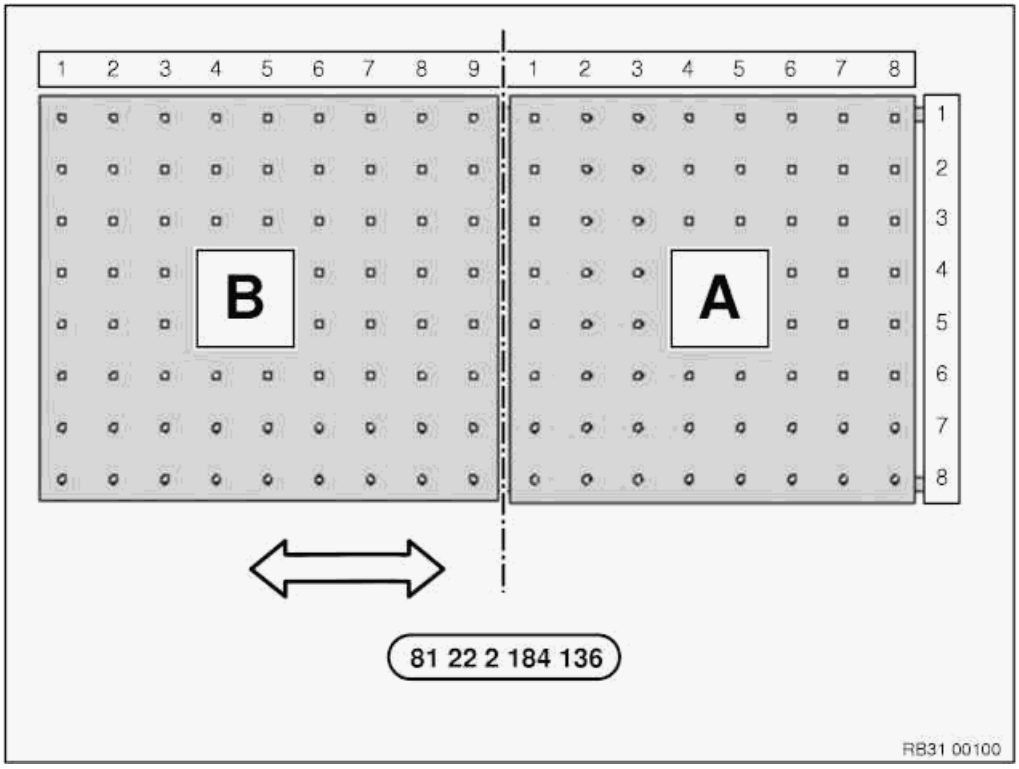


- Ensure that the **40/50** distance pins of table top **A** of the mobile lifting table are installed in mounting points (1) of the oil sump.



- Overview of the set of special tools **2 305 379**:

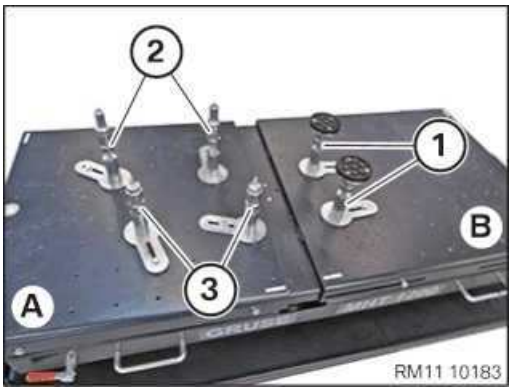
Number	Description
10	For mounting the swivel bearing including brake disc
20	Retaining element for adjustable fixture
30	Adjustable fixture
40	Distance pin 40 x 160 mm
50	Distance pin 40 x 110 mm
60	Distance pin 40 x 60 mm
70	Fixture with U-profile
80	Plate mounting 100 mm



- Overview of special tools **2 184 136**:

Letter	Description
A	Table top for engine with coordinates
B	Table top for transmission with coordinates

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- Position adjustable fixture (30) with distance pin (50) for the engine block on table top (A) at coordinates **6/6** and **2/6** (2).
- Position adjustable fixture (30) with distance pin (50) for the engine oil sump on table top (A) at coordinates **4/2** and **2/3** (3).
- Position adjustable fixture (30) with distance pin (80) for the transmission housing on table top (B) at coordinates **7/3** and **7/5** (1).



- Position the lifting table below the engine.
- Abut all fixtures and screw them to the lifting table.



- Attach the adjustable fixture to the housing of the clutch slave cylinder with screw (1).



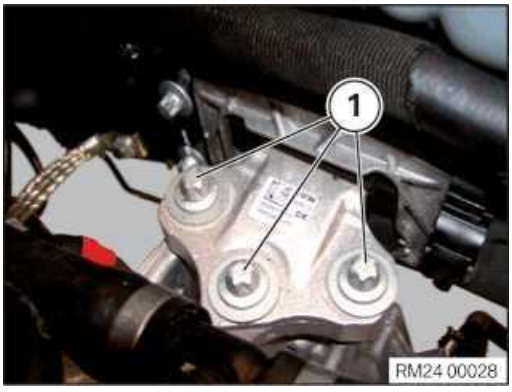
WARNING

Motor vehicle may slip off the vehicle hoist if the weight is distributed unevenly.

Danger! Life-threatening injuries!

- Ensure there is a specific weight compensation on the motor vehicle.

- Position the weight compensation (1) on the vehicle.



WARNING

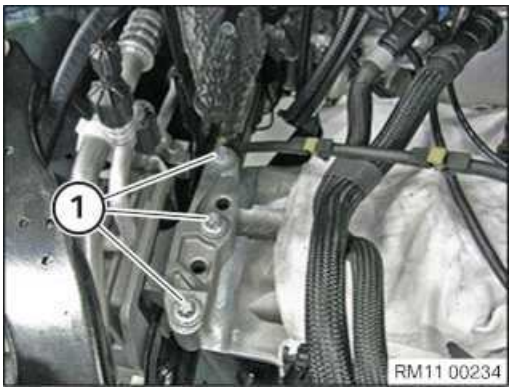
Motor vehicle may slip off the vehicle hoist if the weight is distributed unevenly.

Danger! Life-threatening injuries!

- Ensure there is a specific weight compensation on the motor vehicle.

- Loosen screws (1).

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WARNING

Vehicle may slip off the vehicle hoist if the vehicle hoist is handled incorrectly.

Danger! Life-threatening injuries!

- Observe safety information on raising the vehicle using a vehicle hoist.
- For additional information see: 00 ... Raising the vehicle using a vehicle hoist.

- Loosen screws (1).
- Raise the vehicle **carefully**.

48 – Install engine



WARNING

Motor vehicle may slip off the vehicle hoist if the weight is distributed unevenly.

Danger! Life-threatening injuries!

- Ensure there is a specific weight compensation on the motor vehicle.

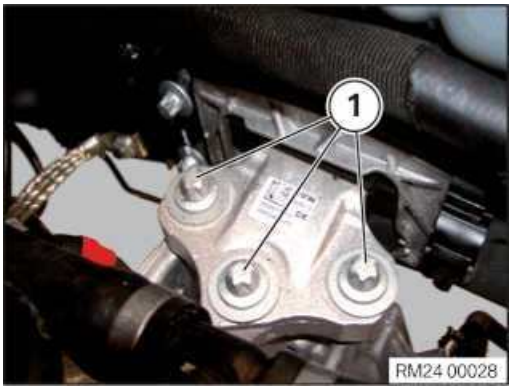
WARNING

Vehicle may slip off the vehicle hoist if the vehicle hoist is handled incorrectly.

Danger! Life-threatening injuries!

- Observe safety information on raising the vehicle using a vehicle hoist.
- For additional information see: 00 ... Raising the vehicle using a vehicle hoist.

- Position the lifting table and the engine under the vehicle.
- **Carefully** lower the vehicle and, if necessary, position the lifting table **correctly** for the vehicle.



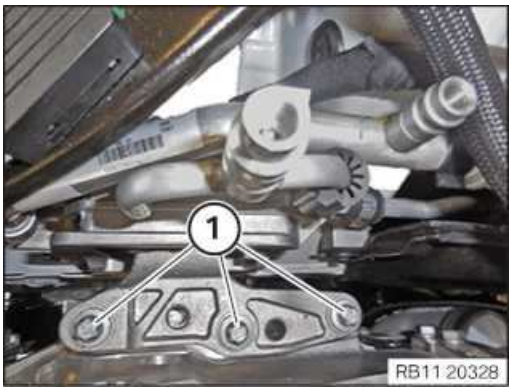
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Transmission mounting

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

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- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Right engine mount to cylinder head

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °



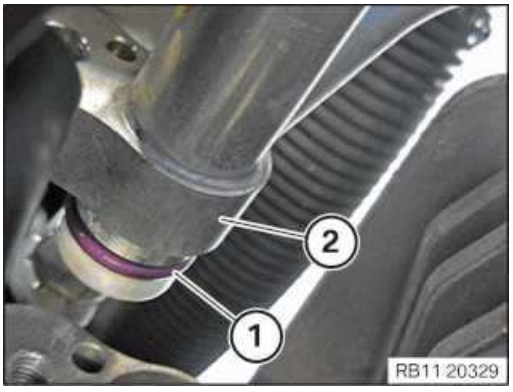
WARNING

Motor vehicle may slip off the vehicle hoist if the weight is distributed unevenly.

Danger! Life-threatening injuries!

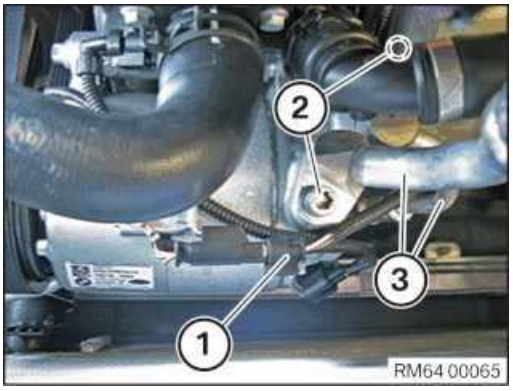
- Ensure there is a specific weight compensation on the motor vehicle.

- Remove weight compensation (1) from the vehicle.
- Lower lifting table(2) and put to one side.



- Renew sealing ring (1) of the refrigerant lines (2).

  Parts: Sealing ring

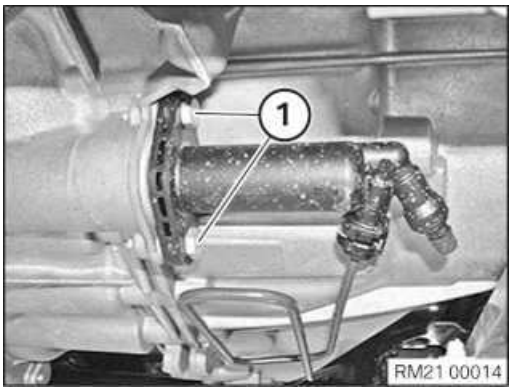


- Feed in and install the refrigerant lines (3).
- Tighten down screws (2).

Refrigerant line on air conditioning compressor

M8		Tightening torque	19 Nm

- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.

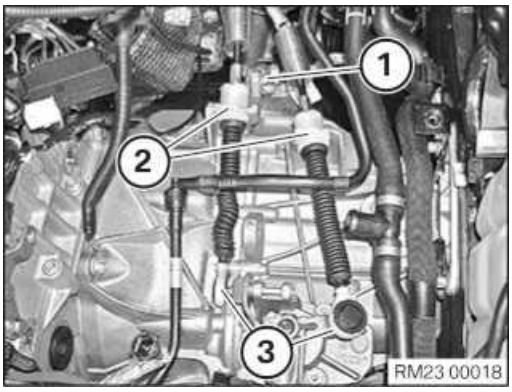


- Feed in and install the clutch slave cylinder .
- Tighten the screws (1).

Clutch slave cylinder to transmission housing

M8		Tightening torque	19 Nm

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- Insert earth strap and tighten the screw (1).

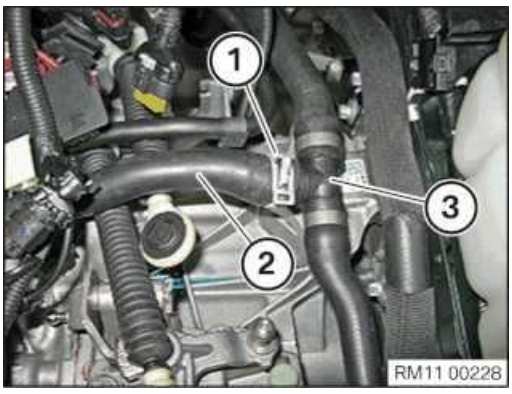
Standard screw connection M8

M8		Tightening torque	19 Nm

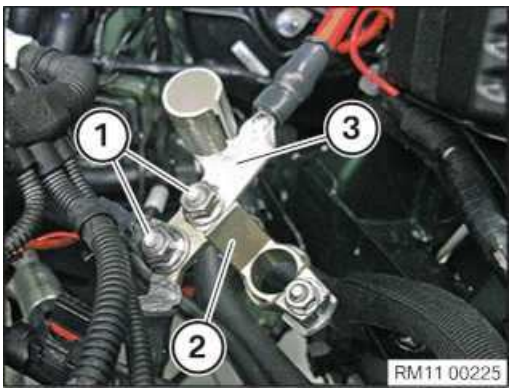
- Attach fixtures (3) of gear selector cables to the ball joints and engage.
- Insert gear selector cables into the holders and secure in the holders with safeguards (2).



- Connect the vacuum line (1) and lock.
- Make sure you can hear the vacuum line (1) engage.



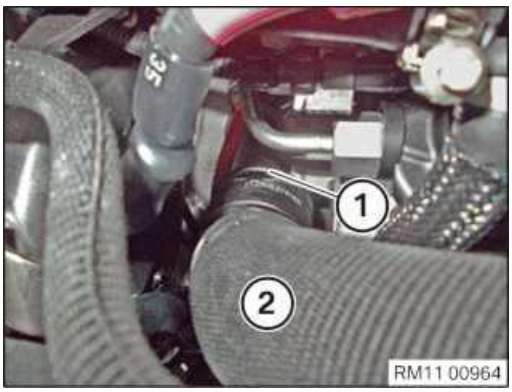
- Insert and install the coolant hose (2) on the coolant line (3).
- Fasten the clamping collar (1).



- Insert and install the positive battery terminal (2) and the remote positive terminal (3).
- Tighten nuts (1).

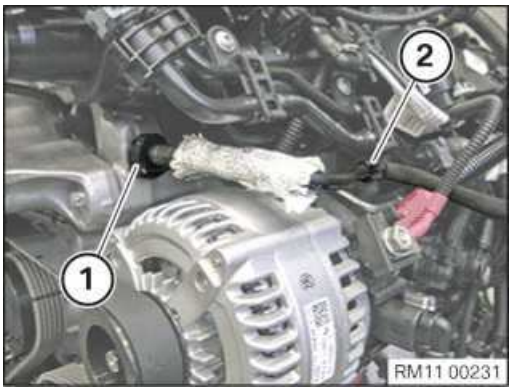
Positive battery cable to positive battery terminal

M8		Tightening torque	15 Nm

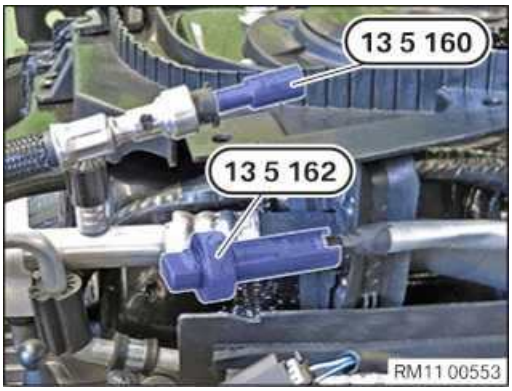


- Connect and lock coolant line (2).
- Ensure that the lock (1)engages audibly.

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- Connect the coolant line (2).
- Lock clamp (1).



- Thread out special tools and and remove.



- Route and connect fuel lines (1).
- Ensure that the locks engage audibly.

POSTPROCESSES

49 – Install propeller shaft.

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

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RISK OF DAMAGE

Damage to the propeller shaft during installation.

Non-observance of the installation guidelines for the propeller shaft on the rear axle differential may cause severe damage.

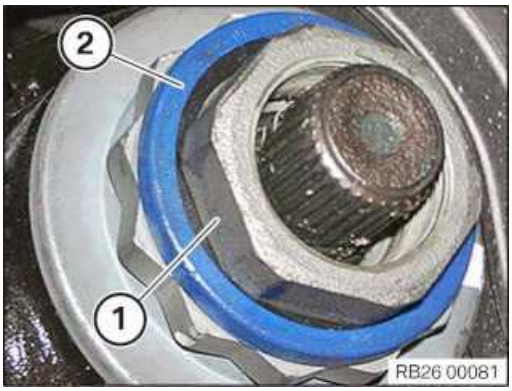
- Always renew the recessed nut on the rear axle differential. Screw locking must be available.
- Strictly observe a minimum hardening time of two hours after having screwed in the recessed nut. The hardening time may be longer at lower temperatures.

RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.

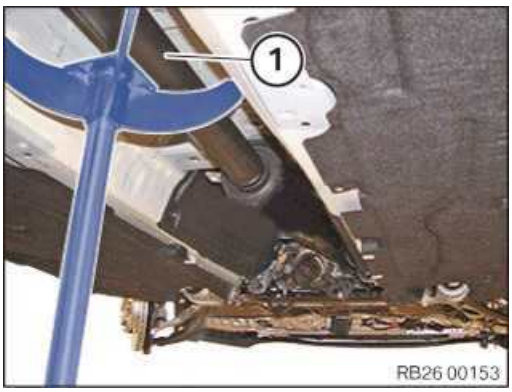


- Renew recessed nut (1).

  Parts: Insert nut
- Renew the retaining clip (2) and the seal.

  Parts: Retaining clip, seal
- Insert the seal with the recessed nut (1) and install.
- Insert the retaining clip (2) and install.
- Make sure that recessed nut (1) is screwed in within 5 min.
- Make sure that the hardening time of **minimum** 2 h for the recessed nut is observed.

  The hardening time must be extended at lower temperatures.

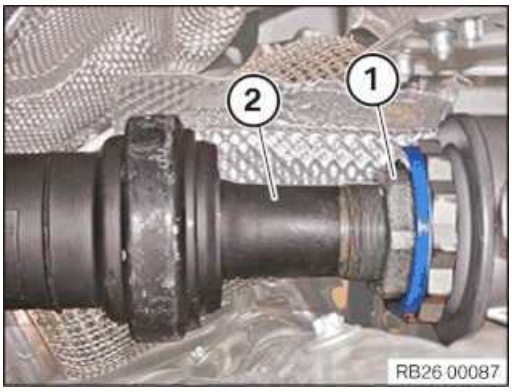


- Insert the propeller shaft (1) and install.
- Always support the propeller shaft (1) with a conventional jack.

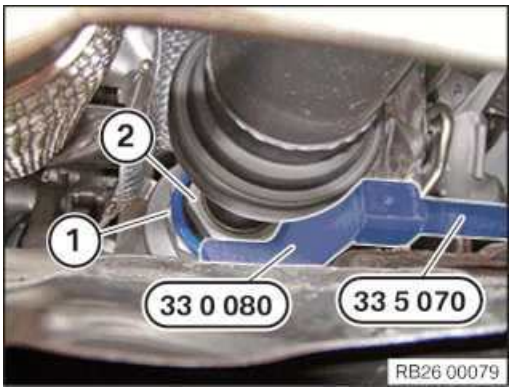


- Hand-tighten the bolts (1).

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- Push the propeller shaft (2) against the recessed nut (1) up to the limit position.
- Screw the propeller shaft (2) at least 2 thread starts onto the recessed nut (1) by hand.



RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.

- Protect the recessed nut (2) on the transfer box from twisting with the special tools **0 495 554 (33 5 070)** and .

  The recessed nut (2) on the transfer box must **not** be used to tighten the propeller shaft.

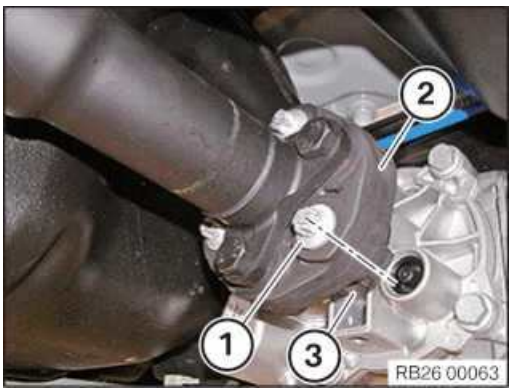
  The double hexagon flange nut (1) must **not** be used for counter support.



- Tighten the front propeller shaft with the special tools **0 495 554 (33 5 070)** and in the direction of the arrow.

Propeller shaft to transfer box

		Tightening torque	80 Nm



TECHNICAL INFORMATION

Compliance with the following instructions is required to avoid a humming noise from the propeller shaft after refitting the propeller shaft.

- Assemble the screw connection (1) of the flexible disc (2) and the three-hole flange (3) according to the mark.
- Renew screws (1).

  Parts: Bolts

- Hand-tighten the bolts (1).

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- Protect the propeller shaft (1) with the special tools **0 495 554 (33 5 070)** and from twisting.



- Tighten the bolts with the special tools **0 490 504 (00 9 120)** and .

Flexible disc to rear axle final drive

M12x1.5	Renew screws.	Tightening torque	55 Nm 90 °



- Tighten the screws (1).

Centre mount to body

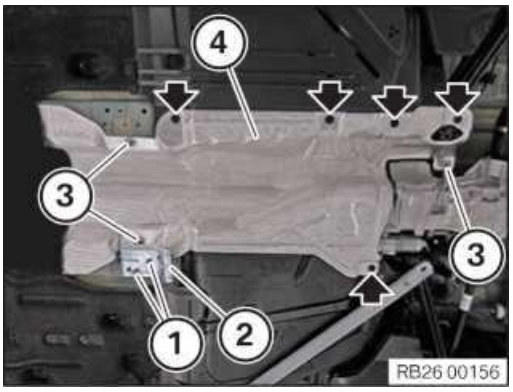
M8		Tightening torque	19 Nm



- Guide the special too l out between the front and rear propeller shaft and remove.

50 – Installing the rear heat shield

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- Insert and install the heat shield (4).
- Tighten screws (arrows).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

- Tighten nuts (3).

Heat shield to body

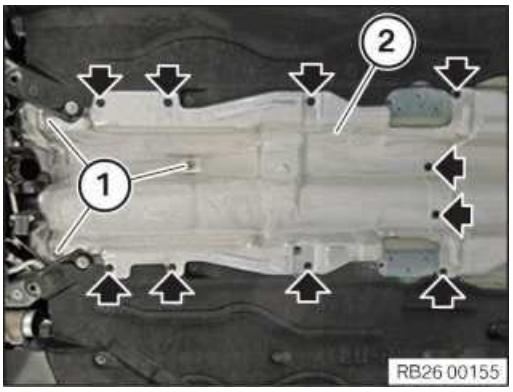
Bolts/nut		Tightening torque	3 Nm

- Insert and install the holder (2).
- Tighten the screws (1).

Bracket to body

M8		Tightening torque	21 Nm

51 – Install the front heat shield



- Insert and install the heat shield (2).
- Tighten screws (arrows).

Heat shield to body

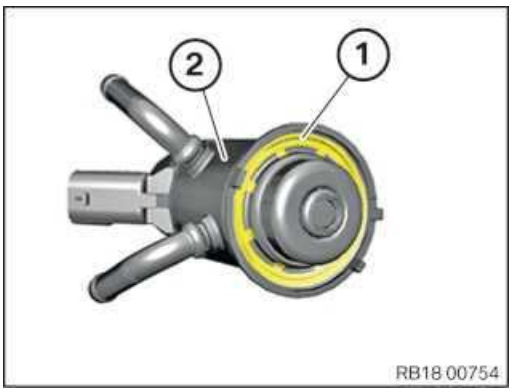
Bolts/nut		Tightening torque	3 Nm

- Tighten nuts (1).

Heat shield to body

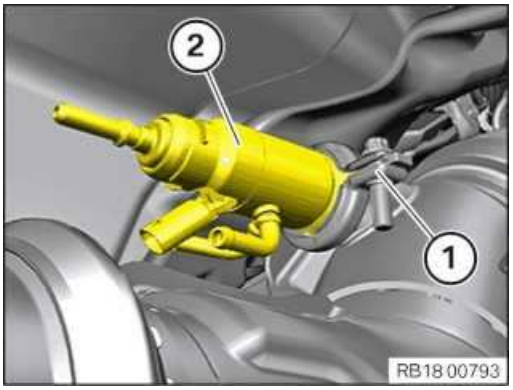
Bolts/nut		Tightening torque	3 Nm

52 – Install the SCR metering module



- Renew the seal (1) of the SCR metering module (2).

  Parts: Sealing ring



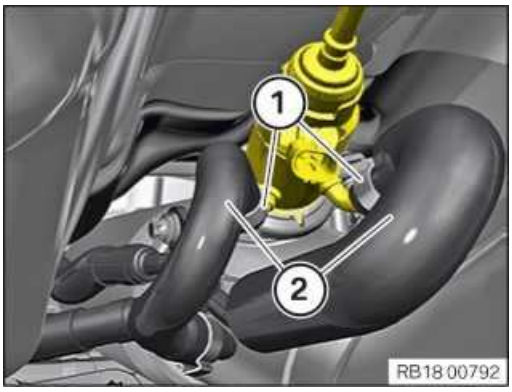
- Insert and install the SCR metering module (2).
- Renew the V-clip (1).

  Parts: V-band clamp
- Tighten V-band clamp (1).

SCR metering module V-clip to exhaust system

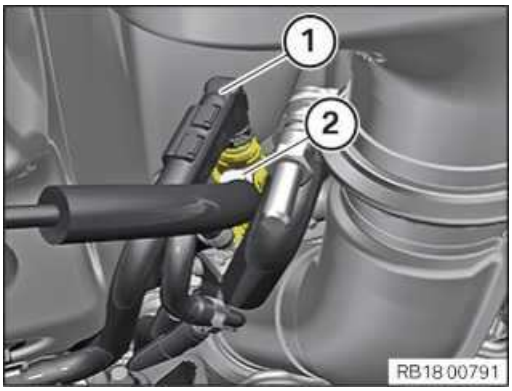
V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm

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- Connect the coolant lines (2).
- Renew the clamps (1).

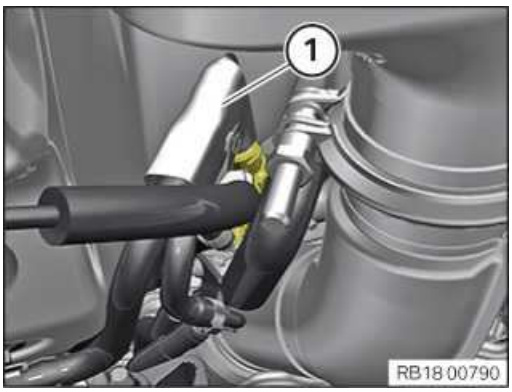
  Parts: Clamps
- Fasten the clamps (1).



- Connect connectors (2) and lock.

  The connector (2) must engage audibly.
- Connect and lock the metering line (1).

  Metering line (1) must engage audibly.



- Insert and install the heat protection cap (1).

53 – Install exhaust system

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

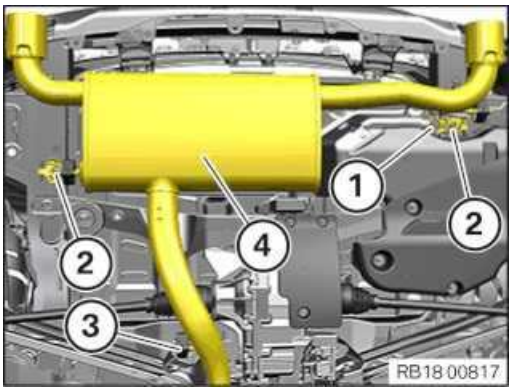
CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

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- Feed in and install the exhaust system (4) with a second person.
- Renew nuts (2).

  Parts: Nuts
- Tighten nuts (2).

Exhaust system to body

M8	Replace nuts.	Tightening torque	19 Nm

- Tighten down screw (1).

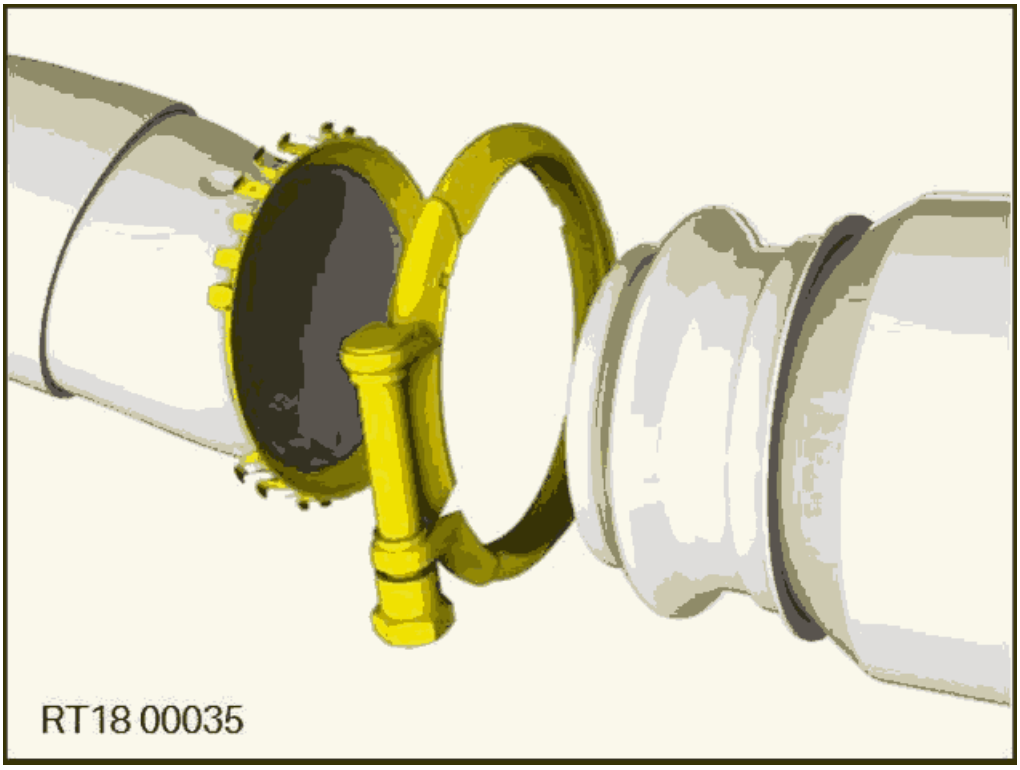
Exhaust bracket on body

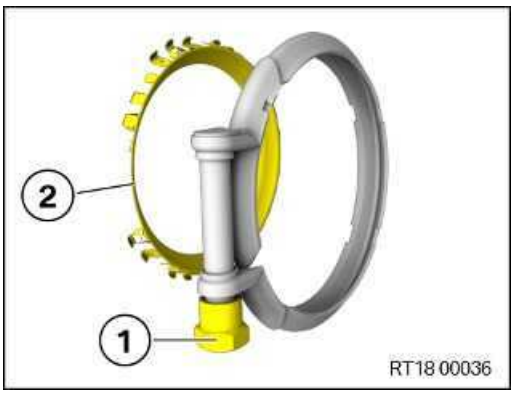
Hexagon screw M8x30		Tightening torque	19 Nm

- Check the rubber mount (3) for damage and renew as needed.
- Mount rubber mount (3) on the exhaust system (4).

▸ **Install the V-clip**

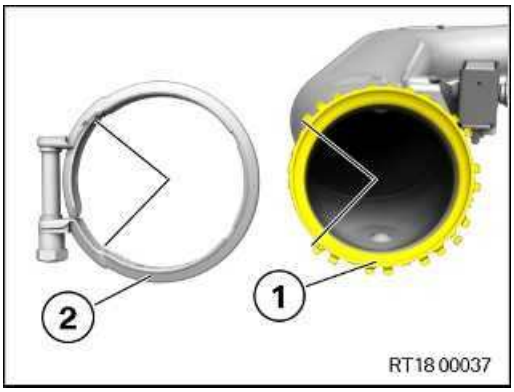
V-band clamp





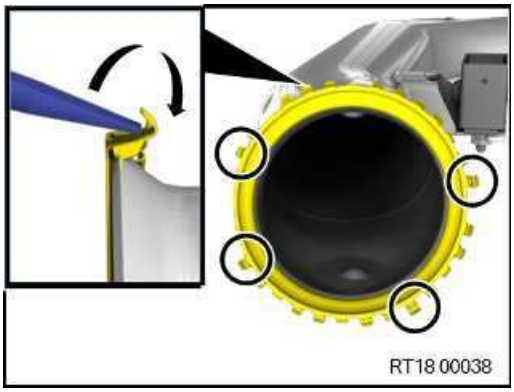
- Unscrew the nut (1) and remove the sealing ring (2).

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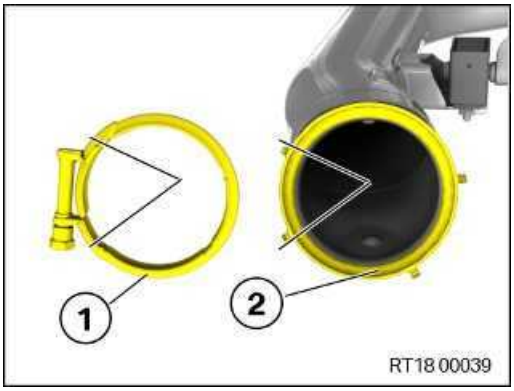


- Renew the V-clip (2).

  Parts: V-band clamp
- Mount the sealing ring (1) on the exhaust system.
- Ensure that the sealing ring (1) for the V-clip (2) is positioned correctly.



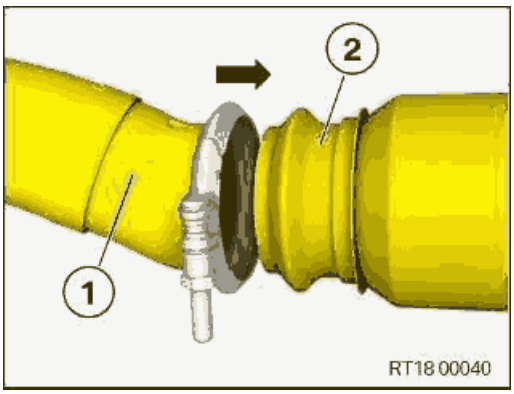
- Bend all sheet metal tabs over with a suitable tool, except those in the marked areas.



- Mount the V-clip (1) on the sealing ring (2).
- Make sure that the V-clip (1) is positioned correctly on the sealing ring (2).

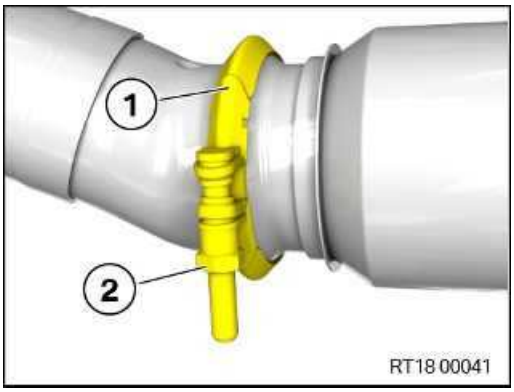


- Make sure that the V-clip rests against the sheet metal tabs after mounting (marks).



- Connect the exhaust system (1) with the catalytic converter (2) and position correctly.

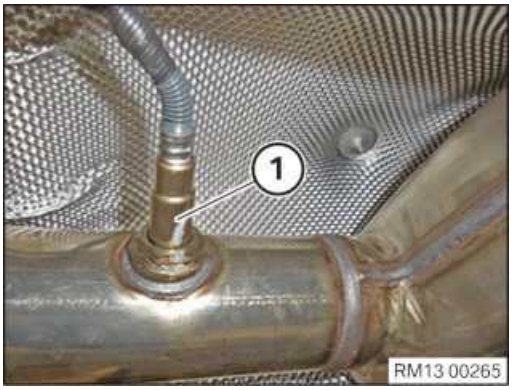
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- Make sure that V-clip (1) is fitted correctly.
- Tighten down screw (2).

V-clip to catalytic converter

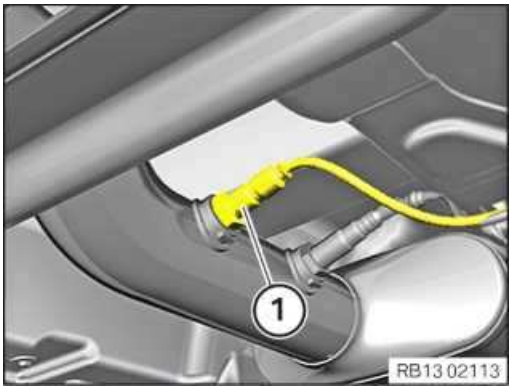
V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm



- Feed in, install and tighten diesel particulate sensor (1).

Diesel particulate sensor to exhaust system

Sensor		Tightening torque	50 Nm

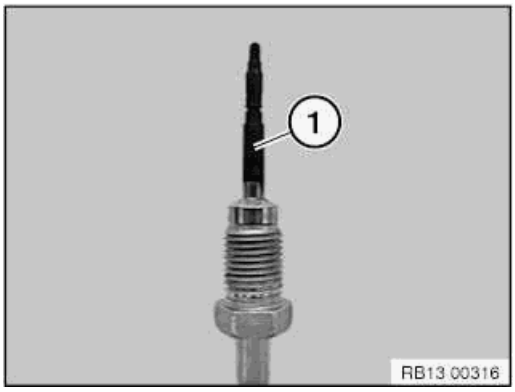


- Feed in, install and tighten nitrogen oxide sensor (1).

Nitrogen oxide sensor downstream of SCR catalytic converter

Sensor		Tightening torque	50 Nm

54 – Installing exhaust temperature sensor on catalytic converter

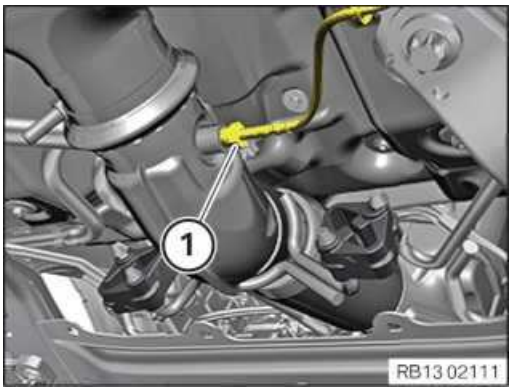


RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.
- Check the gauge tip (1) for damage and replace the exhaust temperature sensor as needed.



- Feed in and install the exhaust temperature sensor (1).
- Tighten the exhaust temperature sensor (1).

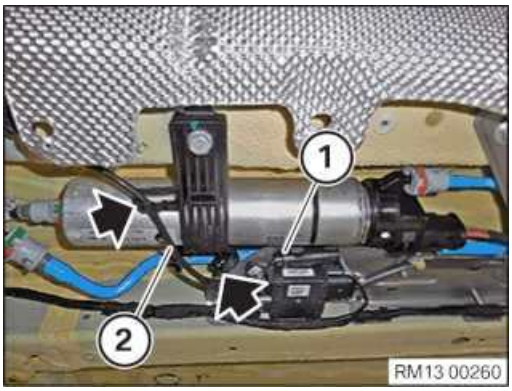
Exhaust-gas temperature sensor to exhaust system

Exhaust-gas temperature sensor		Tightening torque	28 Nm

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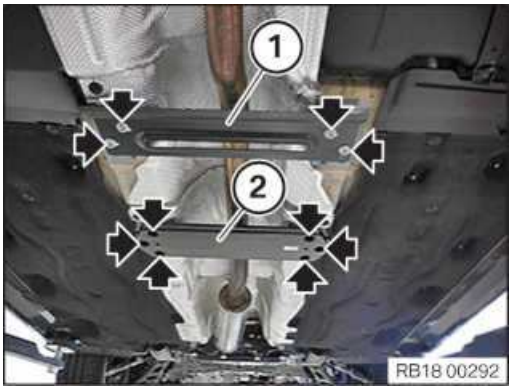
- Secure the cable clips (1).



- Feed cable (2) from exhaust temperature sensor into the clamps (arrows) and install.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

55 – Install the connecting support on the tunnel in front and back



- Insert and install connecting supports (2).
- Tighten the screws (arrows) from the connecting support (2).

Front connection carrier to body

M10x18		Tightening torque	56 Nm

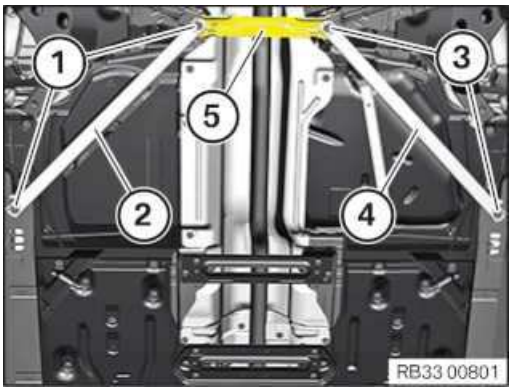
- Insert and install connecting supports (1).
- Tighten the screws (arrows) from the connecting support (1).

Rear connection carrier to body

M8x18		Tightening torque	28 Nm

56 – Install the cross-member with torsion struts

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- Insert and install the cross-member (5).
- Thread in torsion strut (4) at right and install.
- Renew screws (3).

  Parts: Bolts
- Tighten down screws (3).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

- Guide in and install the left torsion strut (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

57 – Installing right output shaft partially



- Renew the circlip (1).

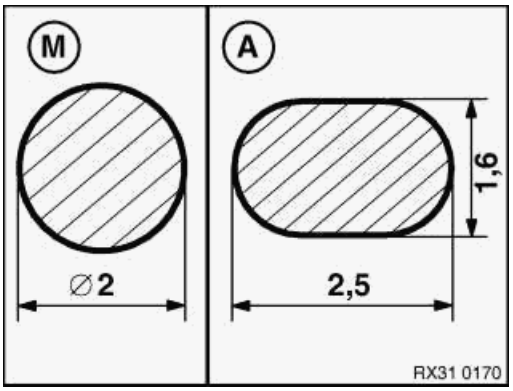
  Parts: Circlip
- Slide output shaft into the transmission as far as the limit position.
- Check for secure seat by levering.

58 – Partially installing the left output shaft



- **With automatic transmission only:**
- Lever out O-ring (1).
- Renew O-ring (1).

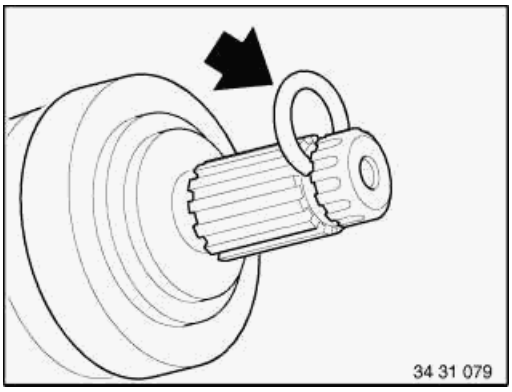
  Parts: O-ring
- Insert new O-ring (1).



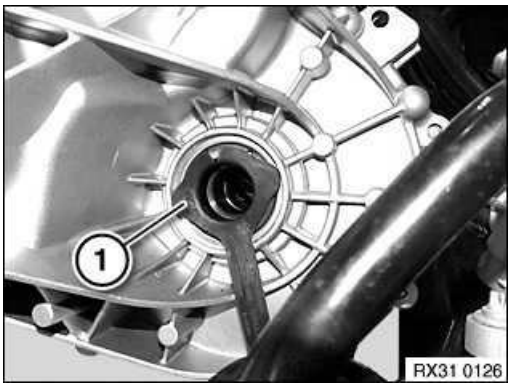
- Do not mix up circlips.

  Different types of output shafts fitted:
  - M: Manual transmission
  - A: Automatic transmission

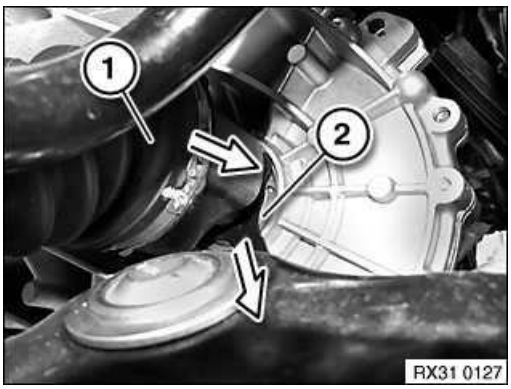
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- Renew circlip (arrow).



- Insert installation protection ring (1) into the radial shaft seal.
- Make sure the tool fits over the lip of the radial shaft seal so there is no damage to sealing ring when the output shaft is inserted.



- Insert output shaft (1) into transmission.
- **Manual gearbox only:** Pull on the handle to remove the installation protection ring (2) and dispose of it.
- Slide output shaft (1) into the transmission as far as the limit position.

  The output shaft (1) must engage audibly.
- Check for secure seat by levering.

59 – Installing starter motor

CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.



- Insert and install the starter motor .
- Tighten the screws (1).

Starter motor to transmission

M8x45		Tightening torque	19 Nm

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- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

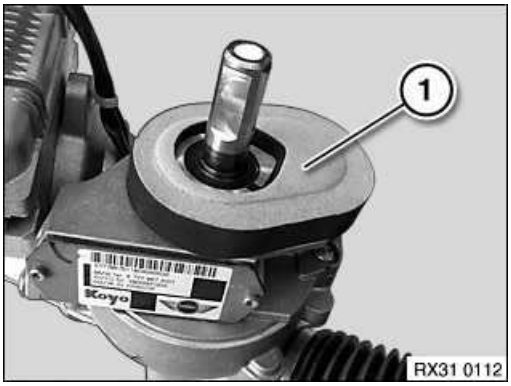
Battery positive lead to starter

M8		Tightening torque	13,5 Nm



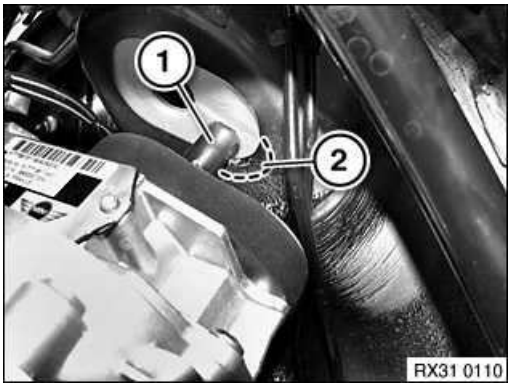
- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.

60 – Mount and secure the complete front axle



- Remove the seal (1).
- Clean surface on steering gear.
- Renew gasket (1).

  Parts: Gasket
- Position the seal (1) and glue it on.



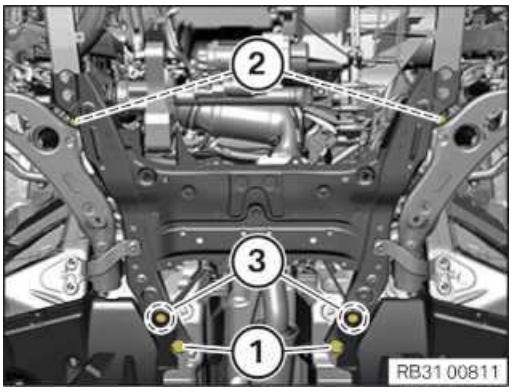
TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!

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- Position front axle support.
- Bend underbody panellings in the areas (3) to one side.
- Raise front axle support.
- When raising, insert charge air cooler into the rubber mount of the charge air cooler on cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

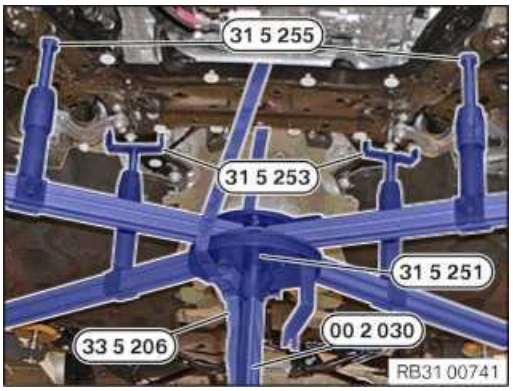
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

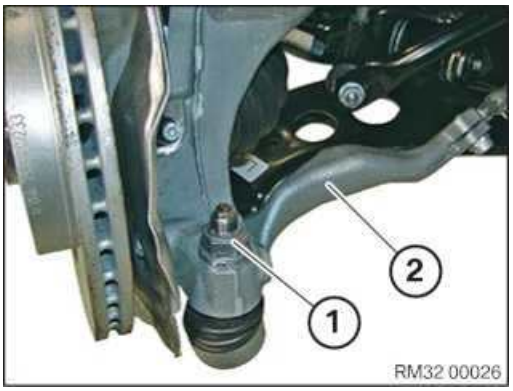
- If necessary, tighten the screws in the areas (3).

Underbody protection to body

Screw		Tightening torque	3 Nm



- Remove special tool from special tool .
- Lower universal jack **0 490 133 (00 2 030)** with the special tool and place it to the side.



NOTICE

Perform the operations on the left and right side.

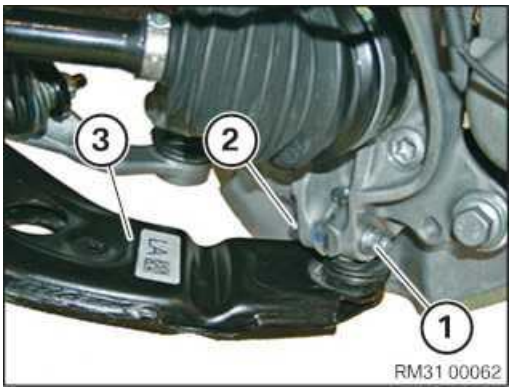
- Position the track rod (2) on the swivel bearing .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Track rod end to swivel bearing

M14	Renew nut.	Tightening torque	175 Nm

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NOTICE

Perform the operations on the left and right side.

- Position the wishbone (3) on the swivel bearing .
- Renew the bolt (2) and the nut (1).

  Parts: Bolt, nut
- Insert screw (2).
- Tighten nut (1).

Wishbone to swivel bearing

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

61 – Install the mounted parts on the front axle support



NOTICE

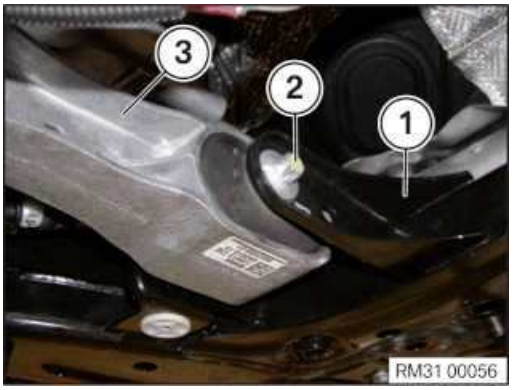
Perform the operations on the left and right side.

- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Holder, wishbone rubber mount, to body

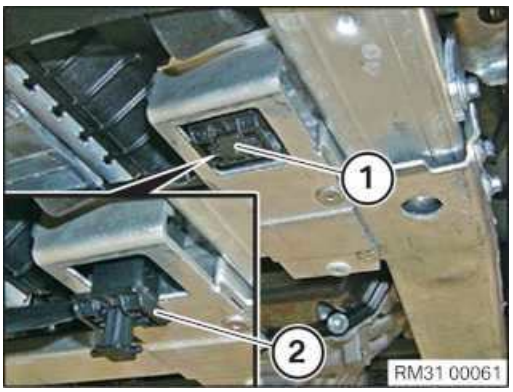
M10 screw	Renew screw.	Jointing torque	56 Nm
		Angle of rotation	90 °



- Position the engine support (3) on the front axle support (1).
- Tighten down screw (2).

Holder with rubber mount to front axle support

M12 screw		100 Nm

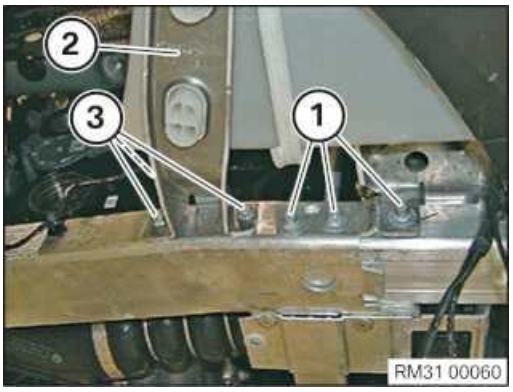


NOTICE

Perform the operations on the left and right side.

- Position the lock (2).
- Lock the bracket (1) of the lock (2) of the holder for the charge air cooler.

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- **Only on right side:** Position the holder for the washer fluid reservoir (2).
- Tighten down screws (3).

Washer fluid reservoir holder to front axle support adapter plate

		Tightening torque	10 Nm

NOTICE

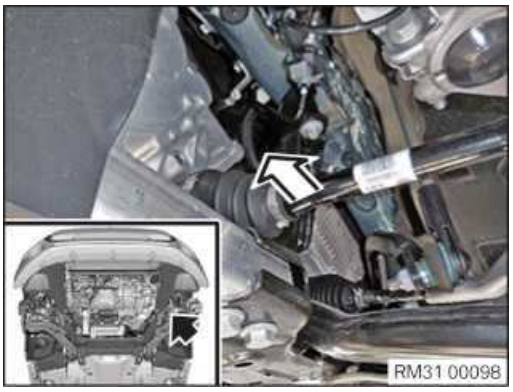
Perform the operations on the left and right side.

- Tighten the screws (1).

Deformation element, bottom, to adapter plate, front axle carrier

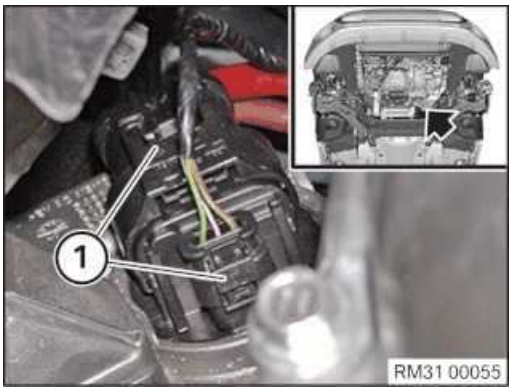
		Tightening torque	11,8 Nm

62 – Attaching connector at steering gear

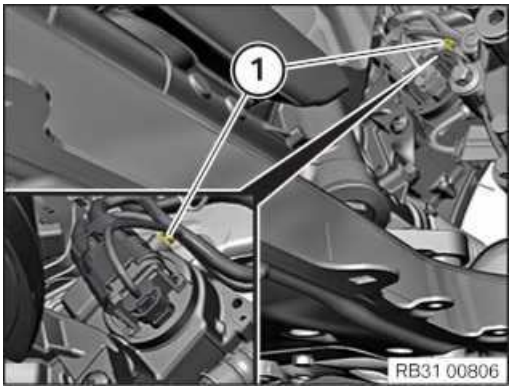


- To connect the connector (see the following step): Connect the connector with the right hand.

  The connectors can be accessed via the left output shaft.



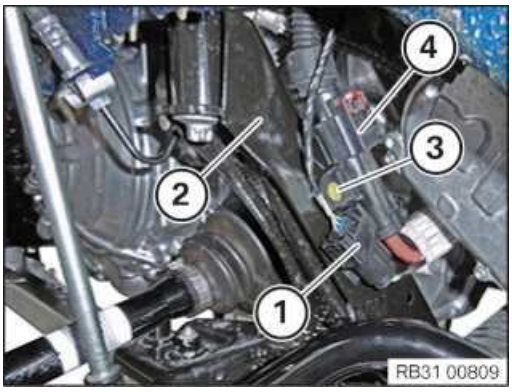
- Connect and lock connector (arrow) (1) with the steering gear.



- Fasten the wiring harness (1) on the steering gear.

▸ **If installed: Fasten the plug connections at the front axle support**

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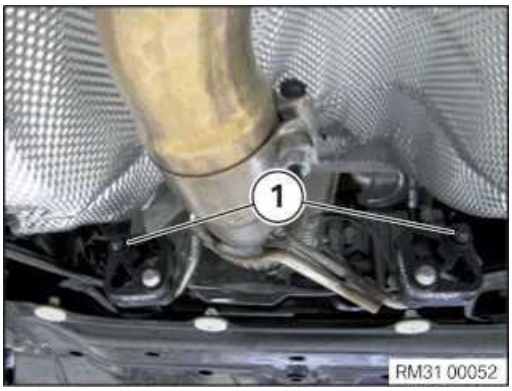
- Position the plug connection (4) at the front axle support (2).
- Tighten down screw (3).

Holder to front axle support

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

- Fasten the plug connection (1) at the front axle support (2).

63 – Securing rubber mount on front axle support



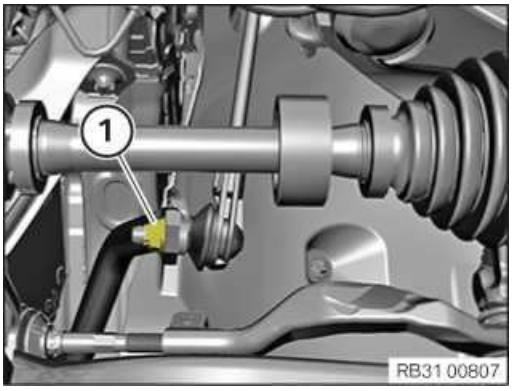
- Check rubber mount (1), replace if necessary.

  Parts: Rubber mount
- Spray rubber mount (1) with lubricant and slide onto holder on front axle support.

64 – Securing anti-roll bar on left and right on the anti-roll bar link

NOTICE

Perform the operations on the left and right side.



▸ **Fastening anti-roll bar on the anti-roll bar link**

- Position the anti-roll bar link on the anti-roll bar .
- Renew nut (1).

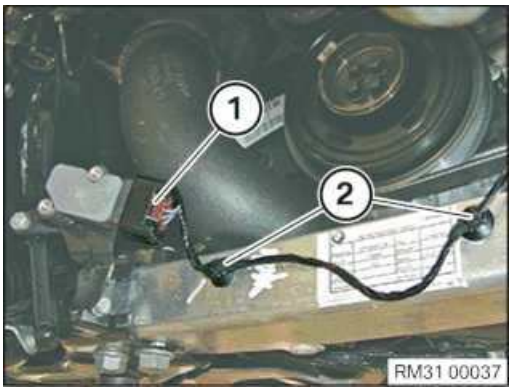
  Parts: Nut
- Tighten nut (1).

Note: Use the Torx socket for counter support.

Anti-roll bar link to anti-roll bar

M10	Renew nut.	Tightening torque	56 Nm

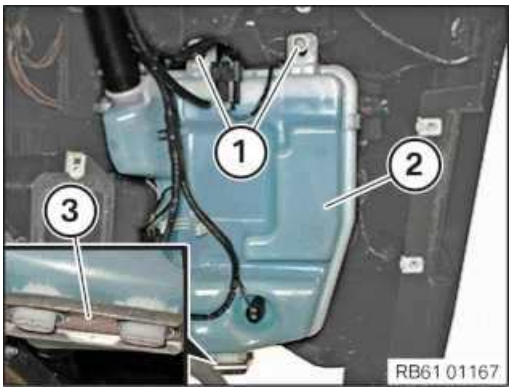
65 – With right installation: Securing the cable for the ride height sensor



- Secure the cable clip (2) on the adapter of the deformation element.
- Connect connectors (1) and lock.

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66 – Install the washer fluid reservoir in the fixture



- Feed washer fluid reservoir (2) into the mounting (3) and install.
- Tighten the screws (1).

Washer fluid reservoir to body

M6x20		Tightening torque	8 Nm

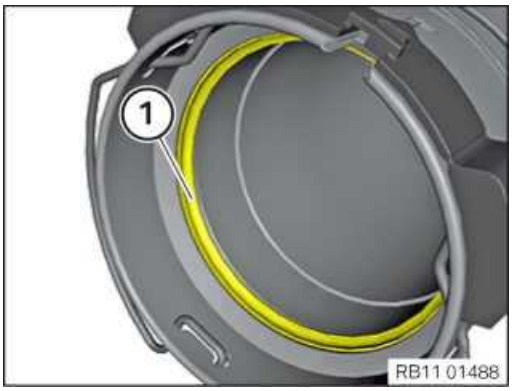
67 – Installing pressure pipe between throttle body and charge air cooler

RISK OF DAMAGE

Damage to the exhaust turbocharger.

A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.



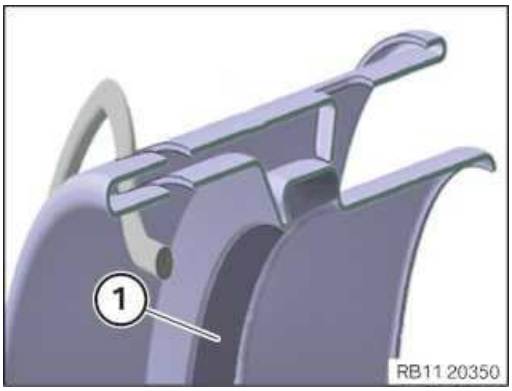
- Check seal (1) for damage and renew seal (1) as needed.

  Parts: Gasket

▸ **Replace damaged gasket**

TECHNICAL INFORMATION

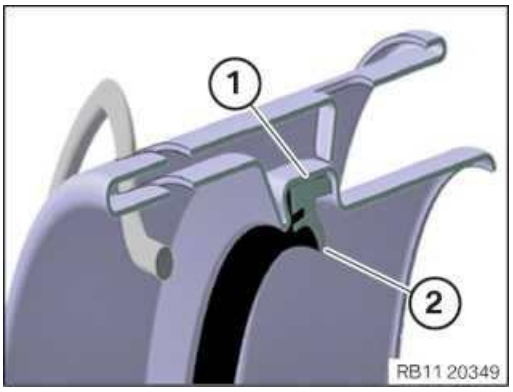
Do not use pointed or sharp-edged tools for the installation and/or removal.



- Remove damaged seal.
- Clean gasket groove (1) with a dry towel.

  The gasket groove (1) must be clean.

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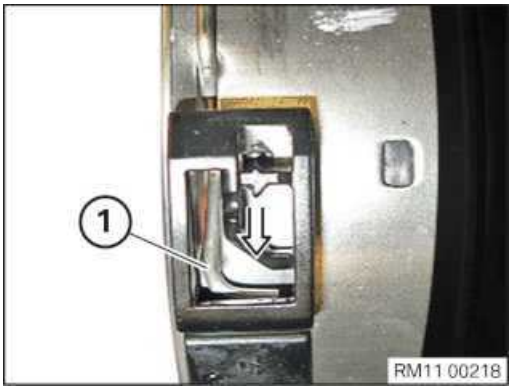
- Renew gasket.

  Parts: Gasket
- Install seal dry without lubricant or mounting agent.

TECHNICAL INFORMATION

Incorrect assembly is possible. Ensure correct installation position.

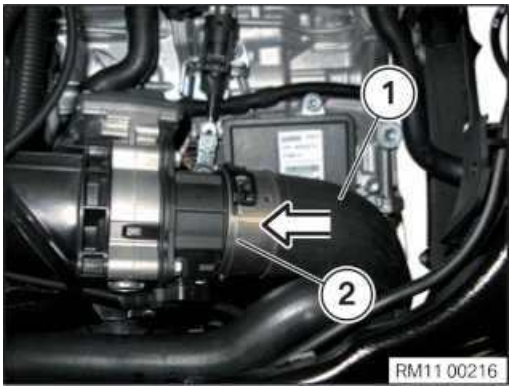
- Feed in and install the seal.
- Make sure the seal is correctly installed in the gasket groove (1).
- Make sure that the sealing lip (2) is pointing downwards (see figure).



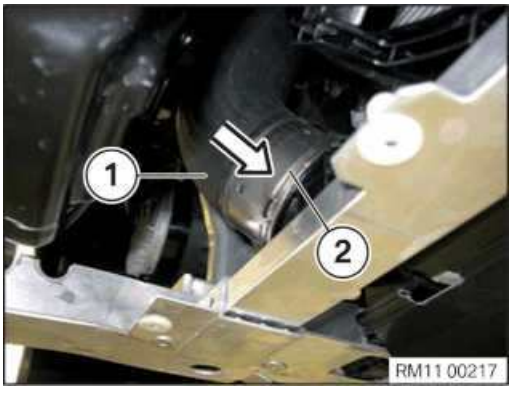
- Detach the locks (1) in the direction of the arrow from the brackets.



- Insert and install the pressure pipe (1) in the direction of the arrow.



- Insert and install the pressure pipe (1) in the direction of the arrow.
- Ensure that the locks (1) engage audibly.



- Insert and install the pressure pipe (1) in the direction of the arrow.
- Ensure that the locks (2)engage audibly.

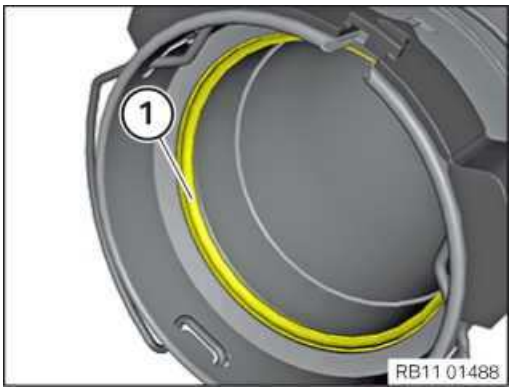
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RISK OF DAMAGE

Damage to the exhaust turbocharger.

A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.



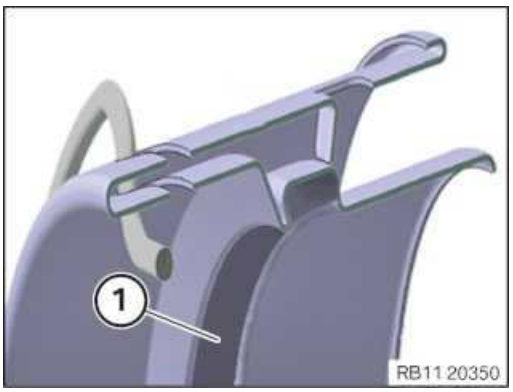
- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Gasket

▶ **Replace damaged gasket**

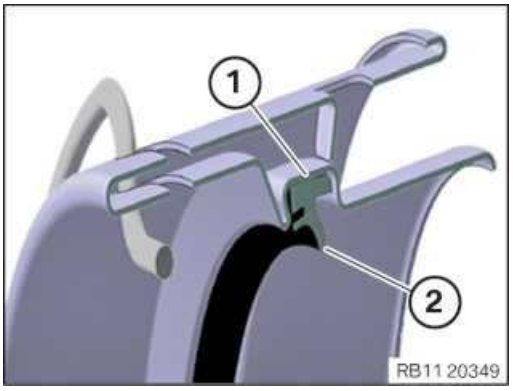
TECHNICAL INFORMATION

Do not use pointed or sharp-edged tools for the installation and/or removal.



- Remove damaged seal.
- Clean gasket groove (1) with a dry towel.

  The gasket groove (1) must be clean.



- Renew gasket.

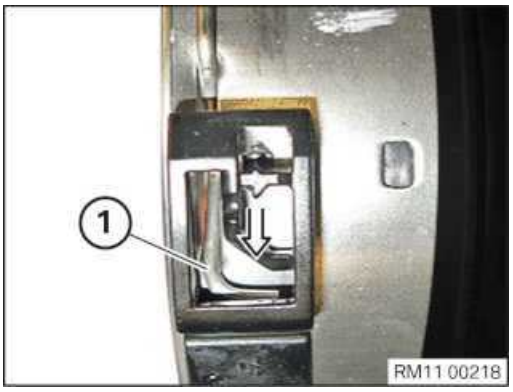
  Parts: Gasket
- Install seal dry without lubricant or mounting agent.

TECHNICAL INFORMATION

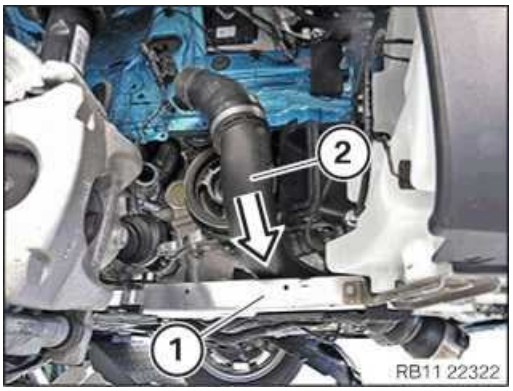
Incorrect assembly is possible. Ensure correct installation position.

- Feed in and install the seal.
- Make sure the seal is correctly installed in the gasket groove (1).
- Make sure that the sealing lip (2) is pointing downwards (see figure).

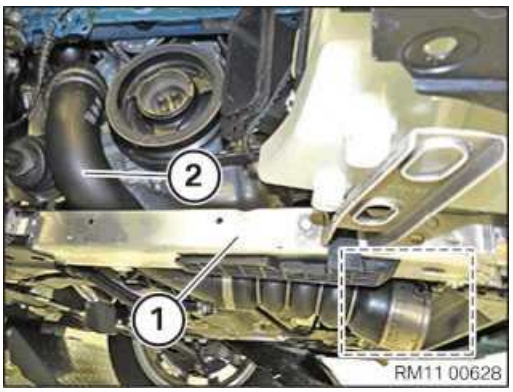
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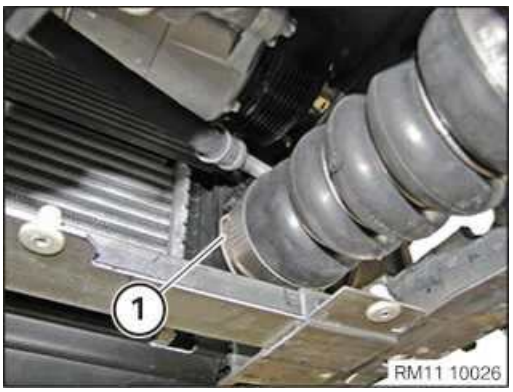
- Detach the locks (1) in the direction of the arrow from the brackets.
- Ensure that the locks (1) engage audibly.



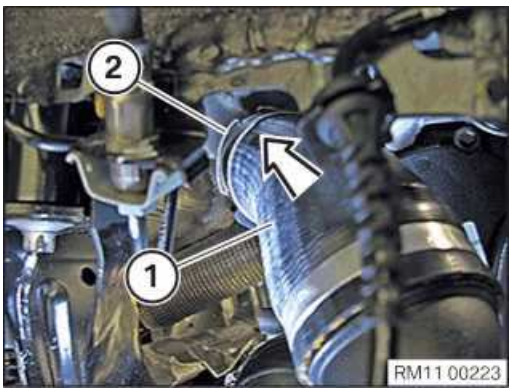
- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed in the charge air duct (1) in the **direction** of arrow between the side member and the deformation element and position.



- Pull the adapter of the front axle support (1) downwards to the front right.
- Position the charge air duct (2) in **marked** area on the charge air cooler.



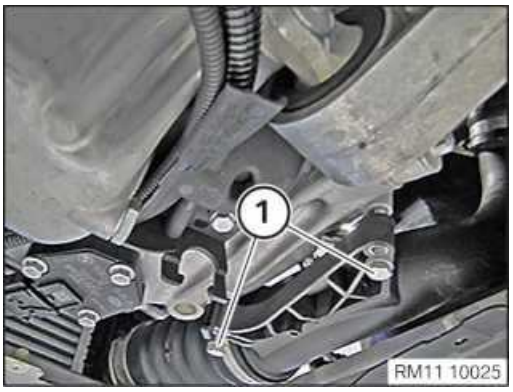
- Feed in and install the charge air duct (1) on the charge air cooler .
- Make sure the charge air duct (1) engages audibly on the charge air cooler.



- Feed in and install charge air duct (1) in the **direction** of the arrow on exhaust turbocharger.

  The locks (2) must engage audibly.

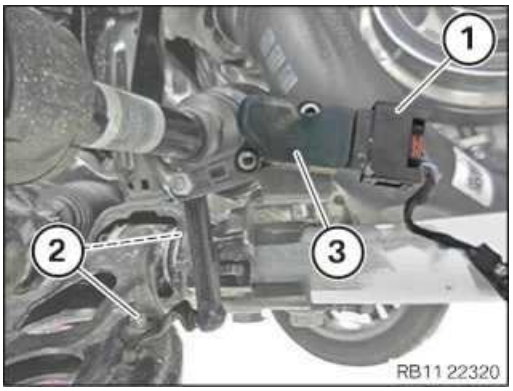
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- Tighten the screws (1).

Charge air duct to oil sump

M6		Tightening torque	8 Nm



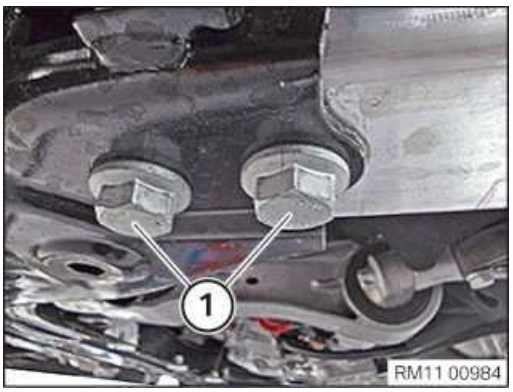
- **If installed:**
- Feed in and install the ride height sensor (3).
- Tighten the screws (2).

Ride height sensor holder to front axle support

M6		Tightening torque	8 Nm

- Connect and lock the connector (1).

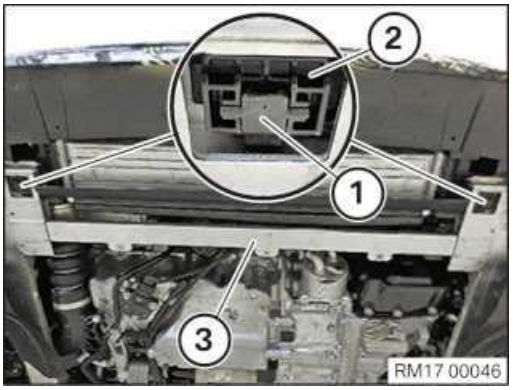
  The connector (1) must engage audibly.



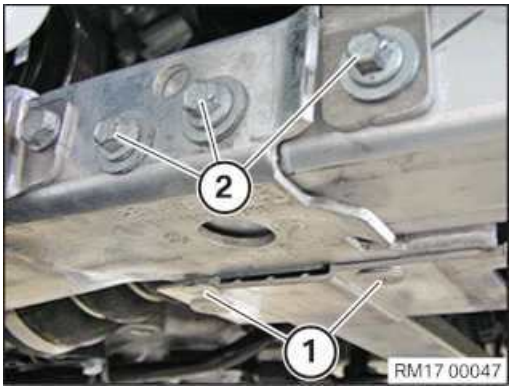
- Tighten the screws (1) on the adapter of the front axle support.

Adapter, front axle support to front axle support

		Tightening torque	100 Nm



- Guide in cross connection (3) and install.
- Guide in locks (2) and install.
- Lock the locking pins (1).
- Ensure that the locking pins (1) audibly engage.



- Tighten the bolts (2) at the front left.

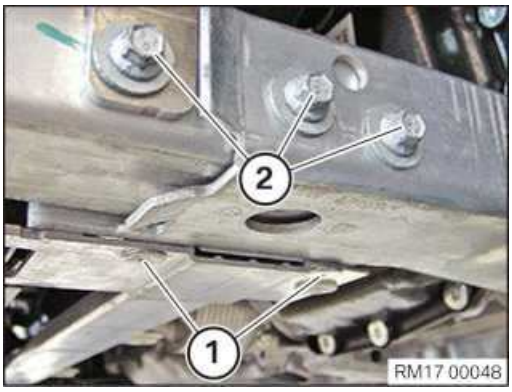
Cross connection to front axle support

M6		Tightening torque	12 Nm

- Renew the blind rivet (1).

  Parts: Blind rivet
- Mount the blind rivets (1) at the front left.

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- Tighten the bolts (2) at the front right.

Cross connection to front axle support

M6		Tightening torque	12 Nm

- Renew the blind rivet (1).

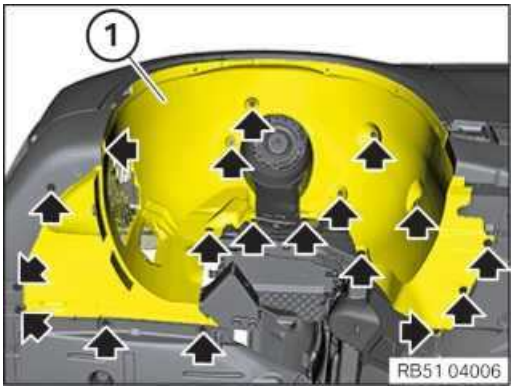
  Parts: Blind rivet

- Mount the blind rivets (1) at the front right.

69 – Installing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.



▸ **Installing the front wheel arch cover**

- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Plastic nut		Tightening torque	2,6 Nm
Screw		Tightening torque	2,6 Nm

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

▸ **Installing front wheel arch trim**

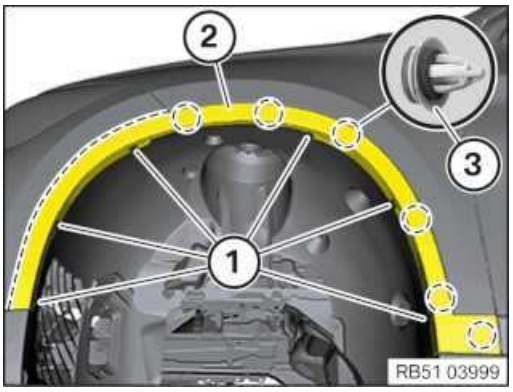
NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.

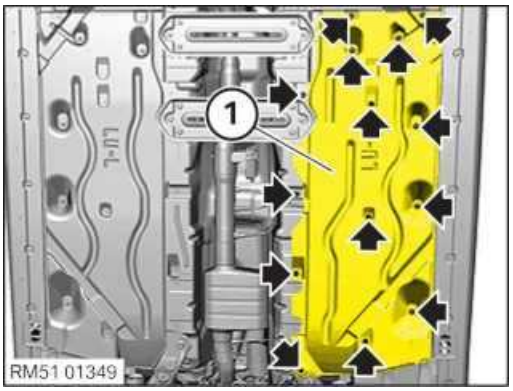
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- Check the clips (3) for damage and renew where required.

  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

70 – Installing underbody panelling , right



- Correctly position the underbody panelling (1).
- Tighten all bolts and nuts (arrows).

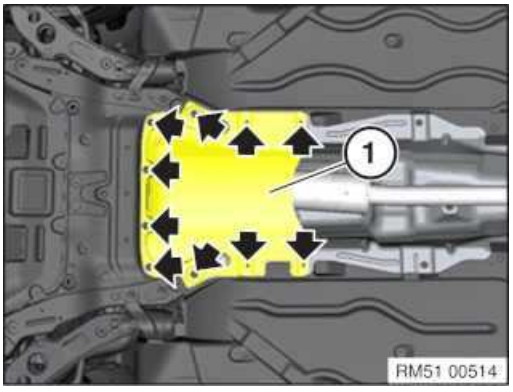
Underbody panelling, side

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side

Plastic nut		Tightening torque	2,6 Nm

71 – If installed: Installing underbody protection at rear

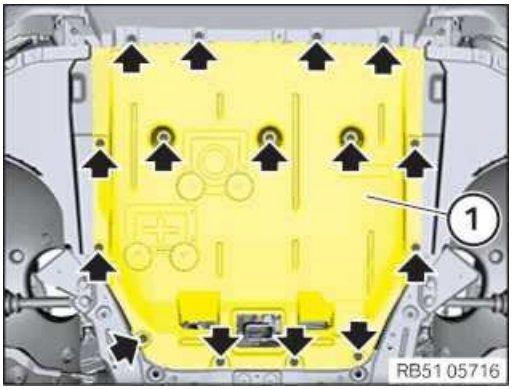


- Position rear underbody protection (1).
- Tighten screws (arrows).

Underbody protection to body

Screw		Tightening torque	3 Nm

72 – Installing the front underbody protection

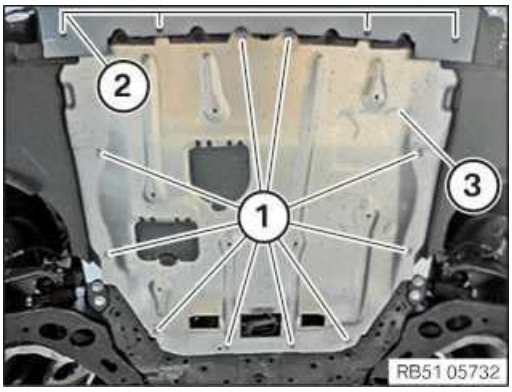


- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

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- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

73 – Installing both front wheels

▶ **Mounting the wheel**

▷ **Clean the contact surfaces between the brake disc and the wheel rim**



TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

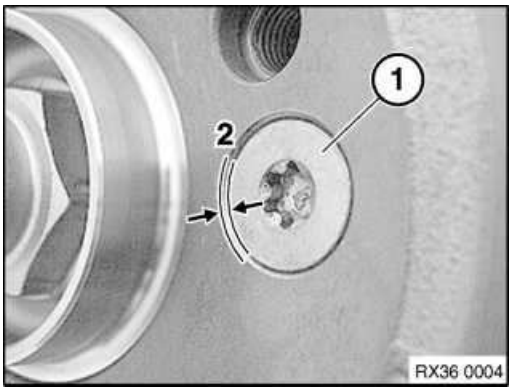
  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue in the area of the wheel bolt holes, remove and clean the brake disc.



- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

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- Renew mounting bolt (1).

  Parts: Mounting bolt

- Check that the mounting bolt (1) for the brake disc is securely seated.

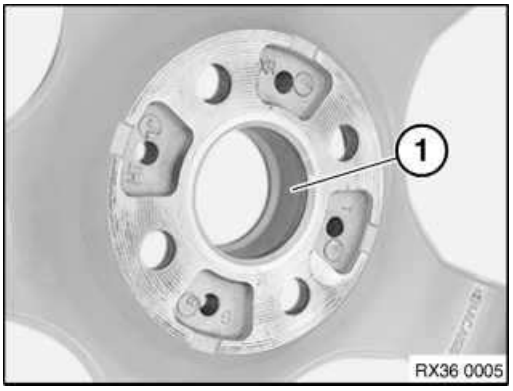
  The mounting bolt (1) for the brake disc may not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to rear wheel hub

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub

M8	Renew screw.	Tightening torque	16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring (1).

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

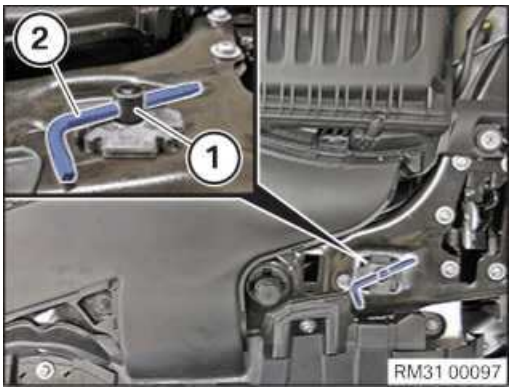
- Renew corroded wheel bolts.

  Parts: Wheel bolts
- Clean the wheel bolts.
- Check the wheel bolts and threads for damage, renew the wheel bolts if necessary.
- Join and tighten the wheel bolts (arrows).

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

74 – Removing fastener for left and right radiator



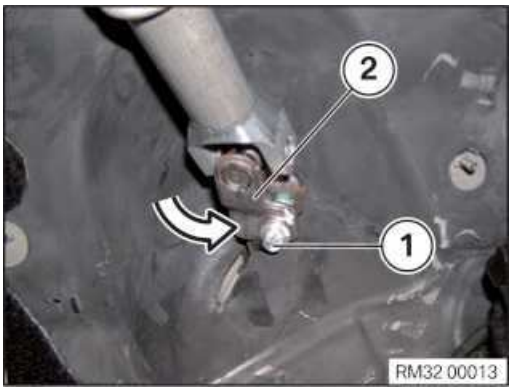
NOTICE

Perform the operations on the left and right side.

- Remove suitable tool (2) from the centering pin (1).

75 – Secure the steering shaft at the bottom on the steering gear

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- Clean the screw lock residue from the screw thread in the universal joint (2).
- Pivot the universal joint (2) in the direction of the arrow to the steering gear.
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Lower steering shaft to steering gear

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

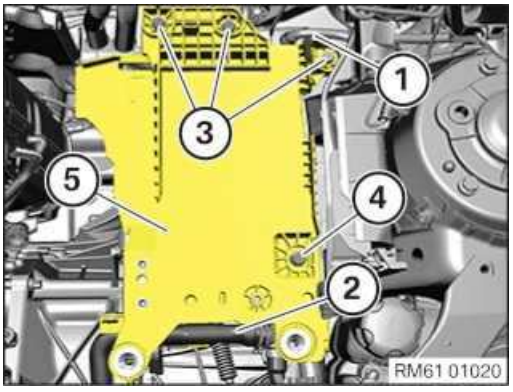


- **If installed:**
- Position the cover on the steering column (2).
- Tighten nuts (1).

Steering column cover to bulkhead

Plastic nut		Tightening torque	3 Nm

76 – Install the battery holder



- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

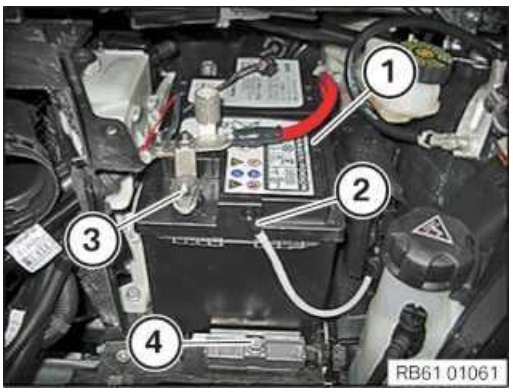
- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

77 – Install vehicle battery



- Install vehicle battery (1).
- Position the bracket and tighten with the screw (4) .

Battery terminal rail to battery tray

M8		19 Nm

- Position the vent hose (2) and clip it in.
- Position the positive battery terminal and tighten with the nut (3) .

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

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▸ **Check the vent holes of the battery**

WARNING

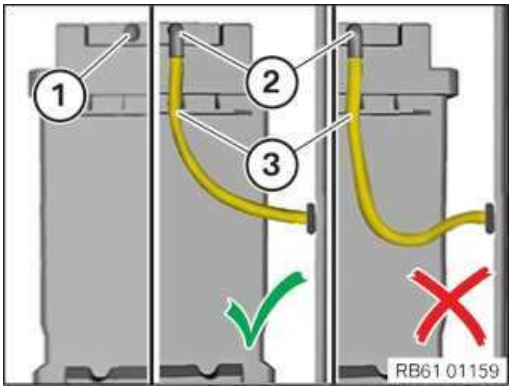
Gas emission.

Danger of injury! Danger of explosion!

- Assign the vent holes correctly.
- Route the vent hose correctly.

TECHNICAL INFORMATION

The battery has two vent holes, opposite:
One vent hole (1) must be closed correctly with a dummy plug.
The vent hose (3) must be correctly connected and routed at the other vent hole (2).



Check

- Check if the vent hole (1) is correctly closed with a dummy plug.

Result

» No dummy plug.

Measure

- Close the vent hole (1) correctly with a dummy plug.

Check

- Check if the vent hole (2) has a correctly connected vent hose (3).

Result

» The vent hose (3) is not correctly connected.

Measure

- At the vent hole (2), connect the vent hose (3) correctly.

Check

- Check if the vent hose (3) is routed to the outside with a downhill gradient (**no siphon formation!**).

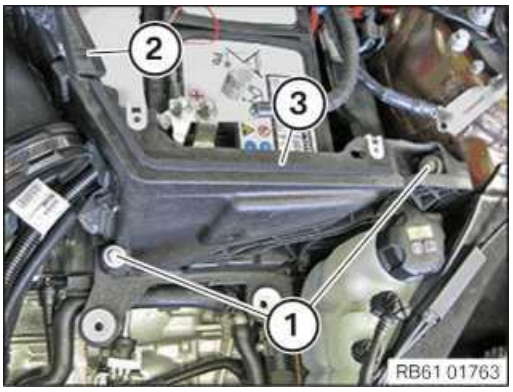
Result

» The vent hose (3) is not correctly routed as shown in the image on the right.

Measure

- Route the vent hose (3) correctly as shown in the centre image.

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- Insert tension strut (3) and tighten with screws (1).

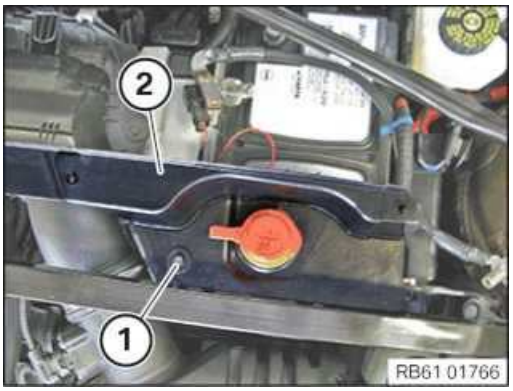
Trailing link

M8		Tightening torque	19 Nm

- Tighten down screw (2).

Battery cover

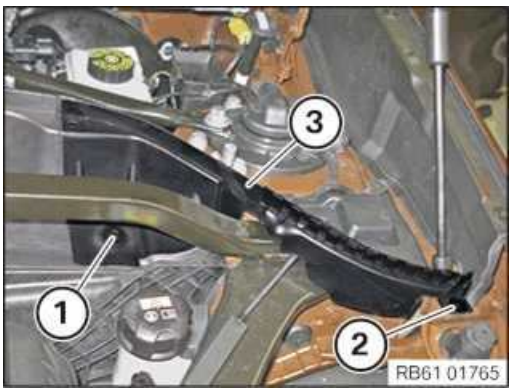
M8		2,8 Nm



- Position the cover (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm

78 – Install electronics box

Prerequisite

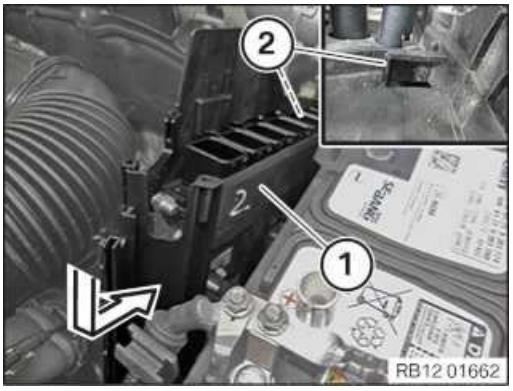
Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.

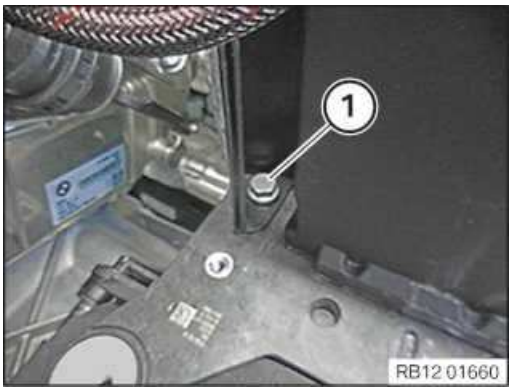


- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.

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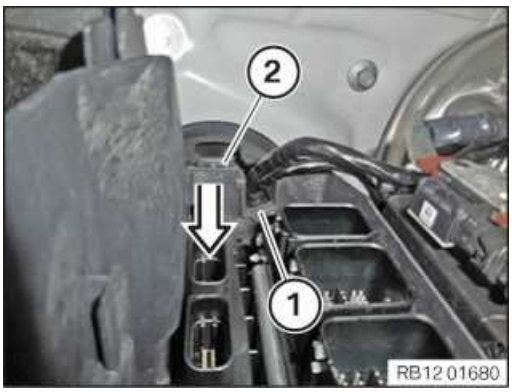
- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).



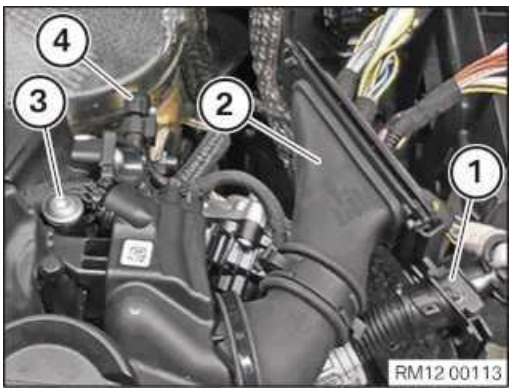
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.

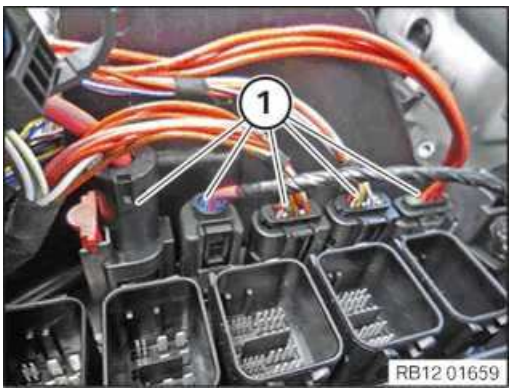


- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

Wiring harness to cylinder head cover

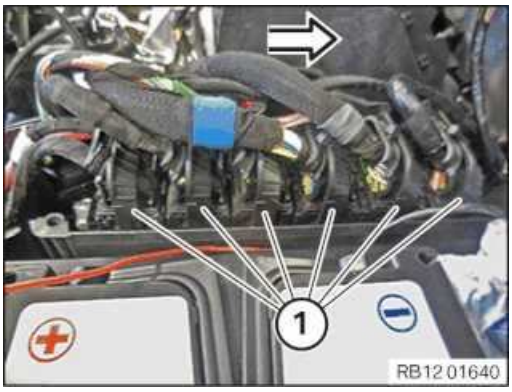
TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.

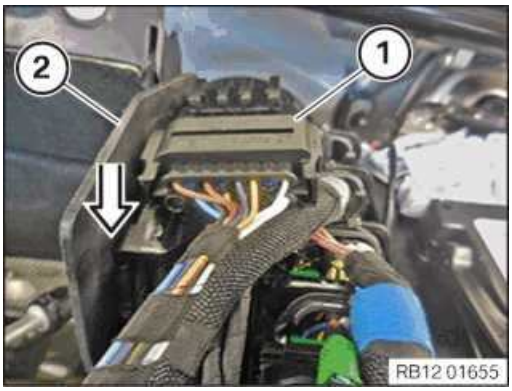


- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.

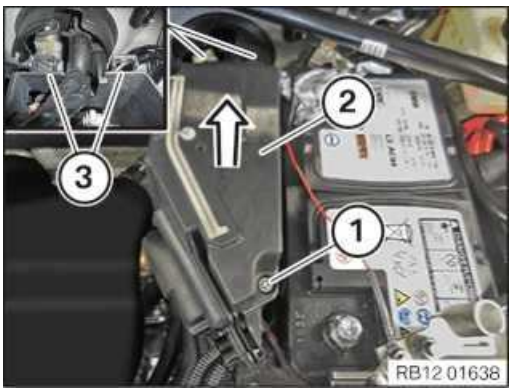
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- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



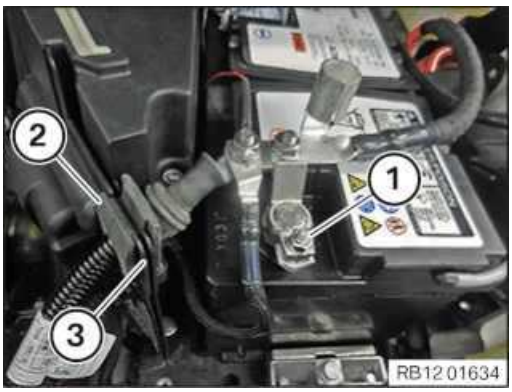
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

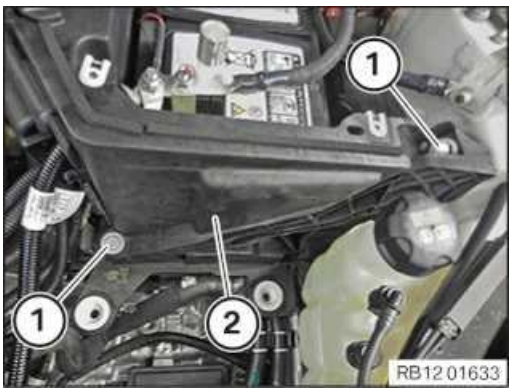
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm



- Feed in and install tension strut (2).
- Tighten the screws (1).

Tension strut to spring strut dome/battery tray

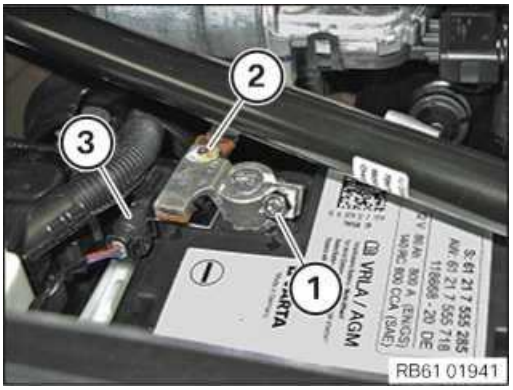
M8		Tightening torque	19 Nm

79 – Connecting the battery earth lead

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TECHNICAL INFORMATION

For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)



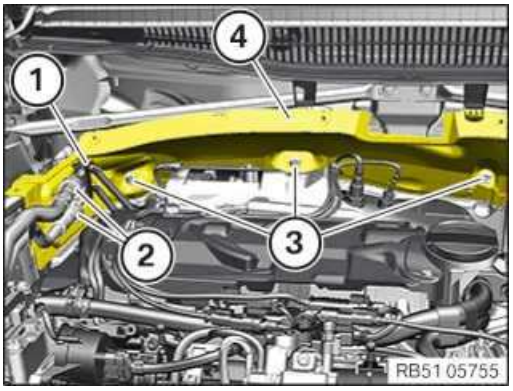
- Remove the protective cover of the positive battery terminal.
- Position the battery earth lead (2).
- Tighten nut (1).

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

- If required, connect the connector (3).

80 – Installing rear bulkhead upper part



- Feed in and install the rear bulkhead upper part (4).
- Tighten down screws (3).

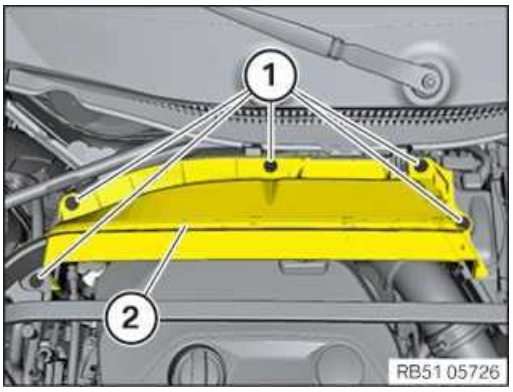
Rear bulkhead upper part to lower section of bulkhead

Oval-head screw		Tightening torque	5 Nm

- Feed the fuel line (2) into the holder (1) and install.
- Connect and lock the holder (1).

  The holder (1) must engage audibly.

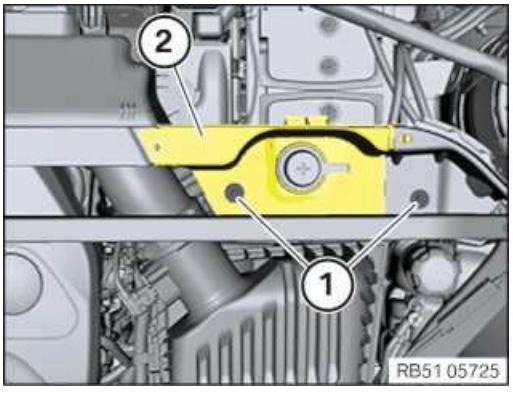
81 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Cover of top bulkhead

Screw		Tightening torque	2,6 Nm



- Guide in and install cover (2).
- Tighten down screw (1).

Cover of remote positive terminal

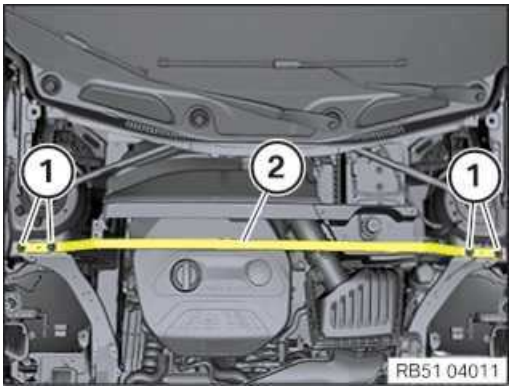
Screw		Tightening torque	2,6 Nm

82 – Install strut brace

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TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.

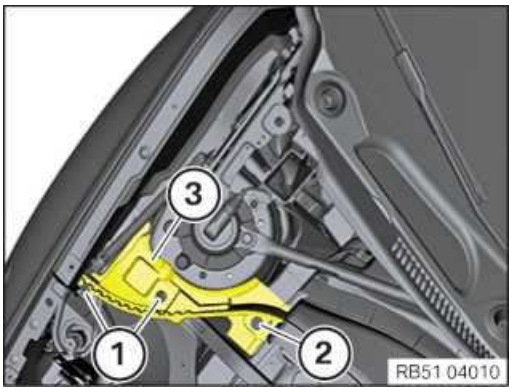


- Install the strut brace (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-brace to spring strut dome

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °



NOTICE

Description is for right component only. The procedure on the left side is identical.

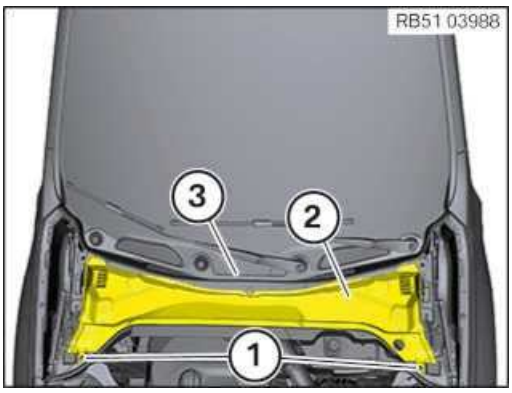
- Install the cover (3).
- Tighten down screw (2).

Cover on body

Hexagon screw		Tightening torque	3 Nm

- Install the expanding rivet (1).

83 – Installing front cowl panel cover



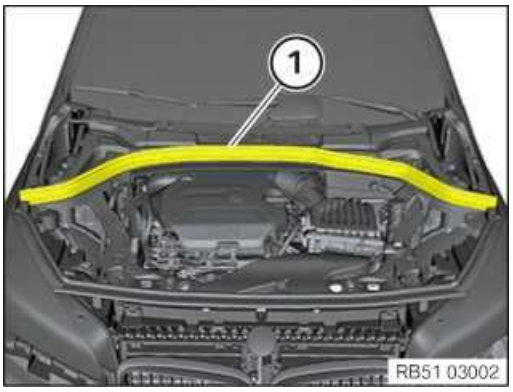
- Insert and install cowl panel cover at front (2) into cowl panel cover at rear (3).
- Check cowl panel cover at front is correctly seated (2).
- Secure expanding rivet (1).

84 – Install the seal for the bonnet

NOTICE

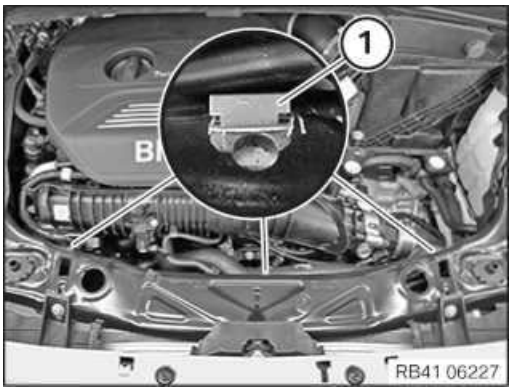
Schematic diagram is for example purposes. Some parts may differ in certain details.

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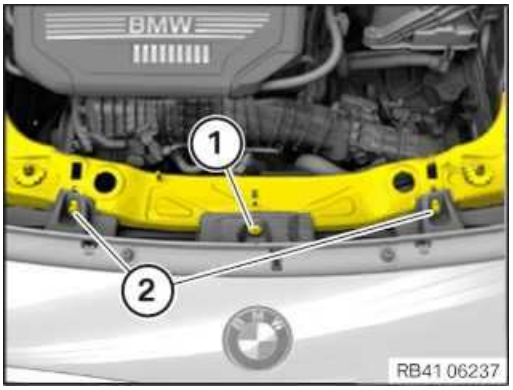


- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

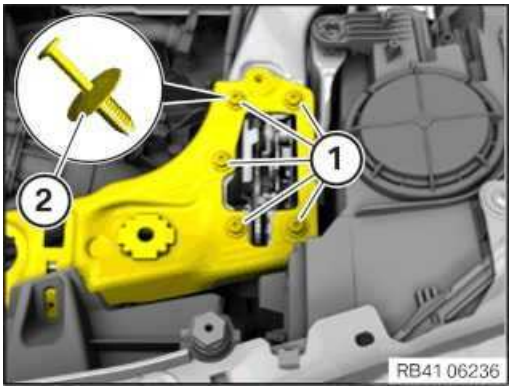
85 – Remove front cross connection



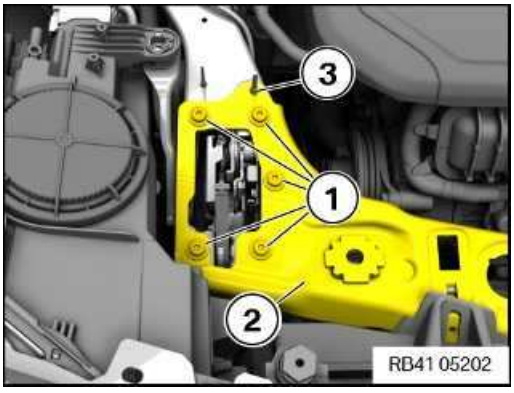
- Detach the clamps (1) for the Bowden cable of the bonnet locks from the cross connection.



- Loosen screw (1).
- Loosen screws (2).



- Loosen screws (1).
- Lever out expanding rivet (2).



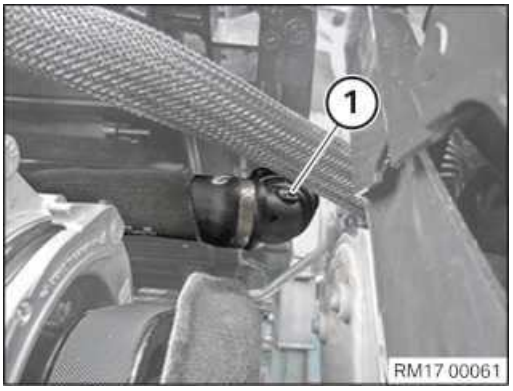
- Loosen screws (1).
- Unclip the front cross connection (2) from the rubber retainer (3) and remove it upward.

86 – Connect the coolant line

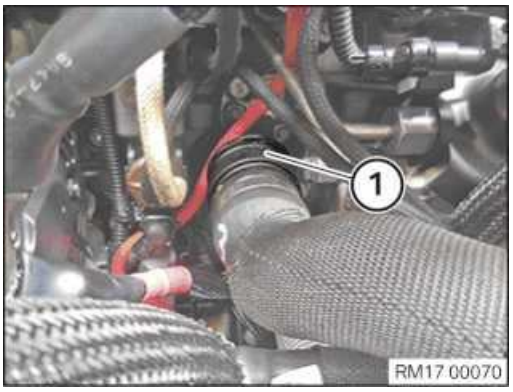
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TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Connect the right coolant line (1) to the radiator and lock audibly.

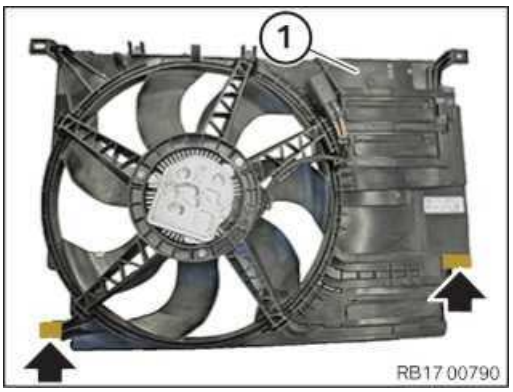


- Connect the coolant line (1) to the connecting branch and lock audibly.

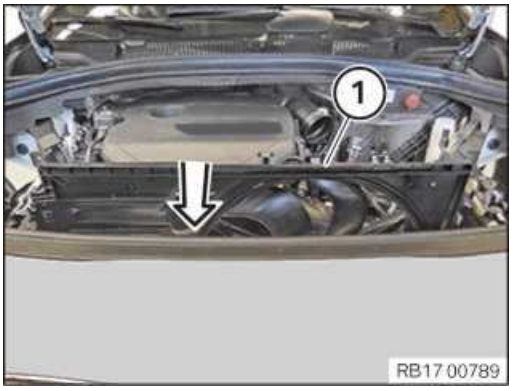
87 – Installing fan cowl with electric fan

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Feed the guides (arrows) of the fan cowl (1) into the charge air cooler.

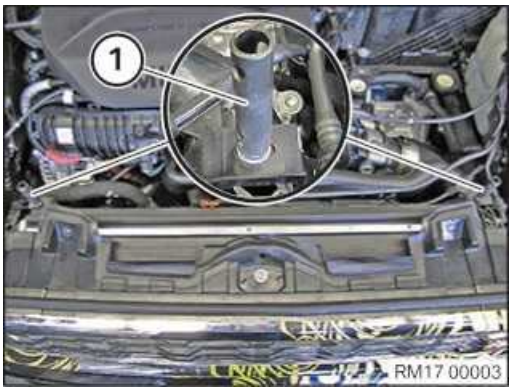


- Feed in and install the fan cowl (1) in the direction of the arrow.

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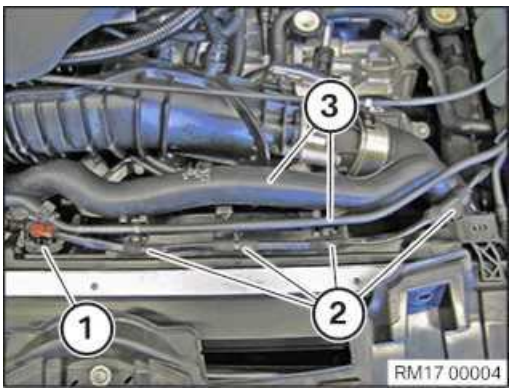
- Lock the left and right locks (arrows).



- Tighten the screws (1).

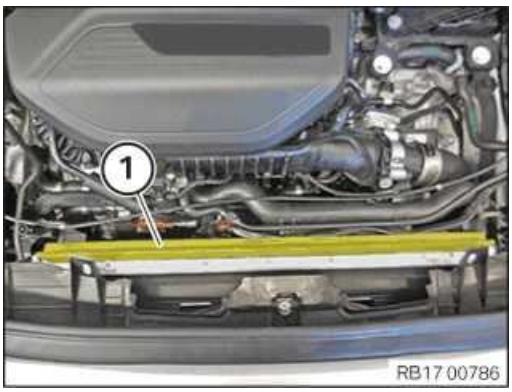
Fan cowl on radiator

M6X12		Tightening torque	6 Nm



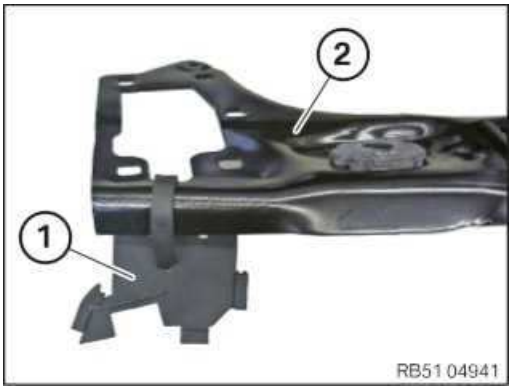
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.
- Secure clamps (2).
- Thread in and install coolant line (3).



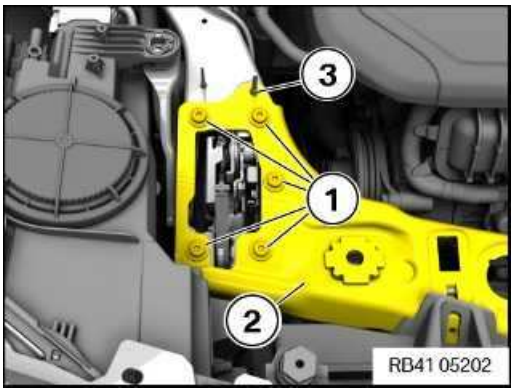
- Guide the sealing (1) on the radiator in and install it.

88 – Install front cross connection



- Right side of vehicle only: Secure spray guard (1) on the cross connection (2) as pictured.

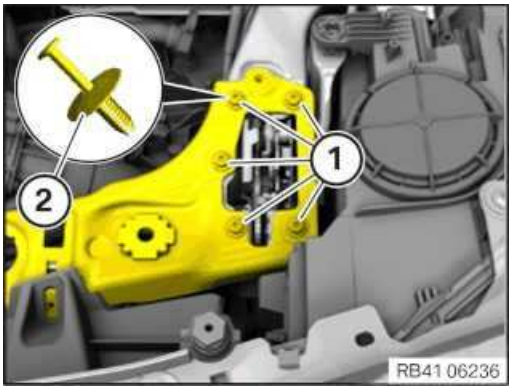
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- Position front cross connection (2) and clip front cross connection (2) into the rubber retainer (3) at the same time.
- Tighten the screws (1).

Cross connection to carrier support

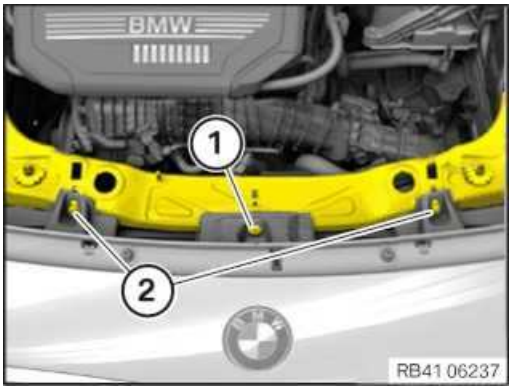
Screws M6x20		Tightening torque	11,8 Nm



- Tighten the screws (1).

Cross connection to carrier support

Screws M6x20		Tightening torque	11,8 Nm



- Position screws (3) on the rubber mounts for the radiator and tighten.

Screw connection for rubber mount of coolant radiator to coolant radiator

Bolt to rubber mount		Tightening torque	8 Nm

- Tighten down screws (2).

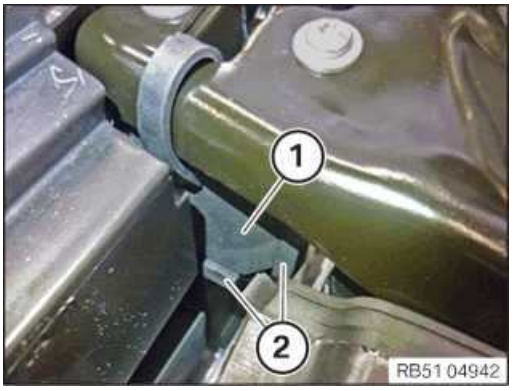
Air duct to upper connection

M6x20 screw		Tightening torque	11,8 Nm

- Tighten down screw (1).

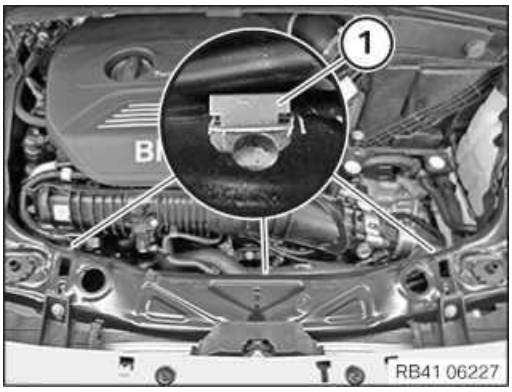
Bracing strut to upper connection

M8x20 screw		Tightening torque	28 Nm



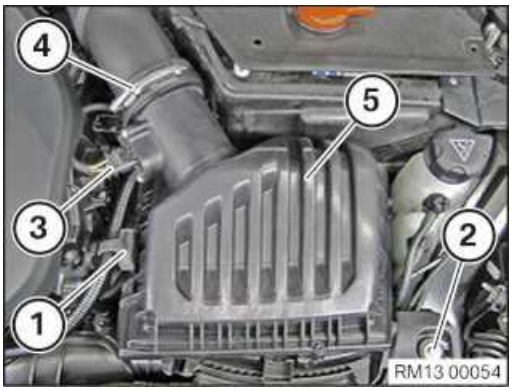
- Right side of vehicle only: Properly mount spray guard (1) to prevent corrosion.
- Secure spray guard (1) to the bridge with retaining tabs (2).

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- Fasten the clamps (1) from the Bowden cable of the bonnet lock on the cross connection.

89 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.

  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

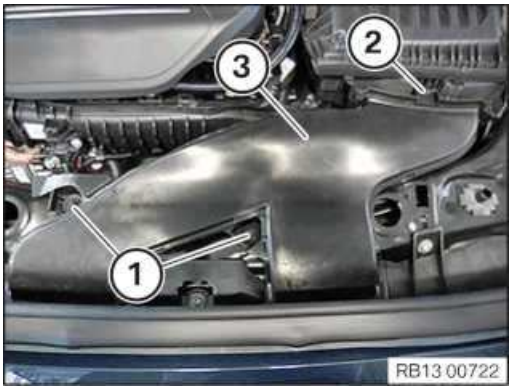
Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Insert and install the holder (1).

90 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

91 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

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- Check for correct installation of all rubber mounts in the acoustic cover (1).



- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

92 – Removing the oil filler cap



- Open oil filler cap (1).

93 – Topping up the engine oil

RISK OF DAMAGE

Damage to the petrol particulate filter.

Vehicles equipped with a petrol particulate filter must be operated with low-ash engine oil only.

- Use BMW Longlife-04 , BMW Longlife-12 FE or BMW Longlife-17 FE+ engine oils or engine oils approved by BMW matching the same specifications only.
- For additional information see: Overview of approved engine oils for BMW Group engines.

RISK OF DAMAGE

Engine damage caused by excessively filling the engine with engine oil.

Filling an excessive quantity of engine oil may cause engine damage.

- Observe the exact engine oil filling capacity.
- Drain the engine oil.

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- Pour in engine oil.

Engine oilB47TÜ1

Capacity of engine oil	5,5 l

Engine oil: Technically suitable engine oils for BMW Group engines

94 – Installing the oil filler cap



- Close oil filler cap (1).

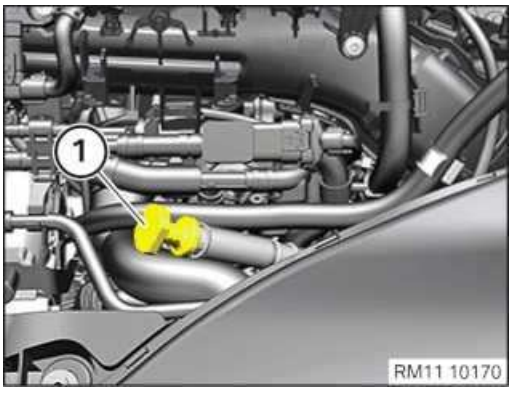
95 – Check engine oil level

- Park vehicle on a horizontal surface.
- In the case of automatic transmission, shift to selector lever position N or P.
- Accelerator pedal is not pressed.
- Engine is running and is at operating temperature.
- Read off the engine oil level in the instrument cluster (KOMBI) or on the control display.
- Top up engine oil if necessary.

▶ **Check engine oil level**

TECHNICAL INFORMATION

Always check the engine oil level when the engine is at operating temperature (engine oil temperature > 70°C).



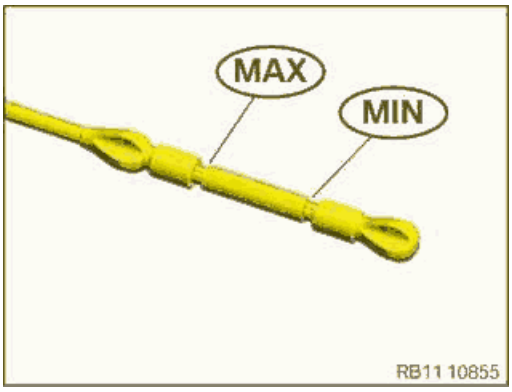
- Park vehicle on a horizontal surface.
- Stop the engine and wait for 5 minutes.
- Pull out the oil dipstick (1) and wipe off using a lint-free cloth.

TECHNICAL INFORMATION

Do not pull out or insert the oil dipstick into the guide tube too quickly or slowly.

- Push the oil dipstick (1) into the guide tube up to the limit position and pull it out again.

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96 – Fill and bleed the coolant circuit

TECHNICAL INFORMATION

The engine oil level must be between the minimum mark and the maximum mark of the oil dipstick.

- Read the engine oil level on the oil dipstick.
- Top up engine oil if necessary.

▶ **Filling and bleed the high-temperature coolant circuit**



97 – Evacuate and fill air conditioning

- See additional information.

- See additional information.

Additional Information

Overview of Tightening Torques

Oil drain plug on oil sump — Used in step 11

M12x1.5	Renew the sealing ring.	Tightening torque	25 Nm

Cross connection to carrier support — Used in step 13 88

Screws M6x20		Tightening torque	11,8 Nm

Screw connection for rubber mount of coolant radiator to coolant radiator — Used in step 13 88

Bolt to rubber mount		Tightening torque	8 Nm

Air duct to upper connection — Used in step 13 88

M6x20 screw		Tightening torque	11,8 Nm

Bracing strut to upper connection — Used in step 13 88

M8x20 screw		Tightening torque	28 Nm

Transmission mounting — Used in step 48

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

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Right engine mount to cylinder head

Used in step 48

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

Refrigerant line on air conditioning compressor

Used in step 48

M8		Tightening torque	19 Nm

Clutch slave cylinder to transmission housing

Used in step 48

M8		Tightening torque	19 Nm

Standard screw connection M8

Used in step 48

M8		Tightening torque	19 Nm

Positive battery cable to positive battery terminal

Used in step 48

M8		Tightening torque	15 Nm

Propeller shaft to transfer box

Used in step 49

		Tightening torque	80 Nm

Flexible disc to rear axle final drive

Used in step 49

M12x1.5	Renew screws.	Tightening torque	55 Nm
			90 °

Centre mount to body

Used in step 49

M8		Tightening torque	19 Nm

Heat shield to body

Used in step 50 51

Bolts/nut		Tightening torque	3 Nm

Bracket to body

Used in step 50

M8		Tightening torque	21 Nm

SCR metering module V-clip to exhaust system

Used in step 52

V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm

Exhaust system to body

Used in step 53

M8	Replace nuts.	Tightening torque	19 Nm

Exhaust bracket on body

Used in step 53

Hexagon screw M8x30		Tightening torque	19 Nm

V-clip to catalytic converter

Used in step 53

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

Diesel particulate sensor to exhaust system

Used in step 53

Sensor		Tightening torque	50 Nm

Nitrogen oxide sensor downstream of SCR catalytic converter

Used in step 53

Sensor		Tightening torque	50 Nm

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Exhaust-gas temperature sensor to exhaust system

Used in step 54

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Front connection carrier to body

Used in step 55

M10x18		Tightening torque	56 Nm

Rear connection carrier to body

Used in step 55

M8x18		Tightening torque	28 Nm

Cross-member/torsion strut to axle support and mounting

Used in step 56

M12x48	Renew screws.	Jointing torque Angle of rotation	100 Nm 90 °

Starter motor to transmission

Used in step 59

M8x45		Tightening torque	19 Nm

Battery positive lead to starter

Used in step 59

M8		Tightening torque	13,5 Nm

Rear end of front axle support to body

Used in step 60

M14 screw	Renew screw.	Tightening torque	175 Nm

Front axle support, front to body

Used in step 60

M12 screw	Renew screw.	Tightening torque	108 Nm

Underbody protection to body

Used in step 60 71

Screw		Tightening torque	3 Nm

Track rod end to swivel bearing

Used in step 60

M14	Renew nut.	Tightening torque	175 Nm

Wishbone to swivel bearing

Used in step 60

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

Holder, wishbone rubber mount, to body

Used in step 61

M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °

Holder with rubber mount to front axle support

Used in step 61

M12 screw			100 Nm

Washer fluid reservoir holder to front axle support adapter plate

Used in step 61

		Tightening torque	10 Nm

Deformation element, bottom, to adapter plate, front axle carrier

Used in step 61

		Tightening torque	11,8 Nm

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Holder to front axle support

Used in step 62

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

Anti-roll bar link to anti-roll bar

Used in step 64

M10	Renew nut.	Tightening torque	56 Nm

Washer fluid reservoir to body

Used in step 66

M6x20		Tightening torque	8 Nm

Charge air duct to oil sump

Used in step 68

M6		Tightening torque	8 Nm

Ride height sensor holder to front axle support

Used in step 68

M6		Tightening torque	8 Nm

Adapter, front axle support to front axle support

Used in step 68

		Tightening torque	100 Nm

Cross connection to front axle support

Used in step 68

M6		Tightening torque	12 Nm

Wheel arch cover to body

Used in step 69

Plastic nut		Tightening torque	2,6 Nm
Screw		Tightening torque	2,6 Nm

Wheel arch cover to body

Used in step 69

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Used in step 69

Plastic nut		Tightening torque	3 Nm

Underbody panelling, side

Used in step 70

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side

Used in step 70

Plastic nut		Tightening torque	2,6 Nm

Underbody protection front

Used in step 72

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Brake disc to rear wheel hub

Used in step 73

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub

Used in step 73

M8	Renew screw.	Tightening torque	16 Nm

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Wheel bolts

Used in step 73

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Lower steering shaft to steering gear

Used in step 75

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

Steering column cover to bulkhead

Used in step 75

Plastic nut		Tightening torque	3 Nm

Battery holder to engine support

Used in step 76

Hexagon screw M8x30		Tightening torque	19 Nm

Battery terminal rail to battery tray

Used in step 77

M8			19 Nm

Battery terminal with IBS positive battery terminal / negative battery terminal

Used in step 77 79

NutM6			5 Nm

Trailing link

Used in step 77

M8		Tightening torque	19 Nm

Battery cover

Used in step 77

M8			2,8 Nm

Electronics box to battery tray

Used in step 78

M8X16		Tightening torque	15 Nm

Wiring harness to cylinder head cover

Used in step 78

TS5x20		Tightening torque	3,5 Nm

Cover to electronics box

Used in step 78

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery

Used in step 78

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray

Used in step 78

M8		Tightening torque	19 Nm

Rear bulkhead upper part to lower section of bulkhead

Used in step 80

Oval-head screw		Tightening torque	5 Nm

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Cover of top bulkhead Used in step 81

Screw		Tightening torque	2,6 Nm

Cover of remote positive terminal Used in step 81

Screw		Tightening torque	2,6 Nm

Cross-brace to spring strut dome Used in step 82

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

Cover on body Used in step 82

Hexagon screw		Tightening torque	3 Nm

Fan cowl on radiator Used in step 87

M6X12		Tightening torque	6 Nm

Intake silencer housing to lock bridge Used in step 89

M6X30		Tightening torque	8 Nm

Clean air pipe to intake silencer housing Used in step 89

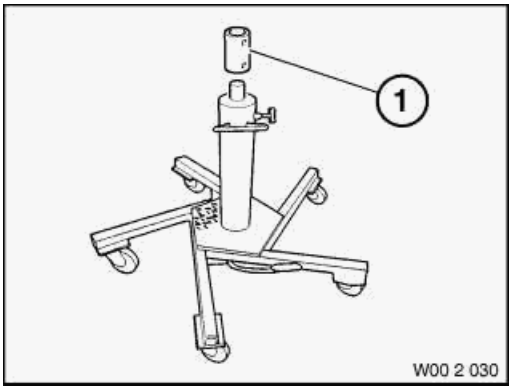
Clamp		Tightening torque	3 Nm

Intake neck to cross connection Used in step 90

M6		Tightening torque	8 Nm

Overview of Special Tools

0 490 133 (00 2 030) Device



Common Used in step 35 60

Usage	(universal hydraulic lifter base unit) Chassis and hydraulic lifter - For removing and installing rear axle supports and gearboxes. Also for soft top mounts. Is replaced by 81 22 2 219 012
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 90 (207)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 490 134 (00 2 031)		**Adapter** (adapter for gearbox holder) Model series: E30, E31, E32, E34, E36	

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0 495 554 (33 5 070) Extension



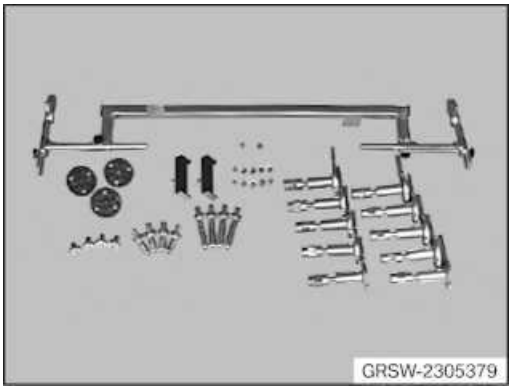
Common Used in step 46 49

Usage	Pull-out extension for 33 5 040, 33 5 050, 33 5 060.
Included in the tool or work	
Storage location	A18
Replaced by	
In connection with	
SI-Number	01 21 06 (300)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 592 (33 5 071)		**Extension** (Extension (1 item)) discontinued, can only be ordered using complete tool	

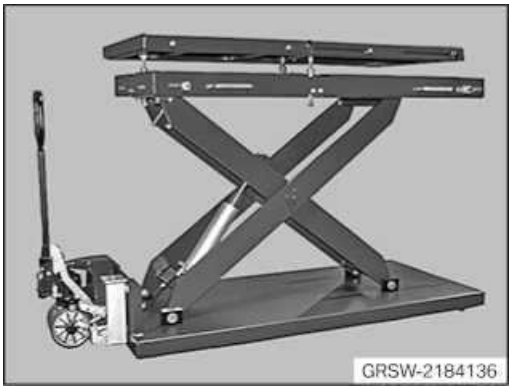
2 305 379 Accessories



Common Used in step 47

Usage	Attachment set for unit table lift MHT 1200.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	Mobile major assembly table lift MHT 1200 81222184136
SI-Number	06 01 10 (649)

2 184 136 Mobile equipment table lift

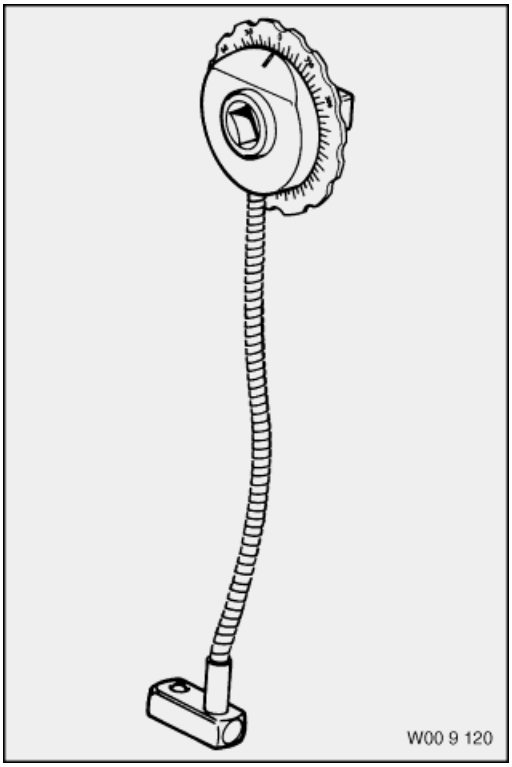


Common Used in step 47

Usage	Table lift MHT 1200
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	06 01 10 (649)

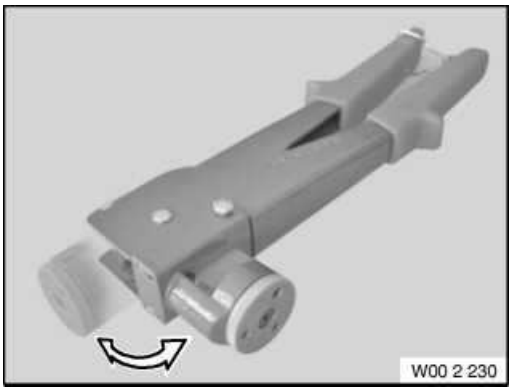
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0 490 504 (00 9 120) Torque angle measuring dial



Common	Used in step 49
Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

0 496 521 (00 2 230) Pliers



Common	Used in step 69
Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

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2 344 011 Tool



Common	Used in step 73
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

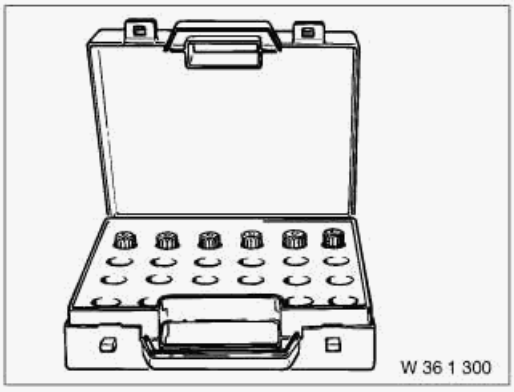
0 495 221 (36 1 323) Wheel stud



Common	Used in step 23
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 224 (36 1 326) Wheel stud



Common	Used in step 23
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud



Common	Used in step 23
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

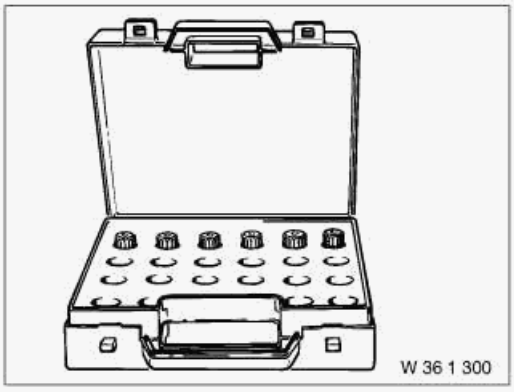
0 495 226 (36 1 328) Wheel stud



Common	Used in step 23
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 227 (36 1 329) Wheel stud



Common	Used in step 23
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud



Common	Used in step 23
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

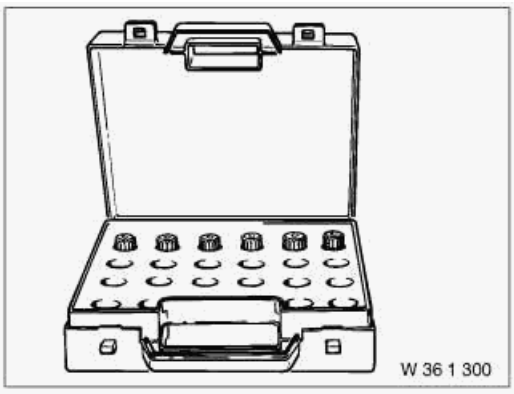
0 495 229 (36 1 332) Wheel stud



Common	Used in step 23
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 230 (36 1 333) Wheel stud



Common	Used in step 23
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Engine oilB47TÜ1	Used in step 93
Capacity of engine oil	5,5 l

Engine oil: Technically suitable engine oils for BMW Group engines

Links

General repair instructions	Used in step
61 20 ... Notes on AGM battery	79
61 12 ... Notes on intelligent battery sensor (IBS)	79
61 00 ... Notes for disconnecting and connecting battery	79

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64 50 010 Drawing off, evacuating and filling air conditioning (R134a)	1 97
64 50 ... Notes on repairs to air conditioning	1 97
64 50 010 Drawing off, evacuating and filling air conditioning (R1234yf)	1 97
64 50 ... Safety information for handling refrigerant R1234yf	1 97
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Operating materials	Used in step
2.0 Grease for wheel centring	73
3.0 Technically appropriate engine oils for BMW Group engines	93

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11 00 050 Removing and installing engine with transmission (B47AO0)

Special tools required:

- 32 1 270
- 13 5 160
- 13 5 162
- 00 9 030

Recycling:

Catch and dispose of escaping fuel with auxiliary materials.

Observe country-specific waste disposal regulations.

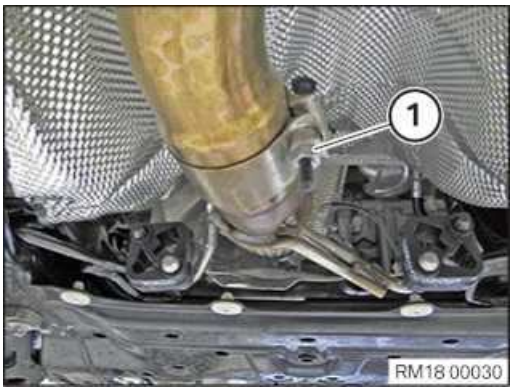
Important!

Seal openings or lines on air conditioning with special tool 32 1 270 to prevent escape of media and contamination.

Necessary preliminary tasks:

- Remove acoustic cover
- Remove battery.
- Remove DDE control unit.
- Remove front axle complete.
- Remove both output shafts.
- Remove starter motor.
- Drain engine oil.
- Remove charge air cooler.
- Remove radiator.

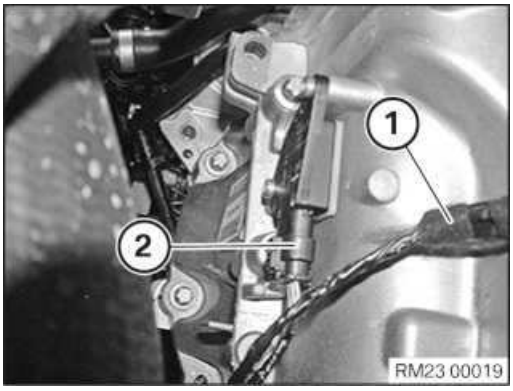
REMOVAL:



Release clamp (1).

Slide exhaust system from diesel particulate filter.

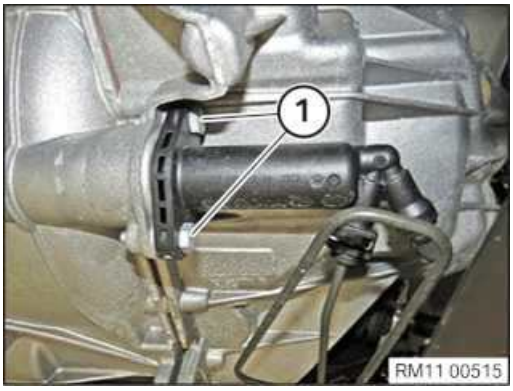
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Vehicles with manual gearbox:

Disconnect plug connection (2) on gear sensor.

Detach cable (1) with holder from transmission.



Vehicles with manual gearbox:

Note:
Pressure line of clutch slave cylinder remains connected.

Important!

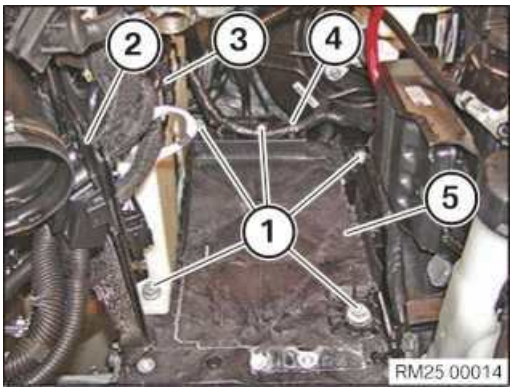
Slowly relieve tension on clutch slave cylinder otherwise air may be drawn in through sealing sleeve.

If possible, do not deflect push rod of clutch slave cylinder.

A deflection of the push rod caused by removal will cause easy escape of fluid. This escape of fluid does not mean that the clutch slave cylinder is damaged.

Exchange is therefore not necessary.

Release nuts (1) and remove clutch slave cylinder.



Release screws (1).

Release battery housing (2) from bracket and remove.

Release control unit holder (3).

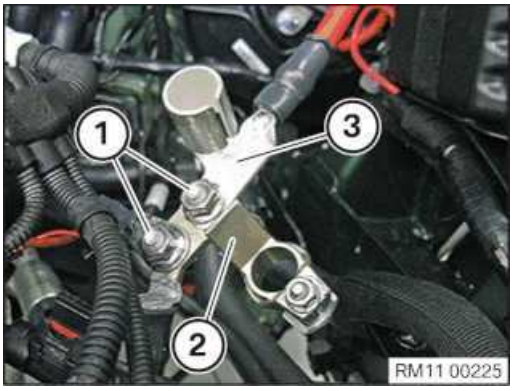
Detach wiring harness (4) from battery tray (5).

Remove battery tray (5).



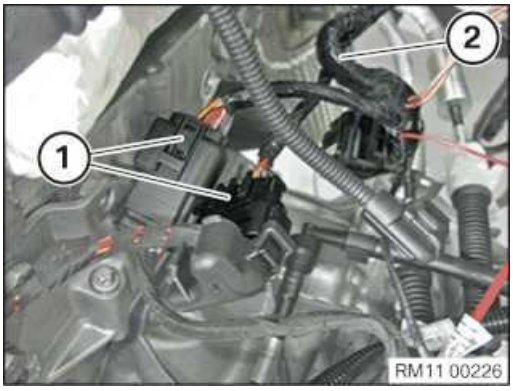
Loosen screw connection (1) of the ground strap.

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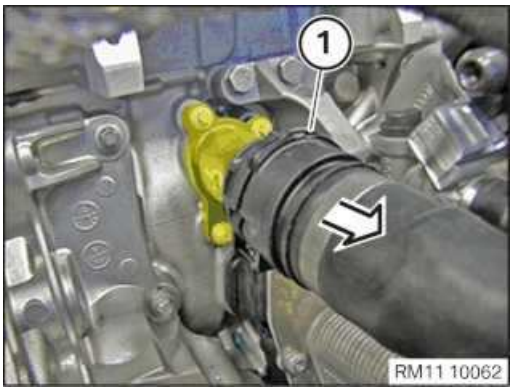
Unscrew nuts (1).

Disconnect positive battery terminal (2) and positive battery connection point (3).



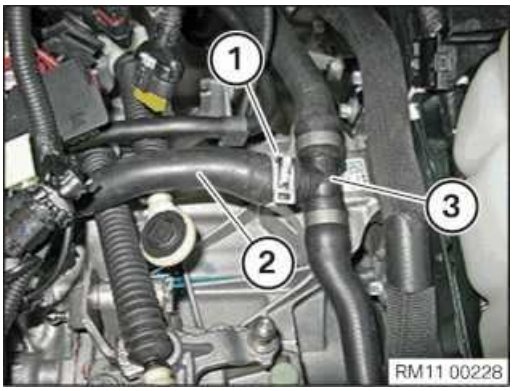
Unlock plug connections (1) and disconnect.

Disconnect wiring harness (2) from engine wiring harness.



Release coolant hose (1) and pull off connecting branch.

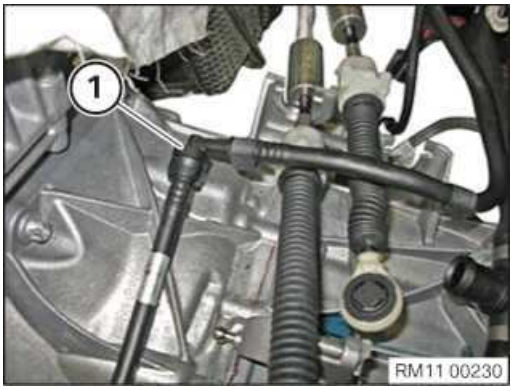
Shown with intake plenum removed for purposes of clarity.



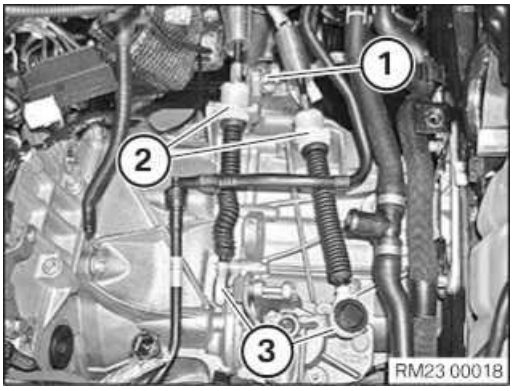
Release clamp (1).

Pull hose (2) off connecting pipe (3).

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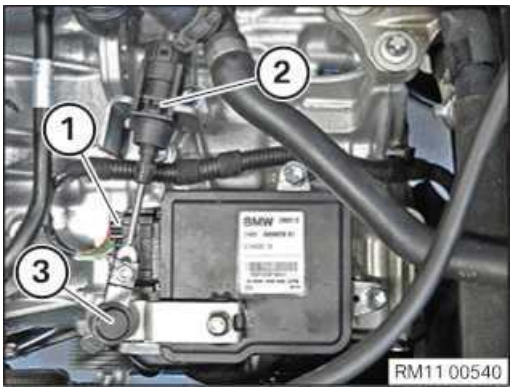
Release vacuum line (1) connection and disconnect.



Vehicles with manual gearbox:

Release clips on limit position/holder (2).

Detach selector lever cables (3) at ball joints.

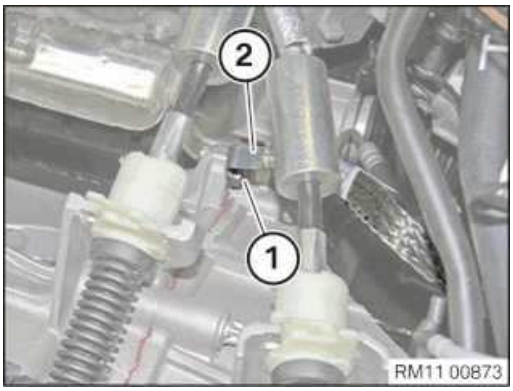


Vehicles with automatic transmission:

Unlock and disconnect the connector (1).

Release clips on limit position/holder (2).

Detach selector lever cable (3) at ball joint.

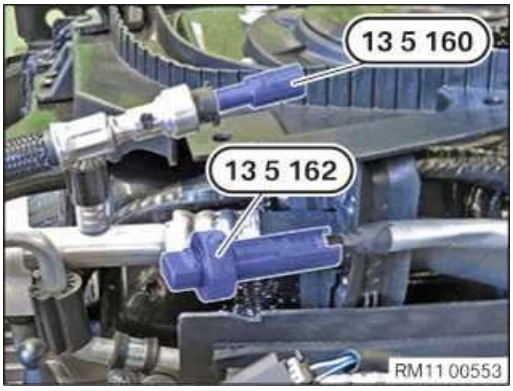


Slacken screw (1) and remove ground strap (2).

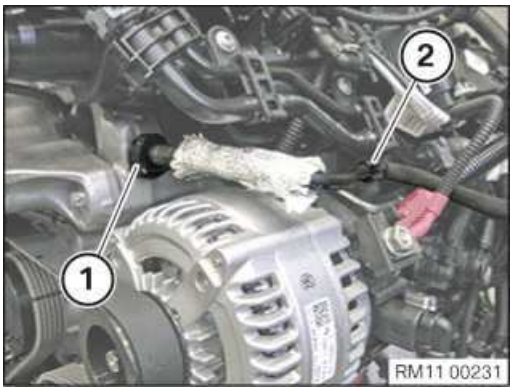
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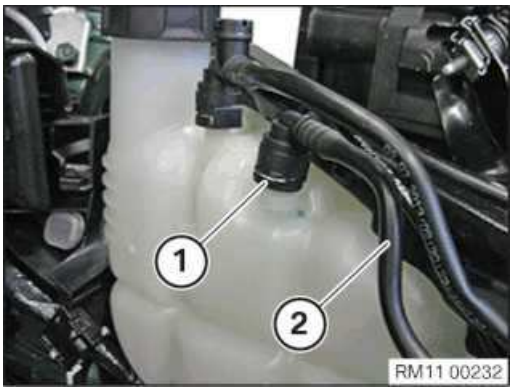
Disconnect fuel lines (1).
Catch and dispose of escaping fuel.



Seal fuel lines with special tools 13 5 160 and 13 5 162 .

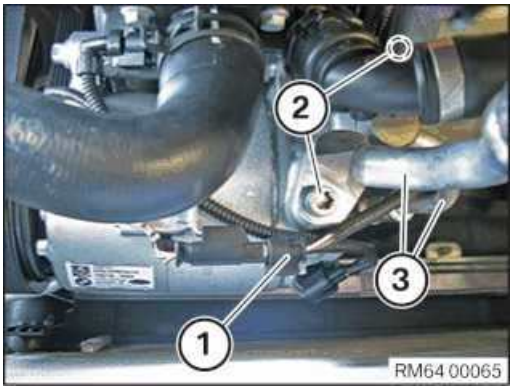


Unlock coolant line (1) and pull off.
Unclip coolant line (1) from holder (2).



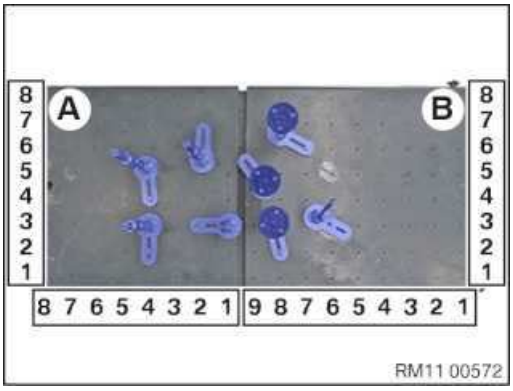
Unlock coolant line (1) and pull off.
Detach coolant line (1) from front end.

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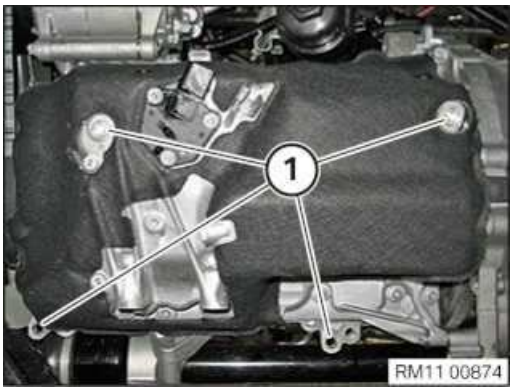


Unfasten screws (2).

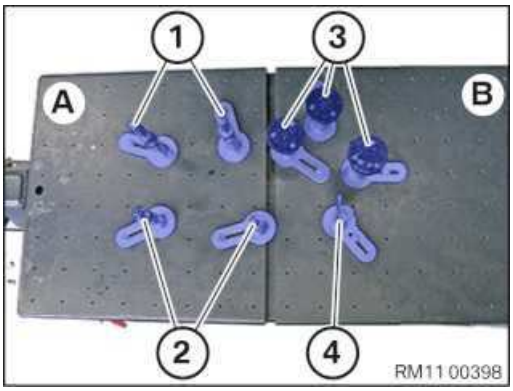
Remove refrigerant lines (3).



Note:
Overview of coordinates for mobile table lift.



Note:
The fixtures (40/50) of table top **A** of the mobile table lift must be seated in the mounting points (1).



Vehicle with manual gearbox:

Prepare mobile table lift:

Note:
Position engine assembly on table top **A**.

Position transmission on table top **B** .

Structure of table lift.

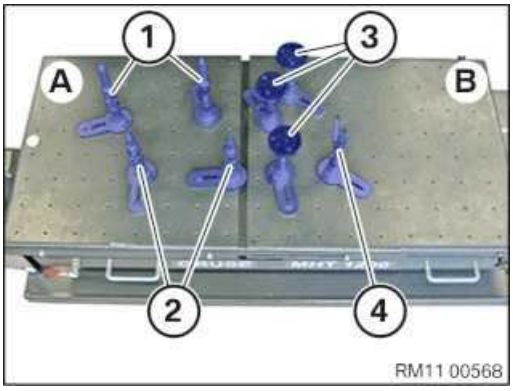
Position fixture (30) with fixture (40) for engine block on table top **A** at coordinates **6/6** and **1/7** (1).

Position fixture (30) with fixture (50) for oil sump on table top **A** at co-ordinates **5/3** and **2/3** (2).

Position fixture (30) with fixture (80) for transmission housing on table top **B** at co-ordinates **6/5**, **2/5** and **2/7** (3).

Position fixture (83 30 2 357 221) for transmission housing on table top **B** at co-ordinates **7/3** (4).

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Vehicle with automatic transmission:

Prepare mobile table lift:

Note:
Position engine assembly on table top **A**.

Position transmission on table top **B** .

Structure of table lift.

Position fixture (30) with fixture (40) for engine block on table top **A** at coordinates **6/5** and **2/6** (1).

Position fixture (30) with fixture (50) for oil sump on table top **A** at co-ordinates **4/2** and **2/3** (2).

Position fixture (30) with fixture (80) for transmission housing on table top **B** at co-ordinates **9/6**, **7/6** and **8/2** (3).

Position fixture (83 30 2 357 221) for transmission housing on table top **B** at co-ordinates **6/3** (4).

Important!

Removal weight approx. 150 kg to 300 kg.

Check payload of vehicle, empty if necessary.

Load front footwell with sandbags if necessary, approx. 100 kg.

Note safety instructions of table lift.



Vehicles with manual gearbox:

Position table lift under the engine.

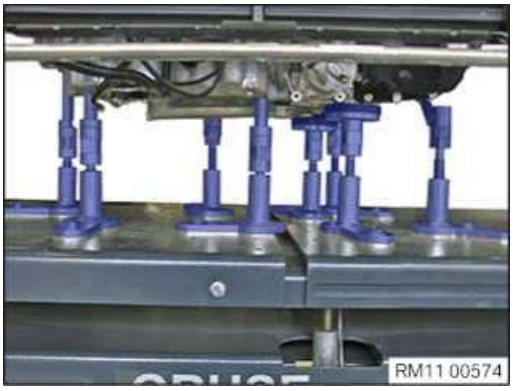
Abut all fixtures and screw to the table lift.



Vehicles with manual gearbox:

Screw fixture (83 30 2 357 221) to the housing for the clutch slave cylinder.

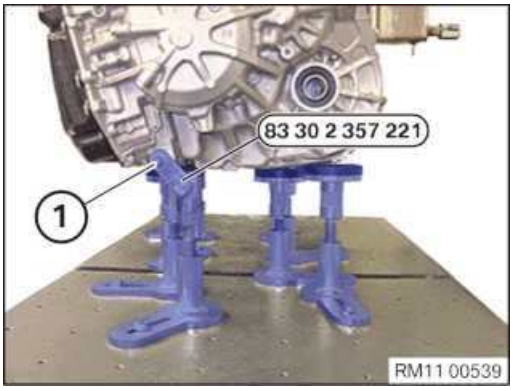
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Vehicles with automatic transmission:

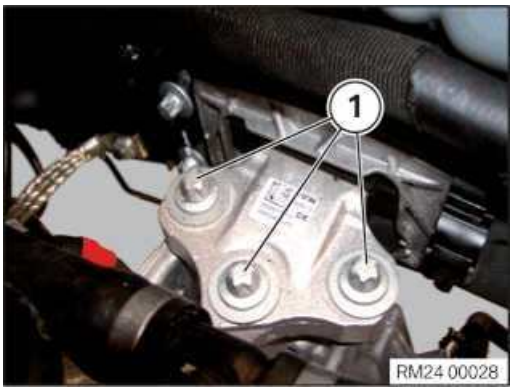
Position table lift under the engine.

Abut all fixtures and screw to the table lift.

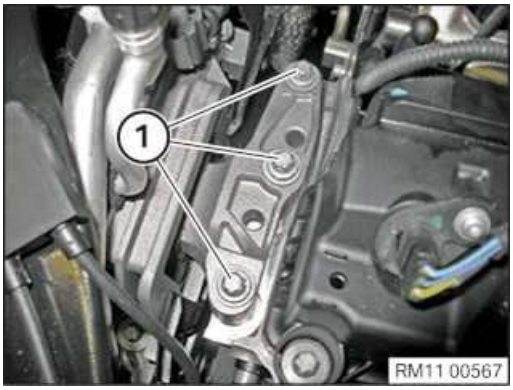


Vehicles with automatic transmission:

Screw fixture (83 30 2 357 221) to the transmission housing with screw (1).



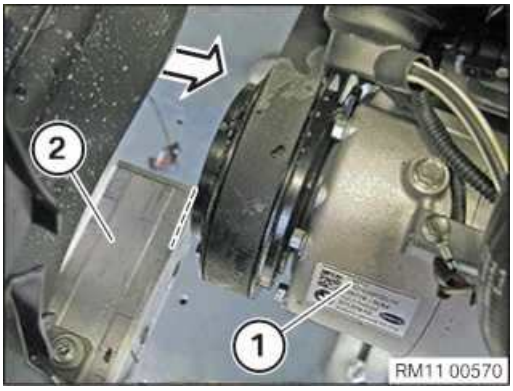
Release screws (1).



Release screw connection (1) of right engine support.

Carefully raise the vehicle.

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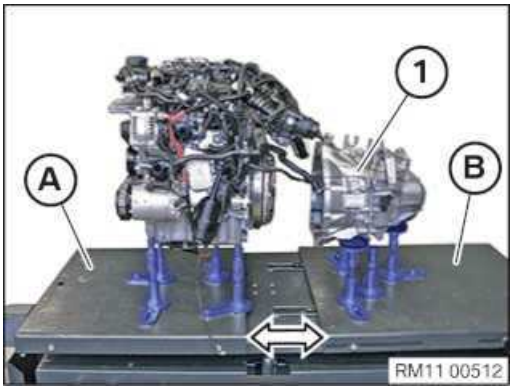
Important!

Take care when removing the engine!

Risk of damage of the compressor (1) at the deformation element (2).

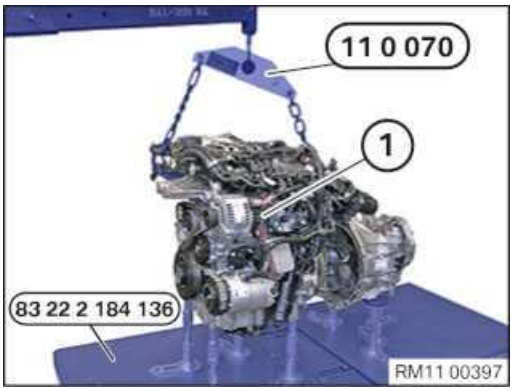
Slightly slide the table lift with the engine in direction of arrow.

Remove engine with transmission.



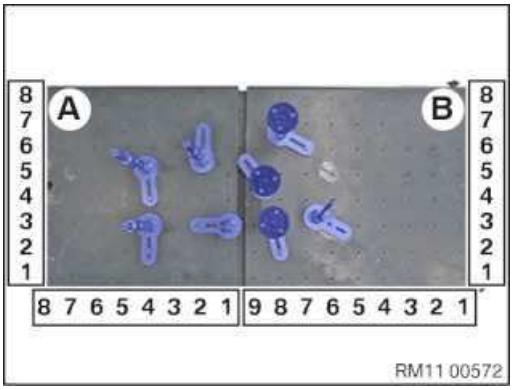
Loosen transmission.

Slide table top **B** in direction of arrow and remove transmission.



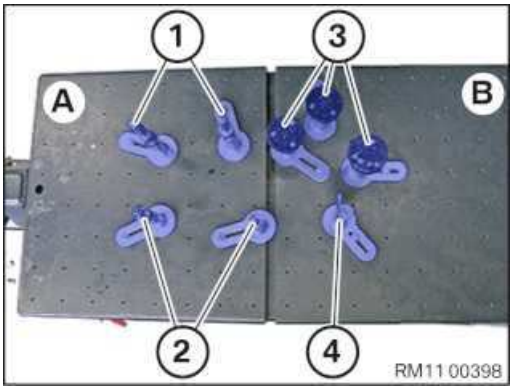
Attach engine lifter and lift engine from table lift.

INSTALLATION:



Note:
Overview of coordinates for mobile table lift.

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Vehicles with manual gearbox:

Prepare mobile table lift:

Note:
Position engine assembly on table top **A**.

Position transmission on table top **B** .

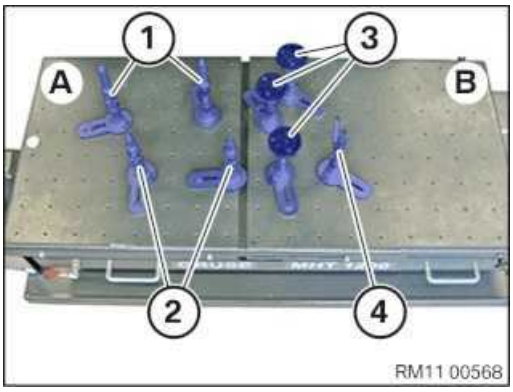
Structure of table lift.

Position fixture (30) with fixture (40) for engine block on table top **A** at coordinates **6/6** and **1/7** (1).

Position fixture (30) with fixture (5) for oil sump on table top **A** at co-ordinates **5/3** and **2/3** (2).

Position fixture (30) with fixture (80) for transmission housing on table top **B** at co-ordinates **6/5**, **2/5** and **2/7** (3).

Position fixture (83 30 2 357 221) for transmission housing on table top **B** at co-ordinates **7/3** (4).



Vehicle with automatic transmission:

Prepare mobile table lift:

Note:
Position engine assembly on table top **A**.

Position transmission on table top **B** .

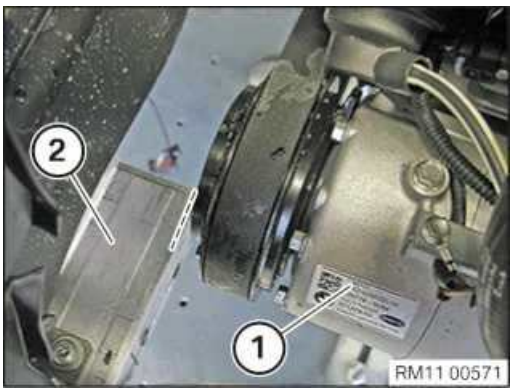
Structure of table lift.

Position fixture (30) with fixture (40) for engine block on table top **A** at coordinates **6/5** and **2/6** (1).

Position fixture (30) with fixture (50) for oil sump on table top **A** at co-ordinates **4/2** and **2/3** (2).

Position fixture (30) with fixture (80) for transmission housing on table top **B** at co-ordinates **9/6**, **7/6** and **8/2** (3).

Position fixture (83 30 2 357 221) for transmission housing on table top **B** at co-ordinates **6/3** (4).



Important!

Take care when installing the engine!

Risk of damage of the compressor (1) at the deformation element (2).

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Vehicles with manual gearbox:

Place engine and transmission on table lift.

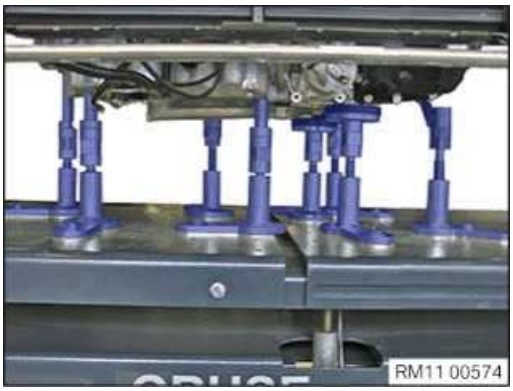
Mount transmission on engine.



Vehicles with manual gearbox:

Screw fixture (83 30 2 357 221) to the housing for the clutch slave cylinder.

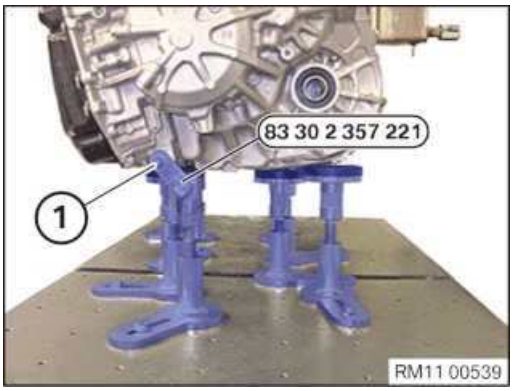
Lower vehicle.



Vehicles with automatic transmission:

Place engine on table lift.

Mount transmission on engine.

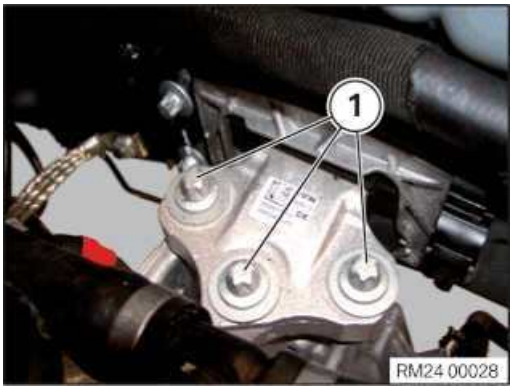


Vehicles with automatic transmission:

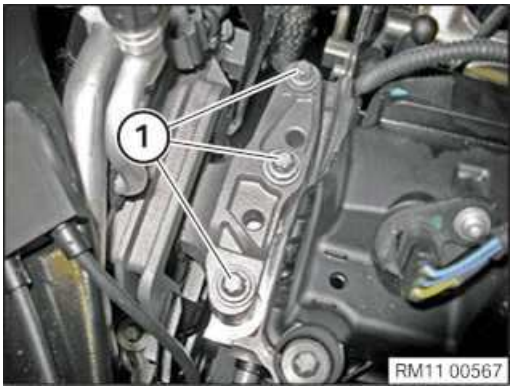
Screw fixture (83 30 2 357 221) to the transmission housing with screw (1).

Lower vehicle.

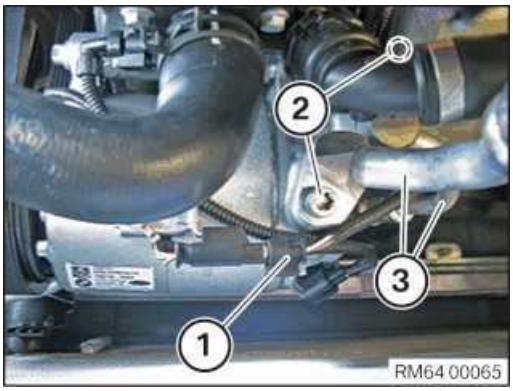
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Position table lift with engine and transmission under the vehicle.
Carefully lower the vehicle.
Tighten screws (1) on transmission carrier.
Tightening torque 22 32 1AZ.



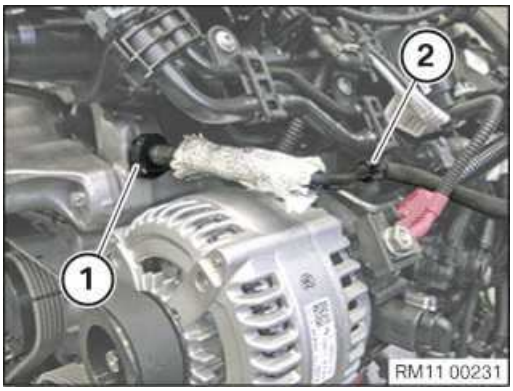
Tighten screws (1) on right engine support.
Tightening torque 22 11 1AZ.



Parts: Replace sealing rings.

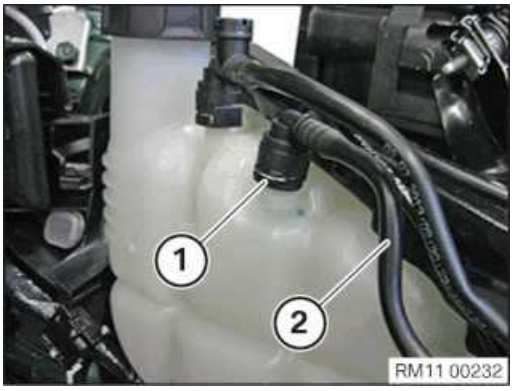
Note:
Use special tool 00 9 030 to mount sealing rings without damaging them.

Join refrigerant lines (3) to compressor.
Tighten down screws (2).
Tightening torque 64 53 4AZ.



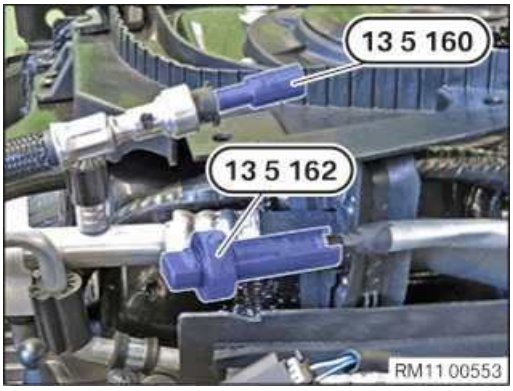
Install coolant line (1) in vehicle
Connect and lock coolant line (1).
Clip coolant line (1) into holder (2).

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Connect and lock coolant line (1).

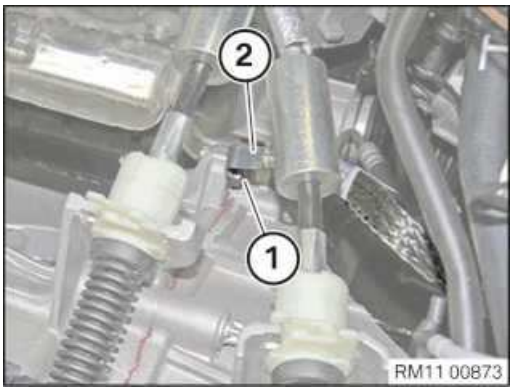
Route coolant line (1) correctly in the front end.



Remove special tools13 5 160 and 13 5 162 .

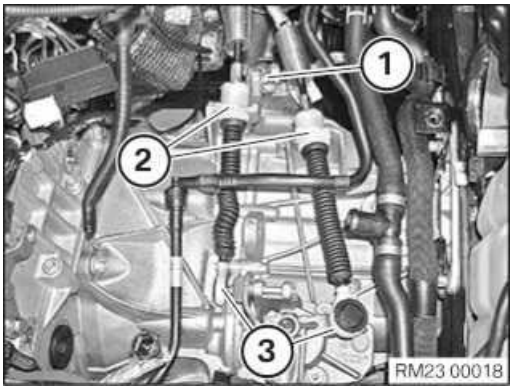


Connect fuel lines (1).



Position ground strap (2) and tighten screw (1).

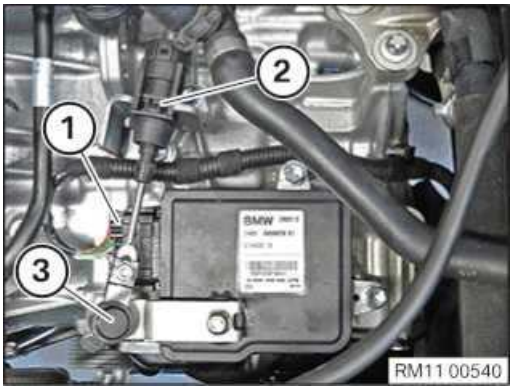
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Vehicles with manual gearbox:

Attach selector lever cables (3) at ball joints.

Fasten limit position/holder (2) with clips.



Vehicles with automatic transmission:

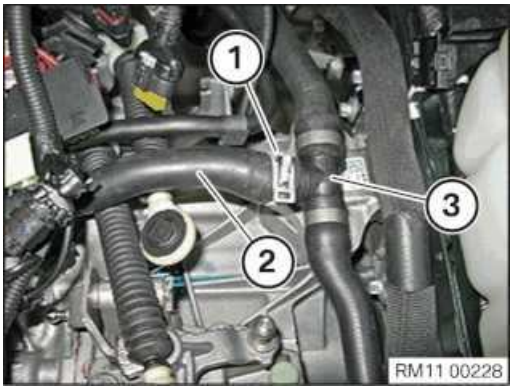
Connect the connector (1).

Attach clip at limit position/holder (2).

Attach selector lever cable (3) to ball joint.



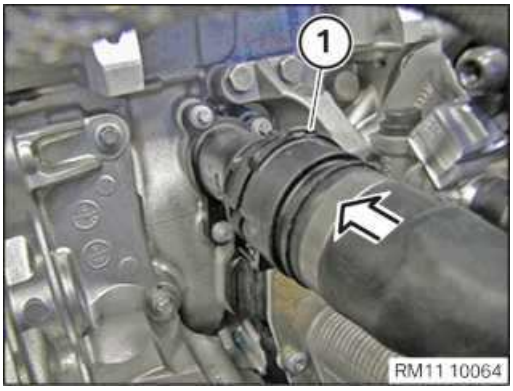
Connect vacuum line (1).



Connect hose (2) to connecting pipe (3).

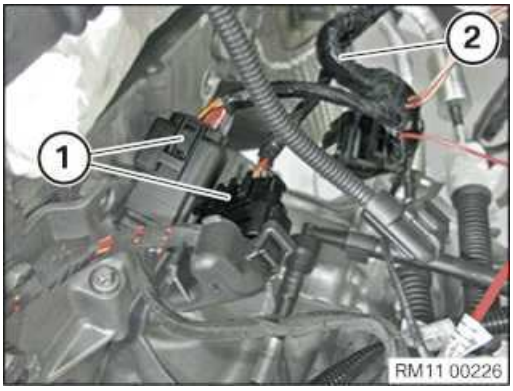
Fasten clamp (1).

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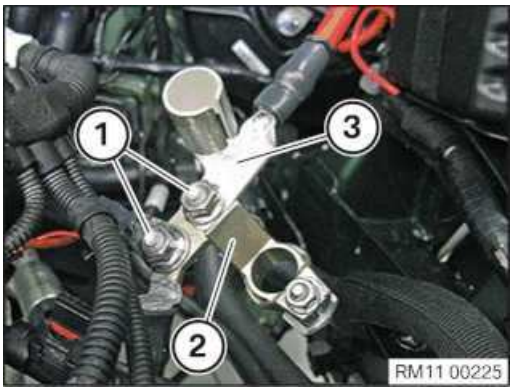
Place coolant hose (1) on connecting branch and lock.

Shown with intake plenum removed for purposes of clarity.



Join wiring harness (2) and engine wiring harness.

Connect the connector (1).



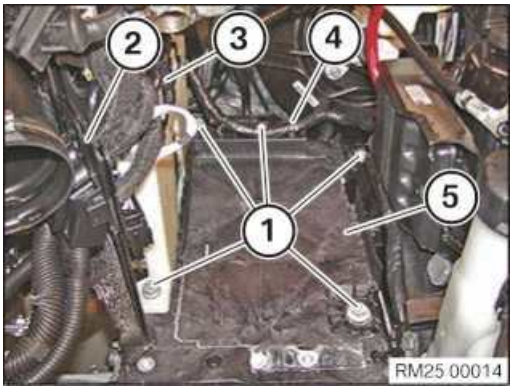
Connect positive battery terminal (2) and positive battery connection point (3).

Tighten down nuts (1).



Attach ground cable with screw (1).*Note:*
Position ground cable correctly in holder.

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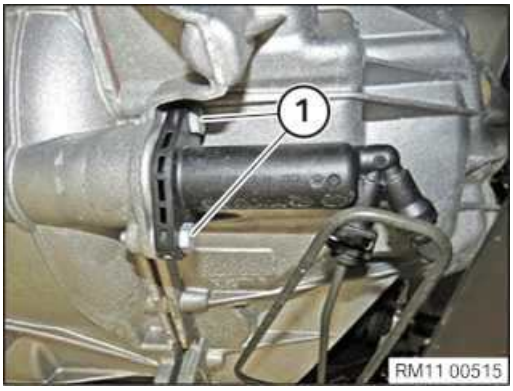
Install battery tray (5).

Attach wiring harness (4) to battery tray (5).

Install control unit holder (3).

Install battery housing (2).

Tighten down screws (1).



Vehicles with manual gearbox:

Important!

Slowly relieve tension on clutch slave cylinder otherwise air may be drawn in through sealing sleeve.

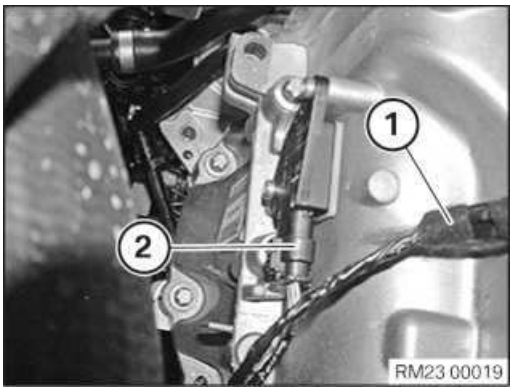
If possible, do not deflect push rod of clutch slave cylinder.

A deflection of the push rod caused by removal will cause easy escape of fluid. This escape of fluid does not mean that the clutch slave cylinder is damaged.

Exchange is therefore not necessary.

Carefully insert clutch slave cylinder and tighten nuts (2).

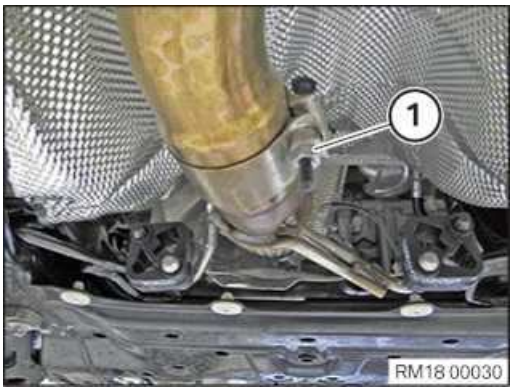
Tightening torque 21 52 1AZ.



Vehicles with manual gearbox:

Connect connector (2) of neutral gear sensor.

Fasten cable (1) with holder on transmission.



Parts: Replace clamp (1).

Slide exhaust system onto diesel particulate filter.

Tighten clamp (1).

Tightening torque 18 20 1AZ.

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Required follow-up work:

- Install radiator.
- Install charge air cooler.
- Install both output shafts.
- Install starter.
- Install complete front axle.
- Top up engine oil.
- Install DDE control unit.
- Install battery.
- Install acoustic cover.



Check cooling system for tightness.

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00 Safety information for working on vehicles with automatic engine start-stop function (MSA)



Warning!

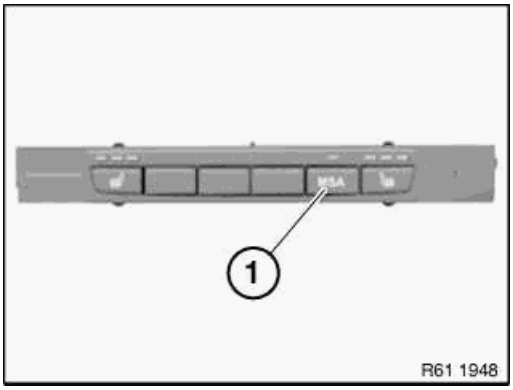
If the engine hood/bonnet contact is pulled upwards (workshop mode), the information "switch closed" is output. The automatic engine start-stop function is active.

An automatic engine start is possible.

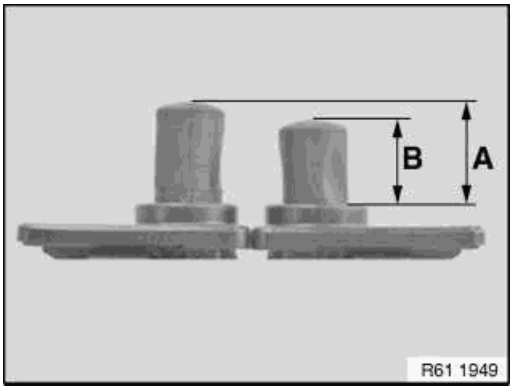
Observe safety precautions when working on MSA vehicles.

Before carrying out practical work on the engine, always ensure that the MSA functionality is deactivated so as to prevent automatic engine starting while work is being carried out in the engine compartment.

MSA function is deactivated by:



- Deactivate MSA by means of button (1) in passenger compartment
- Open seat belt buckle and driver's door



- Open engine bonnet/hood and ensure that engine hood/bonnet contact is not in workshop mode
  - Workshop mode

    A = 10 mm
  - Basic setting (engine hood/bonnet open)

    B = 7 mm

  To make sure that the engine hood/bonnet contact is at the basic setting, if necessary press the hood/bonnet contact up to the limit position before starting work and slowly release.



When working with diagnosis tools:

- Observe instructions in diagnosis tool

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Note:
For further information on automatic engine start-stop function (MSA):

- Refer to the Service Information (bulletin) (for manual transmissions) Service Information (bulletin) 61 01 07 335
- Refer to the Service Information (bulletin) (for automatic transmissions or twin-clutch gearboxes) Service Information (bulletin) 61 01 10 629

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00 Safety instructions for handling oil



Warning!

Danger of poisoning if oil is ingested/absorbed through the skin!

Risk of injury if oil comes into contact with eyes and skin!



Recycling:

Observe country-specific waste disposal regulations.



Measures if oil is unintentionally released:

- Personal precautionary measures: Danger of slipping! Keep non-involved persons away from the work area. Wear personal protective clothing/equipment.
- Environmental protection measures: Prevent oil from draining into drain channels, sewerage systems, pits, cellars, water and the ground.
- Limiting spread: Use oil blocks to prevent the surface spread of oil.
- Cleaning procedure: Bind and dispose of escaped oil with nonflammable absorbents.

  Note: Do not flush oil away with water or aqueous cleaning agents.

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11 00 670 Secure engine in installation position

Special tools required:

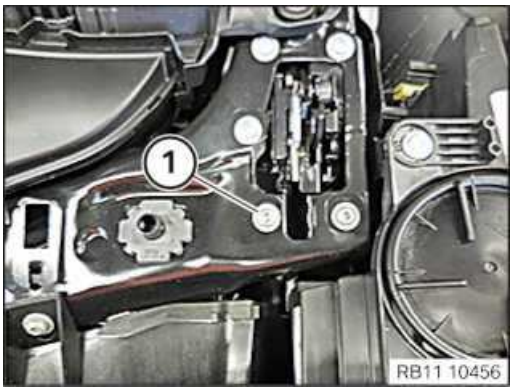
- 00 6 100
- 00 6 130
- 2 365 070
- 00 6 052
- 11 0 000
- 00 0 490

Warning!

Danger of injury!

Observe following instructions relating to special tool:

1. Prior to each use, check the special tools for defects, modifications and operational reliability.
2. Damaged/modified special tools must not be used!
3. No changes or modifications may be made to the special tools!
4. Keep special tools dry, clean and free of grease.

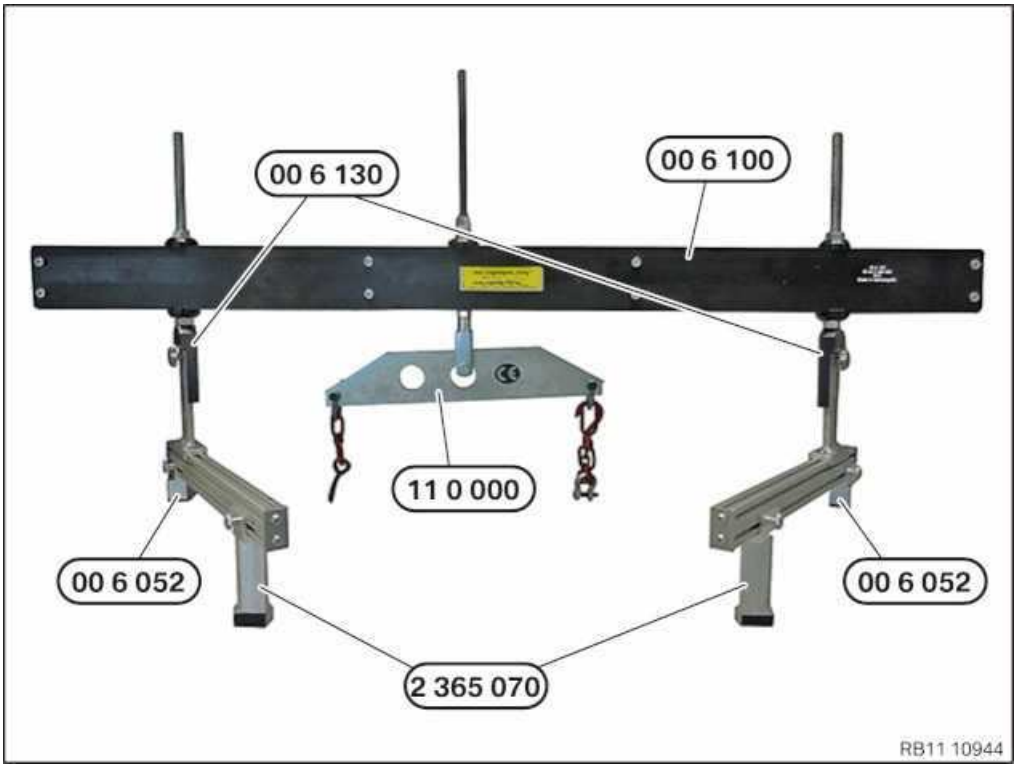


Release screw (1) from left engine compartment lock.



Release screw (1) from right engine compartment lock.

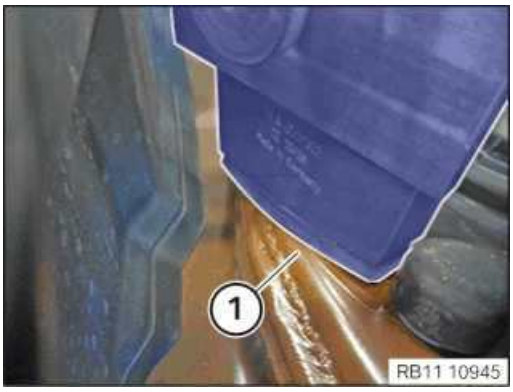
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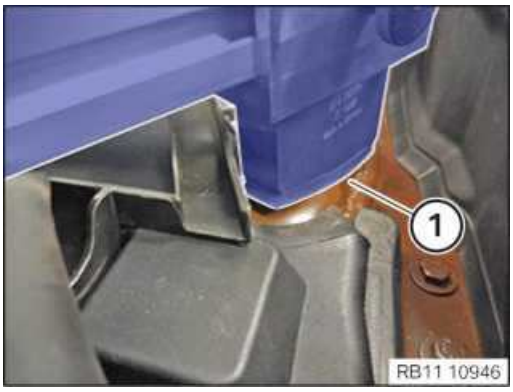
Modify the engine bridge 00 6 100 using special tools 00 6 130 , 2 365 070 , 00 6 052 and 11 0 000 to match the motor vehicle.

With the help of an assistant, fit the entire cross-member 00 6 100 onto the vehicle.

.

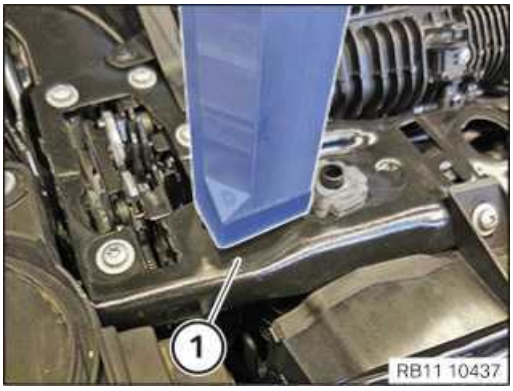


(1) = rear right support point.

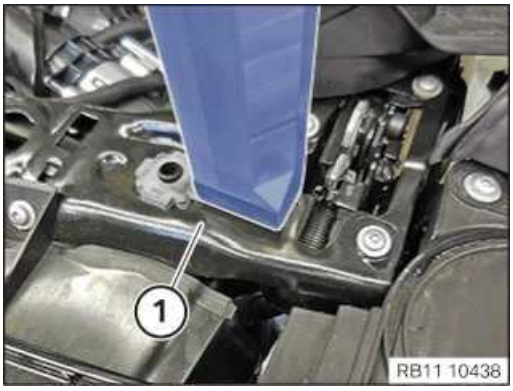


(1) = rear left support point.

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(1) = front right support point.



(1) = front left support point.



Attach the chains to the engine.

Slightly pretension the spindle (1) of the engine support beam.

Warning!
Danger of injury!

Tighten down all adjusting screws, knurled screws and nuts on cross-member 00 6 100 and on special tool 00 0 490 .

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Important!

Avoid a change of engine position in the transverse or longitudinal direction!

Always make sure there is sufficient clearance between the engine (or its add-on parts) and the body.

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11 00 670 Securing engine in installation position

PRELIMINARY WORK

1 – Bring front compartment lid in the service position

Prerequisite

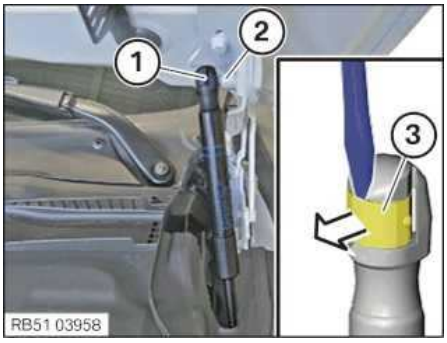
Engine compartment lid is open.

CAUTION

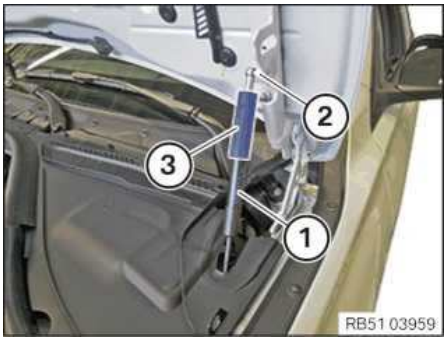
Shutting bonnet or tailgate.

Danger of injury!

- Support bonnet/tailgate in fully open position with the aid of a suitable device.



- Lift clamp (3) slightly using a screwdriver, in the direction of the arrow.
- Lift off ball socket (1) from ball pin (2).
- Repeat the operation on the other side of vehicle.



TECHNICAL INFORMATION

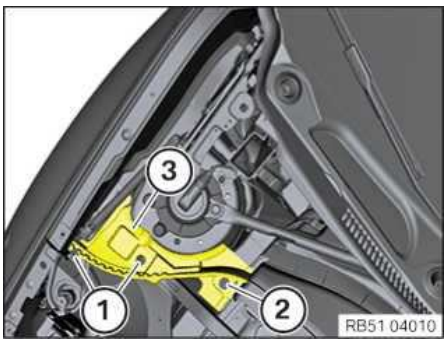
Conduct the following operation with the assistance of a second person.

- Remove the bonnet support and open the bonnet further.
- Push special tool (3) over gas pressure spring (1).
- Place special tool on the ball pin (2) and engage using force.
- Repeat the operation on the other side of vehicle.

2 – Remove suspension cross-brace

TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.

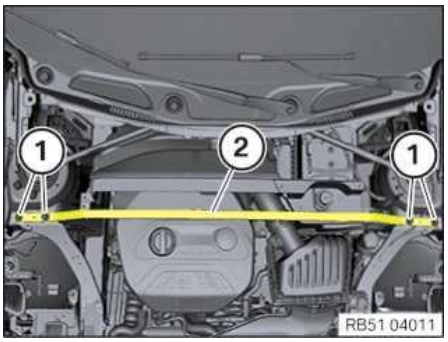


NOTICE

Description is for right component only. The procedure on the left side is identical.

- Loosen expanding rivet (1).
- Loosen screw (2).
- Remove the cover (3).

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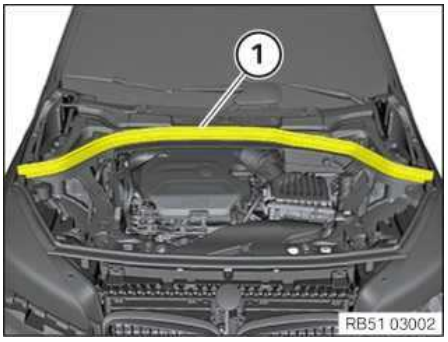


- Loosen screws (1).
- Remove strut brace (2).

3 – Remove the seal for the rear bonnet

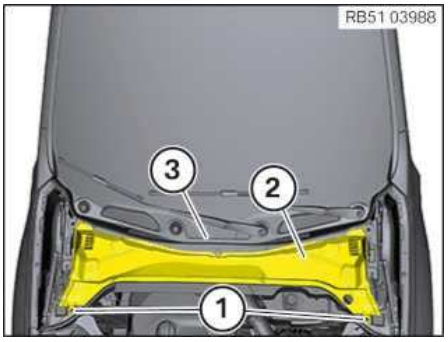
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



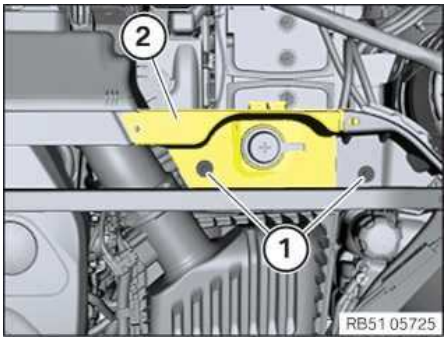
- Pull off rear bonnet seal (1) towards the top and remove.

4 – Removing front cowl panel cover

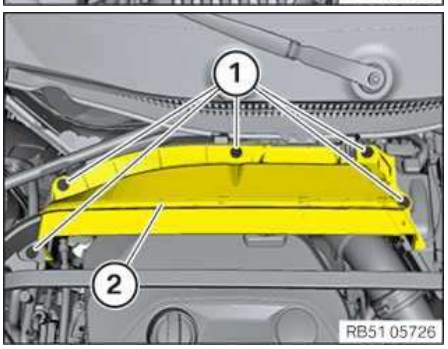


- Loosen the expanding rivet (1).
- Feed out and remove front cowl panel cover (2) from the rear cowl panel cover(3).

5 – Removing the upper bulkhead cover



- Loosen screws (1).
- Guide out and remove the cover (2).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

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6 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

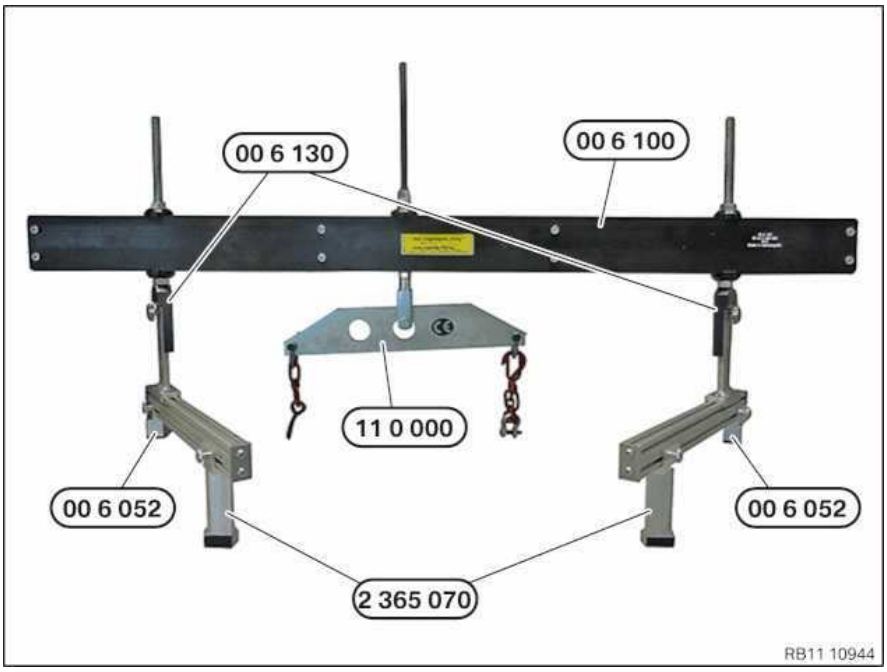
- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

MAIN WORK

7 – Installing the engine bridge

Overview: Prepared engine bridge



Prerequisite

Front compartment lid is in service position.

CAUTION

Components connected to the engine joint or cross member.

Danger of injury!

- Check lifting eyes and engine mounting brackets for damage, e.g. cracks.
- Attach the component to correctly mounted engine joints or cross members only.
- Exclusively lift the component, do not move it forwards, backwards or in transverse direction.

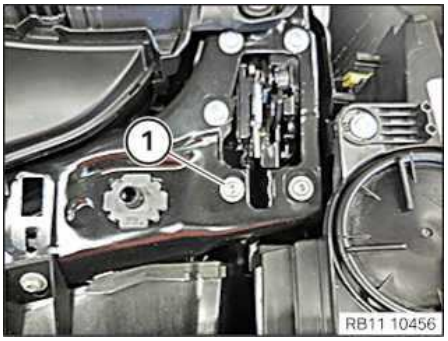
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- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

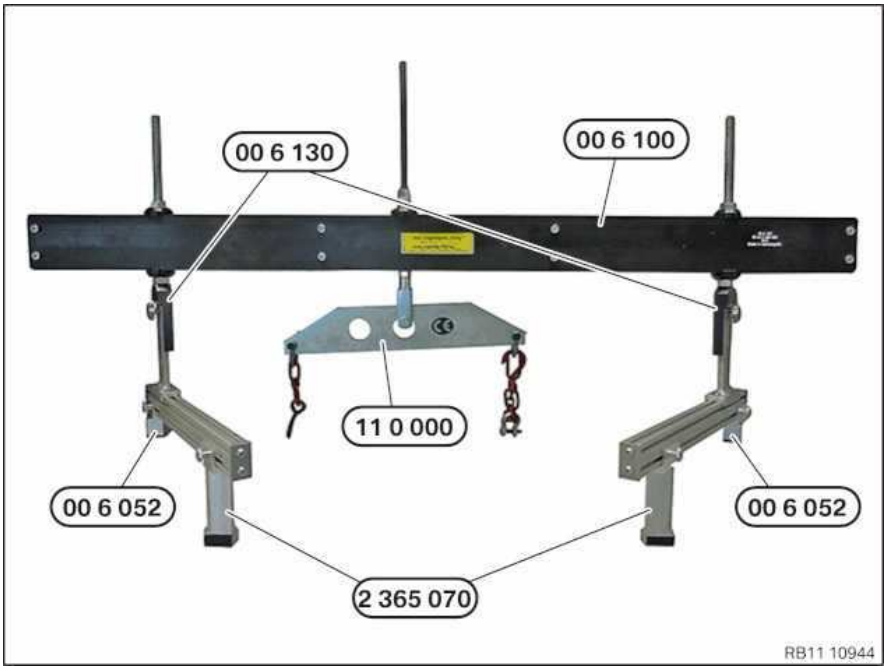
M8		Tightening torque	21,5 Nm



- Loosen screw (1) of the left bonnet catch.



- Loosen screw (1) of the right bonnet catch.



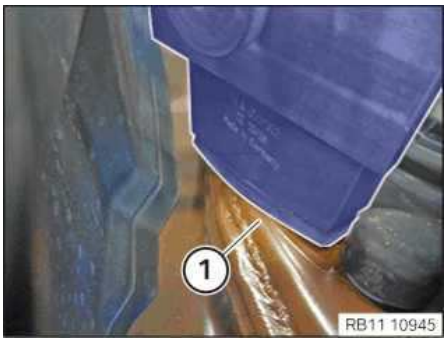
CAUTION

Heavy component.

Heavy components can lead to injury or damage.

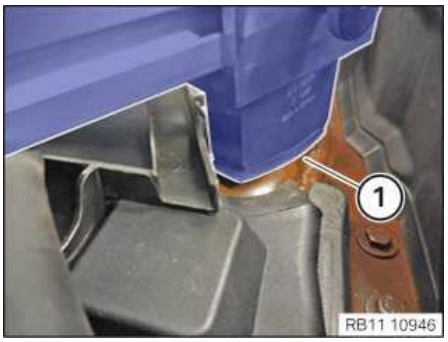
- Remove and install heavy components with the aid of another person/other persons.

- Set entire cross member **0 496 852 (00 6 100)** on the vehicle and position with the help of an auxiliary person.

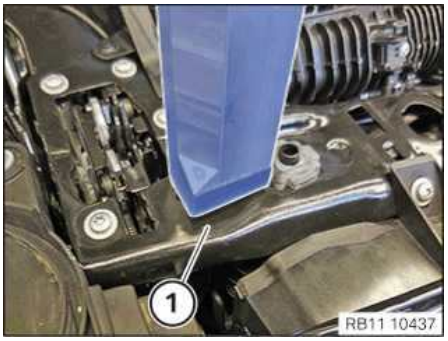


- Position the special tool at the rear mounting point (1) on the **right**.

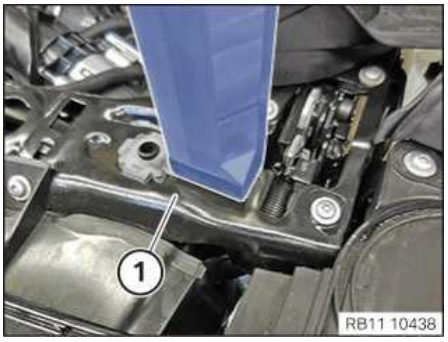
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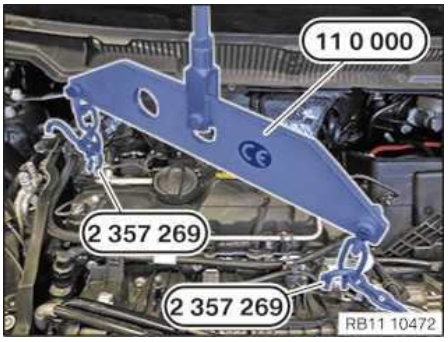
- Position the special tool at the rear mounting point (1) on the **left**.



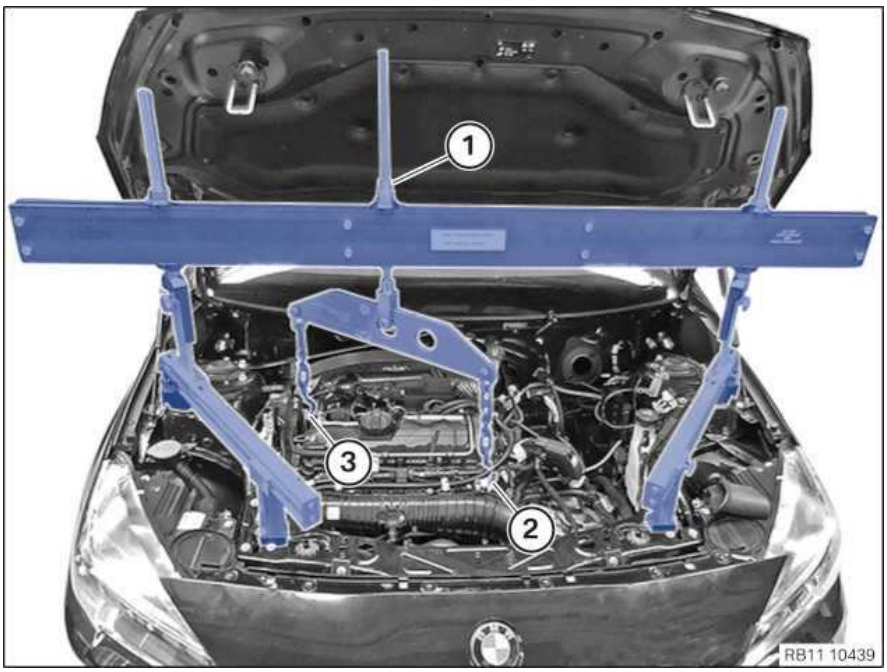
- Position the special tool at the front mounting point (1) on the **right**.



- Position the special tool at the front mounting point (1) on the **left**.



- Position special tool **0 490 561 (11 0 000)** above the engine.
- Attach special tools to the mounting lugs of the engine.



- Tighten side screws (2) and (3).
- Slightly pretension the spindle screw (1) of the engine support beams.
- Tighten down all adjusting screws, knurled screws and nuts on cross member **0 496 852 (00 6 100)** and on special tool .

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CAUTION

Heavy component.

Heavy components can lead to injury or damage.

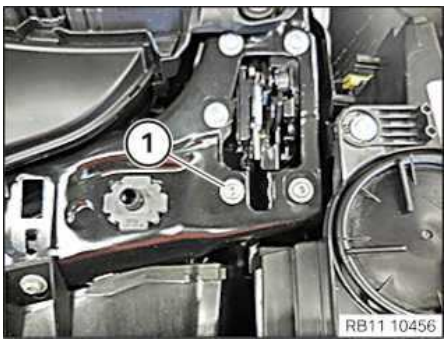
- Remove and install heavy components with the aid of another person/other persons.



- Detach the spindle screw (1) from the engine bridge.
- Unscrew the leg screws (2) and (3).
- Guide the engine bridge out of the vehicle with the help of another person and remove.



- Unscrew the bolts (1) of the special tool **2 459 012**.
- Feed out the special tool **2 459 012** at the cylinder head and remove.



- Tighten the screw (1) of the bonnet catch.

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm



- Tighten the screw (1) of the bonnet catch.

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

POSTPROCESSES

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9 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

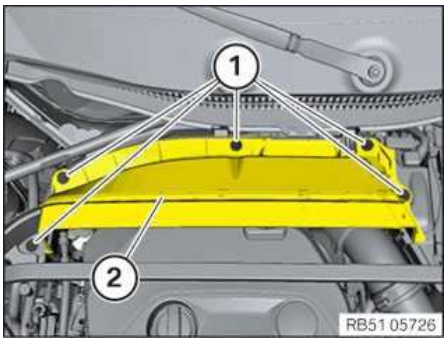


- Check for correct installation of all rubber mounts in the acoustic cover (1).



- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

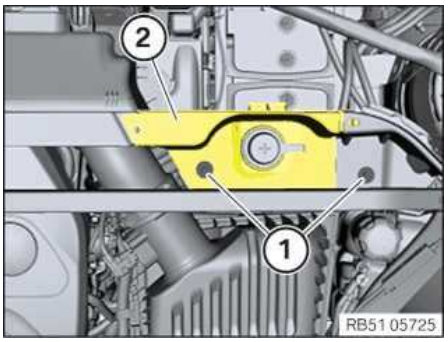
10 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Cover of top bulkhead

Screw		Tightening torque	2,6 Nm



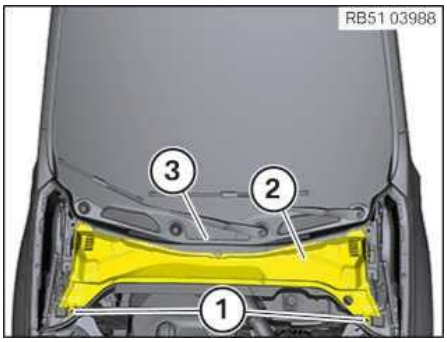
- Guide in and install cover (2).
- Tighten down screw (1).

Cover of remote positive terminal

Screw		Tightening torque	2,6 Nm

11 – Installing front cowl panel cover

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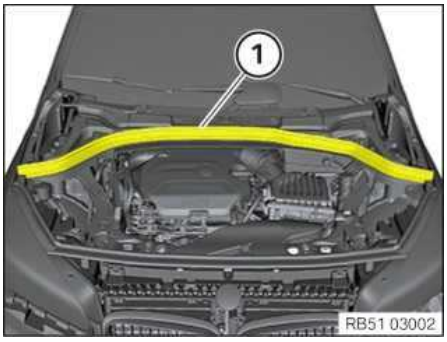


- Insert and install cowl panel cover at front (2) into cowl panel cover at rear (3).
- Check cowl panel cover at front is correctly seated (2).
- Secure expanding rivet (1).

12 – Install the seal for the bonnet

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

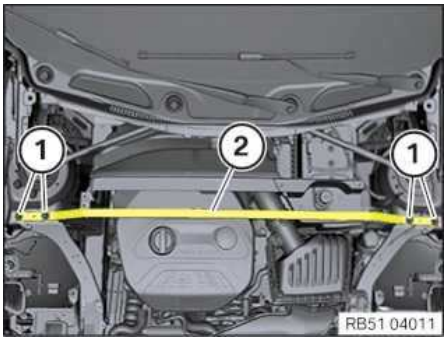


- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

13 – Install strut brace

TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.

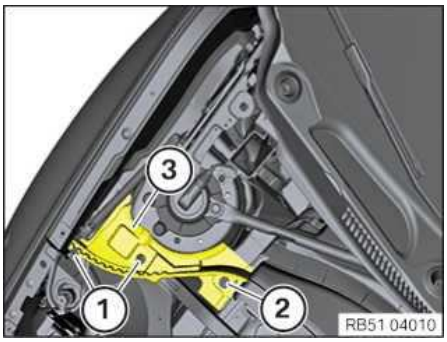


- Install the strut brace (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-brace to spring strut dome

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °



NOTICE

Description is for right component only. The procedure on the left side is identical.

- Install the cover (3).
- Tighten down screw (2).

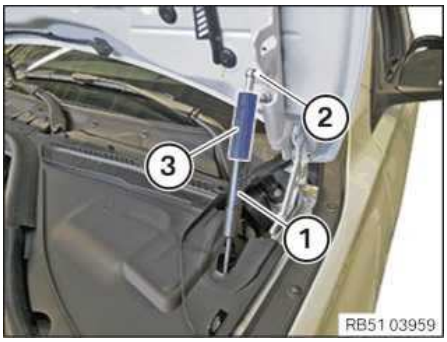
Cover on body

Hexagon screw		Tightening torque	3 Nm

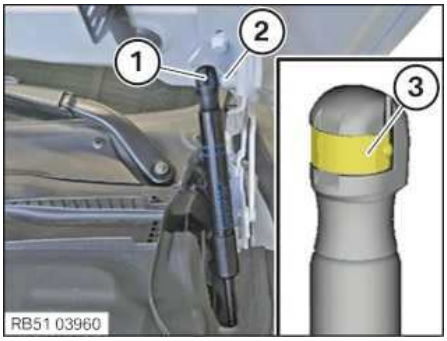
- Install the expanding rivet (1).

14 – Take bonnet out of the service position

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- Support the bonnet by hand.
- Remove the special tool (3) from the ball pin (2).
- Pull off the special tool (3) from the gas pressure spring (1).
- Continue to support the bonnet and repeat the operation on the other side of vehicle.



CAUTION

Shutting bonnet or tailgate.

Danger of injury!

- Support bonnet/tailgate in fully open position with the aid of a suitable device.

- Check the clamp (3) is fitted correctly.
- Connect ball socket (1) to ball pin (2).
- Continue to support the bonnet and repeat the operation on the other side of vehicle.

Additional Information

Overview of Tightening Torques

Special tool to cylinder head			Used in step 7
M8		Tightening torque	21,5 Nm

Cross connection on support for cross connection			Used in step 8
M6x20		Tightening torque	12 Nm

Cover of top bulkhead			Used in step 10
Screw		Tightening torque	2,6 Nm

Cover of remote positive terminal			Used in step 10
Screw		Tightening torque	2,6 Nm

Cross-brace to spring strut dome			Used in step 13
	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

Cover on body			Used in step 13
Hexagon screw		Tightening torque	3 Nm

Overview of Special Tools

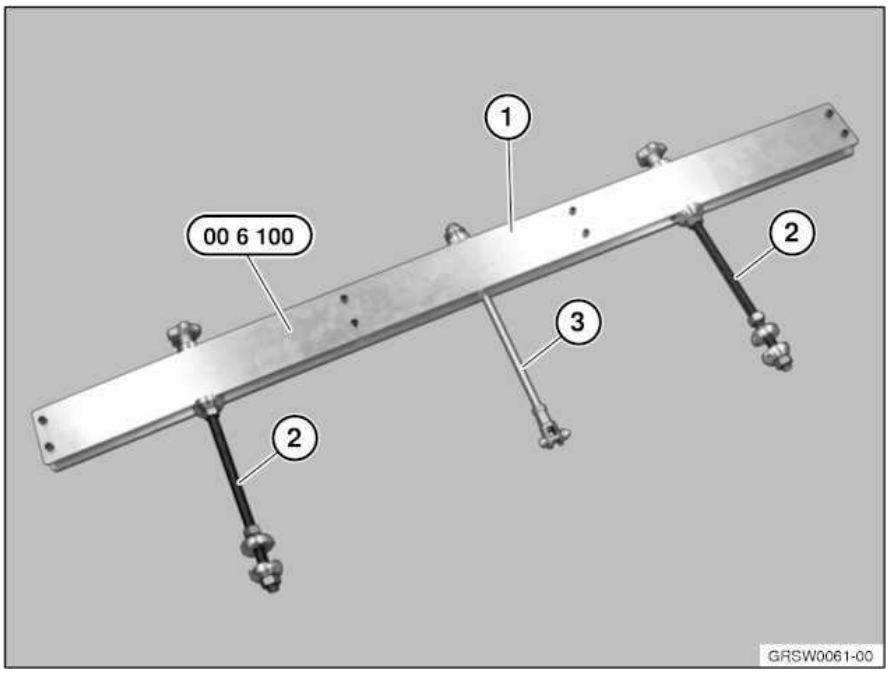
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2 459 012 Holder



Common	Used in step 7 8
Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

0 496 852 (00 6 100) Device



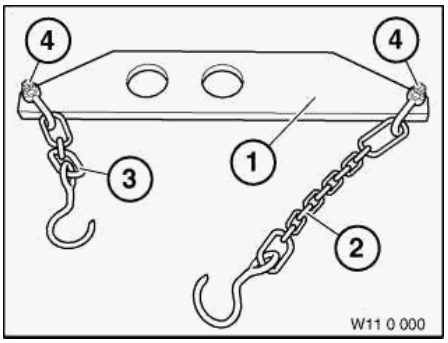
Common	Used in step 7
Usage	Engine bridge (device) 006000
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 10 (659)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
2	2 361 507 (00 6 102)		**Spindle** Set (2 pieces) in connection with 00 6 100.	
3	2 361 506 (00 6 103)		**Spindle** Spindle (central spindle) for Traverse 00 6 100.	

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0 490 561 (11 0 000) Lifting gear



Common

Used in step 7

Usage	(Hoisting gear) For removing and installing engines. As of 08/2011 only available as a complete set. Delivered with TÜV inspection certificate and operating instructions. No delivery of separate parts.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 13 94 (888)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
4	0 490 565 (11 0 009)		**Shackle** (Shackle) 2 pieces. As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 562 (11 0 001)		**Lifting gear** (Cross member) As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
2	0 490 563 (11 0 002)		**Chain** (Chain) Version: long As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
3	0 490 564 (11 0 003)		**Chain** (Chain) Version: short As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	

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11 12 729 Checking cylinder head for watertightness

WARNING

Vehicle may slip off the vehicle hoist if the vehicle hoist is handled incorrectly.

Danger! Life-threatening injuries!

- Observe safety information on raising the vehicle using a vehicle hoist.
- For additional information see: 00 ... Raising the vehicle using a vehicle hoist.

WARNING

Motor vehicle may slip off the vehicle hoist where components are supported.

Danger! Life-threatening injuries!

- Secure the vehicle hoist against lowering and lifting.

WARNING

Motor vehicle may slip off the vehicle hoist if the weight is distributed unevenly.

Danger! Life-threatening injuries!

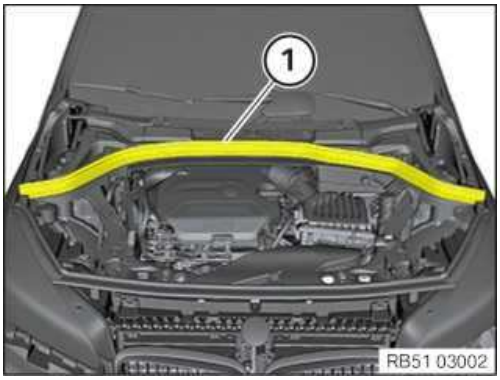
- Ensure there is a specific weight compensation on the motor vehicle.

PRELIMINARY WORK

1 – Remove the seal for the rear bonnet

NOTICE

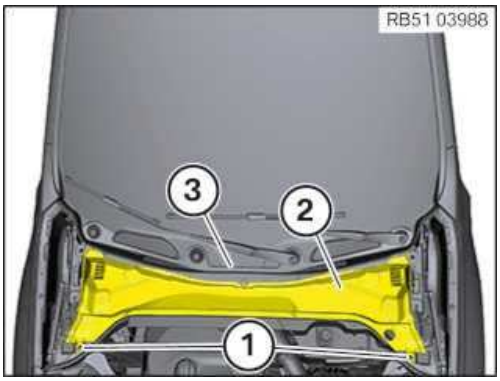
Schematic diagram is for example purposes. Some parts may differ in certain details.



- Pull off rear bonnet seal (1) towards the top and remove.

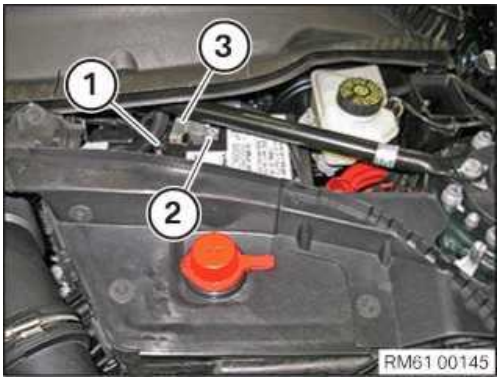
2 – Removing front cowl panel cover

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- Loosen the expanding rivet (1).
- Feed out and remove front cowl panel cover (2) from the rear cowl panel cover(3).

3 – Disconnecting the battery earth lead

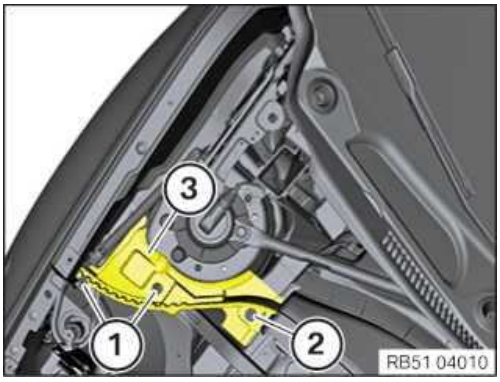


- Unlock plug connection (1) and disconnect.
- Unfasten nut (2).
- Remove the battery earth lead (3) and secure to one side.

4 – Remove suspension cross-brace

TECHNICAL INFORMATION

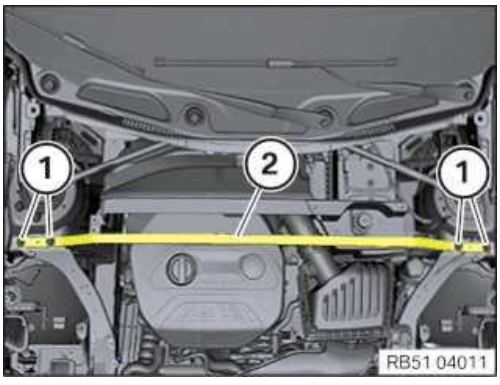
Driving without the strut brace/front end or tension strut is not permitted.



NOTICE

Description is for right component only. The procedure on the left side is identical.

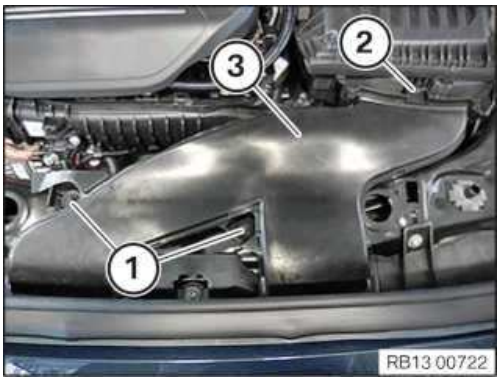
- Loosen expanding rivet (1).
- Loosen screw (2).
- Remove the cover (3).



- Loosen screws (1).
- Remove strut brace (2).

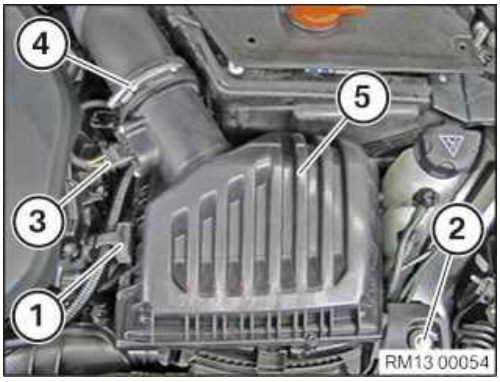
5 – Remove the intake neck for intake silencer housing

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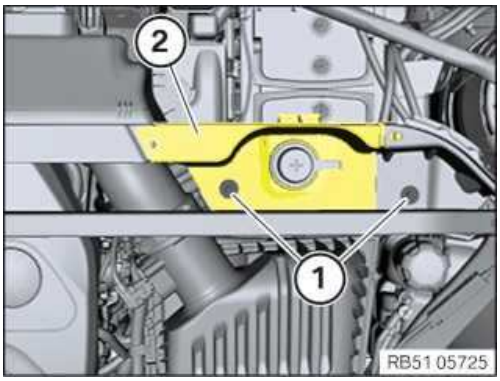
- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

6 – Removing intake silencer housing

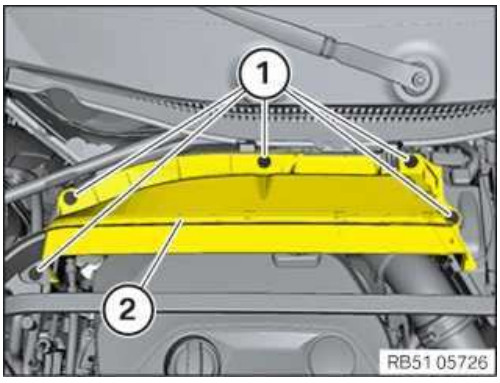


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

7 – Removing the upper bulkhead cover



- Loosen screws (1).
- Guide out and remove the cover (2).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

8 – Remove vehicle battery

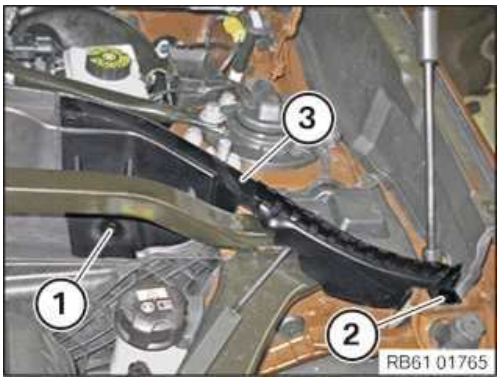
WARNING

Working on 12 V vehicle electrical system.

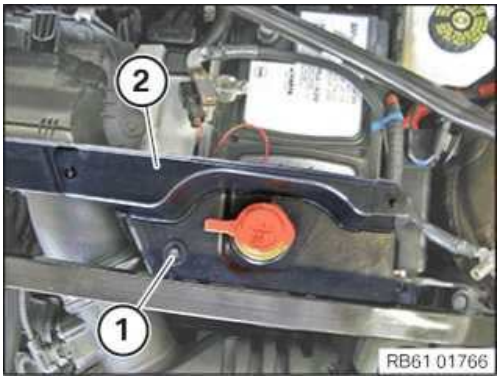
Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

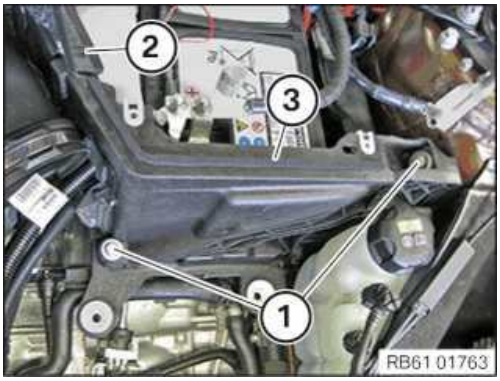
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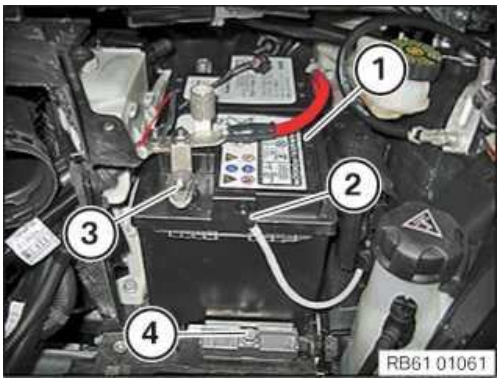
- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).



- Loosen screw (1).
- Remove the cover (2).



- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.



- Pull off the vent hose (2).
- Slacken the nut (3) on the positive battery terminal and remove the positive battery terminal.

WARNING

Unprotected battery terminals.

Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

9 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

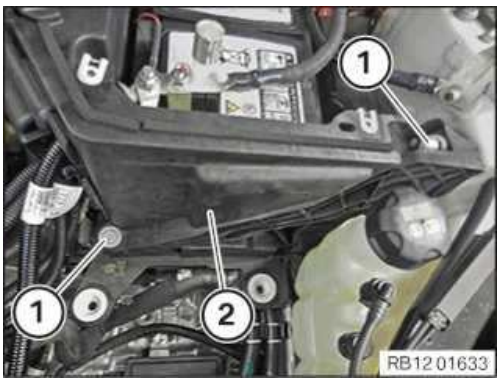
TECHNICAL INFORMATION

Follow instructions for removing and installing control units.

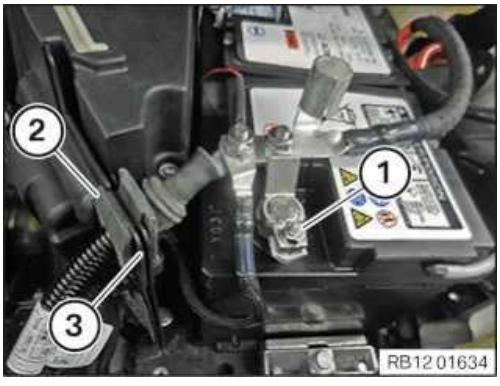
For additional information see: 12 00 ... Notes on removal and installation of control units

TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.

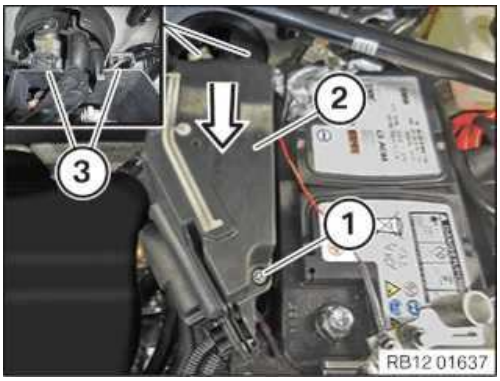


- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.

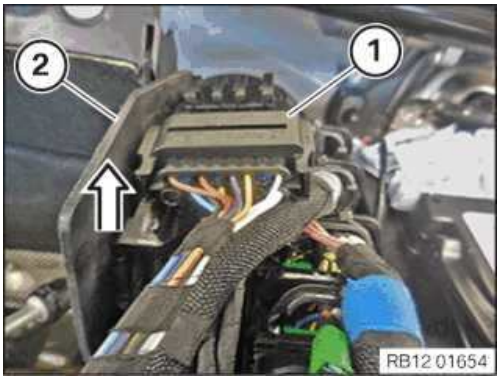


- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

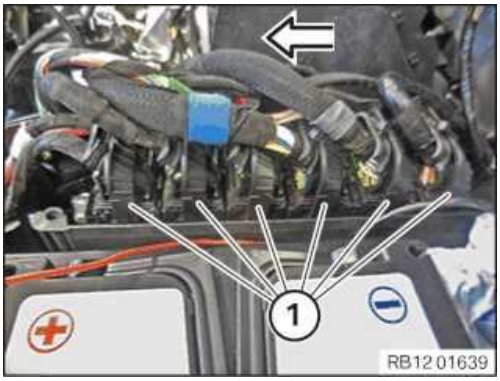
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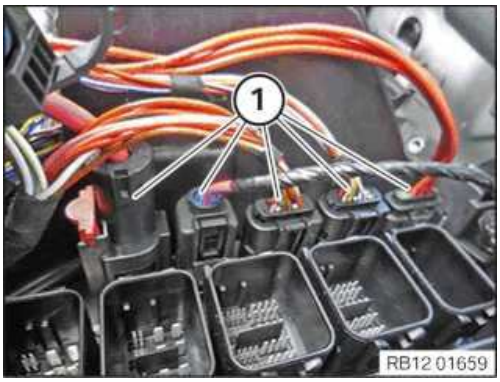
- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



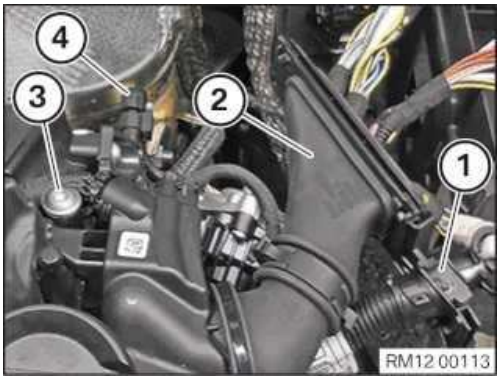
- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).



- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

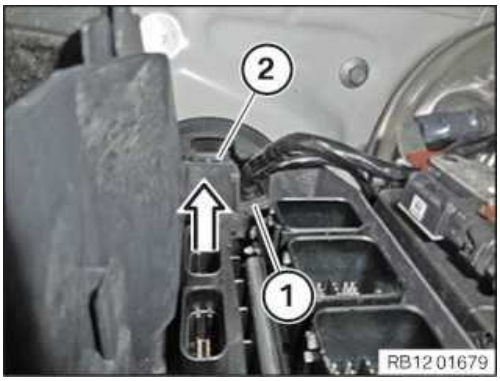


- Unlock and loosen connector (1).

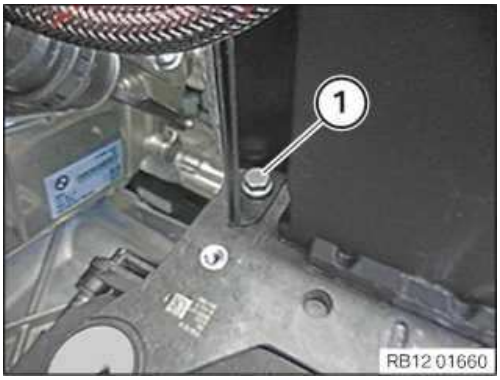


- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.

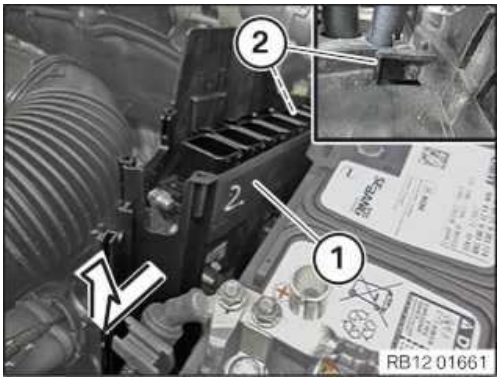
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- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.

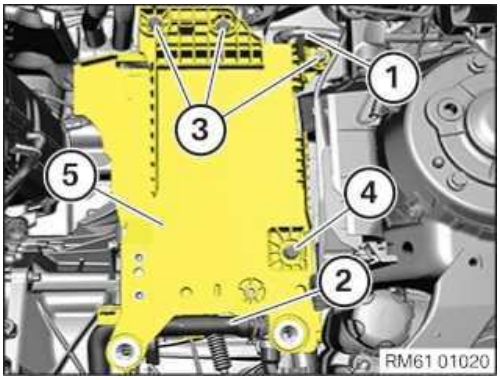


- Loosen screw (1).



- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

10 – Remove battery holder



- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

11 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

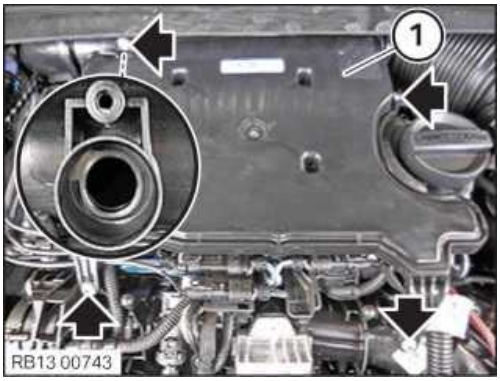
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

12 – Remove resonator

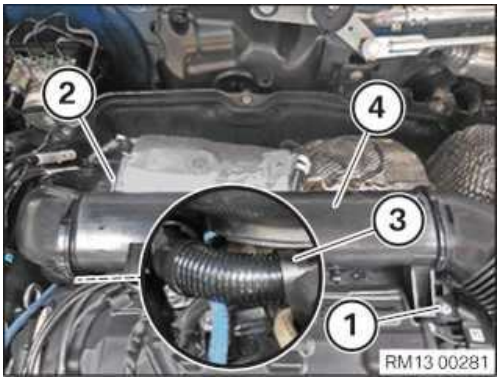


- Remove screws (arrows).
- Guide out and remove the resonator (1).

13 – Removing clean air pipe



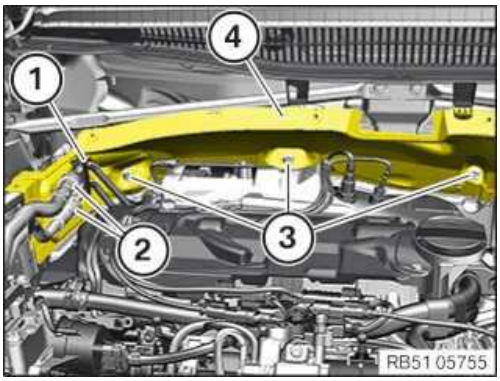
- Detach clamp (1) on the clean air pipe.
- Pull off the clean air pipe from the intake silencer housing.



- Loosen screw (1).
- Loosen clamp (2).
- Unlock the ventilation line (3) and pull it off the cylinder head cover.
- Feed out clean air pipe and remove.

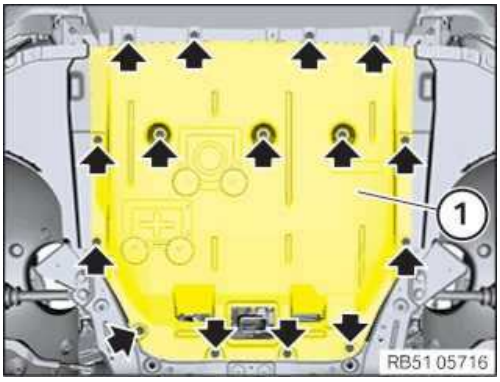
14 – Remove the rear bulkhead upper part

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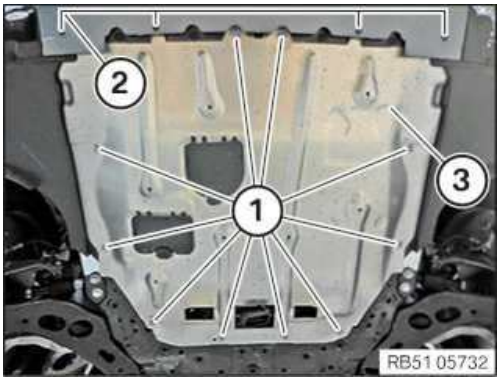


- Unlock the holder (1) and disconnect.
- Guide out and remove the fuel lines (2).
- Loosen screws (3).
- Guide out the rear bulkhead upper part (4) and remove.

15 – Removing the front underbody protection

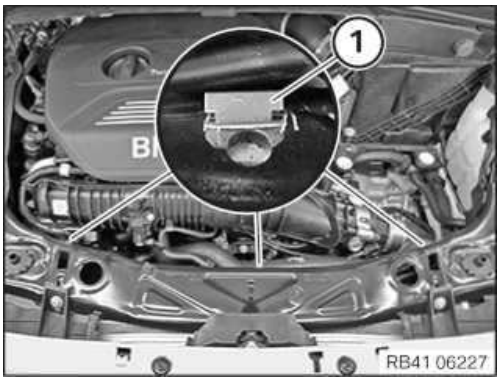


- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.

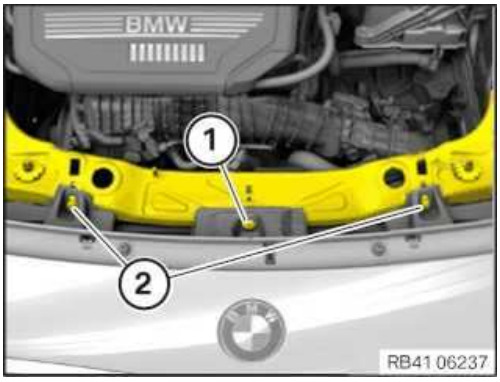


- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

16 – Remove front cross connection

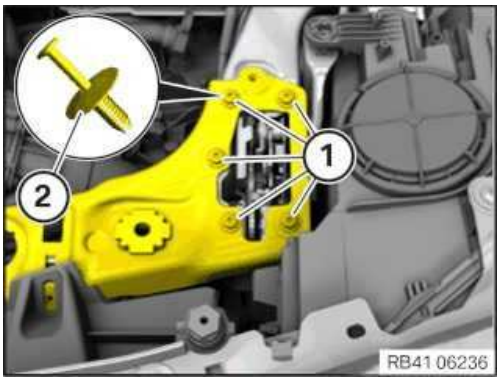


- Detach the clamps (1) for the Bowden cable of the bonnet locks from the cross connection.

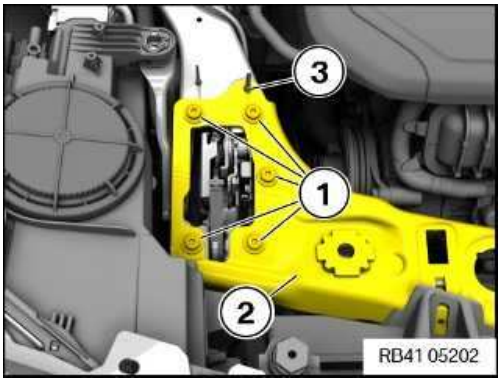


- Loosen screw (1).
- Loosen screws (2).

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- Loosen screws (1).
- Lever out expanding rivet (2).



- Loosen screws (1).
- Unclip the front cross connection (2) from the rubber retainer (3) and remove it upward.

17 – Draining coolant

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

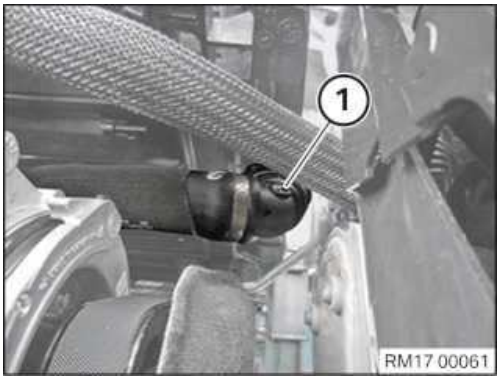
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

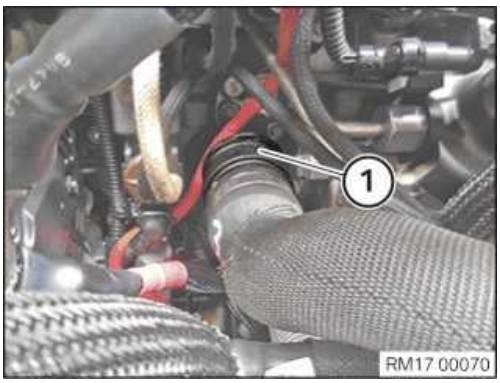
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- Loosen sealing cap (1).



- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.

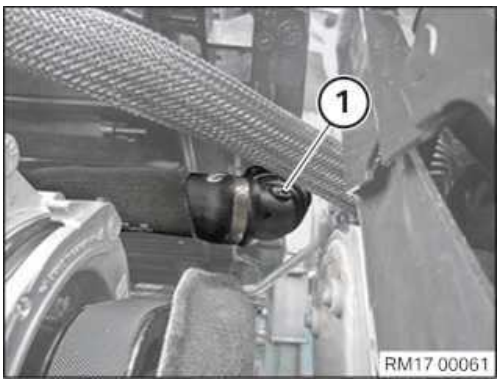


- Unlock the coolant line (1) and pull it off the connecting branch.
- Catch and dispose of escaping coolant.

18 – Connect the coolant line

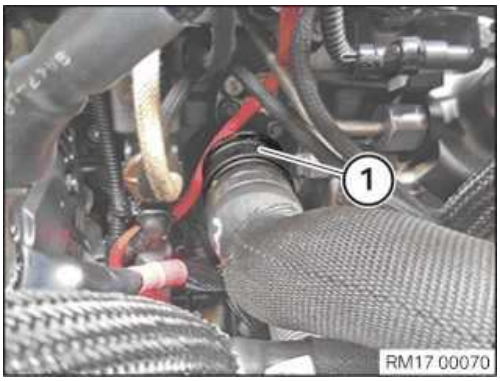
TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Connect the right coolant line (1) to the radiator and lock audibly.

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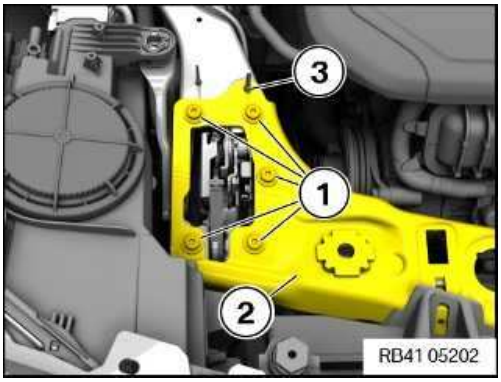


- Connect the coolant line (1) to the connecting branch and lock audibly.

19 – Install front cross connection



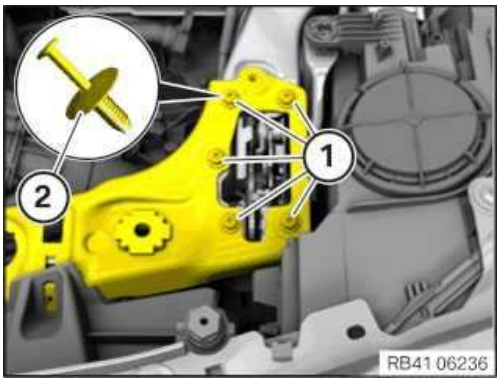
- Right side of vehicle only: Secure spray guard (1) on the cross connection (2) as pictured.



- Position front cross connection (2) and clip front cross connection (2) into the rubber retainer (3) at the same time.
- Tighten the screws (1).

Cross connection to carrier support

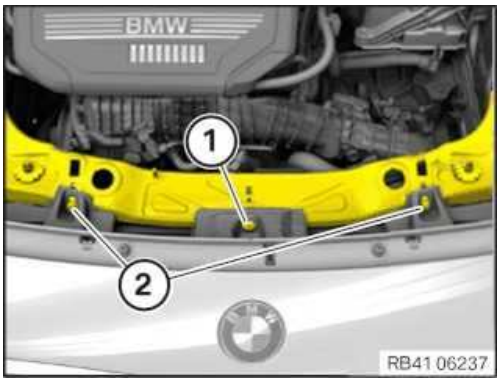
Screws M6x20		Tightening torque	11,8 Nm



- Tighten the screws (1).

Cross connection to carrier support

Screws M6x20		Tightening torque	11,8 Nm



- Position screws (3) on the rubber mounts for the radiator and tighten.

Screw connection for rubber mount of coolant radiator to coolant radiator

Bolt to rubber mount		Tightening torque	8 Nm

- Tighten down screws (2).

Air duct to upper connection

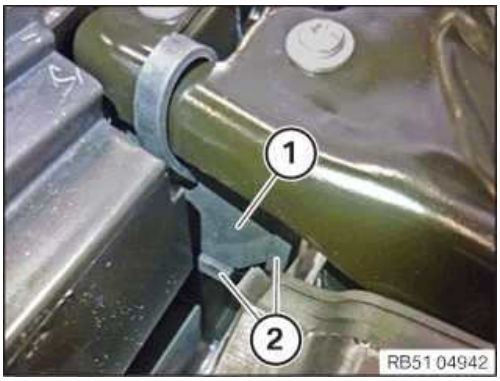
M6x20 screw		Tightening torque	11,8 Nm

- Tighten down screw (1).

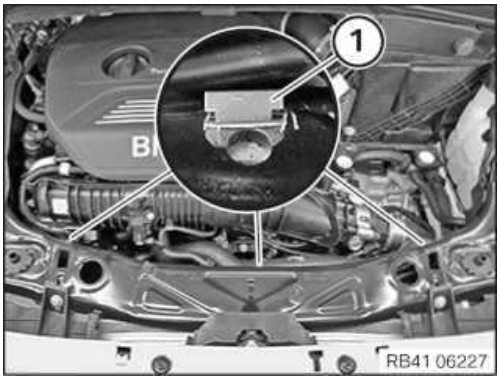
Bracing strut to upper connection

M8x20 screw		Tightening torque	28 Nm

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- Right side of vehicle only: Properly mount spray guard (1) to prevent corrosion.
- Secure spray guard (1) to the bridge with retaining tabs (2).



- Fasten the clamps (1) from the Bowden cable of the bonnet lock on the cross connection.

20 – Removing heat shield from top exhaust turbocharger

WARNING

Hot surfaces.

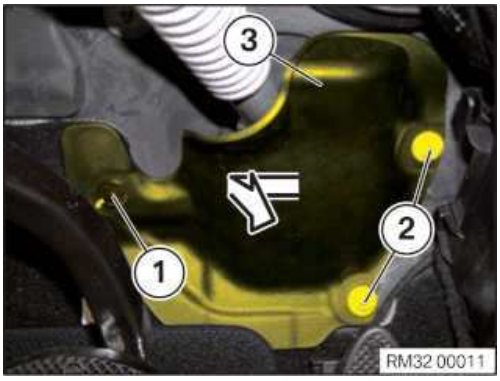
Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from holders.
- Release the screws (1) at the top and bottom of the heat shield.
- Feed out and remove the heat shield (2).

21 – Releasing lower steering shaft from steering gear

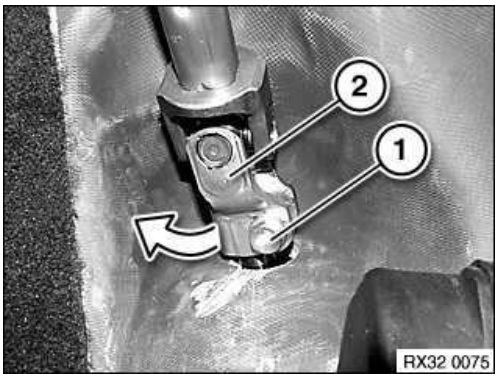


- **If installed:**
- Unfasten nut (1).
- Unscrew the nuts (2) by 1 rotation.

  Do not remove the nuts (2) !
- Remove the cover (3) on the steering column in the direction of the arrow.

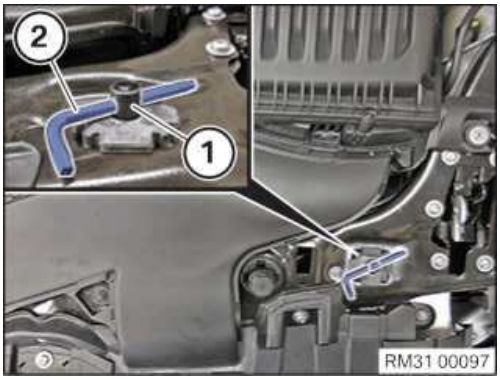
  The side footwell trim must not be disassembled!

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- Loosen screw (1).
- Swivel out the universal joint (2) of the bottom steering shaft from the steering gear in the direction of the arrow.

22 – Securing radiator on left and right



NOTICE

Perform the operations on the left and right side.

- Fasten radiator at centring pin (1) with suitable tool (2).

23 – Removing both front wheels

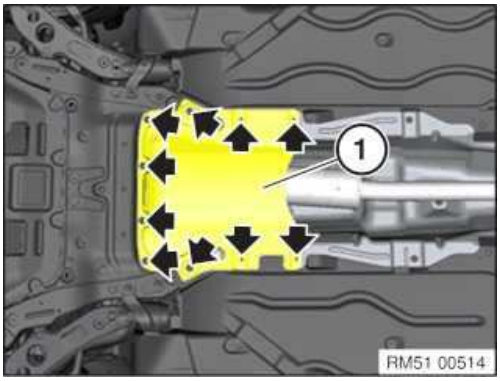
▶ **Removing the wheel**



- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Unscrew the wheel bolts (arrows) and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

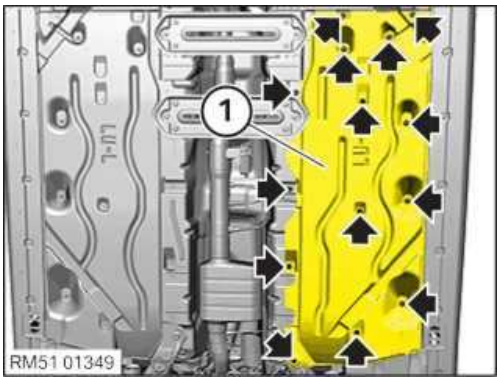
24 – If installed: Removing rear underbody protection



- Remove screws (arrows).
- Remove the rear underbody protection (1).

25 – Removing right underbody panelling

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- Unscrew all bolts and nuts (arrows).
- Remove the underbody panelling (1).

26 – Removing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

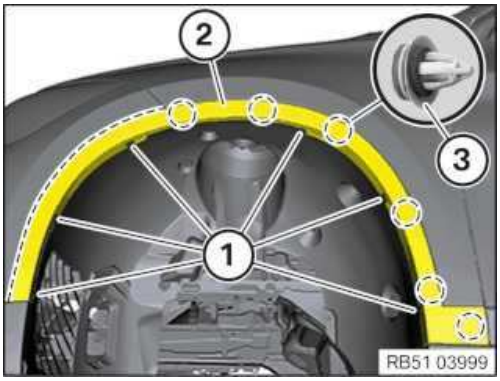
▶ **Remove the front wheel arch trim**

NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

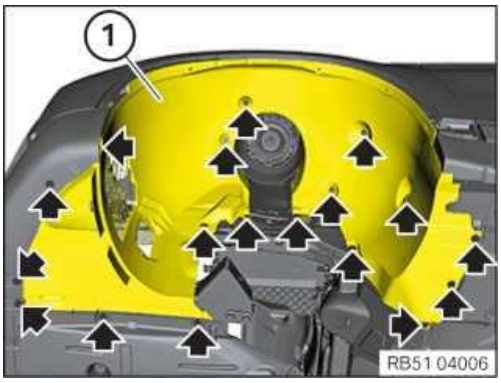
NOTICE

Description is for left component only. Procedure on the right side is identical.



- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.

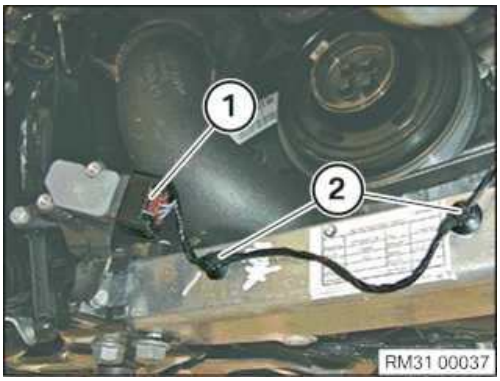
▶ **Remove front wheel arch cover**



- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

27 – With right installation: Detaching ride height sensor cable

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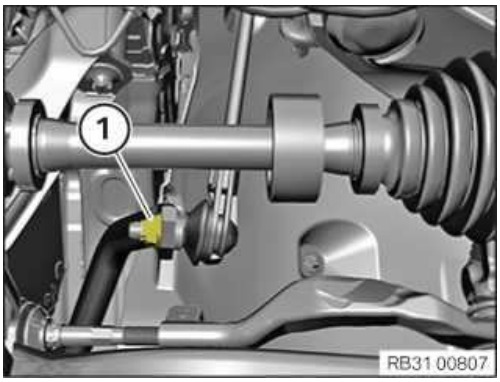
- Unlock plug connection (1) and disconnect.
- Release cable clip (2) from deformation element adapter.

28 – Releasing anti-roll bar on left and right from anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▶ Detach the anti-roll bar from the anti-roll bar link

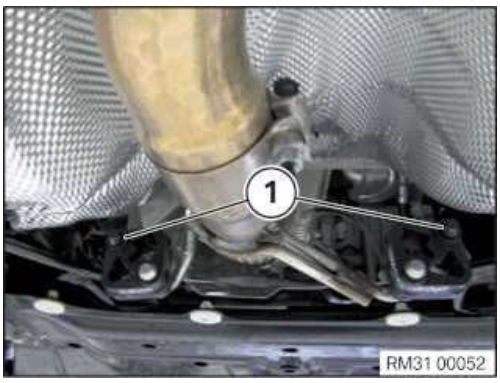


- Unfasten nut (1).

Note: Use the Torx socket for counter support.

- Loosen the anti-roll bar link from the anti-roll bar .

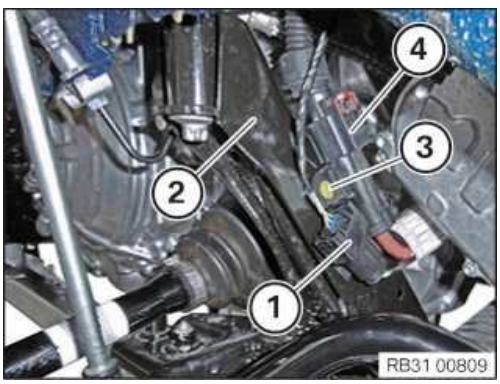
29 – Detaching rubber mount from front axle support



- Spray rubber mount (1) with lubricant and release from holder on front axle support.

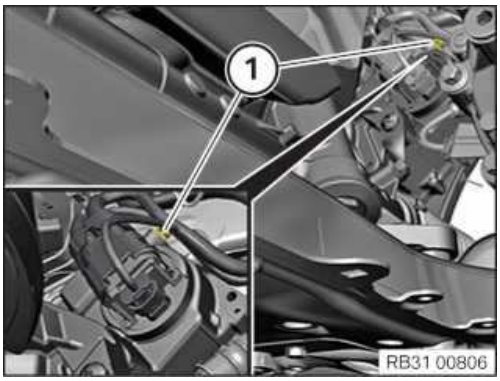
30 – Disconnecting plug connections from steering gear

▶ If installed: Detach connectors from the front axle carrier

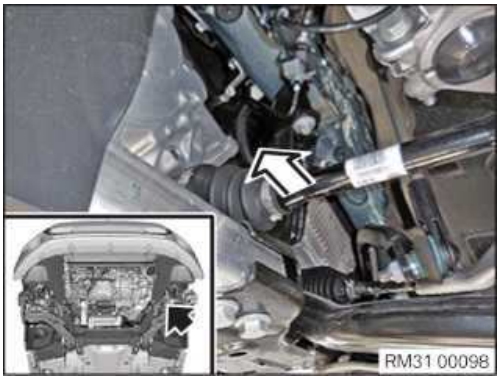


- Release the plug connection (1) from the front axle support (2).
- Loosen screw (3).
- Release the plug connection (4) from the front axle support (2).

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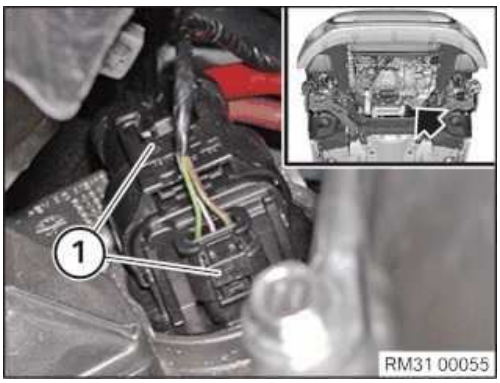


- Disconnect wiring harness (1) from steering gear.



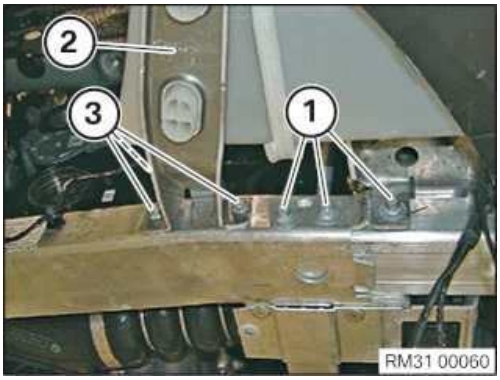
- To unlock the plug connections (see the following work step): unlock plug connections (arrow) with the right hand.

  The plug connections can be reached via the left-hand output shaft.



- Unlock plug connections (arrow) (1)and disconnect from the steering gear.
- Make sure when lowering the front axle that the cables are not damaged!

31 – Releasing the mounted part from the front axle support

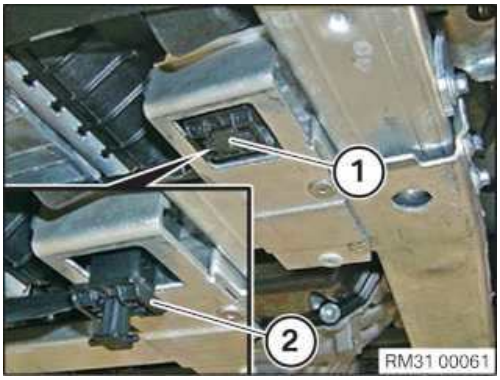


- **Only on right side:** Loosen screws (3) and remove holder for washer fluid reservoir (2).

NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).



NOTICE

Perform the operations on the left and right side.

- Unlock safety catch (1) of the lock (2) from the holder for the charge air cooler.
- Completely remove locks (2).

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- Loosen screw (2) of the engine support (3) on the front axle (1).

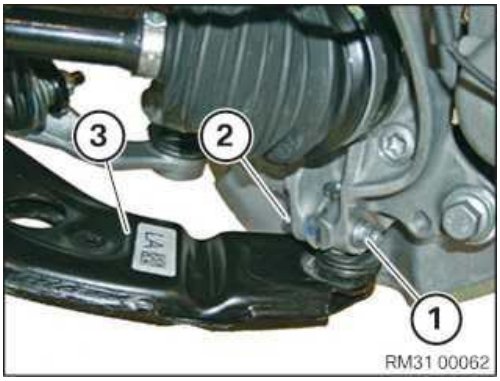


NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

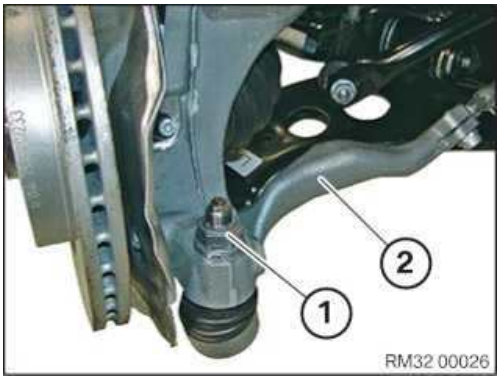
32 – Detaching and removing front axle completely



NOTICE

Perform the operations on the left and right side.

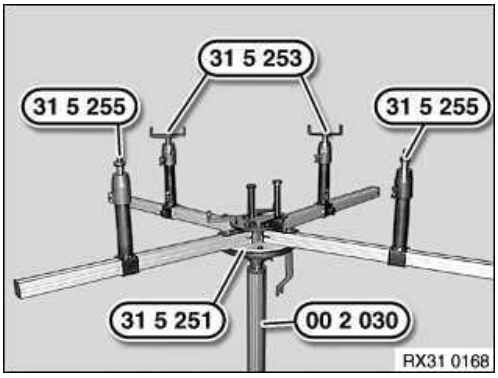
- Unfasten nut (1).
- (2)Pull out screw.
- Detach the wishbone (3) from the swivel bearing .



NOTICE

Perform the operations on the left and right side.

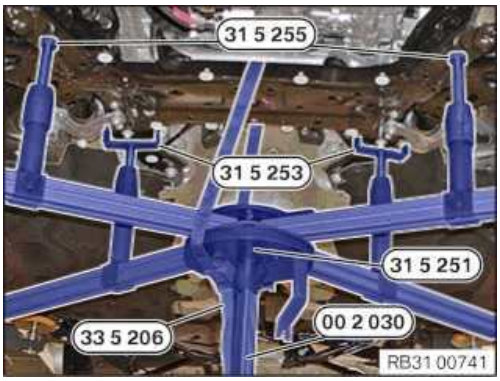
- Unfasten nut (1).
- Detach the track rod (2) from the swivel bearing.



- Fit the special tool completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools in telescopic supports of a profile rail pair.
- Insert special tools in telescopic supports of other profile rail pair.

Note: In a profile rail pair, two profile rails are connected to one another by gearing.

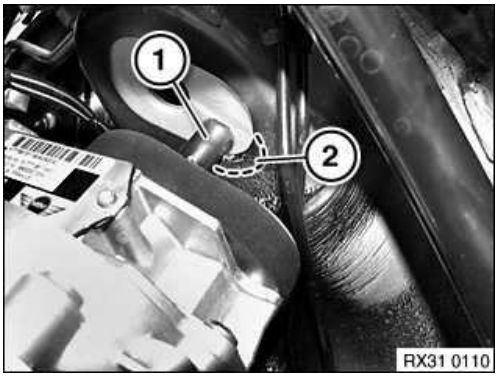
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- Align special tools and to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool to special tool .

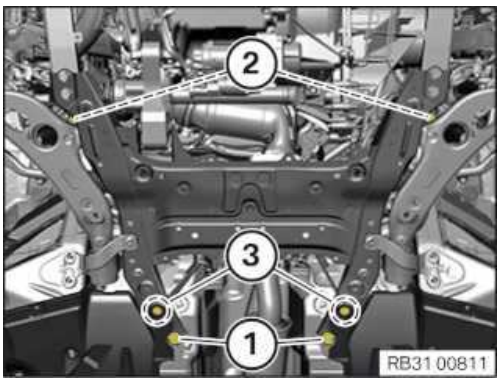


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



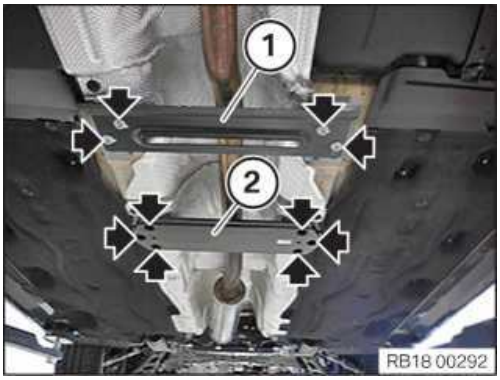
- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and remove the front axle.

TECHNICAL INFORMATION

Note the information on thread repairs using Helicoil thread inserts.
For more information see: 41 00 ... Notes on repairing threads

- Check threads for damage; if necessary, repair with Helicoil thread inserts.

33 – Removing the connecting support from the tunnel in front and back



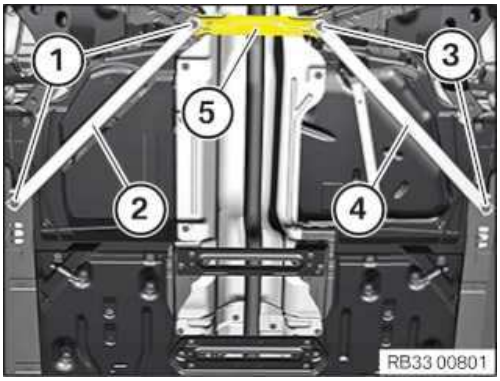
- Unscrew the bolts (arrows) from the connecting support (1).
- Feed out and remove the crossbeam (1).
- Unscrew the bolts (arrows) from the connecting support (2).
- Feed out and remove the crossbeam (2).

34 – Remove the cross strut with the torsion strut

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TECHNICAL INFORMATION

Driving without a torsion strut is not permitted.



- Loosen screws (1).
- Thread out torsion strut (2) at left and remove.
- Loosen screws (3).
- Thread out torsion strut (4) at right and remove.
- Feed out and remove the cross-member (5).

35 – Remove exhaust system

WARNING

Hot surfaces.

Risk of burning!

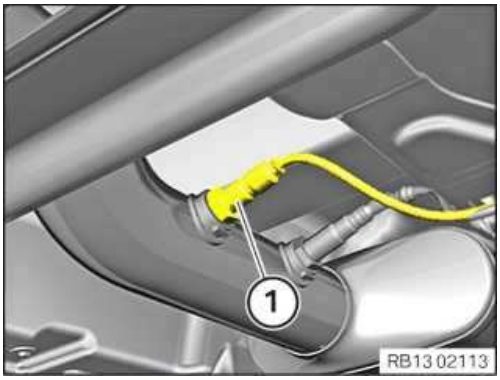
- Perform all work only on components that have cooled down.

CAUTION

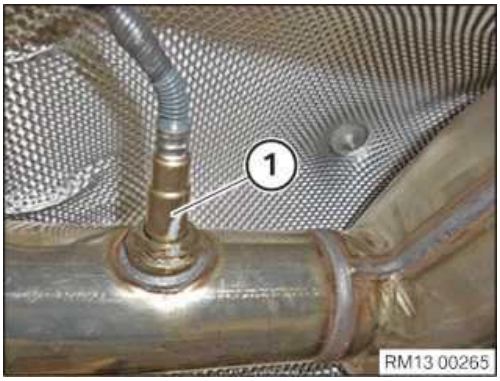
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

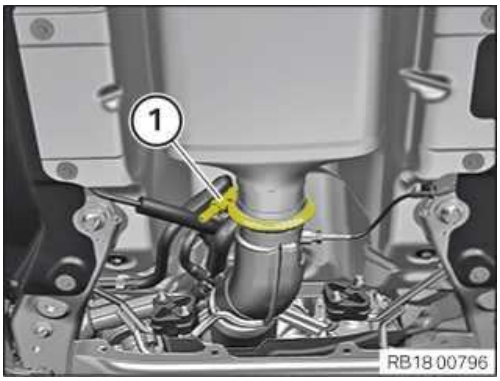


- Release the nitrogen oxide sensor (1) downstream of the SCR catalytic converter, guide it out and set it aside.

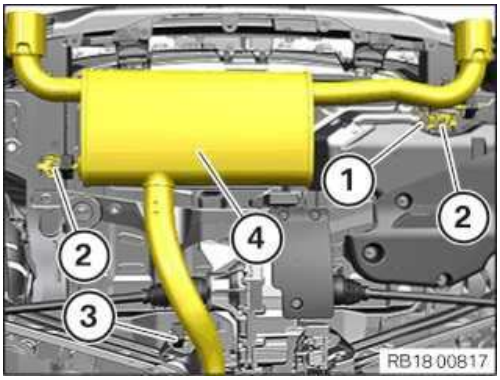


- Release the diesel particulate sensor (1), guide it out and set it aside.

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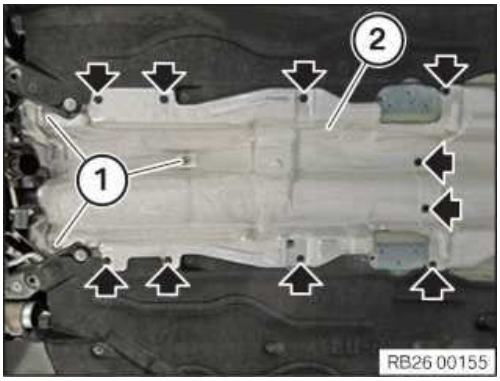


- Loosen V-band clamp (1).



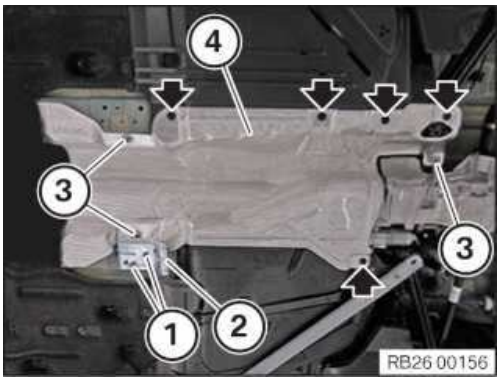
- Loosen screw (1).
- Loosen nuts (2).
- Release the rubber mount (3) of the exhaust system (4).
- Lower and guide out the exhaust system (4) with assistance of a second person and remove it.

36 – Remove front heat shield



- Remove screws (arrows).
- Loosen nuts (1).
- Guide the heat shield (2) out and remove it.

37 – Remove heat shield at rear.



- Loosen screws (1).
- Guide out and remove holder (2).
- Remove screws (arrows).
- Loosen nuts (3).
- Guide the heat shield (4) out and remove it.

38 – Remove propeller shaft

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CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

RISK OF DAMAGE

Damage to propeller shaft during removal.

Non-observance of the removal guidelines for the propeller shaft on the rear axle differential may cause severe damage.

- Do not disassemble the three-hole flange, flexible disc and propeller shaft. The three-hole flange to the rear axle differential is balanced with the flexible disc and propeller shaft.
- Loosen the recessed nut against the direction of travel in clockwise direction. The propeller shaft must be loosened on the recessed nut only and exclusively in the direction of rotation otherwise the anti-twist lock of the bi-hexagonal flange nut is damaged.
- In the event of a damaged anti-twist lock on the bi-hexagonal flange nut: Replace the rear axle differential.



- Install the special too l between the front and rear propeller shaft.
- Make sure that the arrows on the special tool point forward in the direction of travel.

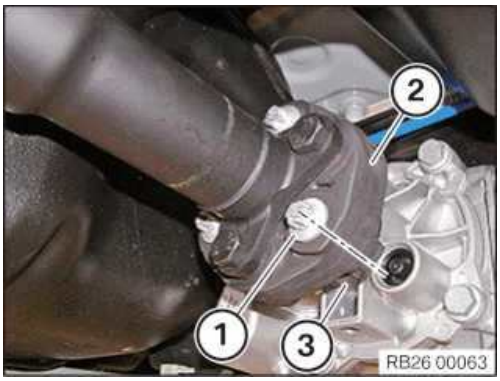


- Always support the propeller shaft (1) with a conventional jack.



- Protect the propeller shaft (1) with the special tools **0 495 554 (33 5 070)** and from twisting.

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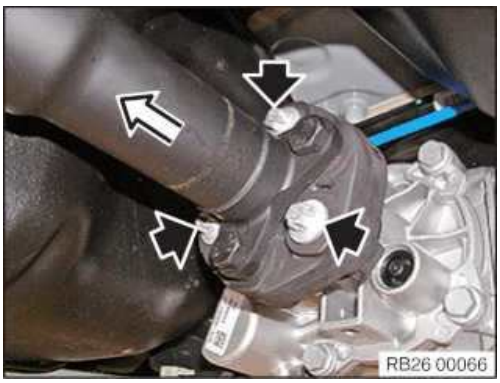
TECHNICAL INFORMATION

Compliance with the following instructions is required to avoid a humming noise from the propeller shaft after refitting the propeller shaft.

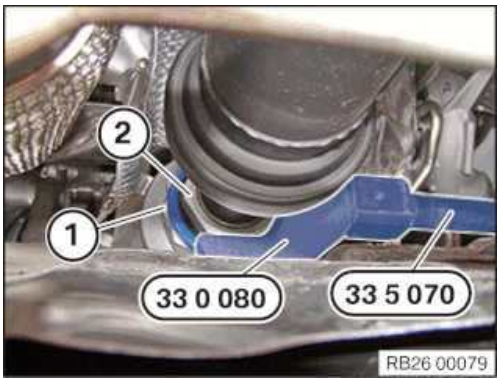
- Mark the installation position of the screw connection (1), the flexible disc (2) and the three-hole flange (3) on the same level.
- Loosen the screw connection (1).



- Loosen screws (1).



- Remove screws (arrows).
- Guide the propeller shaft out in the direction of the arrow and set it aside.



RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.

- Protect the recessed nut (2) on the transfer box from twisting with the special tools **0 495 554 (33 5 070)** and .

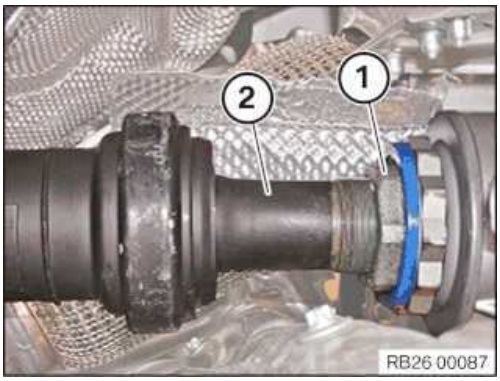
  The recessed nut (2) on the transfer box must **not** be used to detach the propeller shaft.

  The double hexagon flange nut (1) must **not** be used for counter support.

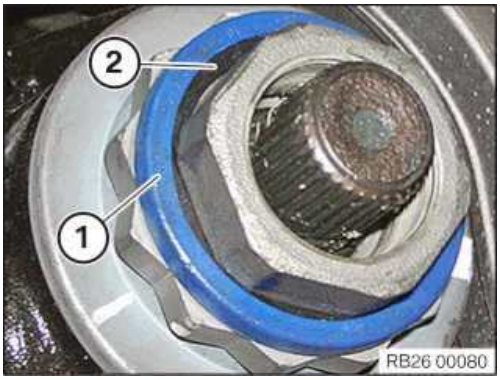


- Release the front propeller shaft with the special tools **0 495 554 (33 5 070)** and in the direction of the arrow.

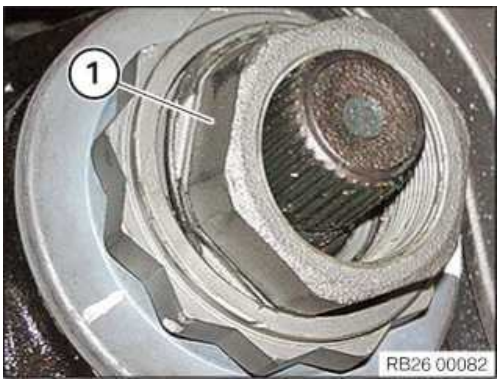
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- Thread the propeller shaft (2) out of the recessed nut (1) and remove.



- Thread the retaining clip (1) and the seal (2) out and remove.



- Thread out and remove the recessed nut (1).

39 – Removing starter motor

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and loosen connector (1).
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).



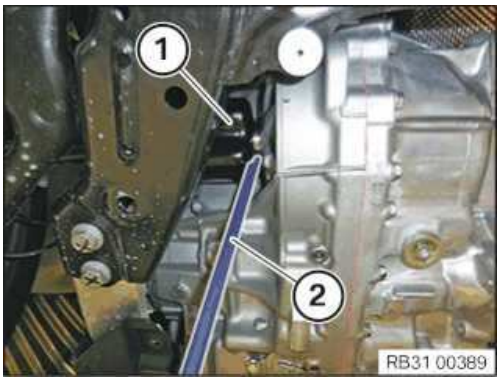
- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.



- Loosen screws (1).
- Feed out starter motor and remove.

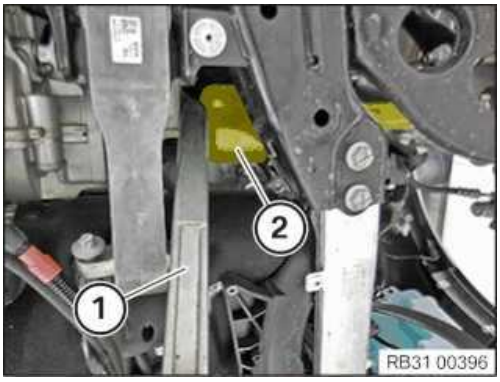
40 – Partially removing the left output shaft

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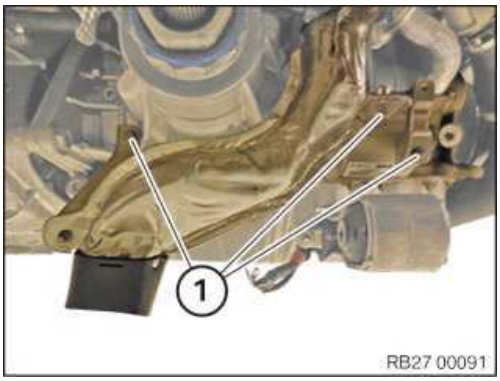
- Protect the output shaft (1) from falling.
- Lever out the output shaft (1) with a mounting lever (2) from the transmission.
- Tie up output shaft (1).

41 – Partially removing right output shaft

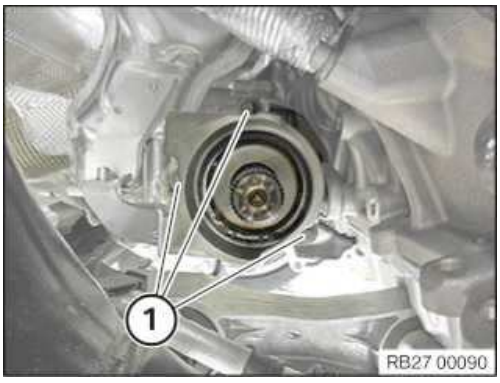


- Lever out the output shaft (2) with a mounting lever (1).
- Tie up output shaft (1).

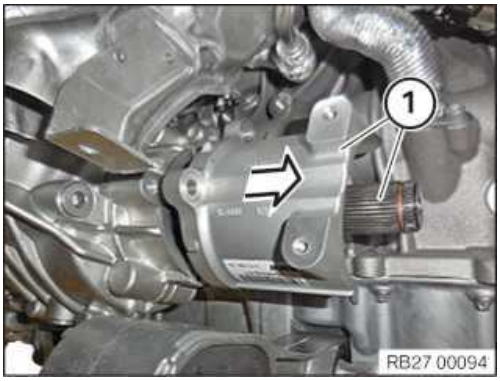
42 – Remove the intermediate shaft with the support tube



- With air duct installation: Loosen screws (1).
- Remove air duct



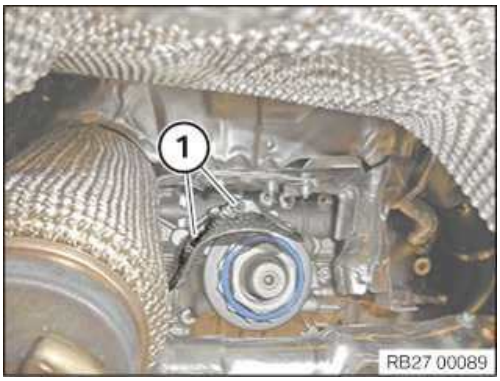
- Loosen screws (1).



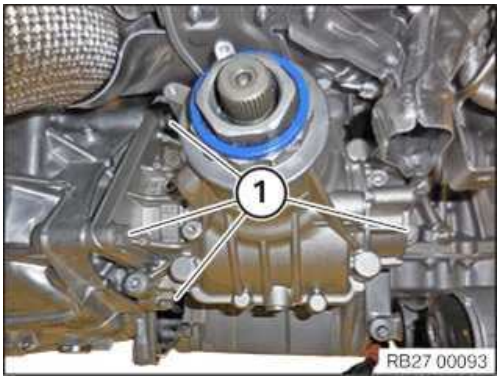
- Pull the intermediate shaft with the support tube (1) out of the transfer box.

43 – Remove transfer box (VTG)

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- Loosen screws (1).
- Remove heat shield.



- Loosen screws (1).
- Remove the transfer box (VTG).

44 – Remove the monitoring oxygen sensor

WARNING

Hot surfaces.

Risk of burning!

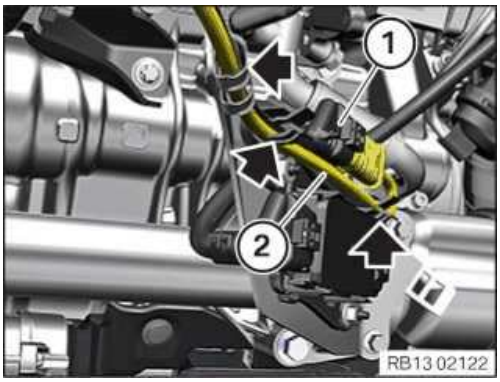
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

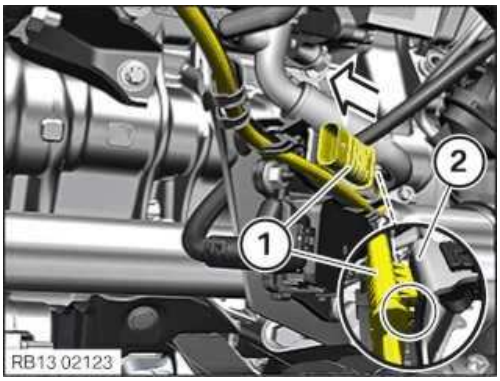
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

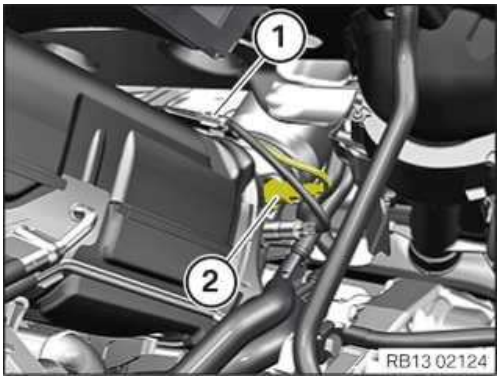


- Unlock plug connection (1) and disconnect.
- Feed oxygen monitor sensor cable (1) out of the clamps (arrows).

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- Unlock the connector (1) in the marked area and disconnect it from the holder (2) in the direction of arrow.



- Guide the cable of the monitoring oxygen sensor (2) out of the clamp (1).
- Release the monitoring oxygen sensor (2) using special tool **0 491 074 (11 7 020)**.
- Remove the monitoring oxygen sensor (2).

45 – Removing the nitrogen oxide sensor before SCR catalytic converter

WARNING

Hot surfaces.

Risk of burning!

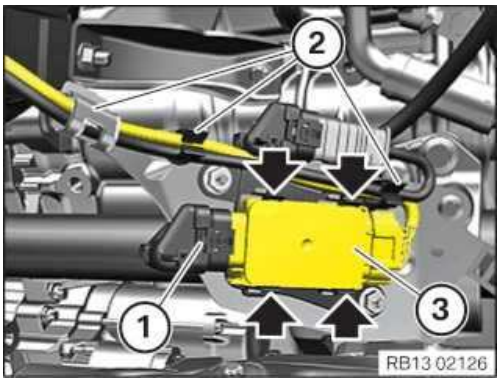
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

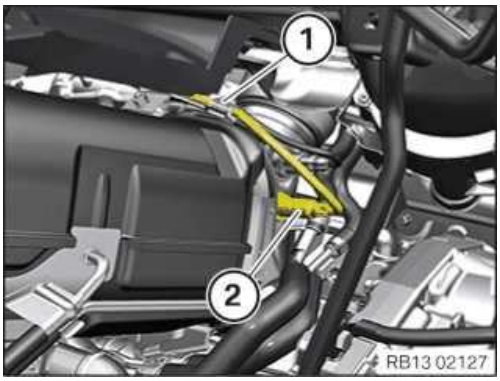
Damage to or destruction of electrical components.

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- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



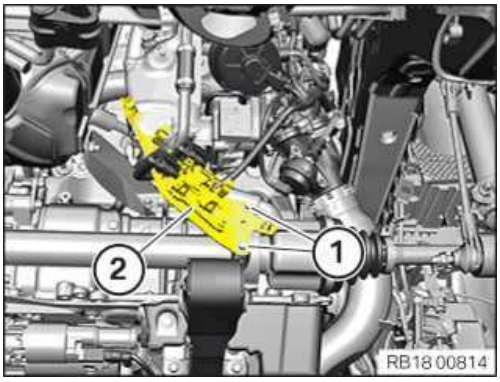
- Unlock plug connection (1) and disconnect.
- Slide the cable of the nitrogen oxide sensor evaluation electronics (3) out of the clamps (2) and remove.
- Unlock (arrows) and remove the evaluation electronics for the nitrogen oxide sensor (3).

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- Slide the cable of the nitrogen oxide sensor before the SCR catalytic converter (2) out of the clamps (1) and remove.
- Detach the nitrogen oxide sensor before the SCR catalytic converter (2) using the special tool **0 491 074 (11 7 020)**.
- Guide out and remove the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

46 – Remove holder for oxygen sensor



- Loosen screws (1).
- Thread out the holder (2) for the oxygen sensor and remove.

47 – Remove the exhaust temperature sensor on the catalytic converter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

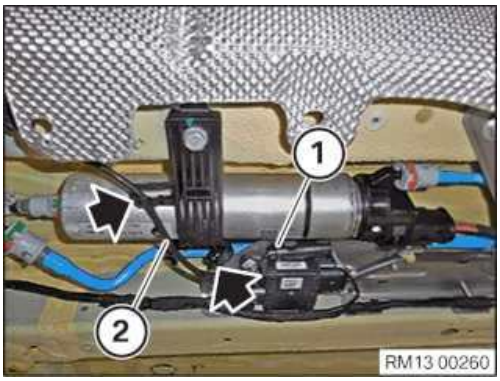
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

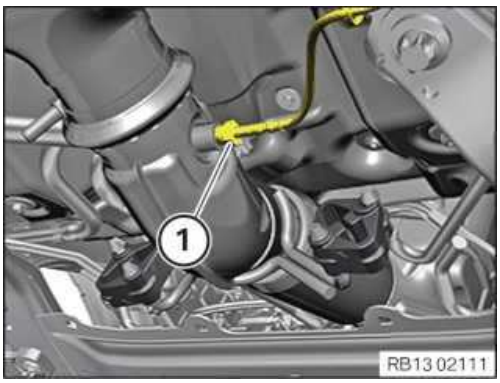
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- Unlock and loosen connector (1).
- Feed out the cable (2) of the exhaust temperature sensor from the clamps (arrows) and remove.



- Loosen the cable clip (1).



- Loosen exhaust temperature sensor (1).
- Feed out and remove exhaust temperature sensor (1).

48 – Removing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

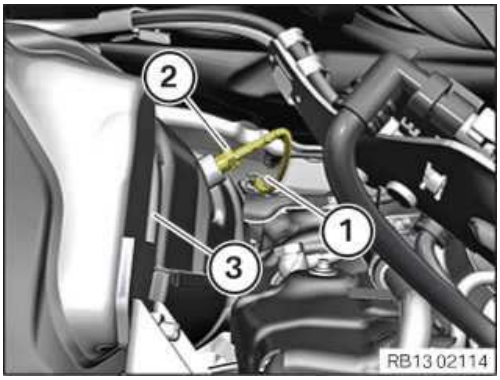
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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- Unlock and loosen connector (1).
- Uncover the exhaust temperature sensor cable.



- Guide the exhaust temperature sensor cable (2) out of the clamp (1) and place it to one side.
- Release the exhaust temperature sensor (2) with conventional tools .
- Feed out and remove the exhaust temperature sensor (2) from the diesel particulate filter (3).

49 – Remove the exhaust temperature sensor on the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

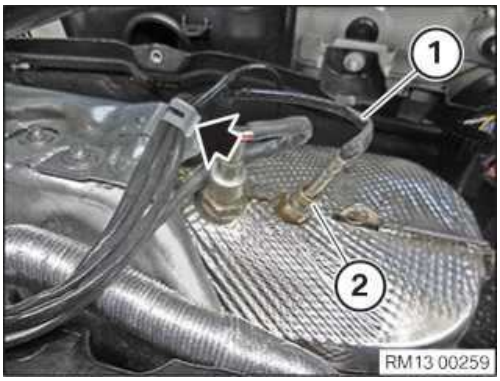
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect connector (1).
- Put the cable of the exhaust temperature sensor to one side.

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- Guide cable (1) of the exhaust temperature sensor out of the clamp (arrow) and remove it.
- Loosen exhaust temperature sensor (2).
- Feed out and remove exhaust temperature sensor (2).

50 – Remove the control sensor

WARNING

Hot surfaces.

Risk of burning!

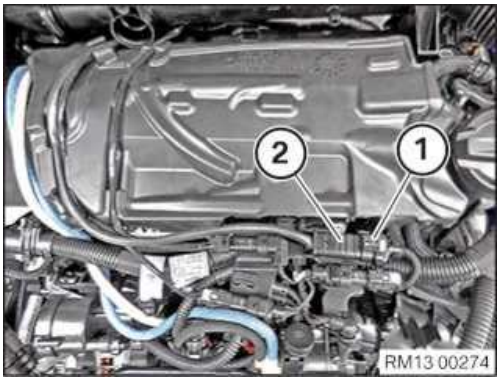
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock plug connection (1) and disconnect.
- Detach the connector (2) from the holder .
- Release the front oxygen sensor cable.



- Detach the control sensor (1) with the special tool .
- Feed out and remove the control sensor (1).

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51 – Removing the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

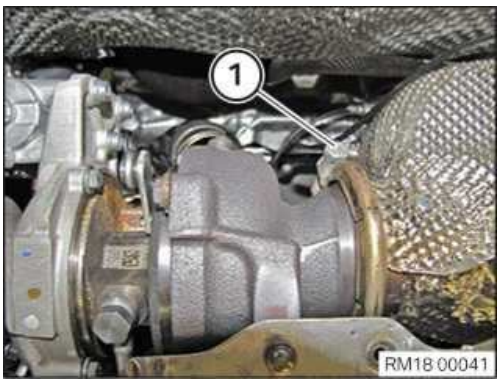
- Perform all work only on components that have cooled down.

CAUTION

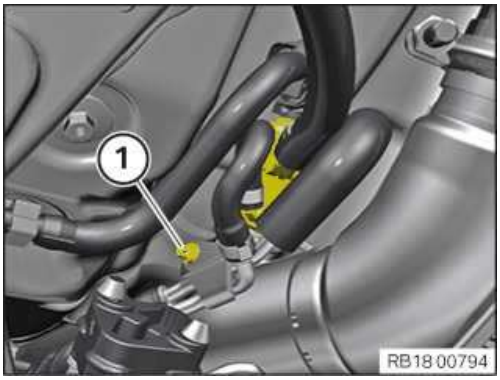
Heavy component.

Heavy components can lead to injury or damage.

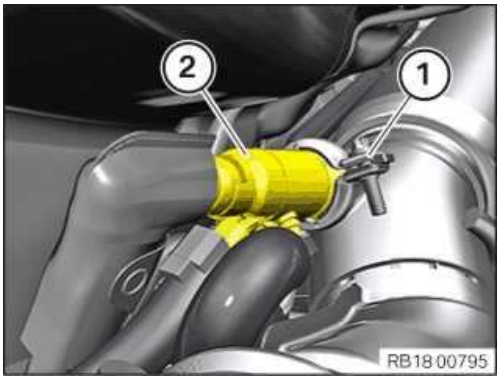
- Remove and install heavy components with the aid of another person/other persons.



- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.

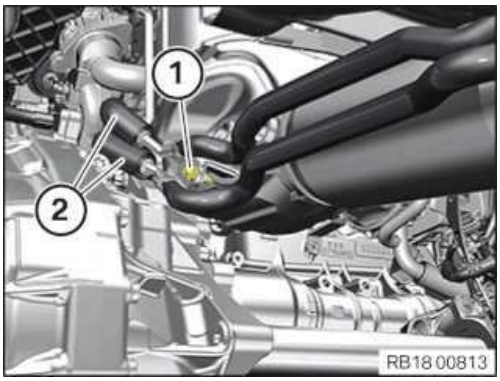


- Loosen screw (1).



- Loosen V-band clamp (1).
- Remove the SCR metering module (2) and set it aside.

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- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.

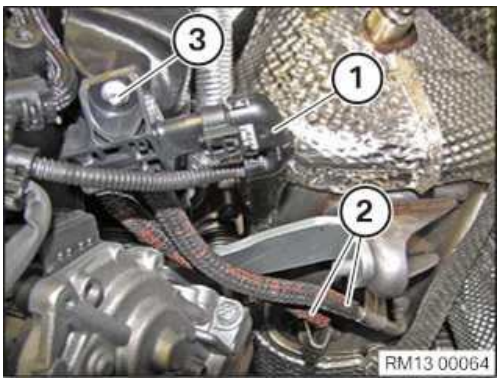
▶ **Remove differential pressure sensor**

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

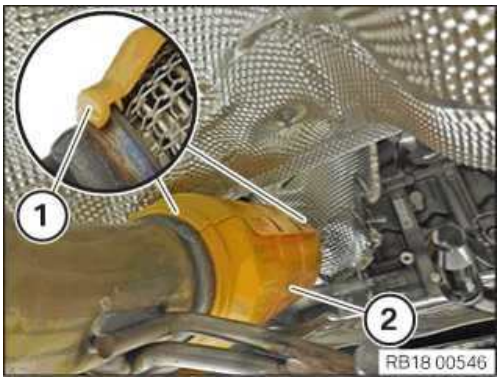


- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

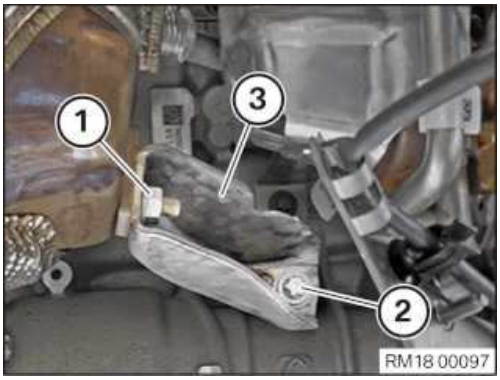


- Loosen nuts (1).

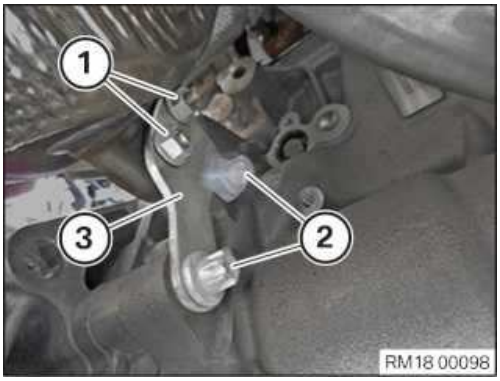
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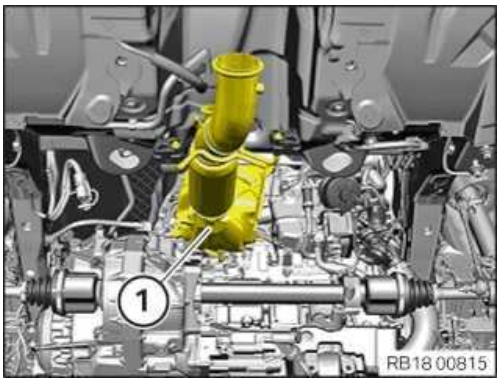
- Mount fitting aid (2).
- Make sure that the fitting aid is correctly position on the edges (1) of the flexible tube.



- Unfasten nut (1).
- Loosen screw (2).
- Remove holder (3).



- Loosen nuts (1).
- Loosen screws (2).
- Remove holder (3).

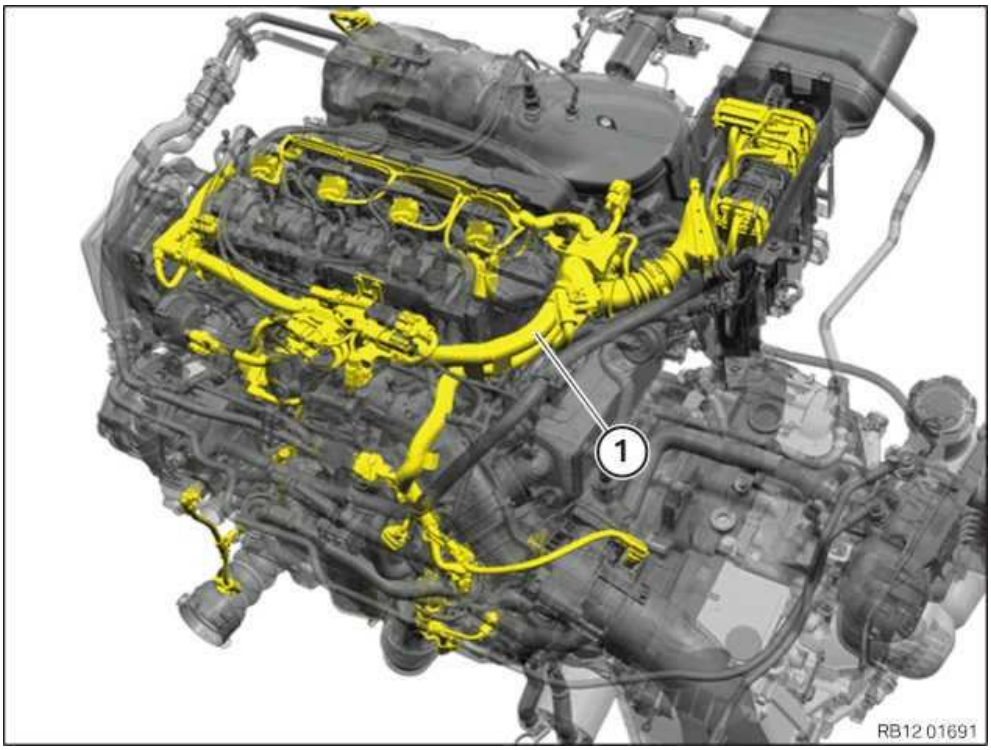


- Feed out diesel particulate filter (1) toward the bottom and remove.

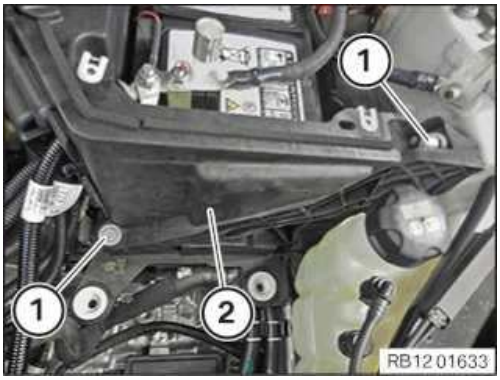
52 – Releasing the wiring harness section for the intake plenum

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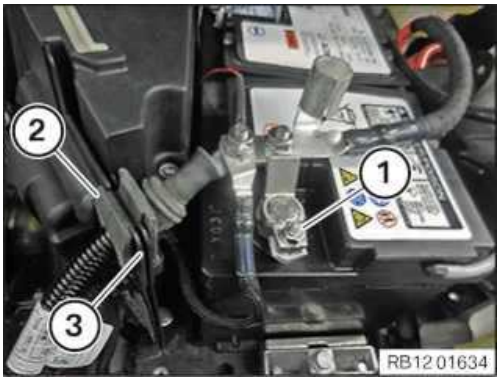
Overview: Wiring harness section for the engine



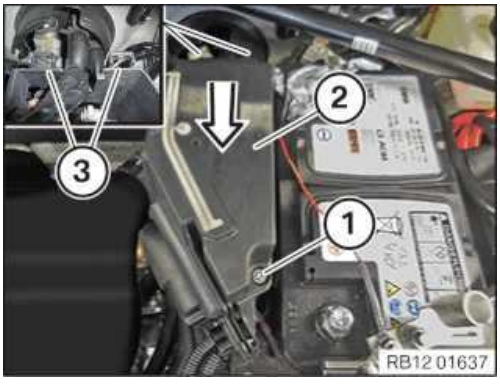
1 Wiring harness section for the engine



- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.

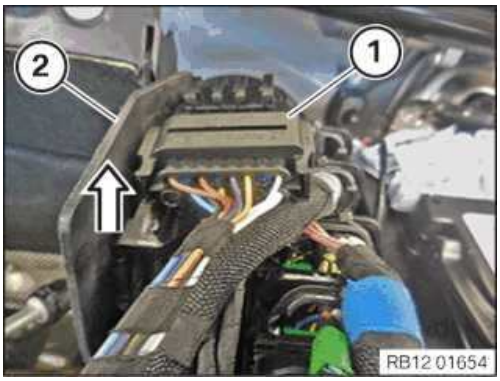


- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

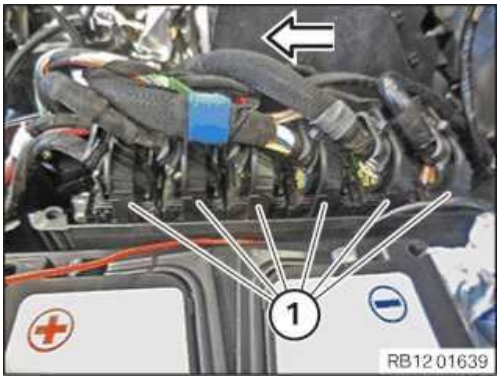


- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.

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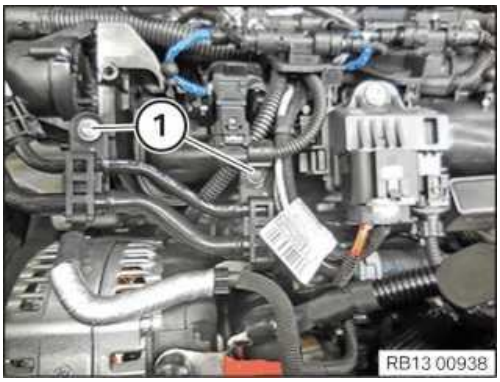
- Guide the connector (1)out of the electronics box (2) in the direction of arrow and remove it.
- Unlock and loosen connector (1).



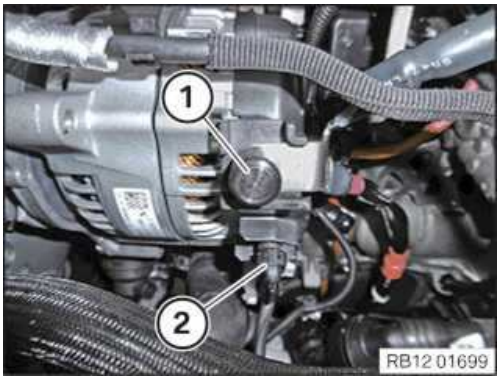
- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



- Unlock and loosen connector (1).

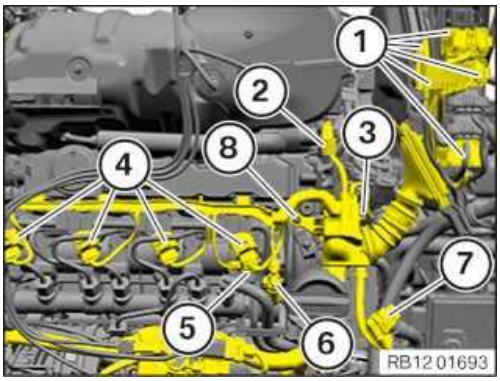


- Loosen screws (1).

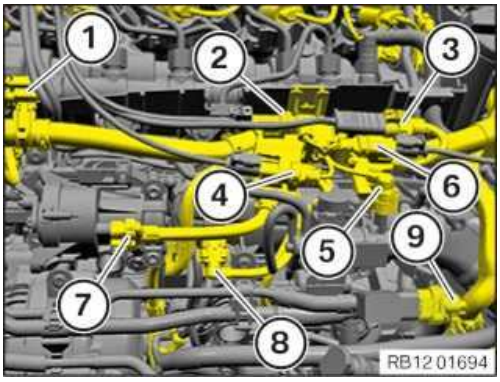


- Release the positive battery cable (1) on the alternator and place to one side.
- Unlock connector (2) and pull off.

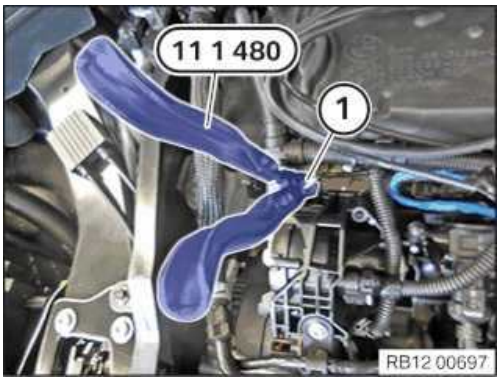
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- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock the connector (2) and disconnect it from the differential pressure sensor.
- Unlock the connector (3) and disconnect it from the exhaust-gas recirculation valve.
- Unlock the connector (4) and pull off from the injectors.
- Unlock the connector (5) and disconnect it from the camshaft sensor.
- Unlock the connector (6) and disconnect it from the fuel pressure regulator.
- Unlock connector (7) and pull off from hot film air mass meter.
- Loosen screw (8).

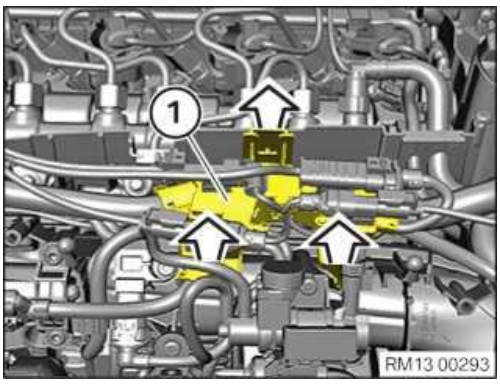


- Unlock connector (1) and pull off from the rail pressure sensor.
- Unlock the connector (2) and disconnect it from the exhaust temperature sensor before the diesel particulate filter.
- Unlock and disconnect the connector (3) from the front oxygen sensor.
- Unlock the connector (4) and disconnect it from the exhaust temperature sensor after the diesel particulate filter.
- Unlock and disconnect the connector (5) from the electric changeover valve.
- Unlock the connector (6) and disconnect it from the exhaust temperature sensor for the exhaust-gas recirculation cooler.
- Unlock the connector (7) and disconnect it from the servomotor for the swirl flaps.
- Unlock the connector (8) and pull it off the charging pressure sensor.
- Unlock the connector (9) and disconnect from the fuel pressure and temperature sensor.



- Unlock the connectors (1) of all glow elements with the special tool **0 490 796 (11 1 480)** and release them.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.

▶ **Removing the cable clips from the intake plenum**



- Detach the cable clip (1) in the direction of the arrow.
- Guide out the cable clip (1) in direction of arrow and set it aside.

53 – Removing the intake plenum

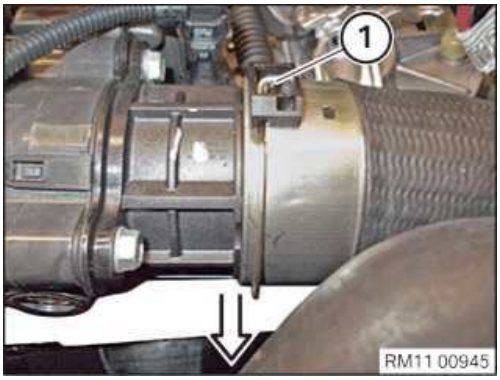
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TECHNICAL INFORMATION

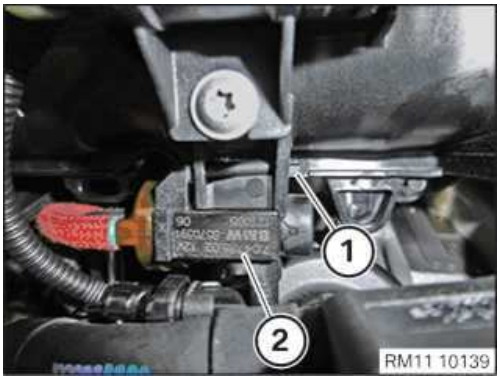
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



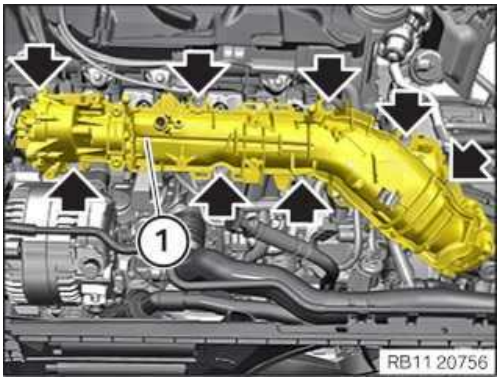
- Unlock the lock (1).



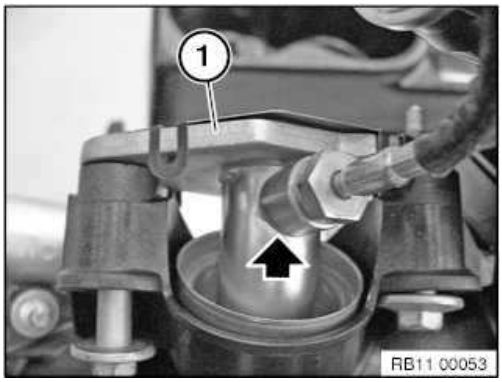
- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.



- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



- Release the screws (arrows) from the intake plenum (1).
- Guide the intake plenum (1) out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

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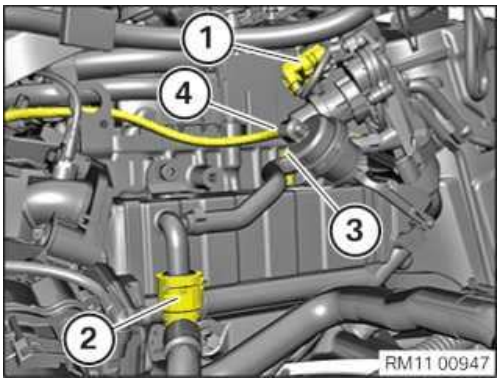
54 – Removing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

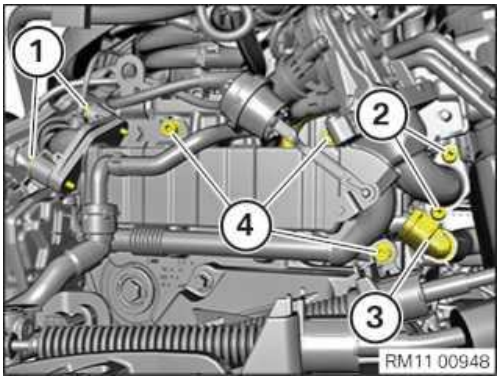
- Perform all work only on components that have cooled down.



TECHNICAL INFORMATION

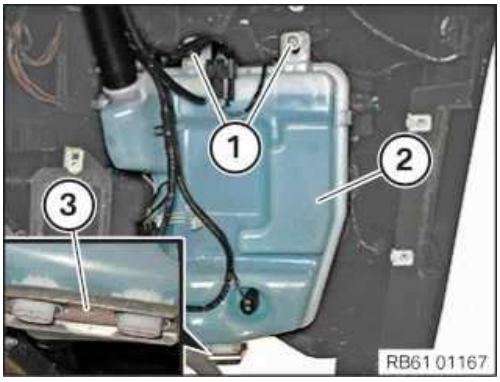
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.

55 – Remove the washer fluid reservoir from the fixture



- Loosen screws (1).
- Guide the washer fluid reservoir (2) up and out of the fixture (3) and set it aside.

56 – Removing the right charge air duct between the exhaust turbocharger and the charge air cooler

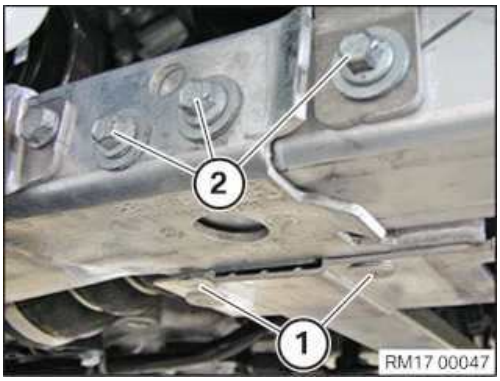
WARNING

Hot surfaces.

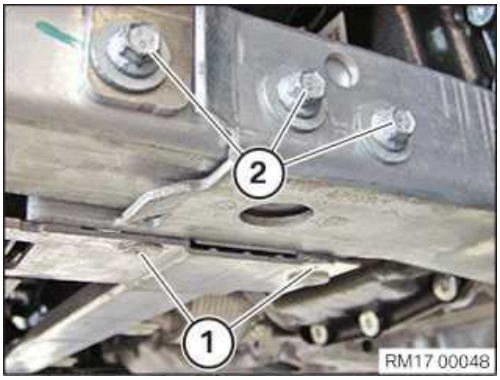
Risk of burning!

- Perform all work only on components that have cooled down.

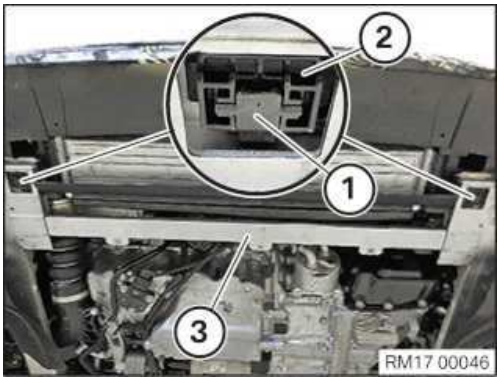
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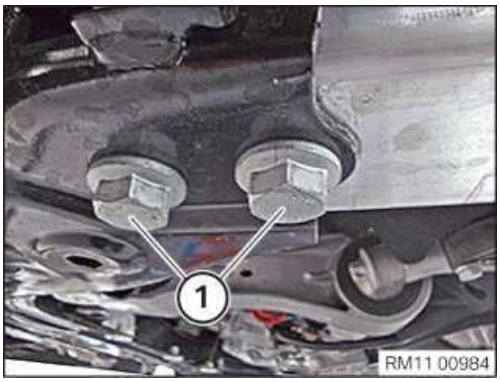
- Undo screws (2) at front left.
- Drill out blind rivets (1) at front left.



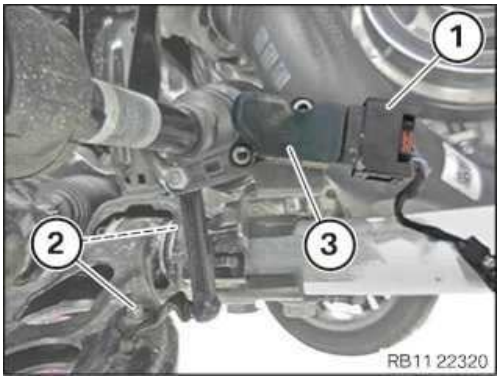
- Undo screws (2) at front right.
- Drill out blind rivets (1) at front right.



- Unlock locking pins (1).
- Thread out and remove locks (2).
- Thread out and remove cross connection (3).

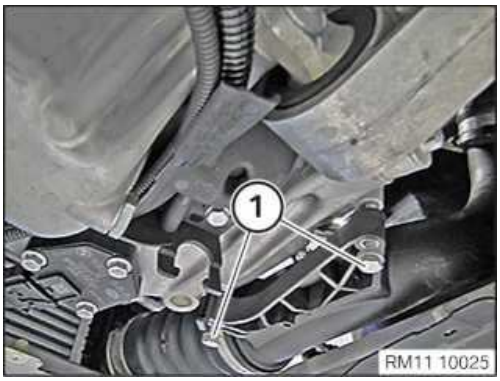


- Release the screws (1) on the right front axle support.

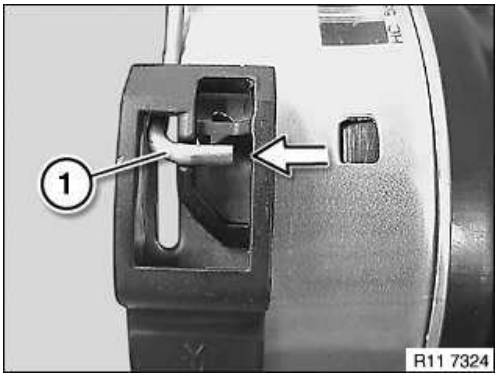


- **If installed:**
- Unlock and release plug connection (1).
- Loosen screws (2).
- Feed out the ride height sensor (3) and remove.

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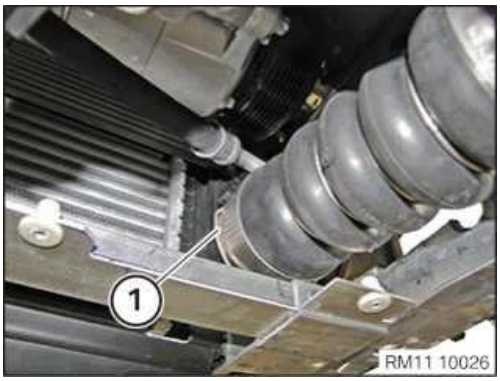


- Release screws (1) of charge air duct on right oil sump.

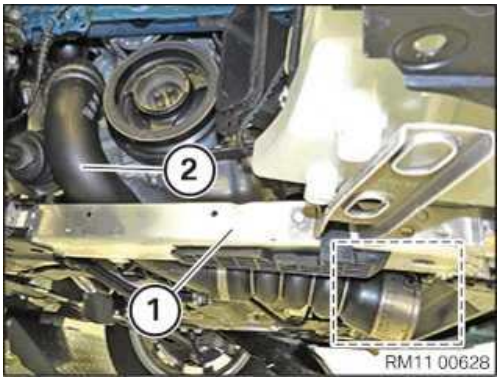


- Unlock lock (1).

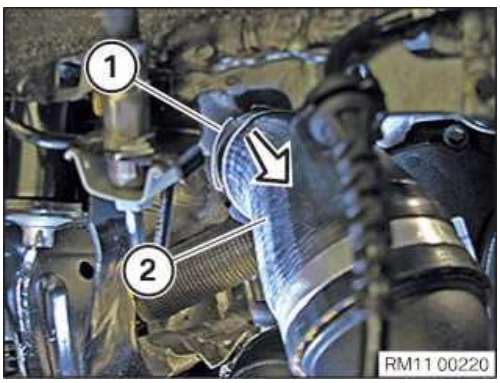
  The lock (1) must engage in the bracket during unlocking (arrow).



- Unlock and release the charge air duct (1) on the charge air cooler.



- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed out the charge air duct (2) in the **marked** area towards the bottom and set it aside.



- Unlock and detach the locks (1) on both sides.
- Feed out the charge air duct (2) on the exhaust turbocharger in the direction of the arrow and set it aside.

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- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed out the charge air duct (1) in the direction of arrow between the side member and the deformation element and remove.

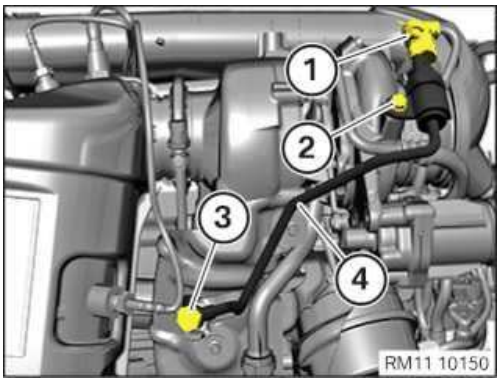
57 – Remove the heat shield from the exhaust turbocharger at the bottom

WARNING

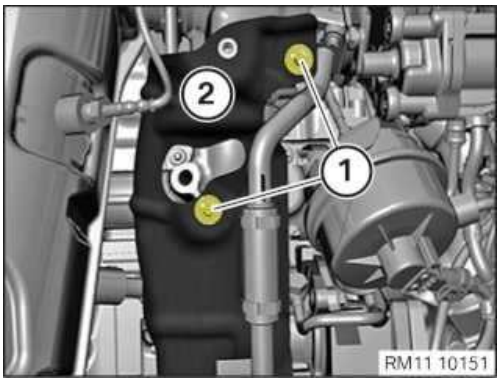
Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Unlock and disconnect connector (1).
- Unscrew the banjo bolt (3).
- The seals of the banjo bolt (3) must be renewed.
- Loosen screw (2).
- Remove the exhaust gas pressure pipe (4).



- Unscrew the bolts (1) on the heat shield .
- Feed out and remove the heat shield (2).

58 – Removing the low-pressure stage turbocharger

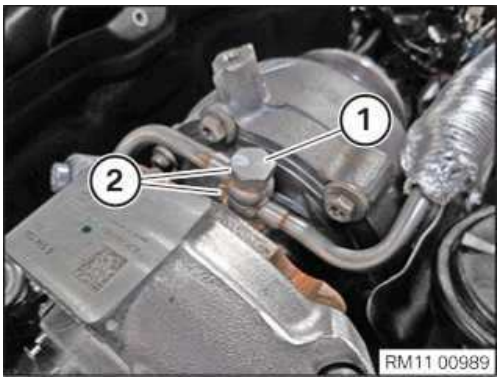
WARNING

Hot surfaces.

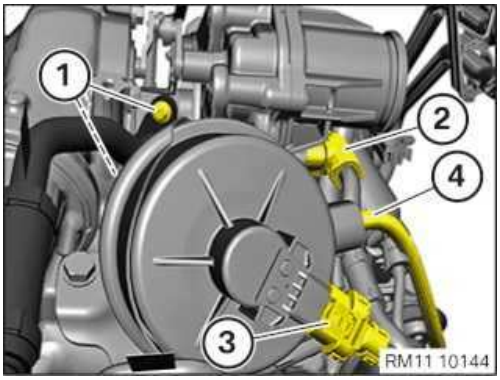
Risk of burning!

- Perform all work only on components that have cooled down.

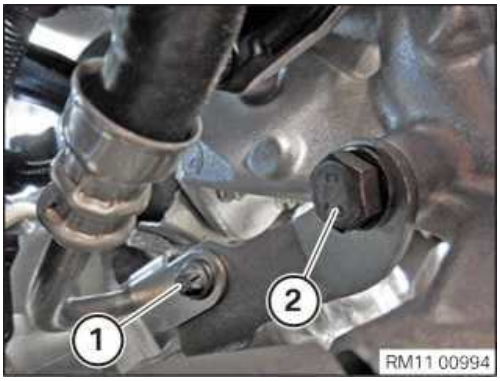
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- Release the banjo bolt (1) of the oil feed lines.
- Remove sealing rings (2).
- Place oil feed lines to one side.



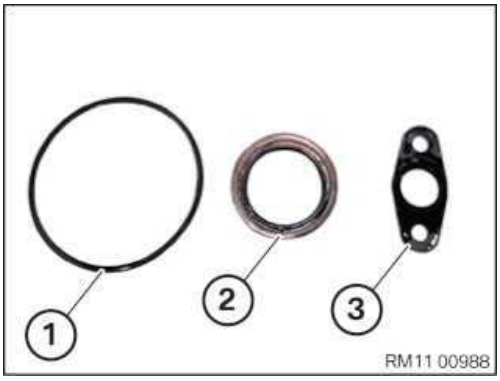
- Release the screws (1) of the oil return line.
- Unlock and disconnect the plug connections (2) and (3).
- Pull off the vacuum hose (4) carefully.



- Undo the bolt (1) of the oil feed line.
- Loosen screw (2).

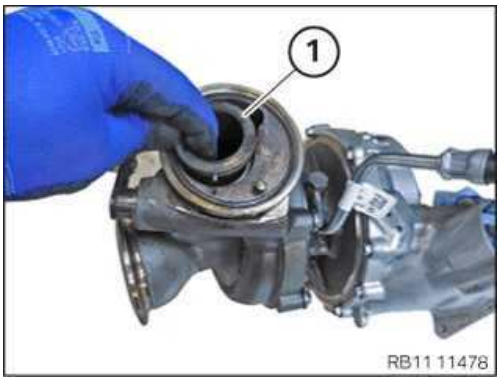


- Loosen screw (1).
- Remove the V hose clamp.
- Guide the low-pressure stage turbocharger out towards the top and remove.



- Remove seals (1), (2) and (3).

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- Remove the spacer ring (1).

59 – Removing the high-pressure stage exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

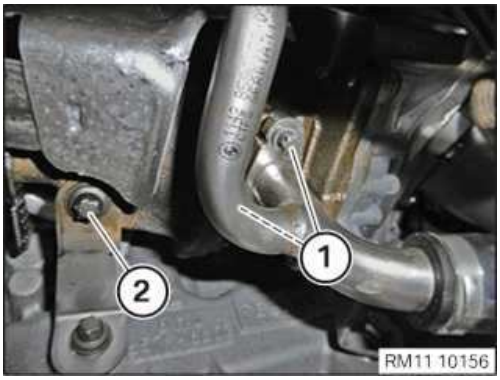
- Perform all work only on components that have cooled down.

CAUTION

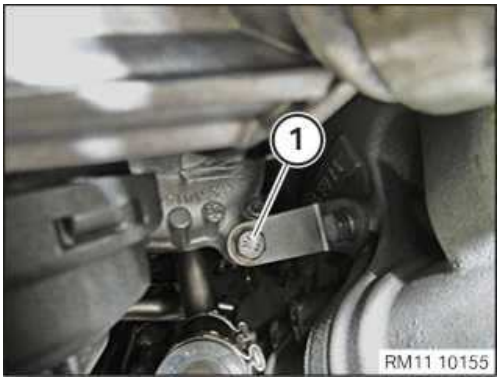
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

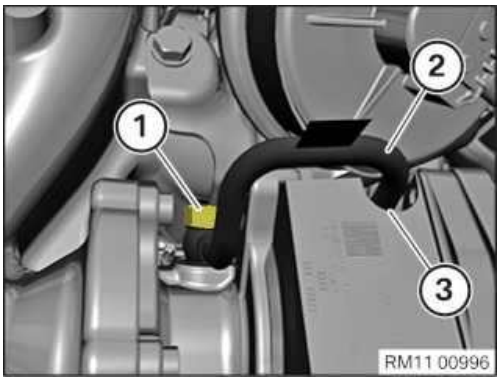


- Unscrew the bolts (1) on the oil return line .
- Loosen screw (2).

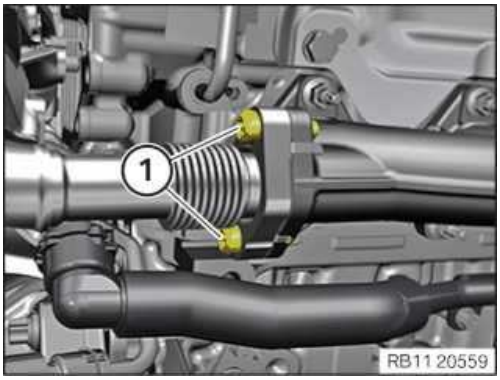


- Release screw (1) from the right wheel arch.

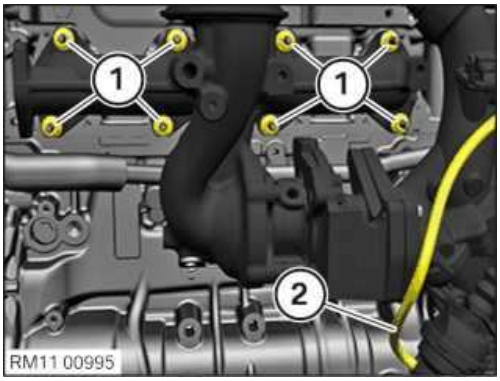
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- Unscrew the banjo bolt (1).
- Guide out oil feed line (2) from holder (3).



- Loosen screws (1).



- Pull off the vacuum hose (2).
- Loosen nuts (1).
- Guide out the exhaust manifold and the high-pressure stage exhaust turbocharger to the top and remove them.

60 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

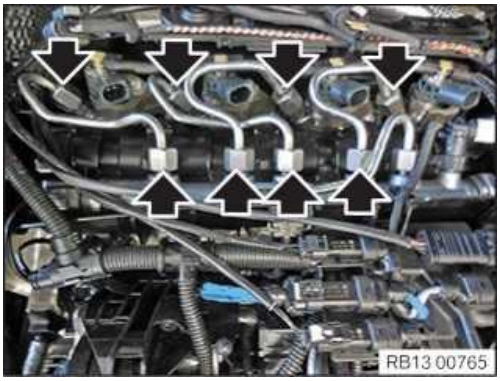
If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release the high pressure lines (arrows) with the special tool .
- Catch and dispose of escaping fuel.
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool .

61 – Remove leakage oil lines

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

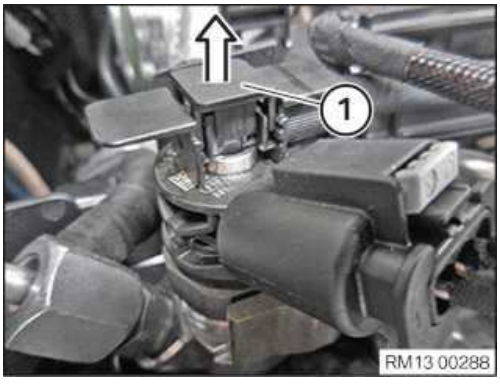
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

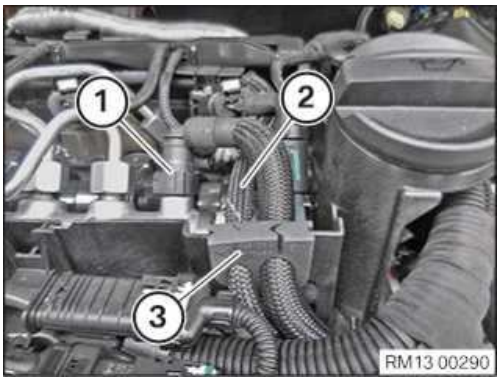


- Unlock the connectors (arrows) and disconnect.

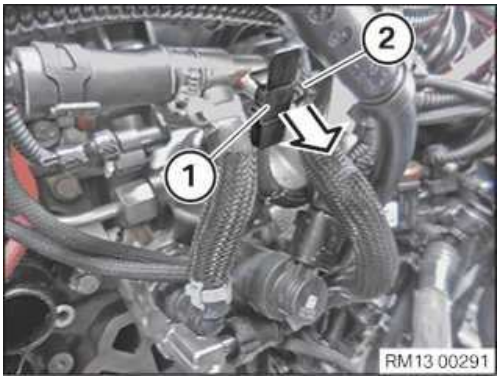


- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

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- Unlock and loosen fuel line (1) and set it aside.
- Guide the leakage oil line (2) out of the rubber grommet (3) and set it aside.



- Release lock (1) in direction of arrow.
- Feed out leakage oil line (2) and remove.

62 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

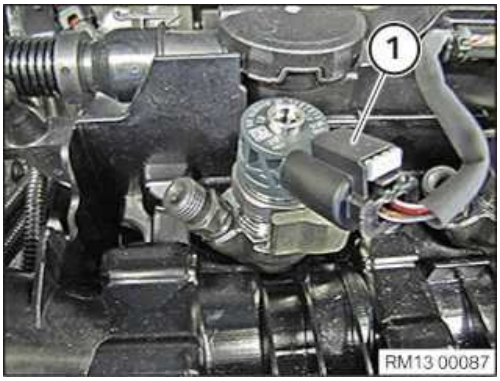
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

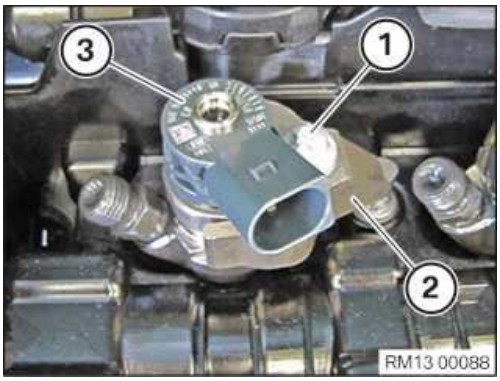
TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.



- Unlock and disconnect connector (1).

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- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

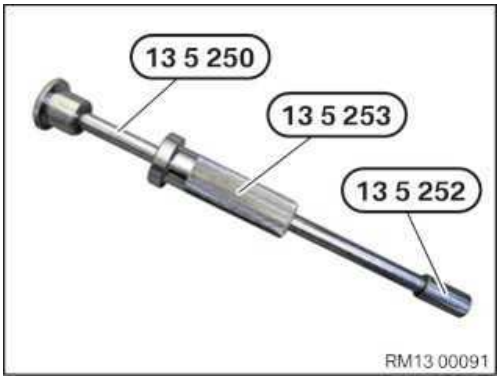
▶ **Loosen stuck injectors**

RISK OF DAMAGE

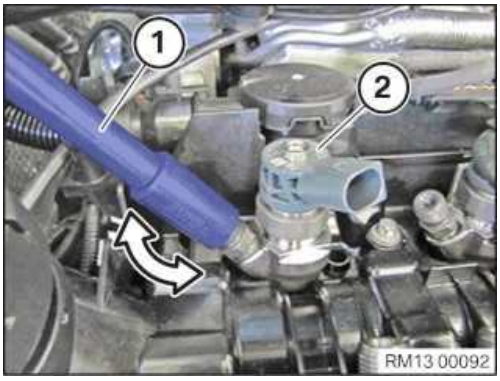
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)** back onto the special tool **0 493 321 (13 5 250)**.



- Screw the special tool (1) **0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1) **0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

63 – Remove differential pressure sensor

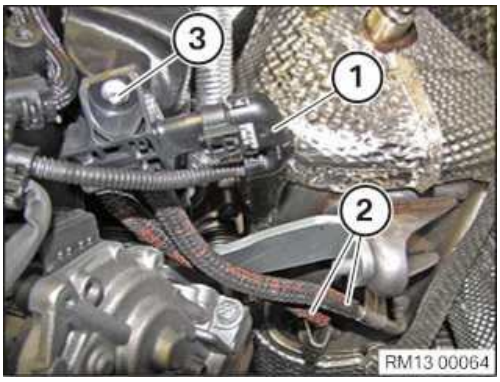
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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

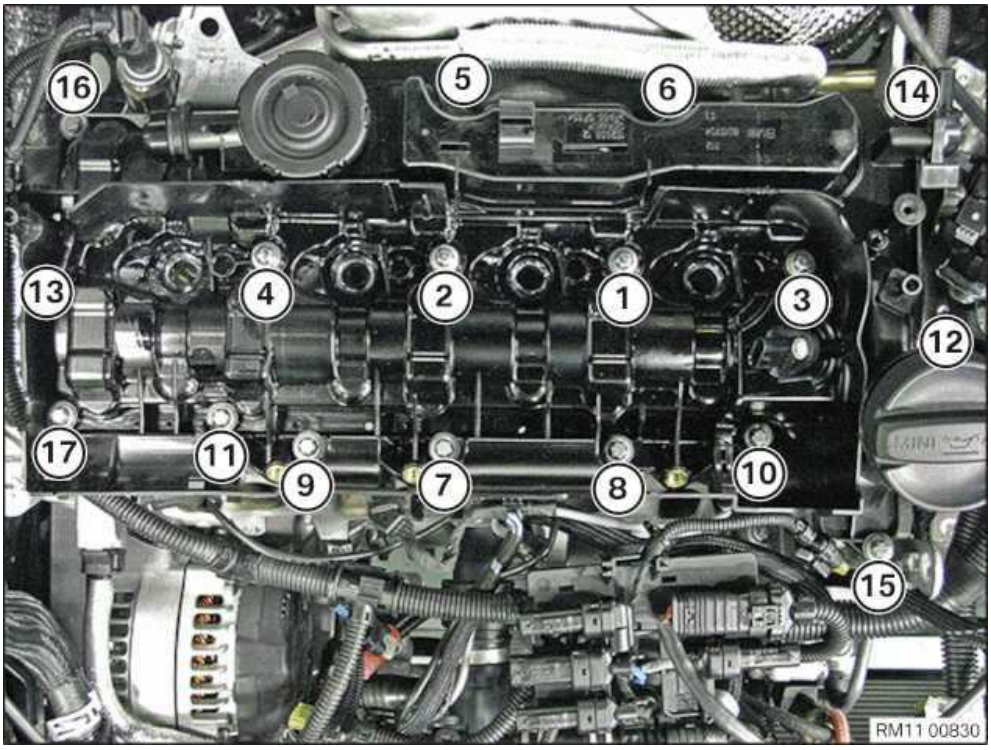
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

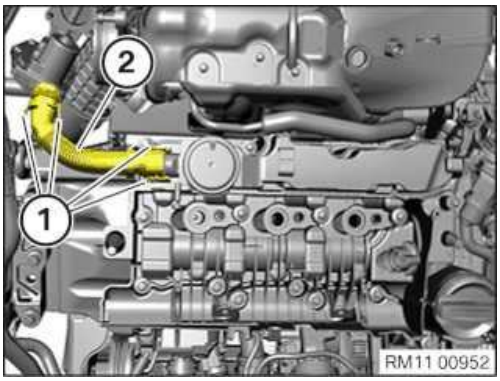
64 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover

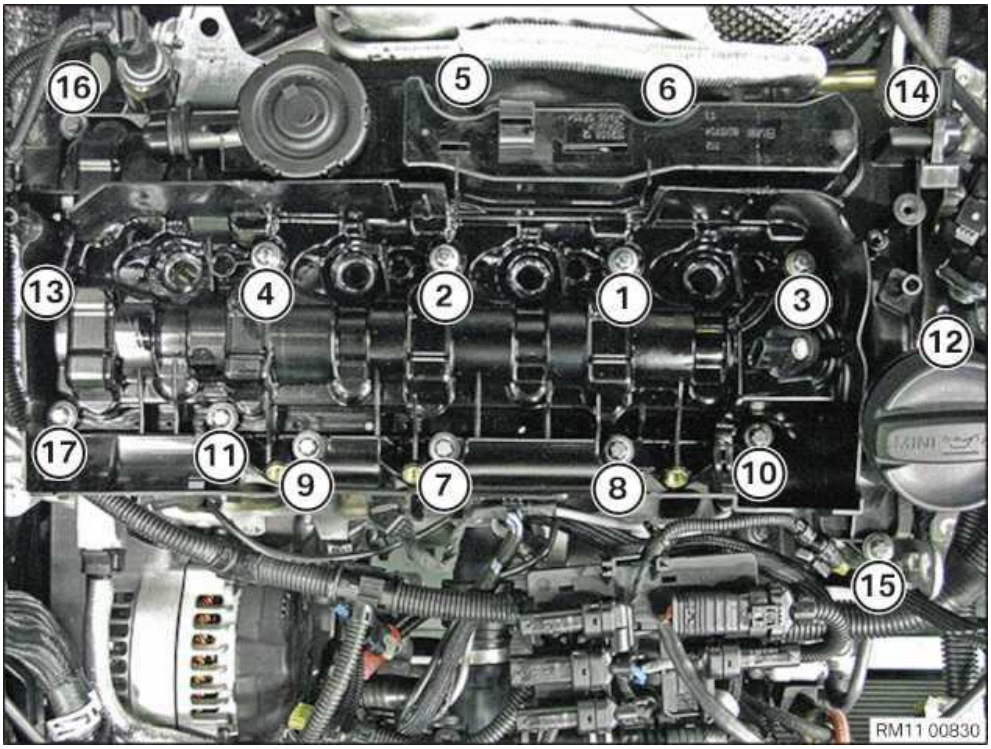


1 to 16 screws of the cylinder head cover.

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- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).



- Loosen screws in the order (17) to (1).
- Remove cylinder head cover by lifting it out.

65 – Checking camshaft timing



- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**

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RISK OF DAMAGE

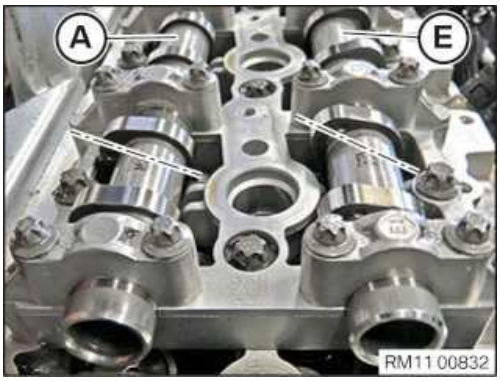
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

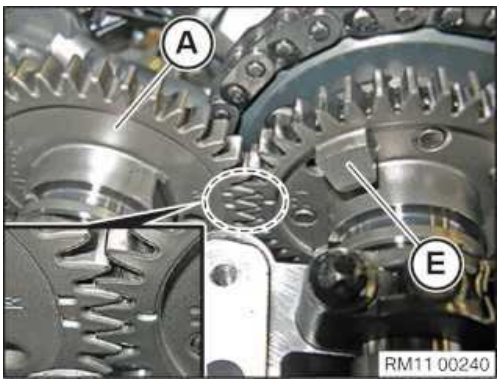
  Do **not** crank the engine in reverse.



- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

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- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

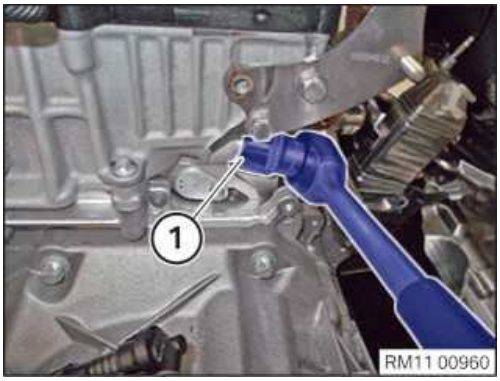
66 – Remove chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

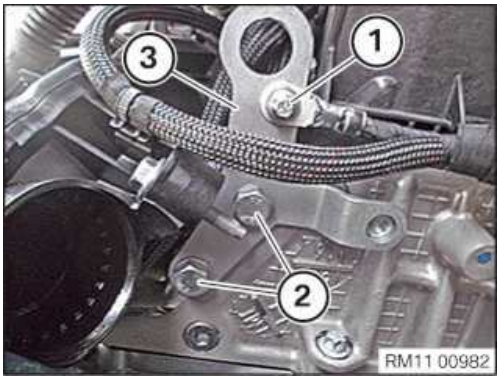


TECHNICAL INFORMATION

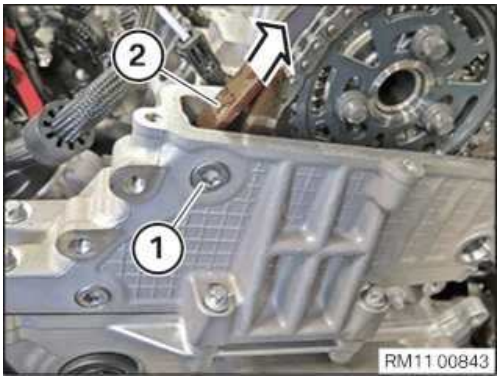
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

67 – Remove the timing chain guide rail



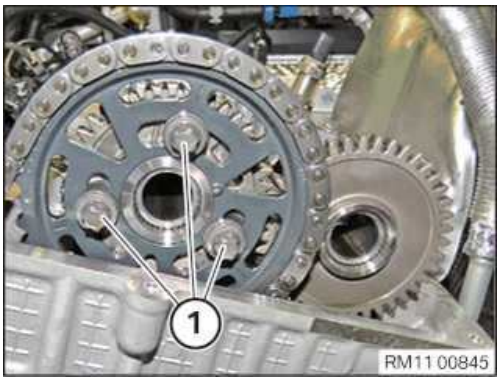
- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

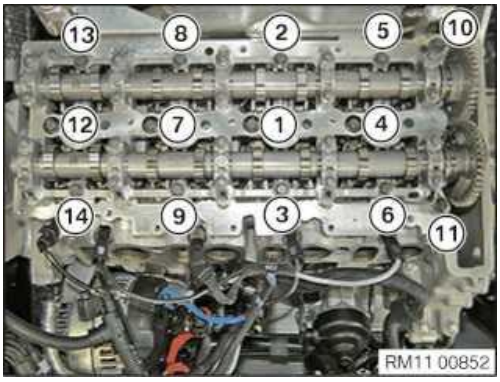
68 – Removing the camshaft sprocket on the intake camshaft

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- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

69 – Removing the camshaft support



- Evenly loosen all screws in a sequence from (14) to (1).
- Loosen and remove all screws in a sequence from (14) to (1).

  Both camshafts can be removed with the camshaft carrier.
- Remove the camshaft support including camshafts towards the top.

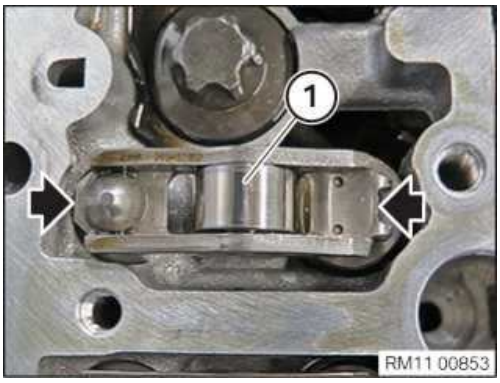
70 – Remove roller cam followers

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



RISK OF DAMAGE

Damage to the engine.

If the classification of the roller cam followers is ignored, this can lead to engine damage.

- Observe the classification of the roller cam followers.
- Always reuse used roller cam followers at the same position.

- Remove the roller cam follower (1) and place it onto the special tool **0 495 105 (11 4 480)**.
- Repeat the process for all roller cam followers.

71 – Removing the hydraulic valve clearance compensating element

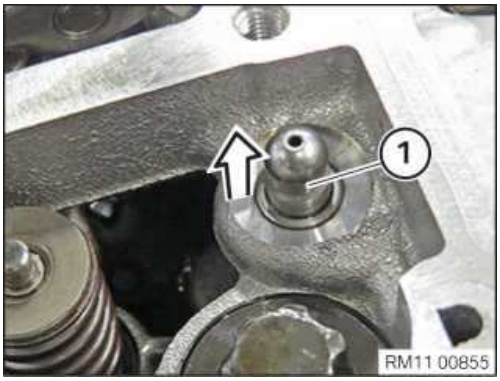
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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Remove the hydraulic valve clearance compensating element (1) in the direction of the arrow and place on the special tool **0 495 105 (11 4 480)**.
- Repeat the process on all hydraulic valve clearance compensating elements.

72 – Removing glow elements

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Damage to the glow elements.

Excessive force may damage the glow elements and they may then have to be renewed.

- Handle glow elements with care and do not drop.
- Do not rest the cylinder head on glow elements. Glow elements protrude from the sealing surface of the cylinder head.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

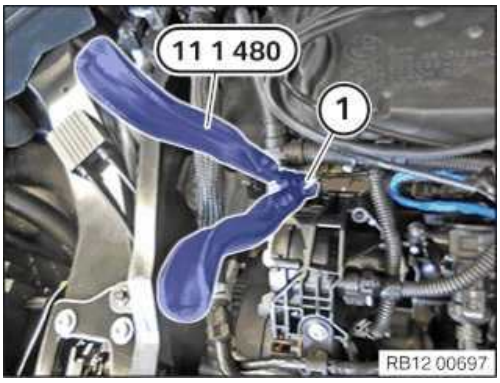
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect plug connection (1) using special tool **0 490 796 (11 1 480)**.



- Release the glow elements with the special tool or conventional tools.
- Feed out preheating elements and remove.

73 – Remove cylinder head.

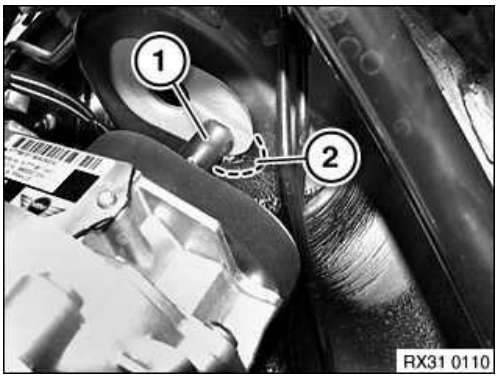
CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

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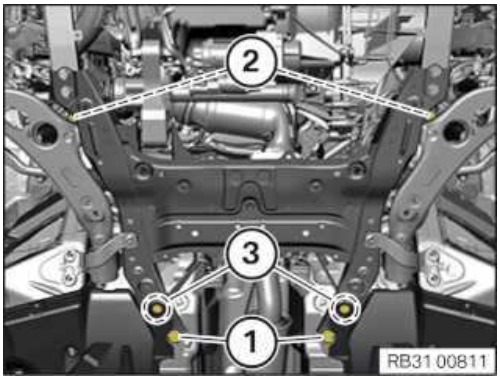


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- Position front axle support.
- Bend the underbody panelling to the side in area (3).
- Raise front axle support.
- When raising, insert the charge air cooler into its rubber mount on the transmission cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

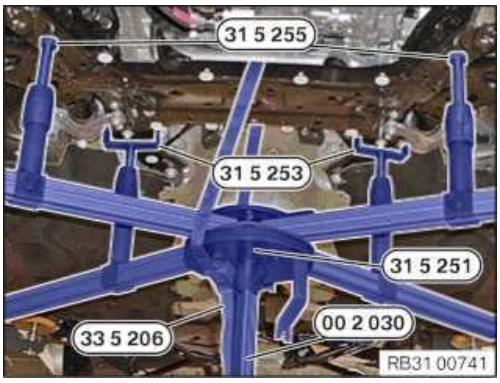
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

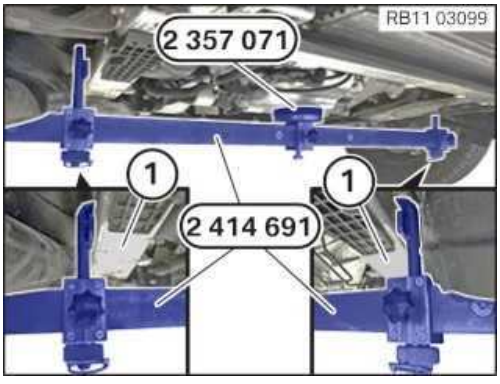
- If applicable, tighten the screws in area (3).

Underbody protection to body

Screw		Tightening torque	3 Nm

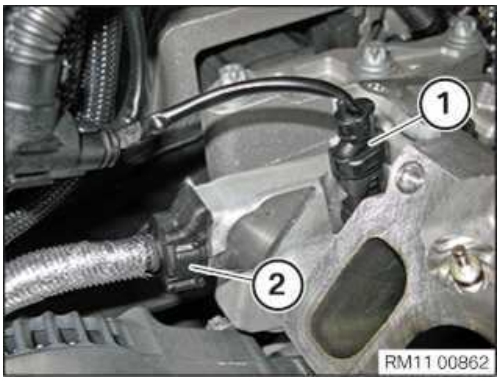


- Remove special tool from special tool .
- Lower the universal jack **0 490 133 (00 2 030)** with the special tool and set it aside.



- Prepare special tool together with the special tool **2 357 071**.
- Attach special tool to front axle support and align special tool **2 357 071** correctly under the oil sump and then tighten.
- Turn special tool at adjusting screw uniformly upwards, until the special tool **2 357 071** makes contact with the oil sump.
- Tighten all adjusting screws of special tools and **2 357 071**.

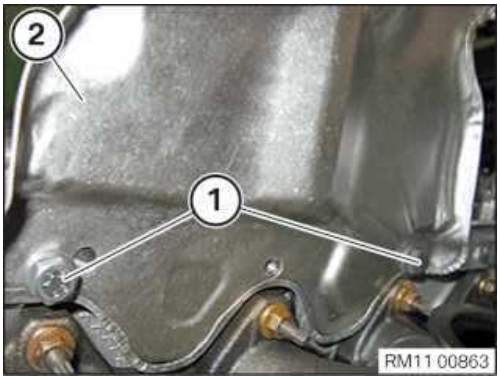
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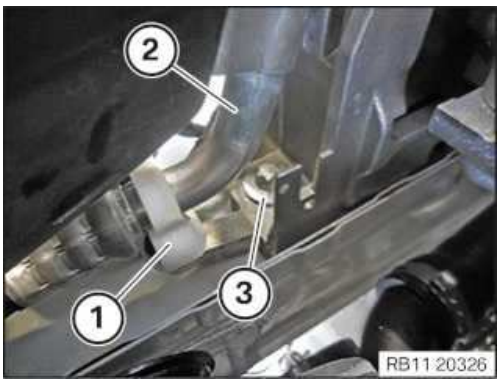
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Release the connector (1) from the coolant temperature sensor.
- Unlock and loosen coolant line (2).



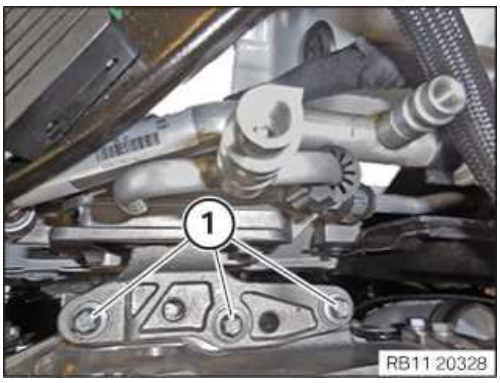
- Loosen screws (1).
- Feed out the heat shield (2) and set it aside.



- Unlock and loosen holder (1).
- Feed out the refrigerant line (2) and put to one side.
- Loosen screw (3).

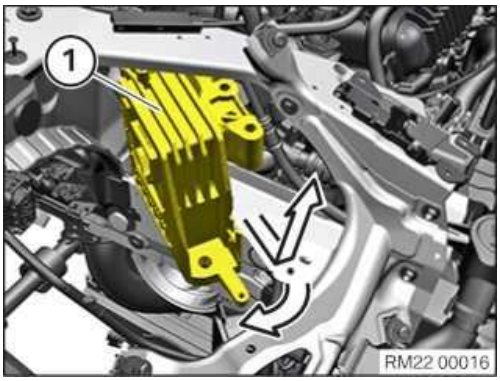


- Loosen screw (1).

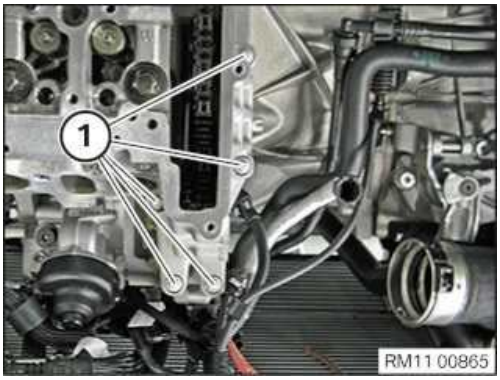


- Loosen screws (1).

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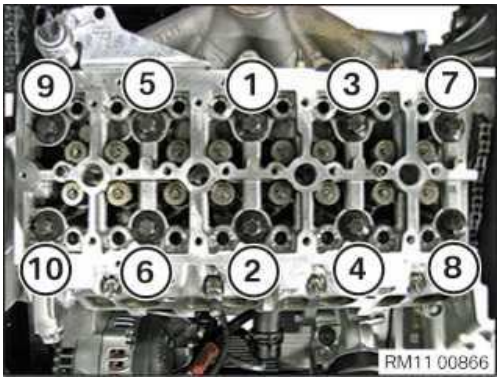
- Turn engine mount (1) in direction of arrow and remove upwards.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screws (1).



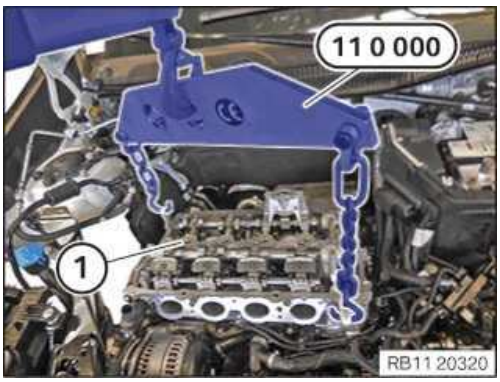
- Loosen the cylinder head bolts in the sequence from (10) to (1).
- Remove cylinder head bolts (1) to (10) with washers.



- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

M8		Tightening torque	21,5 Nm



RISK OF DAMAGE

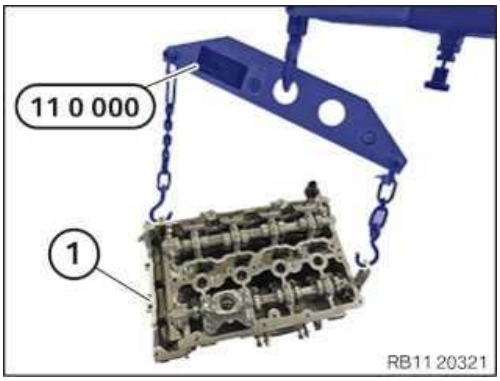
Damage to the guide rails.

Large amounts of force may damage the guide rails of the timing chain.

- Make sure not to damage the guide rail with the cylinder head when removing and installing the cylinder head.

- **Carefully** guide out the cylinder head (1) with the engine lifter and the special tool **0 490 561 (11 0 000)** and remove.

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- Mount the cylinder head (1) on the special tool **0 494 362 (11 9 000)**.

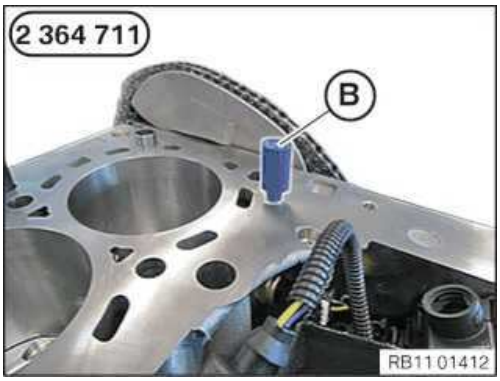
74 – Cleaning the sealing surface

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Lock the front oil duct using special tool (B) from special tool **2 364 711**.



RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 103 (11 4 471)**.



RISK OF DAMAGE

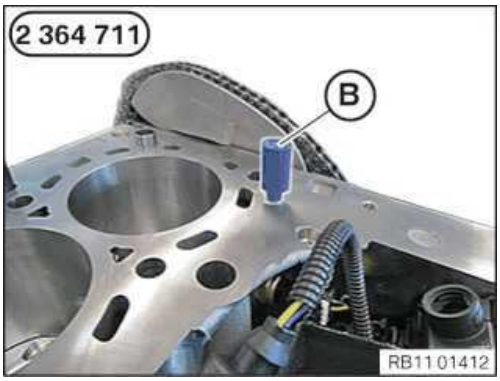
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

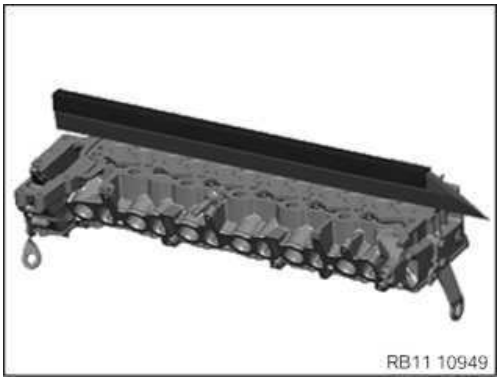
- Clean the sealing surface using special tool **0 495 104 (11 4 472)**.

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- Remove special tool (B).

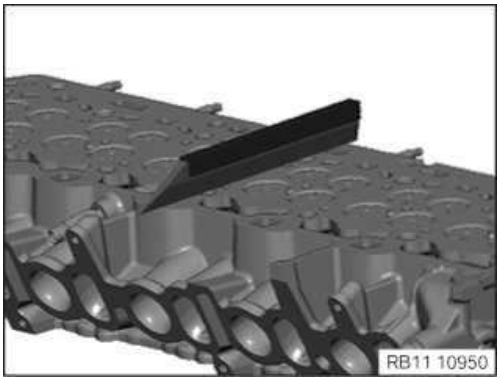
75 – Check the flatness of the cylinder head



- Check the flatness of the cylinder head lengthwise using a straightedge.

Cylinder head flatness

Maximum lengthwise deviation from flatness	0,10 mm
Maximum transverse deviation from flatness	0,05 mm

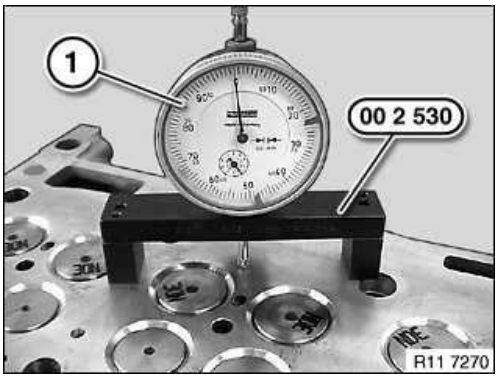


- Check the flatness of the cylinder head crosswise using a straightedge.

Cylinder head flatness

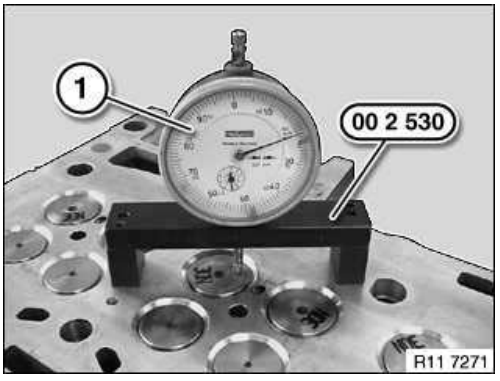
Maximum lengthwise deviation from flatness	0,10 mm
Maximum transverse deviation from flatness	0,05 mm

76 – Checking the valve underprotrusion



- Set the dial gauge (1) onto the cleaned cylinder sealing surface with slight preload in special tool **0 490 185 (00 2 530)**.
- Set dial gauge in mildly preloaded state to "zero".

Check



- Position the dial gauge (1) on the valve with special tool **0 490 185 (00 2 530)**.
- Measure valve underprotrusion and compare with the setpoint value.

Valve underprotrusion

	0,8 (0,7 - 0,9) mm

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Result

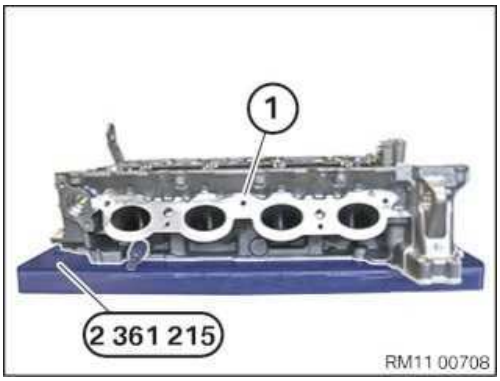
» Valve underprotrusion is outside tolerance.

Measure

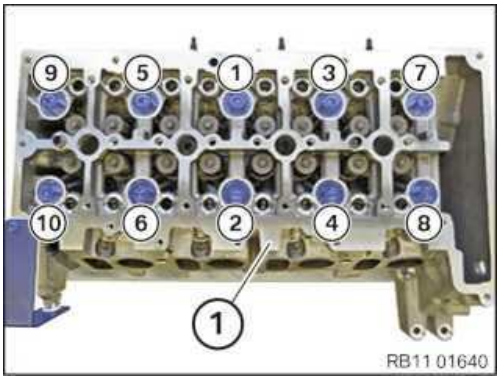
- Replace cylinder head.

MAIN WORK

77 – Checking cylinder head for watertightness



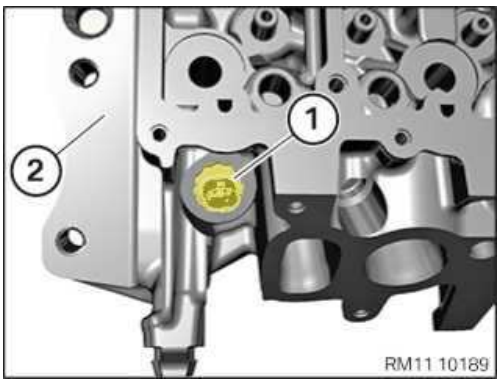
- Position the cylinder head (1) on the special tool so that the rubber layer faces the cylinder head (1) and all water ducts at the cylinder head (1) are closed.



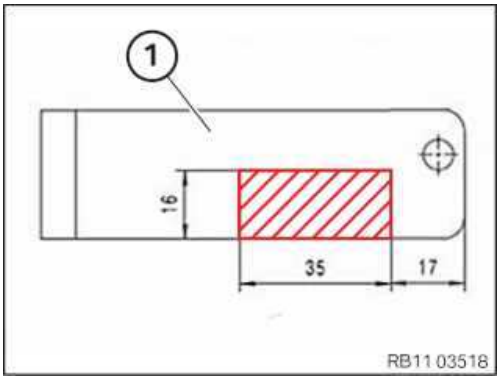
- Tighten special tool **0 496 184 (11 8 891)** using the screws **0 496 186 (11 8 893)** in the sequence (1) to (10) on the cylinder head (1).

Special tool to cylinder head

Special tool		Tightening torque	20 Nm

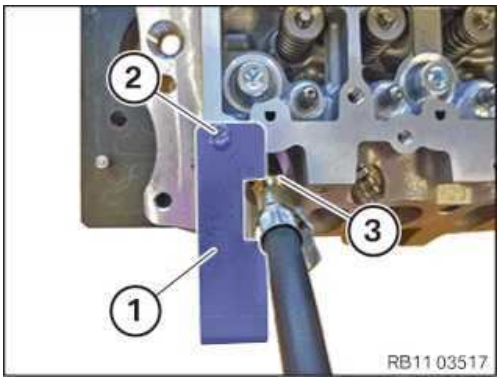


- Remove coolant temperature sensor (1) from the cylinder head (2) using special tool .



- Dimension special tool **2 405 214** as shown.
- Drill through top corners of the marked area on the special tool **2 405 214** using drill M6.
- Cut off marked area from the special tool **2 405 214**.

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- Lock coolant duct on the cylinder head using special tool (1) and secure with screw (2).
- Tighten down screw (2).

Standard screw connection M6

M6		8 Nm

- Install valve (3) into the cylinder head from the special tool .

Special tool to cylinder head

Special tool		Tightening torque	20 Nm

Check

- Heat up the cylinder head.

Check for cylinder head watertightness

Temperature of the cylinder head	60 °C

- Connect compressed air to the valve (3).

Check for cylinder head watertightness

Testing pressure	max. 3,0 bar

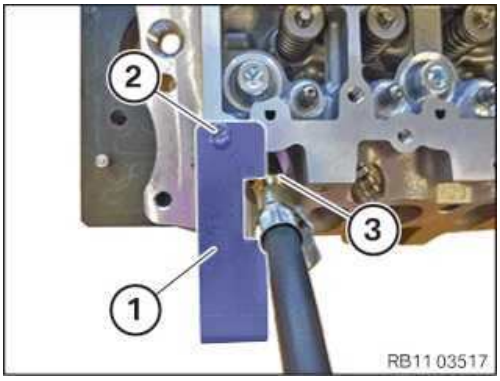
- Check the cylinder head in for tightness in a water bath.

Result

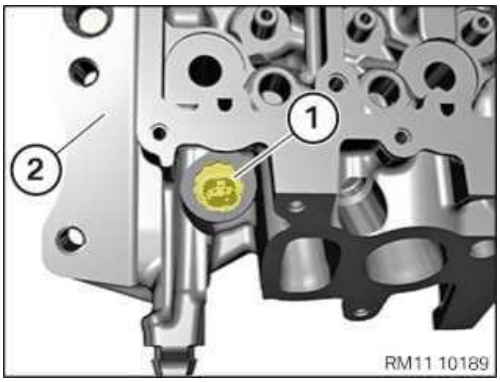
» Air bubbles develop.

Measure

- Check cylinder head at the point of exit of the air bubbles for damage, repair or renew if required.



- Loosen screw (2).
- Remove position (1) of special tool **2 405 214**.
- Remove valve (3).

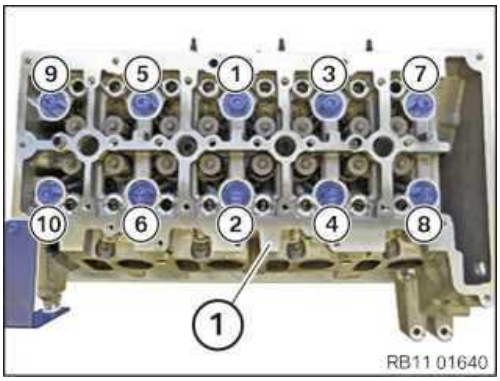


- Install coolant temperature sensor (1) and tighten using special tool .

Coolant temperature sensor at cylinder head

Temperature sensor		Tightening torque	3,5 Nm

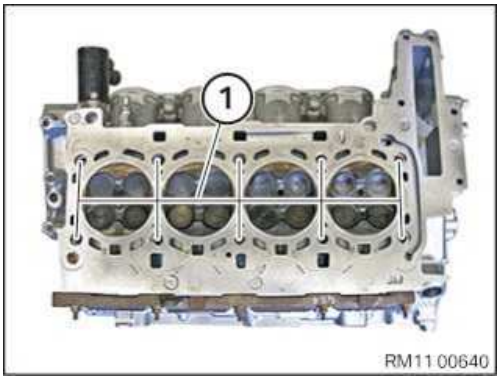
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- Loosen screws in the order (10) to (1).
- Remove cylinder head (1) from the special tool .

POSTPROCESSES

78 – Renewing the cylinder head gasket



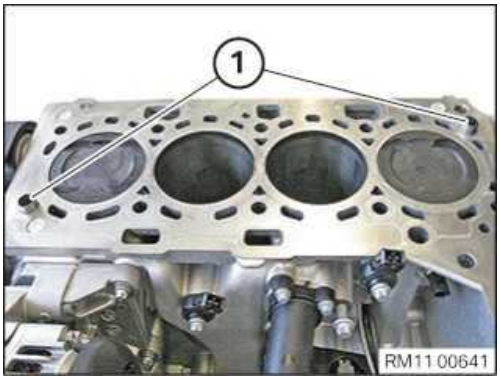
RISK OF DAMAGE

Damage to the surface.

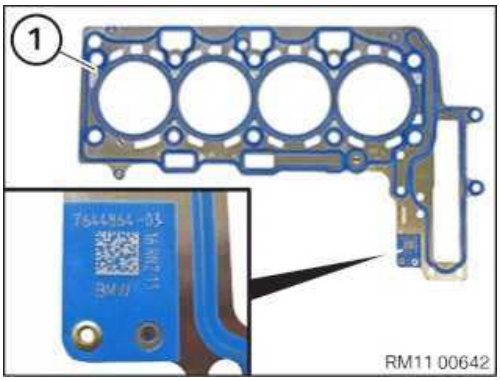
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Remove oil and dirt residue from the blind holes (1).

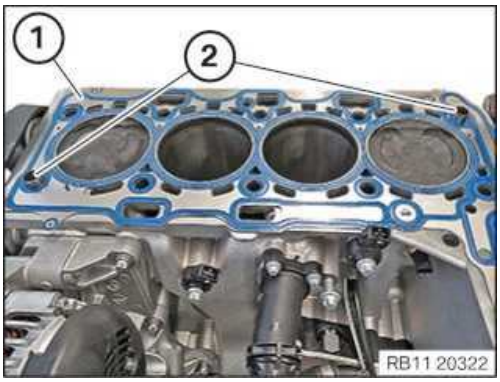


- Check the fitting sleeves (1) for secure fit and damage.



- Identify the cylinder head gasket (1) using the part number.

Note: If the cylinder head is reworked, an additional thicker gasket 0.3 mm is available for service personnel.



- Guide in the cylinder head gasket (1) and install.
- Ensure that the cylinder head gasket (1) is installed correctly in the fitting sleeves (2).

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79 – Installing the cylinder head

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Damage to threads.

Fluid in the threaded hole may damage the thread when screws are tightened in the threads.

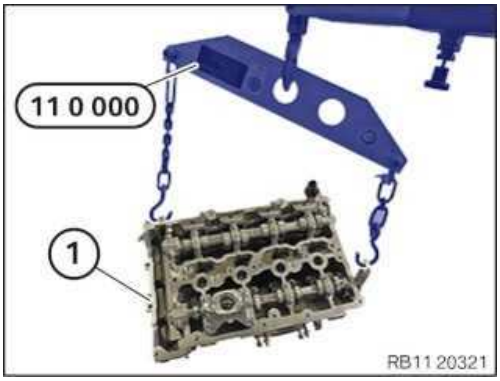
- Dry threaded holes (e.g. using compressed air).

TECHNICAL INFORMATION

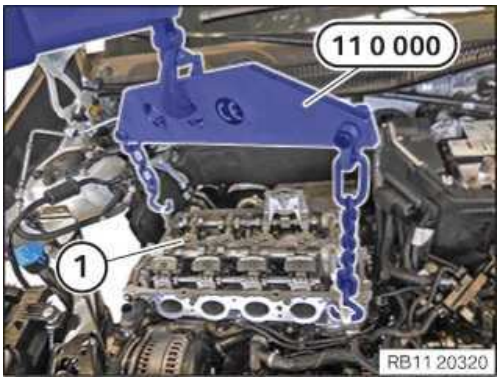
Do not remove bolt coating.

TECHNICAL INFORMATION

When replacing the cylinder head: The complete valve control and the Valvetronic servomotor are already pre-assembled for new cylinder heads.



- Position cylinder head (1) on special tool **0 490 561 (11 0 000)** and engine lifter.



RISK OF DAMAGE

Damage to the guide rails.

Large amounts of force may damage the guide rails of the timing chain.

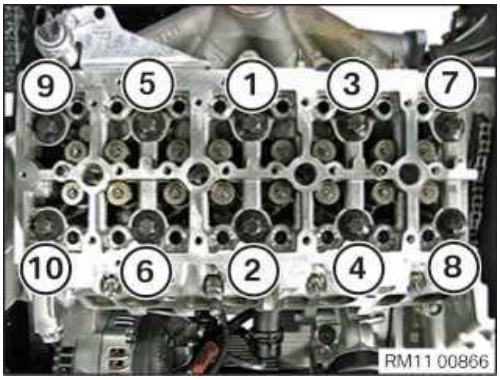
- Make sure not to damage the guide rail with the cylinder head when removing and installing the cylinder head.

- Feed in the cylinder head (1) **carefully** with the engine lifter and the special tool **0 490 561 (11 0 000)** and install.

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- Unscrew the bolts (1) of the special tool **2 459 012**.
- Guide the special tool **2 459 012** out and remove.



- Renew the cylinder head bolts (1).

  Parts: Cylinder head bolts
- Do **not** wash off coating of cylinder head bolts.
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

  No coolant, water or engine oil must be present in threaded holes of engine block.

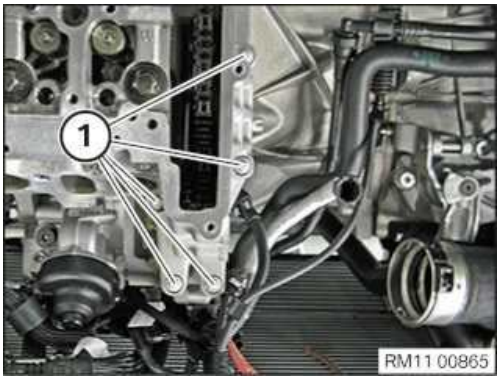
TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Feed in cylinder head bolts and install.
- Screw in cylinder head bolts in sequence (1) to (10).
- Tighten cylinder head bolts using special tools **0 490 504 (00 9 120)** and in sequence (1) to (10).

Cylinder head to crankcase

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

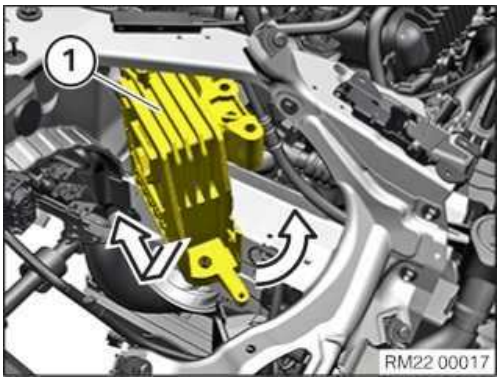


- Tighten the cylinder head bolts (1).

Cylinder head bolt to timing case cover

M8x40		Tightening torque	19 Nm

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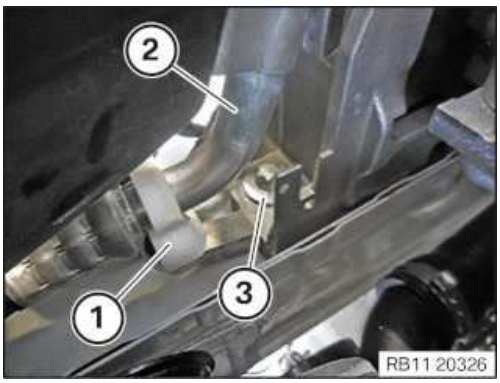
- Thread in engine mount (1) in direction of arrow then install.



- Tighten down screw (1).

Right engine mount to side member

M12		Tightening torque	100 Nm

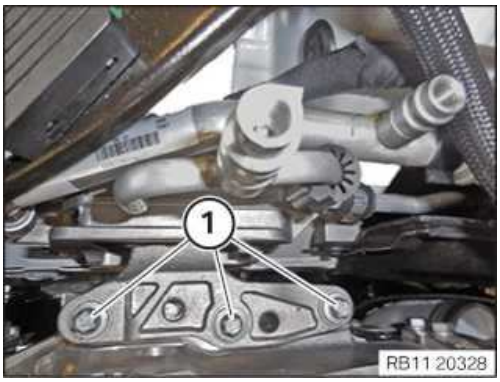


- Tighten down screw (3).

Right engine mount to side member

M12		Tightening torque	100 Nm

- Feed in and install the refrigerant line (2).
- Lock holder (1).
- Make sure the bracket (1) engages audibly.

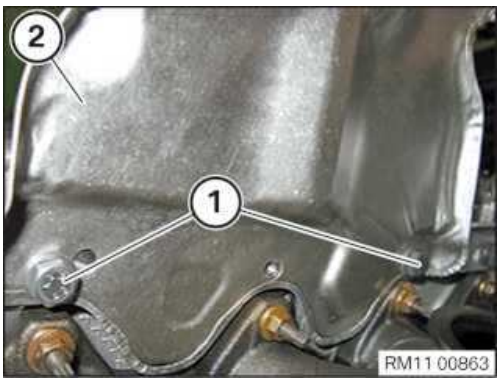


- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Right engine mount to cylinder head

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

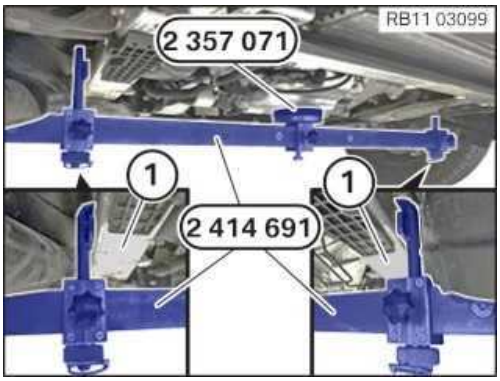


- Feed in and install the heat shield (2).
- Tighten the screws (1).

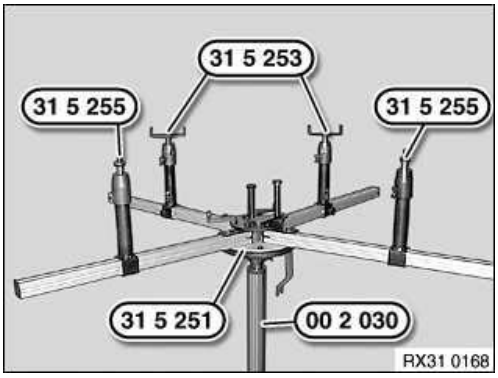
Heat shield to cylinder head

M8X16		Tightening torque	10 Nm

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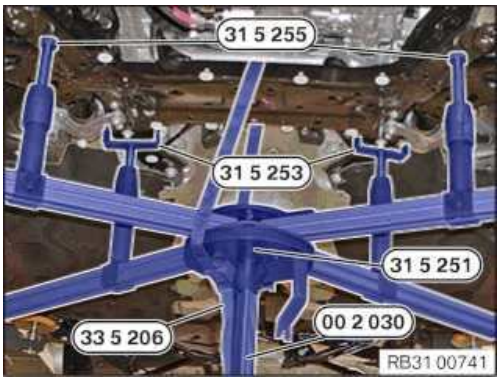


- Disassemble special tool using special tool **2 357 071**.



- Fit the special tool completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools in telescopic supports of a profile rail pair.
- Insert special tools in telescopic supports of other profile rail pair.

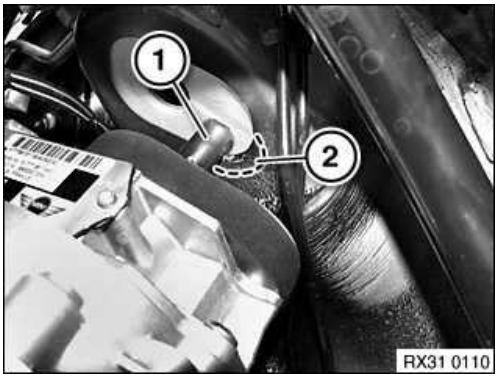
Note: In a profile rail pair, two profile rails are connected to one another by gearing.



- Align special tools and to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool to special tool .

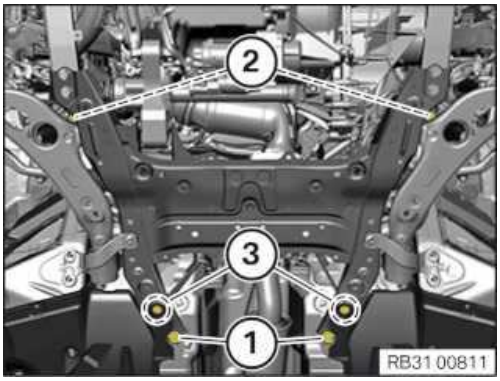


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

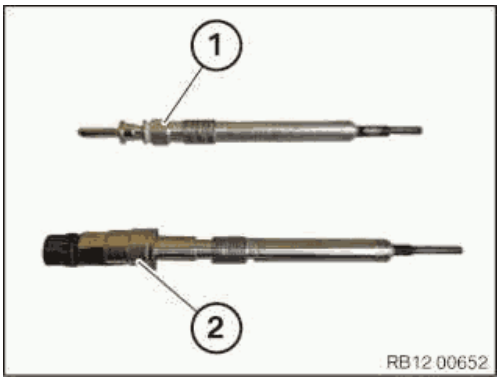
- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and the front axle remove.

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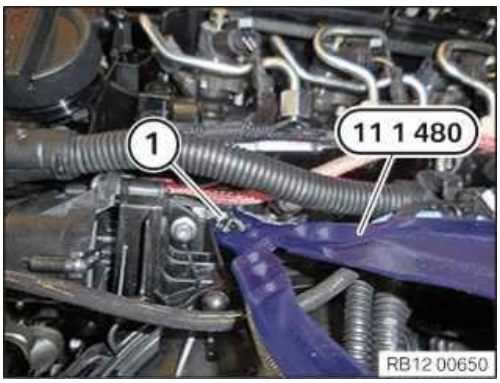
- Install glow elements (1) in cylinders 1, 2, 3 and 4.
- If fitted: Glow element (2) with the **combustion chamber pressure sensor** must be installed in cylinder **2**.



- Tighten the glow element with the special tool or conventional tools.

Glow elements to cylinder head

Glow element		Tightening torque	13 Nm



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

81 – Installing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Install the hydraulic valve clearance compensating element (1) in the direction of the arrow.
- Repeat the process on all hydraulic valve clearance compensating elements.

82 – Install the roller cam followers

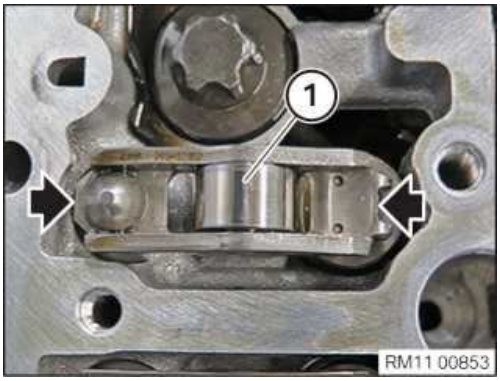
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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



RISK OF DAMAGE

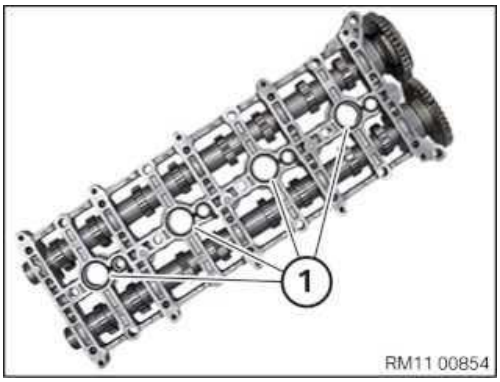
Damage to the engine.

If the classification of the roller cam followers is ignored, this can lead to engine damage.

- Observe the classification of the roller cam followers.
- Always reuse used roller cam followers at the same position.

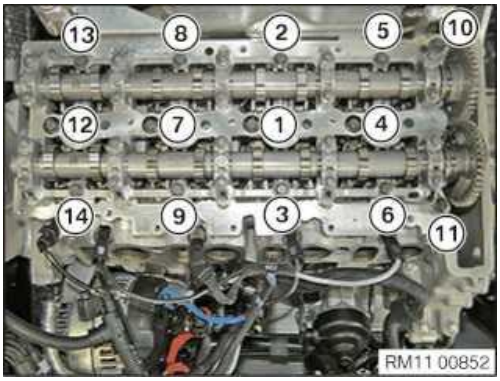
- Install the roller cam follower (1).
- Repeat the process for all roller cam followers.

83 – Installing the camshaft support



- Renew gaskets (1).

  Parts: gaskets



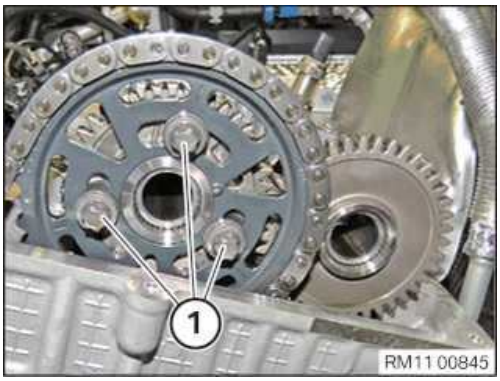
- Position the camshaft support including the camshafts.
- Tighten the screws in a sequence from (1) to (14) in several steps.

Camshaft carrier to cylinder head

M7x35		Tightening torque	13 Nm

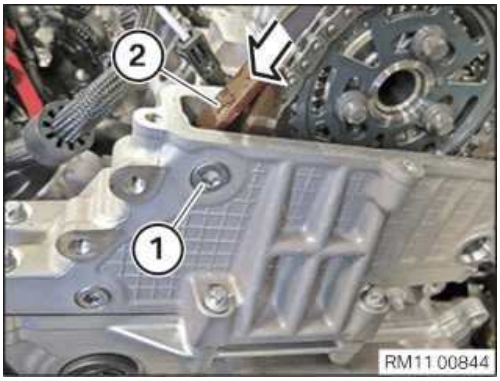
84 – Installing the camshaft sprocket on the intake camshaft

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- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

85 – Install the timing chain guide rail



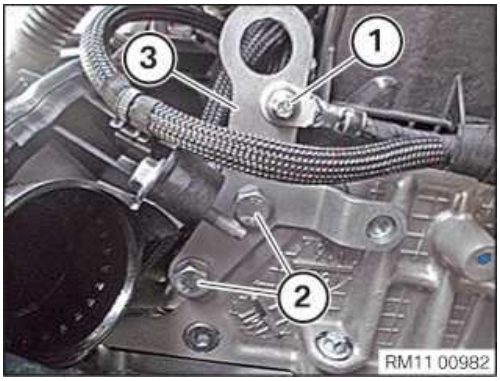
- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm



- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6		8 Nm

86 – Installing the chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Renew sealing ring (1).

  Parts: Sealing ring

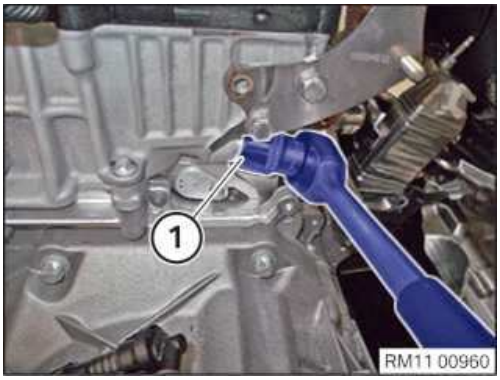
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TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.

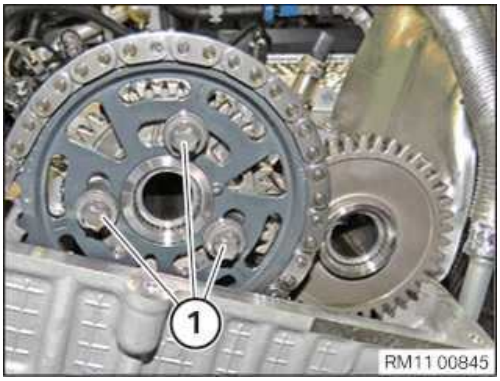


- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

87 – Tightening the camshaft sprocket on the intake camshaft



- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

88 – Checking camshaft timing



- Remove protective cap (1) from oil sump.

- **Spin the engine twice in the direction of rotation.**

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RISK OF DAMAGE

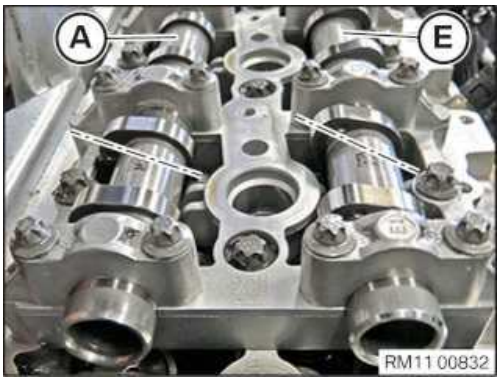
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

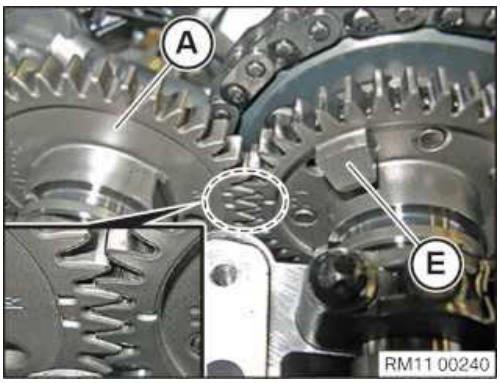
  Do **not** crank the engine in reverse.



- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

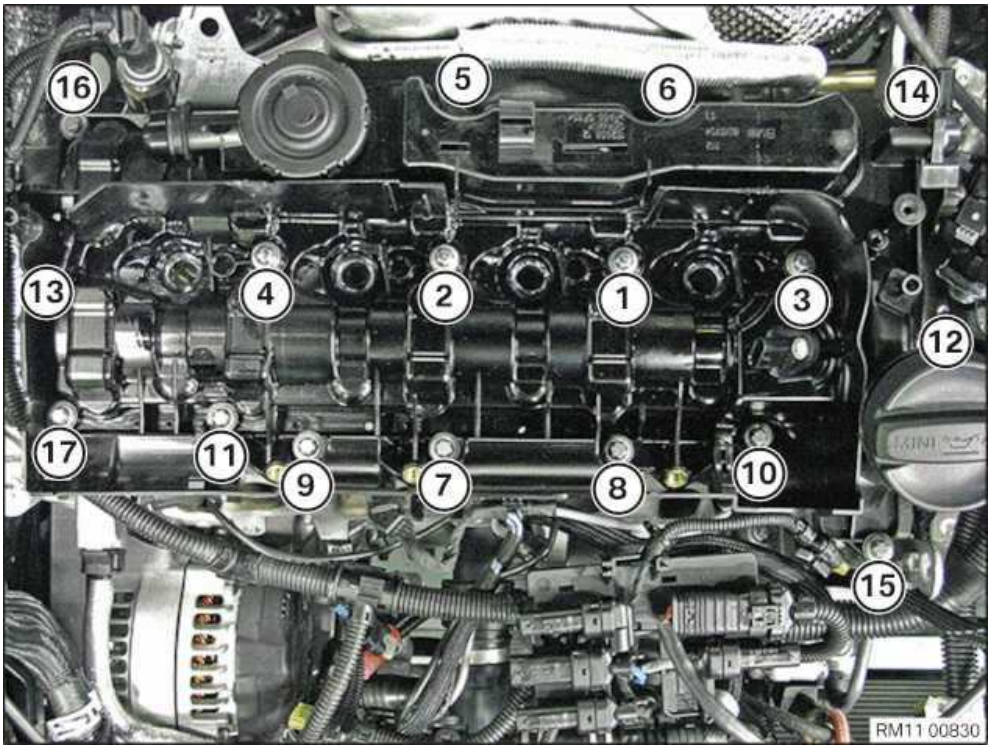
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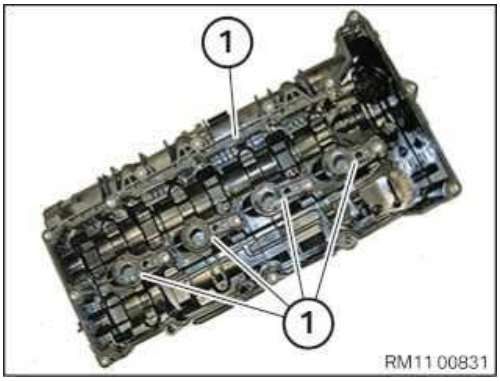
- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

89 – Installing cylinder head cover

Overview: Screw connection of the cylinder head cover



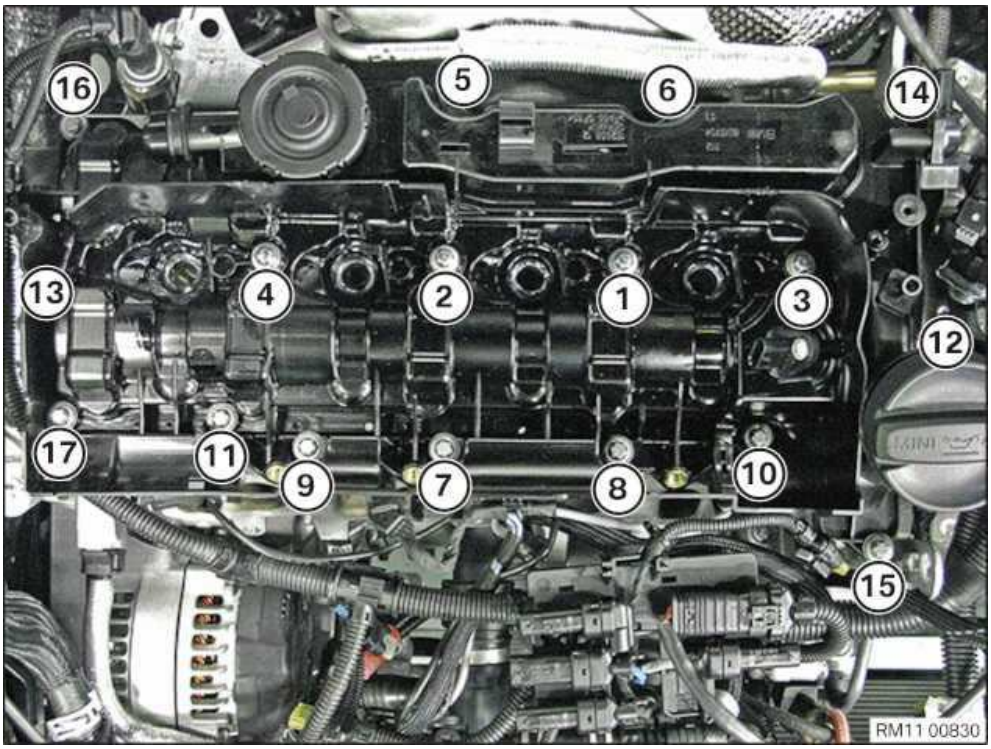
1 to 16 screws of the cylinder head cover.



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket

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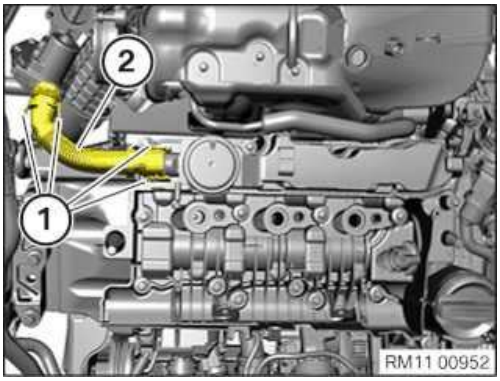


- Install cylinder head cover.
- Tighten screws in the order (1) to (17).

Cylinder head cover to cylinder head

M6		Tightening torque.	8, Nr

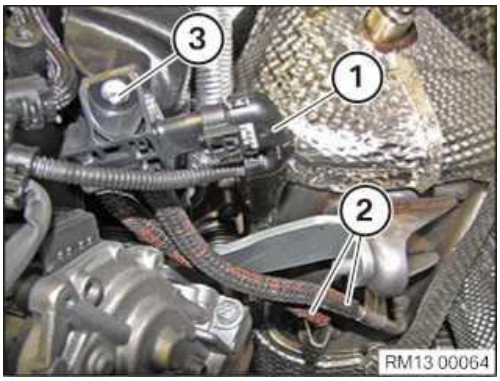
-



- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

90 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

91 – Installing injectors of injection system

▸ **Cleaning the injector shafts**

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CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.



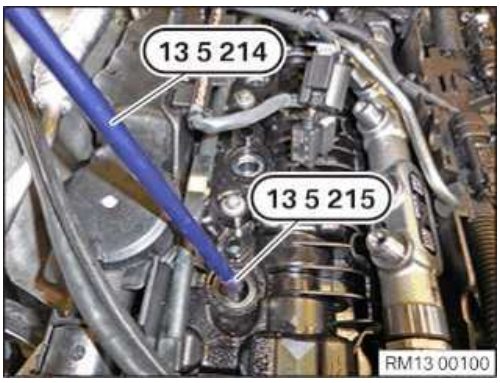
- Wear safety goggles.

RISK OF DAMAGE

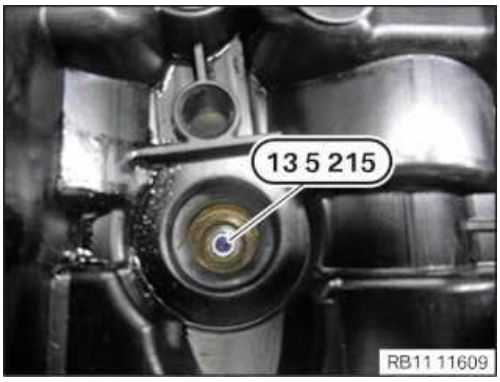
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.



- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.

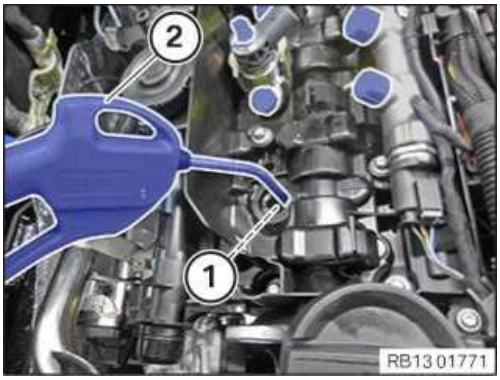


- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.

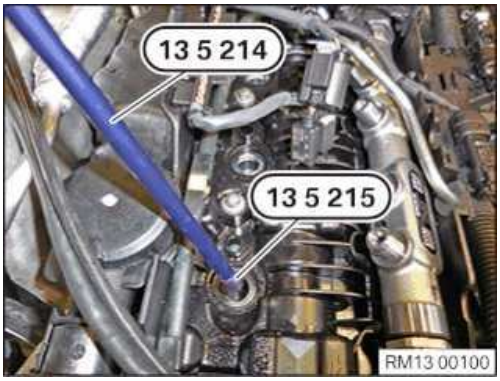
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- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.



- Blow out injector shaft (1) with air gun (2).



- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

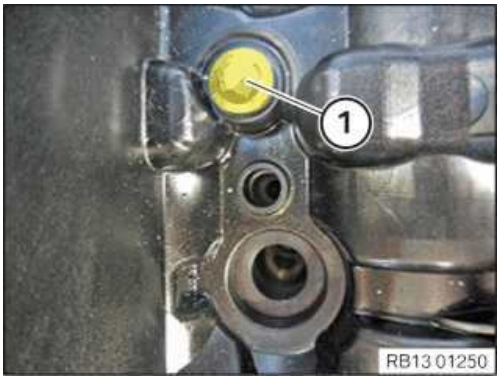
▸ **Check the placement of the clamping claw**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▸ **Prepare the injector for installation**

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



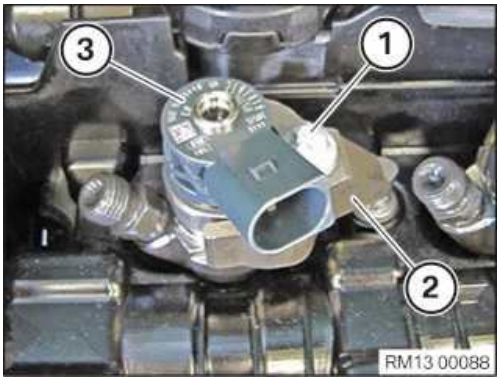
- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring

- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

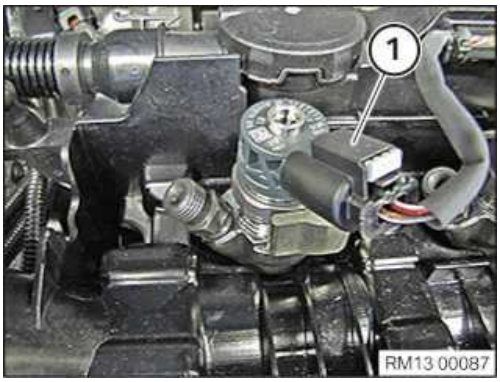
Injector lubricating grease	50 g, Can	83230441070



- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

▸ **Replacement: Perform injection quantity compensation**

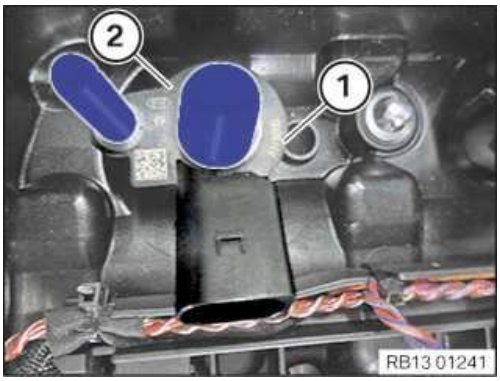
TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

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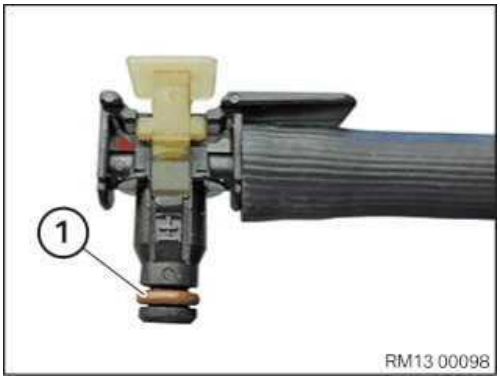


- Read off the adjustment value (1) on the new injector (2).



- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

92 – Connect the leakage oil line on the injector



- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.



- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

93 – Installing high pressure lines between rail and injectors

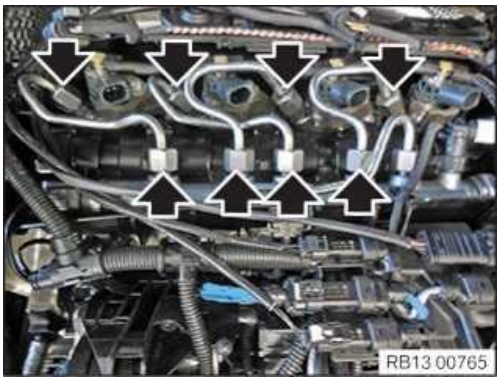
TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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- Remove special tool .
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten the high pressure lines (arrows) with the special tool .

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

94 – Prepare for the installation of the exhaust turbocharger

- Check the oil feed lines and the oil return lines for contamination or obstruction, clean or renew if necessary.
- If the oil feed lines and/or oil return lines are heavily contaminated, we recommend changing the engine oil and the oil filter.
- If installed: Check the coolant feed lines and the coolant return lines for the exhaust turbocharger for contamination or obstruction, clean or renew if necessary.
- Check that the screw connections and the plug connections of all the lines are correct.
- Check air cleaner for contamination and clean or renew as needed.
- Check correct functioning of crankcase ventilation.
- Replace all gaskets.

  Parts: Seals

95 – Installing the high-pressure stage exhaust turbocharger

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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RISK OF DAMAGE

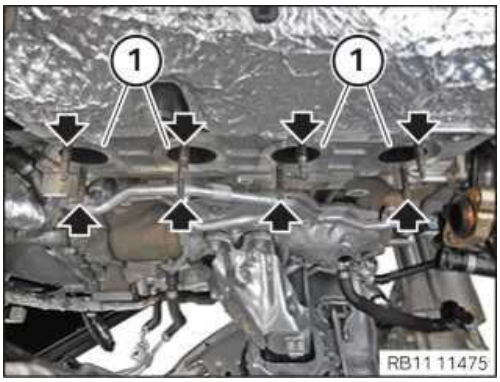
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

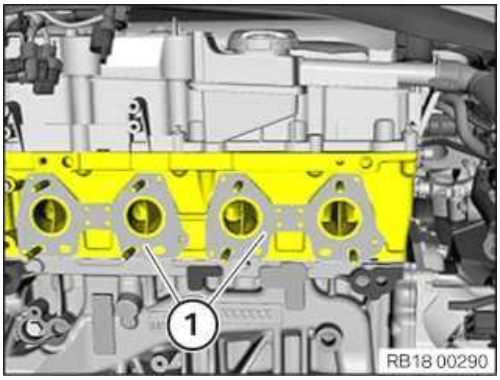
The sealing surfaces must be free from oils, grease and cleaning agents.



- Clean the sealing surfaces (1) on the cylinder head using special tool **0 495 102 (11 4 470)**.
- Check the stud bolts (arrows) on the cylinder head for correct fit.

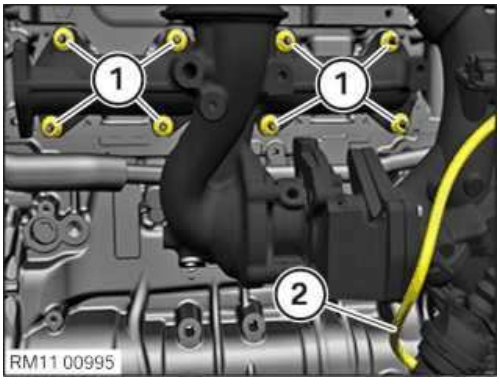


- Clean the sealing surfaces on the exhaust manifold using special tool **0 495 102 (11 4 470)**.



- Renew gasket (1).

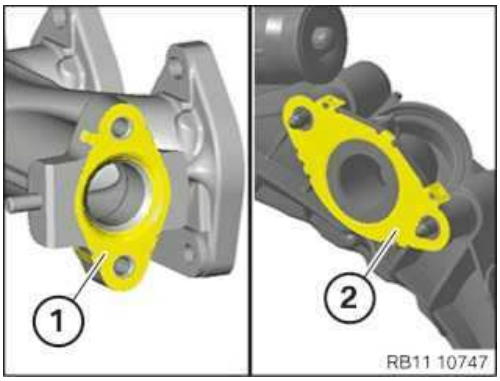
  Parts: Gasket
- Install new gasket (1).



- Feed in and install the exhaust manifold and the high-pressure stage exhaust turbocharger.
- Tighten nuts (1).

  Parts: Nuts
- Connect vacuum hose(2).

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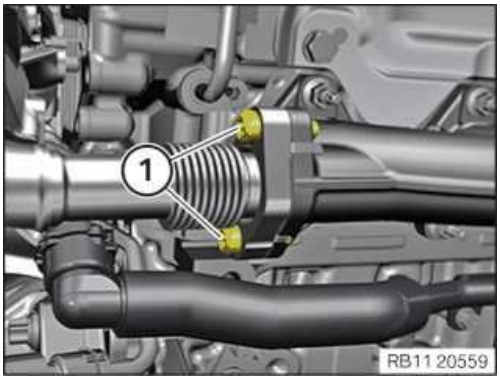


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

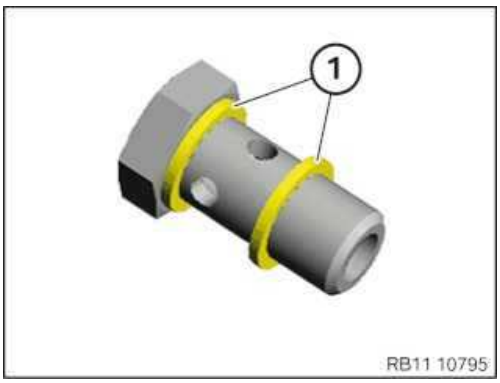
  Parts: Gasket



- Tighten the screws (1).

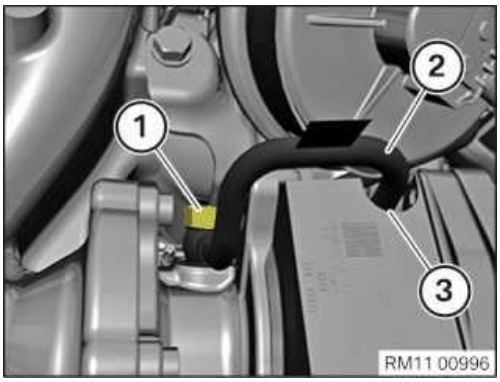
Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm



- Renew sealing rings (1) of banjo bolt.

  Parts: Sealing ring

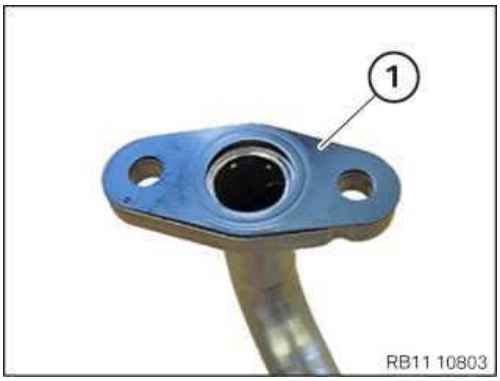


- Guide the oil feed line into the holder (3) and install it.
- Tighten down screw (1).



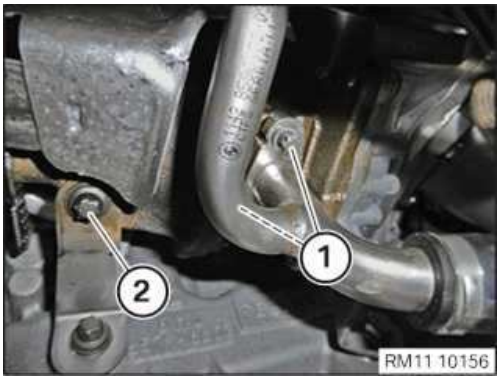
- Tighten bolt (1) from the right wheel arch.

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- Renew seal (1) of oil return line.

  Parts: Gasket



- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

96 – Installing the low-pressure stage turbocharger

RISK OF DAMAGE

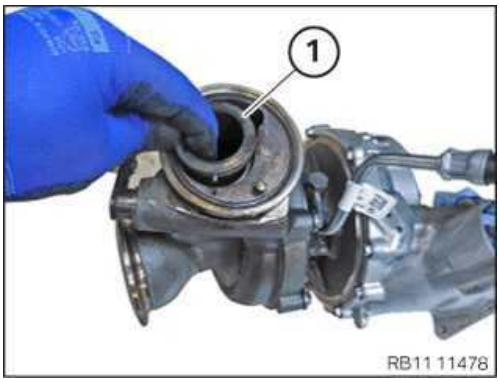
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.



- Check the spacer plug (1) for damage, renew if necessary.

  Parts: Spacer ring
- Insert and install the spacer ring (1).
- Position spacer ring (1) correctly.

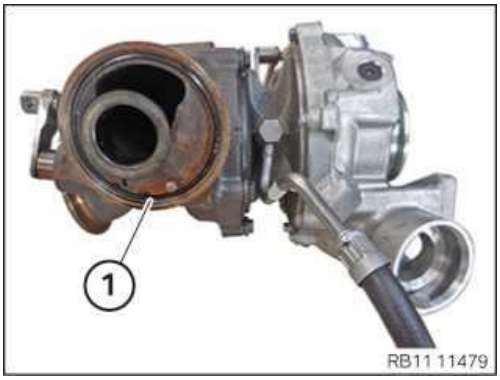
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- Renew gasket (1).

  Parts: Gasket
- Position the seal (1).
- Renew the sleeve(2).

  Parts: Holding sleeve



- Renew sealing ring (1).

  Parts: Sealing ring
- Affix the sealing rings on the exhaust turbocharger.

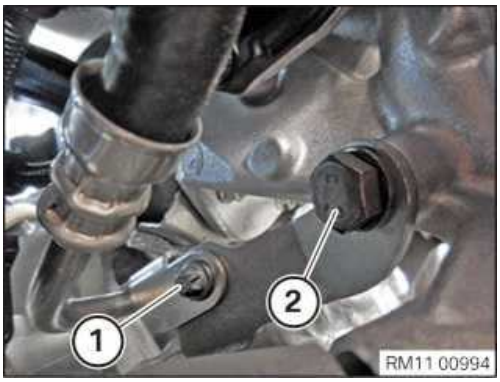


- Insert and install the low-pressure stage exhaust turbocharger on the exhaust manifold .
- Feed in and install V-band clamp .
- Tighten V-band clamp (2).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Screw in nut (1) with 2 **revolutions**.



- Tighten down screw (1).

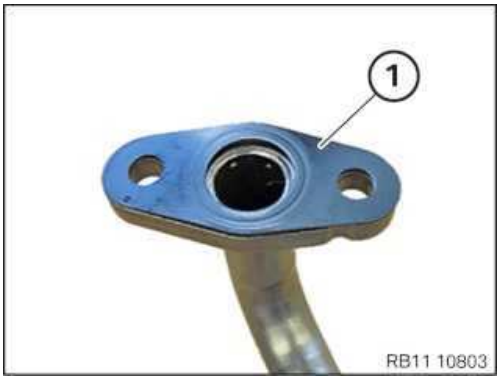
Oil feed line to bracket

Torx screw M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

Holder to exhaust turbocharger and crankcase

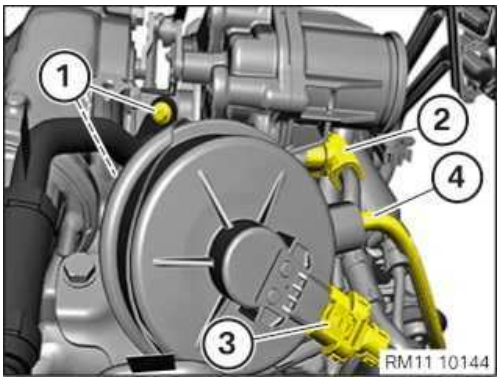
M8x16		Tightening torque	22 Nm



- Renew seal (1) on the oil return line.

  Parts: Gasket

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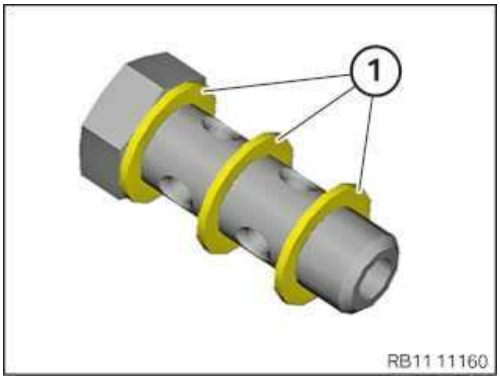
- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

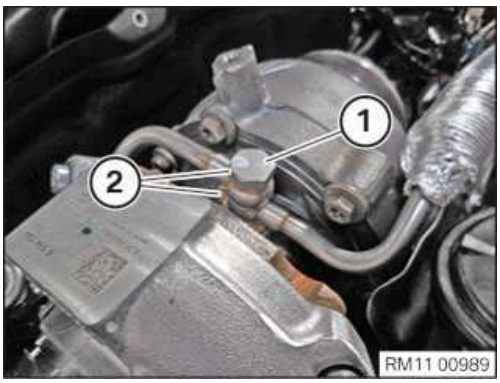
M6x12		Tightening torque	8 Nm

- Connect and lock connectors (2) and (3).

  The locks must engage audibly.
- Connect vacuum hose (4).



- Renew banjo bolt and sealing rings (1).
- **Parts:** Banjo bolt, sealing rings



- Install sealing rings (1).
- Tighten the banjo bolt (1).
- Ensure that the lines do not rest against the adjacent components.

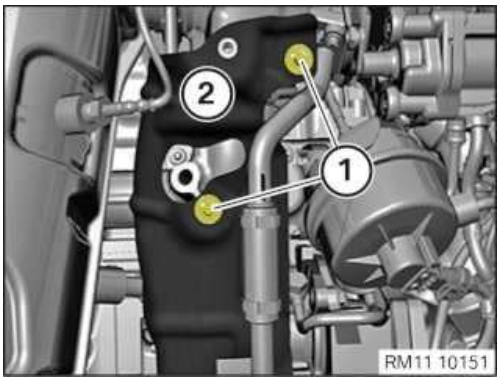
97 – Installing heat shield on exhaust turbocharger at bottom

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

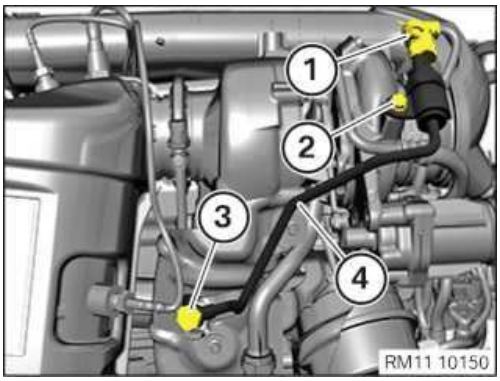


- Feed in and install the heat shield (2).
- Tighten the bolts (1) on the heat shield .

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

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- Position the exhaust gas pressure pipe (4).
- Hand-tighten the bolt (2).
- Renew sealing rings on the banjo bolt (3).

  Parts: Sealing ring
- Tighten the banjo bolt (3).

Banjo bolt for exhaust pressure pipe to exhaust manifold

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

- Tighten down screw (2).

Standard screw connection M6

M6		8 Nm

- Connect connectors (1) and lock.

  Lock must audibly engage.

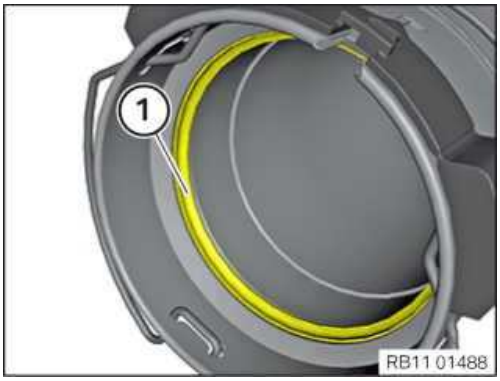
98 – Installing the right charge air duct between the exhaust turbocharger and the charge air cooler

RISK OF DAMAGE

Damage to the exhaust turbocharger.

A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.



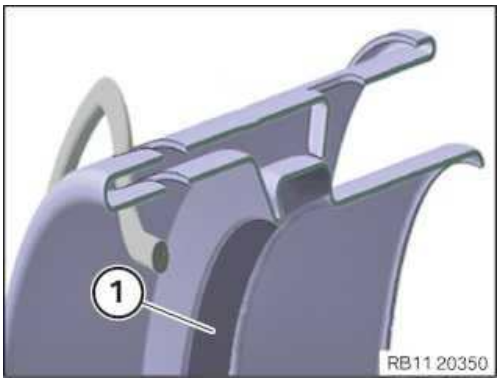
- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Gasket

▶ **Replace damaged gasket**

TECHNICAL INFORMATION

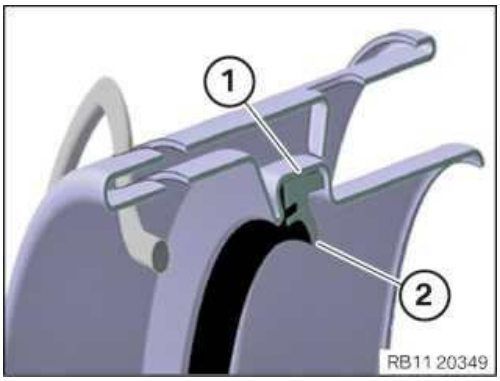
Do not use pointed or sharp-edged tools for the installation and/or removal.



- Remove damaged seal.
- Clean gasket groove (1) with a dry towel.

  The gasket groove (1) must be clean.

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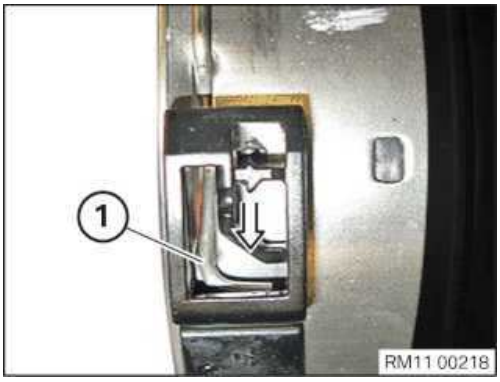
- Renew gasket.

  Parts: Gasket
- Install seal dry without lubricant or mounting agent.

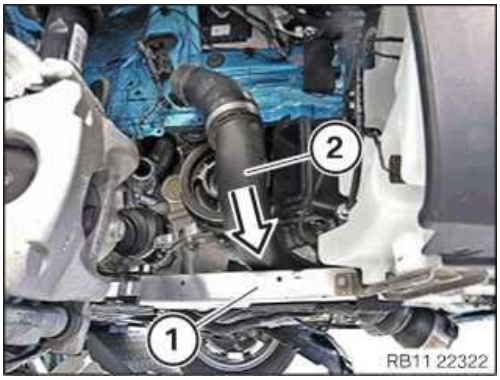
TECHNICAL INFORMATION

Incorrect assembly is possible. Ensure correct installation position.

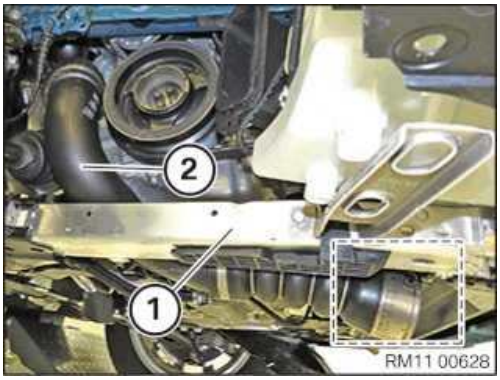
- Feed in and install the seal.
- Make sure the seal is correctly installed in the gasket groove (1).
- Make sure that the sealing lip (2) is pointing downwards (see figure).



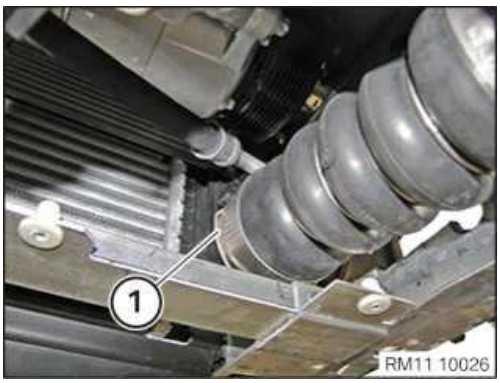
- Detach the locks (1) in the direction of the arrow from the brackets.
- Ensure that the locks (1) engage audibly.



- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed in the charge air duct (1) in the **direction** of arrow between the side member and the deformation element and position.

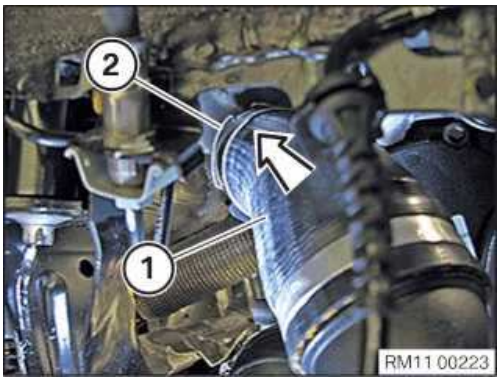


- Pull the adapter of the front axle support (1) downwards to the front right.
- Position the charge air duct (2) in **marked** area on the charge air cooler.



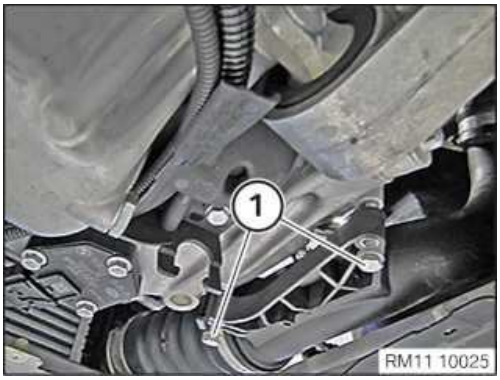
- Feed in and install the charge air duct (1) on the charge air cooler .
- Make sure the charge air duct (1) engages audibly on the charge air cooler.

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- Feed in and install charge air duct (1) in the **direction** of the arrow on exhaust turbocharger.

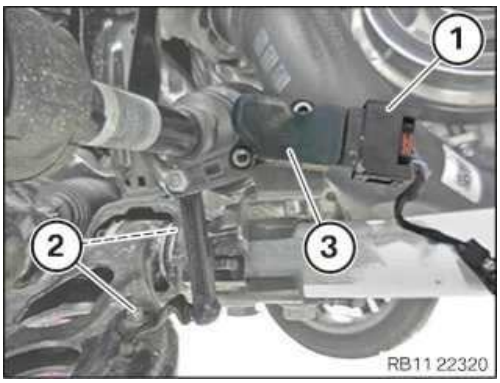
  The locks (2) must engage audibly.



- Tighten the screws (1).

Charge air duct to oil sump

M6		Tightening torque	8 Nm



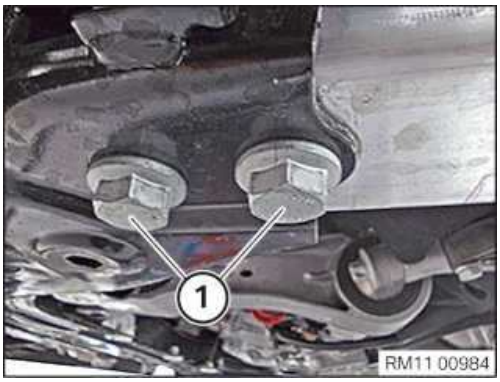
- **If installed:**
- Feed in and install the ride height sensor (3).
- Tighten the screws (2).

Ride height sensor holder to front axle support

M6		Tightening torque	8 Nm

- Connect and lock the connector (1).

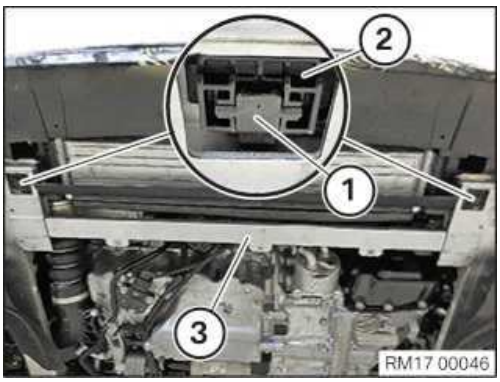
  The connector (1) must engage audibly.



- Tighten the screws (1) on the adapter of the front axle support.

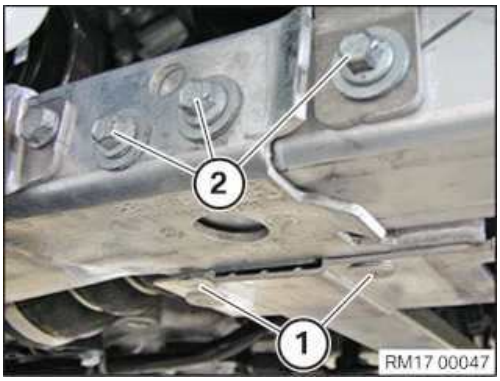
Adapter, front axle support to front axle support

		Tightening torque	100 Nm



- Guide in cross connection (3) and install.
- Guide in locks (2) and install.
- Lock the locking pins (1).
- Ensure that the locking pins (1) audibly engage.

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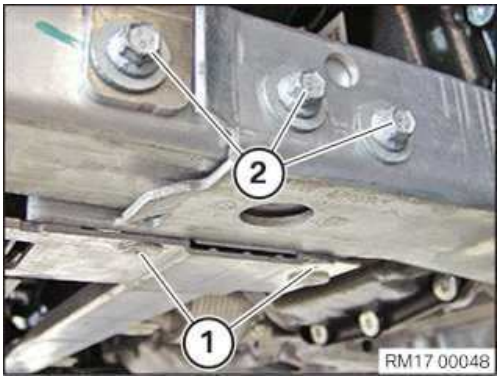
- Tighten the bolts (2) at the front left.

Cross connection to front axle support

M6		Tightening torque	12 Nm

- Renew the blind rivet (1).

  Parts: Blind rivet
- Mount the blind rivets (1) at the front left.



- Tighten the bolts (2) at the front right.

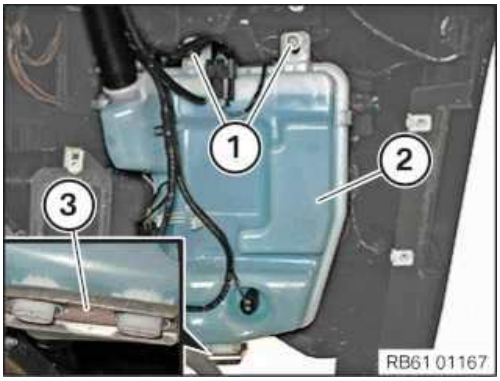
Cross connection to front axle support

M6		Tightening torque	12 Nm

- Renew the blind rivet (1).

  Parts: Blind rivet
- Mount the blind rivets (1) at the front right.

99 – Install the washer fluid reservoir in the fixture

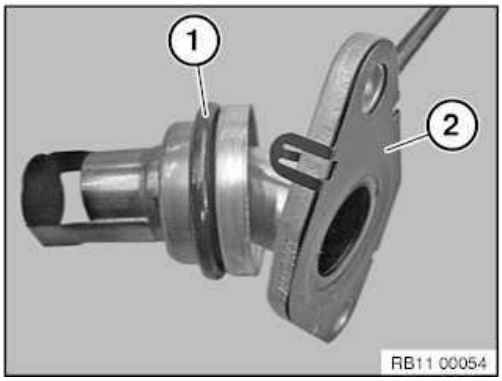


- Feed washer fluid reservoir (2) into the mounting (3) and install.
- Tighten the screws (1).

Washer fluid reservoir to body

M6x20		Tightening torque	8 Nm

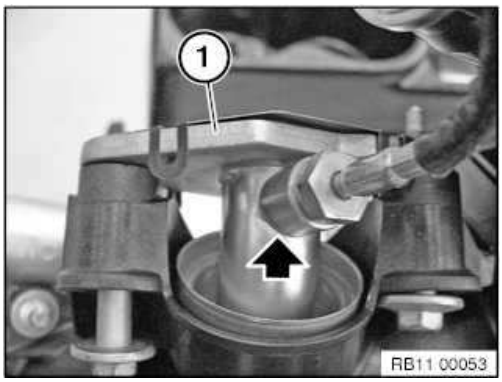
100 – Installing the intake plenum



- Renew O-ring (1).

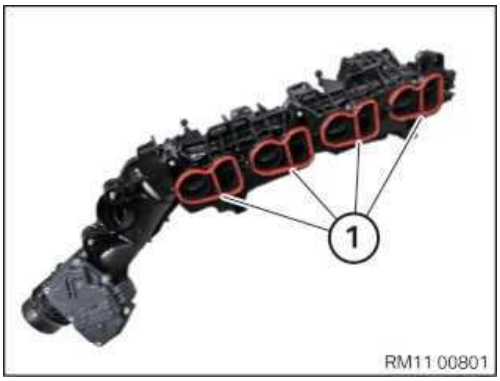
  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position the seal (2) and clip it in.



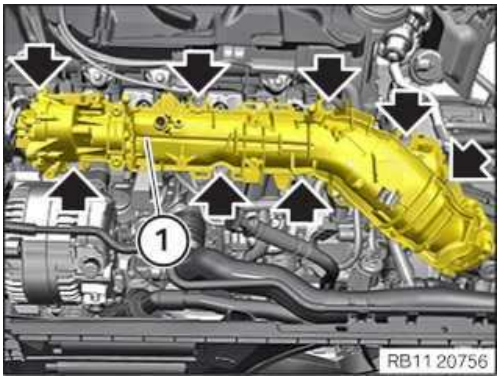
- Install the exhaust-gas recirculation pipe (1) in the intake plenum.

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- Renew gaskets (1).

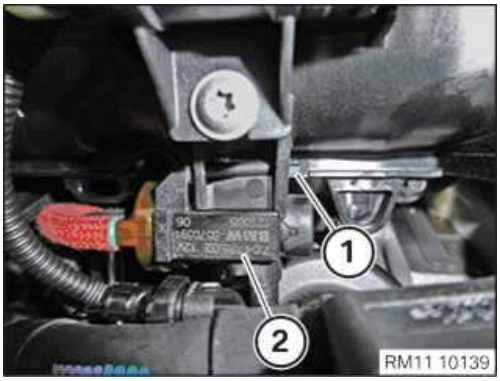
  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.



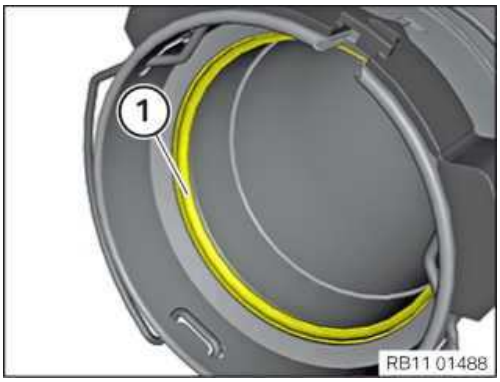
- Guide in and install intake (1) plenum.
- Tighten screws (arrows).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm

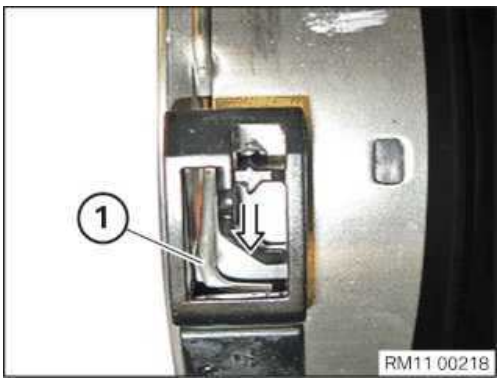


- Install the electric changeover valve (2) in the holder on the plenum from left to right.
- Lock (1) must engage audibly.



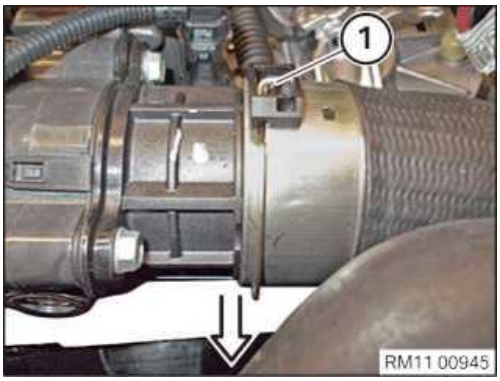
- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring



- Engage the lock (1) on the bracket (arrow).

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- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

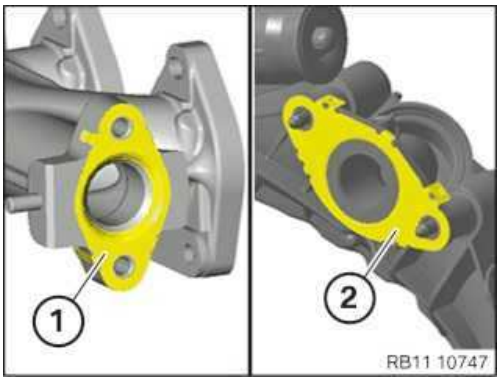
101 – Installing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

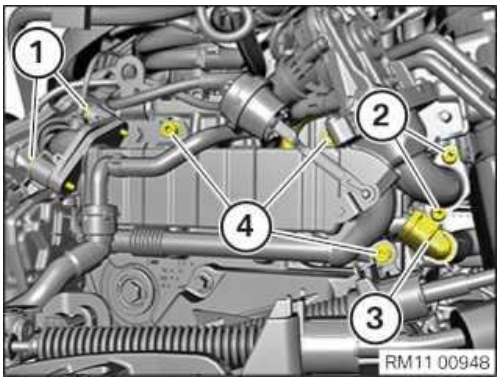


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket
- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket

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- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts
- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

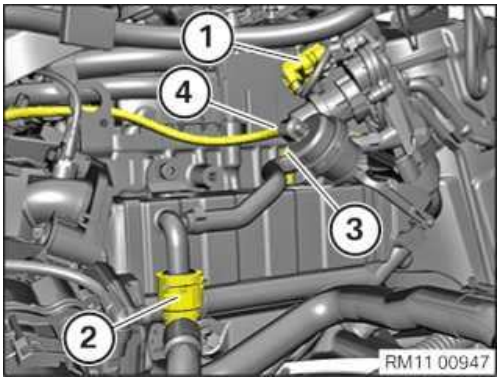
M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.
- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm



TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

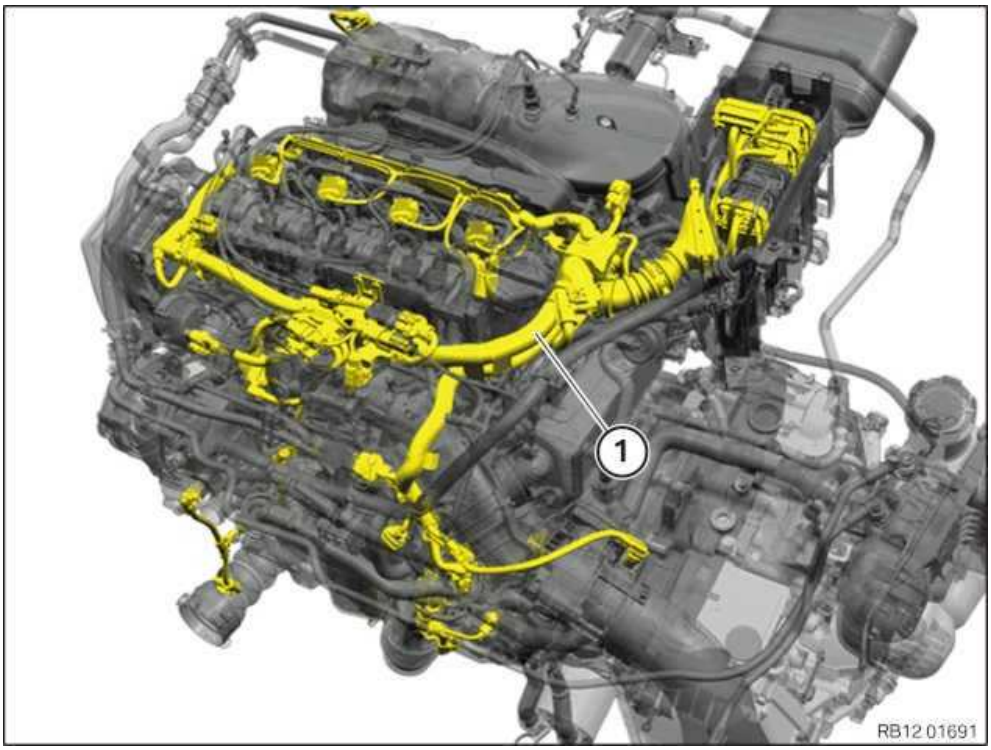
- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

102 – Fastening the wiring harness section for the intake plenum

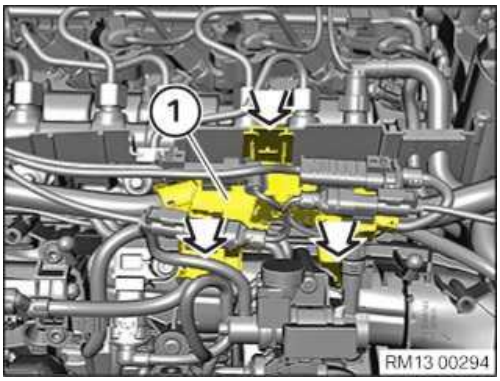
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Overview: Wiring harness section for the engine

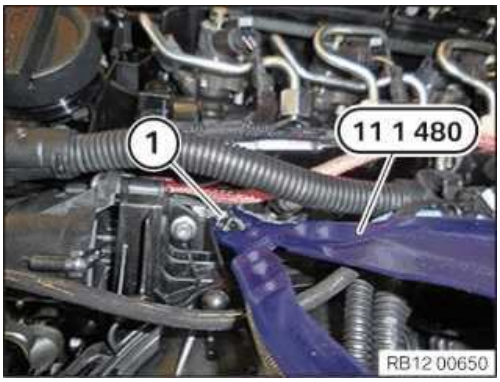


1 Wiring harness section for the engine

▶ **Installing the cable clip for the intake plenum**

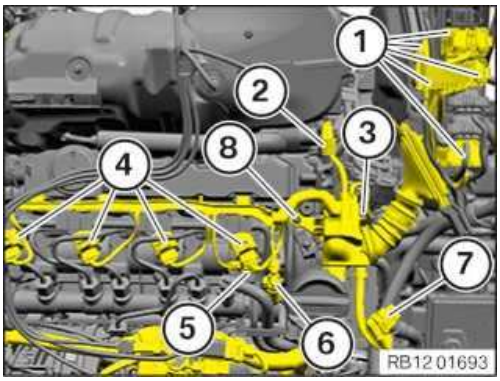


- Insert and install the cable clip (1) in the direction of the arrow.
- Make sure the cable clip (1) is fitted correctly.



- Connect and lock the connector (1) on the glow elements.
  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.

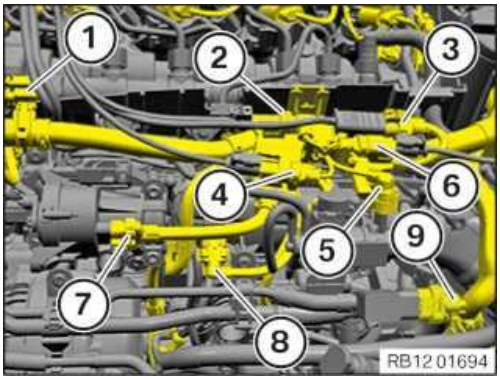
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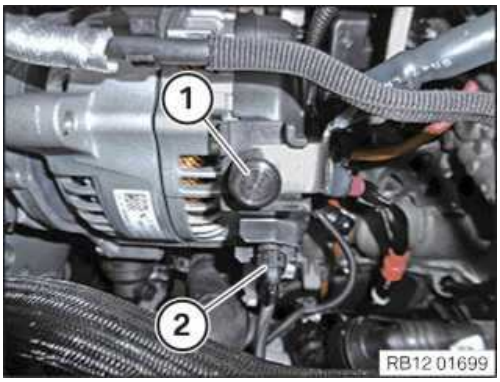
- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the DME control unit and remove the integrated supply module (PDM).
- Attach connector (2) to the differential pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust-gas recirculation valve and lock audibly.
- Attach connector (4) to the injectors and lock it audibly.
- Attach connector (5) to the camshaft sensor and lock it audibly.
- Attach connector (6) to the fuel pressure regulator and lock it audibly.
- Connect and audibly lock the connector (7) to the hot film air mass meter.
- Tighten down screw (8).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm



- Connect the connector (1) to the rail pressure sensor and lock it audibly.
- Attach connector (2) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (3) to the front oxygen sensor and lock audibly.
- Attach connector (4) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Connect the connector (5) to the electric changeover valve and lock audibly.
- Attach connector (6) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (7) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (8) to the charging pressure sensor and lock it audibly.
- Attach connector (9) to the fuel pressure and temperature sensor and lock it audibly.

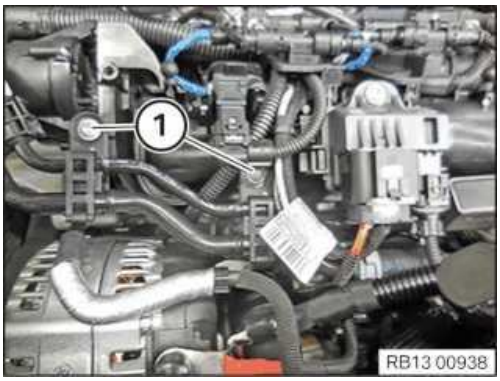


- Connect and lock the connector (2).

  Lock must snap audibly into place.
- Connect the positive battery cable (1) and tighten.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

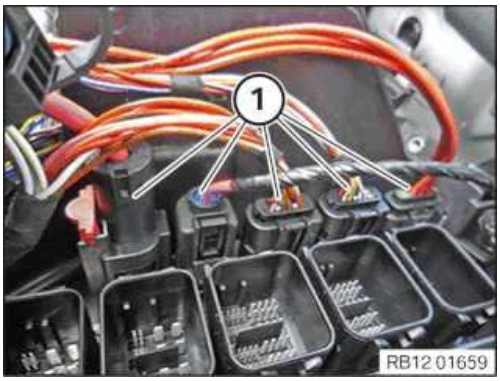


- Position the fuel line.
- Tighten the screws (1).

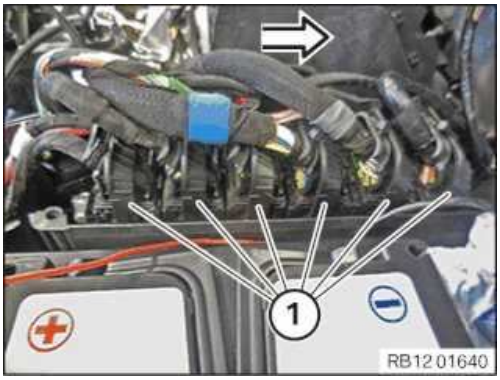
Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

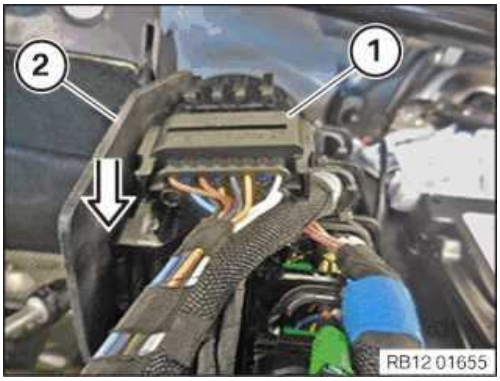
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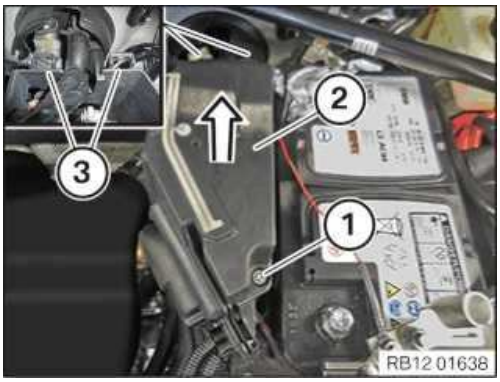
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



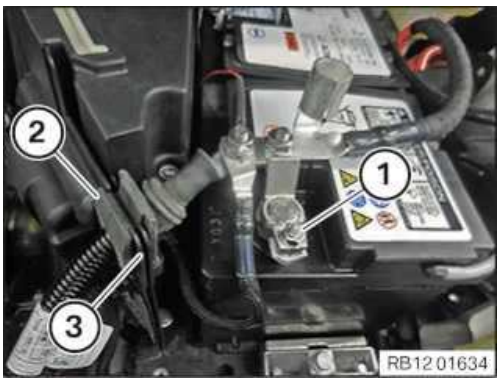
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert and install the cover (2) into the guides (3) in the direction of the arrow.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

RF5x26.5		Tightening torque	2,5 Nm

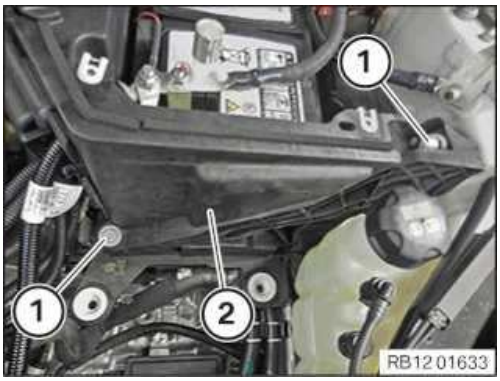


- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

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- Feed in and install tension strut (2).
- Tighten the screws (1).

Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

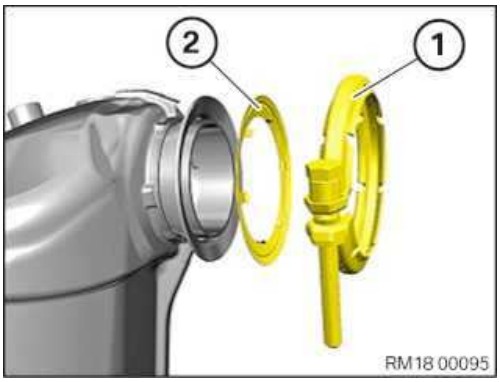
103 – Installing the diesel particulate filter

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



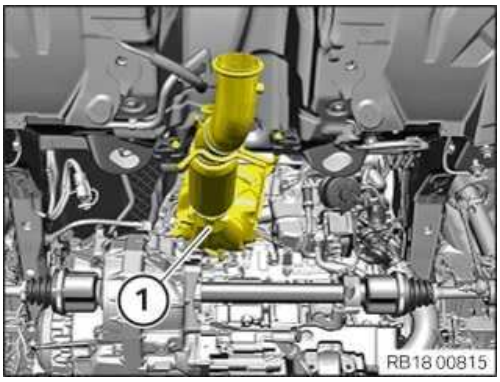
- Renew the V-clip (1).

  Parts: V-band clamp
- Renew the gasket (2).

  Parts: Gasket

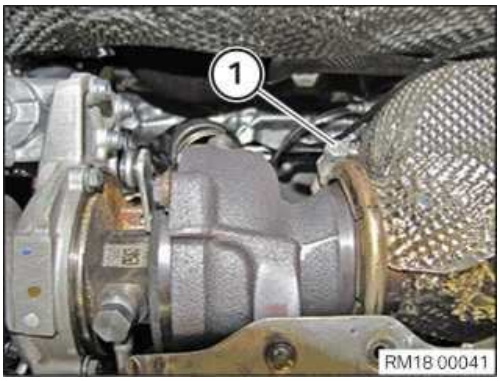


- Before installing the diesel particulate filter: Mount fitting aid (1) for the flexible tube.



- Carefully insert and install the diesel particulate filter (1).

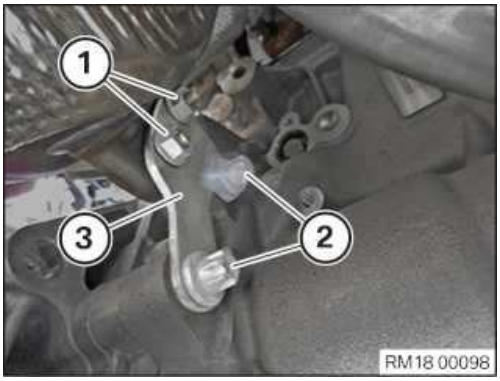
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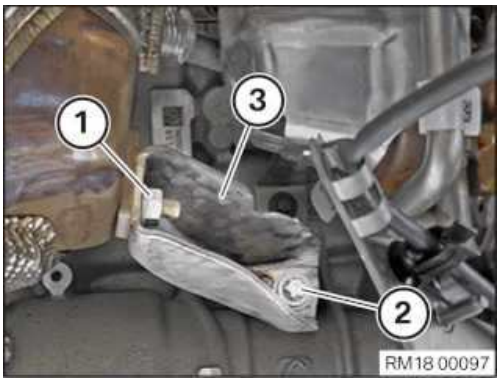
- Feed in and install V-band clamp (1).
- Make sure that the seal between the diesel particulate filter and the exhaust turbocharger is installed correctly.
- Align the diesel particulate filter on the exhaust turbocharger.
- Position V-clip (1).
- Hand-tighten the V-clip (1).



- Tighten nuts (1) by hand.



- Install holder (3).
- Hand-tighten the bolts (2).
- Tighten nuts (1) by hand.

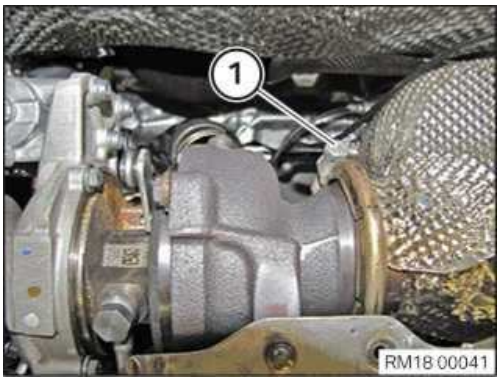


- Install holder (3).
- Tighten the nut (1) hand-tight.
- Hand-tighten the bolt (2).



- Remove fitting aid (1) for the flexible tube.

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- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

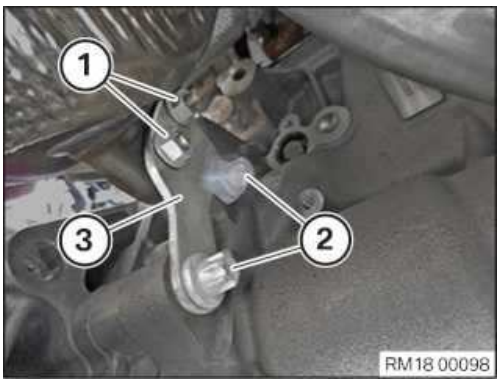
V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm



- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screws (2).

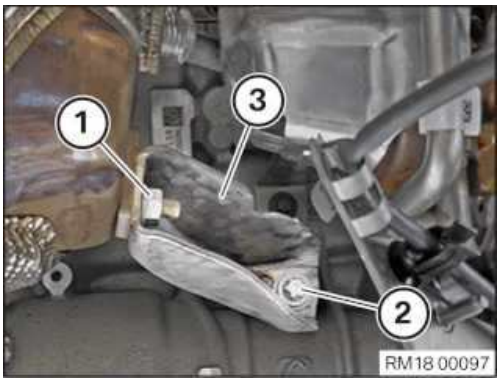
Diesel particulate filter holder to gearbox

M12x75		Tightening torque	66 Nm

- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screw (2).

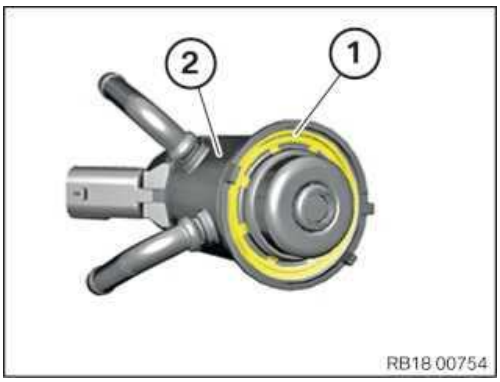
Diesel particulate filter bracket to crankcase

M10x35		Tightening torque	38 Nm

- Tighten nut (1).

Diesel particle filter to holder

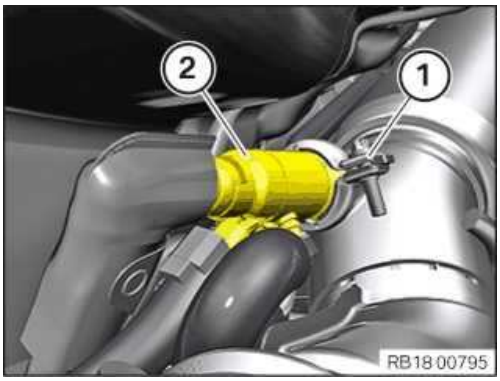
M8 hexagon nut		Tightening torque	19 Nm



- Renew sealing ring (1) of the SCR metering module (2).

  Parts: Sealing ring

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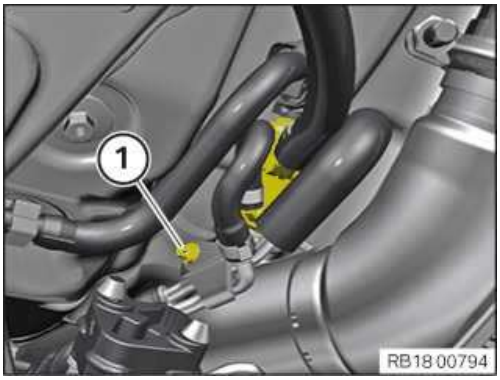


- Insert and install the SCR metering module (2).
- Renew the V-clip (1).

  Parts: V-band clamp
- Tighten V-band clamp (1).

SCR metering module V-clip to exhaust system

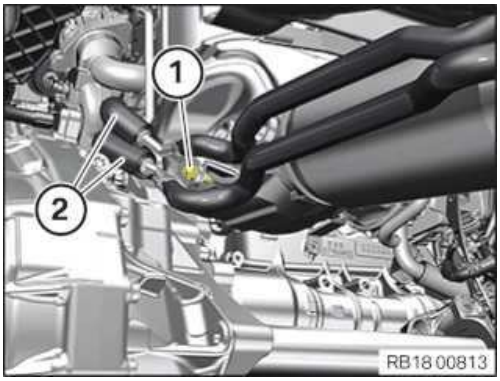
V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm



- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm

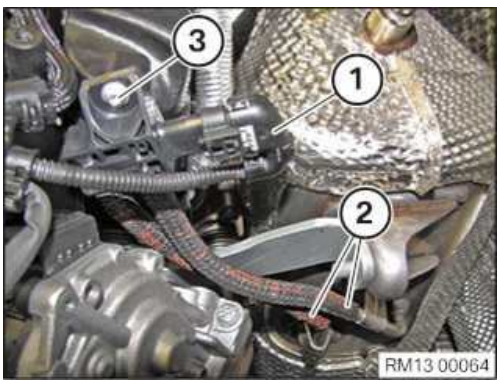


- Thread in and install coolant line (2) of the SCR metering module.
- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm

▶ **Installing differential pressure sensor**



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

104 – Install the control sensor

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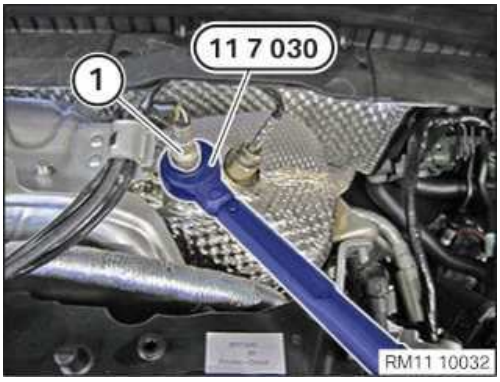
TECHNICAL INFORMATION

New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue



- Feed in front oxygen sensor (1) and install.
- Tighten front oxygen sensor (1) using special tool .

Control sensor

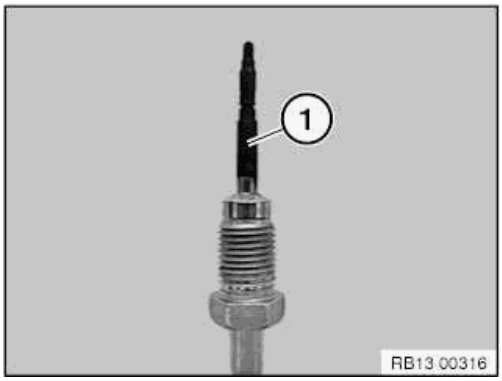
Control sensor		Tightening torque	50 Nm



- Lay and secure cable of oxygen control sensor.
- Secure the connector (2) to the holder.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

105 – Install the exhaust-gas temperature sensor on the diesel particulate filter



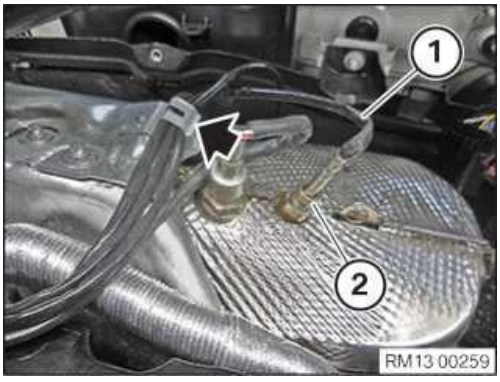
RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

- Check the gauge tip (1) for damage and renew the exhaust temperature sensor as needed.



- Feed in and install the exhaust temperature sensor (2).
- Tighten the exhaust temperature sensor (2).

Exhaust temperature sensor to diesel particulate filter

Exhaust-gas temperature sensor		Tightening torque	28 Nm

- Insert and install cable (1) of the exhaust temperature sensor in the clamp (arrow).

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- Lay and fasten the cable of the exhaust gas temperature sensor.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

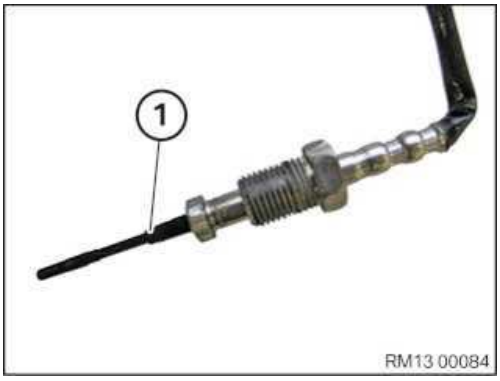
106 – Installing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

RISK OF DAMAGE

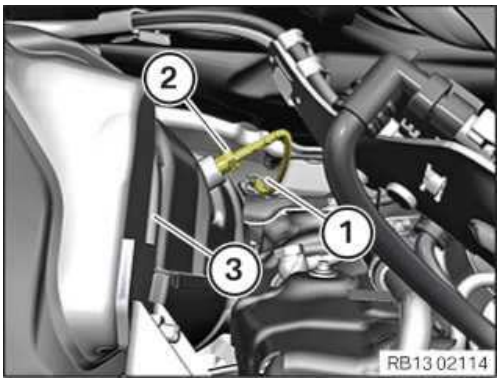
Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.



- Make sure the gauge tip (1) is not damaged during installation.

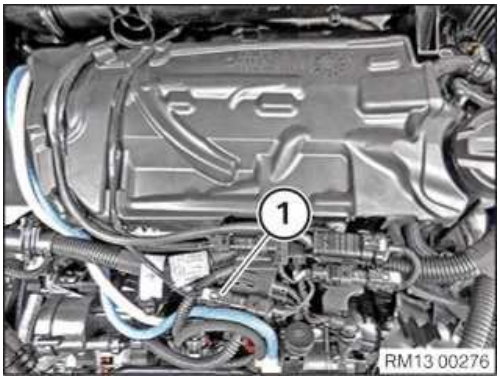


- Guide the exhaust temperature sensor (2) into diesel particulate filter (3) and install.
- Tighten the exhaust temperature sensor (2) with conventional tools .

Exhaust temperature sensor to diesel particulate filter

Exhaust-gas temperature sensor		Tightening torque	28 Nm

- Insert and install the cable of the exhaust temperature sensor (2) in the clamps (1).

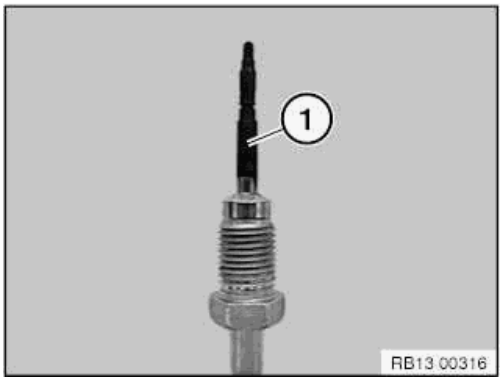


- Lay and fasten the cable of the exhaust gas temperature sensor.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

107 – Installing exhaust temperature sensor on catalytic converter

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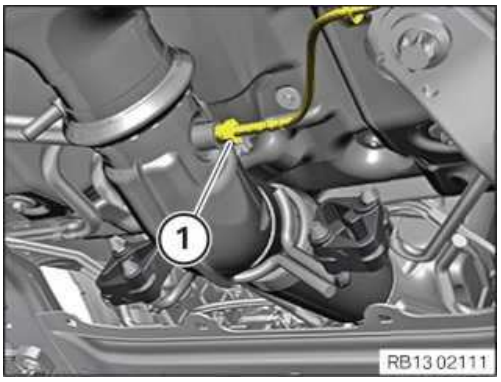
RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

- Check the gauge tip (1) for damage and replace the exhaust temperature sensor as needed.



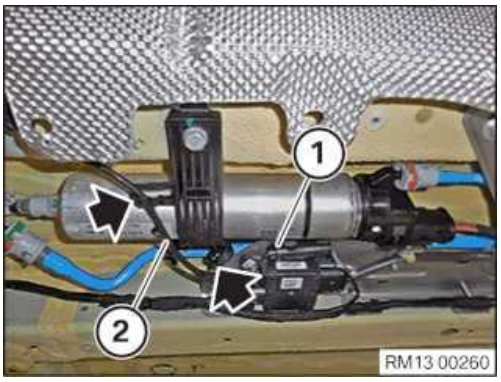
- Feed in and install the exhaust temperature sensor (1).
- Tighten the exhaust temperature sensor (1).

Exhaust-gas temperature sensor to exhaust system

Exhaust-gas temperature sensor		Tightening torque	28 Nm



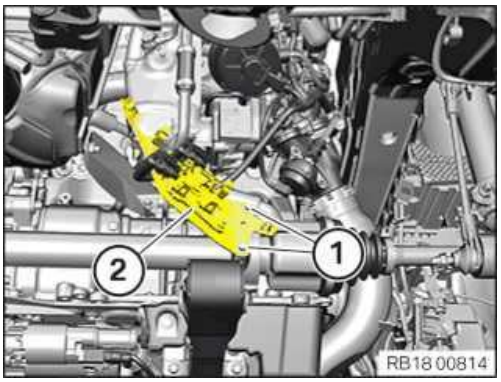
- Secure the cable clips (1).



- Feed cable (2) from exhaust temperature sensor into the clamps (arrows) and install.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

108 – Install holder for oxygen sensor



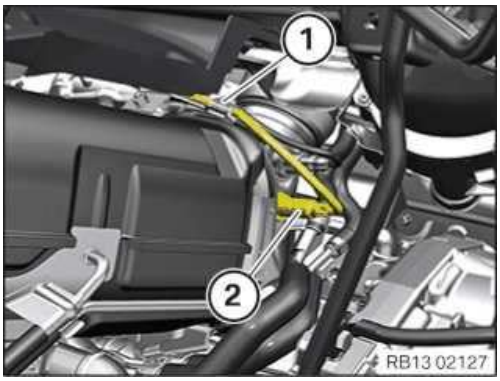
- Insert and install the holder (2).
- Tighten the screws (1).

Oxygen sensor holder to intermediate shaft

Hexagon screw M6x16		Tightening torque	8 Nm

109 – Installing the nitrogen oxide sensor before SCR catalytic converter

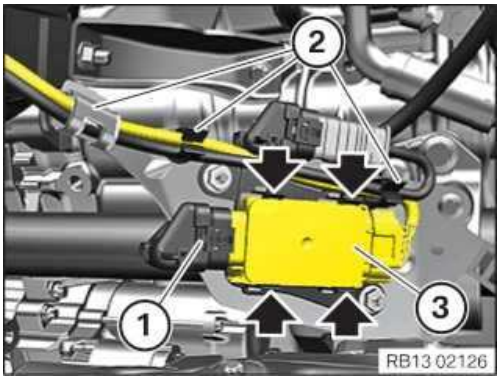
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- Insert nitrogen oxide sensor before the SCR catalytic converter (2) and install.
- Tighten the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

Nitrogen oxide sensor before SCR catalytic converter

Sensor		Tightening torque	50 Nm



- Install and lock the evaluation electronics for the nitrogen oxide sensor (3) (arrows).
- Insert the evaluation electronics cable for the nitrogen oxide sensor (3) into the clamps (2) and install.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

110 – Install the monitoring sensor

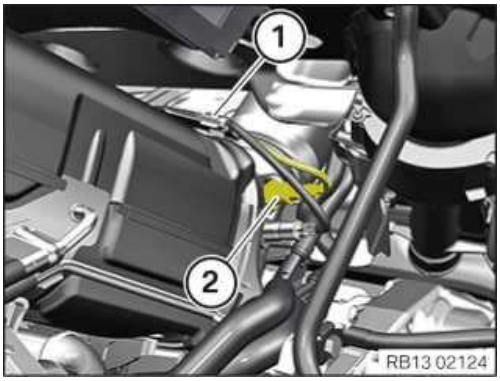
TECHNICAL INFORMATION

New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

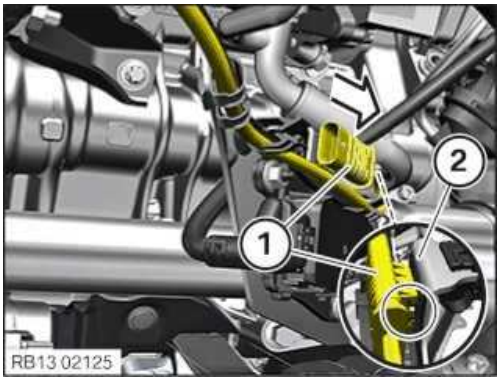


- Feed in the monitoring oxygen sensor (2) and install.
- Tighten the monitoring oxygen sensor (2) with special tool **0 491 074 (11 7 020)** .

Monitoring sensor

Sensor		Tightening torque	50 Nm

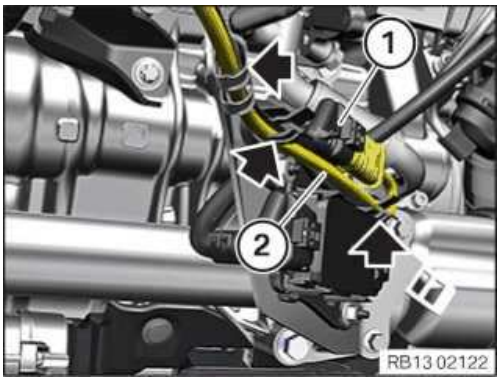
- Insert the cable of the monitoring oxygen sensor (2) into the clamp (1) and secure it.



- Connect the connector (1) with the bracket (2) in the direction of arrow.
- Make sure that the connector (1) is locked correctly in the marked area.

  The connector (1) must engage audibly.

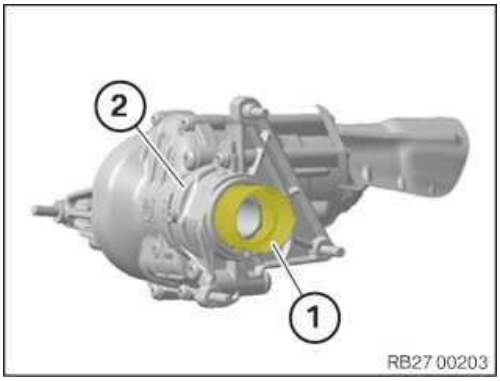
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- Insert and attach the cable of the monitoring oxygen sensor (2) to the clamps (arrows).
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

111 – Install the transfer box (VTG)



- If intermediate shaft (1) gets caught on transfer box (VTG) (2), renew intermediate shaft (1) and the radial shaft seals in the automatic or manual transmission.



- Screw special tool **2 409 025** into the outer radial shaft seal.
- Turn the screw on the special tool **2 409 025** until the outer radial shaft seal has been pulled out.

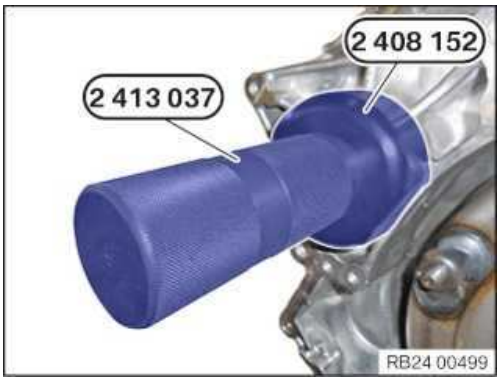


- Insert special tool **2 411 739** into the inner radial shaft seal.

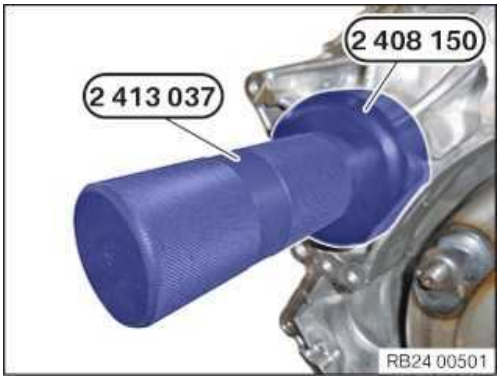


- Screw special tool **2 411 739** into the inner radial shaft seal.
- Turn the screw on the special tool **2 411 739** until the inner radial shaft seal has been pulled out.

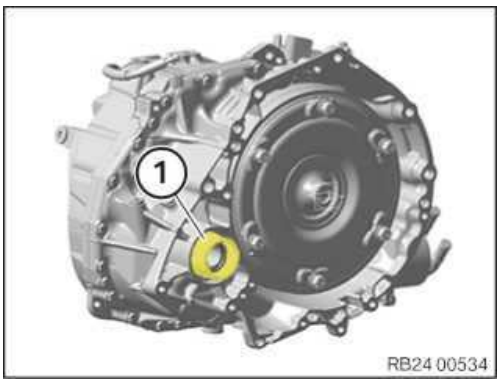
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- Drive in the inner radial shaft seal using special tools **2 408 152** and **2 413 037** up to the limit position.



- Drive in the outer radial shaft seal using special tools **2 413 037** and **2 408 150** up to the limit position.



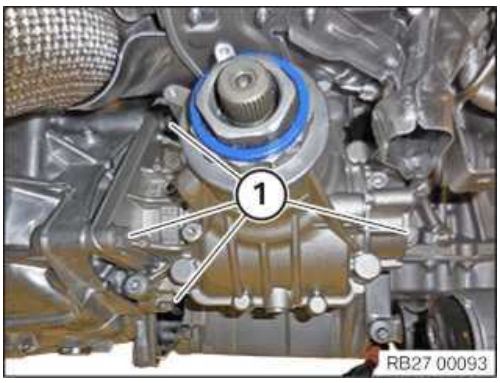
- If necessary, connect the new intermediate shaft (1) to the output flange of the automatic transmission or manual transmission.



- Coat the inside of the output flange (arrows) evenly with approx. 5 g of grease.

Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754

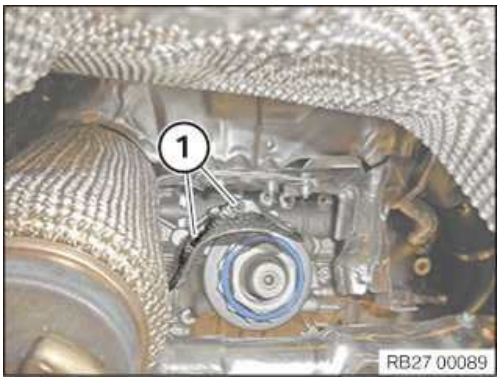


- Install the transfer box (VTG).
- Tighten the screws (1).

Transfer box to transmission

M10		Tightening torque	56 Nm

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- Install heat shield.
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Heat shield to transfer box

M6	Renew screws.	Tightening torque	6 Nm

▸ **Check the transfer box oil level**

RISK OF DAMAGE

Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.



- Check transfer case oil level, correct:
- Open the oil filler plug (1).
- Check transfer box oil level.
- If necessary, top up transmission oil up to the lower edge of the oil filler plug opening (1).

Transmission oil

Technically suitable transfer box and electrical transmission oils	

Main group 27

- Tighten the oil filler plug (1).

Oil filler plug on transfer box (VTG)

M18x1.5		Tightening torque	35 Nm

112 – Install the intermediate shaft with the support tube

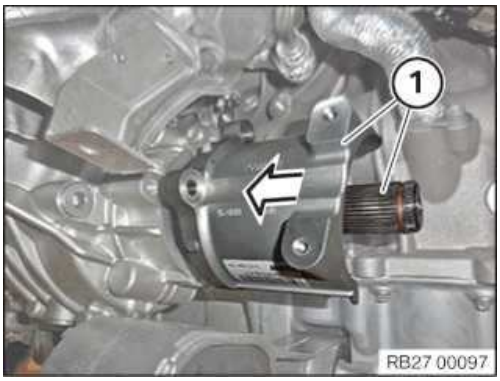


- Coat gearing of the intermediate shaft uniformly with 5 g of grease.

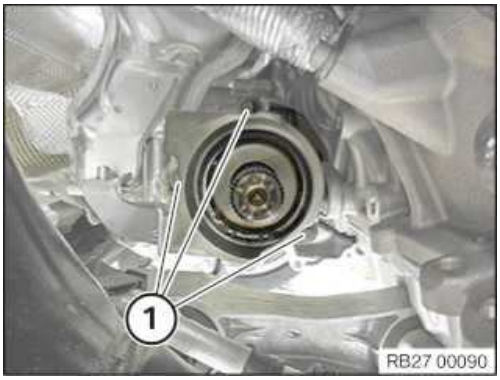
Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754

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- Install the intermediate shaft with support tube (1) in the transfer box.



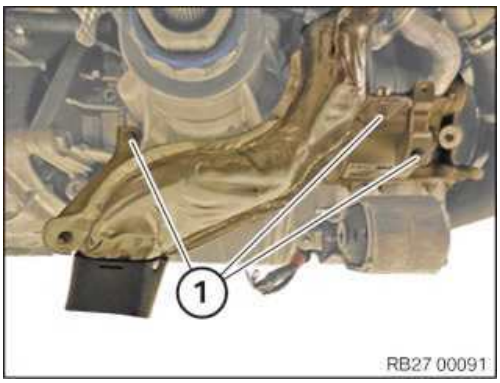
- Position screws (1).

Note: Check for correct screw length! Bolt M8x35 8.8

- Tighten the screws (1).

Intermediate shaft to transfer box

M8x35		Tightening torque	19 Nm



- If installed: Install air duct.
- Tighten the screws (1).

113 – Installing starter motor

CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.



- Insert and install the starter motor .
- Tighten the screws (1).

Starter motor to transmission

M8x45		Tightening torque	19 Nm

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- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

Battery positive lead to starter

M8		Tightening torque	13,5 Nm



- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.

114 – Installing right output shaft partially



- Renew the circlip (1).

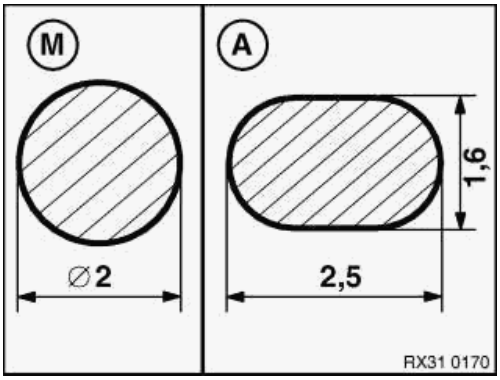
  Parts: Circlip
- Slide output shaft into the transmission as far as the limit position.
- Check for secure seat by levering.

115 – Partially installing the left output shaft



- **With automatic transmission only:**
- Lever out O-ring (1).
- Renew O-ring (1).

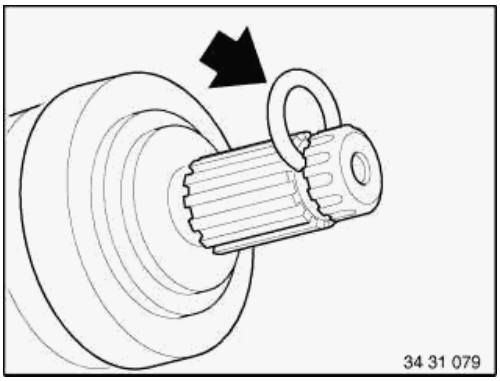
  Parts: O-ring
- Insert new O-ring (1).



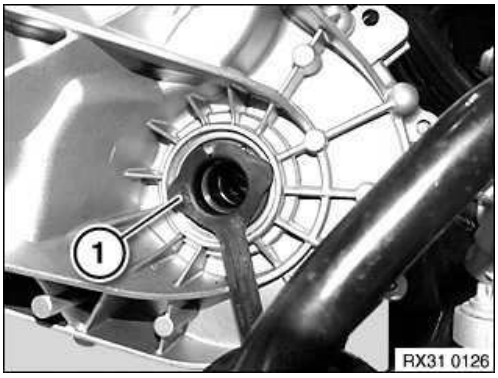
- Do not mix up circlips.

  Different types of output shafts fitted:
  - M: Manual transmission
  - A: Automatic transmission

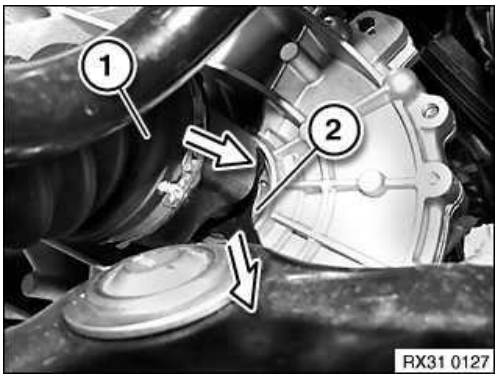
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- Renew circlip (arrow).



- Insert installation protection ring (1) into the radial shaft seal.
- Make sure the tool fits over the lip of the radial shaft seal so there is no damage to sealing ring when the output shaft is inserted.



- Insert output shaft (1) into transmission.
- **Manual gearbox only:** Pull on the handle to remove the installation protection ring (2) and dispose of it.
- Slide output shaft (1) into the transmission as far as the limit position.

  The output shaft (1) must engage audibly.
- Check for secure seat by levering.

116 – Install propeller shaft.

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

RISK OF DAMAGE

Damage to the propeller shaft during installation.

Non-observance of the installation guidelines for the propeller shaft on the rear axle differential may cause severe damage.

- Always renew the recessed nut on the rear axle differential. Screw locking must be available.
- Strictly observe a minimum hardening time of two hours after having screwed in the recessed nut. The hardening time may be longer at lower temperatures.

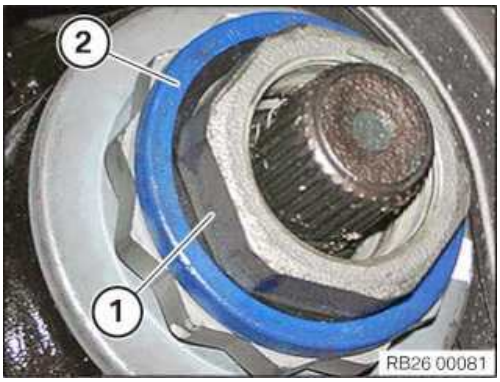
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RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.



- Renew recessed nut (1).

  Parts: Insert nut
- Renew the retaining clip (2) and the seal.

  Parts: Retaining clip, seal
- Insert the seal with the recessed nut (1) and install.
- Insert the retaining clip (2) and install.
- Make sure that recessed nut (1) is screwed in within 5 min.
- Make sure that the hardening time of **minimum** 2 h for the recessed nut is observed.

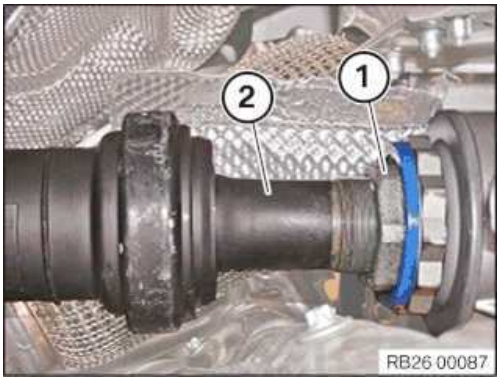
  The hardening time must be extended at lower temperatures.



- Insert the propeller shaft (1) and install.
- Always support the propeller shaft (1) with a conventional jack.

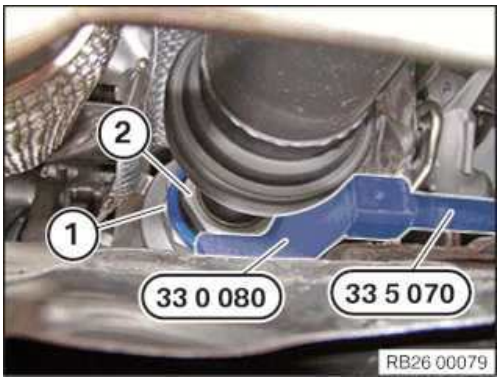


- Hand-tighten the bolts (1).



- Push the propeller shaft (2) against the recessed nut (1) up to the limit position.
- Screw the propeller shaft (2) at least 2 thread starts onto the recessed nut (1) by hand.

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RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.

- Protect the recessed nut (2) on the transfer box from twisting with the special tools **0 495 554 (33 5 070)** and .

  The recessed nut (2) on the transfer box must **not** be used to tighten the propeller shaft.

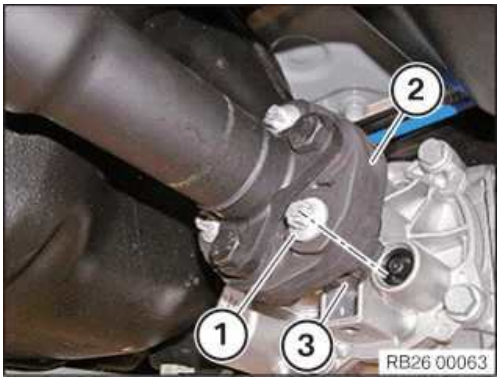
  The double hexagon flange nut (1) must **not** be used for counter support.



- Tighten the front propeller shaft with the special tools **0 495 554 (33 5 070)** and in the direction of the arrow.

Propeller shaft to transfer box

		Tightening torque	80 Nm



TECHNICAL INFORMATION

Compliance with the following instructions is required to avoid a humming noise from the propeller shaft after refitting the propeller shaft.

- Assemble the screw connection (1) of the flexible disc (2) and the three-hole flange (3) according to the mark.
- Renew screws (1).

  Parts: Bolts

- Hand-tighten the bolts (1).



- Protect the propeller shaft (1) with the special tools **0 495 554 (33 5 070)** and from twisting.

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- Tighten the bolts with the special tools **0 490 504 (00 9 120)** and .

Flexible disc to rear axle final drive

M12x1.5	Renew screws.	Tightening torque	55 Nm 90 °



- Tighten the screws (1).

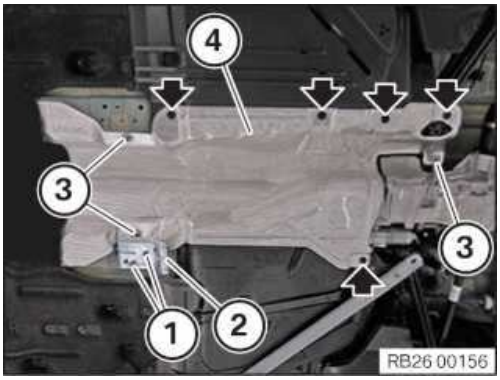
Centre mount to body

M8		Tightening torque	19 Nm



- Guide the special too l out between the front and rear propeller shaft and remove.

117 – Installing the rear heat shield



- Insert and install the heat shield (4).
- Tighten screws (arrows).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

- Tighten nuts (3).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

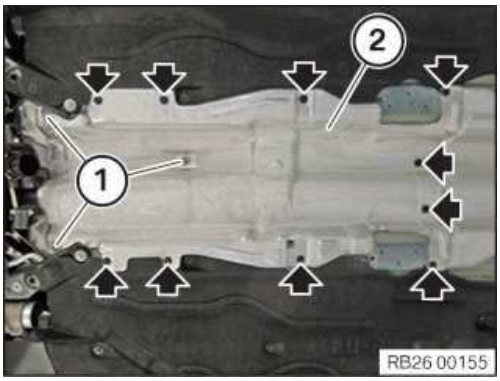
- Insert and install the holder (2).
- Tighten the screws (1).

Bracket to body

M8		Tightening torque	21 Nm

118 – Install the front heat shield

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- Insert and install the heat shield (2).
- Tighten screws (arrows).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

- Tighten nuts (1).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

119 – Install exhaust system

CAUTION

Component with heavy weight.

Danger of injury!

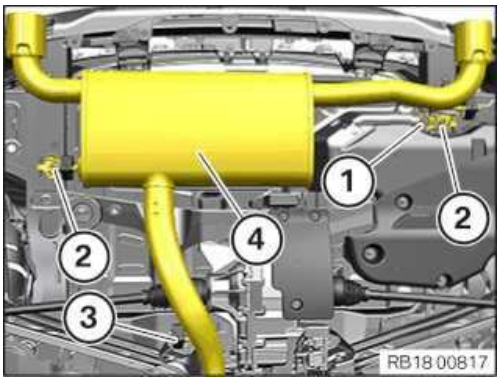
- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Feed in and install the exhaust system (4) with a second person.
- Renew nuts (2).

  Parts: Nuts
- Tighten nuts (2).

Exhaust system to body

M8	Replace nuts.	Tightening torque	19 Nm

- Tighten down screw (1).

Exhaust bracket on body

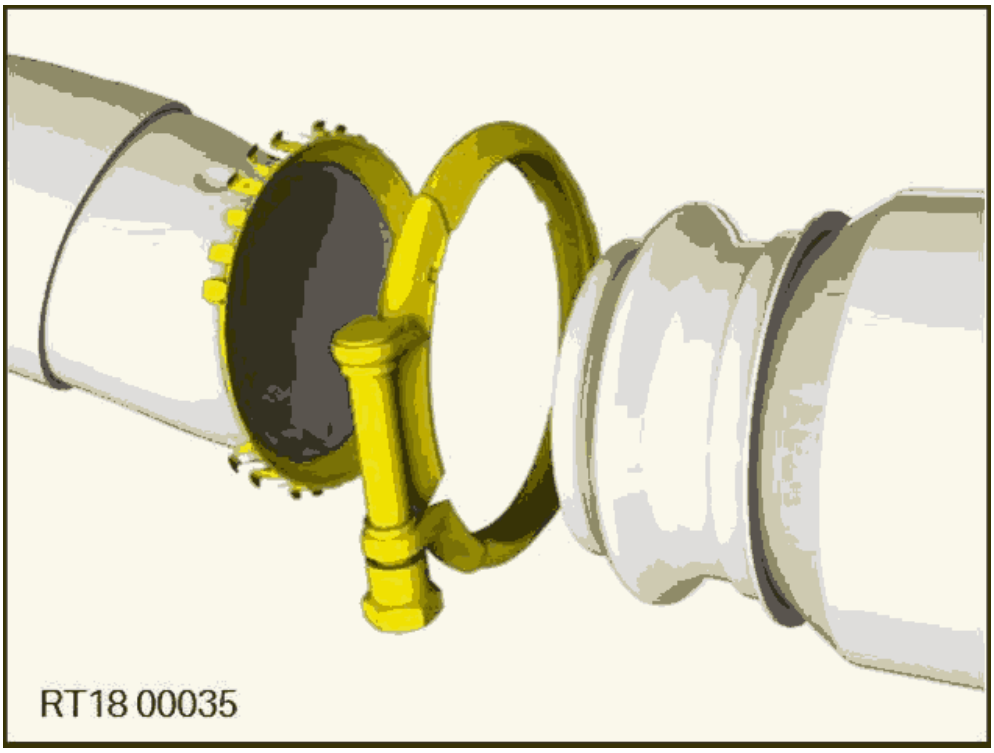
Hexagon screw M8x30		Tightening torque	19 Nm

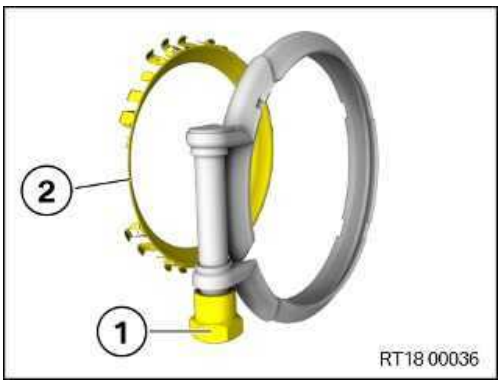
- Check the rubber mount (3) for damage and renew as needed.
- Mount rubber mount (3) on the exhaust system (4).

▸ **Install the V-clip**

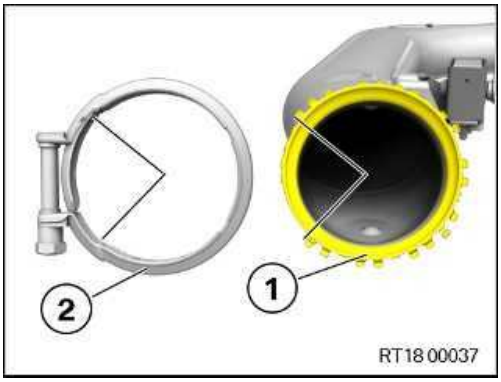
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V-band clamp



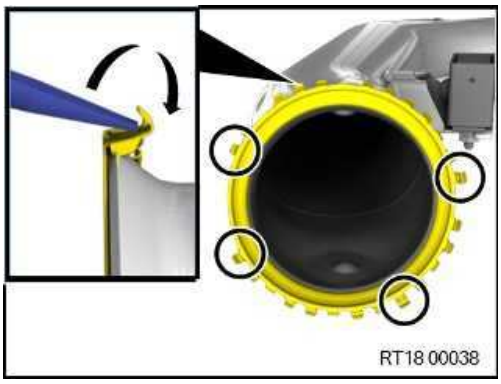


- Unscrew the nut (1) and remove the sealing ring (2).



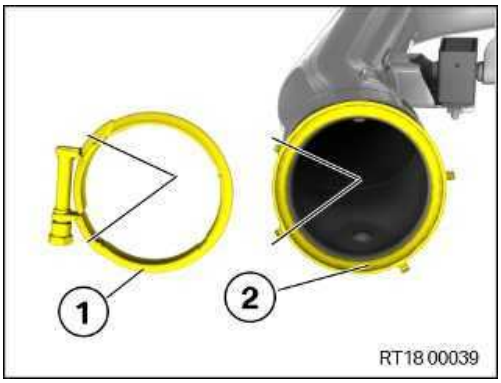
- Renew the V-clip (2).

  Parts: V-band clamp
- Mount the sealing ring (1) on the exhaust system.
- Ensure that the sealing ring (1) for the V-clip (2) is positioned correctly.



- Bend all sheet metal tabs over with a suitable tool, except those in the marked areas.

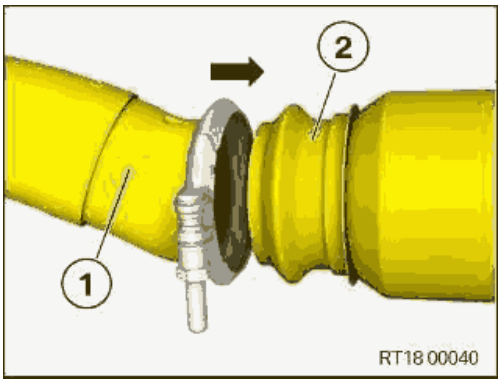
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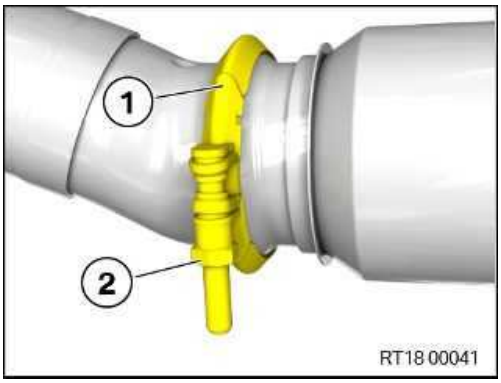
- Mount the V-clip (1) on the sealing ring (2).
- Make sure that the V-clip (1) is positioned correctly on the sealing ring (2).



- Make sure that the V-clip rests against the sheet metal tabs after mounting (marks).



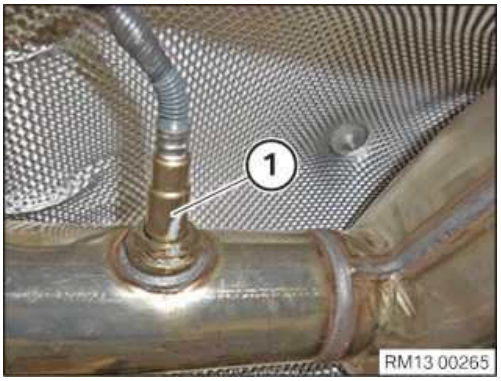
- Connect the exhaust system (1) with the catalytic converter (2) and position correctly.



- Make sure that V-clip (1) is fitted correctly.
- Tighten down screw (2).

V-clip to catalytic converter

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

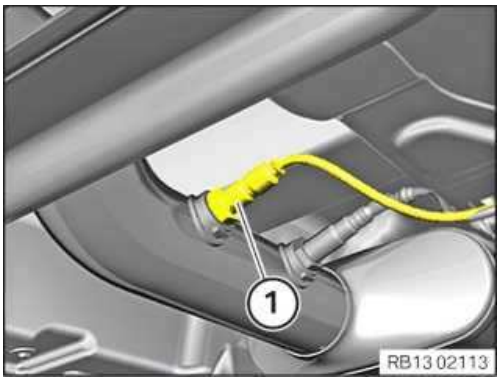


- Feed in, install and tighten diesel particulate sensor (1).

Diesel particulate sensor to exhaust system

Sensor		Tightening torque	50 Nm

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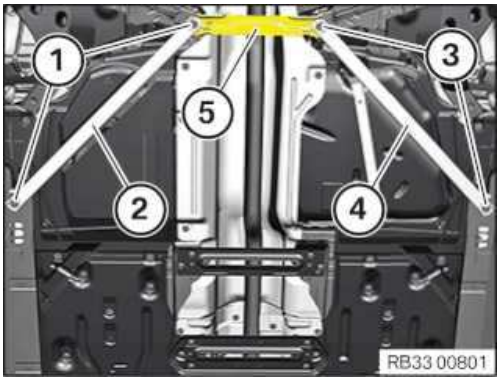


- Feed in, install and tighten nitrogen oxide sensor (1).

Nitrogen oxide sensor downstream of SCR catalytic converter

Sensor		Tightening torque	50 Nm

120 – Install the cross-member with torsion struts



- Insert and install the cross-member (5).
- Thread in torsion strut (4) at right and install.
- Renew screws (3).

  Parts: Bolts
- Tighten down screws (3).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

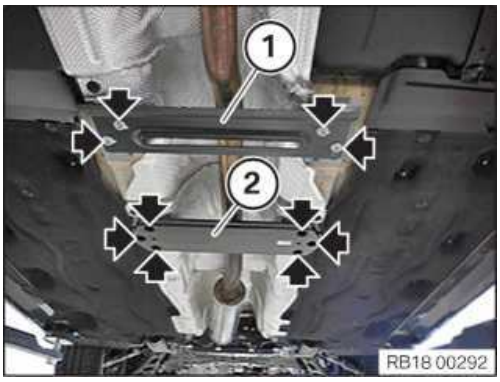
- Guide in and install the left torsion strut (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

121 – Install the connecting support on the tunnel in front and back



- Insert and install connecting supports (2).
- Tighten the screws (arrows) from the connecting support (2).

Front connection carrier to body

M10x18		Tightening torque	56 Nm

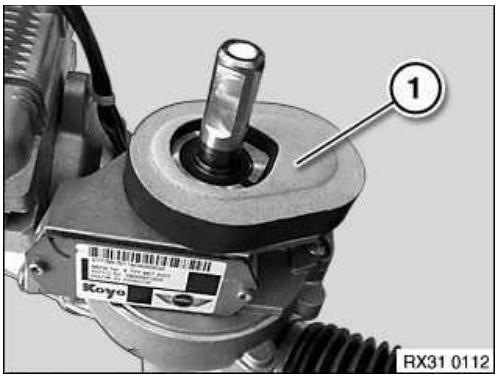
- Insert and install connecting supports (1).
- Tighten the screws (arrows) from the connecting support (1).

Rear connection carrier to body

M8x18		Tightening torque	28 Nm

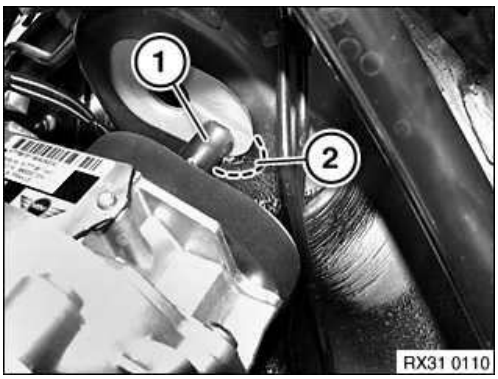
122 – Mount and secure the complete front axle

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- Remove the seal (1).
- Clean surface on steering gear.
- Renew gasket (1).

  Parts: Gasket
- Position the seal (1) and glue it on.

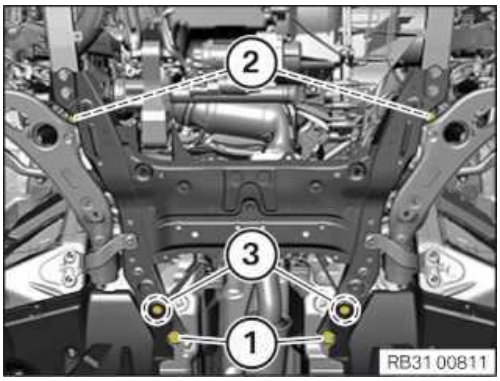


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- Position front axle support.
- Bend underbody panellings in the areas (3) to one side.
- Raise front axle support.
- When raising, insert charge air cooler into the rubber mount of the charge air cooler on cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

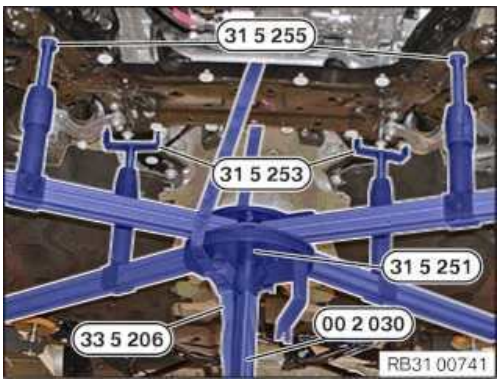
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

- If necessary, tighten the screws in the areas (3).

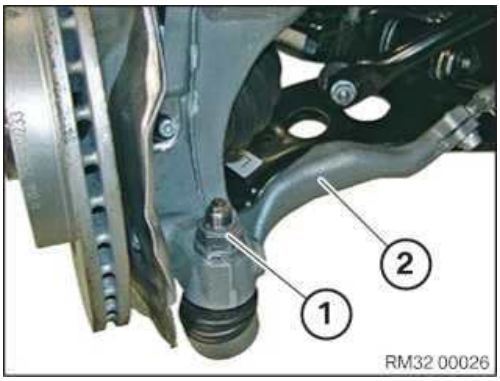
Underbody protection to body

Screw		Tightening torque	3 Nm



- Remove special tool from special tool .
- Lower universal jack **0 490 133 (00 2 030)** with the special tool and place it to the side.

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NOTICE

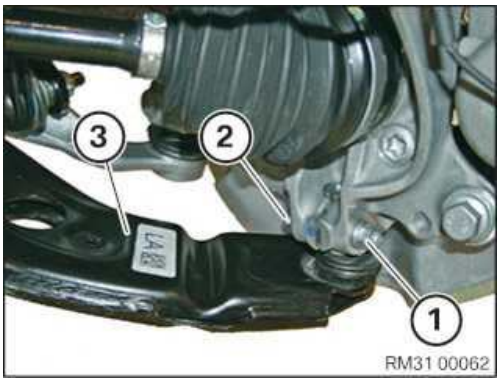
Perform the operations on the left and right side.

- Position the track rod (2) on the swivel bearing .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Track rod end to swivel bearing

M14	Renew nut.	Tightening torque	175 Nm



NOTICE

Perform the operations on the left and right side.

- Position the wishbone (3) on the swivel bearing .
- Renew the bolt (2) and the nut (1).

  Parts: Bolt, nut
- Insert screw (2).
- Tighten nut (1).

Wishbone to swivel bearing

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

123 – Install the mounted parts on the front axle support



NOTICE

Perform the operations on the left and right side.

- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Holder, wishbone rubber mount, to body

M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °

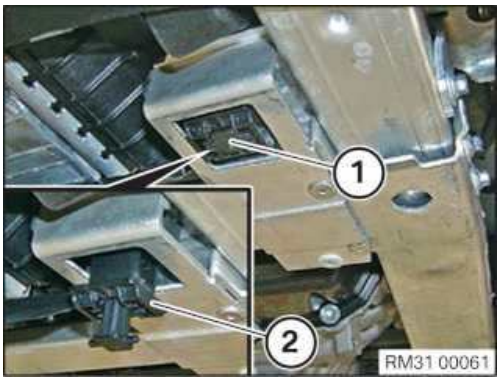


- Position the engine support (3) on the front axle support (1).
- Tighten down screw (2).

Holder with rubber mount to front axle support

M12 screw		100 Nm

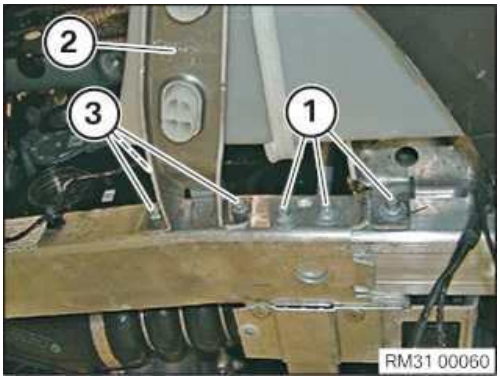
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NOTICE

Perform the operations on the left and right side.

- Position the lock (2).
- Lock the bracket (1) of the lock (2) of the holder for the charge air cooler.



- **Only on right side:** Position the holder for the washer fluid reservoir (2).
- Tighten down screws (3).

Washer fluid reservoir holder to front axle support adapter plate

		Tightening torque	10 Nm

NOTICE

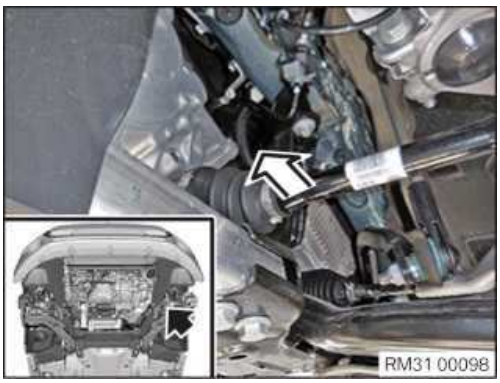
Perform the operations on the left and right side.

- Tighten the screws (1).

Deformation element, bottom, to adapter plate, front axle carrier

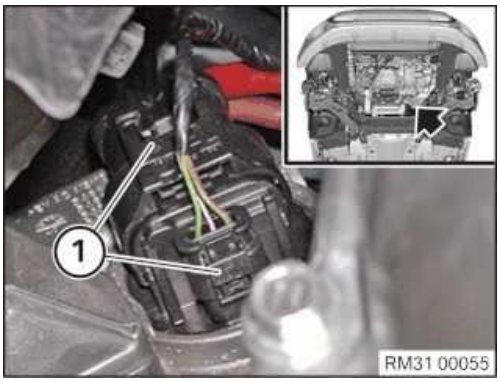
		Tightening torque	11,8 Nm

124 – Attaching connector at steering gear



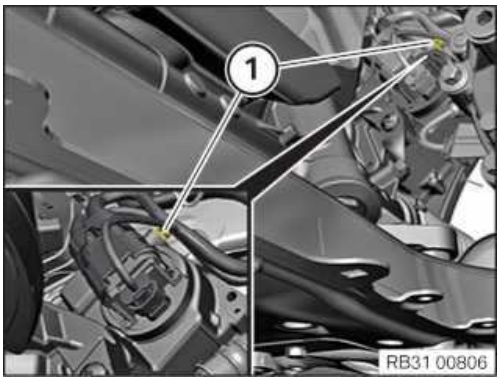
- To connect the connector (see the following step): Connect the connector with the right hand.

  The connectors can be accessed via the left output shaft.



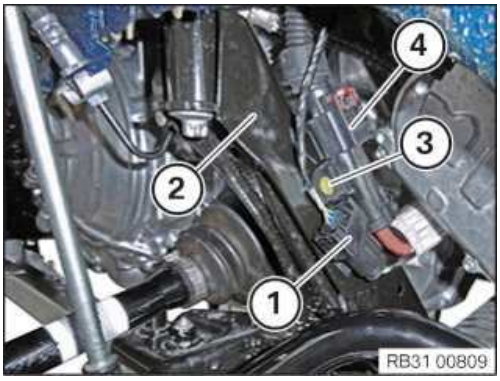
- Connect and lock connector (arrow) (1) with the steering gear.

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- Fasten the wiring harness (1) on the steering gear.

▶ **If installed: Fasten the plug connections at the front axle support**



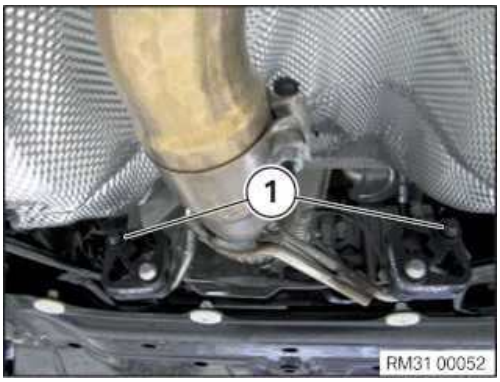
- Position the plug connection (4) at the front axle support (2).
- Tighten down screw (3).

Holder to front axle support

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

- Fasten the plug connection (1) at the front axle support (2).

125 – Securing rubber mount on front axle support



- Check rubber mount (1), replace if necessary.

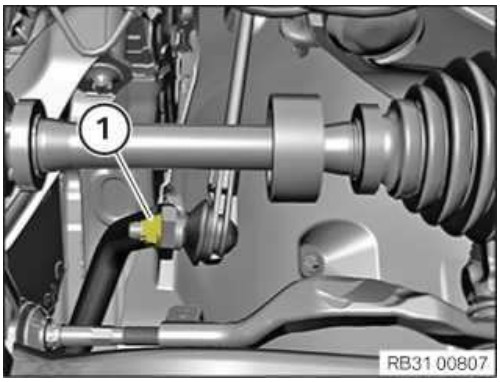
  Parts: Rubber mount
- Spray rubber mount (1) with lubricant and slide onto holder on front axle support.

126 – Securing anti-roll bar on left and right on the anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▶ **Fastening anti-roll bar on the anti-roll bar link**



- Position the anti-roll bar link on the anti-roll bar .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

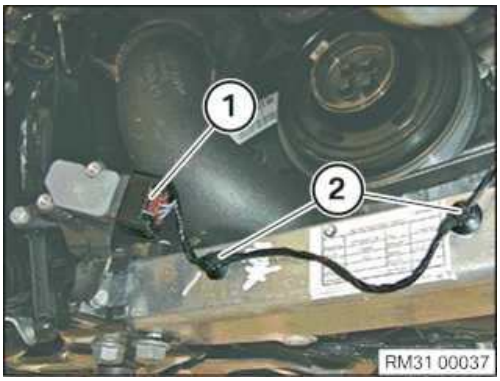
Note: Use the Torx socket for counter support.

Anti-roll bar link to anti-roll bar

M10	Renew nut.	Tightening torque	56 Nm

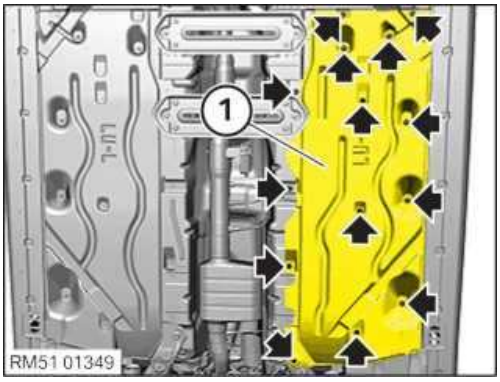
127 – With right installation: Securing the cable for the ride height sensor

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- Secure the cable clip (2) on the adapter of the deformation element.
- Connect connectors (1) and lock.

128 – Installing underbody panelling , right



- Correctly position the underbody panelling (1).
- Tighten all bolts and nuts (arrows).

Underbody panelling, side

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side

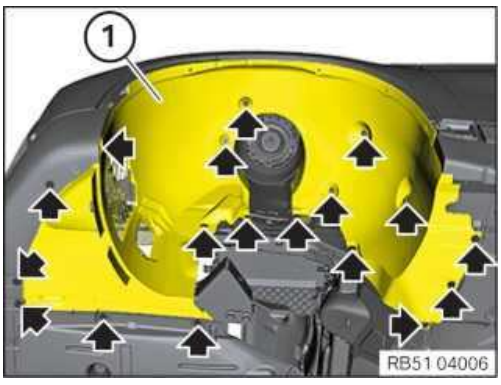
Plastic nut		Tightening torque	2,6 Nm

129 – Installing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

▸ **Installing the front wheel arch cover**



- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Plastic nut		Tightening torque	2,6 Nm
Screw		Tightening torque	2,6 Nm

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

▸ **Installing front wheel arch trim**

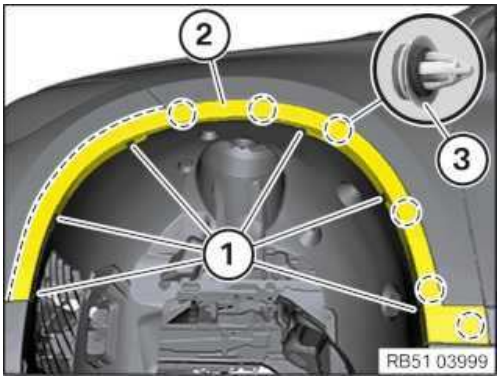
NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

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NOTICE

Description is for left component only. Procedure on the right side is identical.



- Check the clips (3) for damage and renew where required.

  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

130 – Installing both front wheels

▶ Mounting the wheel

▷ Clean the contact surfaces between the brake disc and the wheel rim



TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

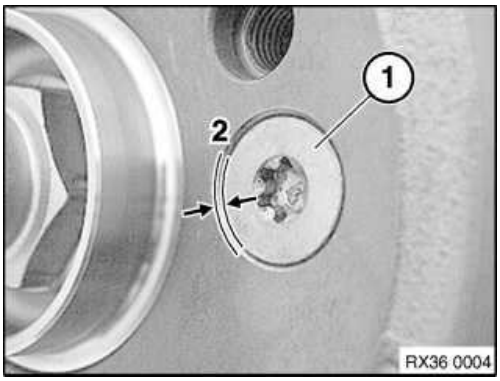
  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue in the area of the wheel bolt holes, remove and clean the brake disc.



- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

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- Renew mounting bolt (1).

  Parts: Mounting bolt

- Check that the mounting bolt (1) for the brake disc is securely seated.

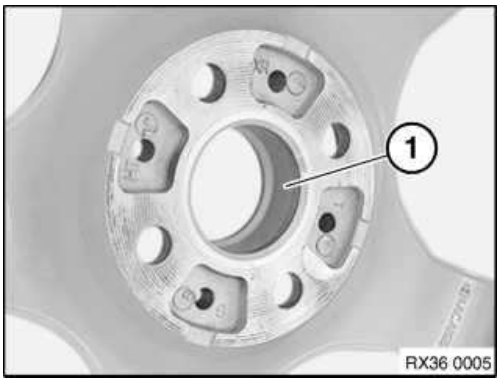
  The mounting bolt (1) for the brake disc may not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to rear wheel hub

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub

M8	Renew screw.	Tightening torque	16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring (1).

◁



TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

  Parts: Wheel bolts

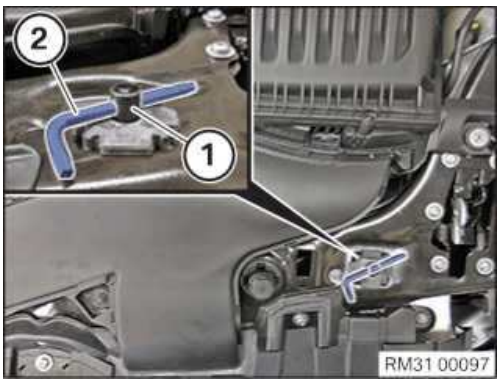
- Clean the wheel bolts.
- Check the wheel bolts and threads for damage, renew the wheel bolts if necessary.
- Join and tighten the wheel bolts (arrows).

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

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131 – Removing fastener for left and right radiator

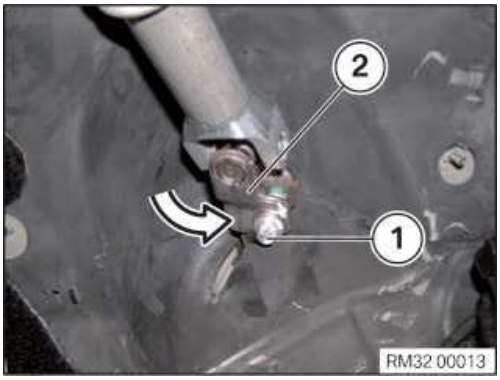


NOTICE

Perform the operations on the left and right side.

- Remove suitable tool (2) from the centering pin (1).

132 – Secure the steering shaft at the bottom on the steering gear



- Clean the screw lock residue from the screw thread in the universal joint (2).
- Pivot the universal joint (2) in the direction of the arrow to the steering gear.
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Lower steering shaft to steering gear

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

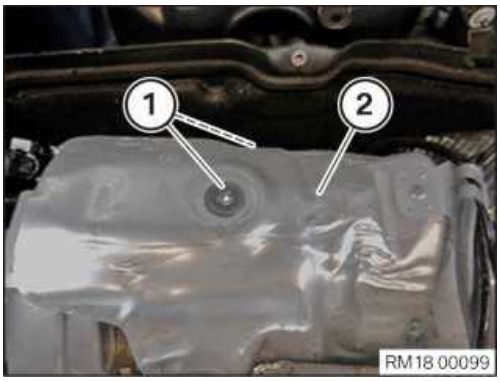


- **If installed:**
- Position the cover on the steering column (2).
- Tighten nuts (1).

Steering column cover to bulkhead

Plastic nut		Tightening torque	3 Nm

133 – Install the heat shield on the exhaust turbocharger



- Feed in and install the heat shield (2).
- Tighten the screws (1) at the top and bottom of the heat shield.

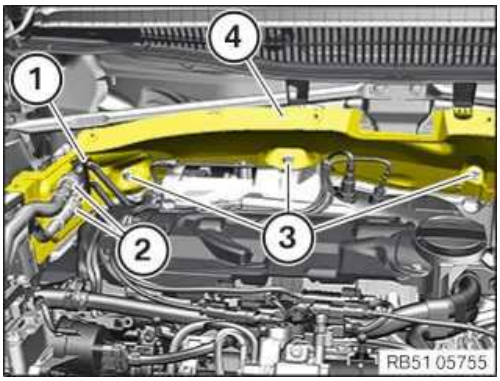
Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Fasten the cable at the clips .

134 – Installing rear bulkhead upper part

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- Feed in and install the rear bulkhead upper part (4).
- Tighten down screws (3).

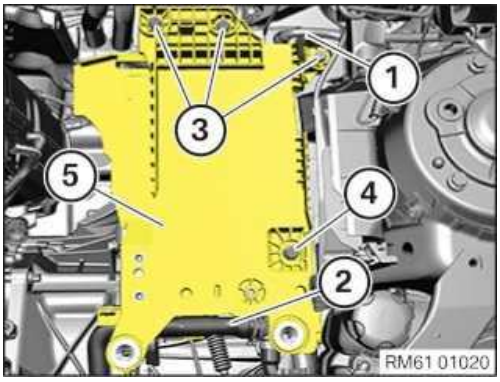
Rear bulkhead upper part to lower section of bulkhead

Oval-head screw		Tightening torque	5 Nm

- Feed the fuel line (2) into the holder (1) and install.
- Connect and lock the holder (1).

  The holder (1) must engage audibly.

135 – Install the battery holder



- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

136 – Install electronics box

Prerequisite

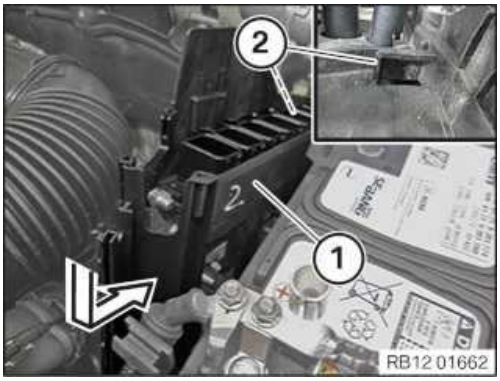
Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.

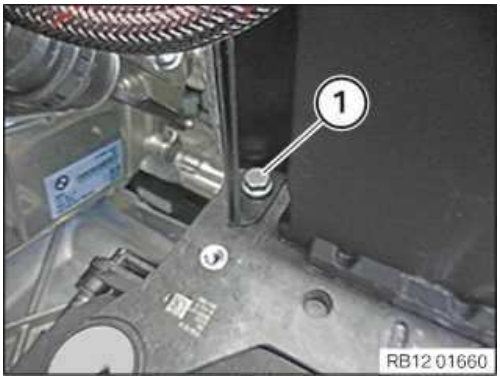


- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.

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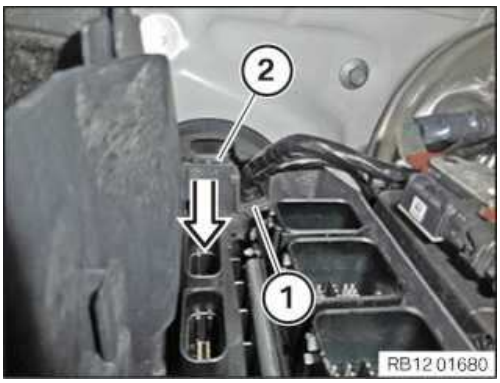
- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).



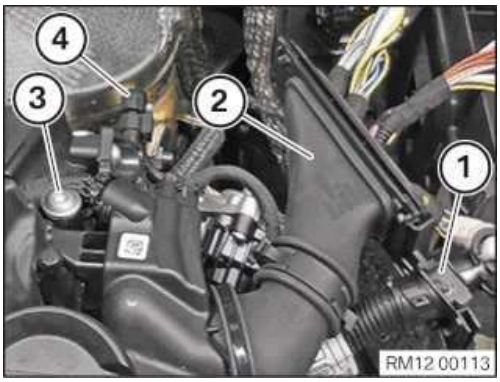
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.

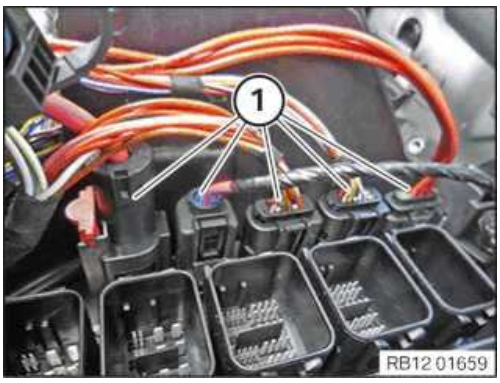


- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

Wiring harness to cylinder head cover

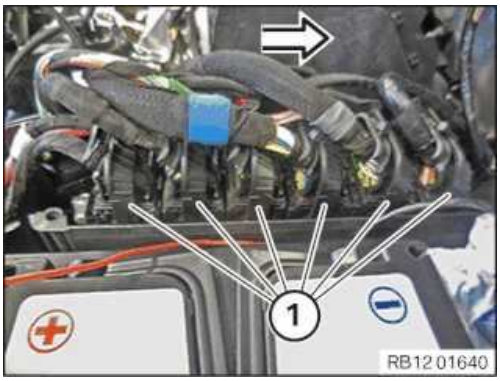
TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.

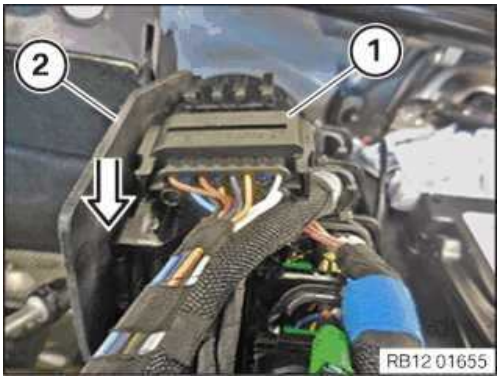


- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.

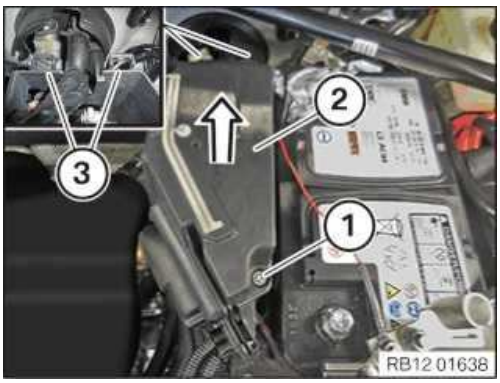
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- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



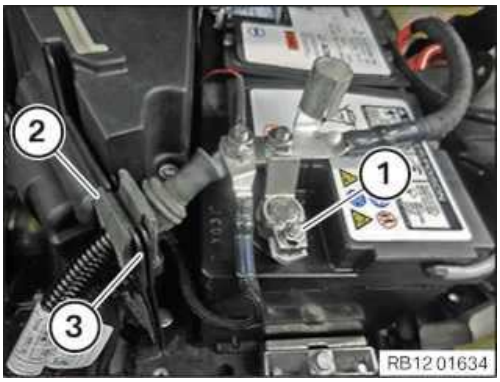
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

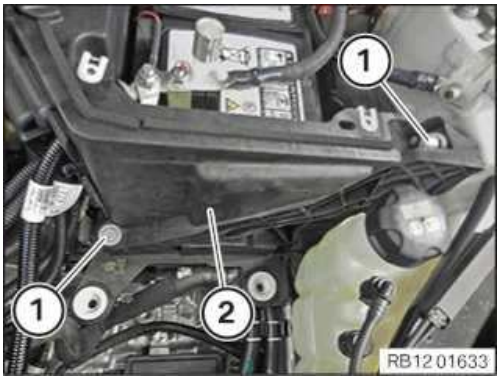
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

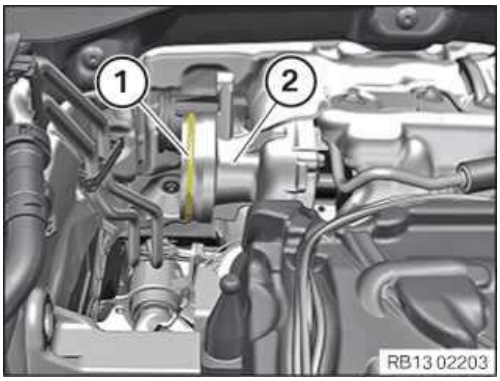


- Feed in and install tension strut (2).
- Tighten the screws (1).

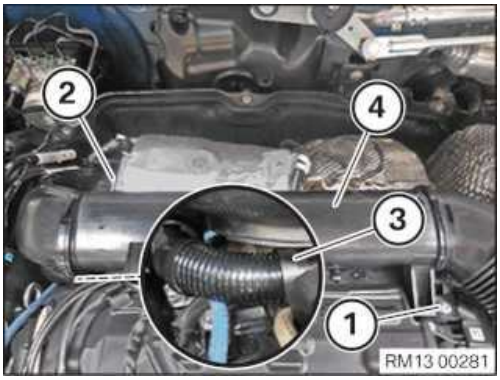
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

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- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.



- Feed in clean air pipe and install.
- Connect clean air pipe to the exhaust turbocharger and lock audibly in the clamps (2).
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Connect ventilation line (3) to the cylinder head cover and lock audibly.

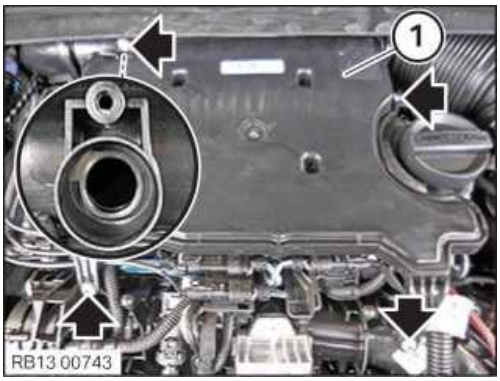


- Mount clean air pipe onto the intake filter housing.
- Tighten clamp (1) on the clean air pipe.

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

138 – Install resonator



- Insert and install the resonator (1).
- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

139 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

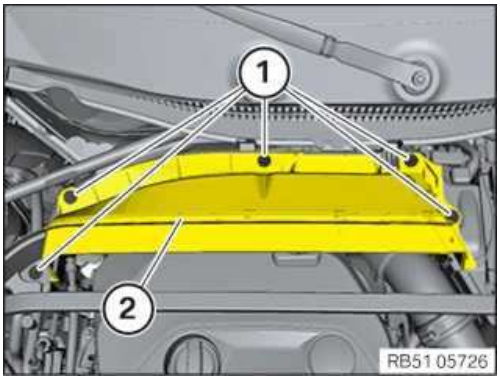


- Check for correct installation of all rubber mounts in the acoustic cover (1).



- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

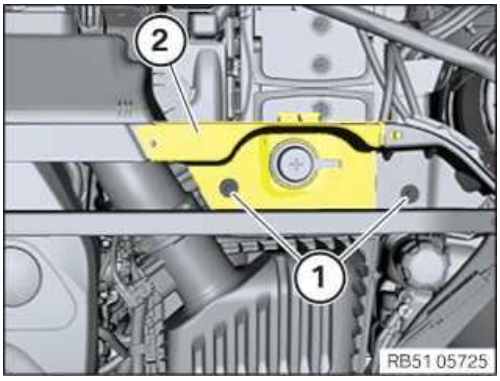
140 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Cover of top bulkhead

Screw		Tightening torque	2,6 Nm



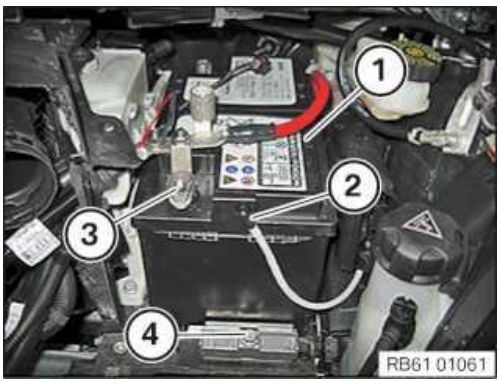
- Guide in and install cover (2).
- Tighten down screw (1).

Cover of remote positive terminal

Screw		Tightening torque	2,6 Nm

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141 – Install vehicle battery



- Install vehicle battery (1).
- Position the bracket and tighten with the screw (4) .

Battery terminal rail to battery tray

M8		19 Nm

- Position the vent hose (2) and clip it in.
- Position the positive battery terminal and tighten with the nut (3) .

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

▸ **Check the vent holes of the battery**

WARNING

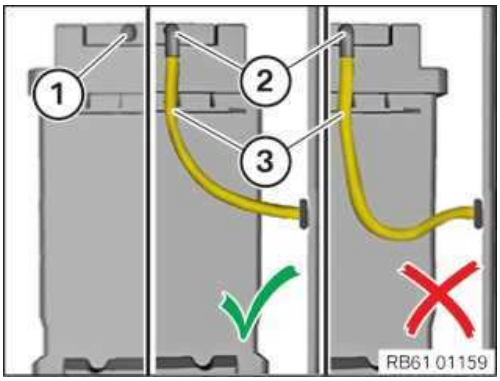
Gas emission.

Danger of injury! Danger of explosion!

- Assign the vent holes correctly.
- Route the vent hose correctly.

TECHNICAL INFORMATION

The battery has two vent holes, opposite:
One vent hole (1) must be closed correctly with a dummy plug.
The vent hose (3) must be correctly connected and routed at the other vent hole (2).



Check

- Check if the vent hole (1) is correctly closed with a dummy plug.

Result

» No dummy plug.

Measure

- Close the vent hole (1) correctly with a dummy plug.

Check

- Check if the vent hole (2) has a correctly connected vent hose (3).

Result

» The vent hose (3) is not correctly connected.

Measure

- At the vent hole (2), connect the vent hose (3) correctly.

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Check

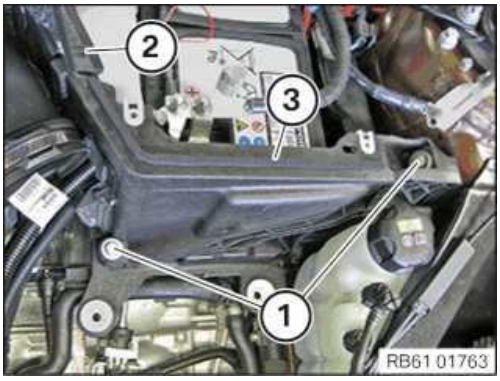
- Check if the vent hose (3) is routed to the outside with a downhill gradient (**no siphon formation!**).

Result

» The vent hose (3) is not correctly routed as shown in the image on the right.

Measure

- Route the vent hose (3) correctly as shown in the centre image.



- Insert tension strut (3) and tighten with screws (1).

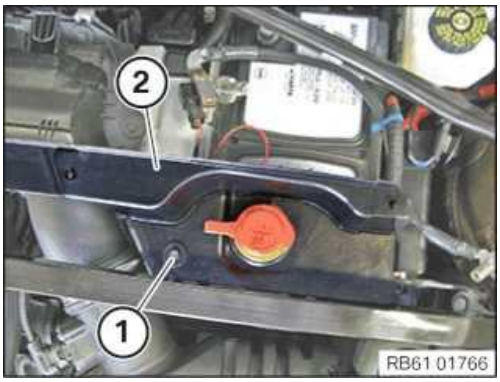
Trailing link

M8		Tightening torque	19 Nm

- Tighten down screw (2).

Battery cover

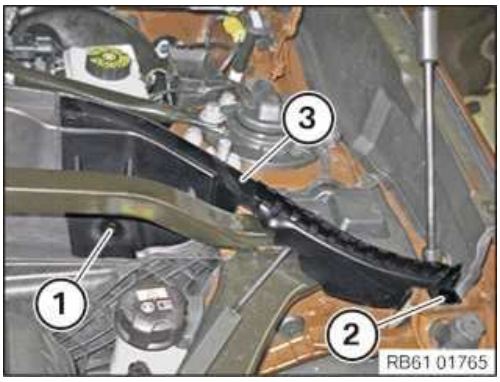
M8		2,8 Nm



- Position the cover (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm

142 – Connecting the battery earth lead

TECHNICAL INFORMATION

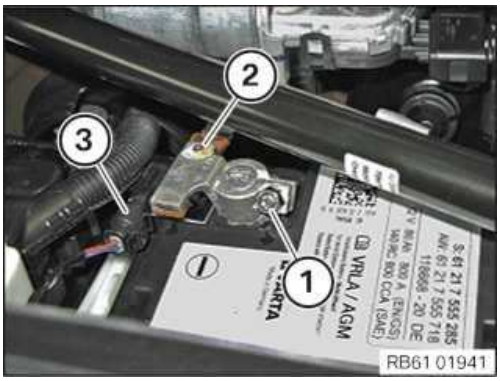
For additional information see:

61 00 ... Safety information on handling the vehicle battery

61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery

61 12 ... Notes on the intelligent battery sensor (IBS)

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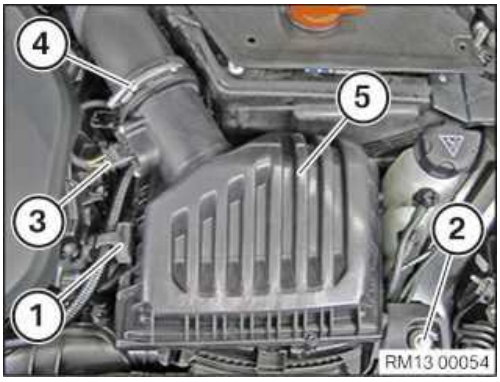
- Remove the protective cover of the positive battery terminal.
- Position the battery earth lead (2).
- Tighten nut (1).

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

- If required, connect the connector (3).

143 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

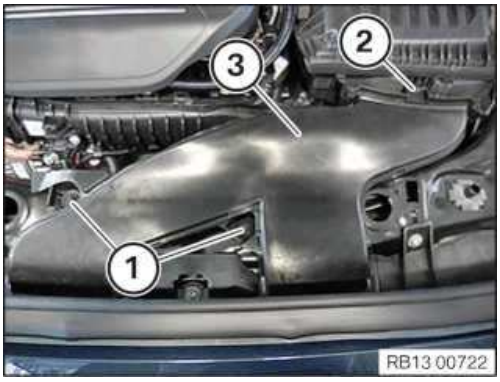
- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

144 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).
  The lock (2) must audibly engage.
- Tighten nuts (1).

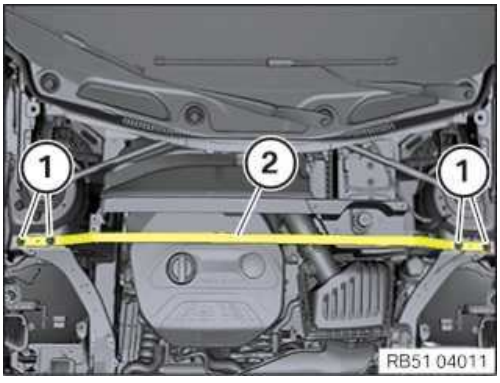
Intake neck to cross connection

M6		Tightening torque	8 Nm

145 – Install strut brace

TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.

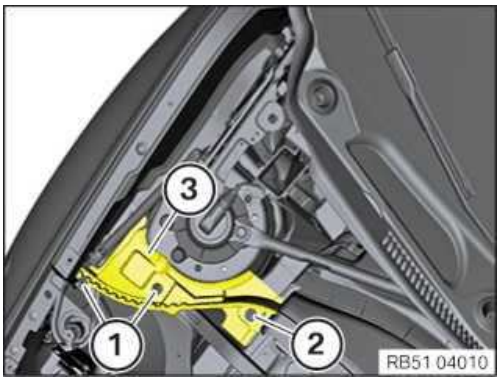


- Install the strut brace (2).
- Renew screws (1).
  Parts: Bolts
- Tighten the screws (1).

Cross-brace to spring strut dome

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

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NOTICE

Description is for right component only. The procedure on the left side is identical.

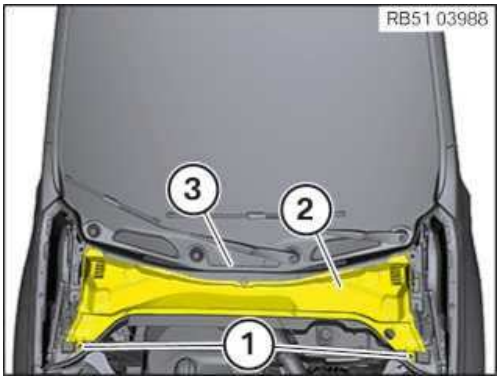
- Install the cover (3).
- Tighten down screw (2).

Cover on body

Hexagon screw		Tightening torque	3 Nm

- Install the expanding rivet (1).

146 – Installing front cowl panel cover

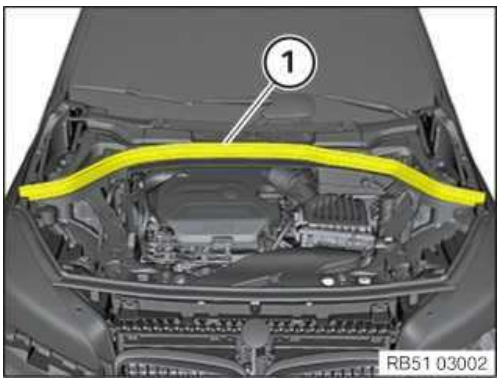


- Insert and install cowl panel cover at front (2) into cowl panel cover at rear (3).
- Check cowl panel cover at front is correctly seated (2).
- Secure expanding rivet (1).

147 – Install the seal for the bonnet

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

148 – Fill and bleed the coolant circuit

▸ **Filling and bleed the high-temperature coolant circuit**

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- See additional information.

149 – Checking/topping up oil level in automatic gearbox (AISIN GA8G45)

Prerequisite

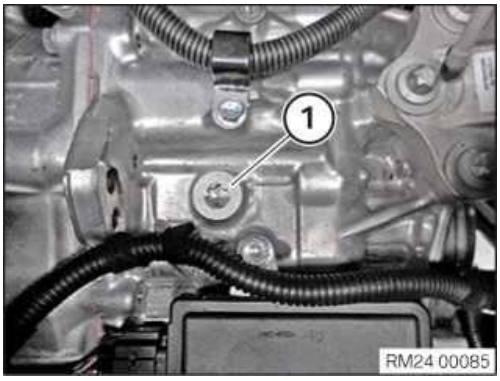
Vehicle in horizontal position.

CAUTION

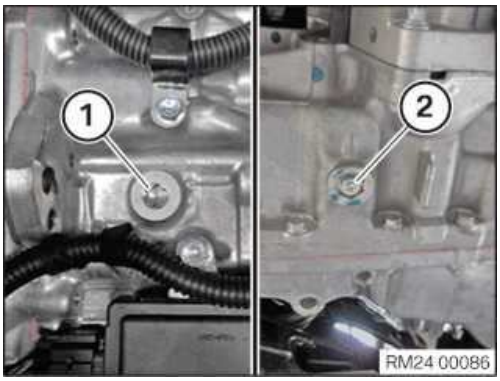
Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.



- Move the selector lever to the "P" position.
- Secure vehicle to prevent it rolling.
- Connect diagnosis system.
- Release the oil filler plug (1) using the Torx T55 .



- **Topping up the automatic transmission fluid (the automatic transmission fluid was drained):**
- Release oil filler plug (1) from engine compartment.
- Loosen the overflow plug (2) below at the transmission.
- Top up automatic transmission fluid at oil filler plug (1) until oil emerges at overflow plug (2).
- Start engine and run at idle speed.
- Check whether the automatic transmission fluid is leaking at the overflow plug (2) .
- If there is no automatic transmission fluid leaking at the overflow plug (2) , fill in the automatic transmission fluid to the oil filler plug (1) .
- Press the footbrake and, when idle, shift through all the gears from "P" to "D" 2 times for more than 2 seconds .
- Move the selector lever to the "P" position.
- Check again whether the automatic transmission fluid is leaking at the overflow plug(2) .
- Read the temperature of the automatic transmission fluid with the diagnosis system.
- Increase temperature of automatic transmission fluid to 35 °C to 45 °C.
- Top up automatic transmission fluid until it flows over.

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- Renew sealing rings.

  Parts: Sealing ring

- Screw in and fasten oil filler plug (1) and overflow plug (2).

Oil filler plug to transmission housing

M14	Renew the sealing ring.	Tightening torque	45 Nm

Overflow screw in oil drain plug

M6	Renew the sealing ring.		8 Nm

- **Check oil level (transmission oil temperature must be between** 35 °C **and** 45 °C **):**
- Open the oil filler plug (1).
- Slacken overflow plug (2).
- Start engine and run at idle speed.
- Unscrew and remove overflow plug (2).
- Check whether the automatic transmission fluid is leaking at the overflow plug (2) .
- If there is no automatic transmission fluid leaking at the overflow plug (2) , fill in the automatic transmission fluid to the oil filler plug (1) .
- Top up the automatic transmission fluid until it overflows at the overflow plug (2) .
- Press the footbrake and, when idle, shift through all the gears from "P" to "D" 2 times for more than 2 seconds .
- Move the selector lever to the "P" position.
- Check the oil level again.
- Renew sealing rings.

  Parts: Sealing ring

- If the oil escapes slightly from the overflow plug (2) , tighten the overflow plug (2) and the oil filler plug (1) .

Overflow screw in oil drain plug

M6	Renew the sealing ring.		8 Nm

Oil filler plug to transmission housing

M14	Renew the sealing ring.	Tightening torque	45 Nm

150 – Topping up oil level in the manual gearbox (GS6X60DA)

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

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TECHNICAL INFORMATION

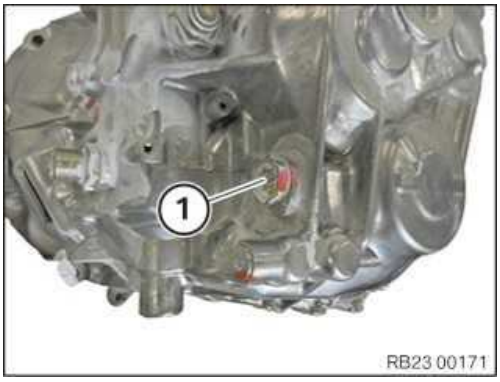
Make sure during removal of the filling/level control screw to note the installed filling/level control screw variant.

It is **mandatory** to use variant 1 in transmissions up to production date 08/2015.

It is **mandatory** to use variant 2 in transmissions from production date 08/2015.

Failure to observe will result in a leak on the transmission.

- Variant 1 **until** production date 08/2015.
- Variant 2 **from** production date 08/2015.



- Unscrew filling/level control screw (1) and fill the transmission until the oil overflows.

Transmission oil capacity

Transmission oil GS6-60DA, GS6X60DA/Owner's Handbook	2,2 l

Transmission oil: Technically suitable manual gearbox oil

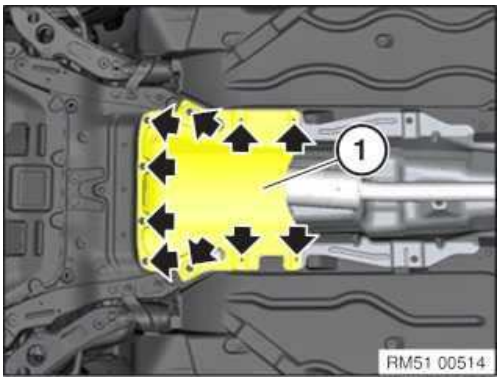
- Allow surplus oil to drain off.
- Renew the filling/level control screw (1).

  Parts: Filling/level control screw
- Tighten filling/level control screw (1).

Oil drain plug / oil filler plug

Hexagon socket		Tightening torque	43 Nm

151 – If installed: Installing underbody protection at rear

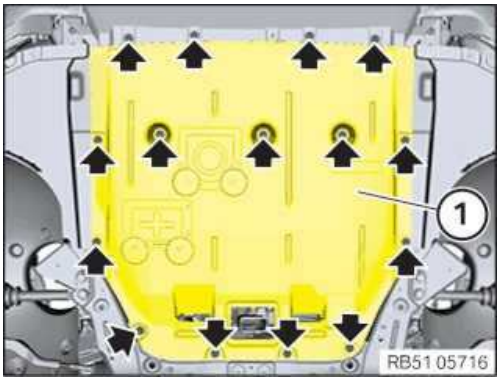


- Position rear underbody protection (1).
- Tighten screws (arrows).

Underbody protection to body

Screw		Tightening torque	3 Nm

152 – Installing the front underbody protection

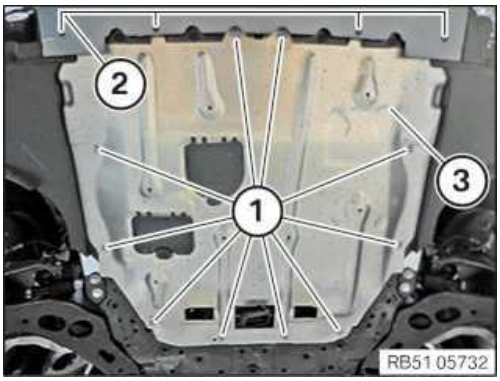


- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

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- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Additional Information

Overview of Tightening Torques

Cross connection to carrier support — Used in step 19

Screws M6x20		Tightening torque	11,8 Nm

Screw connection for rubber mount of coolant radiator to coolant radiator — Used in step 19

Bolt to rubber mount		Tightening torque	8 Nm

Air duct to upper connection — Used in step 19

M6x20 screw		Tightening torque	11,8 Nm

Bracing strut to upper connection — Used in step 19

M8x20 screw		Tightening torque	28 Nm

Rear end of front axle support to body — Used in step 73 122

M14 screw	Renew screw.	Tightening torque	175 Nm

Front axle support, front to body — Used in step 73 122

M12 screw	Renew screw.	Tightening torque	108 Nm

Underbody protection to body — Used in step 73 122 151

Screw		Tightening torque	3 Nm

Special tool to cylinder head — Used in step 73

M8		Tightening torque	21,5 Nm

Special tool to cylinder head — Used in step 77

Special tool		Tightening torque	20 Nm

Standard screw connection M6 — Used in step 77 85 97

M6			8 Nm

Coolant temperature sensor at cylinder head — Used in step 77

Temperature sensor		Tightening torque	3,5 Nm

Cylinder head to crankcase — Used in step 79

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

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Cylinder head bolt to timing case cover

Used in step 79

M8x40		Tightening torque	19 Nm

Right engine mount to side member

Used in step 79

M12		Tightening torque	100 Nm

Right engine mount to cylinder head

Used in step 79

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

Heat shield to cylinder head

Used in step 79

M8X16		Tightening torque	10 Nm

Glow elements to cylinder head

Used in step 80

Glow element		Tightening torque	13 Nm

Camshaft carrier to cylinder head

Used in step 83

M7x35		Tightening torque	13 Nm

Bearing journal to cylinder head

Used in step 85

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8

Used in step 85

M8		Tightening torque	19 Nm

Chain tensioner piston to cylinder head

Used in step 86

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft

Used in step 87

M7x17.			17 Nm

Cylinder head cover to cylinder head

Used in step 89

M6		Tightening torque.	8,5 Nm

Differential pressure sensor to holder

Used in step 90 103

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor

Used in step 90 103

Clamp 15–19mm		Tightening torque	3 Nm

Clamping claw facing to cylinder head cover

Used in step 91

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 91

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

High pressure lines between injector and rail

Used in step 93

High pressure lines		Tightening torque	28 Nm

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Exhaust-gas recirculation cooler to exhaust manifold

Used in step 95 101

M8x28	Replace screws	Tightening torque	32 Nm

Oil return line to turbocharger

Used in step 95 96

M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase

Used in step 95

M8x16		Tightening torque	22 Nm

Exhaust turbocharger to exhaust manifold

Used in step 96

V-band clamp		Tightening torque	19 Nm

Oil feed line to bracket

Used in step 96

Torx screw M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase

Used in step 96

M8x16		Tightening torque	22 Nm

Heat shield for exhaust turbocharger

Used in step 97

Torx screw BM 6x12		Tightening torque	10 Nm

Banjo bolt for exhaust pressure pipe to exhaust manifold

Used in step 97

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

Charge air duct to oil sump

Used in step 98

M6		Tightening torque	8 Nm

Ride height sensor holder to front axle support

Used in step 98

M6		Tightening torque	8 Nm

Adapter, front axle support to front axle support

Used in step 98

		Tightening torque	100 Nm

Cross connection to front axle support

Used in step 98

M6		Tightening torque	12 Nm

Washer fluid reservoir to body

Used in step 99

M6x20		Tightening torque	8 Nm

Intake plenum to cylinder head

Used in step 100

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 101

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler

Used in step 101

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 101

M8x20		Tightening torque	19 Nm

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Wiring harness to cylinder head cover

Used in step 102 136

TS5x20		Tightening torque	3,5 Nm

Positive battery cable to alternator

Used in step 102

M8		Tightening torque	19 Nm

Fuel line to intake plenum

Used in step 102

TS6x20		Tightening torque	5 Nm

Cover to electronics box

Used in step 102 136

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery

Used in step 102 136

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray

Used in step 102 136

M8		Tightening torque	19 Nm

Diesel particulate filter V-clip to exhaust turbocharger

Used in step 103

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Diesel particle filter to holder

Used in step 103

M8 hexagon nut		Tightening torque	19 Nm

Diesel particulate filter holder to gearbox

Used in step 103

M12x75		Tightening torque	66 Nm

Diesel particulate filter bracket to crankcase

Used in step 103

M10x35		Tightening torque	38 Nm

SCR metering module V-clip to exhaust system

Used in step 103

V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm

Holder for coolant lines to diesel particulate filter

Used in step 103

Torx bolt BM6x16		Tightening torque	8 Nm

Control sensor

Used in step 104

Control sensor		Tightening torque	50 Nm

Exhaust temperature sensor to diesel particulate filter

Used in step 105 106

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Exhaust-gas temperature sensor to exhaust system

Used in step 107

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Oxygen sensor holder to intermediate shaft

Used in step 108

Hexagon screw M6x16		Tightening torque	8 Nm

Nitrogen oxide sensor before SCR catalytic converter

Used in step 109

Sensor		Tightening torque	50 Nm

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Monitoring sensor — Used in step 110

Sensor		Tightening torque	50 Nm

Transfer box to transmission — Used in step 111

M10		Tightening torque	56 Nm

Heat shield to transfer box — Used in step 111

M6	Renew screws.	Tightening torque	6 Nm

Oil filler plug on transfer box (VTG) — Used in step 111

M18x1.5		Tightening torque	35 Nm

Intermediate shaft to transfer box — Used in step 112

M8x35		Tightening torque	19 Nm

Starter motor to transmission — Used in step 113

M8x45		Tightening torque	19 Nm

Battery positive lead to starter — Used in step 113

M8		Tightening torque	13,5 Nm

Propeller shaft to transfer box — Used in step 116

		Tightening torque	80 Nm

Flexible disc to rear axle final drive — Used in step 116

M12x1.5	Renew screws.	Tightening torque	55 Nm 90 °

Centre mount to body — Used in step 116

M8		Tightening torque	19 Nm

Heat shield to body — Used in step 117 118

Bolts/nut		Tightening torque	3 Nm

Bracket to body — Used in step 117

M8		Tightening torque	21 Nm

Exhaust system to body — Used in step 119

M8	Replace nuts.	Tightening torque	19 Nm

Exhaust bracket on body — Used in step 119

Hexagon screw M8x30		Tightening torque	19 Nm

V-clip to catalytic converter — Used in step 119

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

Diesel particulate sensor to exhaust system — Used in step 119

Sensor		Tightening torque	50 Nm

Nitrogen oxide sensor downstream of SCR catalytic converter — Used in step 119

Sensor		Tightening torque	50 Nm

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Cross-member/torsion strut to axle support and mounting

Used in step 120

M12x48	Renew screws.	Jointing torque Angle of rotation	100 Nm 90 °

Front connection carrier to body

Used in step 121

M10x18		Tightening torque	56 Nm

Rear connection carrier to body

Used in step 121

M8x18		Tightening torque	28 Nm

Track rod end to swivel bearing

Used in step 122

M14	Renew nut.	Tightening torque	175 Nm

Wishbone to swivel bearing

Used in step 122

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

Holder, wishbone rubber mount, to body

Used in step 123

M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °

Holder with rubber mount to front axle support

Used in step 123

M12 screw			100 Nm

Washer fluid reservoir holder to front axle support adapter plate

Used in step 123

		Tightening torque	10 Nm

Deformation element, bottom, to adapter plate, front axle carrier

Used in step 123

		Tightening torque	11,8 Nm

Holder to front axle support

Used in step 124

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

Anti-roll bar link to anti-roll bar

Used in step 126

M10	Renew nut.	Tightening torque	56 Nm

Underbody panelling, side

Used in step 128

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side

Used in step 128

Plastic nut		Tightening torque	2,6 Nm

Wheel arch cover to body

Used in step 129

Plastic nut		Tightening torque	2,6 Nm
Screw		Tightening torque	2,6 Nm

Wheel arch cover to body

Used in step 129

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Used in step 129

Plastic nut		Tightening torque	3 Nm

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Brake disc to rear wheel hub

Used in step 130

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub

Used in step 130

M8	Renew screw.	Tightening torque	16 Nm

Wheel bolts

Used in step 130

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Lower steering shaft to steering gear

Used in step 132

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

Steering column cover to bulkhead

Used in step 132

Plastic nut		Tightening torque	3 Nm

Heat shield for exhaust turbocharger

Used in step 133

Torx screw BM 6x12		Tightening torque	10 Nm

Rear bulkhead upper part to lower section of bulkhead

Used in step 134

Oval-head screw		Tightening torque	5 Nm

Battery holder to engine support

Used in step 135

Hexagon screw M8x30		Tightening torque	19 Nm

Electronics box to battery tray

Used in step 136

M8X16		Tightening torque	15 Nm

Clean air pipe to cylinder head cover

Used in step 137

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing

Used in step 137 143

Clamp		Tightening torque	3 Nm

Resonator to manifold and clean air pipe

Used in step 138

Screw TS6	Renew screw.	Tightening torque	5 Nm

Cover of top bulkhead

Used in step 140

Screw		Tightening torque	2,6 Nm

Cover of remote positive terminal

Used in step 140

Screw		Tightening torque	2,6 Nm

Battery terminal rail to battery tray

Used in step 141

M8			19 Nm

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Battery terminal with IBS positive battery terminal / negative battery terminal Used in step 141 142

NutM6			5 Nm

Trailing link Used in step 141

M8		Tightening torque	19 Nm

Battery cover Used in step 141

M8			2,8 Nm

Intake silencer housing to lock bridge Used in step 143

M6X30		Tightening torque	8 Nm

Intake neck to cross connection Used in step 144

M6		Tightening torque	8 Nm

Cross-brace to spring strut dome Used in step 145

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

Cover on body Used in step 145

Hexagon screw		Tightening torque	3 Nm

Oil filler plug to transmission housing Used in step 149

M14	Renew the sealing ring.	Tightening torque	45 Nm

Overflow screw in oil drain plug Used in step 149

M6	Renew the sealing ring.		8 Nm

Oil drain plug / oil filler plug Used in step 150

Hexagon socket		Tightening torque	43 Nm

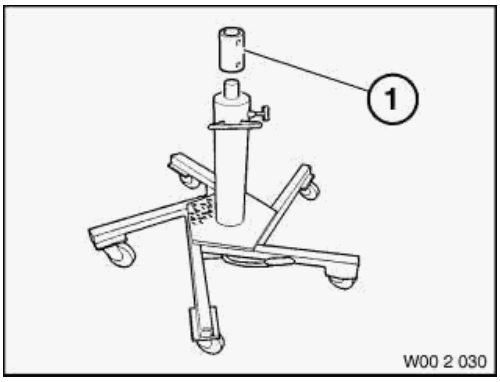
Underbody protection front Used in step 152

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Overview of Special Tools

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0 490 133 (00 2 030) Device



Common

Used in step 32 73 79 122

Usage	(universal hydraulic lifter base unit) Chassis and hydraulic lifter - For removing and installing rear axle supports and gearboxes. Also for soft top mounts. Is replaced by 81 22 2 219 012
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 90 (207)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 490 134 (00 2 031)		**Adapter** (adapter for gearbox holder) Model series: E30, E31, E32, E34, E36	

0 495 554 (33 5 070) Extension



Common

Used in step 38 116

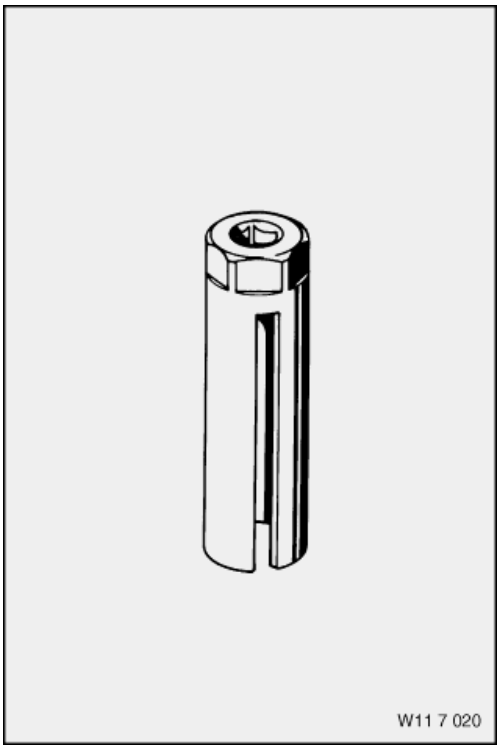
Usage	Pull-out extension for 33 5 040, 33 5 050, 33 5 060.
Included in the tool or work	
Storage location	A18
Replaced by	
In connection with	
SI-Number	01 21 06 (300)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 592 (33 5 071)		**Extension** (Extension (1 item)) discontinued, can only be ordered using complete tool	

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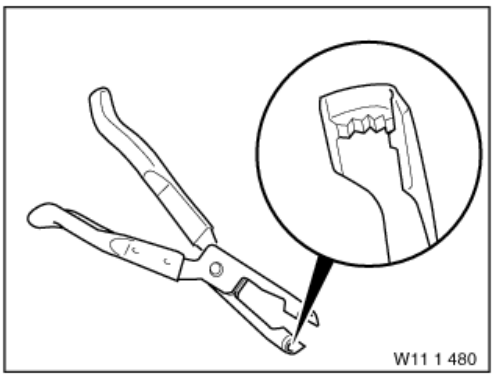
0 491 074 (11 7 020) Socket wrench insert



Common Used in step 44 45 110

Usage	(Socket wrench insert 22 mm) For loosening and tightening the oxygen sensor
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	

0 490 796 (11 1 480) Pliers

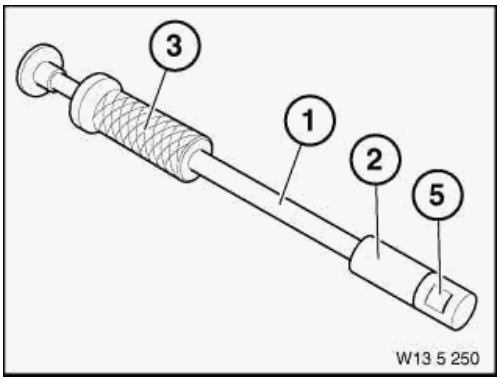


Common Used in step 52 72

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

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0 493 321 (13 5 250) Puller



Common

Used in step 62

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

0 493 339 (13 5 252) Bush



Common

Used in step 62

Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

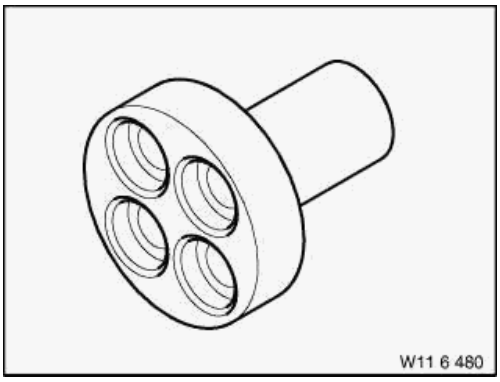
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0 493 340 (13 5 253) Weight



Common	Used in step 62
Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 380 (11 6 480) Connector



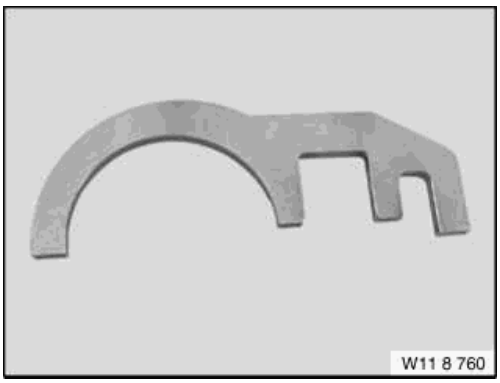
Common	Used in step 65 88
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

2 288 380 Locating stud



Common	Used in step 65 88
Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 112 (11 8 760) Gauge



Common	Used in step 65 88
Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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0 495 105 (11 4 480) oddments tray



Common

Used in step 70 71

Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

2 357 071 Panel



Common

Used in step 73 79

Usage	Additional mounting plate for lifting table MHT 1200. Delivery quantity: 1 piece. During the course of the changeover from BMWi to iPerformance, a tool changeover also takes place from campaign to warehouse.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	Table lift MHT 1200 81222184136
SI-Number	01 21 13 (987)

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2 459 012 Holder



Common

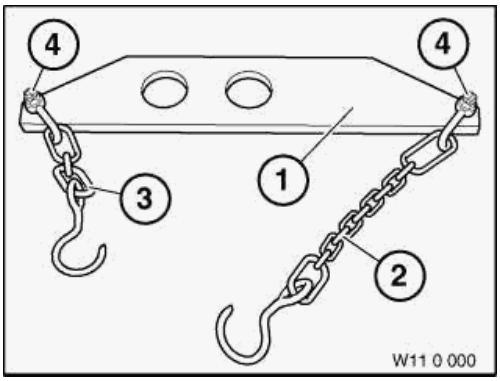
Used in step 73 79

Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

0 490 561 (11 0 000) Lifting gear

Used in step 73 79

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Common

Usage	(Hoisting gear) For removing and installing engines. As of 08/2011 only available as a complete set. Delivered with TÜV inspection certificate and operating instructions. No delivery of separate parts.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 13 94 (888)

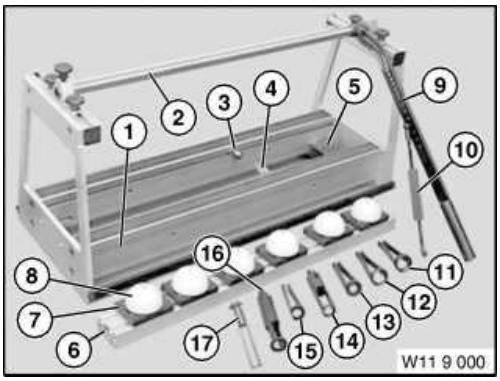
Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
4	0 490 565 (11 0 009)		**Shackle** (Shackle) 2 pieces. As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 562 (11 0 001)		**Lifting gear** (Cross member) As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
2	0 490 563 (11 0 002)		**Chain** (Chain) Version: long As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
3	0 490 564 (11 0 003)		**Chain** (Chain) Version: short As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	

0 494 362 (11 9 000) Device

Used in step 73

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Common

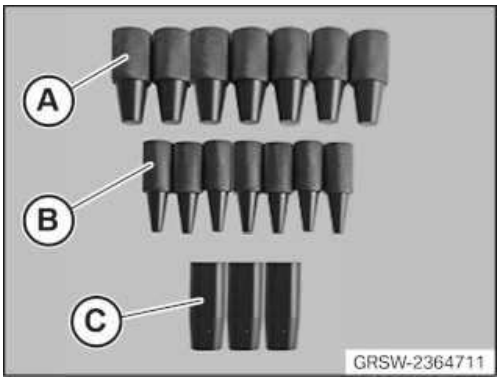
Usage	(Cylinder head expander tool)
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 03 02 (833)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 494 366 (11 9 001)		**Device**	
6	0 494 371 (11 9 006)		**Insert** (Aluminium strip)	
11	0 494 376 (11 9 012)		**Basket** (Valve spring cage) Engine M41, M51, S50	
17	0 495 028 (11 9 017)		**Basket** (Valve spring cage) Engine N52	
2	0 494 367 (11 9 002)		**Rod**	
3	0 494 368 (11 9 003)		**Adapter** (Sliding block)	
4	0 494 369 (11 9 004)		**Tab**	
5	0 494 370 (11 9 005)		**Quick fastener**	
7	0 494 372 (11 9 007)		**Shaped part** (shaped part)	
8	0 494 373 (11 9 008)		**Shaped part** (Shaped part) Shaped part made of plastic	
9	0 494 374 (11 9 009)		**Lever**	
10	0 494 375 (11 9 011)		**Hook**	
12	0 494 377 (11 9 013)		**Basket** (Valve spring cage) Engine M43, M73	
13	0 494 378 (11 9 014)		**Basket** (Valve spring cage) Engine M44, M52, M54, M56, M62, S52, S54, S62	
14	0 494 379 (11 9 015)		**Basket** (Valve spring cage) Engine M47, M47TU, M57, M57TU, N40, N42, N62, N73	
15	0 494 380 (11 9 016)		**Basket** (Valve spring cage) Engine M21, M40	

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2 364 711 Plug



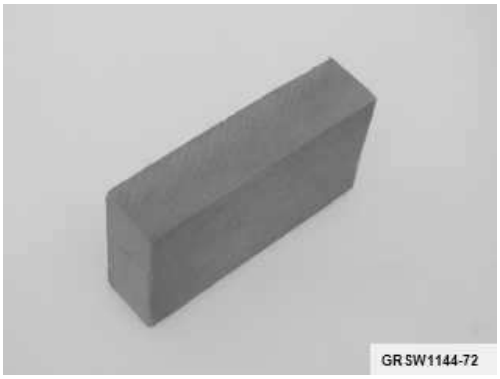
Common	Used in step 74
Usage	For closing the pressure oil holes for cleaning the cylinder head sealing surfaces.
Included in the tool or work	
Storage location	C20
Replaced by	
In connection with	
SI-Number	01 50 14 (203)

0 495 103 (11 4 471) Scraper



Common	Used in step 74
Usage	
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

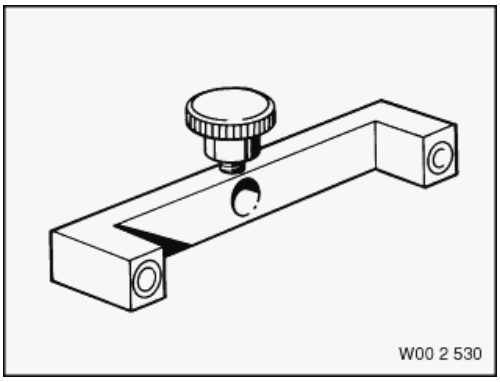
0 495 104 (11 4 472) Extractor



Common	Used in step 74
Usage	(grindstone)
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

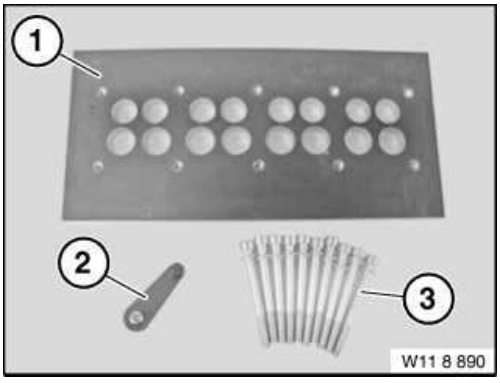
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0 490 185 (00 2 530) Bridge



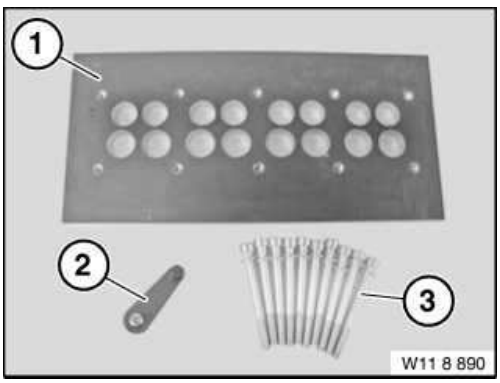
Common	Used in step 76
Usage	(Measuring bridge) For determining the piston projection (Diesel)
Included in the tool or work	
Storage location	A3
Replaced by	
In connection with	
SI-Number	

0 496 184 (11 8 891) Panel



Common	Used in step 77
Usage	(base plate with gasket)
Included in the tool or work	0 496 183
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 186 (11 8 893) Screw



Common	Used in step 77
Usage	(Set of screws) Can only be ordered as part of complete tool 11 9 660 = 0495955
Included in the tool or work	0 496 183
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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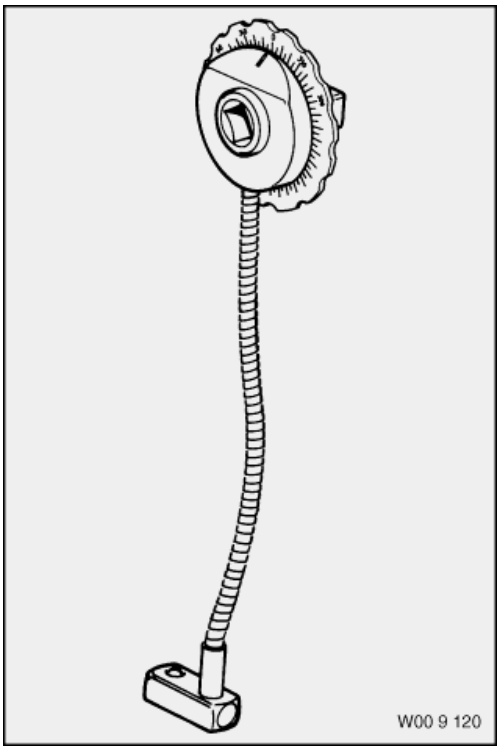
2 405 214 Supplementary set



Common Used in step 77

Usage	For leak-testing cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	2318431, 2337568, 2361215
SI-Number	01 23 17 (517)

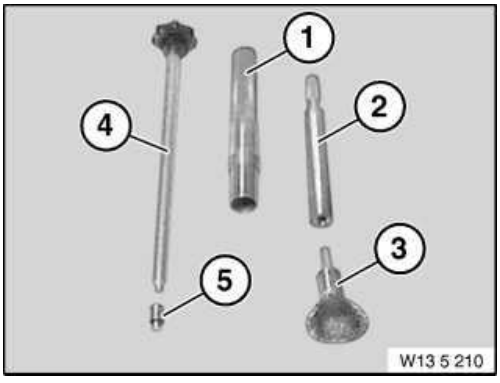
0 490 504 (00 9 120) Torque angle measuring dial



Common Used in step 79 116

Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

0 493 763 (13 5 215) Plug

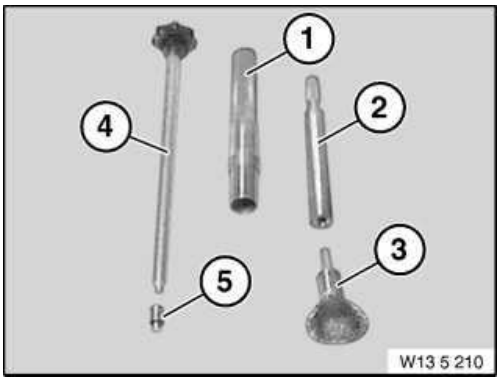


Common Used in step 91

Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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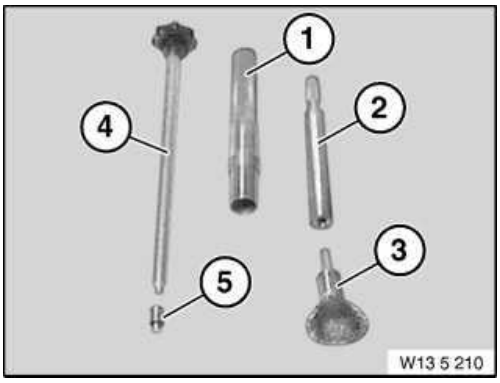
0 493 762 (13 5 214) Rod



Common Used in step 91

Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 758 (13 5 210) Tool



Common Used in step 91

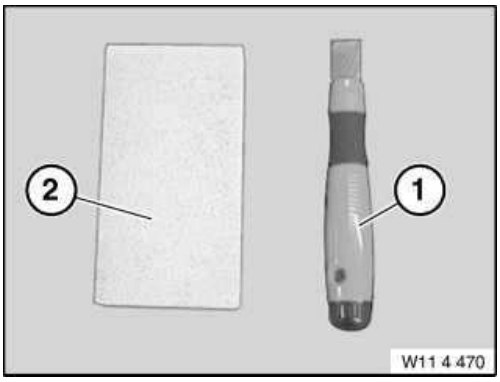
Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

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0 495 102 (11 4 470) Tool



Common Used in step 95

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

2 409 025 Puller



Common Used in step 111

Usage	For disassembly of the outer radial shaft seal of the transmission output shaft, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A76
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

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2 411 739 Puller



Common Used in step 111

Usage	For disassembly of the inner radial shaft seal of the output, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C78
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 408 152 Striking element



Common Used in step 111

Usage	For installation of the right radial shaft seal transmission output shaft (inner). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

2 413 037 Handle



Common Used in step 111

Usage	Universal drift handle. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C77
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

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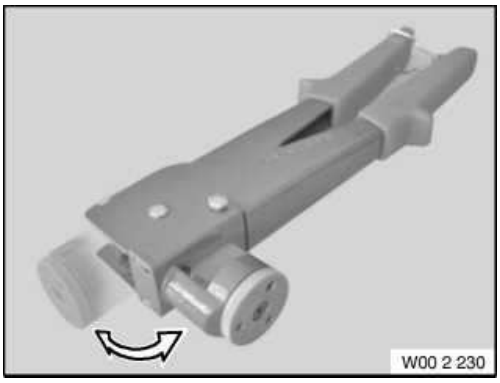
2 408 150 Striking element



Common Used in step 111

Usage	For installing the right radial shaft seal transmission output shaft (outer). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

0 496 521 (00 2 230) Pliers



Common Used in step 129

Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

2 344 011 Tool



Common Used in step 130

Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

0 495 221 (36 1 323) Wheel stud



Common Used in step 23

Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

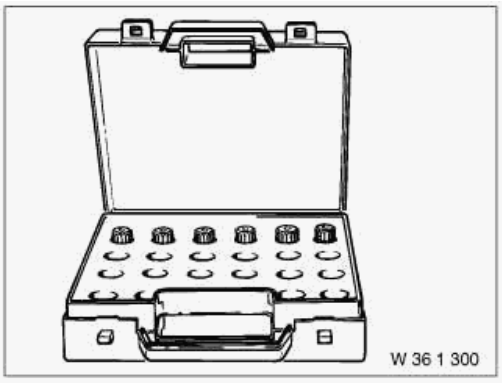
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0 495 224 (36 1 326) Wheel stud



Common	Used in step 23
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud



Common	Used in step 23
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud



Common	Used in step 23
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud



Common	Used in step 23
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 228 (36 1 331) Wheel stud



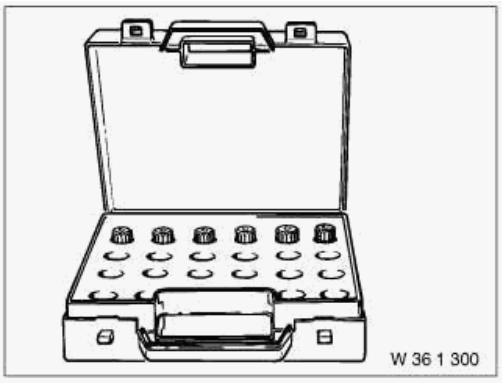
Common	Used in step 23
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 229 (36 1 332) Wheel stud



Common	Used in step 23
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud



Common	Used in step 23
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Cylinder head flatness

Used in step 75

Maximum lengthwise deviation from flatness	0,10 mm
Maximum transverse deviation from flatness	0,05 mm

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Valve underprotrusion	Used in step 76
	0,8 (0,7 - 0,9) mm

Check for cylinder head watertightness	Used in step 77
Temperature of the cylinder head	60 °C

Check for cylinder head watertightness	Used in step 77
Testing pressure	max. 3,0 bar

Transmission oil capacity	Used in step 150
Transmission oil GS6-60DA, GS6X60DA/Owner's Handbook	2,2 l
Transmission oil: Technically suitable manual gearbox oil	

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	54 101
EGR controller	54 101

General repair instructions	Used in step
61 20 ... Notes on AGM battery	142
61 12 ... Notes on intelligent battery sensor (IBS)	142
61 00 ... Notes for disconnecting and connecting battery	142
41 00 ... Notes on repairing threads	
61 00 ... Safety information for handling vehicle battery	

Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	9 44 45 47 48 49 50 51 62 63 72
17 00 008 Draining and topping up coolant for high-temperature circuit	148
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17 00 008 Draining and topping up coolant for high-temperature circuit	148
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	148
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	148
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	148
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17 00 039 Bleed the cooling system and check it for watertightness with the special tool	148
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17 00 039 Bleed the cooling system and check it for watertightness with the special tool	148
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	148
17 00 039 Bleed the cooling system and check for watertightness with the special tool (coolant circuit for low temperature)	148
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	148
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	148
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	148
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	148
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	148
17 00 039 Bleeding the cooling system (B36, B38, B46, B48)	148
17 00 039 Bleeding cooling system (B37, B47)	148
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	148
17 00 039 Filling and bleeding the high-temperature cooling system vacuum filler device (B48)	148
17 00 008 Draining and topping up the high-temperature coolant circuit	148
17 00 008 Draining and topping up the high-temperature coolant circuit	148
17 00 016 Draining and topping up coolant circuit for Range Extender \PREMIUM	148
17 00 008 Draining and topping up the high-temperature coolant circuit	148
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	148
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17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	148

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00 .. ... Raising the vehicle using a vehicle hoist

Operating materials	Used in step
2.0 Grease for wheel centring	130
14.0 Automatic transmission fluid for ZF-transmission GA8HP45Z / GA8HP50Z / GA8HP70Z / GA8HP90Z / GA8P70H / GA8P75H / GA8HP75Z	149

Operating materials	Used in step

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	86
Exhaust-gas recirculation cooler seal on exhaust manifold	101
Exhaust-gas recirculation cooler seal on intake plenum	101

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11 12 729 Checking cylinder head on watertightness (B47)

Special tools required:

- 11 8 890
- 2 405 214

Attention!

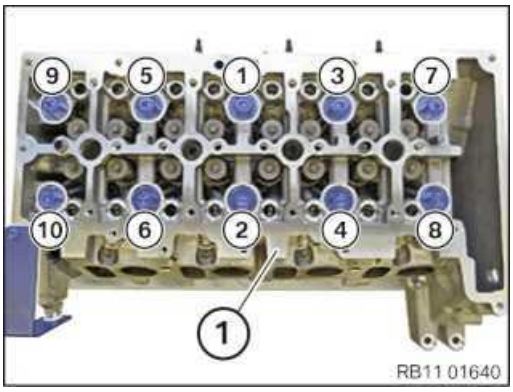
Pressure-test cylinder head to max. **3 bar**.

Heat cylinder head to 60 °.

Check for bubble formation in a water bath.

Necessary preliminary tasks:

- Remove cylinder head.
- Remove all glow elements.
- Remove exhaust manifold.



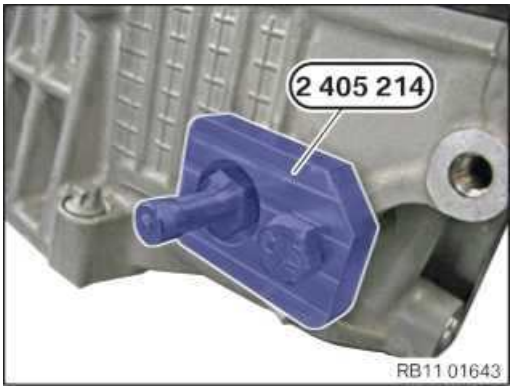
Secure special tool 11 8 890 with screws in sequence (1 - 10) on the cylinder head.

Tightening torque: **20 Nm**.



Mount and secure special tool 2 405 214 on the cylinder head.

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Mount and secure special tool 2 405 214 on the cylinder head.

Note:
Compressed air at valve (1) max. **3 bar**.

Heat cylinder head to 60 °C.

Check for bubble formation in a water bath.

Concluding tasks:

- Remove all special tools
- Attach exhaust manifold.
- Install all glow elements.
- Install cylinder head.

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11 12 800 Clean cylinder head intake channels and intake plenums

PRELIMINARY WORK

1 – Disconnecting all battery earth leads

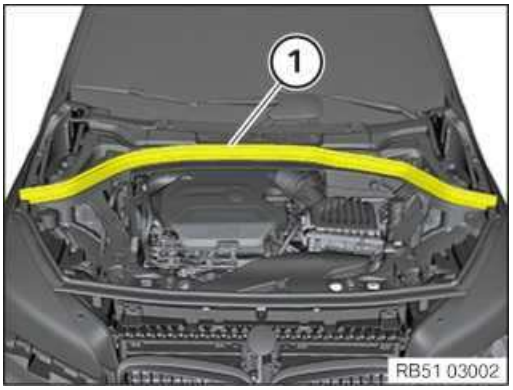


- See additional information.

2 – Remove the seal for the rear bonnet

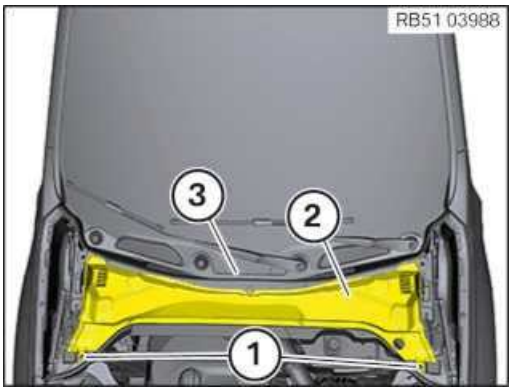
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Pull off rear bonnet seal (1) towards the top and remove.

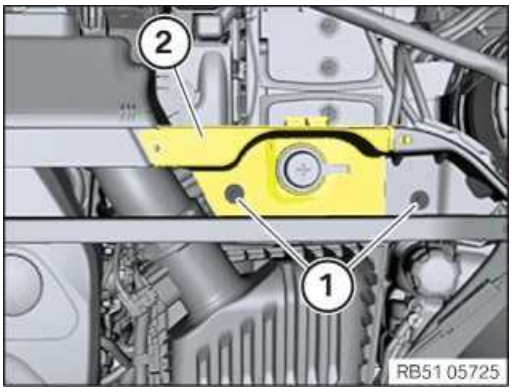
3 – Removing front cowl panel cover



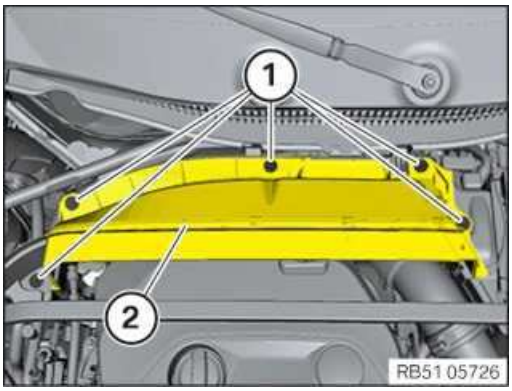
- Loosen the expanding rivet (1).
- Feed out and remove front cowl panel cover (2) from the rear cowl panel cover(3).

4 – Removing the upper bulkhead cover

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- Loosen screws (1).
- Guide out and remove the cover (2).

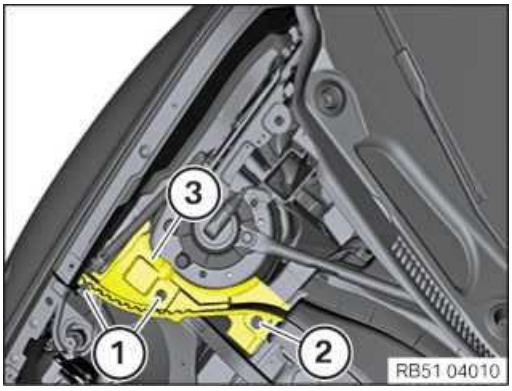


- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

5 – Remove suspension cross-brace

TECHNICAL INFORMATION

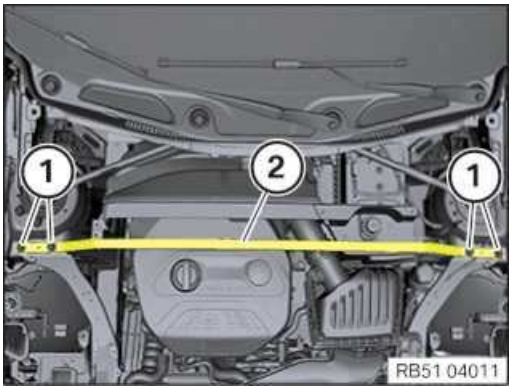
Driving without the strut brace/front end or tension strut is not permitted.



NOTICE

Description is for right component only. The procedure on the left side is identical.

- Loosen expanding rivet (1).
- Loosen screw (2).
- Remove the cover (3).



- Loosen screws (1).
- Remove strut brace (2).

6 – Removing the acoustic cover

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

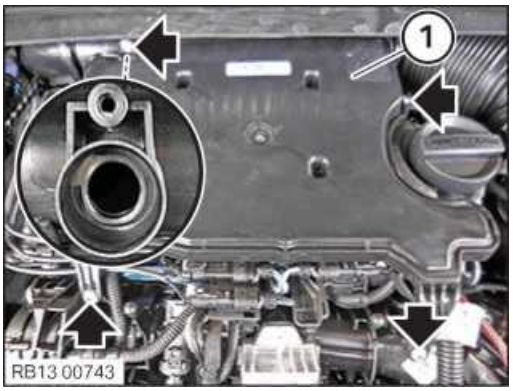
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

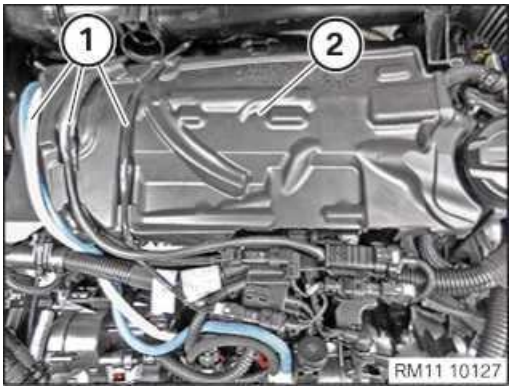
- Unclip the acoustic cover from the marked areas towards the top.

7 – Remove resonator



- Remove screws (arrows).
- Guide out and remove the resonator (1).

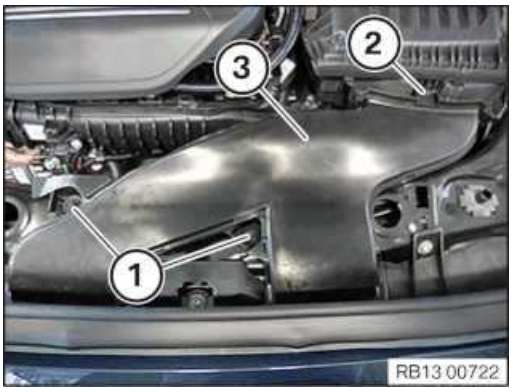
8 – Remove the acoustic cover for the injectors



- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

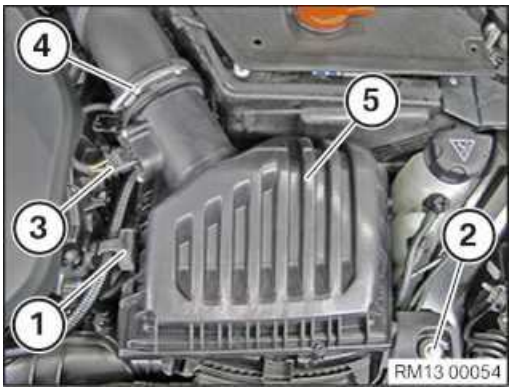
9 – Remove the intake neck for intake silencer housing

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- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

10 – Removing intake silencer housing

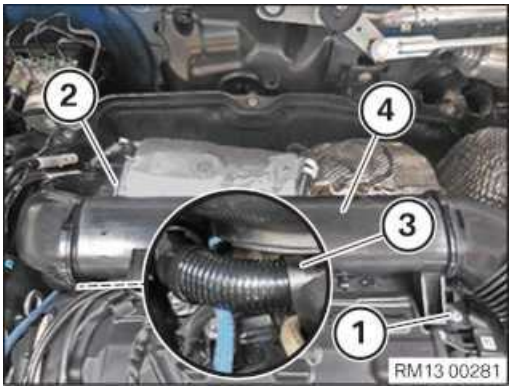


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

11 – Removing clean air pipe



- Detach clamp (1) on the clean air pipe.
- Pull off the clean air pipe from the intake silencer housing.

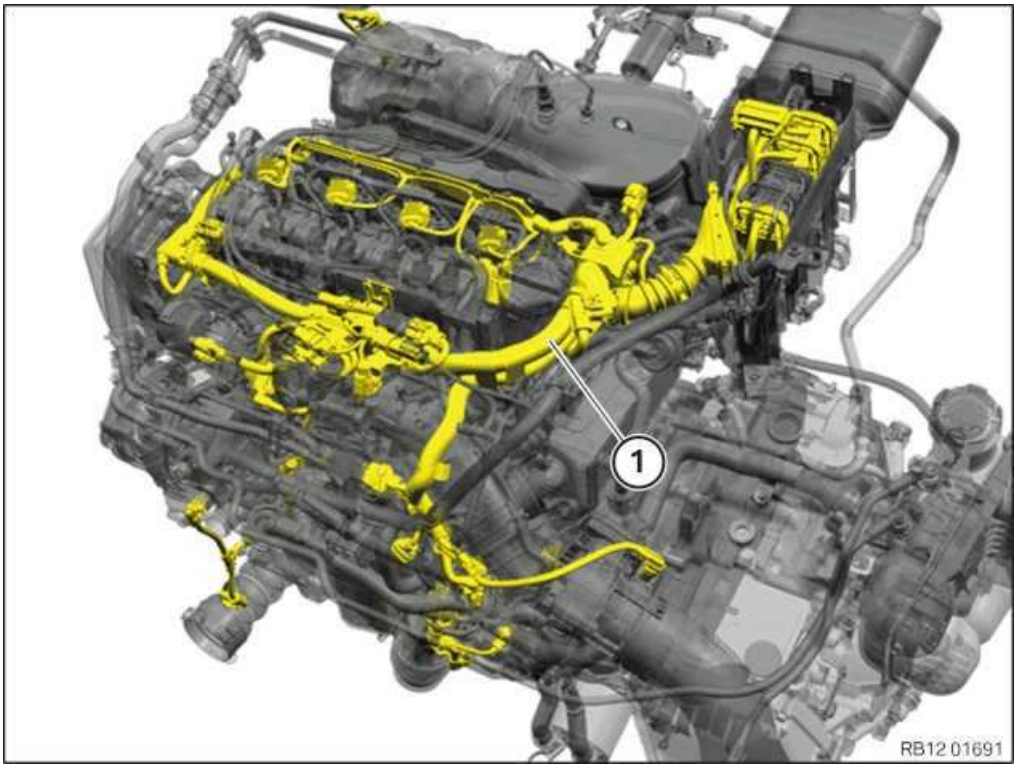


- Loosen screw (1).
- Loosen clamp (2).
- Unlock the ventilation line (3) and pull it off the cylinder head cover.
- Feed out clean air pipe and remove.

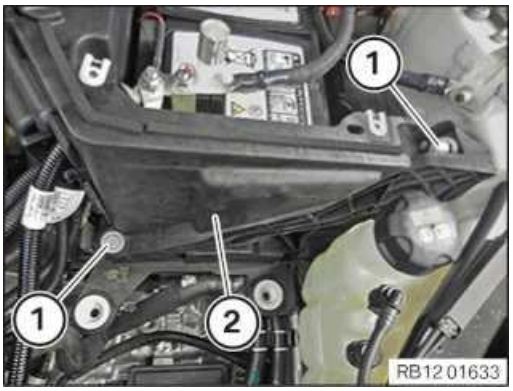
12 – Releasing the wiring harness section for the intake plenum

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Overview: Wiring harness section for the engine



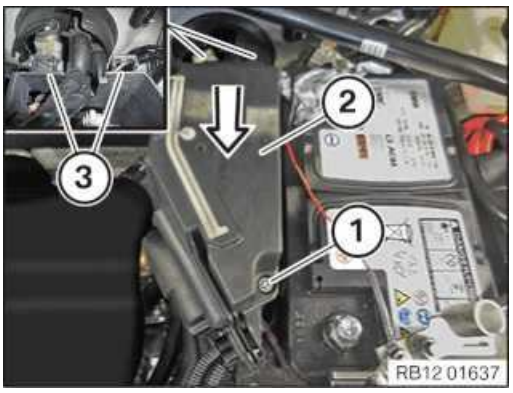
1 Wiring harness section for the engine



- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.

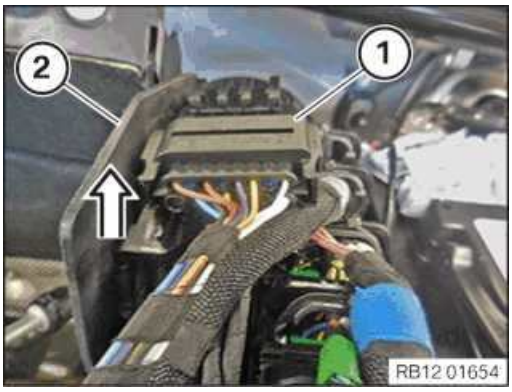


- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

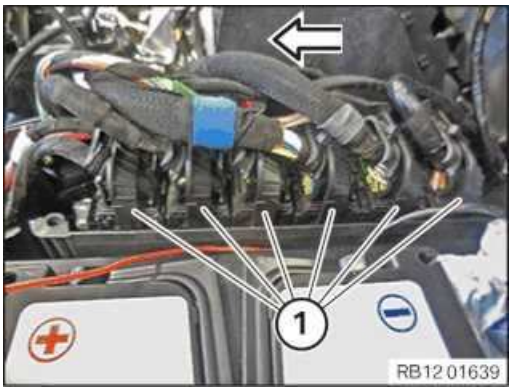


- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.

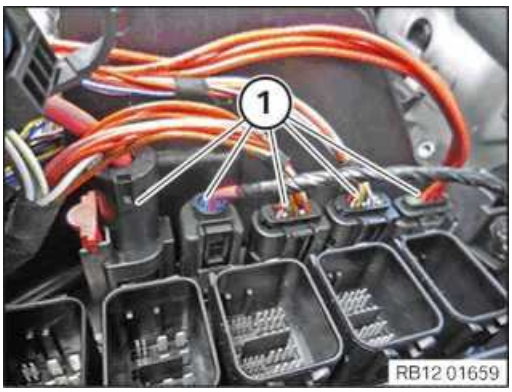
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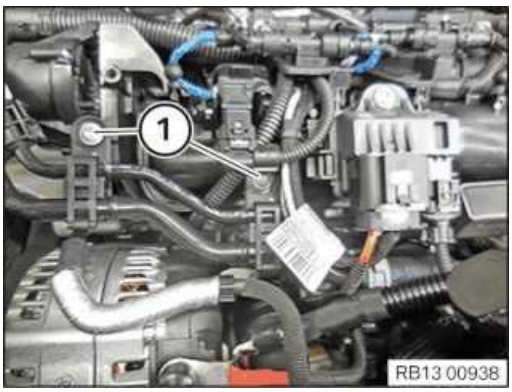
- Guide the connector (1)out of the electronics box (2) in the direction of arrow and remove it.
- Unlock and loosen connector (1).



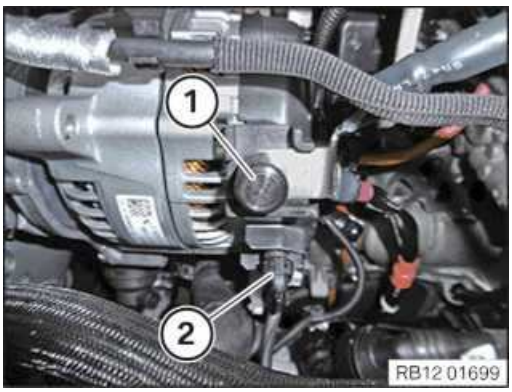
- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



- Unlock and loosen connector (1).

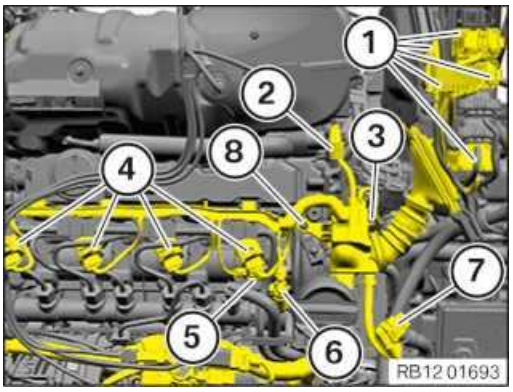


- Loosen screws (1).

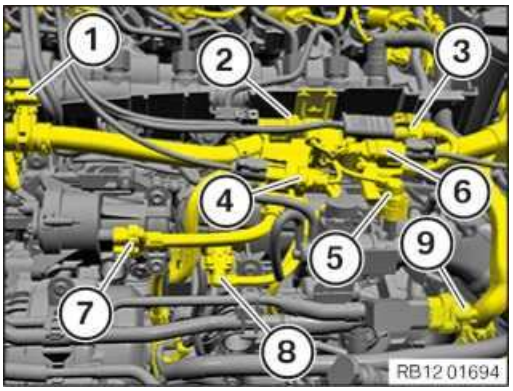


- Release the positive battery cable (1) on the alternator and place to one side.
- Unlock connector (2) and pull off.

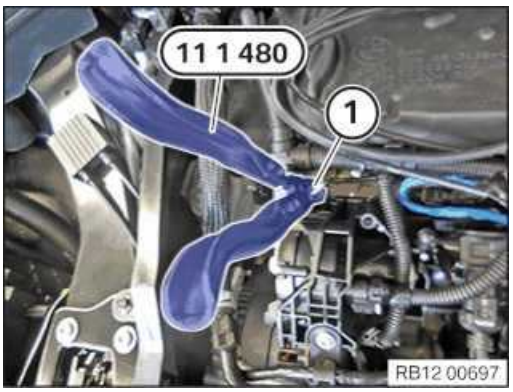
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- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock the connector (2) and disconnect it from the differential pressure sensor.
- Unlock the connector (3) and disconnect it from the exhaust-gas recirculation valve.
- Unlock the connector (4) and pull off from the injectors.
- Unlock the connector (5) and disconnect it from the camshaft sensor.
- Unlock the connector (6) and disconnect it from the fuel pressure regulator.
- Unlock connector (7) and pull off from hot film air mass meter.
- Loosen screw (8).

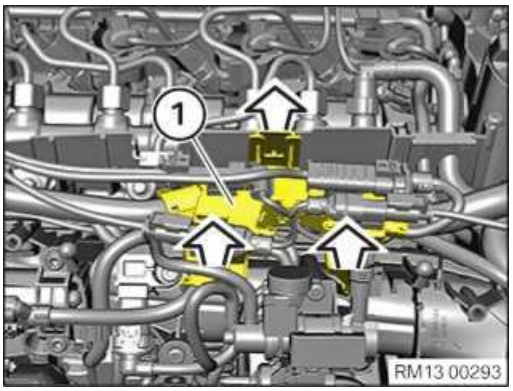


- Unlock connector (1) and pull off from the rail pressure sensor.
- Unlock the connector (2) and disconnect it from the exhaust temperature sensor before the diesel particulate filter.
- Unlock and disconnect the connector (3) from the front oxygen sensor.
- Unlock the connector (4) and disconnect it from the exhaust temperature sensor after the diesel particulate filter.
- Unlock and disconnect the connector (5) from the electric changeover valve.
- Unlock the connector (6) and disconnect it from the exhaust temperature sensor for the exhaust-gas recirculation cooler.
- Unlock the connector (7) and disconnect it from the servomotor for the swirl flaps.
- Unlock the connector (8) and pull it off the charging pressure sensor.
- Unlock the connector (9) and disconnect from the fuel pressure and temperature sensor.



- Unlock the connectors (1) of all glow elements with the special tool **0 490 796 (11 1 480)** and release them.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.

▶ **Removing the cable clips from the intake plenum**



- Detach the cable clip (1) in the direction of the arrow.
- Guide out the cable clip (1) in direction of arrow and set it aside.

13 – Removing the intake plenum

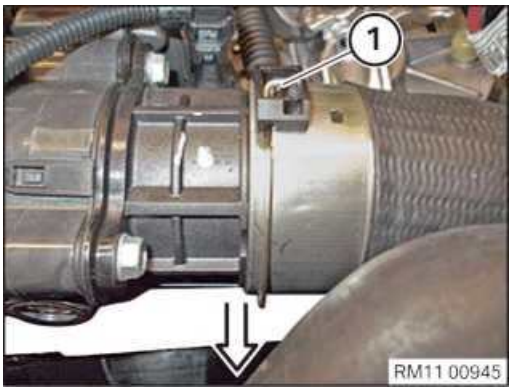
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TECHNICAL INFORMATION

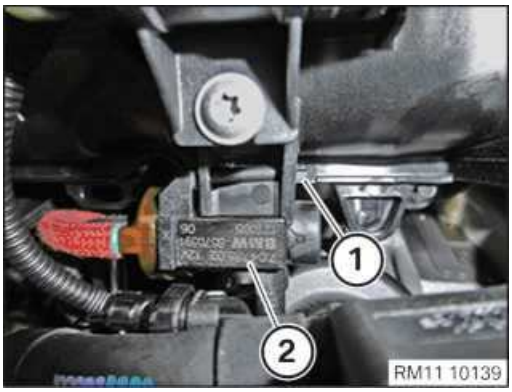
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



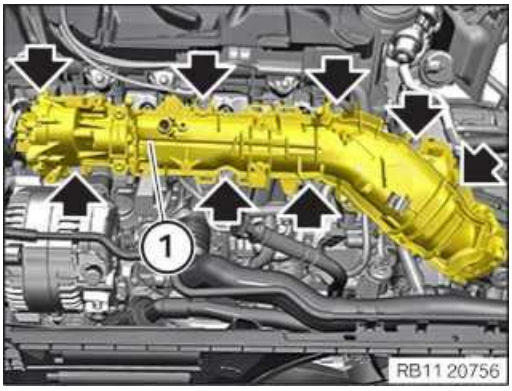
- Unlock the lock (1).



- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.

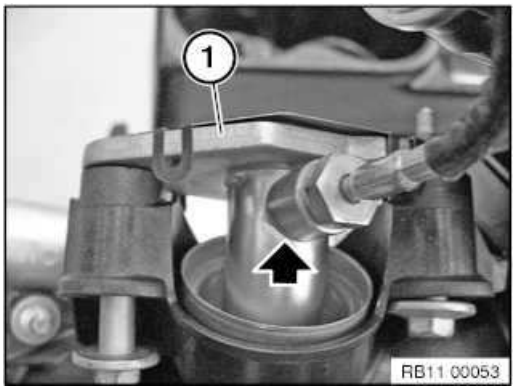


- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



- Release the screws (arrows) from the intake plenum (1).
- Guide the intake plenum (1) out forwards and remove it.

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- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

14 – Remove front right wheel

TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

TECHNICAL INFORMATION

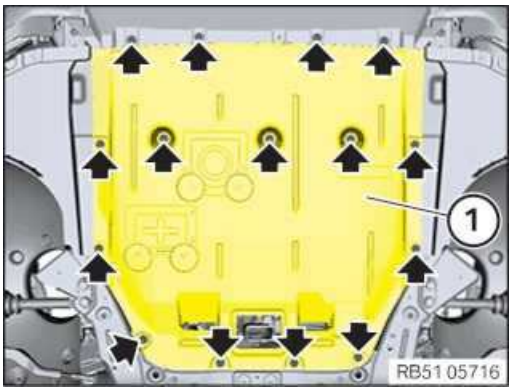
Strictly observe the specified procedure to prevent clamping errors and imbalance.



- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

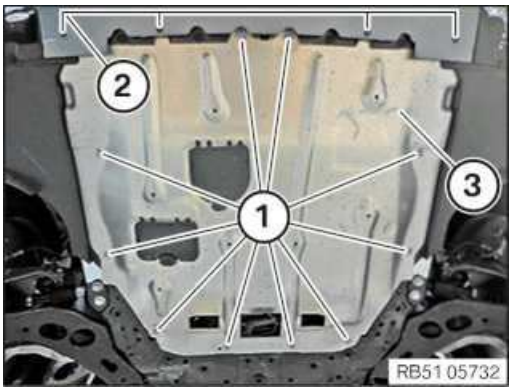
  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

15 – Removing the front underbody protection



- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.

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- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

16 – Removing the front right wheel arch cover

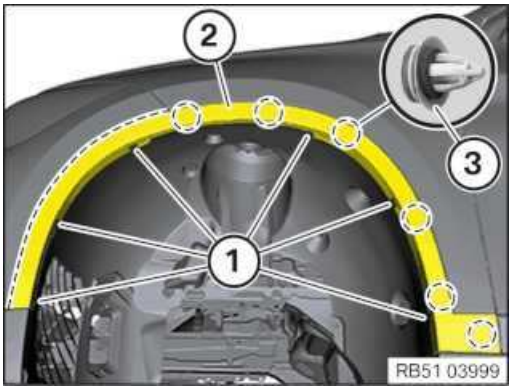
▶ **Remove the front wheel arch trim**

NOTICE

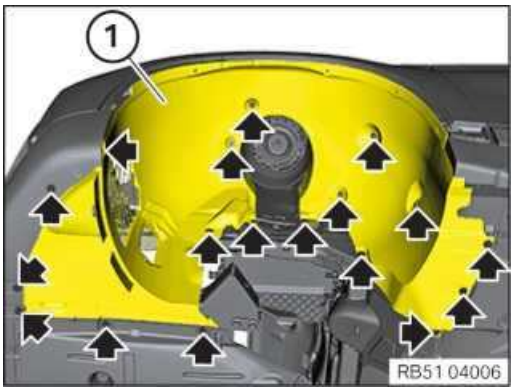
To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.



NOTICE

Description is for left component only. Procedure on the right side is identical.

- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

17 – Removing glow elements

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Damage to the glow elements.

Excessive force may damage the glow elements and they may then have to be renewed.

- Handle glow elements with care and do not drop.
- Do not rest the cylinder head on glow elements. Glow elements protrude from the sealing surface of the cylinder head.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

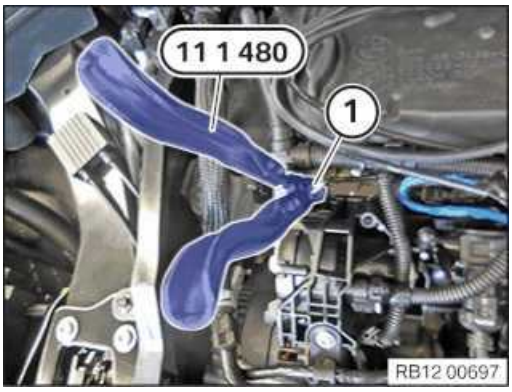


Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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- Unlock and disconnect plug connection (1) using special tool **0 490 796 (11 1 480)**.



- Release the glow elements with the special tool or conventional tools.
- Feed out preheating elements and remove.

MAIN WORK

18 – Clean the intake system

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

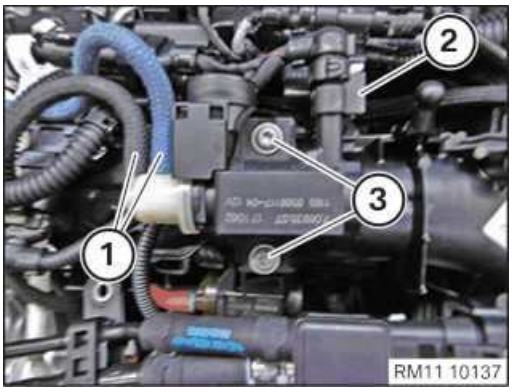
RISK OF DAMAGE

Electrostatic discharge.

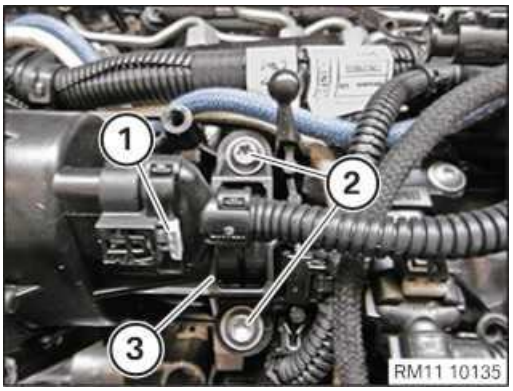
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
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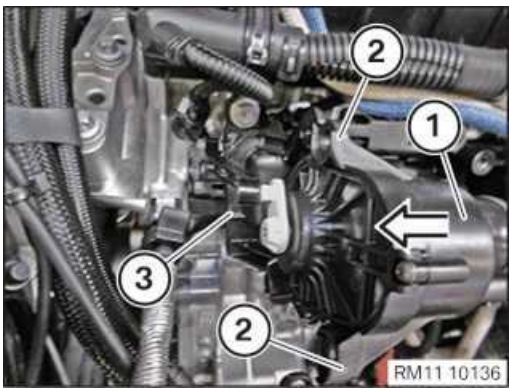
- Pull off the vacuum hoses (1).
- Make sure **not** to lose the green O-ring between the blue vacuum hose and the electric changeover valve.
- Unlock plug connection (2) and disconnect.
- Loosen screws (3).
- Remove electric changeover valve.



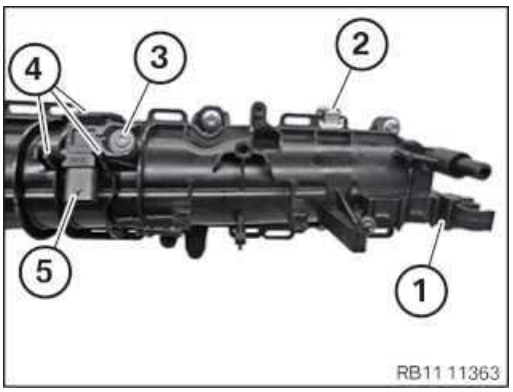
- Unlock plug connection (1) and disconnect.
- Place wiring harness to one side.
- Loosen screws (2).
- Remove holder (3).



- Release the screws (1) with a suitable tool.

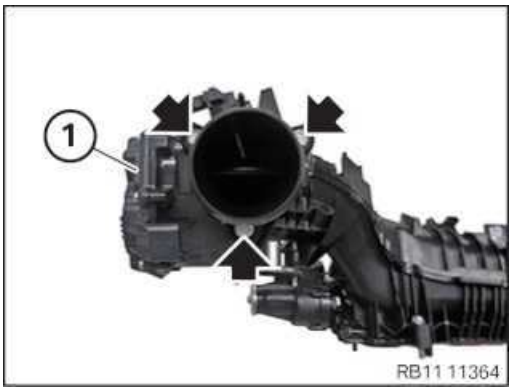


- Slightly lift the swirl-flap controller (1) at rear and in feed out direction of arrow, forwards out of the guides (2).
- Slightly tilt the swirl-flap controller (1).
- Carefully release the drive arm from the adjustment lever (3).
- Remove the swirl-flap controller (1).

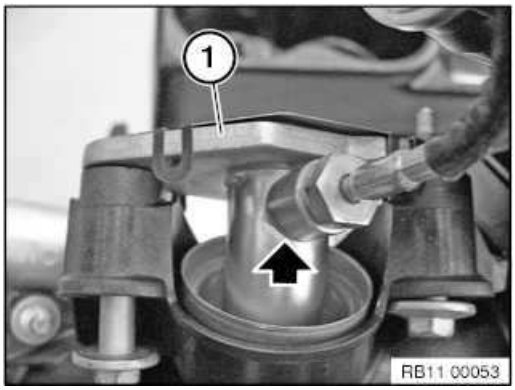


- Guide out and remove holder (1).
- Feed out and remove the clamp (2).
- Loosen screw (3).
- Unlock the locks (4).
- Remove the charging pressure sensor (5).

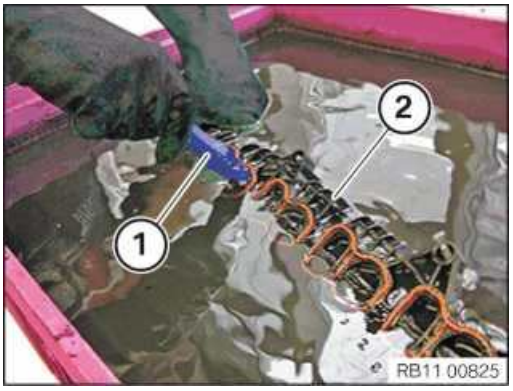
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- Remove screws (arrows).
- Remove the throttle bodies (1).



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Mix the cleaning agent in a large collecting vessel.

Cleaning agent

Universal cleaner must be diluted with water.	
Washer fluid	2 parts water, 1 part universal cleaner

Expendable materials: Universal cleaner

- Place the intake system (2) into the collecting vessel.

Clean the intake system

Soaking time of the cleaning agent	1 h

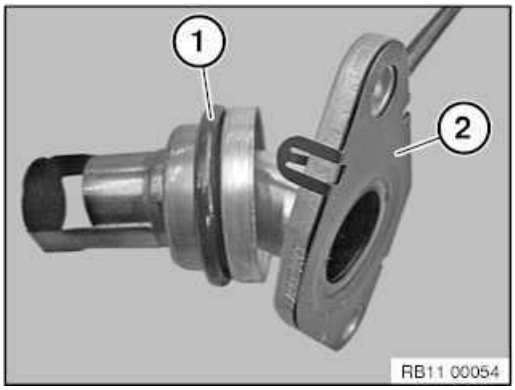
- Clean the intake system (2) with the brushes (1).

Care product

Wheel rim brushes	1x, Set	83192298237

- Then rinse the intake system (2) with water.

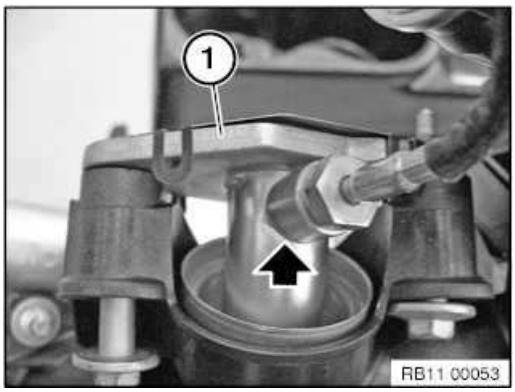
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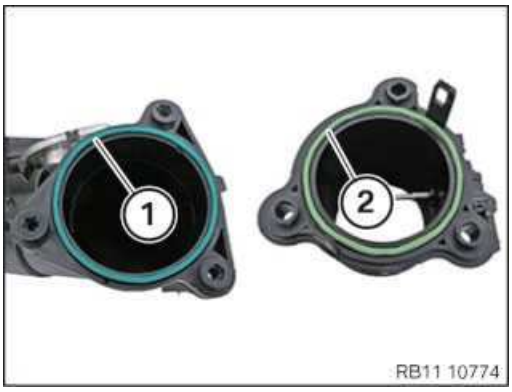
- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew the gasket (2).

  Parts: Gasket
- Position the seal (2) and clip it in.



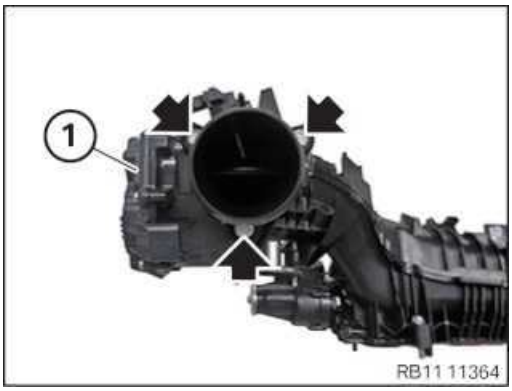
- Install exhaust-gas recirculation pipe (1) in the intake plenum (arrow).
- Position the swirl-flap controller.
- Engage the drive arm of the swirl-flap controller in the adjustment lever of the intake plenum.



- Renew the seal (1) between the intake system and the throttle body.

  Parts: Gasket
- Renew the seal (2) between the throttle body and charge air pipe.

  Parts: Gasket



- Feed in and install the throttle body (1).
- Tighten screws (arrows).

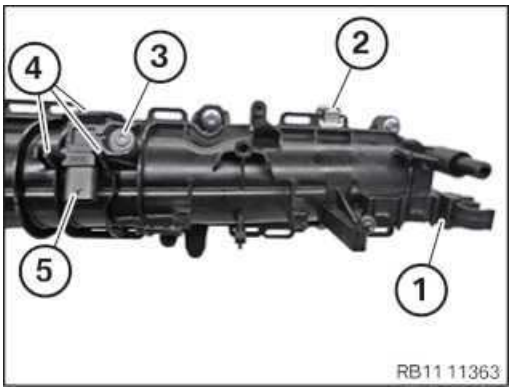
Throttle body to intake plenum

6x50		Tightening torque	7 Nm



- Clean the charging pressure sensor, replace, if applicable.
- Check the sealing ring (1) for damage and renew where required.
- Lightly coat the sealing ring (1) on the charging pressure sensor with lubricant for the installation.

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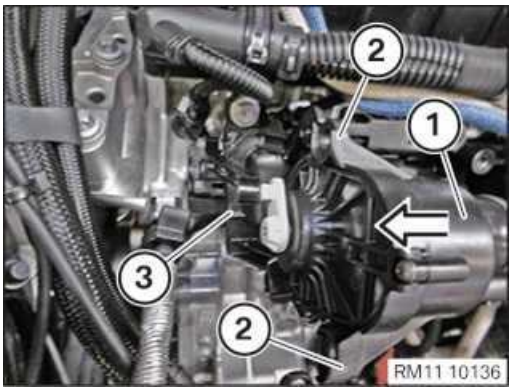
- Insert and install the charging pressure sensor (5).
- Lock the locks (4).

  The locks (4) must engage audibly.
- Tighten down screw (3).

Charging pressure sensor to intake plenum

TS6X20		Tightening torque	4 Nm

- Feed in and install the clamp (2).
- Insert and install the holder (1).



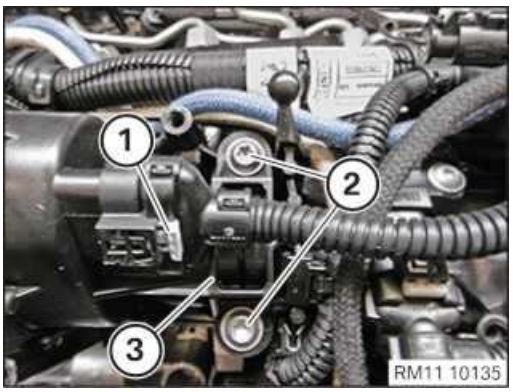
- Feed in the swirl-flap controller (1) in direction of arrow at a slight angle.
- Carefully engage the drive arm into the adjustment lever (3).
- Insert and install the swirl-flap controller (1) in the guides (2).



- Tighten the screws (1).

Swirl-flap controller to intake plenum

M6 x 16	Tighten the bolts in alternating order until flush.	4 Nm



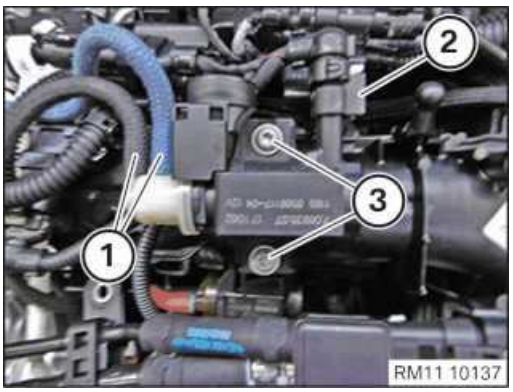
- Position holder (3).
- Tighten the screws (2).

Swirl-flap controller to intake plenum

M6 x 16	Tighten the bolts in alternating order until flush.	4 Nm

- Connect and lock connector (1) .

  Lock must audibly engage.



- Position the electric changeover valve.
- Tighten the screws (3).

Electric changeover valve to intake plenum

TS6x20		Tightening torque	5 Nm

- Connect the blue vacuum hose (1) to the electric changeover valve.

Note: The connection for the blue vacuum hose has a green rubber ring.

- Connect black vacuum hose (1) to the electric changeover valve.
- Connect connectors (2) and lock.

  Lock must audibly engage.

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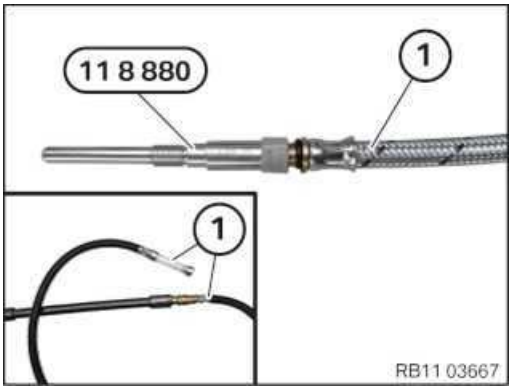
19 – Turn the piston to top dead centre

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Connect TDC gauge (1) from set of special tools to special tool **0 496 146 (11 8 880)**.



- Install special tool **0 496 146 (11 8 880)** in place of the glow element.



- Fit special tool **0 493 380 (11 6 480)**.

RISK OF DAMAGE

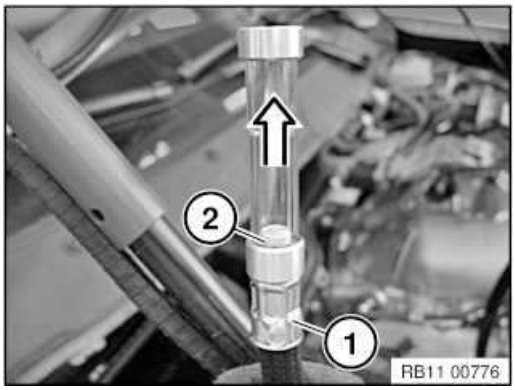
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Turn the engine by hand using special tool **0 493 380 (11 6 480)**.

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- Turn the engine by hand.
- When the piston moves up, the journal (2) in the special tool (1) also moves up.
- In the top dead centre, the piston and also the journal (2) are positioned at the highest point in the special tool (1).
- Turn the piston to the top dead centre.

» The valves are now closed.



RISK OF DAMAGE

Engine damage due to walnut granules in the combustion chamber.

If walnut granules penetrate the combustion chamber while cleaning the intake ports, engine damage may occur.

- Always clean the intake port with valves of the relevant cylinder closed.
- Set the piston of the relevant cylinder to the top dead centre.
- If walnut granules have entered the combustion chamber: Do **not** turn or start the engine by hand. Disassemble the cylinder head and clean all components.

- Engine must not be rotated further.
- Intake valves (1) must be closed while cleaning.

20 – Cleaning intake ports

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.



- Wear safety goggles.

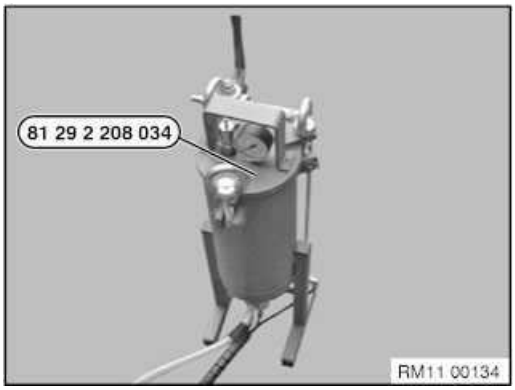
RISK OF DAMAGE

Engine damage due to walnut granules in the combustion chamber.

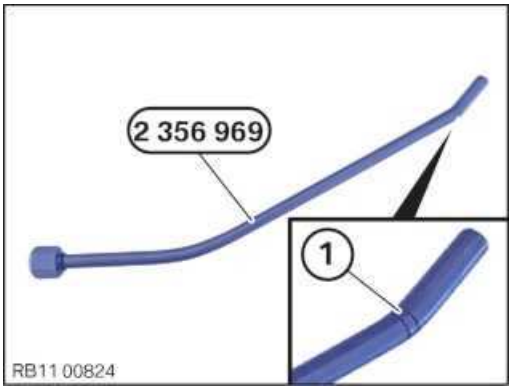
If walnut granules penetrate the combustion chamber while cleaning the intake ports, engine damage may occur.

- Always clean the intake port with valves of the relevant cylinder closed.
- Set the piston of the relevant cylinder to the top dead centre.
- If walnut granules have entered the combustion chamber: Do **not** turn or start the engine by hand. Disassemble the cylinder head and clean all components.

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- Keep the special tool **2 208 034**, the walnut granules and a vacuum cleaner ready.



- Have the special tool **2 356 969** ready.

TECHNICAL INFORMATION

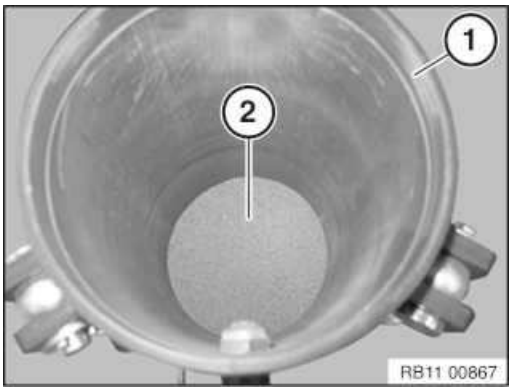
The front area of the blasting wand is marked with two notches. These may additionally be highlighted in colour.

During the blasting process, only pull the blasting wand out of the vacuum adapter until the mark becomes visible.

- Observe the mark (1).



- Stage special tools **2 356 966** and **2 356 967**.

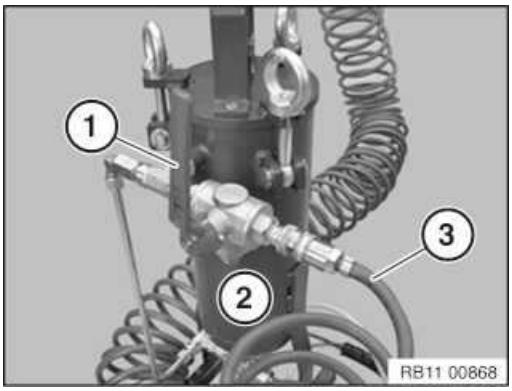


- Open blasting device (1).
- Fill in walnut granules (2).

Walnut granules

Quantity for each blasting process	2 l

- Close blasting device (1).

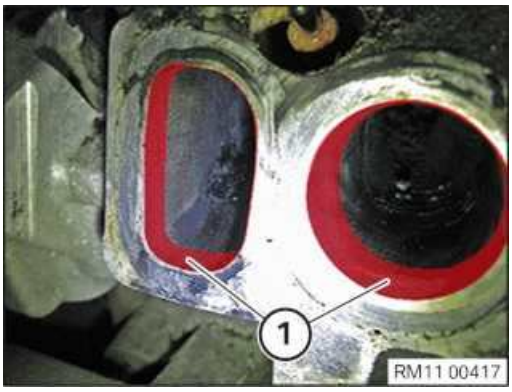


- Close the valve (1) on the blasting device (2).
- Connect compressed air (3).

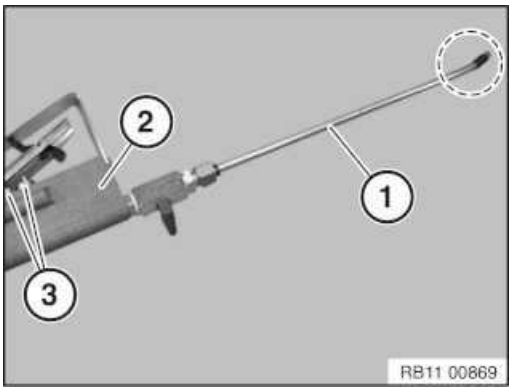
Cleaning the intake ports

Operating pressure	6 bar ... 8 bar

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- Clean marked areas (1) with a brush.



- Attach the blasting wand (2) to the blasting device (1).



- Connect the special tool **2 356 967** to a vacuum cleaner.
- Insert the special tool **2 356 967** into the swirl port of cylinder 1.



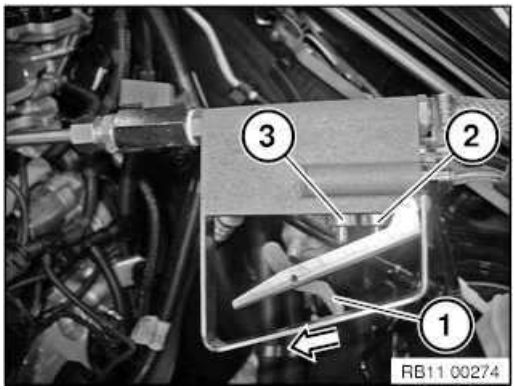
TECHNICAL INFORMATION

Conduct the following operation with the assistance of a second person.

- Insert the special tool **2 356 969** into the special tool **2 356 967**.
- Open the valve (1).
- Move the blasting wand forwards and backwards and rotate.

  This removes any dirt in the tangential port.

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- Slide the locking lever (1) forward in the direction of the arrow.
- To release the compressed air: Actuate valve (2).
- To release the walnut granules and the compressed air: Actuate valves (1) and (2).
- Clean the swirl port.

Cleaning the intake ports

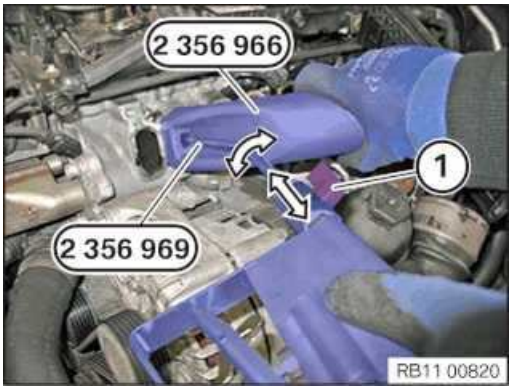
Blast duration with walnut granules	Approx. 20 s
Blast duration with pure compressed air for the complete blowing out of walnut granules	Approx. 10 s

- Close the valve on the blasting wand.

» Check the pressure drop at the pressure measuring device.



- Connect the special tool **2 356 967** to a vacuum cleaner.
- Insert the special tool **2 356 967** into the swirl port of cylinder 1.

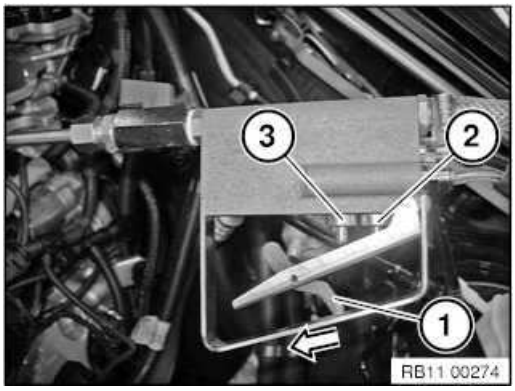


TECHNICAL INFORMATION

Conduct the following operation with the assistance of a second person.

- Insert the special tool **2 356 969** into the special tool **2 356 967**.
- Open the valve (1).
- Move the blasting wand forwards and backwards and rotate.

  This removes any dirt in the swirl port.



- Slide the locking lever (1) forward in the direction of the arrow.
- To release the compressed air: Actuate valve (2).
- To release the walnut granules and the compressed air: Actuate valves (1) and (2).
- Clean the swirl port.

Cleaning the intake ports

Blast duration with walnut granules	Approx. 20 s
Blast duration with pure compressed air for the complete blowing out of walnut granules	Approx. 10 s

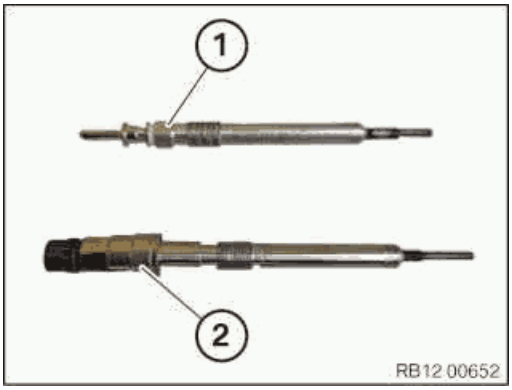
- Close the valve on the blasting wand.

» Check the pressure drop at the pressure measuring device.

- Perform the following steps one after another on all the other cylinders:
  - Turn the piston to top dead centre
  - Cleaning intake ports

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21 – Install glow elements



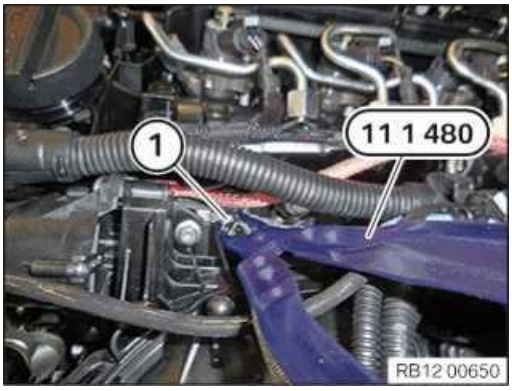
- Install glow elements (1) in cylinders 1, 2, 3 and 4.
- If fitted: Glow element (2) with the **combustion chamber pressure sensor** must be installed in cylinder **2**.



- Tighten the glow element with the special tool or conventional tools.

Glow elements to cylinder head

Glow element		Tightening torque	13 Nm



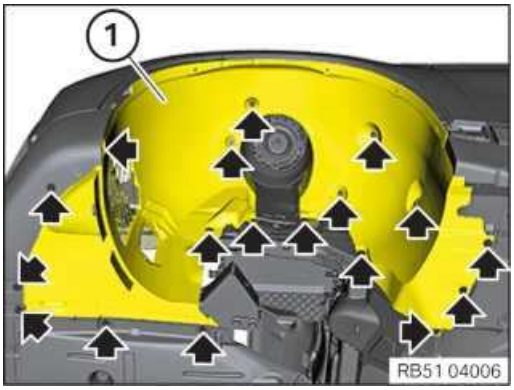
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

22 – Installing the front right wheel arch cover

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

▸ **Installing front wheel arch trim**

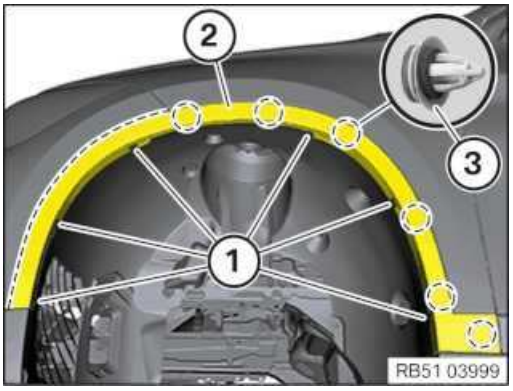
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NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

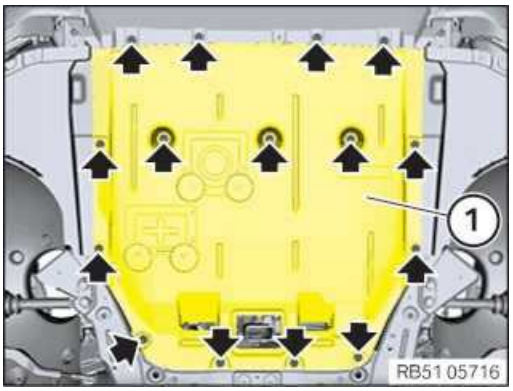
Description is for left component only. Procedure on the right side is identical.



- Check the clips (3) for damage and renew where required.

  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

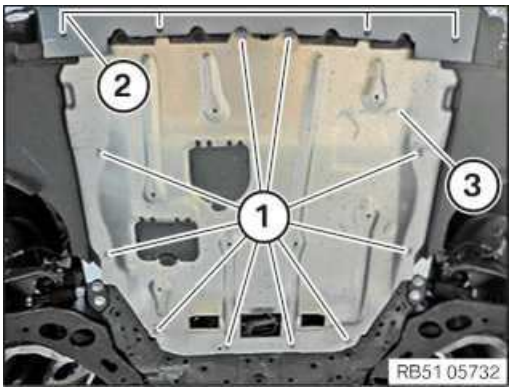
23 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm



- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

24 – Installing the front right wheel

▸ **Clean the contact surfaces between the brake disc and the wheel rim**

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TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

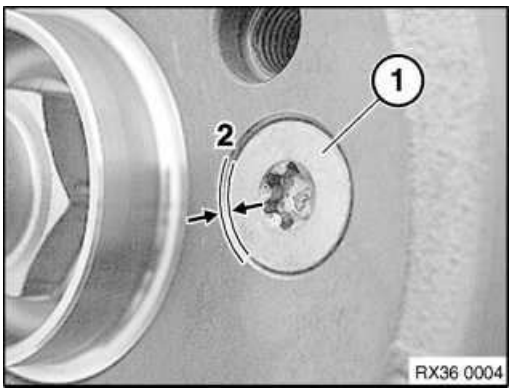
- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.



- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

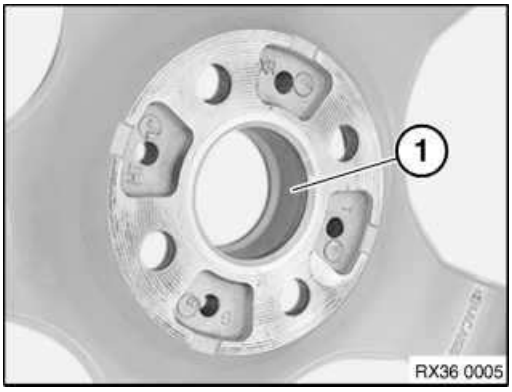


- Check the mounting bolt for the brake disc (1) for secure fit.

  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

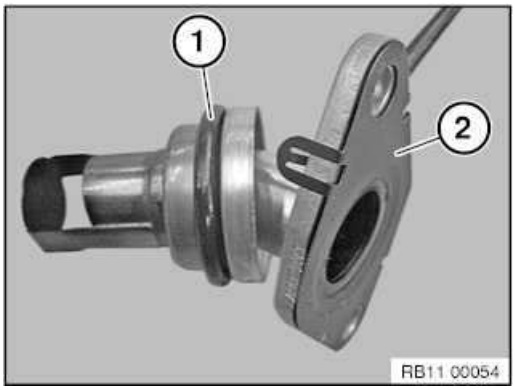
  Parts: Wheel bolts
- Clean the wheel bolts and check the threads for damage. Renew the wheel bolts as needed.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

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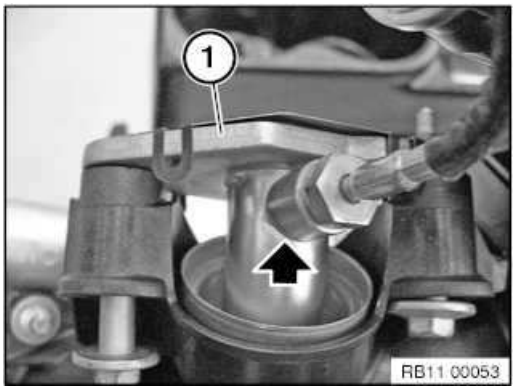
25 – Installing the intake plenum



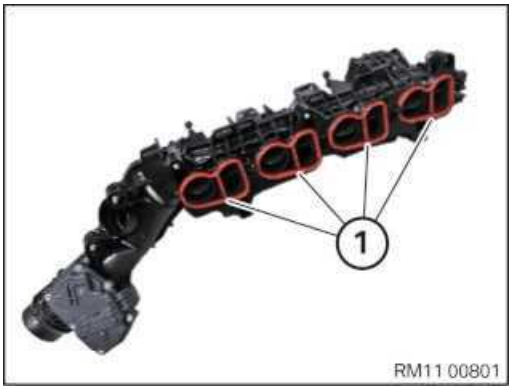
- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position the seal (2) and clip it in.



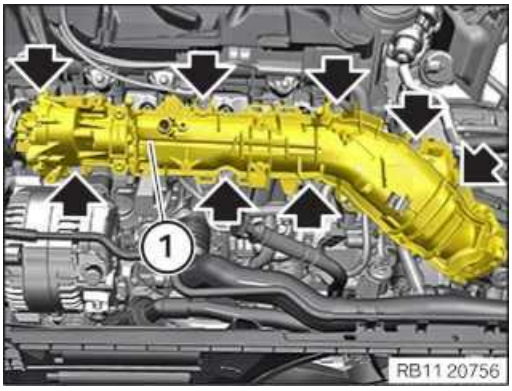
- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (1).

  Parts: Gasket

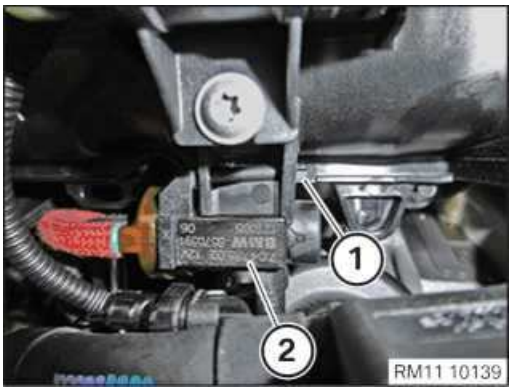
- Ensure that the seal (1) is firmly mounted on the intake plenum.



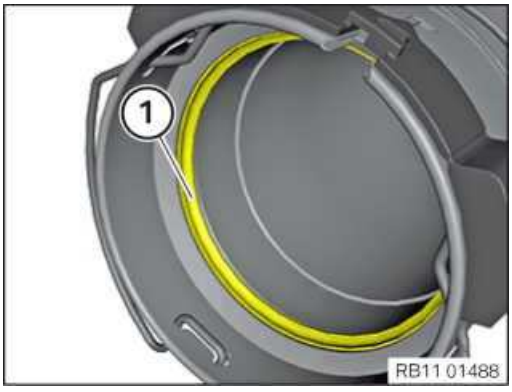
- Guide in and install intake (1) plenum.
- Tighten screws (arrows).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm



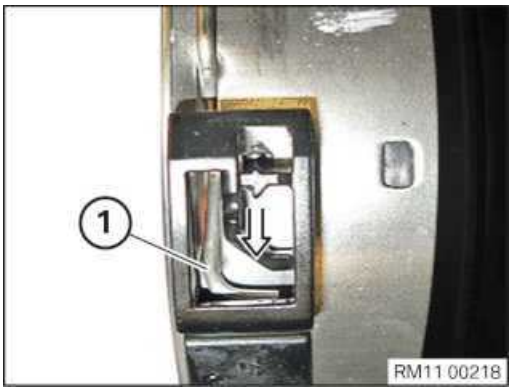
- Install the electric changeover valve (2) in the holder on the plenum from left to right.
- Lock (1) must engage audibly.



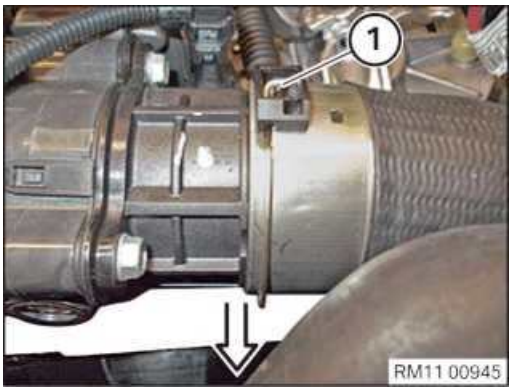
- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring

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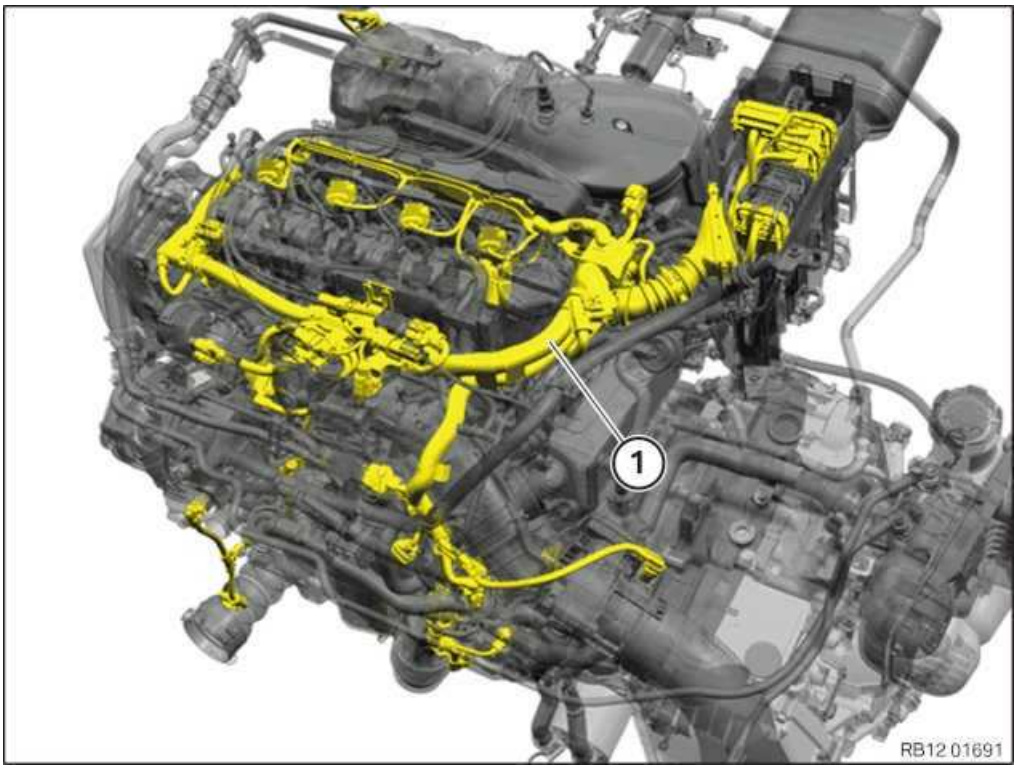
- Engage the lock (1) on the bracket (arrow).



- Connect the charge air line to the throttle valve.
  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

26 – Fastening the wiring harness section for the intake plenum

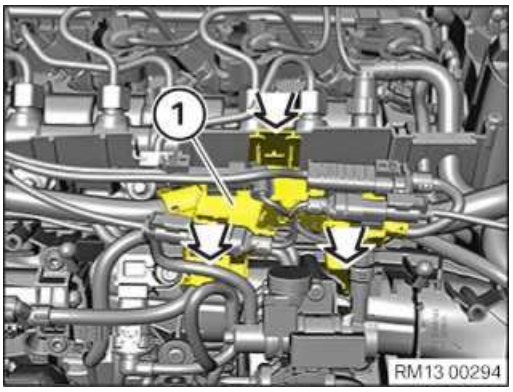
Overview: Wiring harness section for the engine



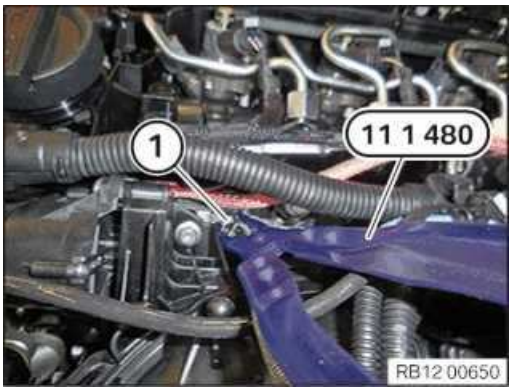
1 Wiring harness section for the engine

▸ **Installing the cable clip for the intake plenum**

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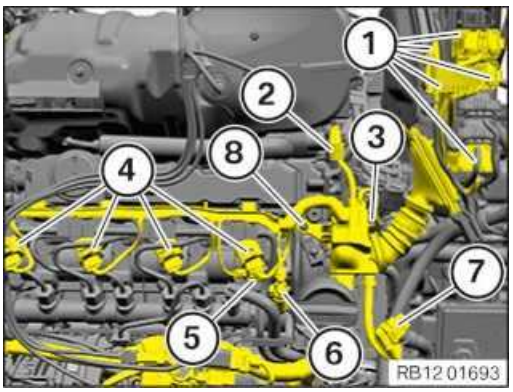


- Insert and install the cable clip (1) in the direction of the arrow.
- Make sure the cable clip (1) is fitted correctly.



- Connect and lock the connector (1) on the glow elements.

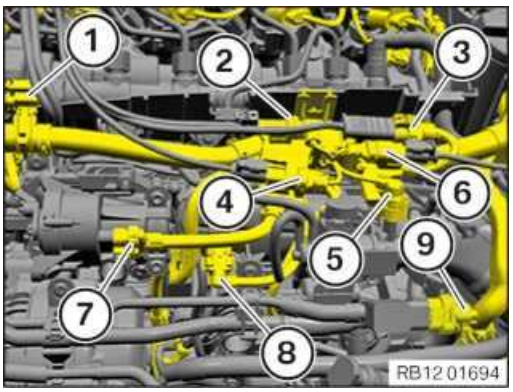
  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.



- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the DME control unit and remove the integrated supply module (PDM).
- Attach connector (2) to the differential pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust-gas recirculation valve and lock audibly.
- Attach connector (4) to the injectors and lock it audibly.
- Attach connector (5) to the camshaft sensor and lock it audibly.
- Attach connector (6) to the fuel pressure regulator and lock it audibly.
- Connect and audibly lock the connector (7) to the hot film air mass meter.
- Tighten down screw (8).

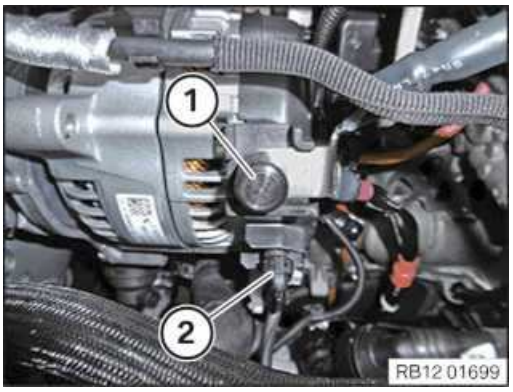
Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm



- Connect the connector (1) to the rail pressure sensor and lock it audibly.
- Attach connector (2) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (3) to the front oxygen sensor and lock audibly.
- Attach connector (4) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Connect the connector (5) to the electric changeover valve and lock audibly.
- Attach connector (6) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (7) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (8) to the charging pressure sensor and lock it audibly.
- Attach connector (9) to the fuel pressure and temperature sensor and lock it audibly.

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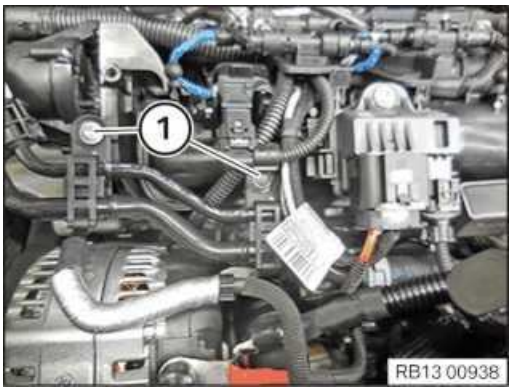


- Connect and lock the connector (2).

  Lock must snap audibly into place.
- Connect the positive battery cable (1) and tighten.

Positive battery cable to alternator

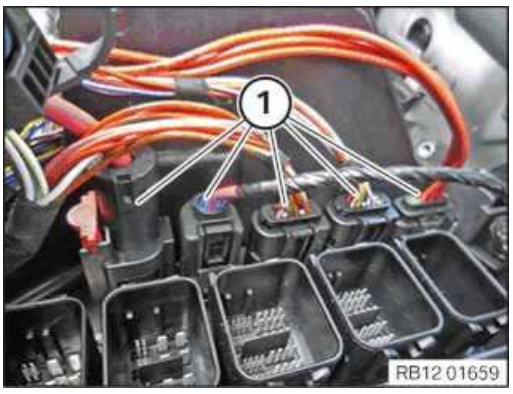
M8		Tightening torque	19 Nm



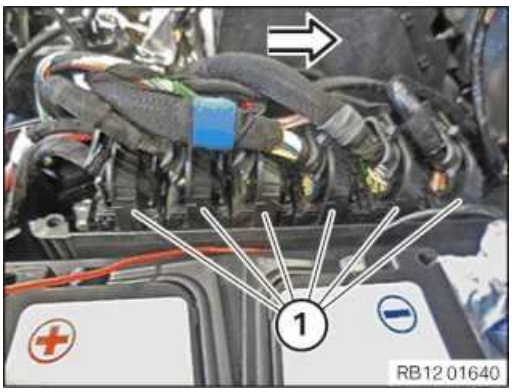
- Position the fuel line.
- Tighten the screws (1).

Fuel line to intake plenum

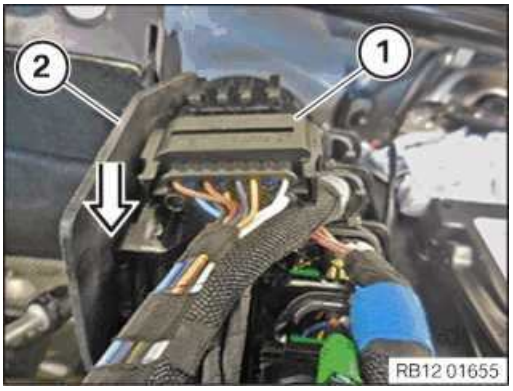
TS6x20		Tightening torque	5 Nm



- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.

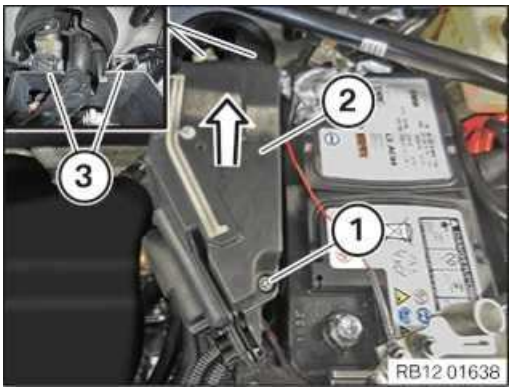


- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.

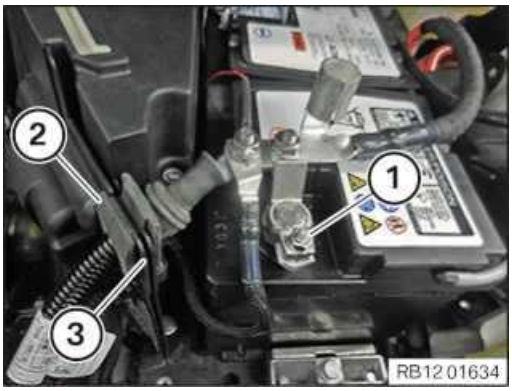
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- Insert and install the cover (2) into the guides (3) in the direction of the arrow.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

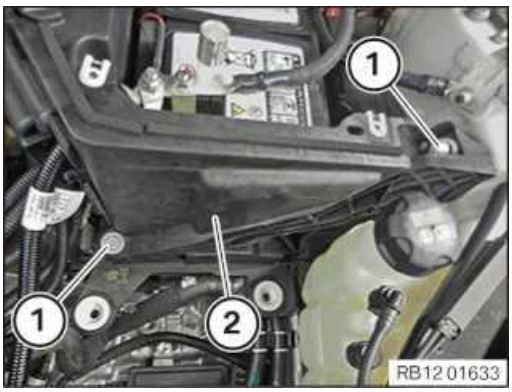
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

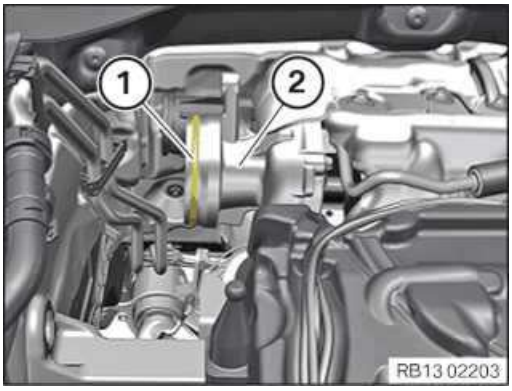


- Feed in and install tension strut (2).
- Tighten the screws (1).

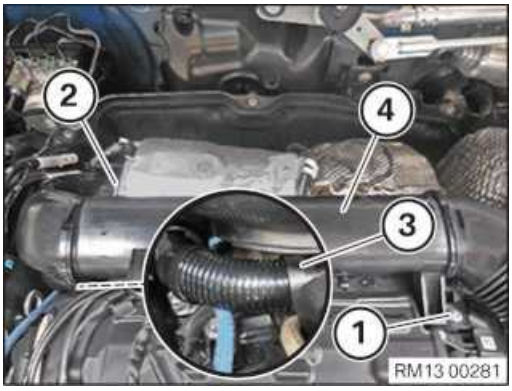
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

27 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.



- Feed in clean air pipe and install.
- Connect clean air pipe to the exhaust turbocharger and lock audibly in the clamps (2).
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Connect ventilation line (3) to the cylinder head cover and lock audibly.

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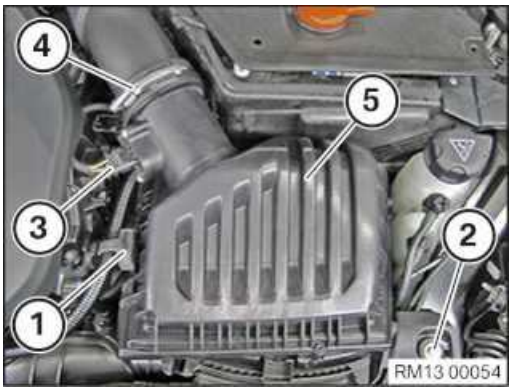


- Mount clean air pipe onto the intake filter housing.
- Tighten clamp (1) on the clean air pipe.

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

28 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.

  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

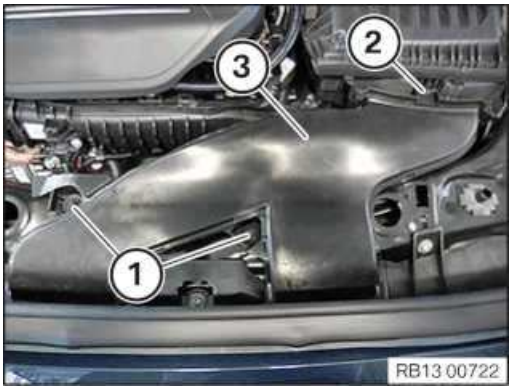
Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Insert and install the holder (1).

29 – Install the intake neck for the intake filter housing



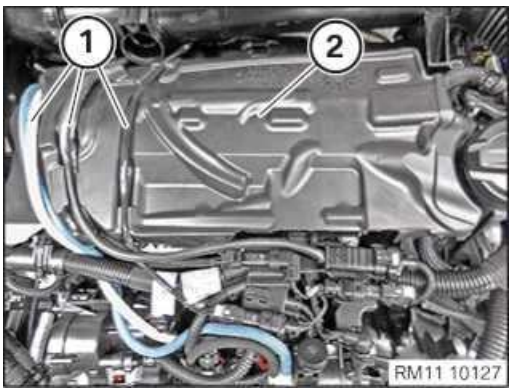
- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

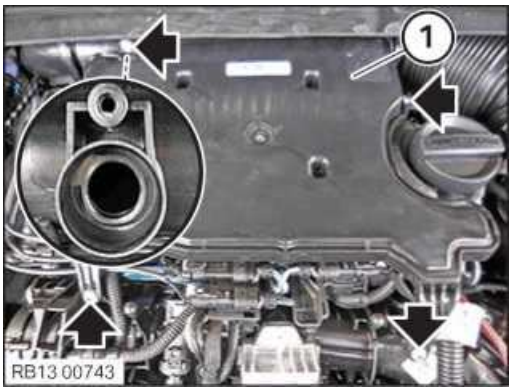
30 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the vehicle wiring harness (1) in the brackets.

31 – Install resonator

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- Insert and install the resonator (1).
- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

32 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Check for correct installation of all rubber mounts in the acoustic cover (1).



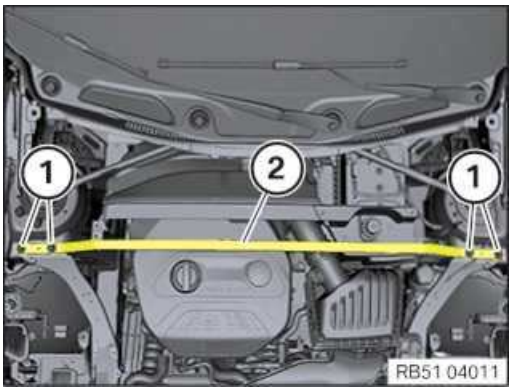
- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

33 – Install strut brace

TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.

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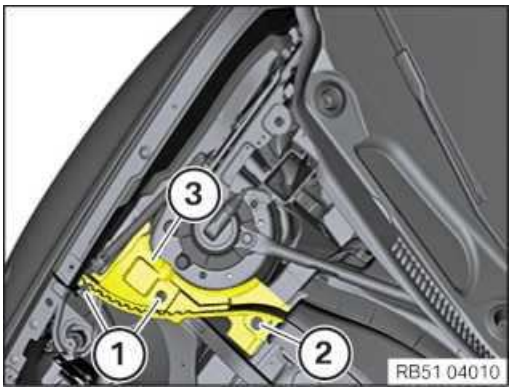


- Install the strut brace (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-brace to spring strut dome

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °



NOTICE

Description is for right component only. The procedure on the left side is identical.

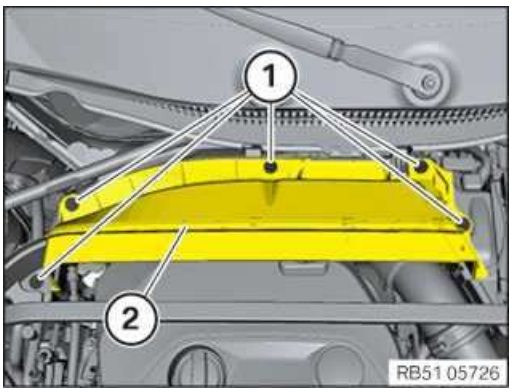
- Install the cover (3).
- Tighten down screw (2).

Cover on body

Hexagon screw		Tightening torque	3 Nm

- Install the expanding rivet (1).

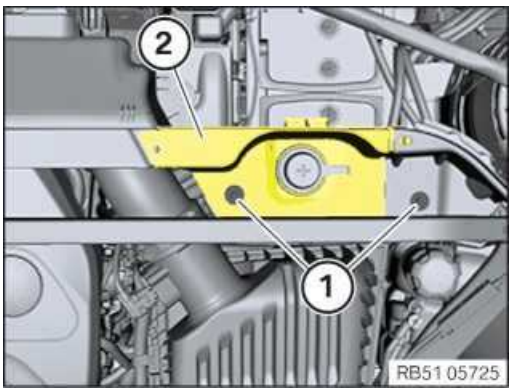
34 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Cover of top bulkhead

Screw		Tightening torque	2,6 Nm



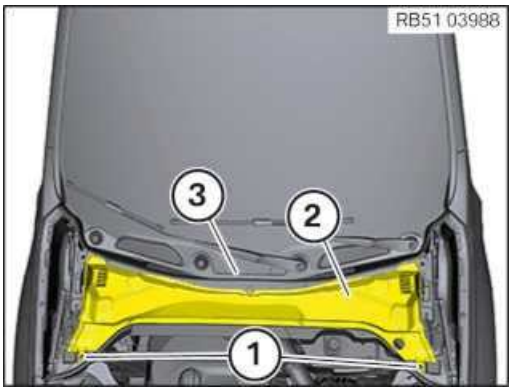
- Guide in and install cover (2).
- Tighten down screw (1).

Cover of remote positive terminal

Screw		Tightening torque	2,6 Nm

35 – Installing front cowl panel cover

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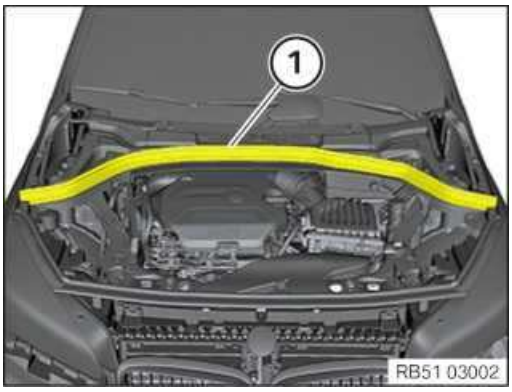


- Insert and install cowl panel cover at front (2) into cowl panel cover at rear (3).
- Check cowl panel cover at front is correctly seated (2).
- Secure expanding rivet (1).

36 – Install the seal for the bonnet

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

37 – Disconnecting all battery earth leads



- See additional information.

38 – Delete adaptations

- Connect diagnosis system.
  - Power train
  - Digital diesel electronics (DDE)
  - Reset adaptations
  - Delete adaptations

Additional Information

Overview of Tightening Torques

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Throttle body to intake plenum

Used in step 18

6x50		Tightening torque	7 Nm

Charging pressure sensor to intake plenum

Used in step 18

TS6X20		Tightening torque	4 Nm

Swirl-flap controller to intake plenum

Used in step 18

M6 x 16	Tighten the bolts in alternating order until flush.		4 Nm

Electric changeover valve to intake plenum

Used in step 18

TS6x20		Tightening torque	5 Nm

Glow elements to cylinder head

Used in step 21

Glow element		Tightening torque	13 Nm

Wheel arch cover to body

Used in step 22

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Used in step 22

Plastic nut		Tightening torque	3 Nm

Underbody protection front

Used in step 23

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Brake disc to front wheel hub

Used in step 24

M8	Renew screw.		16 Nm

Wheel bolts

Used in step 24

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Intake plenum to cylinder head

Used in step 25

M6		Tightening torque	11 Nm

Wiring harness to cylinder head cover

Used in step 26

TS5x20		Tightening torque	3,5 Nm

Positive battery cable to alternator

Used in step 26

M8		Tightening torque	19 Nm

Fuel line to intake plenum

Used in step 26

TS6x20		Tightening torque	5 Nm

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Cover to electronics box — Used in step 26

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery — Used in step 26

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray — Used in step 26

M8		Tightening torque	19 Nm

Clean air pipe to cylinder head cover — Used in step 27

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 27 28

Clamp		Tightening torque	3 Nm

Intake silencer housing to lock bridge — Used in step 28

M6X30		Tightening torque	8 Nm

Intake neck to cross connection — Used in step 29

M6		Tightening torque	8 Nm

Resonator to manifold and clean air pipe — Used in step 31

Screw TS6	Renew screw.	Tightening torque	5 Nm

Cross-brace to spring strut dome — Used in step 33

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

Cover on body — Used in step 33

Hexagon screw		Tightening torque	3 Nm

Cover of top bulkhead — Used in step 34

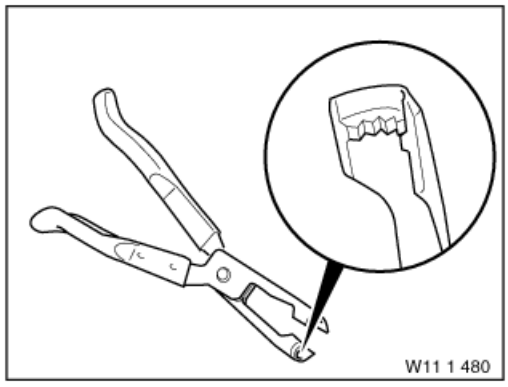
Screw		Tightening torque	2,6 Nm

Cover of remote positive terminal — Used in step 34

Screw		Tightening torque	2,6 Nm

Overview of Special Tools

0 490 796 (11 1 480) Pliers



Common — Used in step 12 17

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

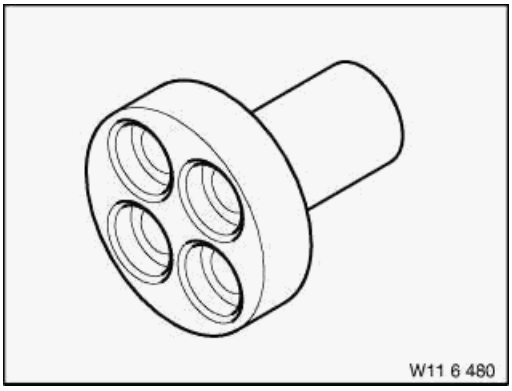
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0 496 146 (11 8 880) Adapter



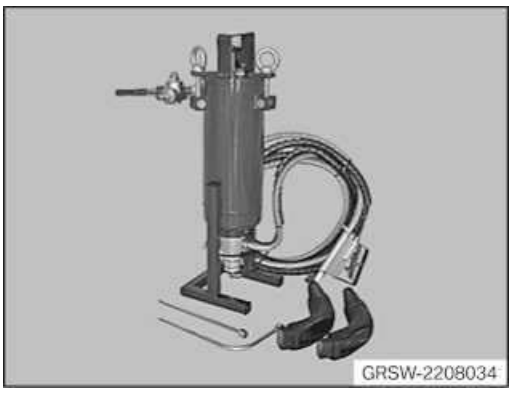
Common	Used in step 19
Usage	For compression testing.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 493 380 (11 6 480) Connector



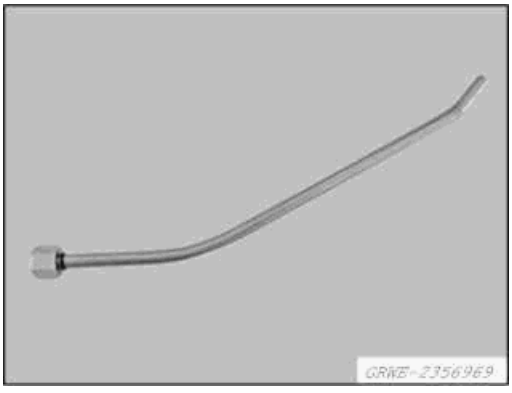
Common	Used in step 19
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

2 208 034 Blasting material device



Common	Used in step 20
Usage	For cleaning of the intake ports and the intake valves.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 02 10 (650)

2 356 969 Beam probe



Common	Used in step 20
Usage	For cleaning of the intake ports and the intake valves.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	Blasting tool 81292208034
SI-Number	08 25 13 (059)

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2 356 966 Vacuum adapter



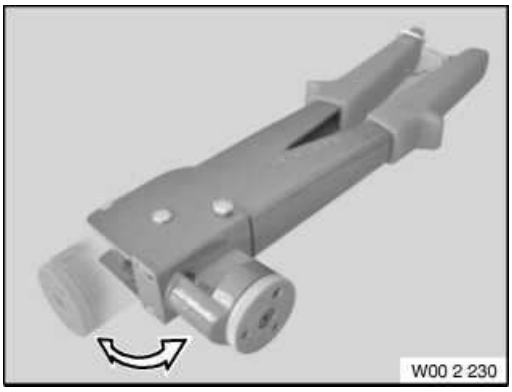
Common	Used in step 20
Usage	For cleaning of the intake ports and the intake valves.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	2208034
SI-Number	08 25 13 (059)

2 356 967 Vacuum adapter



Common	Used in step 20
Usage	For cleaning of the intake ports and the intake valves.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	Blasting tool 81292208034
SI-Number	08 25 13 (059)

0 496 521 (00 2 230) Pliers



Common	Used in step 22
Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

2 344 011 Tool

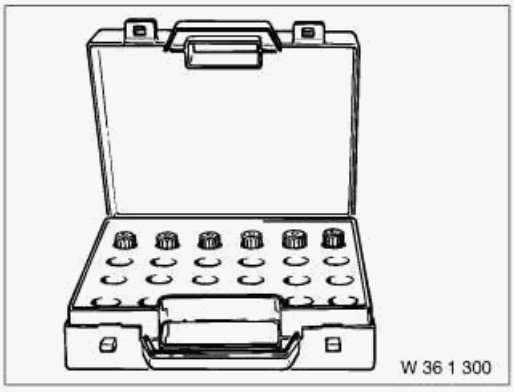


Common	Used in step 24
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

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0 495 221 (36 1 323) Wheel stud



Common	Used in step 14
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud



Common	Used in step 14
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud



Common	Used in step 14
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

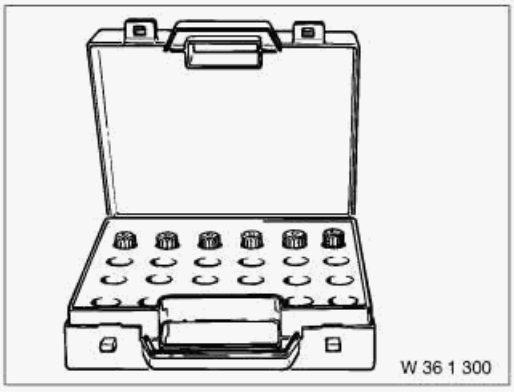
0 495 226 (36 1 328) Wheel stud



Common	Used in step 14
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 227 (36 1 329) Wheel stud



Common	Used in step 14
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud



Common	Used in step 14
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 229 (36 1 332) Wheel stud



Common	Used in step 14
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud



Common	Used in step 14
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Cleaning agent

Used in step 18

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Universal cleaner must be diluted with water.

Washer fluid	2 parts water, 1 part universal cleaner

Expendable materials: Universal cleaner

Clean the intake system	Used in step 18
Soaking time of the cleaning agent	1 h

Walnut granules	Used in step 20
Quantity for each blasting process	2 l

Cleaning the intake ports	Used in step 20
Operating pressure	6 bar ... 8 bar

Cleaning the intake ports	Used in step 20
Blast duration with walnut granules	Approx. 20 s
Blast duration with pure compressed air for the complete blowing out of walnut granules	Approx. 10 s

Links

Functional descriptions	**Used in step**
Reset adaptations	38

Repair instructions	**Used in step**
61 20 900 Disconnecting and connecting battery earth lead	1 37
61 20 900 Disconnecting and connecting battery earth lead	1 37
61 20 900 Disconnecting and connecting battery earth lead	1 37
61 20 900 Disconnecting and connecting battery earth lead	1 37
61 20 900 Disconnecting and connecting battery earth lead	1 37
61 20 900 Disconnecting and connecting battery earth lead	1 37
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 37
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 37
61 20 900 Disconnecting and connecting battery earth lead	1 37
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 37
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	1 37
61 20 900 Disconnecting and connecting battery earth lead	1 37
61 20 900 Disconnecting and connecting battery earth lead	1 37
61 20 900 Disconnecting and connecting battery earth lead	1 37
61 20 900 Disconnecting and connecting battery earth lead	1 37
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61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 37
61 20 900 Disconnecting and connecting battery earth lead	1 37
61 20 900 Disconnecting and connecting battery earth lead	1 37
61 20 900 Disconnecting and connecting battery earth lead	1 37
61 20 900 Disconnecting and connecting battery earth lead	1 37
61 20 900 Disconnecting and connecting battery earth lead	1 37
61 20 900 Disconnecting and connecting battery earth lead	1 37
61 20 900 Disconnecting and connecting battery earth lead	1 37
61 35 ... Notes on ESD protection (Electro Static Discharge)	17

Operating materials	Used in step
2.0 Grease for wheel centring	24

Parts

Parts required

Designation	Used in step
Intake system seal to throttle body	18
Throttle body gasket to charge air pipe with integrated temperature sensor for intake air	18
Charging pressure sensor seal to intake system	18

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11 12 800 Clean cylinder head intake channels and intake plenums

Special tools required:

- 11 8 880
- 11 0 235
- 2 302 630
- 11 6 480
- 11 6 050
- 2 356 969
- 2 356 966
- 2 356 967

Necessary preliminary work:

- Disconnect negative battery lead
- Removing intake plenum
- Remove front right wheel arch panel

Dismantle intake plenum:

- Remove throttle body
- Remove adjuster
- Remove charging pressure sensor
- Remove the temperature sensor for the exhaust-gas recirculation
- If applicable, remove preheating control unit



Wear protective goggles and gloves.



Caution!
Never place electrical components in cleaning agent!

Cleaning intake plenum:

- Wear personal protective clothing/equipment
- Prepare cleaning agent: Mix 2 parts water with 1 part BMW universal cleaner (see Section 3.2)
- Place intake plenum in cleaning agent
- Observe application time of at least 1 hour

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Cleaning intake ports: Caution!

Risk of engine damage!

When cleaning the intake ports, it must be ensured that the intake valves of the corresponding cylinder are closed.

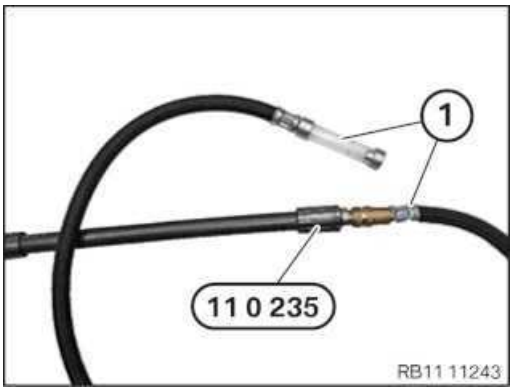
Determine the TDC (intake valves closed) using a TDC determination unit via the glow-plug hole.

Start with the 1st cylinder when cleaning the intake ports.



Remove glow-plug cylinder 1.

Screw in special tools 11 8 880 and 11 0 235 .



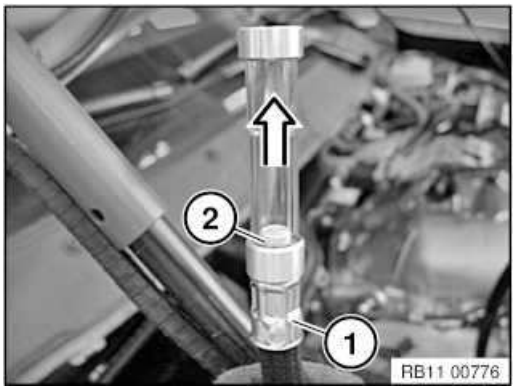
Connect TDC determination unit (1) from special tool 2 302 630 with special tool 11 0 235 .



Turn the engine with special tool 11 6 480 on the central bolt till cylinder 1 is in TDC position.**Caution!**

Do not crank engine in reverse direction.

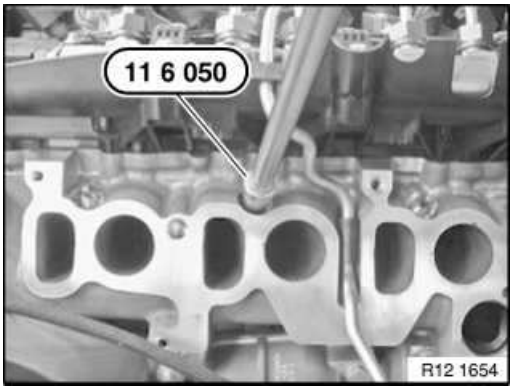
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Caution!

Determine the TDC (intake valves closed) using a TDC determination unit (1) via the glow-plug hole.

Turn the engine on the central bolt until cylinder 1 is in TDC position.

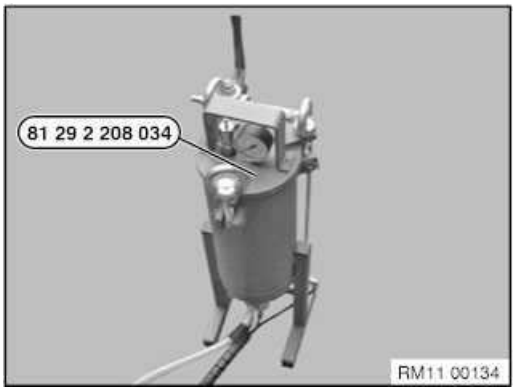


Remove special tools.

Reinstall glow-plug using special tool 11 6 050 .

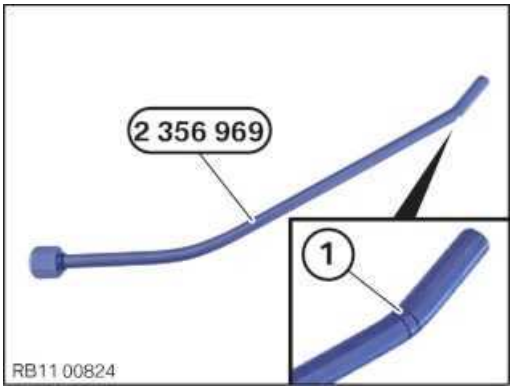
Installation note:

Tightening torque 12 23 1AZ.



The following are required:

- Blasting tool 81 29 2 208 034
- Walnut shell granulate
- Vacuum cleaner



Caution!

Front area of sensors is marked with two notches. These can additionally be highlighted in colour.

During the blasting process, only pull the wands out of the vacuum adapter until the mark becomes visible.

Blasting wand for swirl ports:

- 2 356 969

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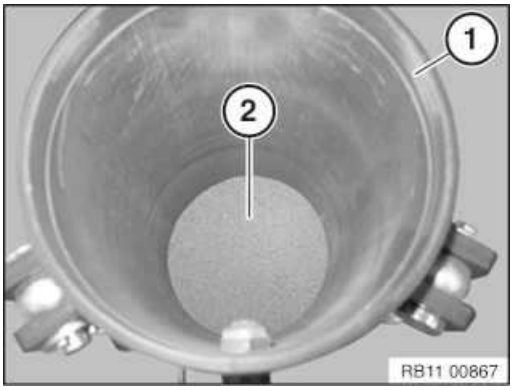


Vacuum adapter for tangential swirl port:

- 2 356 966

Vacuum adapter for swirl port:

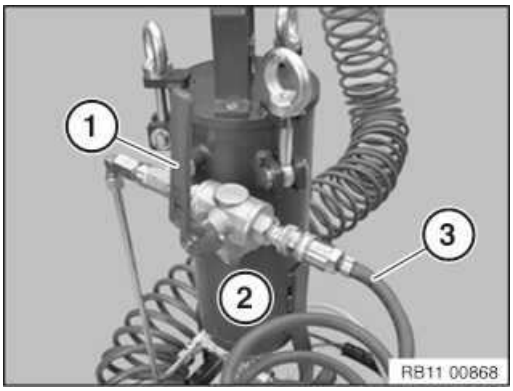
- 2 356 967



Note:
Use 2 litres of granulate per cleaning operation; this corresponds to a blasting duration of approx. 20 seconds.

Open blasting tool (1) and pour in 2 litres of granulate (2).

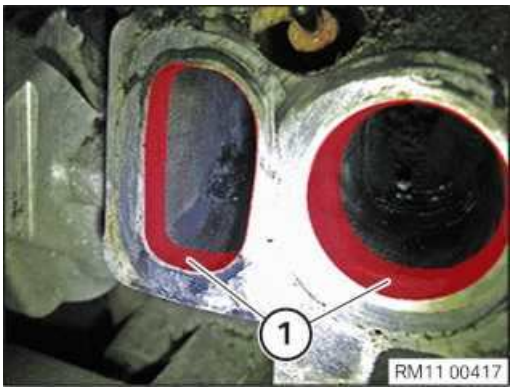
Close the device again.



Note:
Operating pressure 6 - 8 bar.

Close main valve (1) on blasting tool (2).

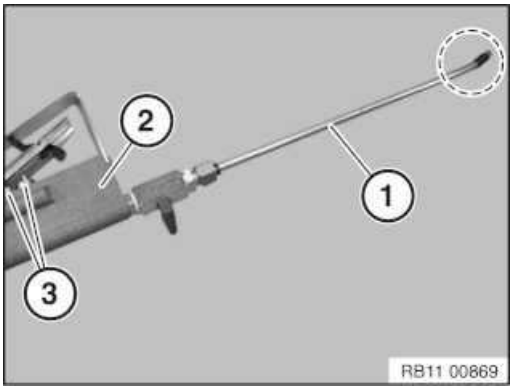
Connect compressed air (3).



Cleaning the swirl port of 1st cylinder:

Prior to the blasting process, clean the front area of both intake ports (1) of first cylinder with a suitable tool (e.g. plastic scraper, brushes 83 19 2 298 237).

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Screw together blasting wand 2 356 969 (1) and actuator (2).

Open blasting tool and pour in 2 l granulate.

Close the device again.

Note:
Actuator (3) has two stages!

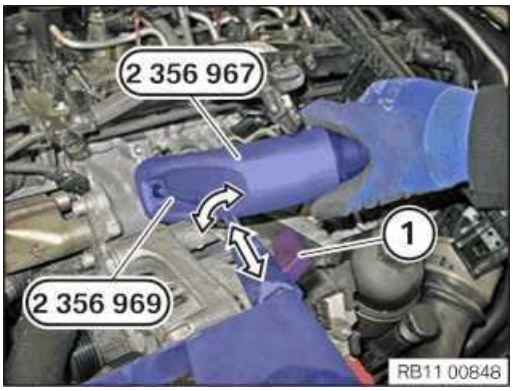
In stage one, only compressed air flows through the blasting wand.

In stage two (operation is fully pressed), granulate is added (blasting process).



Connect vacuum adapter 2 356 967 to vacuum cleaner. Hold vacuum adapter 2 356 967 against swirl port at no. 1 cylinder.

Open the main valve on the blasting tool and switch the vacuum cleaner on.



Caution!

Danger of injury!

Risk of damage!

Second person required to assist.

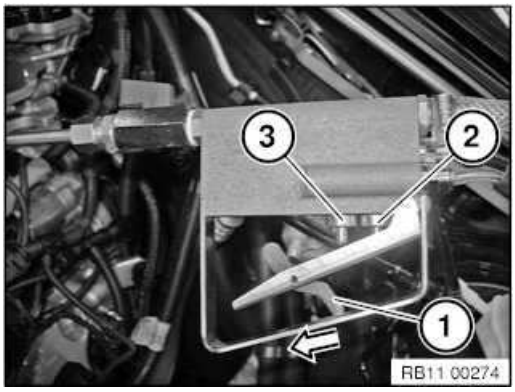
Blasting wand may only be pulled out until the mark becomes visible.



Wear safety goggles.

Insert blasting wand 2 356 969 in the adapter 2 356 967 .

Open the actuator valve (1).



Slide locking lever (1) to the front in direction of arrow.

Operate compressed-air valve (2) at stage one; compressed air can now flow in.

Fully operate valve (3) at stage two; walnut shell granulate is now injected.

Clean intake port, rotating the blasting wand and moving it vertically up and down.

Blasting wand may only be pulled out until the mark becomes visible.

When you notice that the collection container is becoming empty, continue operation for at least 10 seconds at stage one in order to swirl up and draw off the remaining granulate.

Close operation valve. Close main valve, check pressure drop at the pressure gauge.

Evaluate result if necessary.

If necessary, repeat procedure.

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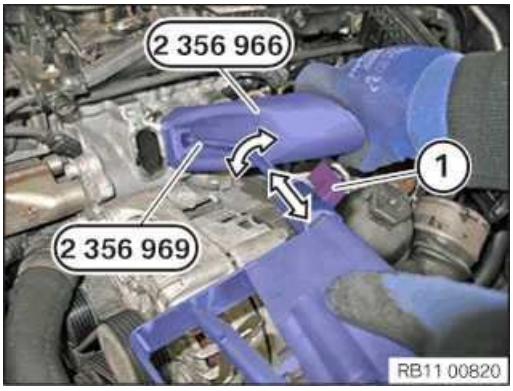
Cleaning the tangential swirl port of 1st cylinder:

Open blasting tool and pour in 2 l granulate.

Close the device again.

Connect vacuum adapter 2 356 966 to vacuum cleaner. Hold vacuum adapter 2 356 966 on swirl port of first cylinder.

Open the main valve on the blasting tool and switch the vacuum cleaner on.



Caution!

Danger of injury!

Risk of damage!

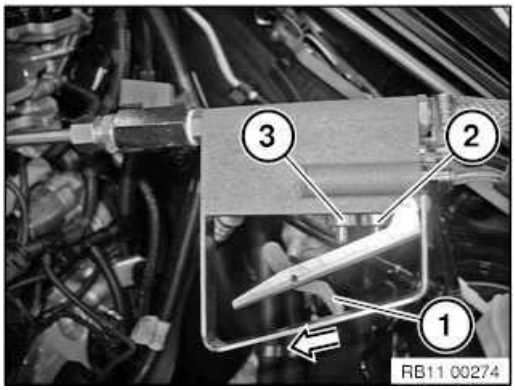
Second person required to assist.

Blasting wand may only be pulled out until the mark becomes visible.

Wear safety goggles.

Insert blasting wand 2 356 969 in the adapter 2 356 966 .

Open the actuator valve (1).



Slide locking lever (1) to the front in direction of arrow.

Operate compressed-air valve (2) at stage one; compressed air can now flow in.

Fully operate valve (3) at stage two; walnut shell granulate is now injected.

Clean intake port, rotating the blasting wand and moving it vertically up and down.

Blasting wand may only be pulled out until the mark becomes visible.

When you notice that the collection container is becoming empty, continue operation for at least 10 seconds at stage one in order to swirl up and draw off the remaining granulate.

Close operation valve. Close main valve, check pressure drop at the pressure gauge.

Evaluate result if necessary.

If necessary, repeat procedure.

Cleaning the other cylinders:

Clean the tangential ports and swirl ports of the next cylinder using the same procedure.

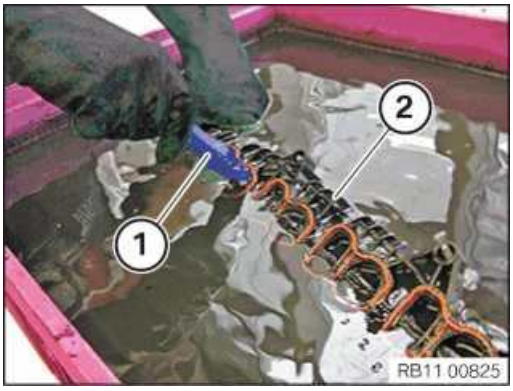
Caution!

When cleaning the intake ports, it must be ensured that the intake valves of the corresponding cylinder are closed.

Determine the TDC (intake valves closed) using a TDC determination unit via the glow-plug hole.

Do not crank engine in reverse direction.

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Wear protective goggles and gloves.

Caution!
Do not clean electrical components with a parts cleaning unit or high pressure cleaner!

Cleaning intake plenum:

- Remove the intake plenum (2) from the cleaning agent
- Clean the openings on intake plenum (2) and swirl flap using the brush (1)

  (Part number: 83 19 2 298 237)
- Clean throttle valve, exhaust-gas recirculation valve, mixing tube and mounted parts with the brush (1) if necessary
- Then clean intake plenum (2) with a parts cleaning unit or a high-pressure cleaner
- Check all seals for damage and renew, if applicable

Observe country-specific waste disposal regulations.

Required follow-up work:

Assemble intake plenum:

- Installing the throttle body
- Install adjuster
- Install the charging pressure sensor
- Install the temperature sensor for the exhaust-gas recirculation
- If applicable, install preheating control unit

- Crank the engine at the central bolt at minimum twice
- Install front right wheel arch panel trim
- Install intake plenum
- Connect battery earth lead

- Reset the quantity correction under:
  - Service functions
  - 01 Drive
  - Digital Diesel Electronics
  - Reset correction values of injectors

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11 12 ... Clean intake plenum (B37, B47)

Necessary preliminary work:

- Remove intake plenum

Dismantle intake plenum:

- Remove throttle body
- Remove adjuster
- Remove charging pressure sensor
- Remove the temperature sensor for the exhaust-gas recirculation .
- If applicable, remove preheating control unit

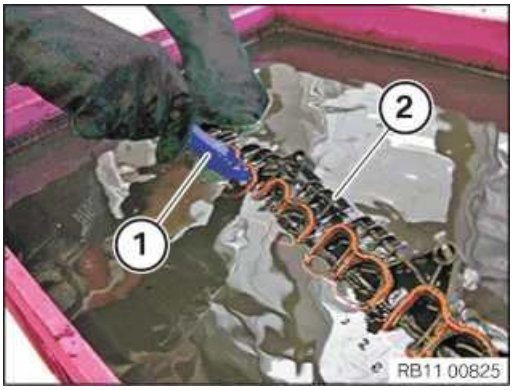


Wear protective goggles and gloves.



Caution!
Never place electrical components in cleaning agent!

- Put on personal protective clothing/equipment!
- Prepare cleaning agent: Mix 2 parts water with 1 part BMW universal cleaner (part number: 83 19 2 360 981) mixed
- Place intake plenum in cleaning agent
- Adhere to an application time of at least 1 h





Wear protective goggles and gloves.



Caution!
Do not clean electrical components with a parts cleaning unit or high pressure cleaner.

- Remove the intake plenum (2) from the cleaning agent
- Clean the openings of the intake plenum (2) and swirl flaps using the brush (1)

  (Part number: 83 19 2 298 237)
- Clean throttle valve, exhaust-gas recirculation valve, mixing tube and mounted parts with brush (1) if necessary
- Clean the intake plenum (2) with a parts cleaning unit or a high-pressure cleaner.
- Check all seals for damage and renew, if applicable.

Pay attention to country specific instructions for disposal.

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Required follow-up work:

Assemble intake plenum:

- Installing the throttle body
- Install adjuster
- Install the charging pressure sensor
- Install the temperature sensor for the exhaust-gas recirculation.
- If applicable, install preheating control unit

- Install intake plenum

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11 12 070 Remove and install/replace acoustic cover

1 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

2 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Check for correct installation of all rubber mounts in the acoustic cover (1).

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- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

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11 12 070 Remove and install/replace acoustic cover

1 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

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- Check for correct installation of all rubber mounts in the acoustic cover (1).

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- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

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11 12 100 Removing and installing cylinder head

WARNING

Vehicle may slip off the vehicle hoist if the vehicle hoist is handled incorrectly.

Danger! Life-threatening injuries!

- Observe safety information on raising the vehicle using a vehicle hoist.
- For additional information see: 00 ... Raising the vehicle using a vehicle hoist.

WARNING

Motor vehicle may slip off the vehicle hoist where components are supported.

Danger! Life-threatening injuries!

- Secure the vehicle hoist against lowering and lifting.

WARNING

Motor vehicle may slip off the vehicle hoist if the weight is distributed unevenly.

Danger! Life-threatening injuries!

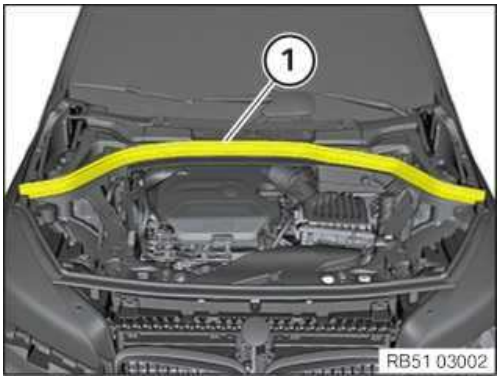
- Ensure there is a specific weight compensation on the motor vehicle.

PRELIMINARY WORK

1 – Remove the seal for the rear bonnet

NOTICE

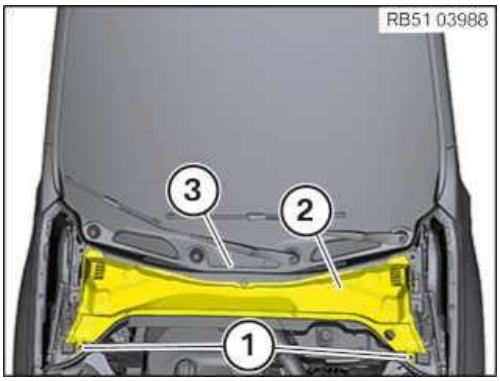
Schematic diagram is for example purposes. Some parts may differ in certain details.



- Pull off rear bonnet seal (1) towards the top and remove.

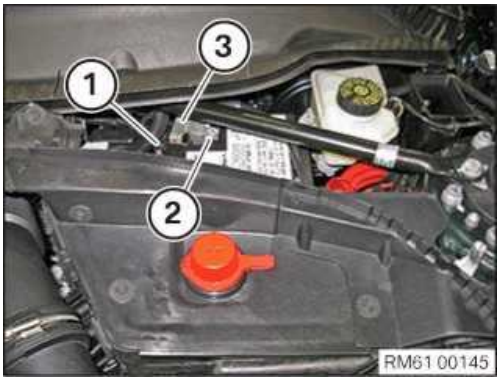
2 – Removing front cowl panel cover

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- Loosen the expanding rivet (1).
- Feed out and remove front cowl panel cover (2) from the rear cowl panel cover(3).

3 – Disconnecting the battery earth lead

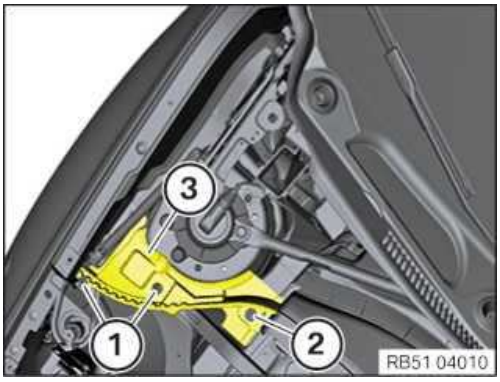


- Unlock plug connection (1) and disconnect.
- Unfasten nut (2).
- Remove the battery earth lead (3) and secure to one side.

4 – Remove suspension cross-brace

TECHNICAL INFORMATION

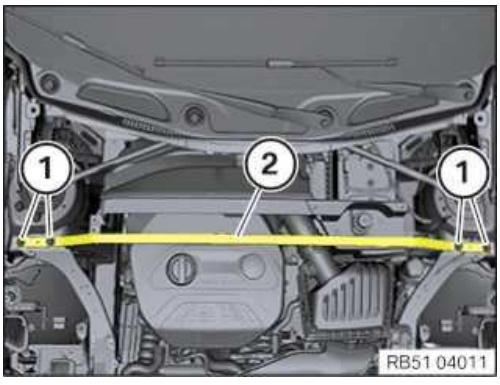
Driving without the strut brace/front end or tension strut is not permitted.



NOTICE

Description is for right component only. The procedure on the left side is identical.

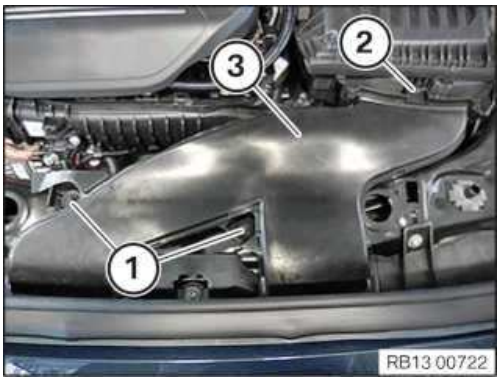
- Loosen expanding rivet (1).
- Loosen screw (2).
- Remove the cover (3).



- Loosen screws (1).
- Remove strut brace (2).

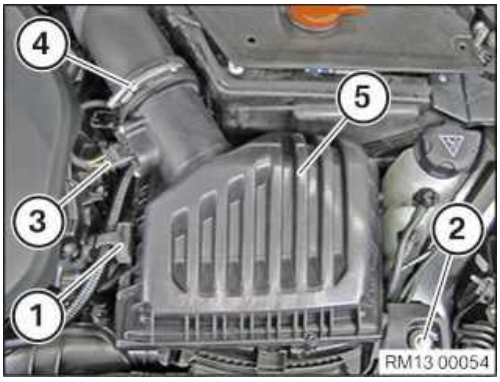
5 – Remove the intake neck for intake silencer housing

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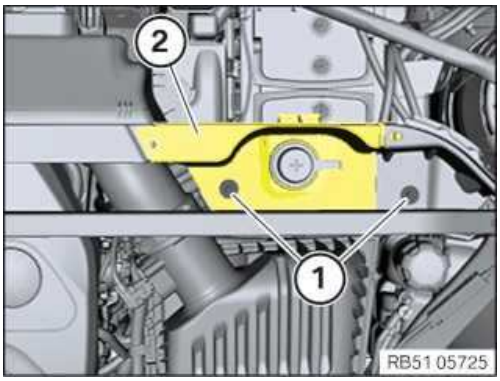
- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

6 – Removing intake silencer housing

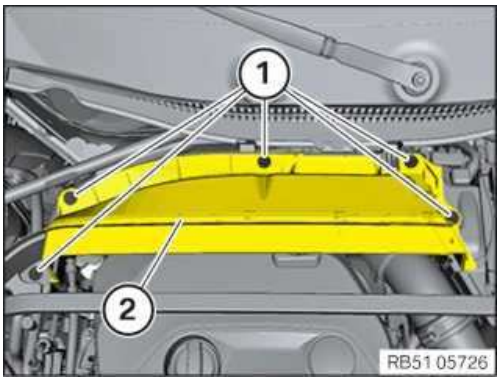


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

7 – Removing the upper bulkhead cover



- Loosen screws (1).
- Guide out and remove the cover (2).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

8 – Remove vehicle battery

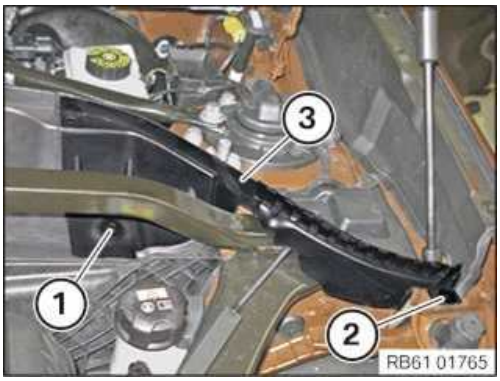
WARNING

Working on 12 V vehicle electrical system.

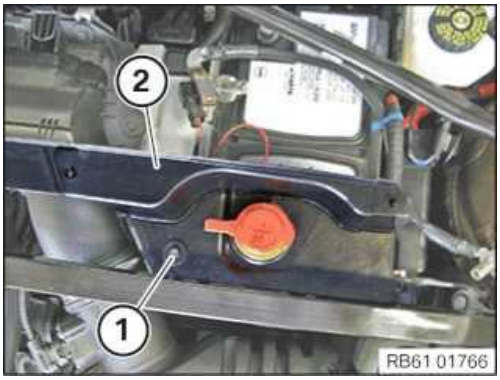
Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

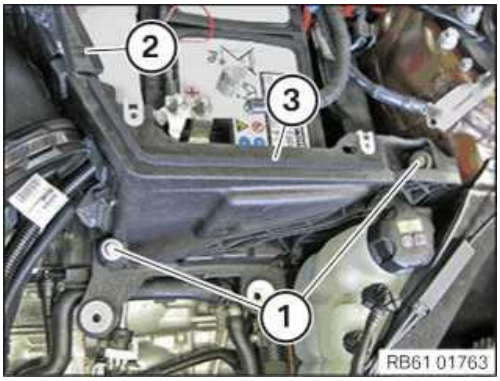
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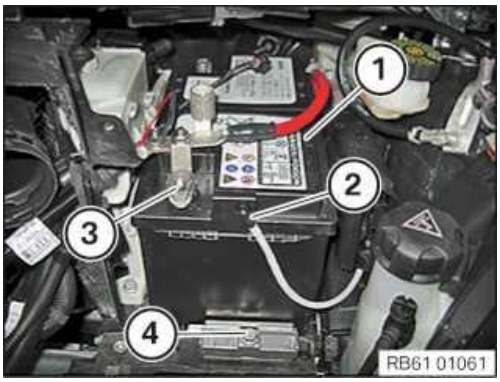
- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).



- Loosen screw (1).
- Remove the cover (2).



- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.



- Pull off the vent hose (2).
- Slacken the nut (3) on the positive battery terminal and remove the positive battery terminal.

WARNING

Unprotected battery terminals.

Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

9 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

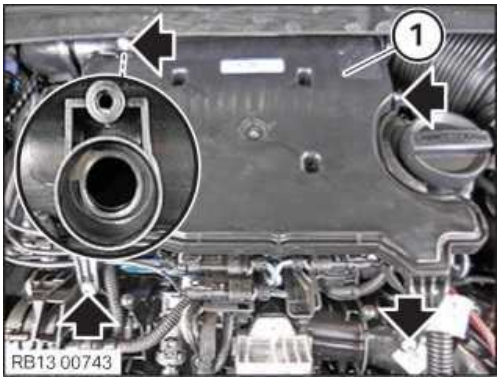
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

10 – Remove resonator

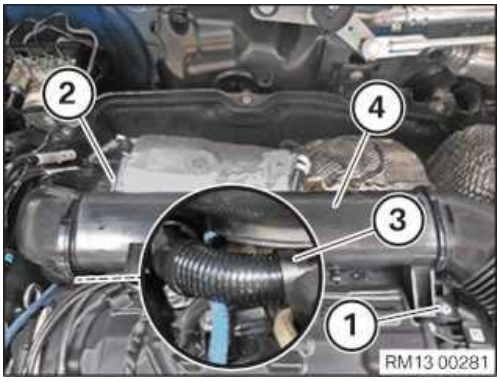


- Remove screws (arrows).
- Guide out and remove the resonator (1).

11 – Removing clean air pipe



- Detach clamp (1) on the clean air pipe.
- Pull off the clean air pipe from the intake silencer housing.



- Loosen screw (1).
- Loosen clamp (2).
- Unlock the ventilation line (3) and pull it off the cylinder head cover.
- Feed out clean air pipe and remove.

12 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

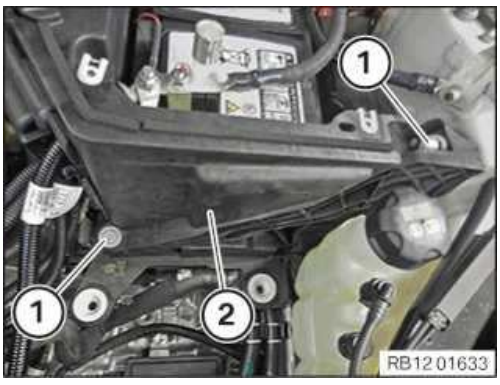
TECHNICAL INFORMATION

Follow instructions for removing and installing control units.

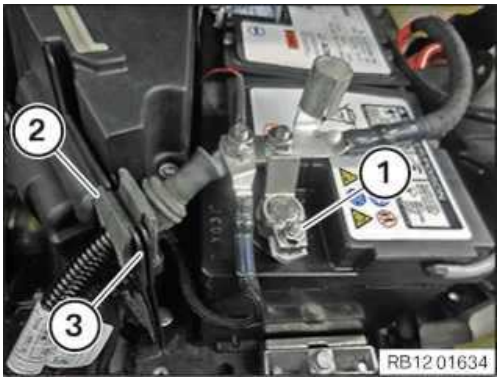
For additional information see: 12 00 ... Notes on removal and installation of control units

TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.

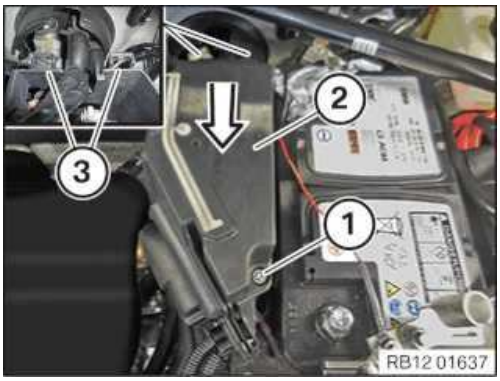


- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.

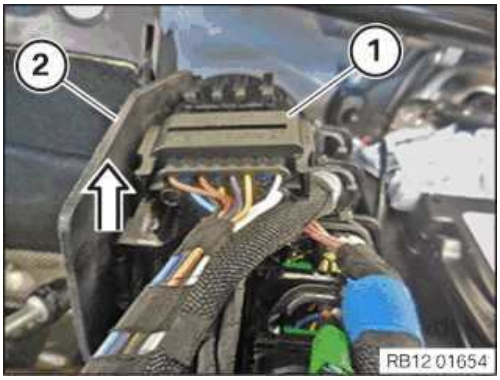


- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

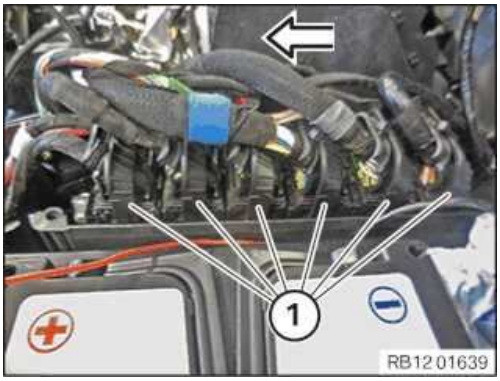
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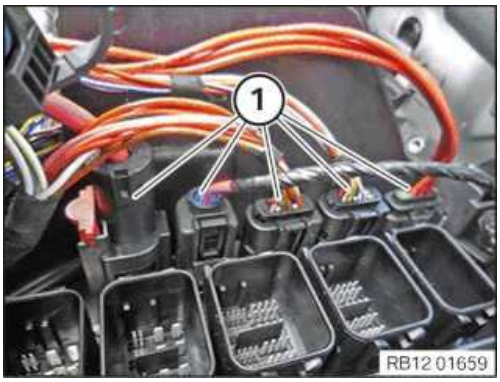
- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



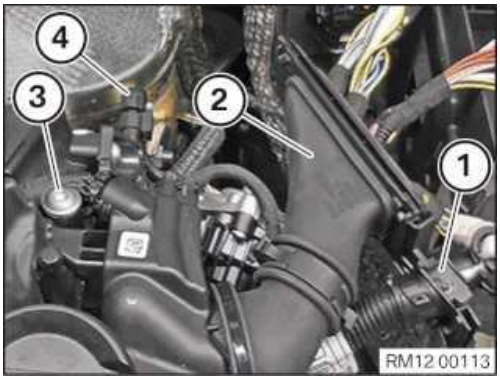
- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).



- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

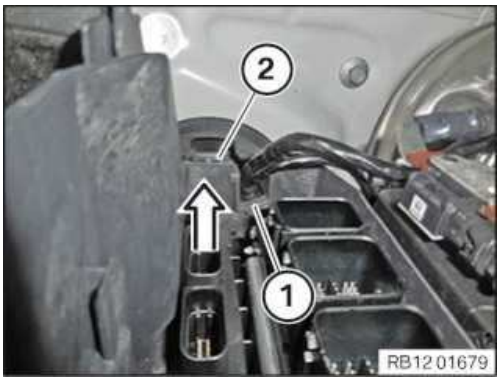


- Unlock and loosen connector (1).

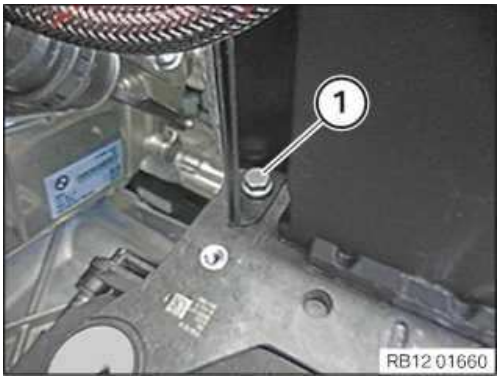


- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.

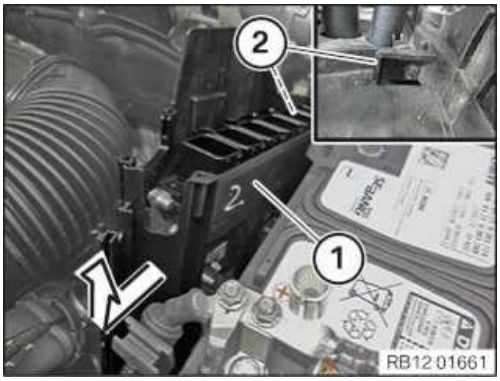
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- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.

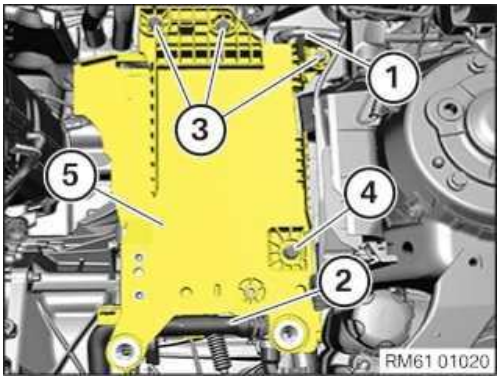


- Loosen screw (1).



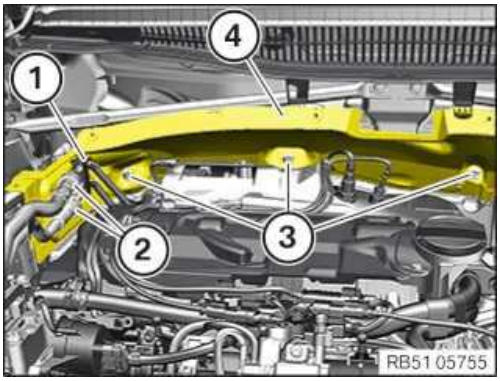
- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

13 – Remove battery holder



- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

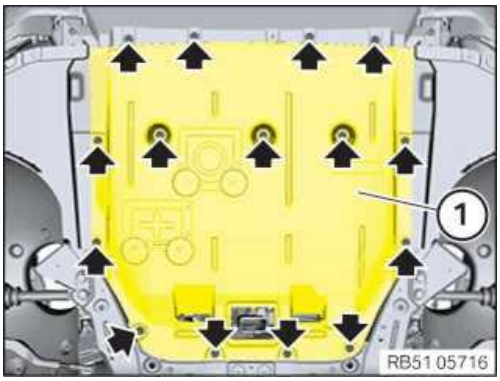
14 – Remove the rear bulkhead upper part



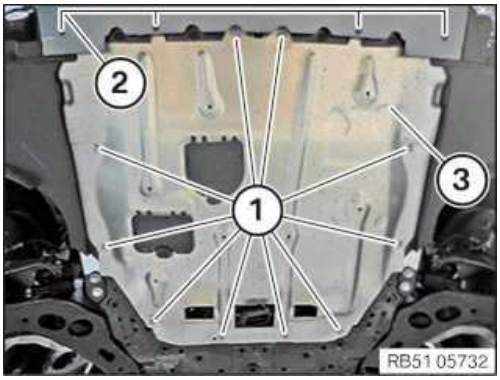
- Unlock the holder (1) and disconnect.
- Guide out and remove the fuel lines (2).
- Loosen screws (3).
- Guide out the rear bulkhead upper part (4) and remove.

15 – Removing the front underbody protection

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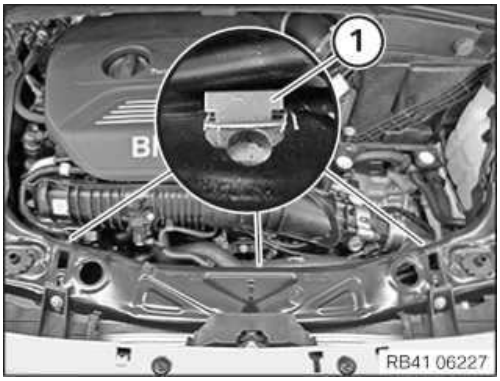


- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.

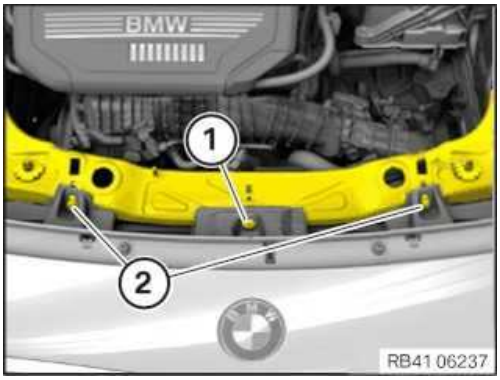


- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

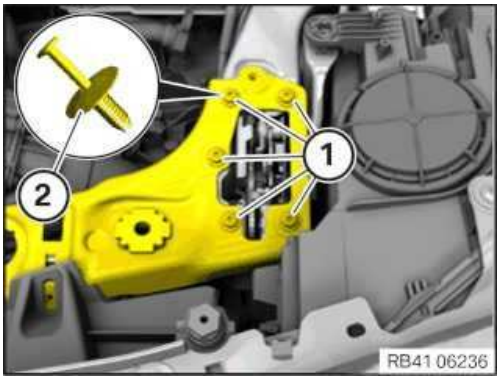
16 – Remove front cross connection



- Detach the clamps (1) for the Bowden cable of the bonnet locks from the cross connection.

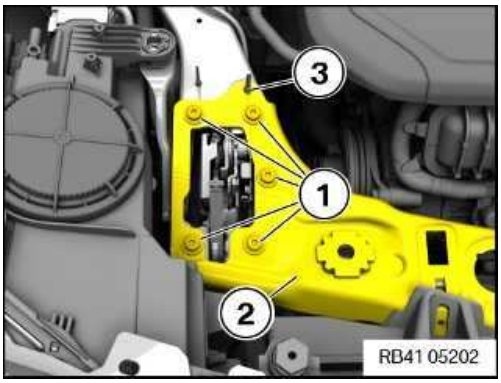


- Loosen screw (1).
- Loosen screws (2).



- Loosen screws (1).
- Lever out expanding rivet (2).

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- Loosen screws (1).
- Unclip the front cross connection (2) from the rubber retainer (3) and remove it upward.

17 – Draining coolant

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

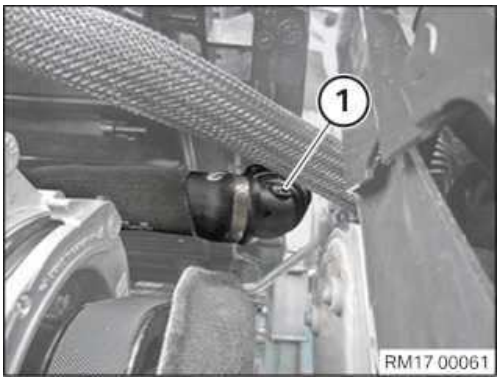
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

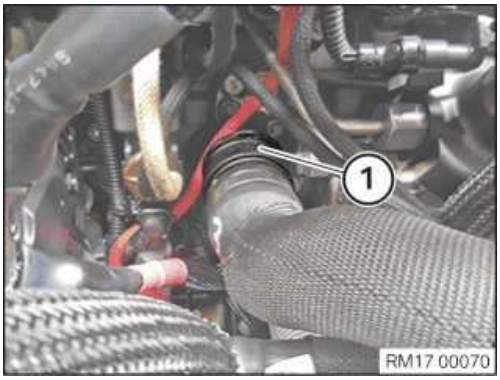


- Loosen sealing cap (1).

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- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.

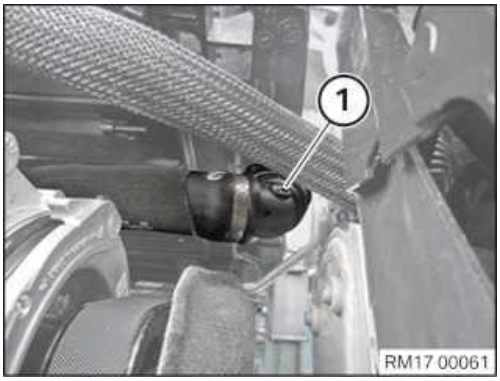


- Unlock the coolant line (1) and pull it off the connecting branch.
- Catch and dispose of escaping coolant.

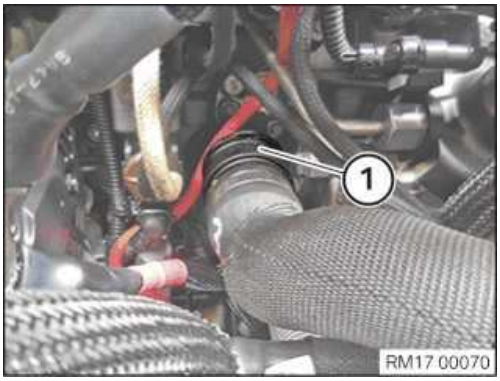
18 – Connect the coolant line

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Connect the right coolant line (1) to the radiator and lock audibly.



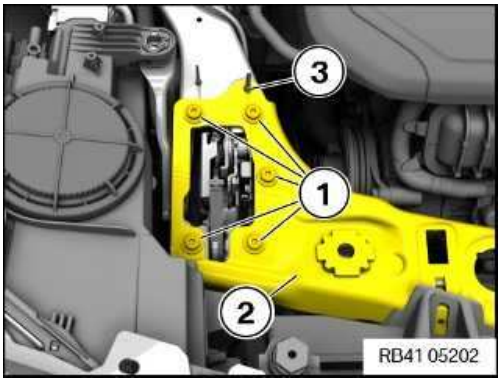
- Connect the coolant line (1) to the connecting branch and lock audibly.

19 – Install front cross connection

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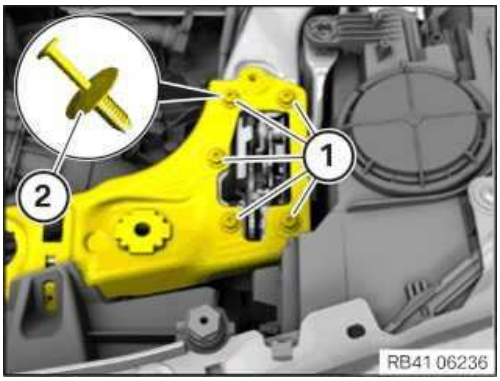
- Right side of vehicle only: Secure spray guard (1) on the cross connection (2) as pictured.



- Position front cross connection (2) and clip front cross connection (2) into the rubber retainer (3) at the same time.
- Tighten the screws (1).

Cross connection to carrier support

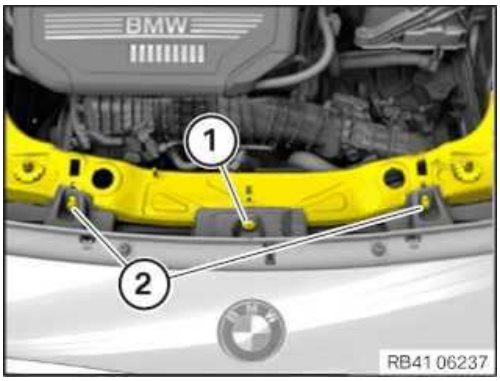
Screws M6x20		Tightening torque	11,8 Nm



- Tighten the screws (1).

Cross connection to carrier support

Screws M6x20		Tightening torque	11,8 Nm



- Position screws (3) on the rubber mounts for the radiator and tighten.

Screw connection for rubber mount of coolant radiator to coolant radiator

Bolt to rubber mount		Tightening torque	8 Nm

- Tighten down screws (2).

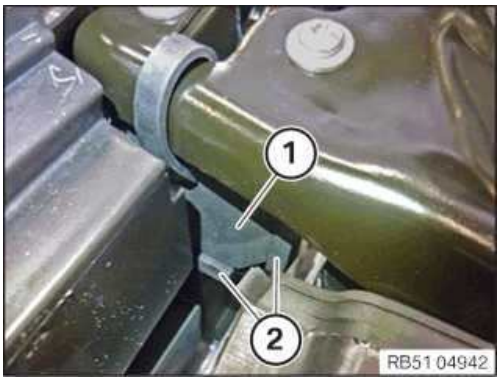
Air duct to upper connection

M6x20 screw		Tightening torque	11,8 Nm

- Tighten down screw (1).

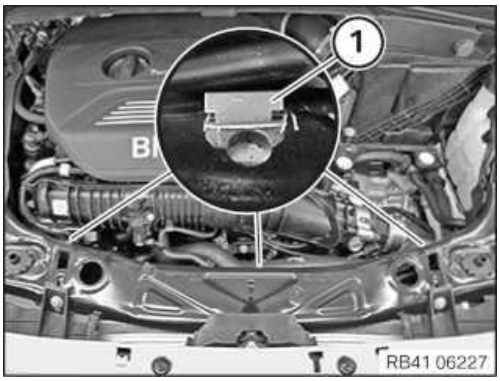
Bracing strut to upper connection

M8x20 screw		Tightening torque	28 Nm



- Right side of vehicle only: Properly mount spray guard (1) to prevent corrosion.
- Secure spray guard (1) to the bridge with retaining tabs (2).

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- Fasten the clamps (1) from the Bowden cable of the bonnet lock on the cross connection.

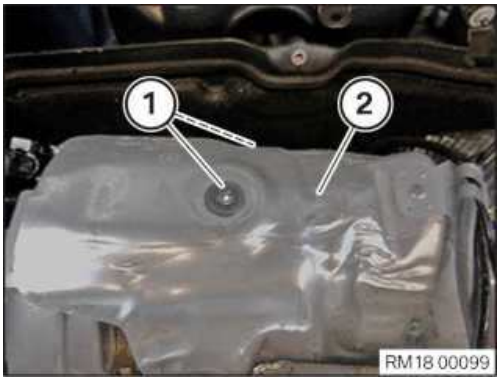
20 – Removing heat shield from top exhaust turbocharger

WARNING

Hot surfaces.

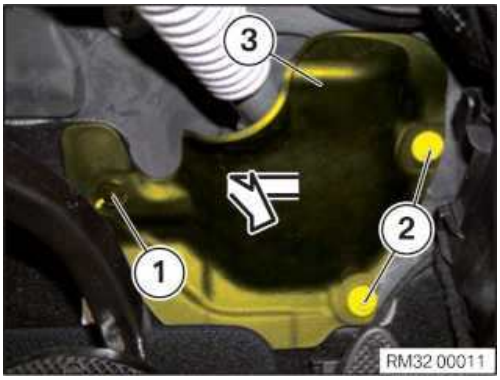
Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from holders.
- Release the screws (1) at the top and bottom of the heat shield.
- Feed out and remove the heat shield (2).

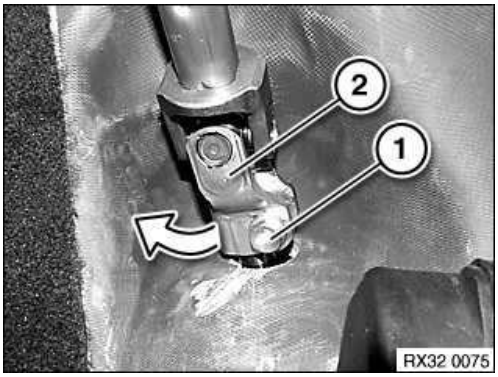
21 – Releasing lower steering shaft from steering gear



- **If installed:**
- Unfasten nut (1).
- Unscrew the nuts (2) by 1 rotation.

  Do not remove the nuts (2) !
- Remove the cover (3) on the steering column in the direction of the arrow.

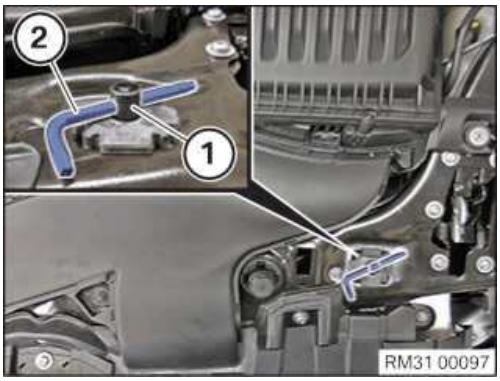
  The side footwell trim must not be disassembled!



- Loosen screw (1).
- Swivel out the universal joint (2) of the bottom steering shaft from the steering gear in the direction of the arrow.

22 – Securing radiator on left and right

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NOTICE

Perform the operations on the left and right side.

- Fasten radiator at centring pin (1) with suitable tool (2).

23 – Removing both front wheels

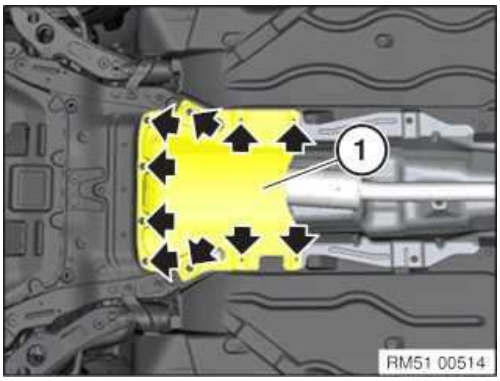
▶ **Removing the wheel**



- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Unscrew the wheel bolts (arrows) and remove the wheel.

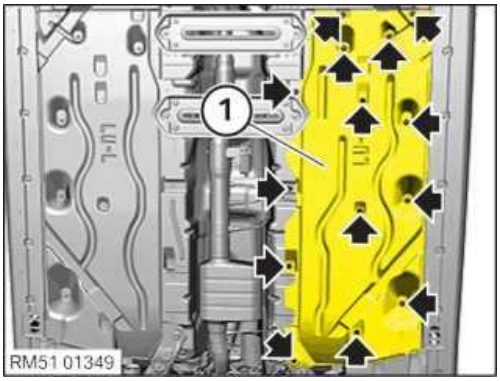
  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

24 – If installed: Removing rear underbody protection



- Remove screws (arrows).
- Remove the rear underbody protection (1).

25 – Removing right underbody panelling



- Unscrew all bolts and nuts (arrows).
- Remove the underbody panelling (1).

26 – Removing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

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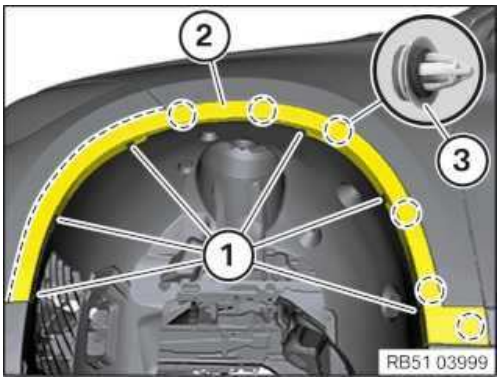
▶ **Remove the front wheel arch trim**

NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

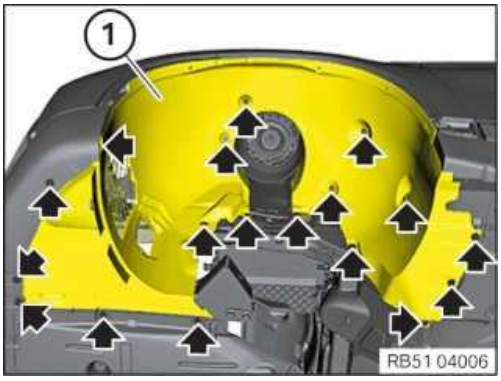
NOTICE

Description is for left component only. Procedure on the right side is identical.



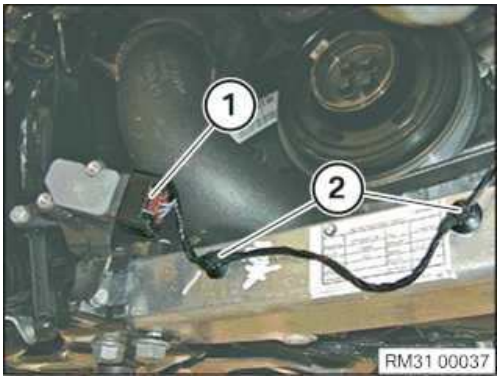
- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.

▶ **Remove front wheel arch cover**



- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

27 – With right installation: Detaching ride height sensor cable



- Unlock plug connection (1) and disconnect.
- Release cable clip (2) from deformation element adapter.

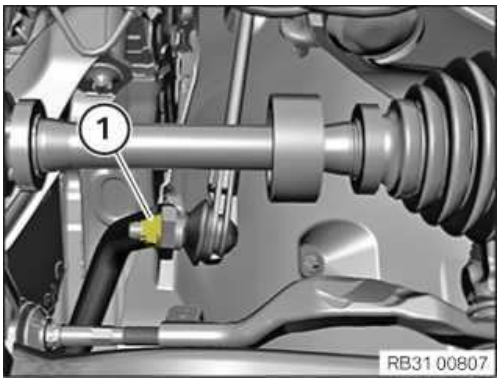
28 – Releasing anti-roll bar on left and right from anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▶ **Detach the anti-roll bar from the anti-roll bar link**

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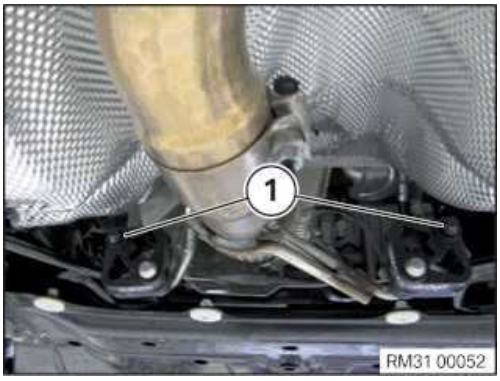


- Unfasten nut (1).

Note: Use the Torx socket for counter support.

- Loosen the anti-roll bar link from the anti-roll bar .

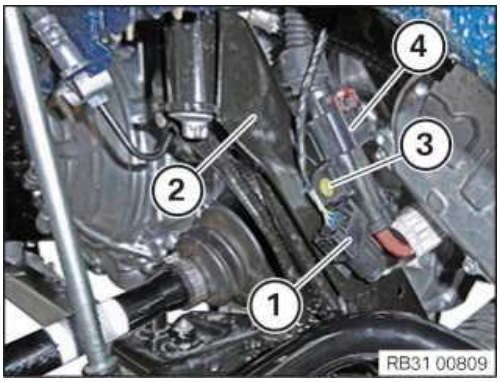
29 – Detaching rubber mount from front axle support



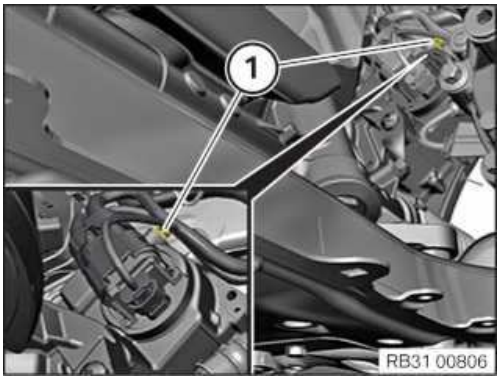
- Spray rubber mount (1) with lubricant and release from holder on front axle support.

30 – Disconnecting plug connections from steering gear

▶ **If installed: Detach connectors from the front axle carrier**

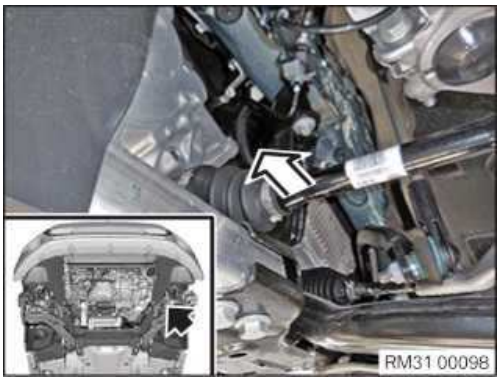


- Release the plug connection (1) from the front axle support (2).
- Loosen screw (3).
- Release the plug connection (4) from the front axle support (2).



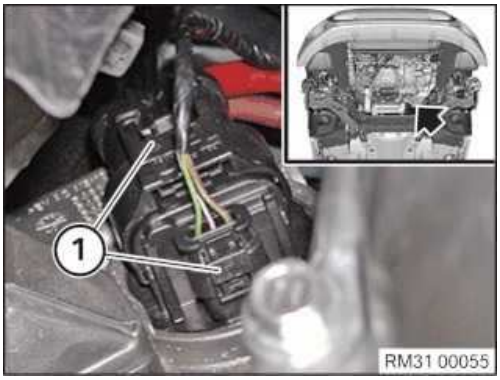
- Disconnect wiring harness (1) from steering gear.

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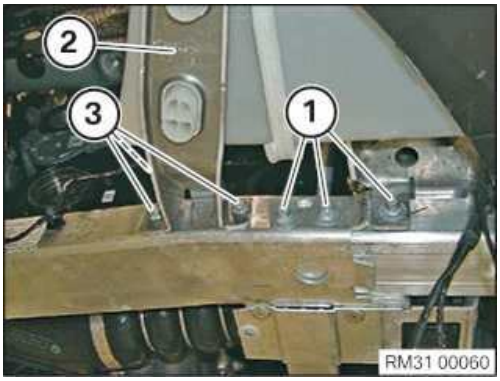
- To unlock the plug connections (see the following work step): unlock plug connections (arrow) with the right hand.

  The plug connections can be reached via the left-hand output shaft.



- Unlock plug connections (arrow) (1)and disconnect from the steering gear.
- Make sure when lowering the front axle that the cables are not damaged!

31 – Releasing the mounted part from the front axle support

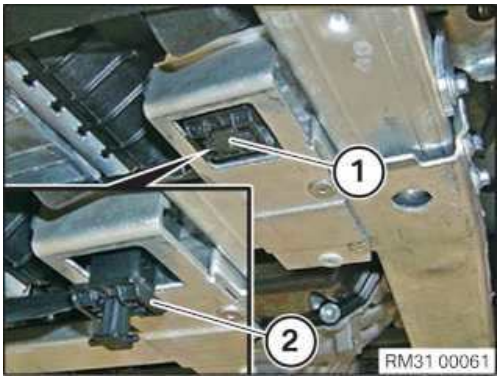


- **Only on right side:** Loosen screws (3) and remove holder for washer fluid reservoir (2).

NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).



NOTICE

Perform the operations on the left and right side.

- Unlock safety catch (1) of the lock (2) from the holder for the charge air cooler.
- Completely remove locks (2).



- Loosen screw (2) of the engine support (3) on the front axle (1).

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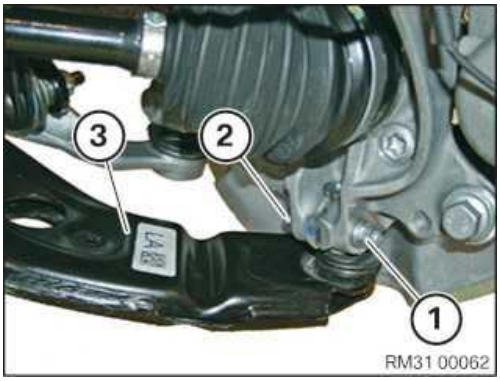


NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

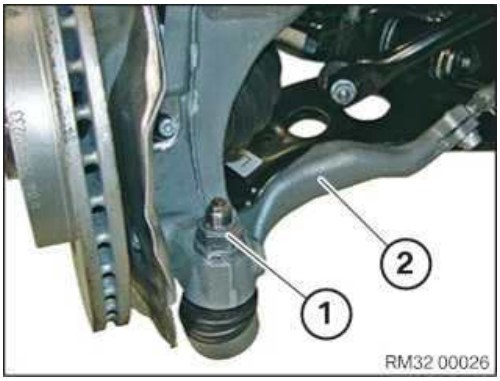
32 – Detaching and removing front axle completely



NOTICE

Perform the operations on the left and right side.

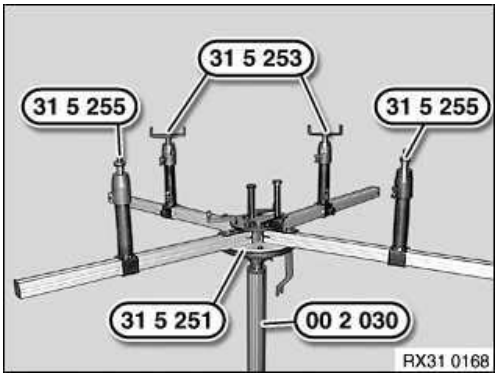
- Unfasten nut (1).
- (2)Pull out screw.
- Detach the wishbone (3) from the swivel bearing .



NOTICE

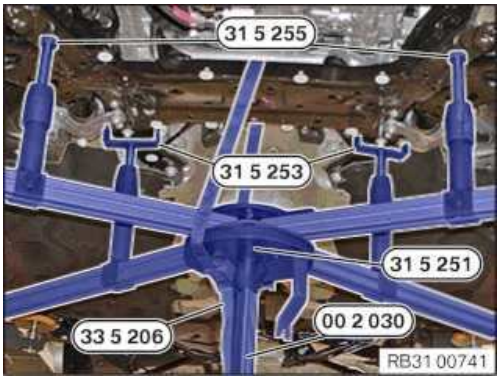
Perform the operations on the left and right side.

- Unfasten nut (1).
- Detach the track rod (2) from the swivel bearing.



- Fit the special tool completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools in telescopic supports of a profile rail pair.
- Insert special tools in telescopic supports of other profile rail pair.

Note: In a profile rail pair, two profile rails are connected to one another by gearing.

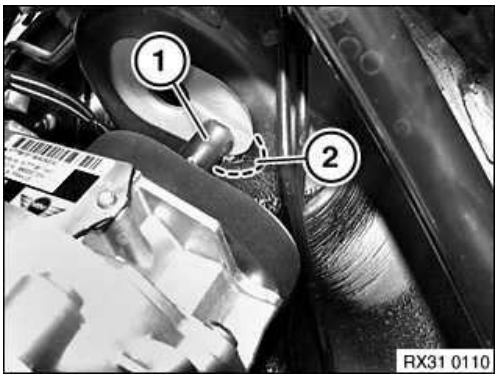


- Align special tools and to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool to special tool .

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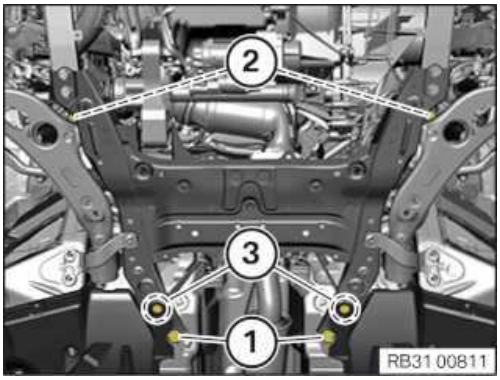


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



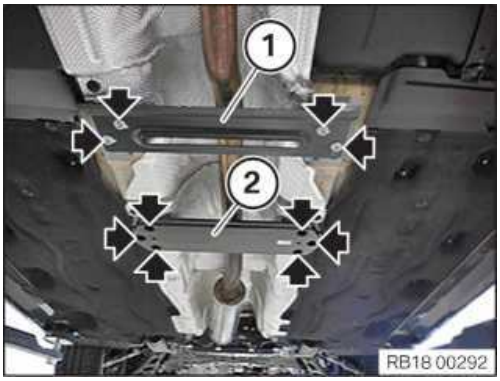
- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and remove the front axle.

TECHNICAL INFORMATION

Note the information on thread repairs using Helicoil thread inserts.
For more information see: 41 00 ... Notes on repairing threads

- Check threads for damage; if necessary, repair with Helicoil thread inserts.

33 – Removing the connecting support from the tunnel in front and back



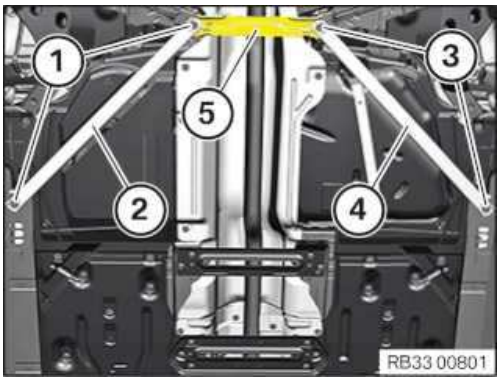
- Unscrew the bolts (arrows) from the connecting support (1).
- Feed out and remove the crossbeam (1).
- Unscrew the bolts (arrows) from the connecting support (2).
- Feed out and remove the crossbeam (2).

34 – Remove the cross strut with the torsion strut

TECHNICAL INFORMATION

Driving without a torsion strut is not permitted.

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- Loosen screws (1).
- Thread out torsion strut (2) at left and remove.
- Loosen screws (3).
- Thread out torsion strut (4) at right and remove.
- Feed out and remove the cross-member (5).

35 – Remove exhaust system

WARNING

Hot surfaces.

Risk of burning!

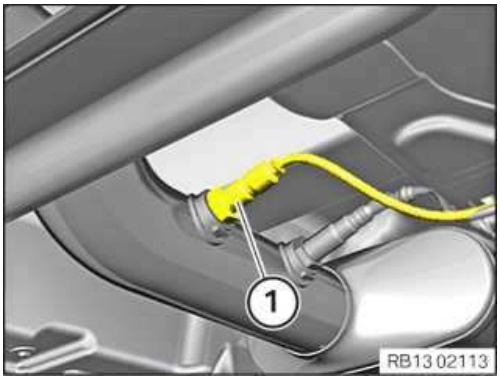
- Perform all work only on components that have cooled down.

CAUTION

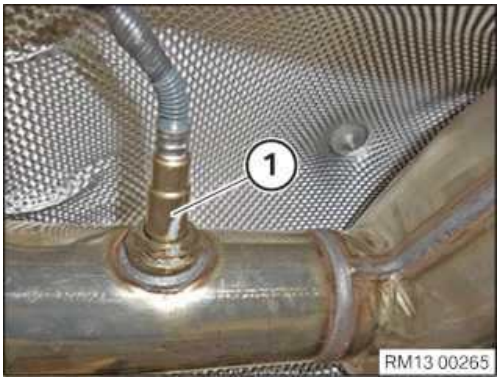
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

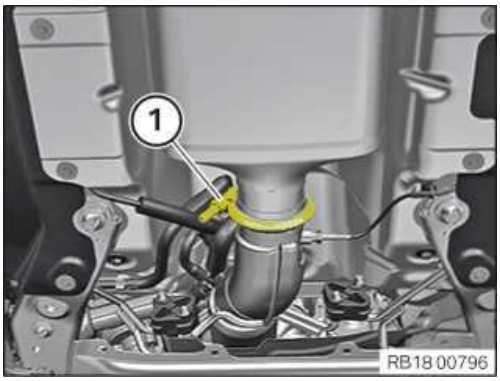


- Release the nitrogen oxide sensor (1) downstream of the SCR catalytic converter, guide it out and set it aside.

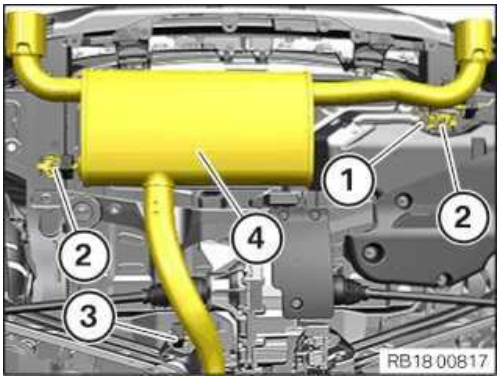


- Release the diesel particulate sensor (1), guide it out and set it aside.

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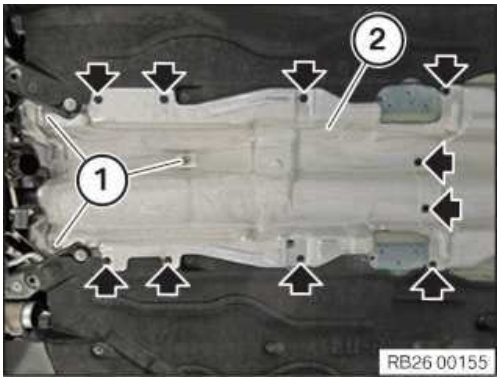


- Loosen V-band clamp (1).



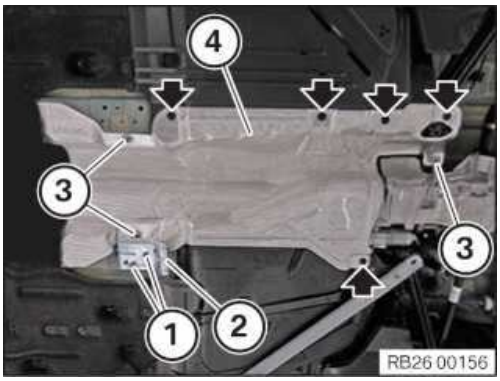
- Loosen screw (1).
- Loosen nuts (2).
- Release the rubber mount (3) of the exhaust system (4).
- Lower and guide out the exhaust system (4) with assistance of a second person and remove it.

36 – Remove front heat shield



- Remove screws (arrows).
- Loosen nuts (1).
- Guide the heat shield (2) out and remove it.

37 – Remove heat shield at rear.



- Loosen screws (1).
- Guide out and remove holder (2).
- Remove screws (arrows).
- Loosen nuts (3).
- Guide the heat shield (4) out and remove it.

38 – Remove propeller shaft

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CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

RISK OF DAMAGE

Damage to propeller shaft during removal.

Non-observance of the removal guidelines for the propeller shaft on the rear axle differential may cause severe damage.

- Do not disassemble the three-hole flange, flexible disc and propeller shaft. The three-hole flange to the rear axle differential is balanced with the flexible disc and propeller shaft.
- Loosen the recessed nut against the direction of travel in clockwise direction. The propeller shaft must be loosened on the recessed nut only and exclusively in the direction of rotation otherwise the anti-twist lock of the bi-hexagonal flange nut is damaged.
- In the event of a damaged anti-twist lock on the bi-hexagonal flange nut: Replace the rear axle differential.



- Install the special too l between the front and rear propeller shaft.
- Make sure that the arrows on the special tool point forward in the direction of travel.

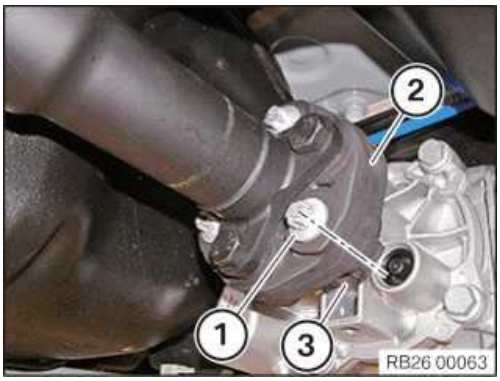


- Always support the propeller shaft (1) with a conventional jack.



- Protect the propeller shaft (1) with the special tools **0 495 554 (33 5 070)** and from twisting.

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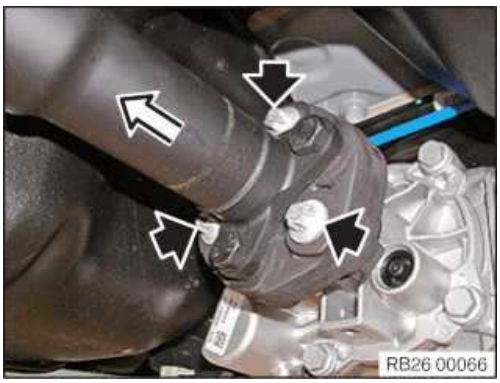
TECHNICAL INFORMATION

Compliance with the following instructions is required to avoid a humming noise from the propeller shaft after refitting the propeller shaft.

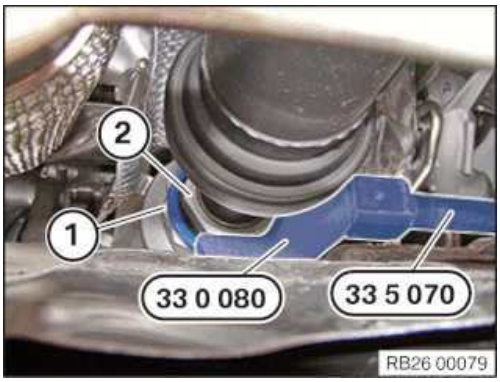
- Mark the installation position of the screw connection (1), the flexible disc (2) and the three-hole flange (3) on the same level.
- Loosen the screw connection (1).



- Loosen screws (1).



- Remove screws (arrows).
- Guide the propeller shaft out in the direction of the arrow and set it aside.



RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.

- Protect the recessed nut (2) on the transfer box from twisting with the special tools **0 495 554 (33 5 070)** and .

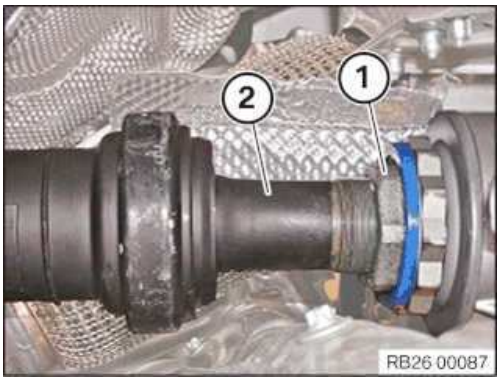
  The recessed nut (2) on the transfer box must **not** be used to detach the propeller shaft.

  The double hexagon flange nut (1) must **not** be used for counter support.

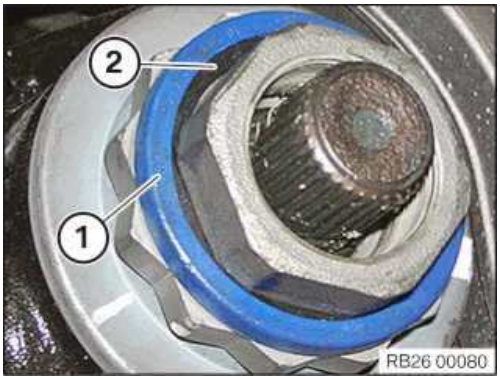


- Release the front propeller shaft with the special tools **0 495 554 (33 5 070)** and in the direction of the arrow.

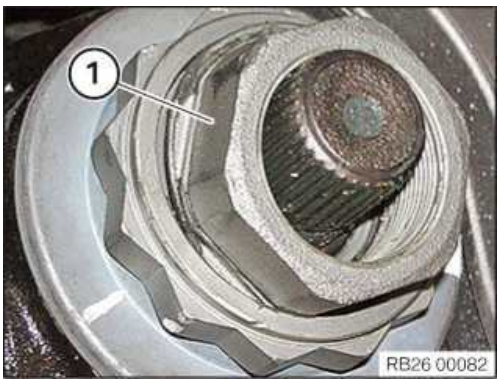
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- Thread the propeller shaft (2) out of the recessed nut (1) and remove.



- Thread the retaining clip (1) and the seal (2) out and remove.



- Thread out and remove the recessed nut (1).

39 – Removing starter motor

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and loosen connector (1).
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).



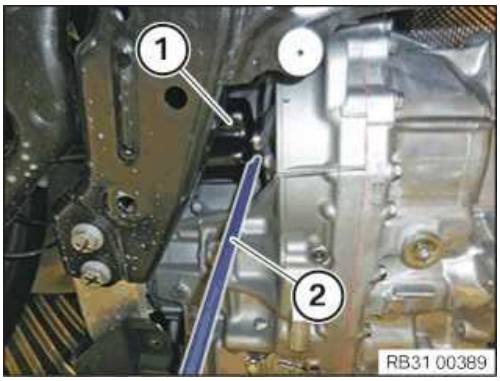
- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.



- Loosen screws (1).
- Feed out starter motor and remove.

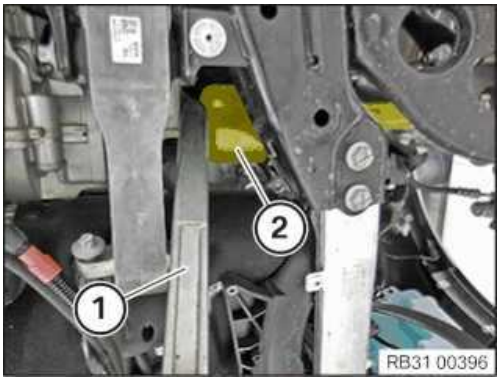
40 – Partially removing the left output shaft

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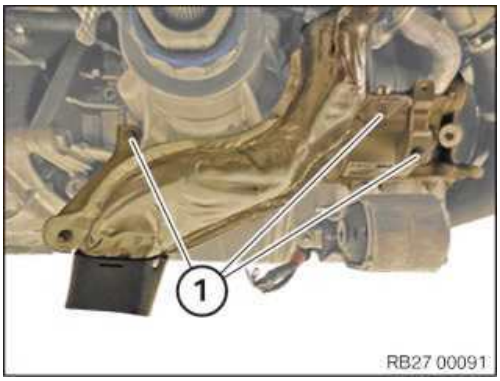
- Protect the output shaft (1) from falling.
- Lever out the output shaft (1) with a mounting lever (2) from the transmission.
- Tie up output shaft (1).

41 – Partially removing right output shaft

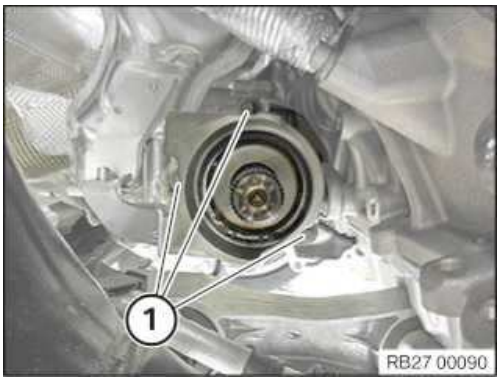


- Lever out the output shaft (2) with a mounting lever (1).
- Tie up output shaft (1).

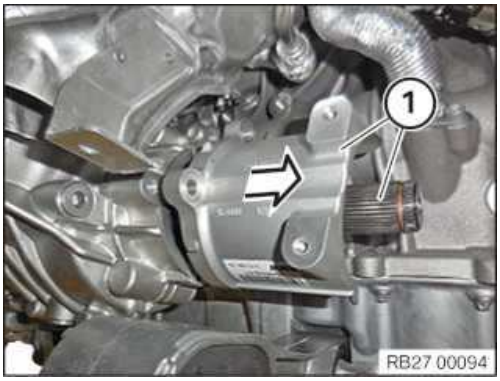
42 – Remove the intermediate shaft with the support tube



- With air duct installation: Loosen screws (1).
- Remove air duct



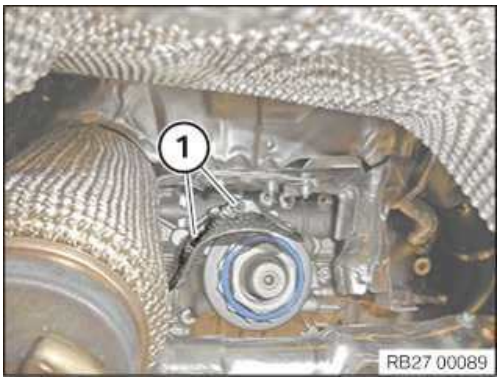
- Loosen screws (1).



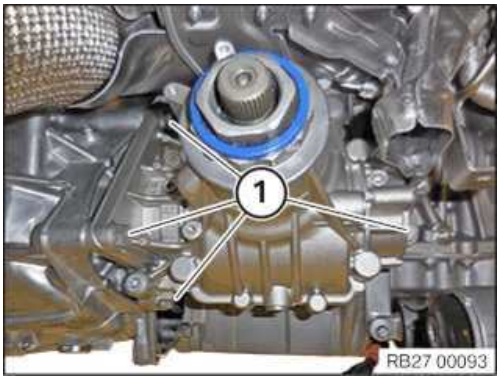
- Pull the intermediate shaft with the support tube (1) out of the transfer box.

43 – Remove transfer box (VTG)

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- Loosen screws (1).
- Remove heat shield.



- Loosen screws (1).
- Remove the transfer box (VTG).

44 – Remove the monitoring oxygen sensor

WARNING

Hot surfaces.

Risk of burning!

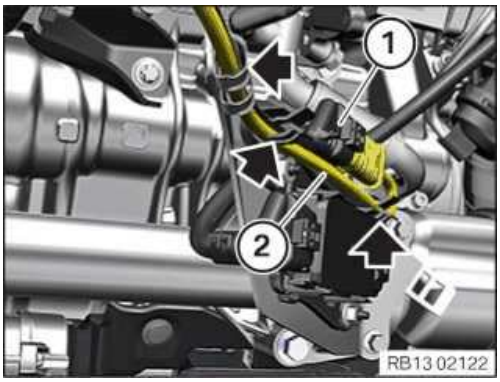
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

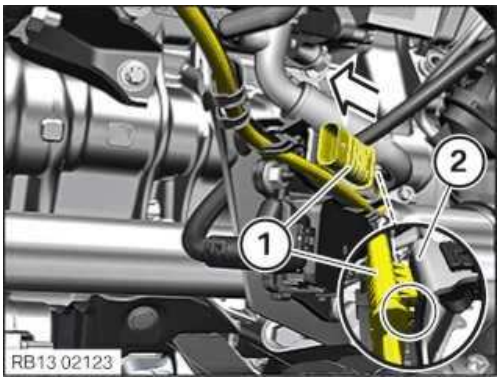
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

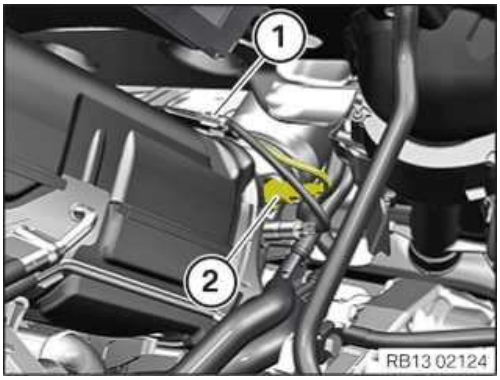


- Unlock plug connection (1) and disconnect.
- Feed oxygen monitor sensor cable (1) out of the clamps (arrows).

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- Unlock the connector (1) in the marked area and disconnect it from the holder (2) in the direction of arrow.



- Guide the cable of the monitoring oxygen sensor (2) out of the clamp (1).
- Release the monitoring oxygen sensor (2) using special tool **0 491 074 (11 7 020)**.
- Remove the monitoring oxygen sensor (2).

45 – Removing the nitrogen oxide sensor before SCR catalytic converter

WARNING

Hot surfaces.

Risk of burning!

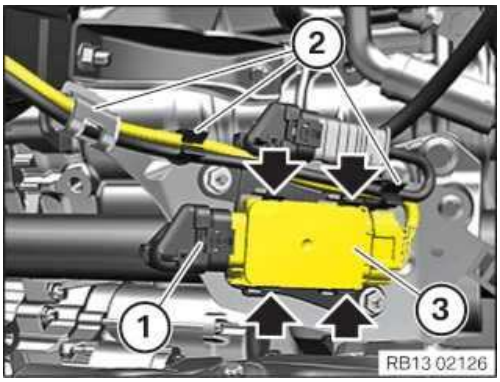
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

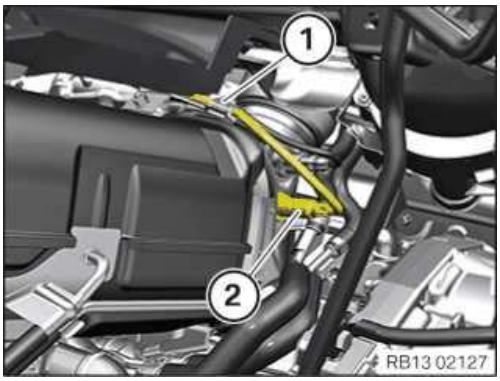
Damage to or destruction of electrical components.

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- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



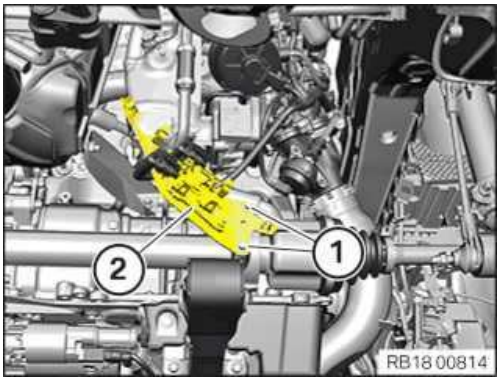
- Unlock plug connection (1) and disconnect.
- Slide the cable of the nitrogen oxide sensor evaluation electronics (3) out of the clamps (2) and remove.
- Unlock (arrows) and remove the evaluation electronics for the nitrogen oxide sensor (3).

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- Slide the cable of the nitrogen oxide sensor before the SCR catalytic converter (2) out of the clamps (1) and remove.
- Detach the nitrogen oxide sensor before the SCR catalytic converter (2) using the special tool **0 491 074 (11 7 020)**.
- Guide out and remove the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

46 – Remove holder for oxygen sensor



- Loosen screws (1).
- Thread out the holder (2) for the oxygen sensor and remove.

47 – Remove the exhaust temperature sensor on the catalytic converter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

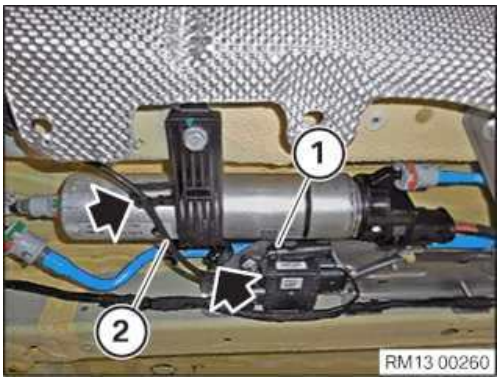
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

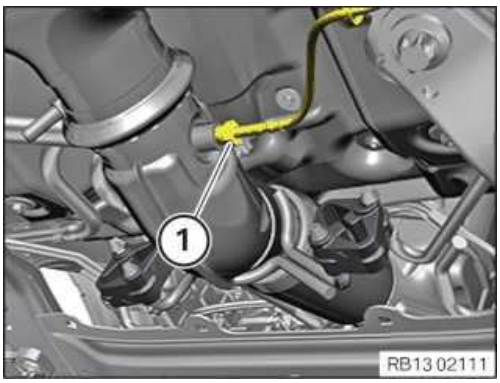
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- Unlock and loosen connector (1).
- Feed out the cable (2) of the exhaust temperature sensor from the clamps (arrows) and remove.



- Loosen the cable clip (1).



- Loosen exhaust temperature sensor (1).
- Feed out and remove exhaust temperature sensor (1).

48 – Removing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

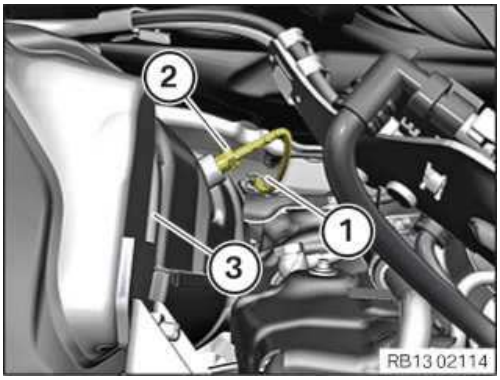
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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- Unlock and loosen connector (1).
- Uncover the exhaust temperature sensor cable.



- Guide the exhaust temperature sensor cable (2) out of the clamp (1) and place it to one side.
- Release the exhaust temperature sensor (2) with conventional tools .
- Feed out and remove the exhaust temperature sensor (2) from the diesel particulate filter (3).

49 – Remove the exhaust temperature sensor on the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

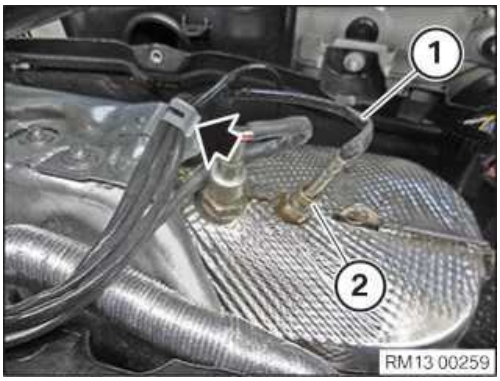
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect connector (1).
- Put the cable of the exhaust temperature sensor to one side.

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- Guide cable (1) of the exhaust temperature sensor out of the clamp (arrow) and remove it.
- Loosen exhaust temperature sensor (2).
- Feed out and remove exhaust temperature sensor (2).

50 – Remove the control sensor

WARNING

Hot surfaces.

Risk of burning!

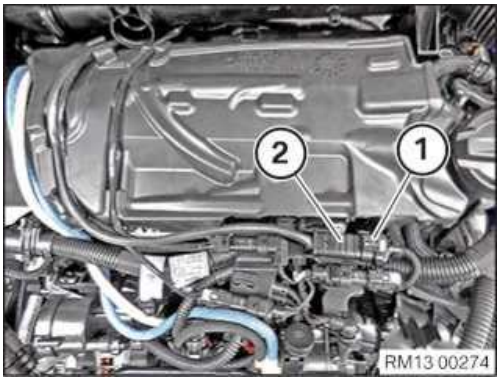
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock plug connection (1) and disconnect.
- Detach the connector (2) from the holder .
- Release the front oxygen sensor cable.



- Detach the control sensor (1) with the special tool .
- Feed out and remove the control sensor (1).

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51 – Removing the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

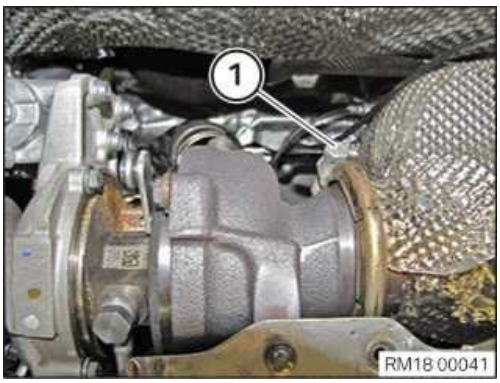
- Perform all work only on components that have cooled down.

CAUTION

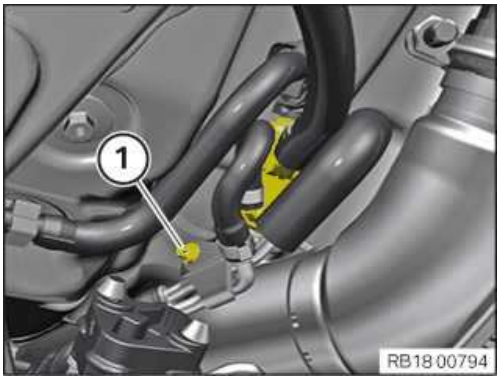
Heavy component.

Heavy components can lead to injury or damage.

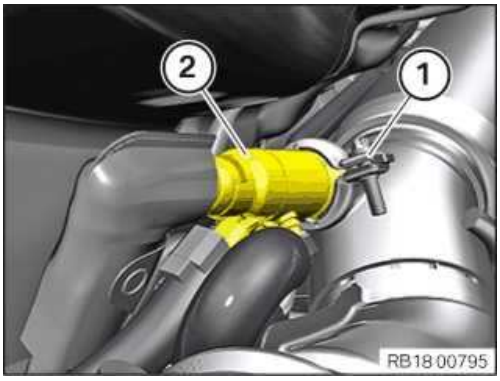
- Remove and install heavy components with the aid of another person/other persons.



- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.

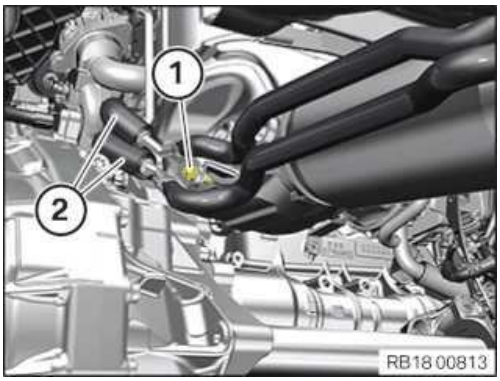


- Loosen screw (1).



- Loosen V-band clamp (1).
- Remove the SCR metering module (2) and set it aside.

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- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.

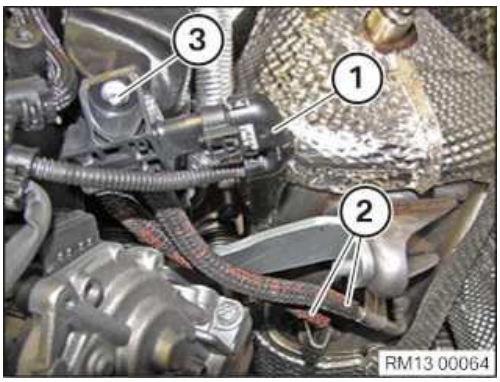
▶ **Remove differential pressure sensor**

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

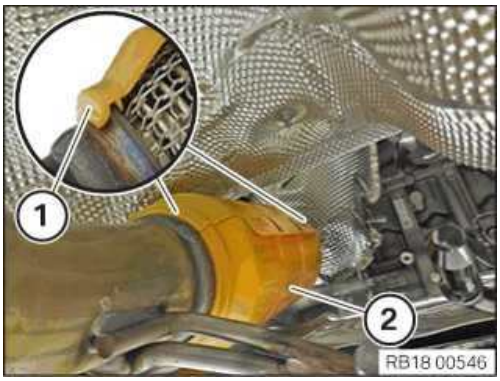


- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

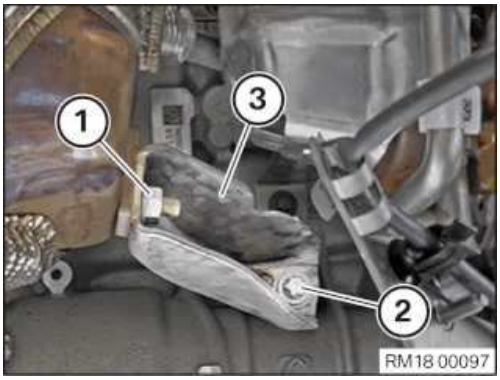


- Loosen nuts (1).

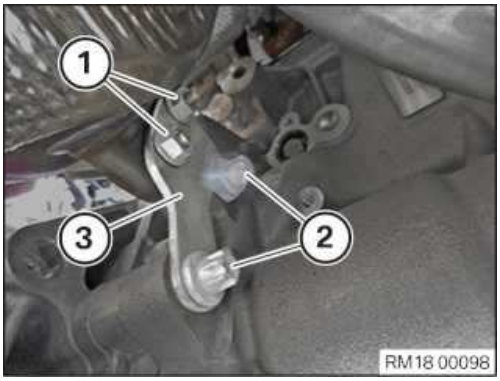
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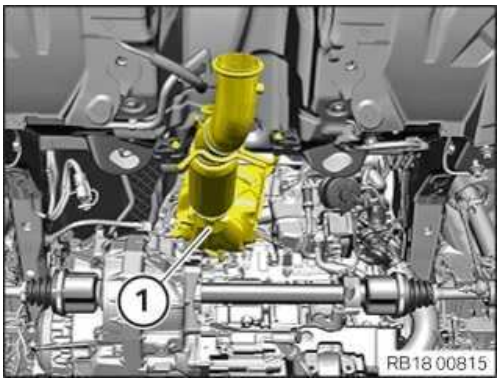
- Mount fitting aid (2).
- Make sure that the fitting aid is correctly position on the edges (1) of the flexible tube.



- Unfasten nut (1).
- Loosen screw (2).
- Remove holder (3).



- Loosen nuts (1).
- Loosen screws (2).
- Remove holder (3).

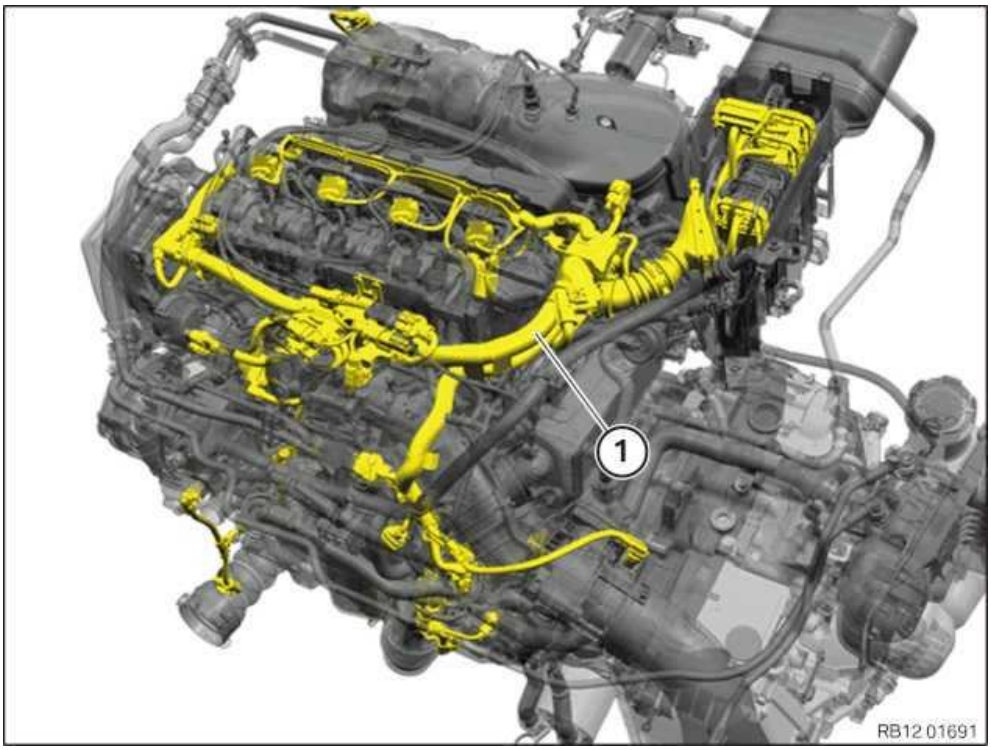


- Feed out diesel particulate filter (1) toward the bottom and remove.

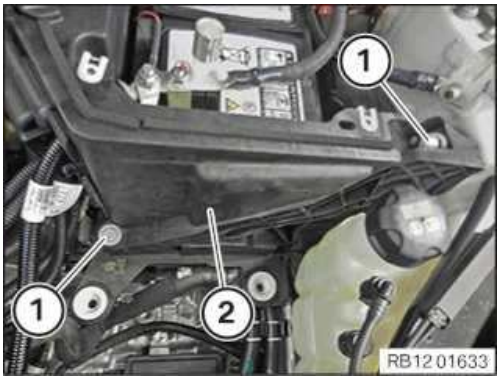
52 – Releasing the wiring harness section for the intake plenum

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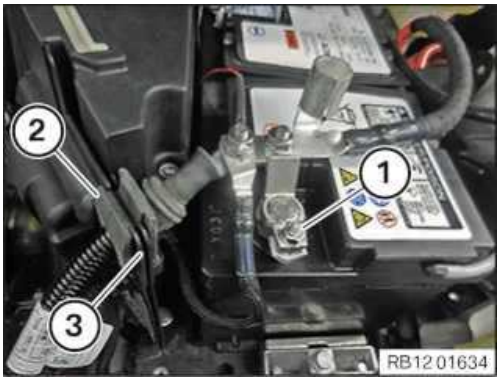
Overview: Wiring harness section for the engine



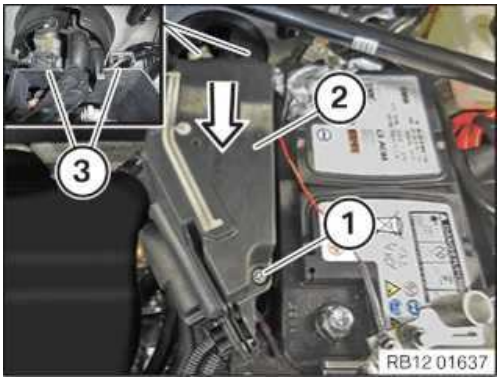
1 Wiring harness section for the engine



- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.

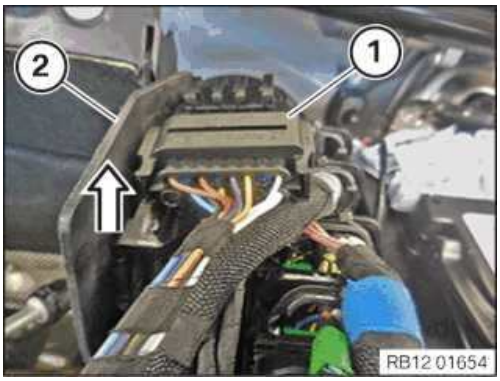


- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

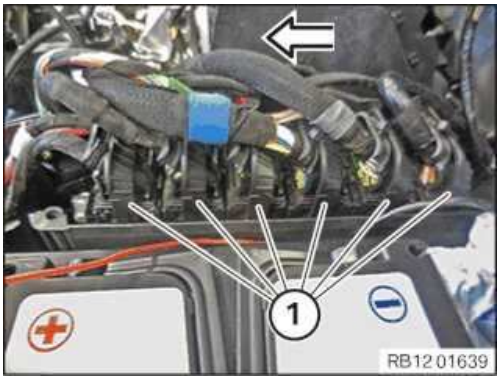


- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.

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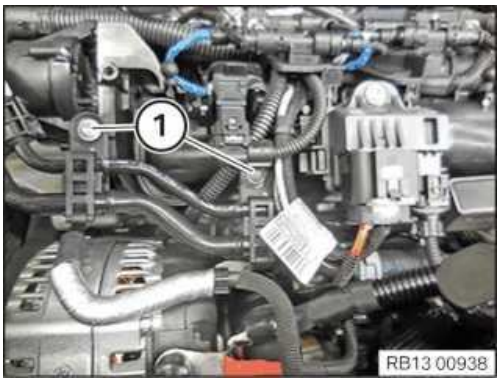
- Guide the connector (1)out of the electronics box (2) in the direction of arrow and remove it.
- Unlock and loosen connector (1).



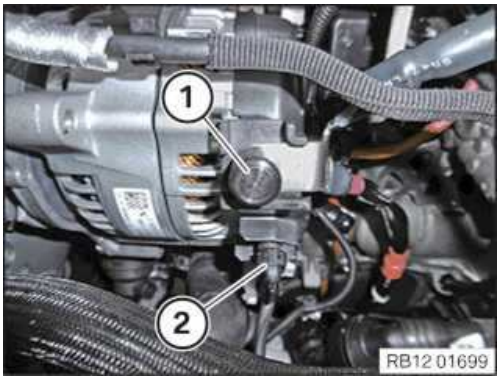
- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



- Unlock and loosen connector (1).

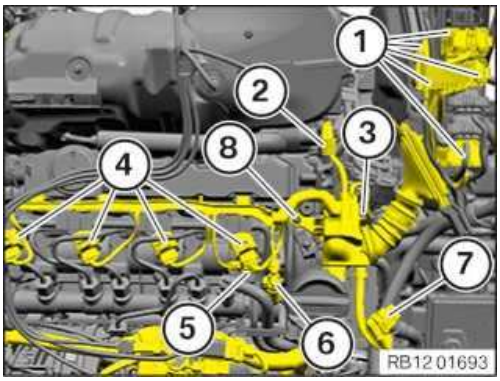


- Loosen screws (1).

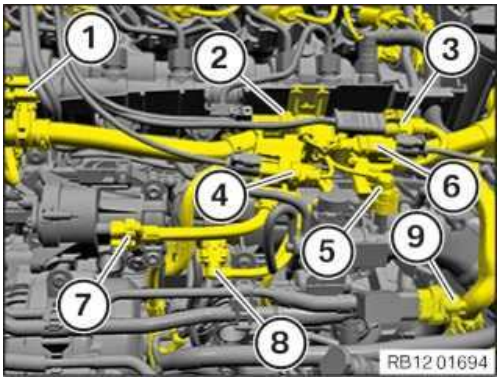


- Release the positive battery cable (1) on the alternator and place to one side.
- Unlock connector (2) and pull off.

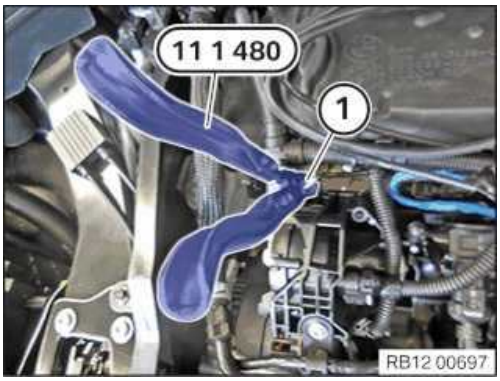
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- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock the connector (2) and disconnect it from the differential pressure sensor.
- Unlock the connector (3) and disconnect it from the exhaust-gas recirculation valve.
- Unlock the connector (4) and pull off from the injectors.
- Unlock the connector (5) and disconnect it from the camshaft sensor.
- Unlock the connector (6) and disconnect it from the fuel pressure regulator.
- Unlock connector (7) and pull off from hot film air mass meter.
- Loosen screw (8).

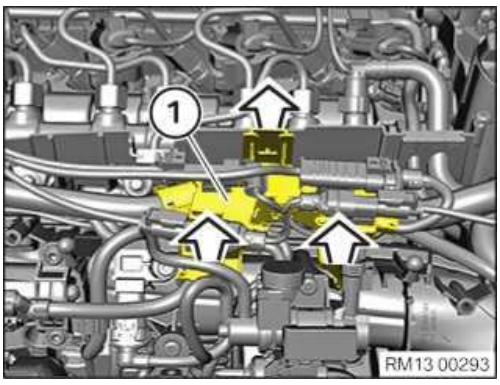


- Unlock connector (1) and pull off from the rail pressure sensor.
- Unlock the connector (2) and disconnect it from the exhaust temperature sensor before the diesel particulate filter.
- Unlock and disconnect the connector (3) from the front oxygen sensor.
- Unlock the connector (4) and disconnect it from the exhaust temperature sensor after the diesel particulate filter.
- Unlock and disconnect the connector (5) from the electric changeover valve.
- Unlock the connector (6) and disconnect it from the exhaust temperature sensor for the exhaust-gas recirculation cooler.
- Unlock the connector (7) and disconnect it from the servomotor for the swirl flaps.
- Unlock the connector (8) and pull it off the charging pressure sensor.
- Unlock the connector (9) and disconnect from the fuel pressure and temperature sensor.



- Unlock the connectors (1) of all glow elements with the special tool **0 490 796 (11 1 480)** and release them.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.

▶ **Removing the cable clips from the intake plenum**



- Detach the cable clip (1) in the direction of the arrow.
- Guide out the cable clip (1) in direction of arrow and set it aside.

53 – Removing the intake plenum

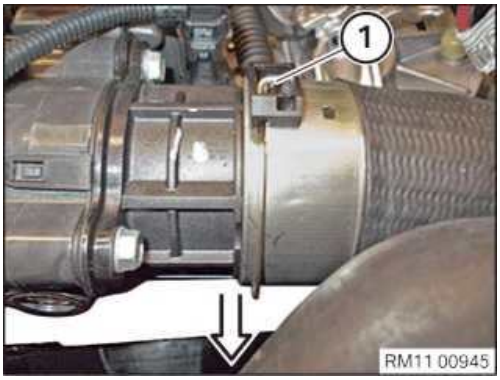
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TECHNICAL INFORMATION

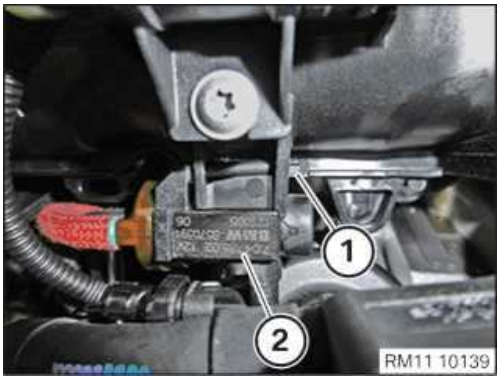
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



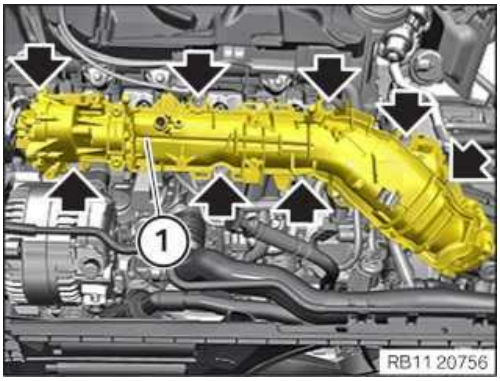
- Unlock the lock (1).



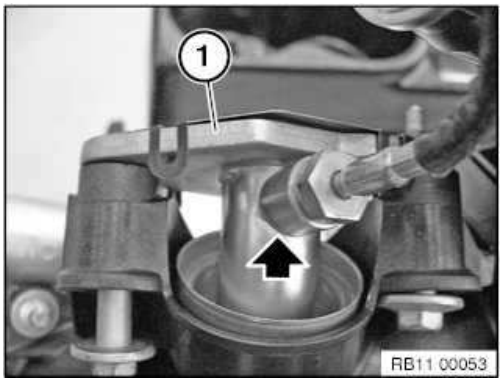
- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.



- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



- Release the screws (arrows) from the intake plenum (1).
- Guide the intake plenum (1) out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

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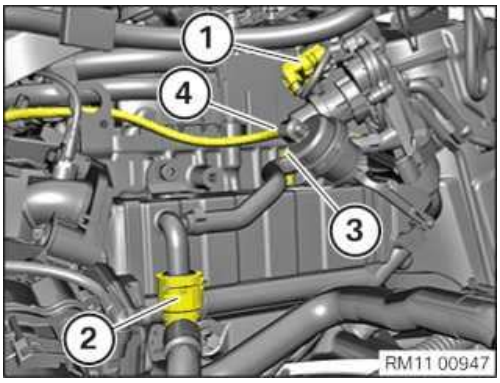
54 – Removing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

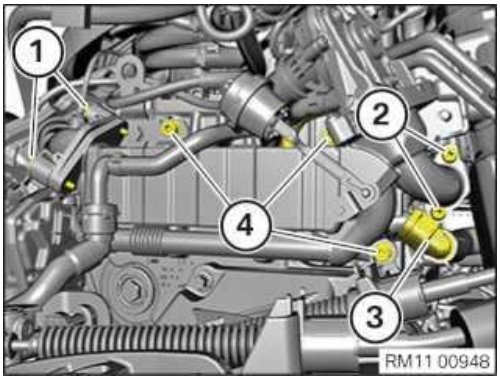
- Perform all work only on components that have cooled down.



TECHNICAL INFORMATION

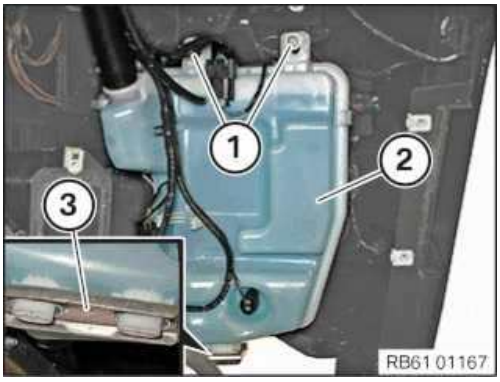
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.

55 – Remove the washer fluid reservoir from the fixture



- Loosen screws (1).
- Guide the washer fluid reservoir (2) up and out of the fixture (3) and set it aside.

56 – Removing the right charge air duct between the exhaust turbocharger and the charge air cooler

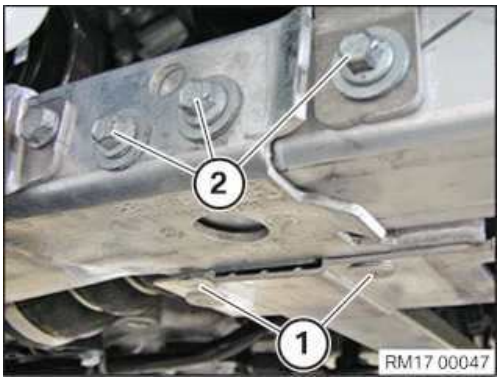
WARNING

Hot surfaces.

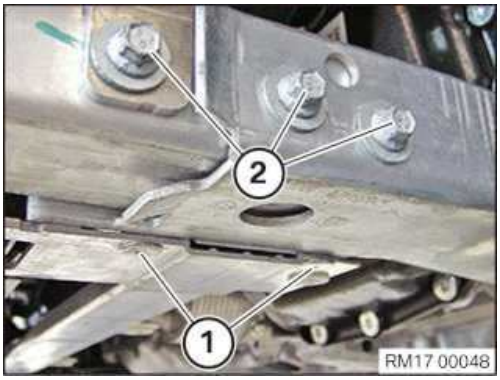
Risk of burning!

- Perform all work only on components that have cooled down.

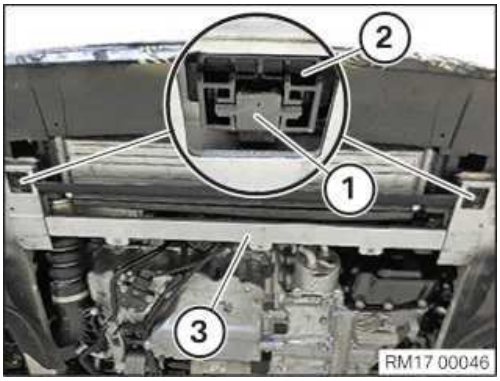
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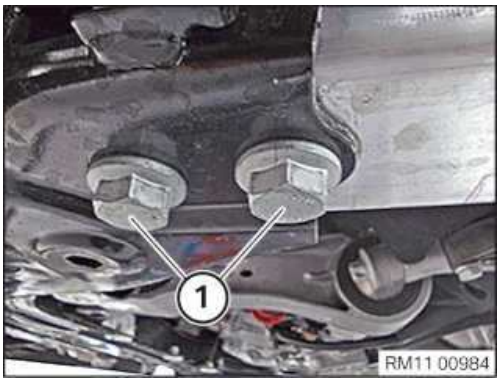
- Undo screws (2) at front left.
- Drill out blind rivets (1) at front left.



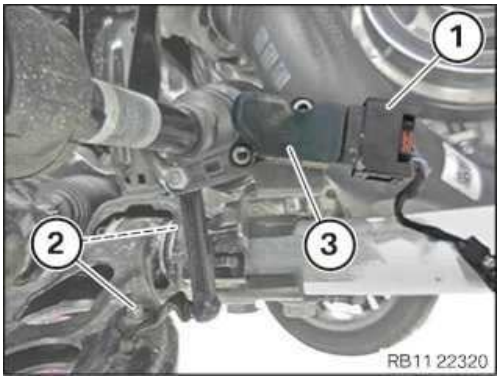
- Undo screws (2) at front right.
- Drill out blind rivets (1) at front right.



- Unlock locking pins (1).
- Thread out and remove locks (2).
- Thread out and remove cross connection (3).

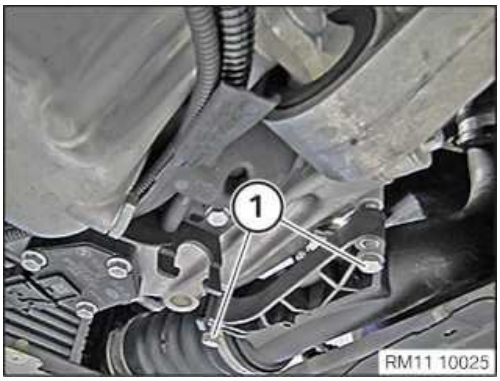


- Release the screws (1) on the right front axle support.

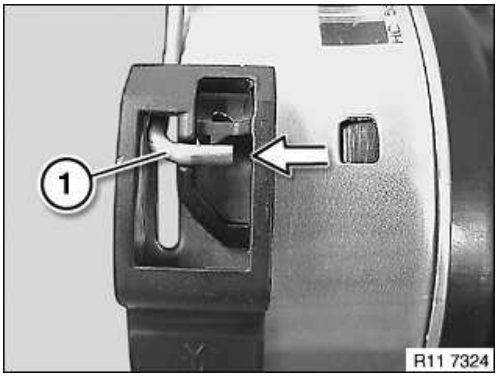


- **If installed:**
- Unlock and release plug connection (1).
- Loosen screws (2).
- Feed out the ride height sensor (3) and remove.

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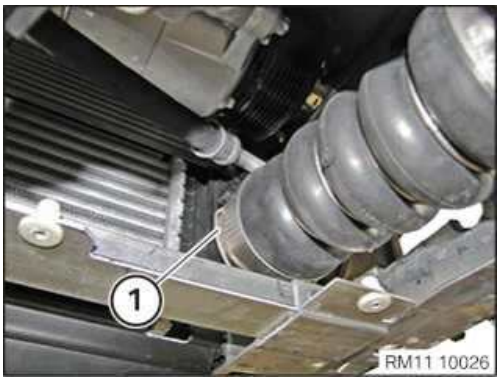


- Release screws (1) of charge air duct on right oil sump.

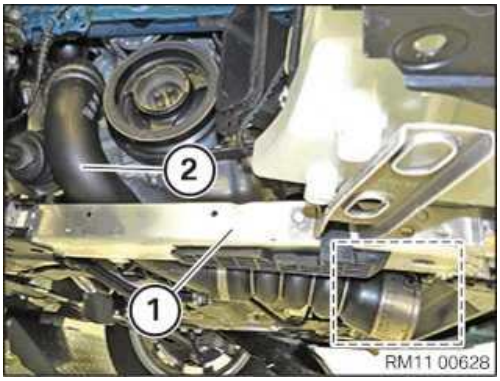


- Unlock lock (1).

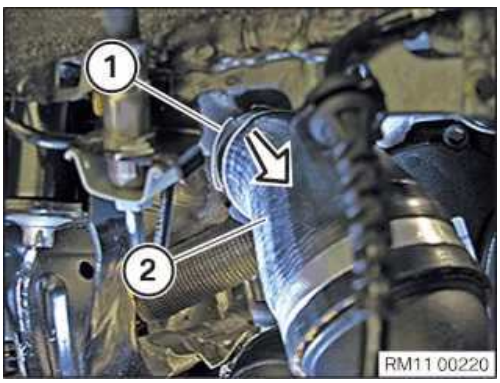
  The lock (1) must engage in the bracket during unlocking (arrow).



- Unlock and release the charge air duct (1) on the charge air cooler.



- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed out the charge air duct (2) in the **marked** area towards the bottom and set it aside.



- Unlock and detach the locks (1) on both sides.
- Feed out the charge air duct (2) on the exhaust turbocharger in the direction of the arrow and set it aside.

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- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed out the charge air duct (1) in the direction of arrow between the side member and the deformation element and remove.

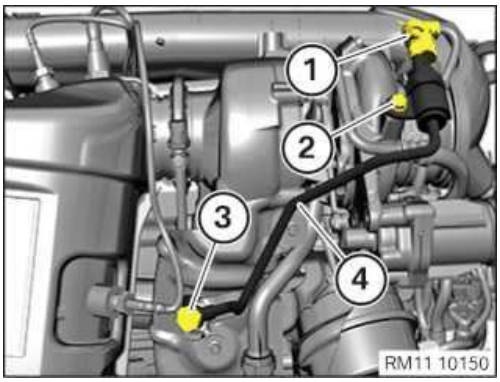
57 – Remove the heat shield from the exhaust turbocharger at the bottom

WARNING

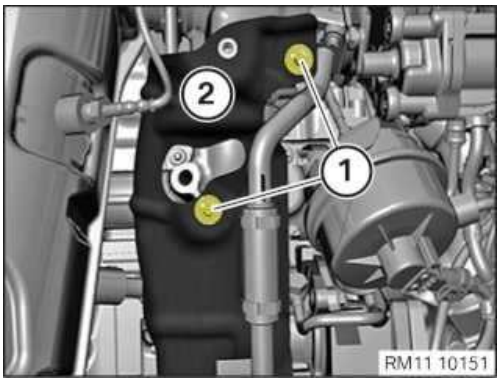
Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Unlock and disconnect connector (1).
- Unscrew the banjo bolt (3).
- The seals of the banjo bolt (3) must be renewed.
- Loosen screw (2).
- Remove the exhaust gas pressure pipe (4).



- Unscrew the bolts (1) on the heat shield .
- Feed out and remove the heat shield (2).

58 – Removing the low-pressure stage turbocharger

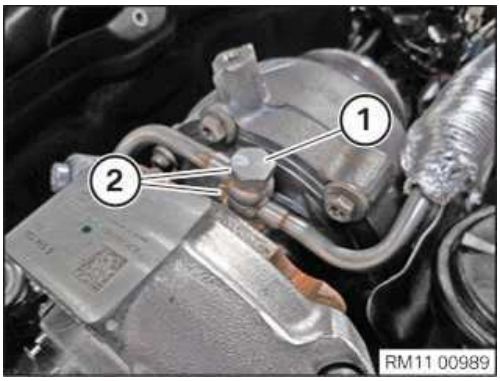
WARNING

Hot surfaces.

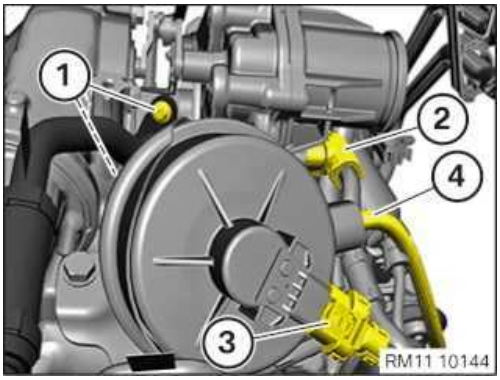
Risk of burning!

- Perform all work only on components that have cooled down.

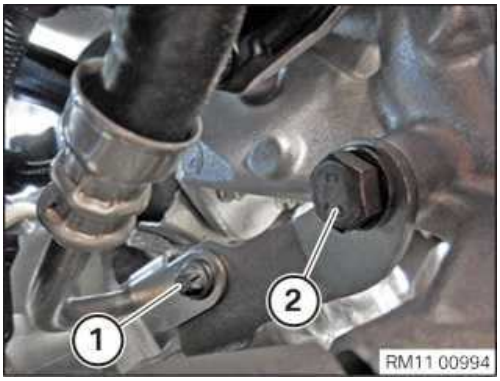
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- Release the banjo bolt (1) of the oil feed lines.
- Remove sealing rings (2).
- Place oil feed lines to one side.



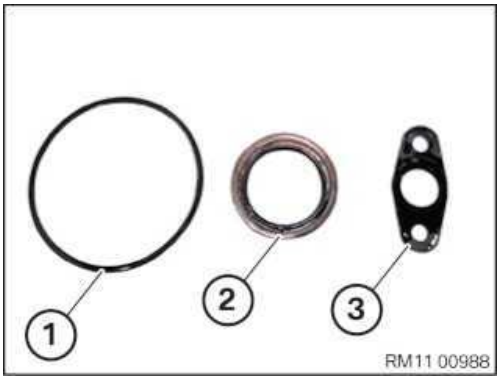
- Release the screws (1) of the oil return line.
- Unlock and disconnect the plug connections (2) and (3).
- Pull off the vacuum hose (4) carefully.



- Undo the bolt (1) of the oil feed line.
- Loosen screw (2).

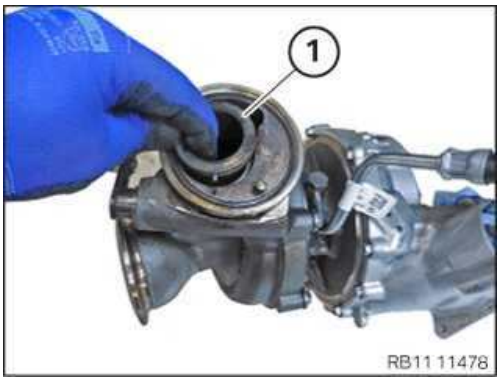


- Loosen screw (1).
- Remove the V hose clamp.
- Guide the low-pressure stage turbocharger out towards the top and remove.



- Remove seals (1), (2) and (3).

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- Remove the spacer ring (1).

59 – Removing the high-pressure stage exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

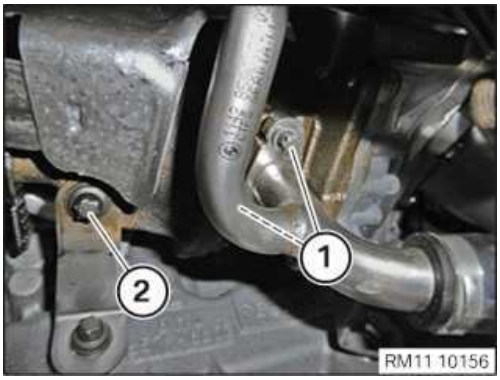
- Perform all work only on components that have cooled down.

CAUTION

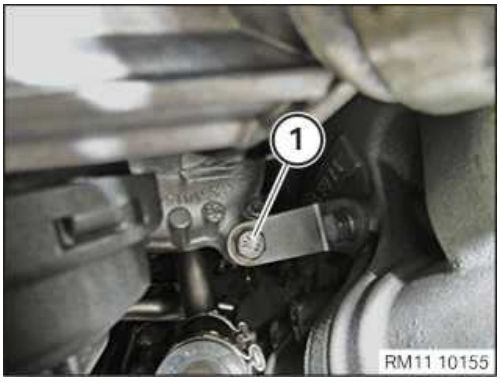
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

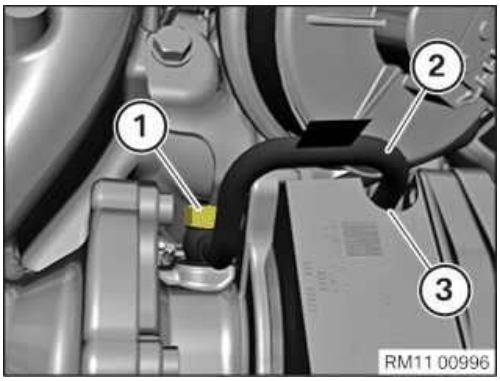


- Unscrew the bolts (1) on the oil return line .
- Loosen screw (2).

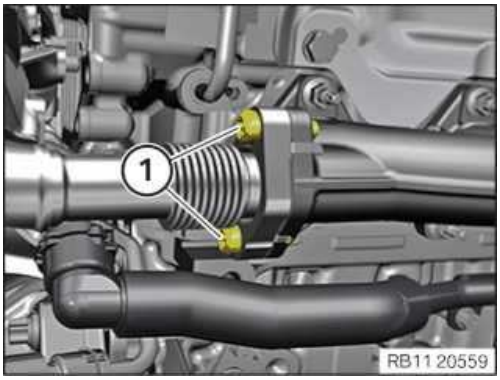


- Release screw (1) from the right wheel arch.

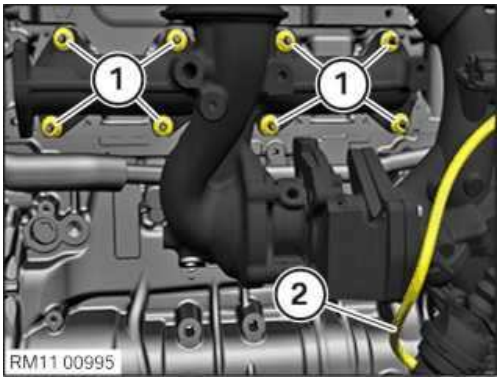
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- Unscrew the banjo bolt (1).
- Guide out oil feed line (2) from holder (3).



- Loosen screws (1).



- Pull off the vacuum hose (2).
- Loosen nuts (1).
- Guide out the exhaust manifold and the high-pressure stage exhaust turbocharger to the top and remove them.

60 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

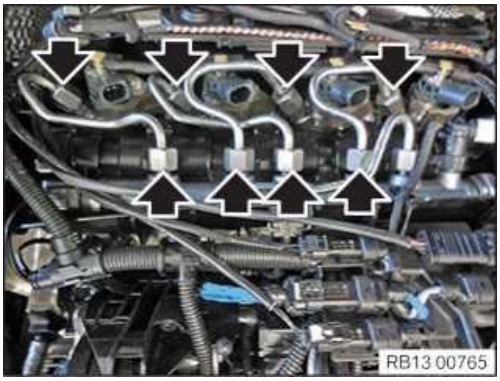
If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release the high pressure lines (arrows) with the special tool .
- Catch and dispose of escaping fuel.
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool .

61 – Remove leakage oil lines

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

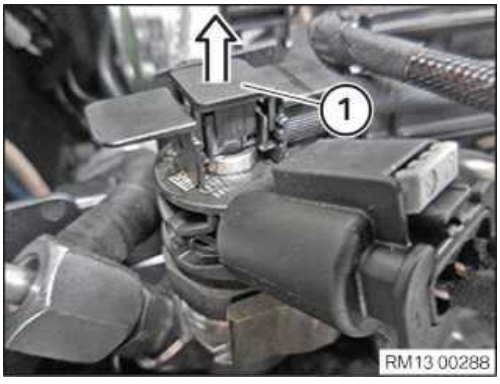
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

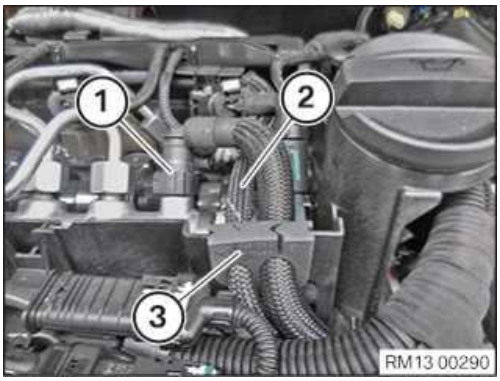


- Unlock the connectors (arrows) and disconnect.

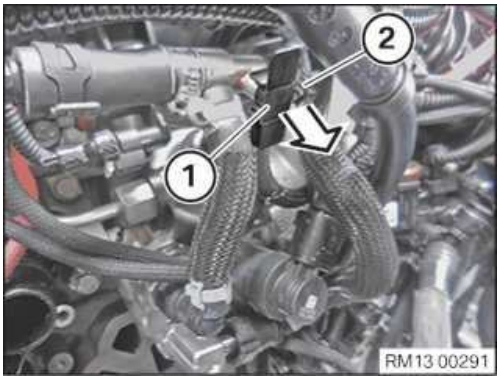


- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

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- Unlock and loosen fuel line (1) and set it aside.
- Guide the leakage oil line (2) out of the rubber grommet (3) and set it aside.



- Release lock (1) in direction of arrow.
- Feed out leakage oil line (2) and remove.

62 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

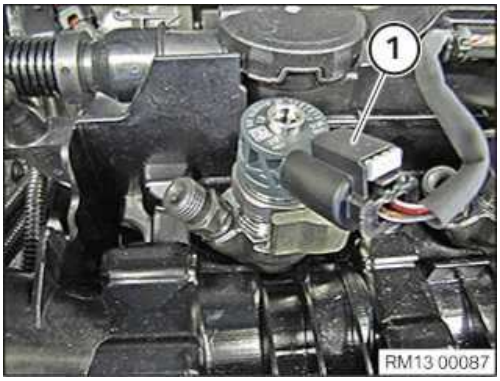
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

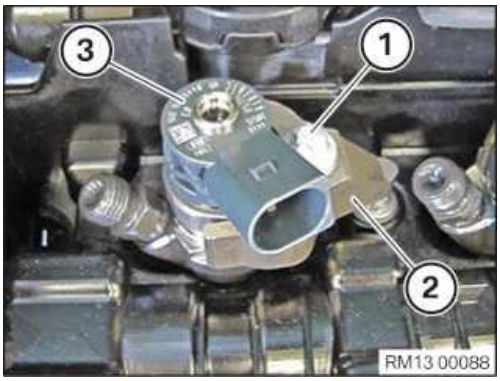
TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.



- Unlock and disconnect connector (1).

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- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

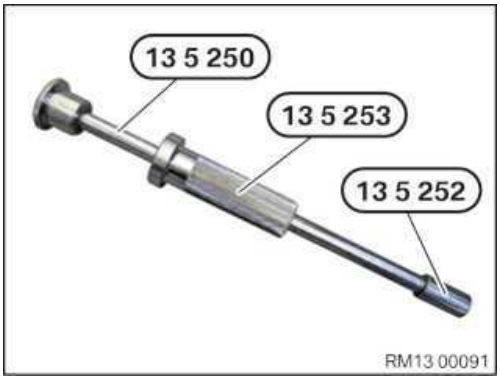
▸ **Loosen stuck injectors**

RISK OF DAMAGE

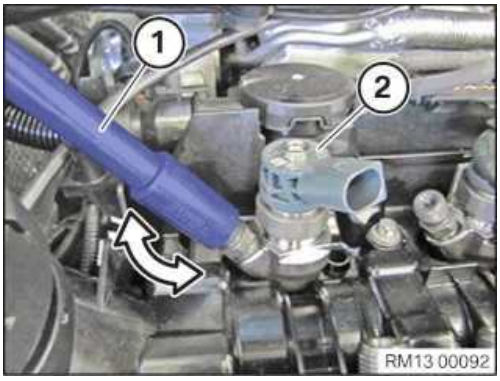
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)** back onto the special tool **0 493 321 (13 5 250)**.

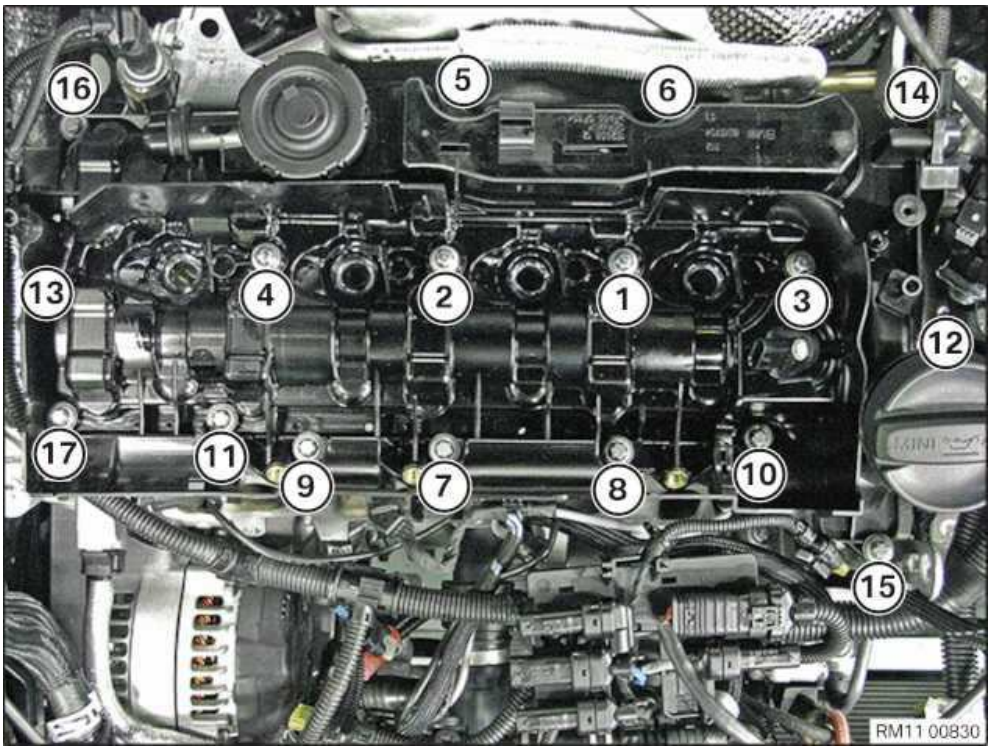


- Screw the special tool (1) **0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1) **0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

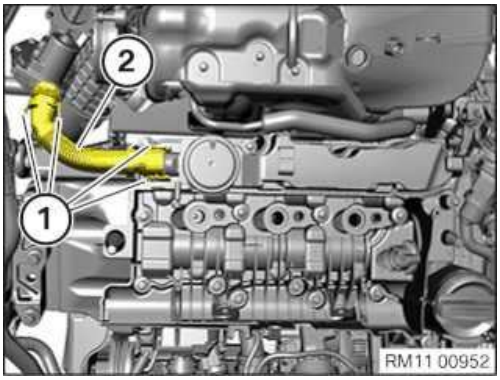
63 – Removing the cylinder head cover

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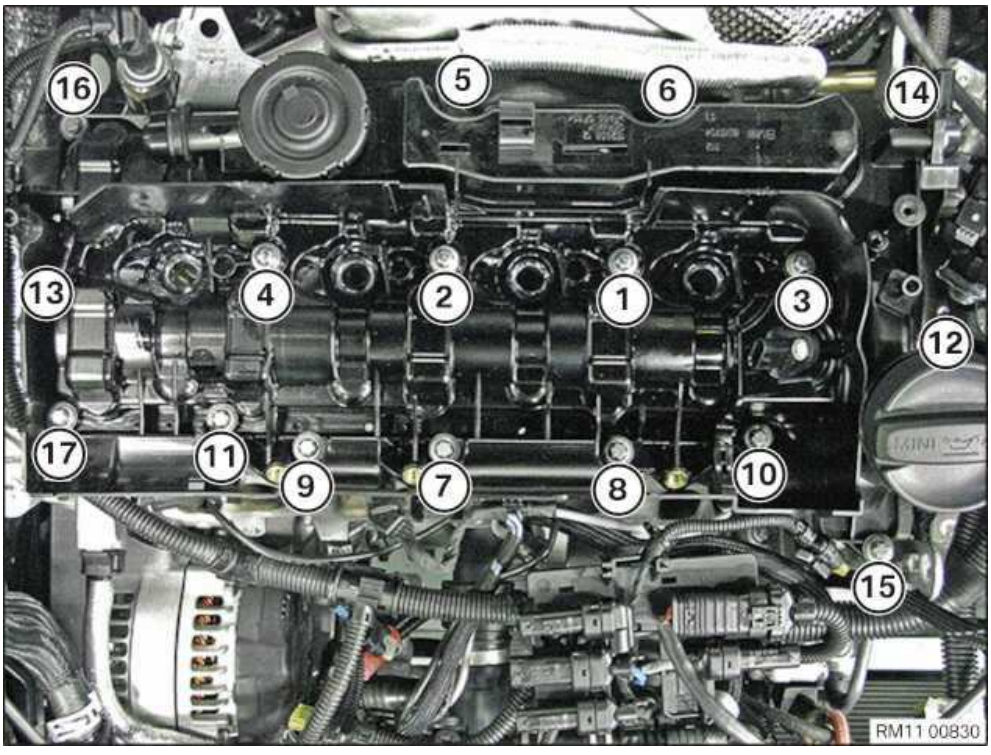
Overview: Screw connection of the cylinder head cover



1 to 16 screws of the cylinder head cover.



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).



- Loosen screws in the order (17) to (1).
- Remove cylinder head cover by lifting it out.

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- Remove protective cap (1) from oil sump.

- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

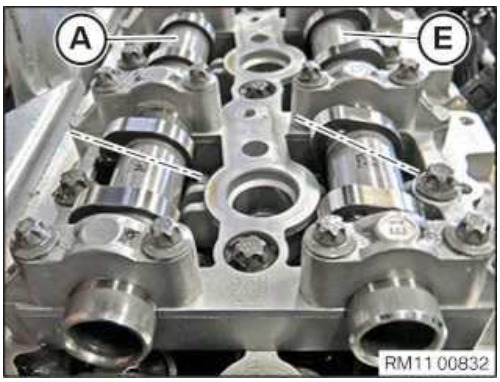
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

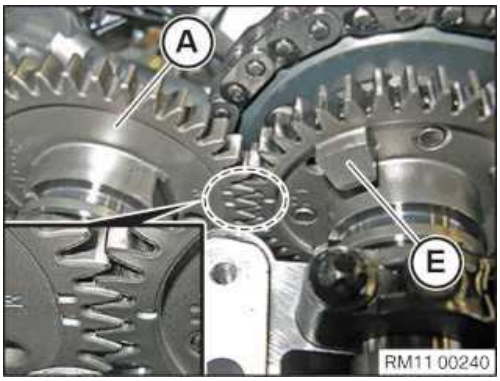


- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.

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- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.



- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

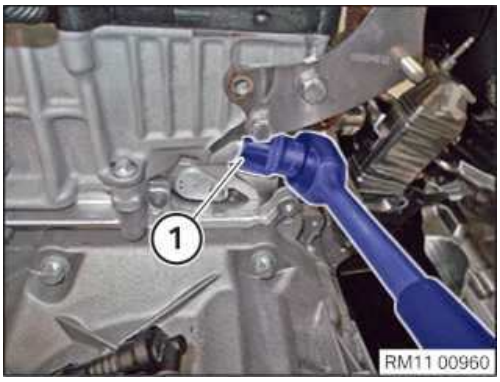
65 – Remove chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



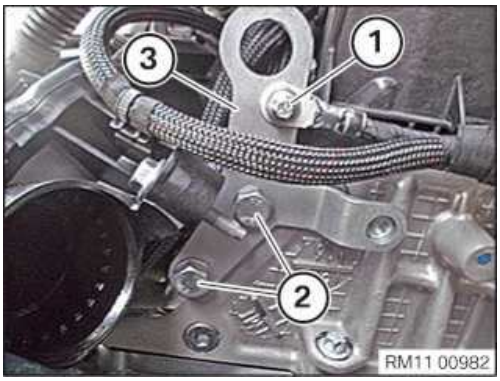
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

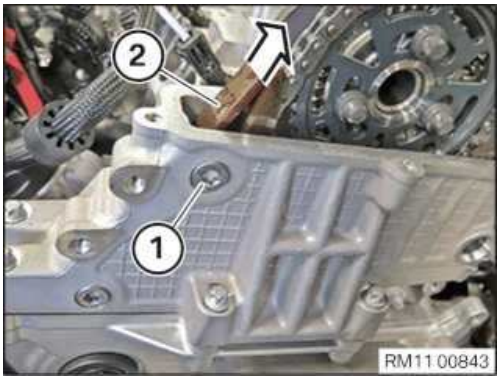
- Remove the chain tensioner piston (1).

66 – Remove the timing chain guide rail

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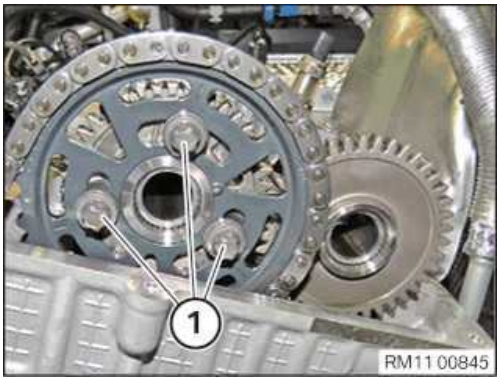


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



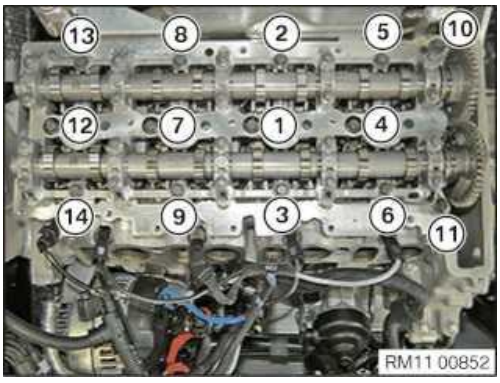
- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

67 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

68 – Removing the camshaft support



- Evenly loosen all screws in a sequence from (14) to (1).
- Loosen and remove all screws in a sequence from (14) to (1).
  Both camshafts can be removed with the camshaft carrier.
- Remove the camshaft support including camshafts towards the top.

69 – Remove roller cam followers

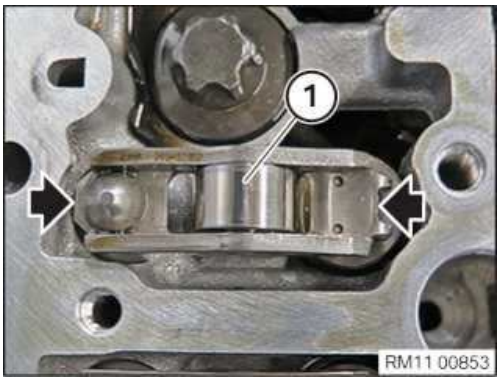
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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RISK OF DAMAGE

Damage to the engine.

If the classification of the roller cam followers is ignored, this can lead to engine damage.

- Observe the classification of the roller cam followers.
- Always reuse used roller cam followers at the same position.

- Remove the roller cam follower (1) and place it onto the special tool **0 495 105 (11 4 480)**.
- Repeat the process for all roller cam followers.

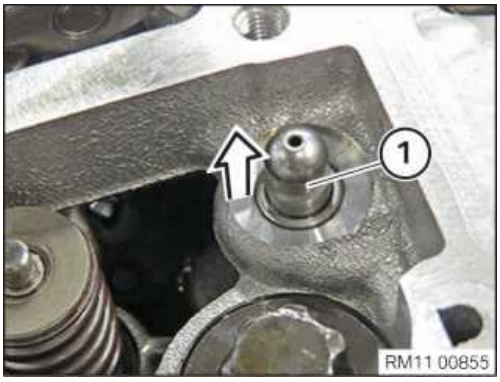
70 – Removing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Remove the hydraulic valve clearance compensating element (1) in the direction of the arrow and place on the special tool **0 495 105 (11 4 480)**.
- Repeat the process on all hydraulic valve clearance compensating elements.

71 – Removing glow elements

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Damage to the glow elements.

Excessive force may damage the glow elements and they may then have to be renewed.

- Handle glow elements with care and do not drop.
- Do not rest the cylinder head on glow elements. Glow elements protrude from the sealing surface of the cylinder head.

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RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect plug connection (1) using special tool **0 490 796 (11 1 480)**.



- Release the glow elements with the special tool or conventional tools.
- Feed out preheating elements and remove.

MAIN WORK

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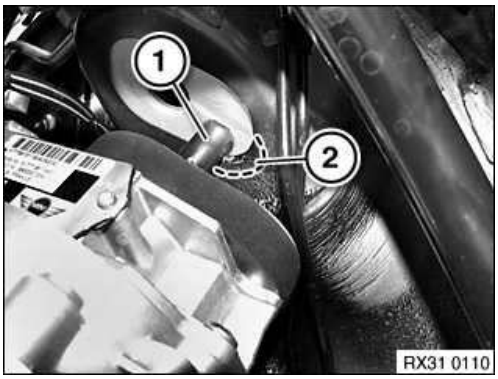
72 – Remove cylinder head.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

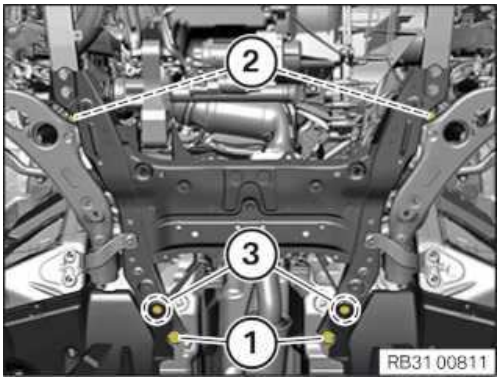


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- Position front axle support.
- Bend the underbody panelling to the side in area (3).
- Raise front axle support.
- When raising, insert the charge air cooler into its rubber mount on the transmission cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

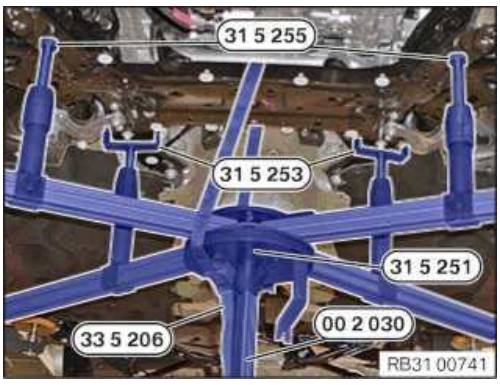
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

- If applicable, tighten the screws in area (3).

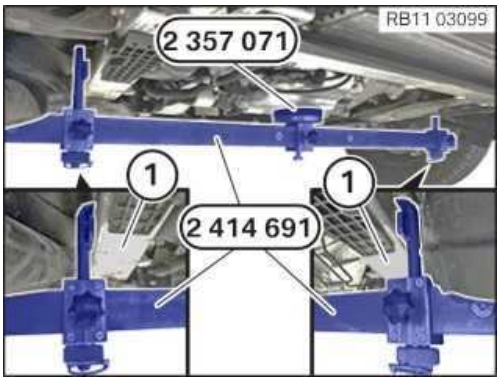
Underbody protection to body

Screw		Tightening torque	3 Nm

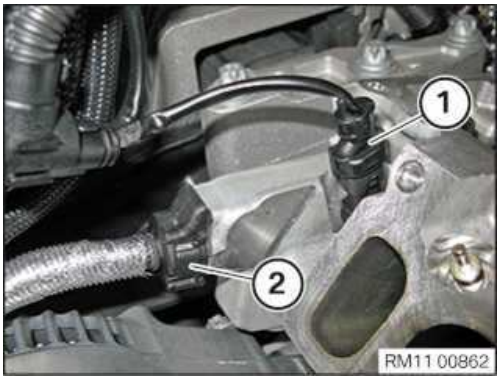


- Remove special tool from special tool .
- Lower the universal jack **0 490 133 (00 2 030)** with the special tool and set it aside.

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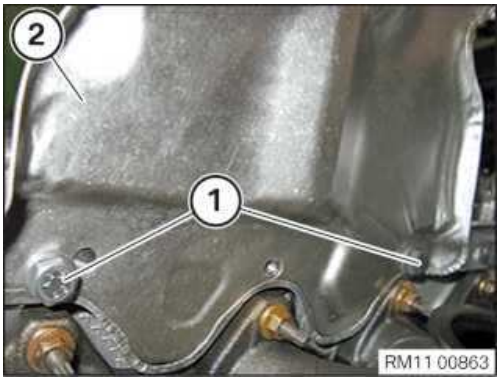
- Prepare special tool together with the special tool **2 357 071**.
- Attach special tool to front axle support and align special tool **2 357 071** correctly under the oil sump and then tighten.
- Turn special tool at adjusting screw uniformly upwards, until the special tool **2 357 071** makes contact with the oil sump.
- Tighten all adjusting screws of special tools and **2 357 071**.



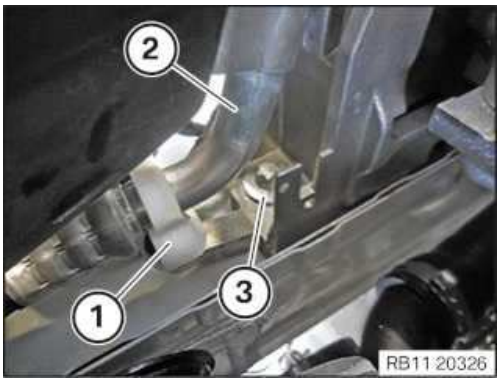
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

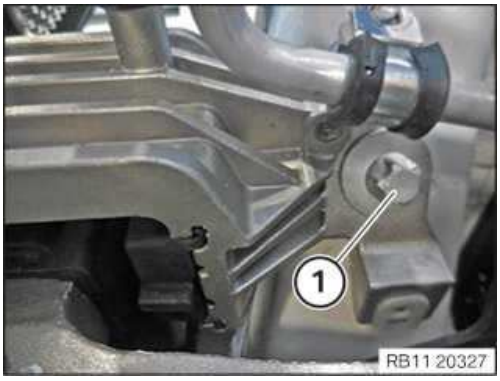
- Release the connector (1) from the coolant temperature sensor.
- Unlock and loosen coolant line (2).



- Loosen screws (1).
- Feed out the heat shield (2) and set it aside.

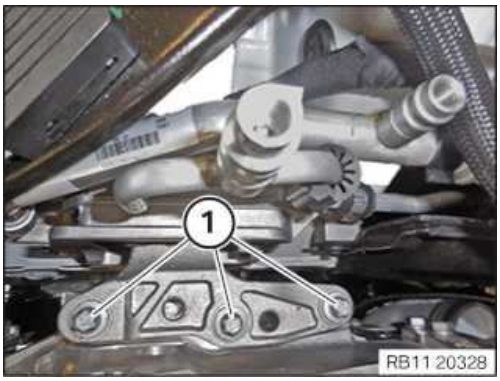


- Unlock and loosen holder (1).
- Feed out the refrigerant line (2) and put to one side.
- Loosen screw (3).

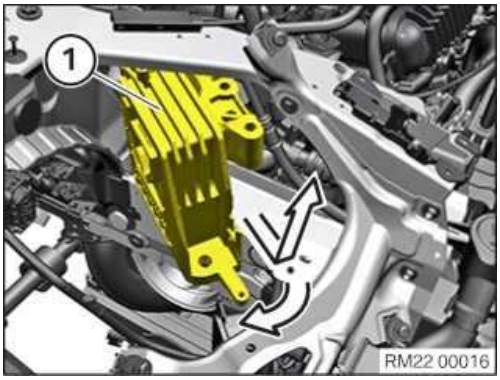


- Loosen screw (1).

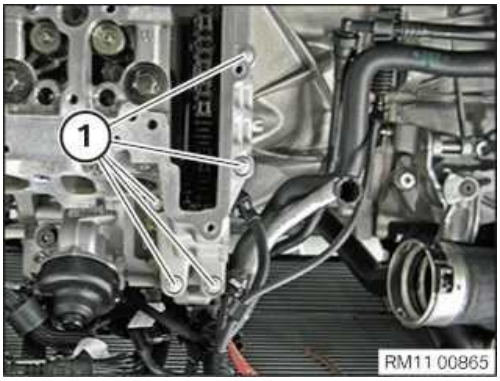
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- Loosen screws (1).



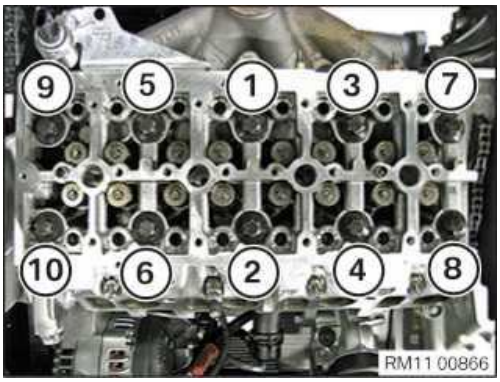
- Turn engine mount (1) in direction of arrow and remove upwards.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screws (1).



- Loosen the cylinder head bolts in the sequence from (10) to (1).
- Remove cylinder head bolts (1) to (10) with washers.

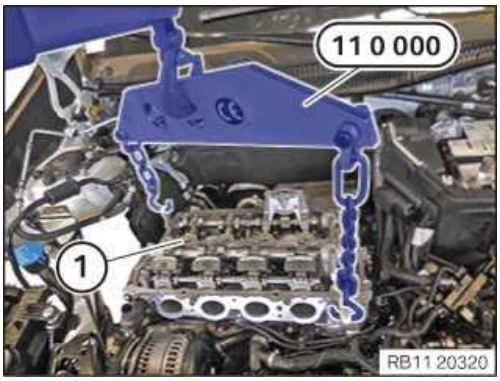


- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

M8		Tightening torque	21,5 Nm

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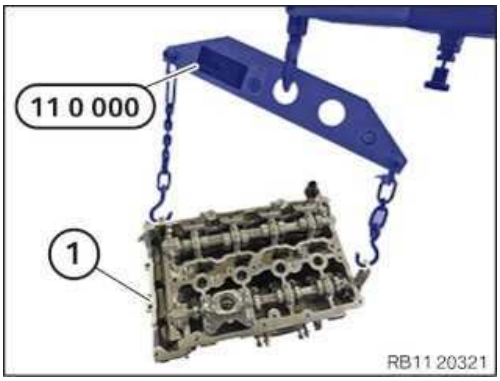
RISK OF DAMAGE

Damage to the guide rails.

Large amounts of force may damage the guide rails of the timing chain.

- Make sure not to damage the guide rail with the cylinder head when removing and installing the cylinder head.

- **Carefully** guide out the cylinder head (1) with the engine lifter and the special tool **0 490 561 (11 0 000)** and remove.



- Mount the cylinder head (1) on the special tool **0 494 362 (11 9 000)**.

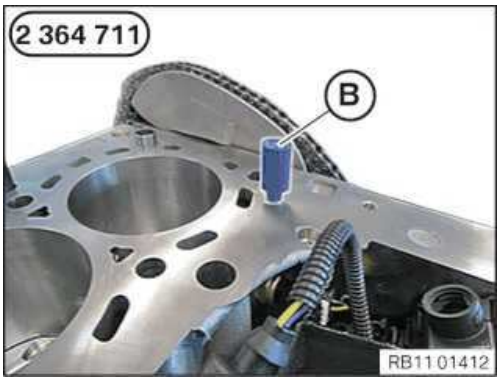
73 – Cleaning the sealing surface

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Lock the front oil duct using special tool (B) from special tool **2 364 711**.



RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 103 (11 4 471)**.

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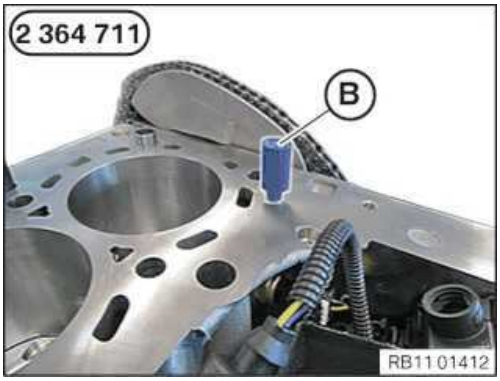
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

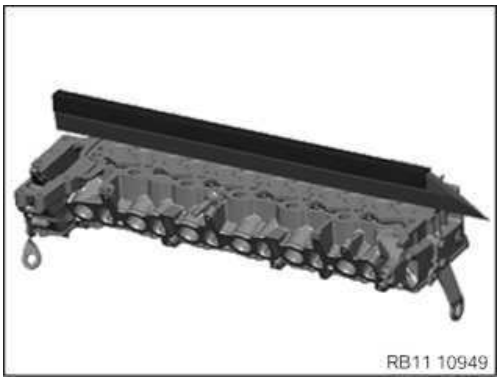
- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 104 (11 4 472)**.



- Remove special tool (B).

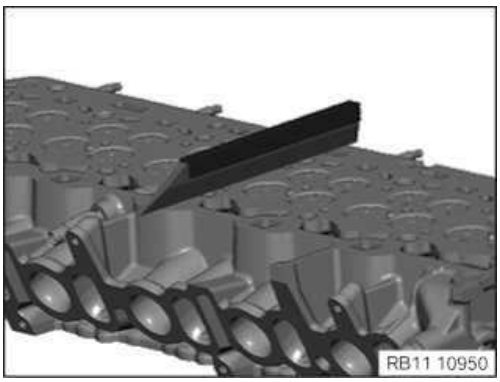
74 – Check the flatness of the cylinder head



- Check the flatness of the cylinder head lengthwise using a straightedge.

Cylinder head flatness

Maximum lengthwise deviation from flatness	0,10 mm
Maximum transverse deviation from flatness	0,05 mm

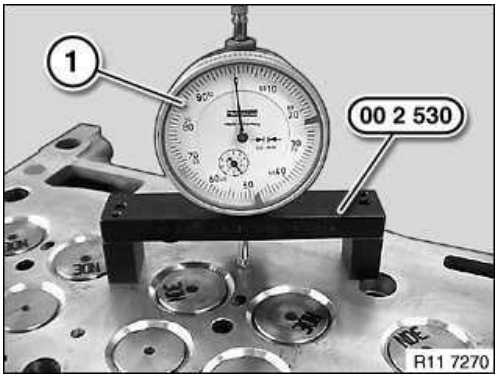


- Check the flatness of the cylinder head crosswise using a straightedge.

Cylinder head flatness

Maximum lengthwise deviation from flatness	0,10 mm
Maximum transverse deviation from flatness	0,05 mm

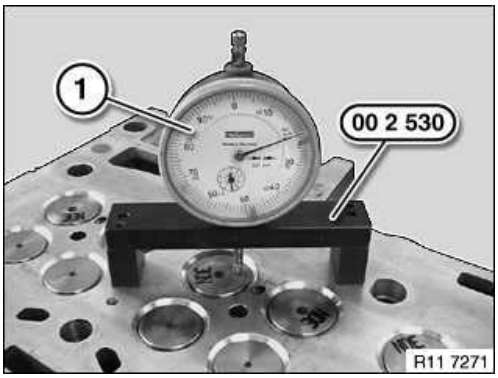
75 – Checking the valve underprotrusion



- Set the dial gauge (1) onto the cleaned cylinder sealing surface with slight preload in special tool **0 490 185 (00 2 530)**.
- Set dial gauge in mildly preloaded state to "zero".

Check

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- Position the dial gauge (1) on the valve with special tool **0 490 185 (00 2 530)**.
- Measure valve underprotrusion and compare with the setpoint value.

Valve underprotrusion

	0,8 (0,7 - 0,9) mm

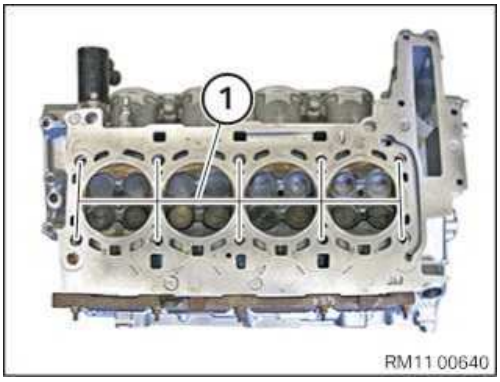
Result

» Valve underprotrusion is outside tolerance.

Measure

- Replace cylinder head.

76 – Renewing the cylinder head gasket



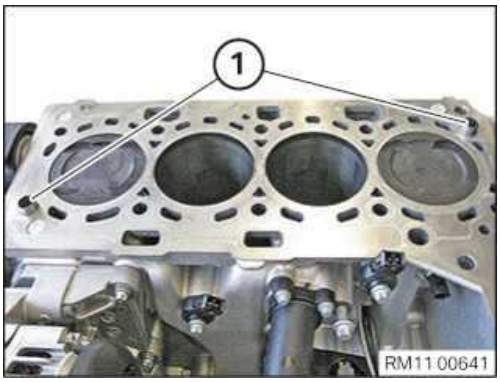
RISK OF DAMAGE

Damage to the surface.

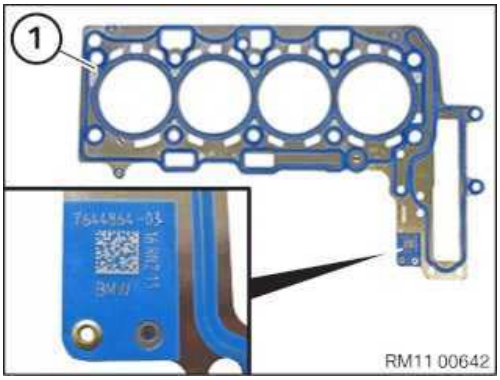
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Remove oil and dirt residue from the blind holes (1).



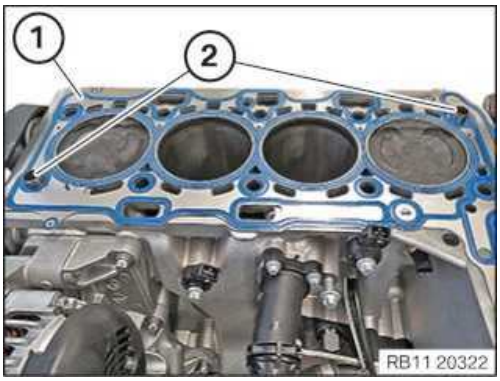
- Check the fitting sleeves (1) for secure fit and damage.



- Identify the cylinder head gasket (1) using the part number.

Note: If the cylinder head is reworked, an additional thicker gasket 0.3 mm is available for service personnel.

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- Guide in the cylinder head gasket (1) and install.
- Ensure that the cylinder head gasket (1) is installed correctly in the fitting sleeves (2).

77 – Installing the cylinder head

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Damage to threads.

Fluid in the threaded hole may damage the thread when screws are tightened in the threads.

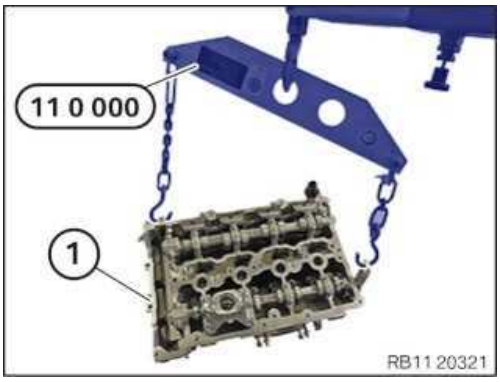
- Dry threaded holes (e.g. using compressed air).

TECHNICAL INFORMATION

Do not remove bolt coating.

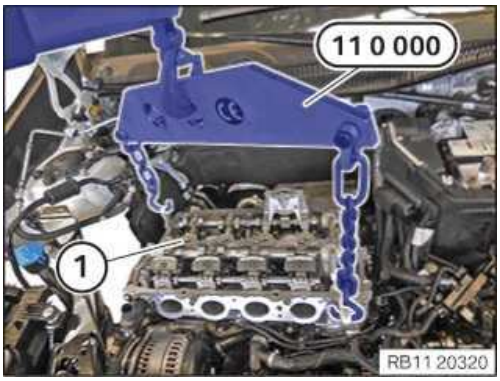
TECHNICAL INFORMATION

When replacing the cylinder head: The complete valve control and the Valvetronic servomotor are already pre-assembled for new cylinder heads.



- Position cylinder head (1) on special tool **0 490 561 (11 0 000)** and engine lifter.

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RISK OF DAMAGE

Damage to the guide rails.

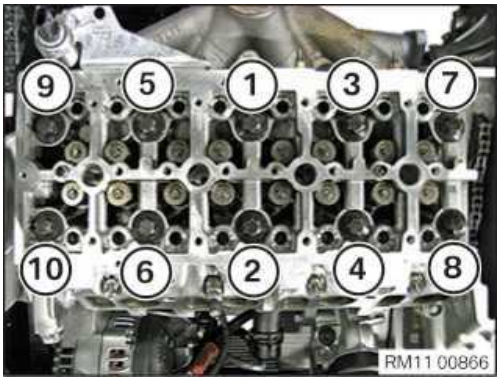
Large amounts of force may damage the guide rails of the timing chain.

- Make sure not to damage the guide rail with the cylinder head when removing and installing the cylinder head.

- Feed in the cylinder head (1) **carefully** with the engine lifter and the special tool **0 490 561 (11 0 000)** and install.



- Unscrew the bolts (1) of the special tool **2 459 012**.
- Guide the special tool **2 459 012** out and remove.



- Renew the cylinder head bolts (1).

  Parts: Cylinder head bolts
- Do **not** wash off coating of cylinder head bolts.
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

  No coolant, water or engine oil must be present in threaded holes of engine block.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

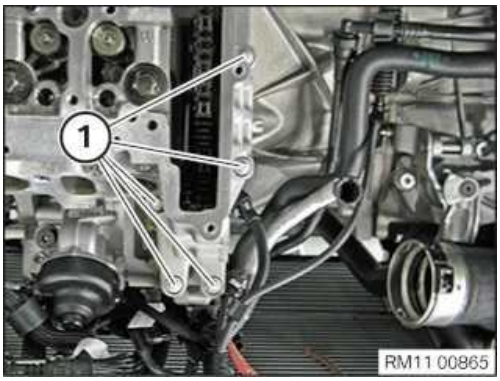
Non-observance of these requirements may result in leaks and damage.

- Feed in cylinder head bolts and install.
- Screw in cylinder head bolts in sequence (1) to (10).
- Tighten cylinder head bolts using special tools **0 490 504 (00 9 120)** and in sequence (1) to (10).

Cylinder head to crankcase

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

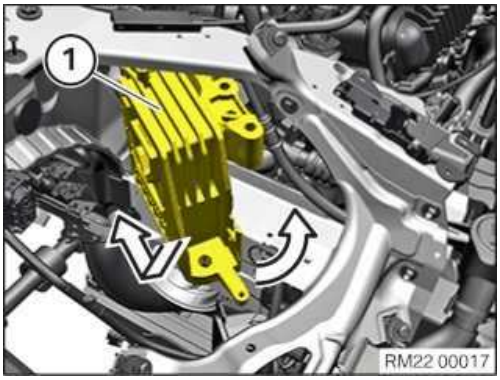
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- Tighten the cylinder head bolts (1).

Cylinder head bolt to timing case cover

M8x40		Tightening torque	19 Nm



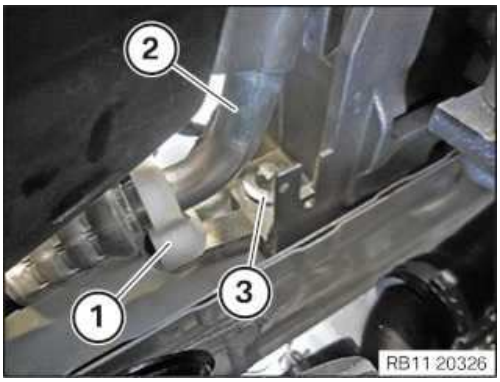
- Thread in engine mount (1) in direction of arrow then install.



- Tighten down screw (1).

Right engine mount to side member

M12		Tightening torque	100 Nm

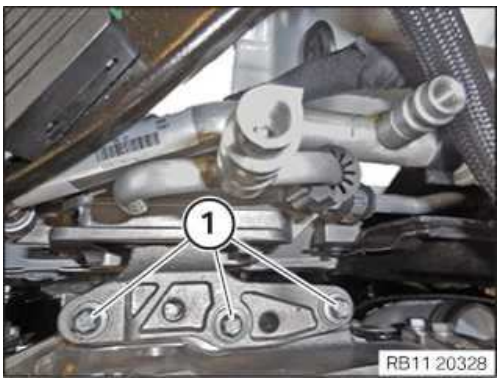


- Tighten down screw (3).

Right engine mount to side member

M12		Tightening torque	100 Nm

- Feed in and install the refrigerant line (2).
- Lock holder (1).
- Make sure the bracket (1) engages audibly.



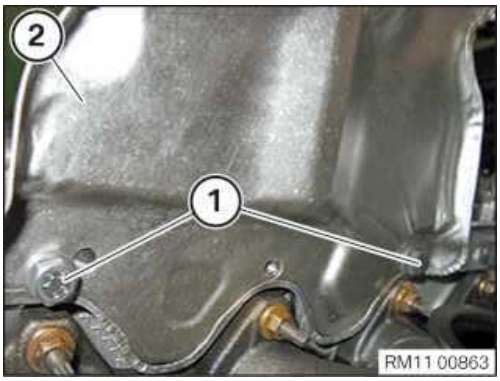
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Right engine mount to cylinder head

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

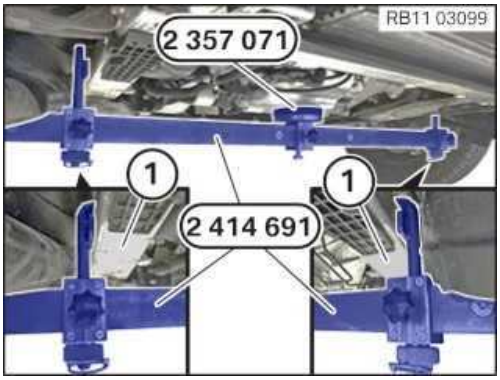
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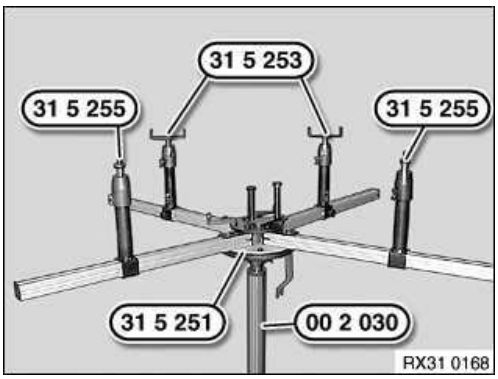
- Feed in and install the heat shield (2).
- Tighten the screws (1).

Heat shield to cylinder head

M8X16		Tightening torque	10 Nm

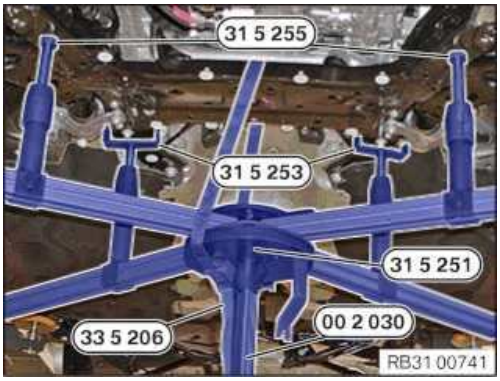


- Disassemble special tool using special tool **2 357 071**.



- Fit the special tool completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools in telescopic supports of a profile rail pair.
- Insert special tools in telescopic supports of other profile rail pair.

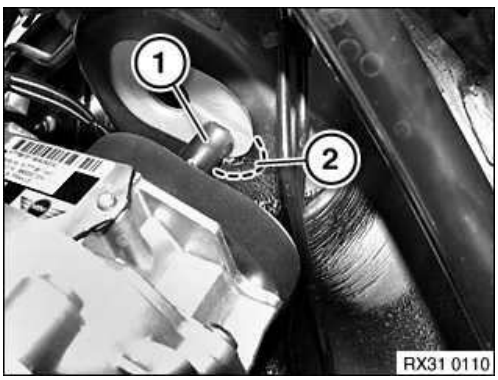
Note: In a profile rail pair, two profile rails are connected to one another by gearing.



- Align special tools and to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool to special tool .



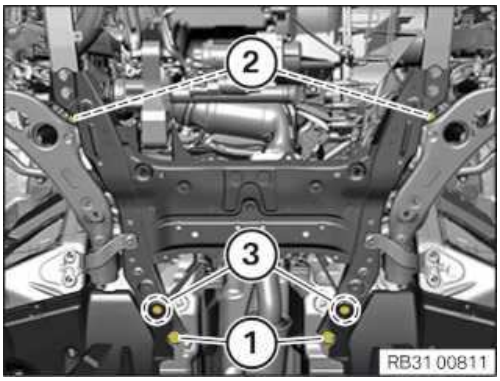
TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!

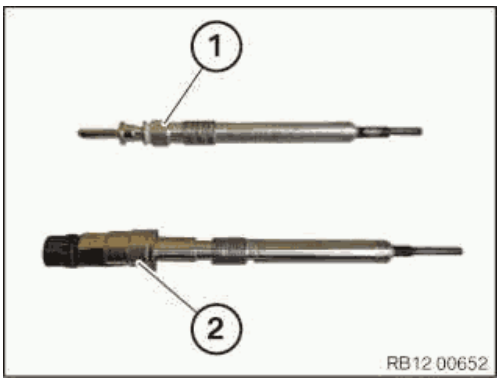
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- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and the front axle remove.

POSTPROCESSES

78 – Install glow elements



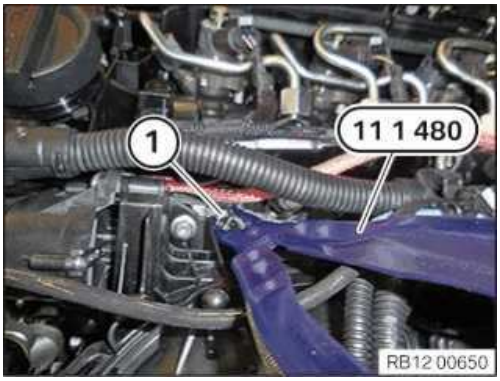
- Install glow elements (1) in cylinders 1, 2, 3 and 4.
- If fitted: Glow element (2) with the **combustion chamber pressure sensor** must be installed in cylinder **2**.



- Tighten the glow element with the special tool or conventional tools.

Glow elements to cylinder head

Glow element		Tightening torque	13 Nm



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

79 – Installing the hydraulic valve clearance compensating element

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Install the hydraulic valve clearance compensating element (1) in the direction of the arrow.
- Repeat the process on all hydraulic valve clearance compensating elements.

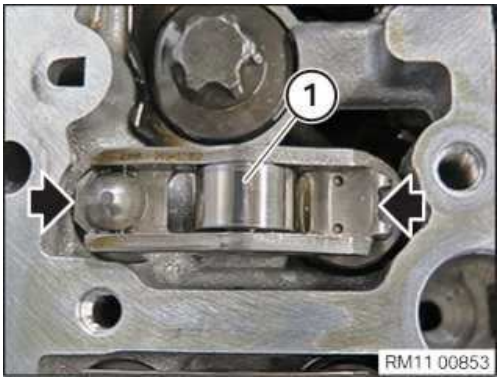
80 – Install the roller cam followers

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



RISK OF DAMAGE

Damage to the engine.

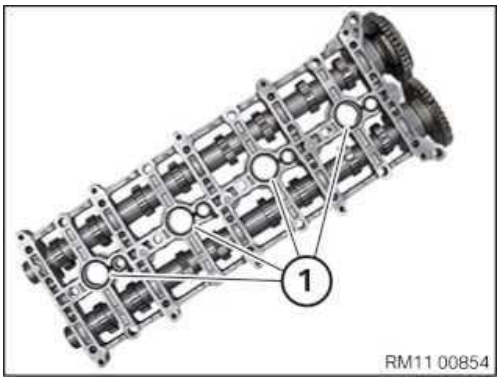
If the classification of the roller cam followers is ignored, this can lead to engine damage.

- Observe the classification of the roller cam followers.
- Always reuse used roller cam followers at the same position.

- Install the roller cam follower (1).
- Repeat the process for all roller cam followers.

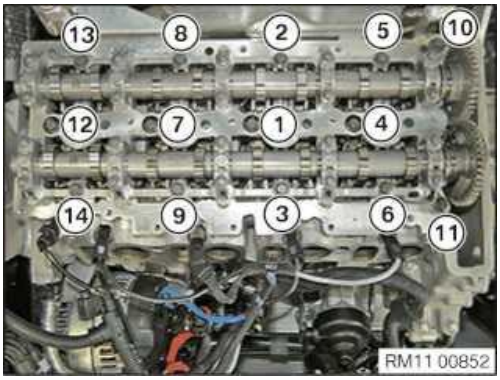
81 – Installing the camshaft support

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- Renew gaskets (1).

  Parts: gaskets

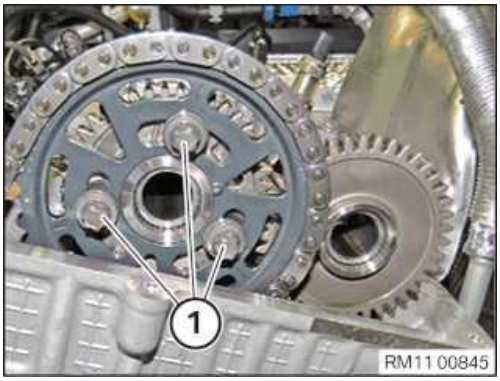


- Position the camshaft support including the camshafts.
- Tighten the screws in a sequence from (1) to (14) in several steps.

Camshaft carrier to cylinder head

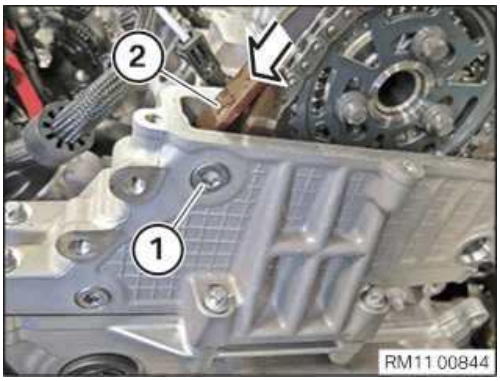
M7x35		Tightening torque	13 Nm

82 – Installing the camshaft sprocket on the intake camshaft



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

83 – Install the timing chain guide rail



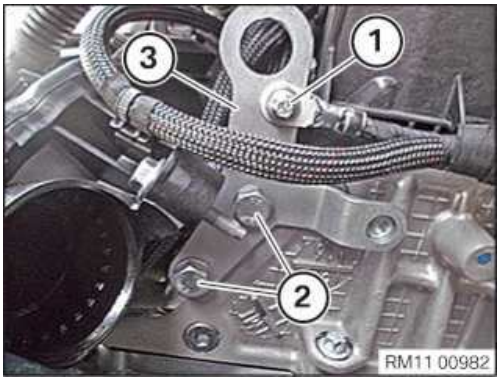
- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm



- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6			8 Nm

84 – Installing the chain tensioner piston

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Renew sealing ring (1).

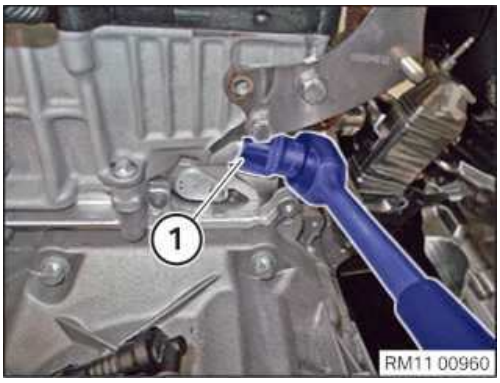
  Parts: Sealing ring



TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.

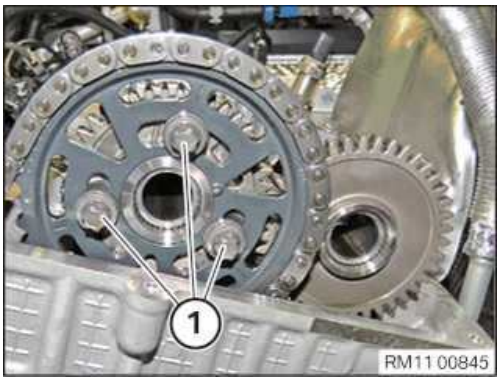


- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

85 – Tightening the camshaft sprocket on the intake camshaft



- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

86 – Checking camshaft timing

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- Remove protective cap (1) from oil sump.

- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

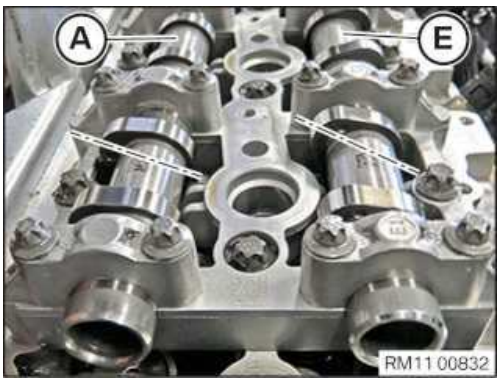
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

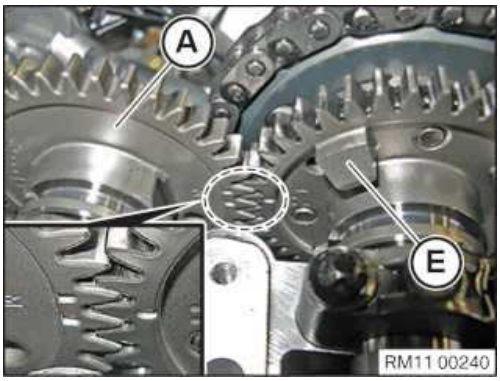


- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.

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- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

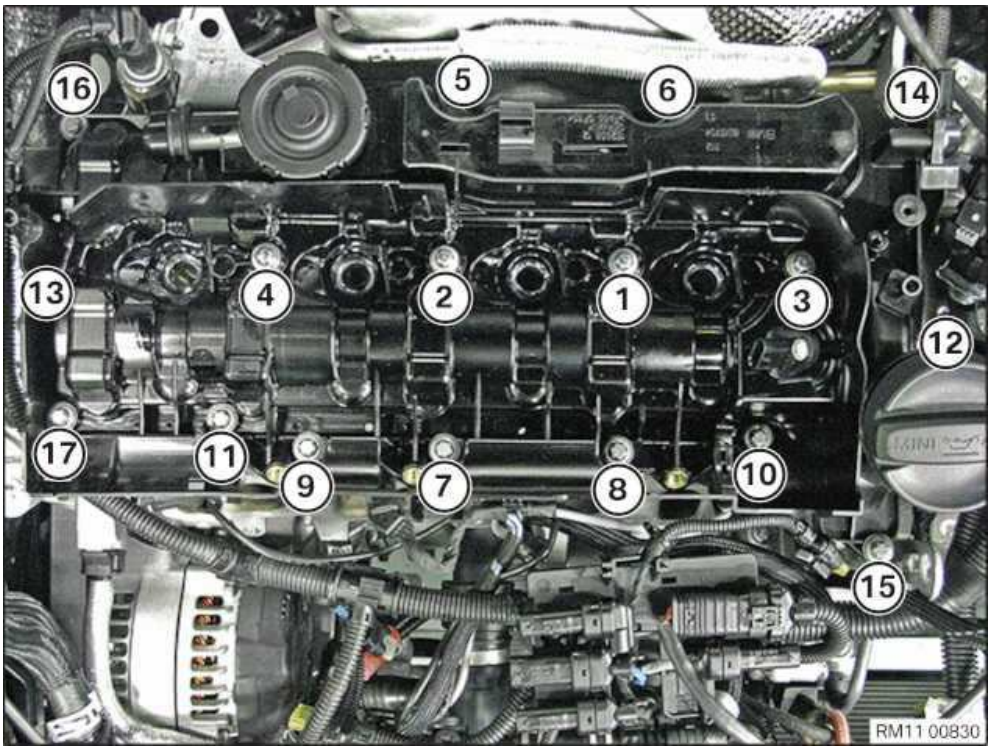
- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.



- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

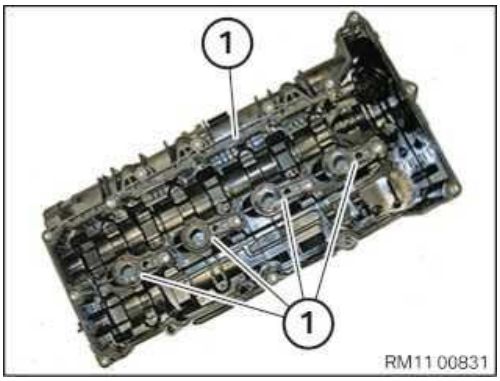
87 – Installing cylinder head cover

Overview: Screw connection of the cylinder head cover



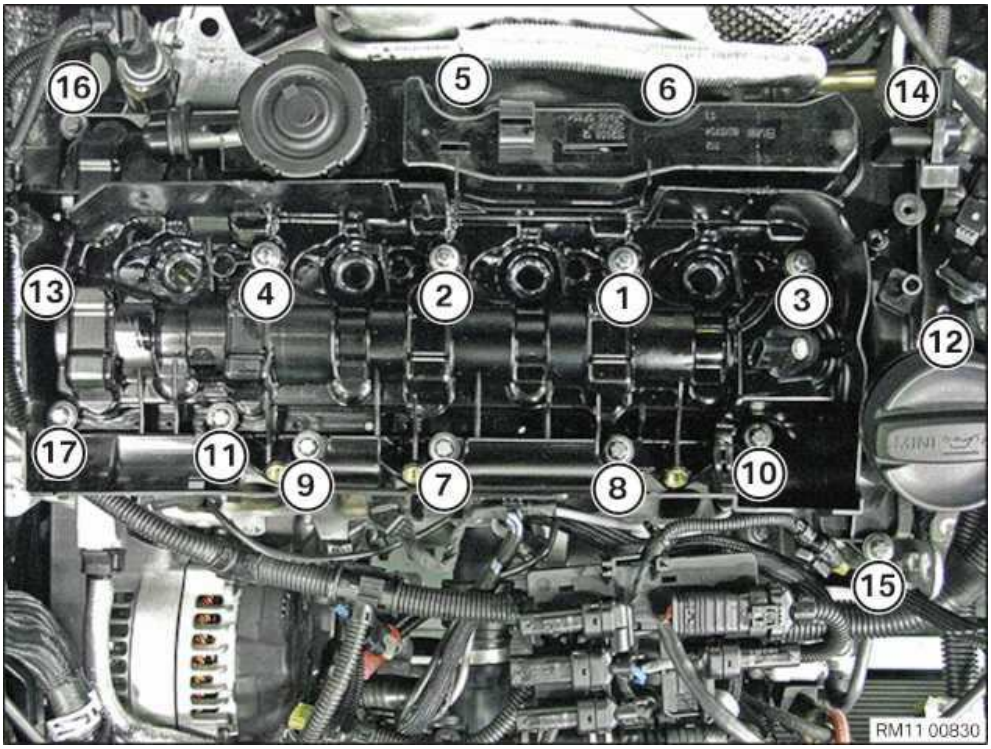
1 to 16 screws of the cylinder head cover.

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- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket

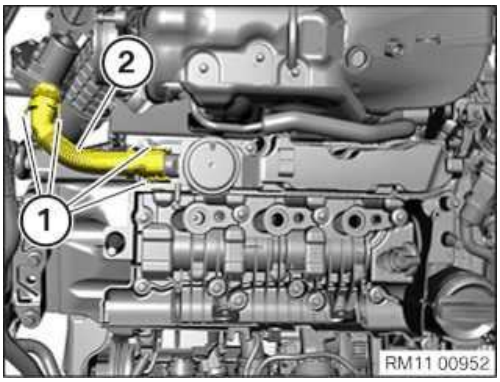


- Install cylinder head cover.
- Tighten screws in the order (1) to (17).

Cylinder head cover to cylinder head

M6		Tightening torque.	8, Nr

-



- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

88 – Installing injectors of injection system

▶ **Cleaning the injector shafts**

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.



- Wear safety goggles.

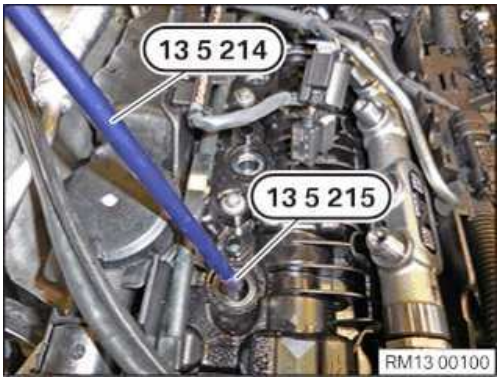
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RISK OF DAMAGE

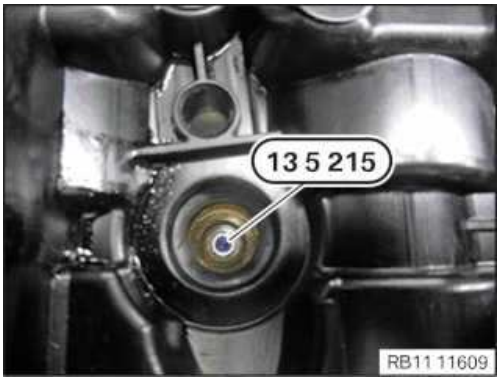
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.



- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.

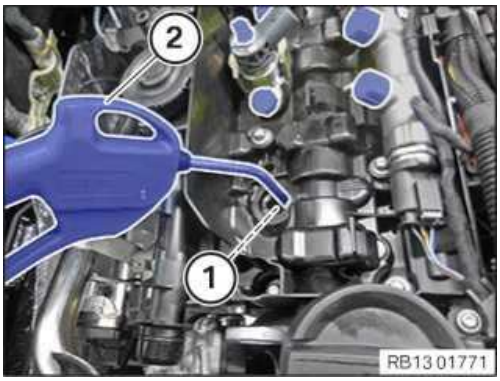


- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.

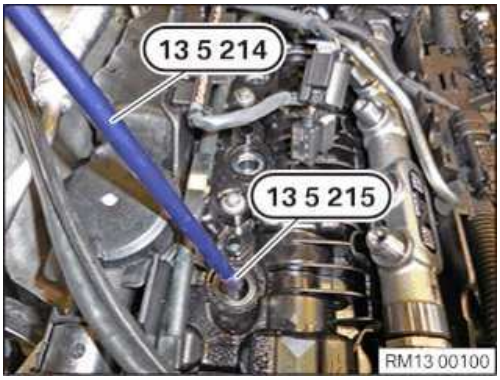


- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.

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- Blow out injector shaft (1) with air gun (2).



- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

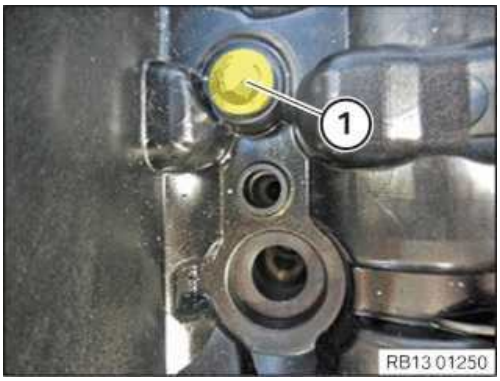
▸ **Check the placement of the clamping claw**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▸ **Prepare the injector for installation**

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



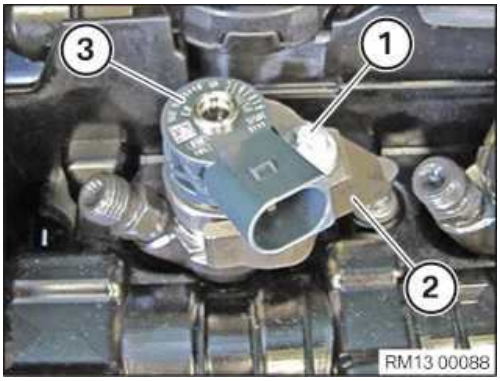
- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring

- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

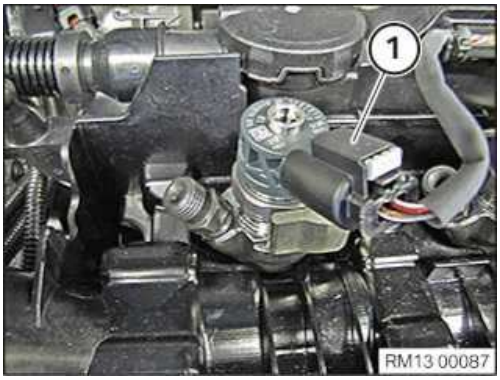
Injector lubricating grease	50 g, Can	83230441070



- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

▸ **Replacement: Perform injection quantity compensation**

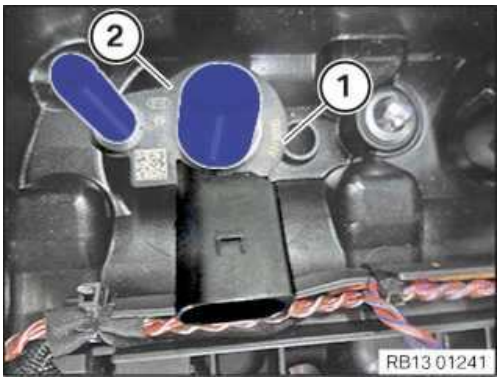
TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

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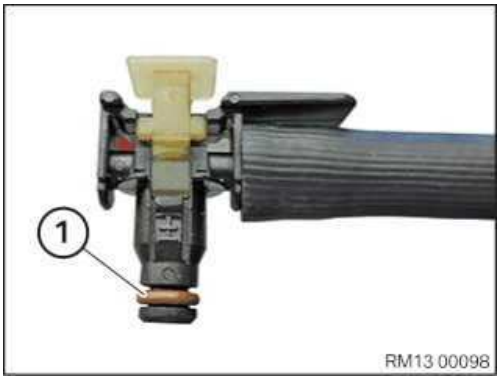


- Read off the adjustment value (1) on the new injector (2).



- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

89 – Connect the leakage oil line on the injector



- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.



- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

90 – Installing high pressure lines between rail and injectors

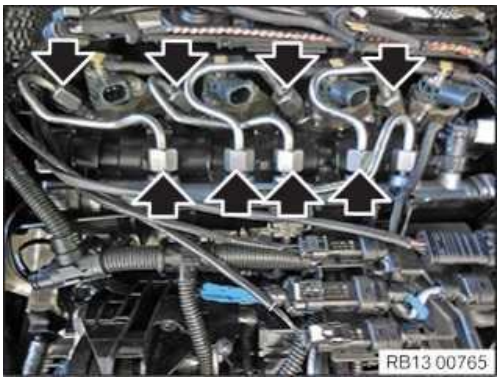
TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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- Remove special tool .
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten the high pressure lines (arrows) with the special tool .

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

91 – Prepare for the installation of the exhaust turbocharger

- Check the oil feed lines and the oil return lines for contamination or obstruction, clean or renew if necessary.
- If the oil feed lines and/or oil return lines are heavily contaminated, we recommend changing the engine oil and the oil filter.
- If installed: Check the coolant feed lines and the coolant return lines for the exhaust turbocharger for contamination or obstruction, clean or renew if necessary.
- Check that the screw connections and the plug connections of all the lines are correct.
- Check air cleaner for contamination and clean or renew as needed.
- Check correct functioning of crankcase ventilation.
- Replace all gaskets.

  Parts: Seals

92 – Installing the high-pressure stage exhaust turbocharger

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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RISK OF DAMAGE

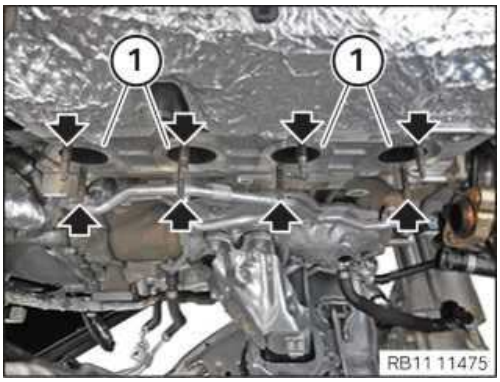
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

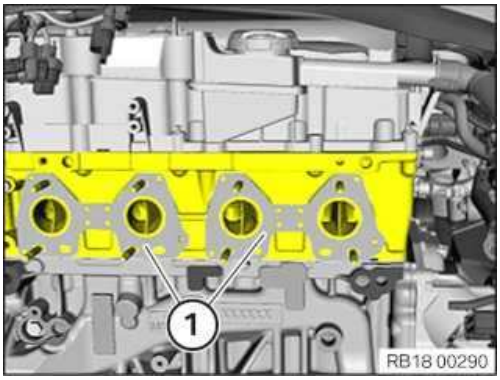
The sealing surfaces must be free from oils, grease and cleaning agents.



- Clean the sealing surfaces (1) on the cylinder head using special tool **0 495 102 (11 4 470)**.
- Check the stud bolts (arrows) on the cylinder head for correct fit.

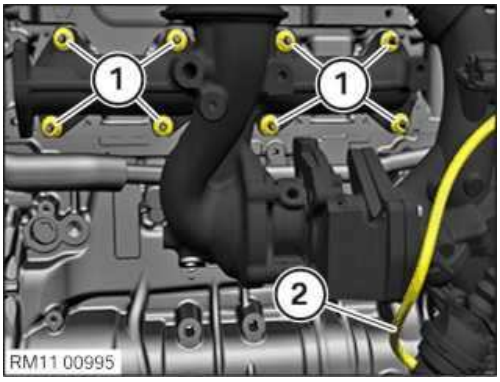


- Clean the sealing surfaces on the exhaust manifold using special tool **0 495 102 (11 4 470)**.



- Renew gasket (1).

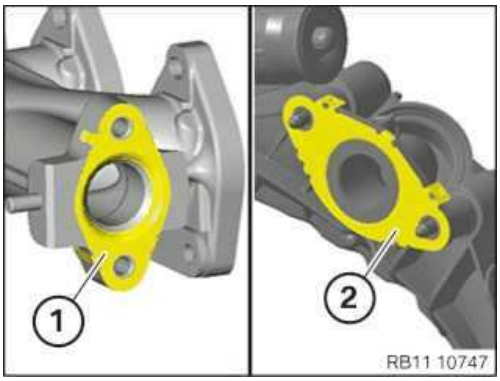
  Parts: Gasket
- Install new gasket (1).



- Feed in and install the exhaust manifold and the high-pressure stage exhaust turbocharger.
- Tighten nuts (1).

  Parts: Nuts
- Connect vacuum hose(2).

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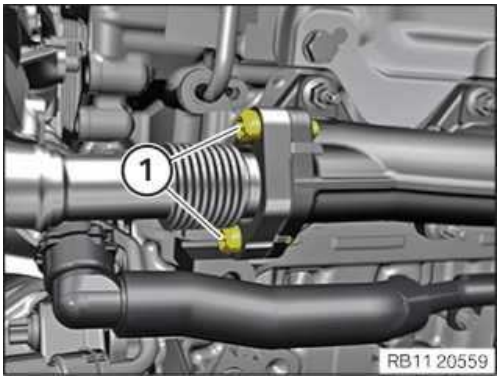


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

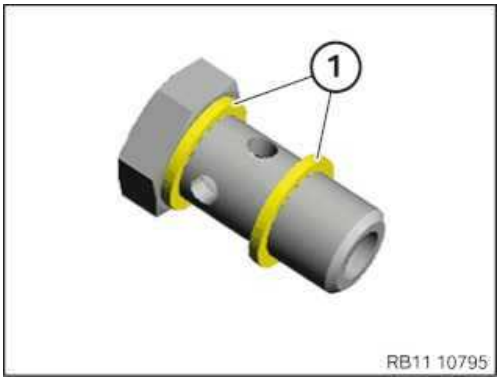
  Parts: Gasket



- Tighten the screws (1).

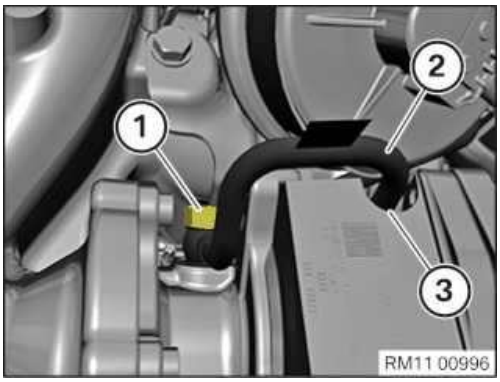
Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm

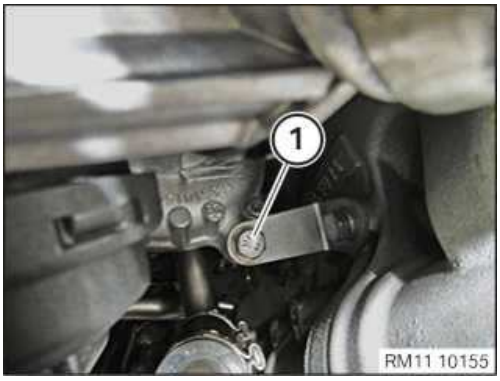


- Renew sealing rings (1) of banjo bolt.

  Parts: Sealing ring

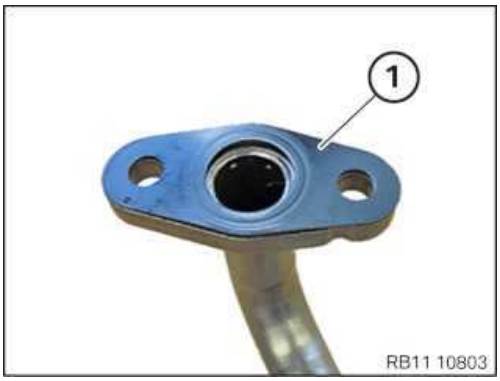


- Guide the oil feed line into the holder (3) and install it.
- Tighten down screw (1).



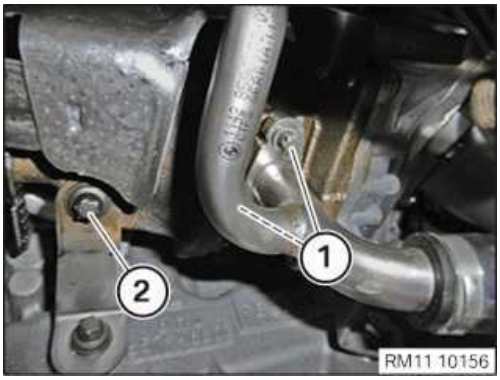
- Tighten bolt (1) from the right wheel arch.

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- Renew seal (1) of oil return line.

  Parts: Gasket



- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

93 – Installing the low-pressure stage turbocharger

RISK OF DAMAGE

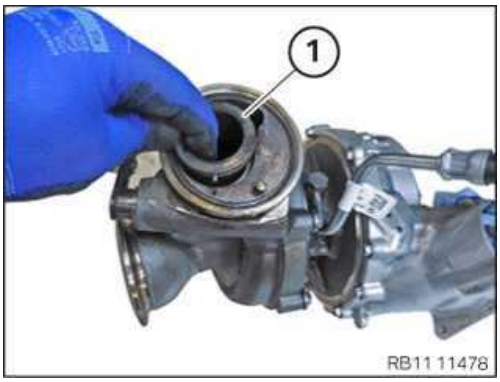
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.



- Check the spacer plug (1) for damage, renew if necessary.

  Parts: Spacer ring
- Insert and install the spacer ring (1).
- Position spacer ring (1) correctly.

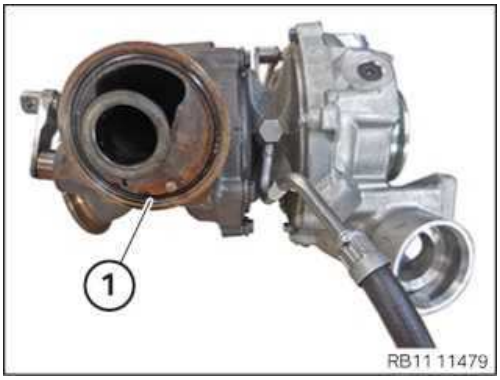
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- Renew gasket (1).

  Parts: Gasket
- Position the seal (1).
- Renew the sleeve(2).

  Parts: Holding sleeve



- Renew sealing ring (1).

  Parts: Sealing ring
- Affix the sealing rings on the exhaust turbocharger.

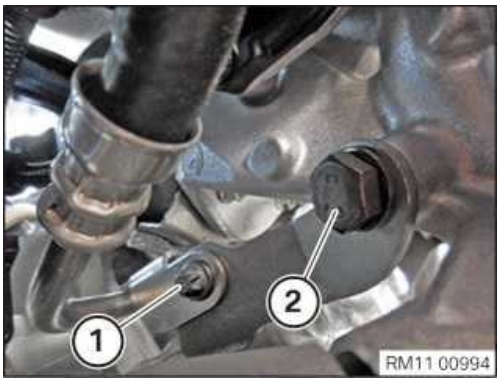


- Insert and install the low-pressure stage exhaust turbocharger on the exhaust manifold .
- Feed in and install V-band clamp .
- Tighten V-band clamp (2).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Screw in nut (1) with 2 **revolutions**.



- Tighten down screw (1).

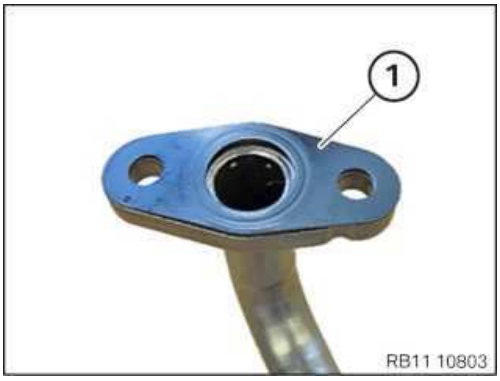
Oil feed line to bracket

Torx screw M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

Holder to exhaust turbocharger and crankcase

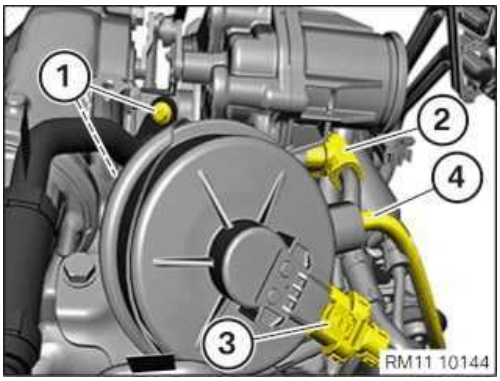
M8x16		Tightening torque	22 Nm



- Renew seal (1) on the oil return line.

  Parts: Gasket

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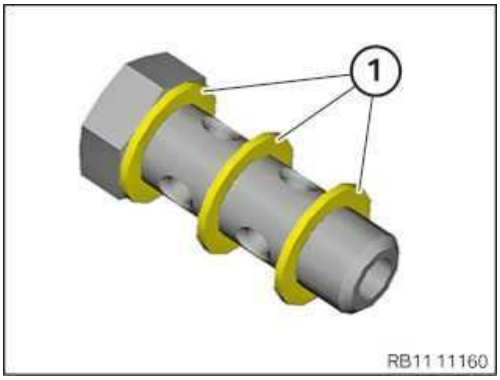
- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

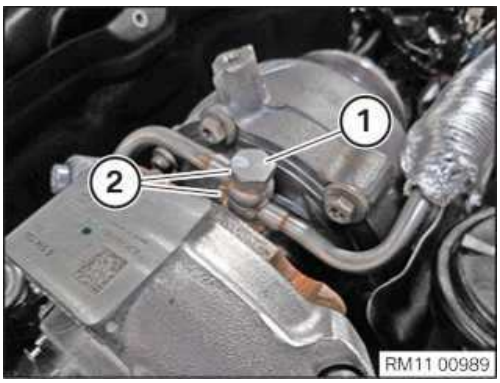
M6x12		Tightening torque	8 Nm

- Connect and lock connectors (2) and (3).

  The locks must engage audibly.
- Connect vacuum hose (4).



- Renew banjo bolt and sealing rings (1).
- **Parts:** Banjo bolt, sealing rings



- Install sealing rings (1).
- Tighten the banjo bolt (1).
- Ensure that the lines do not rest against the adjacent components.

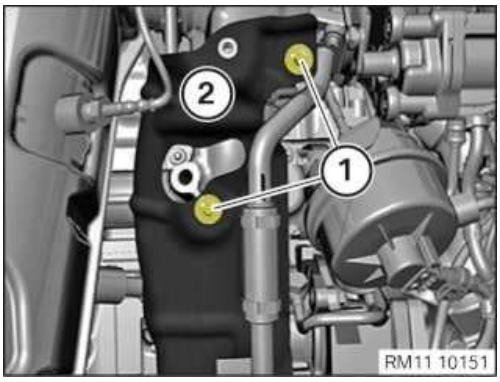
94 – Installing heat shield on exhaust turbocharger at bottom

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

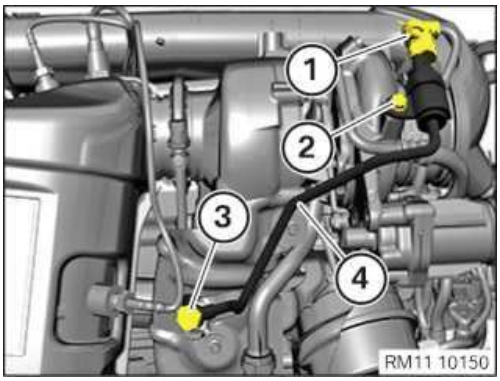


- Feed in and install the heat shield (2).
- Tighten the bolts (1) on the heat shield .

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

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- Position the exhaust gas pressure pipe (4).
- Hand-tighten the bolt (2).
- Renew sealing rings on the banjo bolt (3).

  Parts: Sealing ring
- Tighten the banjo bolt (3).

Banjo bolt for exhaust pressure pipe to exhaust manifold

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

- Tighten down screw (2).

Standard screw connection M6

M6		8 Nm

- Connect connectors (1) and lock.

  Lock must audibly engage.

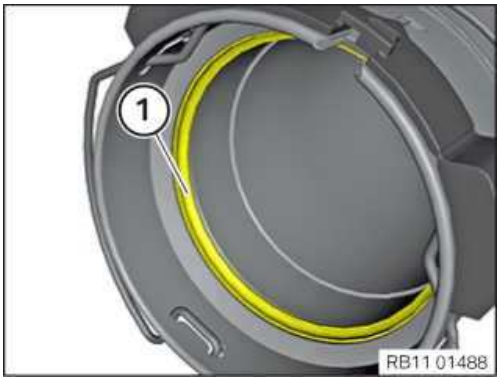
95 – Installing the right charge air duct between the exhaust turbocharger and the charge air cooler

RISK OF DAMAGE

Damage to the exhaust turbocharger.

A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.



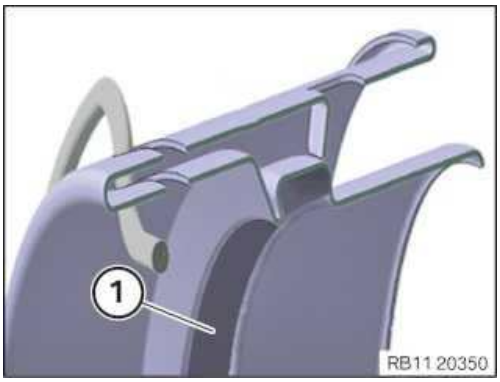
- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Gasket

▶ **Replace damaged gasket**

TECHNICAL INFORMATION

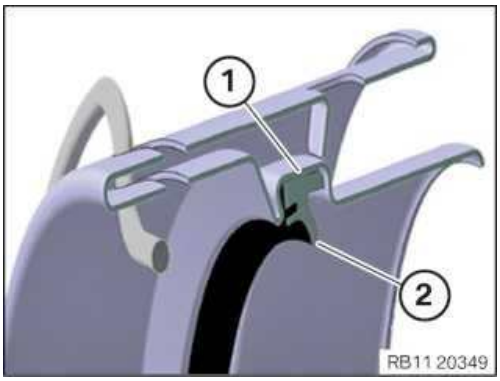
Do not use pointed or sharp-edged tools for the installation and/or removal.



- Remove damaged seal.
- Clean gasket groove (1) with a dry towel.

  The gasket groove (1) must be clean.

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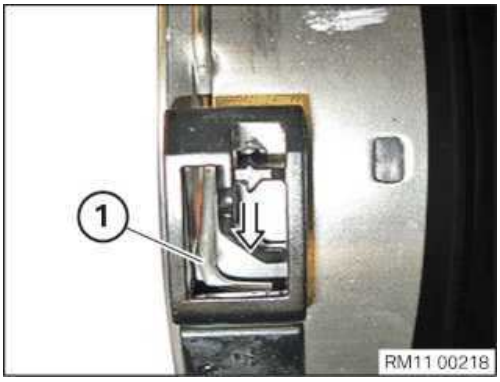
- Renew gasket.

  Parts: Gasket
- Install seal dry without lubricant or mounting agent.

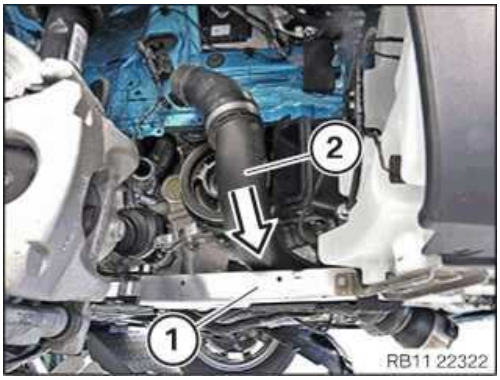
TECHNICAL INFORMATION

Incorrect assembly is possible. Ensure correct installation position.

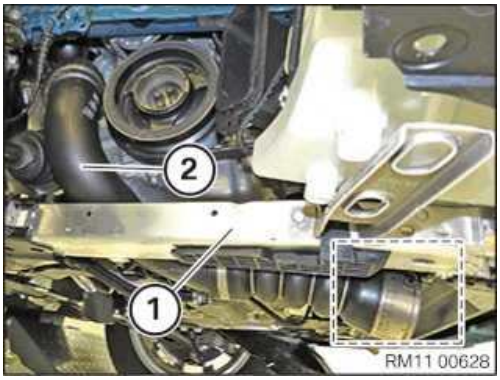
- Feed in and install the seal.
- Make sure the seal is correctly installed in the gasket groove (1).
- Make sure that the sealing lip (2) is pointing downwards (see figure).



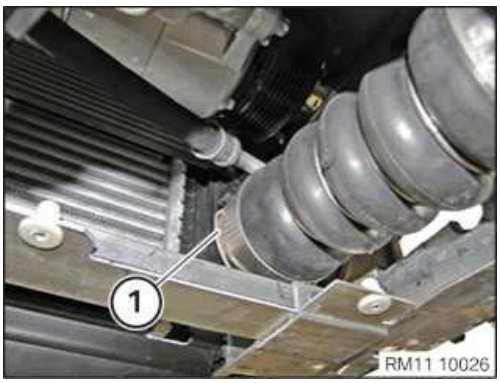
- Detach the locks (1) in the direction of the arrow from the brackets.
- Ensure that the locks (1) engage audibly.



- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed in the charge air duct (1) in the **direction** of arrow between the side member and the deformation element and position.

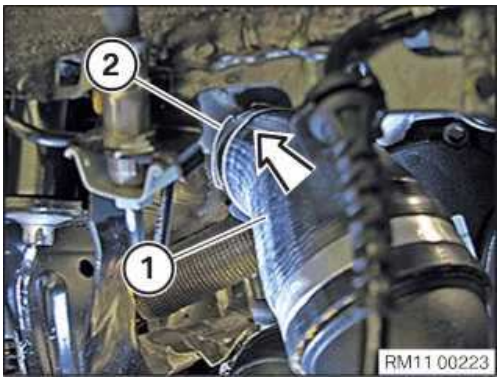


- Pull the adapter of the front axle support (1) downwards to the front right.
- Position the charge air duct (2) in **marked** area on the charge air cooler.



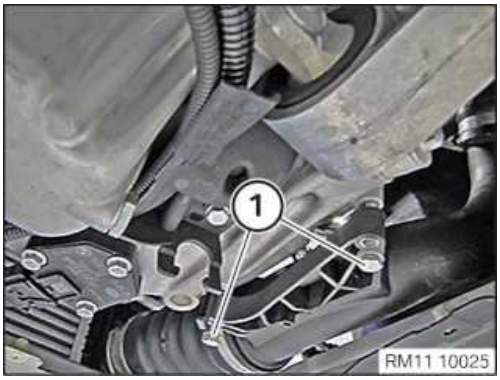
- Feed in and install the charge air duct (1) on the charge air cooler .
- Make sure the charge air duct (1) engages audibly on the charge air cooler.

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- Feed in and install charge air duct (1) in the **direction** of the arrow on exhaust turbocharger.

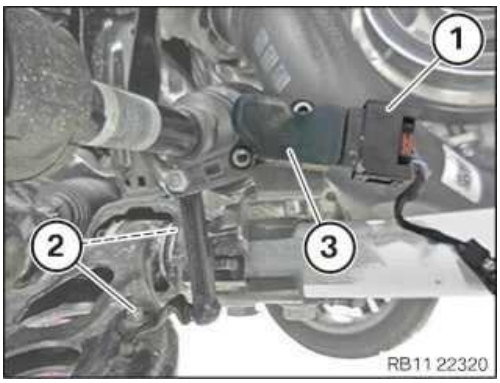
  The locks (2) must engage audibly.



- Tighten the screws (1).

Charge air duct to oil sump

M6		Tightening torque	8 Nm



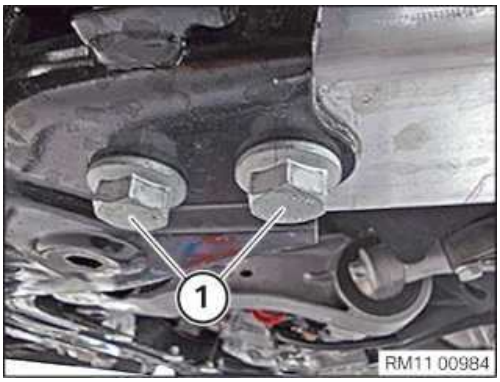
- **If installed:**
- Feed in and install the ride height sensor (3).
- Tighten the screws (2).

Ride height sensor holder to front axle support

M6		Tightening torque	8 Nm

- Connect and lock the connector (1).

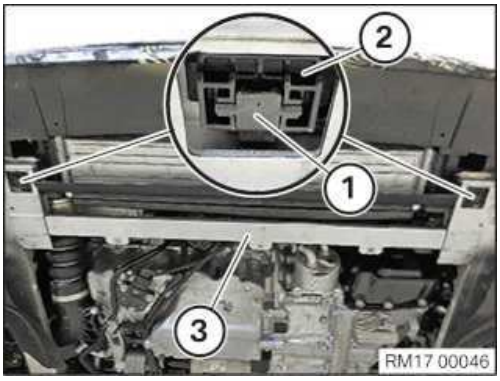
  The connector (1) must engage audibly.



- Tighten the screws (1) on the adapter of the front axle support.

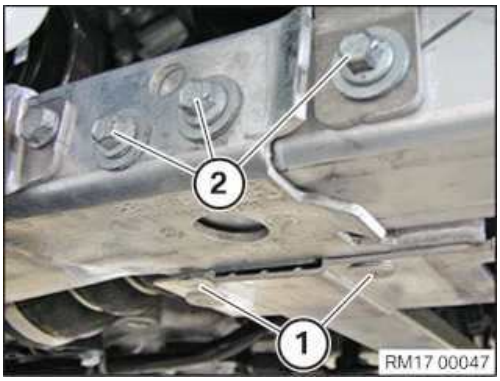
Adapter, front axle support to front axle support

		Tightening torque	100 Nm



- Guide in cross connection (3) and install.
- Guide in locks (2) and install.
- Lock the locking pins (1).
- Ensure that the locking pins (1) audibly engage.

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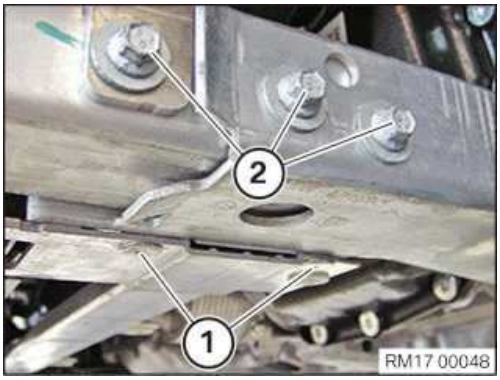
- Tighten the bolts (2) at the front left.

Cross connection to front axle support

M6		Tightening torque	12 Nm

- Renew the blind rivet (1).

  Parts: Blind rivet
- Mount the blind rivets (1) at the front left.



- Tighten the bolts (2) at the front right.

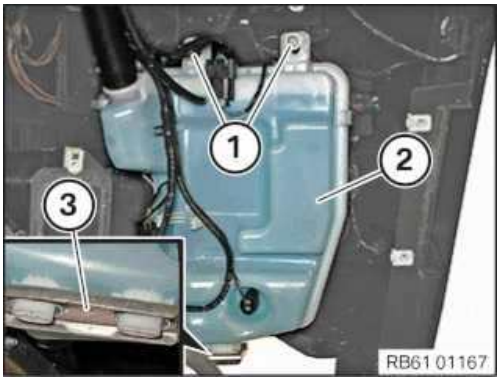
Cross connection to front axle support

M6		Tightening torque	12 Nm

- Renew the blind rivet (1).

  Parts: Blind rivet
- Mount the blind rivets (1) at the front right.

96 – Install the washer fluid reservoir in the fixture

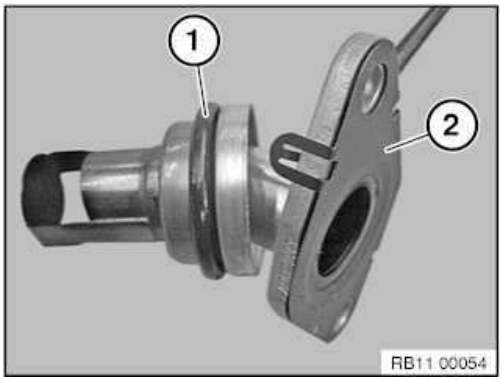


- Feed washer fluid reservoir (2) into the mounting (3) and install.
- Tighten the screws (1).

Washer fluid reservoir to body

M6x20		Tightening torque	8 Nm

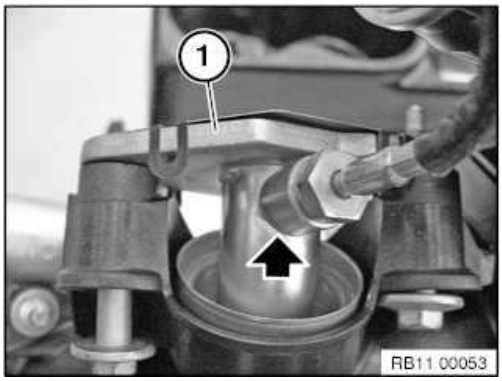
97 – Installing the intake plenum



- Renew O-ring (1).

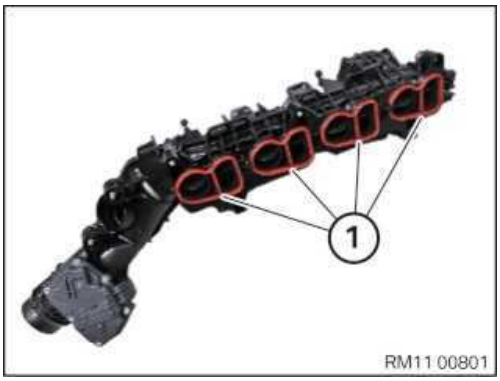
  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position the seal (2) and clip it in.



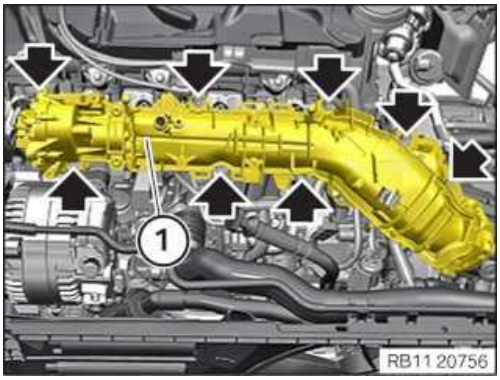
- Install the exhaust-gas recirculation pipe (1) in the intake plenum.

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- Renew gaskets (1).

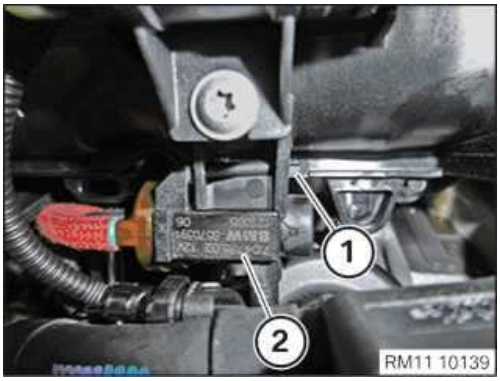
  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.



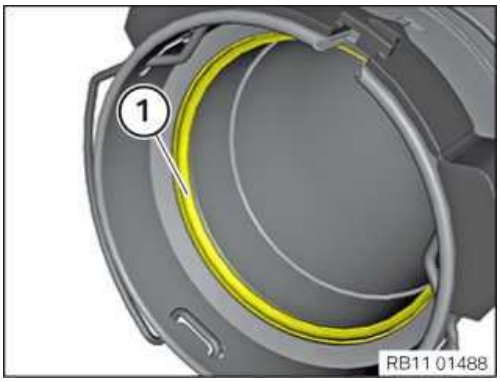
- Guide in and install intake (1) plenum.
- Tighten screws (arrows).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm

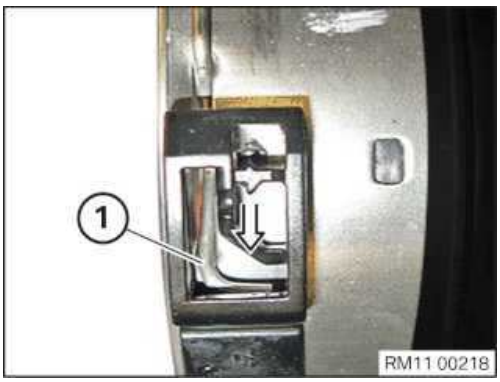


- Install the electric changeover valve (2) in the holder on the plenum from left to right.
- Lock (1) must engage audibly.



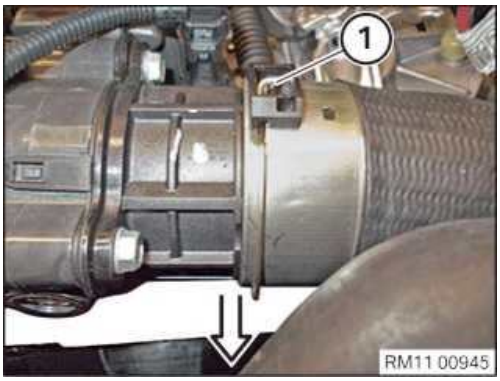
- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring



- Engage the lock (1) on the bracket (arrow).

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- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

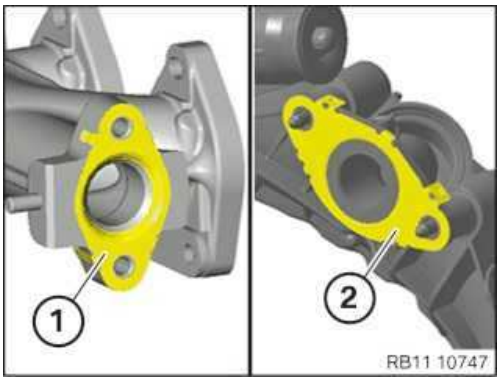
98 – Installing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

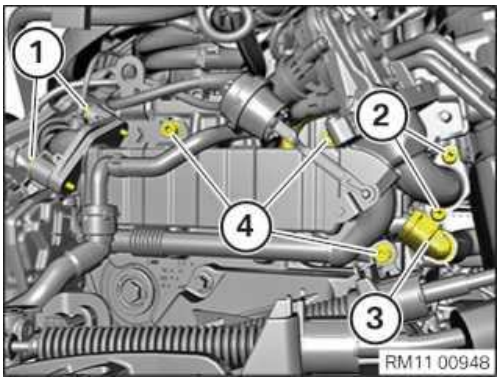


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket
- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket

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- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts
- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

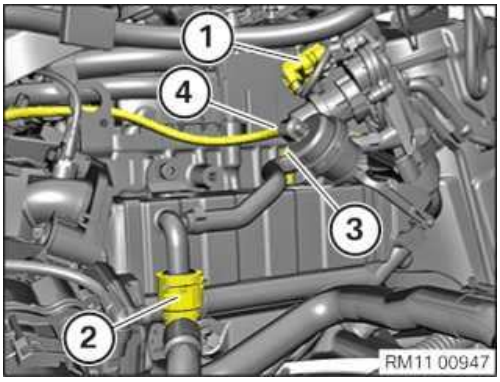
M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.
- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm



TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

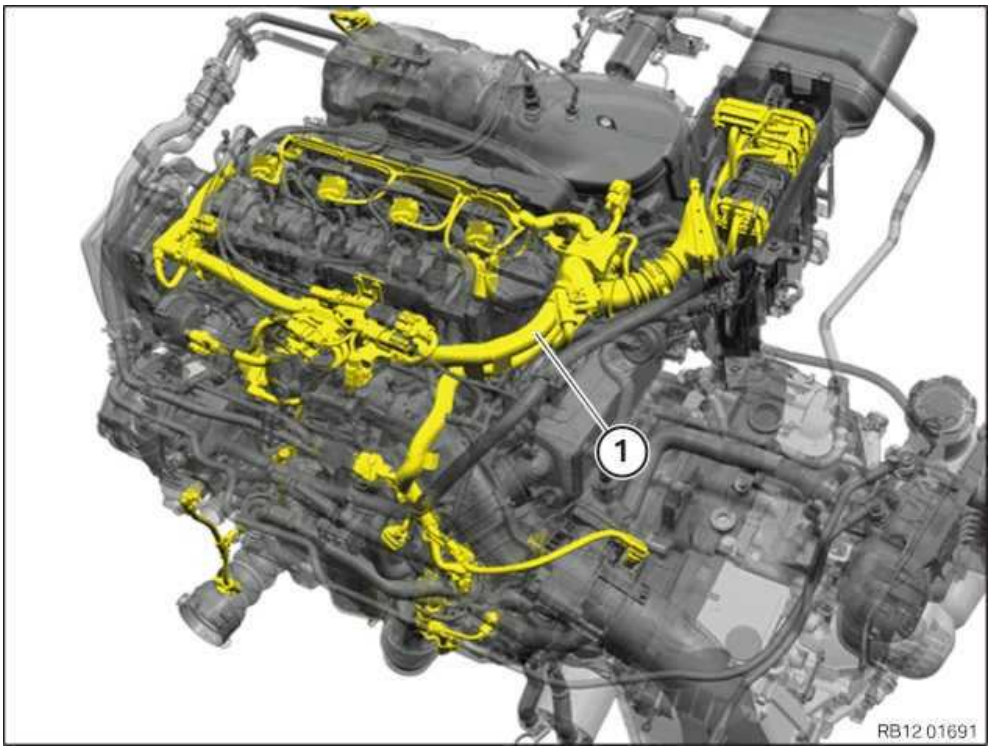
- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

99 – Fastening the wiring harness section for the intake plenum

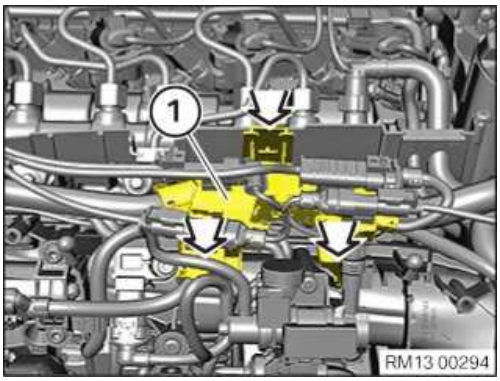
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Overview: Wiring harness section for the engine

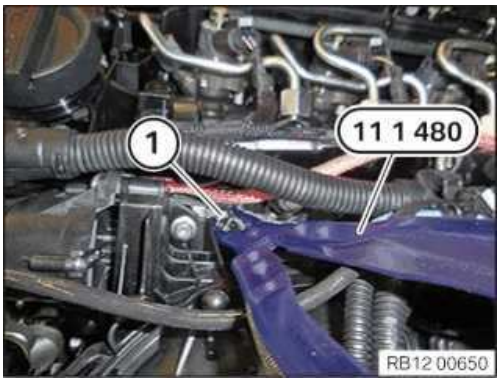


1 Wiring harness section for the engine

▶ **Installing the cable clip for the intake plenum**

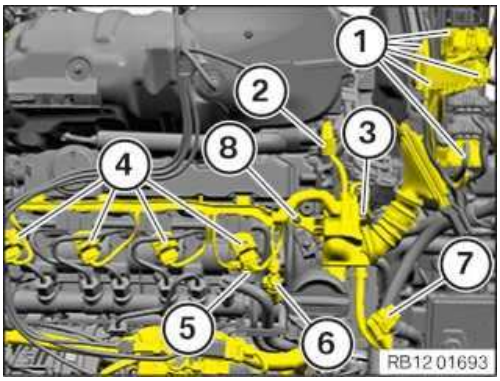


- Insert and install the cable clip (1) in the direction of the arrow.
- Make sure the cable clip (1) is fitted correctly.



- Connect and lock the connector (1) on the glow elements.
  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.

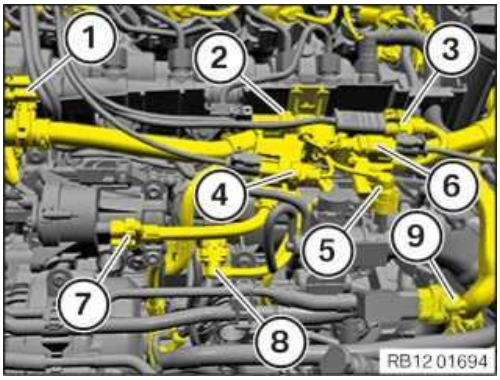
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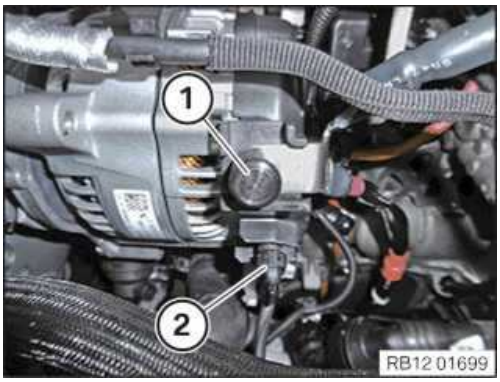
- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the DME control unit and remove the integrated supply module (PDM).
- Attach connector (2) to the differential pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust-gas recirculation valve and lock audibly.
- Attach connector (4) to the injectors and lock it audibly.
- Attach connector (5) to the camshaft sensor and lock it audibly.
- Attach connector (6) to the fuel pressure regulator and lock it audibly.
- Connect and audibly lock the connector (7) to the hot film air mass meter.
- Tighten down screw (8).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm



- Connect the connector (1) to the rail pressure sensor and lock it audibly.
- Attach connector (2) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (3) to the front oxygen sensor and lock audibly.
- Attach connector (4) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Connect the connector (5) to the electric changeover valve and lock audibly.
- Attach connector (6) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (7) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (8) to the charging pressure sensor and lock it audibly.
- Attach connector (9) to the fuel pressure and temperature sensor and lock it audibly.

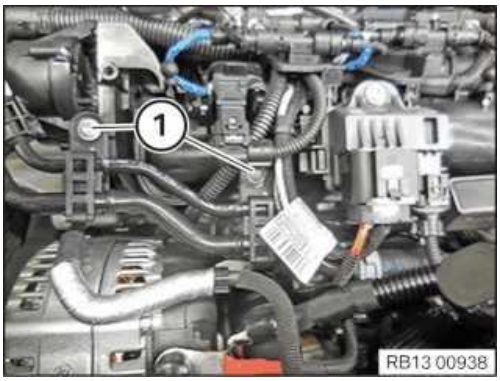


- Connect and lock the connector (2).

  Lock must snap audibly into place.
- Connect the positive battery cable (1) and tighten.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

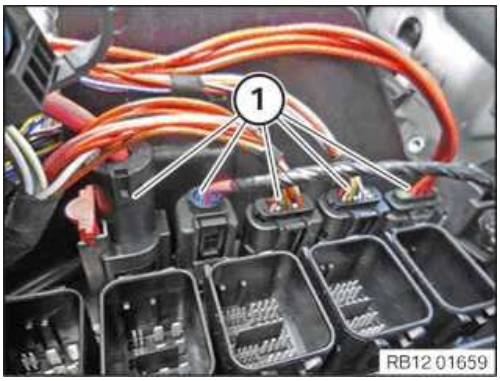


- Position the fuel line.
- Tighten the screws (1).

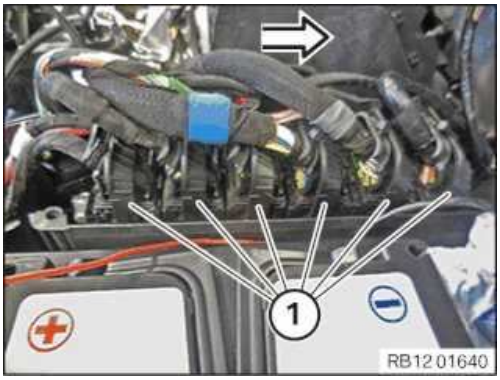
Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

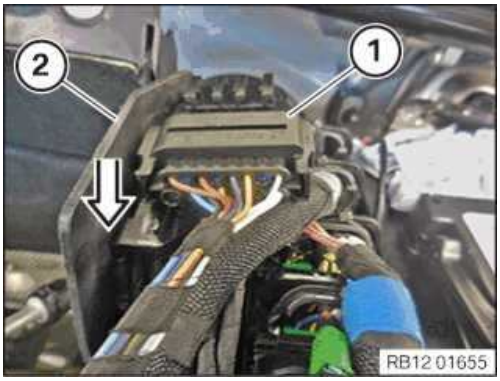
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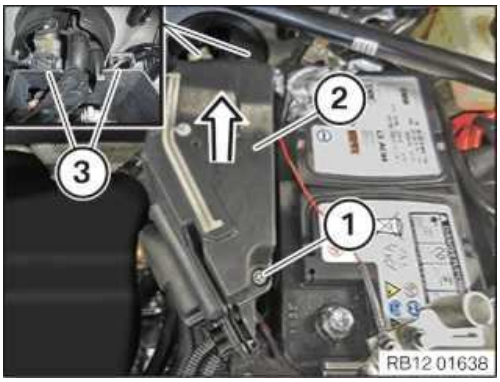
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



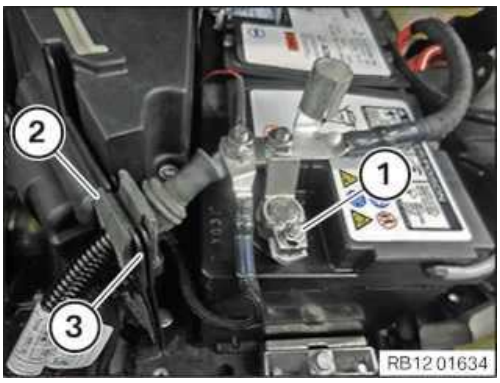
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert and install the cover (2) into the guides (3) in the direction of the arrow.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

RF5x26.5		Tightening torque	2,5 Nm

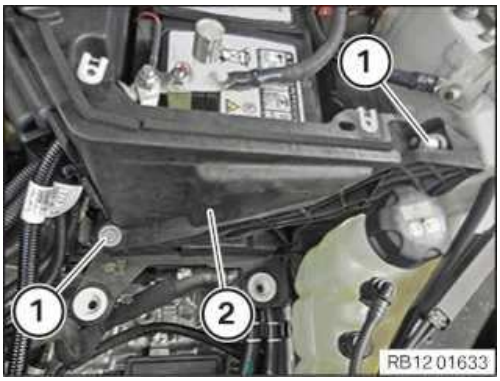


- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

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- Feed in and install tension strut (2).
- Tighten the screws (1).

Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

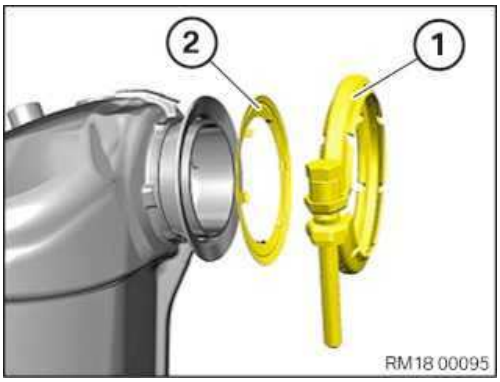
100 – Installing the diesel particulate filter

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



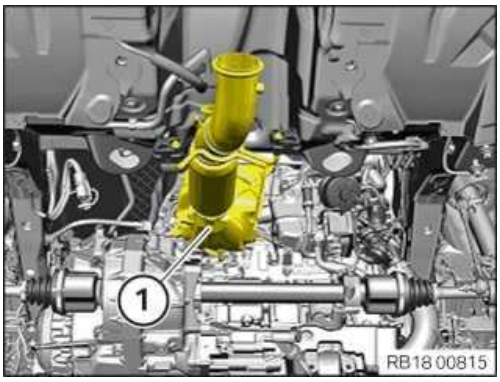
- Renew the V-clip (1).

  Parts: V-band clamp
- Renew the gasket (2).

  Parts: Gasket

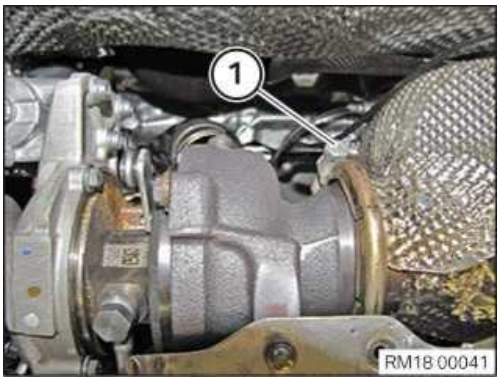


- Before installing the diesel particulate filter: Mount fitting aid (1) for the flexible tube.



- Carefully insert and install the diesel particulate filter (1).

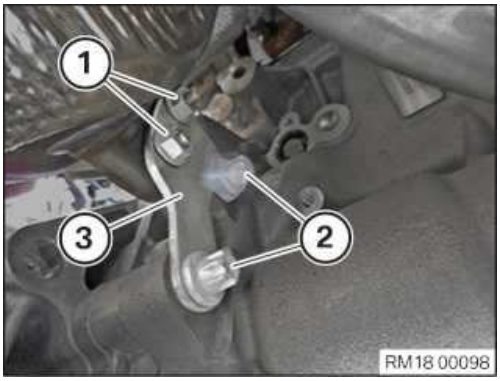
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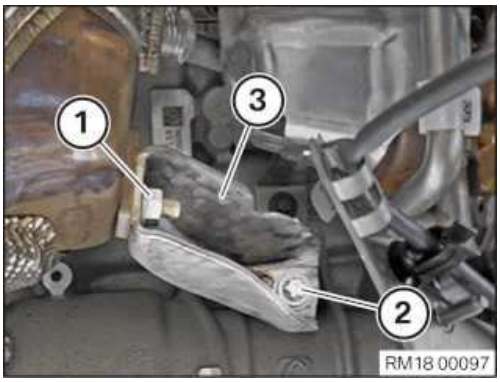
- Feed in and install V-band clamp (1).
- Make sure that the seal between the diesel particulate filter and the exhaust turbocharger is installed correctly.
- Align the diesel particulate filter on the exhaust turbocharger.
- Position V-clip (1).
- Hand-tighten the V-clip (1).



- Tighten nuts (1) by hand.



- Install holder (3).
- Hand-tighten the bolts (2).
- Tighten nuts (1) by hand.

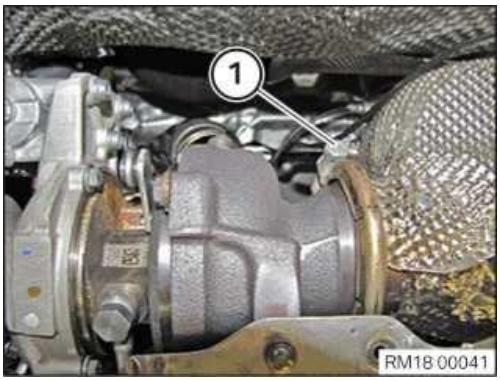


- Install holder (3).
- Tighten the nut (1) hand-tight.
- Hand-tighten the bolt (2).



- Remove fitting aid (1) for the flexible tube.

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- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

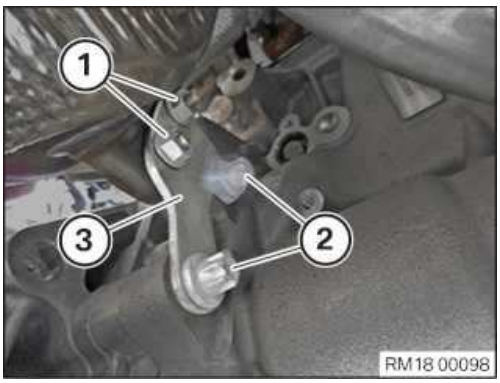
V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm



- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screws (2).

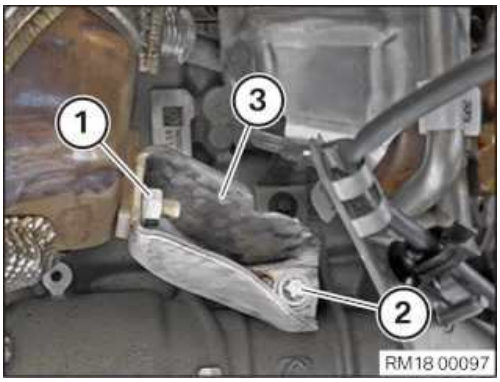
Diesel particulate filter holder to gearbox

M12x75		Tightening torque	66 Nm

- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screw (2).

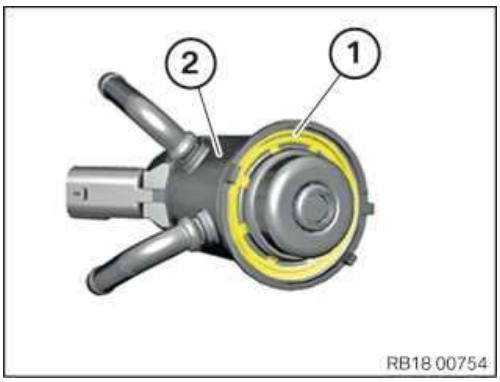
Diesel particulate filter bracket to crankcase

M10x35		Tightening torque	38 Nm

- Tighten nut (1).

Diesel particle filter to holder

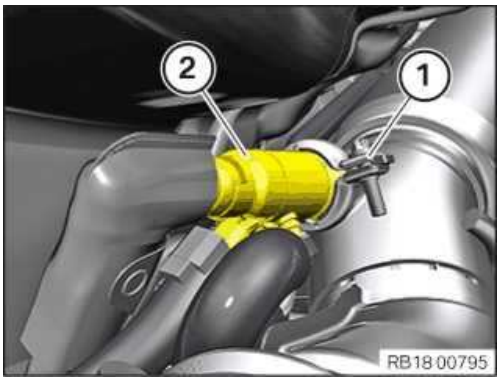
M8 hexagon nut		Tightening torque	19 Nm



- Renew sealing ring (1) of the SCR metering module (2).

  Parts: Sealing ring

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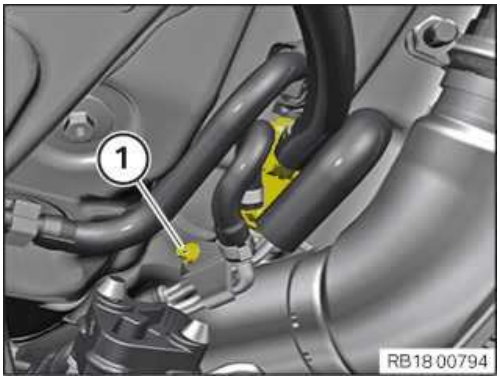


- Insert and install the SCR metering module (2).
- Renew the V-clip (1).

  Parts: V-band clamp
- Tighten V-band clamp (1).

SCR metering module V-clip to exhaust system

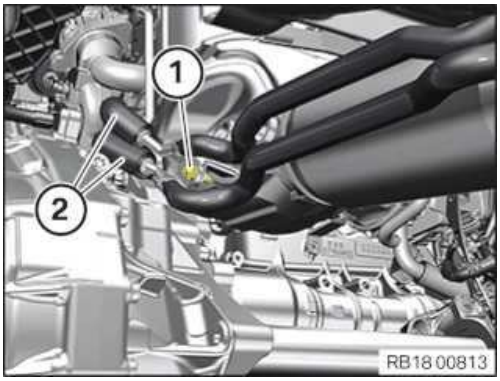
V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm



- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm

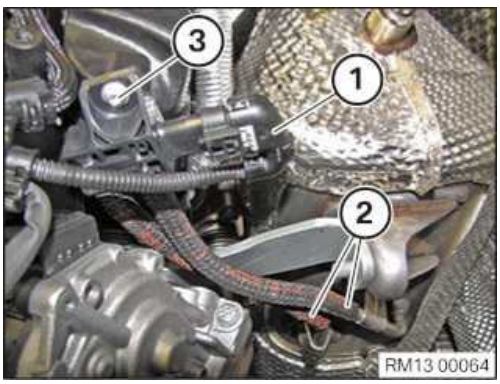


- Thread in and install coolant line (2) of the SCR metering module.
- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm

▶ **Installing differential pressure sensor**



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

101 – Install the control sensor

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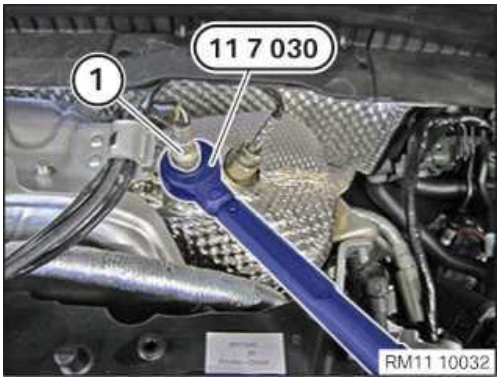
TECHNICAL INFORMATION

New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue



- Feed in front oxygen sensor (1) and install.
- Tighten front oxygen sensor (1) using special tool .

Control sensor

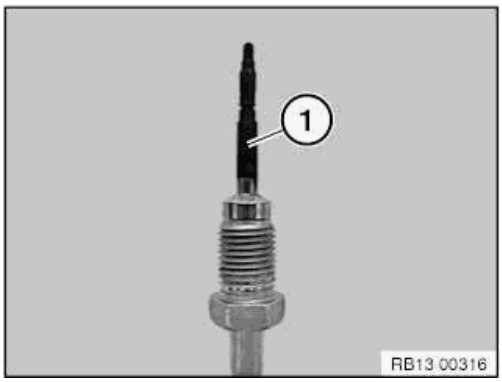
Control sensor		Tightening torque	50 Nm



- Lay and secure cable of oxygen control sensor.
- Secure the connector (2) to the holder.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

102 – Install the exhaust-gas temperature sensor on the diesel particulate filter



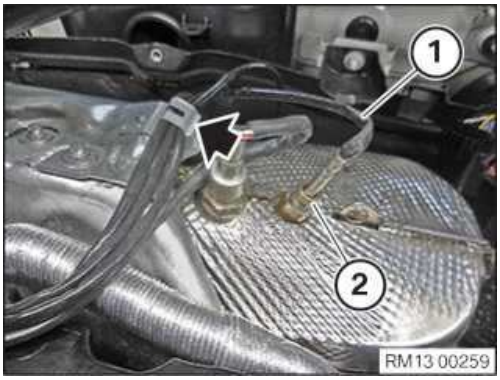
RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

- Check the gauge tip (1) for damage and renew the exhaust temperature sensor as needed.



- Feed in and install the exhaust temperature sensor (2).
- Tighten the exhaust temperature sensor (2).

Exhaust temperature sensor to diesel particulate filter

Exhaust-gas temperature sensor		Tightening torque	28 Nm

- Insert and install cable (1) of the exhaust temperature sensor in the clamp (arrow).

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- Lay and fasten the cable of the exhaust gas temperature sensor.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

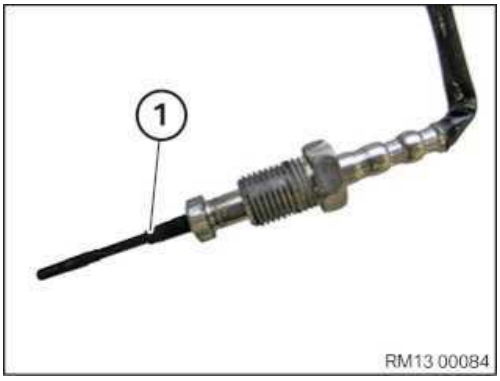
103 – Installing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

RISK OF DAMAGE

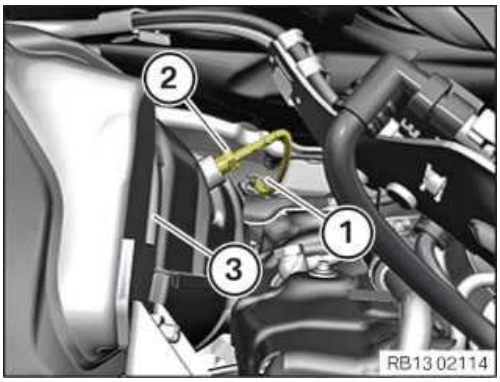
Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.



- Make sure the gauge tip (1) is not damaged during installation.

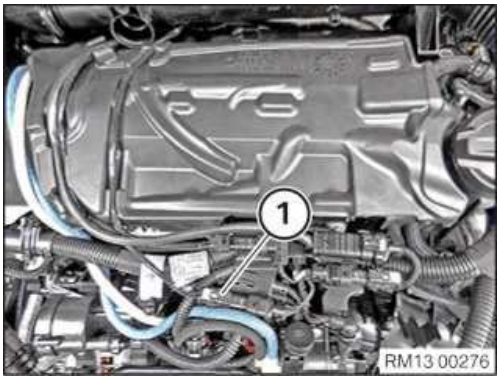


- Guide the exhaust temperature sensor (2) into diesel particulate filter (3) and install.
- Tighten the exhaust temperature sensor (2) with conventional tools .

Exhaust temperature sensor to diesel particulate filter

Exhaust-gas temperature sensor		Tightening torque	28 Nm

- Insert and install the cable of the exhaust temperature sensor (2) in the clamps (1).

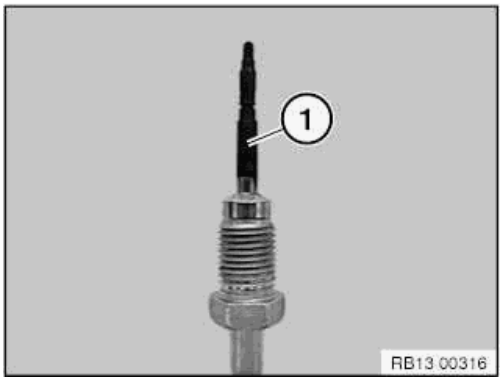


- Lay and fasten the cable of the exhaust gas temperature sensor.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

104 – Installing exhaust temperature sensor on catalytic converter

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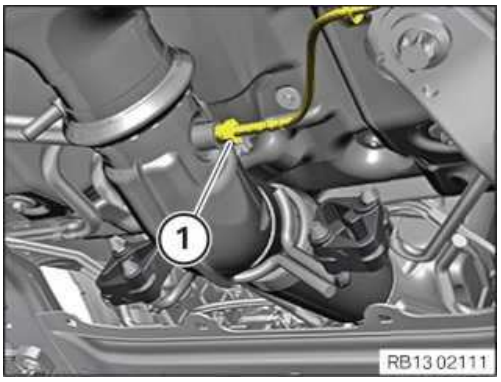
RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

- Check the gauge tip (1) for damage and replace the exhaust temperature sensor as needed.



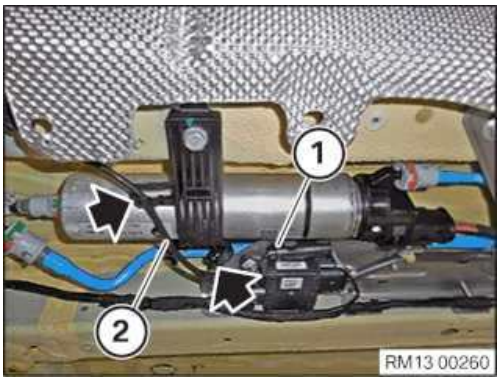
- Feed in and install the exhaust temperature sensor (1).
- Tighten the exhaust temperature sensor (1).

Exhaust-gas temperature sensor to exhaust system

Exhaust-gas temperature sensor		Tightening torque	28 Nm



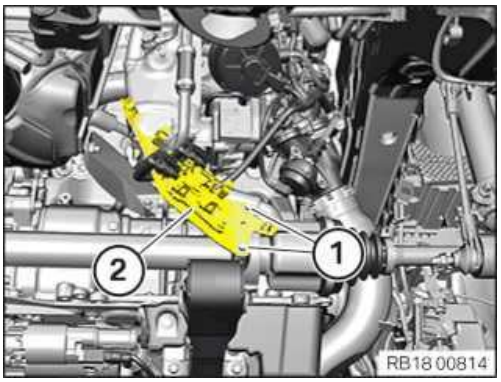
- Secure the cable clips (1).



- Feed cable (2) from exhaust temperature sensor into the clamps (arrows) and install.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

105 – Install holder for oxygen sensor



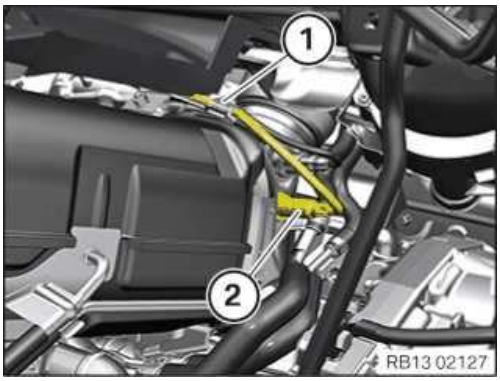
- Insert and install the holder (2).
- Tighten the screws (1).

Oxygen sensor holder to intermediate shaft

Hexagon screw M6x16		Tightening torque	8 Nm

106 – Installing the nitrogen oxide sensor before SCR catalytic converter

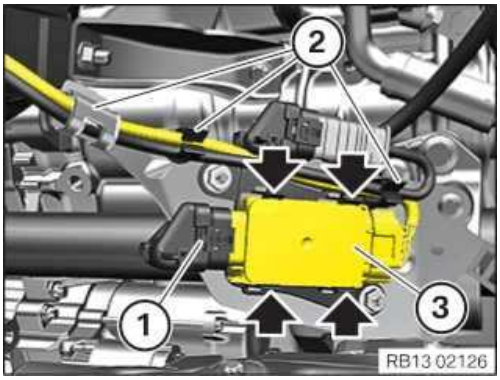
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- Insert nitrogen oxide sensor before the SCR catalytic converter (2) and install.
- Tighten the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

Nitrogen oxide sensor before SCR catalytic converter

Sensor		Tightening torque	50 Nm



- Install and lock the evaluation electronics for the nitrogen oxide sensor (3) (arrows).
- Insert the evaluation electronics cable for the nitrogen oxide sensor (3) into the clamps (2) and install.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

107 – Install the monitoring sensor

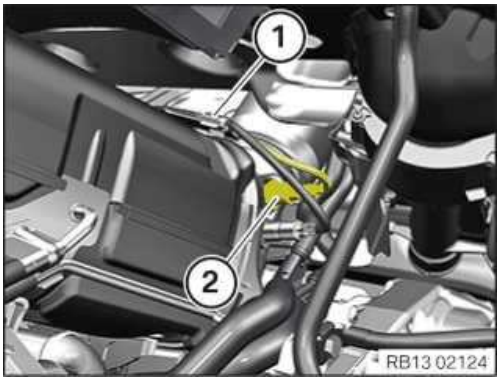
TECHNICAL INFORMATION

New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

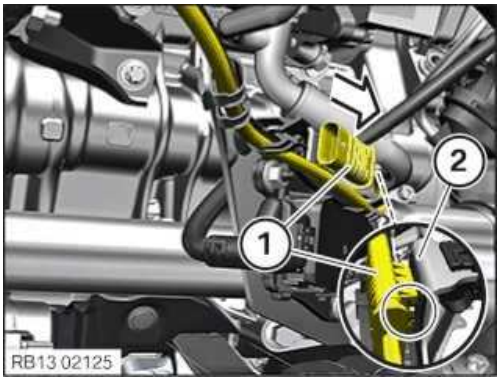


- Feed in the monitoring oxygen sensor (2) and install.
- Tighten the monitoring oxygen sensor (2) with special tool **0 491 074 (11 7 020)** .

Monitoring sensor

Sensor		Tightening torque	50 Nm

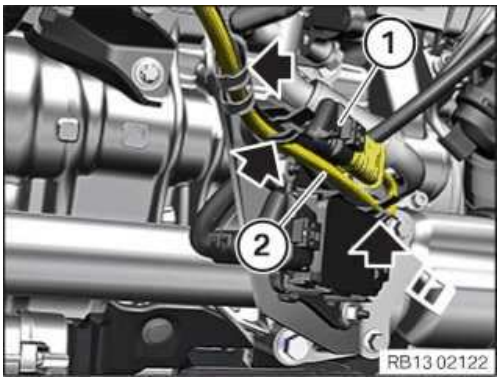
- Insert the cable of the monitoring oxygen sensor (2) into the clamp (1) and secure it.



- Connect the connector (1) with the bracket (2) in the direction of arrow.
- Make sure that the connector (1) is locked correctly in the marked area.

  The connector (1) must engage audibly.

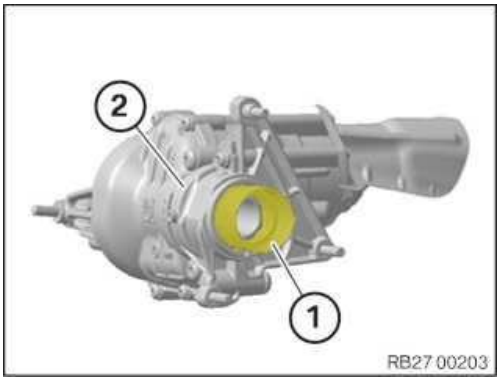
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- Insert and attach the cable of the monitoring oxygen sensor (2) to the clamps (arrows).
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

108 – Install the transfer box (VTG)



- If intermediate shaft (1) gets caught on transfer box (VTG) (2), renew intermediate shaft (1) and the radial shaft seals in the automatic or manual transmission.



- Screw special tool **2 409 025** into the outer radial shaft seal.
- Turn the screw on the special tool **2 409 025** until the outer radial shaft seal has been pulled out.

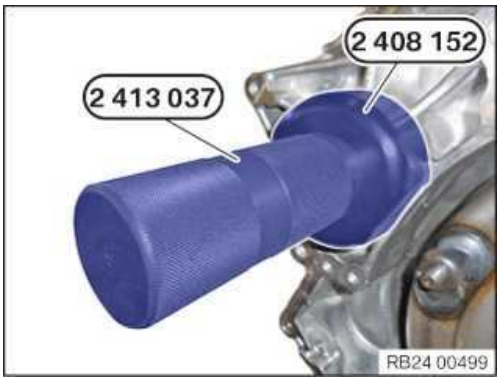


- Insert special tool **2 411 739** into the inner radial shaft seal.

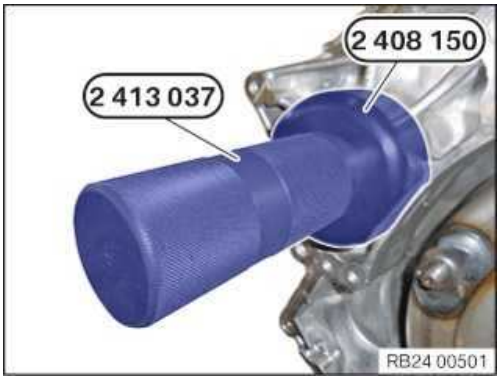


- Screw special tool **2 411 739** into the inner radial shaft seal.
- Turn the screw on the special tool **2 411 739** until the inner radial shaft seal has been pulled out.

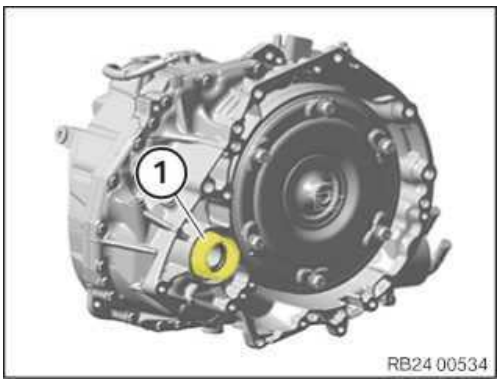
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- Drive in the inner radial shaft seal using special tools **2 408 152** and **2 413 037** up to the limit position.



- Drive in the outer radial shaft seal using special tools **2 413 037** and **2 408 150** up to the limit position.



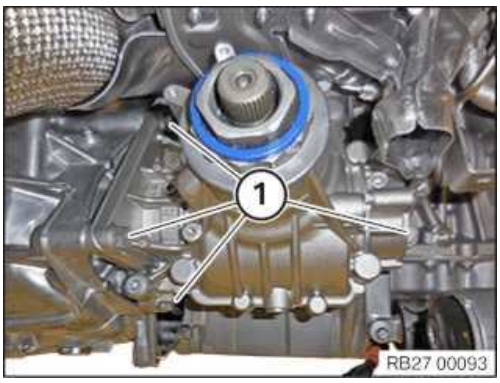
- If necessary, connect the new intermediate shaft (1) to the output flange of the automatic transmission or manual transmission.



- Coat the inside of the output flange (arrows) evenly with approx. 5 g of grease.

Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754

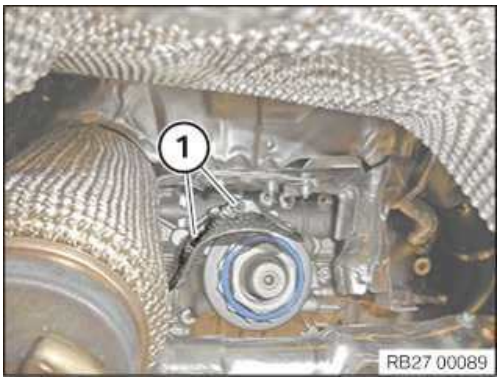


- Install the transfer box (VTG).
- Tighten the screws (1).

Transfer box to transmission

M10		Tightening torque	56 Nm

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- Install heat shield.
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Heat shield to transfer box

M6	Renew screws.	Tightening torque	6 Nm

▸ **Check the transfer box oil level**

RISK OF DAMAGE

Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.



- Check transfer case oil level, correct:
- Open the oil filler plug (1).
- Check transfer box oil level.
- If necessary, top up transmission oil up to the lower edge of the oil filler plug opening (1).

Transmission oil

Technically suitable transfer box and electrical transmission oils	

Main group 27

- Tighten the oil filler plug (1).

Oil filler plug on transfer box (VTG)

M18x1.5		Tightening torque	35 Nm

109 – Install the intermediate shaft with the support tube

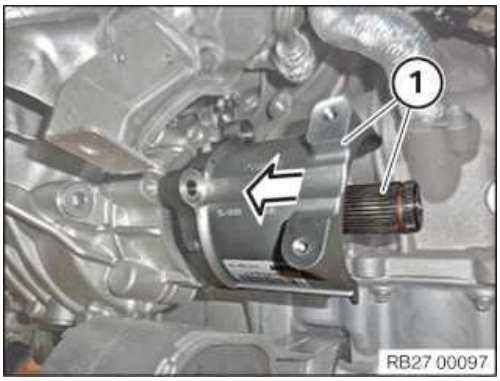


- Coat gearing of the intermediate shaft uniformly with 5 g of grease.

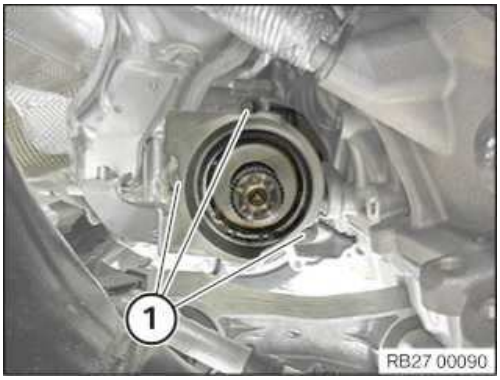
Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754

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- Install the intermediate shaft with support tube (1) in the transfer box.



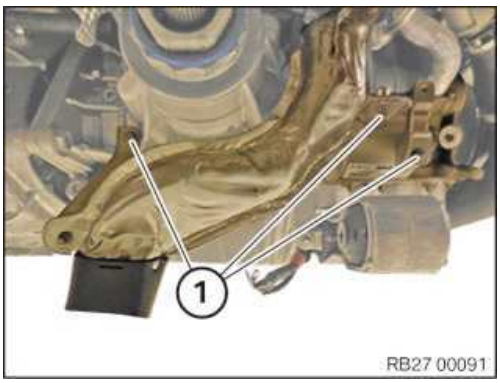
- Position screws (1).

Note: Check for correct screw length! Bolt M8x35 8.8

- Tighten the screws (1).

Intermediate shaft to transfer box

M8x35		Tightening torque	19 Nm



- If installed: Install air duct.
- Tighten the screws (1).

110 – Installing starter motor

CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.



- Insert and install the starter motor .
- Tighten the screws (1).

Starter motor to transmission

M8x45		Tightening torque	19 Nm

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- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

Battery positive lead to starter

M8		Tightening torque	13,5 Nm



- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.

111 – Installing right output shaft partially



- Renew the circlip (1).

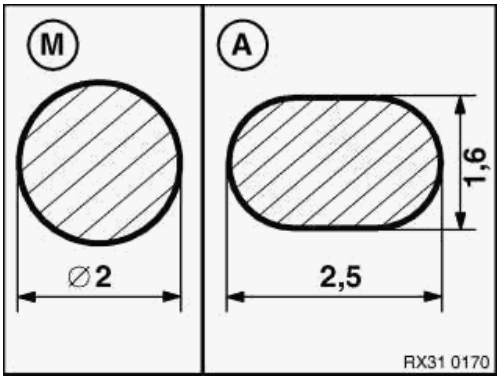
  Parts: Circlip
- Slide output shaft into the transmission as far as the limit position.
- Check for secure seat by levering.

112 – Partially installing the left output shaft



- **With automatic transmission only:**
- Lever out O-ring (1).
- Renew O-ring (1).

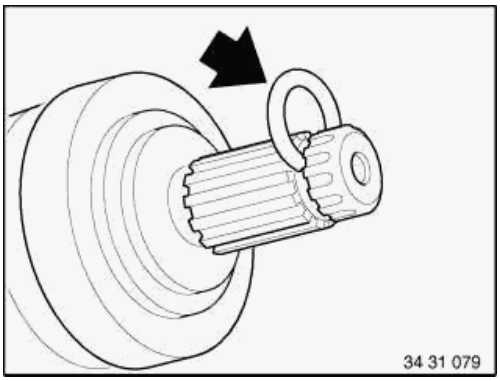
  Parts: O-ring
- Insert new O-ring (1).



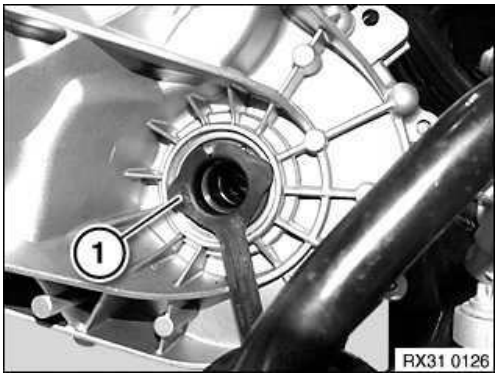
- Do not mix up circlips.

  Different types of output shafts fitted:
  - M: Manual transmission
  - A: Automatic transmission

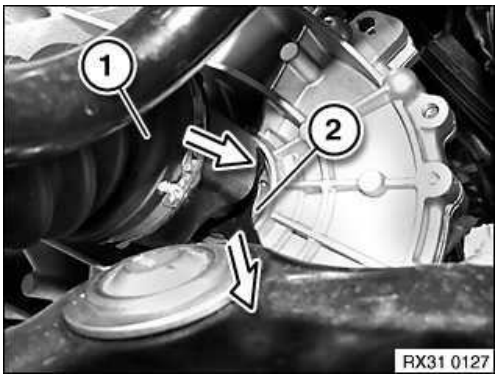
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- Renew circlip (arrow).



- Insert installation protection ring (1) into the radial shaft seal.
- Make sure the tool fits over the lip of the radial shaft seal so there is no damage to sealing ring when the output shaft is inserted.



- Insert output shaft (1) into transmission.
- **Manual gearbox only:** Pull on the handle to remove the installation protection ring (2) and dispose of it.
- Slide output shaft (1) into the transmission as far as the limit position.

  The output shaft (1) must engage audibly.
- Check for secure seat by levering.

113 – Install propeller shaft.

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

RISK OF DAMAGE

Damage to the propeller shaft during installation.

Non-observance of the installation guidelines for the propeller shaft on the rear axle differential may cause severe damage.

- Always renew the recessed nut on the rear axle differential. Screw locking must be available.
- Strictly observe a minimum hardening time of two hours after having screwed in the recessed nut. The hardening time may be longer at lower temperatures.

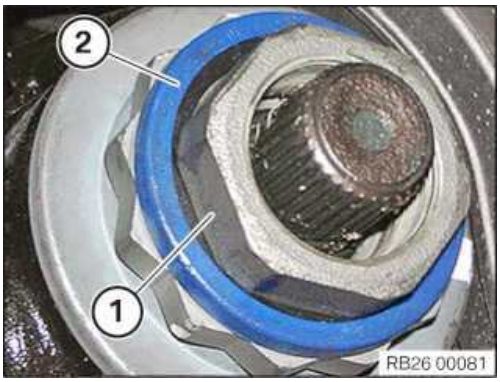
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RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.



- Renew recessed nut (1).

  Parts: Insert nut
- Renew the retaining clip (2) and the seal.

  Parts: Retaining clip, seal
- Insert the seal with the recessed nut (1) and install.
- Insert the retaining clip (2) and install.
- Make sure that recessed nut (1) is screwed in within 5 min.
- Make sure that the hardening time of **minimum** 2 h for the recessed nut is observed.

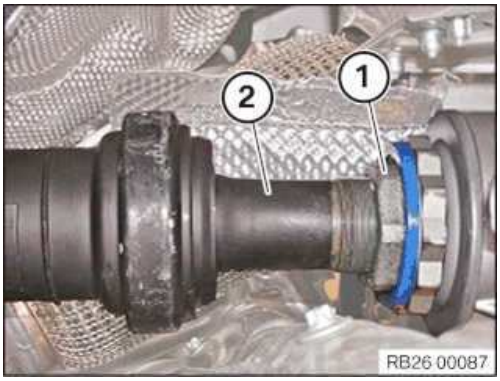
  The hardening time must be extended at lower temperatures.



- Insert the propeller shaft (1) and install.
- Always support the propeller shaft (1) with a conventional jack.

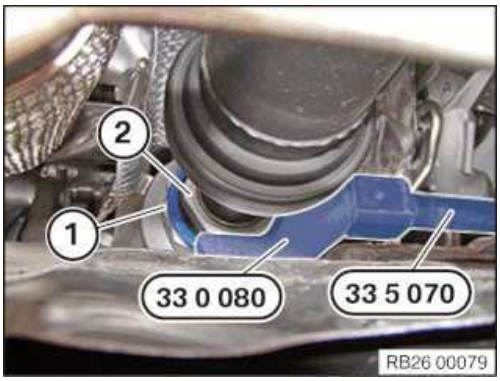


- Hand-tighten the bolts (1).



- Push the propeller shaft (2) against the recessed nut (1) up to the limit position.
- Screw the propeller shaft (2) at least 2 thread starts onto the recessed nut (1) by hand.

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RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.

- Protect the recessed nut (2) on the transfer box from twisting with the special tools **0 495 554 (33 5 070)** and .

  The recessed nut (2) on the transfer box must **not** be used to tighten the propeller shaft.

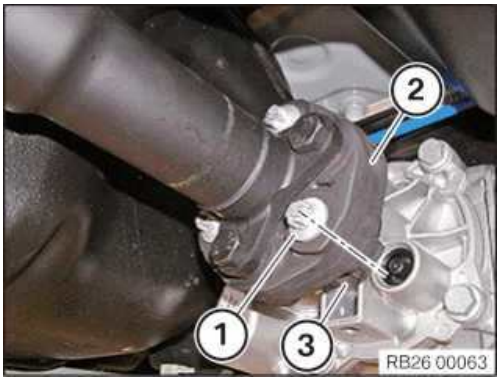
  The double hexagon flange nut (1) must **not** be used for counter support.



- Tighten the front propeller shaft with the special tools **0 495 554 (33 5 070)** and in the direction of the arrow.

Propeller shaft to transfer box

		Tightening torque	80 Nm



TECHNICAL INFORMATION

Compliance with the following instructions is required to avoid a humming noise from the propeller shaft after refitting the propeller shaft.

- Assemble the screw connection (1) of the flexible disc (2) and the three-hole flange (3) according to the mark.
- Renew screws (1).

  Parts: Bolts

- Hand-tighten the bolts (1).



- Protect the propeller shaft (1) with the special tools **0 495 554 (33 5 070)** and from twisting.

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- Tighten the bolts with the special tools **0 490 504 (00 9 120)** and .

Flexible disc to rear axle final drive

M12x1.5	Renew screws.	Tightening torque	55 Nm 90 °



- Tighten the screws (1).

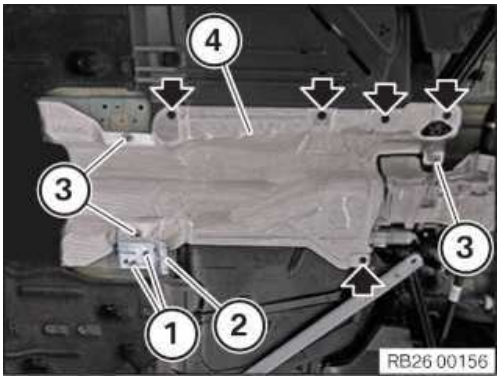
Centre mount to body

M8		Tightening torque	19 Nm



- Guide the special too l out between the front and rear propeller shaft and remove.

114 – Installing the rear heat shield



- Insert and install the heat shield (4).
- Tighten screws (arrows).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

- Tighten nuts (3).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

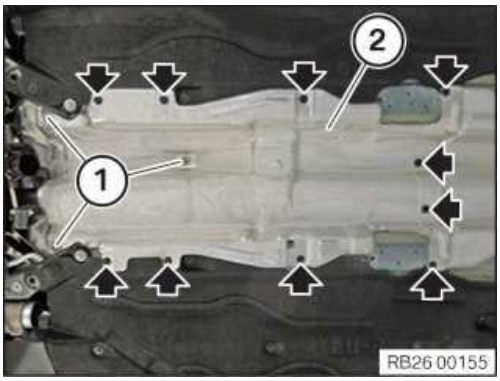
- Insert and install the holder (2).
- Tighten the screws (1).

Bracket to body

M8		Tightening torque	21 Nm

115 – Install the front heat shield

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- Insert and install the heat shield (2).
- Tighten screws (arrows).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

- Tighten nuts (1).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

116 – Install exhaust system

CAUTION

Component with heavy weight.

Danger of injury!

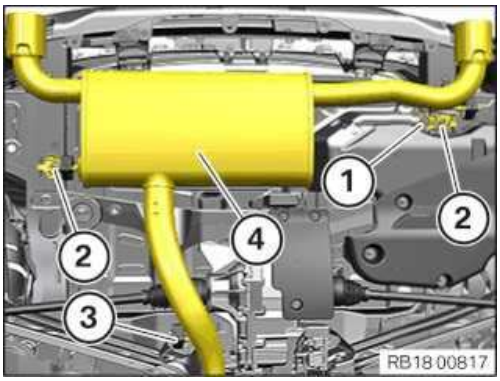
- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Feed in and install the exhaust system (4) with a second person.
- Renew nuts (2).

  Parts: Nuts
- Tighten nuts (2).

Exhaust system to body

M8	Replace nuts.	Tightening torque	19 Nm

- Tighten down screw (1).

Exhaust bracket on body

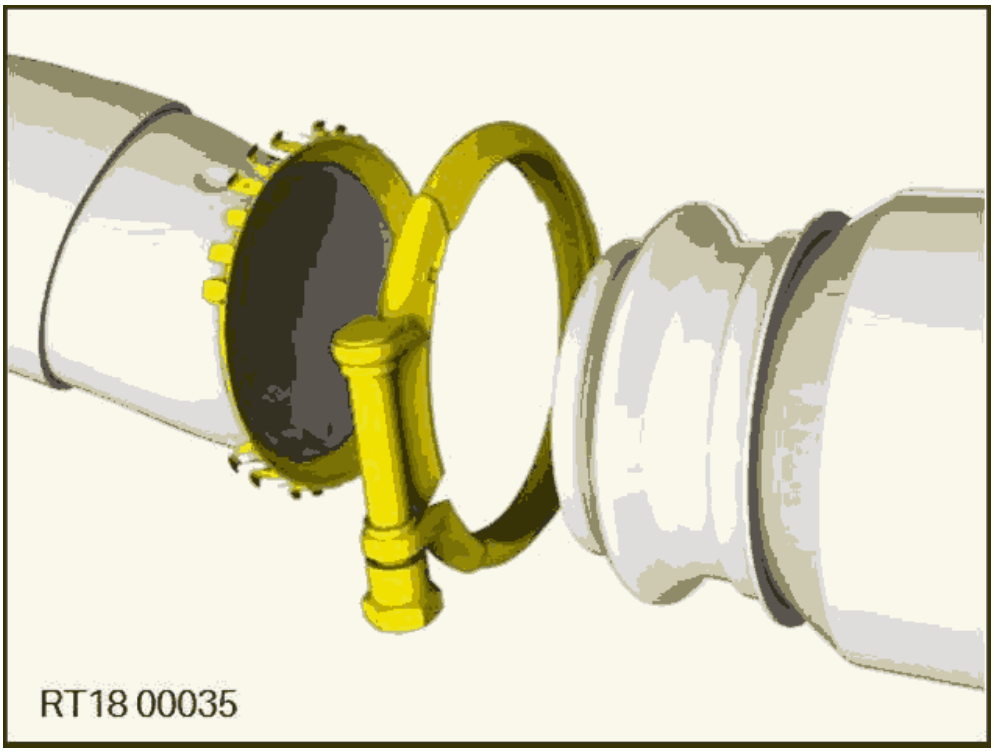
Hexagon screw M8x30		Tightening torque	19 Nm

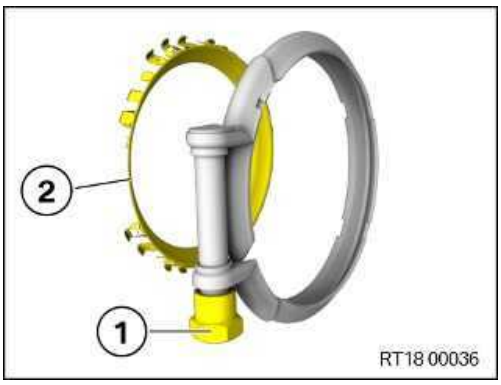
- Check the rubber mount (3) for damage and renew as needed.
- Mount rubber mount (3) on the exhaust system (4).

▸ **Install the V-clip**

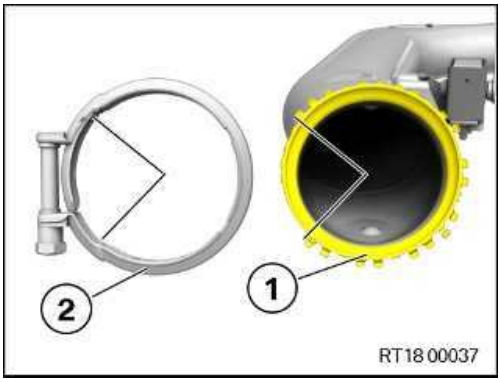
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V-band clamp



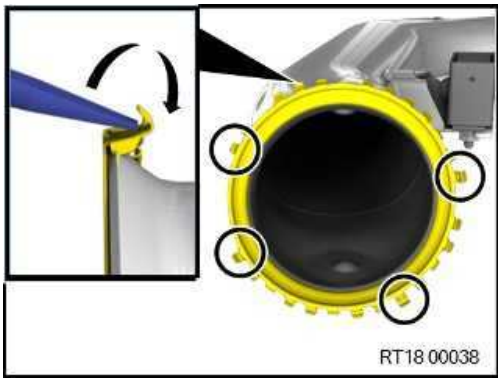


- Unscrew the nut (1) and remove the sealing ring (2).



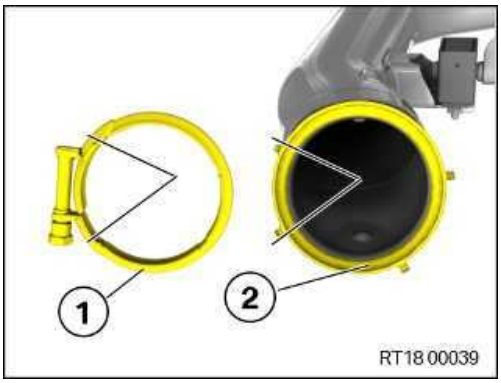
- Renew the V-clip (2).

  Parts: V-band clamp
- Mount the sealing ring (1) on the exhaust system.
- Ensure that the sealing ring (1) for the V-clip (2) is positioned correctly.



- Bend all sheet metal tabs over with a suitable tool, except those in the marked areas.

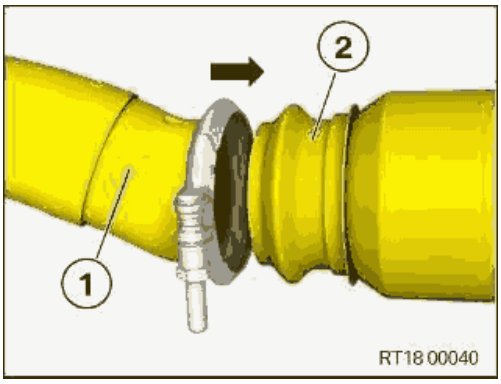
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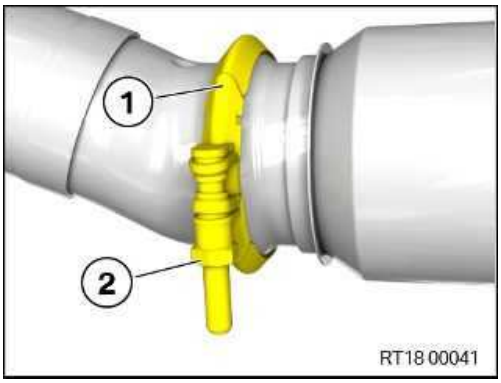
- Mount the V-clip (1) on the sealing ring (2).
- Make sure that the V-clip (1) is positioned correctly on the sealing ring (2).



- Make sure that the V-clip rests against the sheet metal tabs after mounting (marks).



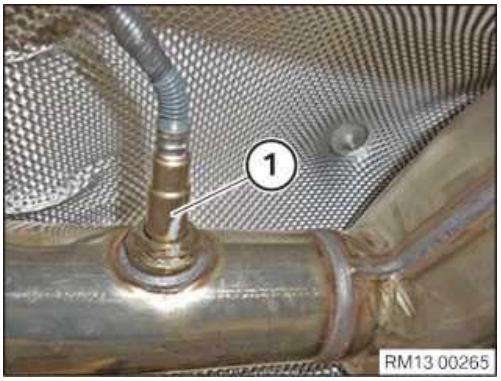
- Connect the exhaust system (1) with the catalytic converter (2) and position correctly.



- Make sure that V-clip (1) is fitted correctly.
- Tighten down screw (2).

V-clip to catalytic converter

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

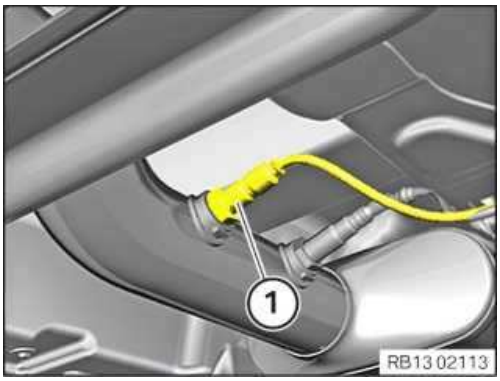


- Feed in, install and tighten diesel particulate sensor (1).

Diesel particulate sensor to exhaust system

Sensor		Tightening torque	50 Nm

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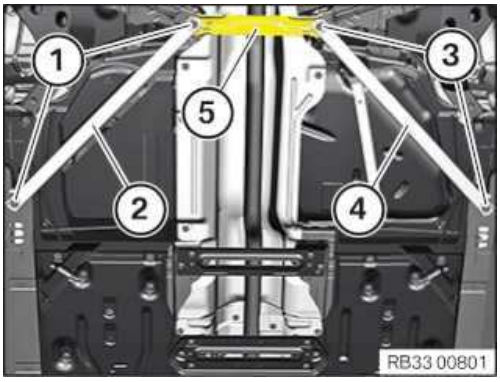


- Feed in, install and tighten nitrogen oxide sensor (1).

Nitrogen oxide sensor downstream of SCR catalytic converter

Sensor		Tightening torque	50 Nm

117 – Install the cross-member with torsion struts



- Insert and install the cross-member (5).
- Thread in torsion strut (4) at right and install.
- Renew screws (3).

  Parts: Bolts
- Tighten down screws (3).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

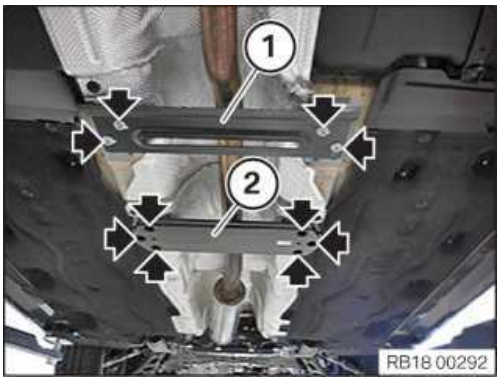
- Guide in and install the left torsion strut (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

118 – Install the connecting support on the tunnel in front and back



- Insert and install connecting supports (2).
- Tighten the screws (arrows) from the connecting support (2).

Front connection carrier to body

M10x18		Tightening torque	56 Nm

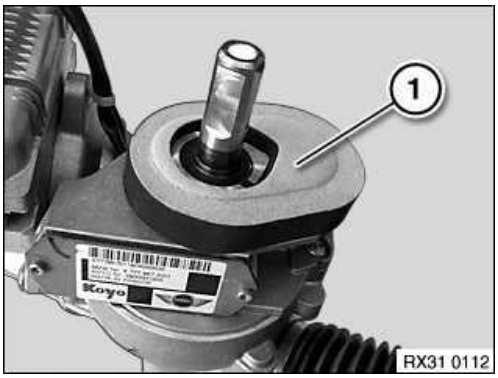
- Insert and install connecting supports (1).
- Tighten the screws (arrows) from the connecting support (1).

Rear connection carrier to body

M8x18		Tightening torque	28 Nm

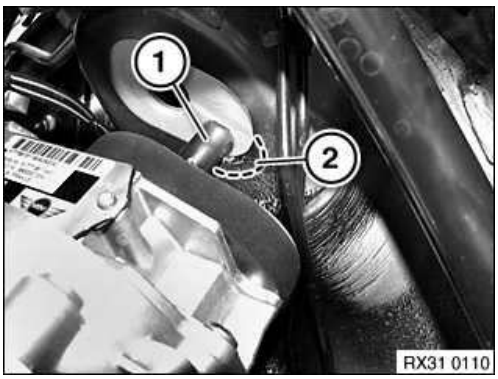
119 – Mount and secure the complete front axle

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- Remove the seal (1).
- Clean surface on steering gear.
- Renew gasket (1).

  Parts: Gasket
- Position the seal (1) and glue it on.

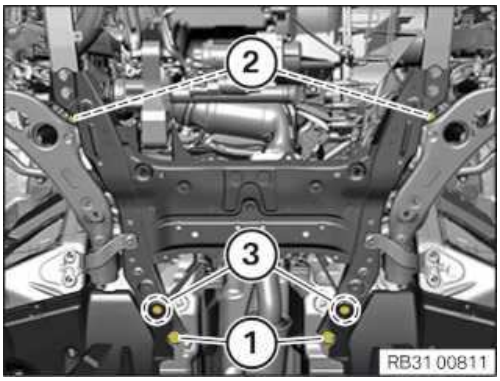


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- Position front axle support.
- Bend underbody panellings in the areas (3) to one side.
- Raise front axle support.
- When raising, insert charge air cooler into the rubber mount of the charge air cooler on cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

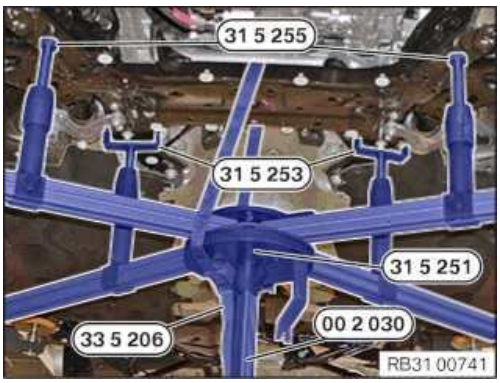
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

- If necessary, tighten the screws in the areas (3).

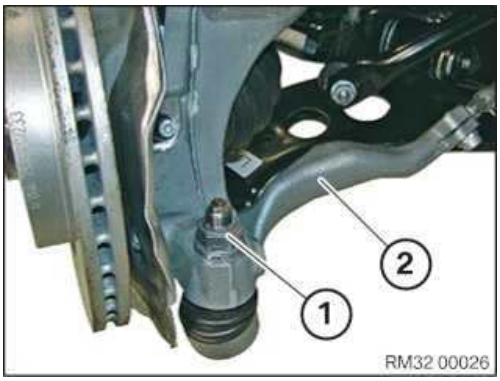
Underbody protection to body

Screw		Tightening torque	3 Nm



- Remove special tool from special tool .
- Lower universal jack **0 490 133 (00 2 030)** with the special tool and place it to the side.

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NOTICE

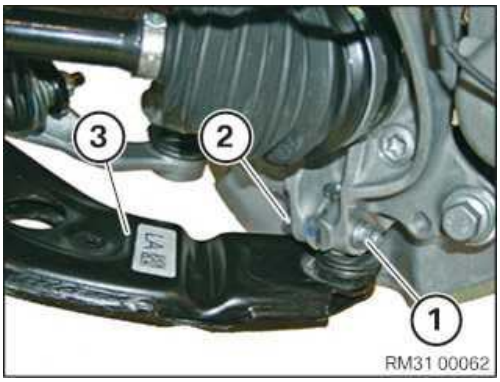
Perform the operations on the left and right side.

- Position the track rod (2) on the swivel bearing .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Track rod end to swivel bearing

M14	Renew nut.	Tightening torque	175 Nm



NOTICE

Perform the operations on the left and right side.

- Position the wishbone (3) on the swivel bearing .
- Renew the bolt (2) and the nut (1).

  Parts: Bolt, nut
- Insert screw (2).
- Tighten nut (1).

Wishbone to swivel bearing

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

120 – Install the mounted parts on the front axle support



NOTICE

Perform the operations on the left and right side.

- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Holder, wishbone rubber mount, to body

M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °

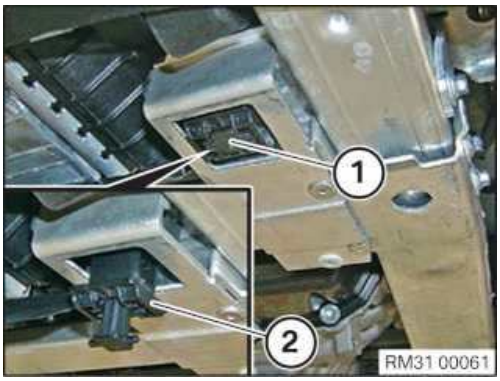


- Position the engine support (3) on the front axle support (1).
- Tighten down screw (2).

Holder with rubber mount to front axle support

M12 screw		100 Nm

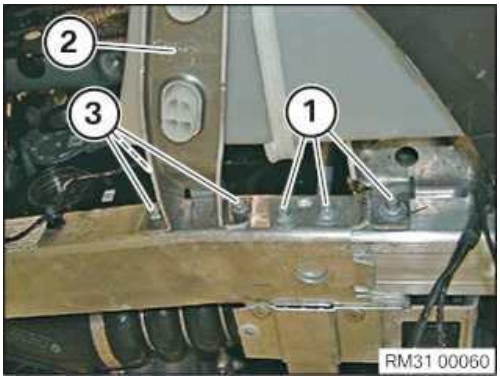
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NOTICE

Perform the operations on the left and right side.

- Position the lock (2).
- Lock the bracket (1) of the lock (2) of the holder for the charge air cooler.



- **Only on right side:** Position the holder for the washer fluid reservoir (2).
- Tighten down screws (3).

Washer fluid reservoir holder to front axle support adapter plate

		Tightening torque	10 Nm

NOTICE

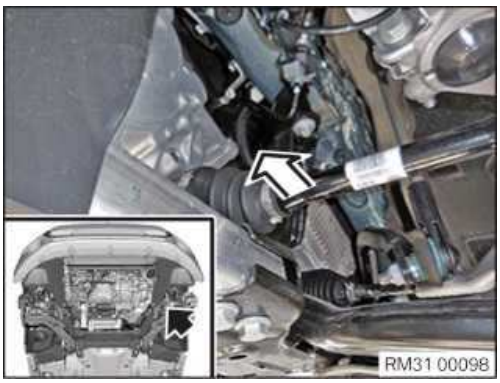
Perform the operations on the left and right side.

- Tighten the screws (1).

Deformation element, bottom, to adapter plate, front axle carrier

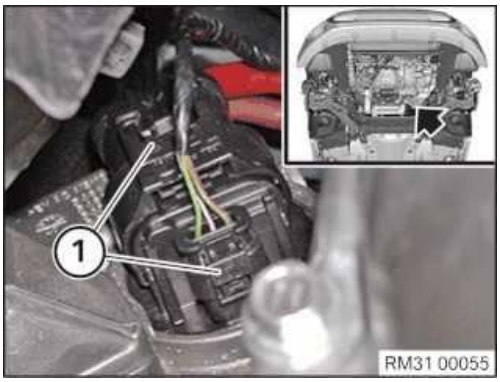
		Tightening torque	11,8 Nm

121 – Attaching connector at steering gear



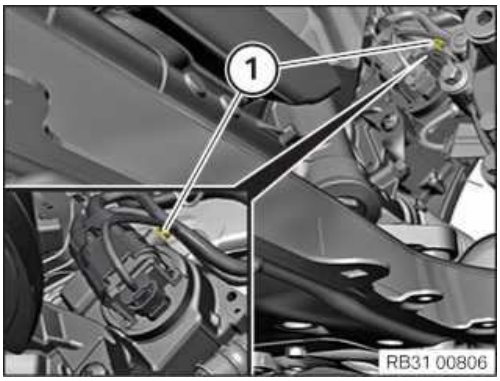
- To connect the connector (see the following step): Connect the connector with the right hand.

  The connectors can be accessed via the left output shaft.



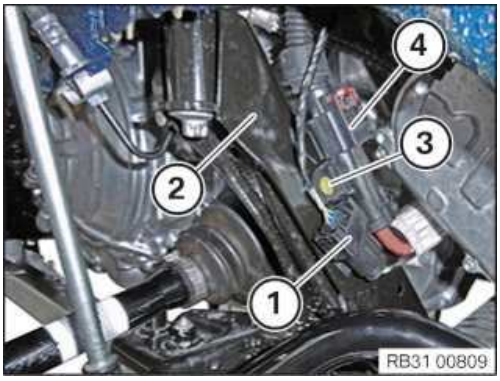
- Connect and lock connector (arrow) (1) with the steering gear.

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- Fasten the wiring harness (1) on the steering gear.

▶ **If installed: Fasten the plug connections at the front axle support**



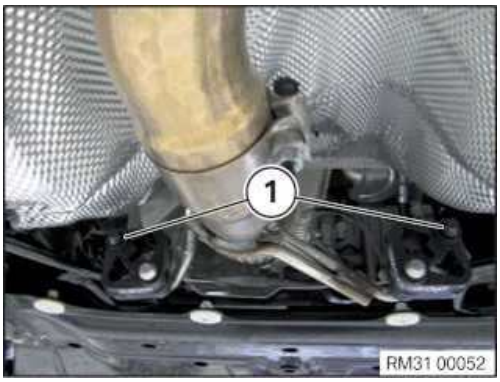
- Position the plug connection (4) at the front axle support (2).
- Tighten down screw (3).

Holder to front axle support

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

- Fasten the plug connection (1) at the front axle support (2).

122 – Securing rubber mount on front axle support



- Check rubber mount (1), replace if necessary.

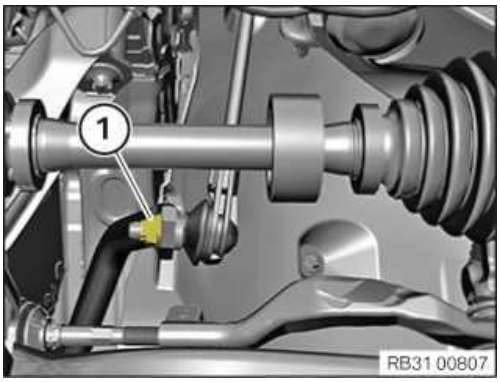
  Parts: Rubber mount
- Spray rubber mount (1) with lubricant and slide onto holder on front axle support.

123 – Securing anti-roll bar on left and right on the anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▶ **Fastening anti-roll bar on the anti-roll bar link**



- Position the anti-roll bar link on the anti-roll bar .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

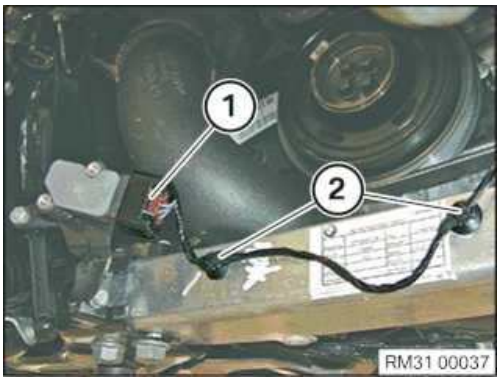
Note: Use the Torx socket for counter support.

Anti-roll bar link to anti-roll bar

M10	Renew nut.	Tightening torque	56 Nm

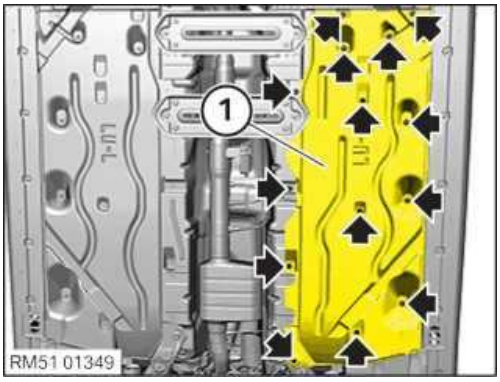
124 – With right installation: Securing the cable for the ride height sensor

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- Secure the cable clip (2) on the adapter of the deformation element.
- Connect connectors (1) and lock.

125 – Installing underbody panelling , right



- Correctly position the underbody panelling (1).
- Tighten all bolts and nuts (arrows).

Underbody panelling, side

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side

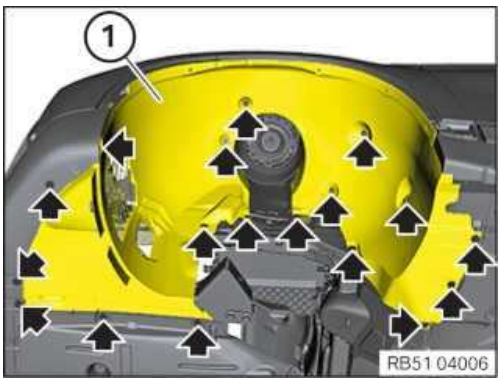
Plastic nut		Tightening torque	2,6 Nm

126 – Installing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

▸ **Installing the front wheel arch cover**



- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Plastic nut		Tightening torque	2,6 Nm
Screw		Tightening torque	2,6 Nm

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

▸ **Installing front wheel arch trim**

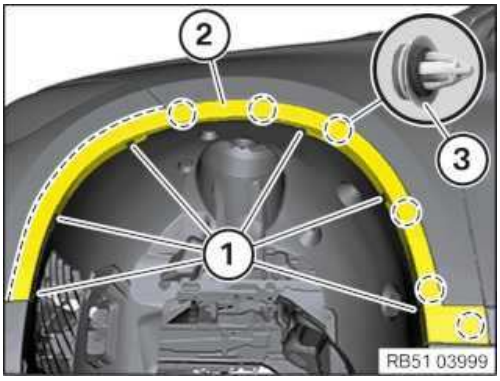
NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

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NOTICE

Description is for left component only. Procedure on the right side is identical.



- Check the clips (3) for damage and renew where required.

  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

127 – Installing both front wheels

▶ Mounting the wheel

▷ Clean the contact surfaces between the brake disc and the wheel rim



TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

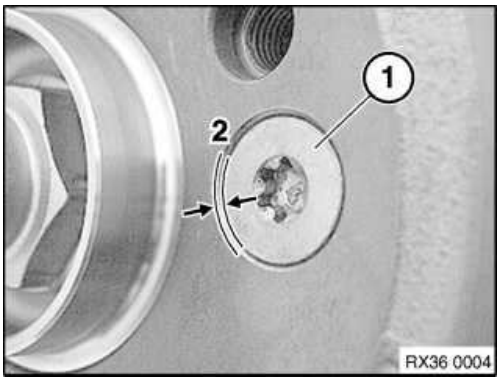
  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue in the area of the wheel bolt holes, remove and clean the brake disc.



- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

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- Renew mounting bolt (1).

  Parts: Mounting bolt

- Check that the mounting bolt (1) for the brake disc is securely seated.

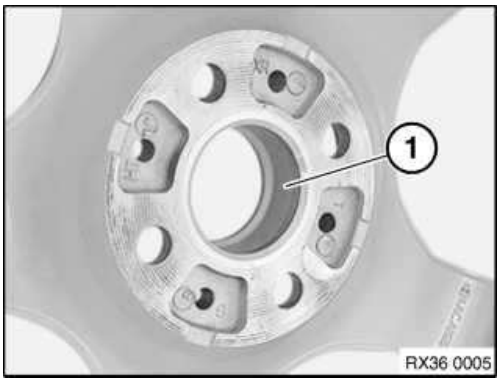
  The mounting bolt (1) for the brake disc may not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to rear wheel hub

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub

M8	Renew screw.	Tightening torque	16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring (1).

◁



TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

  Parts: Wheel bolts

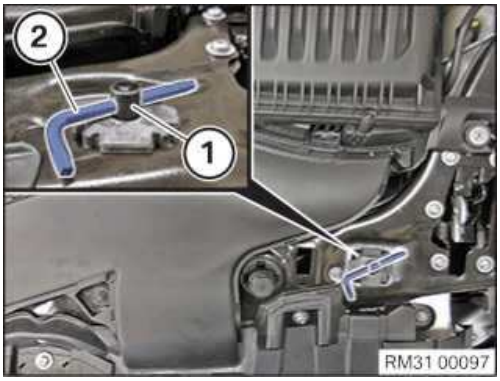
- Clean the wheel bolts.
- Check the wheel bolts and threads for damage, renew the wheel bolts if necessary.
- Join and tighten the wheel bolts (arrows).

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

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128 – Removing fastener for left and right radiator

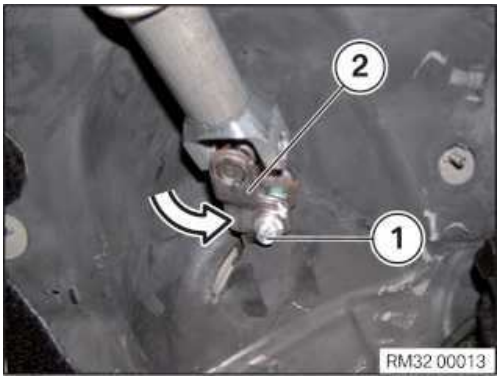


NOTICE

Perform the operations on the left and right side.

- Remove suitable tool (2) from the centering pin (1).

129 – Secure the steering shaft at the bottom on the steering gear



- Clean the screw lock residue from the screw thread in the universal joint (2).
- Pivot the universal joint (2) in the direction of the arrow to the steering gear.
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Lower steering shaft to steering gear

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm



- **If installed:**
- Position the cover on the steering column (2).
- Tighten nuts (1).

Steering column cover to bulkhead

Plastic nut		Tightening torque	3 Nm

130 – Install the heat shield on the exhaust turbocharger



- Feed in and install the heat shield (2).
- Tighten the screws (1) at the top and bottom of the heat shield.

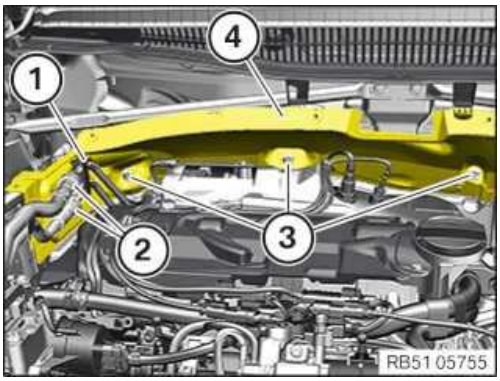
Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Fasten the cable at the clips .

131 – Installing rear bulkhead upper part

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- Feed in and install the rear bulkhead upper part (4).
- Tighten down screws (3).

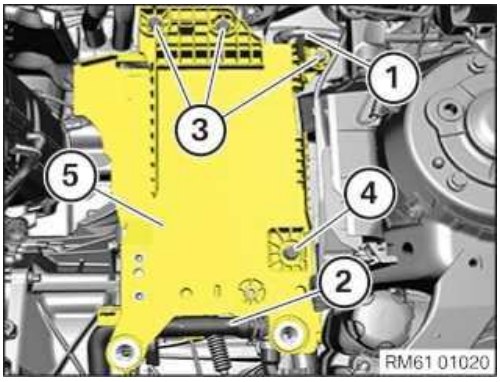
Rear bulkhead upper part to lower section of bulkhead

Oval-head screw		Tightening torque	5 Nm

- Feed the fuel line (2) into the holder (1) and install.
- Connect and lock the holder (1).

  The holder (1) must engage audibly.

132 – Install the battery holder



- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

133 – Install electronics box

Prerequisite

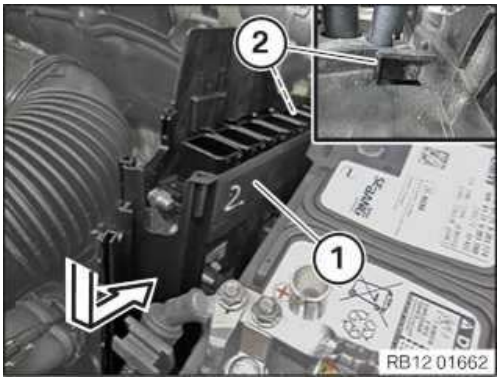
Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.

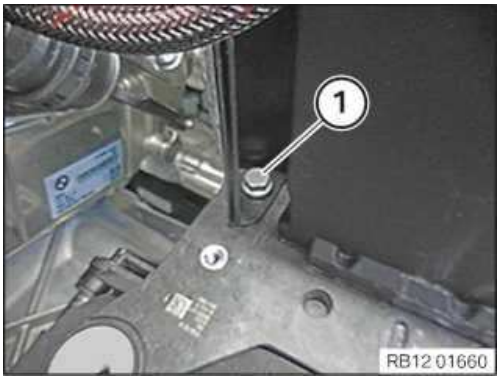


- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.

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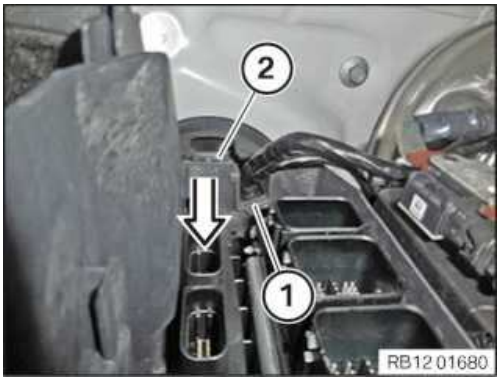
- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).



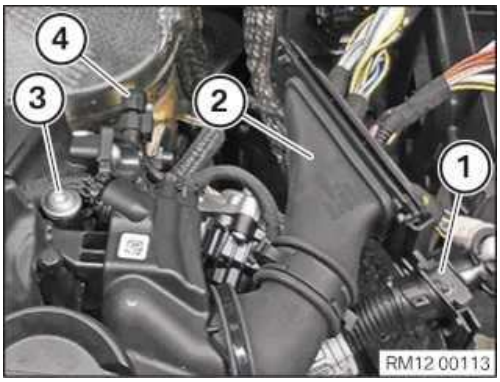
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.

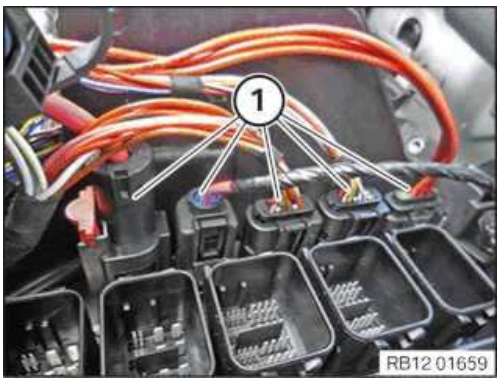


- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

Wiring harness to cylinder head cover

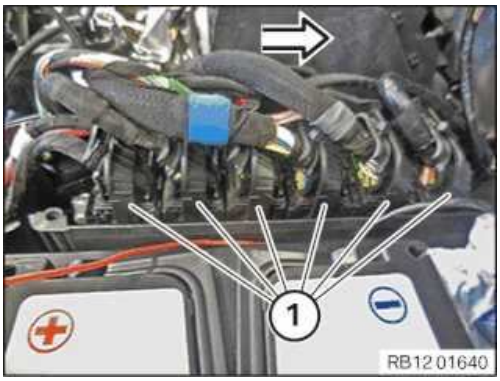
TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.

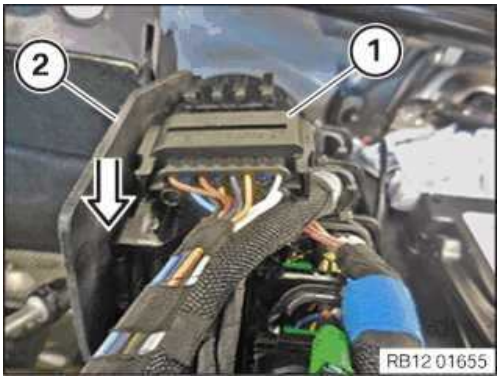


- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.

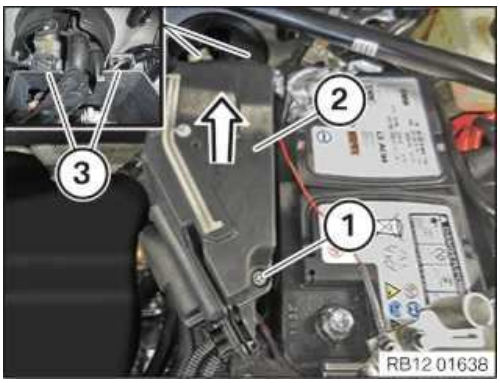
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- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



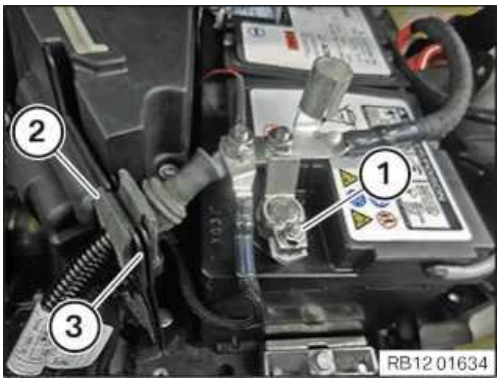
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

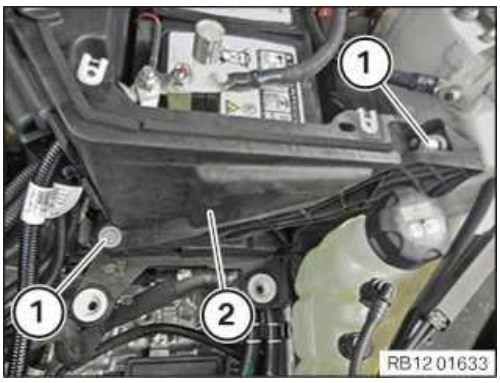
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

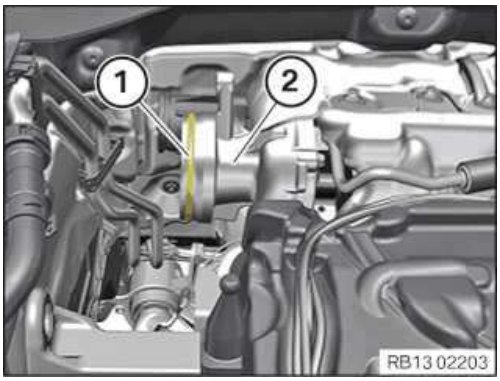


- Feed in and install tension strut (2).
- Tighten the screws (1).

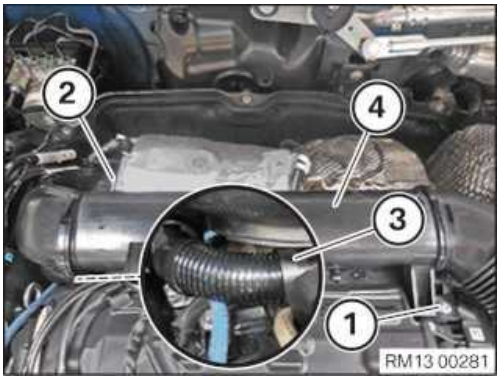
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

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- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.



- Feed in clean air pipe and install.
- Connect clean air pipe to the exhaust turbocharger and lock audibly in the clamps (2).
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Connect ventilation line (3) to the cylinder head cover and lock audibly.

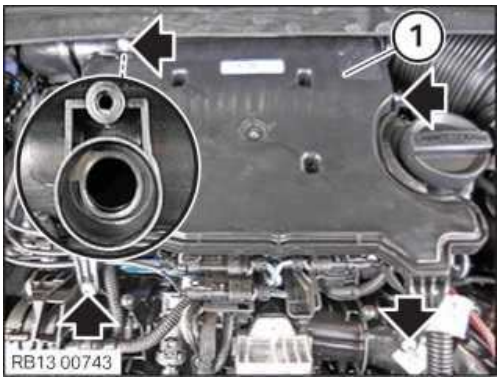


- Mount clean air pipe onto the intake filter housing.
- Tighten clamp (1) on the clean air pipe.

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

135 – Install resonator



- Insert and install the resonator (1).
- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

136 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

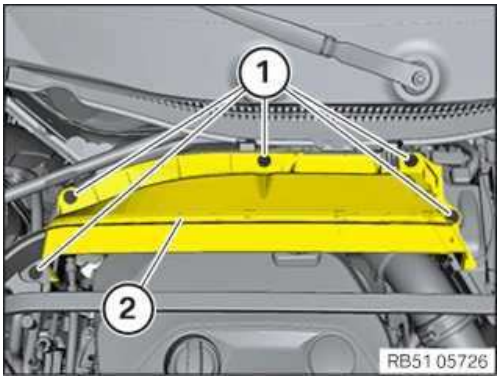


- Check for correct installation of all rubber mounts in the acoustic cover (1).



- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

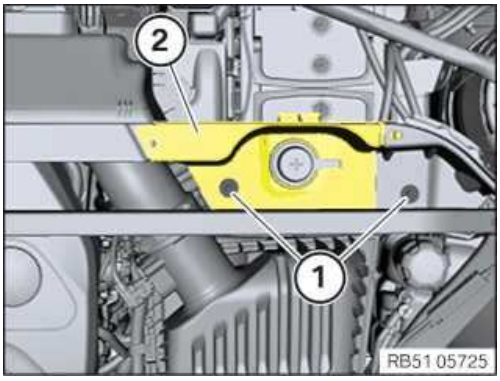
137 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Cover of top bulkhead

Screw		Tightening torque	2,6 Nm



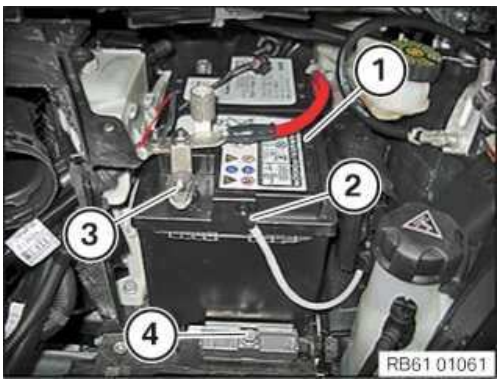
- Guide in and install cover (2).
- Tighten down screw (1).

Cover of remote positive terminal

Screw		Tightening torque	2,6 Nm

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138 – Install vehicle battery



- Install vehicle battery (1).
- Position the bracket and tighten with the screw (4) .

Battery terminal rail to battery tray

M8		19 Nm

- Position the vent hose (2) and clip it in.
- Position the positive battery terminal and tighten with the nut (3) .

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

▸ **Check the vent holes of the battery**

WARNING

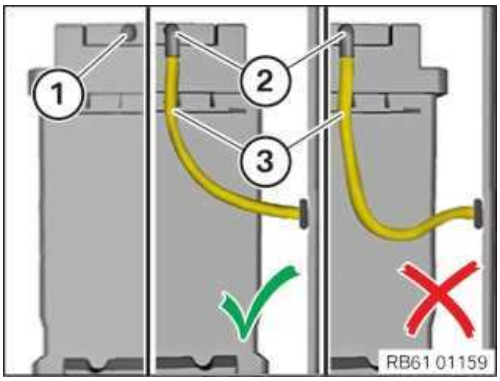
Gas emission.

Danger of injury! Danger of explosion!

- Assign the vent holes correctly.
- Route the vent hose correctly.

TECHNICAL INFORMATION

The battery has two vent holes, opposite:
One vent hole (1) must be closed correctly with a dummy plug.
The vent hose (3) must be correctly connected and routed at the other vent hole (2).



Check

- Check if the vent hole (1) is correctly closed with a dummy plug.

Result

» No dummy plug.

Measure

- Close the vent hole (1) correctly with a dummy plug.

Check

- Check if the vent hole (2) has a correctly connected vent hose (3).

Result

» The vent hose (3) is not correctly connected.

Measure

- At the vent hole (2), connect the vent hose (3) correctly.

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Check

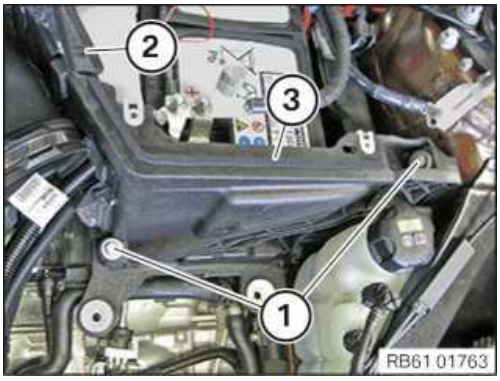
- Check if the vent hose (3) is routed to the outside with a downhill gradient (**no siphon formation!**).

Result

» The vent hose (3) is not correctly routed as shown in the image on the right.

Measure

- Route the vent hose (3) correctly as shown in the centre image.



- Insert tension strut (3) and tighten with screws (1).

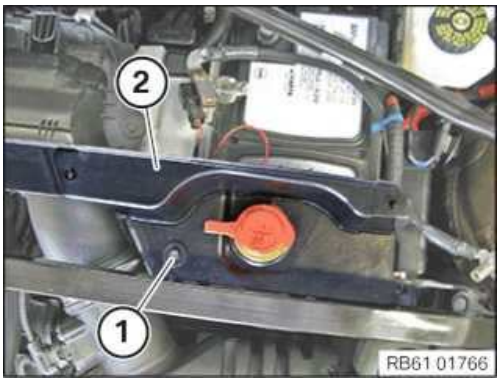
Trailing link

M8		Tightening torque	19 Nm

- Tighten down screw (2).

Battery cover

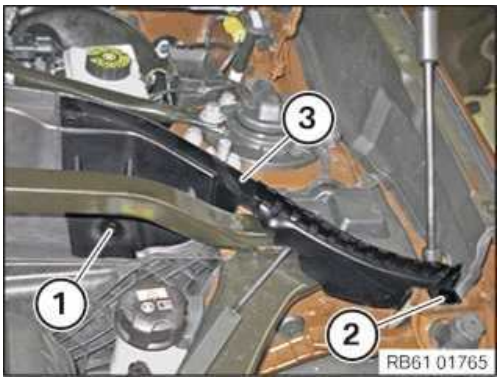
M8		2,8 Nm



- Position the cover (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

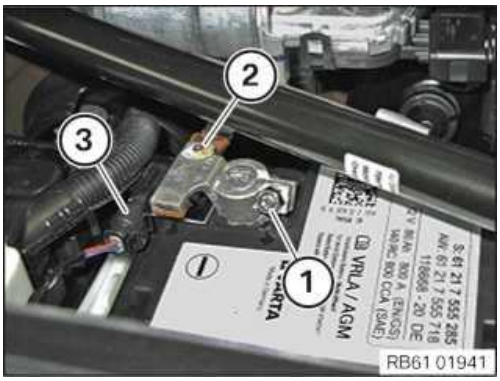
M8		2,8 Nm

139 – Connecting the battery earth lead

TECHNICAL INFORMATION

For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)

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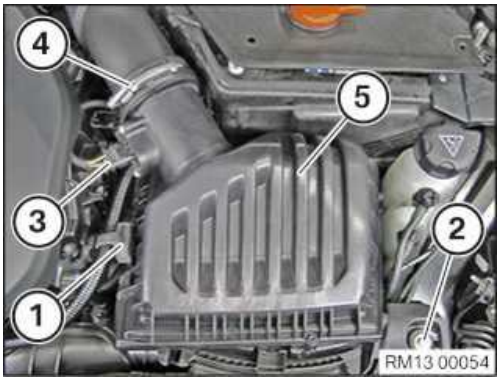
- Remove the protective cover of the positive battery terminal.
- Position the battery earth lead (2).
- Tighten nut (1).

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

- If required, connect the connector (3).

140 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

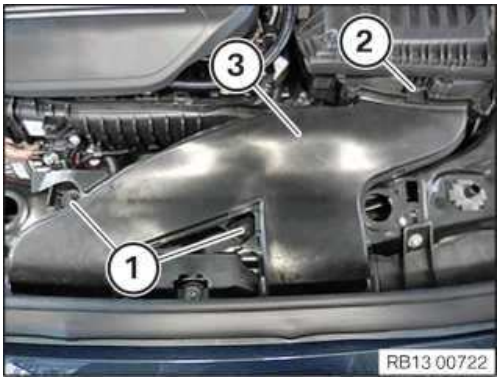
- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

141 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).
  The lock (2) must audibly engage.
- Tighten nuts (1).

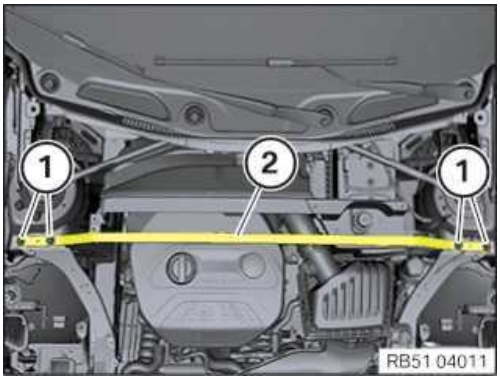
Intake neck to cross connection

M6		Tightening torque	8 Nm

142 – Install strut brace

TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.

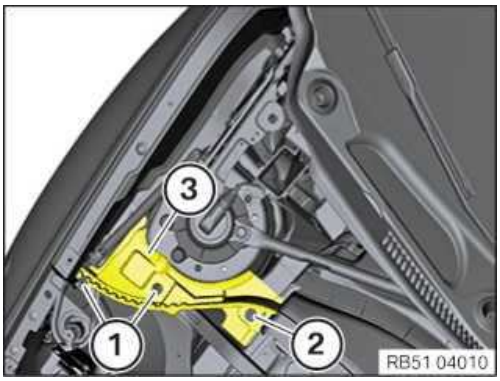


- Install the strut brace (2).
- Renew screws (1).
  Parts: Bolts
- Tighten the screws (1).

Cross-brace to spring strut dome

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

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NOTICE

Description is for right component only. The procedure on the left side is identical.

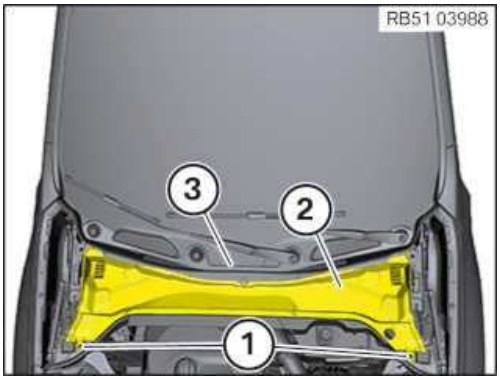
- Install the cover (3).
- Tighten down screw (2).

Cover on body

Hexagon screw		Tightening torque	3 Nm

- Install the expanding rivet (1).

143 – Installing front cowl panel cover

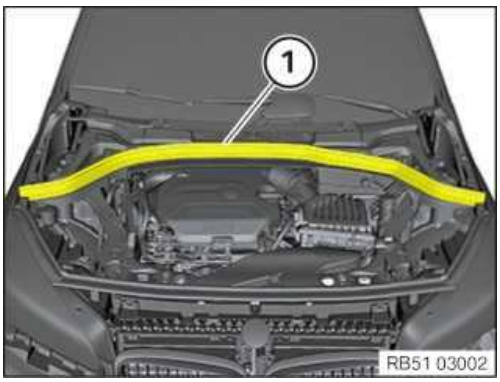


- Insert and install cowl panel cover at front (2) into cowl panel cover at rear (3).
- Check cowl panel cover at front is correctly seated (2).
- Secure expanding rivet (1).

144 – Install the seal for the bonnet

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

145 – Check engine oil level

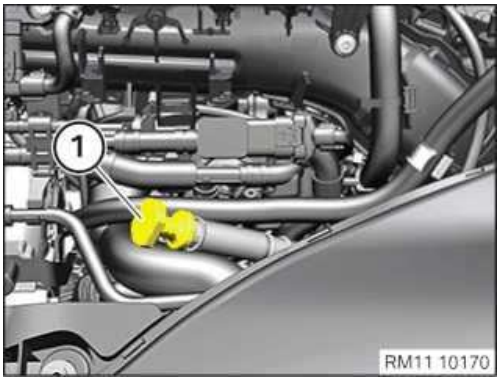
- Park vehicle on a horizontal surface.
- In the case of automatic transmission, shift to selector lever position N or P.
- Accelerator pedal is not pressed.
- Engine is running and is at operating temperature.
- Read off the engine oil level in the instrument cluster (KOMBI) or on the control display.
- Top up engine oil if necessary.

▶ **Check engine oil level**

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TECHNICAL INFORMATION

Always check the engine oil level when the engine is at operating temperature (engine oil temperature > 70°C).

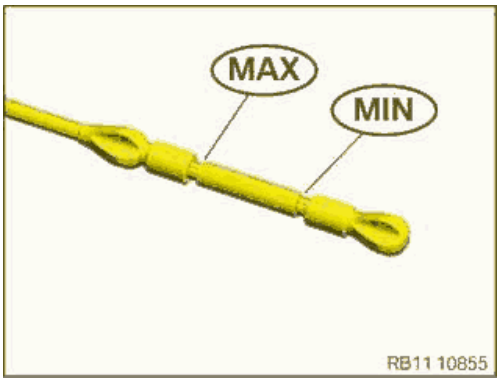


- Park vehicle on a horizontal surface.
- Stop the engine and wait for 5 minutes.
- Pull out the oil dipstick (1) and wipe off using a lint-free cloth.

TECHNICAL INFORMATION

Do not pull out or insert the oil dipstick into the guide tube too quickly or slowly.

- Push the oil dipstick (1) into the guide tube up to the limit position and pull it out again.



TECHNICAL INFORMATION

The engine oil level must be between the minimum mark and the maximum mark of the oil dipstick.

- Read the engine oil level on the oil dipstick.
- Top up engine oil if necessary.

146 – Fill and bleed the coolant circuit

▶ **Filling and bleed the high-temperature coolant circuit**



- See additional information.

147 – Checking/topping up oil level in automatic gearbox (AISIN GA8G45)

Prerequisite

Vehicle in horizontal position.

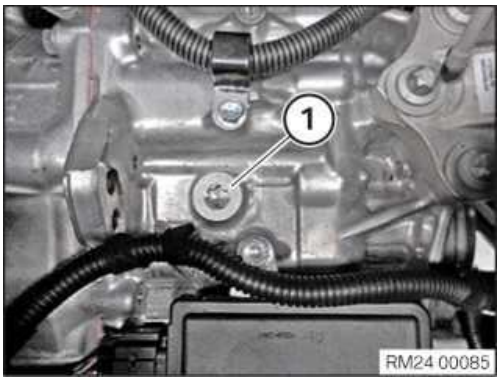
CAUTION

Materials harmful to health.

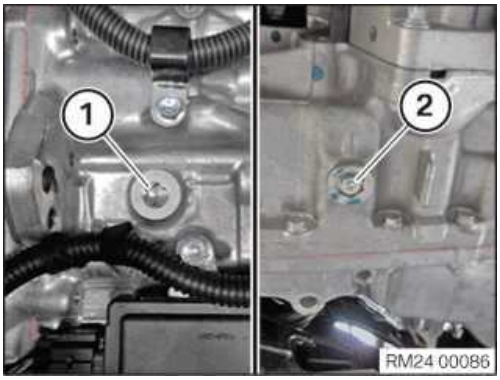
Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

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- Move the selector lever to the "P" position.
- Secure vehicle to prevent it rolling.
- Connect diagnosis system.
- Release the oil filler plug (1) using the Torx T55 .



- **Topping up the automatic transmission fluid (the automatic transmission fluid was drained):**
- Release oil filler plug (1) from engine compartment.
- Loosen the overflow plug (2) below at the transmission.
- Top up automatic transmission fluid at oil filler plug (1) until oil emerges at overflow plug (2).
- Start engine and run at idle speed.
- Check whether the automatic transmission fluid is leaking at the overflow plug (2) .
- If there is no automatic transmission fluid leaking at the overflow plug (2) , fill in the automatic transmission fluid to the oil filler plug (1) .
- Press the footbrake and, when idle, shift through all the gears from "P" to "D" 2 times for more than 2 seconds .
- Move the selector lever to the "P" position.
- Check again whether the automatic transmission fluid is leaking at the overflow plug(2) .
- Read the temperature of the automatic transmission fluid with the diagnosis system.
- Increase temperature of automatic transmission fluid to 35 °C to 45 °C.
- Top up automatic transmission fluid until it flows over.
- Renew sealing rings.

  Parts: Sealing ring
- Screw in and fasten oil filler plug (1) and overflow plug (2).

Oil filler plug to transmission housing

M14	Renew the sealing ring.	Tightening torque	45 Nm

Overflow screw in oil drain plug

M6	Renew the sealing ring.		8 Nm

- **Check oil level (transmission oil temperature must be between** 35 °C **and** 45 °C **):**
- Open the oil filler plug (1).
- Slacken overflow plug (2).
- Start engine and run at idle speed.
- Unscrew and remove overflow plug (2).
- Check whether the automatic transmission fluid is leaking at the overflow plug (2) .
- If there is no automatic transmission fluid leaking at the overflow plug (2) , fill in the automatic transmission fluid to the oil filler plug (1) .
- Top up the automatic transmission fluid until it overflows at the overflow plug (2) .
- Press the footbrake and, when idle, shift through all the gears from "P" to "D" 2 times for more than 2 seconds .

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- Move the selector lever to the "P" position.
- Check the oil level again.
- Renew sealing rings.

  Parts: Sealing ring
- If the oil escapes slightly from the overflow plug (2) , tighten the overflow plug (2) and the oil filler plug (1) .

Overflow screw in oil drain plug

M6	Renew the sealing ring.		8 Nm

Oil filler plug to transmission housing

M14	Renew the sealing ring.	Tightening torque	45 Nm

148 – Topping up oil level in the manual gearbox (GS6X60DA)

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.



TECHNICAL INFORMATION

Make sure during removal of the filling/level control screw to note the installed filling/level control screw variant.

It is **mandatory** to use variant 1 in transmissions up to production date 08/2015.

It is **mandatory** to use variant 2 in transmissions from production date 08/2015.

Failure to observe will result in a leak on the transmission.

- Variant 1 **until** production date 08/2015.
- Variant 2 **from** production date 08/2015.



- Unscrew filling/level control screw (1) and fill the transmission until the oil overflows.

Transmission oil capacity

Transmission oil GS6-60DA, GS6X60DA/Owner's Handbook	2,2 l

Transmission oil: Technically suitable manual gearbox oil

- Allow surplus oil to drain off.
- Renew the filling/level control screw (1).

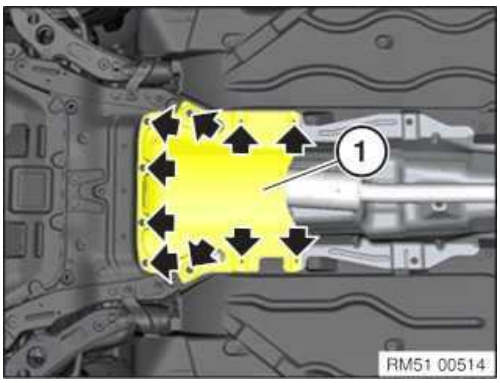
  Parts: Filling/level control screw
- Tighten filling/level control screw (1).

Oil drain plug / oil filler plug

Hexagon socket		Tightening torque	43 Nm

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149 – If installed: Installing underbody protection at rear

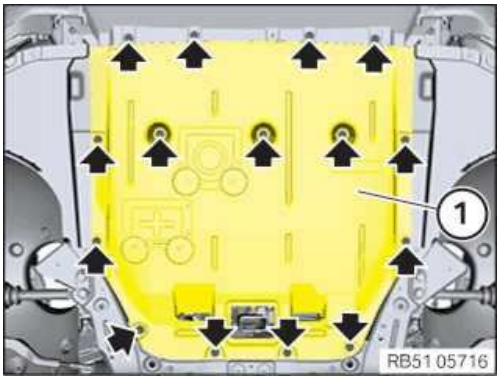


- Position rear underbody protection (1).
- Tighten screws (arrows).

Underbody protection to body

Screw		Tightening torque	3 Nm

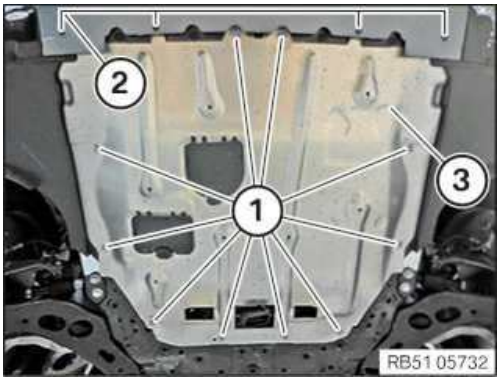
150 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm



- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Additional Information

Overview of Tightening Torques

Cross connection to carrier support — Used in step 19

Screws M6x20		Tightening torque	11,8 Nm

Screw connection for rubber mount of coolant radiator to coolant radiator — Used in step 19

Bolt to rubber mount		Tightening torque	8 Nm

Air duct to upper connection — Used in step 19

M6x20 screw		Tightening torque	11,8 Nm

Bracing strut to upper connection — Used in step 19

M8x20 screw		Tightening torque	28 Nm

Rear end of front axle support to body — Used in step 72 119

M14 screw	Renew screw.	Tightening torque	175 Nm

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Front axle support, front to body

Used in step 72 119

M12 screw	Renew screw.	Tightening torque	108 Nm

Underbody protection to body

Used in step 72 119 149

Screw		Tightening torque	3 Nm

Special tool to cylinder head

Used in step 72

M8		Tightening torque	21,5 Nm

Cylinder head to crankcase

Used in step 77

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

Cylinder head bolt to timing case cover

Used in step 77

M8x40		Tightening torque	19 Nm

Right engine mount to side member

Used in step 77

M12		Tightening torque	100 Nm

Right engine mount to cylinder head

Used in step 77

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

Heat shield to cylinder head

Used in step 77

M8X16		Tightening torque	10 Nm

Glow elements to cylinder head

Used in step 78

Glow element		Tightening torque	13 Nm

Camshaft carrier to cylinder head

Used in step 81

M7x35		Tightening torque	13 Nm

Bearing journal to cylinder head

Used in step 83

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8

Used in step 83

M8		Tightening torque	19 Nm

Standard screw connection M6

Used in step 83 94

M6			8 Nm

Chain tensioner piston to cylinder head

Used in step 84

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft

Used in step 85

M7x17.			17 Nm

Cylinder head cover to cylinder head

Used in step 87

M6		Tightening torque.	8,5 Nm

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Clamping claw facing to cylinder head cover

Used in step 88

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 88

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

High pressure lines between injector and rail

Used in step 90

High pressure lines		Tightening torque	28 Nm

Exhaust-gas recirculation cooler to exhaust manifold

Used in step 92 98

M8x28	Replace screws	Tightening torque	32 Nm

Oil return line to turbocharger

Used in step 92 93

M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase

Used in step 92

M8x16		Tightening torque	22 Nm

Exhaust turbocharger to exhaust manifold

Used in step 93

V-band clamp		Tightening torque	19 Nm

Oil feed line to bracket

Used in step 93

Torx screw M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase

Used in step 93

M8x16		Tightening torque	22 Nm

Heat shield for exhaust turbocharger

Used in step 94

Torx screw BM 6x12		Tightening torque	10 Nm

Banjo bolt for exhaust pressure pipe to exhaust manifold

Used in step 94

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

Charge air duct to oil sump

Used in step 95

M6		Tightening torque	8 Nm

Ride height sensor holder to front axle support

Used in step 95

M6		Tightening torque	8 Nm

Adapter, front axle support to front axle support

Used in step 95

		Tightening torque	100 Nm

Cross connection to front axle support

Used in step 95

M6		Tightening torque	12 Nm

Washer fluid reservoir to body

Used in step 96

M6x20		Tightening torque	8 Nm

Intake plenum to cylinder head

Used in step 97

M6		Tightening torque	11 Nm

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Exhaust-gas recirculation cooler to cylinder head — Used in step 98

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler — Used in step 98

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to cylinder head — Used in step 98

M8x20		Tightening torque	19 Nm

Wiring harness to cylinder head cover — Used in step 99 133

TS5x20		Tightening torque	3,5 Nm

Positive battery cable to alternator — Used in step 99

M8		Tightening torque	19 Nm

Fuel line to intake plenum — Used in step 99

TS6x20		Tightening torque	5 Nm

Cover to electronics box — Used in step 99 133

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery — Used in step 99 133

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray — Used in step 99 133

M8		Tightening torque	19 Nm

Diesel particulate filter V-clip to exhaust turbocharger — Used in step 100

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Diesel particle filter to holder — Used in step 100

M8 hexagon nut		Tightening torque	19 Nm

Diesel particulate filter holder to gearbox — Used in step 100

M12x75		Tightening torque	66 Nm

Diesel particulate filter bracket to crankcase — Used in step 100

M10x35		Tightening torque	38 Nm

SCR metering module V-clip to exhaust system — Used in step 100

V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm

Holder for coolant lines to diesel particulate filter — Used in step 100

Torx bolt BM6x16		Tightening torque	8 Nm

Differential pressure sensor to holder — Used in step 100

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor — Used in step 100

Clamp 15–19mm		Tightening torque	3 Nm

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Control sensor

Used in step 101

Control sensor		Tightening torque	50 Nm

Exhaust temperature sensor to diesel particulate filter

Used in step 102 103

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Exhaust-gas temperature sensor to exhaust system

Used in step 104

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Oxygen sensor holder to intermediate shaft

Used in step 105

Hexagon screw M6x16		Tightening torque	8 Nm

Nitrogen oxide sensor before SCR catalytic converter

Used in step 106

Sensor		Tightening torque	50 Nm

Monitoring sensor

Used in step 107

Sensor		Tightening torque	50 Nm

Transfer box to transmission

Used in step 108

M10		Tightening torque	56 Nm

Heat shield to transfer box

Used in step 108

M6	Renew screws.	Tightening torque	6 Nm

Oil filler plug on transfer box (VTG)

Used in step 108

M18x1.5		Tightening torque	35 Nm

Intermediate shaft to transfer box

Used in step 109

M8x35		Tightening torque	19 Nm

Starter motor to transmission

Used in step 110

M8x45		Tightening torque	19 Nm

Battery positive lead to starter

Used in step 110

M8		Tightening torque	13,5 Nm

Propeller shaft to transfer box

Used in step 113

		Tightening torque	80 Nm

Flexible disc to rear axle final drive

Used in step 113

M12x1.5	Renew screws.	Tightening torque	55 Nm 90 °

Centre mount to body

Used in step 113

M8		Tightening torque	19 Nm

Heat shield to body

Used in step 114 115

Bolts/nut		Tightening torque	3 Nm

Bracket to body

Used in step 114

M8		Tightening torque	21 Nm

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Exhaust system to body — Used in step 116

M8	Replace nuts.	Tightening torque	19 Nm

Exhaust bracket on body — Used in step 116

Hexagon screw M8x30		Tightening torque	19 Nm

V-clip to catalytic converter — Used in step 116

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

Diesel particulate sensor to exhaust system — Used in step 116

Sensor		Tightening torque	50 Nm

Nitrogen oxide sensor downstream of SCR catalytic converter — Used in step 116

Sensor		Tightening torque	50 Nm

Cross-member/torsion strut to axle support and mounting — Used in step 117

M12x48	Renew screws.	Jointing torque Angle of rotation	100 Nm 90 °

Front connection carrier to body — Used in step 118

M10x18		Tightening torque	56 Nm

Rear connection carrier to body — Used in step 118

M8x18		Tightening torque	28 Nm

Track rod end to swivel bearing — Used in step 119

M14	Renew nut.	Tightening torque	175 Nm

Wishbone to swivel bearing — Used in step 119

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

Holder, wishbone rubber mount, to body — Used in step 120

M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °

Holder with rubber mount to front axle support — Used in step 120

M12 screw			100 Nm

Washer fluid reservoir holder to front axle support adapter plate — Used in step 120

		Tightening torque	10 Nm

Deformation element, bottom, to adapter plate, front axle carrier — Used in step 120

		Tightening torque	11,8 Nm

Holder to front axle support — Used in step 121

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

Anti-roll bar link to anti-roll bar — Used in step 123

M10	Renew nut.	Tightening torque	56 Nm

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Underbody panelling, side

Used in step 125

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side

Used in step 125

Plastic nut		Tightening torque	2,6 Nm

Wheel arch cover to body

Used in step 126

Plastic nut		Tightening torque	2,6 Nm
Screw		Tightening torque	2,6 Nm

Wheel arch cover to body

Used in step 126

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Used in step 126

Plastic nut		Tightening torque	3 Nm

Brake disc to rear wheel hub

Used in step 127

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub

Used in step 127

M8	Renew screw.	Tightening torque	16 Nm

Wheel bolts

Used in step 127

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Lower steering shaft to steering gear

Used in step 129

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

Steering column cover to bulkhead

Used in step 129

Plastic nut		Tightening torque	3 Nm

Heat shield for exhaust turbocharger

Used in step 130

Torx screw BM 6x12		Tightening torque	10 Nm

Rear bulkhead upper part to lower section of bulkhead

Used in step 131

Oval-head screw		Tightening torque	5 Nm

Battery holder to engine support

Used in step 132

Hexagon screw M8x30		Tightening torque	19 Nm

Electronics box to battery tray

Used in step 133

M8X16		Tightening torque	15 Nm

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Clean air pipe to cylinder head cover

Used in step 134

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing

Used in step 134 140

Clamp		Tightening torque	3 Nm

Resonator to manifold and clean air pipe

Used in step 135

Screw TS6	Renew screw.	Tightening torque	5 Nm

Cover of top bulkhead

Used in step 137

Screw		Tightening torque	2,6 Nm

Cover of remote positive terminal

Used in step 137

Screw		Tightening torque	2,6 Nm

Battery terminal rail to battery tray

Used in step 138

M8			19 Nm

Battery terminal with IBS positive battery terminal / negative battery terminal

Used in step 138 139

NutM6			5 Nm

Trailing link

Used in step 138

M8		Tightening torque	19 Nm

Battery cover

Used in step 138

M8			2,8 Nm

Intake silencer housing to lock bridge

Used in step 140

M6X30		Tightening torque	8 Nm

Intake neck to cross connection

Used in step 141

M6		Tightening torque	8 Nm

Cross-brace to spring strut dome

Used in step 142

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

Cover on body

Used in step 142

Hexagon screw		Tightening torque	3 Nm

Oil filler plug to transmission housing

Used in step 147

M14	Renew the sealing ring.	Tightening torque	45 Nm

Overflow screw in oil drain plug

Used in step 147

M6	Renew the sealing ring.		8 Nm

Oil drain plug / oil filler plug

Used in step 148

Hexagon socket		Tightening torque	43 Nm

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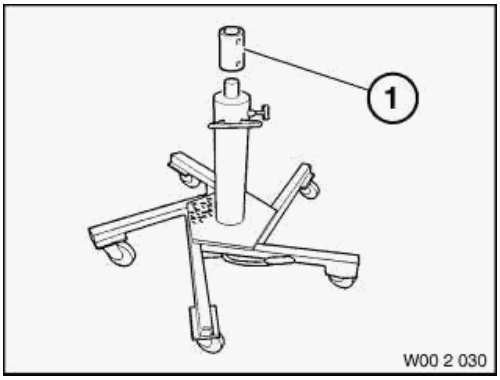
Underbody protection front

Used in step 150

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Overview of Special Tools

0 490 133 (00 2 030) Device



Common Used in step 32 72 77 119

Usage	(universal hydraulic lifter base unit) Chassis and hydraulic lifter - For removing and installing rear axle supports and gearboxes. Also for soft top mounts. Is replaced by 81 22 2 219 012
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 90 (207)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 490 134 (00 2 031)		**Adapter** (adapter for gearbox holder) Model series: E30, E31, E32, E34, E36	

0 495 554 (33 5 070) Extension



Common Used in step 38 113

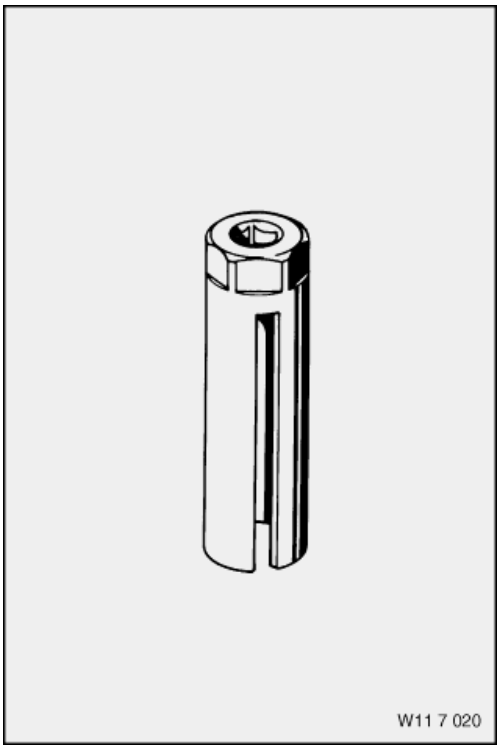
Usage	Pull-out extension for 33 5 040, 33 5 050, 33 5 060.
Included in the tool or work	
Storage location	A18
Replaced by	
In connection with	
SI-Number	01 21 06 (300)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 592 (33 5 071)		**Extension** (Extension (1 item)) discontinued, can only be ordered using complete tool	

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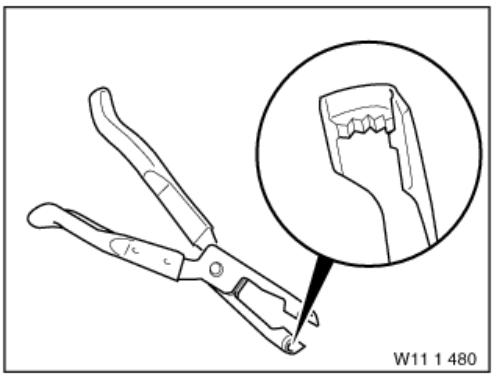
0 491 074 (11 7 020) Socket wrench insert



Common Used in step 44 45 107

Usage	(Socket wrench insert 22 mm) For loosening and tightening the oxygen sensor
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	

0 490 796 (11 1 480) Pliers

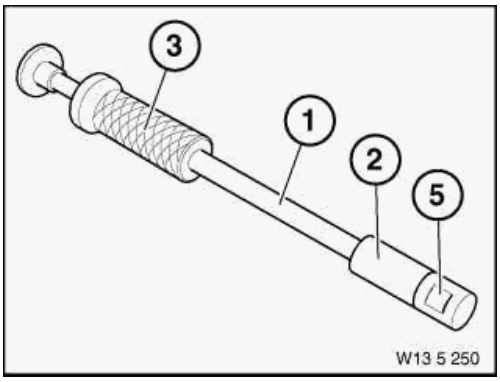


Common Used in step 52 71

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

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0 493 321 (13 5 250) Puller



Common

Used in step 62

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

0 493 339 (13 5 252) Bush



Common

Used in step 62

Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

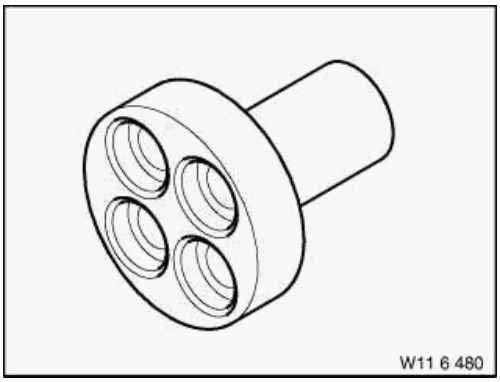
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0 493 340 (13 5 253) Weight



Common	Used in step 62
Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 380 (11 6 480) Connector



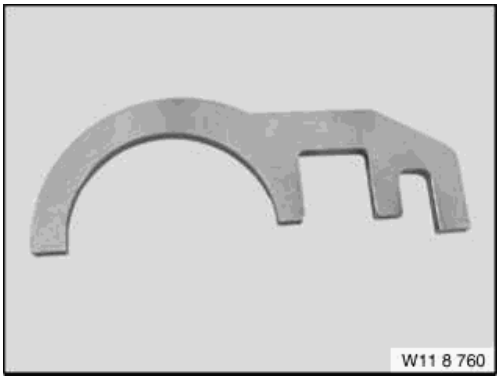
Common	Used in step 64 86
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

2 288 380 Locating stud



Common	Used in step 64 86
Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 112 (11 8 760) Gauge



Common	Used in step 64 86
Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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0 495 105 (11 4 480) oddments tray



Common Used in step 69 70

Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

2 357 071 Panel



Common Used in step 72 77

Usage	Additional mounting plate for lifting table MHT 1200. Delivery quantity: 1 piece. During the course of the changeover from BMWi to iPerformance, a tool changeover also takes place from campaign to warehouse.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	Table lift MHT 1200 81222184136
SI-Number	01 21 13 (987)

2 459 012 Holder

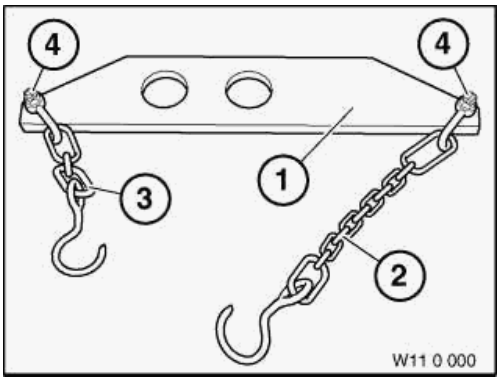


Common Used in step 72 77

Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

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0 490 561 (11 0 000) Lifting gear



Common

Used in step 72 77

Usage	(Hoisting gear) For removing and installing engines. As of 08/2011 only available as a complete set. Delivered with TÜV inspection certificate and operating instructions. No delivery of separate parts.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 13 94 (888)

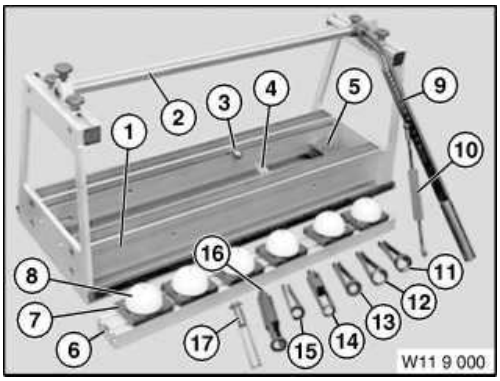
Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
4	0 490 565 (11 0 009)		**Shackle** (Shackle) 2 pieces. As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 562 (11 0 001)		**Lifting gear** (Cross member) As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
2	0 490 563 (11 0 002)		**Chain** (Chain) Version: long As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
3	0 490 564 (11 0 003)		**Chain** (Chain) Version: short As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	

0 494 362 (11 9 000) Device

Used in step 72

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Common

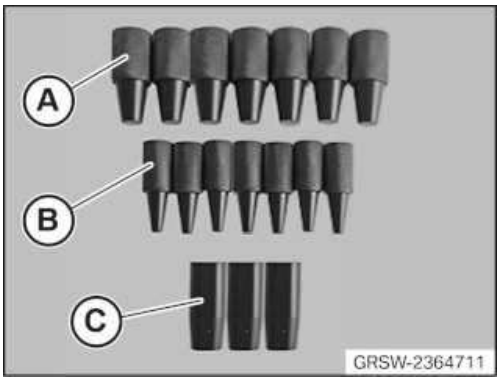
Usage	(Cylinder head expander tool)
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 03 02 (833)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 494 366 (11 9 001)		**Device**	
6	0 494 371 (11 9 006)		**Insert** (Aluminium strip)	
11	0 494 376 (11 9 012)		**Basket** (Valve spring cage) Engine M41, M51, S50	
17	0 495 028 (11 9 017)		**Basket** (Valve spring cage) Engine N52	
2	0 494 367 (11 9 002)		**Rod**	
3	0 494 368 (11 9 003)		**Adapter** (Sliding block)	
4	0 494 369 (11 9 004)		**Tab**	
5	0 494 370 (11 9 005)		**Quick fastener**	
7	0 494 372 (11 9 007)		**Shaped part** (shaped part)	
8	0 494 373 (11 9 008)		**Shaped part** (Shaped part) Shaped part made of plastic	
9	0 494 374 (11 9 009)		**Lever**	
10	0 494 375 (11 9 011)		**Hook**	
12	0 494 377 (11 9 013)		**Basket** (Valve spring cage) Engine M43, M73	
13	0 494 378 (11 9 014)		**Basket** (Valve spring cage) Engine M44, M52, M54, M56, M62, S52, S54, S62	
14	0 494 379 (11 9 015)		**Basket** (Valve spring cage) Engine M47, M47TU, M57, M57TU, N40, N42, N62, N73	
15	0 494 380 (11 9 016)		**Basket** (Valve spring cage) Engine M21, M40	

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2 364 711 Plug



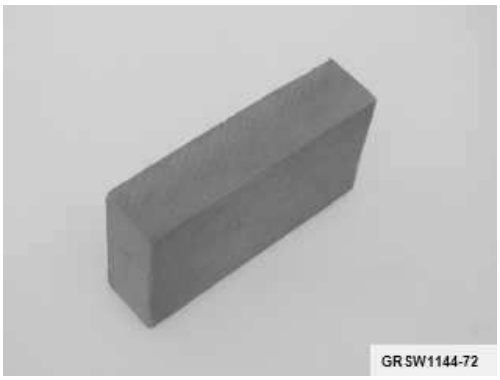
Common	Used in step 73
Usage	For closing the pressure oil holes for cleaning the cylinder head sealing surfaces.
Included in the tool or work	
Storage location	C20
Replaced by	
In connection with	
SI-Number	01 50 14 (203)

0 495 103 (11 4 471) Scraper



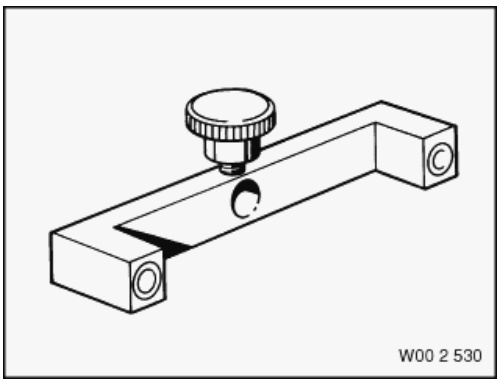
Common	Used in step 73
Usage	
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

0 495 104 (11 4 472) Extractor



Common	Used in step 73
Usage	(grindstone)
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

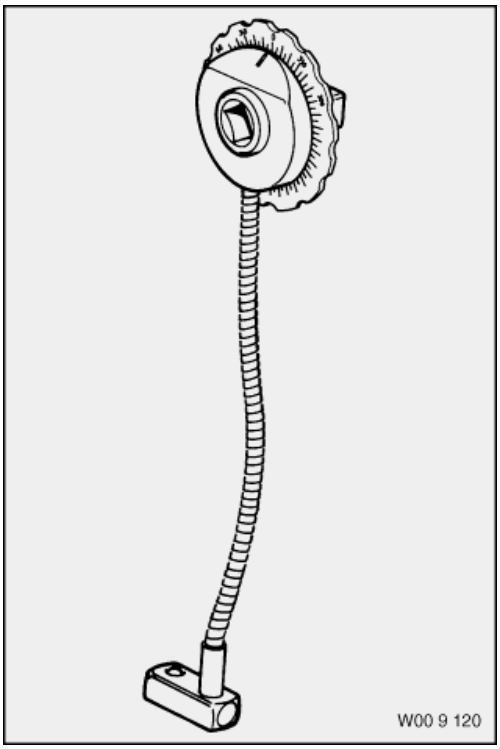
0 490 185 (00 2 530) Bridge



Common	Used in step 75
Usage	(Measuring bridge) For determining the piston projection (Diesel)
Included in the tool or work	
Storage location	A3
Replaced by	
In connection with	
SI-Number	

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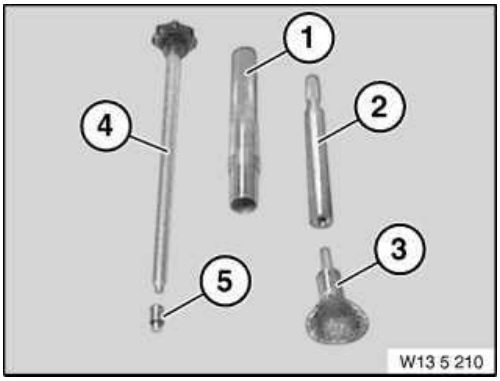
0 490 504 (00 9 120) Torque angle measuring dial



Common Used in step 77 113

Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

0 493 763 (13 5 215) Plug

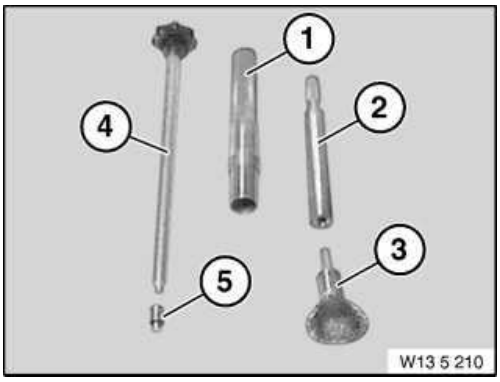


Common Used in step 88

Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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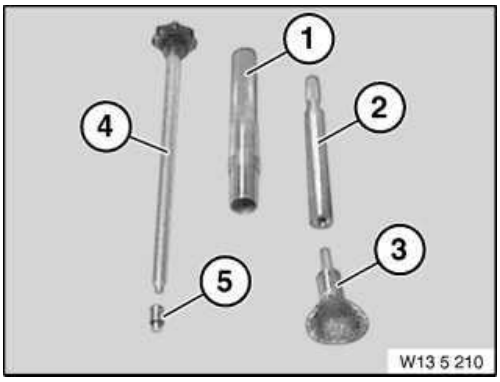
0 493 762 (13 5 214) Rod



Common Used in step 88

Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 758 (13 5 210) Tool



Common Used in step 88

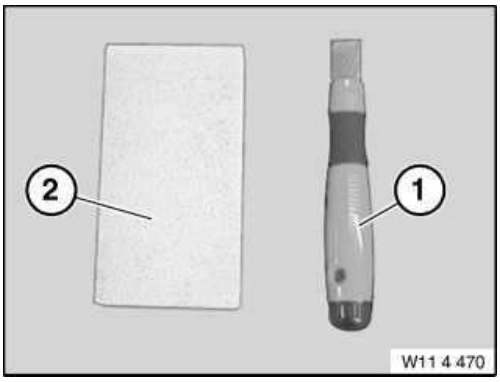
Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

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0 495 102 (11 4 470) Tool



Common Used in step 92

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

2 409 025 Puller



Common Used in step 108

Usage	For disassembly of the outer radial shaft seal of the transmission output shaft, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A76
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 411 739 Puller

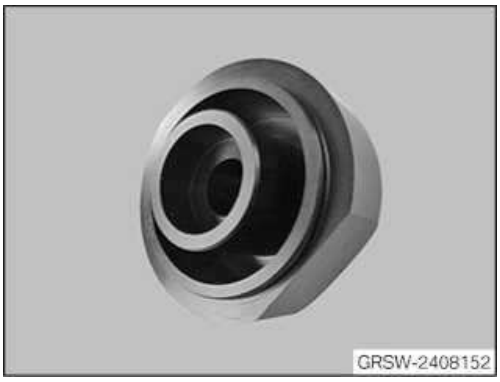


Common Used in step 108

Usage	For disassembly of the inner radial shaft seal of the output, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C78
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

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2 408 152 Striking element



Common Used in step 108

Usage	For installation of the right radial shaft seal transmission output shaft (inner). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

2 413 037 Handle



Common Used in step 108

Usage	Universal drift handle. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C77
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

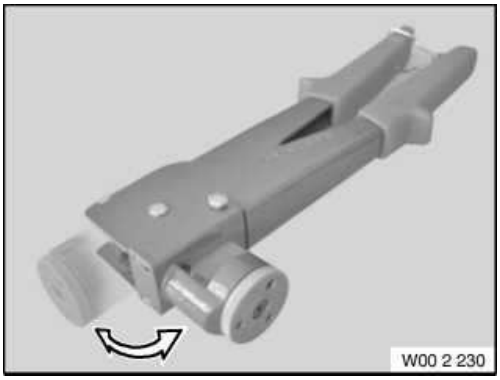
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2 408 150 Striking element



Common	Used in step 108
Usage	For installing the right radial shaft seal transmission output shaft (outer). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

0 496 521 (00 2 230) Pliers



Common	Used in step 126
Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

2 344 011 Tool



Common	Used in step 127
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

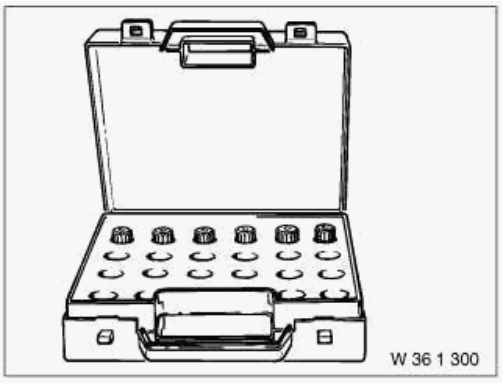
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0 495 221 (36 1 323) Wheel stud



Common	Used in step 23
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud



Common	Used in step 23
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud



Common	Used in step 23
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud



Common	Used in step 23
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 227 (36 1 329) Wheel stud



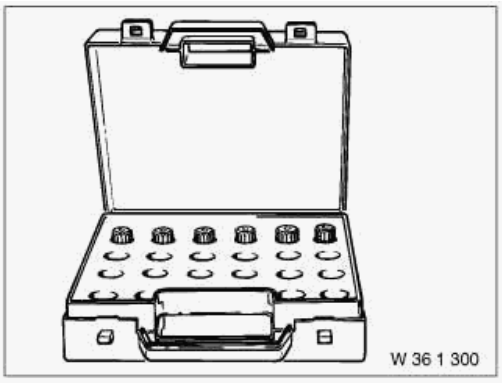
Common	Used in step 23
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud



Common	Used in step 23
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 229 (36 1 332) Wheel stud



Common	Used in step 23
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 230 (36 1 333) Wheel stud



Common	Used in step 23
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Cylinder head flatness	Used in step 74
Maximum lengthwise deviation from flatness	0,10 mm
Maximum transverse deviation from flatness	0,05 mm

Valve underprotrusion	Used in step 75
	0,8 (0,7 - 0,9) mm

Transmission oil capacity	Used in step 148
Transmission oil GS6-60DA, GS6X60DA/Owner's Handbook	2,2 l

Transmission oil: Technically suitable manual gearbox oil

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	54 98
EGR controller	54 98

General repair instructions	Used in step
61 20 ... Notes on AGM battery	139
61 12 ... Notes on intelligent battery sensor (IBS)	139
61 00 ... Notes for disconnecting and connecting battery	139
41 00 ... Notes on repairing threads	
61 00 ... Safety information for handling vehicle battery	

Repair instructions	Used in step

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61 35 ... Notes on ESD protection (Electro Static Discharge)	12 44 45 47 48 49 50 51 62 71
17 00 008 Draining and topping up coolant for high-temperature circuit	146
17 00 008 Draining and topping up coolant for high-temperature circuit	146
17 00 008 Draining and topping up coolant for high-temperature circuit	146
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	146
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	146
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	146
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	146
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17 00 039 Bleed the cooling system and check it for watertightness with the special tool	146
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	146
17 00 039 Bleed the cooling system and check for watertightness with the special tool (coolant circuit for low temperature)	146
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	146
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	146
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	146
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	146
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	146
17 00 039 Bleeding the cooling system (B36, B38, B46, B48)	146
17 00 039 Bleeding cooling system (B37, B47)	146
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	146
17 00 039 Filling and bleeding the high-temperature cooling system vacuum filler device (B48)	146
17 00 008 Draining and topping up the high-temperature coolant circuit	146
17 00 008 Draining and topping up the high-temperature coolant circuit	146
17 00 016 Draining and topping up coolant circuit for Range Extender \PREMIUM	146
17 00 008 Draining and topping up the high-temperature coolant circuit	146
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	146
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	146
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	146

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17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	146
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	146
00 .. ... Raising the vehicle using a vehicle hoist	

Operating materials	Used in step
2.0 Grease for wheel centring	127
14.0 Automatic transmission fluid for ZF-transmission GA8HP45Z / GA8HP50Z / GA8HP70Z / GA8HP90Z / GA8P70H / GA8P75H / GA8HP75Z	147

Operating materials	Used in step

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	84
Exhaust-gas recirculation cooler seal on exhaust manifold	98
Exhaust-gas recirculation cooler seal on intake plenum	98

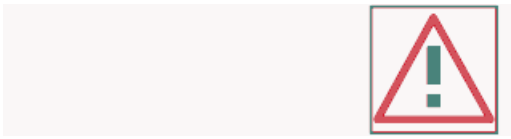
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11 12 100 Removing and installing cylinder head (B47)



Special tools required:

- 11 1 480
- 2 414 691
- 2 357 071
- 11 4 470
- 11 4 471
- 11 4 472
- 2 364 711
- 00 2 530



Attention!

There must be no coolant, water or engine oil in any of the threaded holes in the engine block.

Fit new cylinder head bolts.

Do not wash off bolt coating.

Jointing torque and angle of rotation must be observed without fail (**risk of damage!**).



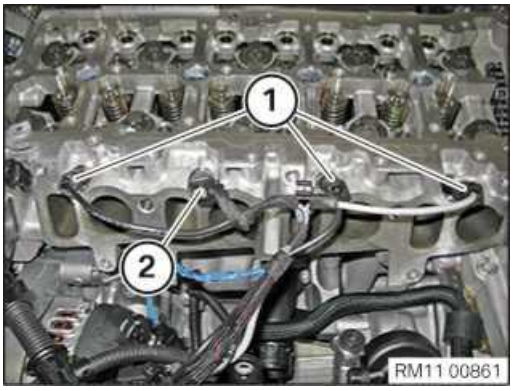
Necessary preliminary work:

- Remove front right wheel arch cover.
  Remove exhaust turbocharger.
- Remove diesel particulate filter.
- Remove exhaust-gas recirculation cooler
- Remove oil feed line.
- Remove cylinder head cover.
- Remove all valve clearance compensating elements.



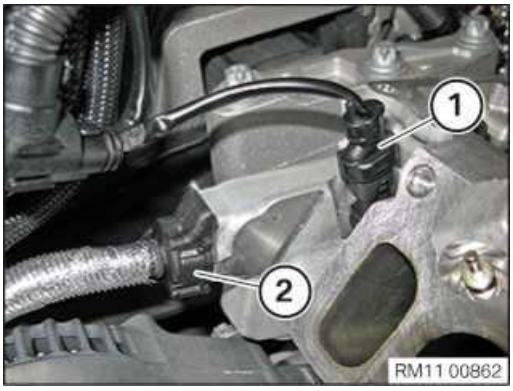
Removal:

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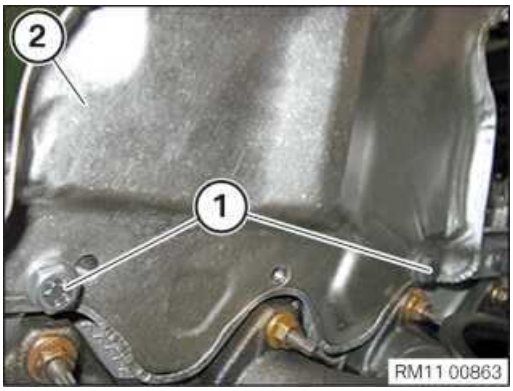
Loosen connector (1) with special tool 11 1 480 .

Disconnect plug (2).



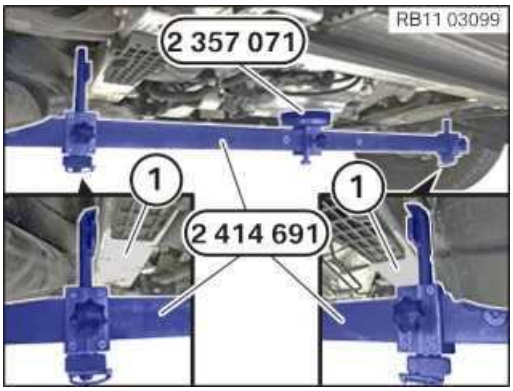
Unlock and disconnect the connector (1) for the coolant temperature sensor.

Unlock coolant line (2) and pull off.



Release screws (1).

Remove heat shield (2).



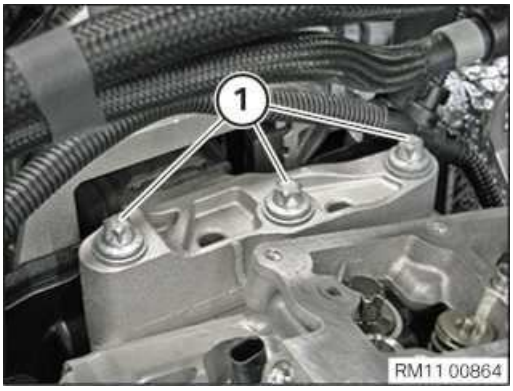
Prepare special tool 2 414 691 together with the special tool 2 357 071 .

Attach the special tool 2 414 691 on the front axle support and correctly align and tighten the special tool 2 357 071 under the oil sump.

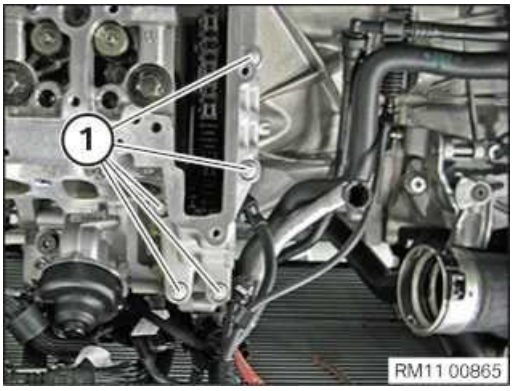
Turn the special tool 2 414 691 on the adjusting screws evenly in an upward direction, until the special tool 2 357 071 touches the oil sump.

Tighten all the adjusting screws of special tools 2 414 691 and 2 357 071 .

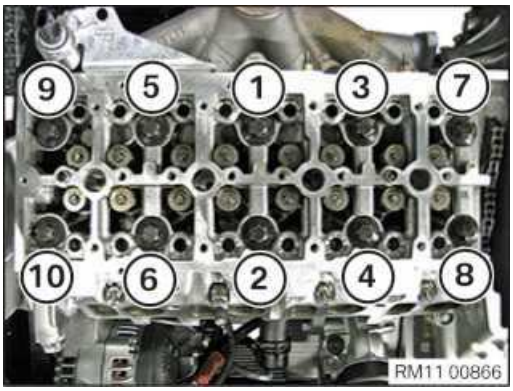
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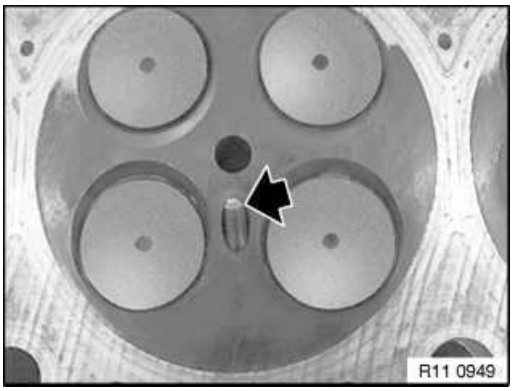
Release screw connection (1) of right engine support.



Release screws (1).



Loosen cylinder head bolts in **sequence 10 - 1** .



Attention!

Glow elements protrude at the sealing surface and may be damaged when put down.

Remove cylinder head.

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Check fitting sleeves (1) for damage and correct installation position.

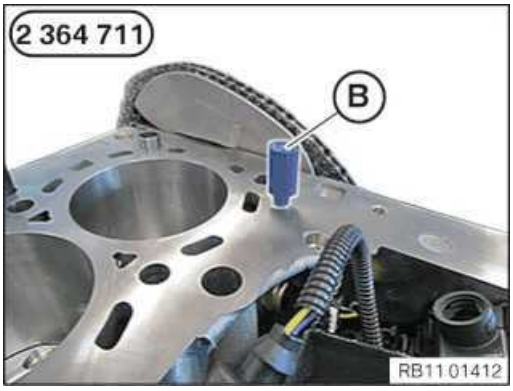
Attention!

Do not use any metal-cutting tools (e.g. emery cloth).

Clean sealing surfaces on the cylinder head and crankcase using special tool 11 4 470 .

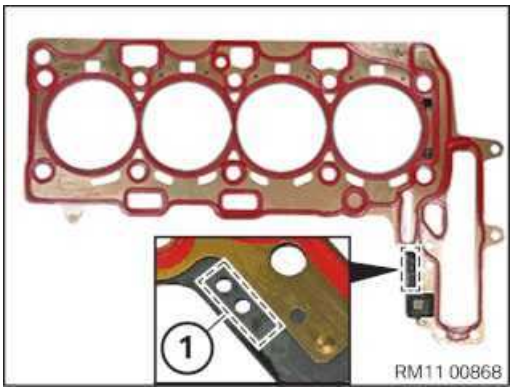
Installation:

Note:
The oil ducts must be sealed before cleaning the sealing surfaces using special tools 11 4 471 and 11 4 472 .



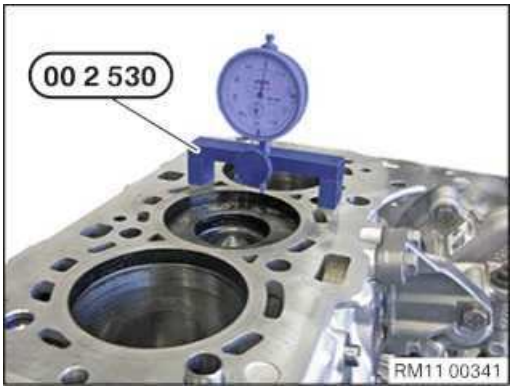
Seal front oil duct with special tool **(B)** from tool set 2 364 711 .**Attention!**

Do not use any metal-cutting tools (e.g. emery cloth).



Note:
Without work on the engine block which alters the piston protrusion, use a new cylinder head gasket with the same gasket thickness (number of holes).

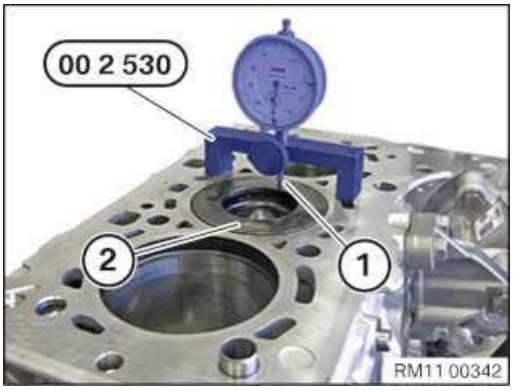
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If work was carried out on the crankshaft drive or piston, the gasket thickness must be redetermined.

Measuring the piston protrusion:

Place dial gauge on the cleaned cylinder sealing surface using special tool 00 2 530 . Set dial gauge to zero under preload.

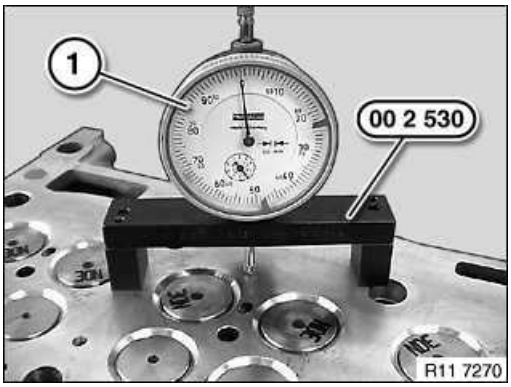


Clean piston at measuring points (1 and 2).

Place dial gauge on the measuring points (1 and 2) on the cleaned piston. Determine highest point by turning crankshaft.

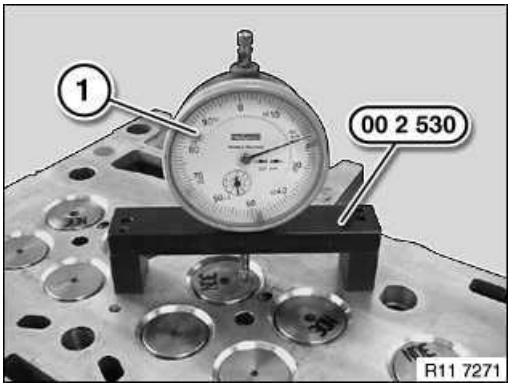
Measure and note down piston protrusion at measuring points (1 and 2) on all 3 pistons.

Note:
Determine thickness of cylinder head gasket.



Position special tool 00 2 530 with dial gauge (1) on cylinder head.

Set dial gauge (1) to zero.



Position special tool 00 2 530 with dial gauge (1) on valve.

Determine valve underprotrusion.

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Attention!

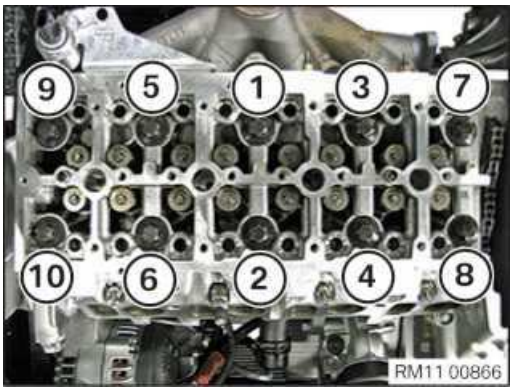
There must be no coolant, water and engine oil in any of the threaded holes in the engine block.

Fit new cylinder head bolts.

Do not wash off bolt coating.

Lightly oil screw head support.

Jointing torque and angle of rotation must be observed without fail (**risk of damage!**).

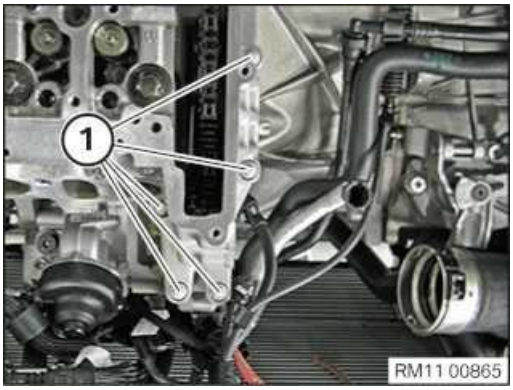


Parts: Fit new cylinder head bolts.

Position the new cylinder head gasket with the previously determined gasket thickness.

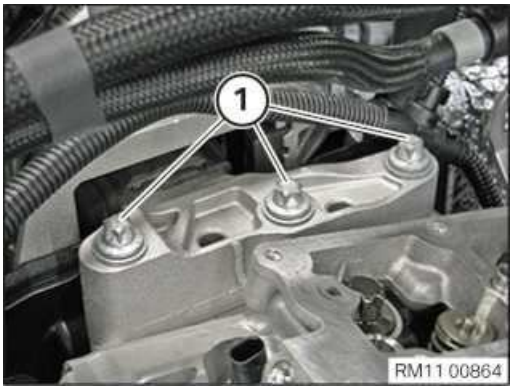
Fit the cylinder head and secure with new bolts, tightening in the sequence 1 to 10.

Tightening torque: 11 12 1AZ.



Install and tighten down screws (1).

Tightening torque: 11 12 2AZ.

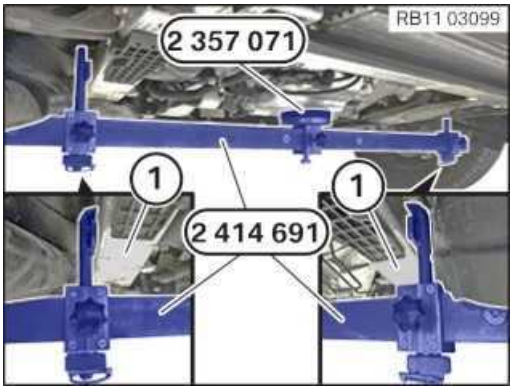


Parts: Renew screws (1).

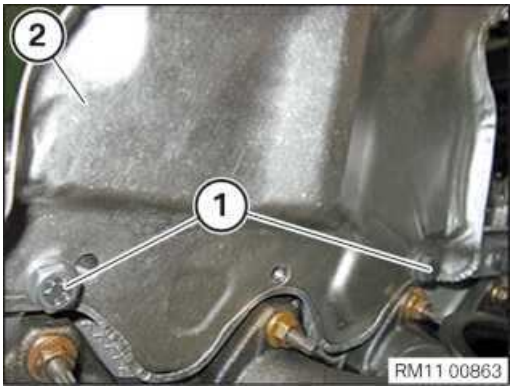
Screw engine mount to engine mounting bracket (1).

Tightening torque: 22 11 1AZ.

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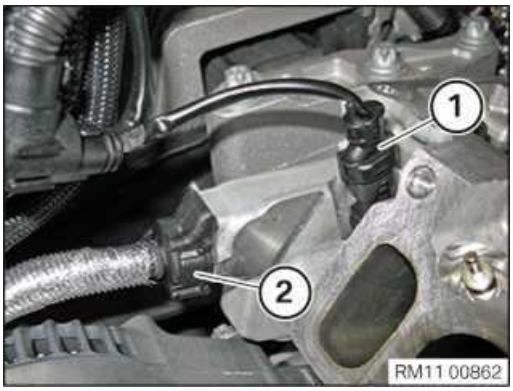
Disassemble the special tool 2 414 691 .



Mount heat shield (2).

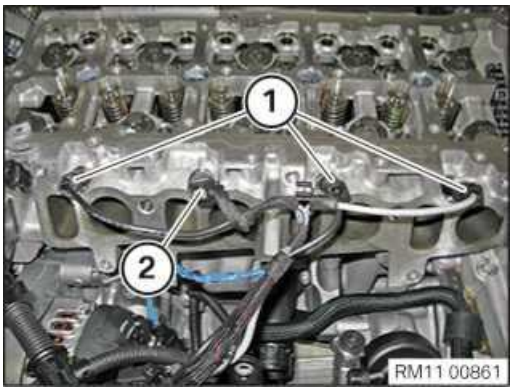
Tighten down screws (1).

Tightening torque: 11 65 3AZ.



Connect coolant line (2).

Connect connector (1) for coolant temperature sensor.



Connect all connectors (1 and 2) and lock.*Note:*
Connectors (1 and 2) must engage audibly.

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Required reworking:

- Install all valve clearance compensating elements.
- Install cylinder head cover.
- Install oil feed line.
- Install exhaust-gas recirculation cooler.
- Install diesel particulate filter.
- Install exhaust turbocharger.
- Install front right wheel arch cover.

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11 12 000 Removing and installing/sealing cylinder head cover

PRELIMINARY WORK

1 – Disconnecting all battery earth leads

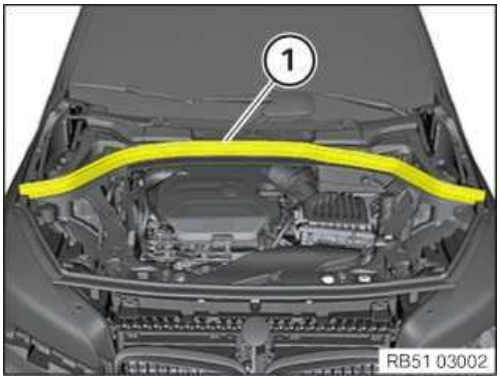


- See additional information.

2 – Remove the seal for the rear bonnet

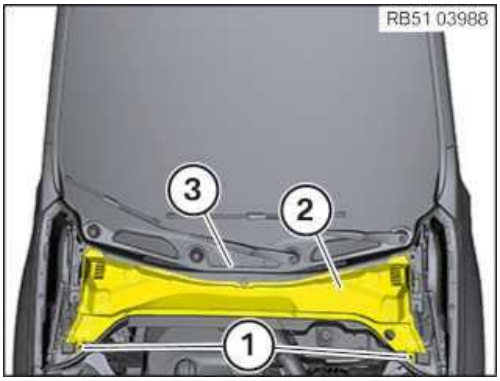
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Pull off rear bonnet seal (1) towards the top and remove.

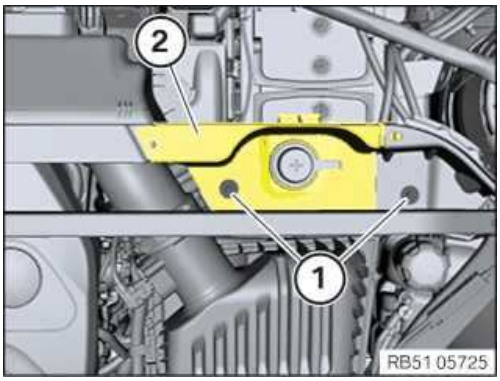
3 – Removing front cowl panel cover



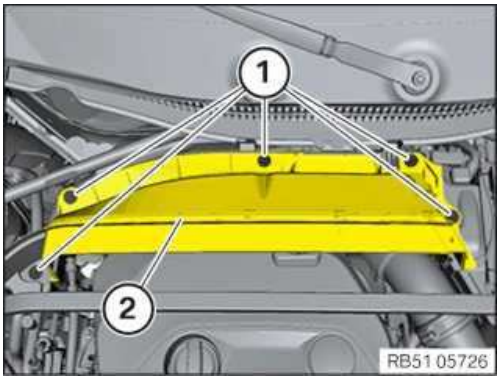
- Loosen the expanding rivet (1).
- Feed out and remove front cowl panel cover (2) from the rear cowl panel cover(3).

4 – Removing the upper bulkhead cover

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- Loosen screws (1).
- Guide out and remove the cover (2).

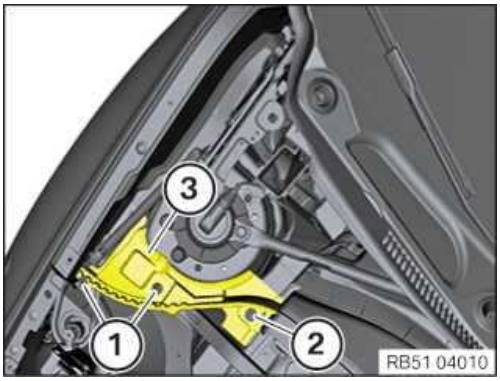


- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

5 – Remove suspension cross-brace

TECHNICAL INFORMATION

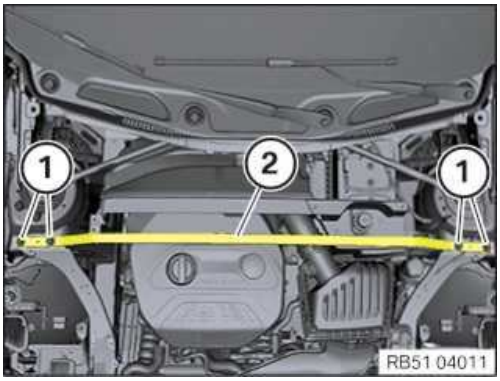
Driving without the strut brace/front end or tension strut is not permitted.



NOTICE

Description is for right component only. The procedure on the left side is identical.

- Loosen expanding rivet (1).
- Loosen screw (2).
- Remove the cover (3).



- Loosen screws (1).
- Remove strut brace (2).

6 – Removing the acoustic cover

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

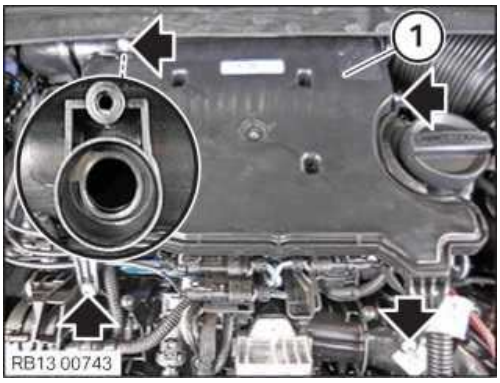
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

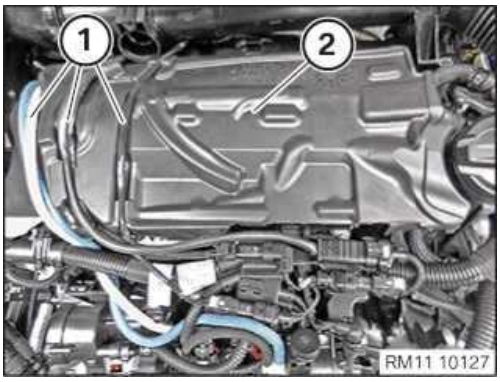
- Unclip the acoustic cover from the marked areas towards the top.

7 – Remove resonator



- Remove screws (arrows).
- Guide out and remove the resonator (1).

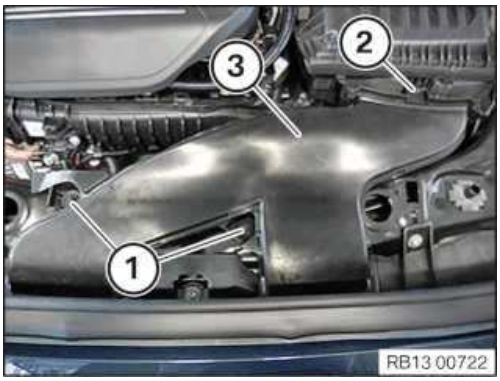
8 – Remove the acoustic cover for the injectors



- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

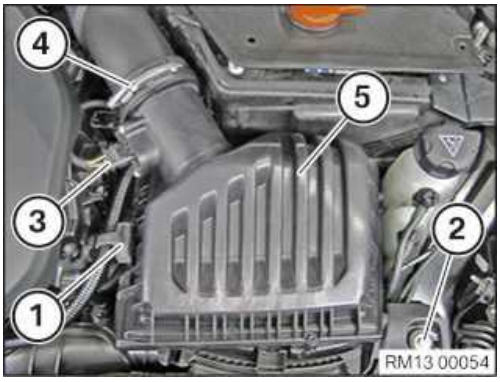
9 – Remove the intake neck for intake silencer housing

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- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

10 – Removing intake silencer housing

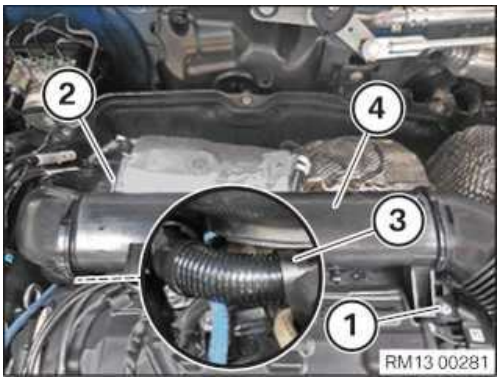


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

11 – Removing clean air pipe



- Detach clamp (1) on the clean air pipe.
- Pull off the clean air pipe from the intake silencer housing.

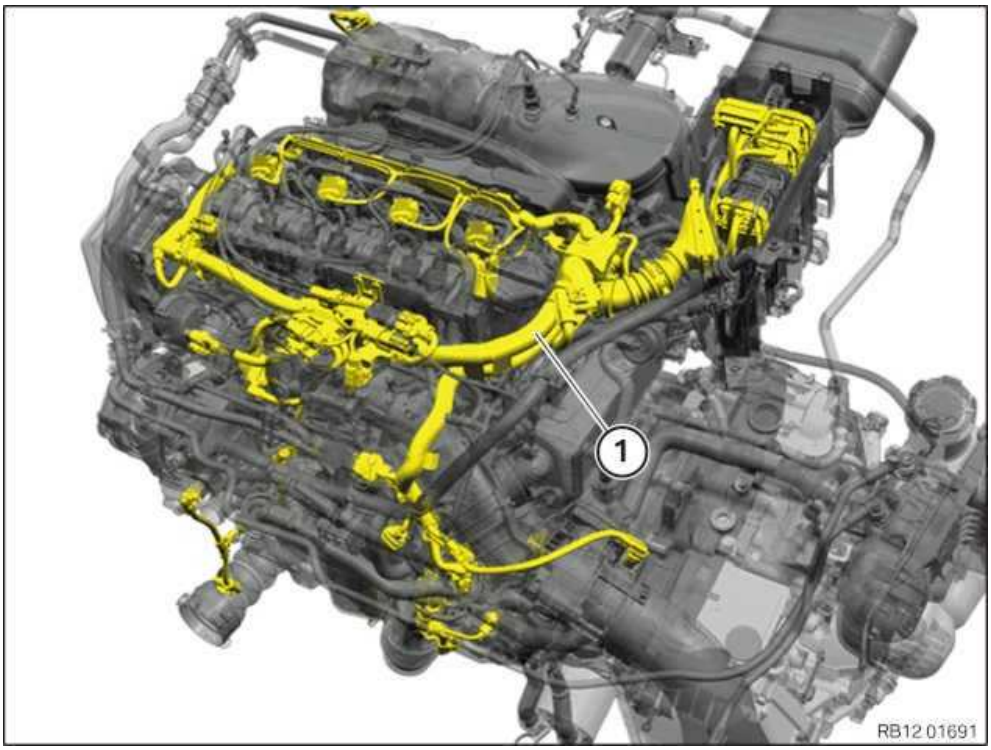


- Loosen screw (1).
- Loosen clamp (2).
- Unlock the ventilation line (3) and pull it off the cylinder head cover.
- Feed out clean air pipe and remove.

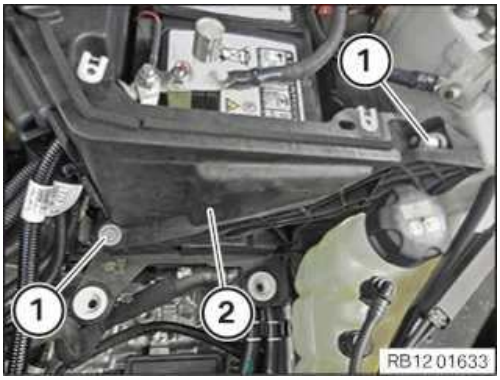
12 – Releasing the wiring harness section for the intake plenum

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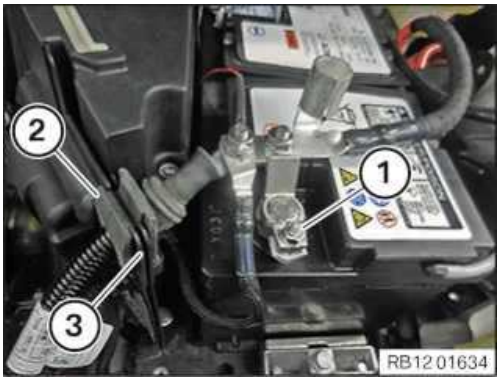
Overview: Wiring harness section for the engine



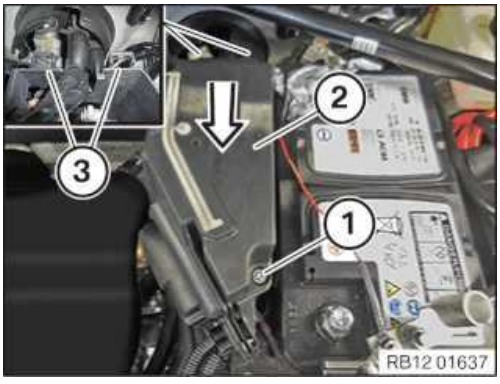
1 Wiring harness section for the engine



- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.

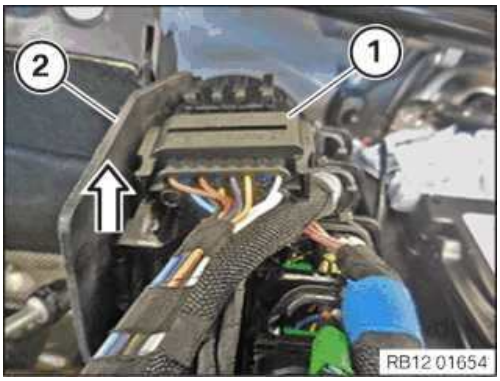


- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

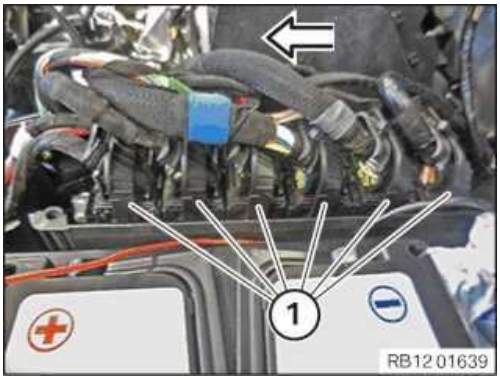


- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.

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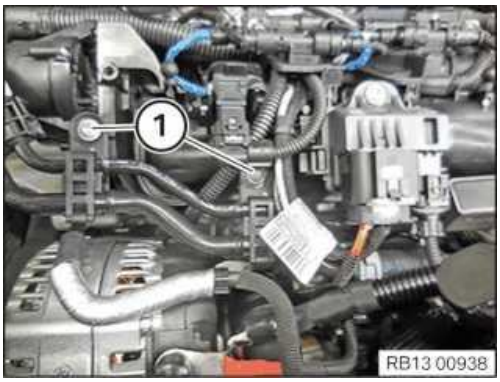
- Guide the connector (1)out of the electronics box (2) in the direction of arrow and remove it.
- Unlock and loosen connector (1).



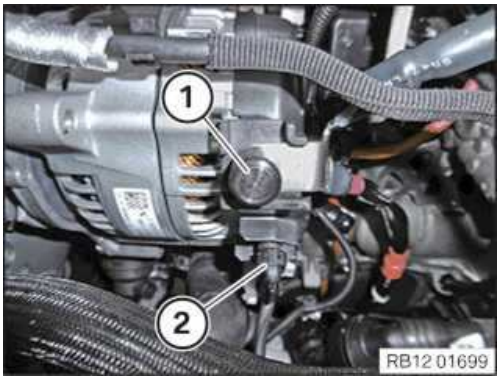
- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



- Unlock and loosen connector (1).

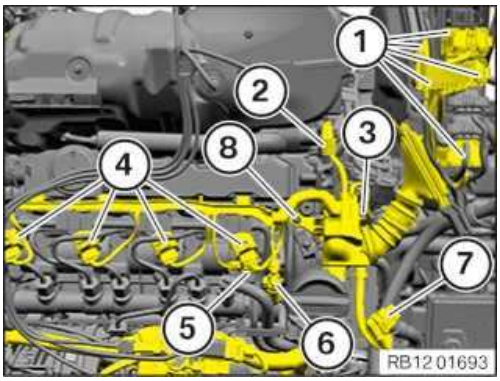


- Loosen screws (1).

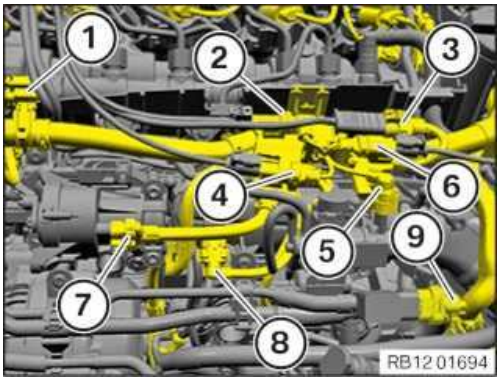


- Release the positive battery cable (1) on the alternator and place to one side.
- Unlock connector (2) and pull off.

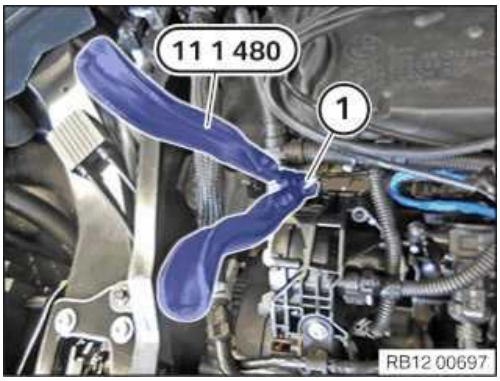
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- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock the connector (2) and disconnect it from the differential pressure sensor.
- Unlock the connector (3) and disconnect it from the exhaust-gas recirculation valve.
- Unlock the connector (4) and pull off from the injectors.
- Unlock the connector (5) and disconnect it from the camshaft sensor.
- Unlock the connector (6) and disconnect it from the fuel pressure regulator.
- Unlock connector (7) and pull off from hot film air mass meter.
- Loosen screw (8).

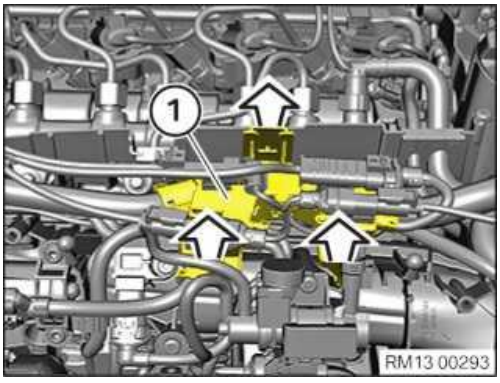


- Unlock connector (1) and pull off from the rail pressure sensor.
- Unlock the connector (2) and disconnect it from the exhaust temperature sensor before the diesel particulate filter.
- Unlock and disconnect the connector (3) from the front oxygen sensor.
- Unlock the connector (4) and disconnect it from the exhaust temperature sensor after the diesel particulate filter.
- Unlock and disconnect the connector (5) from the electric changeover valve.
- Unlock the connector (6) and disconnect it from the exhaust temperature sensor for the exhaust-gas recirculation cooler.
- Unlock the connector (7) and disconnect it from the servomotor for the swirl flaps.
- Unlock the connector (8) and pull it off the charging pressure sensor.
- Unlock the connector (9) and disconnect from the fuel pressure and temperature sensor.



- Unlock the connectors (1) of all glow elements with the special tool **0 490 796 (11 1 480)** and release them.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.

▶ **Removing the cable clips from the intake plenum**



- Detach the cable clip (1) in the direction of the arrow.
- Guide out the cable clip (1) in direction of arrow and set it aside.

13 – Removing the intake plenum

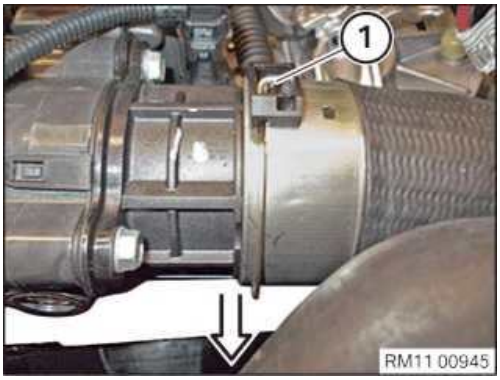
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TECHNICAL INFORMATION

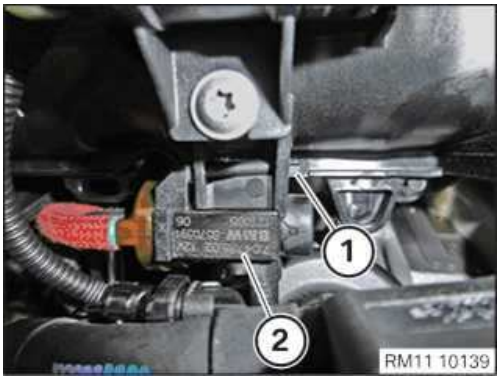
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



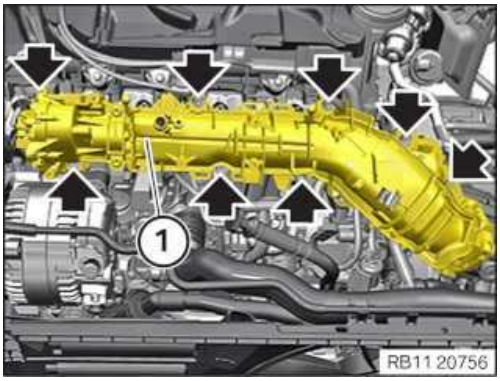
- Unlock the lock (1).



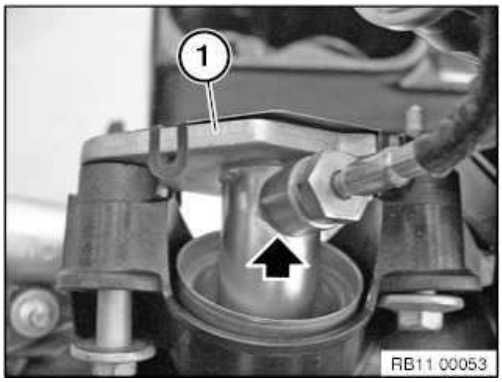
- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.



- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



- Release the screws (arrows) from the intake plenum (1).
- Guide the intake plenum (1) out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

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14 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

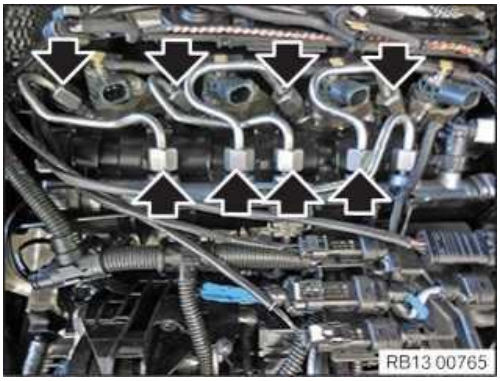
TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release the high pressure lines (arrows) with the special tool .
- Catch and dispose of escaping fuel.
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool .

15 – Detaching leakage oil line from injector

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Contaminant or foreign body.

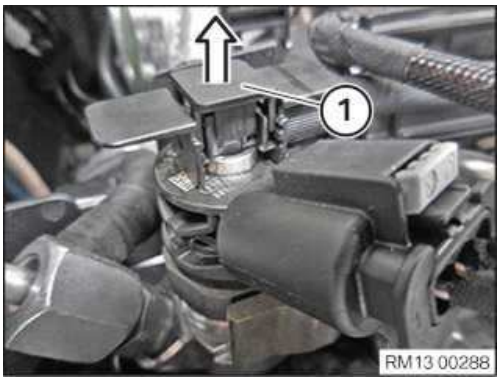
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

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- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

16 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

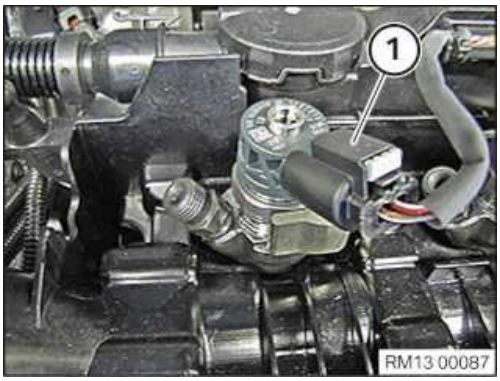
Electrostatic discharge.

Damage to or destruction of electrical components.

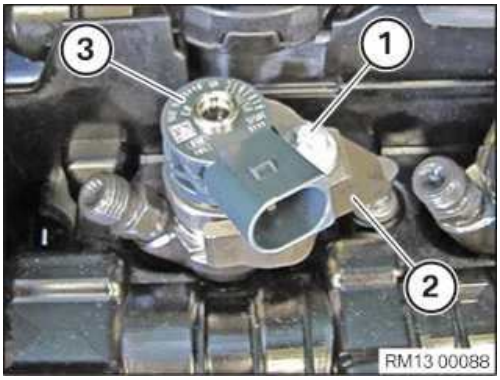
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.



- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

▶ **Loosen stuck injectors**

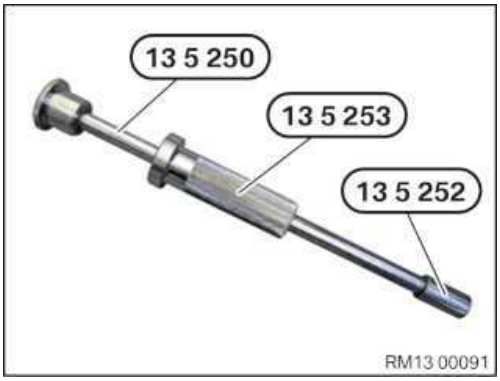
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RISK OF DAMAGE

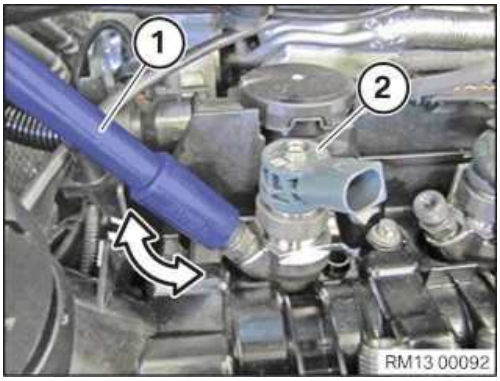
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)**back onto the special tool **0 493 321 (13 5 250)**.



- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

17 – Remove high-pressure rail

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

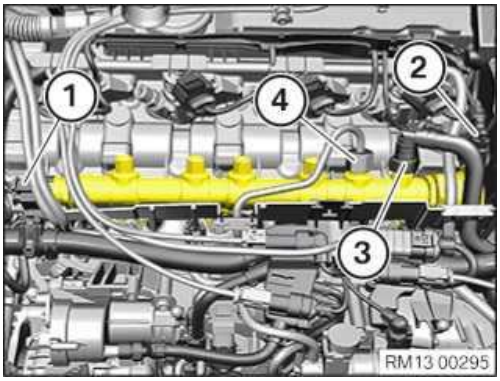
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TECHNICAL INFORMATION

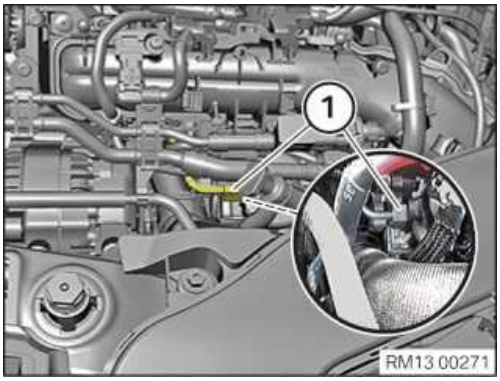
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

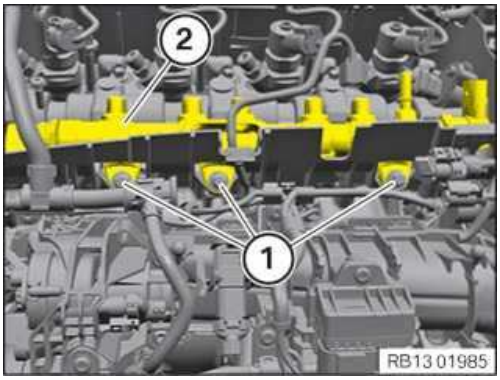
Reset special tool in early to avoid bending pressure lines.



- Unlock and disconnect connector (1).
- Unlock and disconnect connector (2).
- Unlock and release fuel line (3).
- Loosen union nut (4) with special tool .
- Reset special tool early on to avoid bending pressure lines.



- Slacken the union nut (1) on the high pressure pump.



- Loosen screws (1).
- Carefully thread out and remove the rail (2).
- Make sure the pressure line of the high pressure pump is not bent.

18 – Remove differential pressure sensor

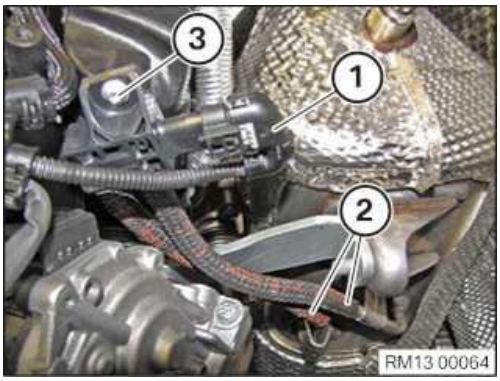
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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

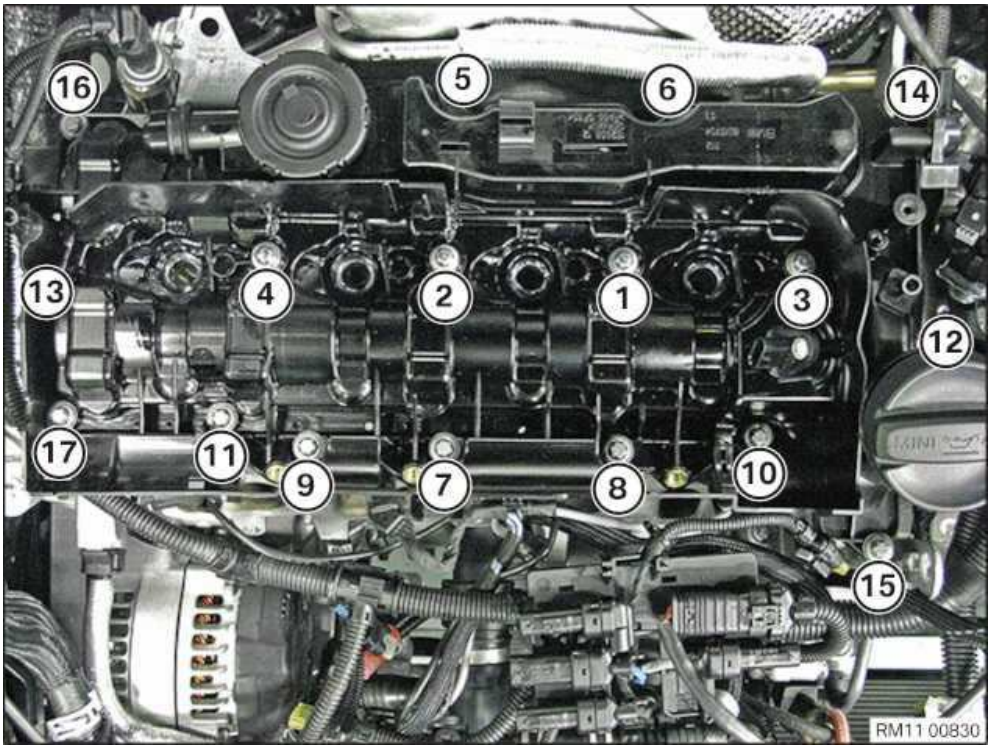


- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

MAIN WORK

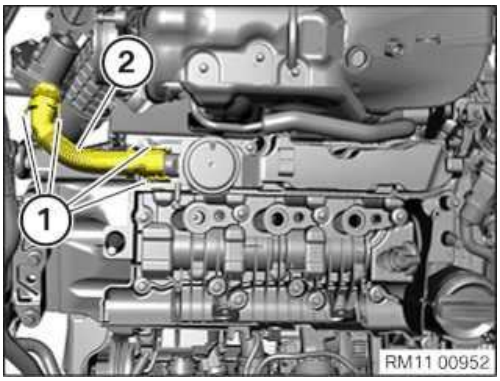
19 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover

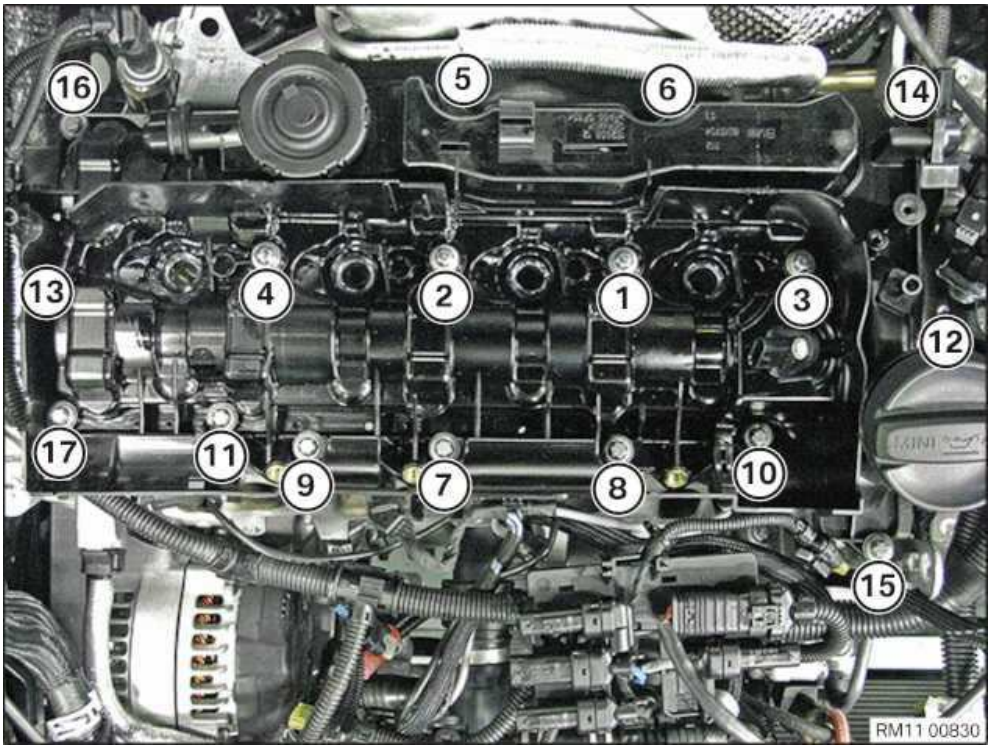


1 to 16 screws of the cylinder head cover.

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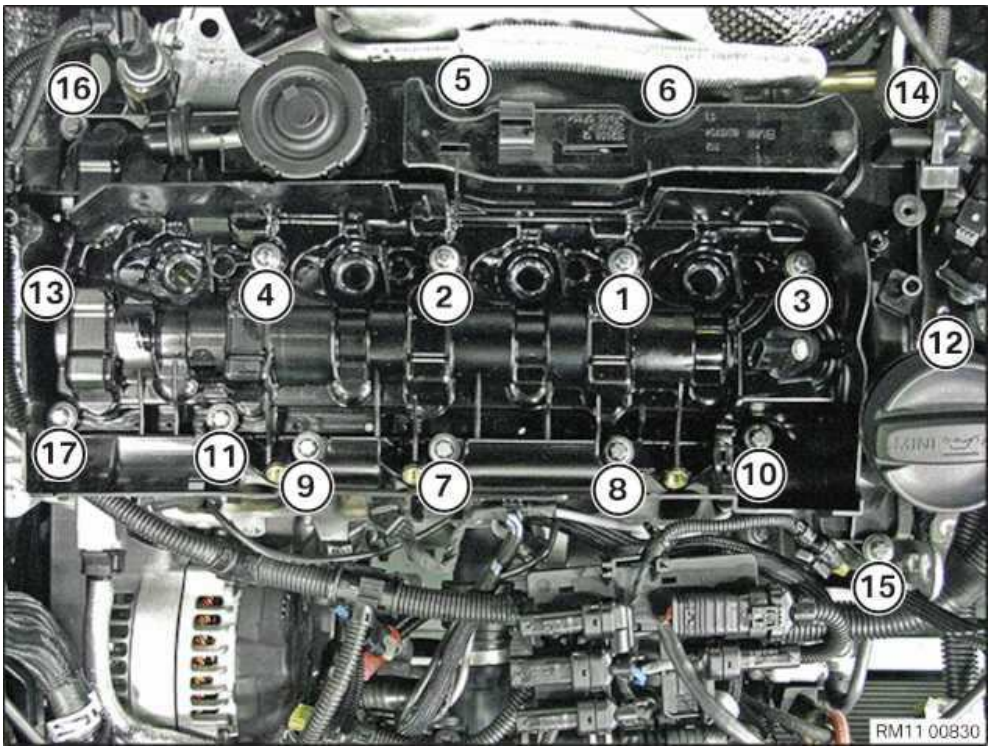
- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).



- Loosen screws in the order (17) to (1).
- Remove cylinder head cover by lifting it out.

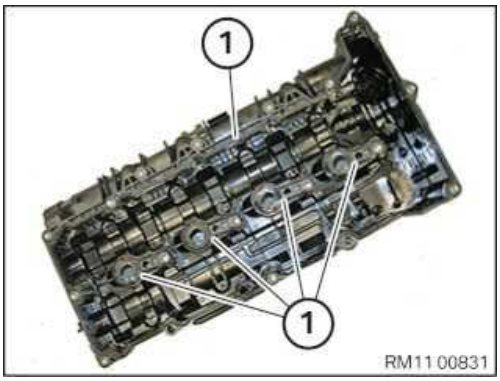
20 – Installing cylinder head cover

Overview: Screw connection of the cylinder head cover



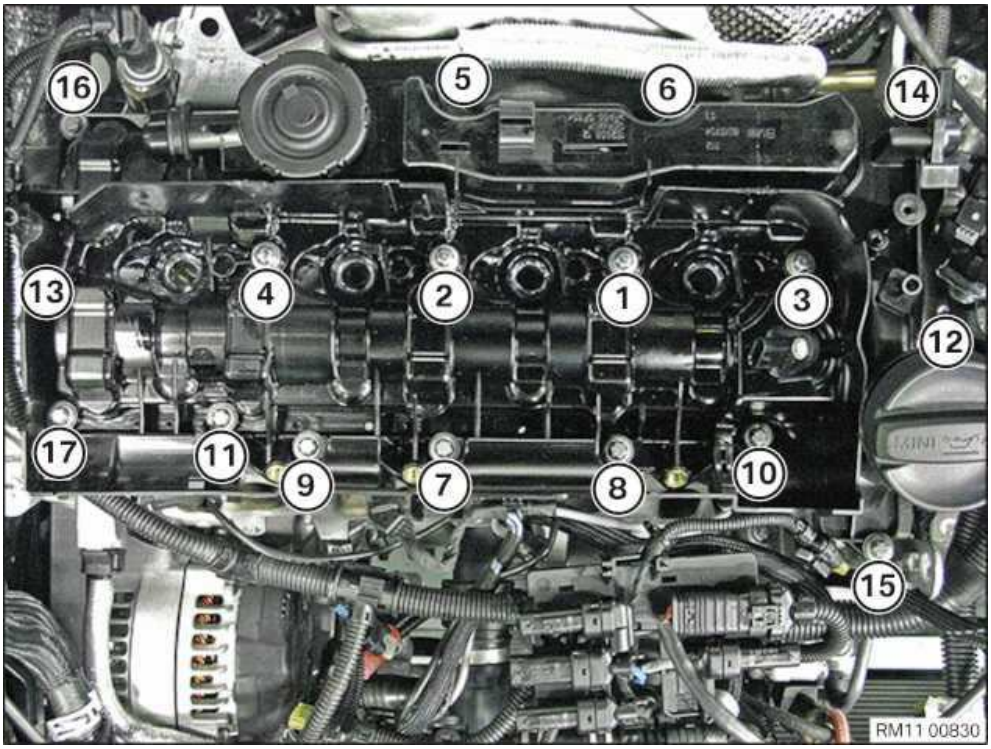
1 to 16 screws of the cylinder head cover.

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- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket

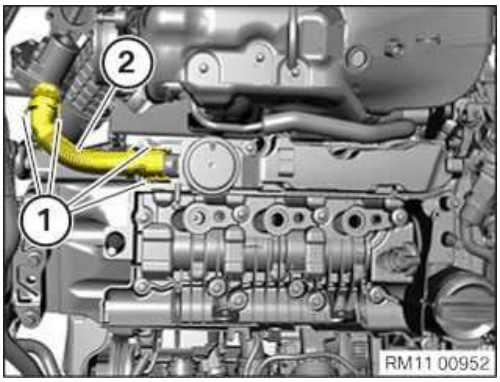


- Install cylinder head cover.
- Tighten screws in the order (1) to (17).

Cylinder head cover to cylinder head

M6		Tightening torque.	8, Nr

-



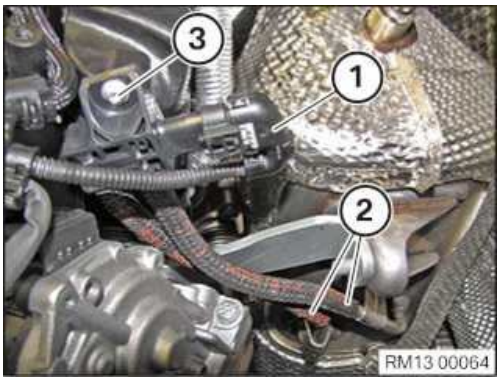
- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

POSTPROCESSES

21 – Installing differential pressure sensor

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- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

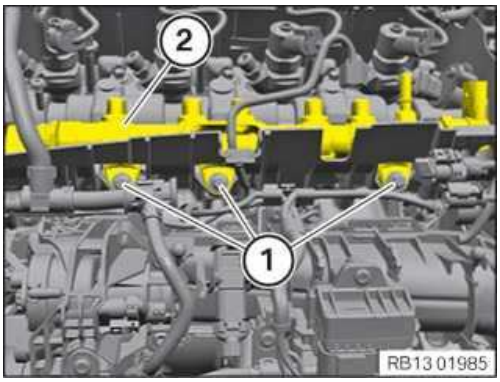
Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

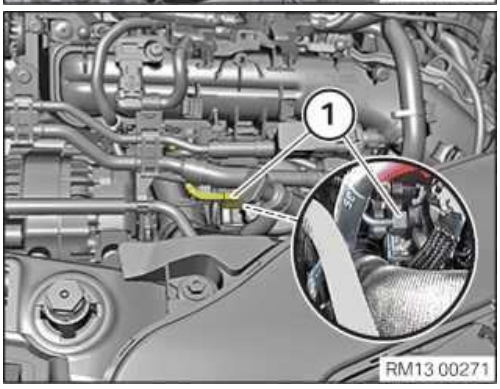
22 – Installing the rail



- Carefully insert and install the rail (2).
- Tighten the screws (1).

Rail on cylinder head cover

Torx screw M8x25		Tightening torque	19 Nm



TECHNICAL INFORMATION

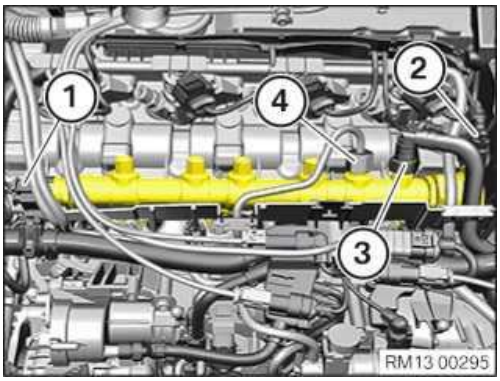
Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten union nut (1).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

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TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten union nut (4) with special tool .

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Connect and lock the fuel line (3).

  Fuel line (3) must engage audibly.
- Connect connectors (2) and lock.

  The connector (2) must engage audibly.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

23 – Installing injectors of injection system

▶ **Cleaning the injector shafts**

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.



- Wear safety goggles.

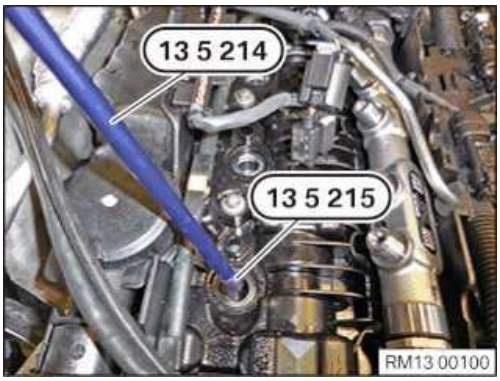
RISK OF DAMAGE

Contaminant or foreign body.

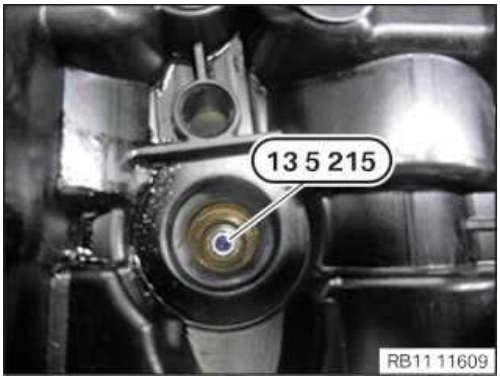
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.



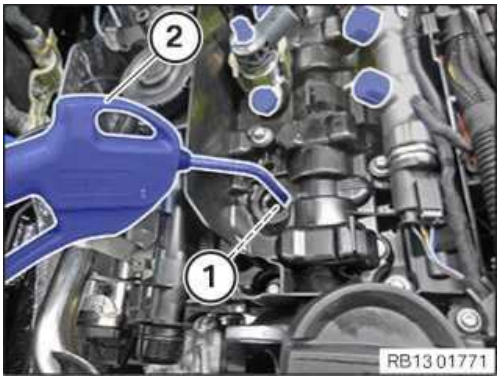
- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.



- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.

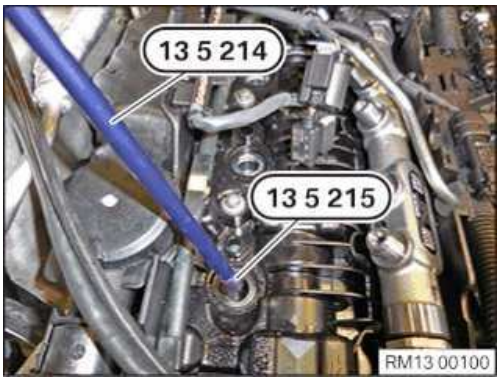


- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.



- Blow out injector shaft (1) with air gun (2).

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- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

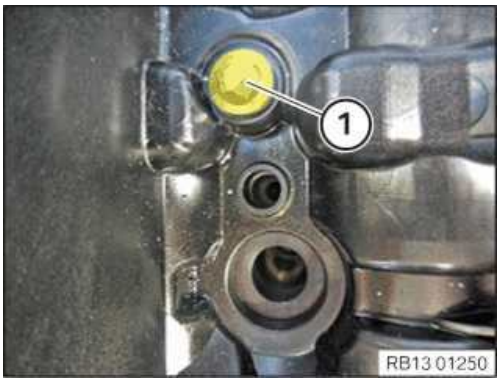
▸ **Check the placement of the clamping claw**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▸ **Prepare the injector for installation**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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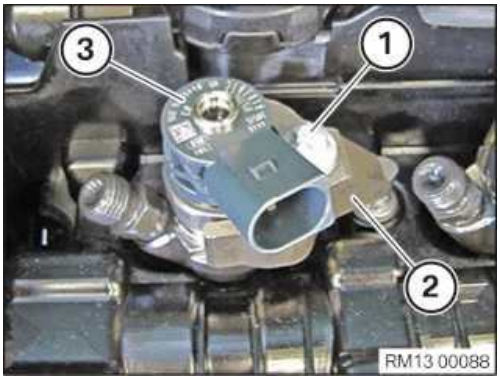
- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring

- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

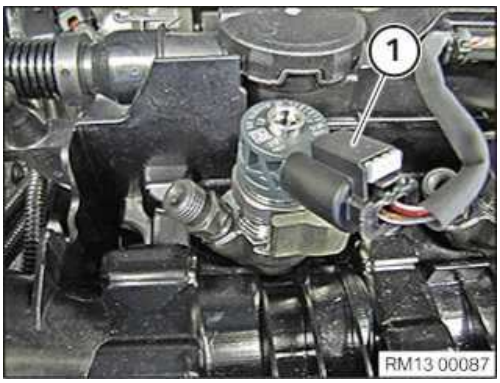
Injector lubricating grease	50 g, Can	83230441070



- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

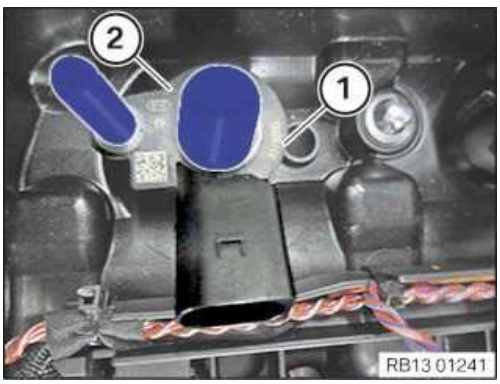
▸ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



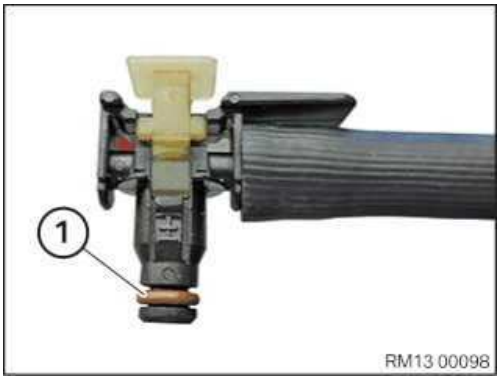
- Read off the adjustment value (1) on the new injector (2).

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- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

24 – Connect the leakage oil line on the injector



- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.



- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

25 – Installing high pressure lines between rail and injectors

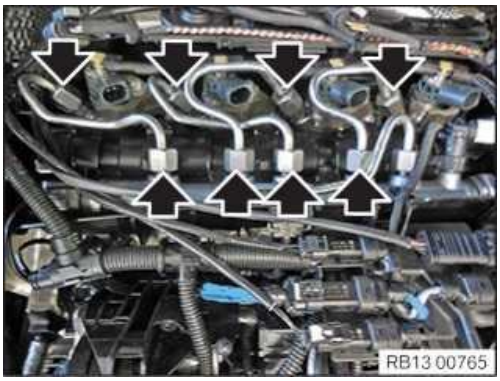
TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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- Remove special tool .
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

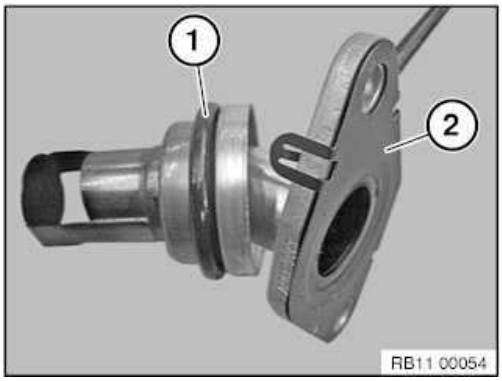
- Tighten the high pressure lines (arrows) with the special tool .

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

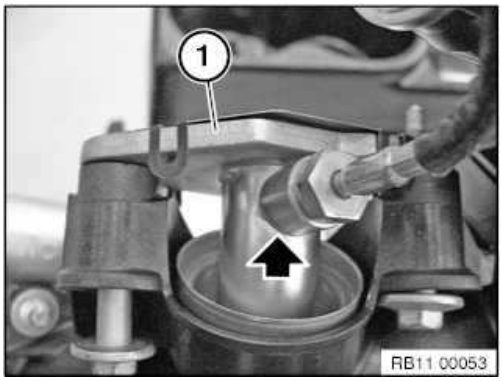
26 – Installing the intake plenum



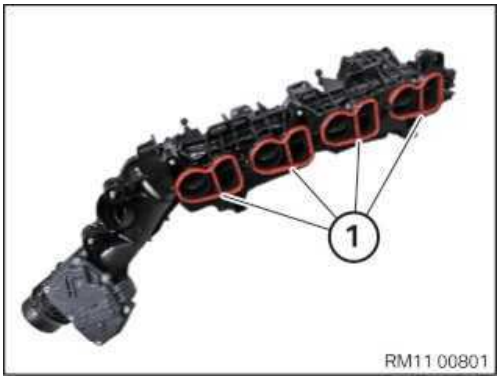
- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position the seal (2) and clip it in.



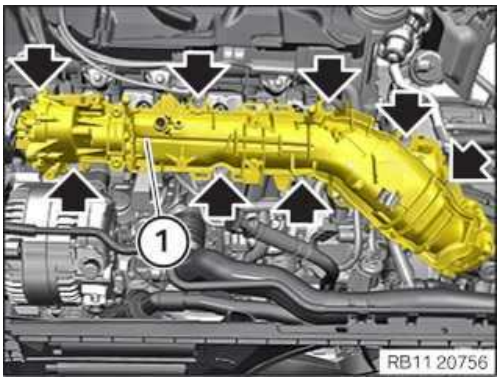
- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (1).

  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.

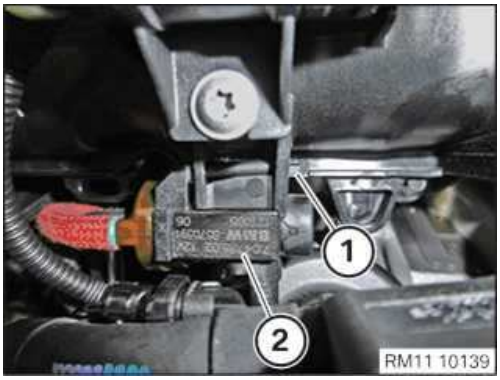
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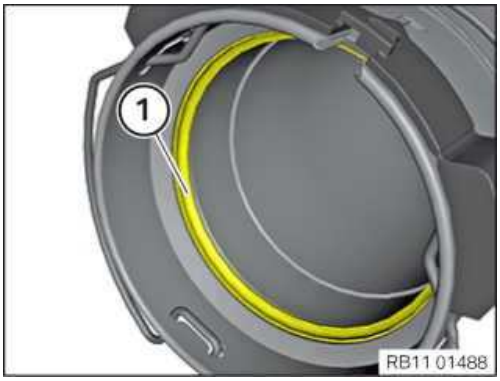
- Guide in and install intake (1) plenum.
- Tighten screws (arrows).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm

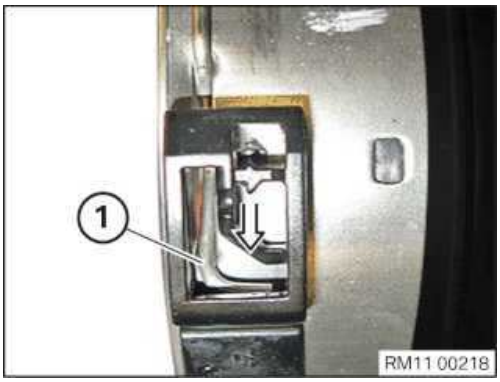


- Install the electric changeover valve (2) in the holder on the plenum from left to right.
- Lock (1) must engage audibly.

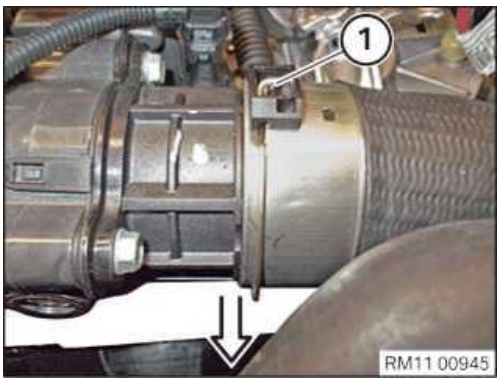


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring



- Engage the lock (1) on the bracket (arrow).



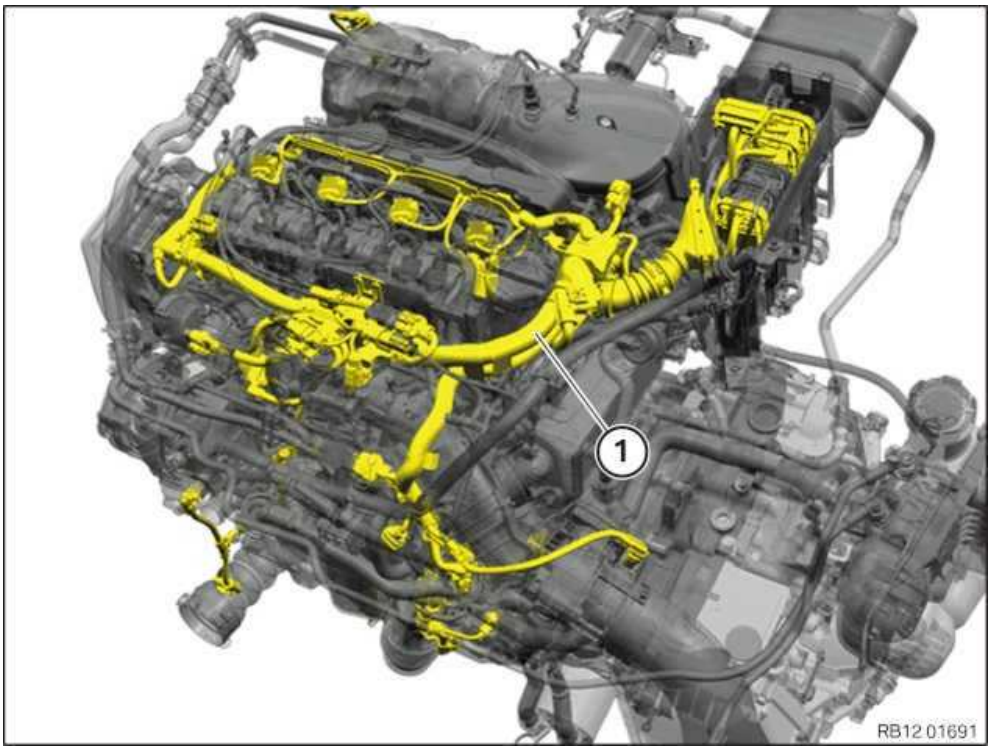
- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

27 – Fastening the wiring harness section for the intake plenum

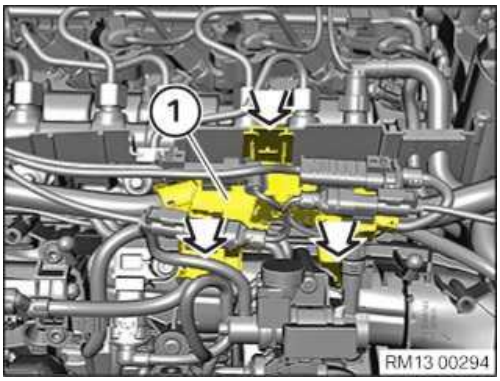
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Overview: Wiring harness section for the engine

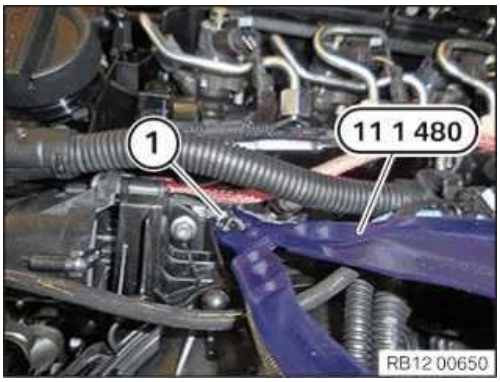


1 Wiring harness section for the engine

▶ **Installing the cable clip for the intake plenum**

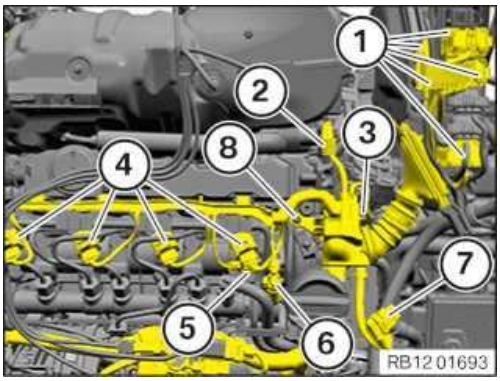


- Insert and install the cable clip (1) in the direction of the arrow.
- Make sure the cable clip (1) is fitted correctly.



- Connect and lock the connector (1) on the glow elements.
  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.

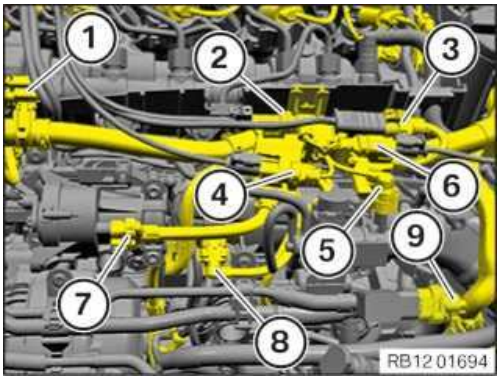
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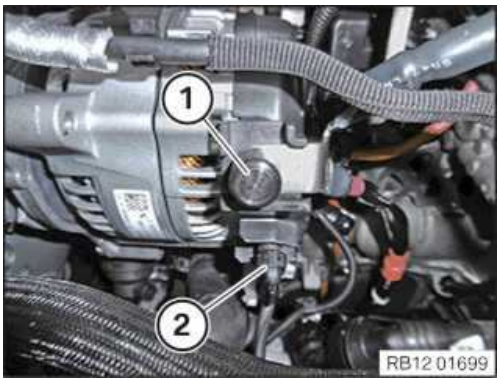
- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the DME control unit and remove the integrated supply module (PDM).
- Attach connector (2) to the differential pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust-gas recirculation valve and lock audibly.
- Attach connector (4) to the injectors and lock it audibly.
- Attach connector (5) to the camshaft sensor and lock it audibly.
- Attach connector (6) to the fuel pressure regulator and lock it audibly.
- Connect and audibly lock the connector (7) to the hot film air mass meter.
- Tighten down screw (8).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm



- Connect the connector (1) to the rail pressure sensor and lock it audibly.
- Attach connector (2) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (3) to the front oxygen sensor and lock audibly.
- Attach connector (4) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Connect the connector (5) to the electric changeover valve and lock audibly.
- Attach connector (6) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (7) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (8) to the charging pressure sensor and lock it audibly.
- Attach connector (9) to the fuel pressure and temperature sensor and lock it audibly.

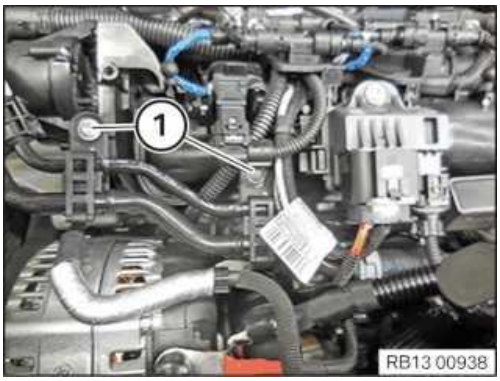


- Connect and lock the connector (2).

  Lock must snap audibly into place.
- Connect the positive battery cable (1) and tighten.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

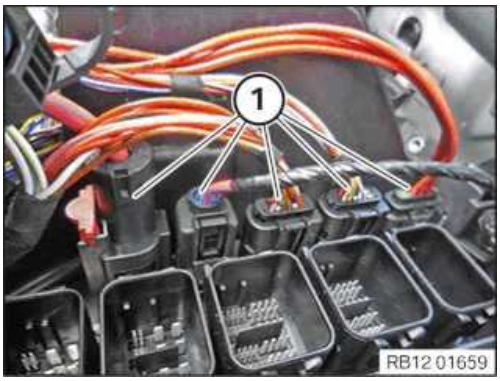


- Position the fuel line.
- Tighten the screws (1).

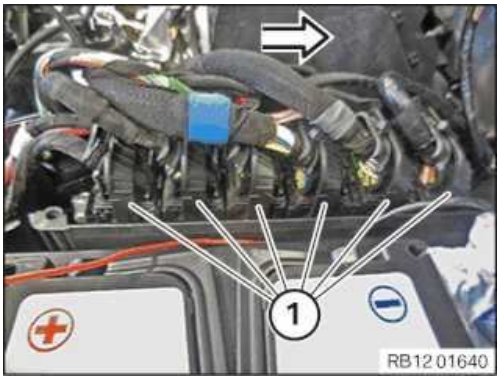
Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

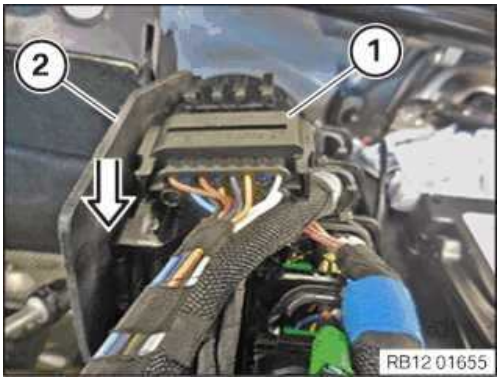
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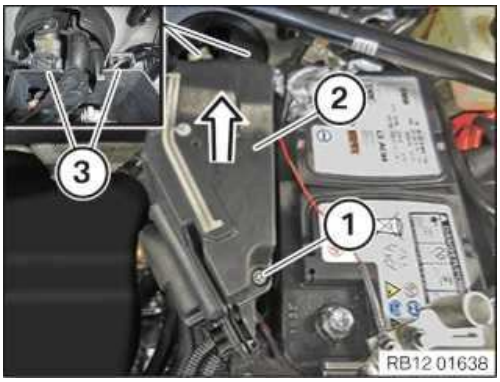
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



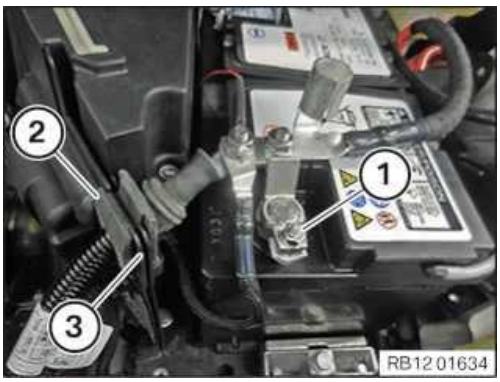
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert and install the cover (2) into the guides (3) in the direction of the arrow.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

RF5x26.5		Tightening torque	2,5 Nm

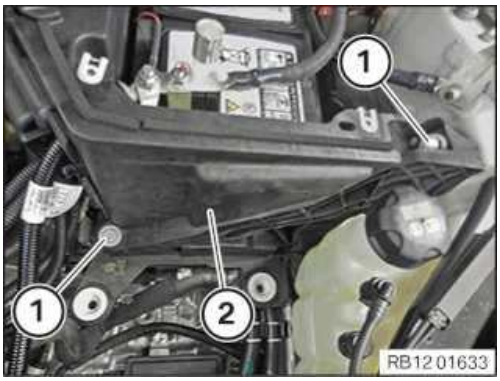


- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

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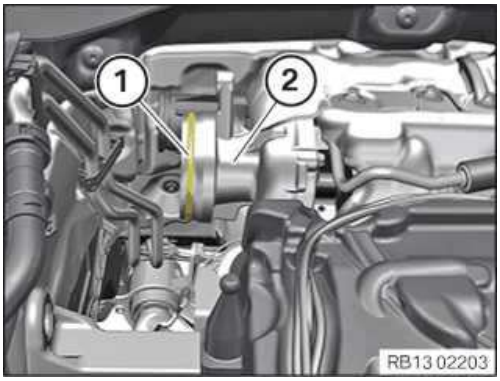


- Feed in and install tension strut (2).
- Tighten the screws (1).

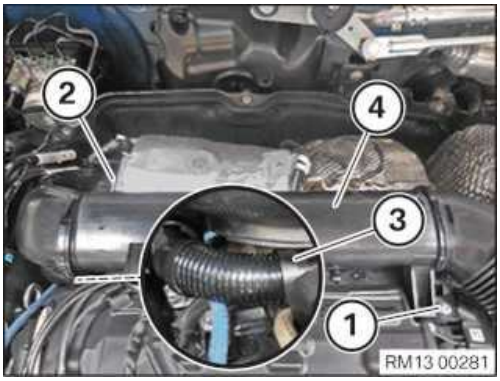
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

28 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.



- Feed in clean air pipe and install.
- Connect clean air pipe to the exhaust turbocharger and lock audibly in the clamps (2).
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Connect ventilation line (3) to the cylinder head cover and lock audibly.



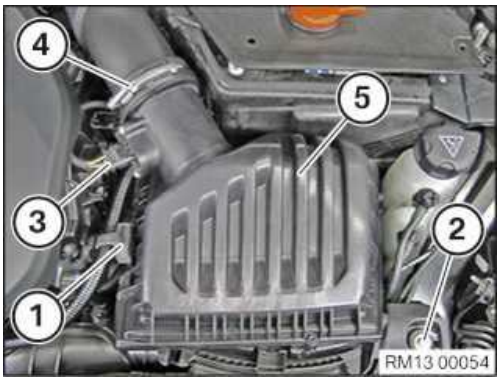
- Mount clean air pipe onto the intake filter housing.
- Tighten clamp (1) on the clean air pipe.

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

29 – Installing intake silencer housing

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- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

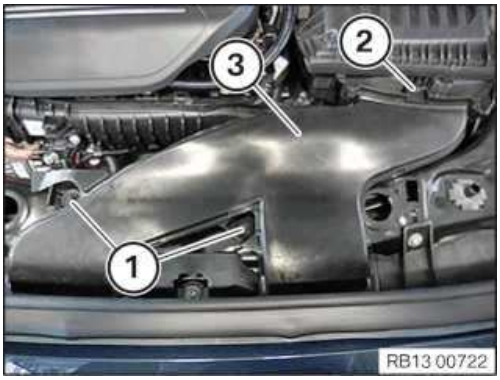
- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

30 – Install the intake neck for the intake filter housing

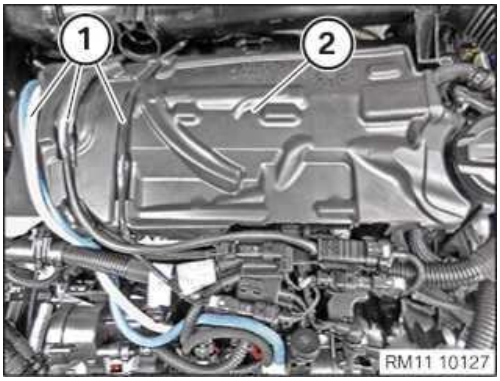


- Insert and install the intake neck (3).
  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

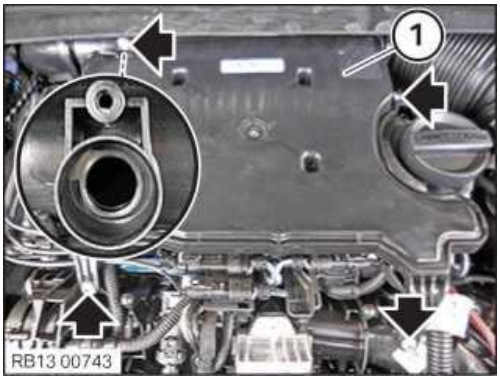
M6		Tightening torque	8 Nm

31 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the vehicle wiring harness (1) in the brackets.

32 – Install resonator



- Insert and install the resonator (1).
- Renew the bolts (arrows).
  Parts: Bolts
- Tighten screws (arrows).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

33 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Check for correct installation of all rubber mounts in the acoustic cover (1).

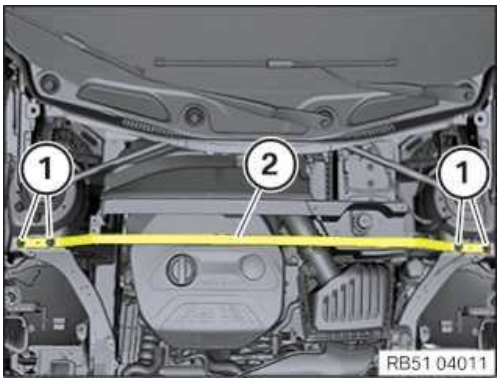


- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

34 – Install strut brace

TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.



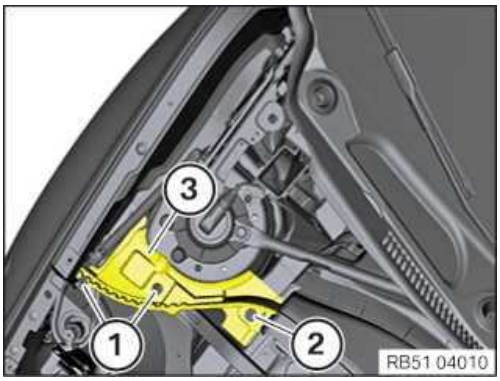
- Install the strut brace (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-brace to spring strut dome

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

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NOTICE

Description is for right component only. The procedure on the left side is identical.

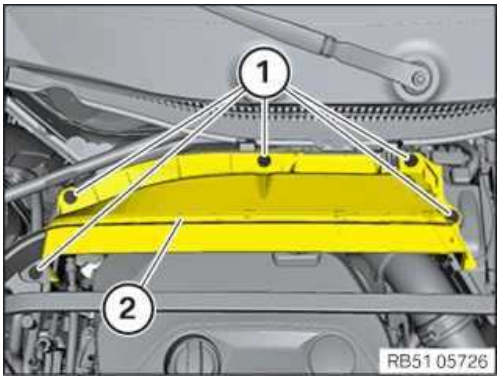
- Install the cover (3).
- Tighten down screw (2).

Cover on body

Hexagon screw		Tightening torque	3 Nm

- Install the expanding rivet (1).

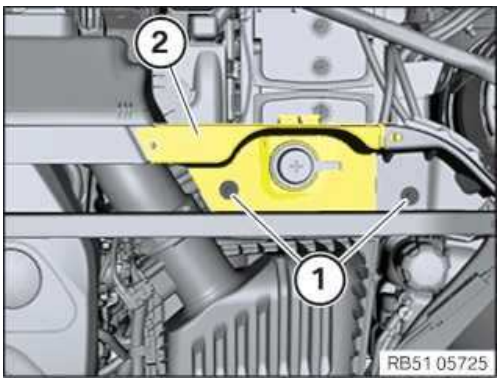
35 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Cover of top bulkhead

Screw		Tightening torque	2,6 Nm

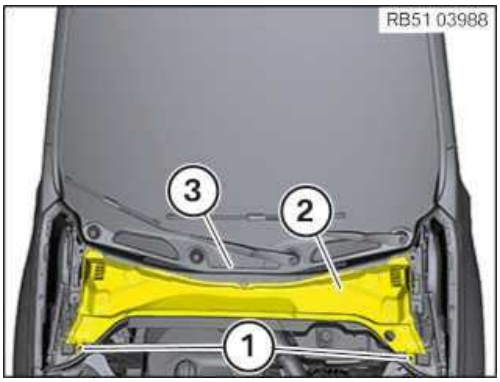


- Guide in and install cover (2).
- Tighten down screw (1).

Cover of remote positive terminal

Screw		Tightening torque	2,6 Nm

36 – Installing front cowl panel cover



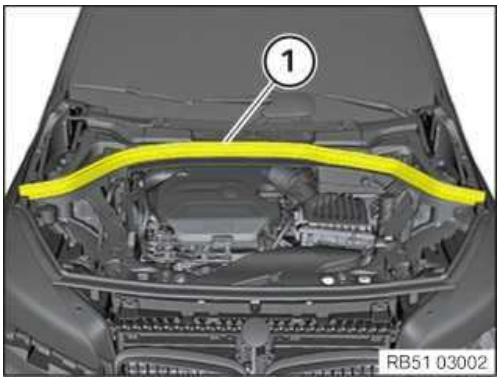
- Insert and install cowl panel cover at front (2) into cowl panel cover at rear (3).
- Check cowl panel cover at front is correctly seated (2).
- Secure expanding rivet (1).

37 – Install the seal for the bonnet

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

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- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

38 – Disconnecting all battery earth leads



- See additional information.

Additional Information

Overview of Tightening Torques

Cylinder head cover to cylinder head — Used in step 20

M6		Tightening torque.	8,5 Nm

Differential pressure sensor to holder — Used in step 21

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor — Used in step 21

Clamp 15–19mm		Tightening torque	3 Nm

Rail on cylinder head cover — Used in step 22

Torx screw M8x25		Tightening torque	19 Nm

High pressure line between high pressure pump and rail — Used in step 22

High-pressure pipe		Tightening torque	28 Nm

Clamping claw facing to cylinder head cover — Used in step 23

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover — Used in step 23

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

High pressure lines between injector and rail — Used in step 25

High pressure lines		Tightening torque	28 Nm

Intake plenum to cylinder head — Used in step 26

M6		Tightening torque	11 Nm

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Wiring harness to cylinder head cover — Used in step 27

TS5x20		Tightening torque	3,5 Nm

Positive battery cable to alternator — Used in step 27

M8		Tightening torque	19 Nm

Fuel line to intake plenum — Used in step 27

TS6x20		Tightening torque	5 Nm

Cover to electronics box — Used in step 27

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery — Used in step 27

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray — Used in step 27

M8		Tightening torque	19 Nm

Clean air pipe to cylinder head cover — Used in step 28

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 28 29

Clamp		Tightening torque	3 Nm

Intake silencer housing to lock bridge — Used in step 29

M6X30		Tightening torque	8 Nm

Intake neck to cross connection — Used in step 30

M6		Tightening torque	8 Nm

Resonator to manifold and clean air pipe — Used in step 32

Screw TS6	Renew screw.	Tightening torque	5 Nm

Cross-brace to spring strut dome — Used in step 34

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

Cover on body — Used in step 34

Hexagon screw		Tightening torque	3 Nm

Cover of top bulkhead — Used in step 35

Screw		Tightening torque	2,6 Nm

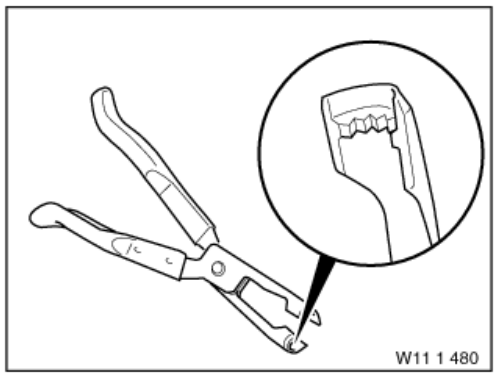
Cover of remote positive terminal — Used in step 35

Screw		Tightening torque	2,6 Nm

Overview of Special Tools

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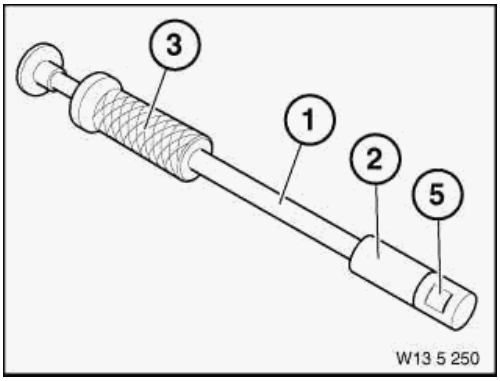
0 490 796 (11 1 480) Pliers



Common Used in step 12

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

0 493 321 (13 5 250) Puller



Common Used in step 16

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

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0 493 339 (13 5 252) Bush



Common Used in step 16

Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

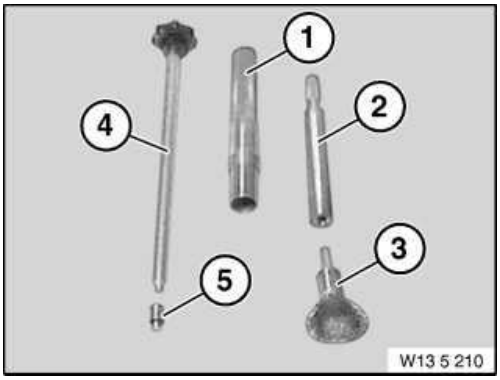
0 493 340 (13 5 253) Weight



Common Used in step 16

Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 763 (13 5 215) Plug

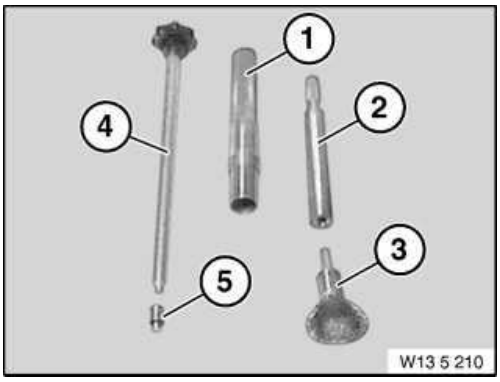


Common Used in step 23

Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 493 762 (13 5 214) Rod



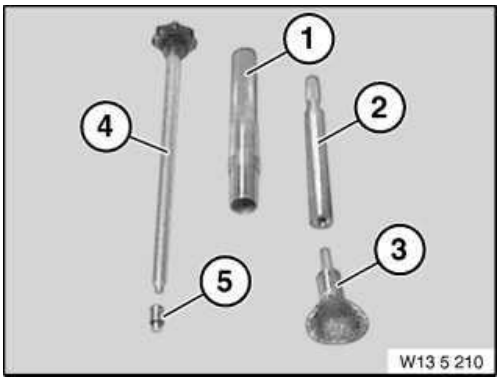
Common

Used in step 23

Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 493 758 (13 5 210) Tool



Common

Used in step 23

Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

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Links

Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	1 38
61 20 900 Disconnecting and connecting battery earth lead	1 38
61 20 900 Disconnecting and connecting battery earth lead	1 38
61 20 900 Disconnecting and connecting battery earth lead	1 38
61 20 900 Disconnecting and connecting battery earth lead	1 38
61 20 900 Disconnecting and connecting battery earth lead	1 38
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 38
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 38
61 20 900 Disconnecting and connecting battery earth lead	1 38

61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads) 1 38
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle) 1 38
61 20 900 Disconnecting and connecting battery earth lead 1 38
61 20 900 Disconnecting and connecting battery earth lead 1 38
61 20 900 Disconnecting and connecting battery earth lead 1 38
61 20 900 Disconnecting and connecting battery earth lead 1 38
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61 20 900 Disconnecting and connecting battery earth lead 1 38
61 20 900 Disconnecting and connecting battery earth lead 1 38
61 20 900 Disconnecting and connecting battery earth lead 1 38
61 35 ... Notes on ESD protection (Electro Static Discharge) 16 18

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11 12 000 Removing and installing/sealing cylinder head cover (B47)

Important!

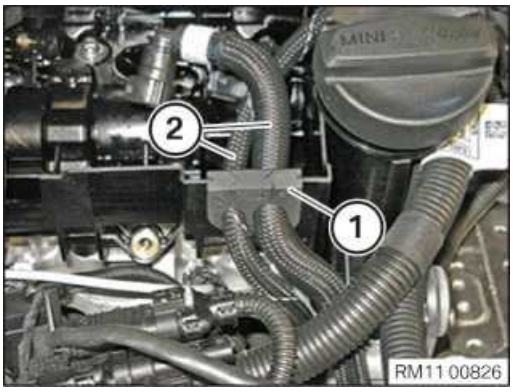
When carrying out repair work on the oil, coolant or fuel circuit, the alternator must be protected against dirt contamination.

Cover alternator with suitable materials.

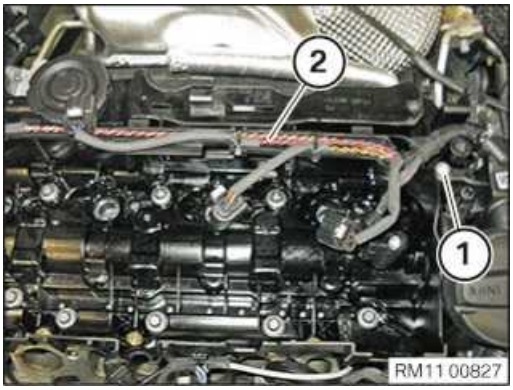
Necessary preliminary tasks:

- Release engine wiring harness in area of cylinder head cover
- Remove intake plenum
- Remove injectors
- Remove pressure accumulator

Removal:



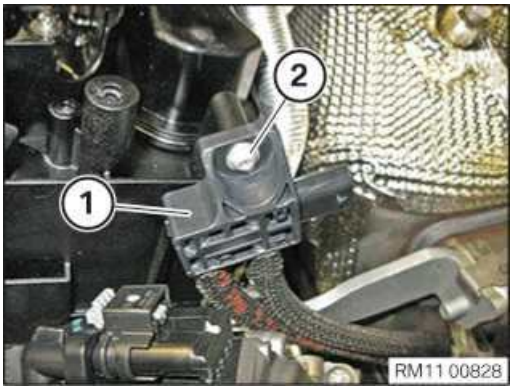
Loosen rubber grommet (1) from cylinder head cover with lines (2).



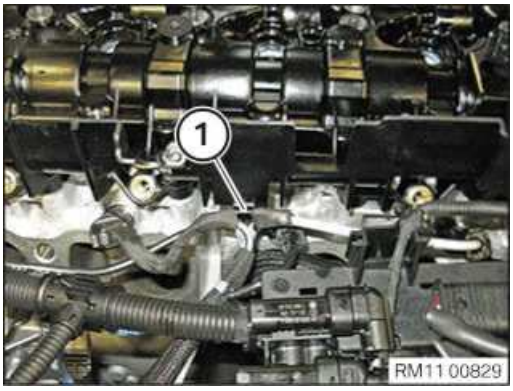
Release screw (1).

Loosen engine wiring harness (2) from cylinder head cover.

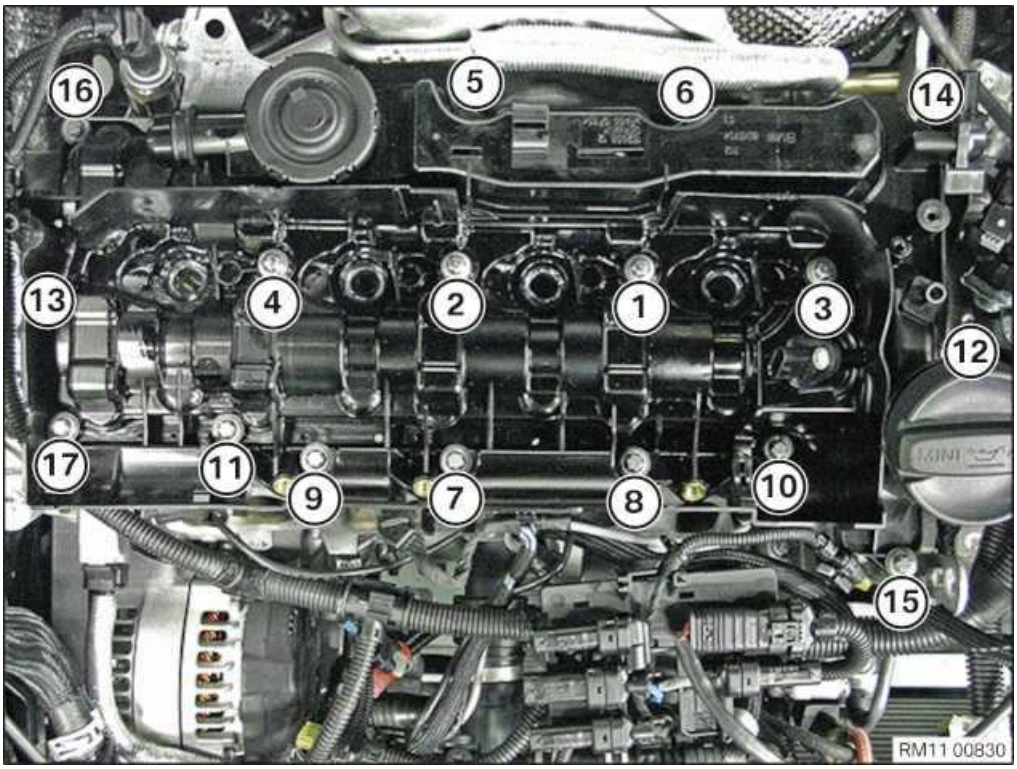
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Loosen exhaust differential pressure sensor (1) with screw (2) on cylinder head cover.



Loosen engine wiring harness (1) from cylinder head cover with clamp.

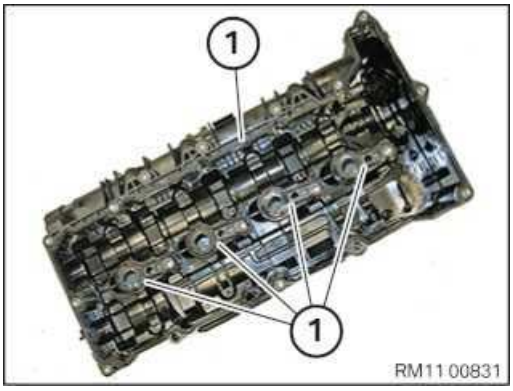


Release bolts in sequence **16 to 1**.

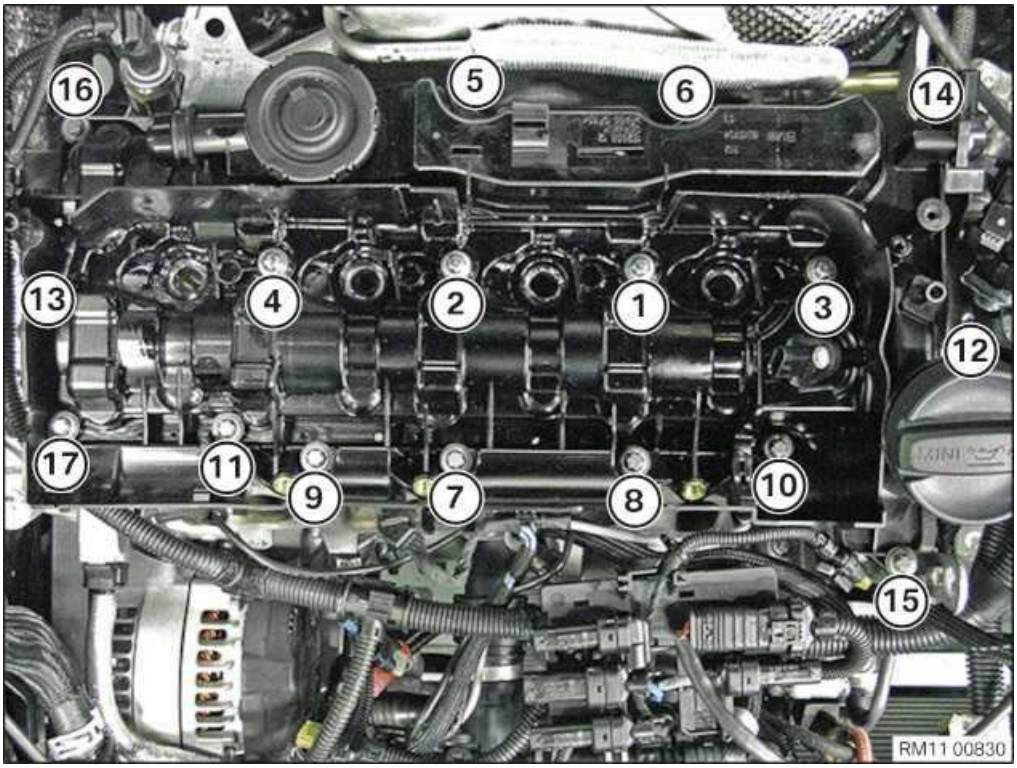
Remove cylinder head cover by lifting it out.

Installation:

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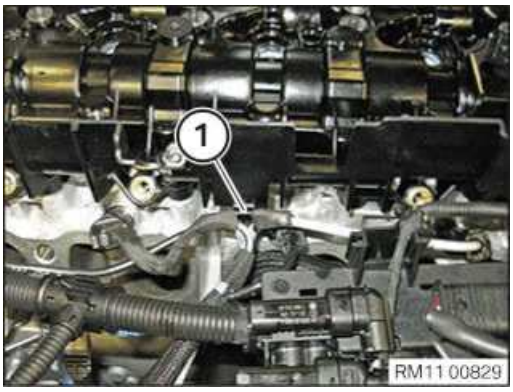
Parts: Replace profile seals (1).



Position cylinder head cover.

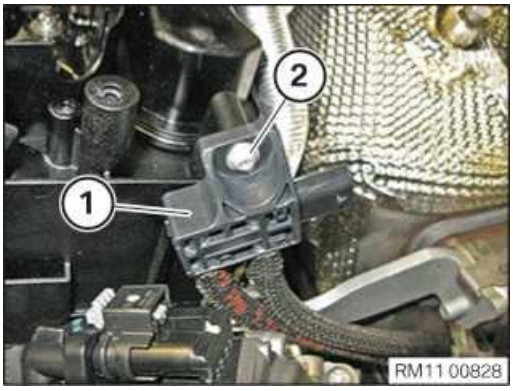
Tighten down bolts in sequence **1 to 16**.

Tightening torque 11 12 3AZ.

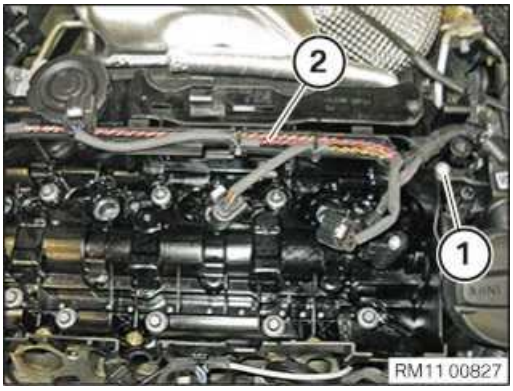


Attach the clamp (1) at the cylinder head cover with clamp.

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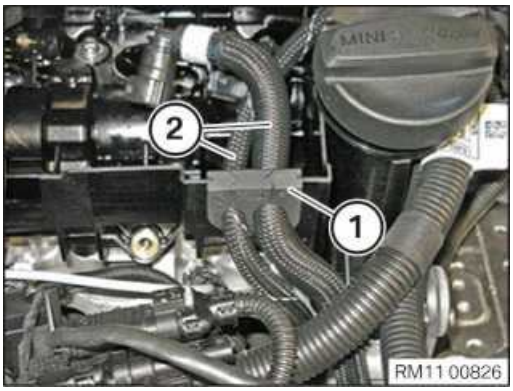


Secure exhaust differential pressure sensor (1) with screw (2) on cylinder head cover.



Clip in engine wiring harness (2) at cylinder head cover.

Tighten screw (1).



Mount rubber grommet (1) on cylinder head cover with lines (2).

Required follow-up work:

- Install pressure accumulator
- Install injectors
- Install intake plenum
- Route and attach engine wiring harness in area of cylinder head cover
- Check engine for tightness

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11 12 161 replace cylinder head

WARNING

Vehicle may slip off the vehicle hoist if the vehicle hoist is handled incorrectly.

Danger! Life-threatening injuries!

- Observe safety information on raising the vehicle using a vehicle hoist.
- For additional information see: 00 ... Raising the vehicle using a vehicle hoist.

WARNING

Motor vehicle may slip off the vehicle hoist where components are supported.

Danger! Life-threatening injuries!

- Secure the vehicle hoist against lowering and lifting.

WARNING

Motor vehicle may slip off the vehicle hoist if the weight is distributed unevenly.

Danger! Life-threatening injuries!

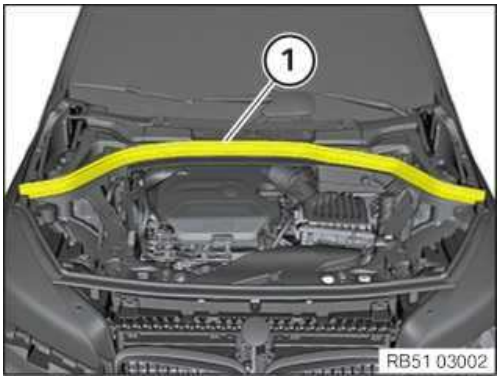
- Ensure there is a specific weight compensation on the motor vehicle.

PRELIMINARY WORK

1 – Remove the seal for the rear bonnet

NOTICE

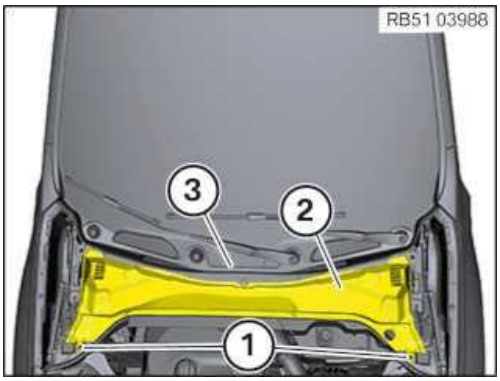
Schematic diagram is for example purposes. Some parts may differ in certain details.



- Pull off rear bonnet seal (1) towards the top and remove.

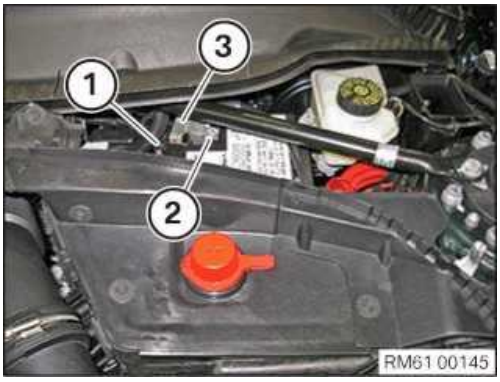
2 – Removing front cowl panel cover

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- Loosen the expanding rivet (1).
- Feed out and remove front cowl panel cover (2) from the rear cowl panel cover(3).

3 – Disconnecting the battery earth lead

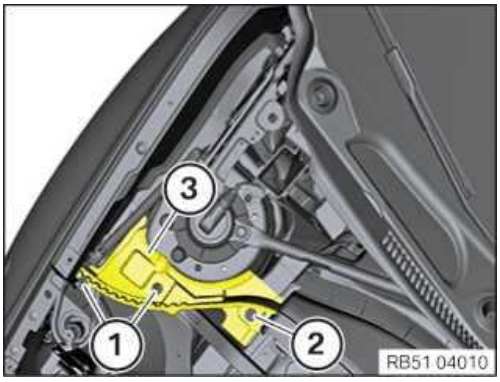


- Unlock plug connection (1) and disconnect.
- Unfasten nut (2).
- Remove the battery earth lead (3) and secure to one side.

4 – Remove suspension cross-brace

TECHNICAL INFORMATION

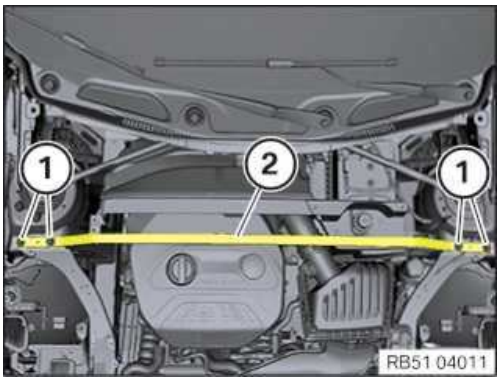
Driving without the strut brace/front end or tension strut is not permitted.



NOTICE

Description is for right component only. The procedure on the left side is identical.

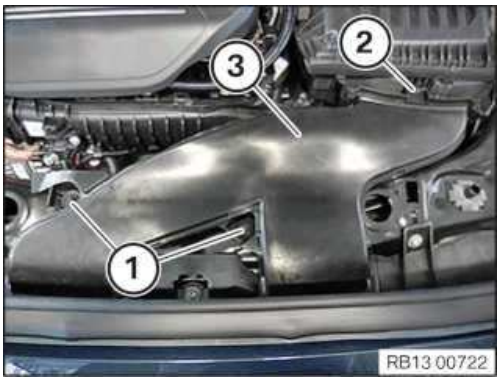
- Loosen expanding rivet (1).
- Loosen screw (2).
- Remove the cover (3).



- Loosen screws (1).
- Remove strut brace (2).

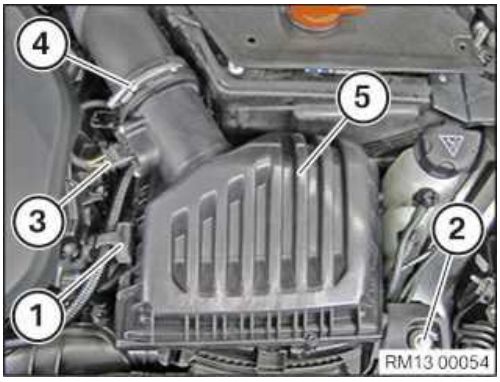
5 – Remove the intake neck for intake silencer housing

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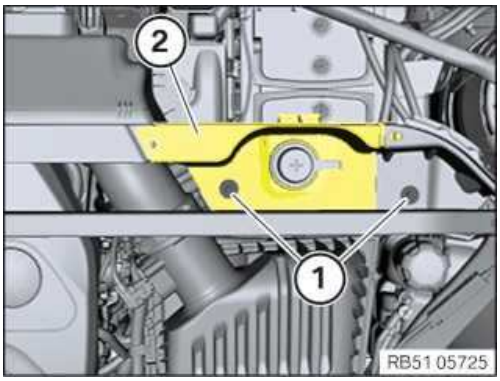
- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

6 – Removing intake silencer housing

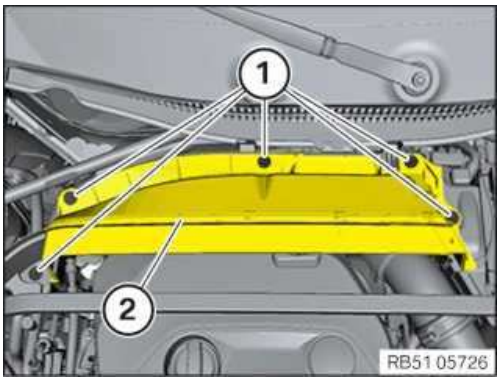


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

7 – Removing the upper bulkhead cover



- Loosen screws (1).
- Guide out and remove the cover (2).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

8 – Remove vehicle battery

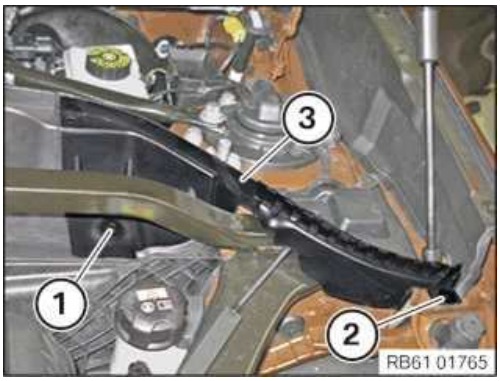
WARNING

Working on 12 V vehicle electrical system.

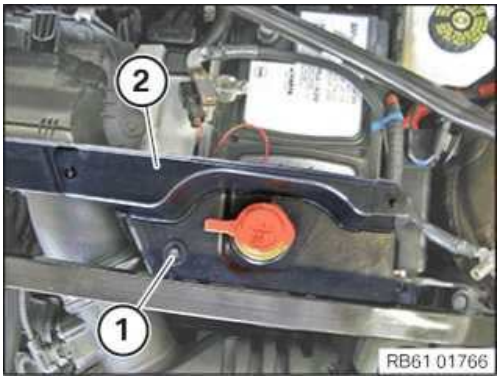
Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

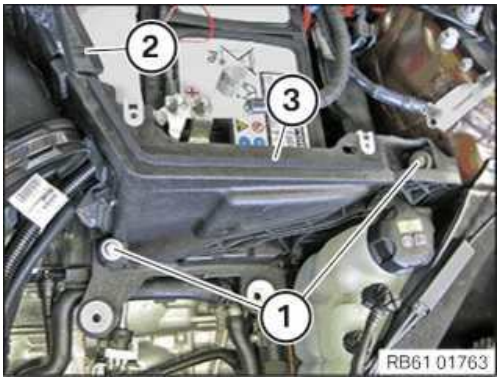
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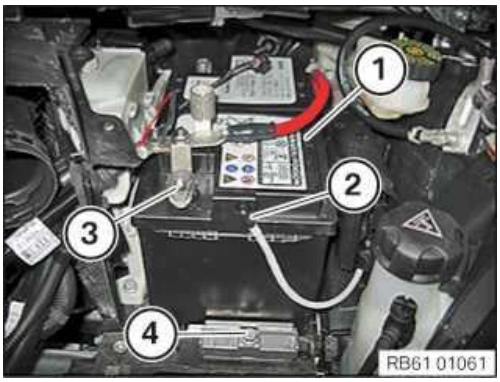
- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).



- Loosen screw (1).
- Remove the cover (2).



- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.



- Pull off the vent hose (2).
- Slacken the nut (3) on the positive battery terminal and remove the positive battery terminal.

WARNING

Unprotected battery terminals.

Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

9 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

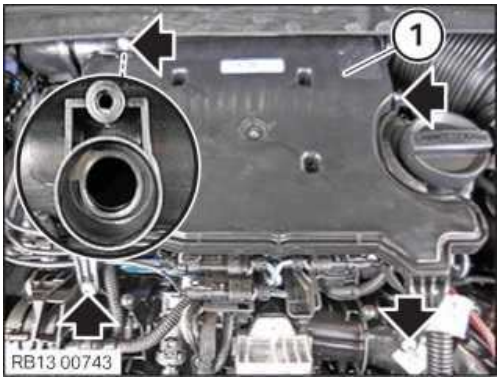
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

10 – Remove resonator

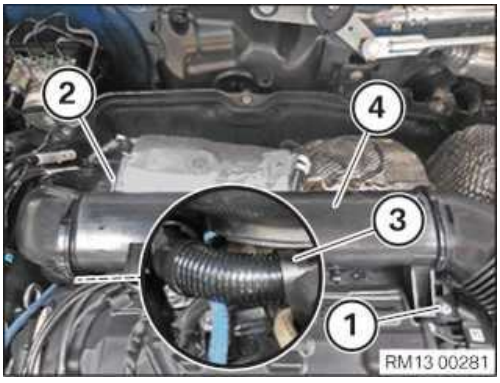


- Remove screws (arrows).
- Guide out and remove the resonator (1).

11 – Removing clean air pipe



- Detach clamp (1) on the clean air pipe.
- Pull off the clean air pipe from the intake silencer housing.



- Loosen screw (1).
- Loosen clamp (2).
- Unlock the ventilation line (3) and pull it off the cylinder head cover.
- Feed out clean air pipe and remove.

12 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

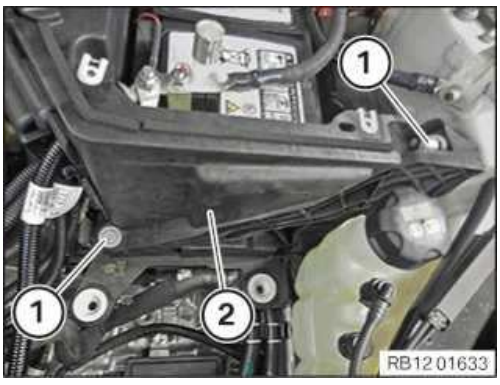
TECHNICAL INFORMATION

Follow instructions for removing and installing control units.

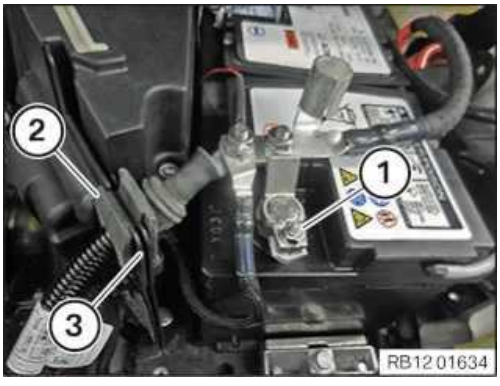
For additional information see: 12 00 ... Notes on removal and installation of control units

TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.

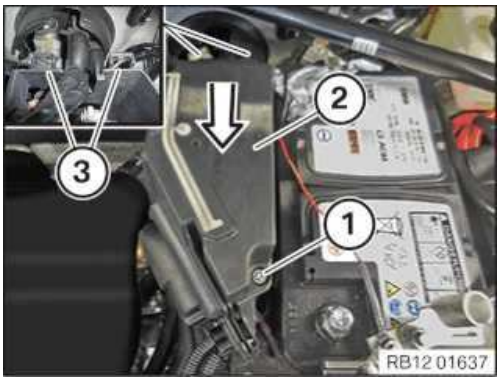


- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.

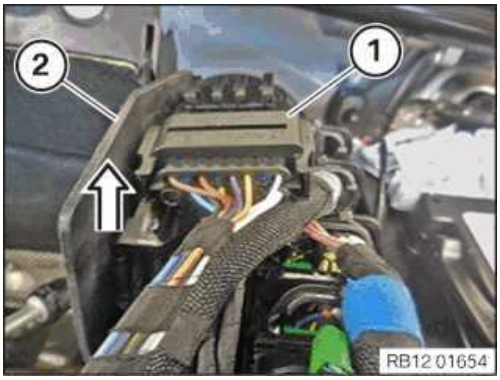


- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

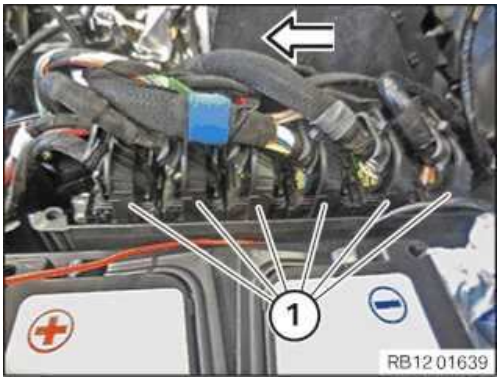
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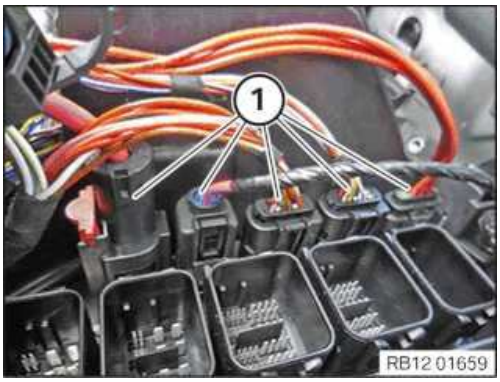
- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



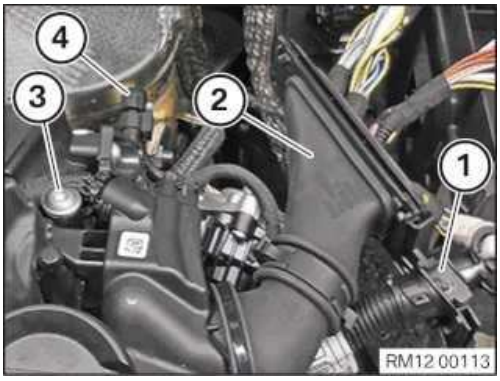
- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).



- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

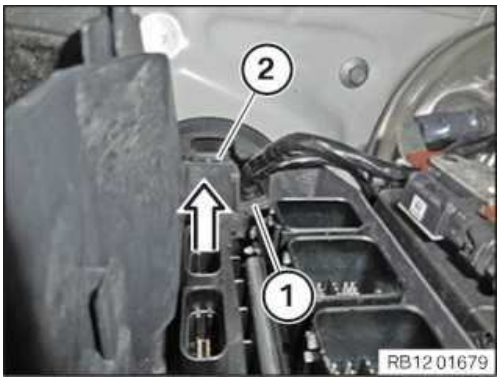


- Unlock and loosen connector (1).

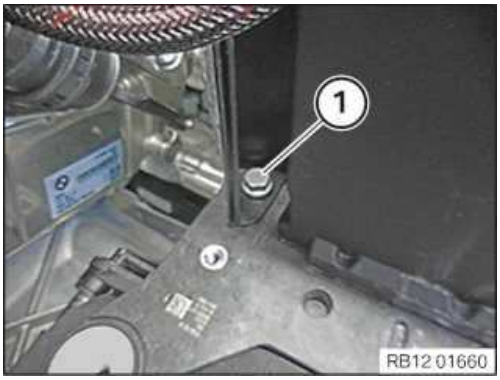


- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.

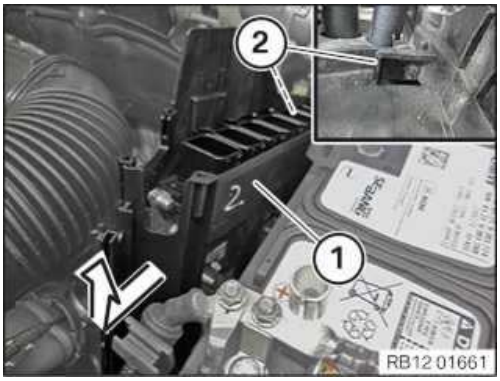
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- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.

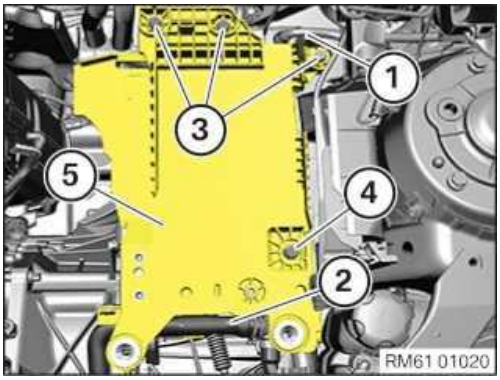


- Loosen screw (1).



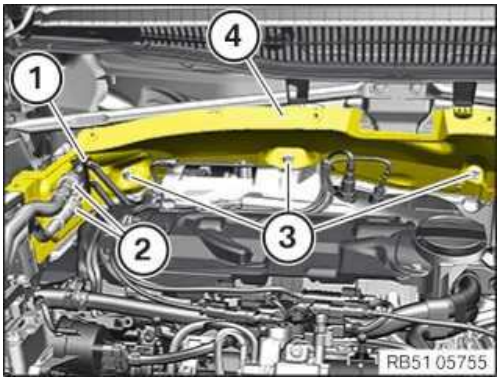
- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

13 – Remove battery holder



- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

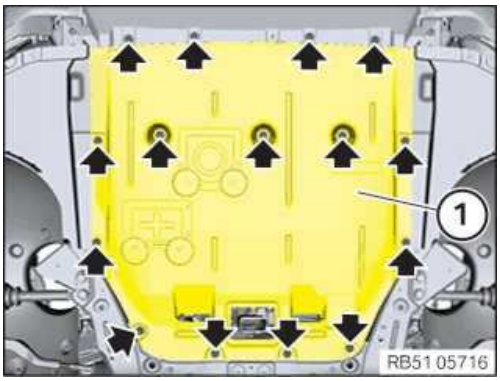
14 – Remove the rear bulkhead upper part



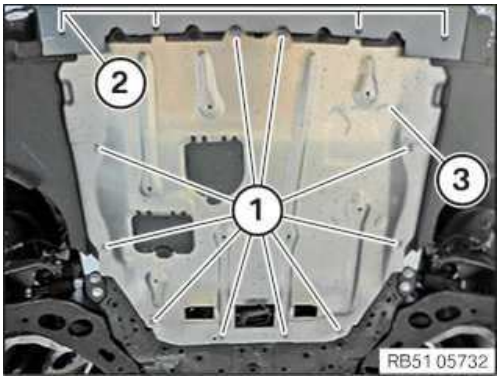
- Unlock the holder (1) and disconnect.
- Guide out and remove the fuel lines (2).
- Loosen screws (3).
- Guide out the rear bulkhead upper part (4) and remove.

15 – Removing the front underbody protection

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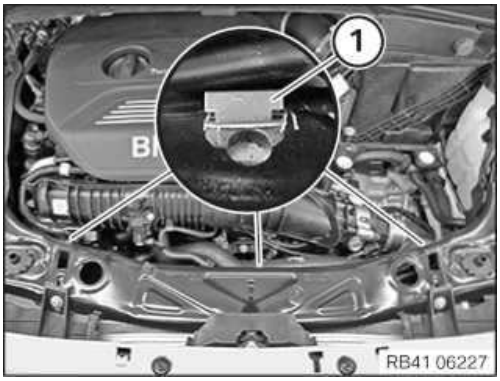


- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.

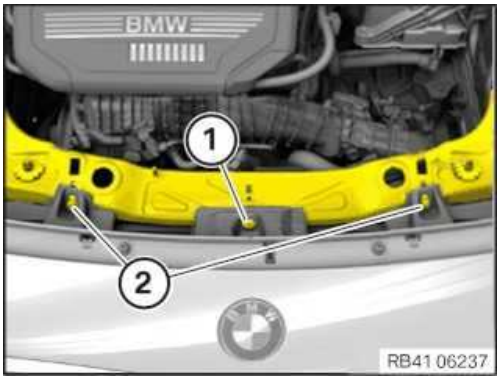


- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

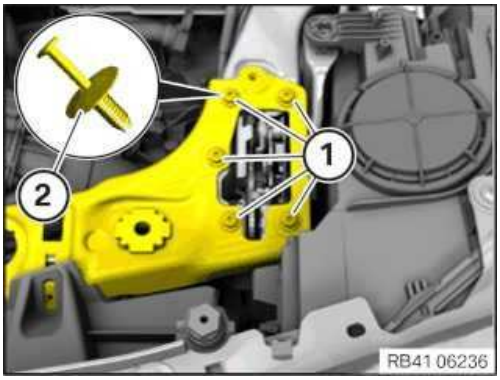
16 – Remove front cross connection



- Detach the clamps (1) for the Bowden cable of the bonnet locks from the cross connection.

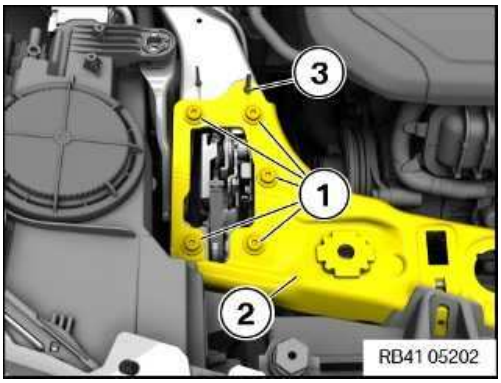


- Loosen screw (1).
- Loosen screws (2).



- Loosen screws (1).
- Lever out expanding rivet (2).

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- Loosen screws (1).
- Unclip the front cross connection (2) from the rubber retainer (3) and remove it upward.

17 – Draining coolant

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

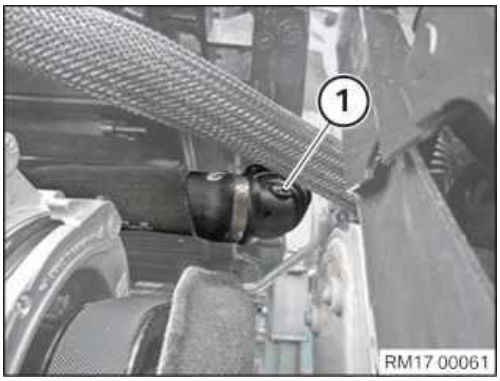
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

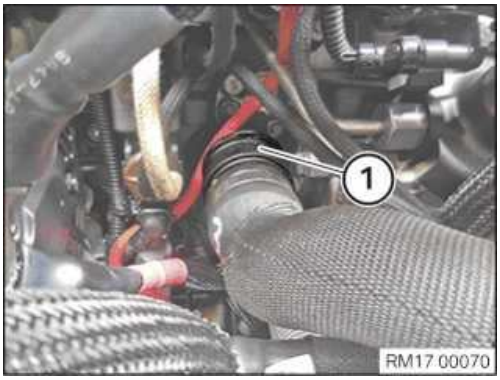


- Loosen sealing cap (1).

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- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.

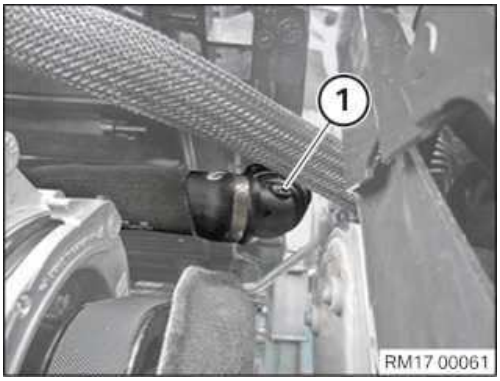


- Unlock the coolant line (1) and pull it off the connecting branch.
- Catch and dispose of escaping coolant.

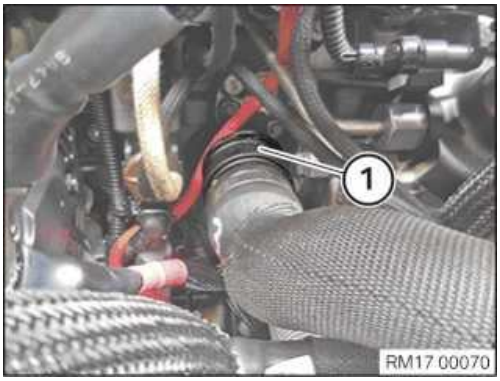
18 – Connect the coolant line

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Connect the right coolant line (1) to the radiator and lock audibly.



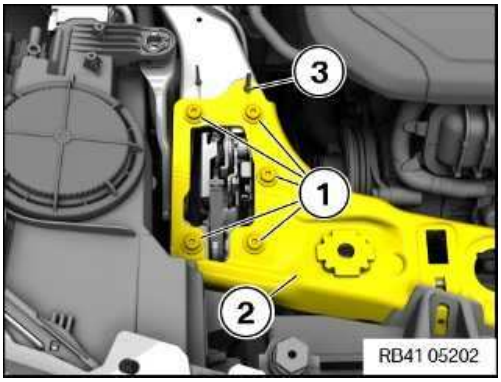
- Connect the coolant line (1) to the connecting branch and lock audibly.

19 – Install front cross connection

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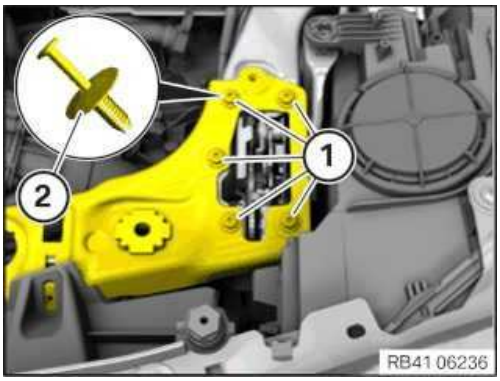
- Right side of vehicle only: Secure spray guard (1) on the cross connection (2) as pictured.



- Position front cross connection (2) and clip front cross connection (2) into the rubber retainer (3) at the same time.
- Tighten the screws (1).

Cross connection to carrier support

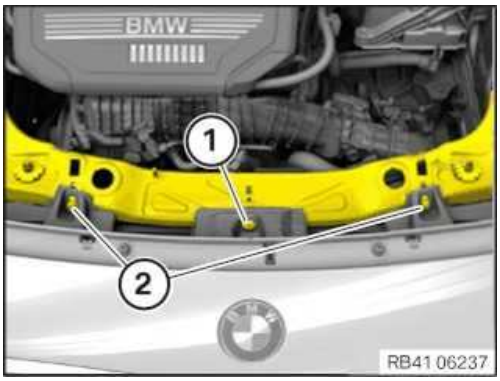
Screws M6x20		Tightening torque	11,8 Nm



- Tighten the screws (1).

Cross connection to carrier support

Screws M6x20		Tightening torque	11,8 Nm



- Position screws (3) on the rubber mounts for the radiator and tighten.

Screw connection for rubber mount of coolant radiator to coolant radiator

Bolt to rubber mount		Tightening torque	8 Nm

- Tighten down screws (2).

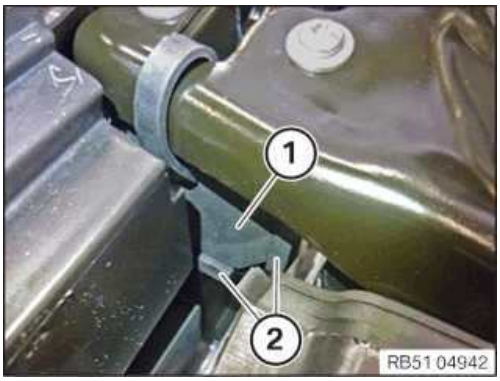
Air duct to upper connection

M6x20 screw		Tightening torque	11,8 Nm

- Tighten down screw (1).

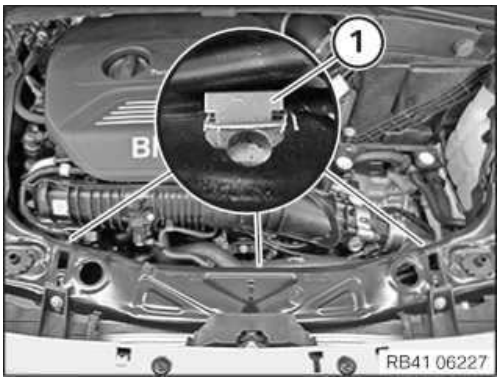
Bracing strut to upper connection

M8x20 screw		Tightening torque	28 Nm



- Right side of vehicle only: Properly mount spray guard (1) to prevent corrosion.
- Secure spray guard (1) to the bridge with retaining tabs (2).

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- Fasten the clamps (1) from the Bowden cable of the bonnet lock on the cross connection.

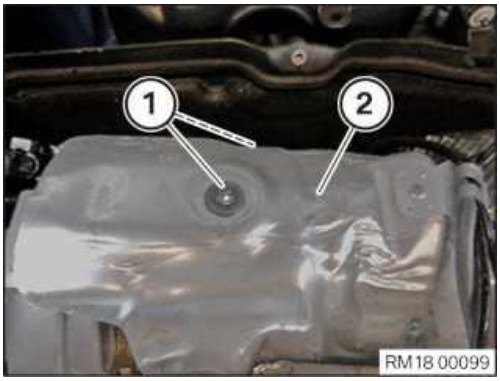
20 – Removing heat shield from top exhaust turbocharger

WARNING

Hot surfaces.

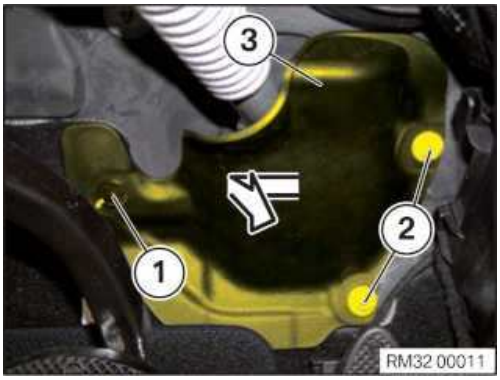
Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from holders.
- Release the screws (1) at the top and bottom of the heat shield.
- Feed out and remove the heat shield (2).

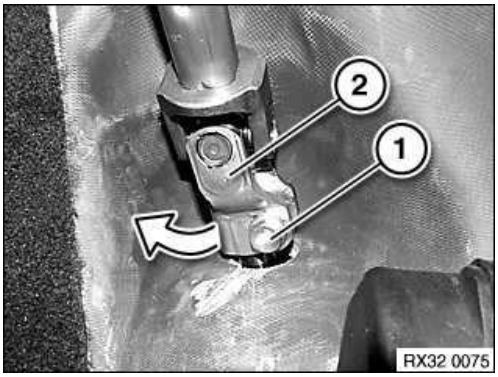
21 – Releasing lower steering shaft from steering gear



- **If installed:**
- Unfasten nut (1).
- Unscrew the nuts (2) by 1 rotation.

  Do not remove the nuts (2) !
- Remove the cover (3) on the steering column in the direction of the arrow.

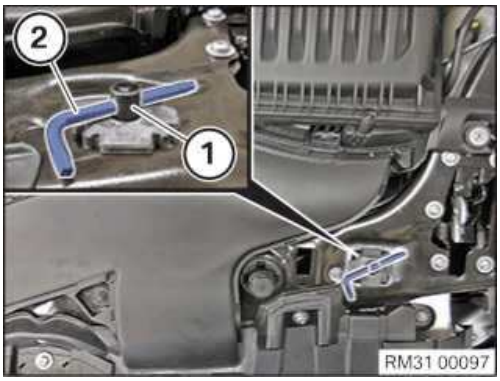
  The side footwell trim must not be disassembled!



- Loosen screw (1).
- Swivel out the universal joint (2) of the bottom steering shaft from the steering gear in the direction of the arrow.

22 – Securing radiator on left and right

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NOTICE

Perform the operations on the left and right side.

- Fasten radiator at centring pin (1) with suitable tool (2).

23 – Removing both front wheels

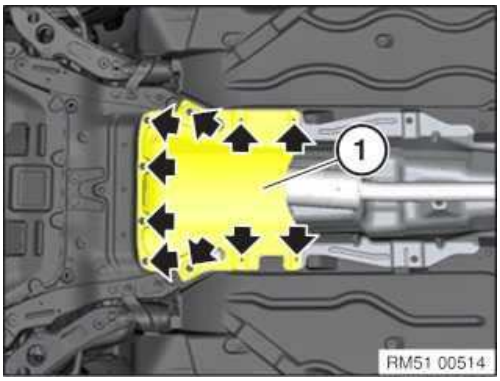
▶ **Removing the wheel**



- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Unscrew the wheel bolts (arrows) and remove the wheel.

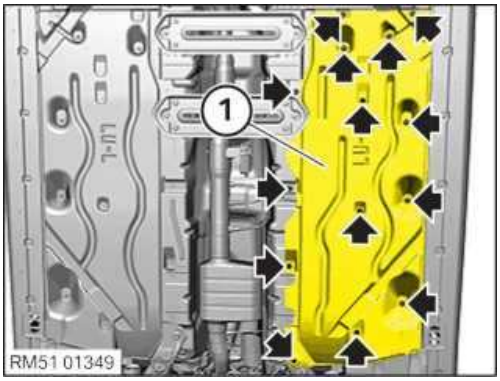
  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

24 – If installed: Removing rear underbody protection



- Remove screws (arrows).
- Remove the rear underbody protection (1).

25 – Removing right underbody panelling



- Unscrew all bolts and nuts (arrows).
- Remove the underbody panelling (1).

26 – Removing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

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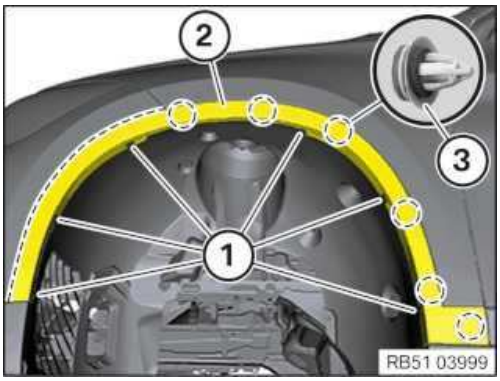
▶ **Remove the front wheel arch trim**

NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

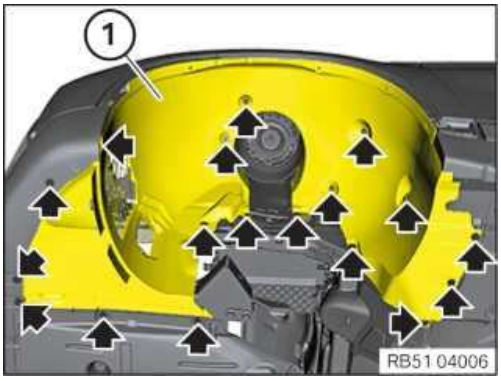
NOTICE

Description is for left component only. Procedure on the right side is identical.



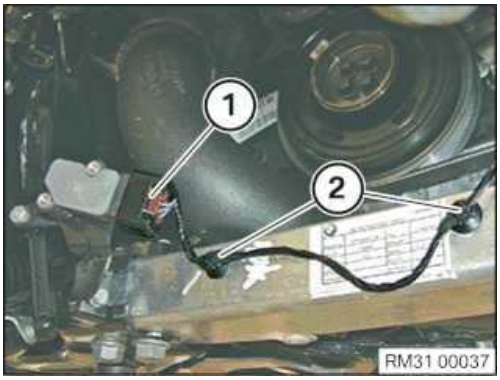
- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.

▶ **Remove front wheel arch cover**



- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

27 – With right installation: Detaching ride height sensor cable



- Unlock plug connection (1) and disconnect.
- Release cable clip (2) from deformation element adapter.

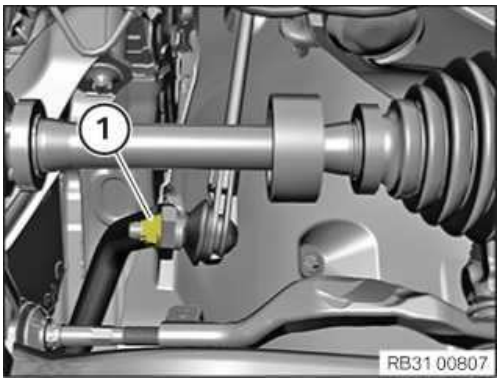
28 – Releasing anti-roll bar on left and right from anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▶ **Detach the anti-roll bar from the anti-roll bar link**

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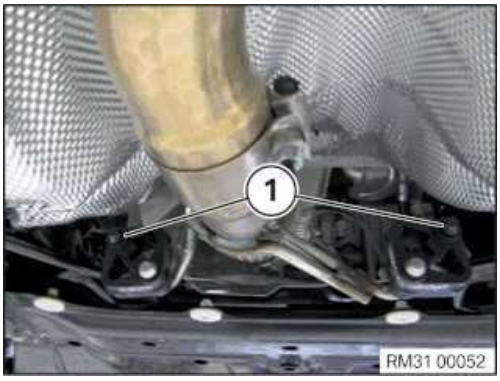


- Unfasten nut (1).

Note: Use the Torx socket for counter support.

- Loosen the anti-roll bar link from the anti-roll bar .

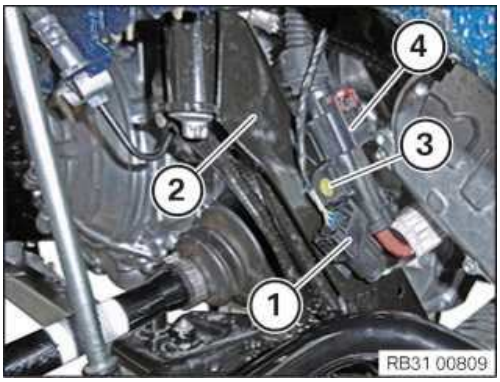
29 – Detaching rubber mount from front axle support



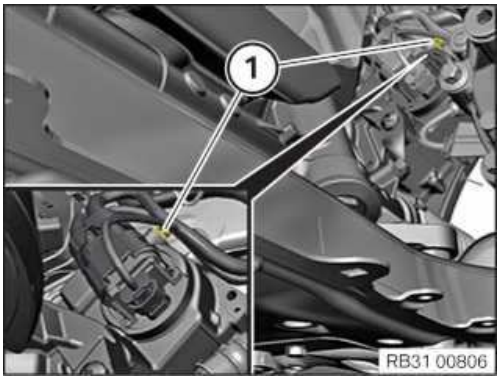
- Spray rubber mount (1) with lubricant and release from holder on front axle support.

30 – Disconnecting plug connections from steering gear

▶ **If installed: Detach connectors from the front axle carrier**

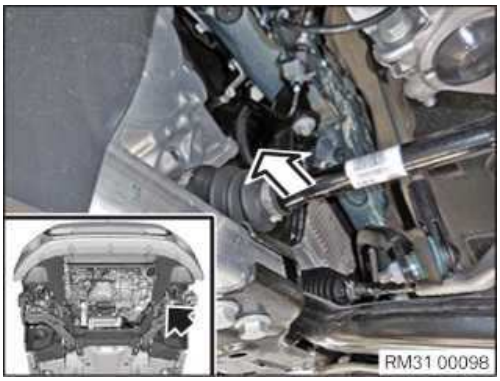


- Release the plug connection (1) from the front axle support (2).
- Loosen screw (3).
- Release the plug connection (4) from the front axle support (2).



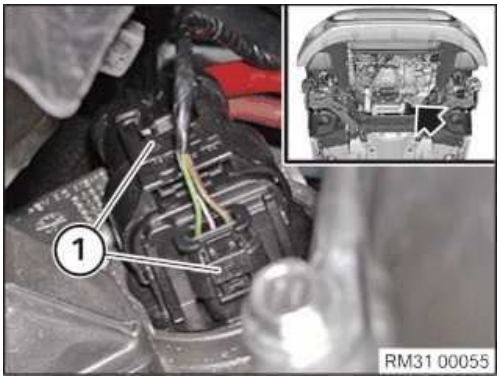
- Disconnect wiring harness (1) from steering gear.

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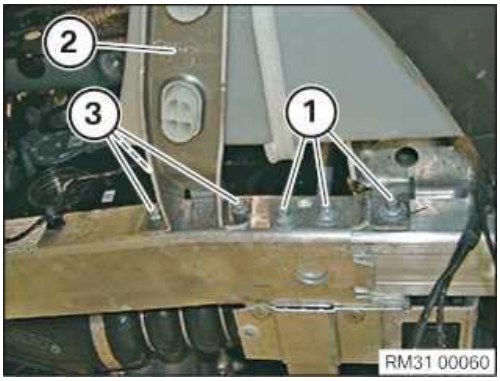
- To unlock the plug connections (see the following work step): unlock plug connections (arrow) with the right hand.

  The plug connections can be reached via the left-hand output shaft.



- Unlock plug connections (arrow) (1)and disconnect from the steering gear.
- Make sure when lowering the front axle that the cables are not damaged!

31 – Releasing the mounted part from the front axle support

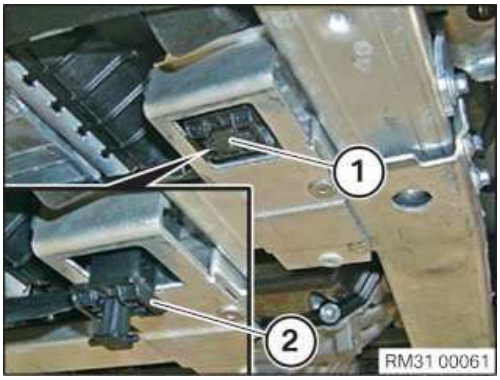


- **Only on right side:** Loosen screws (3) and remove holder for washer fluid reservoir (2).

NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).



NOTICE

Perform the operations on the left and right side.

- Unlock safety catch (1) of the lock (2) from the holder for the charge air cooler.
- Completely remove locks (2).



- Loosen screw (2) of the engine support (3) on the front axle (1).

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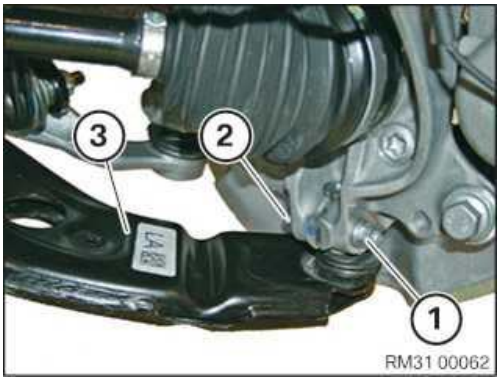


NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

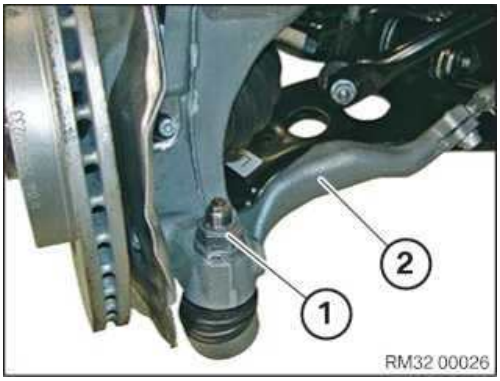
32 – Detaching and removing front axle completely



NOTICE

Perform the operations on the left and right side.

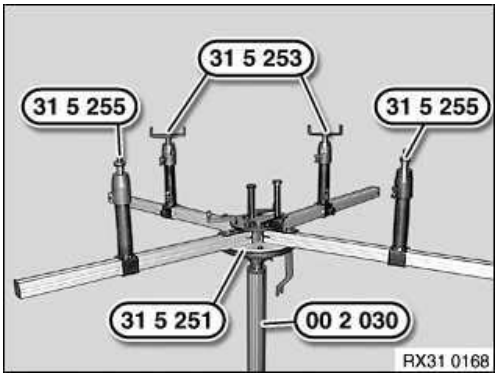
- Unfasten nut (1).
- (2)Pull out screw.
- Detach the wishbone (3) from the swivel bearing .



NOTICE

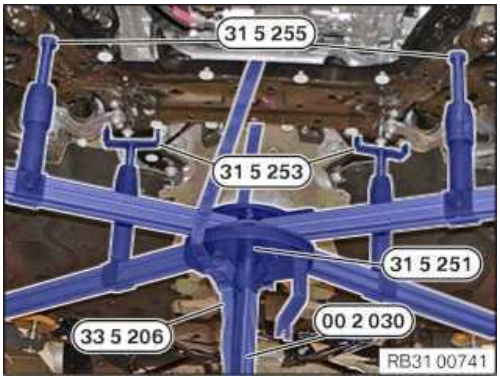
Perform the operations on the left and right side.

- Unfasten nut (1).
- Detach the track rod (2) from the swivel bearing.



- Fit the special tool completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools in telescopic supports of a profile rail pair.
- Insert special tools in telescopic supports of other profile rail pair.

Note: In a profile rail pair, two profile rails are connected to one another by gearing.

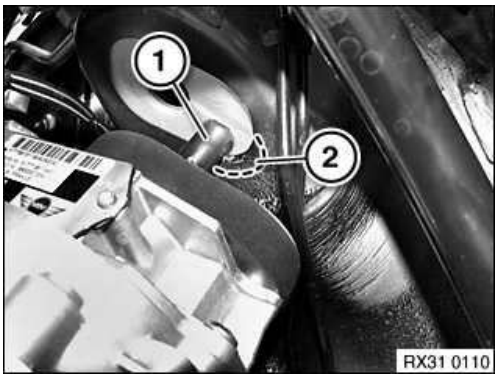


- Align special tools and to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool to special tool .

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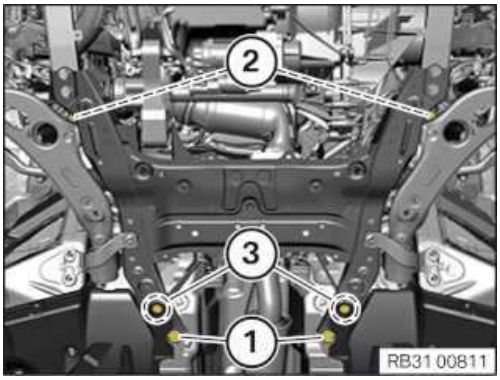


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



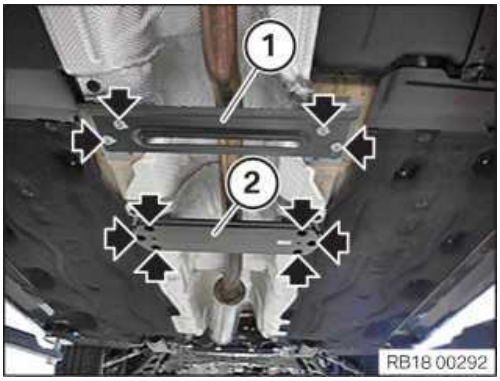
- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and remove the front axle.

TECHNICAL INFORMATION

Note the information on thread repairs using Helicoil thread inserts.
For more information see: 41 00 ... Notes on repairing threads

- Check threads for damage; if necessary, repair with Helicoil thread inserts.

33 – Removing the connecting support from the tunnel in front and back



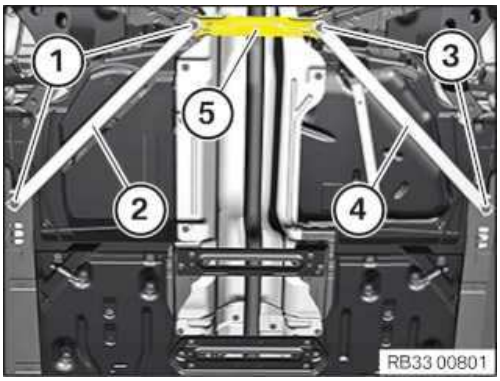
- Unscrew the bolts (arrows) from the connecting support (1).
- Feed out and remove the crossbeam (1).
- Unscrew the bolts (arrows) from the connecting support (2).
- Feed out and remove the crossbeam (2).

34 – Remove the cross strut with the torsion strut

TECHNICAL INFORMATION

Driving without a torsion strut is not permitted.

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- Loosen screws (1).
- Thread out torsion strut (2) at left and remove.
- Loosen screws (3).
- Thread out torsion strut (4) at right and remove.
- Feed out and remove the cross-member (5).

35 – Remove exhaust system

WARNING

Hot surfaces.

Risk of burning!

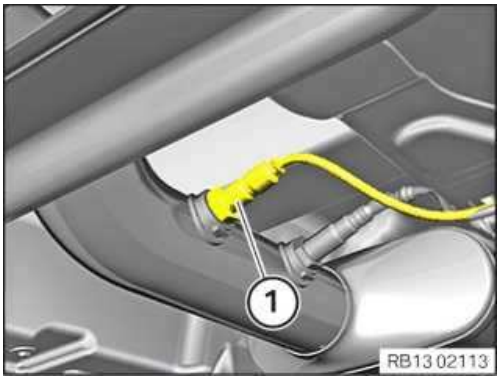
- Perform all work only on components that have cooled down.

CAUTION

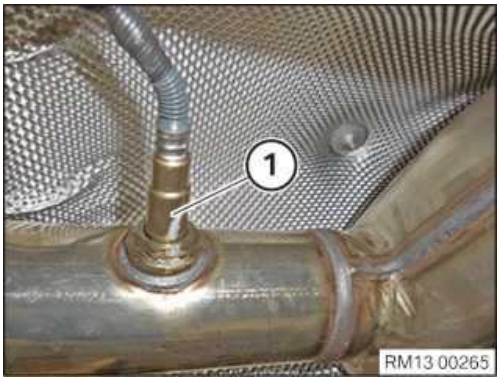
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

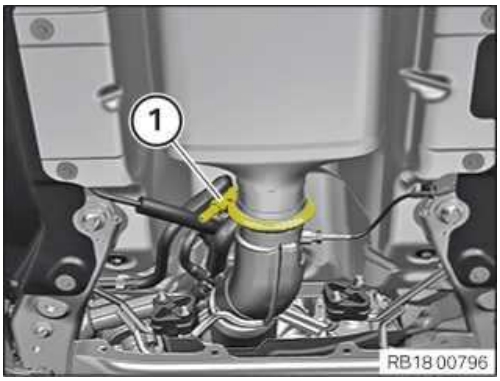


- Release the nitrogen oxide sensor (1) downstream of the SCR catalytic converter, guide it out and set it aside.

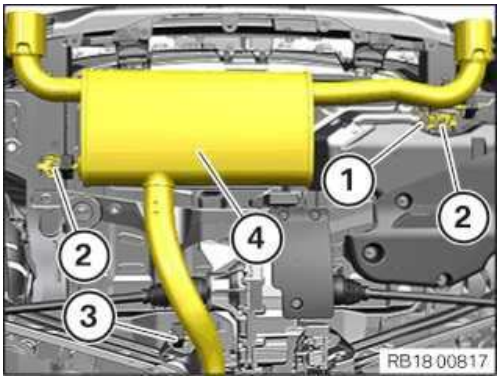


- Release the diesel particulate sensor (1), guide it out and set it aside.

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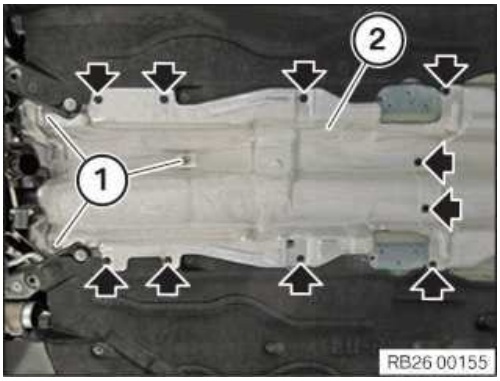


- Loosen V-band clamp (1).



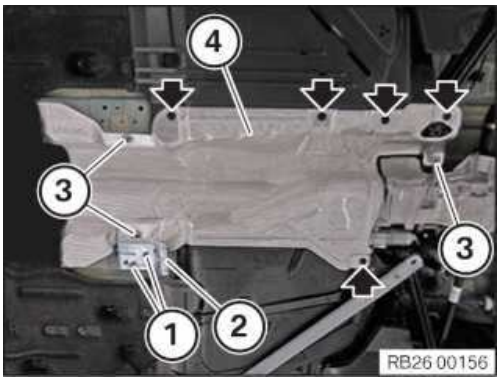
- Loosen screw (1).
- Loosen nuts (2).
- Release the rubber mount (3) of the exhaust system (4).
- Lower and guide out the exhaust system (4) with assistance of a second person and remove it.

36 – Remove front heat shield



- Remove screws (arrows).
- Loosen nuts (1).
- Guide the heat shield (2) out and remove it.

37 – Remove heat shield at rear.



- Loosen screws (1).
- Guide out and remove holder (2).
- Remove screws (arrows).
- Loosen nuts (3).
- Guide the heat shield (4) out and remove it.

38 – Remove propeller shaft

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CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

RISK OF DAMAGE

Damage to propeller shaft during removal.

Non-observance of the removal guidelines for the propeller shaft on the rear axle differential may cause severe damage.

- Do not disassemble the three-hole flange, flexible disc and propeller shaft. The three-hole flange to the rear axle differential is balanced with the flexible disc and propeller shaft.
- Loosen the recessed nut against the direction of travel in clockwise direction. The propeller shaft must be loosened on the recessed nut only and exclusively in the direction of rotation otherwise the anti-twist lock of the bi-hexagonal flange nut is damaged.
- In the event of a damaged anti-twist lock on the bi-hexagonal flange nut: Replace the rear axle differential.



- Install the special too l between the front and rear propeller shaft.
- Make sure that the arrows on the special tool point forward in the direction of travel.

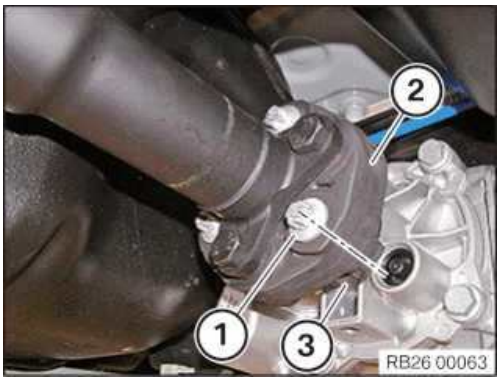


- Always support the propeller shaft (1) with a conventional jack.



- Protect the propeller shaft (1) with the special tools **0 495 554 (33 5 070)** and from twisting.

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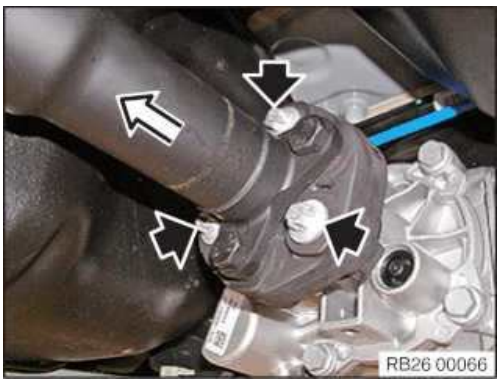
TECHNICAL INFORMATION

Compliance with the following instructions is required to avoid a humming noise from the propeller shaft after refitting the propeller shaft.

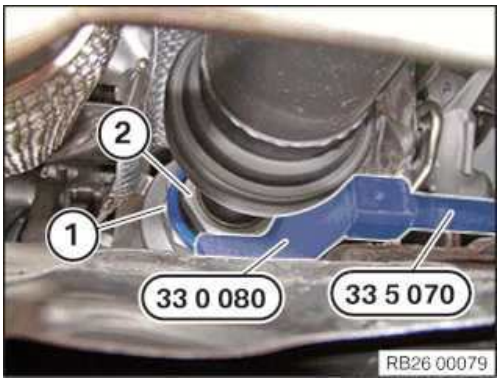
- Mark the installation position of the screw connection (1), the flexible disc (2) and the three-hole flange (3) on the same level.
- Loosen the screw connection (1).



- Loosen screws (1).



- Remove screws (arrows).
- Guide the propeller shaft out in the direction of the arrow and set it aside.



RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.

- Protect the recessed nut (2) on the transfer box from twisting with the special tools **0 495 554 (33 5 070)** and .

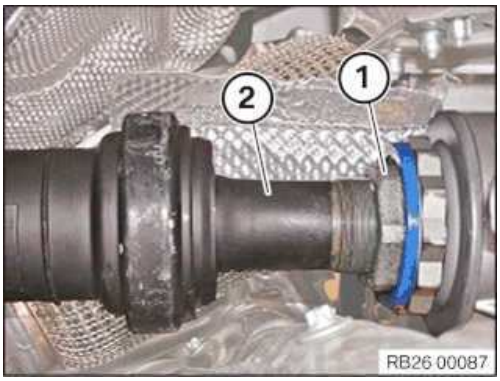
  The recessed nut (2) on the transfer box must **not** be used to detach the propeller shaft.

  The double hexagon flange nut (1) must **not** be used for counter support.

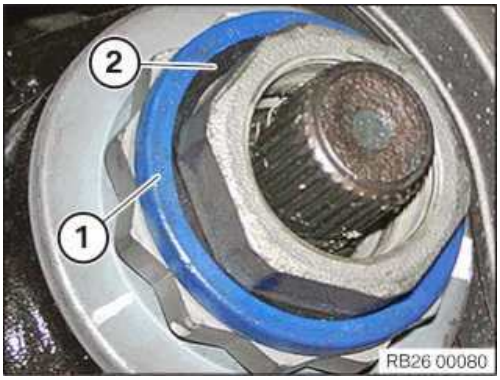


- Release the front propeller shaft with the special tools **0 495 554 (33 5 070)** and in the direction of the arrow.

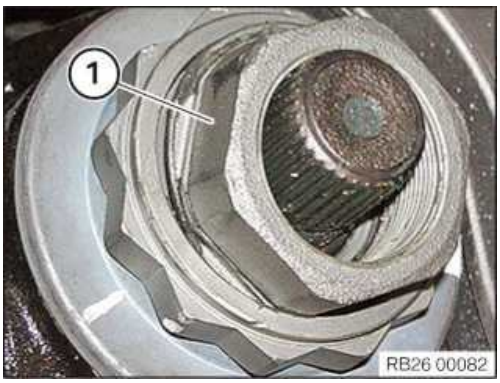
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- Thread the propeller shaft (2) out of the recessed nut (1) and remove.



- Thread the retaining clip (1) and the seal (2) out and remove.



- Thread out and remove the recessed nut (1).

39 – Removing starter motor

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and loosen connector (1).
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).



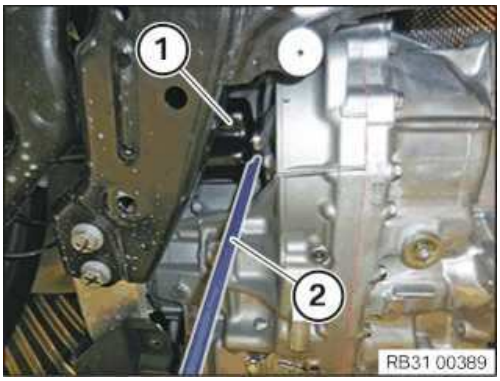
- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.



- Loosen screws (1).
- Feed out starter motor and remove.

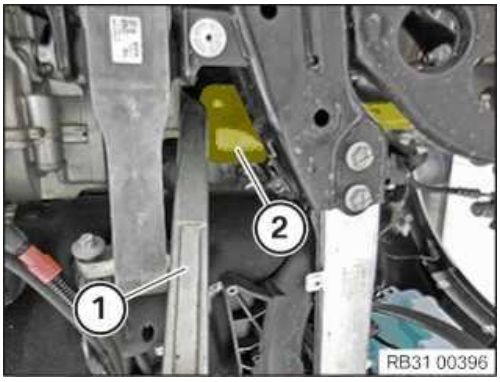
40 – Partially removing the left output shaft

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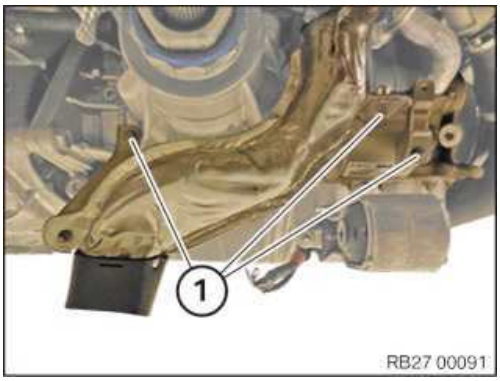
- Protect the output shaft (1) from falling.
- Lever out the output shaft (1) with a mounting lever (2) from the transmission.
- Tie up output shaft (1).

41 – Partially removing right output shaft

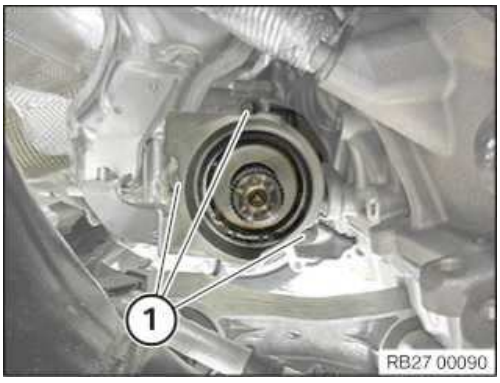


- Lever out the output shaft (2) with a mounting lever (1).
- Tie up output shaft (1).

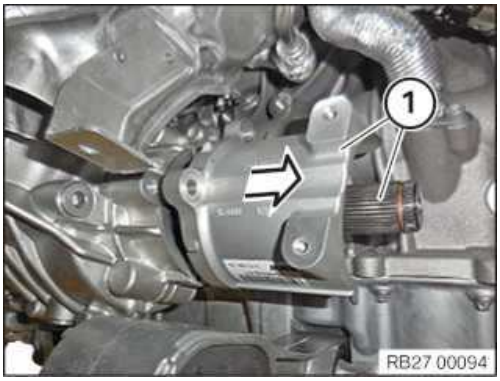
42 – Remove the intermediate shaft with the support tube



- With air duct installation: Loosen screws (1).
- Remove air duct



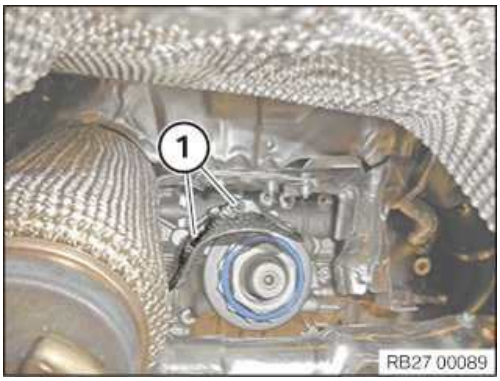
- Loosen screws (1).



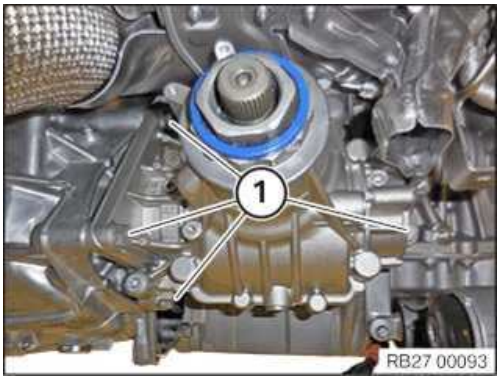
- Pull the intermediate shaft with the support tube (1) out of the transfer box.

43 – Remove transfer box (VTG)

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- Loosen screws (1).
- Remove heat shield.



- Loosen screws (1).
- Remove the transfer box (VTG).

44 – Remove the monitoring oxygen sensor

WARNING

Hot surfaces.

Risk of burning!

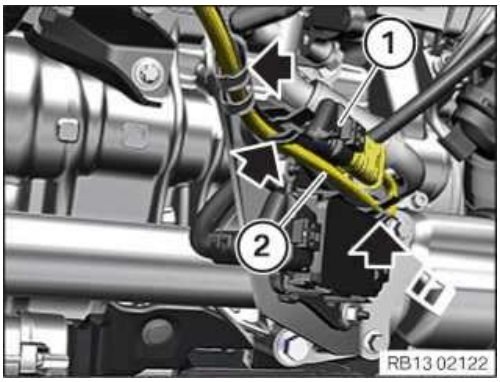
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

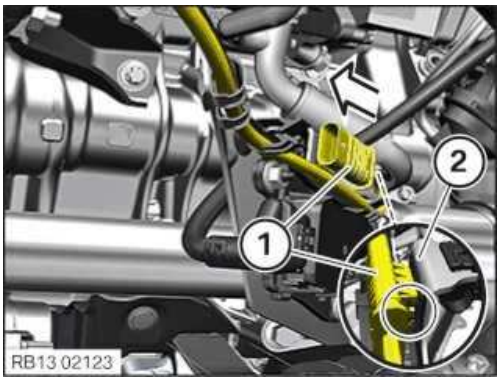
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

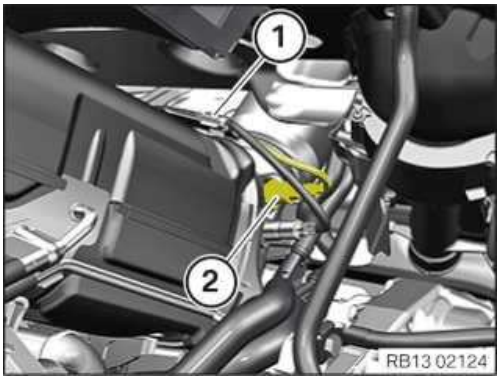


- Unlock plug connection (1) and disconnect.
- Feed oxygen monitor sensor cable (1) out of the clamps (arrows).

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- Unlock the connector (1) in the marked area and disconnect it from the holder (2) in the direction of arrow.



- Guide the cable of the monitoring oxygen sensor (2) out of the clamp (1).
- Release the monitoring oxygen sensor (2) using special tool **0 491 074 (11 7 020)**.
- Remove the monitoring oxygen sensor (2).

45 – Removing the nitrogen oxide sensor before SCR catalytic converter

WARNING

Hot surfaces.

Risk of burning!

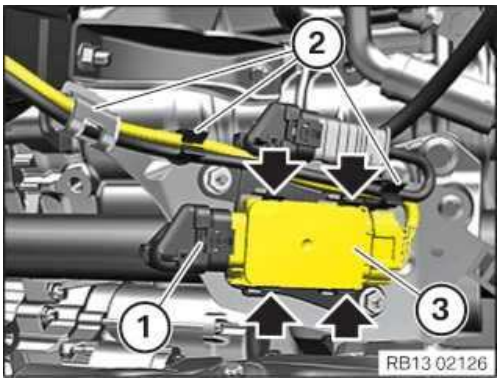
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

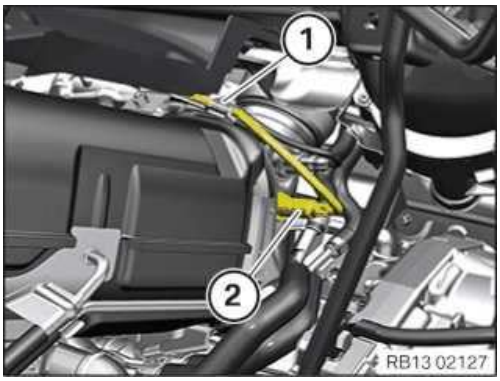
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



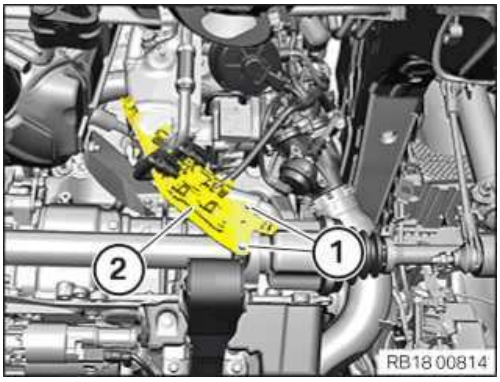
- Unlock plug connection (1) and disconnect.
- Slide the cable of the nitrogen oxide sensor evaluation electronics (3) out of the clamps (2) and remove.
- Unlock (arrows) and remove the evaluation electronics for the nitrogen oxide sensor (3).

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- Slide the cable of the nitrogen oxide sensor before the SCR catalytic converter (2) out of the clamps (1) and remove.
- Detach the nitrogen oxide sensor before the SCR catalytic converter (2) using the special tool **0 491 074 (11 7 020)**.
- Guide out and remove the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

46 – Remove holder for oxygen sensor



- Loosen screws (1).
- Thread out the holder (2) for the oxygen sensor and remove.

47 – Remove the exhaust temperature sensor on the catalytic converter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

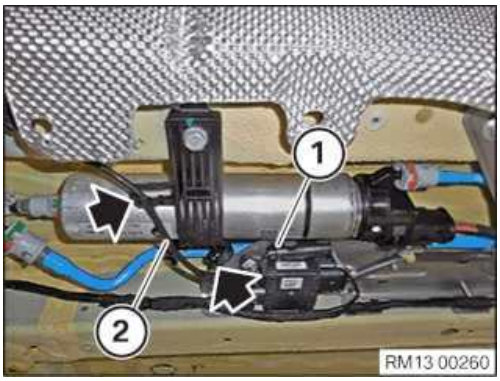
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

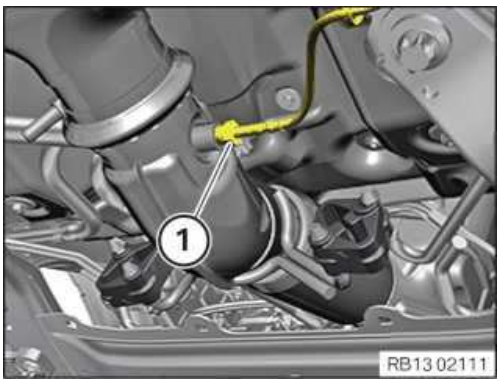
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- Unlock and loosen connector (1).
- Feed out the cable (2) of the exhaust temperature sensor from the clamps (arrows) and remove.



- Loosen the cable clip (1).



- Loosen exhaust temperature sensor (1).
- Feed out and remove exhaust temperature sensor (1).

48 – Removing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

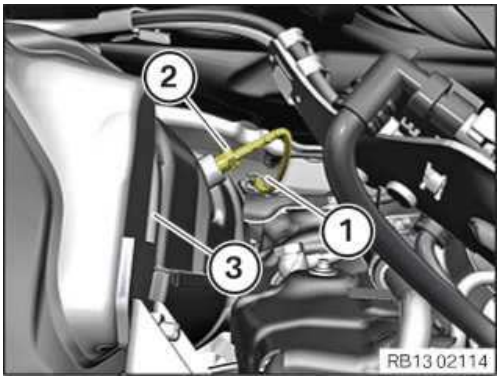
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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- Unlock and loosen connector (1).
- Uncover the exhaust temperature sensor cable.



- Guide the exhaust temperature sensor cable (2) out of the clamp (1) and place it to one side.
- Release the exhaust temperature sensor (2) with conventional tools .
- Feed out and remove the exhaust temperature sensor (2) from the diesel particulate filter (3).

49 – Remove the exhaust temperature sensor on the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

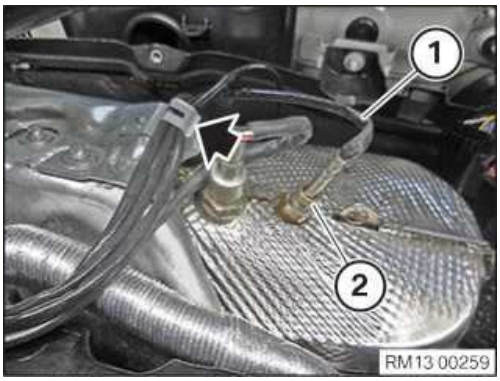
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect connector (1).
- Put the cable of the exhaust temperature sensor to one side.

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- Guide cable (1) of the exhaust temperature sensor out of the clamp (arrow) and remove it.
- Loosen exhaust temperature sensor (2).
- Feed out and remove exhaust temperature sensor (2).

50 – Remove the control sensor

WARNING

Hot surfaces.

Risk of burning!

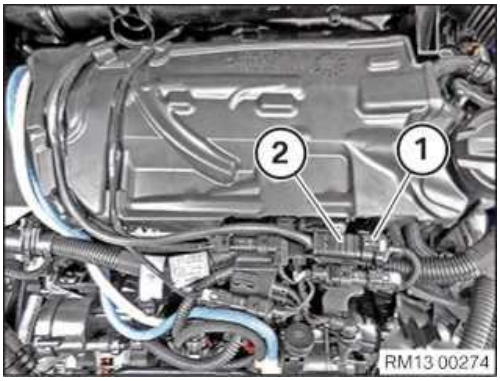
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock plug connection (1) and disconnect.
- Detach the connector (2) from the holder .
- Release the front oxygen sensor cable.



- Detach the control sensor (1) with the special tool .
- Feed out and remove the control sensor (1).

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51 – Removing the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

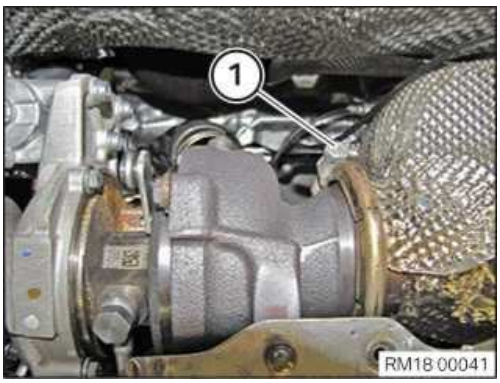
- Perform all work only on components that have cooled down.

CAUTION

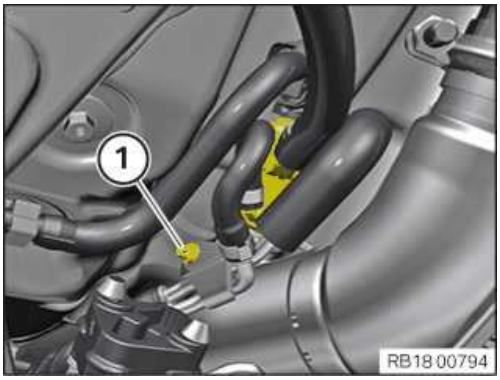
Heavy component.

Heavy components can lead to injury or damage.

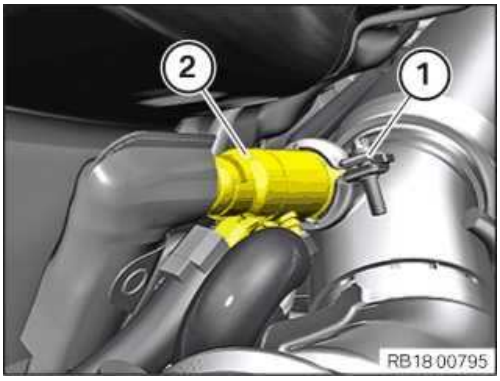
- Remove and install heavy components with the aid of another person/other persons.



- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.

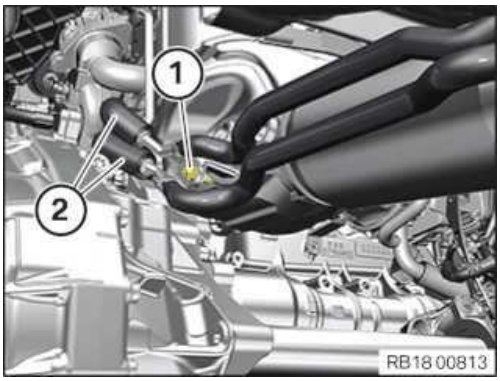


- Loosen screw (1).



- Loosen V-band clamp (1).
- Remove the SCR metering module (2) and set it aside.

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- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.

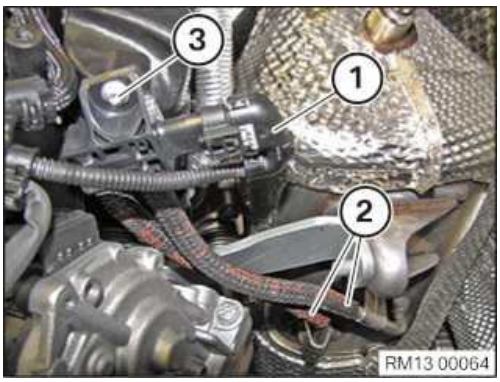
▶ **Remove differential pressure sensor**

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

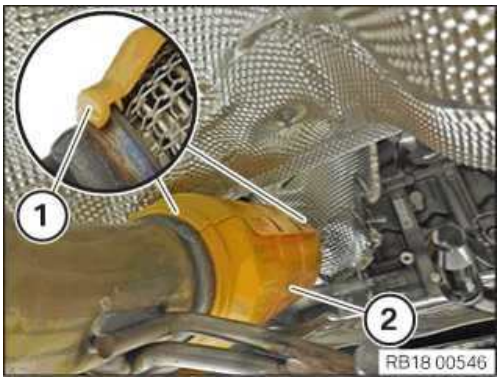


- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

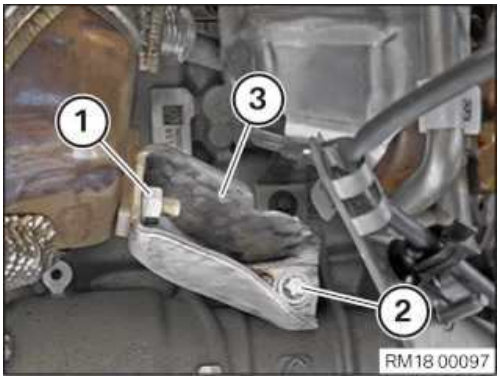


- Loosen nuts (1).

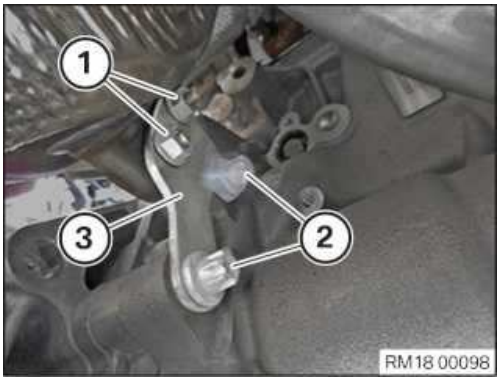
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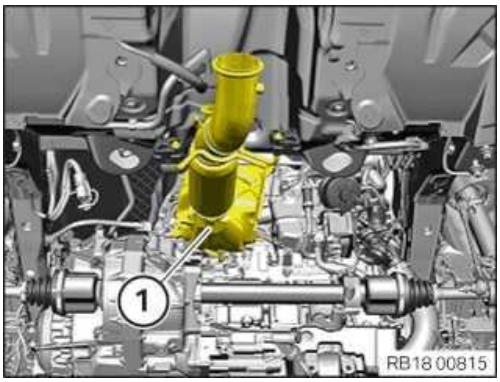
- Mount fitting aid (2).
- Make sure that the fitting aid is correctly position on the edges (1) of the flexible tube.



- Unfasten nut (1).
- Loosen screw (2).
- Remove holder (3).



- Loosen nuts (1).
- Loosen screws (2).
- Remove holder (3).

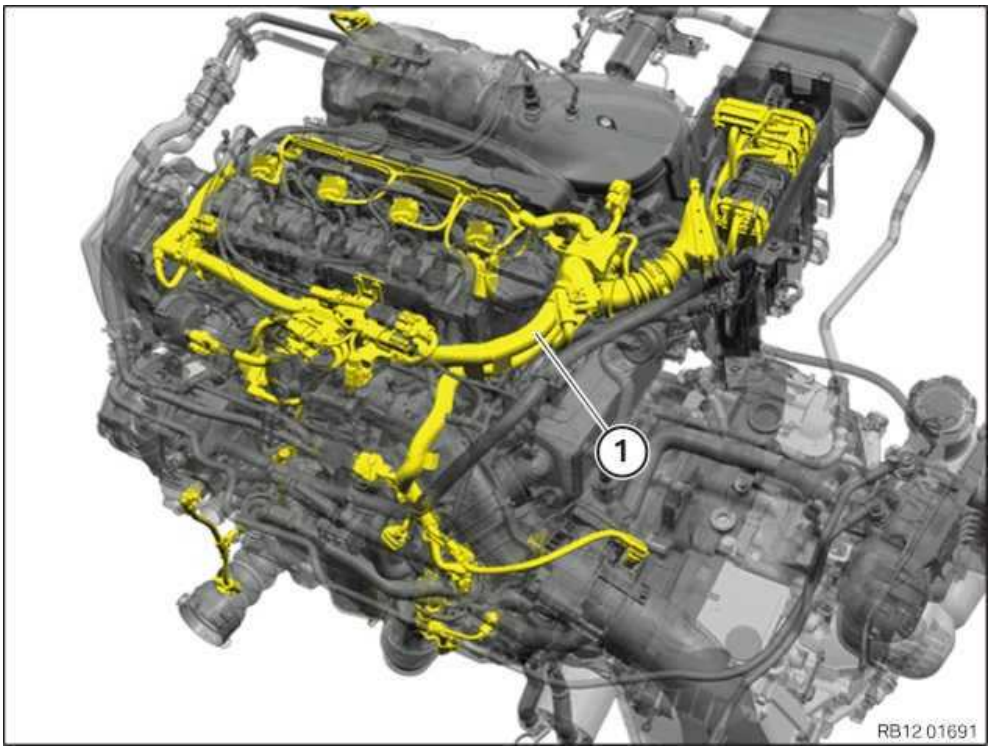


- Feed out diesel particulate filter (1) toward the bottom and remove.

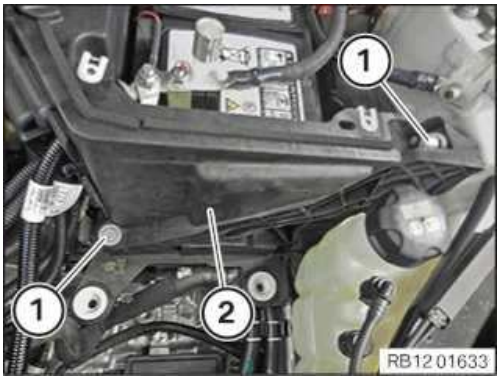
52 – Releasing the wiring harness section for the intake plenum

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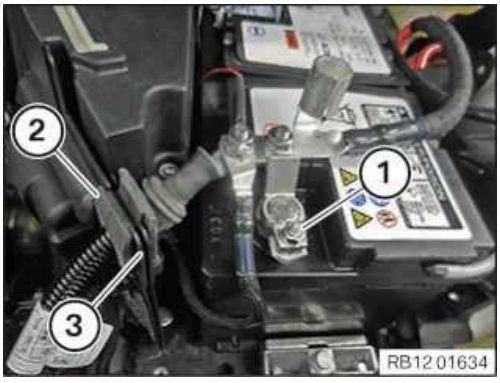
Overview: Wiring harness section for the engine



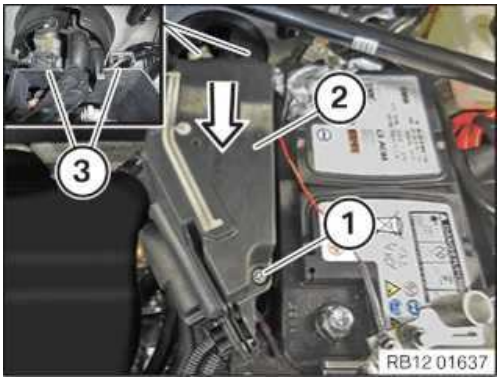
1 Wiring harness section for the engine



- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.

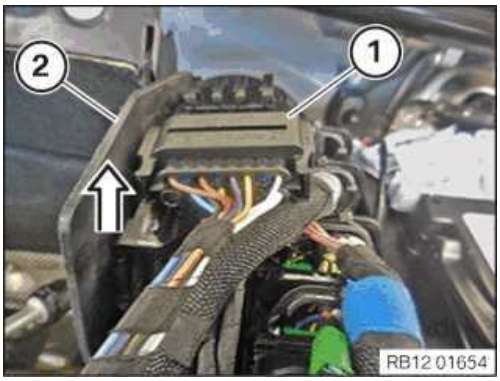


- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

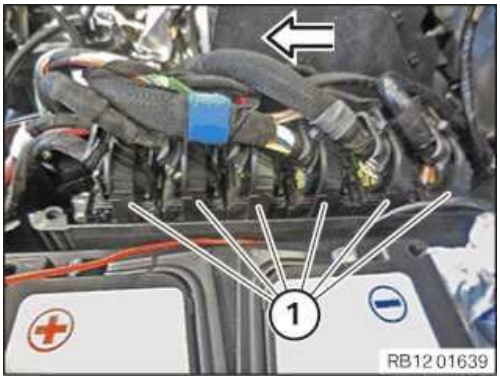


- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.

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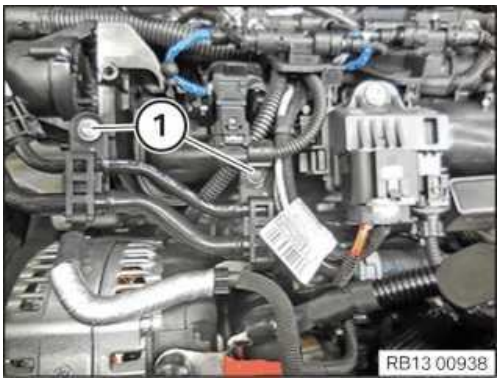
- Guide the connector (1)out of the electronics box (2) in the direction of arrow and remove it.
- Unlock and loosen connector (1).



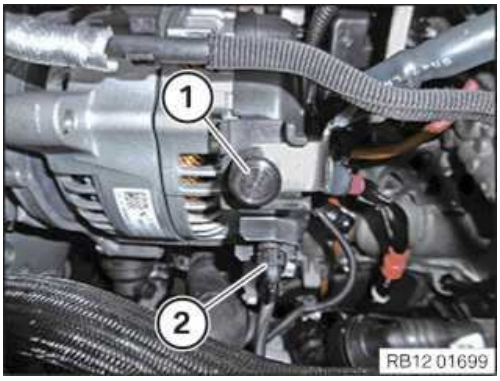
- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



- Unlock and loosen connector (1).

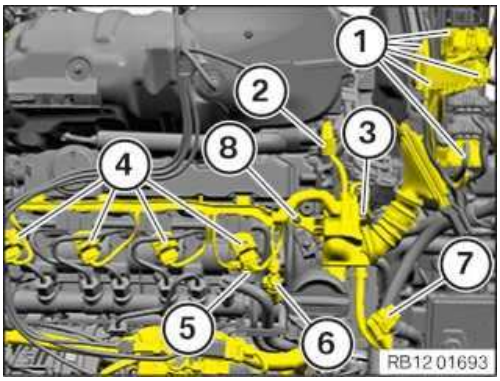


- Loosen screws (1).

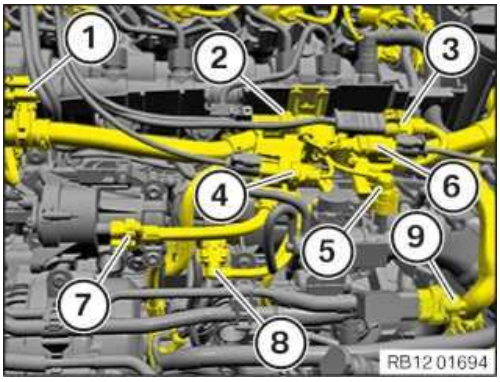


- Release the positive battery cable (1) on the alternator and place to one side.
- Unlock connector (2) and pull off.

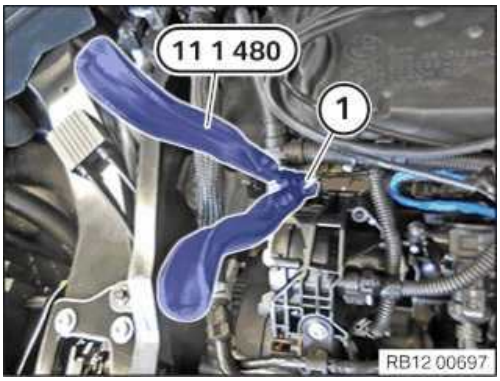
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- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock the connector (2) and disconnect it from the differential pressure sensor.
- Unlock the connector (3) and disconnect it from the exhaust-gas recirculation valve.
- Unlock the connector (4) and pull off from the injectors.
- Unlock the connector (5) and disconnect it from the camshaft sensor.
- Unlock the connector (6) and disconnect it from the fuel pressure regulator.
- Unlock connector (7) and pull off from hot film air mass meter.
- Loosen screw (8).

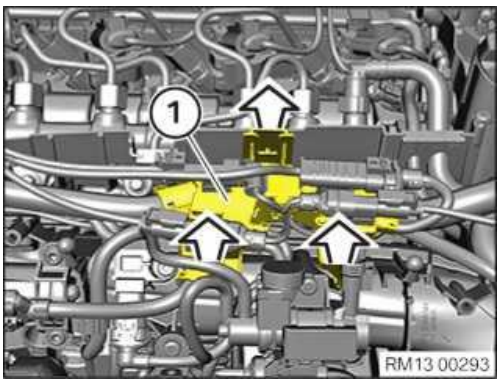


- Unlock connector (1) and pull off from the rail pressure sensor.
- Unlock the connector (2) and disconnect it from the exhaust temperature sensor before the diesel particulate filter.
- Unlock and disconnect the connector (3) from the front oxygen sensor.
- Unlock the connector (4) and disconnect it from the exhaust temperature sensor after the diesel particulate filter.
- Unlock and disconnect the connector (5) from the electric changeover valve.
- Unlock the connector (6) and disconnect it from the exhaust temperature sensor for the exhaust-gas recirculation cooler.
- Unlock the connector (7) and disconnect it from the servomotor for the swirl flaps.
- Unlock the connector (8) and pull it off the charging pressure sensor.
- Unlock the connector (9) and disconnect from the fuel pressure and temperature sensor.



- Unlock the connectors (1) of all glow elements with the special tool **0 490 796 (11 1 480)** and release them.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.

▶ **Removing the cable clips from the intake plenum**



- Detach the cable clip (1) in the direction of the arrow.
- Guide out the cable clip (1) in direction of arrow and set it aside.

53 – Removing the intake plenum

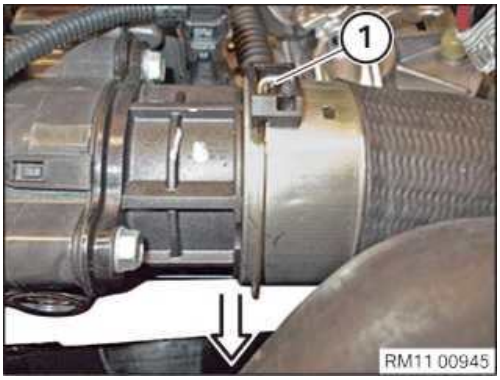
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TECHNICAL INFORMATION

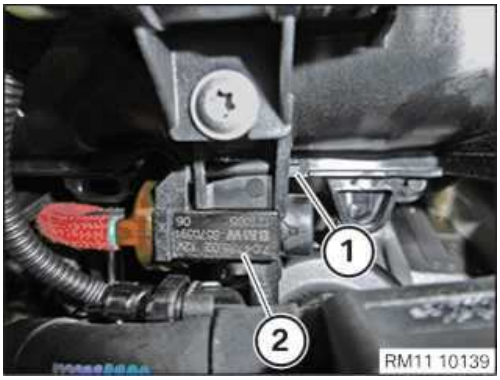
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



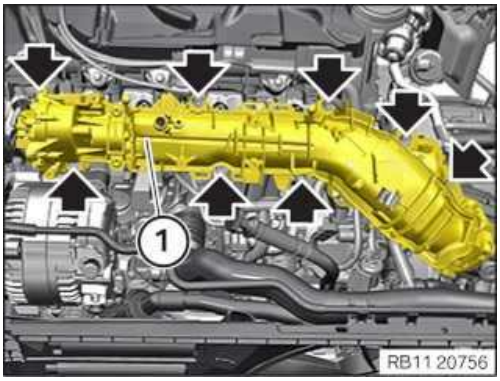
- Unlock the lock (1).



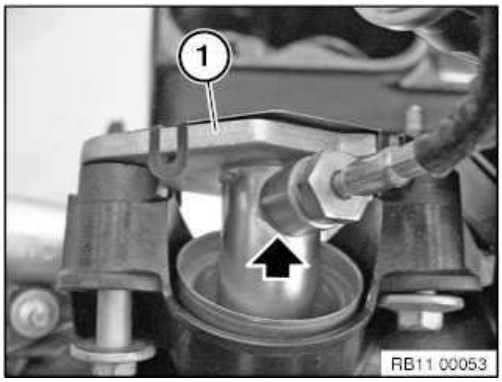
- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.



- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



- Release the screws (arrows) from the intake plenum (1).
- Guide the intake plenum (1) out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

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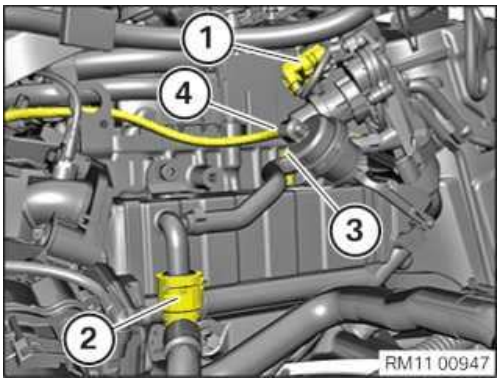
54 – Removing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

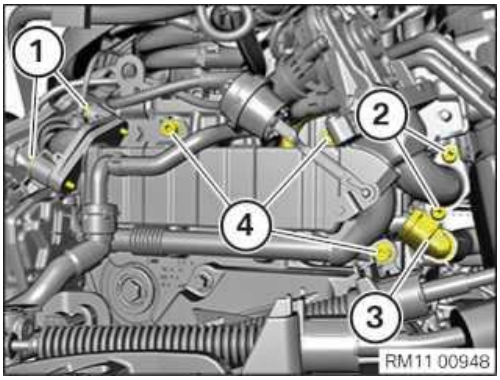
- Perform all work only on components that have cooled down.



TECHNICAL INFORMATION

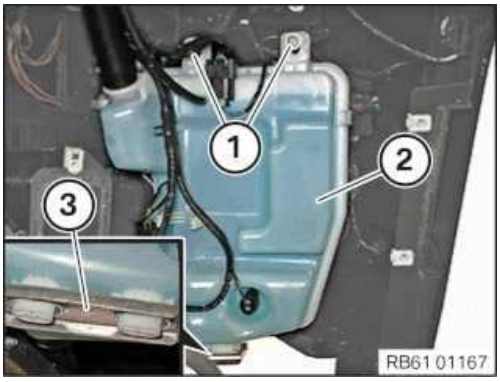
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.

55 – Remove the washer fluid reservoir from the fixture



- Loosen screws (1).
- Guide the washer fluid reservoir (2) up and out of the fixture (3) and set it aside.

56 – Removing the right charge air duct between the exhaust turbocharger and the charge air cooler

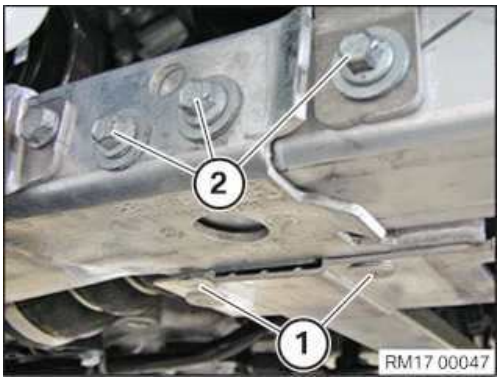
WARNING

Hot surfaces.

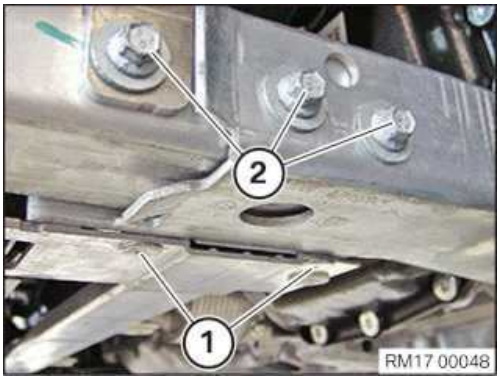
Risk of burning!

- Perform all work only on components that have cooled down.

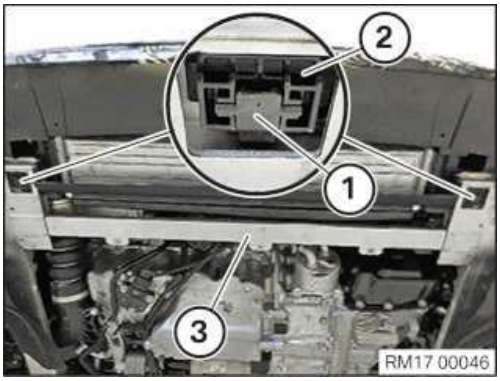
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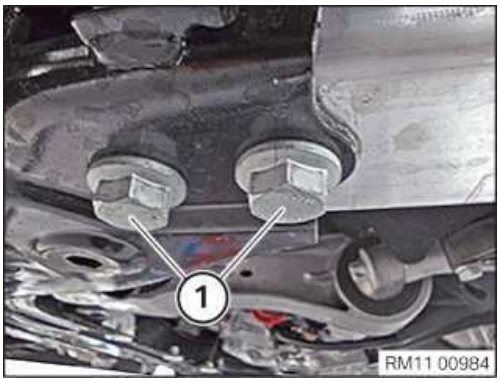
- Undo screws (2) at front left.
- Drill out blind rivets (1) at front left.



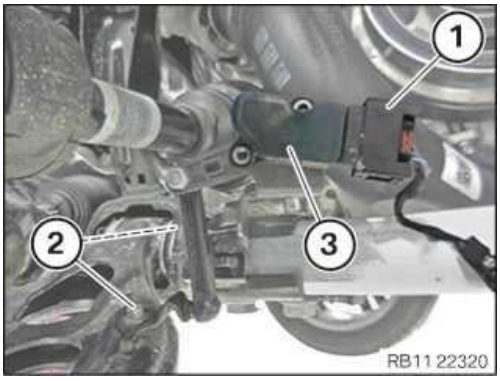
- Undo screws (2) at front right.
- Drill out blind rivets (1) at front right.



- Unlock locking pins (1).
- Thread out and remove locks (2).
- Thread out and remove cross connection (3).

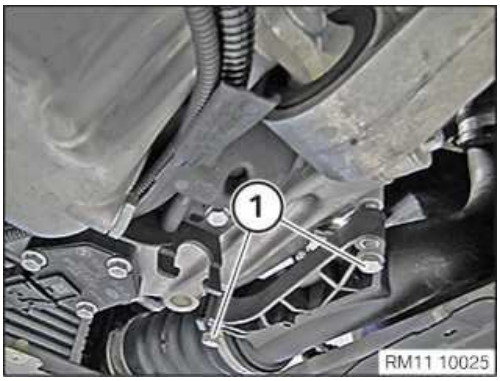


- Release the screws (1) on the right front axle support.

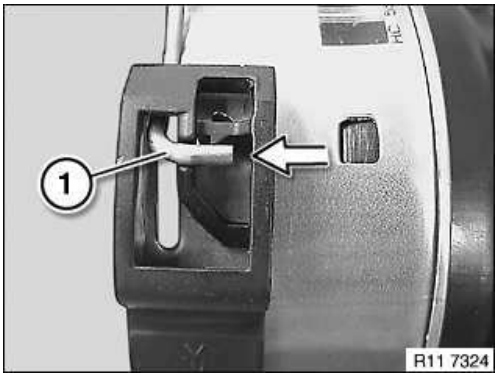


- **If installed:**
- Unlock and release plug connection (1).
- Loosen screws (2).
- Feed out the ride height sensor (3) and remove.

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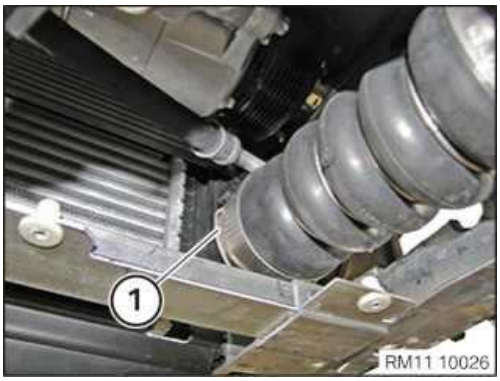


- Release screws (1) of charge air duct on right oil sump.

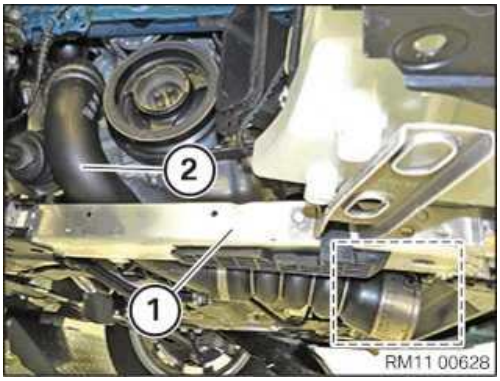


- Unlock lock (1).

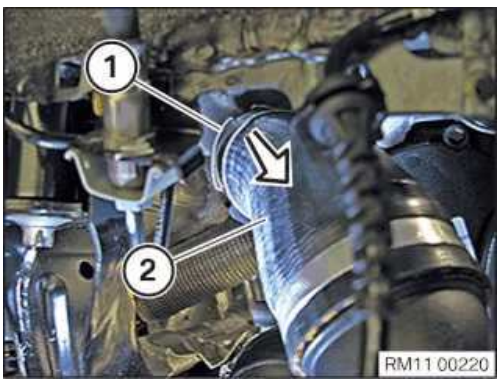
  The lock (1) must engage in the bracket during unlocking (arrow).



- Unlock and release the charge air duct (1) on the charge air cooler.



- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed out the charge air duct (2) in the **marked** area towards the bottom and set it aside.



- Unlock and detach the locks (1) on both sides.
- Feed out the charge air duct (2) on the exhaust turbocharger in the direction of the arrow and set it aside.

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- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed out the charge air duct (1) in the direction of arrow between the side member and the deformation element and remove.

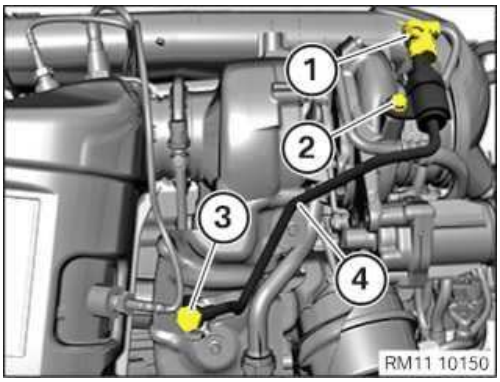
57 – Remove the heat shield from the exhaust turbocharger at the bottom

WARNING

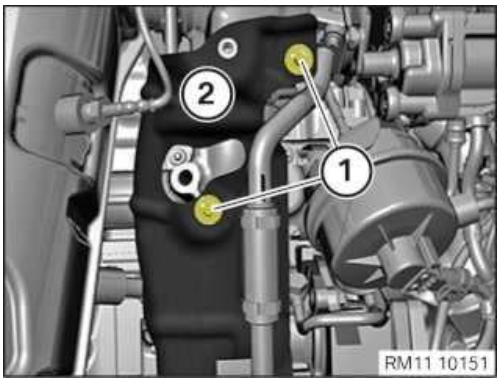
Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Unlock and disconnect connector (1).
- Unscrew the banjo bolt (3).
- The seals of the banjo bolt (3) must be renewed.
- Loosen screw (2).
- Remove the exhaust gas pressure pipe (4).



- Unscrew the bolts (1) on the heat shield .
- Feed out and remove the heat shield (2).

58 – Removing the low-pressure stage turbocharger

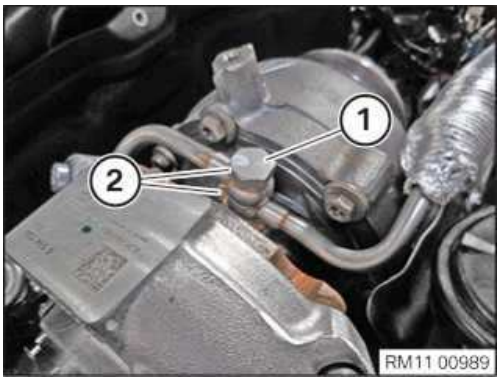
WARNING

Hot surfaces.

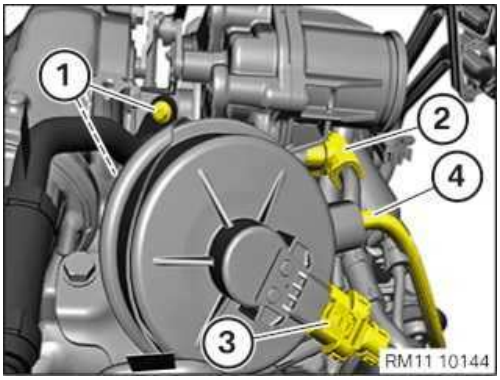
Risk of burning!

- Perform all work only on components that have cooled down.

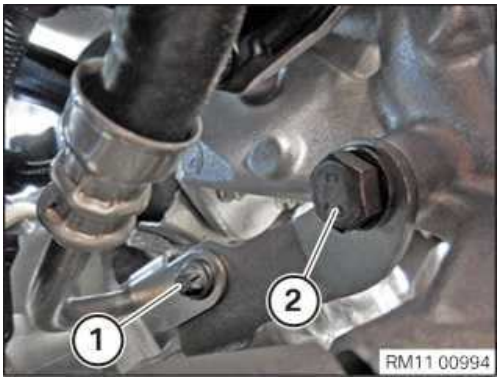
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- Release the banjo bolt (1) of the oil feed lines.
- Remove sealing rings (2).
- Place oil feed lines to one side.



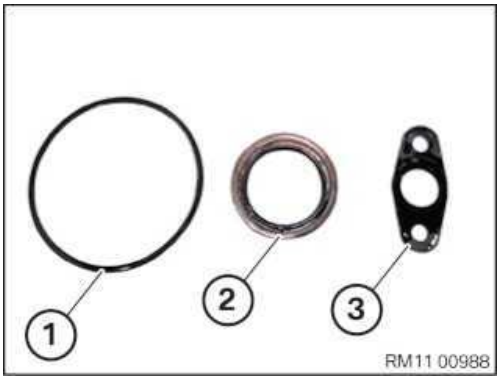
- Release the screws (1) of the oil return line.
- Unlock and disconnect the plug connections (2) and (3).
- Pull off the vacuum hose (4) carefully.



- Undo the bolt (1) of the oil feed line.
- Loosen screw (2).

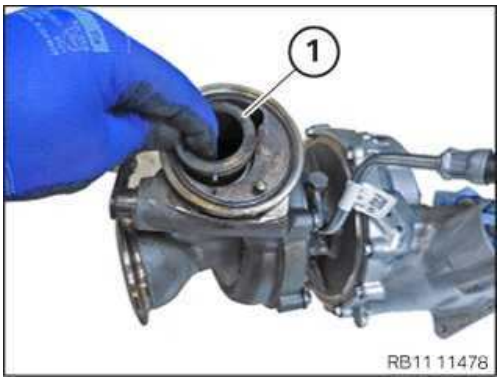


- Loosen screw (1).
- Remove the V hose clamp.
- Guide the low-pressure stage turbocharger out towards the top and remove.



- Remove seals (1), (2) and (3).

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- Remove the spacer ring (1).

59 – Removing the high-pressure stage exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

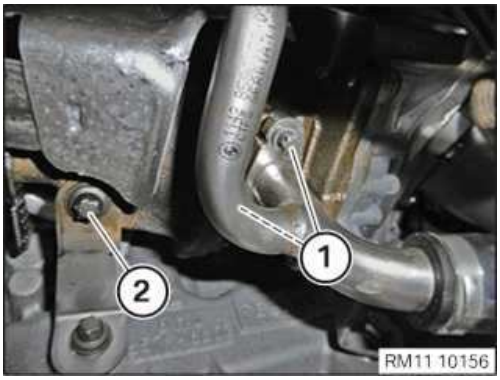
- Perform all work only on components that have cooled down.

CAUTION

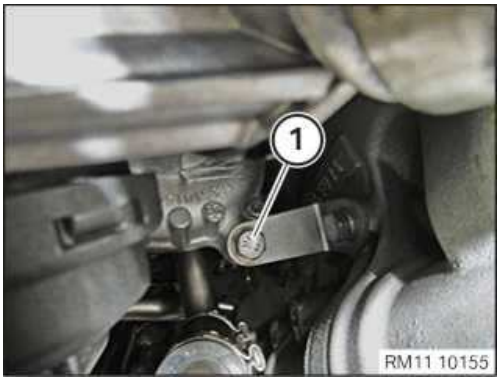
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

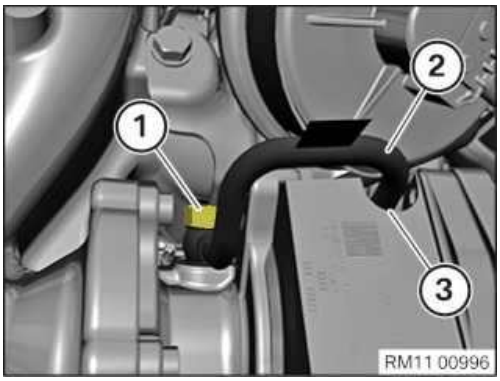


- Unscrew the bolts (1) on the oil return line .
- Loosen screw (2).

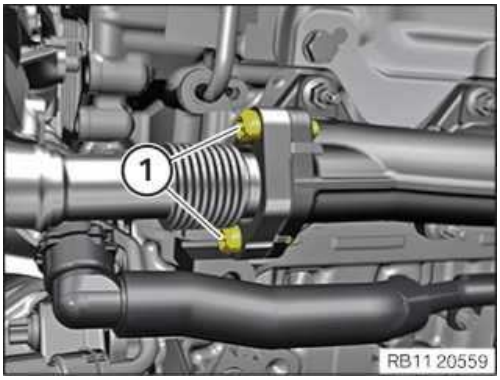


- Release screw (1) from the right wheel arch.

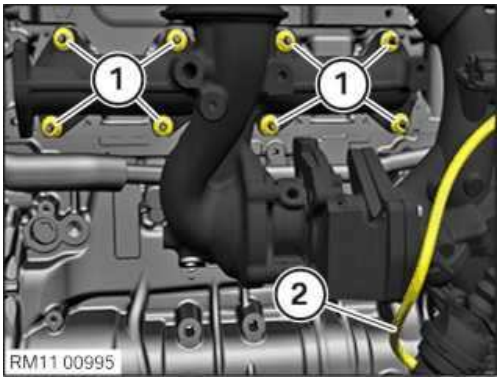
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- Unscrew the banjo bolt (1).
- Guide out oil feed line (2) from holder (3).



- Loosen screws (1).



- Pull off the vacuum hose (2).
- Loosen nuts (1).
- Guide out the exhaust manifold and the high-pressure stage exhaust turbocharger to the top and remove them.

60 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

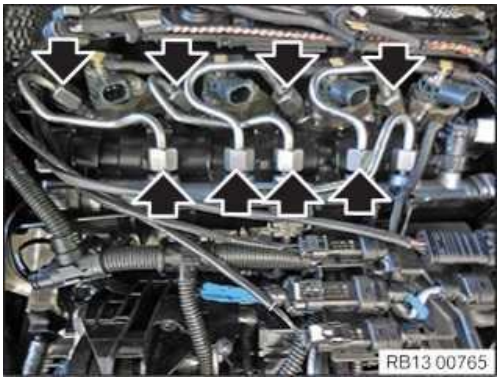
If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release the high pressure lines (arrows) with the special tool .
- Catch and dispose of escaping fuel.
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool .

61 – Remove leakage oil lines

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

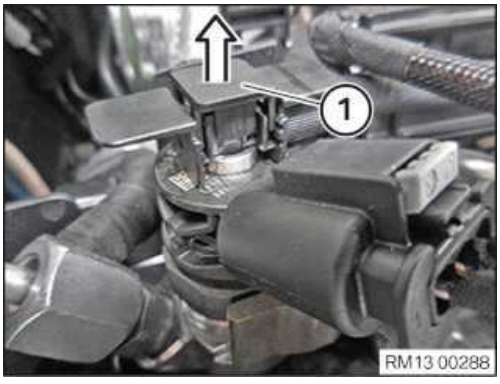
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

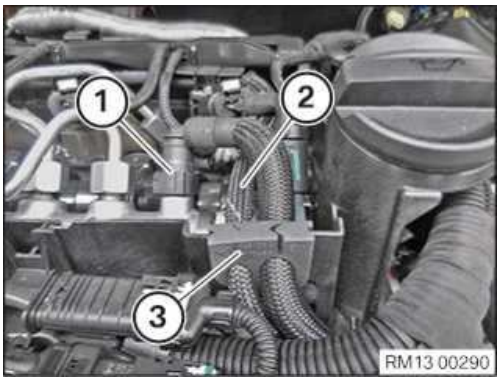


- Unlock the connectors (arrows) and disconnect.

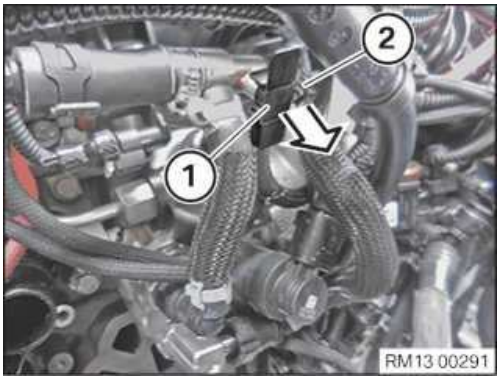


- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

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- Unlock and loosen fuel line (1) and set it aside.
- Guide the leakage oil line (2) out of the rubber grommet (3) and set it aside.



- Release lock (1) in direction of arrow.
- Feed out leakage oil line (2) and remove.

62 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

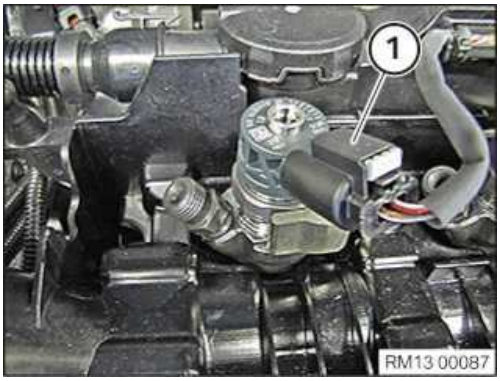
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

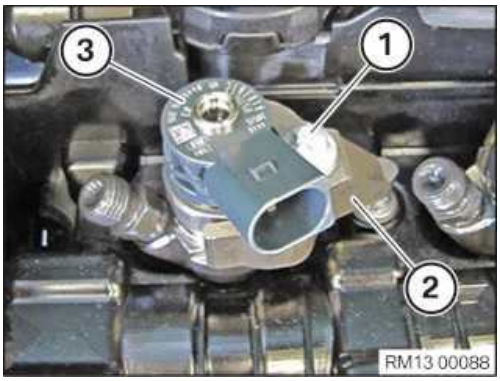
TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.



- Unlock and disconnect connector (1).

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- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

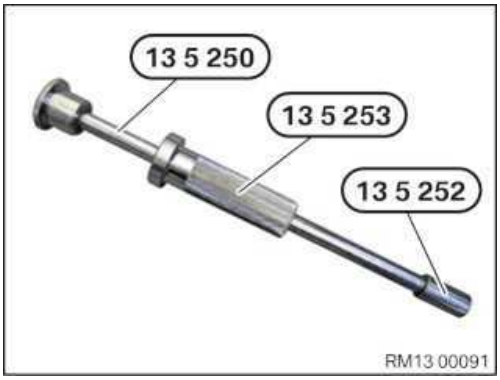
▸ **Loosen stuck injectors**

RISK OF DAMAGE

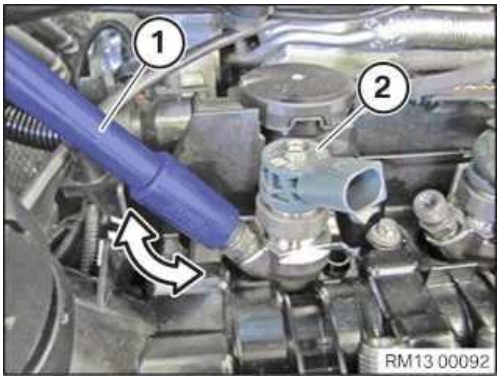
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)** back onto the special tool **0 493 321 (13 5 250)**.

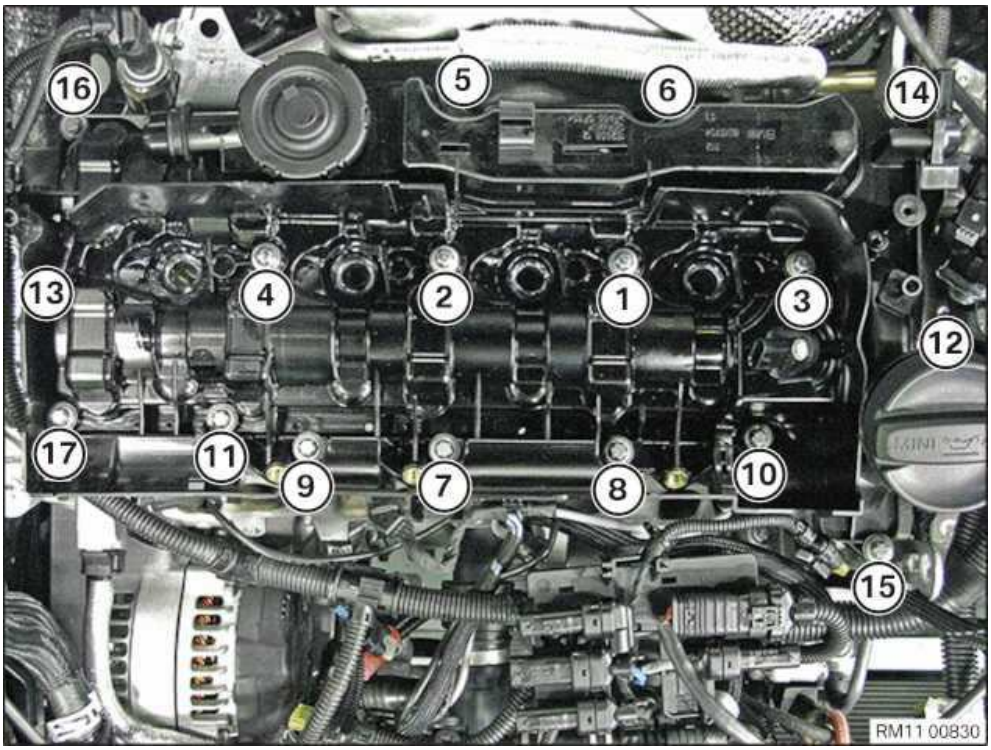


- Screw the special tool (1) **0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1) **0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

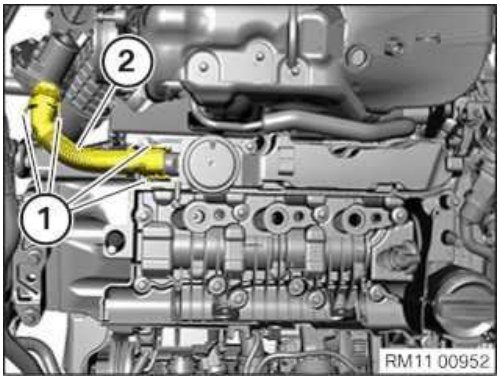
63 – Removing the cylinder head cover

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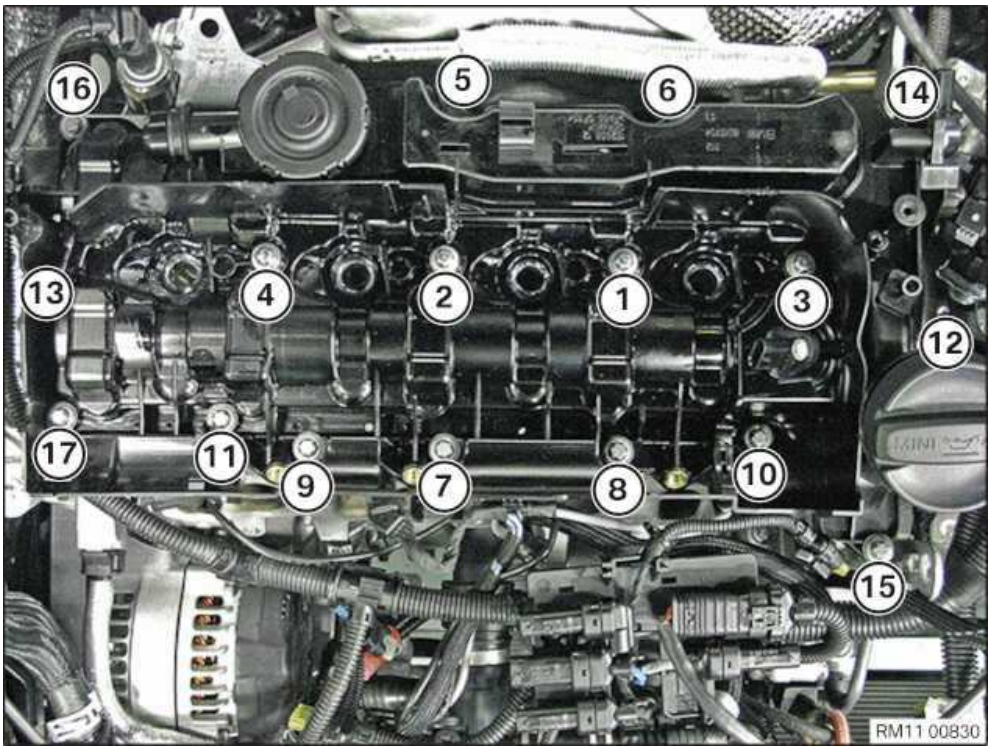
Overview: Screw connection of the cylinder head cover



1 to 16 screws of the cylinder head cover.



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).



- Loosen screws in the order (17) to (1).
- Remove cylinder head cover by lifting it out.

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- Remove protective cap (1) from oil sump.

- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

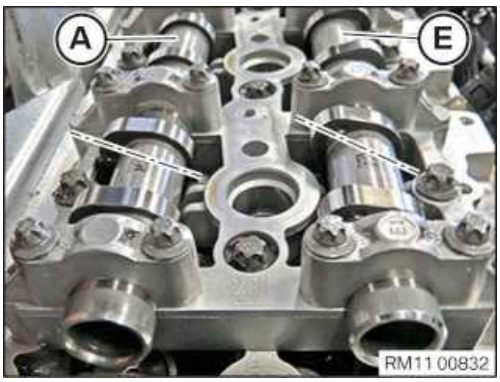
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

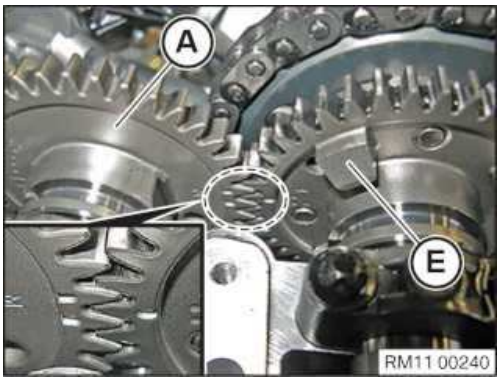


- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.

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- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.



- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

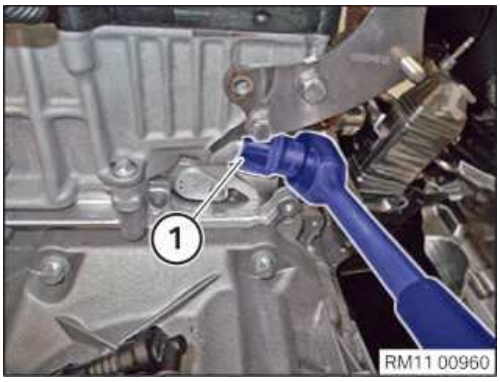
65 – Remove chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



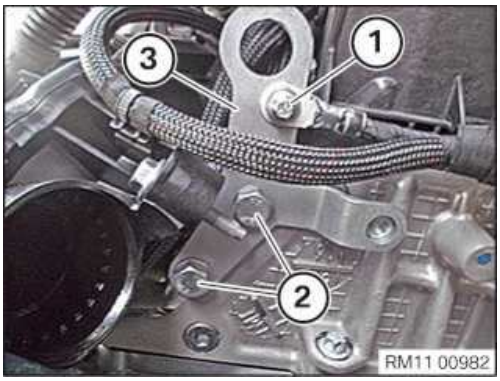
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

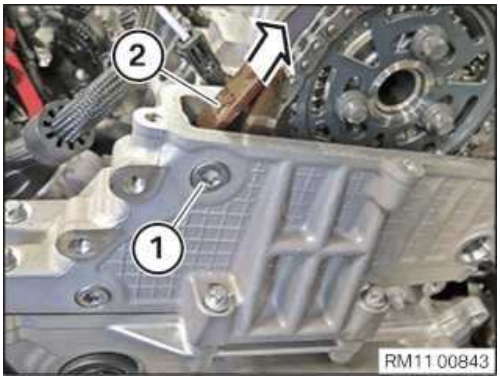
- Remove the chain tensioner piston (1).

66 – Remove the timing chain guide rail

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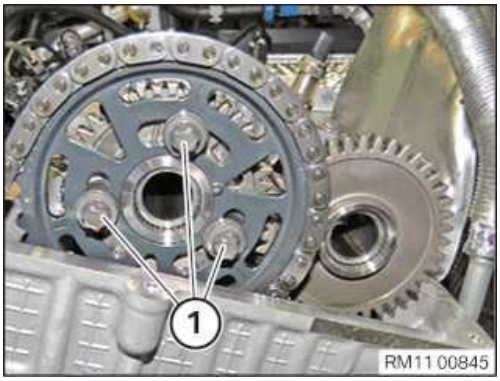


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



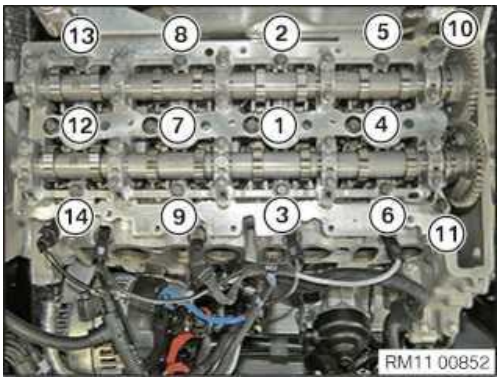
- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

67 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

68 – Removing the camshaft support



- Evenly loosen all screws in a sequence from (14) to (1).
- Loosen and remove all screws in a sequence from (14) to (1).
  Both camshafts can be removed with the camshaft carrier.
- Remove the camshaft support including camshafts towards the top.

69 – Remove roller cam followers

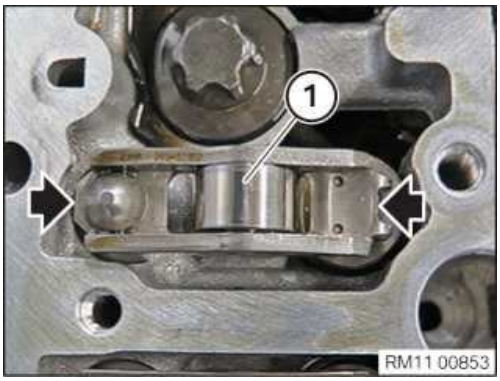
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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RISK OF DAMAGE

Damage to the engine.

If the classification of the roller cam followers is ignored, this can lead to engine damage.

- Observe the classification of the roller cam followers.
- Always reuse used roller cam followers at the same position.

- Remove the roller cam follower (1) and place it onto the special tool **0 495 105 (11 4 480)**.
- Repeat the process for all roller cam followers.

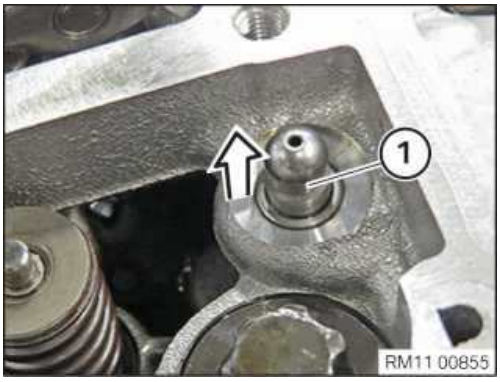
70 – Removing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Remove the hydraulic valve clearance compensating element (1) in the direction of the arrow and place on the special tool **0 495 105 (11 4 480)**.
- Repeat the process on all hydraulic valve clearance compensating elements.

71 – Removing glow elements

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Damage to the glow elements.

Excessive force may damage the glow elements and they may then have to be renewed.

- Handle glow elements with care and do not drop.
- Do not rest the cylinder head on glow elements. Glow elements protrude from the sealing surface of the cylinder head.

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RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect plug connection (1) using special tool **0 490 796 (11 1 480)**.



- Release the glow elements with the special tool or conventional tools.
- Feed out preheating elements and remove.

72 – Remove cylinder head.

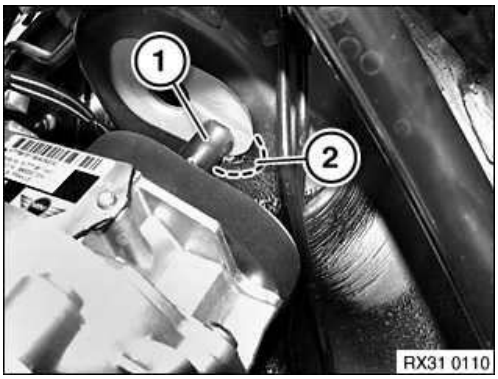
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CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

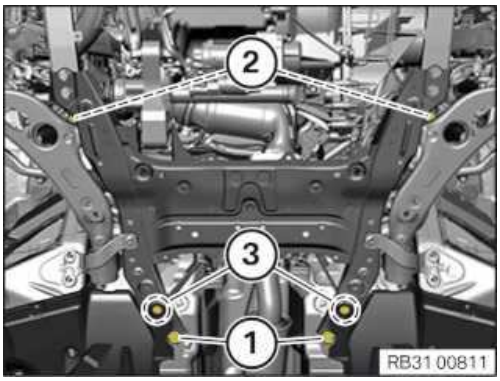


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- Position front axle support.
- Bend the underbody panelling to the side in area (3).
- Raise front axle support.
- When raising, insert the charge air cooler into its rubber mount on the transmission cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

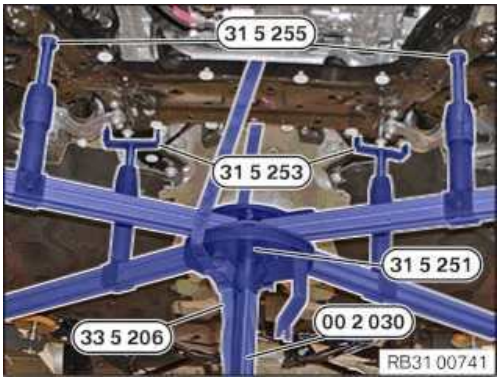
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

- If applicable, tighten the screws in area (3).

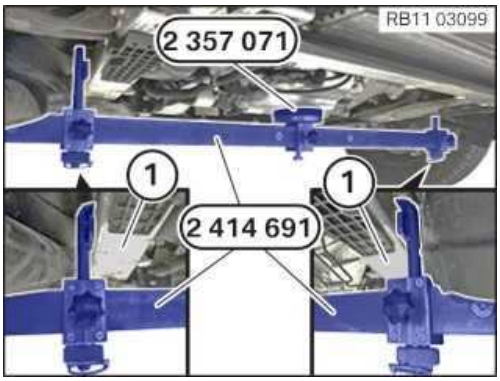
Underbody protection to body

Screw		Tightening torque	3 Nm

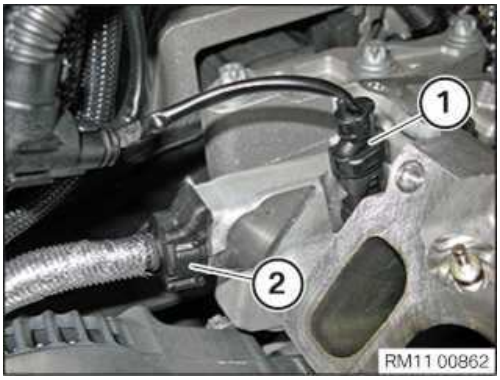


- Remove special tool from special tool .
- Lower the universal jack **0 490 133 (00 2 030)** with the special tool and set it aside.

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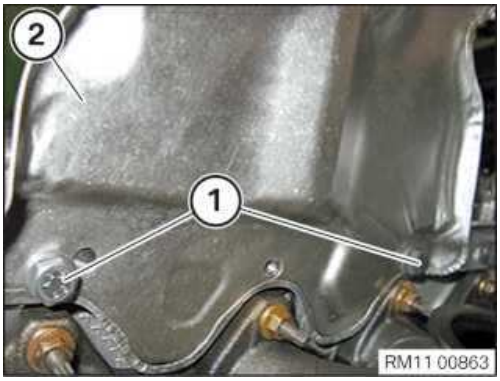
- Prepare special tool together with the special tool **2 357 071**.
- Attach special tool to front axle support and align special tool **2 357 071** correctly under the oil sump and then tighten.
- Turn special tool at adjusting screw uniformly upwards, until the special tool **2 357 071** makes contact with the oil sump.
- Tighten all adjusting screws of special tools and **2 357 071**.



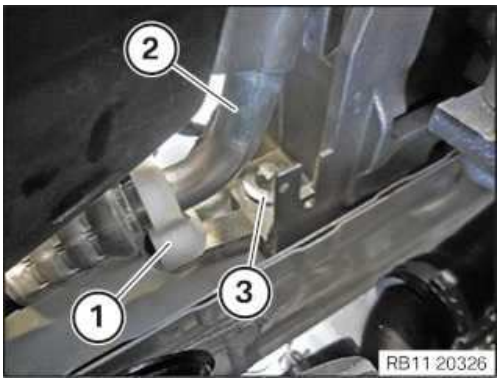
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

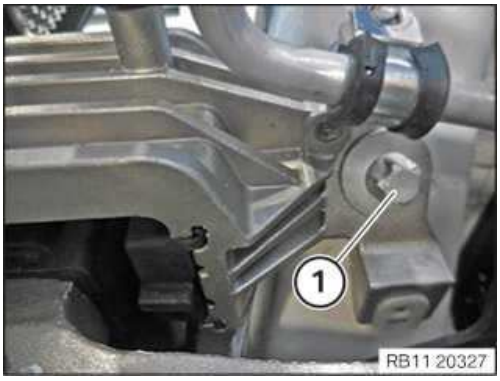
- Release the connector (1) from the coolant temperature sensor.
- Unlock and loosen coolant line (2).



- Loosen screws (1).
- Feed out the heat shield (2) and set it aside.

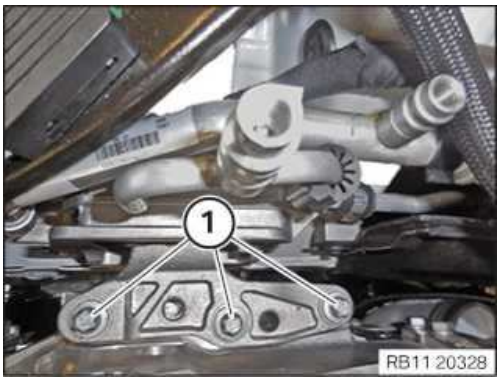


- Unlock and loosen holder (1).
- Feed out the refrigerant line (2) and put to one side.
- Loosen screw (3).

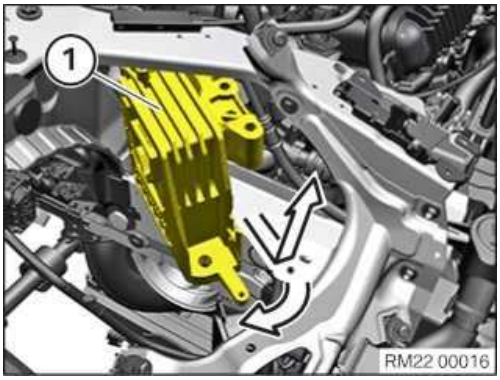


- Loosen screw (1).

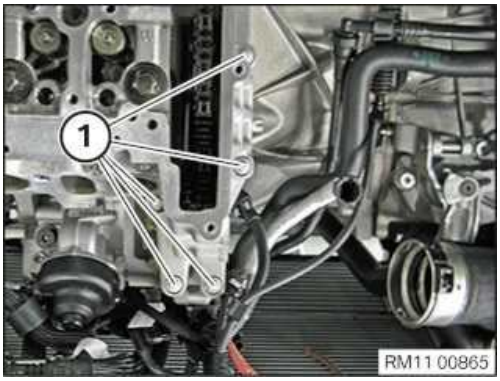
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- Loosen screws (1).



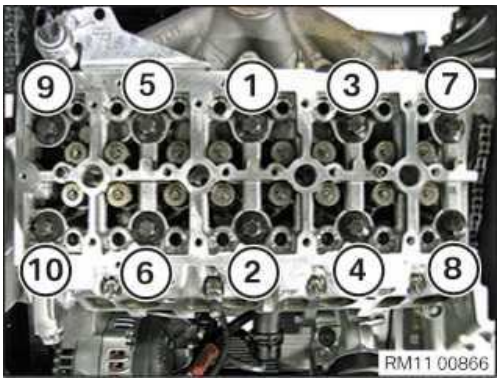
- Turn engine mount (1) in direction of arrow and remove upwards.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screws (1).



- Loosen the cylinder head bolts in the sequence from (10) to (1).
- Remove cylinder head bolts (1) to (10) with washers.

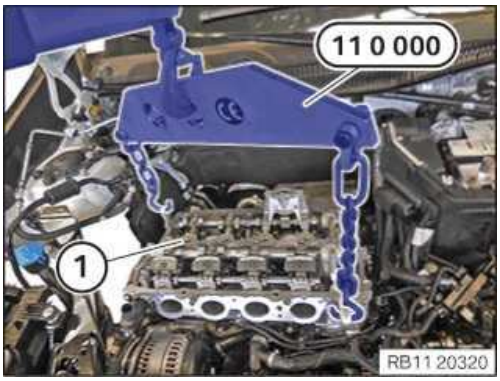


- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

M8		Tightening torque	21,5 Nm

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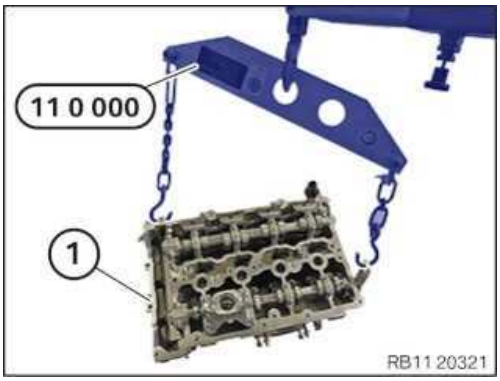
RISK OF DAMAGE

Damage to the guide rails.

Large amounts of force may damage the guide rails of the timing chain.

- Make sure not to damage the guide rail with the cylinder head when removing and installing the cylinder head.

- **Carefully** guide out the cylinder head (1) with the engine lifter and the special tool **0 490 561 (11 0 000)** and remove.



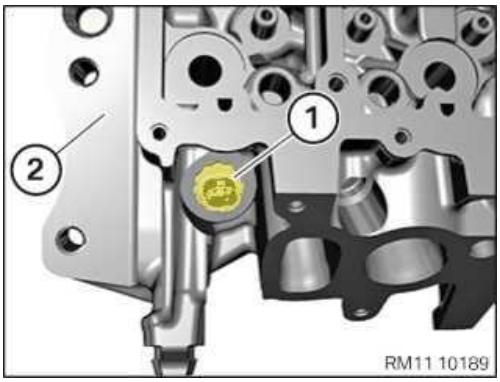
- Mount the cylinder head (1) on the special tool **0 494 362 (11 9 000)**.

MAIN WORK

73 – replace cylinder head

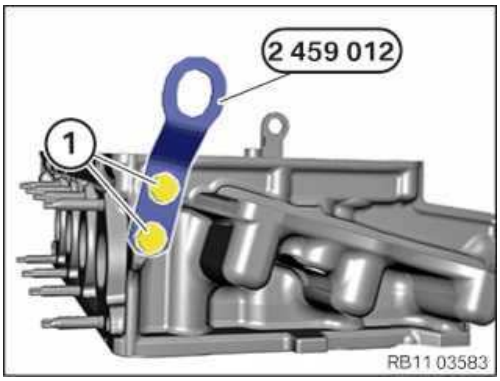


- Unscrew the preheating elements with special tool .

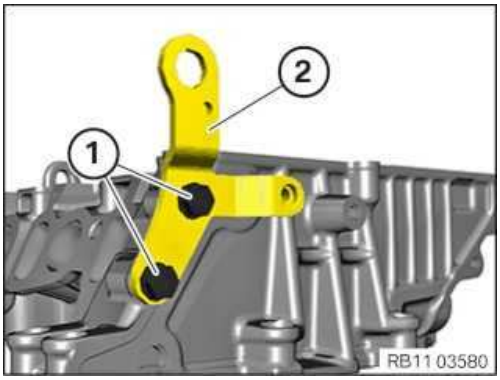


- Detach coolant temperature sensor (1) on cylinder head (2).

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- Loosen screws (1).
- Remove special tool .



- Loosen screws (1).
- Remove mounting lug (2) from cylinder head.

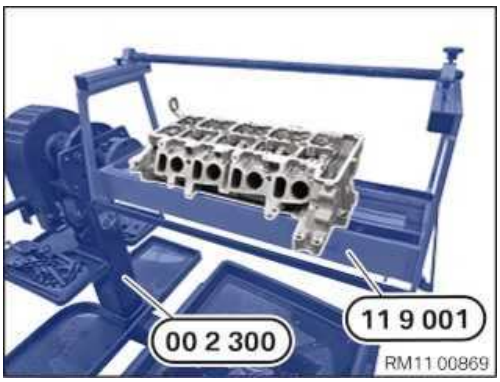
▸ **Remove all valve springs**

RISK OF DAMAGE

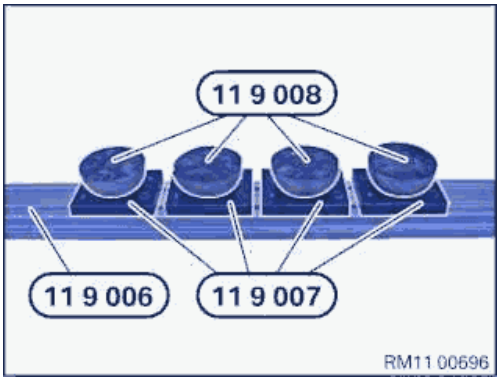
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Mount and screw the cylinder head onto the special tools **0 494 366 (11 9 001)** and **0 495 187 (00 2 300)**.

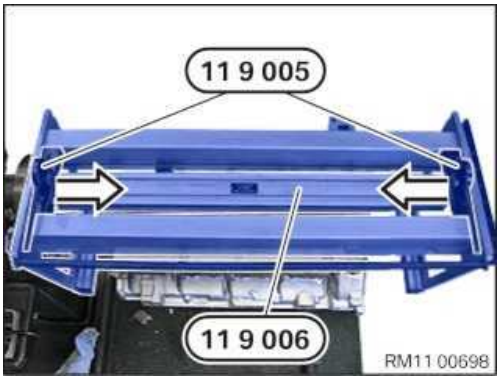


- Prepare the special tools **0 494 371 (11 9 006)**, **0 494 372 (11 9 007)** and **0 494 373 (11 9 008)** as shown.

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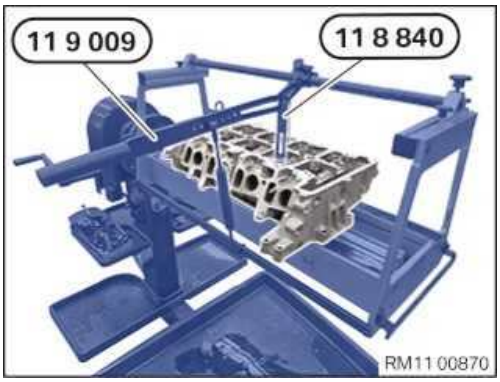
- Position special tool **0 494 373 (11 9 008)** as illustrated.



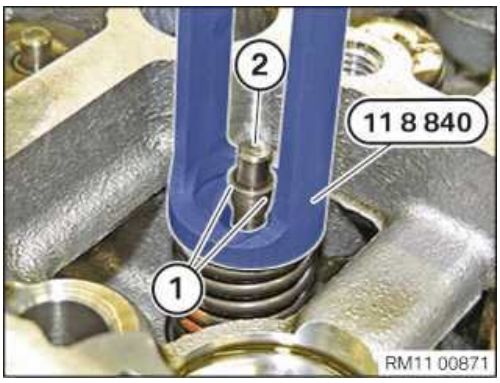
- Turn round special tool **0 494 371 (11 9 006)** and insert as shown.
- Lock special tool **0 494 370 (11 9 005)**in direction of arrow.



- Lock special tool **0 494 370 (11 9 005)**in direction of arrow.
- Use the special tool **0 494 362 (11 9 000)** to bring the cylinder head into the installation position by 180°.



- Align special tool **0 494 374 (11 9 009)** in direction of valve axis.
- Position the special tool **0 496 143 (11 8 840)** according to the nut.
- Press down the valve spring on the upper spring cup with the special tools **0 494 374 (11 9 009)** and **0 496 143 (11 8 840)**.
- The **hooks** from the set of special tools **0 494 362 (11 9 000)** can be used to **hold** the valve spring down.



- Keep the valve spring pressed down with the special tool **0 496 143 (11 8 840)**.
- Remove the valve shims (1) from the valve (2) using a magnet.
- Guide the valve spring and spring cup out and remove.
- Set down valve spring, spring cup and valve shims (2) in the special tool **0 495 105 (11 4 480)** in an orderly manner.

▸ **Remove valve stem seals**

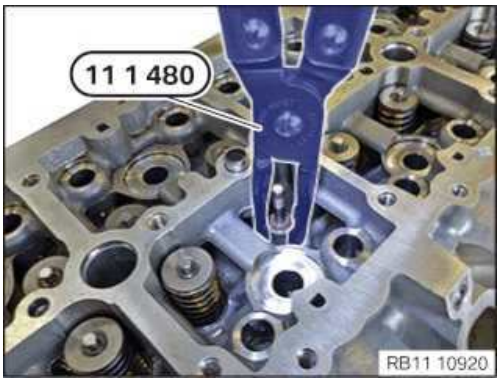
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RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.



- Disassemble the valve stem seal (1) using the special tool **0 490 796 (11 1 480)**.

▸ **Remove all valves**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

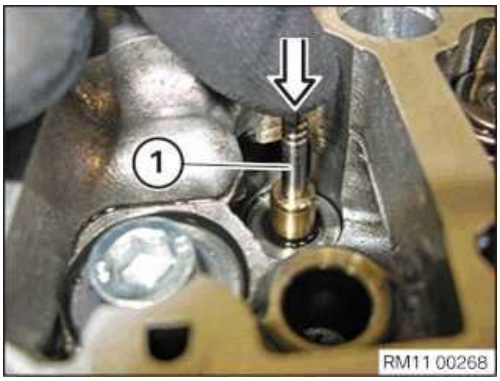


- Turn the cylinder head with the special tool **0 494 362 (11 9 000)**.
- Unlock the special tool **0 494 370 (11 9 005)** in the direction of the arrow.
- Remove special tool **0 494 371 (11 9 006)**.

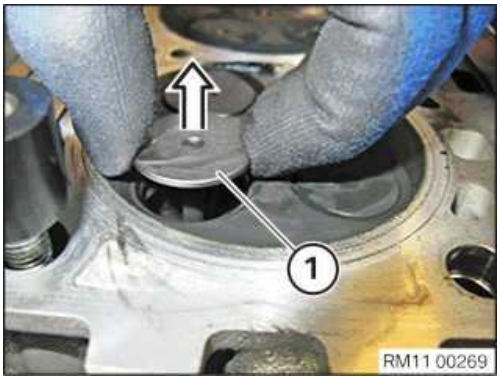


- Remove special tool **0 494 373 (11 9 008)** if necessary.

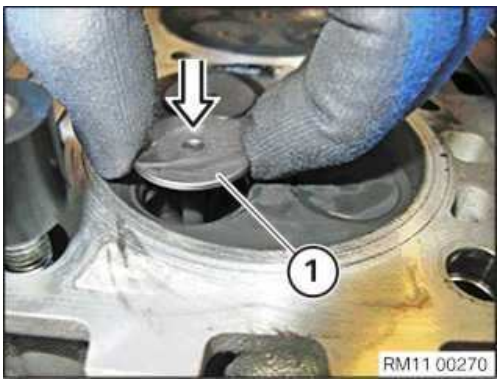
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- Push the valve stem (1) into the cylinder head in the direction of the arrow.

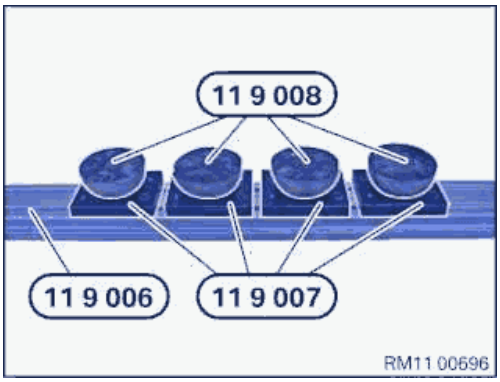


- Remove the valve (1) in the direction of arrow and store it properly in the special tool **0 495 105 (11 4 480)**.



- Install valves (1) in the new cylinder head.

  Parts: Cylinder head
- Feed valves (1) in the direction of arrow and install.
- **Check the valves for tightness.**

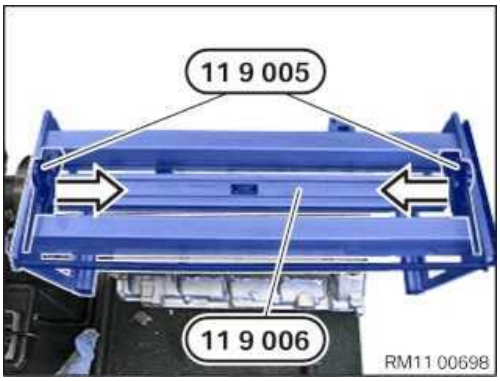


- Prepare the special tools **0 494 371 (11 9 006)**, **0 494 372 (11 9 007)** and **0 494 373 (11 9 008)** as shown.



- The special tools **0 494 373 (11 9 008)** must be set up accordingly in the next operation.

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- Turn round special tool **0 494 371 (11 9 006)** and insert as shown.
- Lock special tool **0 494 370 (11 9 005)** in direction of arrow.



- Lock special tool **0 494 370 (11 9 005)** in direction of arrow.
- Use the special tool **0 494 362 (11 9 000)** to bring the cylinder head into the installation position by 180°.

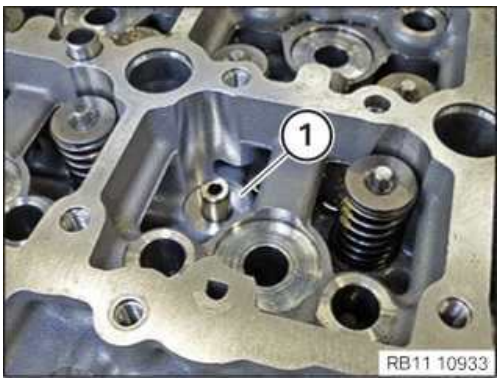
▶ **Installing valve stem seals**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



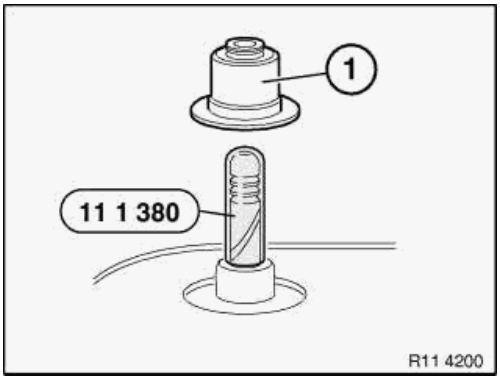
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

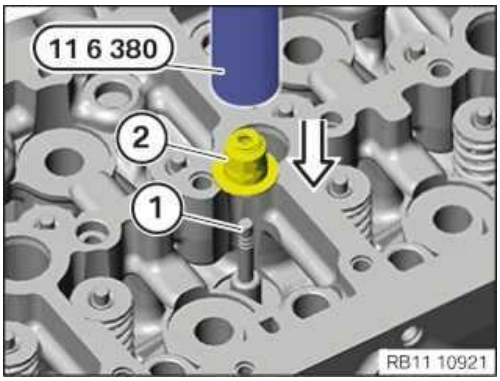
- Clean the contact surfaces (1).



- Fit special tool **0 490 746 (11 1 380)**.
- Oil the valve stem seal (1) and install it.

  Parts: Valve stem seal

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- Position the valve stem seals (2) on the valve (1).
- Use special tool **0 493 249 (11 6 380)** to press down the valve stem seal (2) until they are in contact with the cylinder head.

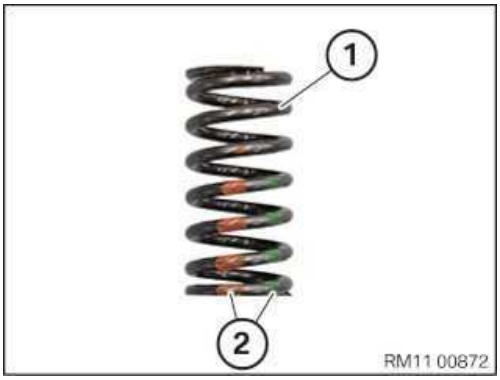
▸ **Install all valve springs**

RISK OF DAMAGE

Contaminant or foreign body.

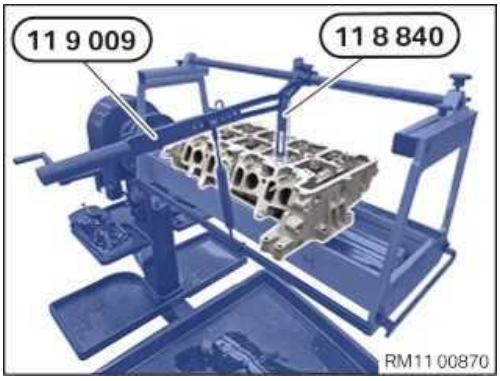
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

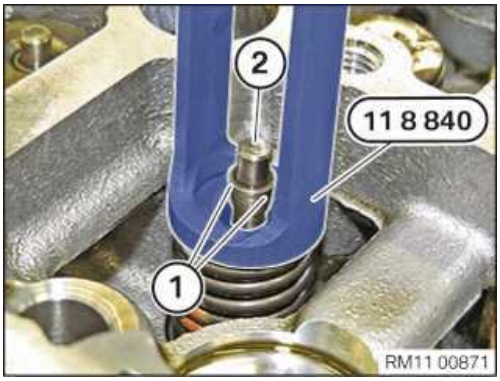


- The valve spring (1) is marked with a colour code (2).

  The mounting orientation of the valve spring (1) can be freely chosen.



- Align special tool **0 494 374 (11 9 009)** in direction of valve axis.
- Position the special tool **0 496 143 (11 8 840)** according to the nut.
- Press down the valve spring on the upper spring cup with the special tools **0 494 374 (11 9 009)** and **0 496 143 (11 8 840)**.
- The **hooks** from the set of special tools **0 494 362 (11 9 000)** can be used to **hold** the valve spring down.

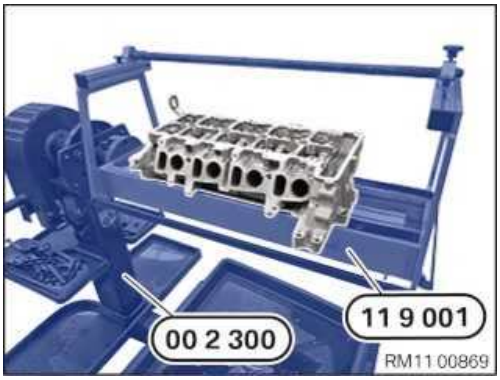


- Keep the valve spring pressed down with the special tool **0 496 143 (11 8 840)**.
- Insert the valve shims (1) at the valve (2) with the magnet and install.
- Relieve load on valve spring.
- Make sure that the valve shims (1) are installed correctly.

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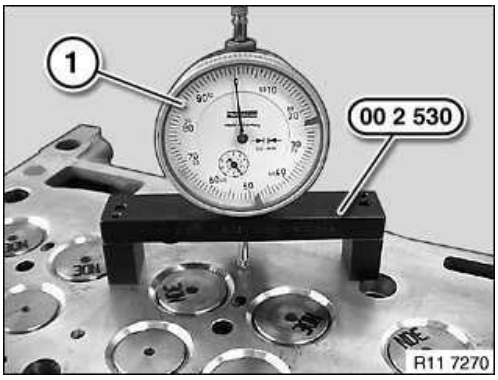


- Unlock the special tool **0 494 370 (11 9 005)** in the direction of the arrow.
- Guide the special tool **0 494 371 (11 9 006)** out and remove.



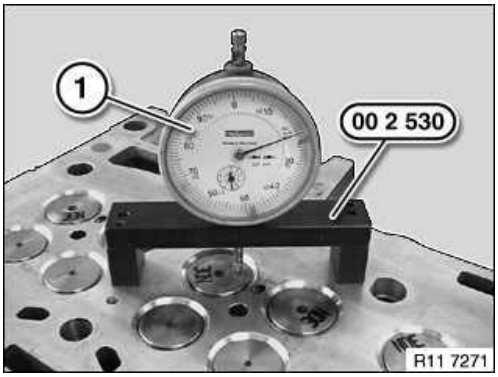
- Unscrew and remove the cylinder head from the special tools **0 494 366 (11 9 001)** and **0 495 187 (00 2 300)**.

▸ **Checking the valve underprotrusion**



- Set the dial gauge (1) onto the cleaned cylinder sealing surface with slight preload in special tool **0 490 185 (00 2 530)**.
- Set dial gauge in mildly preloaded state to "zero".

Check



- Position the dial gauge (1) on the valve with special tool **0 490 185 (00 2 530)**.
- Measure valve underprotrusion and compare with the setpoint value.

Valve underprotrusion

	0,8 (0,7 - 0,9) mm

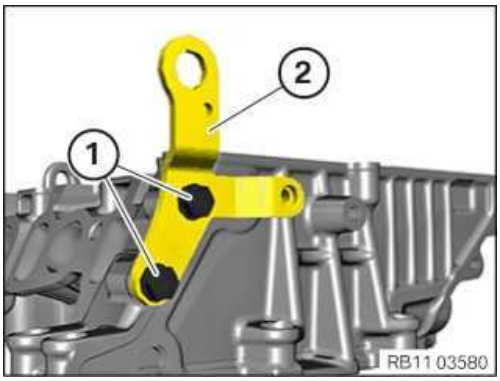
Result

» Valve underprotrusion is outside tolerance.

Measure

- Replace cylinder head.

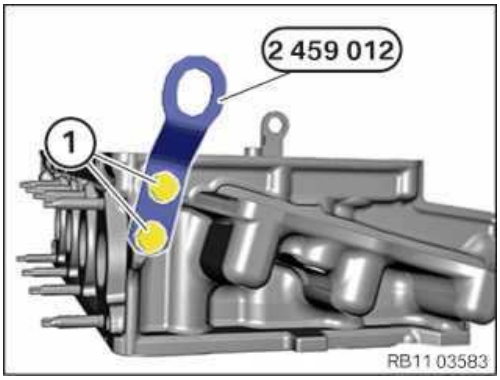
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- Install mounting lug (2) on the rear cylinder head.
- Tighten the screws (1).

Standard screw connection M8

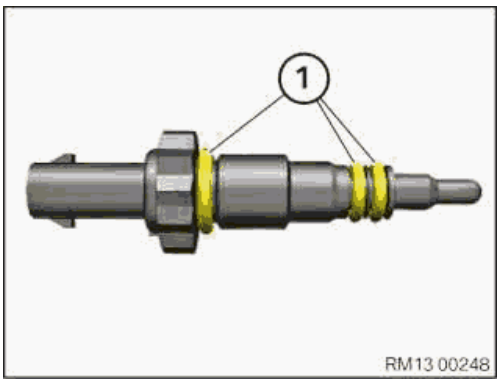
M8		Tightening torque	19 Nm



- Position special tool on cylinder head.
- Tighten the screws (1) of special tool .

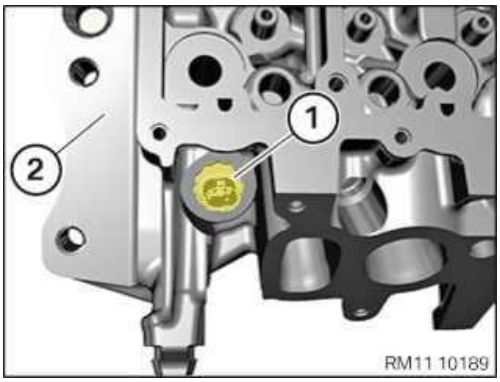
Special tool to cylinder head

M8		Tightening torque	21,5 Nm



- When reusing coolant temperature sensor sealing rings (1), check for damage, renew if necessary.

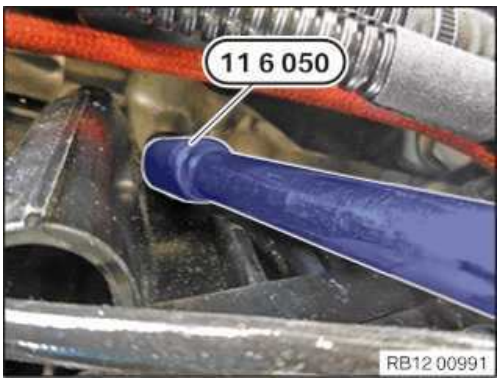
  Parts: Sealing ring



- Tighten coolant temperature sensor (1) on new cylinder head (2).

Coolant temperature sensor at cylinder head

Temperature sensor		Tightening torque	3,5 Nm



- Screw in preheating elements using special tool and tighten.

Glow elements to cylinder head

Glow element		Tightening torque	13 Nm

POSTPROCESSES

74 – Cleaning the sealing surface

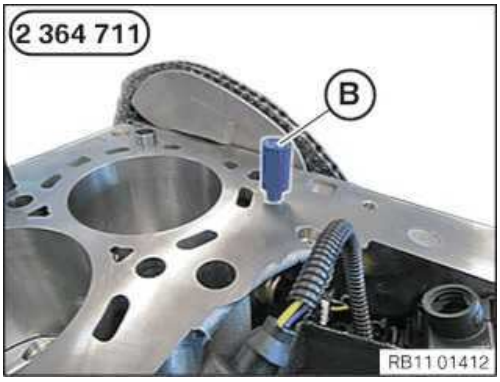
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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Lock the front oil duct using special tool (B) from special tool **2 364 711**.



RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 103 (11 4 471)**.



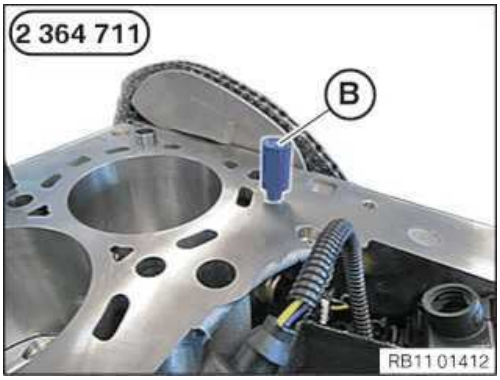
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

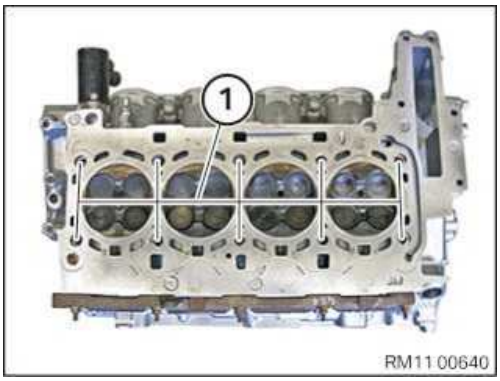
- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 104 (11 4 472)**.



- Remove special tool (B).

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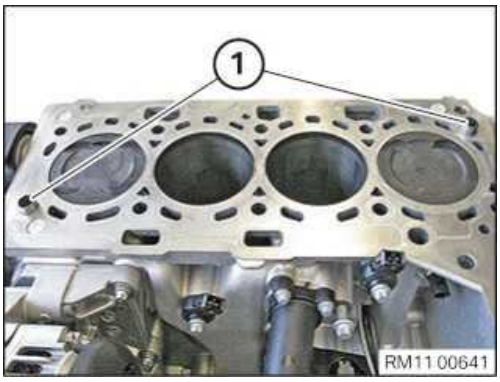
RISK OF DAMAGE

Damage to the surface.

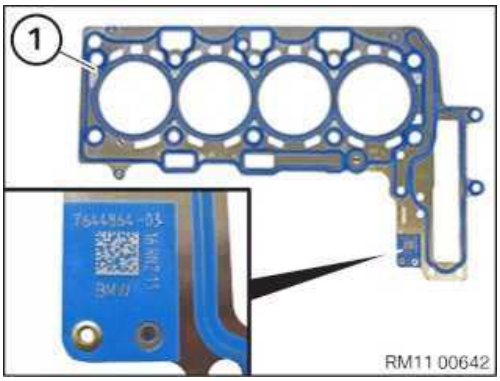
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Remove oil and dirt residue from the blind holes (1).

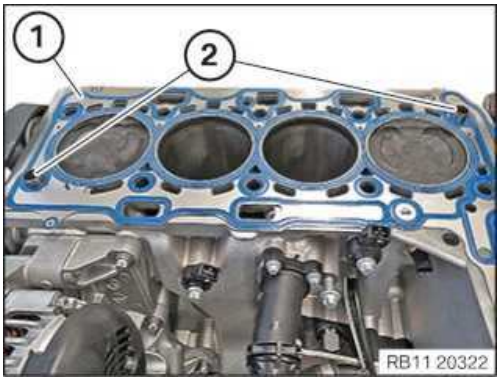


- Check the fitting sleeves (1) for secure fit and damage.



- Identify the cylinder head gasket (1) using the part number.

Note: If the cylinder head is reworked, an additional thicker gasket 0.3 mm is available for service personnel.



- Guide in the cylinder head gasket (1) and install.
- Ensure that the cylinder head gasket (1) is installed correctly in the fitting sleeves (2).

76 – Installing the cylinder head

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

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RISK OF DAMAGE

Damage to threads.

Fluid in the threaded hole may damage the thread when screws are tightened in the threads.

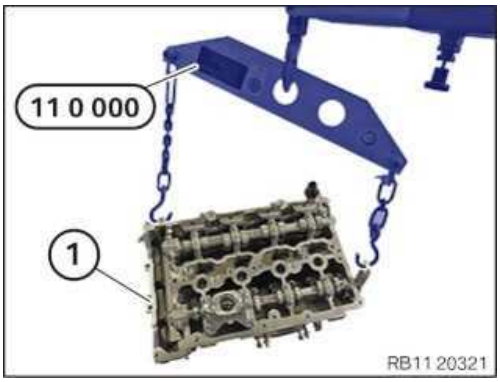
- Dry threaded holes (e.g. using compressed air).

TECHNICAL INFORMATION

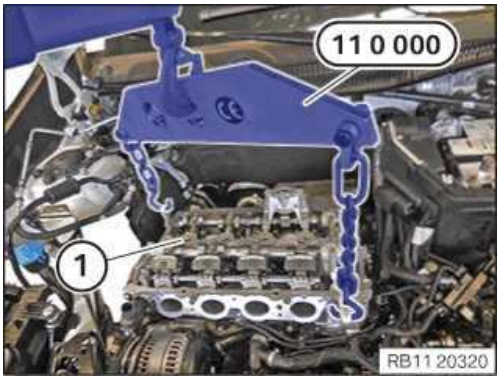
Do not remove bolt coating.

TECHNICAL INFORMATION

When replacing the cylinder head: The complete valve control and the Valvetronic servomotor are already pre-assembled for new cylinder heads.



- Position cylinder head (1) on special tool **0 490 561 (11 0 000)** and engine lifter.



RISK OF DAMAGE

Damage to the guide rails.

Large amounts of force may damage the guide rails of the timing chain.

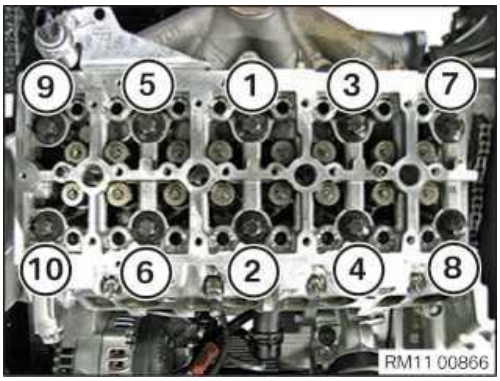
- Make sure not to damage the guide rail with the cylinder head when removing and installing the cylinder head.

- Feed in the cylinder head (1) **carefully** with the engine lifter and the special tool **0 490 561 (11 0 000)** and install.



- Unscrew the bolts (1) of the special tool **2 459 012**.
- Guide the special tool **2 459 012** out and remove.

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- Renew the cylinder head bolts (1).

  Parts: Cylinder head bolts
- Do **not** wash off coating of cylinder head bolts.
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

  No coolant, water or engine oil must be present in threaded holes of engine block.

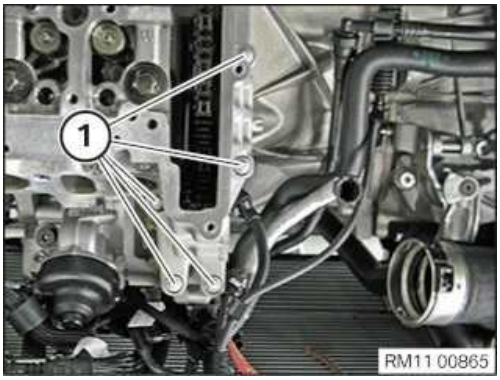
TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Feed in cylinder head bolts and install.
- Screw in cylinder head bolts in sequence (1) to (10).
- Tighten cylinder head bolts using special tools **0 490 504 (00 9 120)** and in sequence (1) to (10).

Cylinder head to crankcase

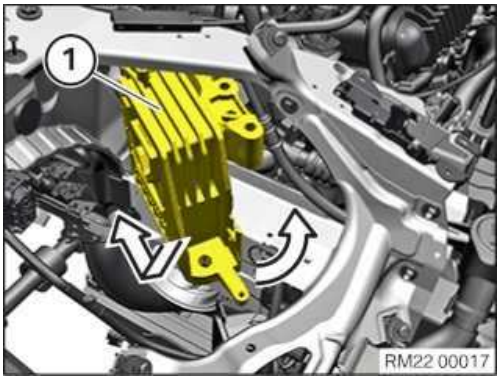
M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °



- Tighten the cylinder head bolts (1).

Cylinder head bolt to timing case cover

M8x40		Tightening torque	19 Nm



- Thread in engine mount (1) in direction of arrow then install.

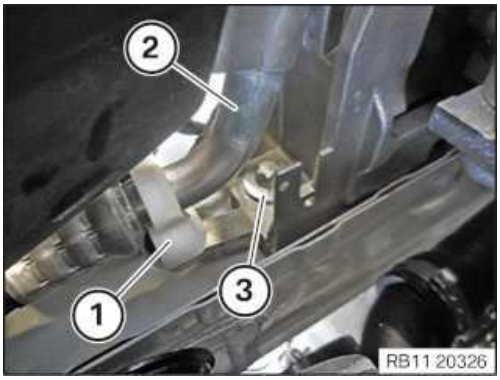
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- Tighten down screw (1).

Right engine mount to side member

M12		Tightening torque	100 Nm

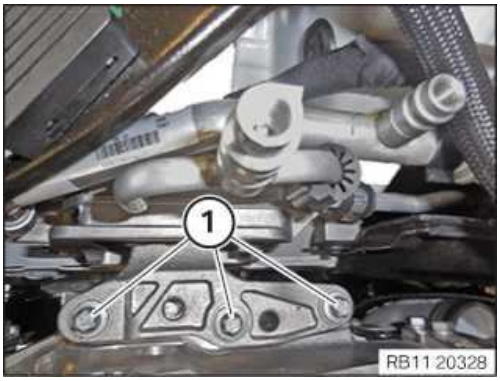


- Tighten down screw (3).

Right engine mount to side member

M12		Tightening torque	100 Nm

- Feed in and install the refrigerant line (2).
- Lock holder (1).
- Make sure the bracket (1) engages audibly.

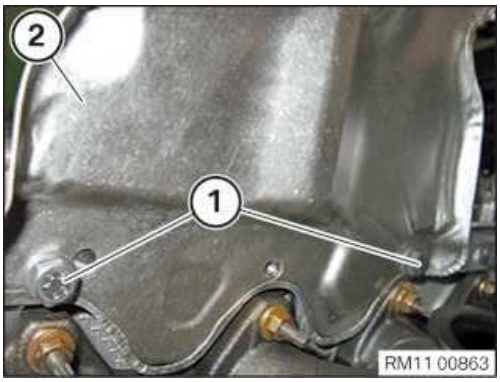


- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Right engine mount to cylinder head

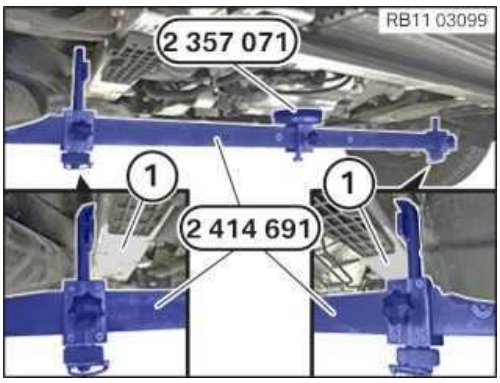
M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °



- Feed in and install the heat shield (2).
- Tighten the screws (1).

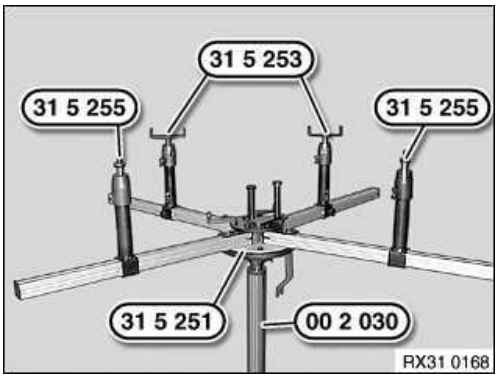
Heat shield to cylinder head

M8X16		Tightening torque	10 Nm



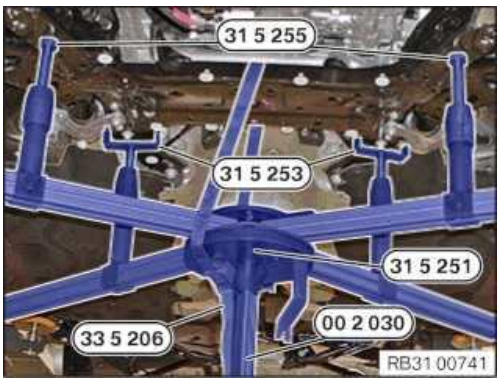
- Disassemble special tool using special tool **2 357 071**.

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- Fit the special tool completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools in telescopic supports of a profile rail pair.
- Insert special tools in telescopic supports of other profile rail pair.

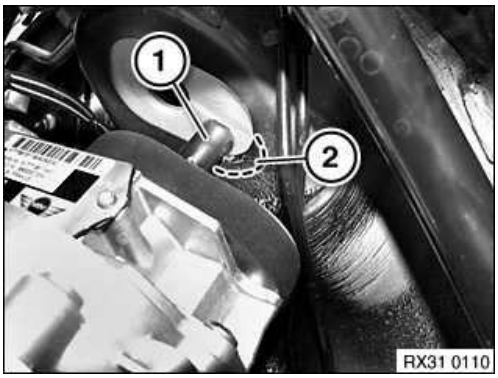
Note: In a profile rail pair, two profile rails are connected to one another by gearing.



- Align special tools and to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool to special tool .

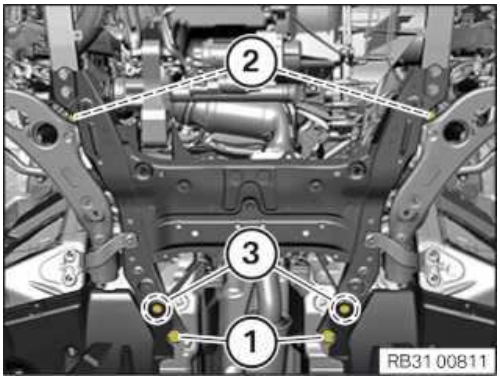


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

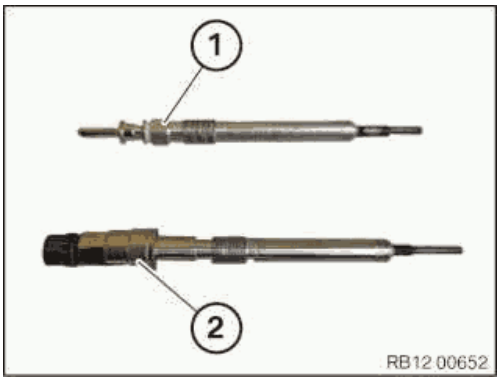
- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and the front axle remove.

77 – Install glow elements



- Install glow elements (1) in cylinders 1, 2, 3 and 4.
- If fitted: Glow element (2) with the **combustion chamber pressure sensor** must be installed in cylinder **2**.

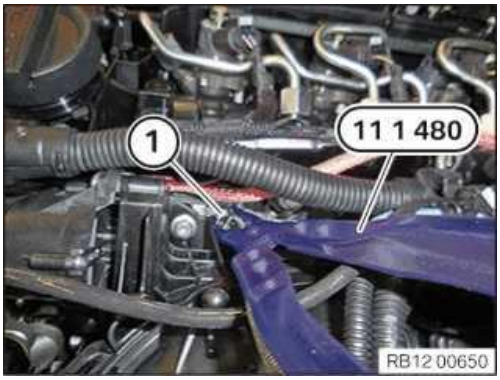
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- Tighten the glow element with the special tool or conventional tools.

Glow elements to cylinder head

Glow element		Tightening torque	13 Nm



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

78 – Installing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Install the hydraulic valve clearance compensating element (1) in the direction of the arrow.
- Repeat the process on all hydraulic valve clearance compensating elements.

79 – Install the roller cam followers

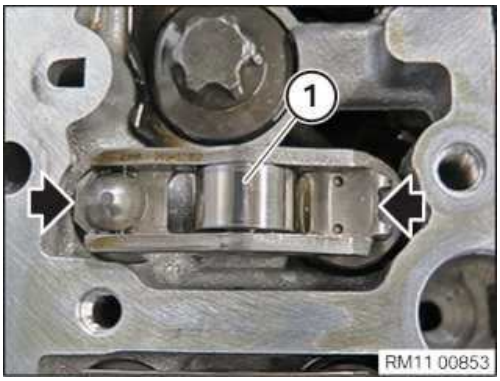
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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RISK OF DAMAGE

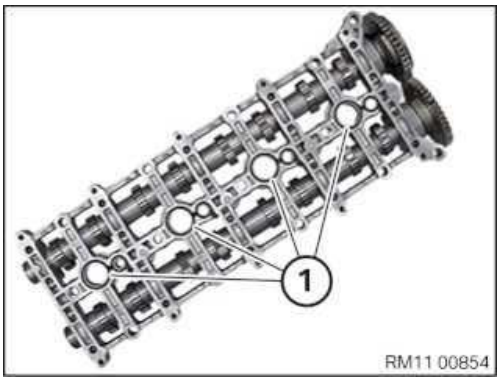
Damage to the engine.

If the classification of the roller cam followers is ignored, this can lead to engine damage.

- Observe the classification of the roller cam followers.
- Always reuse used roller cam followers at the same position.

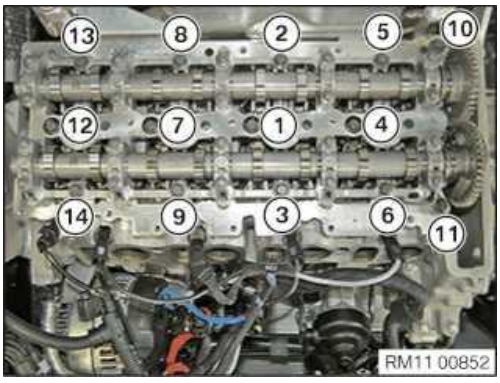
- Install the roller cam follower (1).
- Repeat the process for all roller cam followers.

80 – Installing the camshaft support



- Renew gaskets (1).

  Parts: gaskets

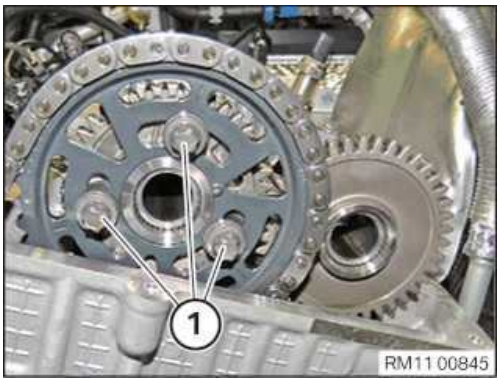


- Position the camshaft support including the camshafts.
- Tighten the screws in a sequence from (1) to (14) in several steps.

Camshaft carrier to cylinder head

M7x35		Tightening torque	13 Nm

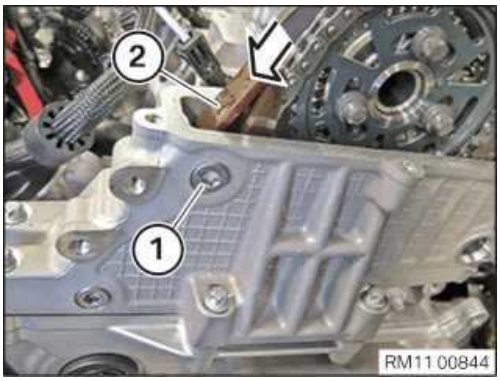
81 – Installing the camshaft sprocket on the intake camshaft



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

82 – Install the timing chain guide rail

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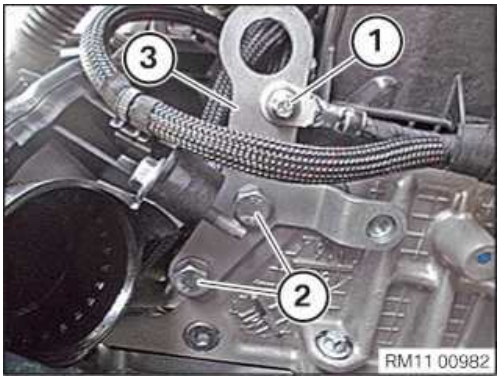
- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm



- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6		8 Nm

83 – Installing the chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Renew sealing ring (1).

  Parts: Sealing ring

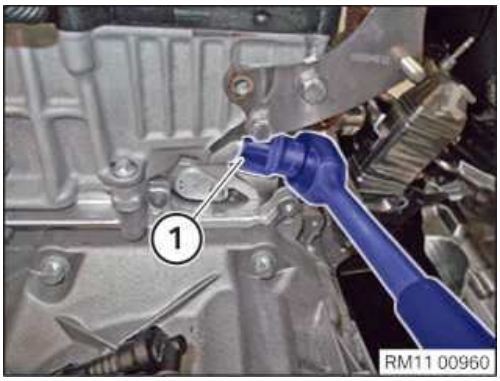


TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.

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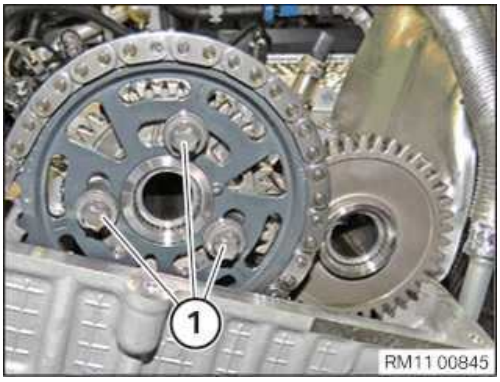


- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

84 – Tightening the camshaft sprocket on the intake camshaft



- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

85 – Checking camshaft timing



- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

Damage to the engine.

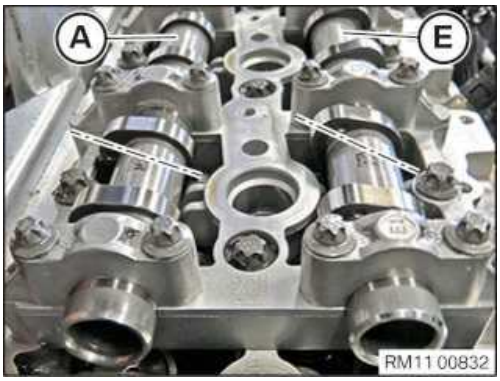
The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

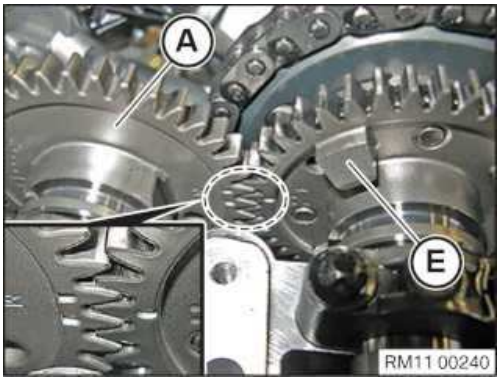
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- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

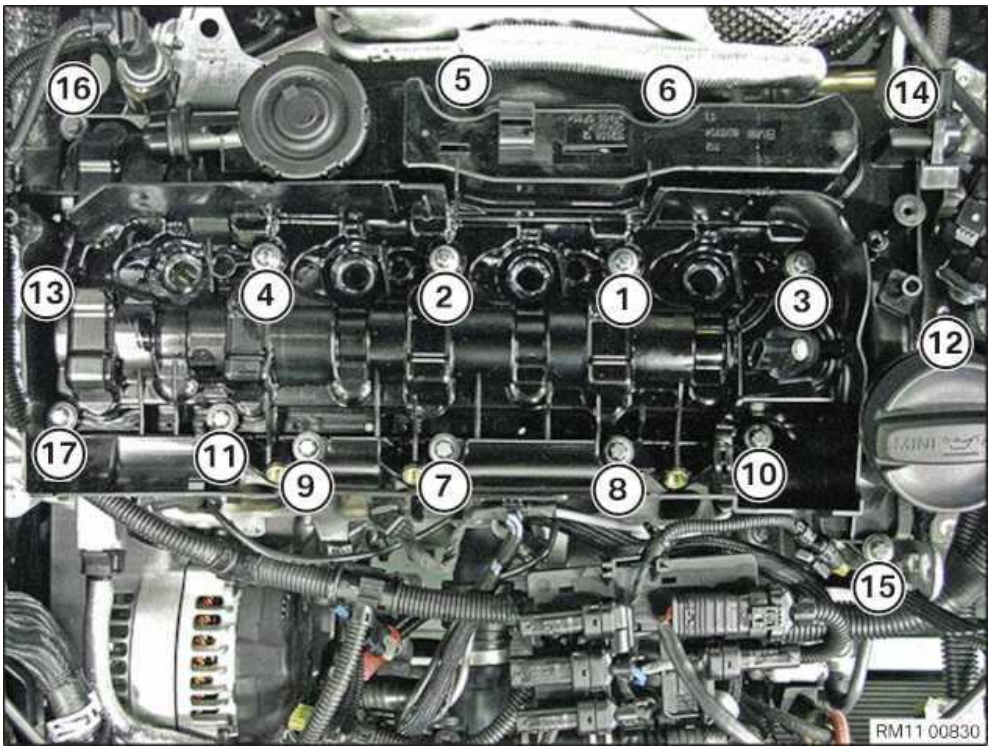
- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.



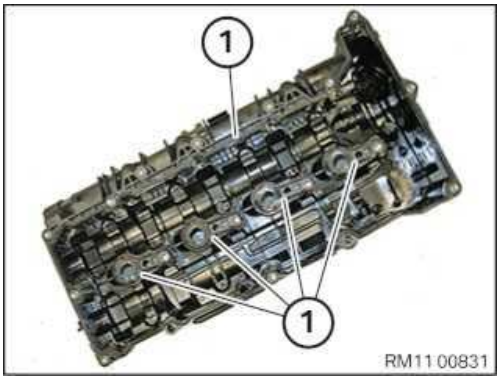
- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

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Overview: Screw connection of the cylinder head cover

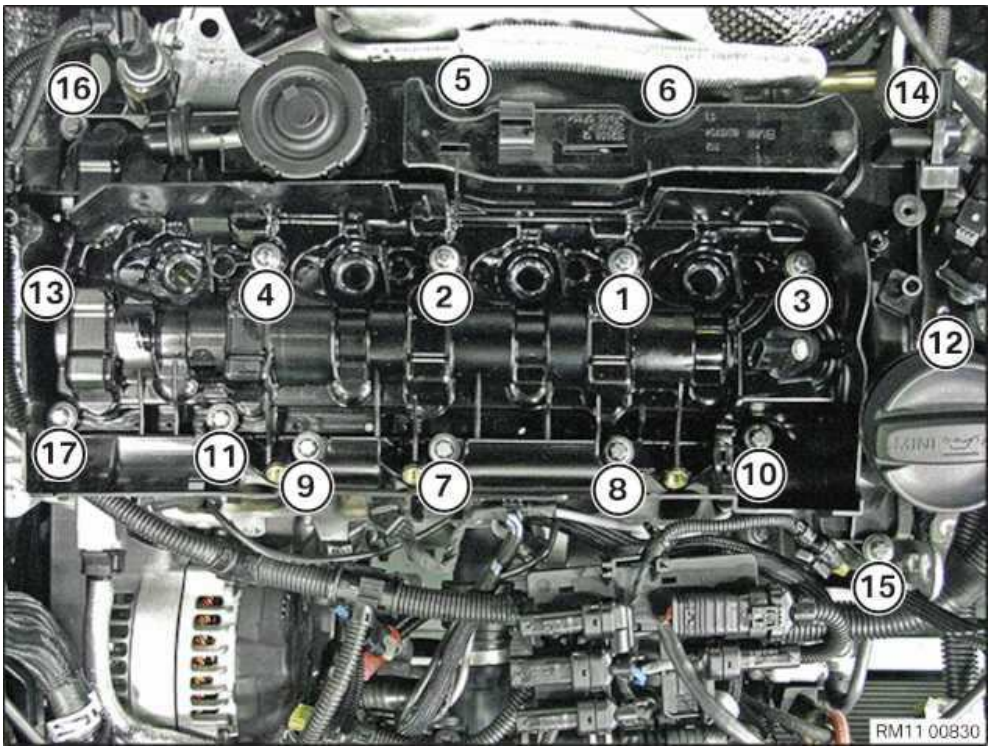


1 to 16 screws of the cylinder head cover.



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket



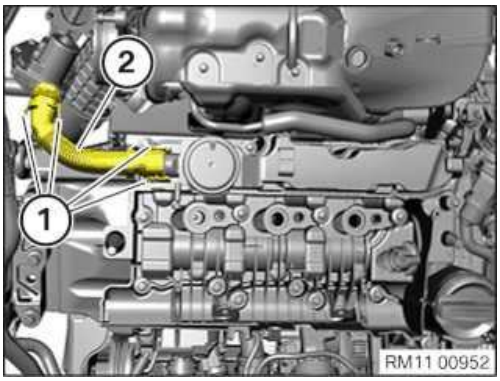
- Install cylinder head cover.
- Tighten screws in the order (1) to (17).

Cylinder head cover to cylinder head

M6		Tightening torque.	8, Nr

-

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- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

87 – Installing injectors of injection system

▸ Cleaning the injector shafts

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

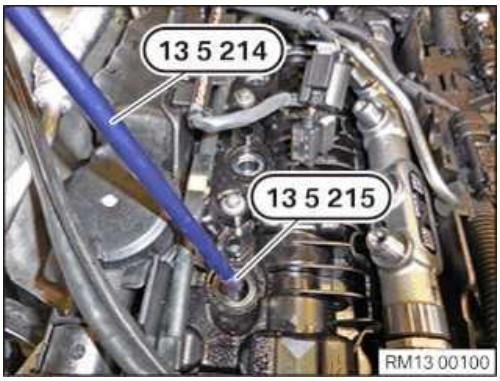
- Wear safety goggles.

RISK OF DAMAGE

Contaminant or foreign body.

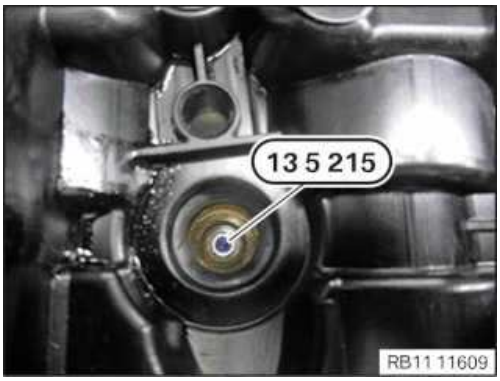
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.

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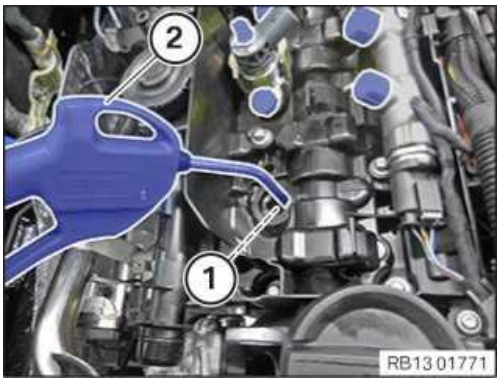
- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.



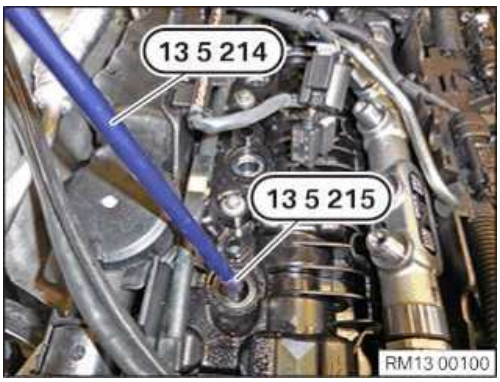
- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.



- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.



- Blow out injector shaft (1) with air gun (2).



- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

► **Check the placement of the clamping claw**

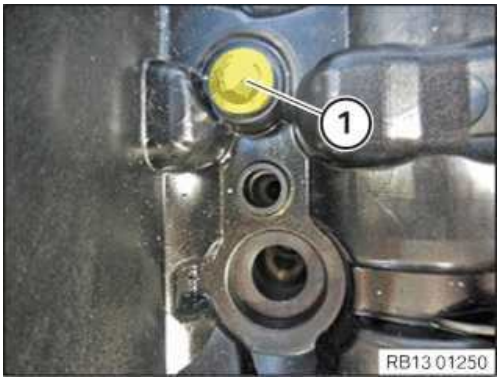
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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▸ **Prepare the injector for installation**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

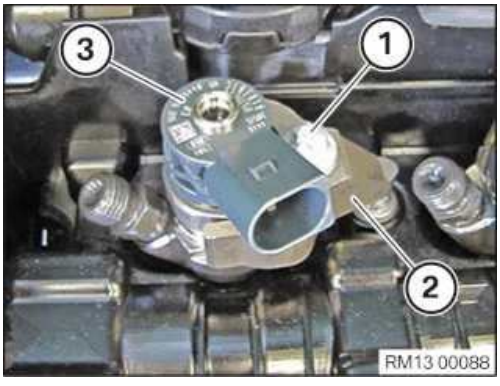


- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring
- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

Injector lubricating grease	50 g, Can	83230441070

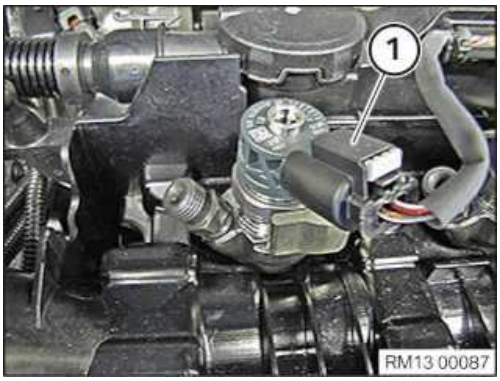


- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

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- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

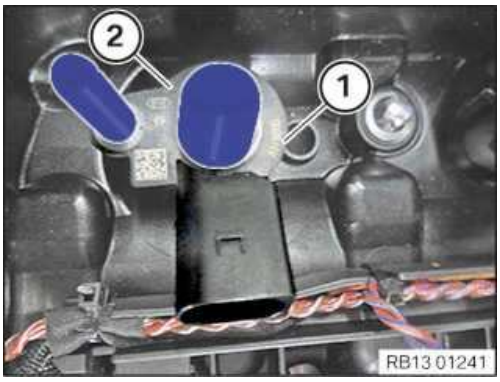
▶ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

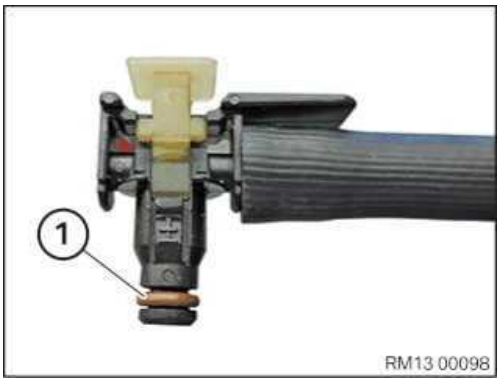


- Read off the adjustment value (1) on the new injector (2).



- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

88 – Connect the leakage oil line on the injector



- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.

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- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

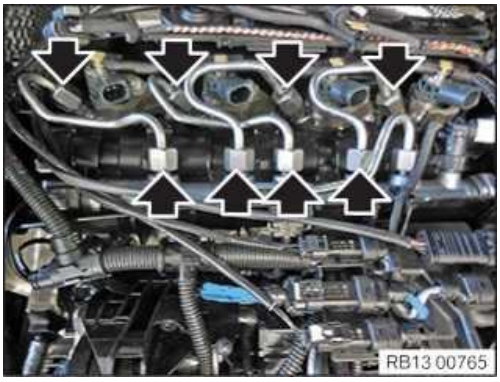
89 – Installing high pressure lines between rail and injectors

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Remove special tool .
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten the high pressure lines (arrows) with the special tool .

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

90 – Prepare for the installation of the exhaust turbocharger

- Check the oil feed lines and the oil return lines for contamination or obstruction, clean or renew if necessary.
- If the oil feed lines and/or oil return lines are heavily contaminated, we recommend changing the engine oil and the oil filter.
- If installed: Check the coolant feed lines and the coolant return lines for the exhaust turbocharger for contamination or obstruction, clean or renew if necessary.
- Check that the screw connections and the plug connections of all the lines are correct.
- Check air cleaner for contamination and clean or renew as needed.
- Check correct functioning of crankcase ventilation.
- Replace all gaskets.

  Parts: Seals

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91 – Installing the high-pressure stage exhaust turbocharger

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

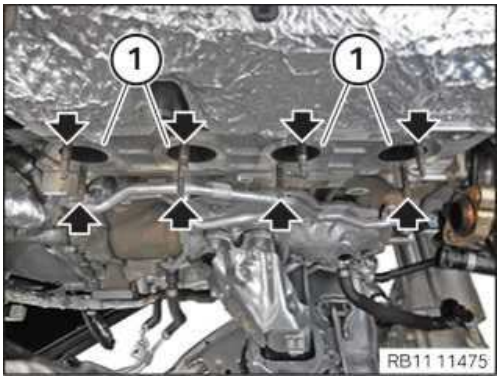
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

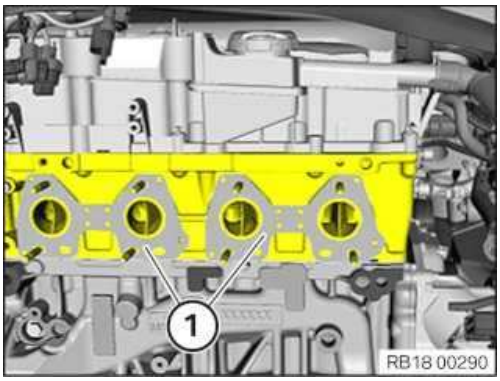


- Clean the sealing surfaces (1) on the cylinder head using special tool **0 495 102 (11 4 470)**.
- Check the stud bolts (arrows) on the cylinder head for correct fit.



- Clean the sealing surfaces on the exhaust manifold using special tool **0 495 102 (11 4 470)**.

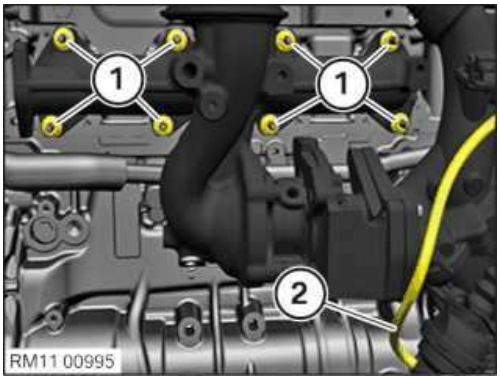
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- Renew gasket (1).

  Parts: Gasket

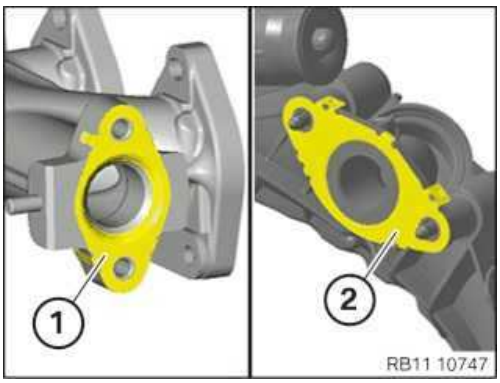
- Install new gasket (1).



- Feed in and install the exhaust manifold and the high-pressure stage exhaust turbocharger.
- Tighten nuts (1).

  Parts: Nuts

- Connect vacuum hose(2).

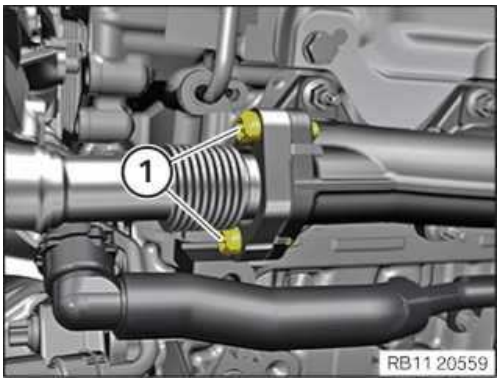


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

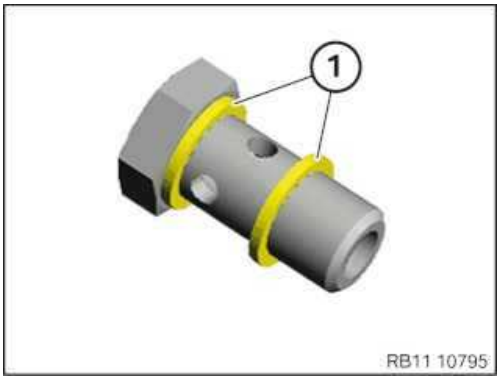
  Parts: Gasket



- Tighten the screws (1).

Exhaust-gas recirculation cooler to exhaust manifold

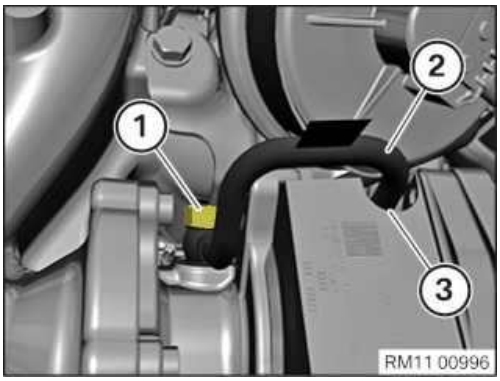
M8x28	Replace screws	Tightening torque	32 Nm



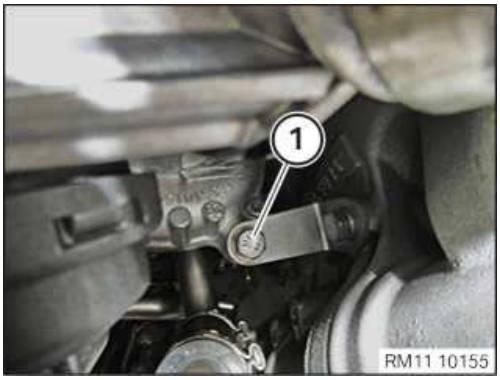
- Renew sealing rings (1) of banjo bolt.

  Parts: Sealing ring

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- Guide the oil feed line into the holder (3) and install it.
- Tighten down screw (1).

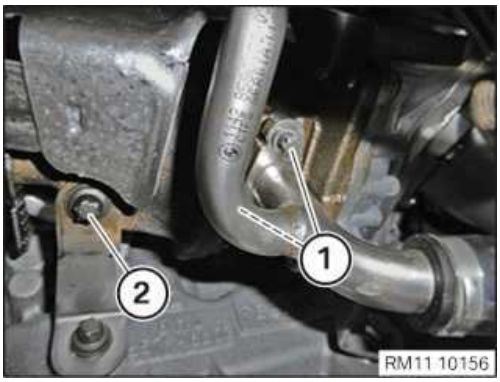


- Tighten bolt (1) from the right wheel arch.



- Renew seal (1) of oil return line.

  Parts: Gasket



- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

92 – Installing the low-pressure stage turbocharger

RISK OF DAMAGE

Damage to the surface.

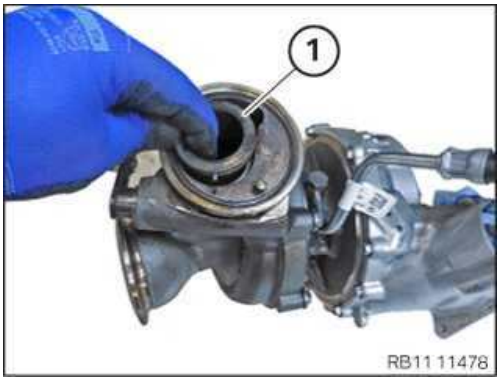
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

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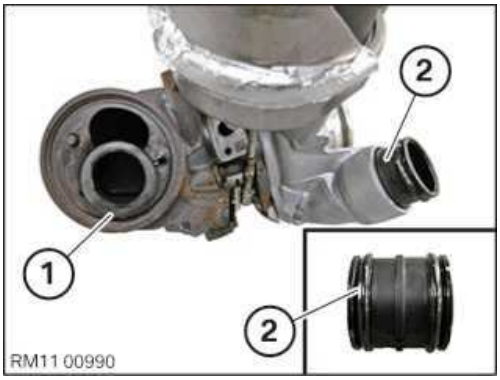
TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.



- Check the spacer plug (1) for damage, renew if necessary.

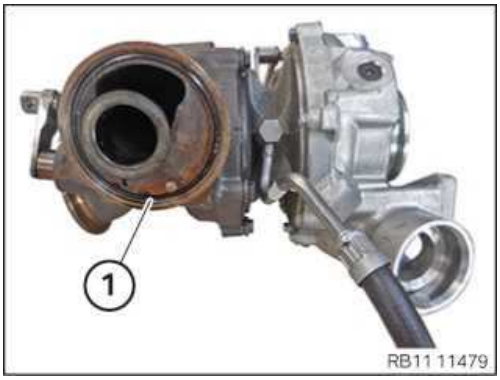
  Parts: Spacer ring
- Insert and install the spacer ring (1).
- Position spacer ring (1) correctly.



- Renew gasket (1).

  Parts: Gasket
- Position the seal (1).
- Renew the sleeve(2).

  Parts: Holding sleeve



- Renew sealing ring (1).

  Parts: Sealing ring
- Affix the sealing rings on the exhaust turbocharger.

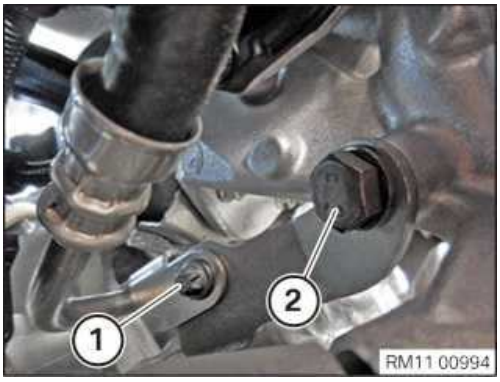


- Insert and install the low-pressure stage exhaust turbocharger on the exhaust manifold .
- Feed in and install V-band clamp .
- Tighten V-band clamp (2).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Screw in nut (1) with 2 **revolutions**.



- Tighten down screw (1).

Oil feed line to bracket

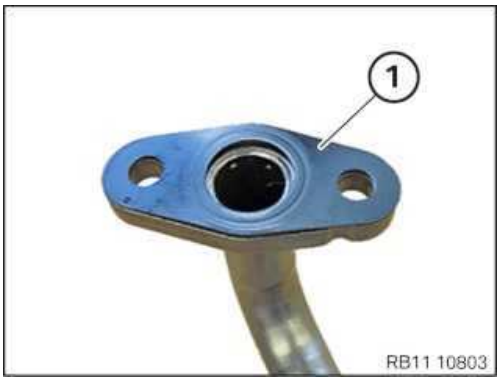
Torx screw M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

Holder to exhaust turbocharger and crankcase

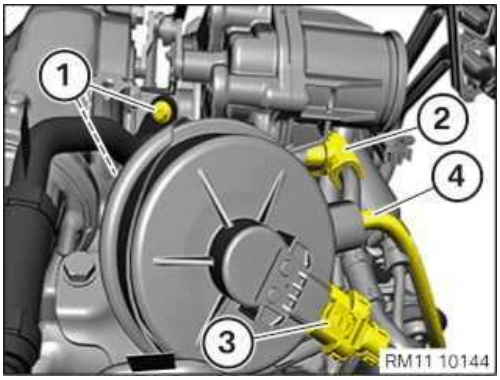
M8x16		Tightening torque	22 Nm

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- Renew seal (1) on the oil return line.

  Parts: Gasket



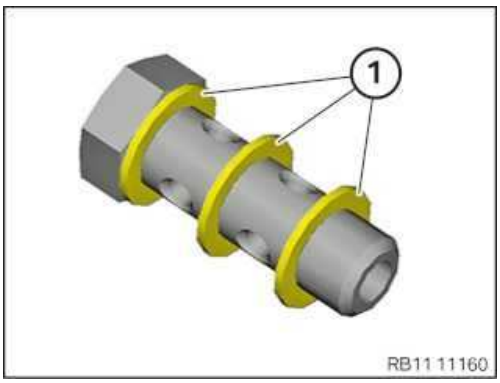
- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

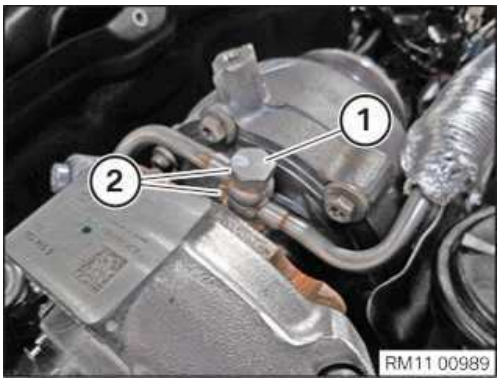
M6x12		Tightening torque	8 Nm

- Connect and lock connectors (2) and (3).

  The locks must engage audibly.
- Connect vacuum hose (4).



- Renew banjo bolt and sealing rings (1).
- **Parts:** Banjo bolt, sealing rings



- Install sealing rings (1).
- Tighten the banjo bolt (1).
- Ensure that the lines do not rest against the adjacent components.

93 – Installing heat shield on exhaust turbocharger at bottom

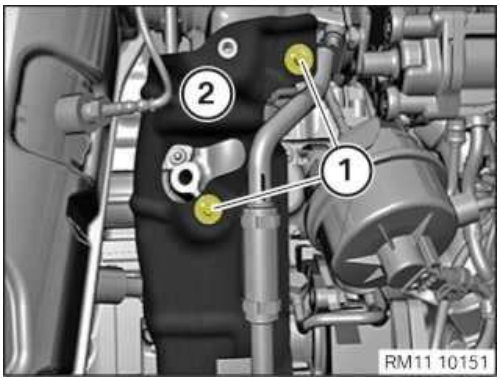
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

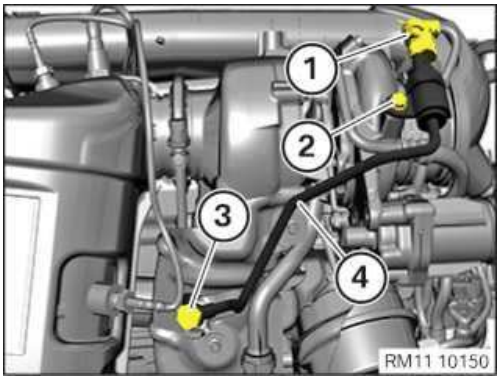
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- Feed in and install the heat shield (2).
- Tighten the bolts (1) on the heat shield .

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm



- Position the exhaust gas pressure pipe (4).
- Hand-tighten the bolt (2).
- Renew sealing rings on the banjo bolt (3).

  Parts: Sealing ring
- Tighten the banjo bolt (3).

Banjo bolt for exhaust pressure pipe to exhaust manifold

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

- Tighten down screw (2).

Standard screw connection M6

M6		8 Nm

- Connect connectors (1) and lock.

  Lock must audibly engage.

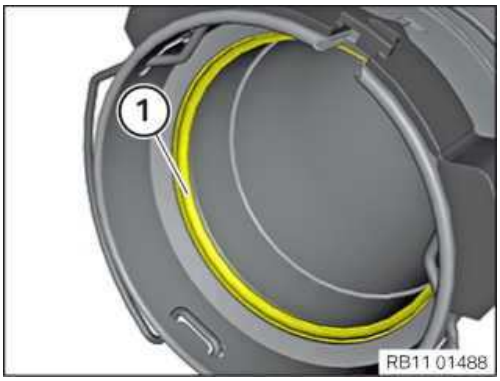
94 – Installing the right charge air duct between the exhaust turbocharger and the charge air cooler

RISK OF DAMAGE

Damage to the exhaust turbocharger.

A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.



- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

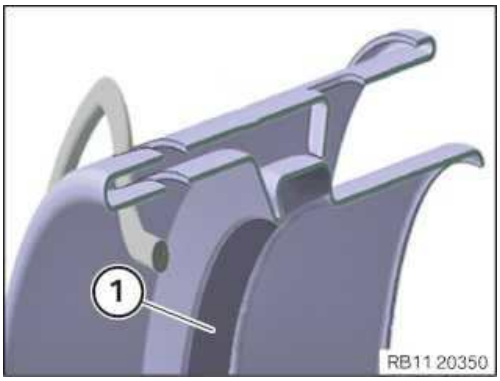
  Parts: Gasket

▸ **Replace damaged gasket**

TECHNICAL INFORMATION

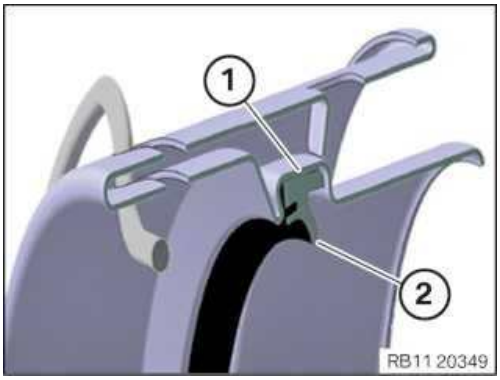
Do not use pointed or sharp-edged tools for the installation and/or removal.

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- Remove damaged seal.
- Clean gasket groove (1) with a dry towel.

  The gasket groove (1) must be clean.



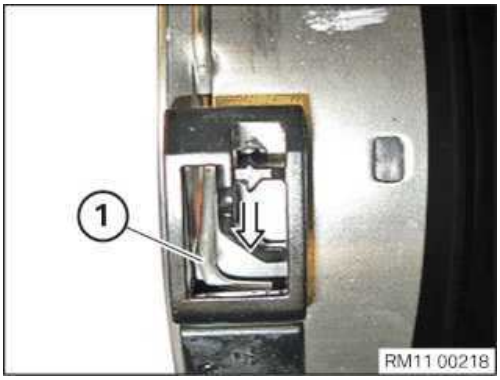
- Renew gasket.

  Parts: Gasket
- Install seal dry without lubricant or mounting agent.

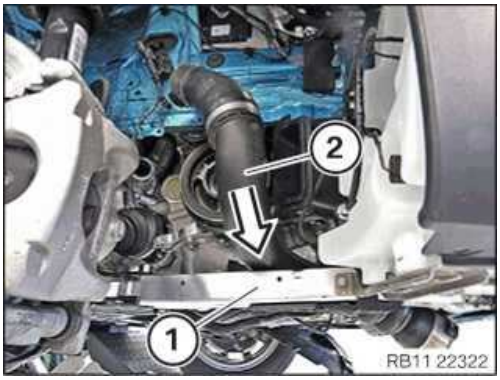
TECHNICAL INFORMATION

Incorrect assembly is possible. Ensure correct installation position.

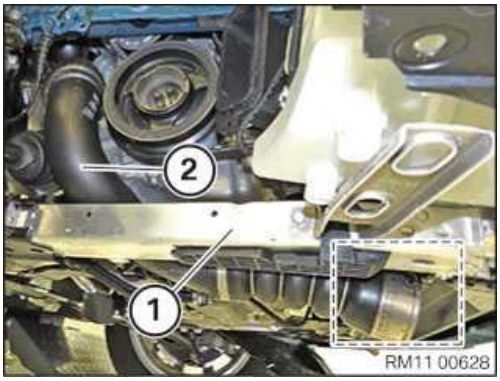
- Feed in and install the seal.
- Make sure the seal is correctly installed in the gasket groove (1).
- Make sure that the sealing lip (2) is pointing downwards (see figure).



- Detach the locks (1) in the direction of the arrow from the brackets.
- Ensure that the locks (1) engage audibly.

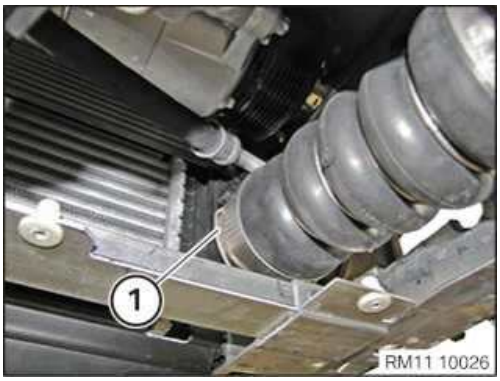


- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed in the charge air duct (1) in the **direction** of arrow between the side member and the deformation element and position.

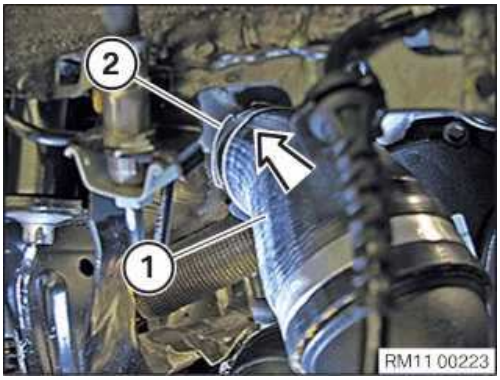


- Pull the adapter of the front axle support (1) downwards to the front right.
- Position the charge air duct (2) in **marked** area on the charge air cooler.

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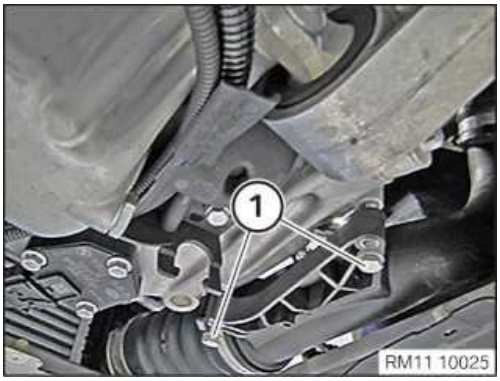


- Feed in and install the charge air duct (1) on the charge air cooler .
- Make sure the charge air duct (1) engages audibly on the charge air cooler.



- Feed in and install charge air duct (1) in the **direction** of the arrow on exhaust turbocharger.

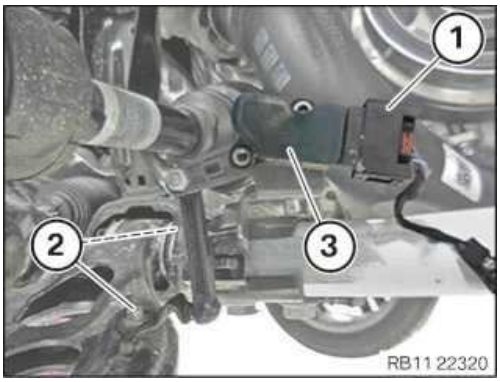
  The locks (2) must engage audibly.



- Tighten the screws (1).

Charge air duct to oil sump

M6		Tightening torque	8 Nm



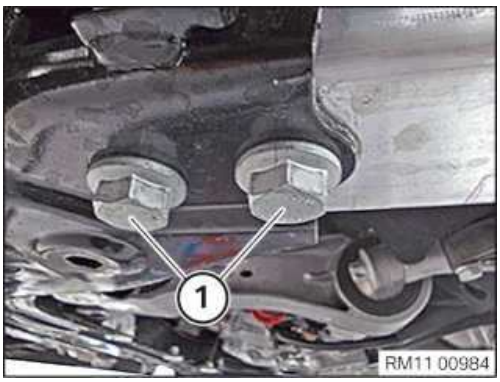
- **If installed:**
- Feed in and install the ride height sensor (3).
- Tighten the screws (2).

Ride height sensor holder to front axle support

M6		Tightening torque	8 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

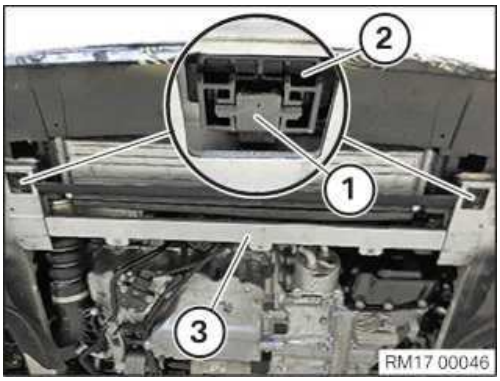


- Tighten the screws (1) on the adapter of the front axle support.

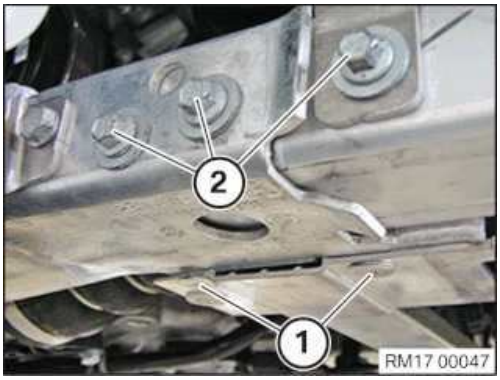
Adapter, front axle support to front axle support

		Tightening torque	100 Nm

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- Guide in cross connection (3) and install.
- Guide in locks (2) and install.
- Lock the locking pins (1).
- Ensure that the locking pins (1) audibly engage.



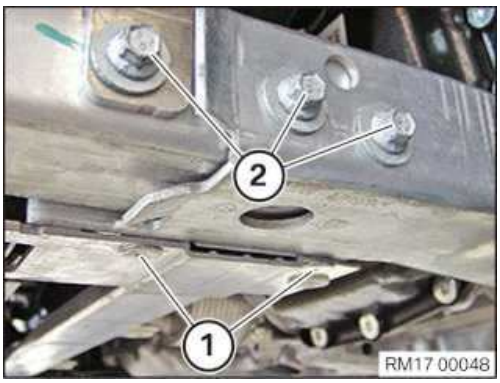
- Tighten the bolts (2) at the front left.

Cross connection to front axle support

M6		Tightening torque	12 Nm

- Renew the blind rivet (1).

  Parts: Blind rivet
- Mount the blind rivets (1) at the front left.



- Tighten the bolts (2) at the front right.

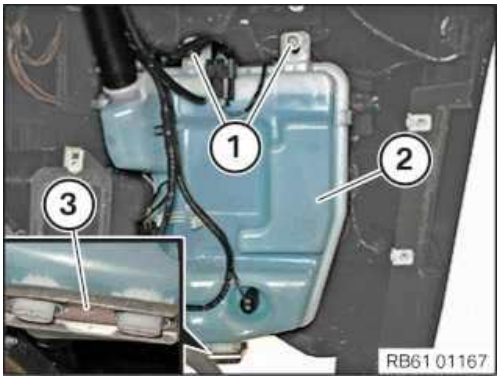
Cross connection to front axle support

M6		Tightening torque	12 Nm

- Renew the blind rivet (1).

  Parts: Blind rivet
- Mount the blind rivets (1) at the front right.

95 – Install the washer fluid reservoir in the fixture

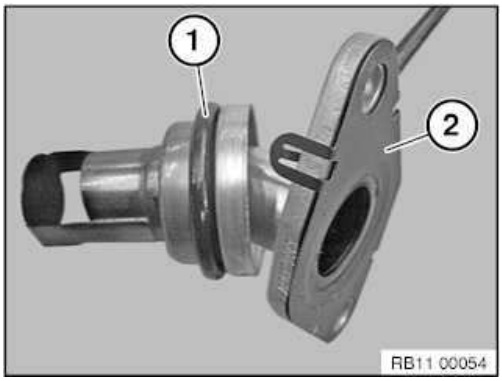


- Feed washer fluid reservoir (2) into the mounting (3) and install.
- Tighten the screws (1).

Washer fluid reservoir to body

M6x20		Tightening torque	8 Nm

96 – Installing the intake plenum

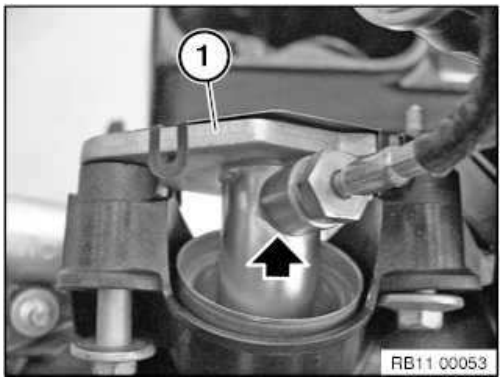


- Renew O-ring (1).

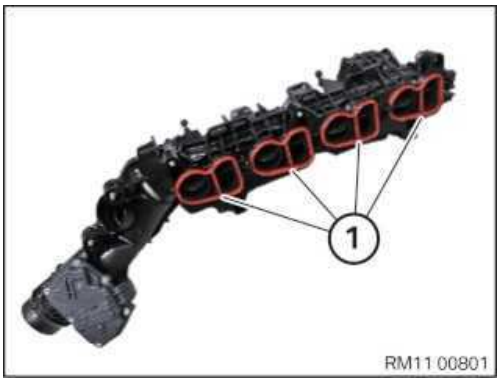
  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position the seal (2) and clip it in.

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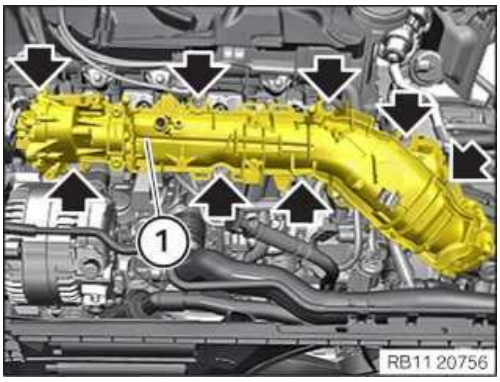


- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (1).

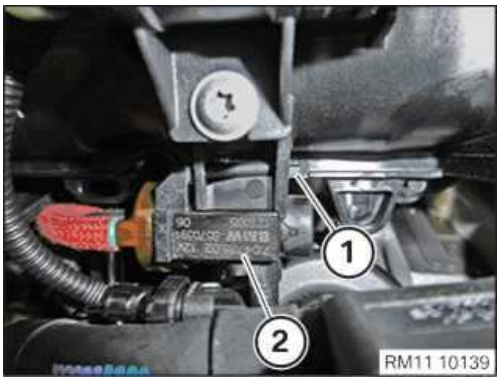
  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.



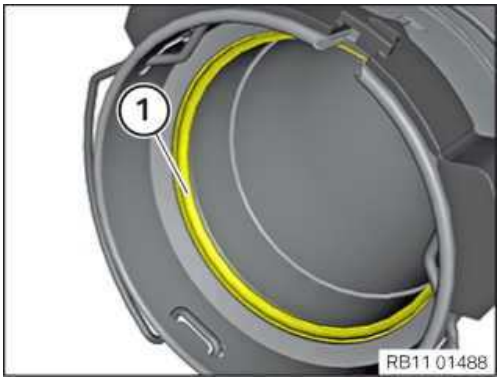
- Guide in and install intake (1) plenum.
- Tighten screws (arrows).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm



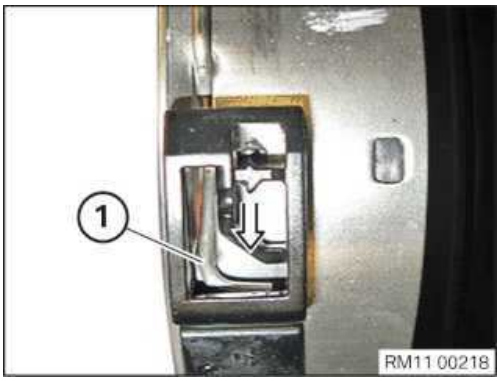
- Install the electric changeover valve (2) in the holder on the plenum from left to right.
- Lock (1) must engage audibly.



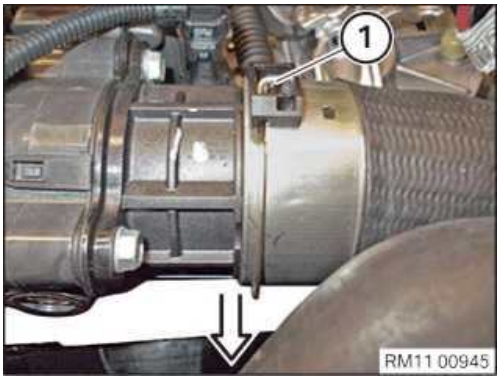
- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring

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- Engage the lock (1) on the bracket (arrow).



- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

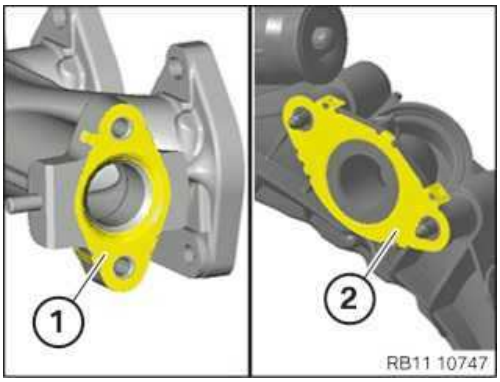
97 – Installing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

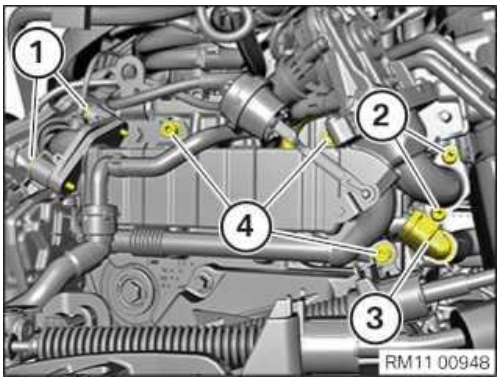


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket
- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket

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- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts
- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

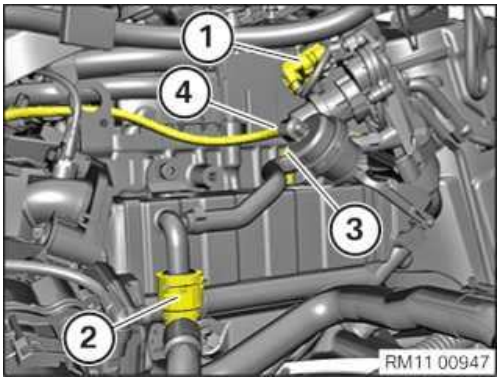
M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.
- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm



TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

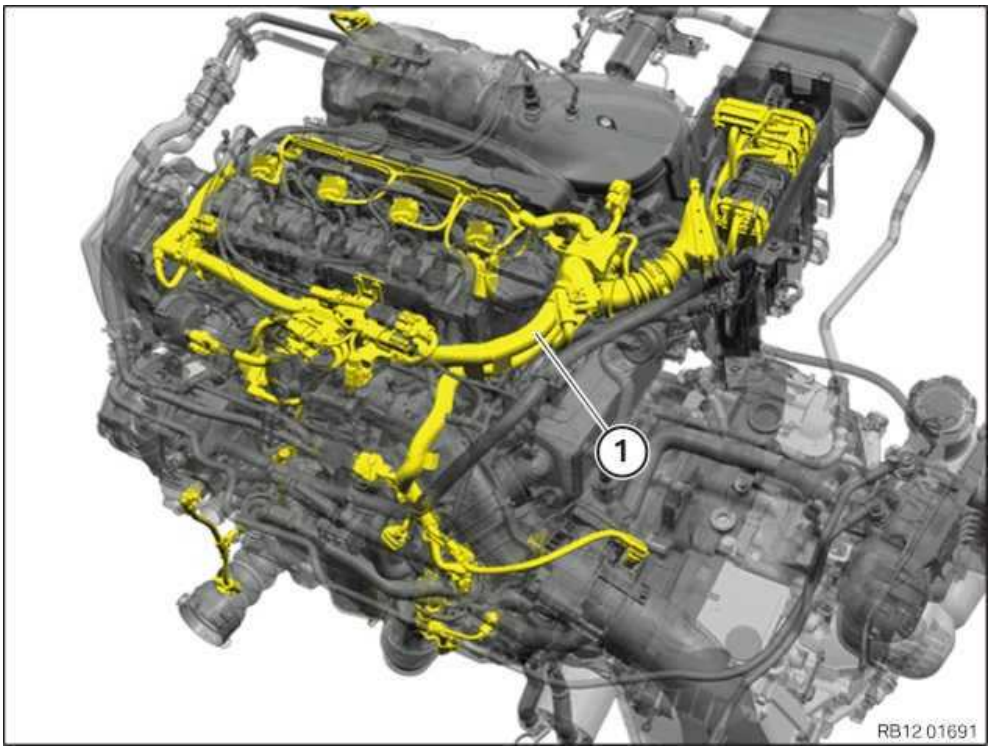
- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

98 – Fastening the wiring harness section for the intake plenum

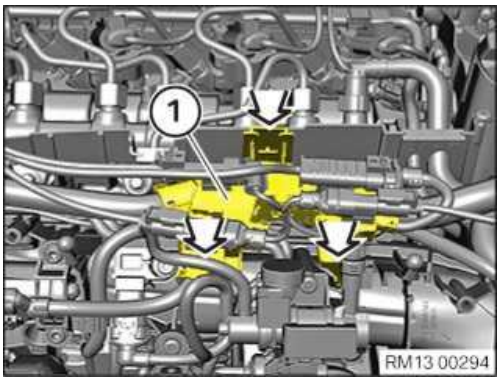
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Overview: Wiring harness section for the engine

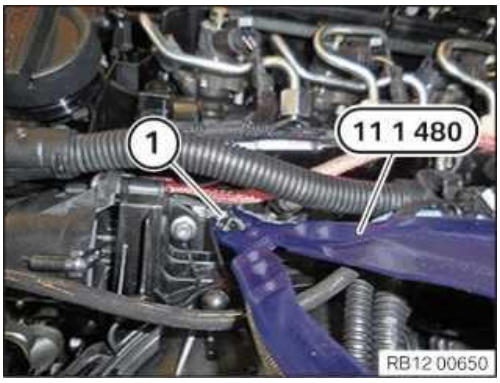


1 Wiring harness section for the engine

▶ **Installing the cable clip for the intake plenum**

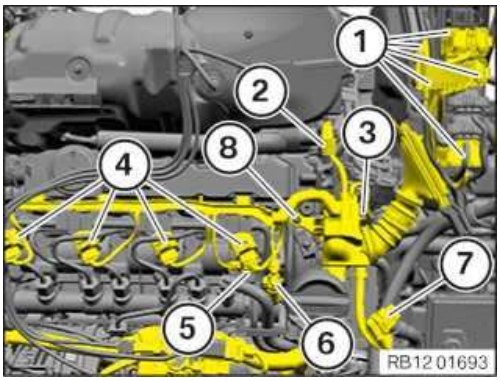


- Insert and install the cable clip (1) in the direction of the arrow.
- Make sure the cable clip (1) is fitted correctly.



- Connect and lock the connector (1) on the glow elements.
  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.

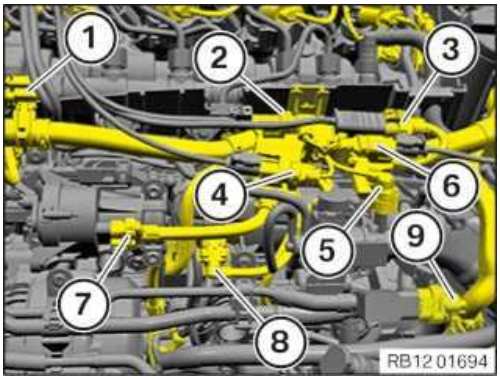
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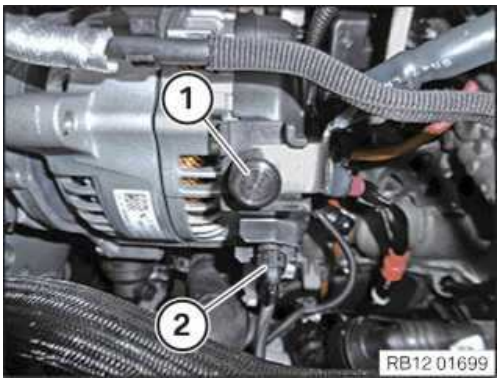
- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the DME control unit and remove the integrated supply module (PDM).
- Attach connector (2) to the differential pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust-gas recirculation valve and lock audibly.
- Attach connector (4) to the injectors and lock it audibly.
- Attach connector (5) to the camshaft sensor and lock it audibly.
- Attach connector (6) to the fuel pressure regulator and lock it audibly.
- Connect and audibly lock the connector (7) to the hot film air mass meter.
- Tighten down screw (8).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm



- Connect the connector (1) to the rail pressure sensor and lock it audibly.
- Attach connector (2) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (3) to the front oxygen sensor and lock audibly.
- Attach connector (4) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Connect the connector (5) to the electric changeover valve and lock audibly.
- Attach connector (6) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (7) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (8) to the charging pressure sensor and lock it audibly.
- Attach connector (9) to the fuel pressure and temperature sensor and lock it audibly.

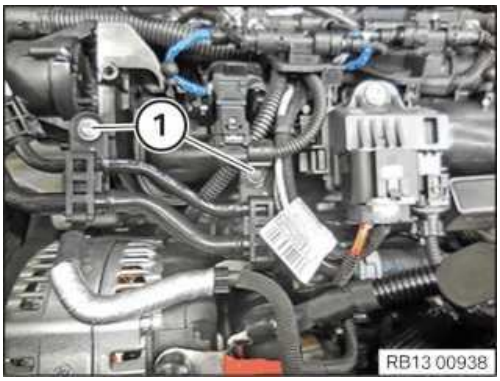


- Connect and lock the connector (2).

  Lock must snap audibly into place.
- Connect the positive battery cable (1) and tighten.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

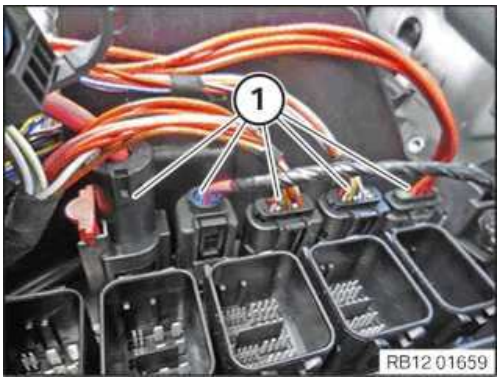


- Position the fuel line.
- Tighten the screws (1).

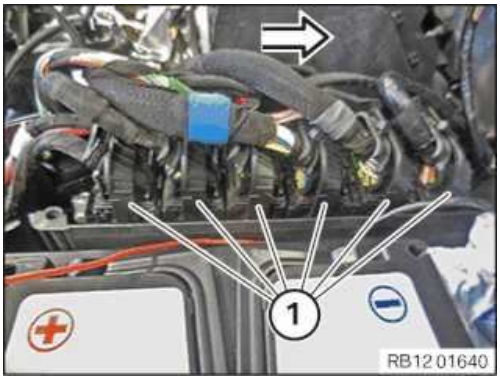
Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

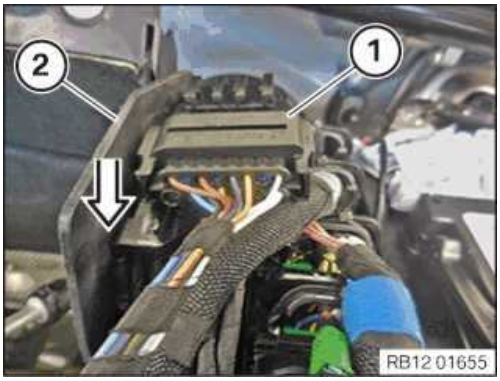
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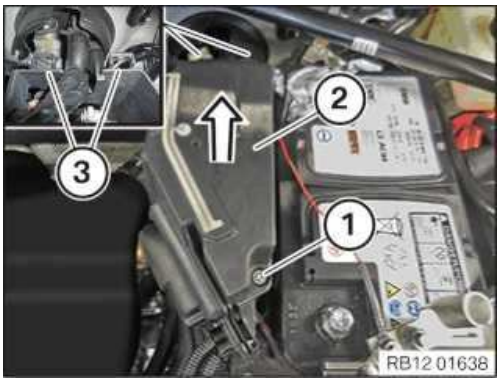
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



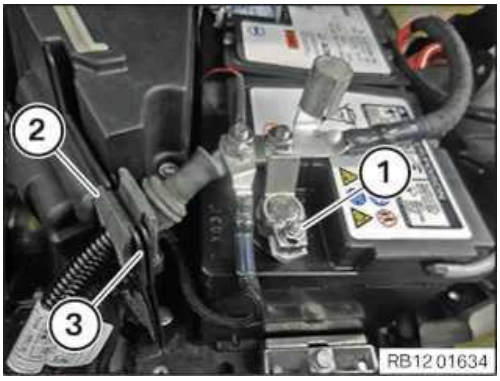
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert and install the cover (2) into the guides (3) in the direction of the arrow.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

RF5x26.5		Tightening torque	2,5 Nm

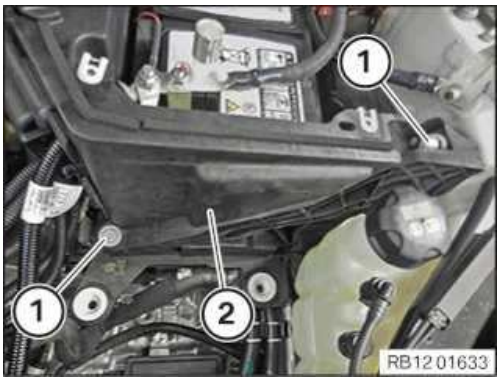


- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

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- Feed in and install tension strut (2).
- Tighten the screws (1).

Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

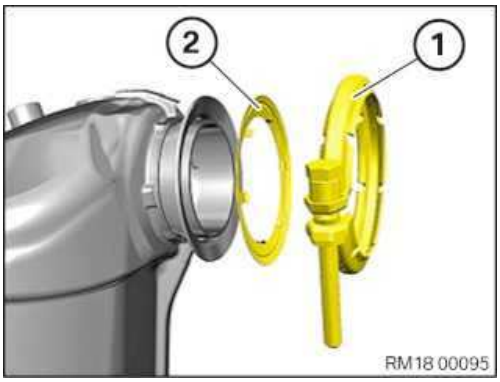
99 – Installing the diesel particulate filter

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



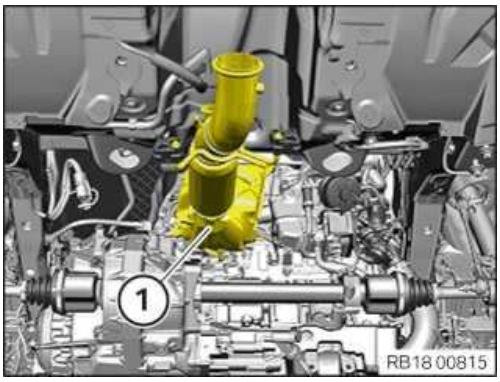
- Renew the V-clip (1).

  Parts: V-band clamp
- Renew the gasket (2).

  Parts: Gasket

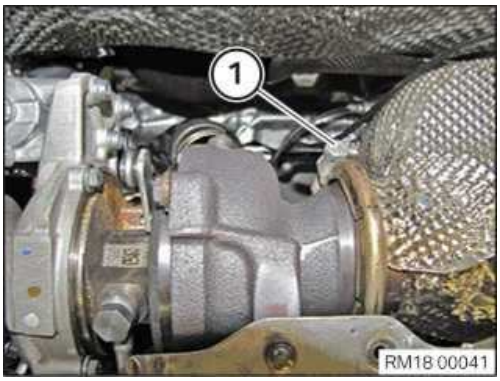


- Before installing the diesel particulate filter: Mount fitting aid (1) for the flexible tube.



- Carefully insert and install the diesel particulate filter (1).

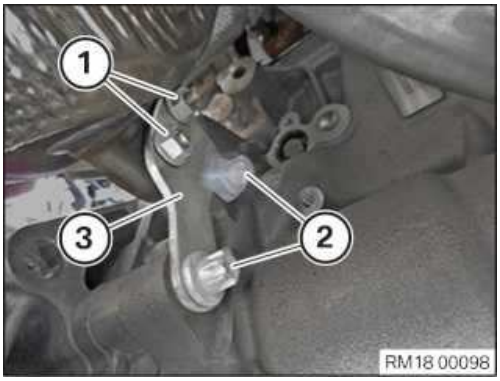
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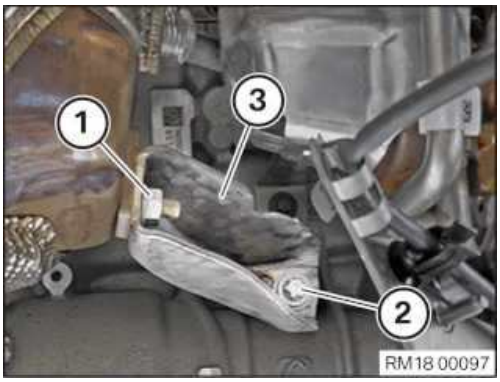
- Feed in and install V-band clamp (1).
- Make sure that the seal between the diesel particulate filter and the exhaust turbocharger is installed correctly.
- Align the diesel particulate filter on the exhaust turbocharger.
- Position V-clip (1).
- Hand-tighten the V-clip (1).



- Tighten nuts (1) by hand.



- Install holder (3).
- Hand-tighten the bolts (2).
- Tighten nuts (1) by hand.

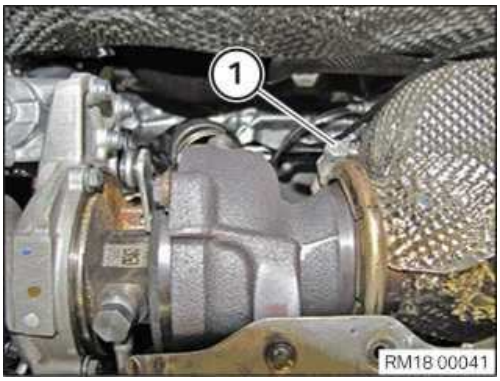


- Install holder (3).
- Tighten the nut (1) hand-tight.
- Hand-tighten the bolt (2).



- Remove fitting aid (1) for the flexible tube.

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- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

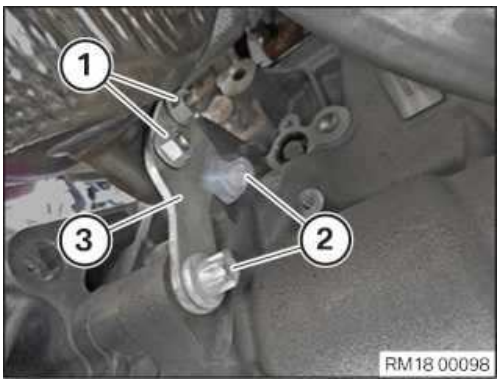
V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm



- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screws (2).

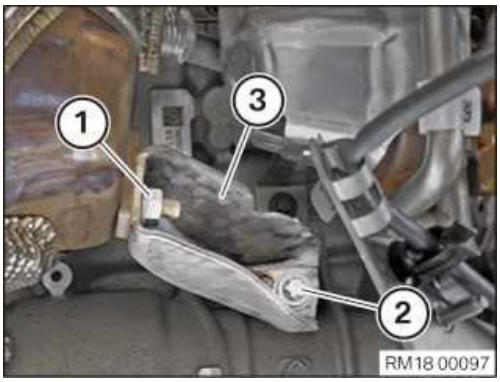
Diesel particulate filter holder to gearbox

M12x75		Tightening torque	66 Nm

- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screw (2).

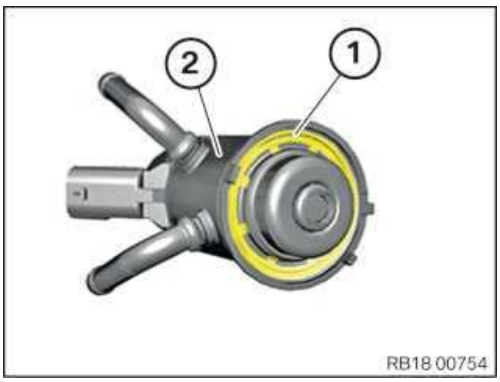
Diesel particulate filter bracket to crankcase

M10x35		Tightening torque	38 Nm

- Tighten nut (1).

Diesel particle filter to holder

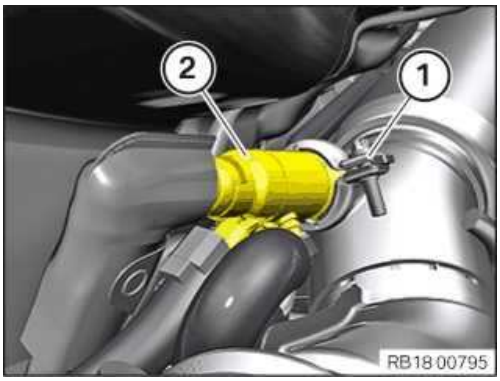
M8 hexagon nut		Tightening torque	19 Nm



- Renew sealing ring (1) of the SCR metering module (2).

  Parts: Sealing ring

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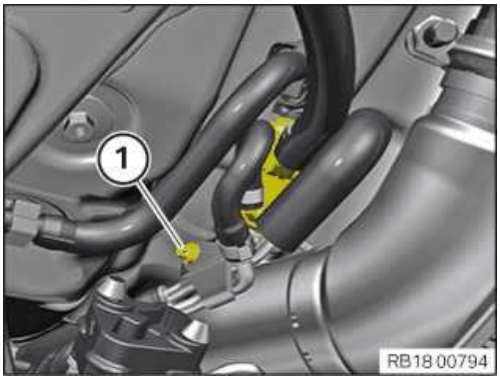


- Insert and install the SCR metering module (2).
- Renew the V-clip (1).

  Parts: V-band clamp
- Tighten V-band clamp (1).

SCR metering module V-clip to exhaust system

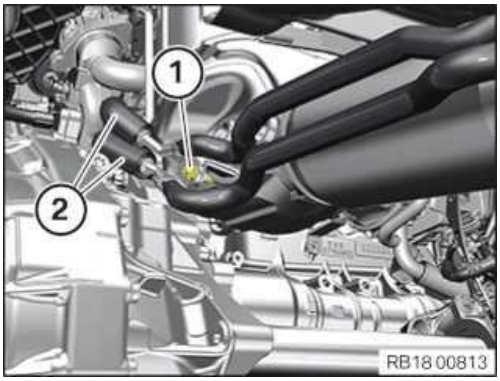
V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm



- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm

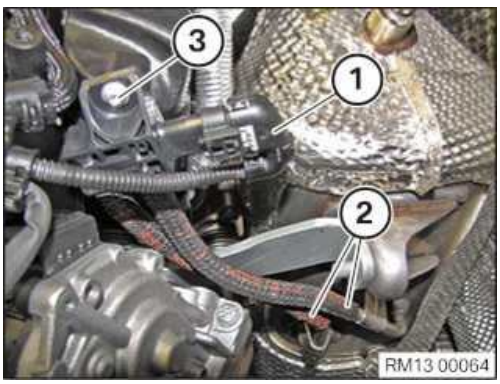


- Thread in and install coolant line (2) of the SCR metering module.
- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm

▶ **Installing differential pressure sensor**



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

100 – Install the control sensor

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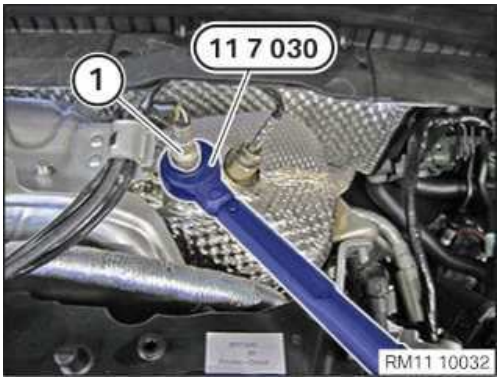
TECHNICAL INFORMATION

New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue



- Feed in front oxygen sensor (1) and install.
- Tighten front oxygen sensor (1) using special tool .

Control sensor

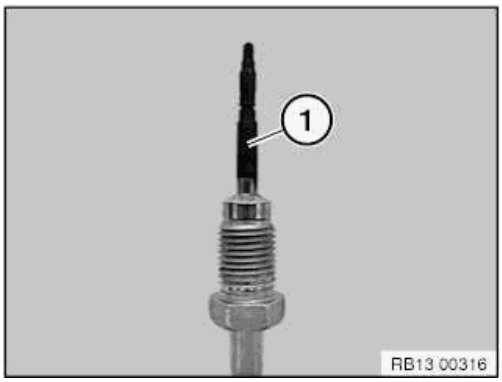
Control sensor		Tightening torque	50 Nm



- Lay and secure cable of oxygen control sensor.
- Secure the connector (2) to the holder.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

101 – Install the exhaust-gas temperature sensor on the diesel particulate filter



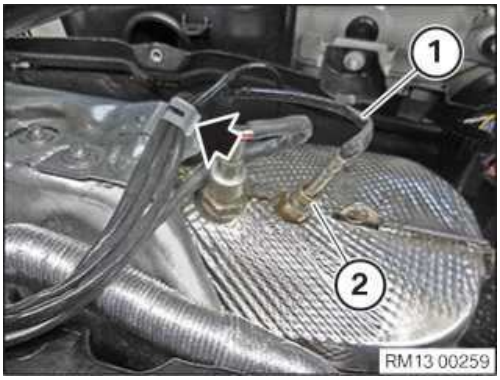
RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

- Check the gauge tip (1) for damage and renew the exhaust temperature sensor as needed.



- Feed in and install the exhaust temperature sensor (2).
- Tighten the exhaust temperature sensor (2).

Exhaust temperature sensor to diesel particulate filter

Exhaust-gas temperature sensor		Tightening torque	28 Nm

- Insert and install cable (1) of the exhaust temperature sensor in the clamp (arrow).

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- Lay and fasten the cable of the exhaust gas temperature sensor.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

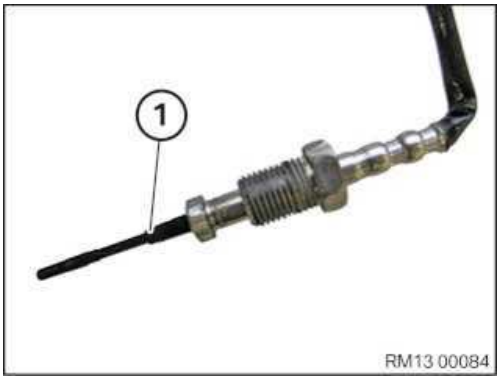
102 – Installing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

RISK OF DAMAGE

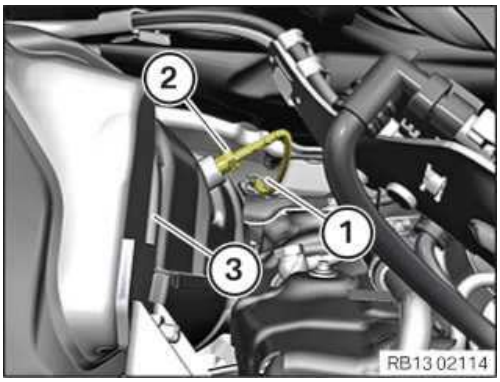
Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.



- Make sure the gauge tip (1) is not damaged during installation.

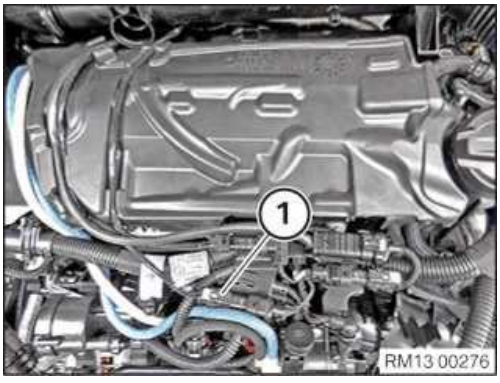


- Guide the exhaust temperature sensor (2) into diesel particulate filter (3) and install.
- Tighten the exhaust temperature sensor (2) with conventional tools .

Exhaust temperature sensor to diesel particulate filter

Exhaust-gas temperature sensor		Tightening torque	28 Nm

- Insert and install the cable of the exhaust temperature sensor (2) in the clamps (1).

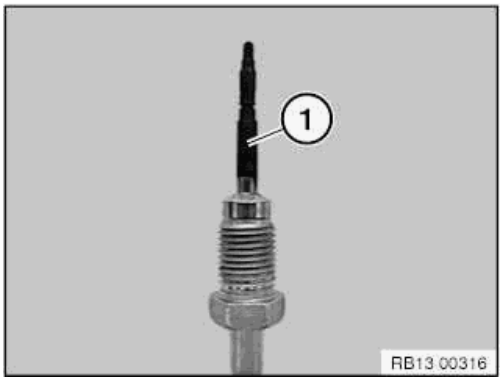


- Lay and fasten the cable of the exhaust gas temperature sensor.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

103 – Installing exhaust temperature sensor on catalytic converter

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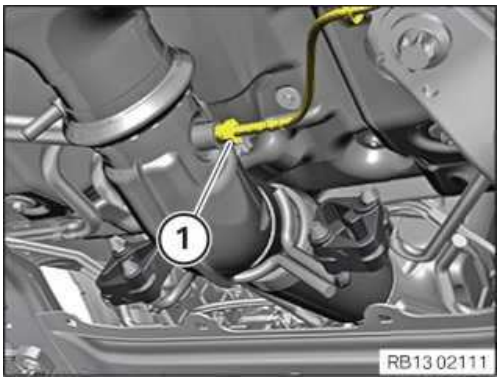
RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

- Check the gauge tip (1) for damage and replace the exhaust temperature sensor as needed.



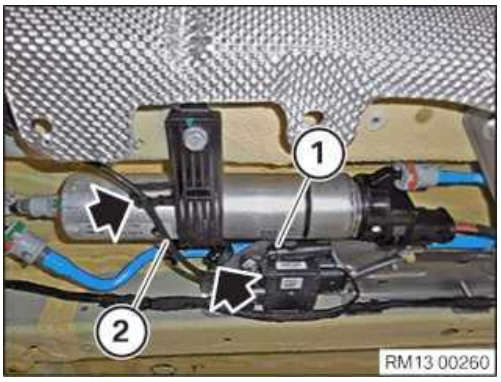
- Feed in and install the exhaust temperature sensor (1).
- Tighten the exhaust temperature sensor (1).

Exhaust-gas temperature sensor to exhaust system

Exhaust-gas temperature sensor		Tightening torque	28 Nm



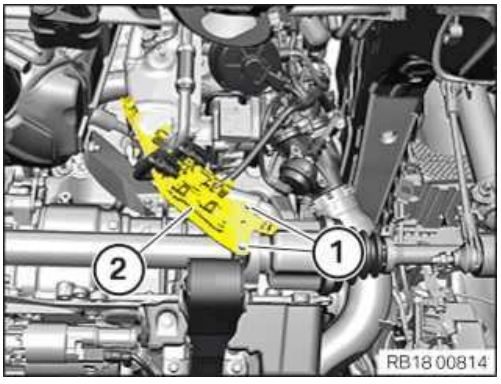
- Secure the cable clips (1).



- Feed cable (2) from exhaust temperature sensor into the clamps (arrows) and install.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

104 – Install holder for oxygen sensor



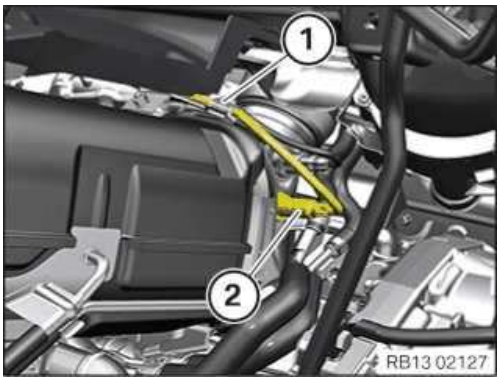
- Insert and install the holder (2).
- Tighten the screws (1).

Oxygen sensor holder to intermediate shaft

Hexagon screw M6x16		Tightening torque	8 Nm

105 – Installing the nitrogen oxide sensor before SCR catalytic converter

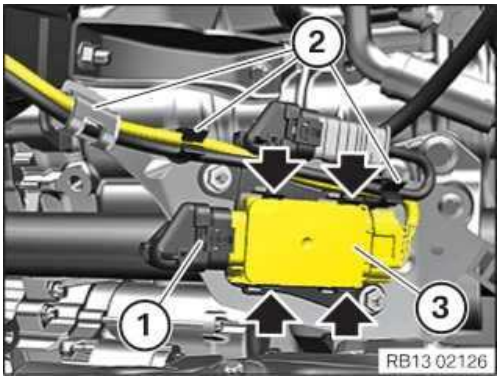
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- Insert nitrogen oxide sensor before the SCR catalytic converter (2) and install.
- Tighten the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

Nitrogen oxide sensor before SCR catalytic converter

Sensor		Tightening torque	50 Nm



- Install and lock the evaluation electronics for the nitrogen oxide sensor (3) (arrows).
- Insert the evaluation electronics cable for the nitrogen oxide sensor (3) into the clamps (2) and install.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

106 – Install the monitoring sensor

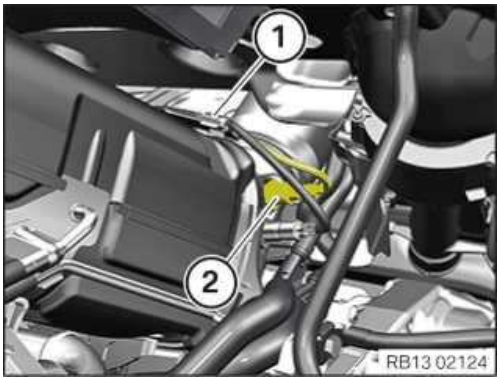
TECHNICAL INFORMATION

New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

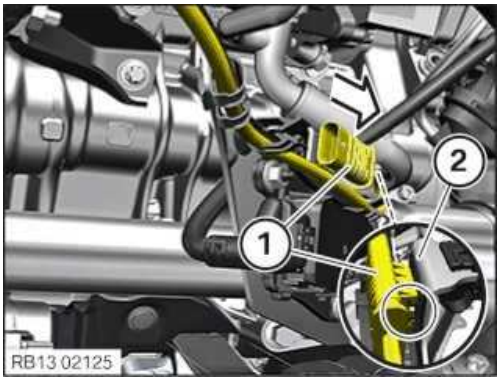


- Feed in the monitoring oxygen sensor (2) and install.
- Tighten the monitoring oxygen sensor (2) with special tool **0 491 074 (11 7 020)** .

Monitoring sensor

Sensor		Tightening torque	50 Nm

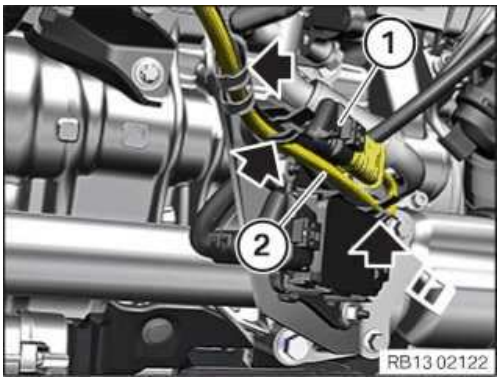
- Insert the cable of the monitoring oxygen sensor (2) into the clamp (1) and secure it.



- Connect the connector (1) with the bracket (2) in the direction of arrow.
- Make sure that the connector (1) is locked correctly in the marked area.

  The connector (1) must engage audibly.

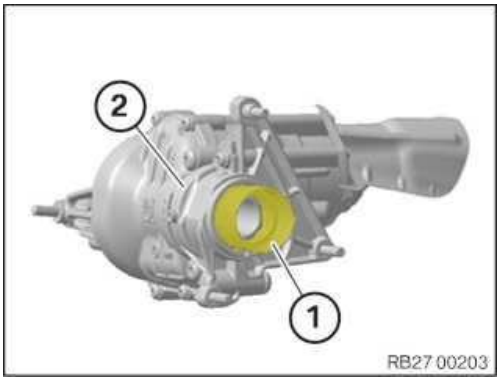
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- Insert and attach the cable of the monitoring oxygen sensor (2) to the clamps (arrows).
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

107 – Install the transfer box (VTG)



- If intermediate shaft (1) gets caught on transfer box (VTG) (2), renew intermediate shaft (1) and the radial shaft seals in the automatic or manual transmission.



- Screw special tool **2 409 025** into the outer radial shaft seal.
- Turn the screw on the special tool **2 409 025** until the outer radial shaft seal has been pulled out.

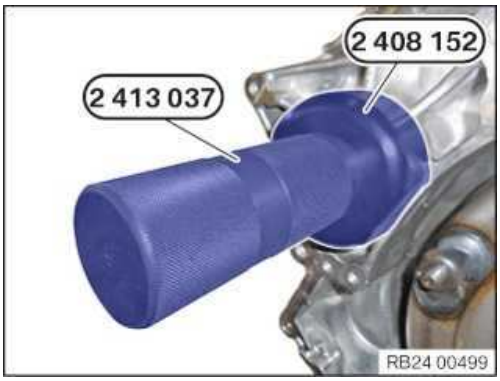


- Insert special tool **2 411 739** into the inner radial shaft seal.

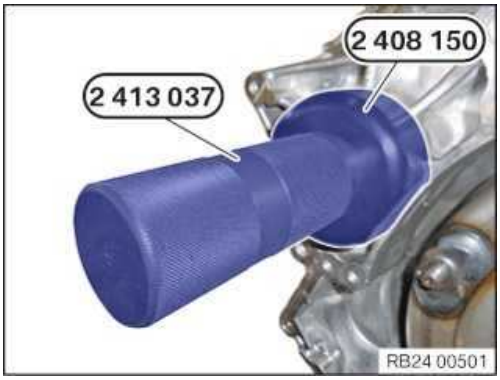


- Screw special tool **2 411 739** into the inner radial shaft seal.
- Turn the screw on the special tool **2 411 739** until the inner radial shaft seal has been pulled out.

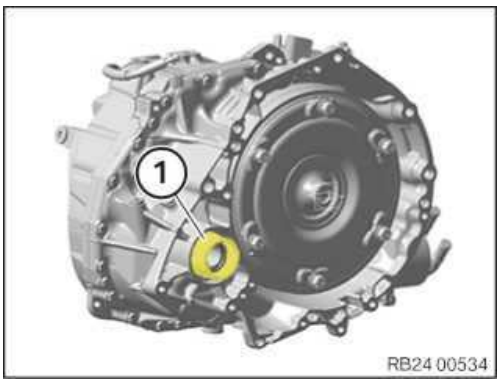
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- Drive in the inner radial shaft seal using special tools **2 408 152** and **2 413 037** up to the limit position.



- Drive in the outer radial shaft seal using special tools **2 413 037** and **2 408 150** up to the limit position.



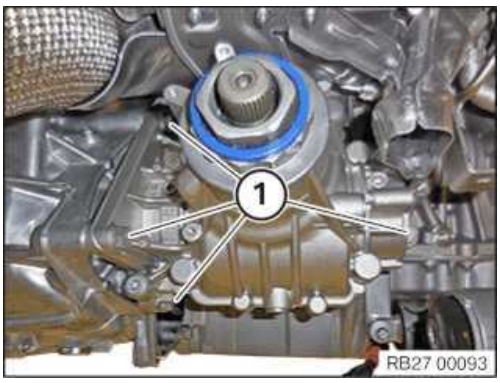
- If necessary, connect the new intermediate shaft (1) to the output flange of the automatic transmission or manual transmission.



- Coat the inside of the output flange (arrows) evenly with approx. 5 g of grease.

Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754

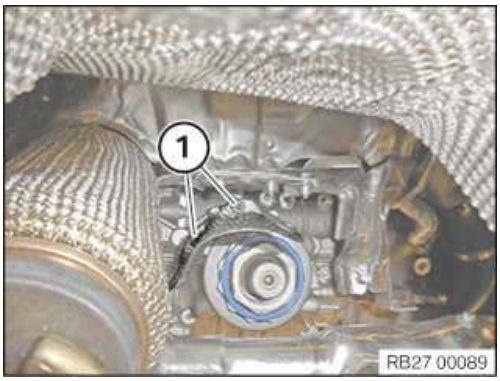


- Install the transfer box (VTG).
- Tighten the screws (1).

Transfer box to transmission

M10		Tightening torque	56 Nm

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- Install heat shield.
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Heat shield to transfer box

M6	Renew screws.	Tightening torque	6 Nm

▸ **Check the transfer box oil level**

RISK OF DAMAGE

Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.



- Check transfer case oil level, correct:
- Open the oil filler plug (1).
- Check transfer box oil level.
- If necessary, top up transmission oil up to the lower edge of the oil filler plug opening (1).

Transmission oil

Technically suitable transfer box and electrical transmission oils	

Main group 27

- Tighten the oil filler plug (1).

Oil filler plug on transfer box (VTG)

M18x1.5		Tightening torque	35 Nm

108 – Install the intermediate shaft with the support tube

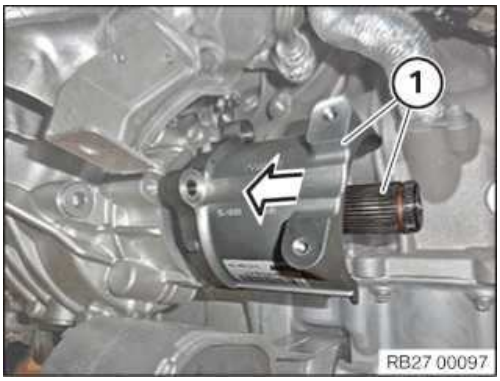


- Coat gearing of the intermediate shaft uniformly with 5 g of grease.

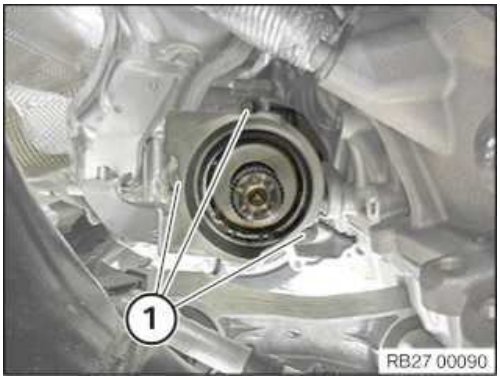
Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754

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- Install the intermediate shaft with support tube (1) in the transfer box.



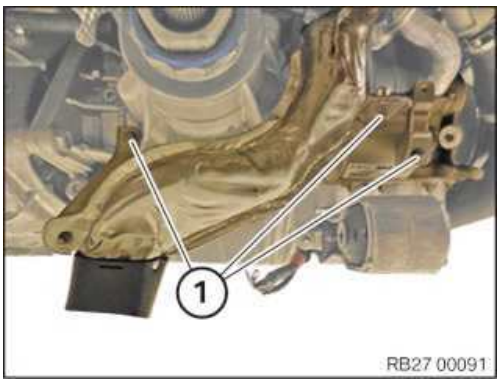
- Position screws (1).

Note: Check for correct screw length! Bolt M8x35 8.8

- Tighten the screws (1).

Intermediate shaft to transfer box

M8x35		Tightening torque	19 Nm



- If installed: Install air duct.
- Tighten the screws (1).

109 – Installing starter motor

CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.



- Insert and install the starter motor .
- Tighten the screws (1).

Starter motor to transmission

M8x45		Tightening torque	19 Nm

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- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

Battery positive lead to starter

M8		Tightening torque	13,5 Nm



- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.

110 – Installing right output shaft partially



- Renew the circlip (1).

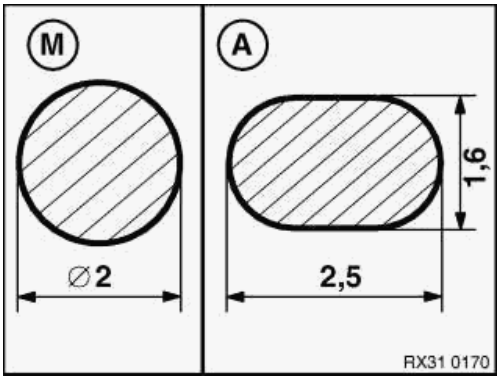
  Parts: Circlip
- Slide output shaft into the transmission as far as the limit position.
- Check for secure seat by levering.

111 – Partially installing the left output shaft



- **With automatic transmission only:**
- Lever out O-ring (1).
- Renew O-ring (1).

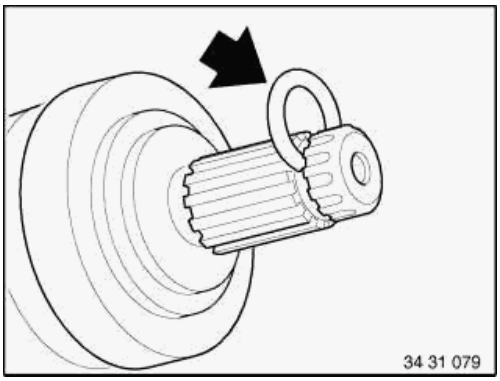
  Parts: O-ring
- Insert new O-ring (1).



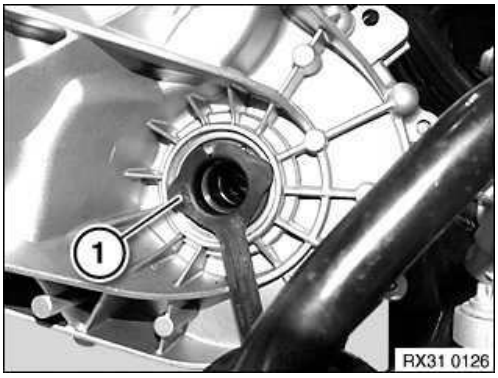
- Do not mix up circlips.

  Different types of output shafts fitted:
  - M: Manual transmission
  - A: Automatic transmission

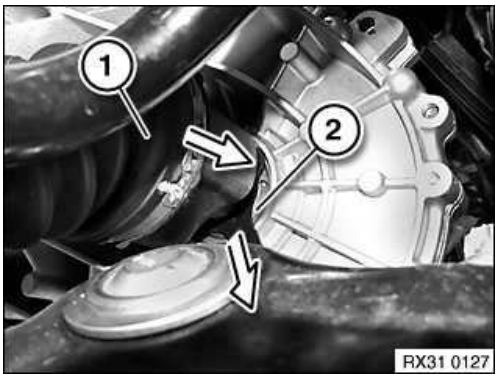
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- Renew circlip (arrow).



- Insert installation protection ring (1) into the radial shaft seal.
- Make sure the tool fits over the lip of the radial shaft seal so there is no damage to sealing ring when the output shaft is inserted.



- Insert output shaft (1) into transmission.
- **Manual gearbox only:** Pull on the handle to remove the installation protection ring (2) and dispose of it.
- Slide output shaft (1) into the transmission as far as the limit position.

  The output shaft (1) must engage audibly.
- Check for secure seat by levering.

112 – Install propeller shaft.

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

RISK OF DAMAGE

Damage to the propeller shaft during installation.

Non-observance of the installation guidelines for the propeller shaft on the rear axle differential may cause severe damage.

- Always renew the recessed nut on the rear axle differential. Screw locking must be available.
- Strictly observe a minimum hardening time of two hours after having screwed in the recessed nut. The hardening time may be longer at lower temperatures.

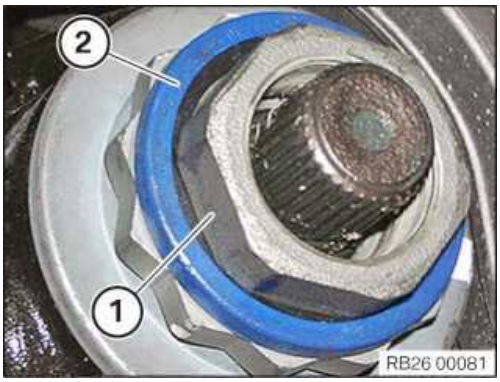
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RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.



- Renew recessed nut (1).

  Parts: Insert nut
- Renew the retaining clip (2) and the seal.

  Parts: Retaining clip, seal
- Insert the seal with the recessed nut (1) and install.
- Insert the retaining clip (2) and install.
- Make sure that recessed nut (1) is screwed in within 5 min.
- Make sure that the hardening time of **minimum** 2 h for the recessed nut is observed.

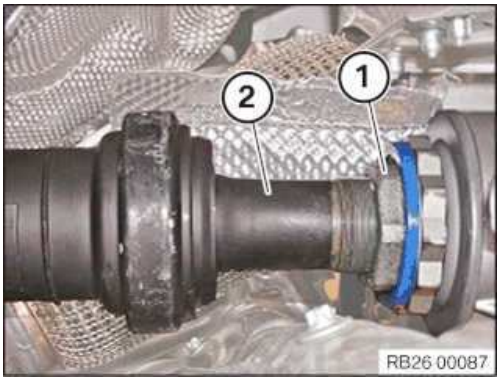
  The hardening time must be extended at lower temperatures.



- Insert the propeller shaft (1) and install.
- Always support the propeller shaft (1) with a conventional jack.

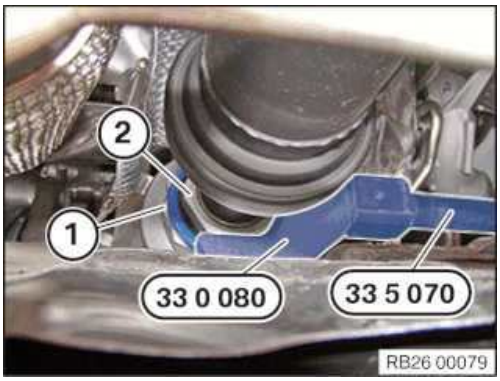


- Hand-tighten the bolts (1).



- Push the propeller shaft (2) against the recessed nut (1) up to the limit position.
- Screw the propeller shaft (2) at least 2 thread starts onto the recessed nut (1) by hand.

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RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.

- Protect the recessed nut (2) on the transfer box from twisting with the special tools **0 495 554 (33 5 070)** and .

  The recessed nut (2) on the transfer box must **not** be used to tighten the propeller shaft.

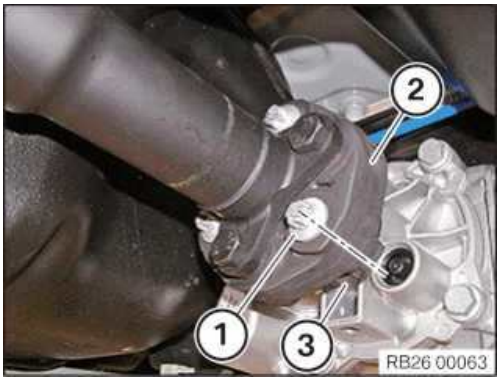
  The double hexagon flange nut (1) must **not** be used for counter support.



- Tighten the front propeller shaft with the special tools **0 495 554 (33 5 070)** and in the direction of the arrow.

Propeller shaft to transfer box

		Tightening torque	80 Nm



TECHNICAL INFORMATION

Compliance with the following instructions is required to avoid a humming noise from the propeller shaft after refitting the propeller shaft.

- Assemble the screw connection (1) of the flexible disc (2) and the three-hole flange (3) according to the mark.
- Renew screws (1).

  Parts: Bolts

- Hand-tighten the bolts (1).



- Protect the propeller shaft (1) with the special tools **0 495 554 (33 5 070)** and from twisting.

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- Tighten the bolts with the special tools **0 490 504 (00 9 120)** and .

Flexible disc to rear axle final drive

M12x1.5	Renew screws.	Tightening torque	55 Nm 90 °



- Tighten the screws (1).

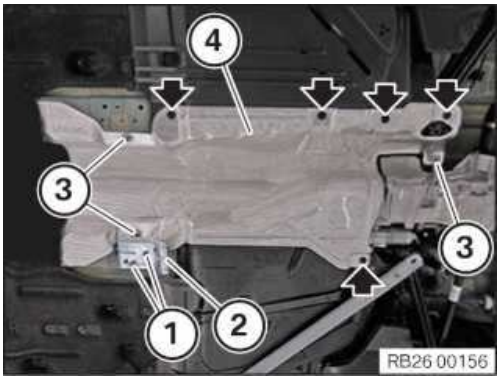
Centre mount to body

M8		Tightening torque	19 Nm



- Guide the special too l out between the front and rear propeller shaft and remove.

113 – Installing the rear heat shield



- Insert and install the heat shield (4).
- Tighten screws (arrows).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

- Tighten nuts (3).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

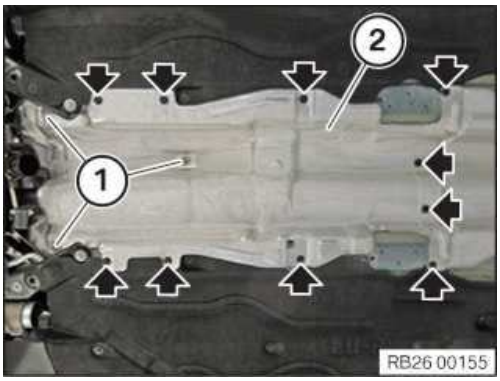
- Insert and install the holder (2).
- Tighten the screws (1).

Bracket to body

M8		Tightening torque	21 Nm

114 – Install the front heat shield

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- Insert and install the heat shield (2).
- Tighten screws (arrows).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

- Tighten nuts (1).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

115 – Install exhaust system

CAUTION

Component with heavy weight.

Danger of injury!

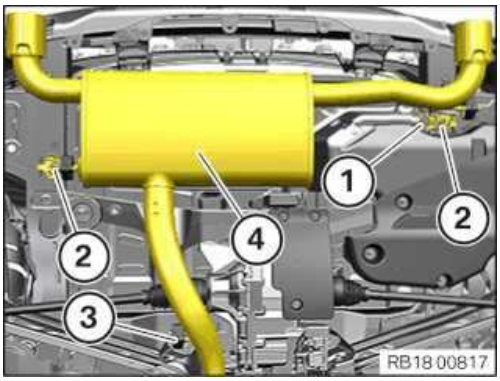
- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Feed in and install the exhaust system (4) with a second person.
- Renew nuts (2).

  Parts: Nuts
- Tighten nuts (2).

Exhaust system to body

M8	Replace nuts.	Tightening torque	19 Nm

- Tighten down screw (1).

Exhaust bracket on body

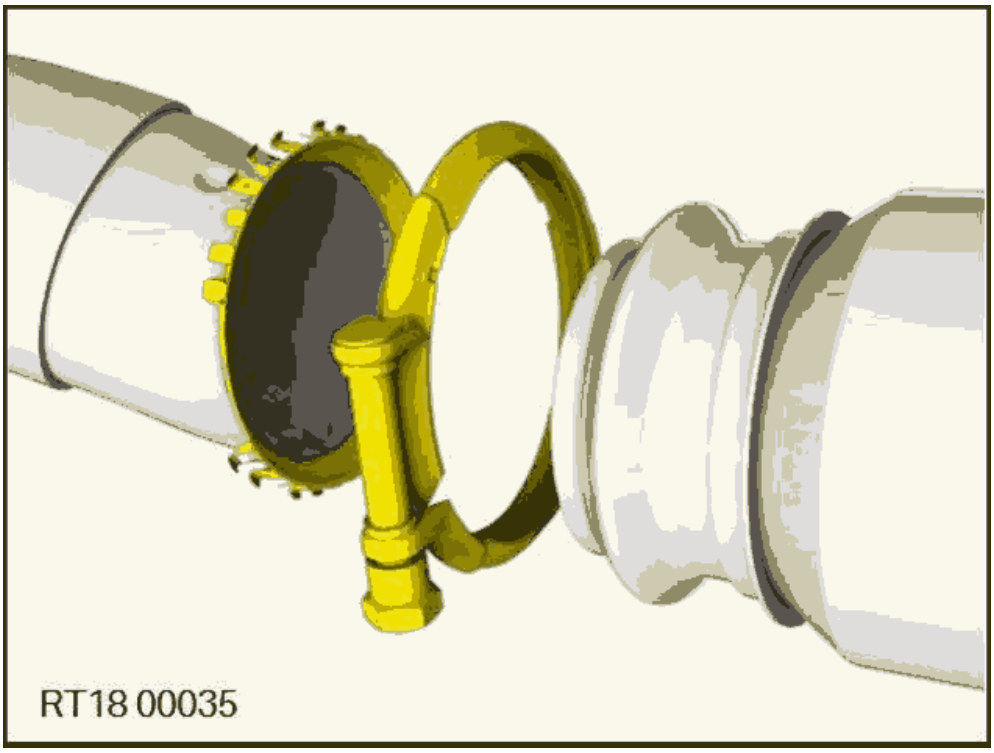
Hexagon screw M8x30		Tightening torque	19 Nm

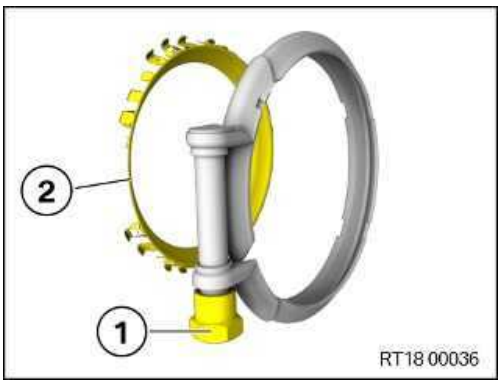
- Check the rubber mount (3) for damage and renew as needed.
- Mount rubber mount (3) on the exhaust system (4).

▸ **Install the V-clip**

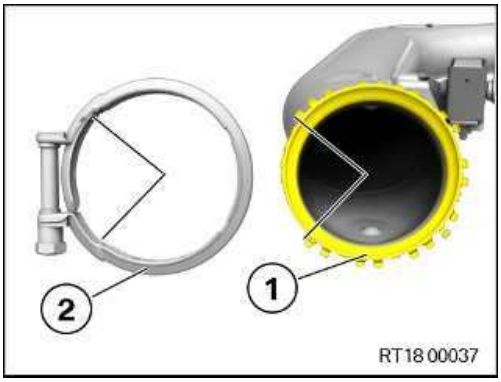
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V-band clamp



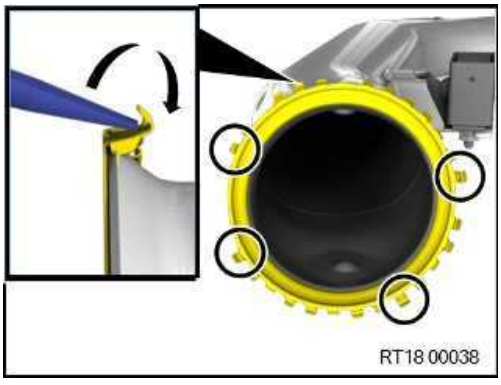


- Unscrew the nut (1) and remove the sealing ring (2).



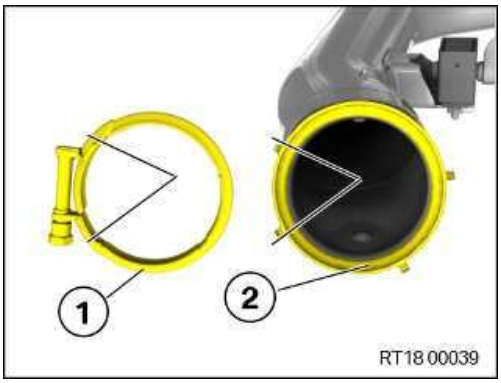
- Renew the V-clip (2).

  Parts: V-band clamp
- Mount the sealing ring (1) on the exhaust system.
- Ensure that the sealing ring (1) for the V-clip (2) is positioned correctly.



- Bend all sheet metal tabs over with a suitable tool, except those in the marked areas.

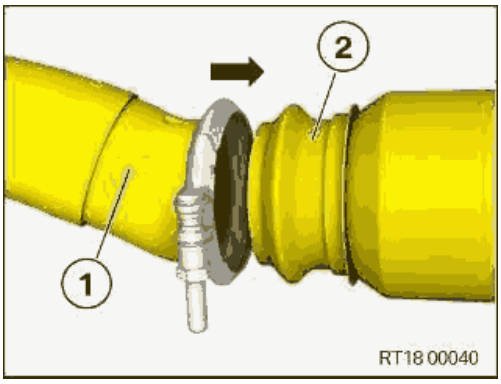
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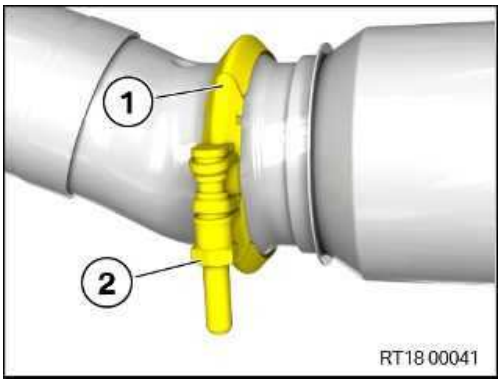
- Mount the V-clip (1) on the sealing ring (2).
- Make sure that the V-clip (1) is positioned correctly on the sealing ring (2).



- Make sure that the V-clip rests against the sheet metal tabs after mounting (marks).



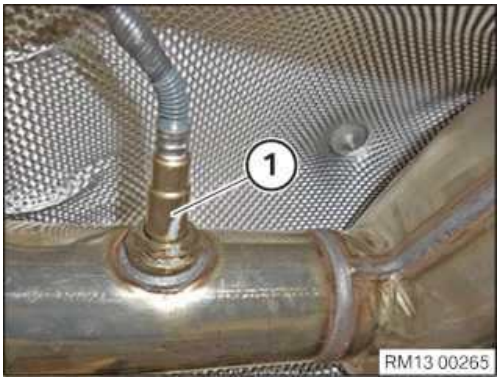
- Connect the exhaust system (1) with the catalytic converter (2) and position correctly.



- Make sure that V-clip (1) is fitted correctly.
- Tighten down screw (2).

V-clip to catalytic converter

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

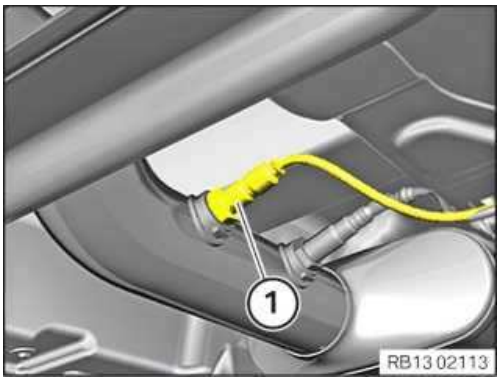


- Feed in, install and tighten diesel particulate sensor (1).

Diesel particulate sensor to exhaust system

Sensor		Tightening torque	50 Nm

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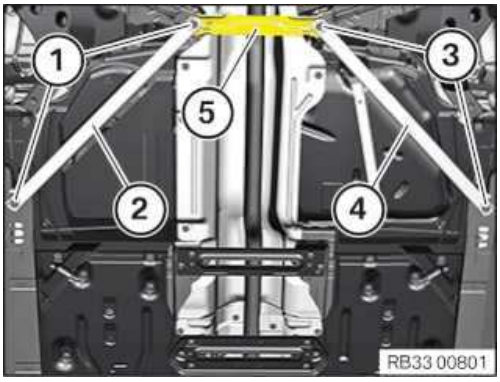


- Feed in, install and tighten nitrogen oxide sensor (1).

Nitrogen oxide sensor downstream of SCR catalytic converter

Sensor		Tightening torque	50 Nm

116 – Install the cross-member with torsion struts



- Insert and install the cross-member (5).
- Thread in torsion strut (4) at right and install.
- Renew screws (3).

  Parts: Bolts
- Tighten down screws (3).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

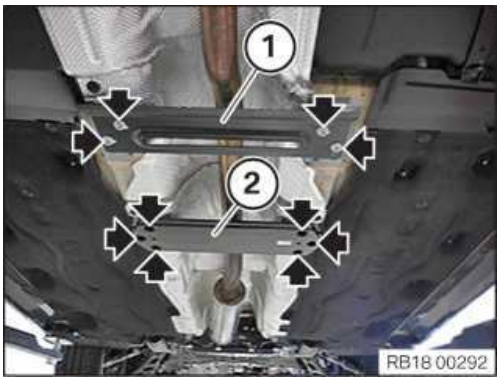
- Guide in and install the left torsion strut (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

117 – Install the connecting support on the tunnel in front and back



- Insert and install connecting supports (2).
- Tighten the screws (arrows) from the connecting support (2).

Front connection carrier to body

M10x18		Tightening torque	56 Nm

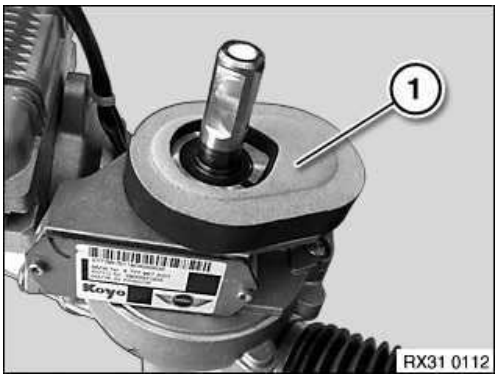
- Insert and install connecting supports (1).
- Tighten the screws (arrows) from the connecting support (1).

Rear connection carrier to body

M8x18		Tightening torque	28 Nm

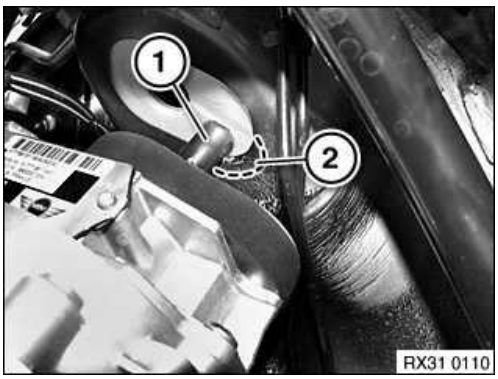
118 – Mount and secure the complete front axle

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- Remove the seal (1).
- Clean surface on steering gear.
- Renew gasket (1).

  Parts: Gasket
- Position the seal (1) and glue it on.

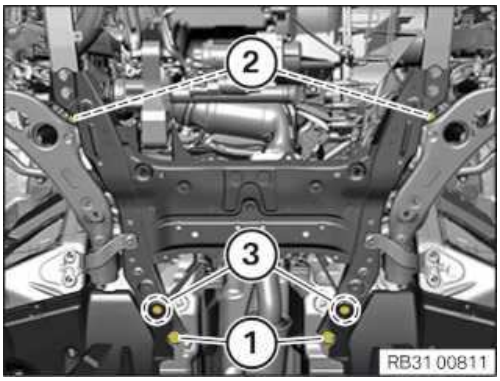


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- Position front axle support.
- Bend underbody panellings in the areas (3) to one side.
- Raise front axle support.
- When raising, insert charge air cooler into the rubber mount of the charge air cooler on cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

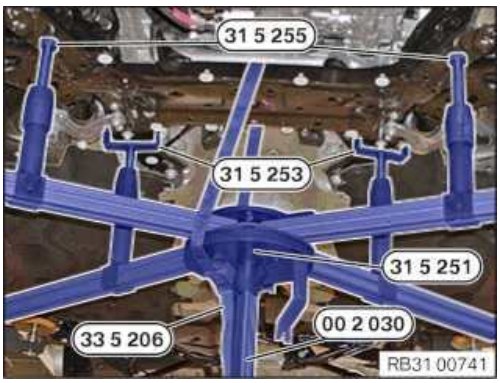
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

- If necessary, tighten the screws in the areas (3).

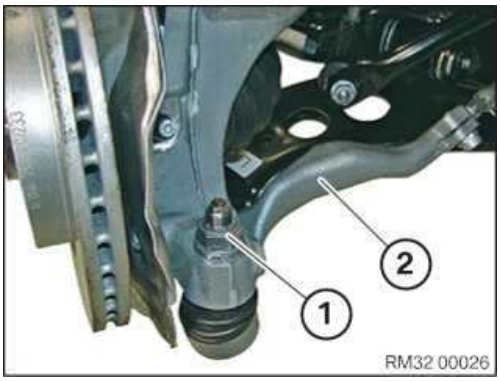
Underbody protection to body

Screw		Tightening torque	3 Nm



- Remove special tool from special tool .
- Lower universal jack **0 490 133 (00 2 030)** with the special tool and place it to the side.

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NOTICE

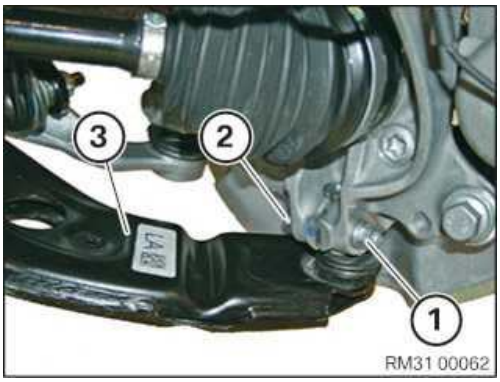
Perform the operations on the left and right side.

- Position the track rod (2) on the swivel bearing .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Track rod end to swivel bearing

M14	Renew nut.	Tightening torque	175 Nm



NOTICE

Perform the operations on the left and right side.

- Position the wishbone (3) on the swivel bearing .
- Renew the bolt (2) and the nut (1).

  Parts: Bolt, nut
- Insert screw (2).
- Tighten nut (1).

Wishbone to swivel bearing

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

119 – Install the mounted parts on the front axle support



NOTICE

Perform the operations on the left and right side.

- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Holder, wishbone rubber mount, to body

M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °

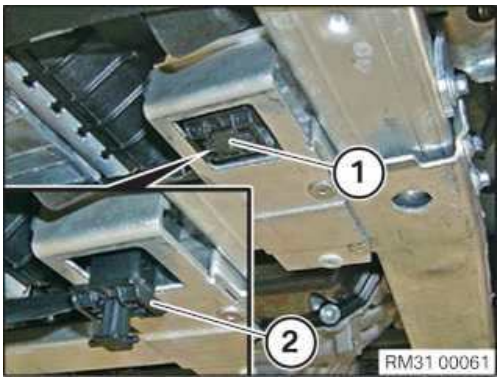


- Position the engine support (3) on the front axle support (1).
- Tighten down screw (2).

Holder with rubber mount to front axle support

M12 screw		100 Nm

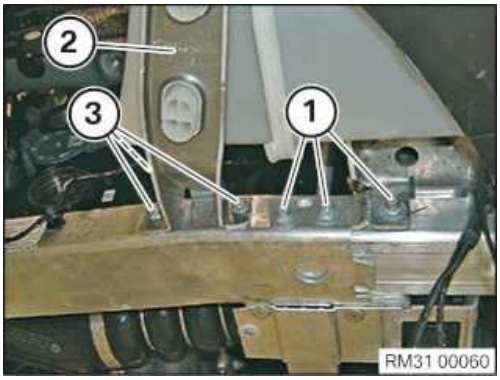
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NOTICE

Perform the operations on the left and right side.

- Position the lock (2).
- Lock the bracket (1) of the lock (2) of the holder for the charge air cooler.



- **Only on right side:** Position the holder for the washer fluid reservoir (2).
- Tighten down screws (3).

Washer fluid reservoir holder to front axle support adapter plate

		Tightening torque	10 Nm

NOTICE

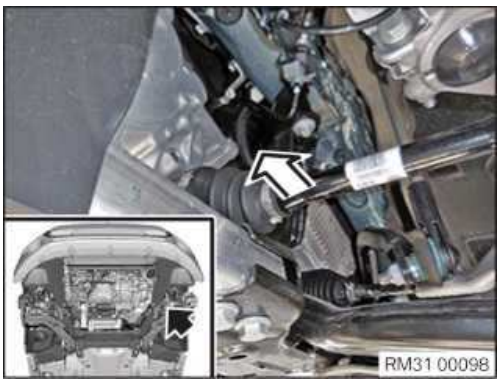
Perform the operations on the left and right side.

- Tighten the screws (1).

Deformation element, bottom, to adapter plate, front axle carrier

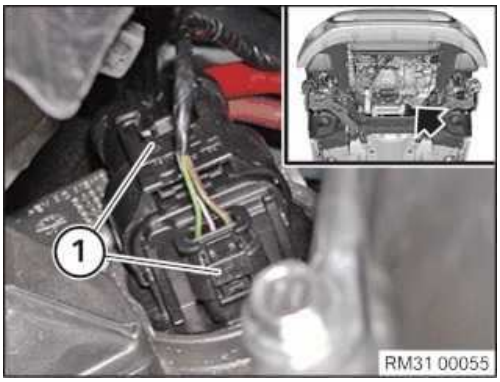
		Tightening torque	11,8 Nm

120 – Attaching connector at steering gear



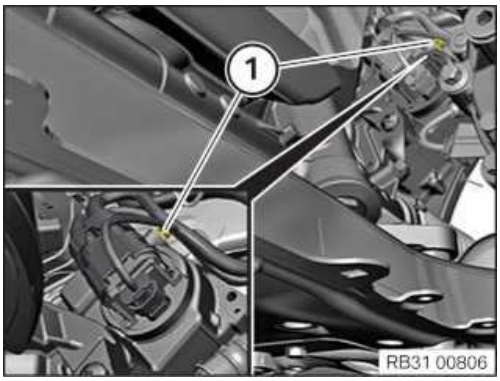
- To connect the connector (see the following step): Connect the connector with the right hand.

  The connectors can be accessed via the left output shaft.



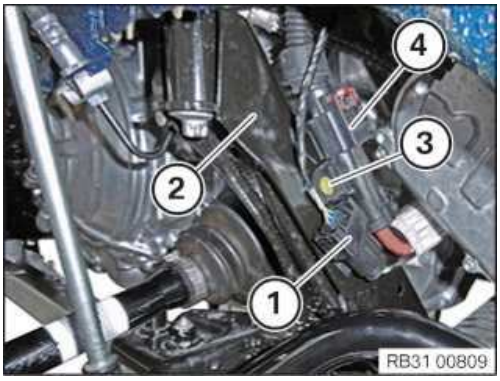
- Connect and lock connector (arrow) (1) with the steering gear.

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- Fasten the wiring harness (1) on the steering gear.

▶ **If installed: Fasten the plug connections at the front axle support**



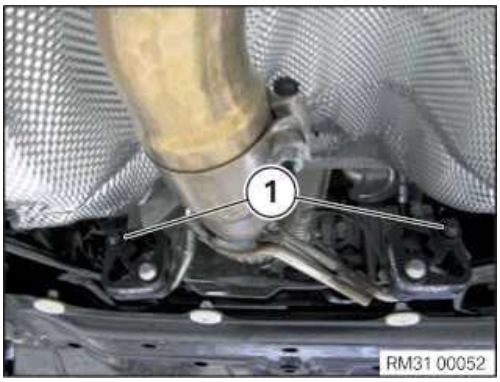
- Position the plug connection (4) at the front axle support (2).
- Tighten down screw (3).

Holder to front axle support

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

- Fasten the plug connection (1) at the front axle support (2).

121 – Securing rubber mount on front axle support



- Check rubber mount (1), replace if necessary.

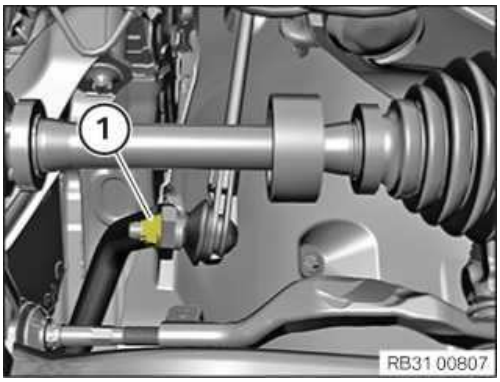
  Parts: Rubber mount
- Spray rubber mount (1) with lubricant and slide onto holder on front axle support.

122 – Securing anti-roll bar on left and right on the anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▶ **Fastening anti-roll bar on the anti-roll bar link**



- Position the anti-roll bar link on the anti-roll bar .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

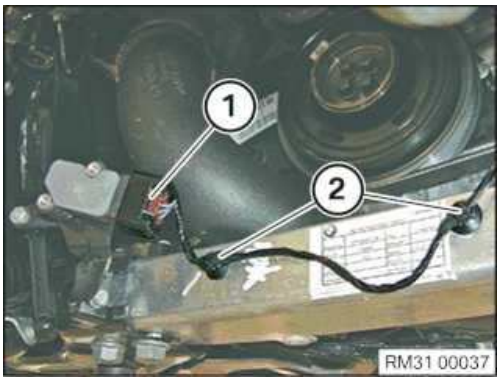
Note: Use the Torx socket for counter support.

Anti-roll bar link to anti-roll bar

M10	Renew nut.	Tightening torque	56 Nm

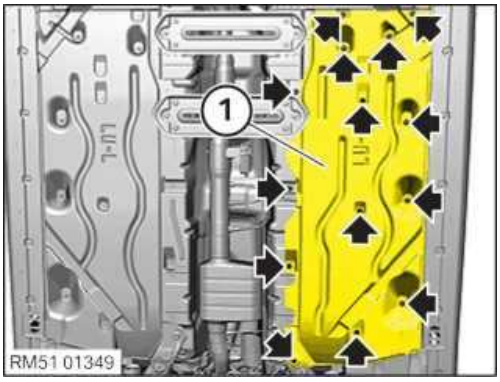
123 – With right installation: Securing the cable for the ride height sensor

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- Secure the cable clip (2) on the adapter of the deformation element.
- Connect connectors (1) and lock.

124 – Installing underbody panelling , right



- Correctly position the underbody panelling (1).
- Tighten all bolts and nuts (arrows).

Underbody panelling, side

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side

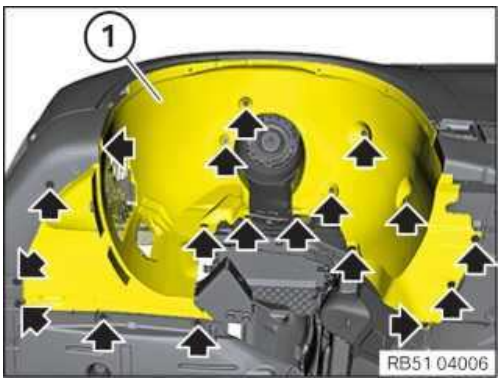
Plastic nut		Tightening torque	2,6 Nm

125 – Installing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

▸ **Installing the front wheel arch cover**



- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Plastic nut		Tightening torque	2,6 Nm
Screw		Tightening torque	2,6 Nm

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

▸ **Installing front wheel arch trim**

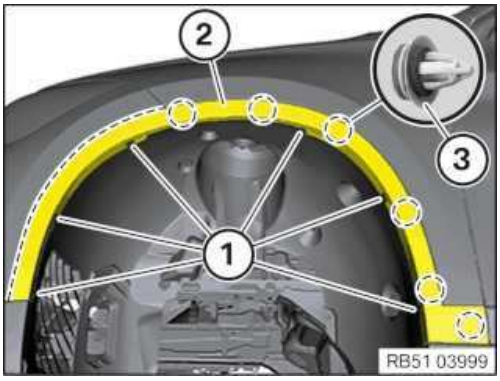
NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

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NOTICE

Description is for left component only. Procedure on the right side is identical.



- Check the clips (3) for damage and renew where required.

  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

126 – Installing both front wheels

▶ **Mounting the wheel**

▷ **Clean the contact surfaces between the brake disc and the wheel rim**



TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

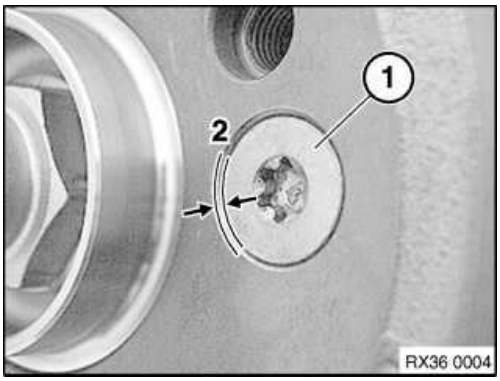
  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue in the area of the wheel bolt holes, remove and clean the brake disc.



- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

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- Renew mounting bolt (1).

  Parts: Mounting bolt

- Check that the mounting bolt (1) for the brake disc is securely seated.

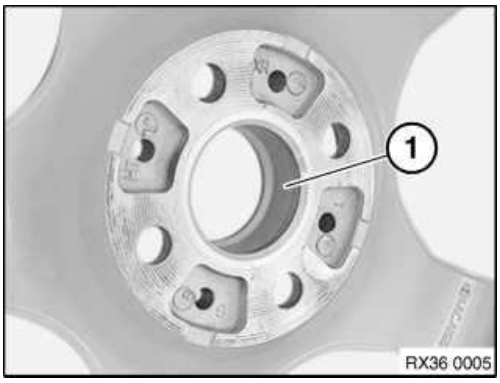
  The mounting bolt (1) for the brake disc may not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to rear wheel hub

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub

M8	Renew screw.	Tightening torque	16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring (1).

◁



TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

  Parts: Wheel bolts

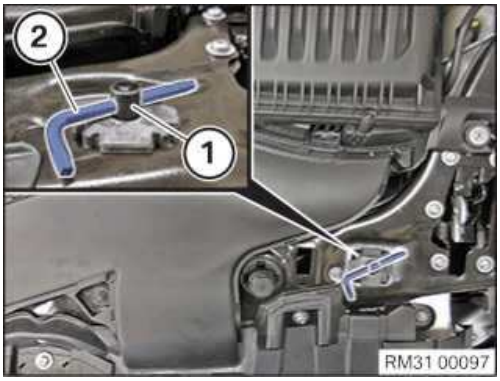
- Clean the wheel bolts.
- Check the wheel bolts and threads for damage, renew the wheel bolts if necessary.
- Join and tighten the wheel bolts (arrows).

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

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127 – Removing fastener for left and right radiator

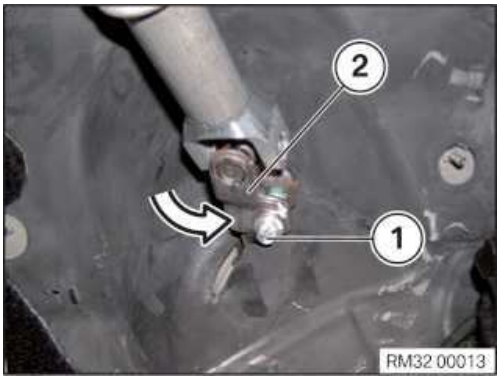


NOTICE

Perform the operations on the left and right side.

- Remove suitable tool (2) from the centering pin (1).

128 – Secure the steering shaft at the bottom on the steering gear



- Clean the screw lock residue from the screw thread in the universal joint (2).
- Pivot the universal joint (2) in the direction of the arrow to the steering gear.
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Lower steering shaft to steering gear

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm



- **If installed:**
- Position the cover on the steering column (2).
- Tighten nuts (1).

Steering column cover to bulkhead

Plastic nut		Tightening torque	3 Nm

129 – Install the heat shield on the exhaust turbocharger



- Feed in and install the heat shield (2).
- Tighten the screws (1) at the top and bottom of the heat shield.

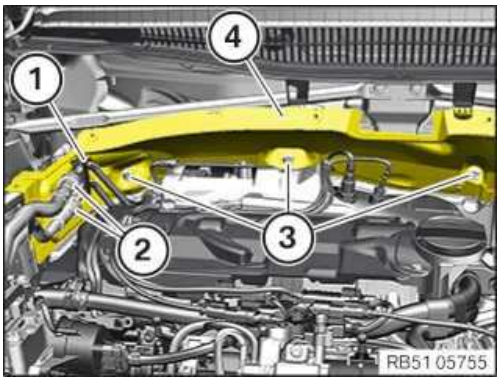
Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Fasten the cable at the clips .

130 – Installing rear bulkhead upper part

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- Feed in and install the rear bulkhead upper part (4).
- Tighten down screws (3).

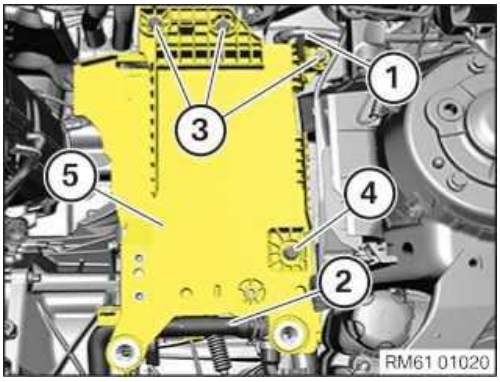
Rear bulkhead upper part to lower section of bulkhead

Oval-head screw		Tightening torque	5 Nm

- Feed the fuel line (2) into the holder (1) and install.
- Connect and lock the holder (1).

  The holder (1) must engage audibly.

131 – Install the battery holder



- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

132 – Install electronics box

Prerequisite

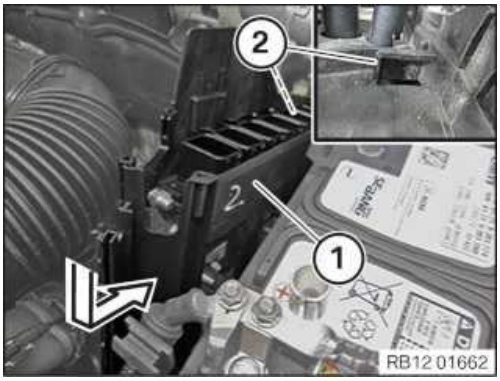
Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.

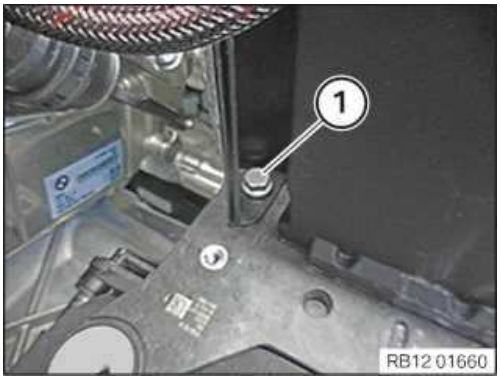


- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.

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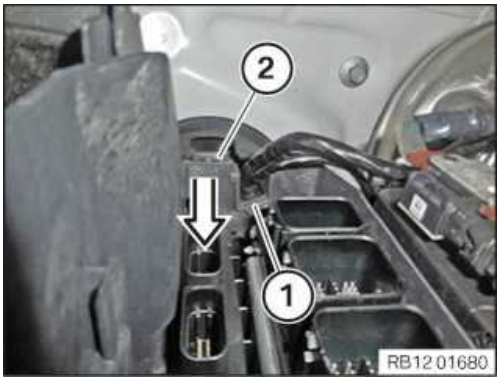
- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).



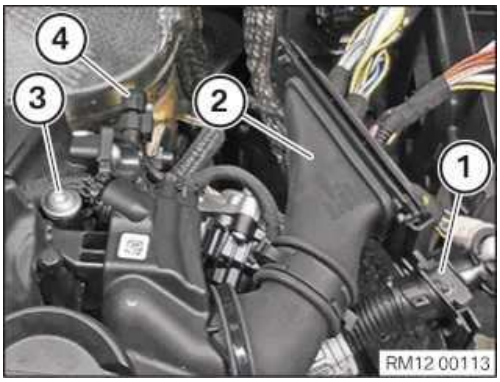
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.

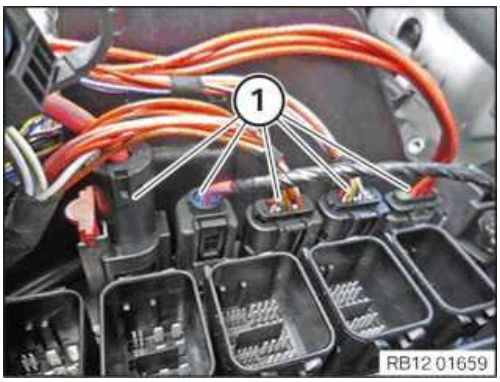


- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

Wiring harness to cylinder head cover

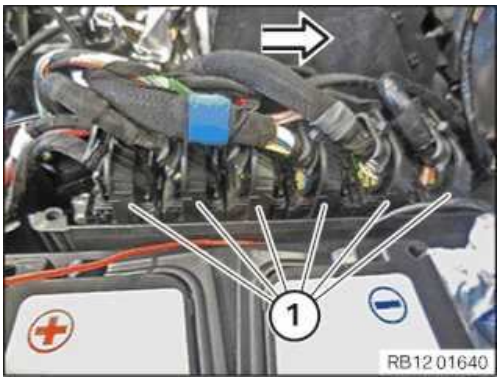
TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.

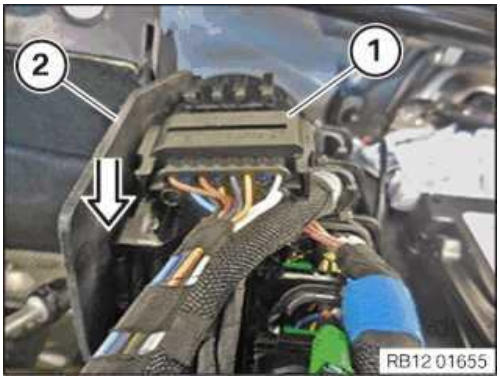


- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.

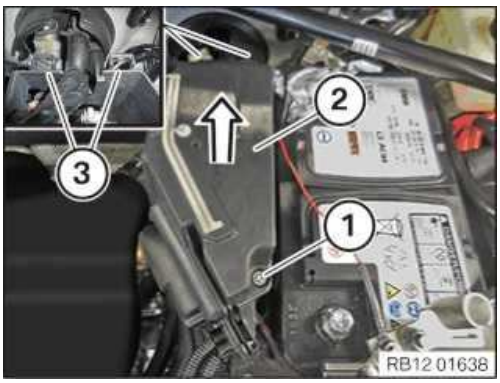
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- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



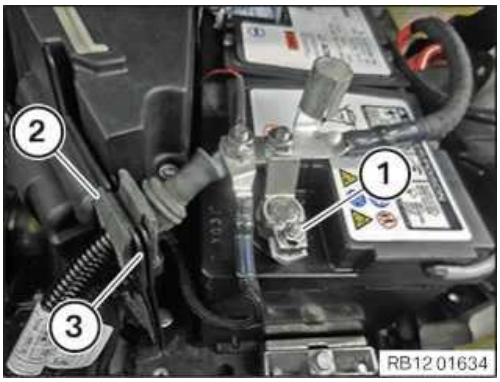
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

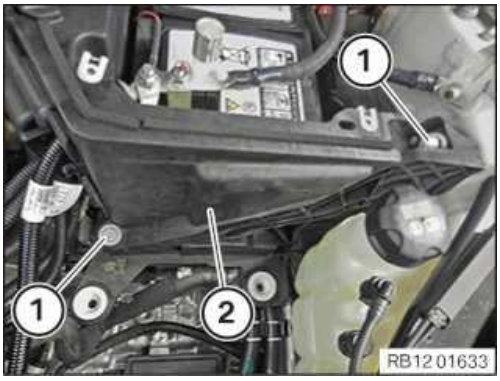
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

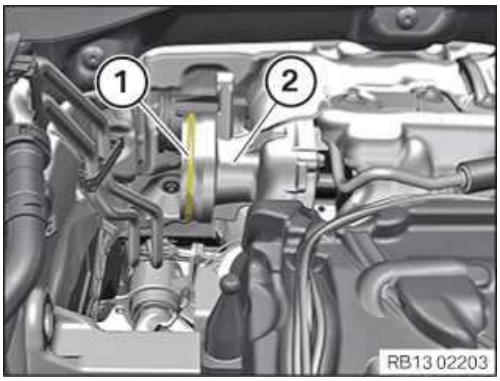


- Feed in and install tension strut (2).
- Tighten the screws (1).

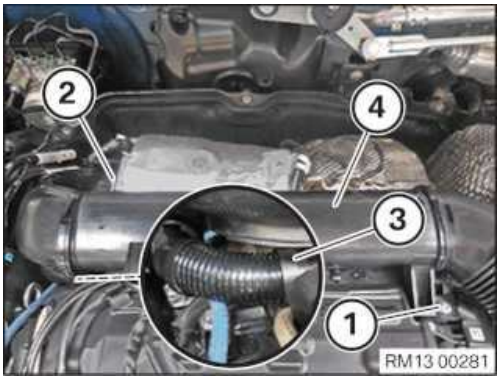
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

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- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.



- Feed in clean air pipe and install.
- Connect clean air pipe to the exhaust turbocharger and lock audibly in the clamps (2).
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Connect ventilation line (3) to the cylinder head cover and lock audibly.

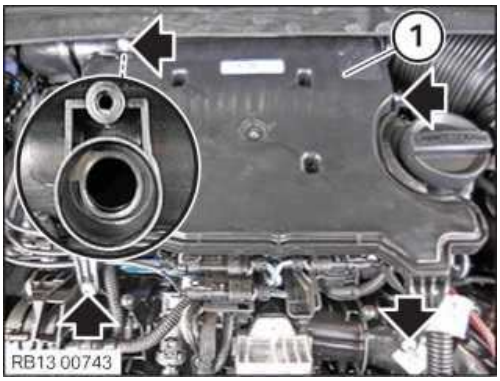


- Mount clean air pipe onto the intake filter housing.
- Tighten clamp (1) on the clean air pipe.

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

134 – Install resonator



- Insert and install the resonator (1).
- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

135 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

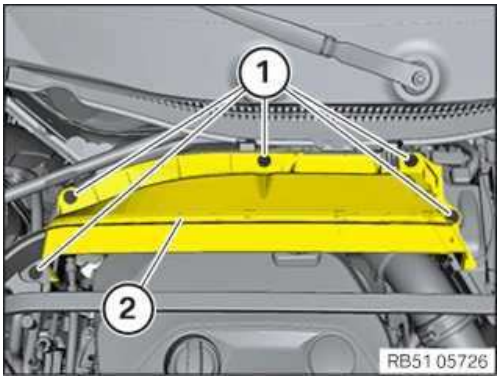


- Check for correct installation of all rubber mounts in the acoustic cover (1).



- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

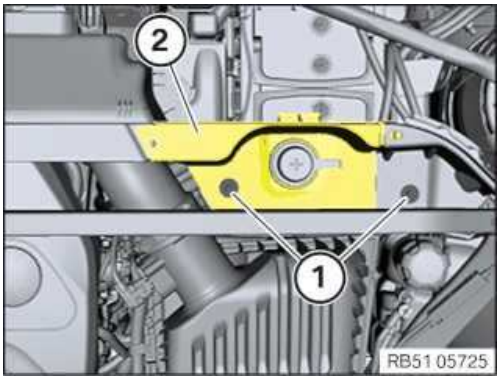
136 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Cover of top bulkhead

Screw		Tightening torque	2,6 Nm



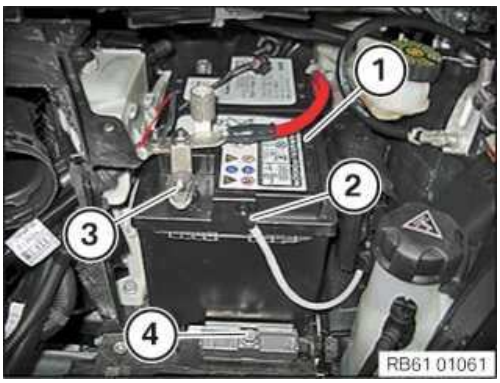
- Guide in and install cover (2).
- Tighten down screw (1).

Cover of remote positive terminal

Screw		Tightening torque	2,6 Nm

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137 – Install vehicle battery



- Install vehicle battery (1).
- Position the bracket and tighten with the screw (4) .

Battery terminal rail to battery tray

M8		19 Nm

- Position the vent hose (2) and clip it in.
- Position the positive battery terminal and tighten with the nut (3) .

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

▸ **Check the vent holes of the battery**

WARNING

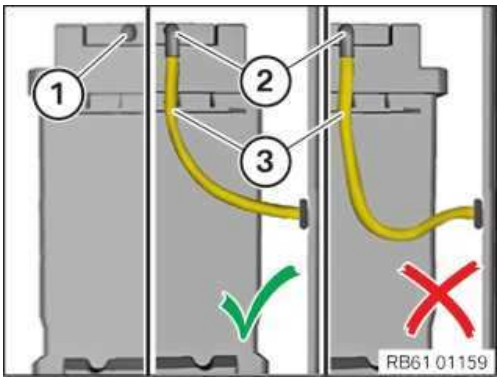
Gas emission.

Danger of injury! Danger of explosion!

- Assign the vent holes correctly.
- Route the vent hose correctly.

TECHNICAL INFORMATION

The battery has two vent holes, opposite:
One vent hole (1) must be closed correctly with a dummy plug.
The vent hose (3) must be correctly connected and routed at the other vent hole (2).



Check

- Check if the vent hole (1) is correctly closed with a dummy plug.

Result

» No dummy plug.

Measure

- Close the vent hole (1) correctly with a dummy plug.

Check

- Check if the vent hole (2) has a correctly connected vent hose (3).

Result

» The vent hose (3) is not correctly connected.

Measure

- At the vent hole (2), connect the vent hose (3) correctly.

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Check

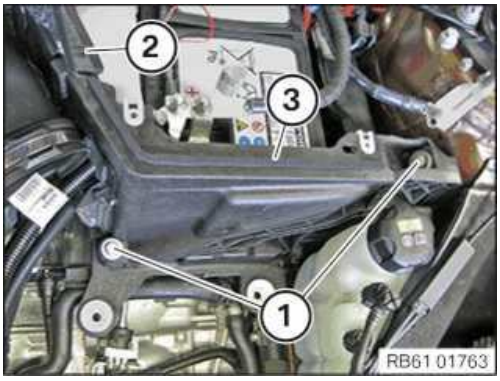
- Check if the vent hose (3) is routed to the outside with a downhill gradient (**no siphon formation!**).

Result

» The vent hose (3) is not correctly routed as shown in the image on the right.

Measure

- Route the vent hose (3) correctly as shown in the centre image.



- Insert tension strut (3) and tighten with screws (1).

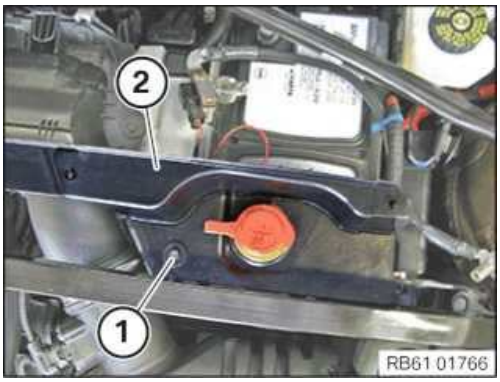
Trailing link

M8		Tightening torque	19 Nm

- Tighten down screw (2).

Battery cover

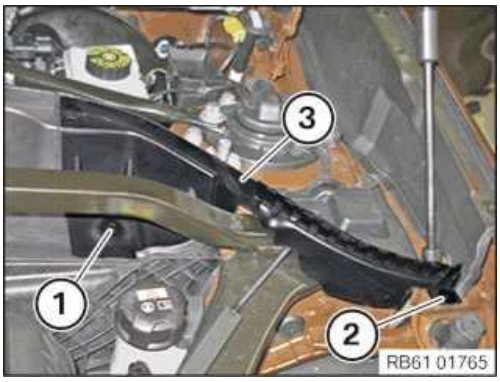
M8		2,8 Nm



- Position the cover (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm

138 – Connecting the battery earth lead

TECHNICAL INFORMATION

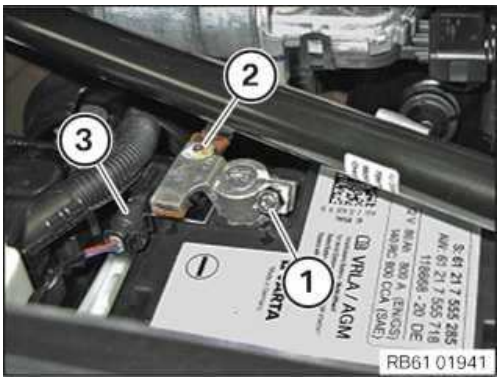
For additional information see:

61 00 ... Safety information on handling the vehicle battery

61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery

61 12 ... Notes on the intelligent battery sensor (IBS)

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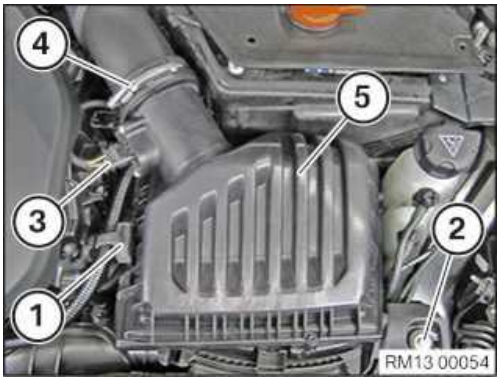
- Remove the protective cover of the positive battery terminal.
- Position the battery earth lead (2).
- Tighten nut (1).

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

- If required, connect the connector (3).

139 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

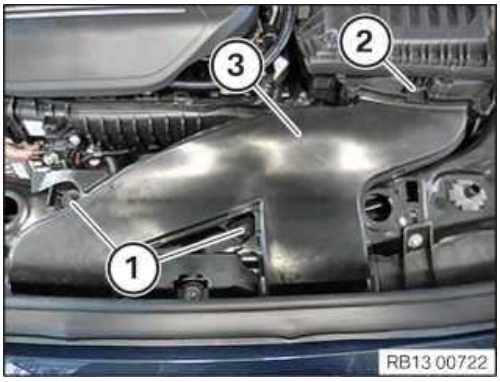
- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

140 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).
  The lock (2) must audibly engage.
- Tighten nuts (1).

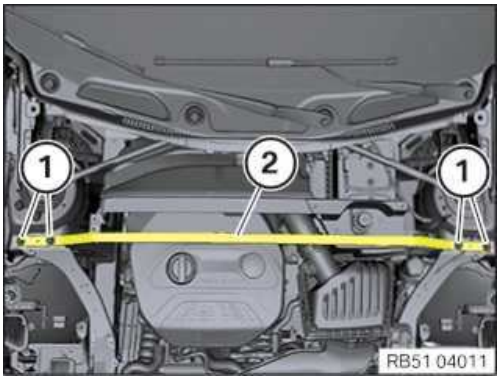
Intake neck to cross connection

M6		Tightening torque	8 Nm

141 – Install strut brace

TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.

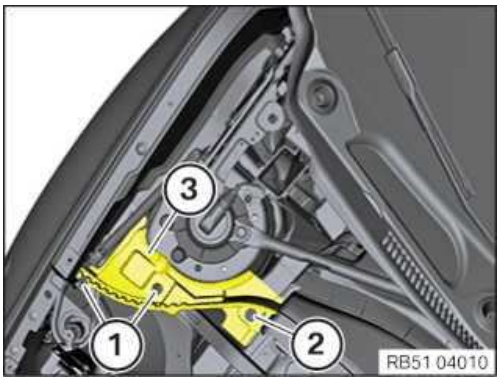


- Install the strut brace (2).
- Renew screws (1).
  Parts: Bolts
- Tighten the screws (1).

Cross-brace to spring strut dome

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

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NOTICE

Description is for right component only. The procedure on the left side is identical.

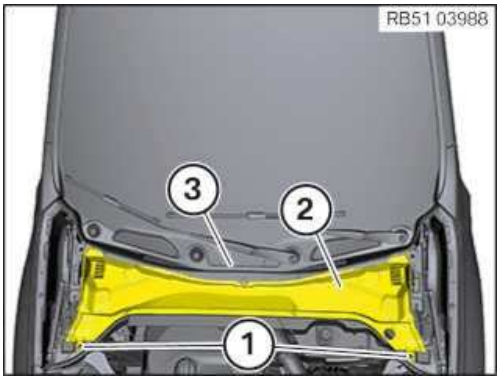
- Install the cover (3).
- Tighten down screw (2).

Cover on body

Hexagon screw		Tightening torque	3 Nm

- Install the expanding rivet (1).

142 – Installing front cowl panel cover

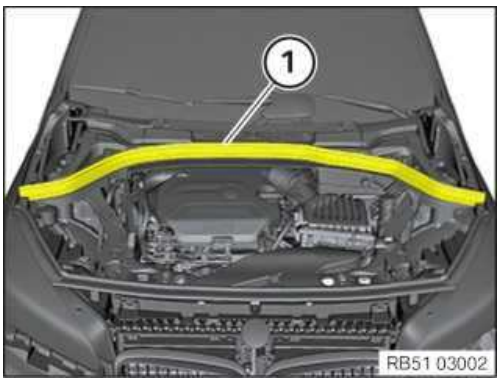


- Insert and install cowl panel cover at front (2) into cowl panel cover at rear (3).
- Check cowl panel cover at front is correctly seated (2).
- Secure expanding rivet (1).

143 – Install the seal for the bonnet

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

144 – Check engine oil level

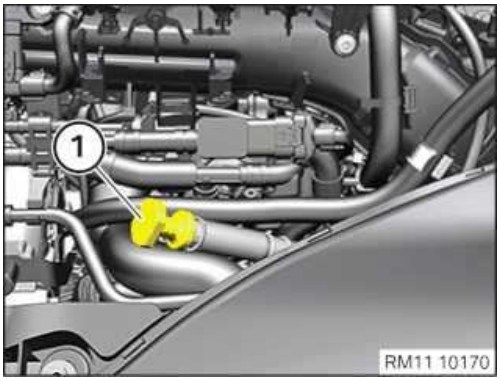
- Park vehicle on a horizontal surface.
- In the case of automatic transmission, shift to selector lever position N or P.
- Accelerator pedal is not pressed.
- Engine is running and is at operating temperature.
- Read off the engine oil level in the instrument cluster (KOMBI) or on the control display.
- Top up engine oil if necessary.

▶ **Check engine oil level**

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TECHNICAL INFORMATION

Always check the engine oil level when the engine is at operating temperature (engine oil temperature > 70°C).

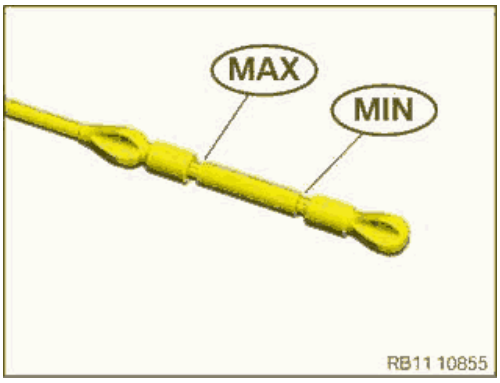


- Park vehicle on a horizontal surface.
- Stop the engine and wait for 5 minutes.
- Pull out the oil dipstick (1) and wipe off using a lint-free cloth.

TECHNICAL INFORMATION

Do not pull out or insert the oil dipstick into the guide tube too quickly or slowly.

- Push the oil dipstick (1) into the guide tube up to the limit position and pull it out again.



TECHNICAL INFORMATION

The engine oil level must be between the minimum mark and the maximum mark of the oil dipstick.

- Read the engine oil level on the oil dipstick.
- Top up engine oil if necessary.

145 – Fill and bleed the coolant circuit

▶ **Filling and bleed the high-temperature coolant circuit**



- See additional information.

146 – Checking/topping up oil level in automatic gearbox (AISIN GA8G45)

Prerequisite

Vehicle in horizontal position.

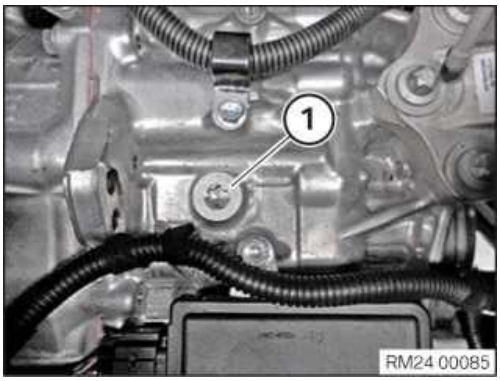
CAUTION

Materials harmful to health.

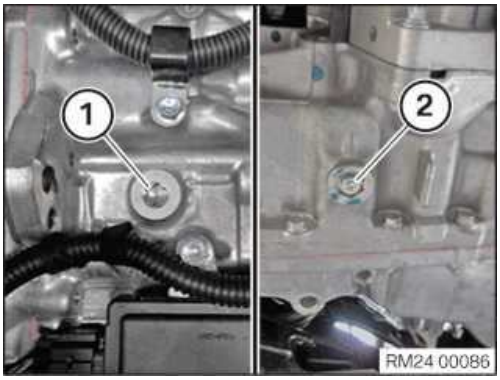
Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

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- Move the selector lever to the "P" position.
- Secure vehicle to prevent it rolling.
- Connect diagnosis system.
- Release the oil filler plug (1) using the Torx T55 .



- **Topping up the automatic transmission fluid (the automatic transmission fluid was drained):**
- Release oil filler plug (1) from engine compartment.
- Loosen the overflow plug (2) below at the transmission.
- Top up automatic transmission fluid at oil filler plug (1) until oil emerges at overflow plug (2).
- Start engine and run at idle speed.
- Check whether the automatic transmission fluid is leaking at the overflow plug (2) .
- If there is no automatic transmission fluid leaking at the overflow plug (2) , fill in the automatic transmission fluid to the oil filler plug (1) .
- Press the footbrake and, when idle, shift through all the gears from "P" to "D" 2 times for more than 2 seconds .
- Move the selector lever to the "P" position.
- Check again whether the automatic transmission fluid is leaking at the overflow plug(2) .
- Read the temperature of the automatic transmission fluid with the diagnosis system.
- Increase temperature of automatic transmission fluid to 35 °C to 45 °C.
- Top up automatic transmission fluid until it flows over.
- Renew sealing rings.

  Parts: Sealing ring
- Screw in and fasten oil filler plug (1) and overflow plug (2).

Oil filler plug to transmission housing

M14	Renew the sealing ring.	Tightening torque	45 Nm

Overflow screw in oil drain plug

M6	Renew the sealing ring.		8 Nm

- **Check oil level (transmission oil temperature must be between** 35 °C **and** 45 °C **):**
- Open the oil filler plug (1).
- Slacken overflow plug (2).
- Start engine and run at idle speed.
- Unscrew and remove overflow plug (2).
- Check whether the automatic transmission fluid is leaking at the overflow plug (2) .
- If there is no automatic transmission fluid leaking at the overflow plug (2) , fill in the automatic transmission fluid to the oil filler plug (1) .
- Top up the automatic transmission fluid until it overflows at the overflow plug (2) .
- Press the footbrake and, when idle, shift through all the gears from "P" to "D" 2 times for more than 2 seconds .

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- Move the selector lever to the "P" position.
- Check the oil level again.
- Renew sealing rings.

  Parts: Sealing ring
- If the oil escapes slightly from the overflow plug (2) , tighten the overflow plug (2) and the oil filler plug (1) .

Overflow screw in oil drain plug

M6	Renew the sealing ring.		8 Nm

Oil filler plug to transmission housing

M14	Renew the sealing ring.	Tightening torque	45 Nm

147 – Topping up oil level in the manual gearbox (GS6X60DA)

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.



TECHNICAL INFORMATION

Make sure during removal of the filling/level control screw to note the installed filling/level control screw variant.

It is **mandatory** to use variant 1 in transmissions up to production date 08/2015.

It is **mandatory** to use variant 2 in transmissions from production date 08/2015.

Failure to observe will result in a leak on the transmission.

- Variant 1 **until** production date 08/2015.
- Variant 2 **from** production date 08/2015.



- Unscrew filling/level control screw (1) and fill the transmission until the oil overflows.

Transmission oil capacity

Transmission oil GS6-60DA, GS6X60DA/Owner's Handbook	2,2 l

Transmission oil: Technically suitable manual gearbox oil

- Allow surplus oil to drain off.
- Renew the filling/level control screw (1).

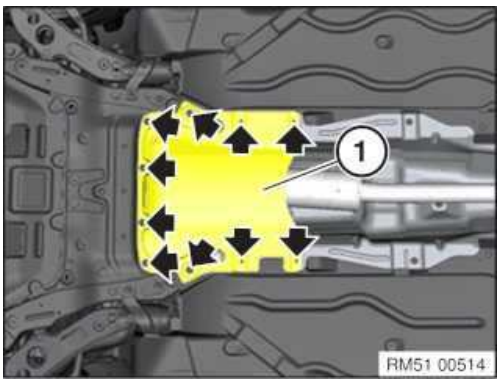
  Parts: Filling/level control screw
- Tighten filling/level control screw (1).

Oil drain plug / oil filler plug

Hexagon socket		Tightening torque	43 Nm

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148 – If installed: Installing underbody protection at rear

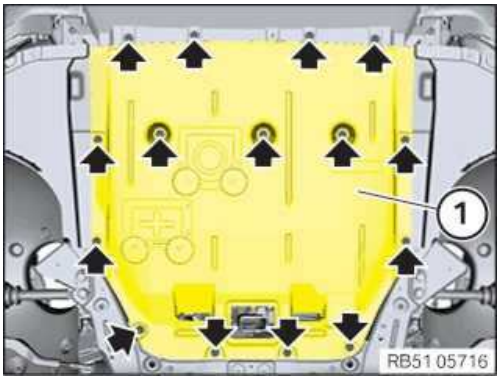


- Position rear underbody protection (1).
- Tighten screws (arrows).

Underbody protection to body

Screw		Tightening torque	3 Nm

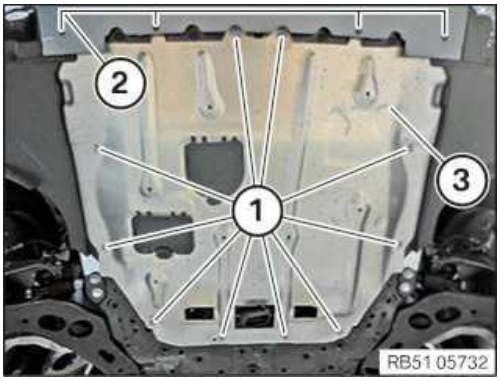
149 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm



- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Additional Information

Overview of Tightening Torques

Cross connection to carrier support — Used in step 19

Screws M6x20		Tightening torque	11,8 Nm

Screw connection for rubber mount of coolant radiator to coolant radiator — Used in step 19

Bolt to rubber mount		Tightening torque	8 Nm

Air duct to upper connection — Used in step 19

M6x20 screw		Tightening torque	11,8 Nm

Bracing strut to upper connection — Used in step 19

M8x20 screw		Tightening torque	28 Nm

Rear end of front axle support to body — Used in step 72 118

M14 screw	Renew screw.	Tightening torque	175 Nm

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Front axle support, front to body

Used in step 72 118

M12 screw	Renew screw.	Tightening torque	108 Nm

Underbody protection to body

Used in step 72 118 148

Screw		Tightening torque	3 Nm

Special tool to cylinder head

Used in step 72 73

M8		Tightening torque	21,5 Nm

Standard screw connection M8

Used in step 73 82

M8		Tightening torque	19 Nm

Coolant temperature sensor at cylinder head

Used in step 73

Temperature sensor		Tightening torque	3,5 Nm

Glow elements to cylinder head

Used in step 73 77

Glow element		Tightening torque	13 Nm

Cylinder head to crankcase

Used in step 76

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

Cylinder head bolt to timing case cover

Used in step 76

M8x40		Tightening torque	19 Nm

Right engine mount to side member

Used in step 76

M12		Tightening torque	100 Nm

Right engine mount to cylinder head

Used in step 76

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

Heat shield to cylinder head

Used in step 76

M8X16		Tightening torque	10 Nm

Camshaft carrier to cylinder head

Used in step 80

M7x35		Tightening torque	13 Nm

Bearing journal to cylinder head

Used in step 82

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M6

Used in step 82 93

M6			8 Nm

Chain tensioner piston to cylinder head

Used in step 83

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft

Used in step 84

M7x17.			17 Nm

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Cylinder head cover to cylinder head

Used in step 86

M6		Tightening torque.	8,5 Nm

Clamping claw facing to cylinder head cover

Used in step 87

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 87

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

High pressure lines between injector and rail

Used in step 89

High pressure lines		Tightening torque	28 Nm

Exhaust-gas recirculation cooler to exhaust manifold

Used in step 91 97

M8x28	Replace screws	Tightening torque	32 Nm

Oil return line to turbocharger

Used in step 91 92

M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase

Used in step 91

M8x16		Tightening torque	22 Nm

Exhaust turbocharger to exhaust manifold

Used in step 92

V-band clamp		Tightening torque	19 Nm

Oil feed line to bracket

Used in step 92

Torx screw M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase

Used in step 92

M8x16		Tightening torque	22 Nm

Heat shield for exhaust turbocharger

Used in step 93

Torx screw BM 6x12		Tightening torque	10 Nm

Banjo bolt for exhaust pressure pipe to exhaust manifold

Used in step 93

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

Charge air duct to oil sump

Used in step 94

M6		Tightening torque	8 Nm

Ride height sensor holder to front axle support

Used in step 94

M6		Tightening torque	8 Nm

Adapter, front axle support to front axle support

Used in step 94

		Tightening torque	100 Nm

Cross connection to front axle support

Used in step 94

M6		Tightening torque	12 Nm

Washer fluid reservoir to body

Used in step 95

M6x20		Tightening torque	8 Nm

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Intake plenum to cylinder head

Used in step 96

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 97

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler

Used in step 97

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 97

M8x20		Tightening torque	19 Nm

Wiring harness to cylinder head cover

Used in step 98 132

TS5x20		Tightening torque	3,5 Nm

Positive battery cable to alternator

Used in step 98

M8		Tightening torque	19 Nm

Fuel line to intake plenum

Used in step 98

TS6x20		Tightening torque	5 Nm

Cover to electronics box

Used in step 98 132

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery

Used in step 98 132

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray

Used in step 98 132

M8		Tightening torque	19 Nm

Diesel particulate filter V-clip to exhaust turbocharger

Used in step 99

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Diesel particle filter to holder

Used in step 99

M8 hexagon nut		Tightening torque	19 Nm

Diesel particulate filter holder to gearbox

Used in step 99

M12x75		Tightening torque	66 Nm

Diesel particulate filter bracket to crankcase

Used in step 99

M10x35		Tightening torque	38 Nm

SCR metering module V-clip to exhaust system

Used in step 99

V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm

Holder for coolant lines to diesel particulate filter

Used in step 99

Torx bolt BM6x16		Tightening torque	8 Nm

Differential pressure sensor to holder

Used in step 99

Screw		Tightening torque	4 Nm

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Clamp for the pressure hose on the differential pressure sensor

Used in step 99

Clamp 15–19mm		Tightening torque	3 Nm

Control sensor

Used in step 100

Control sensor		Tightening torque	50 Nm

Exhaust temperature sensor to diesel particulate filter

Used in step 101 102

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Exhaust-gas temperature sensor to exhaust system

Used in step 103

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Oxygen sensor holder to intermediate shaft

Used in step 104

Hexagon screw M6x16		Tightening torque	8 Nm

Nitrogen oxide sensor before SCR catalytic converter

Used in step 105

Sensor		Tightening torque	50 Nm

Monitoring sensor

Used in step 106

Sensor		Tightening torque	50 Nm

Transfer box to transmission

Used in step 107

M10		Tightening torque	56 Nm

Heat shield to transfer box

Used in step 107

M6	Renew screws.	Tightening torque	6 Nm

Oil filler plug on transfer box (VTG)

Used in step 107

M18x1.5		Tightening torque	35 Nm

Intermediate shaft to transfer box

Used in step 108

M8x35		Tightening torque	19 Nm

Starter motor to transmission

Used in step 109

M8x45		Tightening torque	19 Nm

Battery positive lead to starter

Used in step 109

M8		Tightening torque	13,5 Nm

Propeller shaft to transfer box

Used in step 112

		Tightening torque	80 Nm

Flexible disc to rear axle final drive

Used in step 112

M12x1.5	Renew screws.	Tightening torque	55 Nm 90 °

Centre mount to body

Used in step 112

M8		Tightening torque	19 Nm

Heat shield to body

Used in step 113 114

Bolts/nut		Tightening torque	3 Nm

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Bracket to body — Used in step 113

M8		Tightening torque	21 Nm

Exhaust system to body — Used in step 115

M8	Replace nuts.	Tightening torque	19 Nm

Exhaust bracket on body — Used in step 115

Hexagon screw M8x30		Tightening torque	19 Nm

V-clip to catalytic converter — Used in step 115

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

Diesel particulate sensor to exhaust system — Used in step 115

Sensor		Tightening torque	50 Nm

Nitrogen oxide sensor downstream of SCR catalytic converter — Used in step 115

Sensor		Tightening torque	50 Nm

Cross-member/torsion strut to axle support and mounting — Used in step 116

M12x48	Renew screws.	Jointing torque Angle of rotation	100 Nm 90 °

Front connection carrier to body — Used in step 117

M10x18		Tightening torque	56 Nm

Rear connection carrier to body — Used in step 117

M8x18		Tightening torque	28 Nm

Track rod end to swivel bearing — Used in step 118

M14	Renew nut.	Tightening torque	175 Nm

Wishbone to swivel bearing — Used in step 118

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

Holder, wishbone rubber mount, to body — Used in step 119

M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °

Holder with rubber mount to front axle support — Used in step 119

M12 screw			100 Nm

Washer fluid reservoir holder to front axle support adapter plate — Used in step 119

		Tightening torque	10 Nm

Deformation element, bottom, to adapter plate, front axle carrier — Used in step 119

		Tightening torque	11,8 Nm

Holder to front axle support — Used in step 120

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

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Anti-roll bar link to anti-roll bar

Used in step 122

M10	Renew nut.	Tightening torque	56 Nm

Underbody panelling, side

Used in step 124

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side

Used in step 124

Plastic nut		Tightening torque	2,6 Nm

Wheel arch cover to body

Used in step 125

Plastic nut		Tightening torque	2,6 Nm
Screw		Tightening torque	2,6 Nm

Wheel arch cover to body

Used in step 125

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Used in step 125

Plastic nut		Tightening torque	3 Nm

Brake disc to rear wheel hub

Used in step 126

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub

Used in step 126

M8	Renew screw.	Tightening torque	16 Nm

Wheel bolts

Used in step 126

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Lower steering shaft to steering gear

Used in step 128

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

Steering column cover to bulkhead

Used in step 128

Plastic nut		Tightening torque	3 Nm

Heat shield for exhaust turbocharger

Used in step 129

Torx screw BM 6x12		Tightening torque	10 Nm

Rear bulkhead upper part to lower section of bulkhead

Used in step 130

Oval-head screw		Tightening torque	5 Nm

Battery holder to engine support

Used in step 131

Hexagon screw M8x30		Tightening torque	19 Nm

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Electronics box to battery tray

Used in step 132

M8X16		Tightening torque	15 Nm

Clean air pipe to cylinder head cover

Used in step 133

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing

Used in step 133 139

Clamp		Tightening torque	3 Nm

Resonator to manifold and clean air pipe

Used in step 134

Screw TS6	Renew screw.	Tightening torque	5 Nm

Cover of top bulkhead

Used in step 136

Screw		Tightening torque	2,6 Nm

Cover of remote positive terminal

Used in step 136

Screw		Tightening torque	2,6 Nm

Battery terminal rail to battery tray

Used in step 137

M8			19 Nm

Battery terminal with IBS positive battery terminal / negative battery terminal

Used in step 137 138

NutM6			5 Nm

Trailing link

Used in step 137

M8		Tightening torque	19 Nm

Battery cover

Used in step 137

M8			2,8 Nm

Intake silencer housing to lock bridge

Used in step 139

M6X30		Tightening torque	8 Nm

Intake neck to cross connection

Used in step 140

M6		Tightening torque	8 Nm

Cross-brace to spring strut dome

Used in step 141

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

Cover on body

Used in step 141

Hexagon screw		Tightening torque	3 Nm

Oil filler plug to transmission housing

Used in step 146

M14	Renew the sealing ring.	Tightening torque	45 Nm

Overflow screw in oil drain plug

Used in step 146

M6	Renew the sealing ring.		8 Nm

Oil drain plug / oil filler plug

Used in step 147

Hexagon socket		Tightening torque	43 Nm

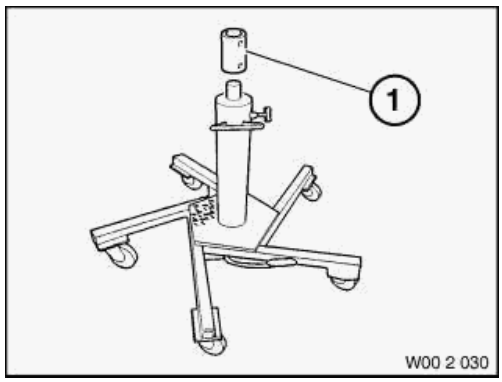
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Underbody protection front Used in step 149

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Overview of Special Tools

0 490 133 (00 2 030) Device



Common Used in step 32 72 76 118

Usage	(universal hydraulic lifter base unit) Chassis and hydraulic lifter - For removing and installing rear axle supports and gearboxes. Also for soft top mounts. Is replaced by 81 22 2 219 012
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 90 (207)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 490 134 (00 2 031)		**Adapter** (adapter for gearbox holder) Model series: E30, E31, E32, E34, E36	

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0 495 554 (33 5 070) Extension



Common

Used in step 38 112

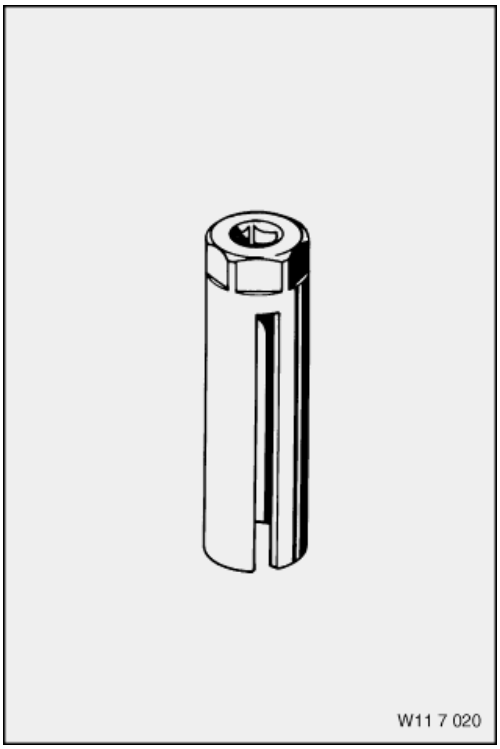
Usage	Pull-out extension for 33 5 040, 33 5 050, 33 5 060.
Included in the tool or work	
Storage location	A18
Replaced by	
In connection with	
SI-Number	01 21 06 (300)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 592 (33 5 071)		**Extension** (Extension (1 item)) discontinued, can only be ordered using complete tool	

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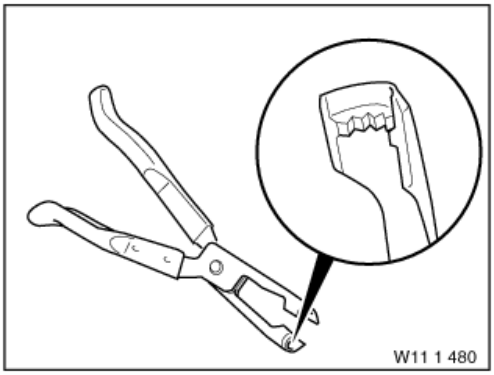
0 491 074 (11 7 020) Socket wrench insert



Common Used in step 44 45 106

Usage	(Socket wrench insert 22 mm) For loosening and tightening the oxygen sensor
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	

0 490 796 (11 1 480) Pliers

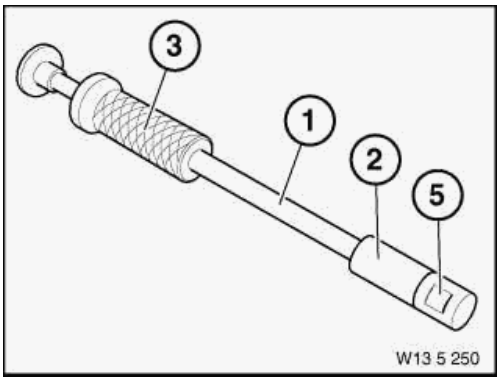


Common Used in step 52 71 73

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

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0 493 321 (13 5 250) Puller



Common

Used in step 62

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

0 493 339 (13 5 252) Bush



Common

Used in step 62

Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

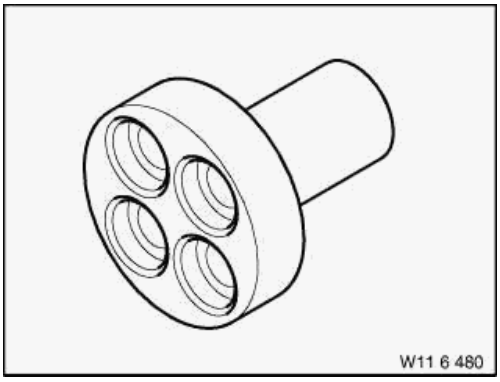
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0 493 340 (13 5 253) Weight



Common	Used in step 62
Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 380 (11 6 480) Connector



Common	Used in step 64 85
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

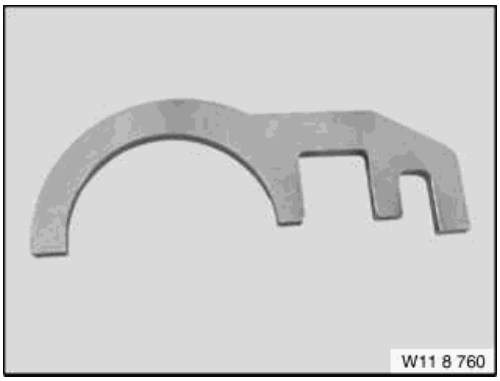
2 288 380 Locating stud



Common	Used in step 64 85
Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

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0 496 112 (11 8 760) Gauge



Common	Used in step 64 85
Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 495 105 (11 4 480) oddments tray



Common	Used in step 69 70 73
Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

2 357 071 Panel



Common	Used in step 72 76
Usage	Additional mounting plate for lifting table MHT 1200. Delivery quantity: 1 piece. During the course of the changeover from BMWi to iPerformance, a tool changeover also takes place from campaign to warehouse.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	Table lift MHT 1200 81222184136
SI-Number	01 21 13 (987)

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2 459 012 Holder



Common

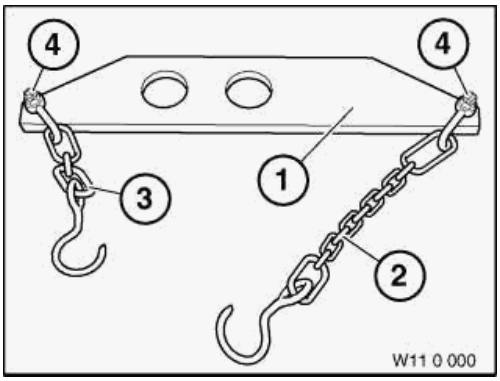
Used in step 72 76

Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

0 490 561 (11 0 000) Lifting gear

Used in step 72 76

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Common

Usage	(Hoisting gear) For removing and installing engines. As of 08/2011 only available as a complete set. Delivered with TÜV inspection certificate and operating instructions. No delivery of separate parts.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 13 94 (888)

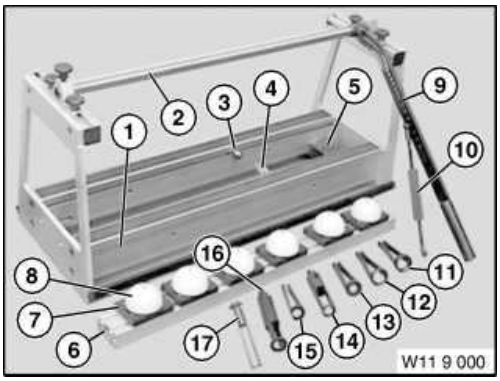
Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
4	0 490 565 (11 0 009)		**Shackle** (Shackle) 2 pieces. As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 562 (11 0 001)		**Lifting gear** (Cross member) As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
2	0 490 563 (11 0 002)		**Chain** (Chain) Version: long As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
3	0 490 564 (11 0 003)		**Chain** (Chain) Version: short As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	

0 494 362 (11 9 000) Device

Used in step 72 73

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Common

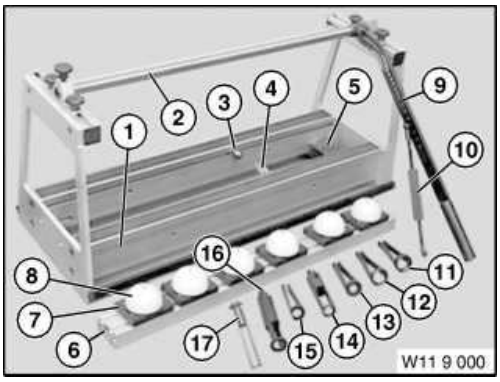
Usage	(Cylinder head expander tool)
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 03 02 (833)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 494 366 (11 9 001)		**Device**	
6	0 494 371 (11 9 006)		**Insert** (Aluminium strip)	
11	0 494 376 (11 9 012)		**Basket** (Valve spring cage) Engine M41, M51, S50	
17	0 495 028 (11 9 017)		**Basket** (Valve spring cage) Engine N52	
2	0 494 367 (11 9 002)		**Rod**	
3	0 494 368 (11 9 003)		**Adapter** (Sliding block)	
4	0 494 369 (11 9 004)		**Tab**	
5	0 494 370 (11 9 005)		**Quick fastener**	
7	0 494 372 (11 9 007)		**Shaped part** (shaped part)	
8	0 494 373 (11 9 008)		**Shaped part** (Shaped part) Shaped part made of plastic	
9	0 494 374 (11 9 009)		**Lever**	
10	0 494 375 (11 9 011)		**Hook**	
12	0 494 377 (11 9 013)		**Basket** (Valve spring cage) Engine M43, M73	
13	0 494 378 (11 9 014)		**Basket** (Valve spring cage) Engine M44, M52, M54, M56, M62, S52, S54, S62	
14	0 494 379 (11 9 015)		**Basket** (Valve spring cage) Engine M47, M47TU, M57, M57TU, N40, N42, N62, N73	
15	0 494 380 (11 9 016)		**Basket** (Valve spring cage) Engine M21, M40	

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0 494 366 (11 9 001) Device

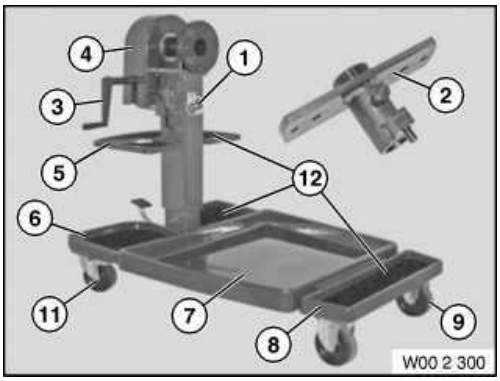


Common		Used in step 73
Usage		
Included in the tool or work	0 494 362	
Storage location		
Replaced by		
In connection with		
SI-Number		

0 495 187 (00 2 300) Assembly stand

Used in step 73

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Common

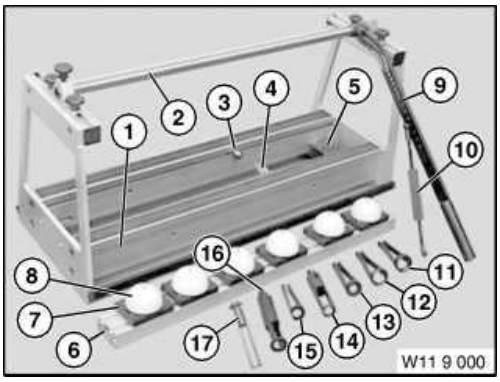
Usage	Assembly stand with universal flange for mounting engines from S85
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 188 (00 2 301)		**Assembly stand** available only as complete assembly stand 83 30 0 495 187.	
2	0 495 189 (00 2 302)	**2 299 563**	**Tool** (Universal flange). Do not use any more!!! Technically locked. Replaced with a new flange with material number 83 30 2 299 563. All flanges delivered until the end of 2011 will be replaced at no charge. From 2012, only the new flange will be supplied. Also applies to the complete engine mounting stand 00 2 300.	
3	0 495 200 (00 2 303)		**Crank**	
4	0 495 201 (00 2 304)		**Cover** (Protective hood)	
5	0 495 202 (00 2 305)		**oddments tray** (Oddments tray for small parts)	
6	0 495 203 (00 2 306)		**Shaped element** (Rear shaped pan)	
7	0 495 204 (00 2 307)		**Collection pan** (Oil collection pan)	
8	0 495 205 (00 2 308)		**Shaped element** (Front shaped pan)	
9	0 495 206 (00 2 309)		**Wheel** (Front wheel (without stop))	
10	0 495 207 (00 2 311)		**Wheel** (Rear wheel (with stop))	
11	0 495 208 (00 2 312)		**Mat** (Checker mat set)	
2	2 299 563		**Adapter** New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.	

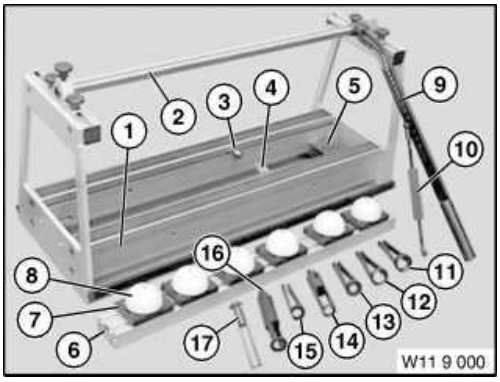
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0 494 371 (11 9 006) Insert



Common	Used in step 73
Usage	(Aluminium strip)
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 372 (11 9 007) Shaped part



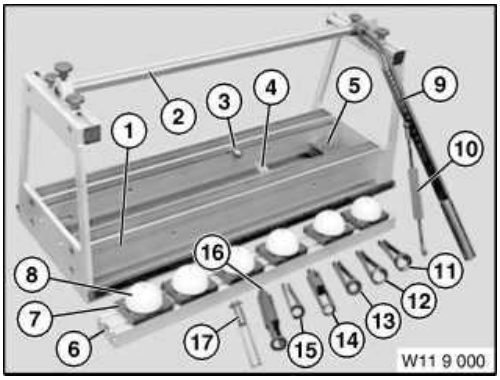
Common	Used in step 73
Usage	(Shaped part)
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 373 (11 9 008) Shaped part



Common	Used in step 73
Usage	(Shaped part) Shaped part made of plastic
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 370 (11 9 005) Quick fastener



Common	Used in step 73
Usage	
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 494 374 (11 9 009) Lever



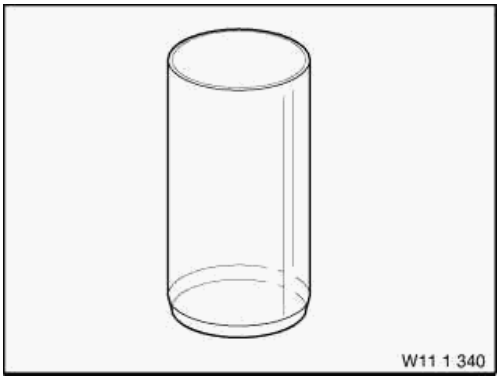
Common	Used in step 73
Usage	
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 496 143 (11 8 840) Basket



Common	Used in step 73
Usage	(Valve spring cage) For removing and fitting the valves.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

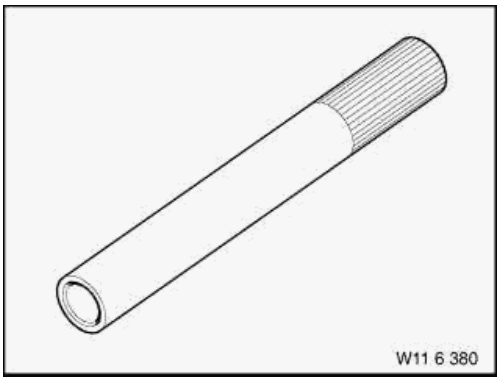
0 490 746 (11 1 380) Holding sleeve



Common	Used in step 73
Usage	(Assembly sleeve) For fitting the valve stem seal, diameter 7 mm
Included in the tool or work	
Storage location	individual
Replaced by	
In connection with	
SI-Number	

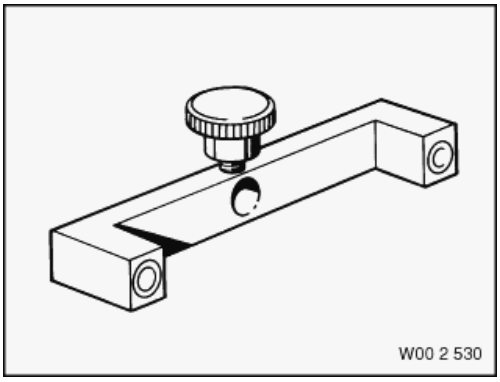
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0 493 249 (11 6 380) Bush



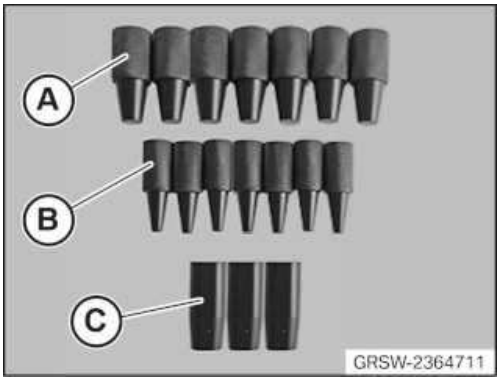
Common	Used in step 73
Usage	For fitting valve stem seal
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

0 490 185 (00 2 530) Bridge



Common	Used in step 73
Usage	(Measuring bridge) For determining the piston projection (Diesel)
Included in the tool or work	
Storage location	A3
Replaced by	
In connection with	
SI-Number	

2 364 711 Plug



Common	Used in step 74
Usage	For closing the pressure oil holes for cleaning the cylinder head sealing surfaces.
Included in the tool or work	
Storage location	C20
Replaced by	
In connection with	
SI-Number	01 50 14 (203)

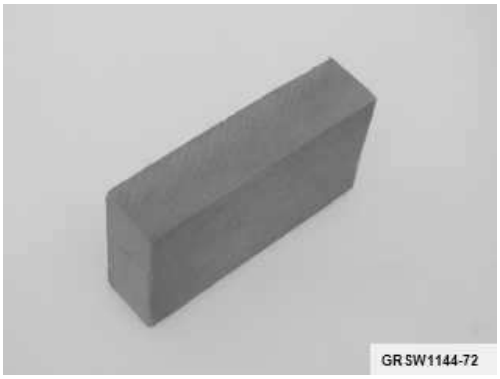
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0 495 103 (11 4 471) Scraper



Common	Used in step 74
Usage	
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

0 495 104 (11 4 472) Extractor

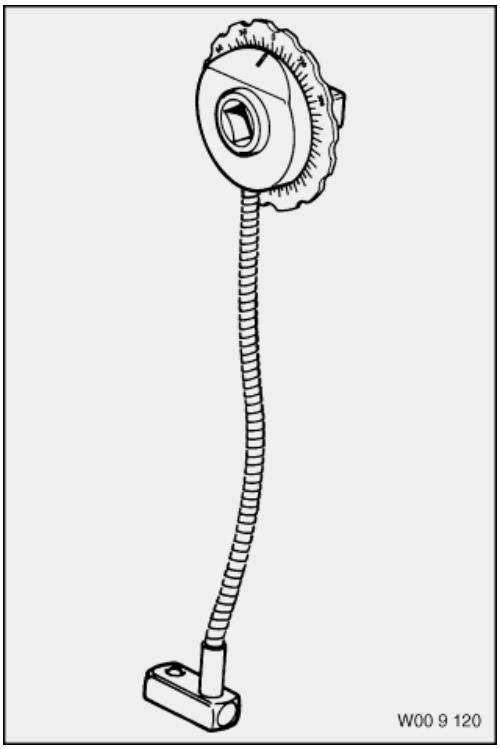


Common	Used in step 74
Usage	(grindstone)
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

0 490 504 (00 9 120) Torque angle measuring dial

Used in step 76 112

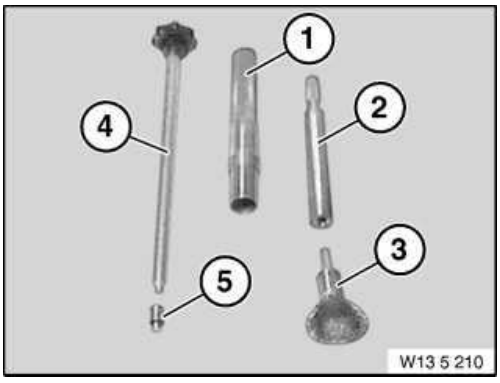
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Common

Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

0 493 763 (13 5 215) Plug

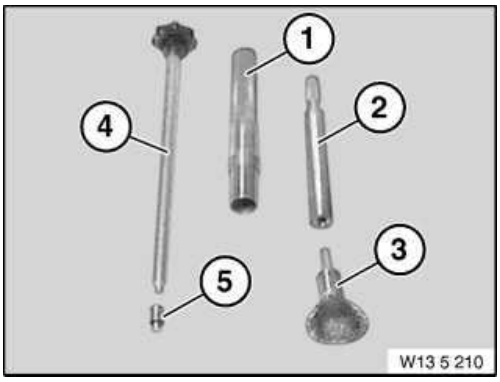


Common Used in step 87

Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

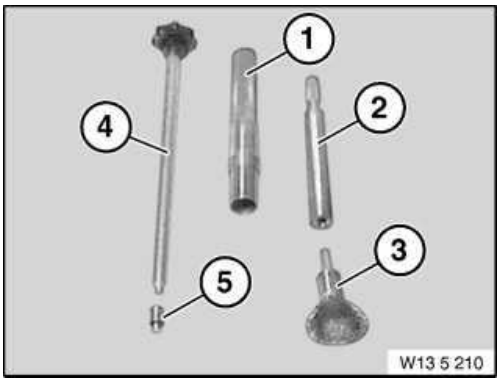
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0 493 762 (13 5 214) Rod



Common	Used in step 87
Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 758 (13 5 210) Tool



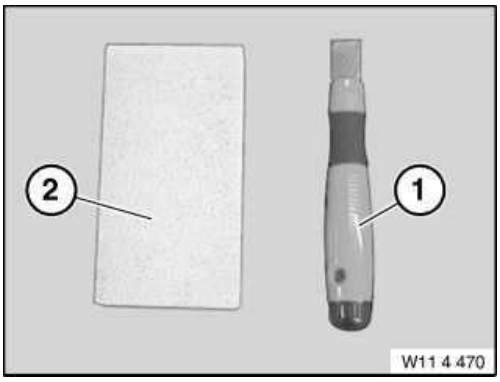
Common	Used in step 87
Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

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0 495 102 (11 4 470) Tool



Common Used in step 91

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

2 409 025 Puller



Common Used in step 107

Usage	For disassembly of the outer radial shaft seal of the transmission output shaft, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A76
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 411 739 Puller

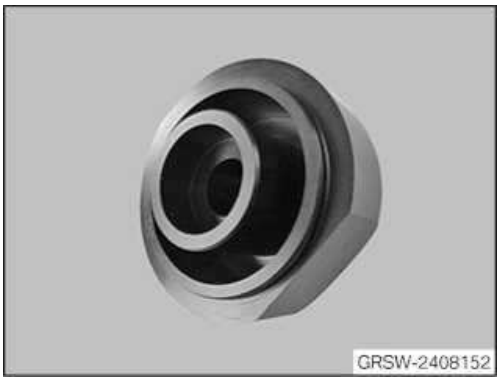


Common Used in step 107

Usage	For disassembly of the inner radial shaft seal of the output, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C78
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

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2 408 152 Striking element



Common Used in step 107

Usage	For installation of the right radial shaft seal transmission output shaft (inner). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

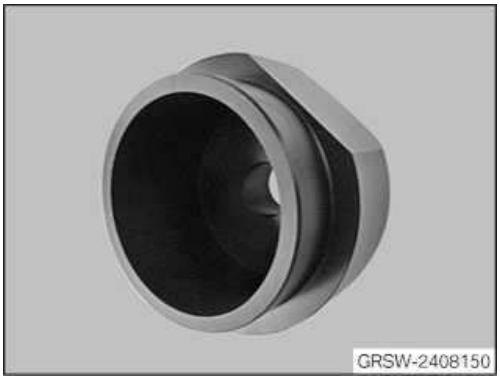
2 413 037 Handle



Common Used in step 107

Usage	Universal drift handle. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C77
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 408 150 Striking element

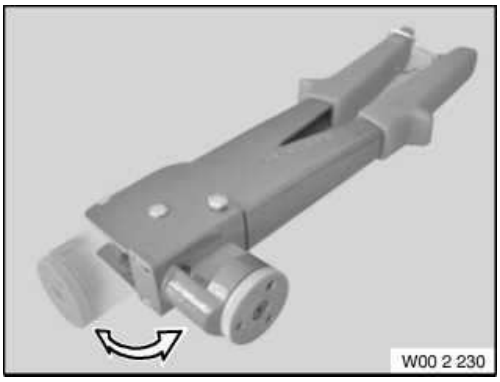


Common Used in step 107

Usage	For installing the right radial shaft seal transmission output shaft (outer). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

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0 496 521 (00 2 230) Pliers



Common	Used in step 125
Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

2 344 011 Tool



Common	Used in step 126
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

0 495 221 (36 1 323) Wheel stud



Common	Used in step 23
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud



Common	Used in step 23
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

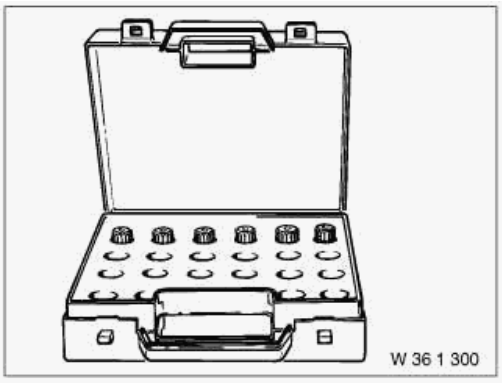
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0 495 225 (36 1 327) Wheel stud



Common	Used in step 23
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud



Common	Used in step 23
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud



Common	Used in step 23
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud



Common	Used in step 23
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 229 (36 1 332) Wheel stud



Common	Used in step 23
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

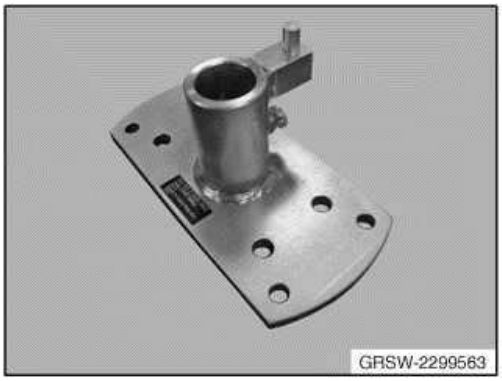
0 495 230 (36 1 333) Wheel stud



Common	Used in step 23
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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2 299 563 Adapter



Common	Used in step 73
Usage	New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.
Included in the tool or work	0 495 187
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Valve underprotrusion	Used in step 73
	0,8 (0,7 - 0,9) mm

Transmission oil capacity	Used in step 147
Transmission oil GS6-60DA, GS6X60DA/Owner's Handbook	2,2 l
Transmission oil: Technically suitable manual gearbox oil	

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	54 97
EGR controller	54 97

General repair instructions	Used in step
61 20 ... Notes on AGM battery	138
61 12 ... Notes on intelligent battery sensor (IBS)	138
61 00 ... Notes for disconnecting and connecting battery	138
41 00 ... Notes on repairing threads	
61 00 ... Safety information for handling vehicle battery	

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Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	12 44 45 47 48 49 50 51 62 71
17 00 008 Draining and topping up coolant for high-temperature circuit	145
17 00 008 Draining and topping up coolant for high-temperature circuit	145
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17 00 039 Bleed the cooling system and check it for watertightness with the special tool	145
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	145
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	145
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17 00 039 Bleed the cooling system and check for watertightness with the special tool (coolant circuit for low temperature)	145
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	145
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	145
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	145
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	145
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	145
17 00 039 Bleeding the cooling system (B36, B38, B46, B48)	145
17 00 039 Bleeding cooling system (B37, B47)	145
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	145
17 00 039 Filling and bleeding the high-temperature cooling system vacuum filler device (B48)	145
17 00 008 Draining and topping up the high-temperature coolant circuit	145
17 00 008 Draining and topping up the high-temperature coolant circuit	145
17 00 016 Draining and topping up coolant circuit for Range Extender \PREMIUM	145
17 00 008 Draining and topping up the high-temperature coolant circuit	145
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	145
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	145
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	145

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17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	145
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	145
00 .. ... Raising the vehicle using a vehicle hoist	

Operating materials	Used in step
2.0 Grease for wheel centring	126
14.0 Automatic transmission fluid for ZF-transmission GA8HP45Z / GA8HP50Z / GA8HP70Z / GA8HP90Z / GA8P70H / GA8P75H / GA8HP75Z	146

Operating materials	Used in step

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	83
Exhaust-gas recirculation cooler seal on exhaust manifold	97
Exhaust-gas recirculation cooler seal on intake plenum	97

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11 12 631 replace cylinder head

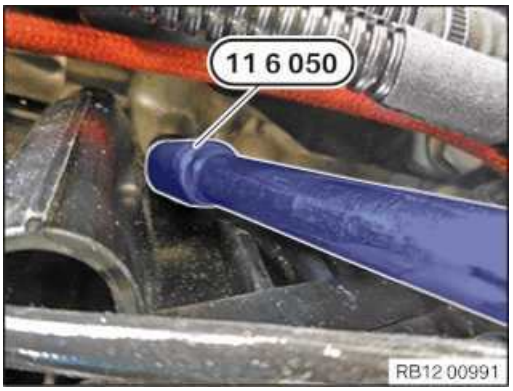
PRELIMINARY WORK

1 – Remove cylinder head.

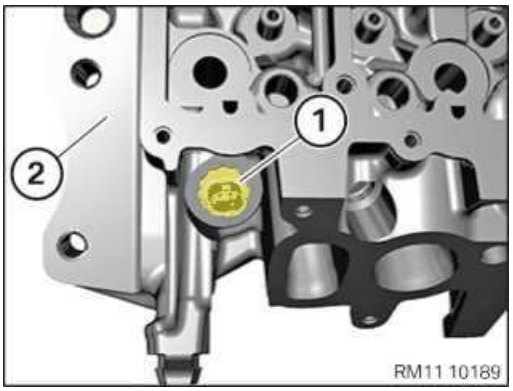
- See additional information.

MAIN WORK

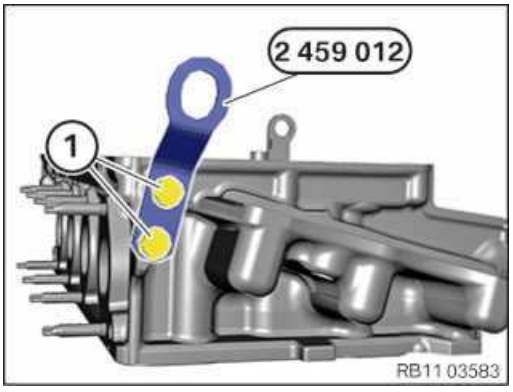
2 – replace cylinder head



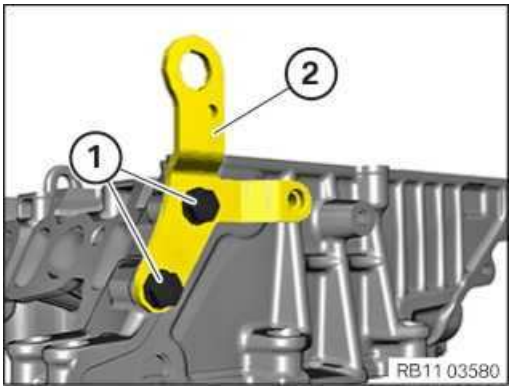
- Unscrew the preheating elements with special tool .



- Detach coolant temperature sensor (1) on cylinder head (2).



- Loosen screws (1).
- Remove special tool .



- Loosen screws (1).
- Remove mounting lug (2) from cylinder head.

▸ **Remove all valve springs**

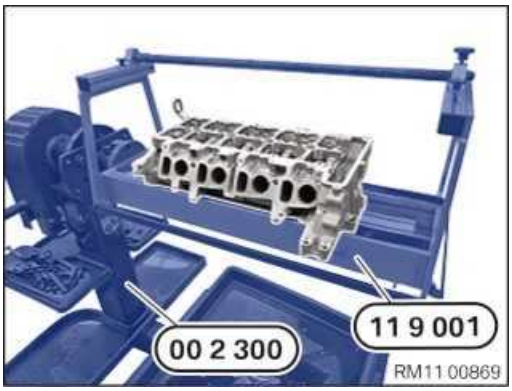
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RISK OF DAMAGE

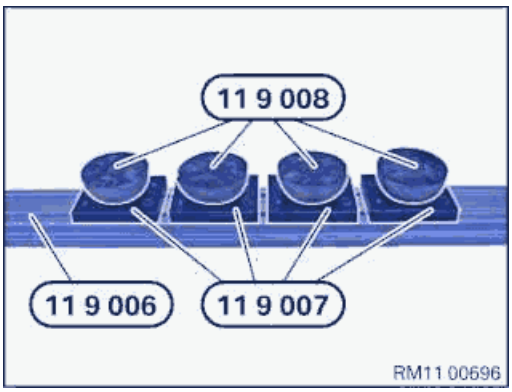
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



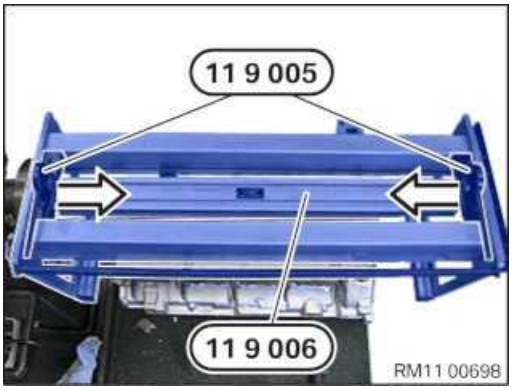
- Mount and screw the cylinder head onto the special tools **0 494 366 (11 9 001)** and **0 495 187 (00 2 300)**.



- Prepare the special tools **0 494 371 (11 9 006)**, **0 494 372 (11 9 007)** and **0 494 373 (11 9 008)** as shown.



- Position special tool **0 494 373 (11 9 008)** as illustrated.

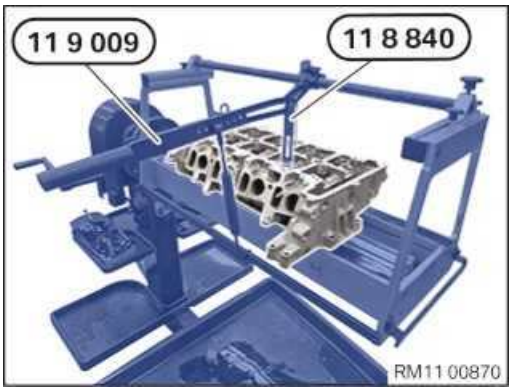


- Turn round special tool **0 494 371 (11 9 006)** and insert as shown.
- Lock special tool **0 494 370 (11 9 005)** in direction of arrow.

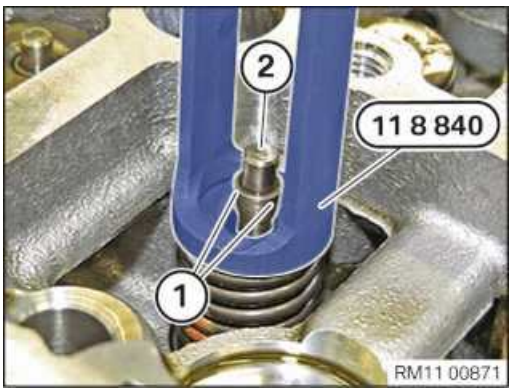
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- Lock special tool **0 494 370 (11 9 005)** in direction of arrow.
- Use the special tool **0 494 362 (11 9 000)** to bring the cylinder head into the installation position by 180°.



- Align special tool **0 494 374 (11 9 009)** in direction of valve axis.
- Position the special tool **0 496 143 (11 8 840)** according to the nut.
- Press down the valve spring on the upper spring cup with the special tools **0 494 374 (11 9 009)** and **0 496 143 (11 8 840)**.
- The **hooks** from the set of special tools **0 494 362 (11 9 000)** can be used to **hold** the valve spring down.



- Keep the valve spring pressed down with the special tool **0 496 143 (11 8 840)**.
- Remove the valve shims (1) from the valve (2) using a magnet.
- Guide the valve spring and spring cup out and remove.
- Set down valve spring, spring cup and valve shims (2) in the special tool **0 495 105 (11 4 480)** in an orderly manner.

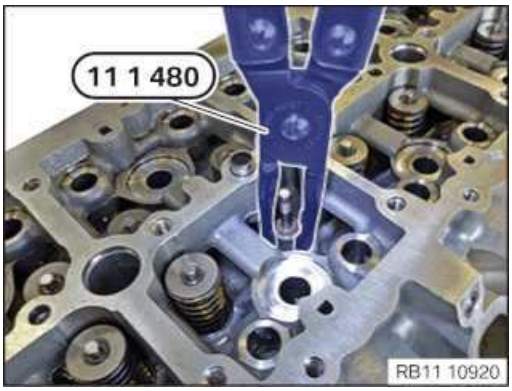
▸ **Remove valve stem seals**

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.



- Disassemble the valve stem seal (1) using the special tool **0 490 796 (11 1 480)**.

▸ **Remove all valves**

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

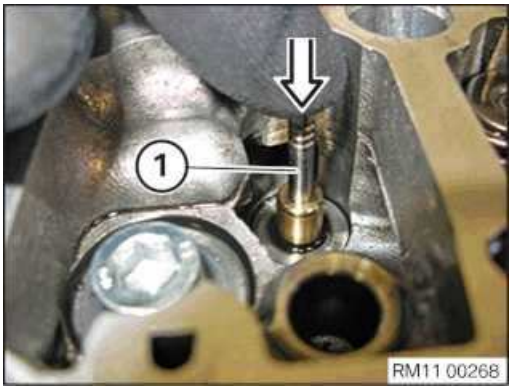
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



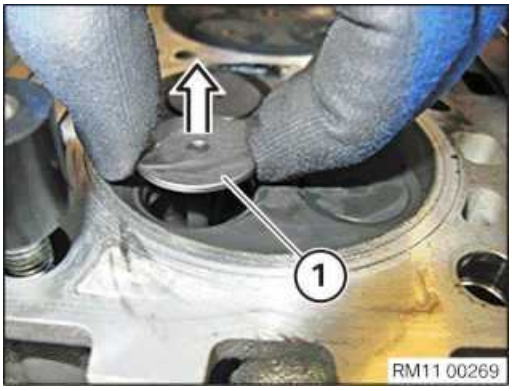
- Turn the cylinder head with the special tool **0 494 362 (11 9 000)**.
- Unlock the special tool **0 494 370 (11 9 005)** in the direction of the arrow.
- Remove special tool **0 494 371 (11 9 006)**.



- Remove special tool **0 494 373 (11 9 008)** if necessary.

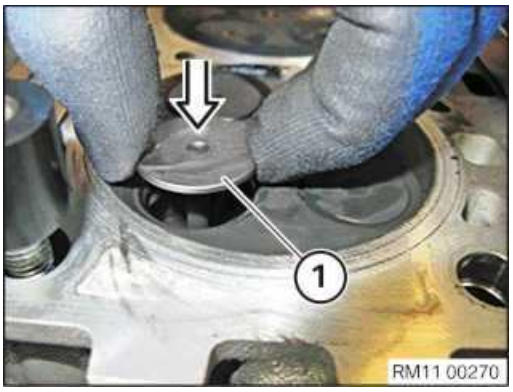


- Push the valve stem (1) into the cylinder head in the direction of the arrow.



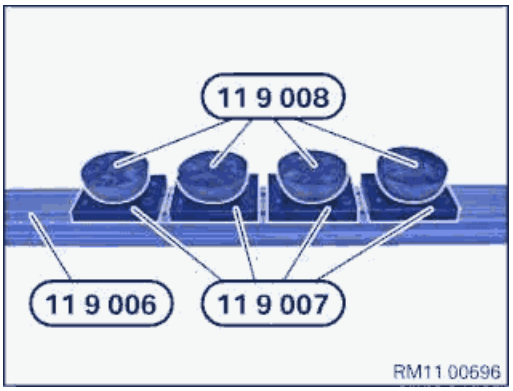
- Remove the valve (1) in the direction of arrow and store it properly in the special tool **0 495 105 (11 4 480)**.

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- Install valves (1) in the new cylinder head.

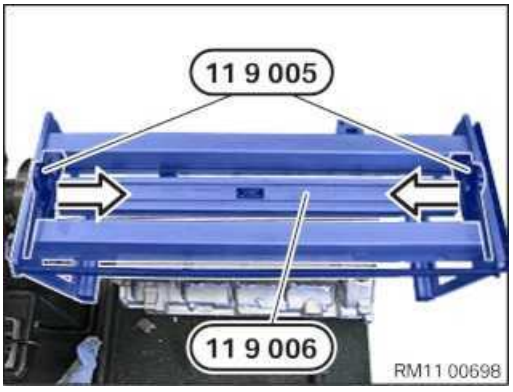
  Parts: Cylinder head
- Feed valves (1) in the direction of arrow and install.
- **Check the valves for tightness.**



- Prepare the special tools **0 494 371 (11 9 006)**, **0 494 372 (11 9 007)** and **0 494 373 (11 9 008)** as shown.



- The special tools **0 494 373 (11 9 008)** must be set up accordingly in the next operation.



- Turn round special tool **0 494 371 (11 9 006)** and insert as shown.
- Lock special tool **0 494 370 (11 9 005)**in direction of arrow.



- Lock special tool **0 494 370 (11 9 005)**in direction of arrow.
- Use the special tool **0 494 362 (11 9 000)** to bring the cylinder head into the installation position by 180°.

▸ **Installing valve stem seals**

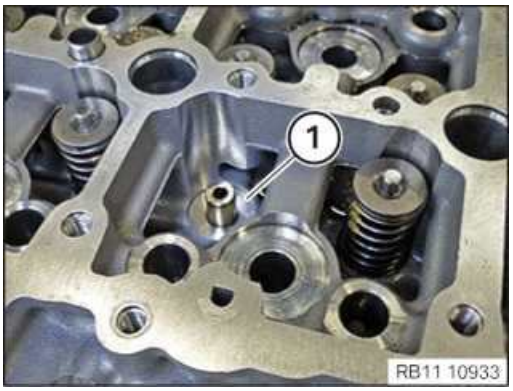
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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



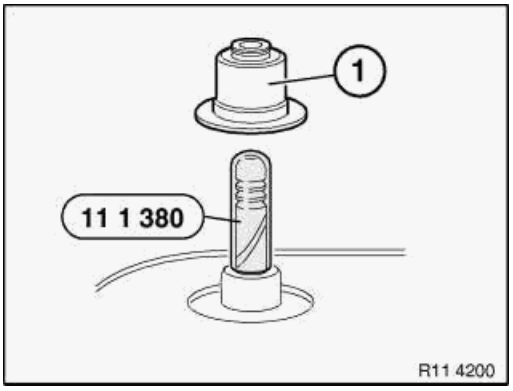
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

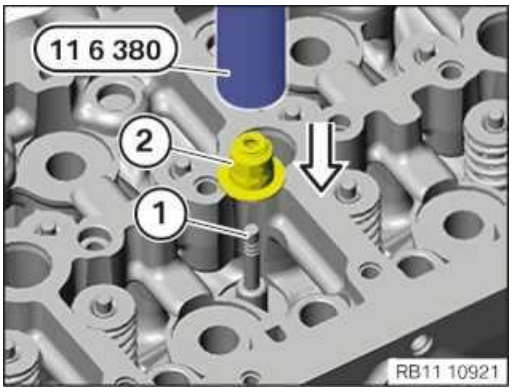
- Do not use any metal-cutting tools.

- Clean the contact surfaces (1).



- Fit special tool **0 490 746 (11 1 380)**.
- Oil the valve stem seal (1) and install it.

  Parts: Valve stem seal



- Position the valve stem seals (2) on the valve (1).
- Use special tool **0 493 249 (11 6 380)** to press down the valve stem seal (2) until they are in contact with the cylinder head.

▸ **Install all valve springs**

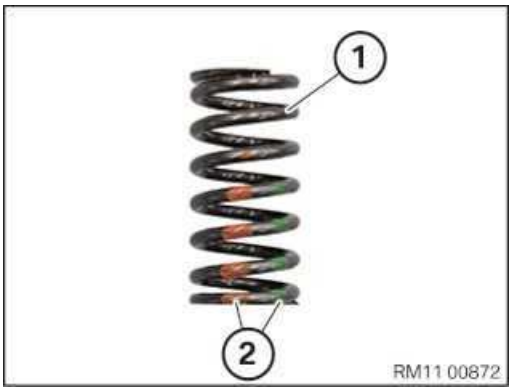
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

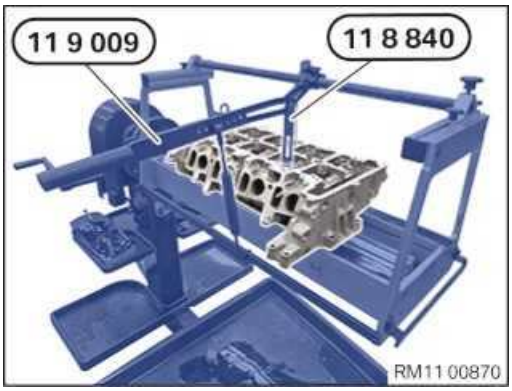
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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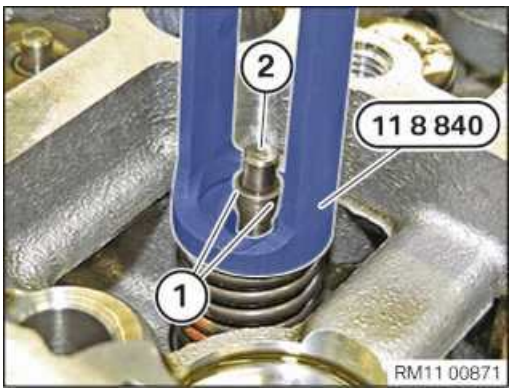


- The valve spring (1) is marked with a colour code (2).

  The mounting orientation of the valve spring (1) can be freely chosen.



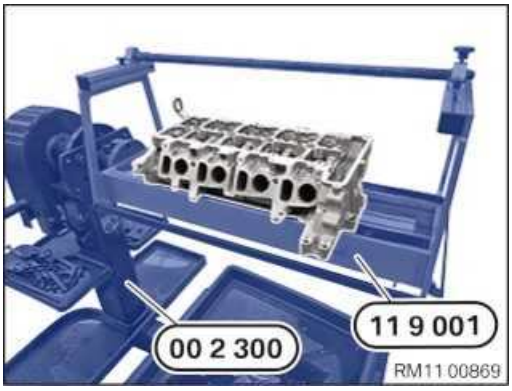
- Align special tool **0 494 374 (11 9 009)** in direction of valve axis.
- Position the special tool **0 496 143 (11 8 840)** according to the nut.
- Press down the valve spring on the upper spring cup with the special tools **0 494 374 (11 9 009)** and **0 496 143 (11 8 840)**.
- The **hooks** from the set of special tools **0 494 362 (11 9 000)** can be used to **hold** the valve spring down.



- Keep the valve spring pressed down with the special tool **0 496 143 (11 8 840)**.
- Insert the valve shims (1) at the valve (2) with the magnet and install.
- Relieve load on valve spring.
- Make sure that the valve shims (1) are installed correctly.



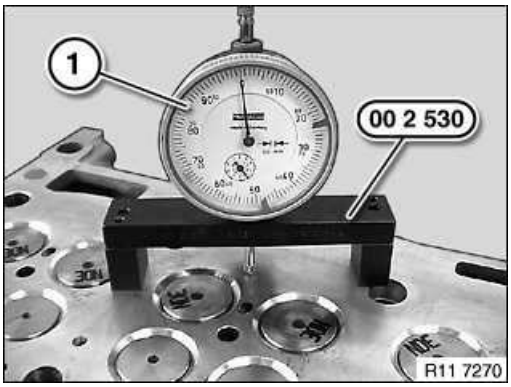
- Unlock the special tool **0 494 370 (11 9 005)** in the direction of the arrow.
- Guide the special tool **0 494 371 (11 9 006)** out and remove.



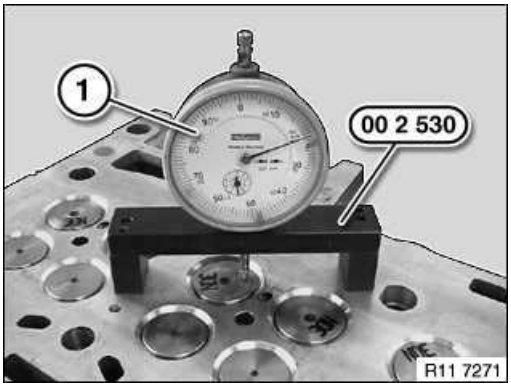
- Unscrew and remove the cylinder head from the special tools **0 494 366 (11 9 001)** and **0 495 187 (00 2 300)**.

▸ **Checking the valve underprotrusion**

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- Set the dial gauge (1) onto the cleaned cylinder sealing surface with slight preload in special tool **0 490 185 (00 2 530)**.
- Set dial gauge in mildly preloaded state to "zero".



Check

- Position the dial gauge (1) on the valve with special tool **0 490 185 (00 2 530)**.
- Measure valve underprotrusion and compare with the setpoint value.

Valve underprotrusion

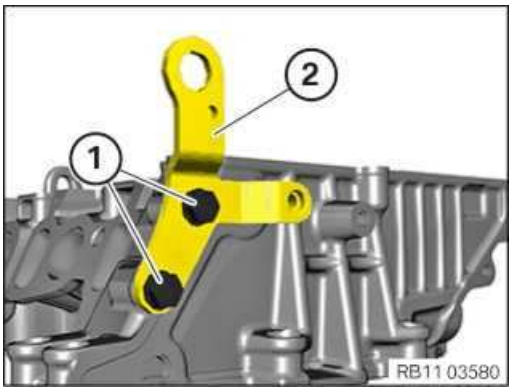
	0,8 (0,7 - 0,9) mm

Result

» Valve underprotrusion is outside tolerance.

Measure

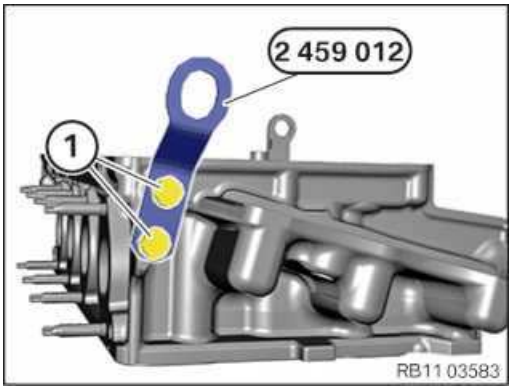
- Replace cylinder head.



- Install mounting lug (2) on the rear cylinder head.
- Tighten the screws (1).

Standard screw connection M8

M8		Tightening torque	19 Nm

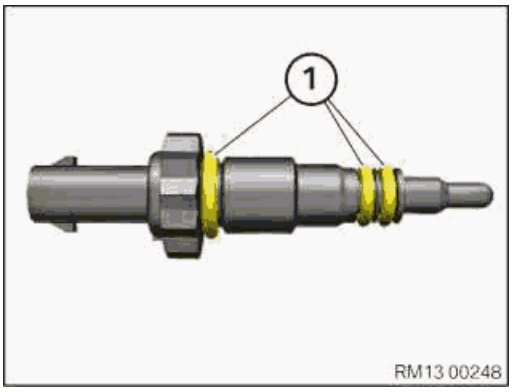


- Position special tool on cylinder head.
- Tighten the screws (1) of special tool .

Special tool to cylinder head

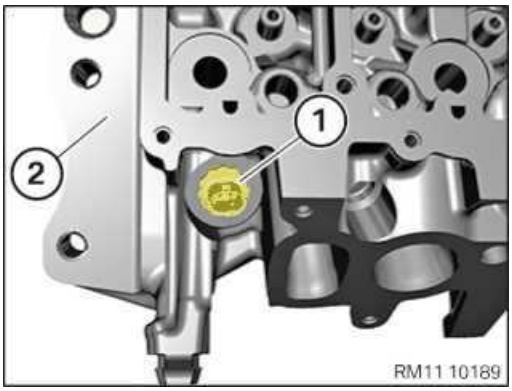
M8		Tightening torque	21,5 Nm

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- When reusing coolant temperature sensor sealing rings (1), check for damage, renew if necessary.

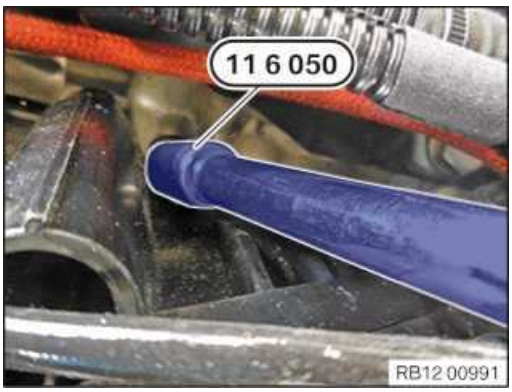
  Parts: Sealing ring



- Tighten coolant temperature sensor (1) on new cylinder head (2).

Coolant temperature sensor at cylinder head

Temperature sensor		Tightening torque	3,5 Nm



- Screw in preheating elements using special tool and tighten.

Glow elements to cylinder head

Glow element		Tightening torque	13 Nm

POSTPROCESSES

3 – Installing the cylinder head

- See additional information.

Additional Information

Overview of Tightening Torques

Standard screw connection M8 Used in step 2

M8		Tightening torque	19 Nm

Special tool to cylinder head Used in step 2

M8		Tightening torque	21,5 Nm

Coolant temperature sensor at cylinder head Used in step 2

Temperature sensor		Tightening torque	3,5 Nm

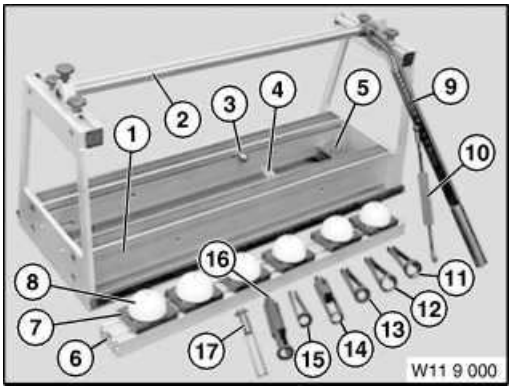
Glow elements to cylinder head Used in step 2

Glow element		Tightening torque	13 Nm

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Overview of Special Tools

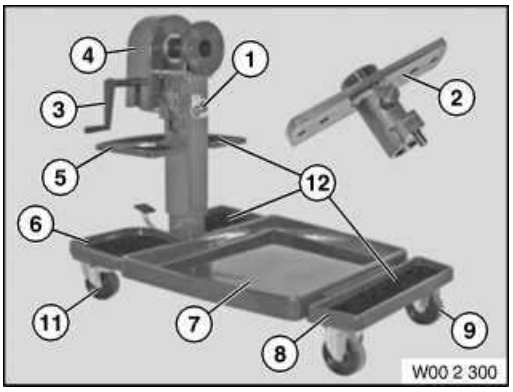
0 494 366 (11 9 001) Device



Common Used in step 2

Usage	
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 187 (00 2 300) Assembly stand



Common Used in step 2

Usage	Assembly stand with universal flange for mounting engines from S85
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 25 04 (155)

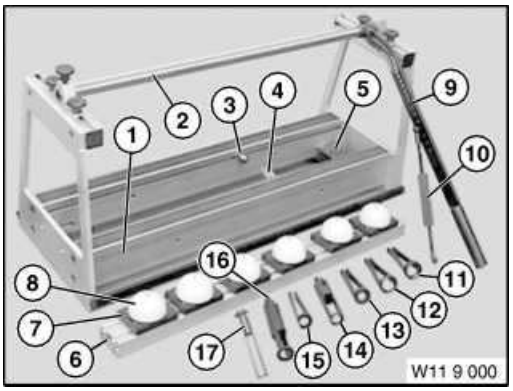
Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 188 (00 2 301)		**Assembly stand** available only as complete assembly stand 83 30 0 495 187.	
2	0 495 189 (00 2 302)	**2 299 563**	**Tool** (Universal flange). Do not use any more!!! Technically locked. Replaced with a new flange with material number 83 30 2 299 563. All flanges delivered until the end of 2011 will be replaced at no charge. From 2012, only the new flange will be supplied. Also applies to the complete engine mounting stand 00 2 300.	
3	0 495 200 (00 2 303)		**Crank**	
4	0 495 201 (00 2 304)		**Cover** (Protective hood)	
5	0 495 202 (00 2 305)		**oddments tray** (Oddments tray for small parts)	
6	0 495 203 (00 2 306)		**Shaped element** (Rear shaped pan)	

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7	0 495 204 (00 2 307)		**Collection pan** (Oil collection pan)	
8	0 495 205 (00 2 308)		**Shaped element** (Front shaped pan)	
9	0 495 206 (00 2 309)		**Wheel** (Front wheel (without stop))	
10	0 495 207 (00 2 311)		**Wheel** (Rear wheel (with stop))	
11	0 495 208 (00 2 312)		**Mat** (Checker mat set)	
2	2 299 563		**Adapter** New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.	

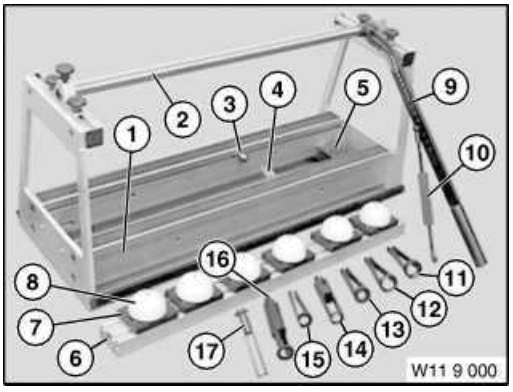
0 494 371 (11 9 006) Insert



Common Used in step 2

Usage	(Aluminium strip)
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 372 (11 9 007) Shaped part



Common Used in step 2

Usage	(Shaped part)
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 373 (11 9 008) Shaped part

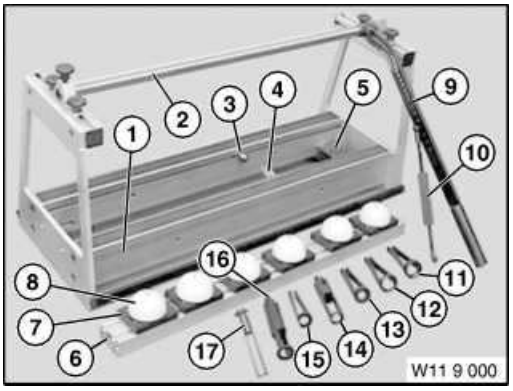


Common Used in step 2

Usage	(Shaped part) Shaped part made of plastic
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

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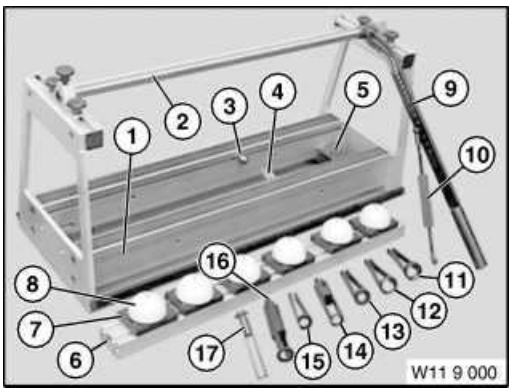
0 494 370 (11 9 005) Quick fastener



Common Used in step 2

Usage	
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 362 (11 9 000) Device



Common Used in step 2

Usage	(Cylinder head expander tool)
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 03 02 (833)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 494 366 (11 9 001)		**Device**	
6	0 494 371 (11 9 006)		**Insert** (Aluminium strip)	
11	0 494 376 (11 9 012)		**Basket** (Valve spring cage) Engine M41, M51, S50	
17	0 495 028 (11 9 017)		**Basket** (Valve spring cage) Engine N52	
2	0 494 367 (11 9 002)		**Rod**	
3	0 494 368 (11 9 003)		**Adapter** (Sliding block)	
4	0 494 369 (11 9 004)		**Tab**	
5	0 494 370 (11 9 005)		**Quick fastener**	
7	0 494 372 (11 9 007)		**Shaped part** (shaped part)	
8	0 494 373 (11 9 008)		**Shaped part** (Shaped part) Shaped part made of plastic	
9	0 494 374 (11 9 009)		**Lever**	

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10	0 494 375 (11 9 011)		**Hook**	
12	0 494 377 (11 9 013)		**Basket** (Valve spring cage) Engine M43, M73	
13	0 494 378 (11 9 014)		**Basket** (Valve spring cage) Engine M44, M52, M54, M56, M62, S52, S54, S62	
14	0 494 379 (11 9 015)		**Basket** (Valve spring cage) Engine M47, M47TU, M57, M57TU, N40, N42, N62, N73	
15	0 494 380 (11 9 016)		**Basket** (Valve spring cage) Engine M21, M40	

0 494 374 (11 9 009) Lever



Common Used in step 2

Usage	
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 496 143 (11 8 840) Basket

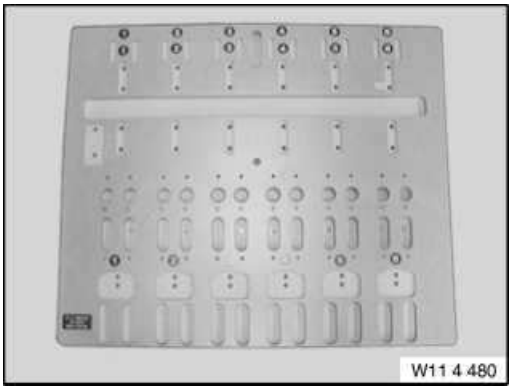


Common Used in step 2

Usage	(Valve spring cage) For removing and fitting the valves.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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0 495 105 (11 4 480) oddments tray



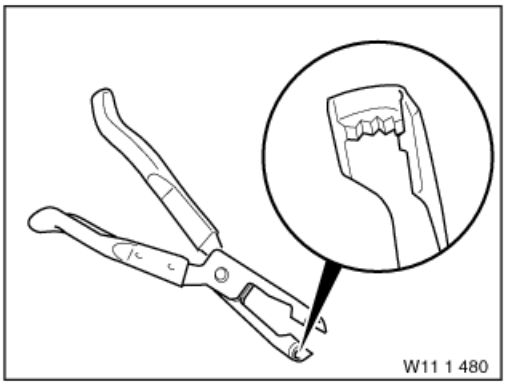
Common Used in step 2

Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

0 490 796 (11 1 480) Pliers

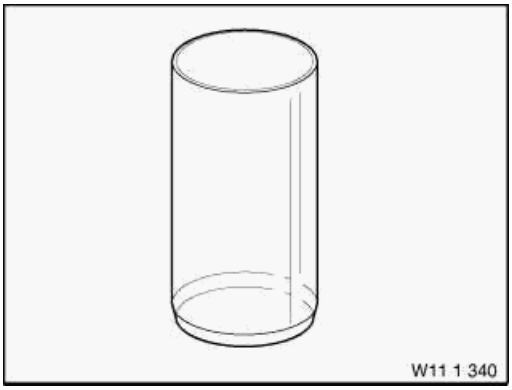


Common Used in step 2

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

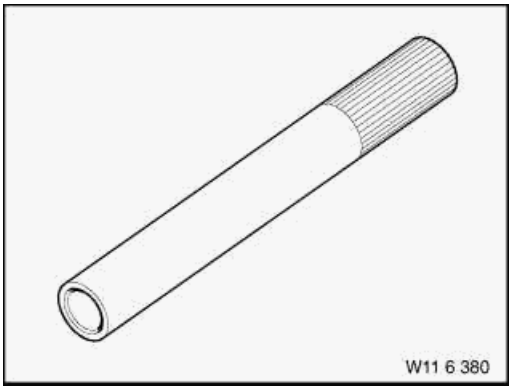
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0 490 746 (11 1 380) Holding sleeve



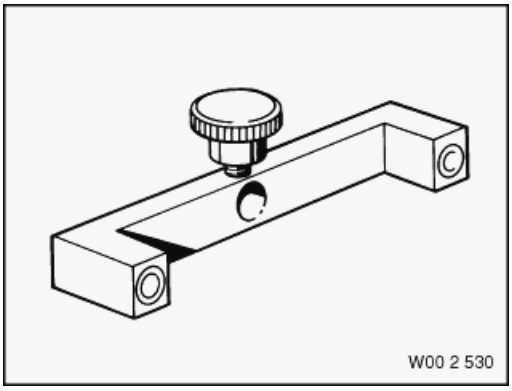
Common	Used in step 2
Usage	(Assembly sleeve) For fitting the valve stem seal, diameter 7 mm
Included in the tool or work	
Storage location	individual
Replaced by	
In connection with	
SI-Number	

0 493 249 (11 6 380) Bush



Common	Used in step 2
Usage	For fitting valve stem seal
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

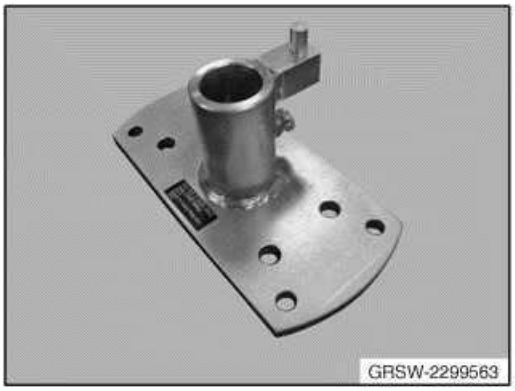
0 490 185 (00 2 530) Bridge



Common	Used in step 2
Usage	(Measuring bridge) For determining the piston projection (Diesel)
Included in the tool or work	
Storage location	A3
Replaced by	
In connection with	
SI-Number	

Replacement tools:

2 299 563 Adapter



Common	Used in step 2
Usage	New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.
Included in the tool or work	0 495 187
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

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Valve underprotrusion	Used in step 2
	0,8 (0,7 - 0,9) mm

Links

Repair instructions	Used in step
11 12 100 Removing and installing cylinder head	1 3
11 12 100 Removing and installing cylinder head	1 3
11 12 100 Removing and installing cylinder head	1 3
11 12 100 Removing and installing cylinder head	1 3
11 12 100 Removing and installing cylinder head	1 3
11 12 100 Removing and installing cylinder head	1 3
11 12 100 Removing and installing cylinder head	1 3

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11 12 101 Replace cylinder head gasket

WARNING

Vehicle may slip off the vehicle hoist if the vehicle hoist is handled incorrectly.

Danger! Life-threatening injuries!

- Observe safety information on raising the vehicle using a vehicle hoist.
- For additional information see: 00 ... Raising the vehicle using a vehicle hoist.

WARNING

Motor vehicle may slip off the vehicle hoist where components are supported.

Danger! Life-threatening injuries!

- Secure the vehicle hoist against lowering and lifting.

WARNING

Motor vehicle may slip off the vehicle hoist if the weight is distributed unevenly.

Danger! Life-threatening injuries!

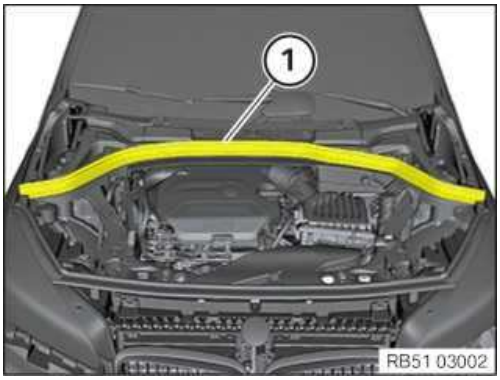
- Ensure there is a specific weight compensation on the motor vehicle.

PRELIMINARY WORK

1 – Remove the seal for the rear bonnet

NOTICE

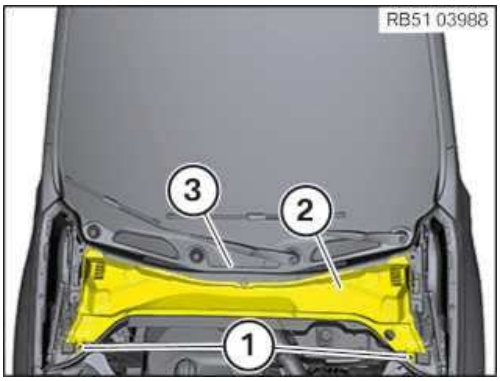
Schematic diagram is for example purposes. Some parts may differ in certain details.



- Pull off rear bonnet seal (1) towards the top and remove.

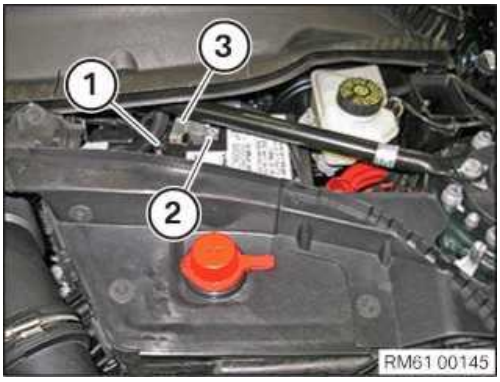
2 – Removing front cowl panel cover

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- Loosen the expanding rivet (1).
- Feed out and remove front cowl panel cover (2) from the rear cowl panel cover(3).

3 – Disconnecting the battery earth lead

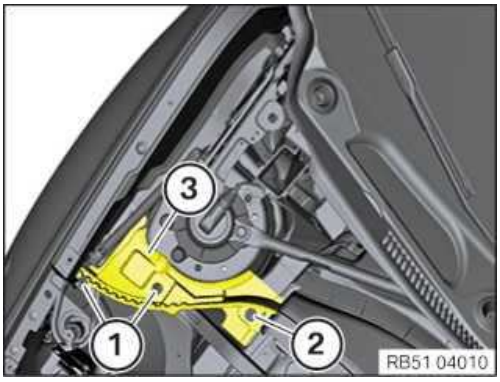


- Unlock plug connection (1) and disconnect.
- Unfasten nut (2).
- Remove the battery earth lead (3) and secure to one side.

4 – Remove suspension cross-brace

TECHNICAL INFORMATION

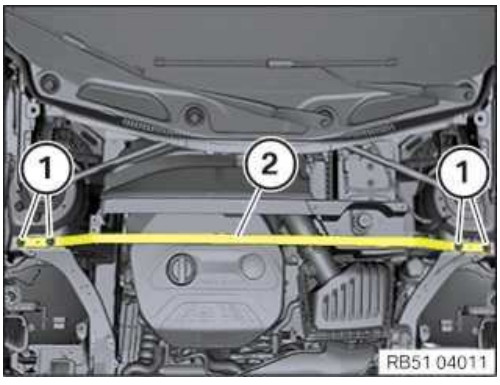
Driving without the strut brace/front end or tension strut is not permitted.



NOTICE

Description is for right component only. The procedure on the left side is identical.

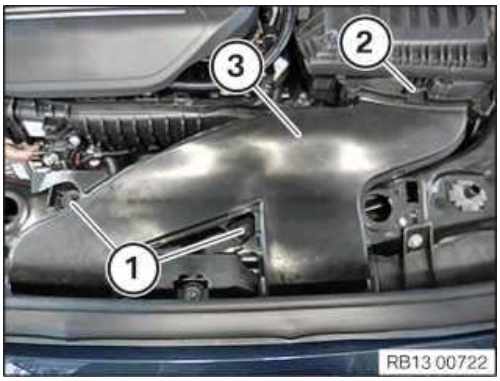
- Loosen expanding rivet (1).
- Loosen screw (2).
- Remove the cover (3).



- Loosen screws (1).
- Remove strut brace (2).

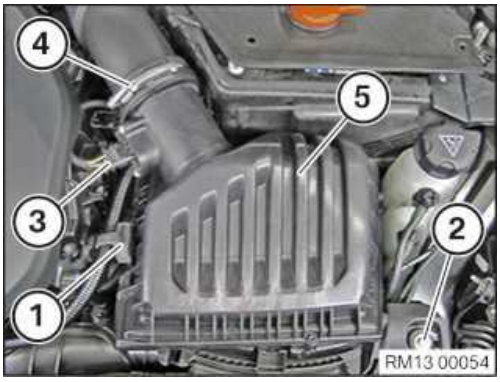
5 – Remove the intake neck for intake silencer housing

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- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

6 – Removing intake silencer housing



- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

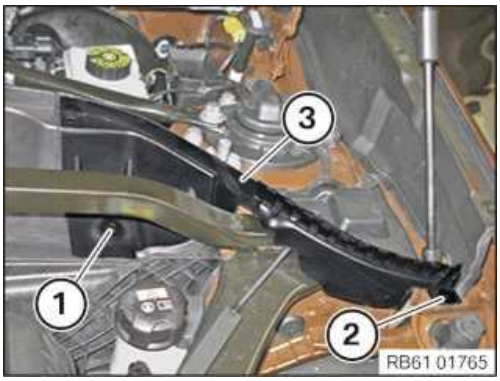
7 – Remove vehicle battery

WARNING

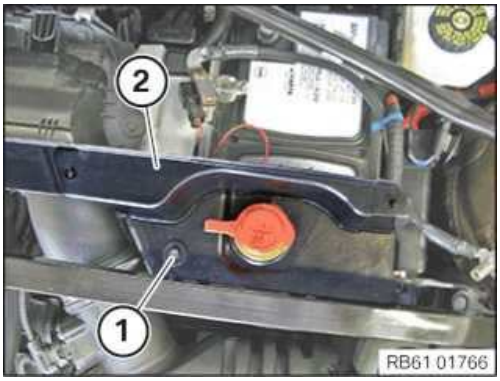
Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

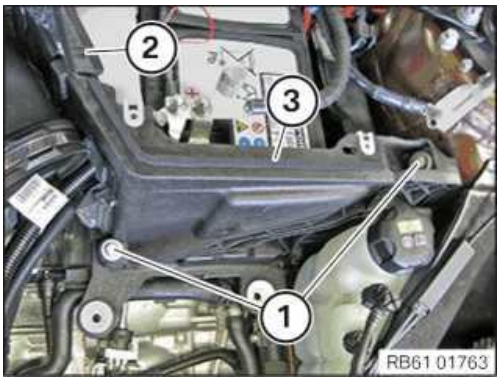


- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

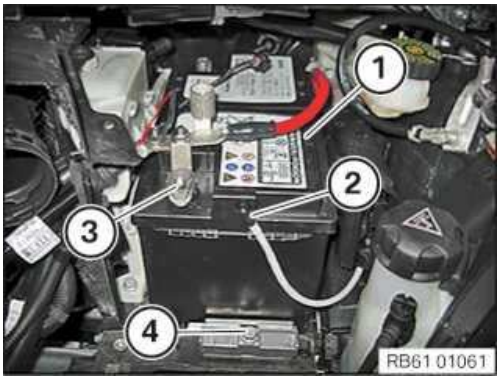


- Loosen screw (1).
- Remove the cover (2).

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- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.



- Pull off the vent hose (2).
- Slacken the nut (3) on the positive battery terminal and remove the positive battery terminal.

WARNING

Unprotected battery terminals.

Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

8 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

Damage to the acoustic cover.

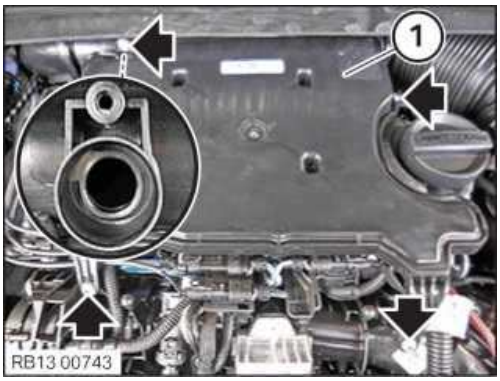
Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

9 – Remove resonator

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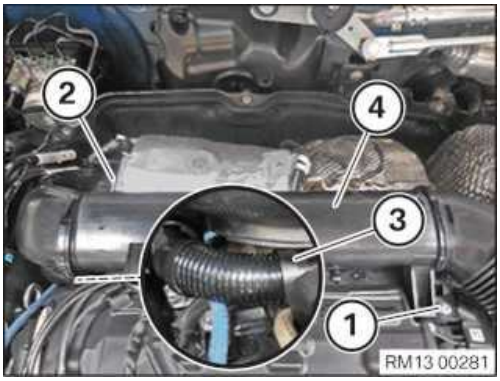


- Remove screws (arrows).
- Guide out and remove the resonator (1).

10 – Removing clean air pipe



- Detach clamp (1) on the clean air pipe.
- Pull off the clean air pipe from the intake silencer housing.



- Loosen screw (1).
- Loosen clamp (2).
- Unlock the ventilation line (3) and pull it off the cylinder head cover.
- Feed out clean air pipe and remove.

11 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

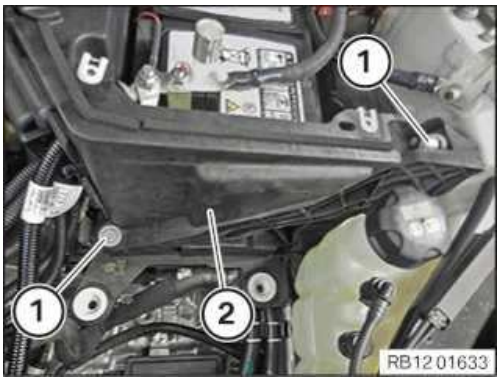
TECHNICAL INFORMATION

Follow instructions for removing and installing control units.

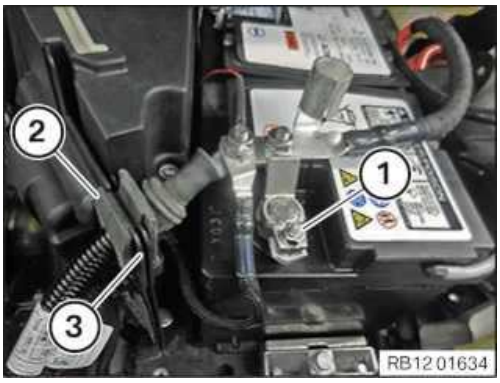
For additional information see: 12 00 ... Notes on removal and installation of control units

TECHNICAL INFORMATION

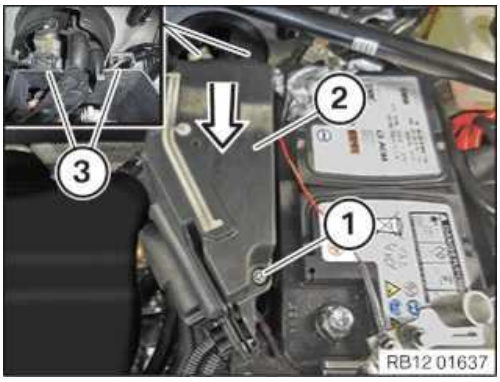
Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.



- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.

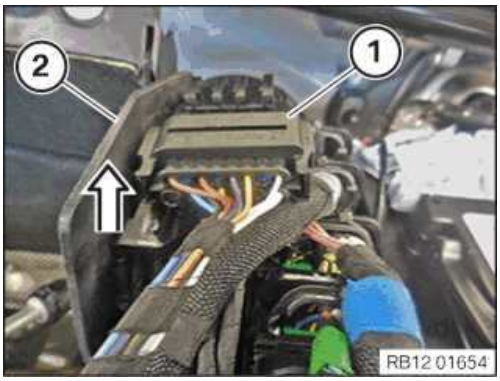


- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

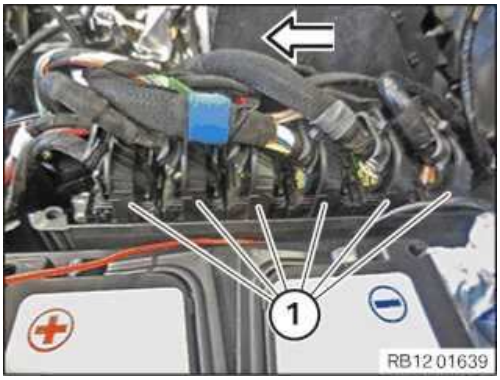


- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.

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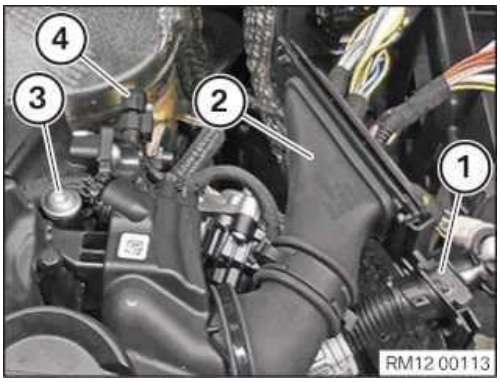
- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).



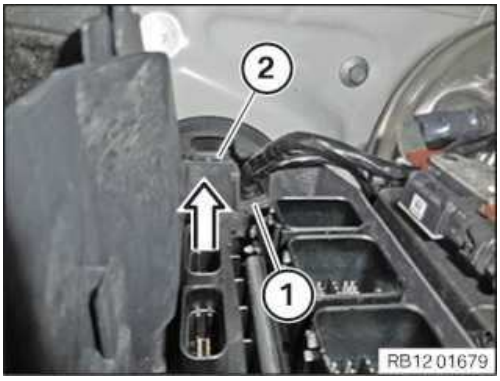
- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



- Unlock and loosen connector (1).

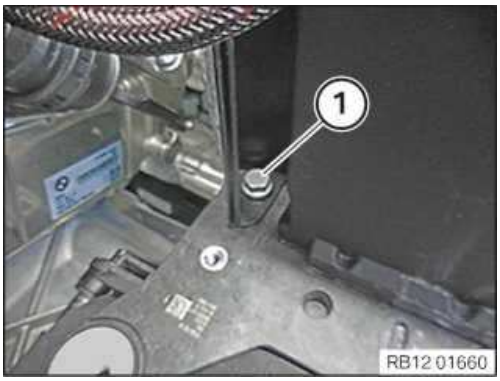


- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.

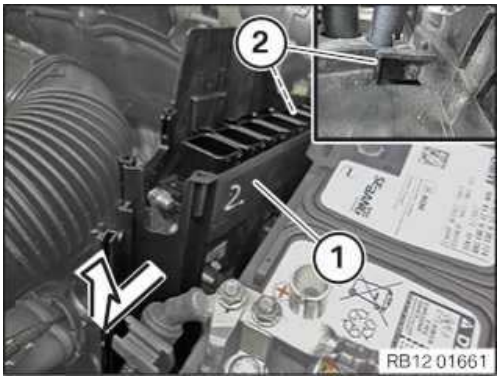


- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.

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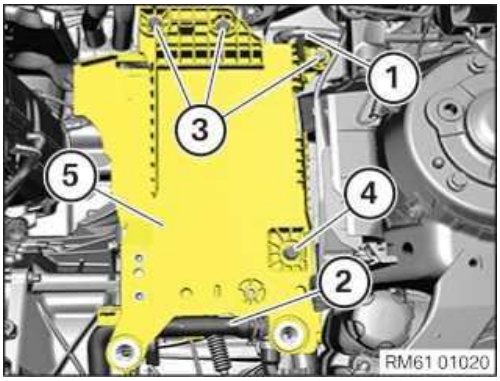


- Loosen screw (1).



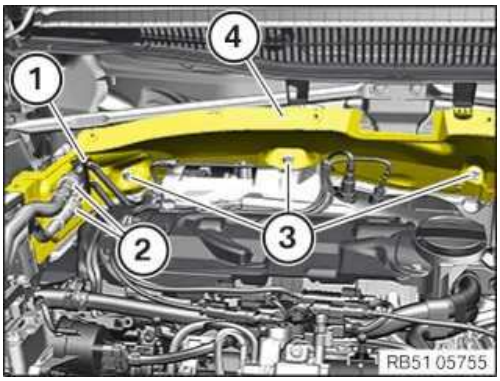
- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

12 – Remove battery holder



- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

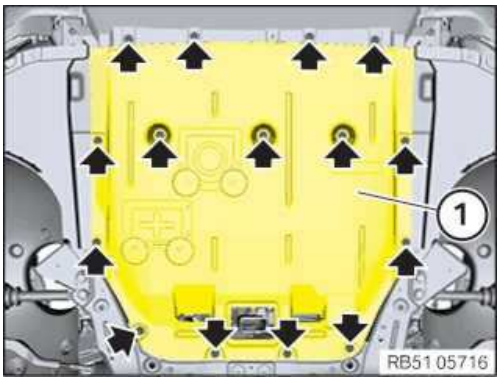
13 – Remove the rear bulkhead upper part



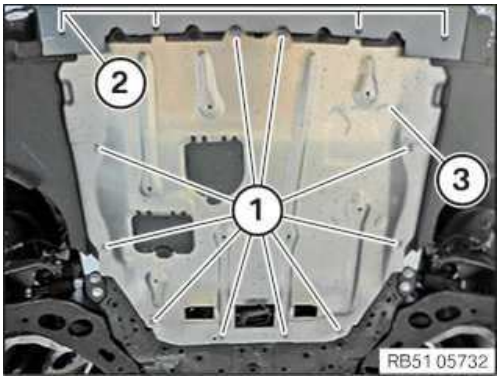
- Unlock the holder (1) and disconnect.
- Guide out and remove the fuel lines (2).
- Loosen screws (3).
- Guide out the rear bulkhead upper part (4) and remove.

14 – Removing the front underbody protection

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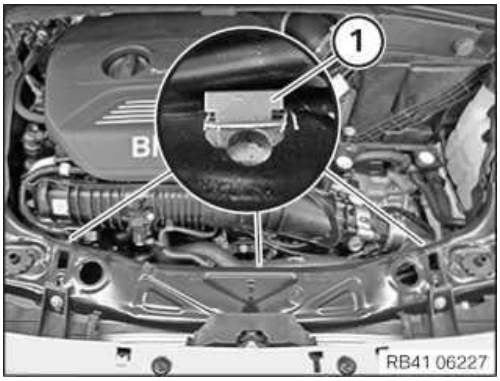


- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.

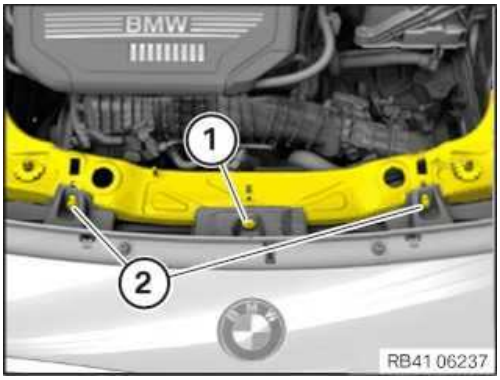


- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

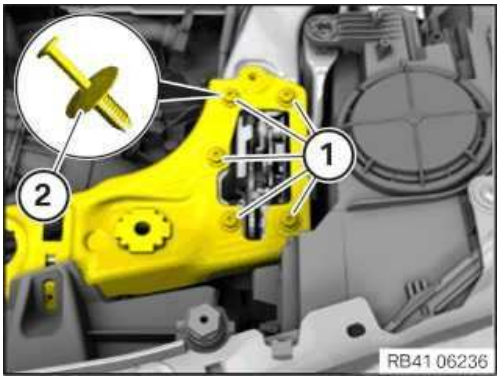
15 – Remove front cross connection



- Detach the clamps (1) for the Bowden cable of the bonnet locks from the cross connection.

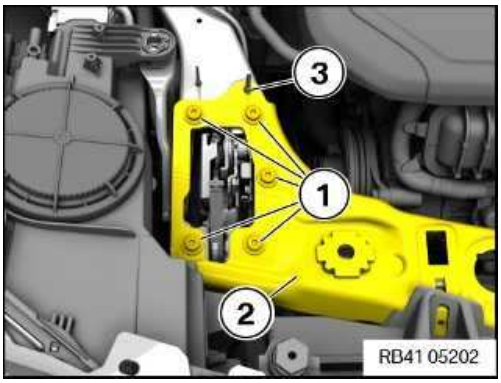


- Loosen screw (1).
- Loosen screws (2).



- Loosen screws (1).
- Lever out expanding rivet (2).

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- Loosen screws (1).
- Unclip the front cross connection (2) from the rubber retainer (3) and remove it upward.

16 – Draining coolant

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

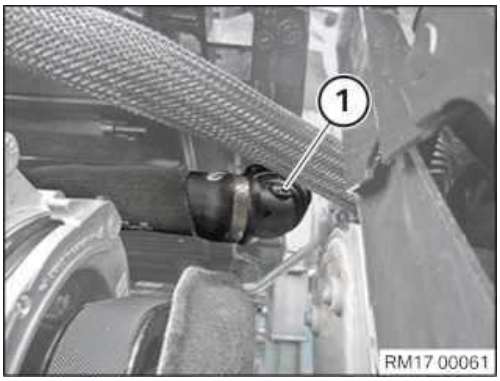
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

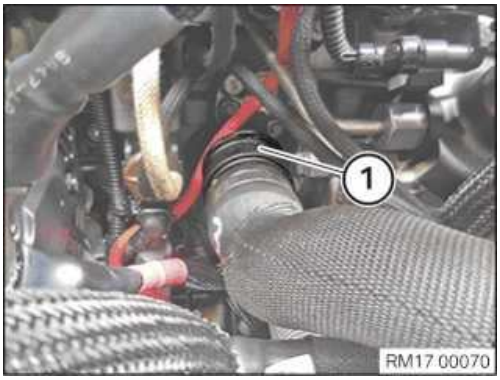


- Loosen sealing cap (1).

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- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.

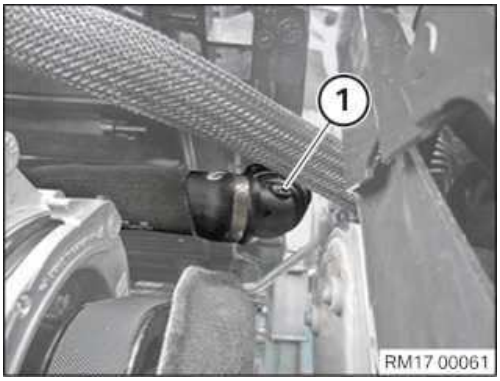


- Unlock the coolant line (1) and pull it off the connecting branch.
- Catch and dispose of escaping coolant.

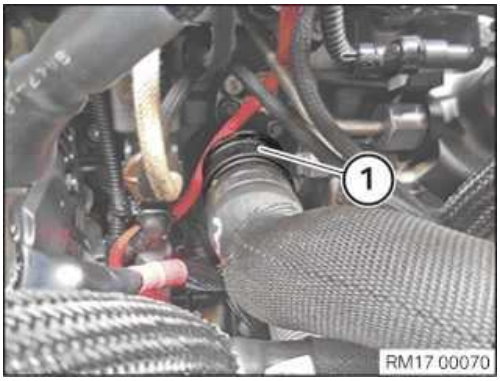
17 – Connect the coolant line

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Connect the right coolant line (1) to the radiator and lock audibly.



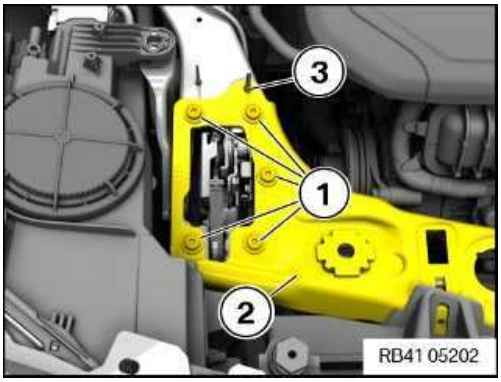
- Connect the coolant line (1) to the connecting branch and lock audibly.

18 – Install front cross connection

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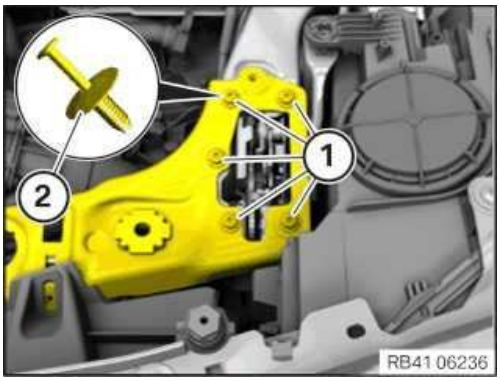
- Right side of vehicle only: Secure spray guard (1) on the cross connection (2) as pictured.



- Position front cross connection (2) and clip front cross connection (2) into the rubber retainer (3) at the same time.
- Tighten the screws (1).

Cross connection to carrier support

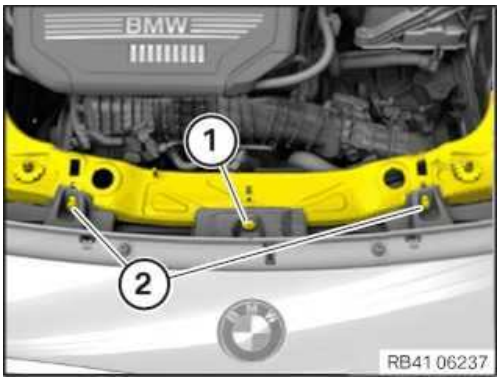
Screws M6x20		Tightening torque	11,8 Nm



- Tighten the screws (1).

Cross connection to carrier support

Screws M6x20		Tightening torque	11,8 Nm



- Position screws (3) on the rubber mounts for the radiator and tighten.

Screw connection for rubber mount of coolant radiator to coolant radiator

Bolt to rubber mount		Tightening torque	8 Nm

- Tighten down screws (2).

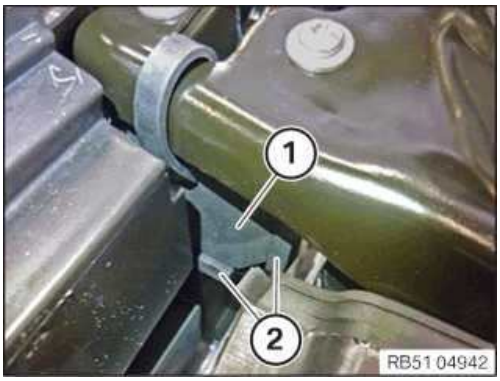
Air duct to upper connection

M6x20 screw		Tightening torque	11,8 Nm

- Tighten down screw (1).

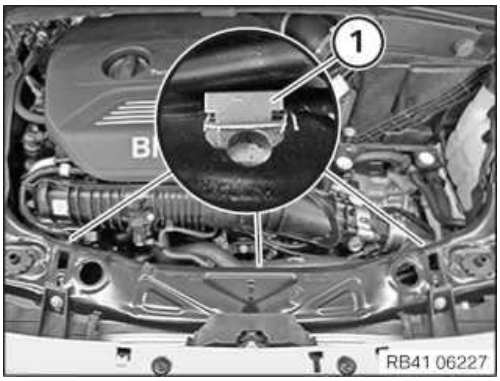
Bracing strut to upper connection

M8x20 screw		Tightening torque	28 Nm



- Right side of vehicle only: Properly mount spray guard (1) to prevent corrosion.
- Secure spray guard (1) to the bridge with retaining tabs (2).

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- Fasten the clamps (1) from the Bowden cable of the bonnet lock on the cross connection.

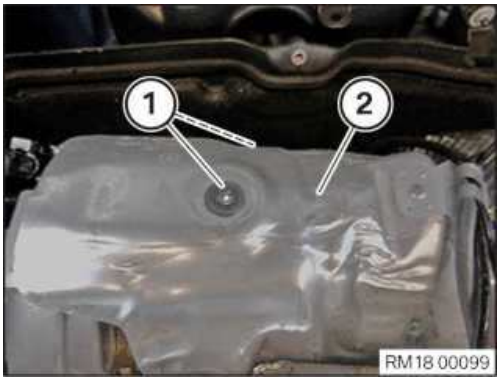
19 – Removing heat shield from top exhaust turbocharger

WARNING

Hot surfaces.

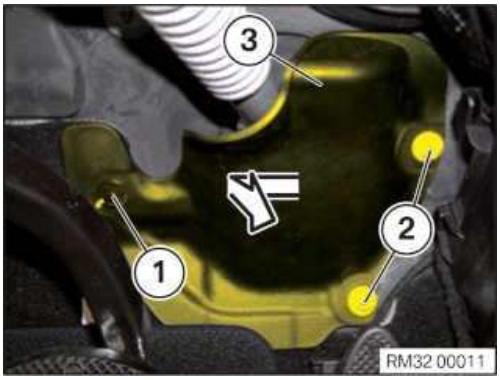
Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from holders.
- Release the screws (1) at the top and bottom of the heat shield.
- Feed out and remove the heat shield (2).

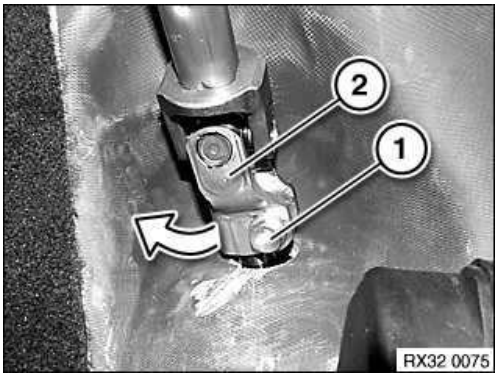
20 – Releasing lower steering shaft from steering gear



- **If installed:**
- Unfasten nut (1).
- Unscrew the nuts (2) by 1 rotation.

  Do not remove the nuts (2) !
- Remove the cover (3) on the steering column in the direction of the arrow.

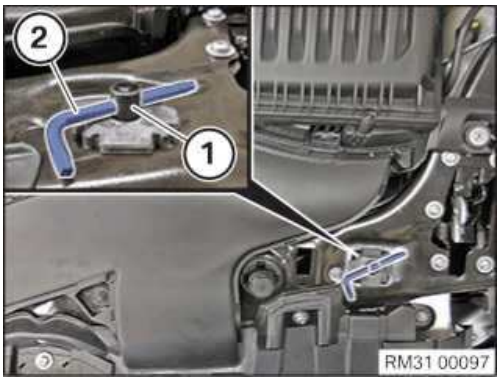
  The side footwell trim must not be disassembled!



- Loosen screw (1).
- Swivel out the universal joint (2) of the bottom steering shaft from the steering gear in the direction of the arrow.

21 – Securing radiator on left and right

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NOTICE

Perform the operations on the left and right side.

- Fasten radiator at centring pin (1) with suitable tool (2).

22 – Removing both front wheels

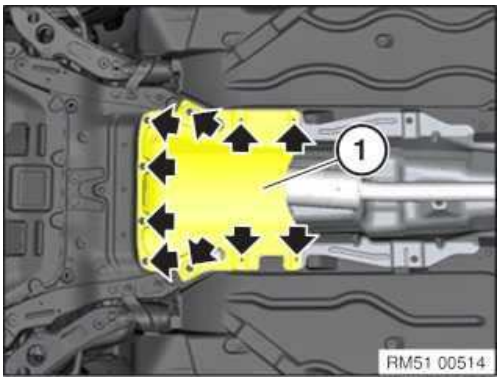
▶ **Removing the wheel**



- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Unscrew the wheel bolts (arrows) and remove the wheel.

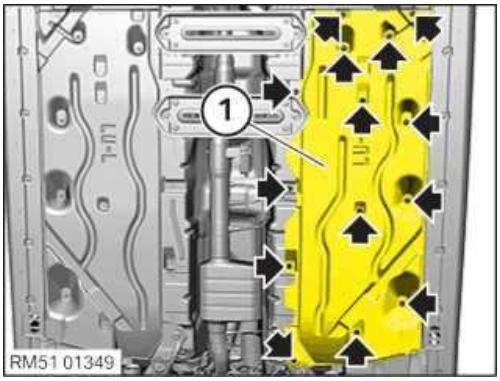
  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

23 – If installed: Removing rear underbody protection



- Remove screws (arrows).
- Remove the rear underbody protection (1).

24 – Removing right underbody panelling



- Unscrew all bolts and nuts (arrows).
- Remove the underbody panelling (1).

25 – Removing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

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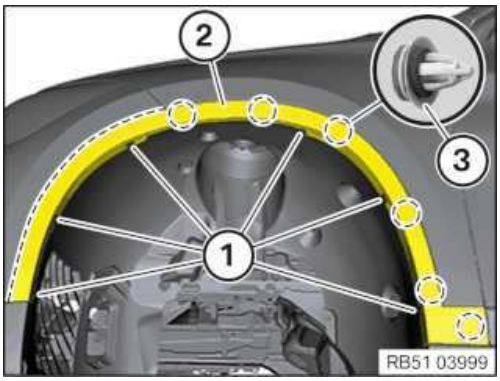
▶ **Remove the front wheel arch trim**

NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

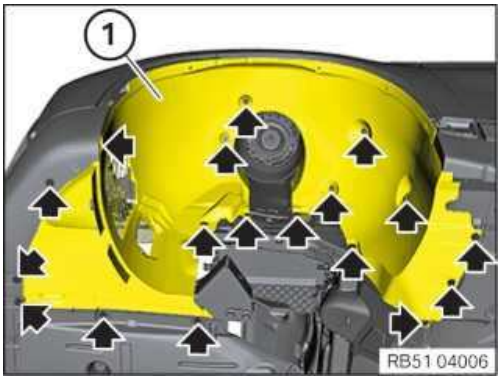
NOTICE

Description is for left component only. Procedure on the right side is identical.



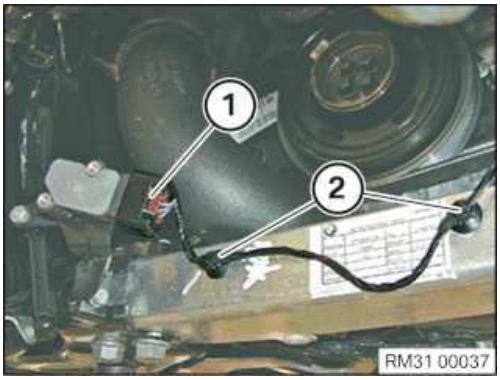
- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.

▶ **Remove front wheel arch cover**



- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

26 – With right installation: Detaching ride height sensor cable



- Unlock plug connection (1) and disconnect.
- Release cable clip (2) from deformation element adapter.

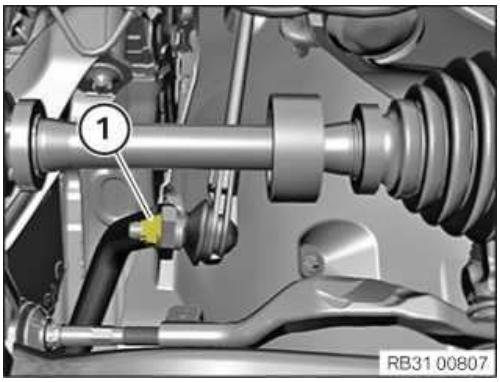
27 – Releasing anti-roll bar on left and right from anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▶ **Detach the anti-roll bar from the anti-roll bar link**

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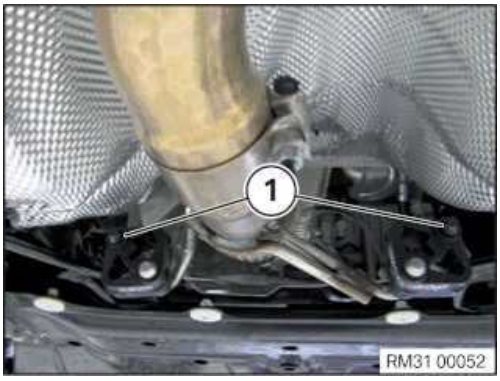


- Unfasten nut (1).

Note: Use the Torx socket for counter support.

- Loosen the anti-roll bar link from the anti-roll bar .

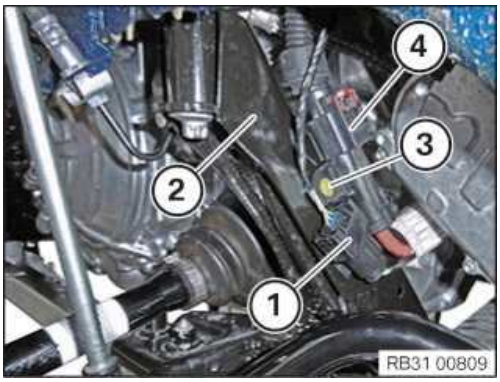
28 – Detaching rubber mount from front axle support



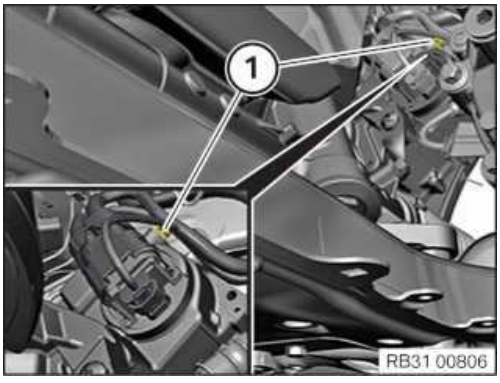
- Spray rubber mount (1) with lubricant and release from holder on front axle support.

29 – Disconnecting plug connections from steering gear

▸ **If installed: Detach connectors from the front axle carrier**

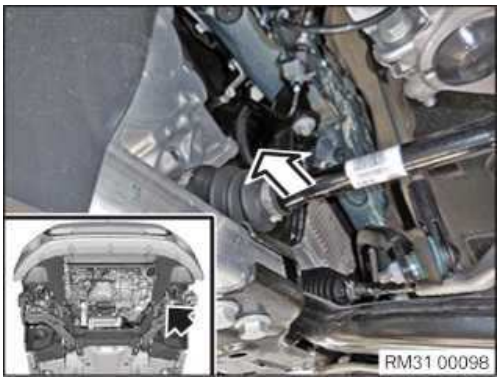


- Release the plug connection (1) from the front axle support (2).
- Loosen screw (3).
- Release the plug connection (4) from the front axle support (2).



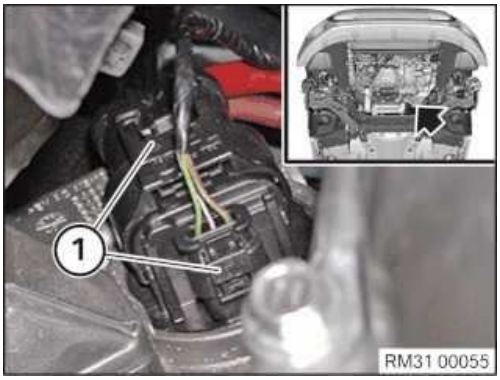
- Disconnect wiring harness (1) from steering gear.

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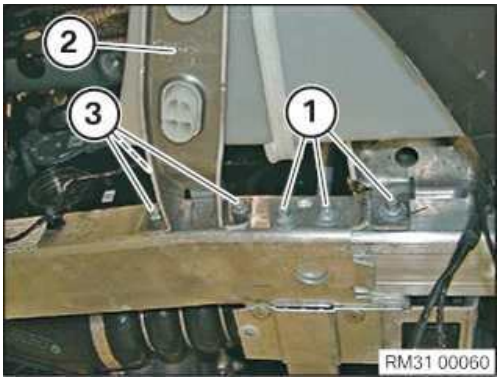
- To unlock the plug connections (see the following work step): unlock plug connections (arrow) with the right hand.

  The plug connections can be reached via the left-hand output shaft.



- Unlock plug connections (arrow) (1)and disconnect from the steering gear.
- Make sure when lowering the front axle that the cables are not damaged!

30 – Releasing the mounted part from the front axle support

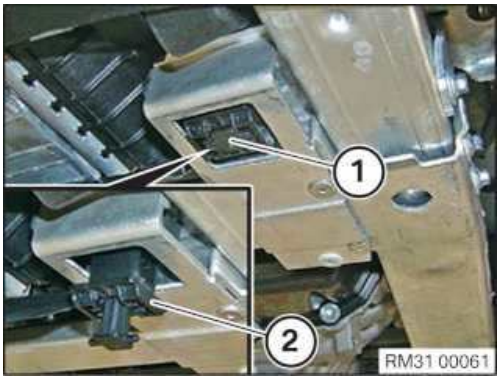


- **Only on right side:** Loosen screws (3) and remove holder for washer fluid reservoir (2).

NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).



NOTICE

Perform the operations on the left and right side.

- Unlock safety catch (1) of the lock (2) from the holder for the charge air cooler.
- Completely remove locks (2).



- Loosen screw (2) of the engine support (3) on the front axle (1).

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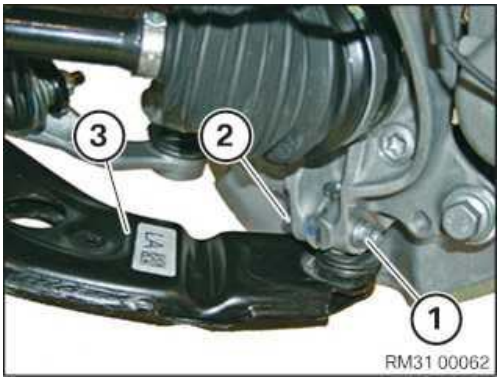


NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

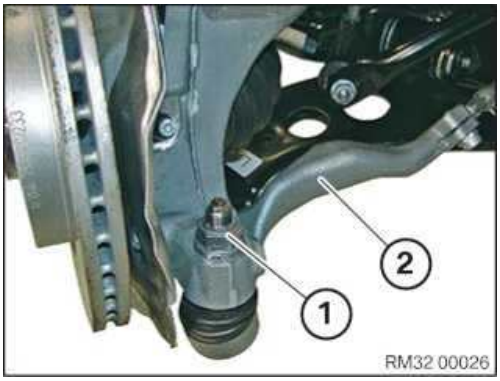
31 – Detaching and removing front axle completely



NOTICE

Perform the operations on the left and right side.

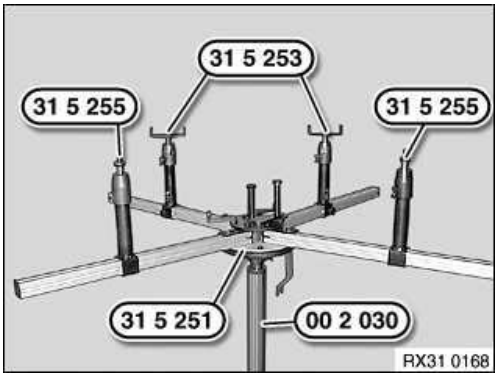
- Unfasten nut (1).
- (2)Pull out screw.
- Detach the wishbone (3) from the swivel bearing .



NOTICE

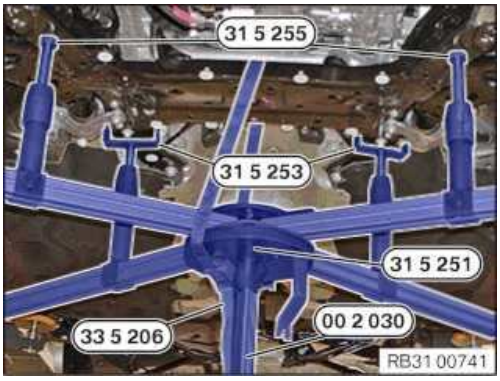
Perform the operations on the left and right side.

- Unfasten nut (1).
- Detach the track rod (2) from the swivel bearing.



- Fit the special tool completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools in telescopic supports of a profile rail pair.
- Insert special tools in telescopic supports of other profile rail pair.

Note: In a profile rail pair, two profile rails are connected to one another by gearing.

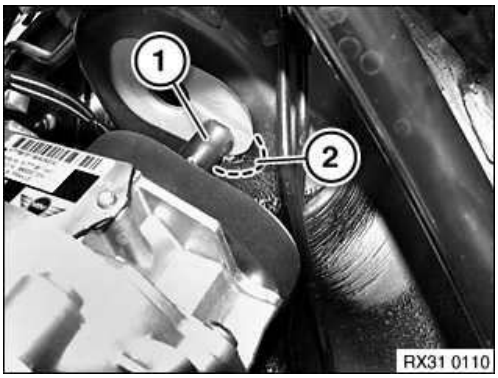


- Align special tools and to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool to special tool .

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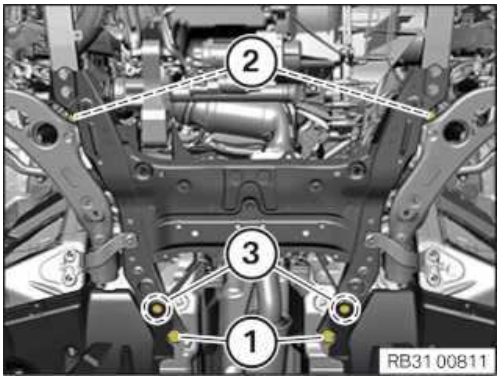


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



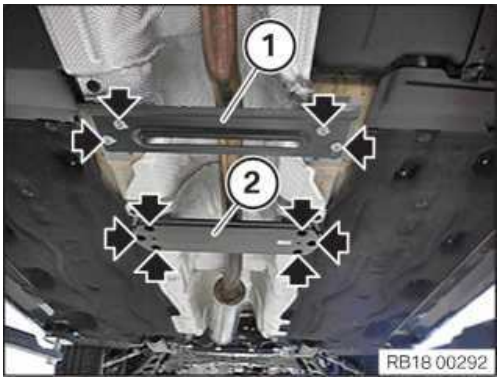
- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and remove the front axle.

TECHNICAL INFORMATION

Note the information on thread repairs using Helicoil thread inserts.
For more information see: 41 00 ... Notes on repairing threads

- Check threads for damage; if necessary, repair with Helicoil thread inserts.

32 – Removing the connecting support from the tunnel in front and back



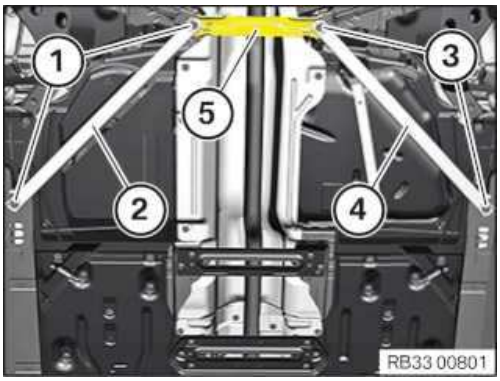
- Unscrew the bolts (arrows) from the connecting support (1).
- Feed out and remove the crossbeam (1).
- Unscrew the bolts (arrows) from the connecting support (2).
- Feed out and remove the crossbeam (2).

33 – Remove the cross strut with the torsion strut

TECHNICAL INFORMATION

Driving without a torsion strut is not permitted.

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- Loosen screws (1).
- Thread out torsion strut (2) at left and remove.
- Loosen screws (3).
- Thread out torsion strut (4) at right and remove.
- Feed out and remove the cross-member (5).

34 – Remove exhaust system

WARNING

Hot surfaces.

Risk of burning!

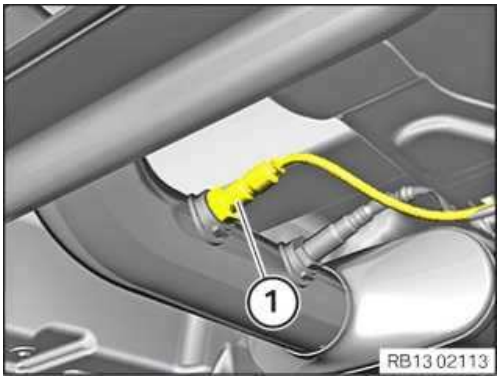
- Perform all work only on components that have cooled down.

CAUTION

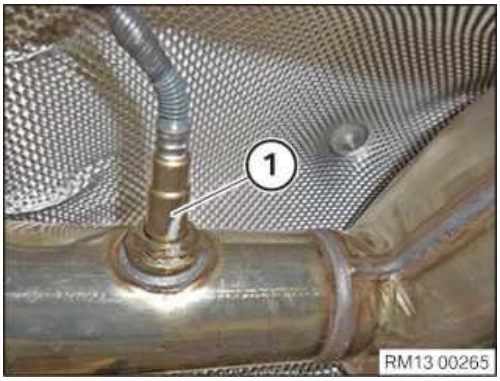
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

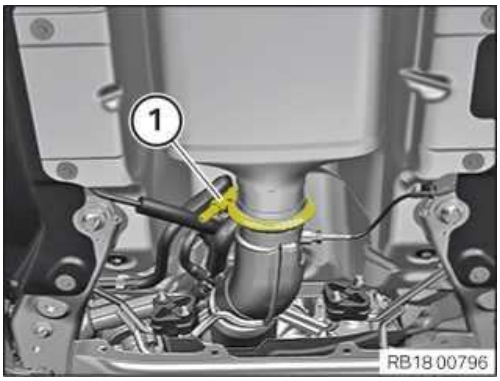


- Release the nitrogen oxide sensor (1) downstream of the SCR catalytic converter, guide it out and set it aside.

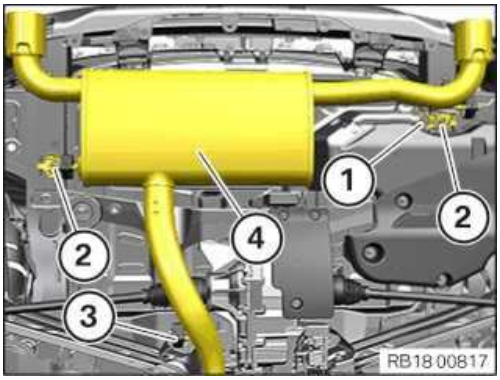


- Release the diesel particulate sensor (1), guide it out and set it aside.

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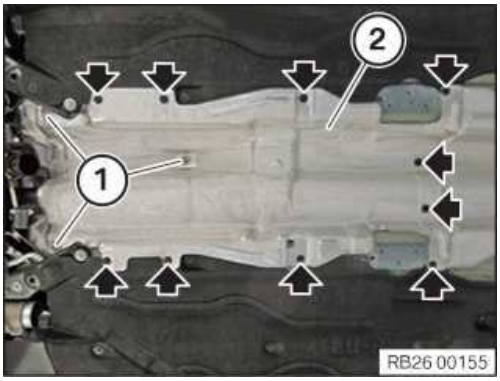


- Loosen V-band clamp (1).



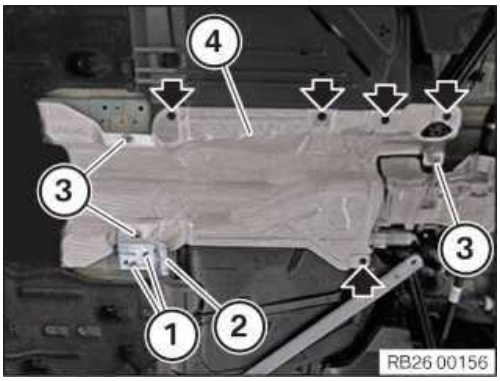
- Loosen screw (1).
- Loosen nuts (2).
- Release the rubber mount (3) of the exhaust system (4).
- Lower and guide out the exhaust system (4) with assistance of a second person and remove it.

35 – Remove front heat shield



- Remove screws (arrows).
- Loosen nuts (1).
- Guide the heat shield (2) out and remove it.

36 – Remove heat shield at rear.



- Loosen screws (1).
- Guide out and remove holder (2).
- Remove screws (arrows).
- Loosen nuts (3).
- Guide the heat shield (4) out and remove it.

37 – Remove propeller shaft

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CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

RISK OF DAMAGE

Damage to propeller shaft during removal.

Non-observance of the removal guidelines for the propeller shaft on the rear axle differential may cause severe damage.

- Do not disassemble the three-hole flange, flexible disc and propeller shaft. The three-hole flange to the rear axle differential is balanced with the flexible disc and propeller shaft.
- Loosen the recessed nut against the direction of travel in clockwise direction. The propeller shaft must be loosened on the recessed nut only and exclusively in the direction of rotation otherwise the anti-twist lock of the bi-hexagonal flange nut is damaged.
- In the event of a damaged anti-twist lock on the bi-hexagonal flange nut: Replace the rear axle differential.



- Install the special too l between the front and rear propeller shaft.
- Make sure that the arrows on the special tool point forward in the direction of travel.

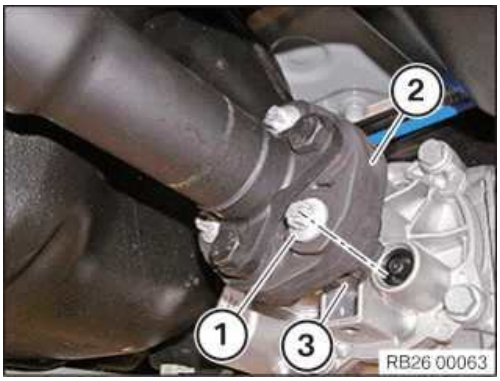


- Always support the propeller shaft (1) with a conventional jack.



- Protect the propeller shaft (1) with the special tools **0 495 554 (33 5 070)** and from twisting.

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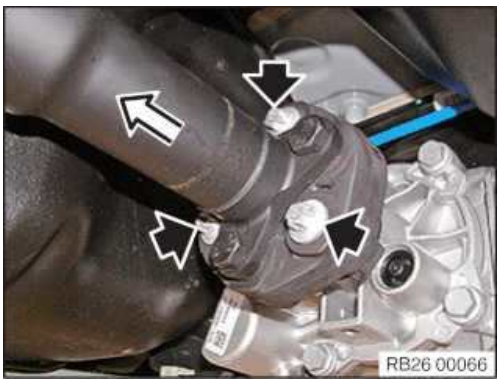
TECHNICAL INFORMATION

Compliance with the following instructions is required to avoid a humming noise from the propeller shaft after refitting the propeller shaft.

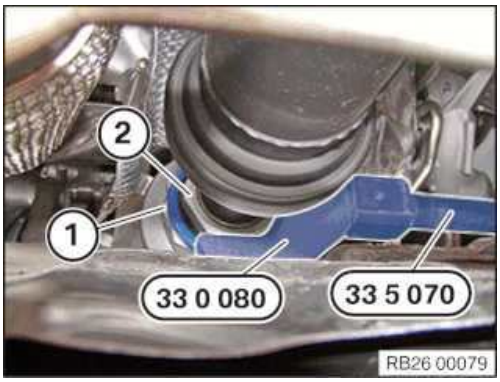
- Mark the installation position of the screw connection (1), the flexible disc (2) and the three-hole flange (3) on the same level.
- Loosen the screw connection (1).



- Loosen screws (1).



- Remove screws (arrows).
- Guide the propeller shaft out in the direction of the arrow and set it aside.



RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.

- Protect the recessed nut (2) on the transfer box from twisting with the special tools **0 495 554 (33 5 070)** and .

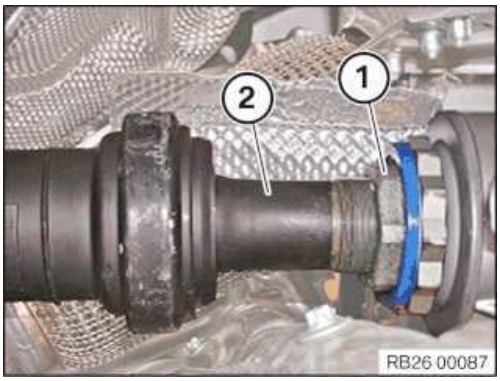
  The recessed nut (2) on the transfer box must **not** be used to detach the propeller shaft.

  The double hexagon flange nut (1) must **not** be used for counter support.

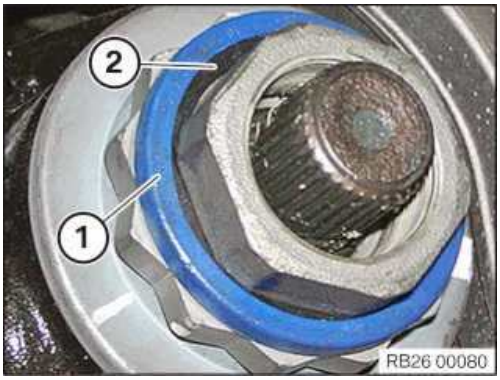


- Release the front propeller shaft with the special tools **0 495 554 (33 5 070)** and in the direction of the arrow.

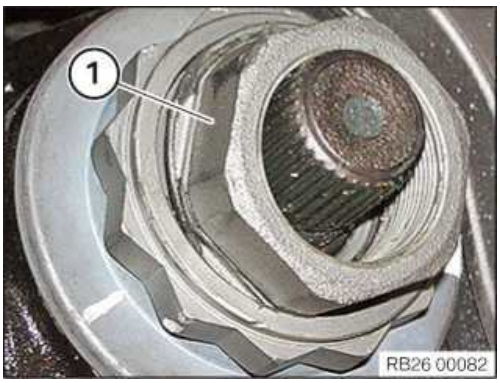
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- Thread the propeller shaft (2) out of the recessed nut (1) and remove.



- Thread the retaining clip (1) and the seal (2) out and remove.



- Thread out and remove the recessed nut (1).

38 – Removing starter motor

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and loosen connector (1).
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).



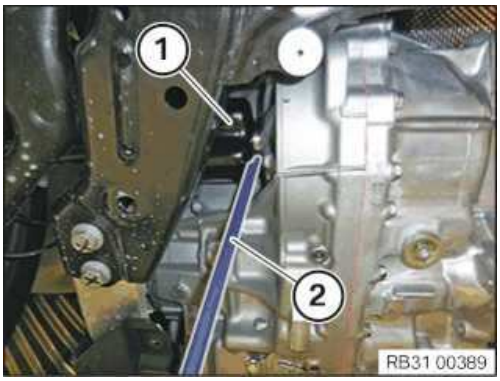
- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.



- Loosen screws (1).
- Feed out starter motor and remove.

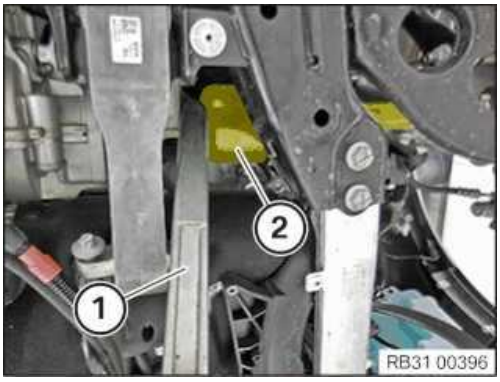
39 – Partially removing the left output shaft

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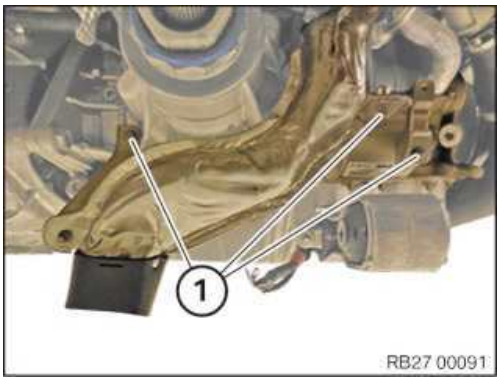
- Protect the output shaft (1) from falling.
- Lever out the output shaft (1) with a mounting lever (2) from the transmission.
- Tie up output shaft (1).

40 – Partially removing right output shaft

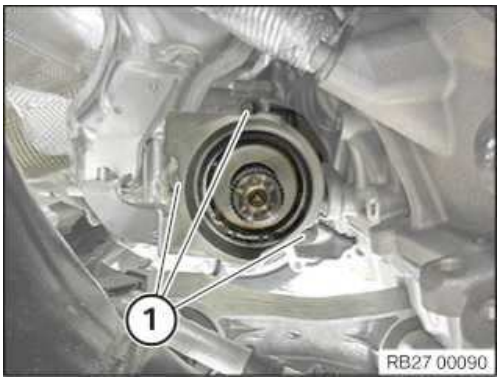


- Lever out the output shaft (2) with a mounting lever (1).
- Tie up output shaft (1).

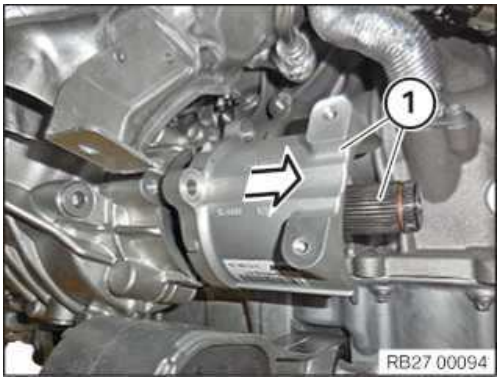
41 – Remove the intermediate shaft with the support tube



- With air duct installation: Loosen screws (1).
- Remove air duct



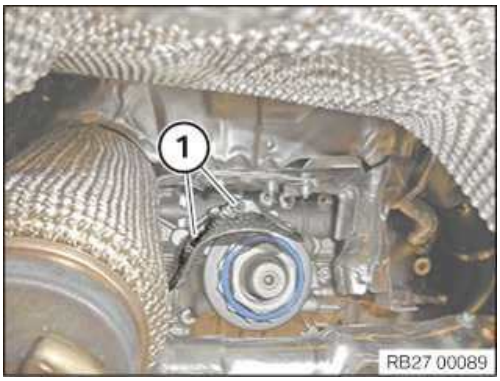
- Loosen screws (1).



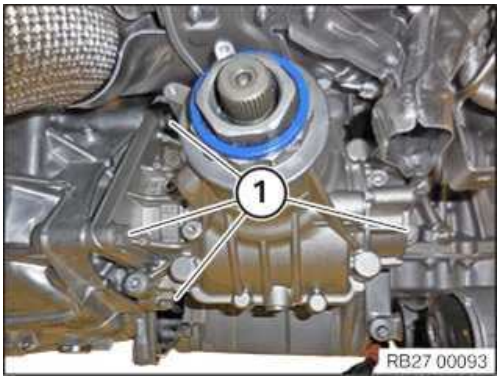
- Pull the intermediate shaft with the support tube (1) out of the transfer box.

42 – Remove transfer box (VTG)

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- Loosen screws (1).
- Remove heat shield.



- Loosen screws (1).
- Remove the transfer box (VTG).

43 – Remove the monitoring oxygen sensor

WARNING

Hot surfaces.

Risk of burning!

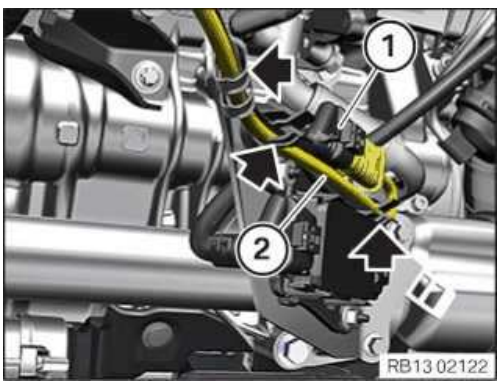
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

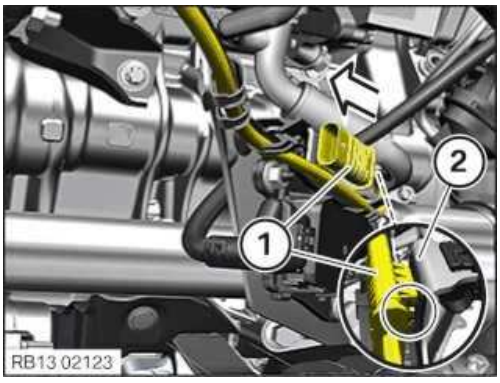
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

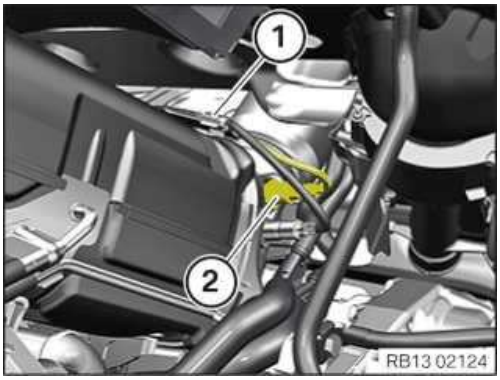


- Unlock plug connection (1) and disconnect.
- Feed oxygen monitor sensor cable (1) out of the clamps (arrows).

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- Unlock the connector (1) in the marked area and disconnect it from the holder (2) in the direction of arrow.



- Guide the cable of the monitoring oxygen sensor (2) out of the clamp (1).
- Release the monitoring oxygen sensor (2) using special tool **0 491 074 (11 7 020)**.
- Remove the monitoring oxygen sensor (2).

44 – Removing the nitrogen oxide sensor before SCR catalytic converter

WARNING

Hot surfaces.

Risk of burning!

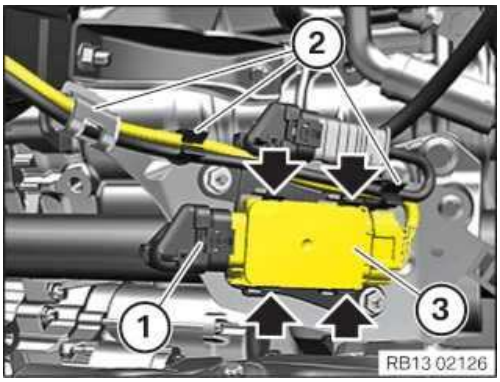
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

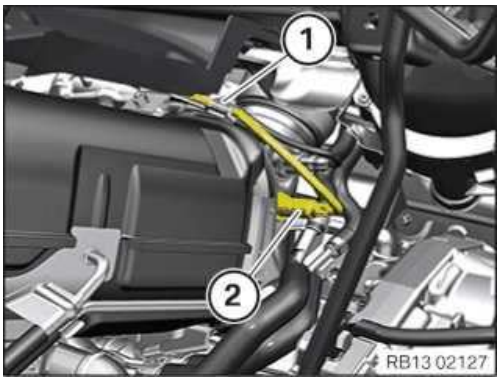
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- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



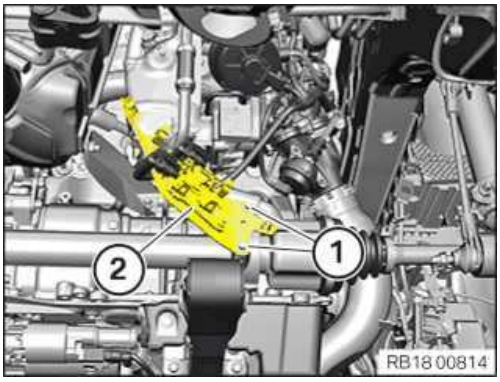
- Unlock plug connection (1) and disconnect.
- Slide the cable of the nitrogen oxide sensor evaluation electronics (3) out of the clamps (2) and remove.
- Unlock (arrows) and remove the evaluation electronics for the nitrogen oxide sensor (3).

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- Slide the cable of the nitrogen oxide sensor before the SCR catalytic converter (2) out of the clamps (1) and remove.
- Detach the nitrogen oxide sensor before the SCR catalytic converter (2) using the special tool **0 491 074 (11 7 020)**.
- Guide out and remove the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

45 – Remove holder for oxygen sensor



- Loosen screws (1).
- Thread out the holder (2) for the oxygen sensor and remove.

46 – Remove the exhaust temperature sensor on the catalytic converter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

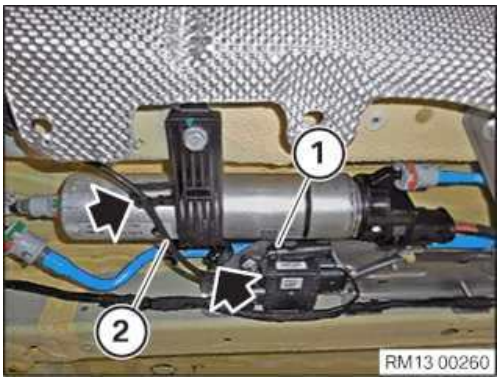
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

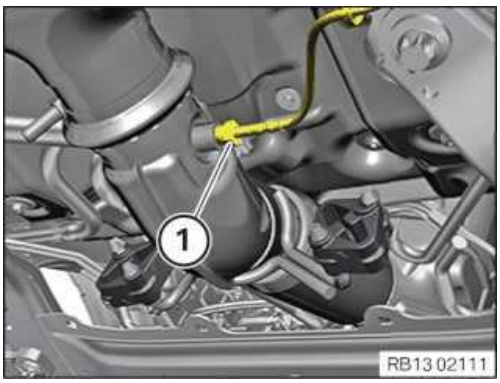
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- Unlock and loosen connector (1).
- Feed out the cable (2) of the exhaust temperature sensor from the clamps (arrows) and remove.



- Loosen the cable clip (1).



- Loosen exhaust temperature sensor (1).
- Feed out and remove exhaust temperature sensor (1).

47 – Removing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

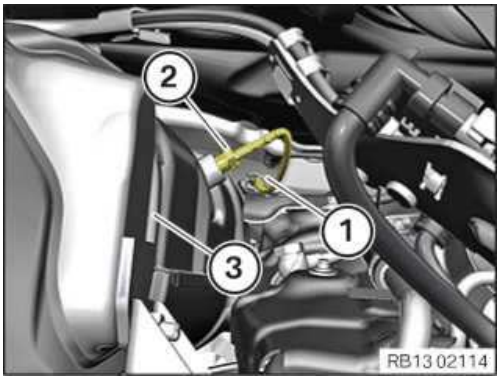
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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- Unlock and loosen connector (1).
- Uncover the exhaust temperature sensor cable.



- Guide the exhaust temperature sensor cable (2) out of the clamp (1) and place it to one side.
- Release the exhaust temperature sensor (2) with conventional tools .
- Feed out and remove the exhaust temperature sensor (2) from the diesel particulate filter (3).

48 – Remove the exhaust temperature sensor on the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

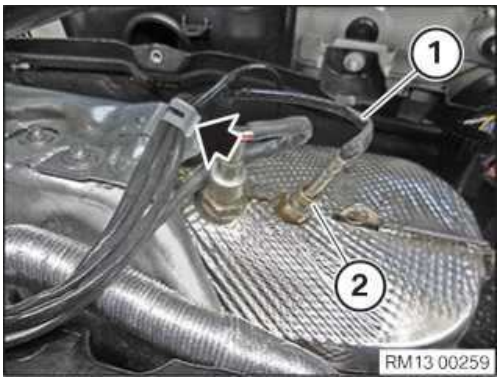
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect connector (1).
- Put the cable of the exhaust temperature sensor to one side.

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- Guide cable (1) of the exhaust temperature sensor out of the clamp (arrow) and remove it.
- Loosen exhaust temperature sensor (2).
- Feed out and remove exhaust temperature sensor (2).

49 – Remove the control sensor

WARNING

Hot surfaces.

Risk of burning!

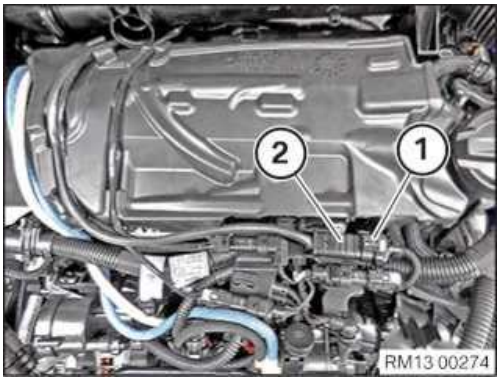
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

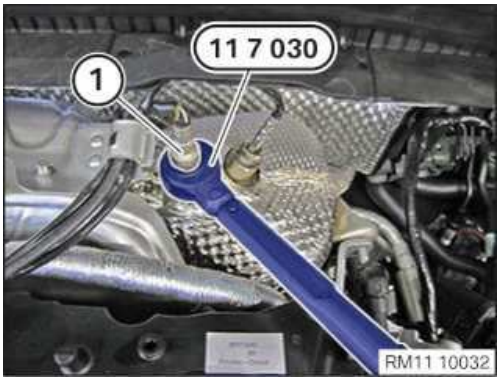
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock plug connection (1) and disconnect.
- Detach the connector (2) from the holder .
- Release the front oxygen sensor cable.



- Detach the control sensor (1) with the special tool .
- Feed out and remove the control sensor (1).

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50 – Removing the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

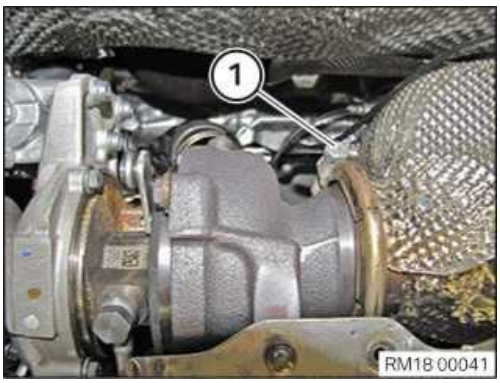
- Perform all work only on components that have cooled down.

CAUTION

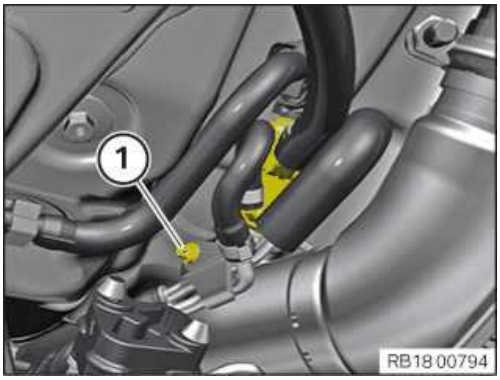
Heavy component.

Heavy components can lead to injury or damage.

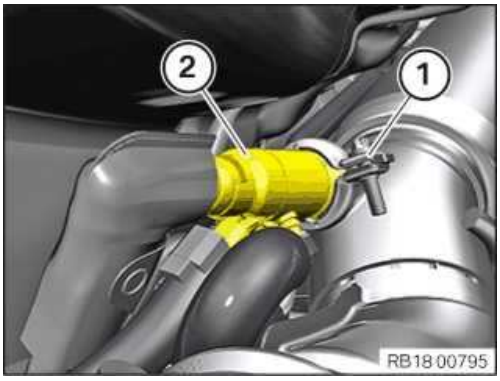
- Remove and install heavy components with the aid of another person/other persons.



- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.

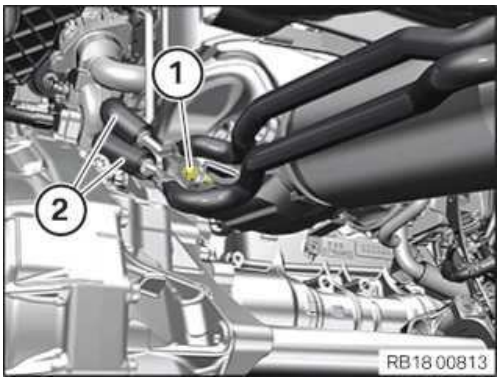


- Loosen screw (1).



- Loosen V-band clamp (1).
- Remove the SCR metering module (2) and set it aside.

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- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.

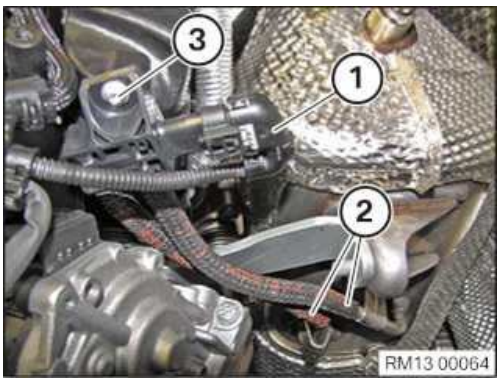
▶ **Remove differential pressure sensor**

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

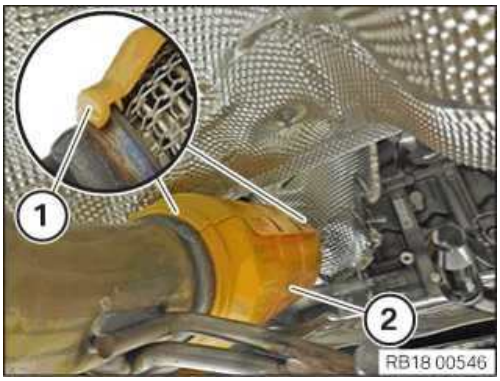


- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

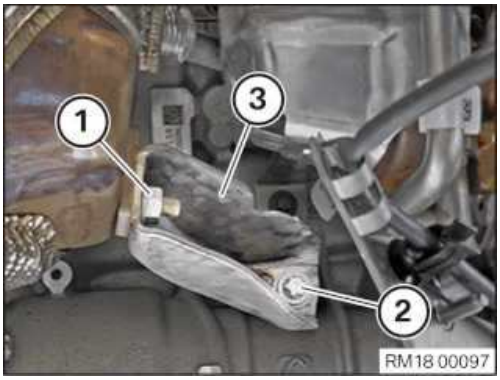


- Loosen nuts (1).

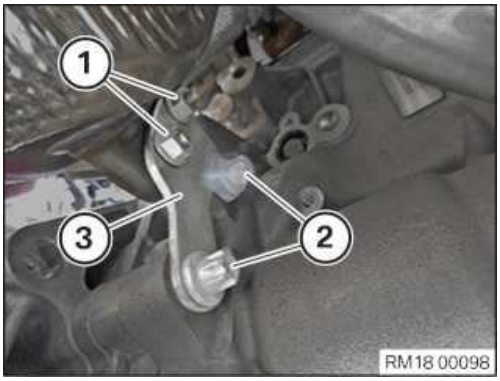
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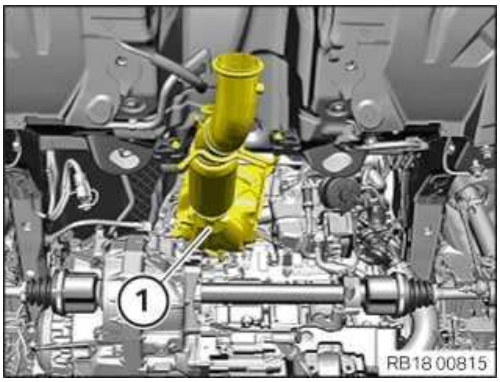
- Mount fitting aid (2).
- Make sure that the fitting aid is correctly position on the edges (1) of the flexible tube.



- Unfasten nut (1).
- Loosen screw (2).
- Remove holder (3).



- Loosen nuts (1).
- Loosen screws (2).
- Remove holder (3).

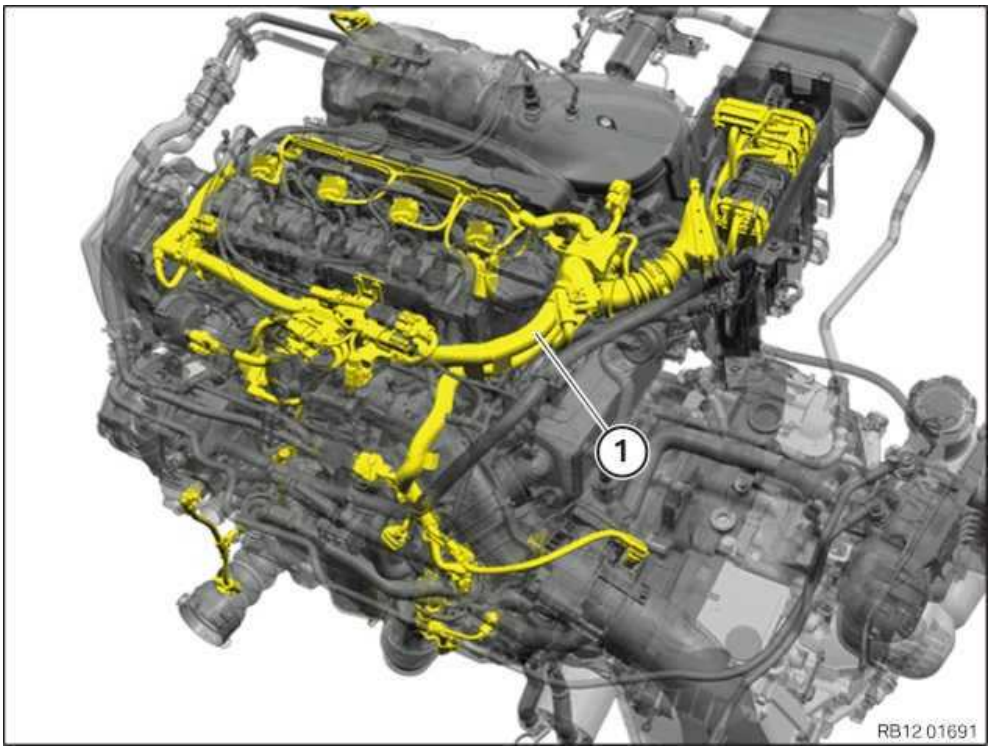


- Feed out diesel particulate filter (1) toward the bottom and remove.

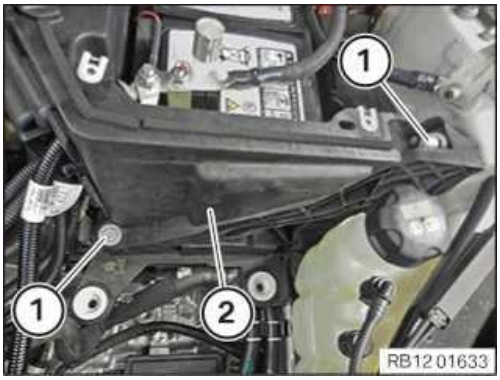
51 – Releasing the wiring harness section for the intake plenum

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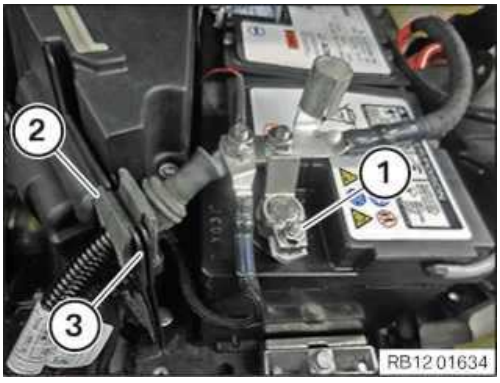
Overview: Wiring harness section for the engine



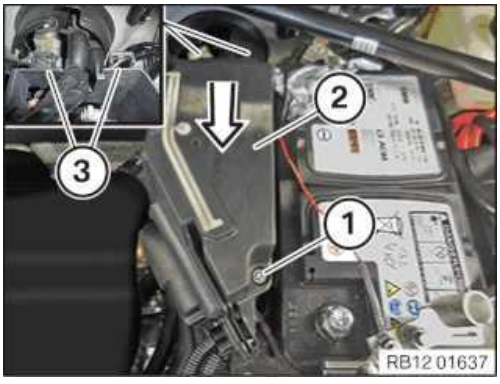
1 Wiring harness section for the engine



- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.

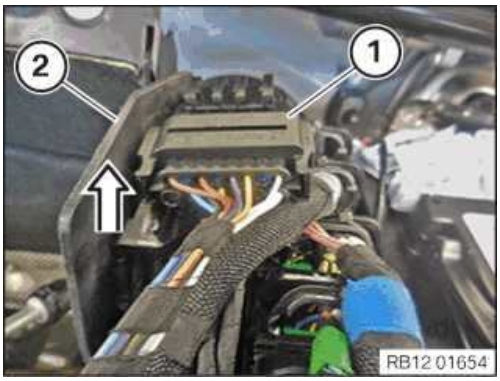


- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

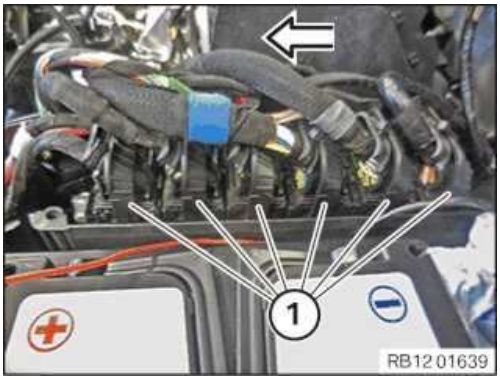


- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.

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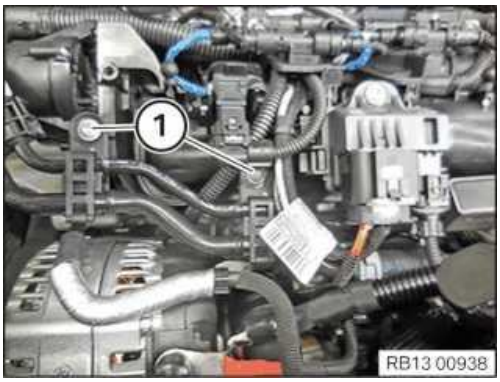
- Guide the connector (1)out of the electronics box (2) in the direction of arrow and remove it.
- Unlock and loosen connector (1).



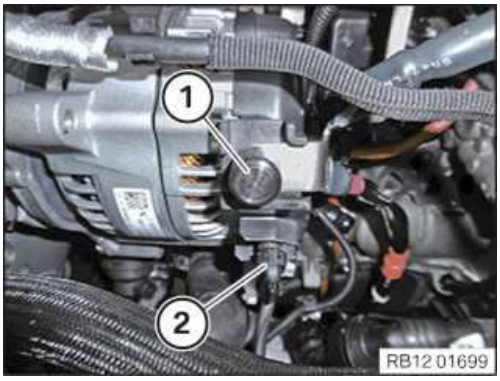
- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



- Unlock and loosen connector (1).

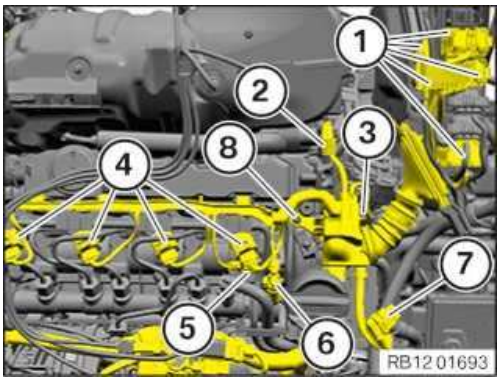


- Loosen screws (1).

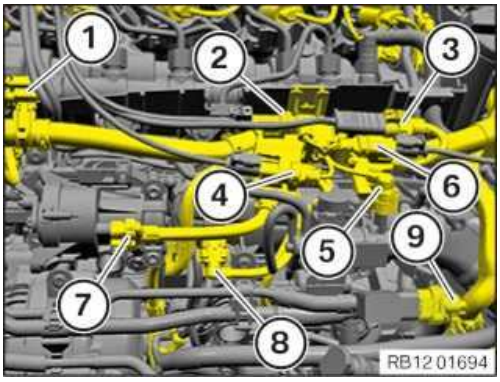


- Release the positive battery cable (1) on the alternator and place to one side.
- Unlock connector (2) and pull off.

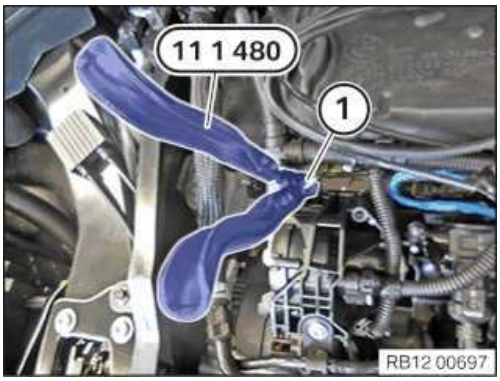
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- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock the connector (2) and disconnect it from the differential pressure sensor.
- Unlock the connector (3) and disconnect it from the exhaust-gas recirculation valve.
- Unlock the connector (4) and pull off from the injectors.
- Unlock the connector (5) and disconnect it from the camshaft sensor.
- Unlock the connector (6) and disconnect it from the fuel pressure regulator.
- Unlock connector (7) and pull off from hot film air mass meter.
- Loosen screw (8).

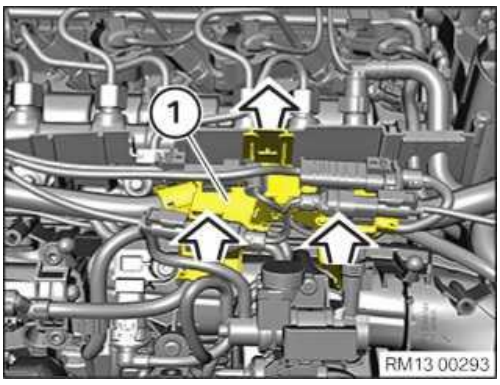


- Unlock connector (1) and pull off from the rail pressure sensor.
- Unlock the connector (2) and disconnect it from the exhaust temperature sensor before the diesel particulate filter.
- Unlock and disconnect the connector (3) from the front oxygen sensor.
- Unlock the connector (4) and disconnect it from the exhaust temperature sensor after the diesel particulate filter.
- Unlock and disconnect the connector (5) from the electric changeover valve.
- Unlock the connector (6) and disconnect it from the exhaust temperature sensor for the exhaust-gas recirculation cooler.
- Unlock the connector (7) and disconnect it from the servomotor for the swirl flaps.
- Unlock the connector (8) and pull it off the charging pressure sensor.
- Unlock the connector (9) and disconnect from the fuel pressure and temperature sensor.



- Unlock the connectors (1) of all glow elements with the special tool **0 490 796 (11 1 480)** and release them.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.

▶ **Removing the cable clips from the intake plenum**



- Detach the cable clip (1) in the direction of the arrow.
- Guide out the cable clip (1) in direction of arrow and set it aside.

52 – Removing the intake plenum

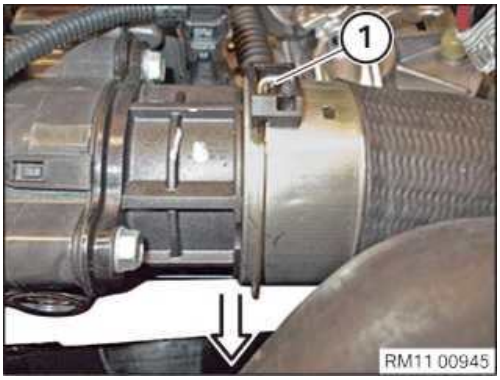
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TECHNICAL INFORMATION

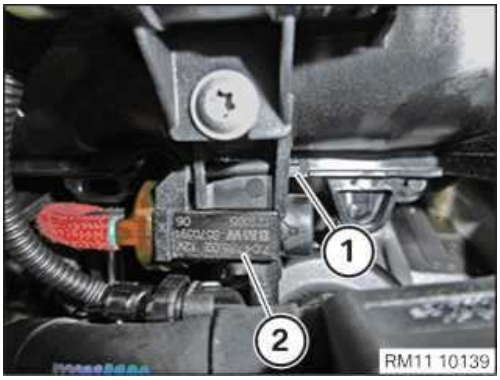
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



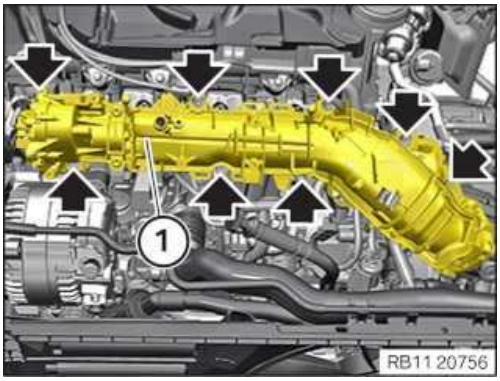
- Unlock the lock (1).



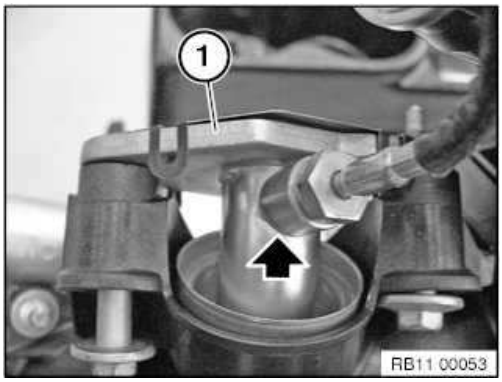
- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.



- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



- Release the screws (arrows) from the intake plenum (1).
- Guide the intake plenum (1) out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

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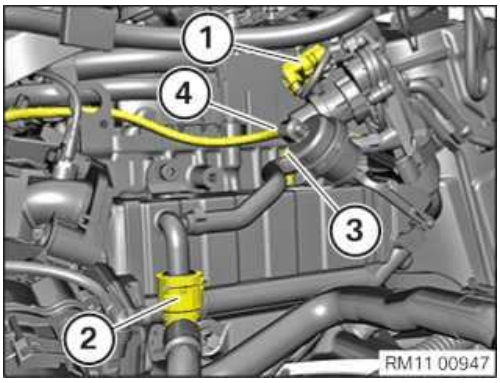
53 – Removing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

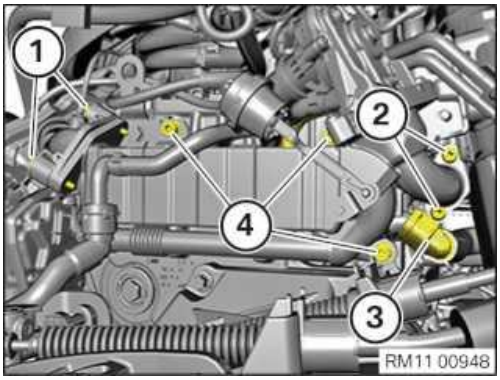
- Perform all work only on components that have cooled down.



TECHNICAL INFORMATION

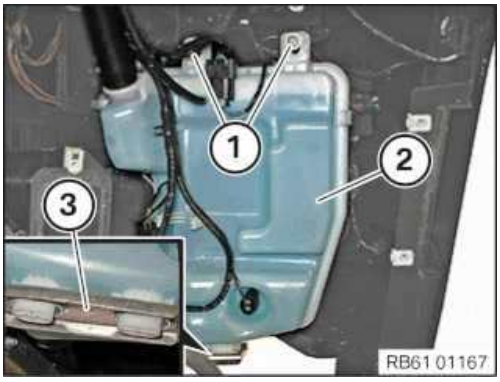
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.

54 – Remove the washer fluid reservoir from the fixture



- Loosen screws (1).
- Guide the washer fluid reservoir (2) up and out of the fixture (3) and set it aside.

55 – Removing the right charge air duct between the exhaust turbocharger and the charge air cooler

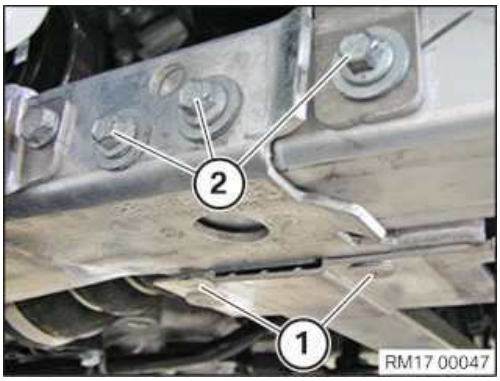
WARNING

Hot surfaces.

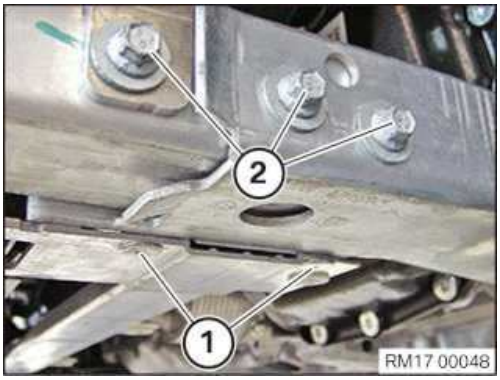
Risk of burning!

- Perform all work only on components that have cooled down.

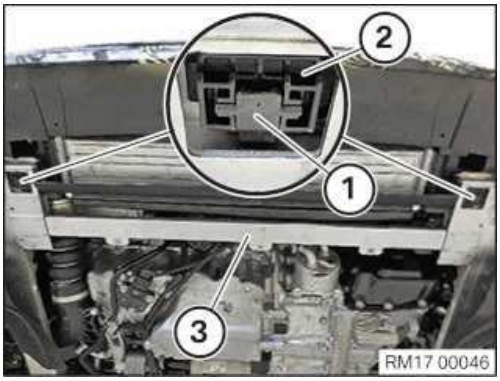
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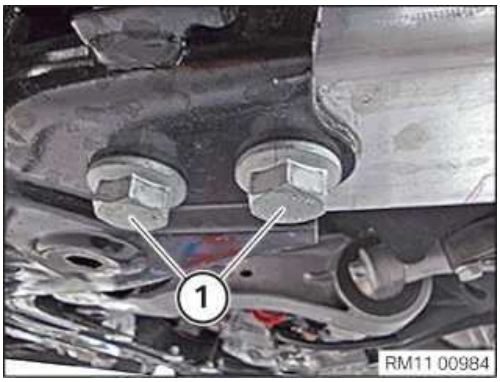
- Undo screws (2) at front left.
- Drill out blind rivets (1) at front left.



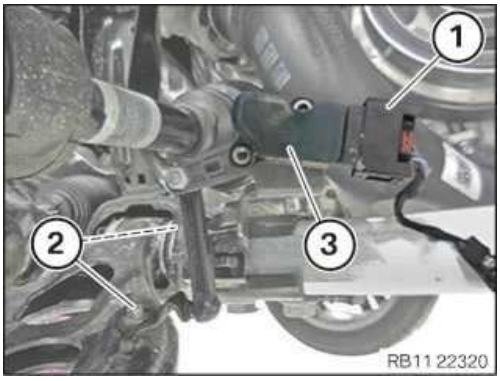
- Undo screws (2) at front right.
- Drill out blind rivets (1) at front right.



- Unlock locking pins (1).
- Thread out and remove locks (2).
- Thread out and remove cross connection (3).

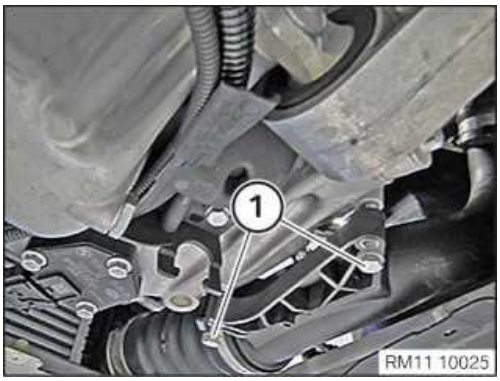


- Release the screws (1) on the right front axle support.

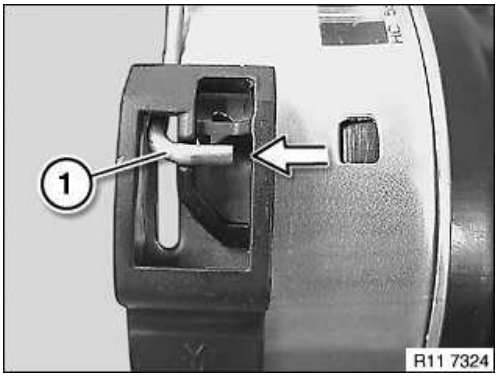


- **If installed:**
- Unlock and release plug connection (1).
- Loosen screws (2).
- Feed out the ride height sensor (3) and remove.

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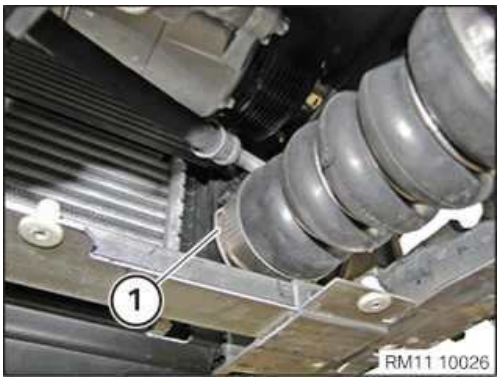


- Release screws (1) of charge air duct on right oil sump.

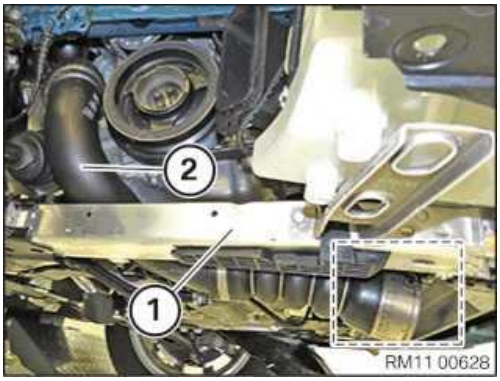


- Unlock lock (1).

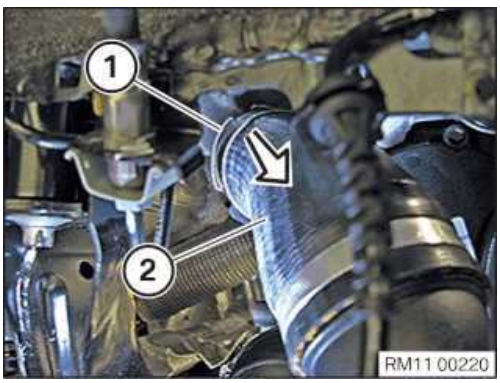
  The lock (1) must engage in the bracket during unlocking (arrow).



- Unlock and release the charge air duct (1) on the charge air cooler.



- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed out the charge air duct (2) in the **marked** area towards the bottom and set it aside.



- Unlock and detach the locks (1) on both sides.
- Feed out the charge air duct (2) on the exhaust turbocharger in the direction of the arrow and set it aside.

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- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed out the charge air duct (1) in the direction of arrow between the side member and the deformation element and remove.

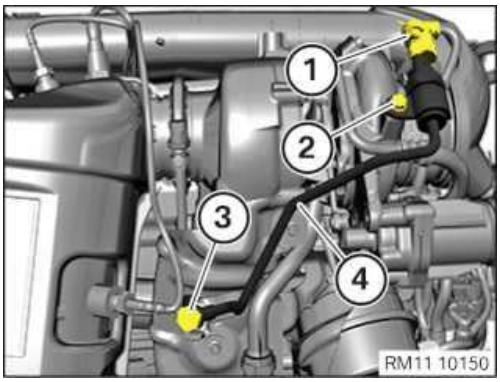
56 – Remove the heat shield from the exhaust turbocharger at the bottom

WARNING

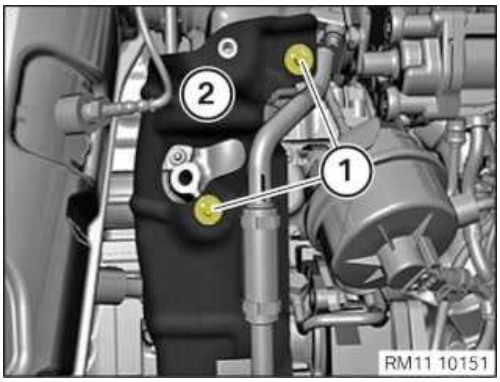
Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Unlock and disconnect connector (1).
- Unscrew the banjo bolt (3).
- The seals of the banjo bolt (3) must be renewed.
- Loosen screw (2).
- Remove the exhaust gas pressure pipe (4).



- Unscrew the bolts (1) on the heat shield .
- Feed out and remove the heat shield (2).

57 – Removing the low-pressure stage turbocharger

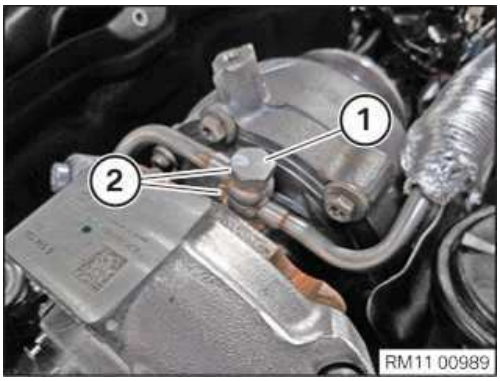
WARNING

Hot surfaces.

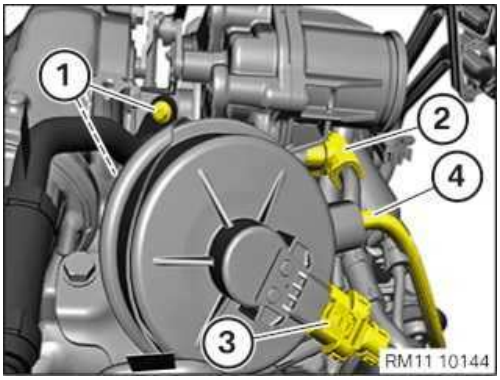
Risk of burning!

- Perform all work only on components that have cooled down.

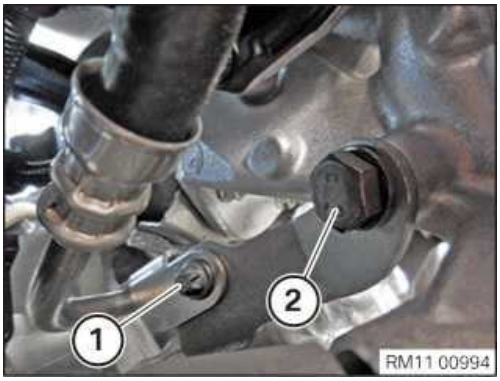
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- Release the banjo bolt (1) of the oil feed lines.
- Remove sealing rings (2).
- Place oil feed lines to one side.



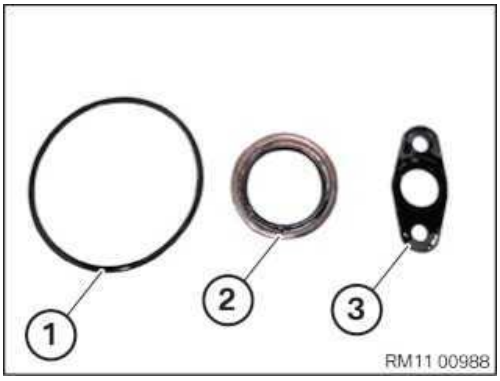
- Release the screws (1) of the oil return line.
- Unlock and disconnect the plug connections (2) and (3).
- Pull off the vacuum hose (4) carefully.



- Undo the bolt (1) of the oil feed line.
- Loosen screw (2).

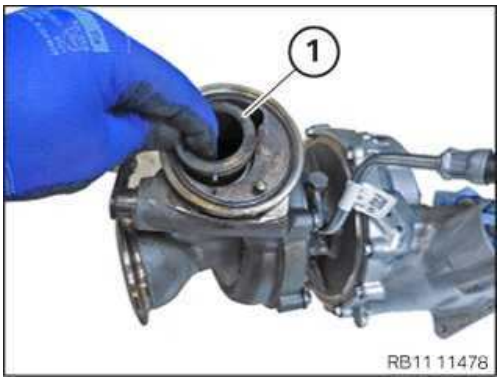


- Loosen screw (1).
- Remove the V hose clamp.
- Guide the low-pressure stage turbocharger out towards the top and remove.



- Remove seals (1), (2) and (3).

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- Remove the spacer ring (1).

58 – Removing the high-pressure stage exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

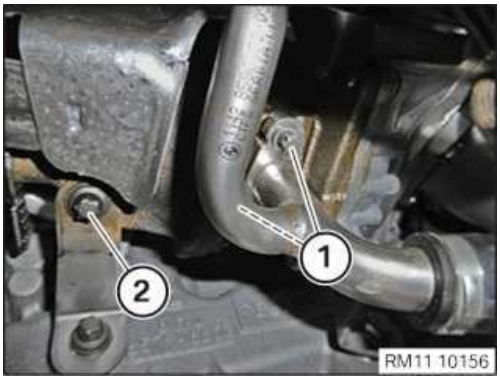
- Perform all work only on components that have cooled down.

CAUTION

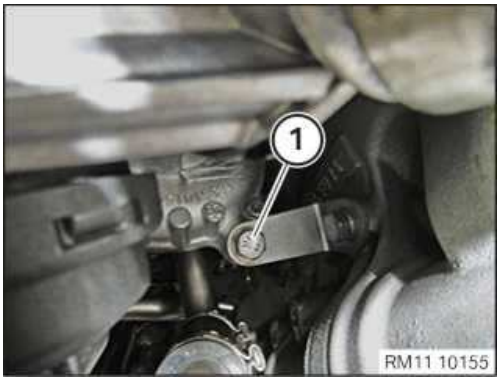
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

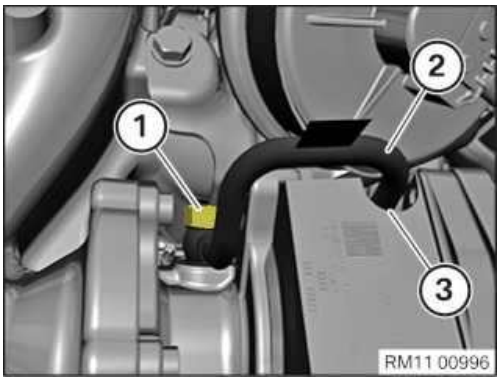


- Unscrew the bolts (1) on the oil return line .
- Loosen screw (2).

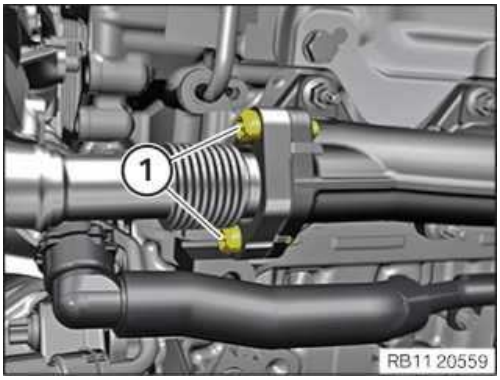


- Release screw (1) from the right wheel arch.

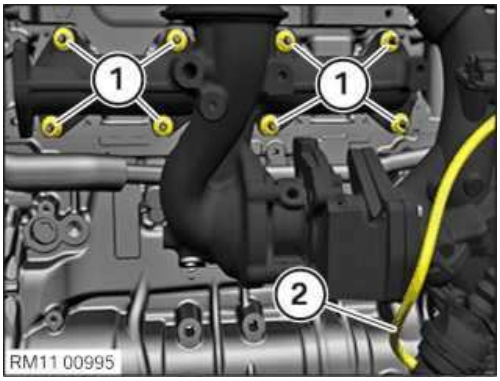
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- Unscrew the banjo bolt (1).
- Guide out oil feed line (2) from holder (3).



- Loosen screws (1).



- Pull off the vacuum hose (2).
- Loosen nuts (1).
- Guide out the exhaust manifold and the high-pressure stage exhaust turbocharger to the top and remove them.

59 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

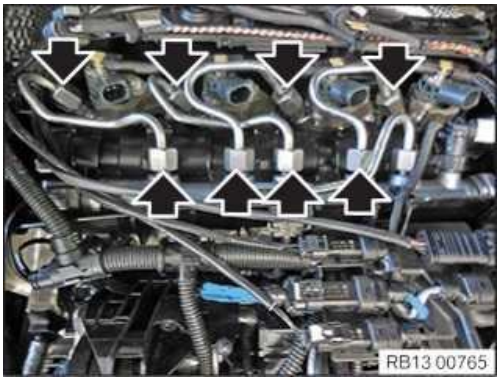
If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release the high pressure lines (arrows) with the special tool .
- Catch and dispose of escaping fuel.
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool .

60 – Remove leakage oil lines

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

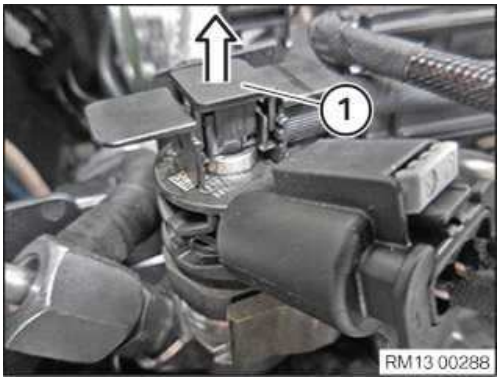
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

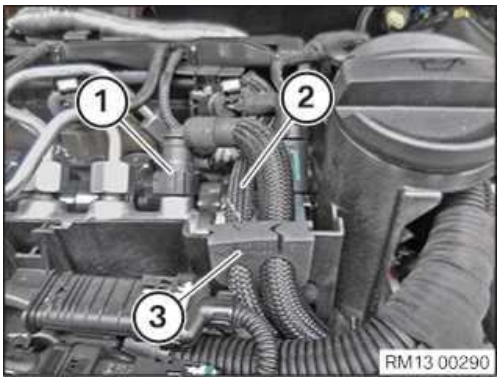


- Unlock the connectors (arrows) and disconnect.

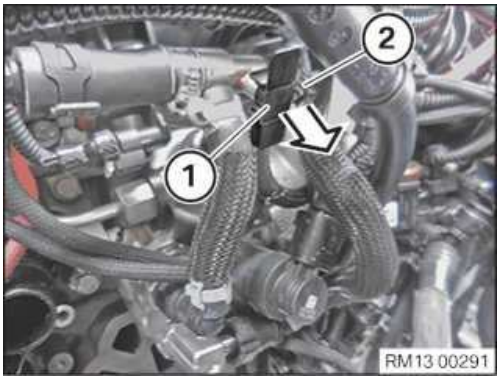


- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

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- Unlock and loosen fuel line (1) and set it aside.
- Guide the leakage oil line (2) out of the rubber grommet (3) and set it aside.



- Release lock (1) in direction of arrow.
- Feed out leakage oil line (2) and remove.

61 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

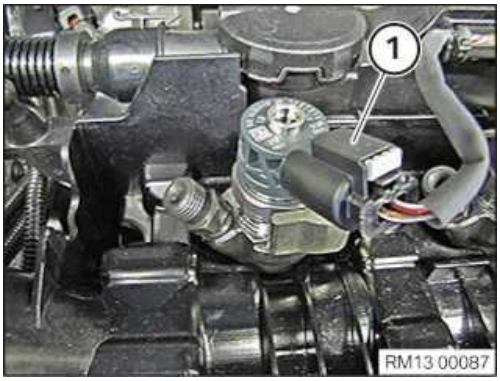
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

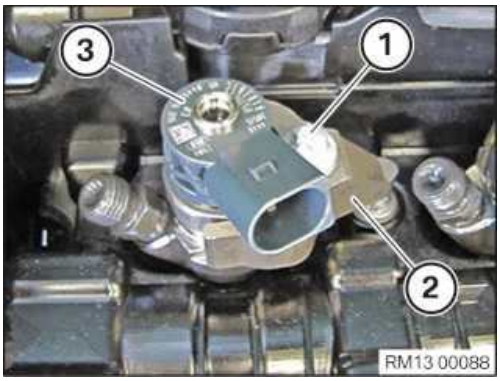
TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.



- Unlock and disconnect connector (1).

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- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

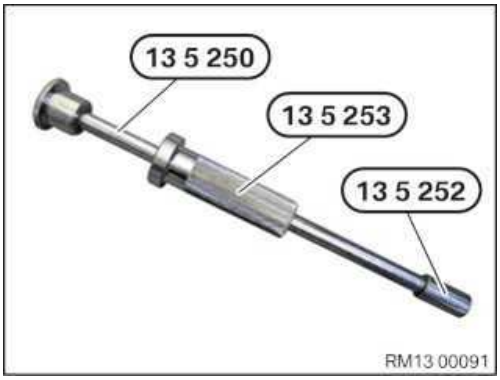
▶ **Loosen stuck injectors**

RISK OF DAMAGE

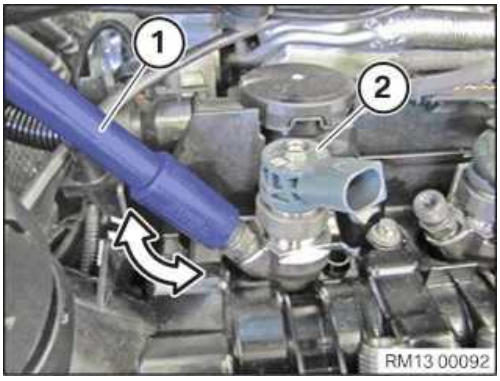
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)** back onto the special tool **0 493 321 (13 5 250)**.

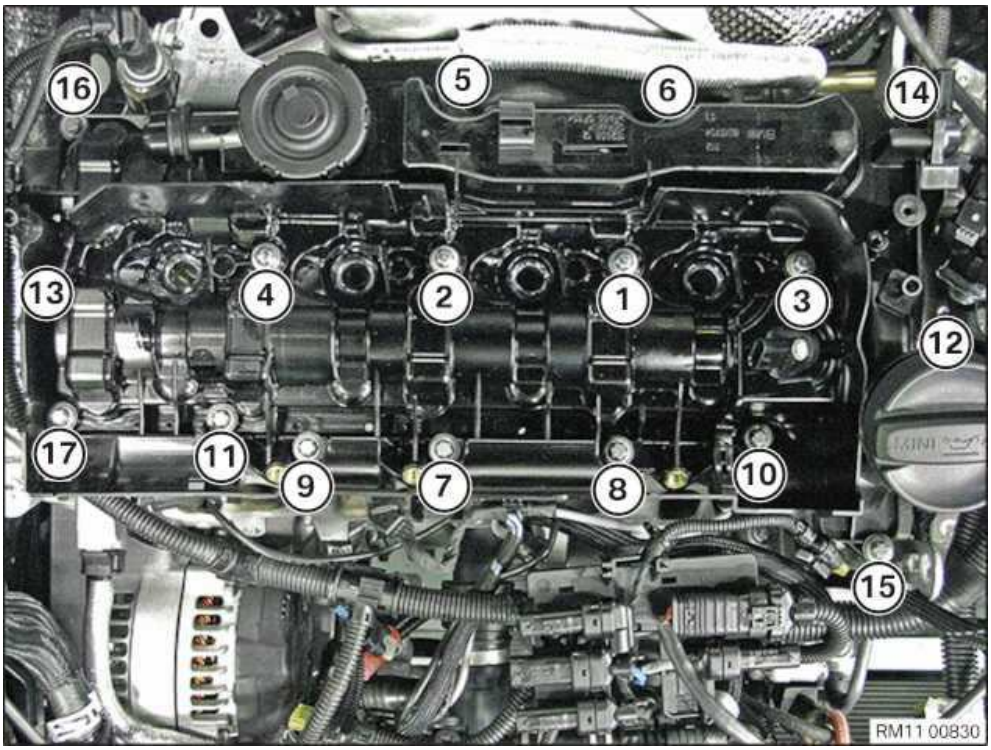


- Screw the special tool (1) **0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1) **0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

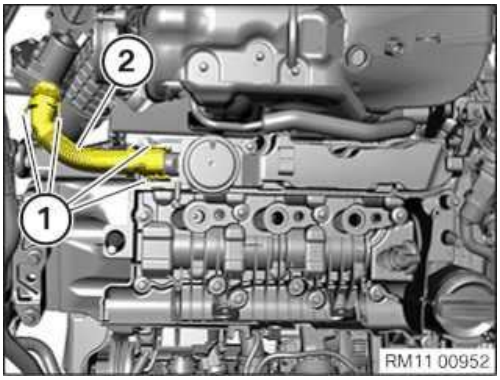
62 – Removing the cylinder head cover

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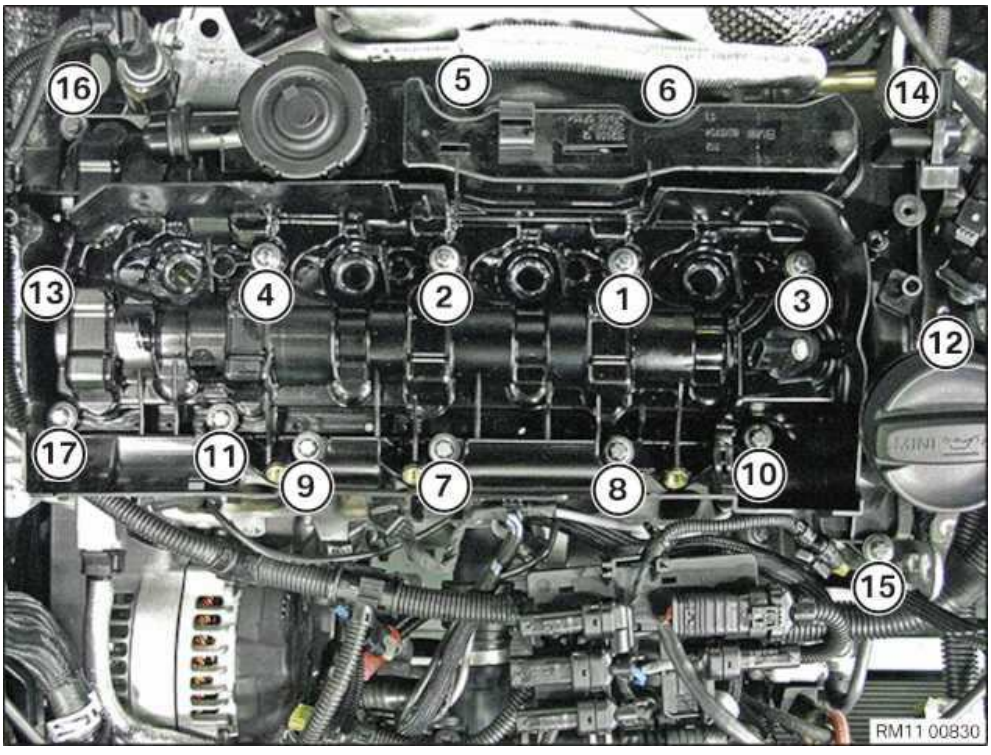
Overview: Screw connection of the cylinder head cover



1 to 16 screws of the cylinder head cover.



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).



- Loosen screws in the order (17) to (1).
- Remove cylinder head cover by lifting it out.

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- Remove protective cap (1) from oil sump.

- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

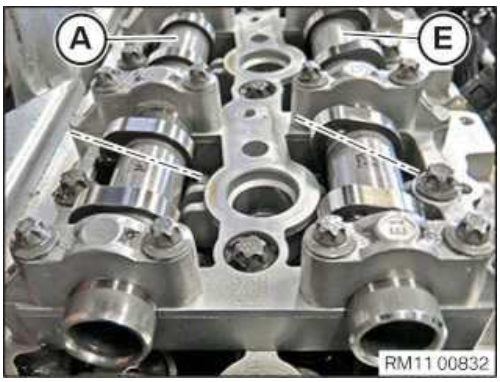
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

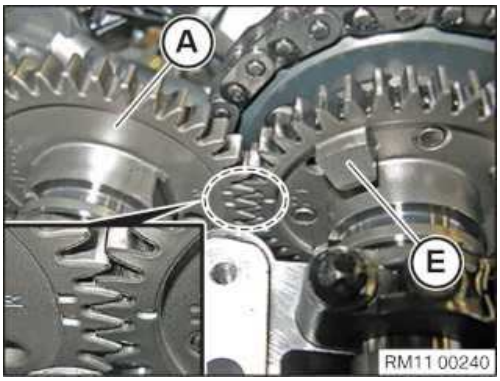


- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.

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- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.



- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

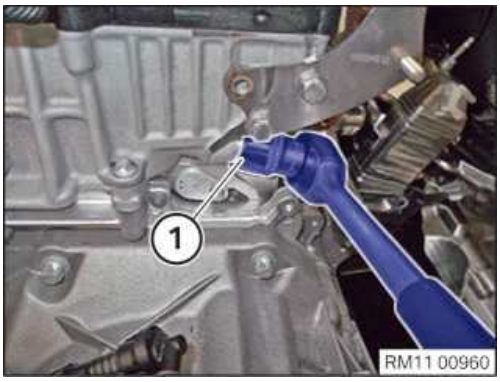
64 – Remove chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



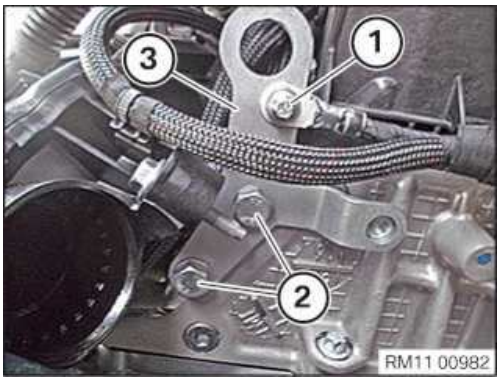
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

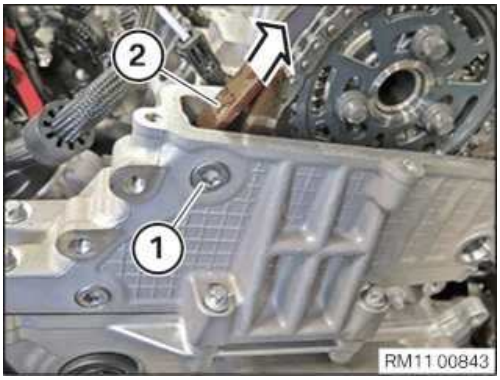
- Remove the chain tensioner piston (1).

65 – Remove the timing chain guide rail

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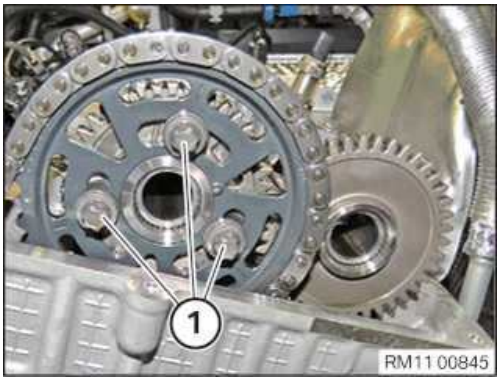


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



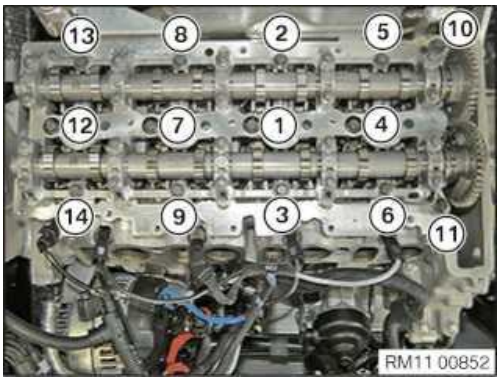
- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

66 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

67 – Removing the camshaft support



- Evenly loosen all screws in a sequence from (14) to (1).
- Loosen and remove all screws in a sequence from (14) to (1).
  Both camshafts can be removed with the camshaft carrier.
- Remove the camshaft support including camshafts towards the top.

68 – Remove roller cam followers

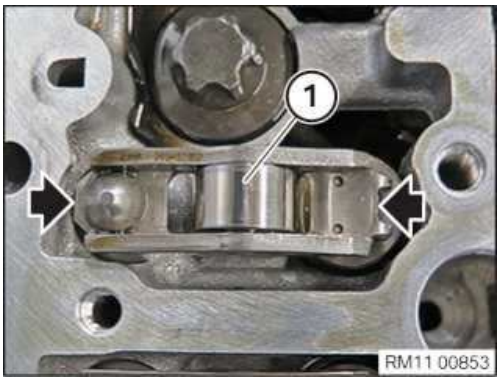
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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RISK OF DAMAGE

Damage to the engine.

If the classification of the roller cam followers is ignored, this can lead to engine damage.

- Observe the classification of the roller cam followers.
- Always reuse used roller cam followers at the same position.

- Remove the roller cam follower (1) and place it onto the special tool **0 495 105 (11 4 480)**.
- Repeat the process for all roller cam followers.

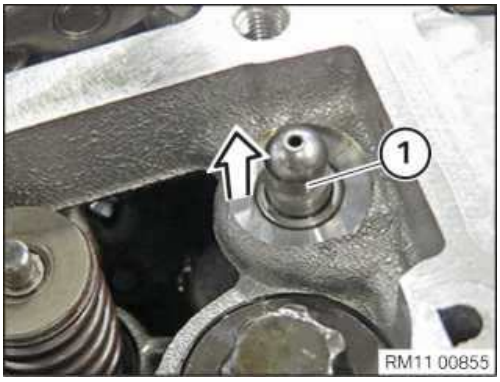
69 – Removing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Remove the hydraulic valve clearance compensating element (1) in the direction of the arrow and place on the special tool **0 495 105 (11 4 480)**.
- Repeat the process on all hydraulic valve clearance compensating elements.

70 – Removing glow elements

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Damage to the glow elements.

Excessive force may damage the glow elements and they may then have to be renewed.

- Handle glow elements with care and do not drop.
- Do not rest the cylinder head on glow elements. Glow elements protrude from the sealing surface of the cylinder head.

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RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect plug connection (1) using special tool **0 490 796 (11 1 480)**.



- Release the glow elements with the special tool or conventional tools.
- Feed out preheating elements and remove.

71 – Remove cylinder head.

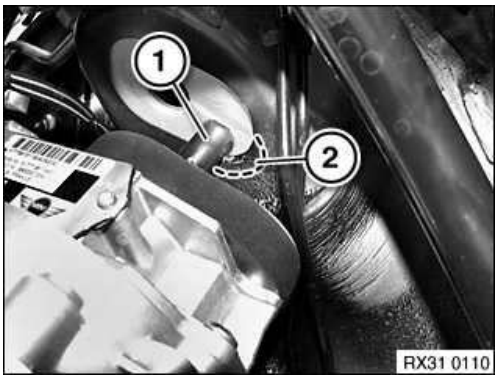
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CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

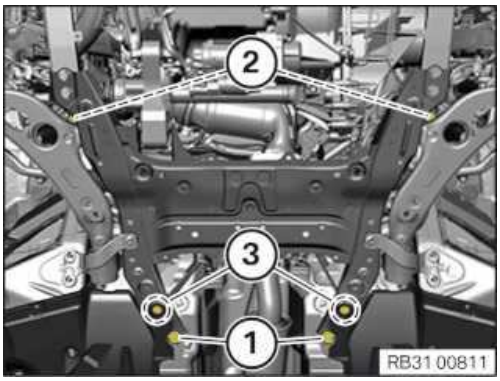


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- Position front axle support.
- Bend the underbody panelling to the side in area (3).
- Raise front axle support.
- When raising, insert the charge air cooler into its rubber mount on the transmission cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

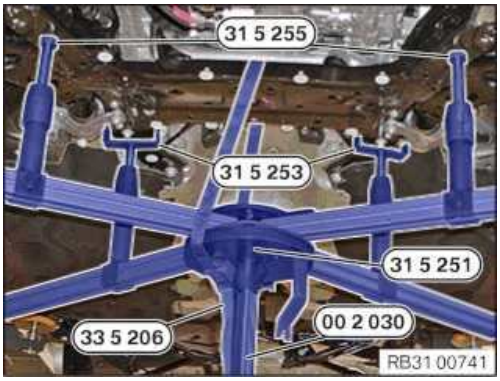
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

- If applicable, tighten the screws in area (3).

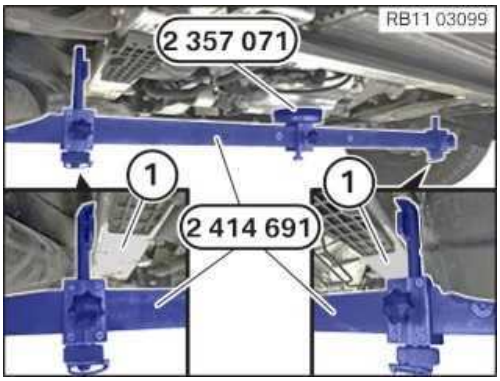
Underbody protection to body

Screw		Tightening torque	3 Nm

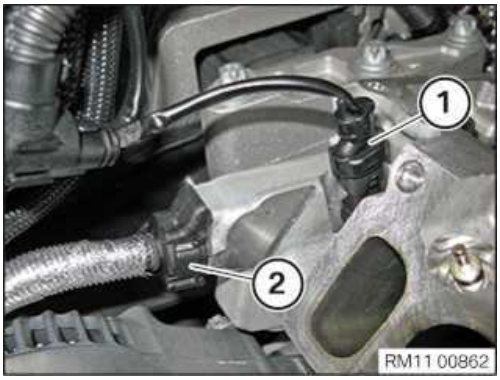


- Remove special tool from special tool .
- Lower the universal jack **0 490 133 (00 2 030)** with the special tool and set it aside.

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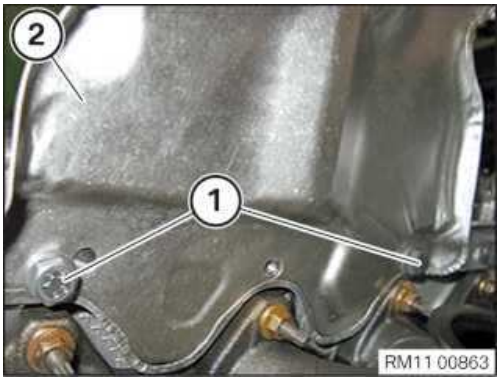
- Prepare special tool together with the special tool **2 357 071**.
- Attach special tool to front axle support and align special tool **2 357 071** correctly under the oil sump and then tighten.
- Turn special tool at adjusting screw uniformly upwards, until the special tool **2 357 071** makes contact with the oil sump.
- Tighten all adjusting screws of special tools and **2 357 071**.



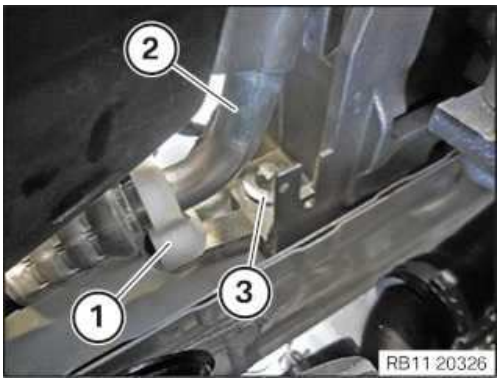
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

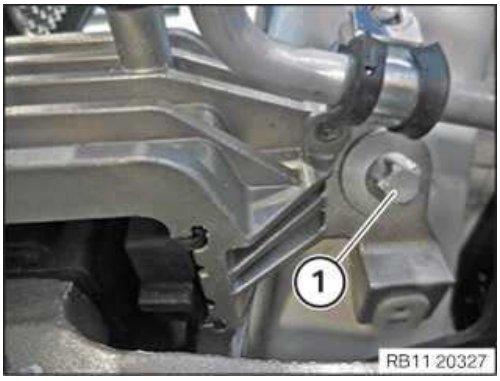
- Release the connector (1) from the coolant temperature sensor.
- Unlock and loosen coolant line (2).



- Loosen screws (1).
- Feed out the heat shield (2) and set it aside.

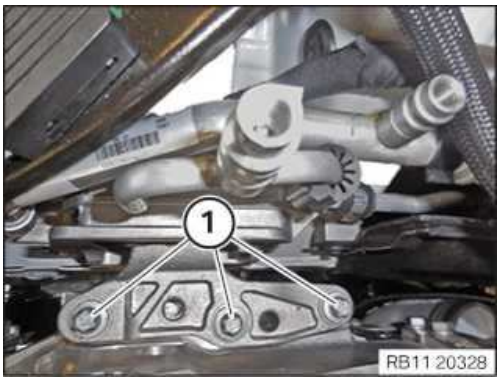


- Unlock and loosen holder (1).
- Feed out the refrigerant line (2) and put to one side.
- Loosen screw (3).

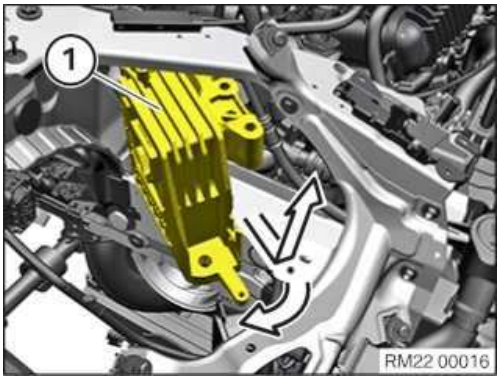


- Loosen screw (1).

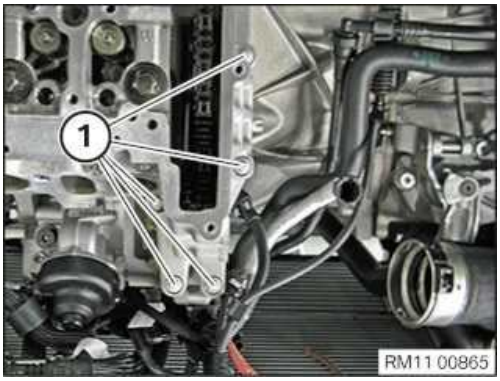
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- Loosen screws (1).



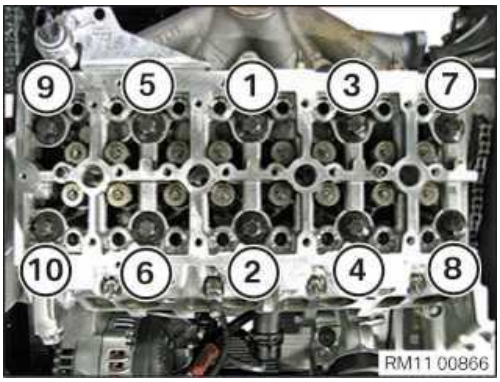
- Turn engine mount (1) in direction of arrow and remove upwards.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screws (1).



- Loosen the cylinder head bolts in the sequence from (10) to (1).
- Remove cylinder head bolts (1) to (10) with washers.

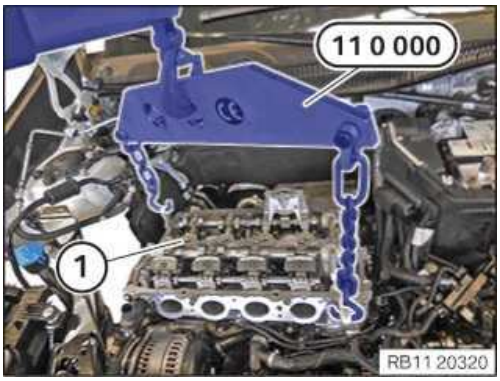


- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

M8		Tightening torque	21,5 Nm

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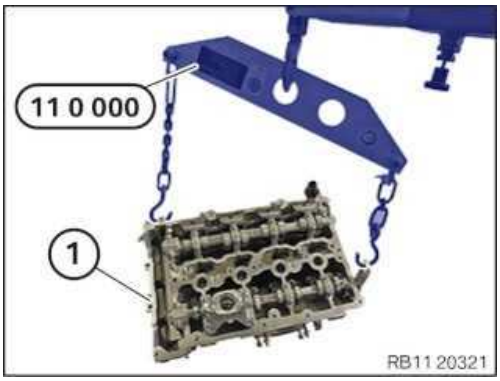
RISK OF DAMAGE

Damage to the guide rails.

Large amounts of force may damage the guide rails of the timing chain.

- Make sure not to damage the guide rail with the cylinder head when removing and installing the cylinder head.

- **Carefully** guide out the cylinder head (1) with the engine lifter and the special tool **0 490 561 (11 0 000)** and remove.



- Mount the cylinder head (1) on the special tool **0 494 362 (11 9 000)**.

MAIN WORK

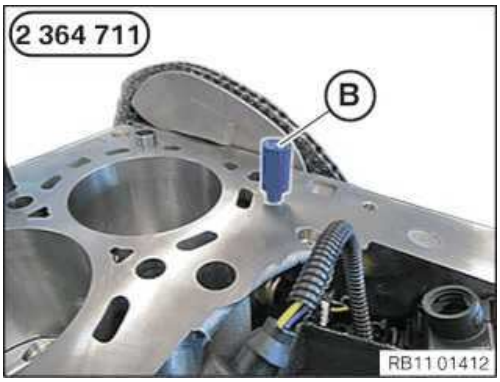
72 – Cleaning the sealing surface

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Lock the front oil duct using special tool (B) from special tool **2 364 711**.

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RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 103 (11 4 471)**.



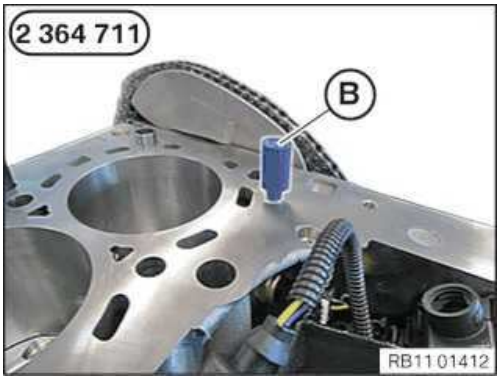
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

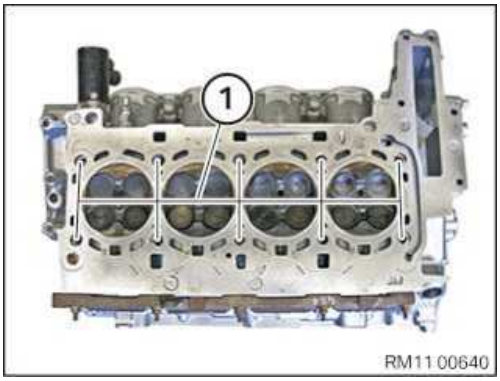
- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 104 (11 4 472)**.



- Remove special tool (B).

73 – Renewing the cylinder head gasket



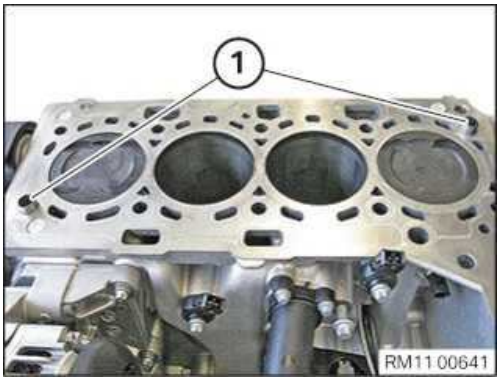
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

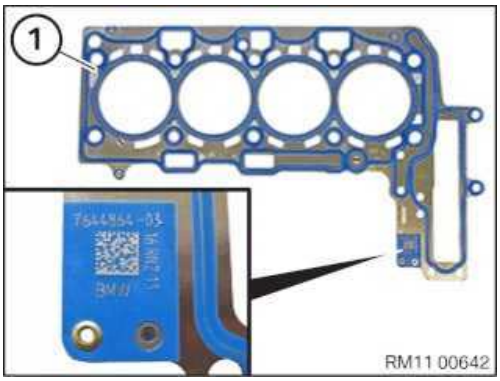
- Do not use any metal-cutting tools.

- Remove oil and dirt residue from the blind holes (1).



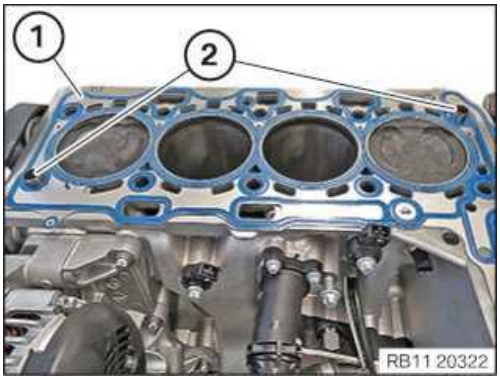
- Check the fitting sleeves (1) for secure fit and damage.

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- Identify the cylinder head gasket (1) using the part number.

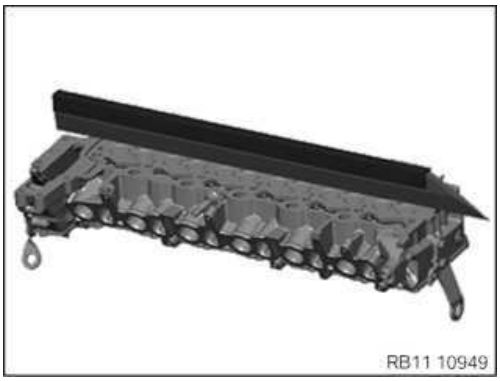
Note: If the cylinder head is reworked, an additional thicker gasket 0.3 mm is available for service personnel.



- Guide in the cylinder head gasket (1) and install.
- Ensure that the cylinder head gasket (1) is installed correctly in the fitting sleeves (2).

POSTPROCESSES

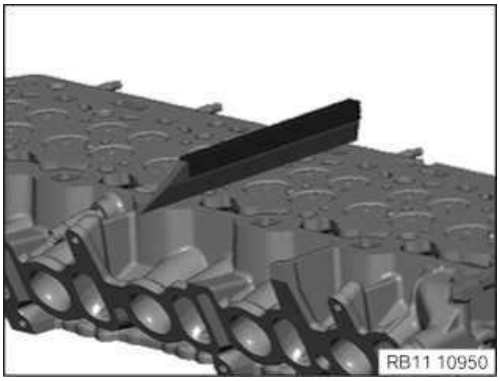
74 – Check the flatness of the cylinder head



- Check the flatness of the cylinder head lengthwise using a straightedge.

Cylinder head flatness

Maximum lengthwise deviation from flatness	0,10 mm
Maximum transverse deviation from flatness	0,05 mm



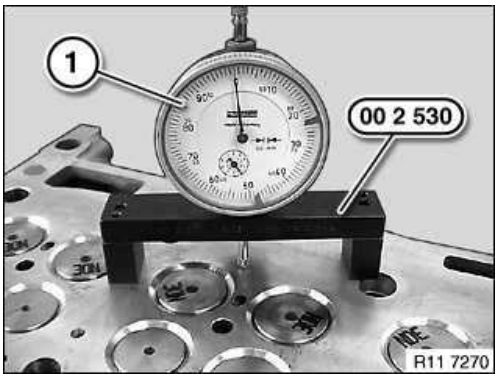
- Check the flatness of the cylinder head crosswise using a straightedge.

Cylinder head flatness

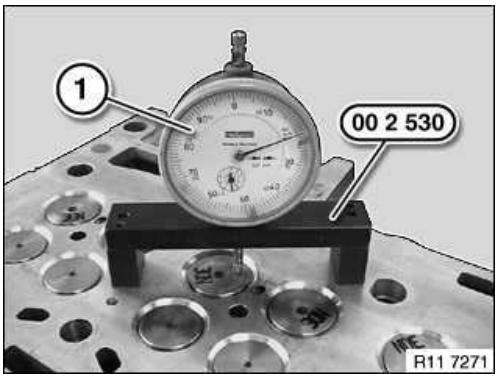
Maximum lengthwise deviation from flatness	0,10 mm
Maximum transverse deviation from flatness	0,05 mm

75 – Checking the valve underprotrusion

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- Set the dial gauge (1) onto the cleaned cylinder sealing surface with slight preload in special tool **0 490 185 (00 2 530)**.
- Set dial gauge in mildly preloaded state to "zero".



Check

- Position the dial gauge (1) on the valve with special tool **0 490 185 (00 2 530)**.
- Measure valve underprotrusion and compare with the setpoint value.

Valve underprotrusion

	0,8 (0,7 - 0,9) mm

Result

» Valve underprotrusion is outside tolerance.

Measure

- Replace cylinder head.

76 – Installing the cylinder head

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Damage to threads.

Fluid in the threaded hole may damage the thread when screws are tightened in the threads.

- Dry threaded holes (e.g. using compressed air).

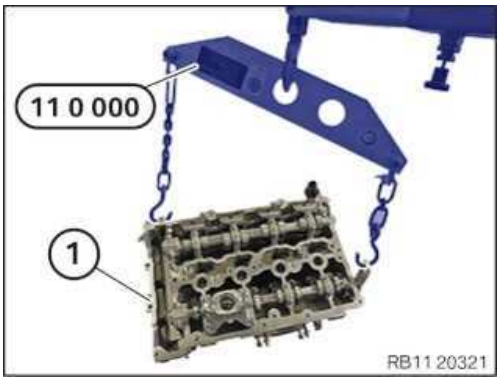
TECHNICAL INFORMATION

Do not remove bolt coating.

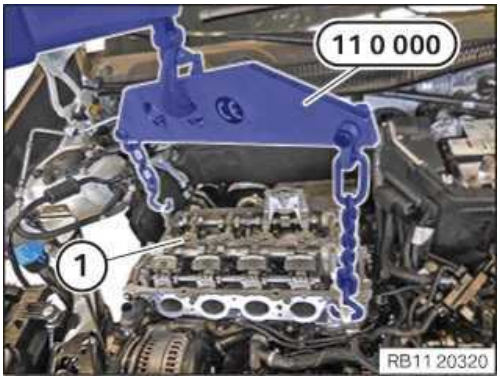
TECHNICAL INFORMATION

When replacing the cylinder head: The complete valve control and the Valvetronic servomotor are already pre-assembled for new cylinder heads.

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- Position cylinder head (1) on special tool **0 490 561 (11 0 000)** and engine lifter.



RISK OF DAMAGE

Damage to the guide rails.

Large amounts of force may damage the guide rails of the timing chain.

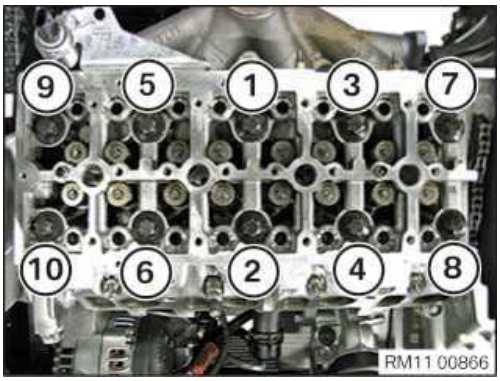
- Make sure not to damage the guide rail with the cylinder head when removing and installing the cylinder head.

- Feed in the cylinder head (1) **carefully** with the engine lifter and the special tool **0 490 561 (11 0 000)** and install.



- Unscrew the bolts (1) of the special tool **2 459 012**.
- Guide the special tool **2 459 012** out and remove.

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- Renew the cylinder head bolts (1).

  Parts: Cylinder head bolts
- Do **not** wash off coating of cylinder head bolts.
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

  No coolant, water or engine oil must be present in threaded holes of engine block.

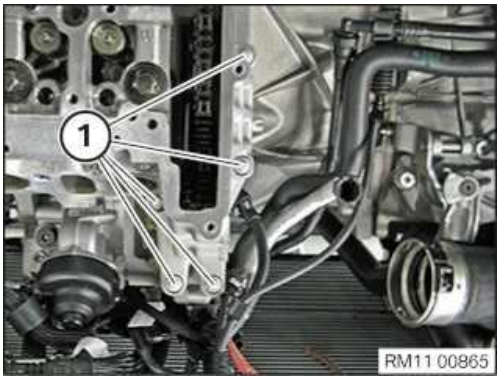
TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Feed in cylinder head bolts and install.
- Screw in cylinder head bolts in sequence (1) to (10).
- Tighten cylinder head bolts using special tools **0 490 504 (00 9 120)** and in sequence (1) to (10).

Cylinder head to crankcase

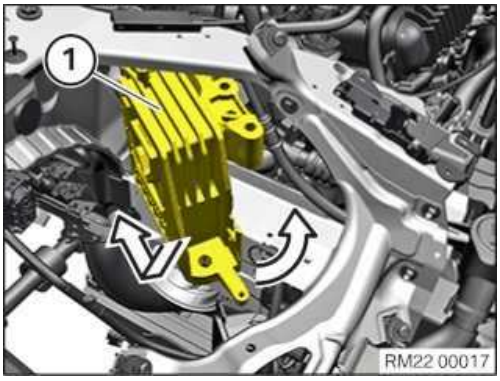
M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °



- Tighten the cylinder head bolts (1).

Cylinder head bolt to timing case cover

M8x40		Tightening torque	19 Nm



- Thread in engine mount (1) in direction of arrow then install.

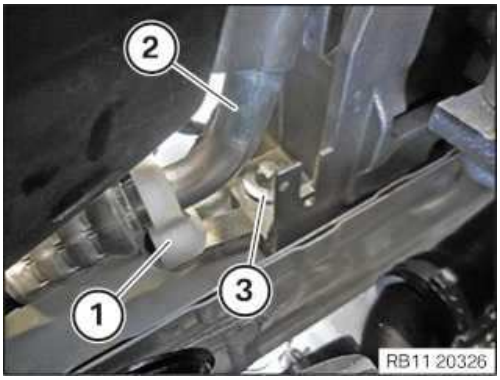
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- Tighten down screw (1).

Right engine mount to side member

M12		Tightening torque	100 Nm

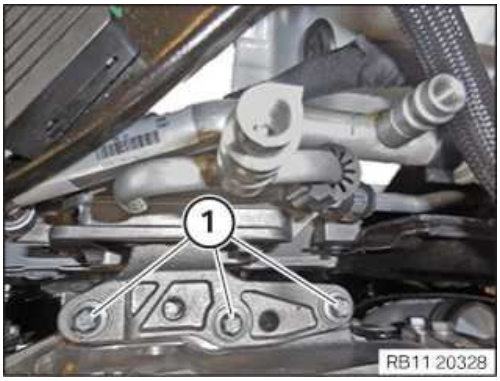


- Tighten down screw (3).

Right engine mount to side member

M12		Tightening torque	100 Nm

- Feed in and install the refrigerant line (2).
- Lock holder (1).
- Make sure the bracket (1) engages audibly.

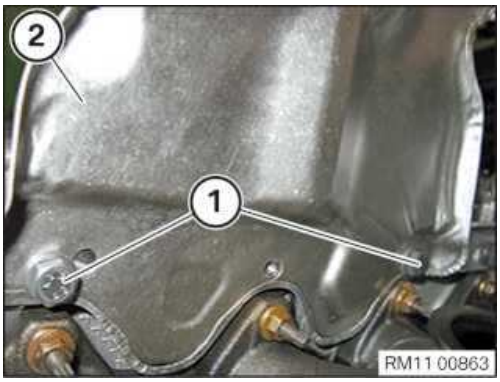


- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Right engine mount to cylinder head

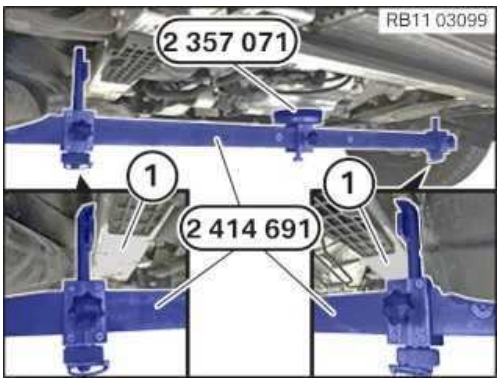
M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °



- Feed in and install the heat shield (2).
- Tighten the screws (1).

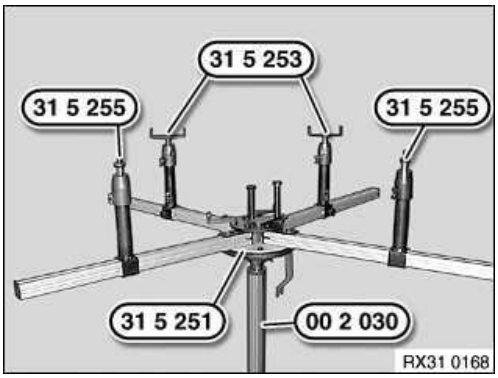
Heat shield to cylinder head

M8X16		Tightening torque	10 Nm



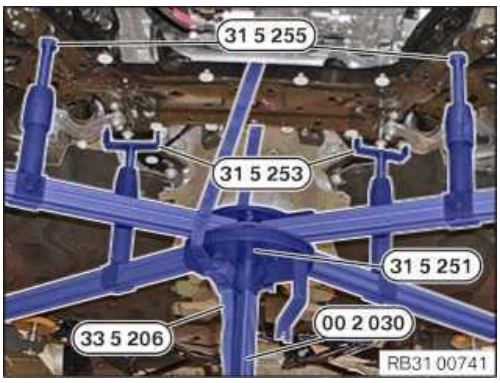
- Disassemble special tool using special tool **2 357 071**.

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- Fit the special tool completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools in telescopic supports of a profile rail pair.
- Insert special tools in telescopic supports of other profile rail pair.

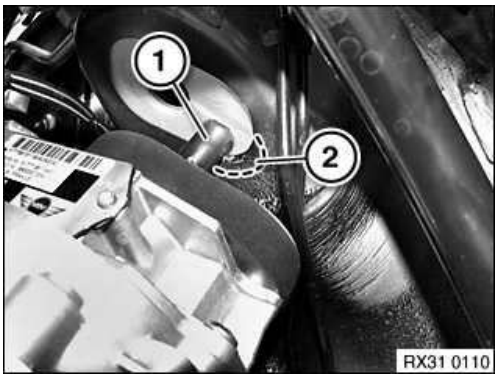
Note: In a profile rail pair, two profile rails are connected to one another by gearing.



- Align special tools and to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool to special tool .

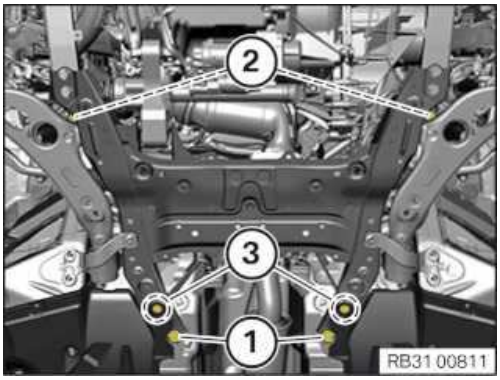


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

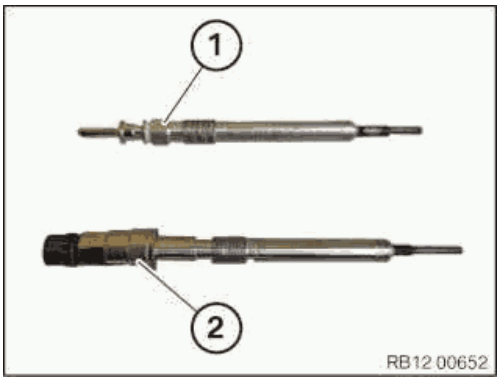
- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and the front axle remove.

77 – Install glow elements



- Install glow elements (1) in cylinders 1, 2, 3 and 4.
- If fitted: Glow element (2) with the **combustion chamber pressure sensor** must be installed in cylinder **2**.

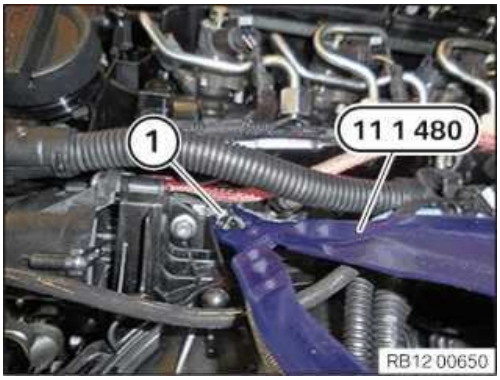
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- Tighten the glow element with the special tool or conventional tools.

Glow elements to cylinder head

Glow element		Tightening torque	13 Nm



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

78 – Installing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Install the hydraulic valve clearance compensating element (1) in the direction of the arrow.
- Repeat the process on all hydraulic valve clearance compensating elements.

79 – Install the roller cam followers

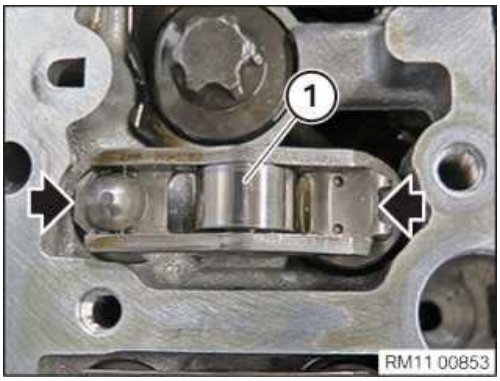
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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RISK OF DAMAGE

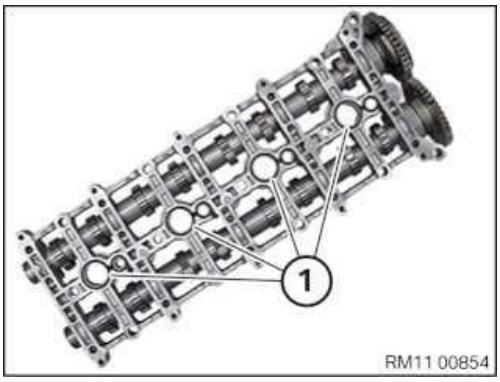
Damage to the engine.

If the classification of the roller cam followers is ignored, this can lead to engine damage.

- Observe the classification of the roller cam followers.
- Always reuse used roller cam followers at the same position.

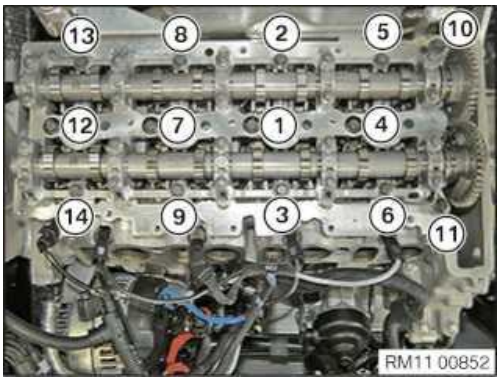
- Install the roller cam follower (1).
- Repeat the process for all roller cam followers.

80 – Installing the camshaft support



- Renew gaskets (1).

  Parts: gaskets

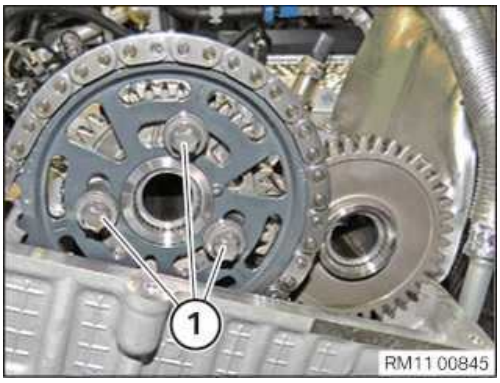


- Position the camshaft support including the camshafts.
- Tighten the screws in a sequence from (1) to (14) in several steps.

Camshaft carrier to cylinder head

M7x35		Tightening torque	13 Nm

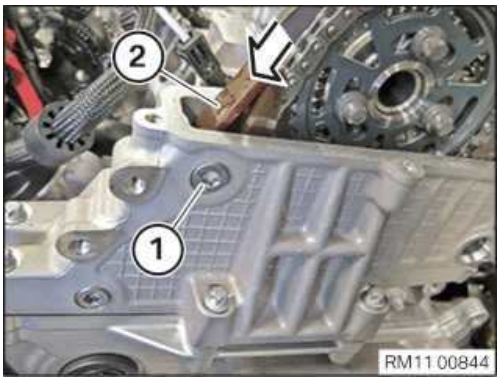
81 – Installing the camshaft sprocket on the intake camshaft



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

82 – Install the timing chain guide rail

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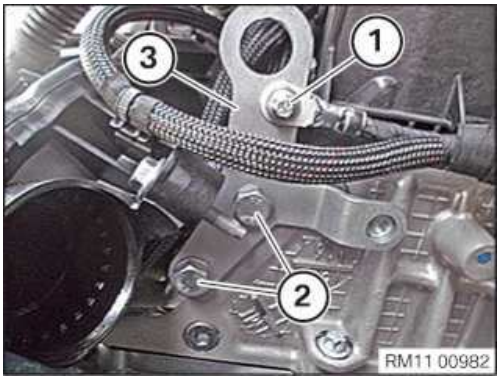
- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm



- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6		8 Nm

83 – Installing the chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Renew sealing ring (1).

  Parts: Sealing ring

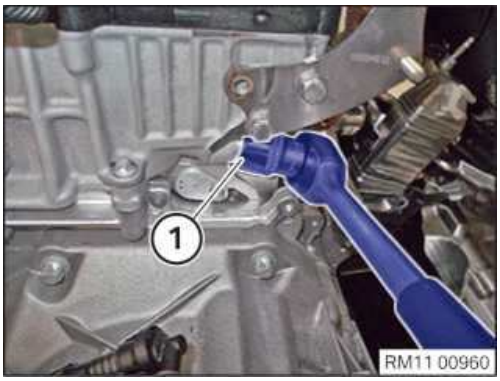


TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.

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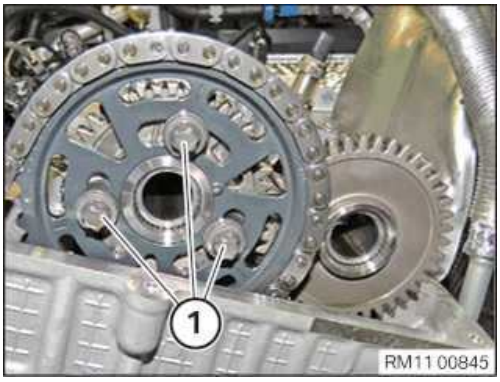


- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

84 – Tightening the camshaft sprocket on the intake camshaft



- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

85 – Checking camshaft timing



- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

Damage to the engine.

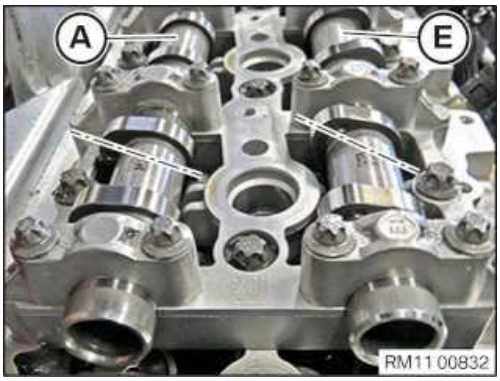
The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

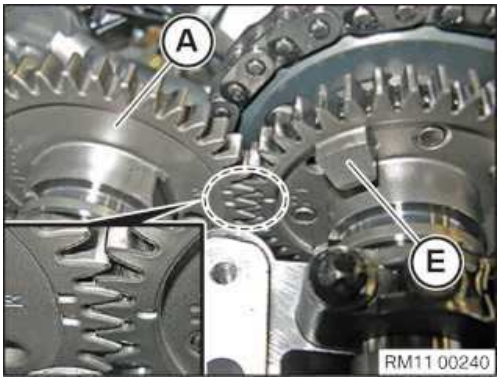
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- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

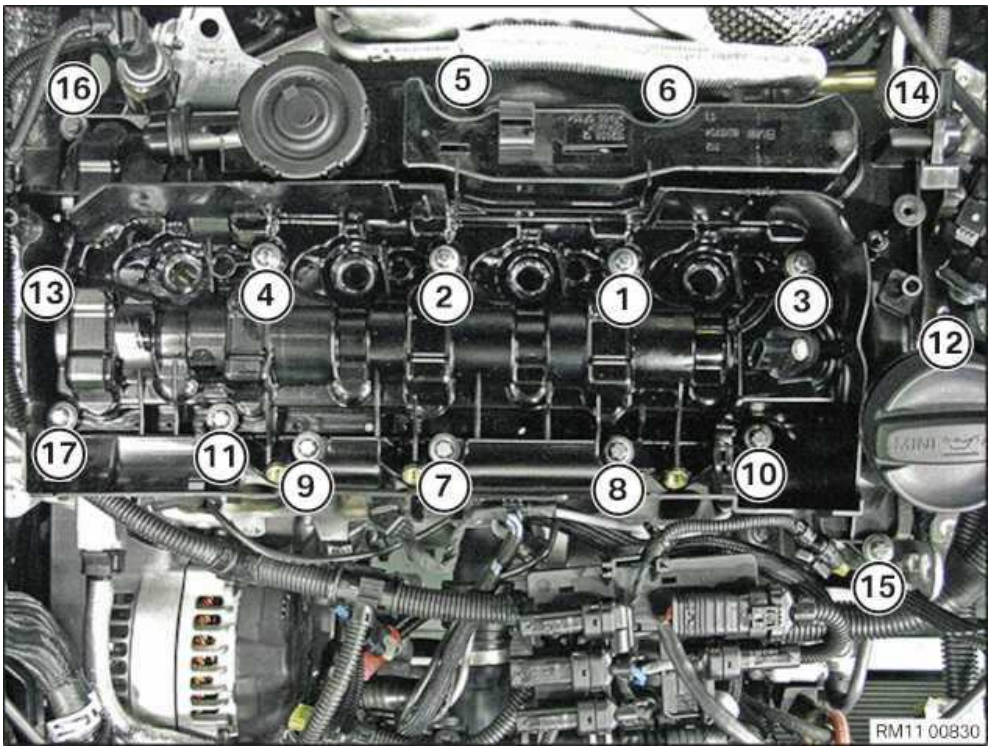
- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.



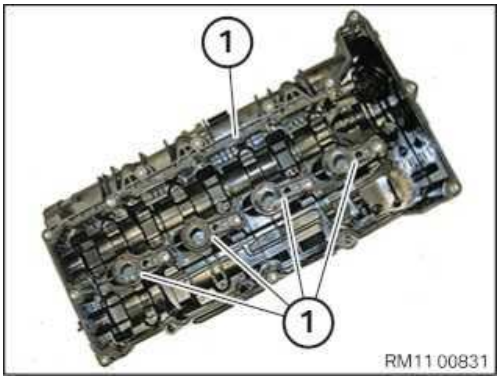
- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

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Overview: Screw connection of the cylinder head cover

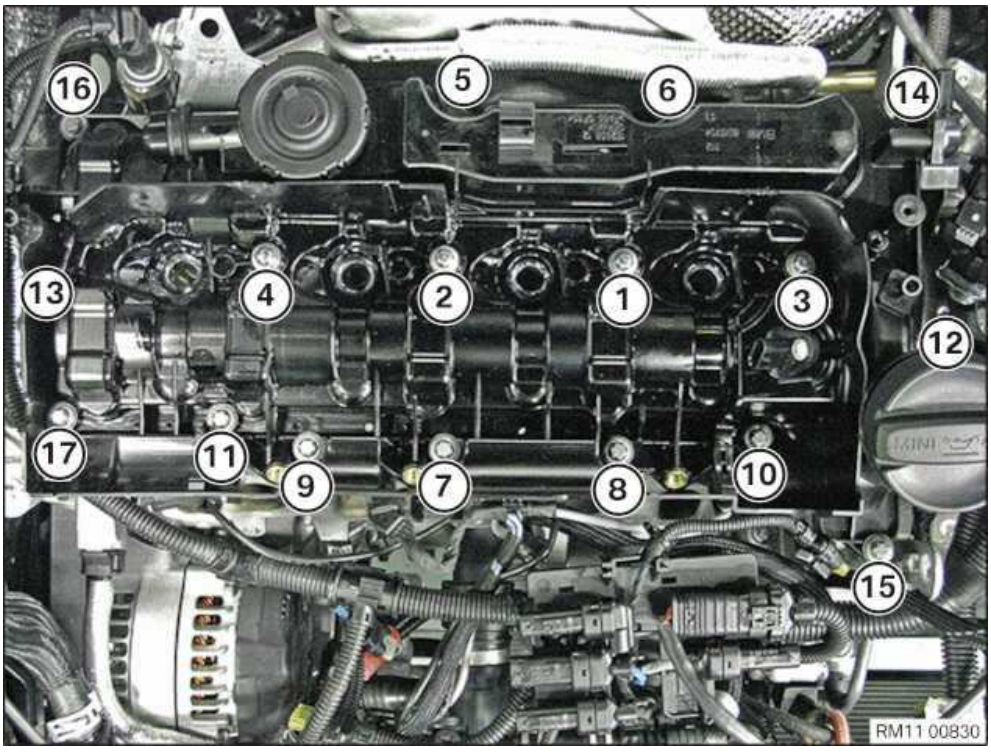


1 to 16 screws of the cylinder head cover.



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket



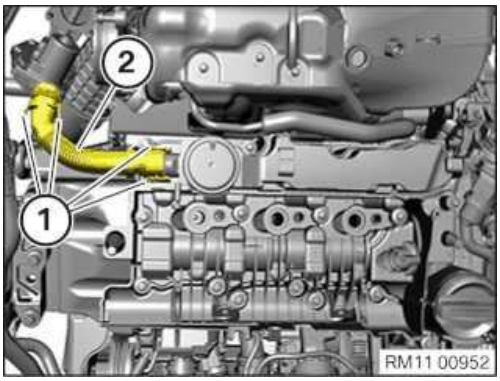
- Install cylinder head cover.
- Tighten screws in the order (1) to (17).

Cylinder head cover to cylinder head

M6		Tightening torque.	8, Nr

-

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- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

87 – Installing injectors of injection system

▸ Cleaning the injector shafts

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

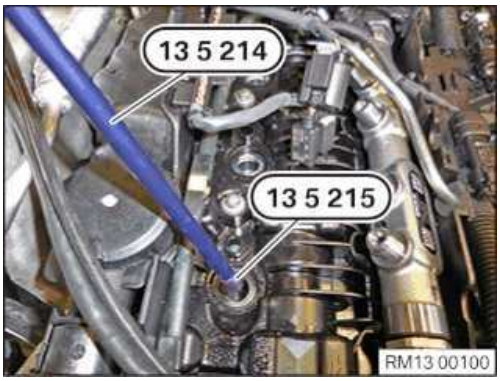
- Wear safety goggles.

RISK OF DAMAGE

Contaminant or foreign body.

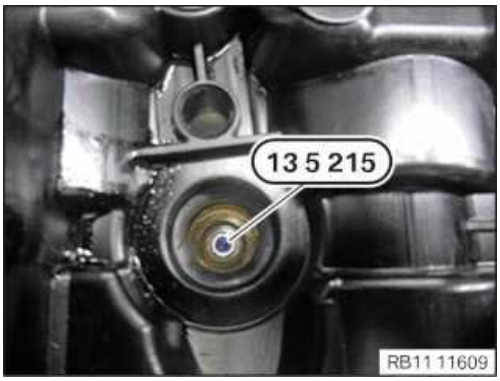
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.

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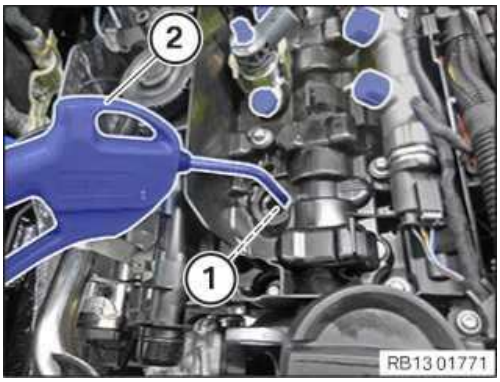
- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.



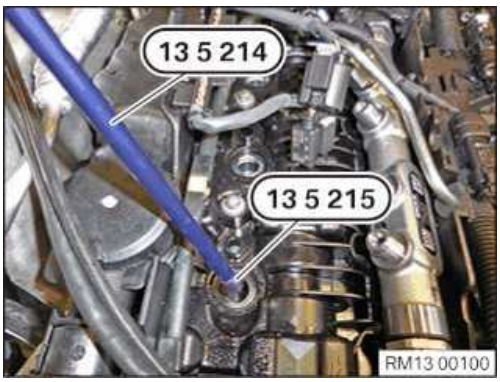
- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.



- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.



- Blow out injector shaft (1) with air gun (2).



- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

► **Check the placement of the clamping claw**

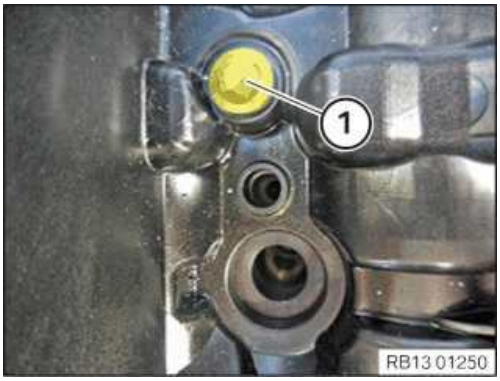
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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▸ **Prepare the injector for installation**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

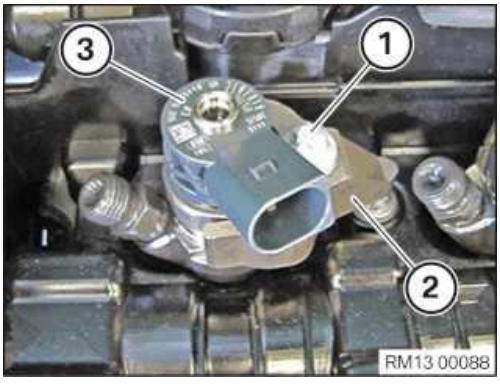


- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring
- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

Injector lubricating grease	50 g, Can	83230441070

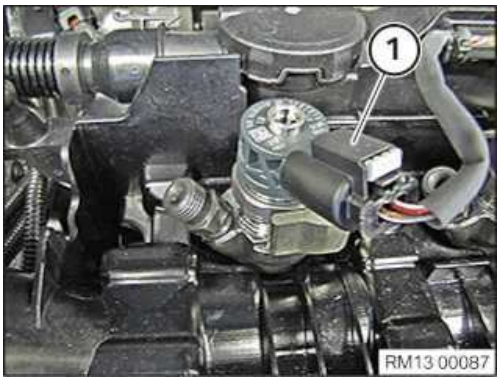


- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

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- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

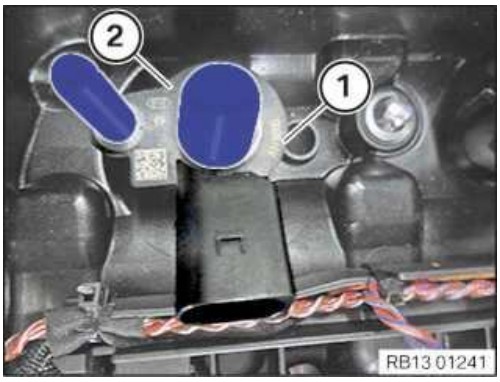
▶ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

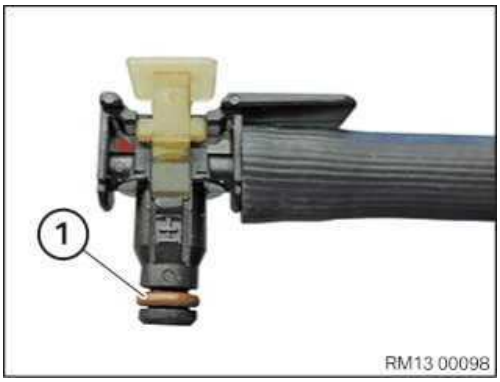


- Read off the adjustment value (1) on the new injector (2).



- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

88 – Connect the leakage oil line on the injector



- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.

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- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

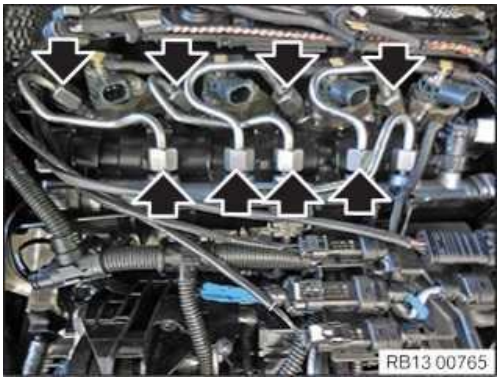
89 – Installing high pressure lines between rail and injectors

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Remove special tool .
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten the high pressure lines (arrows) with the special tool .

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

90 – Prepare for the installation of the exhaust turbocharger

- Check the oil feed lines and the oil return lines for contamination or obstruction, clean or renew if necessary.
- If the oil feed lines and/or oil return lines are heavily contaminated, we recommend changing the engine oil and the oil filter.
- If installed: Check the coolant feed lines and the coolant return lines for the exhaust turbocharger for contamination or obstruction, clean or renew if necessary.
- Check that the screw connections and the plug connections of all the lines are correct.
- Check air cleaner for contamination and clean or renew as needed.
- Check correct functioning of crankcase ventilation.
- Replace all gaskets.

  Parts: Seals

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91 – Installing the high-pressure stage exhaust turbocharger

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

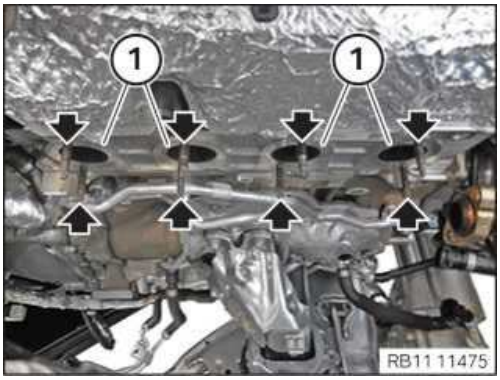
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

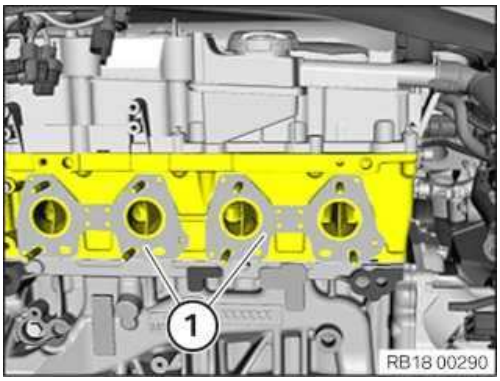


- Clean the sealing surfaces (1) on the cylinder head using special tool **0 495 102 (11 4 470)**.
- Check the stud bolts (arrows) on the cylinder head for correct fit.



- Clean the sealing surfaces on the exhaust manifold using special tool **0 495 102 (11 4 470)**.

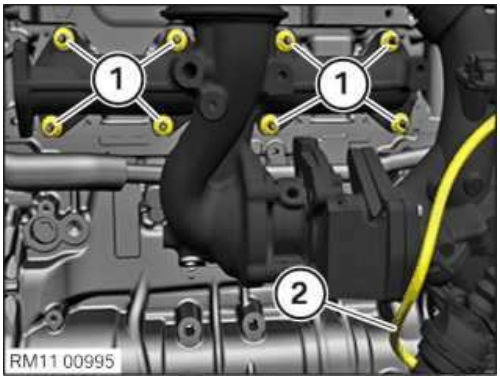
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- Renew gasket (1).

  Parts: Gasket

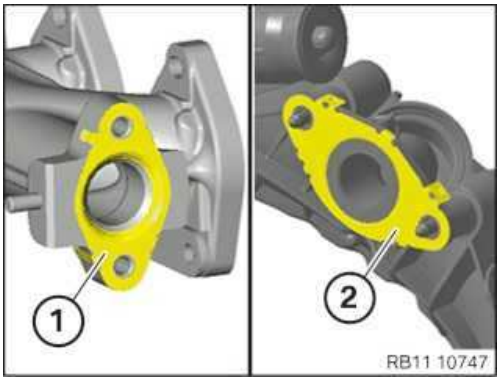
- Install new gasket (1).



- Feed in and install the exhaust manifold and the high-pressure stage exhaust turbocharger.
- Tighten nuts (1).

  Parts: Nuts

- Connect vacuum hose(2).

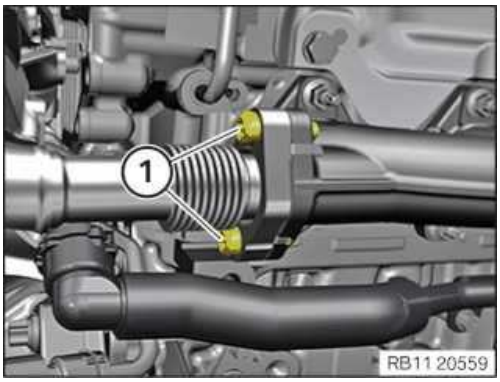


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

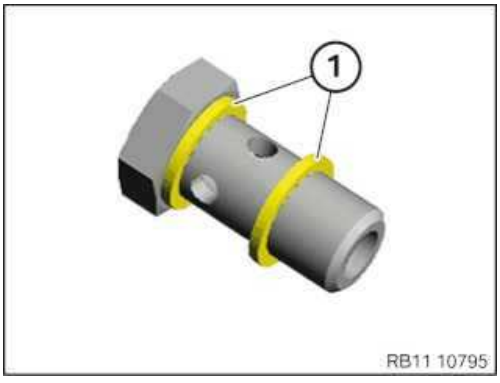
  Parts: Gasket



- Tighten the screws (1).

Exhaust-gas recirculation cooler to exhaust manifold

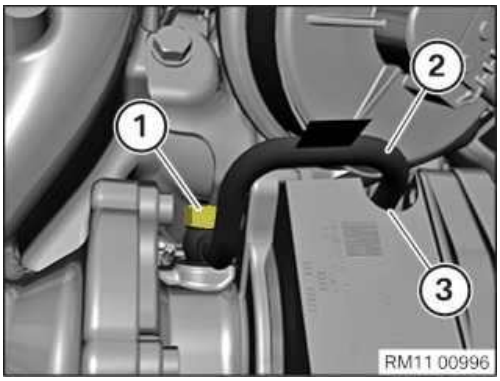
M8x28	Replace screws	Tightening torque	32 Nm



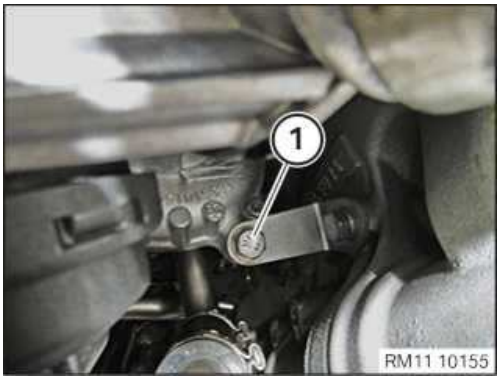
- Renew sealing rings (1) of banjo bolt.

  Parts: Sealing ring

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- Guide the oil feed line into the holder (3) and install it.
- Tighten down screw (1).

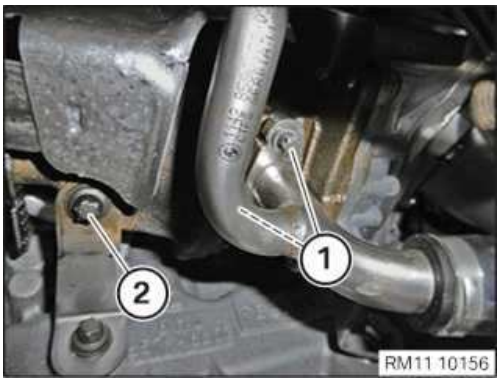


- Tighten bolt (1) from the right wheel arch.



- Renew seal (1) of oil return line.

  Parts: Gasket



- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

92 – Installing the low-pressure stage turbocharger

RISK OF DAMAGE

Damage to the surface.

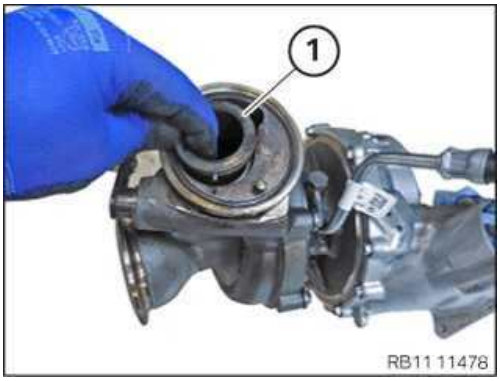
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

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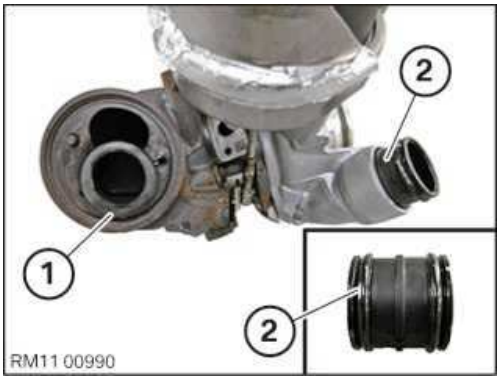
TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.



- Check the spacer plug (1) for damage, renew if necessary.

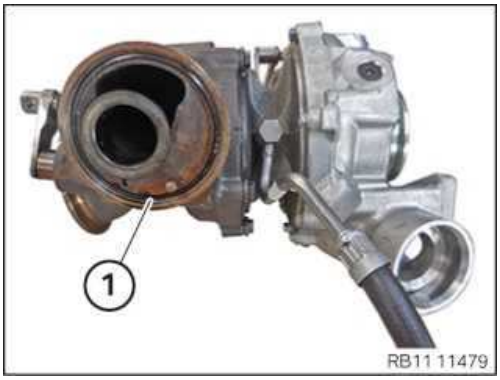
  Parts: Spacer ring
- Insert and install the spacer ring (1).
- Position spacer ring (1) correctly.



- Renew gasket (1).

  Parts: Gasket
- Position the seal (1).
- Renew the sleeve(2).

  Parts: Holding sleeve



- Renew sealing ring (1).

  Parts: Sealing ring
- Affix the sealing rings on the exhaust turbocharger.

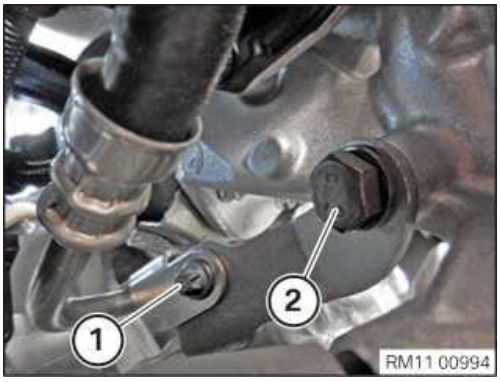


- Insert and install the low-pressure stage exhaust turbocharger on the exhaust manifold .
- Feed in and install V-band clamp .
- Tighten V-band clamp (2).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Screw in nut (1) with 2 **revolutions**.



- Tighten down screw (1).

Oil feed line to bracket

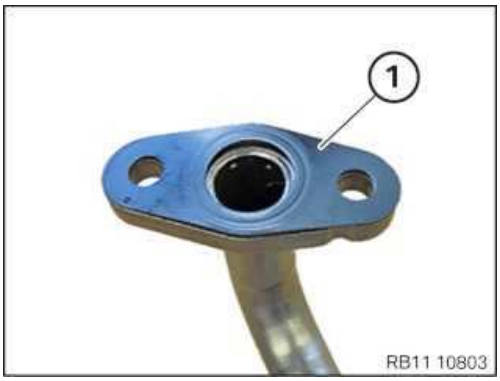
Torx screw M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

Holder to exhaust turbocharger and crankcase

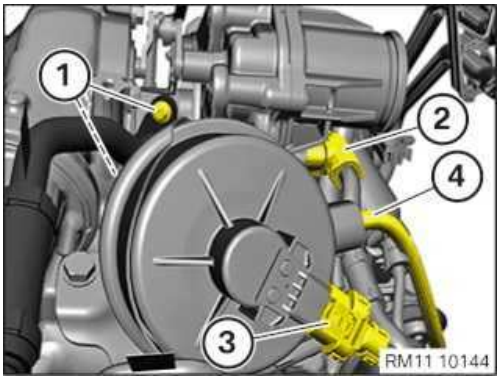
M8x16		Tightening torque	22 Nm

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- Renew seal (1) on the oil return line.

  Parts: Gasket



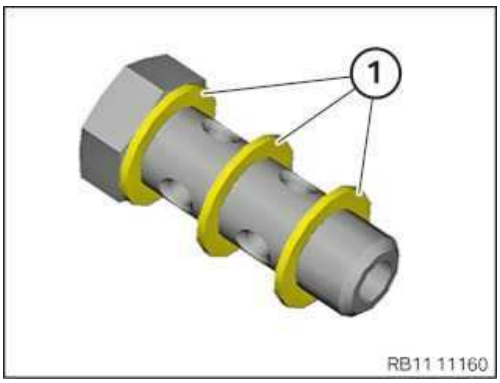
- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

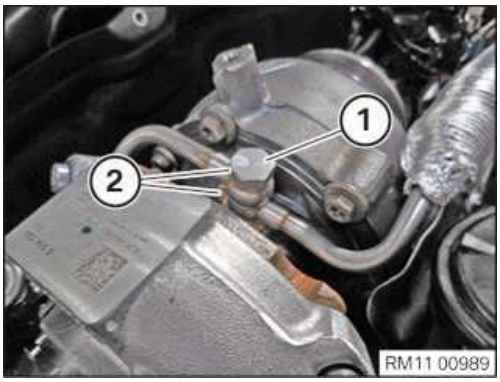
M6x12		Tightening torque	8 Nm

- Connect and lock connectors (2) and (3).

  The locks must engage audibly.
- Connect vacuum hose (4).



- Renew banjo bolt and sealing rings (1).
- **Parts:** Banjo bolt, sealing rings



- Install sealing rings (1).
- Tighten the banjo bolt (1).
- Ensure that the lines do not rest against the adjacent components.

93 – Installing heat shield on exhaust turbocharger at bottom

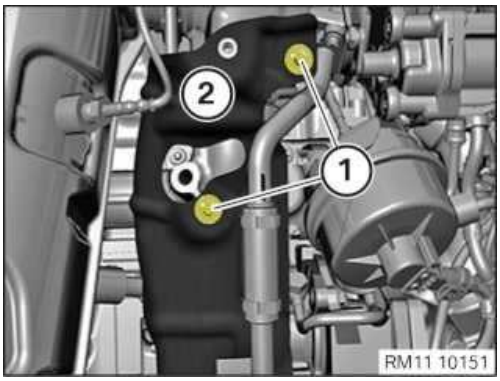
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

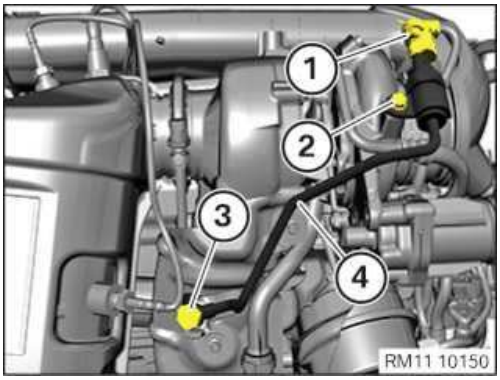
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- Feed in and install the heat shield (2).
- Tighten the bolts (1) on the heat shield .

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm



- Position the exhaust gas pressure pipe (4).
- Hand-tighten the bolt (2).
- Renew sealing rings on the banjo bolt (3).

  Parts: Sealing ring
- Tighten the banjo bolt (3).

Banjo bolt for exhaust pressure pipe to exhaust manifold

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

- Tighten down screw (2).

Standard screw connection M6

M6		8 Nm

- Connect connectors (1) and lock.

  Lock must audibly engage.

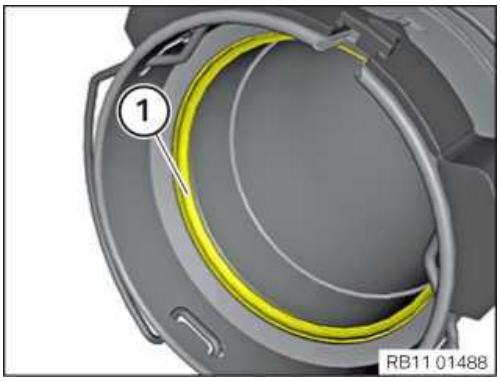
94 – Installing the right charge air duct between the exhaust turbocharger and the charge air cooler

RISK OF DAMAGE

Damage to the exhaust turbocharger.

A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.



- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

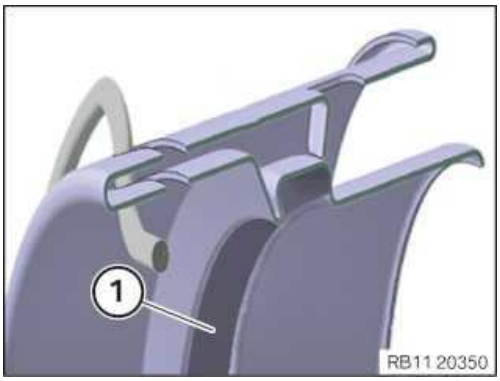
  Parts: Gasket

▸ **Replace damaged gasket**

TECHNICAL INFORMATION

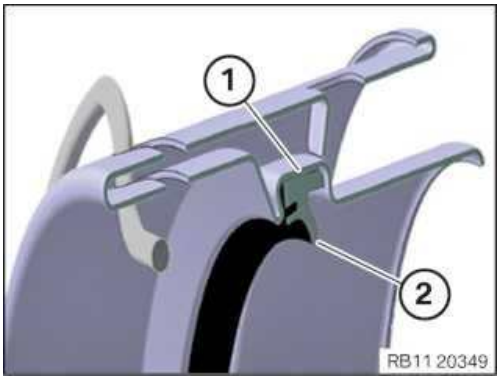
Do not use pointed or sharp-edged tools for the installation and/or removal.

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- Remove damaged seal.
- Clean gasket groove (1) with a dry towel.

  The gasket groove (1) must be clean.



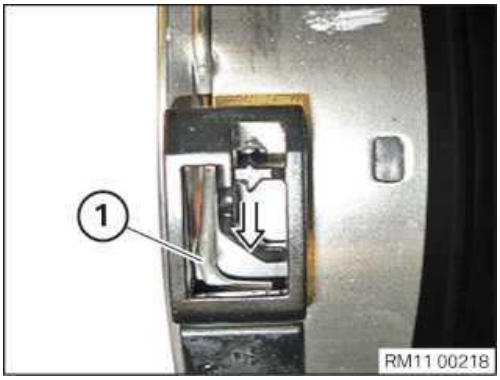
- Renew gasket.

  Parts: Gasket
- Install seal dry without lubricant or mounting agent.

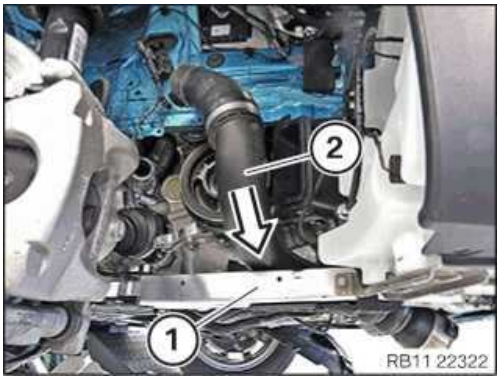
TECHNICAL INFORMATION

Incorrect assembly is possible. Ensure correct installation position.

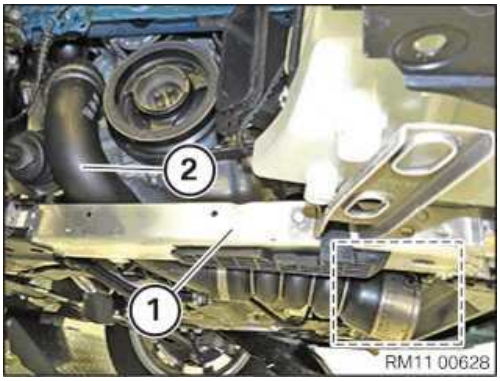
- Feed in and install the seal.
- Make sure the seal is correctly installed in the gasket groove (1).
- Make sure that the sealing lip (2) is pointing downwards (see figure).



- Detach the locks (1) in the direction of the arrow from the brackets.
- Ensure that the locks (1) engage audibly.

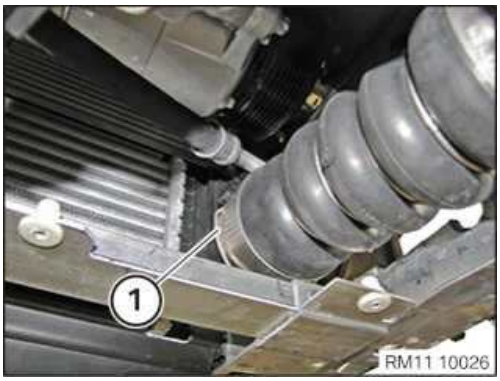


- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed in the charge air duct (1) in the **direction** of arrow between the side member and the deformation element and position.

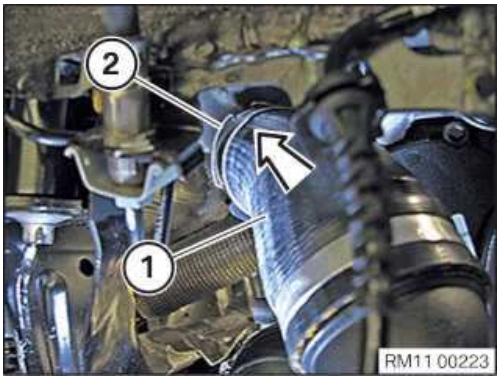


- Pull the adapter of the front axle support (1) downwards to the front right.
- Position the charge air duct (2) in **marked** area on the charge air cooler.

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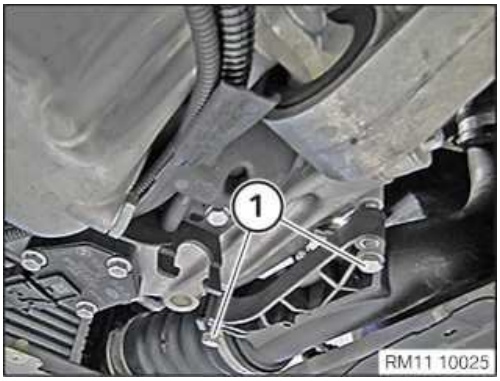


- Feed in and install the charge air duct (1) on the charge air cooler .
- Make sure the charge air duct (1) engages audibly on the charge air cooler.



- Feed in and install charge air duct (1) in the **direction** of the arrow on exhaust turbocharger.

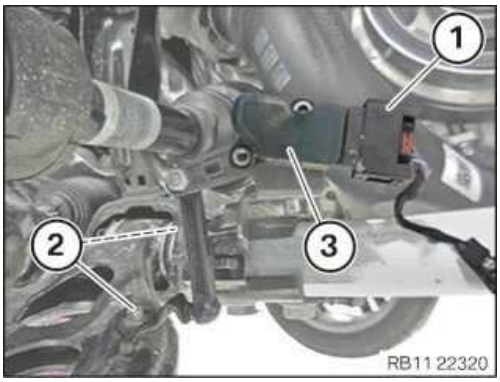
  The locks (2) must engage audibly.



- Tighten the screws (1).

Charge air duct to oil sump

M6		Tightening torque	8 Nm



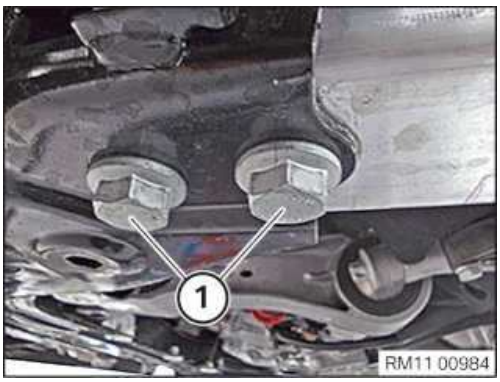
- **If installed:**
- Feed in and install the ride height sensor (3).
- Tighten the screws (2).

Ride height sensor holder to front axle support

M6		Tightening torque	8 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

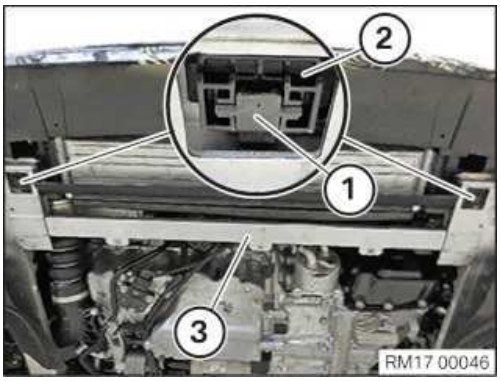


- Tighten the screws (1) on the adapter of the front axle support.

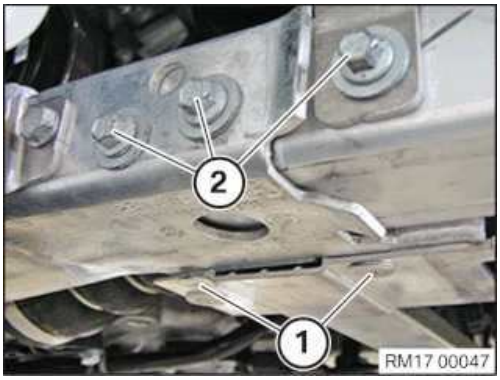
Adapter, front axle support to front axle support

		Tightening torque	100 Nm

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- Guide in cross connection (3) and install.
- Guide in locks (2) and install.
- Lock the locking pins (1).
- Ensure that the locking pins (1) audibly engage.



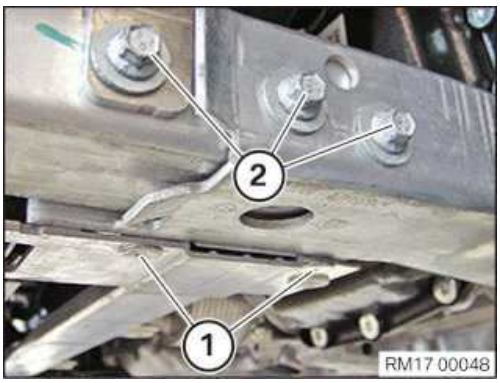
- Tighten the bolts (2) at the front left.

Cross connection to front axle support

M6		Tightening torque	12 Nm

- Renew the blind rivet (1).

  Parts: Blind rivet
- Mount the blind rivets (1) at the front left.



- Tighten the bolts (2) at the front right.

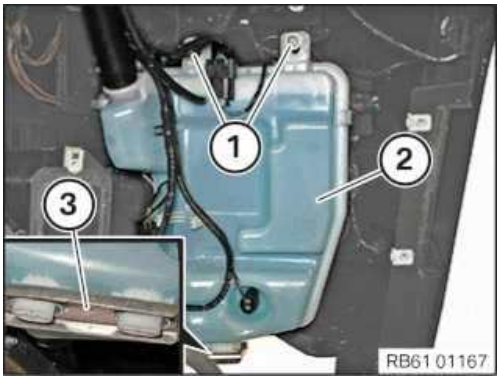
Cross connection to front axle support

M6		Tightening torque	12 Nm

- Renew the blind rivet (1).

  Parts: Blind rivet
- Mount the blind rivets (1) at the front right.

95 – Install the washer fluid reservoir in the fixture

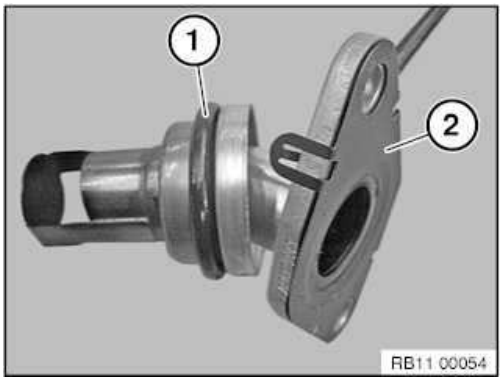


- Feed washer fluid reservoir (2) into the mounting (3) and install.
- Tighten the screws (1).

Washer fluid reservoir to body

M6x20		Tightening torque	8 Nm

96 – Installing the intake plenum

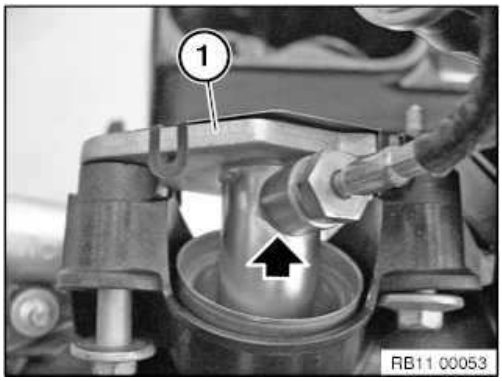


- Renew O-ring (1).

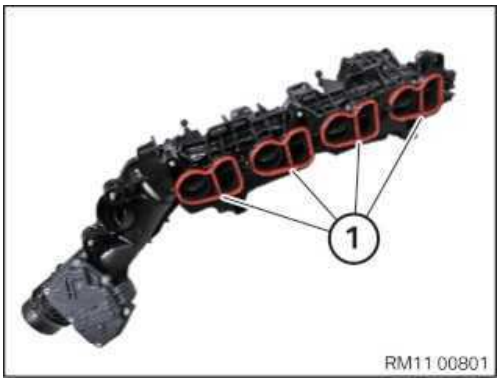
  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position the seal (2) and clip it in.

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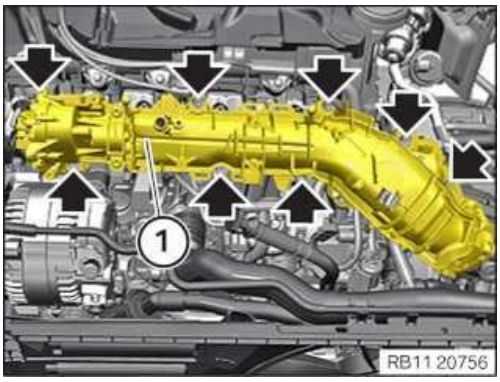


- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (1).

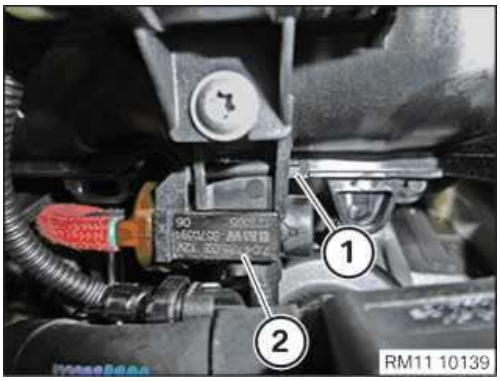
  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.



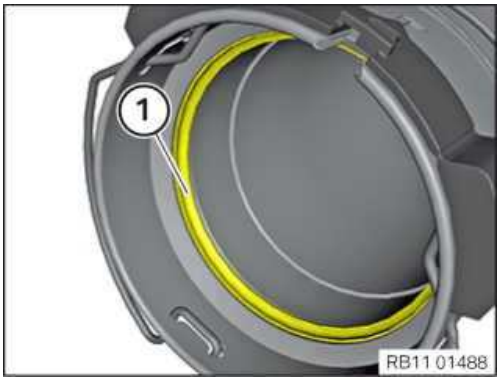
- Guide in and install intake (1) plenum.
- Tighten screws (arrows).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm



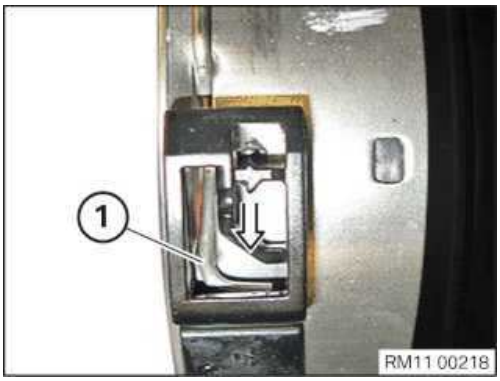
- Install the electric changeover valve (2) in the holder on the plenum from left to right.
- Lock (1) must engage audibly.



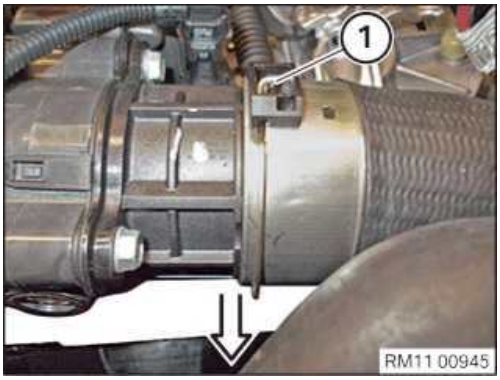
- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring

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- Engage the lock (1) on the bracket (arrow).



- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

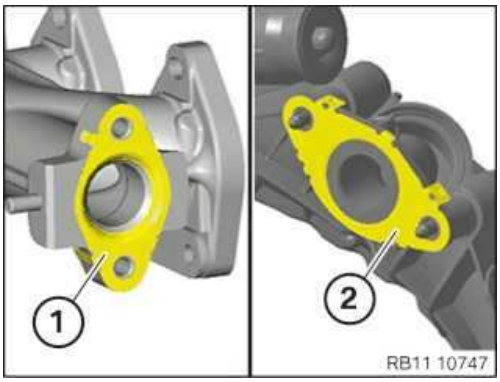
97 – Installing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

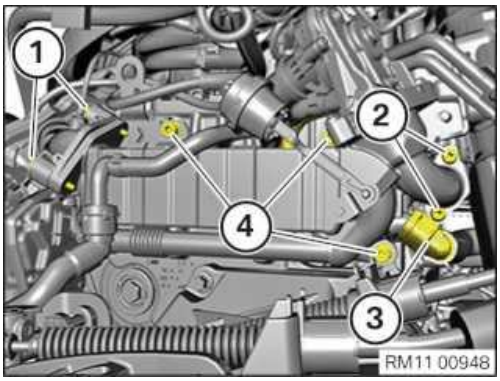


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket
- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket

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- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts
- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

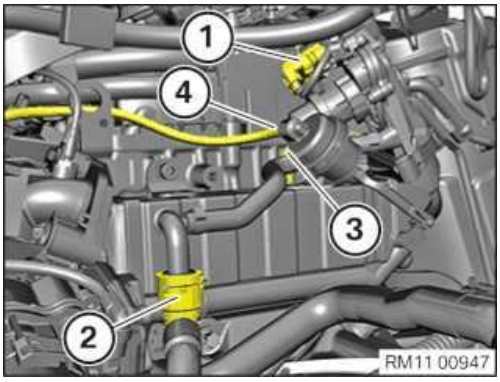
M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.
- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm



TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

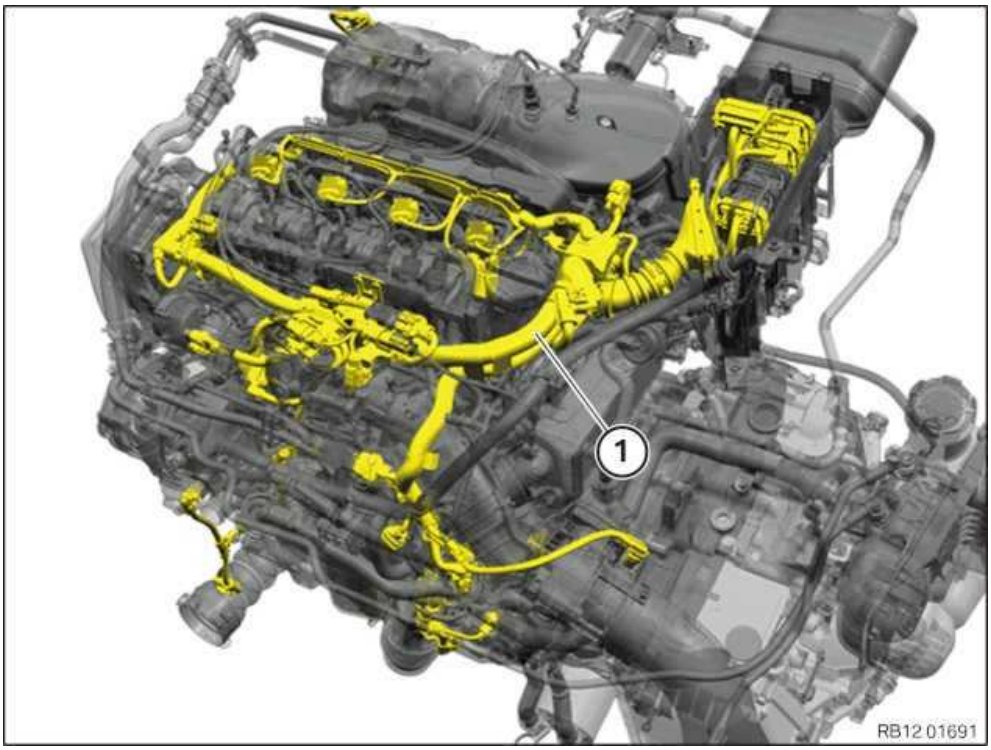
- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

98 – Fastening the wiring harness section for the intake plenum

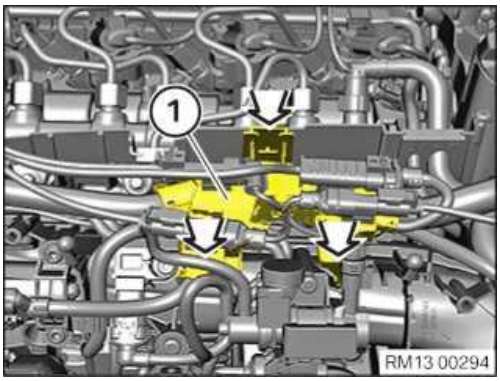
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Overview: Wiring harness section for the engine

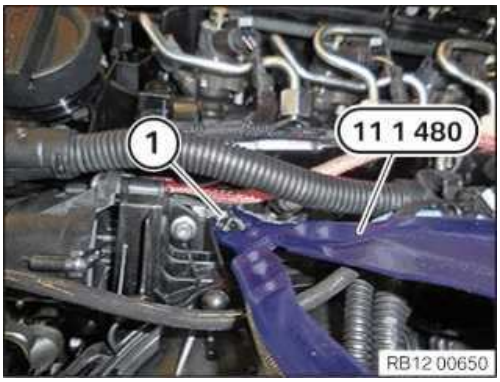


1 Wiring harness section for the engine

▶ **Installing the cable clip for the intake plenum**

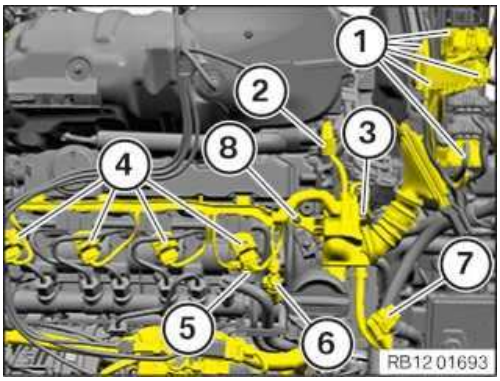


- Insert and install the cable clip (1) in the direction of the arrow.
- Make sure the cable clip (1) is fitted correctly.



- Connect and lock the connector (1) on the glow elements.
  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.

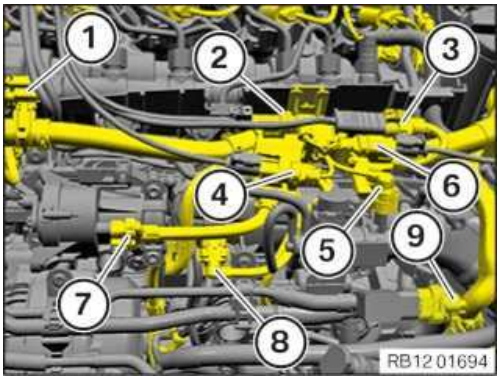
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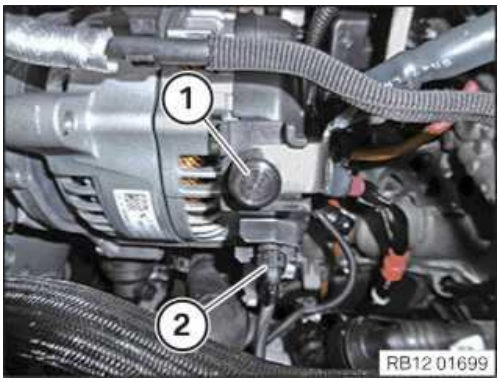
- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the DME control unit and remove the integrated supply module (PDM).
- Attach connector (2) to the differential pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust-gas recirculation valve and lock audibly.
- Attach connector (4) to the injectors and lock it audibly.
- Attach connector (5) to the camshaft sensor and lock it audibly.
- Attach connector (6) to the fuel pressure regulator and lock it audibly.
- Connect and audibly lock the connector (7) to the hot film air mass meter.
- Tighten down screw (8).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm



- Connect the connector (1) to the rail pressure sensor and lock it audibly.
- Attach connector (2) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (3) to the front oxygen sensor and lock audibly.
- Attach connector (4) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Connect the connector (5) to the electric changeover valve and lock audibly.
- Attach connector (6) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (7) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (8) to the charging pressure sensor and lock it audibly.
- Attach connector (9) to the fuel pressure and temperature sensor and lock it audibly.

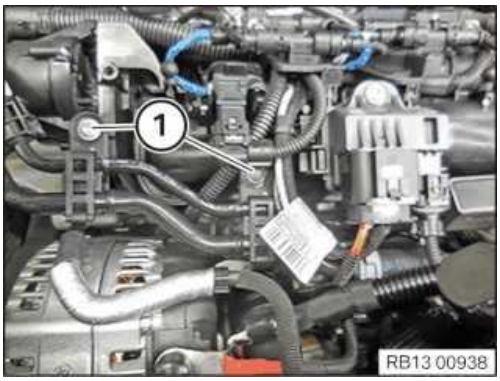


- Connect and lock the connector (2).

  Lock must snap audibly into place.
- Connect the positive battery cable (1) and tighten.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

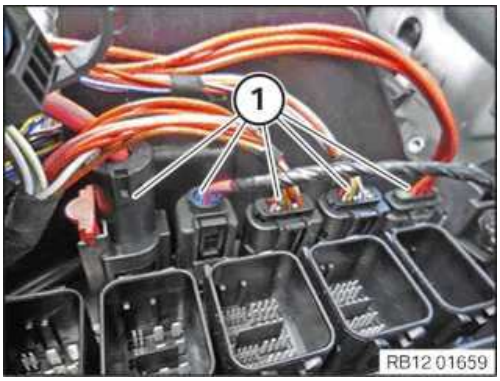


- Position the fuel line.
- Tighten the screws (1).

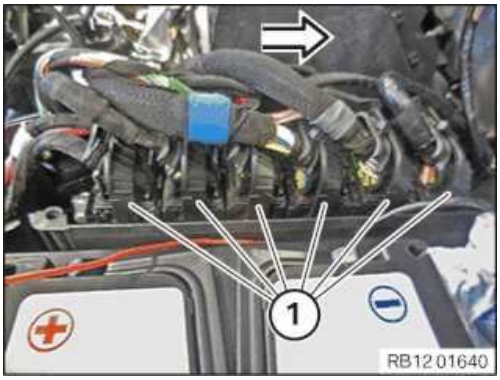
Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

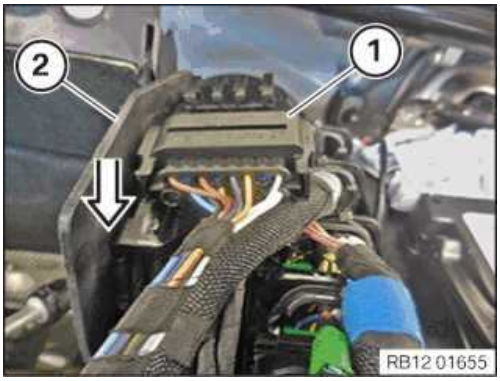
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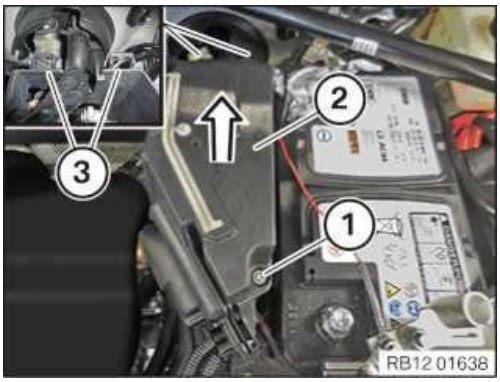
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



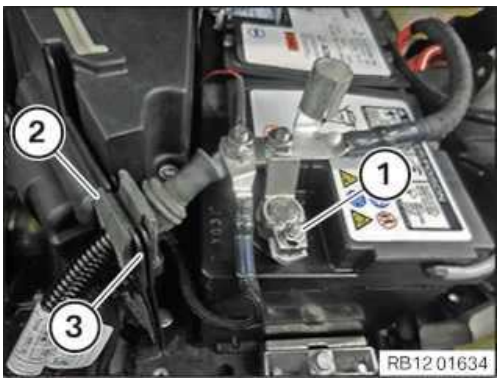
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert and install the cover (2) into the guides (3) in the direction of the arrow.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

RF5x26.5		Tightening torque	2,5 Nm

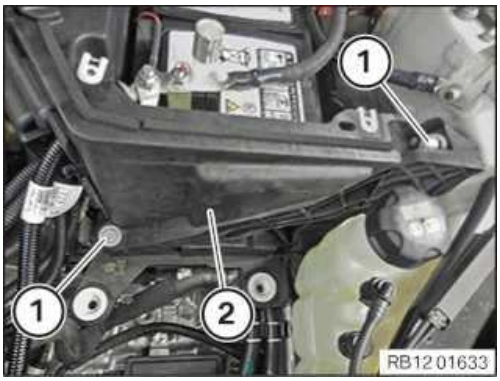


- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

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- Feed in and install tension strut (2).
- Tighten the screws (1).

Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

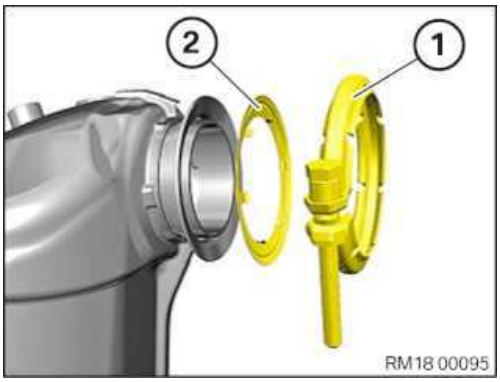
99 – Installing the diesel particulate filter

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



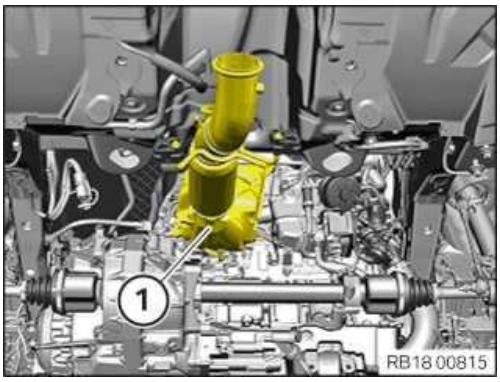
- Renew the V-clip (1).

  Parts: V-band clamp
- Renew the gasket (2).

  Parts: Gasket

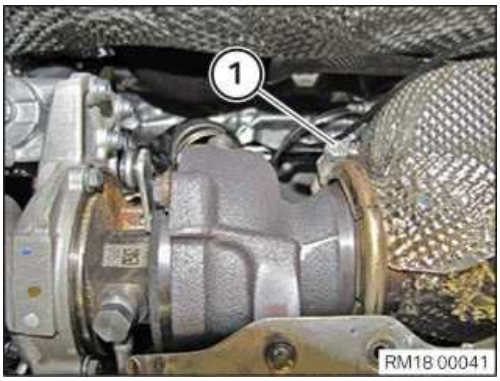


- Before installing the diesel particulate filter: Mount fitting aid (1) for the flexible tube.



- Carefully insert and install the diesel particulate filter (1).

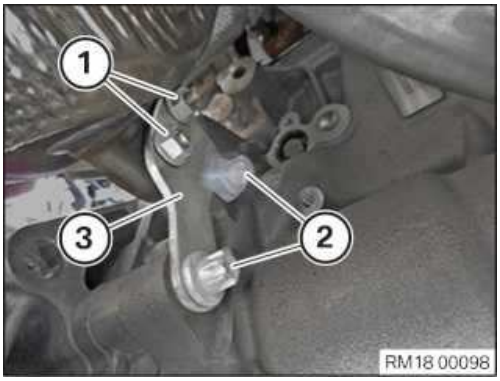
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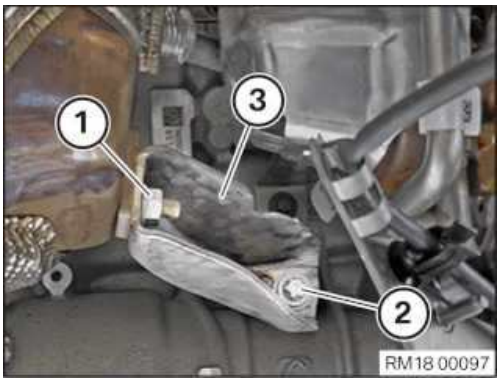
- Feed in and install V-band clamp (1).
- Make sure that the seal between the diesel particulate filter and the exhaust turbocharger is installed correctly.
- Align the diesel particulate filter on the exhaust turbocharger.
- Position V-clip (1).
- Hand-tighten the V-clip (1).



- Tighten nuts (1) by hand.



- Install holder (3).
- Hand-tighten the bolts (2).
- Tighten nuts (1) by hand.

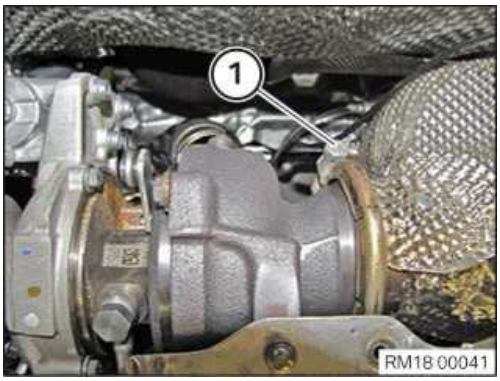


- Install holder (3).
- Tighten the nut (1) hand-tight.
- Hand-tighten the bolt (2).



- Remove fitting aid (1) for the flexible tube.

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- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

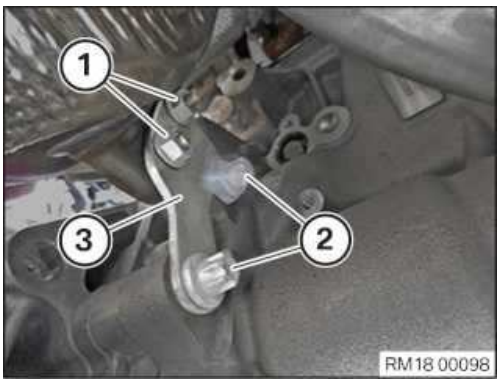
V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm



- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screws (2).

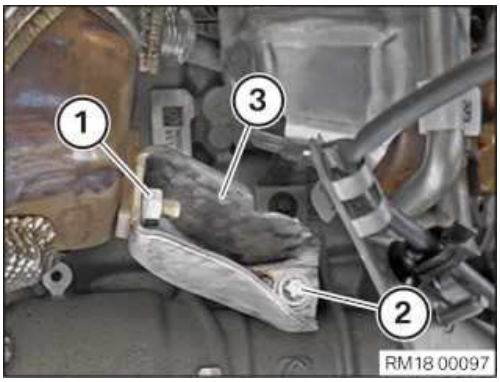
Diesel particulate filter holder to gearbox

M12x75		Tightening torque	66 Nm

- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screw (2).

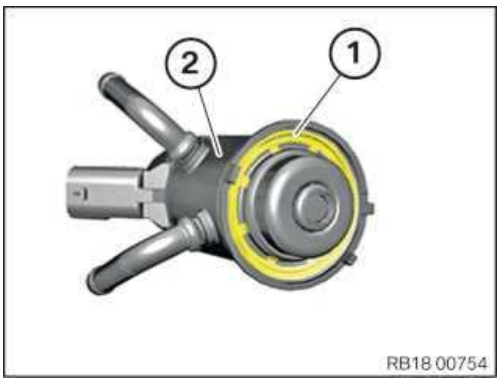
Diesel particulate filter bracket to crankcase

M10x35		Tightening torque	38 Nm

- Tighten nut (1).

Diesel particle filter to holder

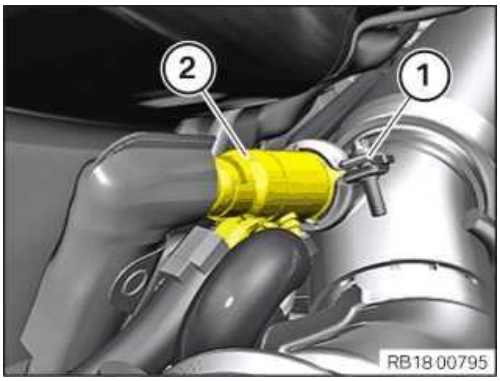
M8 hexagon nut		Tightening torque	19 Nm



- Renew sealing ring (1) of the SCR metering module (2).

  Parts: Sealing ring

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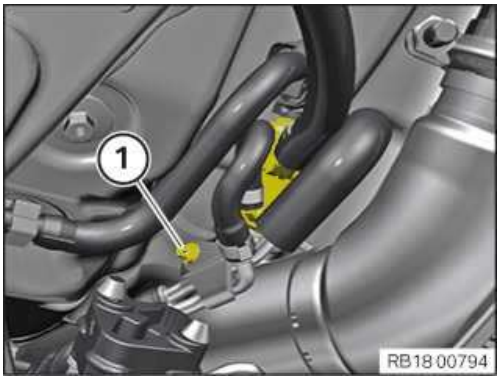


- Insert and install the SCR metering module (2).
- Renew the V-clip (1).

  Parts: V-band clamp
- Tighten V-band clamp (1).

SCR metering module V-clip to exhaust system

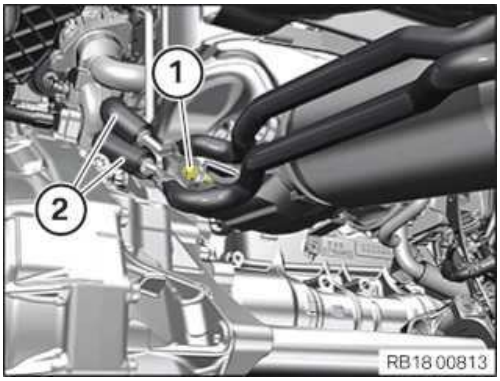
V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm



- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm

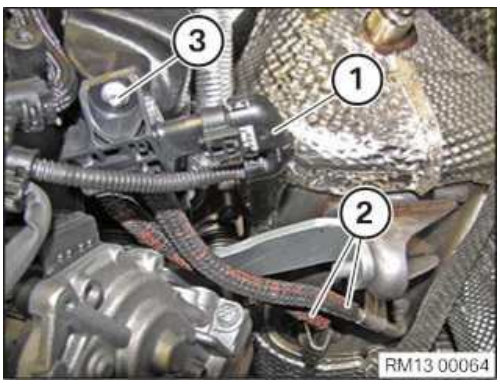


- Thread in and install coolant line (2) of the SCR metering module.
- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm

▶ **Installing differential pressure sensor**



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

100 – Install the control sensor

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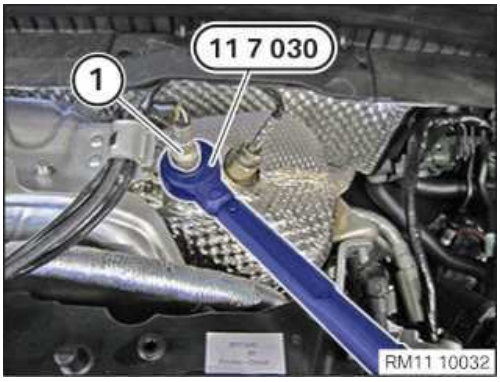
TECHNICAL INFORMATION

New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue



- Feed in front oxygen sensor (1) and install.
- Tighten front oxygen sensor (1) using special tool .

Control sensor

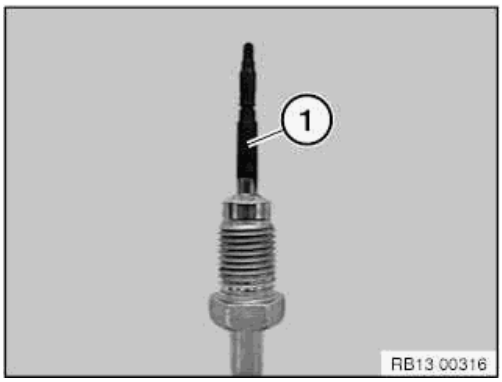
Control sensor		Tightening torque	50 Nm



- Lay and secure cable of oxygen control sensor.
- Secure the connector (2) to the holder.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

101 – Install the exhaust-gas temperature sensor on the diesel particulate filter



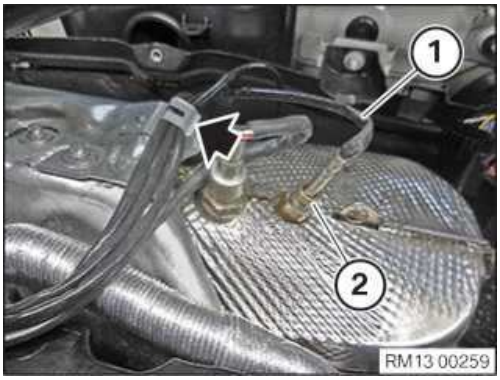
RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

- Check the gauge tip (1) for damage and renew the exhaust temperature sensor as needed.



- Feed in and install the exhaust temperature sensor (2).
- Tighten the exhaust temperature sensor (2).

Exhaust temperature sensor to diesel particulate filter

Exhaust-gas temperature sensor		Tightening torque	28 Nm

- Insert and install cable (1) of the exhaust temperature sensor in the clamp (arrow).

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- Lay and fasten the cable of the exhaust gas temperature sensor.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

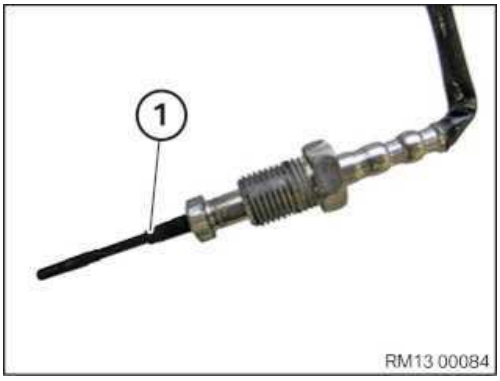
102 – Installing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

RISK OF DAMAGE

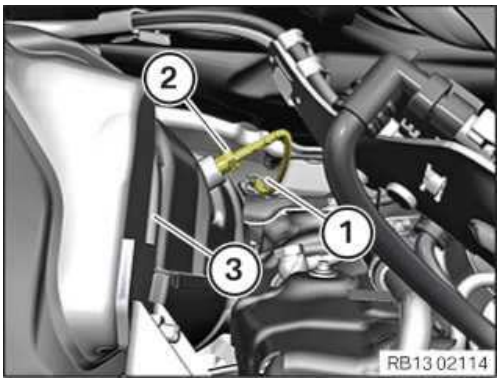
Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.



- Make sure the gauge tip (1) is not damaged during installation.

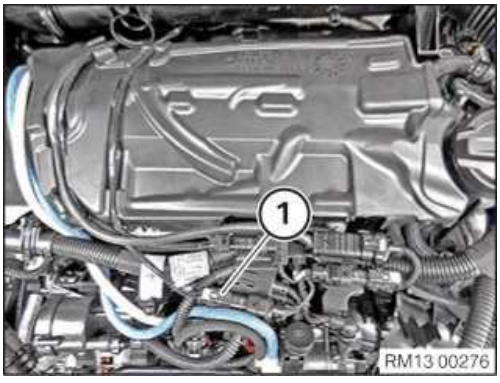


- Guide the exhaust temperature sensor (2) into diesel particulate filter (3) and install.
- Tighten the exhaust temperature sensor (2) with conventional tools .

Exhaust temperature sensor to diesel particulate filter

Exhaust-gas temperature sensor		Tightening torque	28 Nm

- Insert and install the cable of the exhaust temperature sensor (2) in the clamps (1).

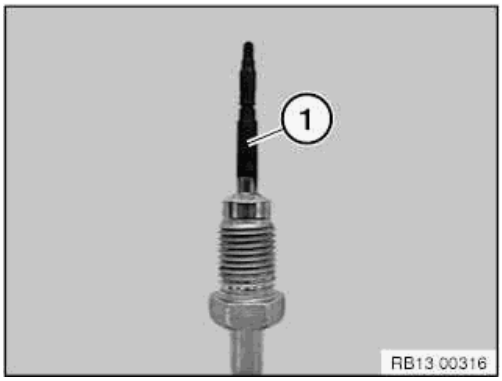


- Lay and fasten the cable of the exhaust gas temperature sensor.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

103 – Installing exhaust temperature sensor on catalytic converter

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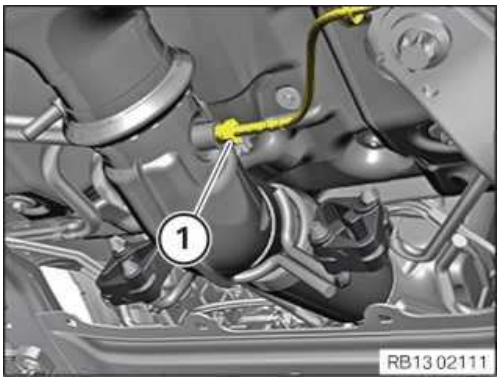
RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

- Check the gauge tip (1) for damage and replace the exhaust temperature sensor as needed.



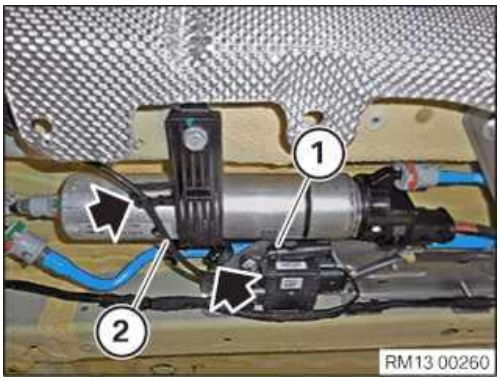
- Feed in and install the exhaust temperature sensor (1).
- Tighten the exhaust temperature sensor (1).

Exhaust-gas temperature sensor to exhaust system

Exhaust-gas temperature sensor		Tightening torque	28 Nm



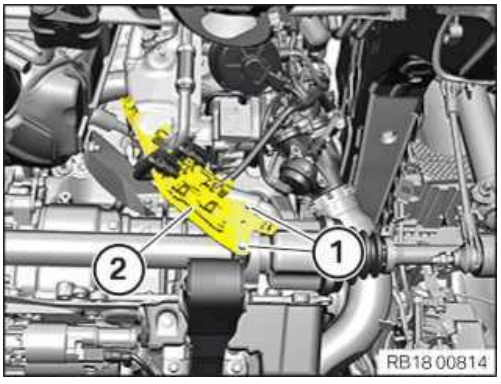
- Secure the cable clips (1).



- Feed cable (2) from exhaust temperature sensor into the clamps (arrows) and install.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

104 – Install holder for oxygen sensor



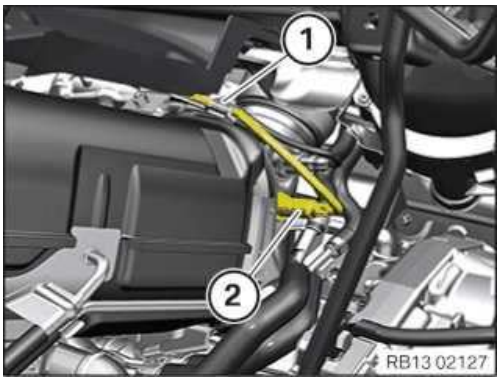
- Insert and install the holder (2).
- Tighten the screws (1).

Oxygen sensor holder to intermediate shaft

Hexagon screw M6x16		Tightening torque	8 Nm

105 – Installing the nitrogen oxide sensor before SCR catalytic converter

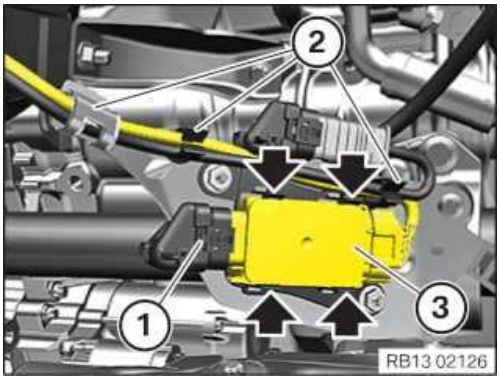
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- Insert nitrogen oxide sensor before the SCR catalytic converter (2) and install.
- Tighten the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

Nitrogen oxide sensor before SCR catalytic converter

Sensor		Tightening torque	50 Nm



- Install and lock the evaluation electronics for the nitrogen oxide sensor (3) (arrows).
- Insert the evaluation electronics cable for the nitrogen oxide sensor (3) into the clamps (2) and install.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

106 – Install the monitoring sensor

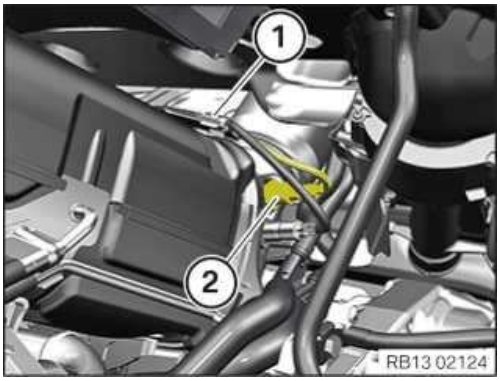
TECHNICAL INFORMATION

New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

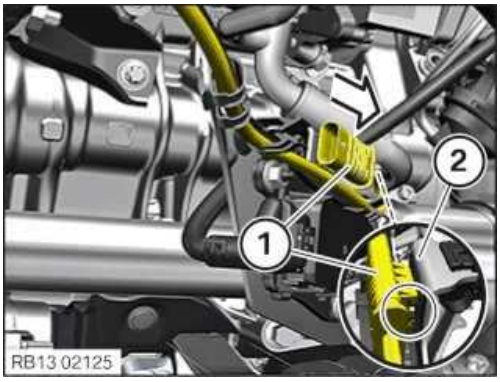


- Feed in the monitoring oxygen sensor (2) and install.
- Tighten the monitoring oxygen sensor (2) with special tool **0 491 074 (11 7 020)** .

Monitoring sensor

Sensor		Tightening torque	50 Nm

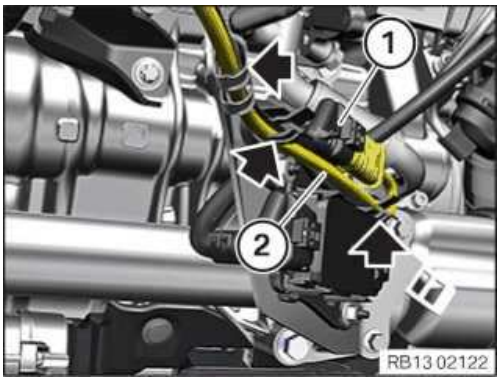
- Insert the cable of the monitoring oxygen sensor (2) into the clamp (1) and secure it.



- Connect the connector (1) with the bracket (2) in the direction of arrow.
- Make sure that the connector (1) is locked correctly in the marked area.

  The connector (1) must engage audibly.

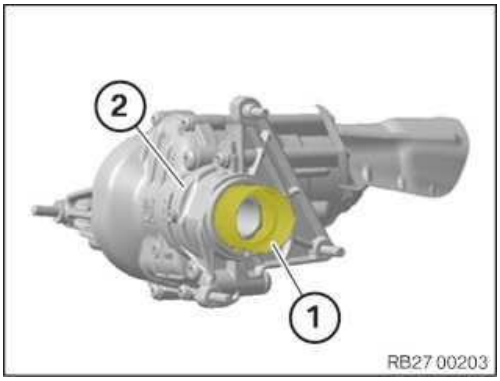
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- Insert and attach the cable of the monitoring oxygen sensor (2) to the clamps (arrows).
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

107 – Install the transfer box (VTG)



- If intermediate shaft (1) gets caught on transfer box (VTG) (2), renew intermediate shaft (1) and the radial shaft seals in the automatic or manual transmission.



- Screw special tool **2 409 025** into the outer radial shaft seal.
- Turn the screw on the special tool **2 409 025** until the outer radial shaft seal has been pulled out.

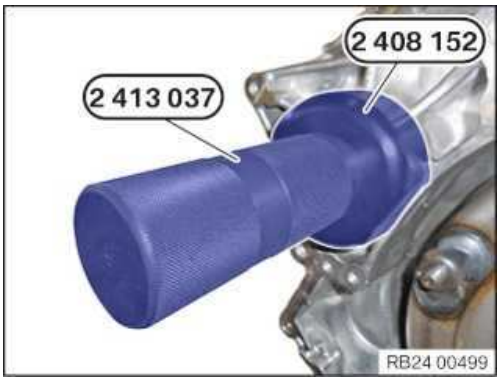


- Insert special tool **2 411 739** into the inner radial shaft seal.

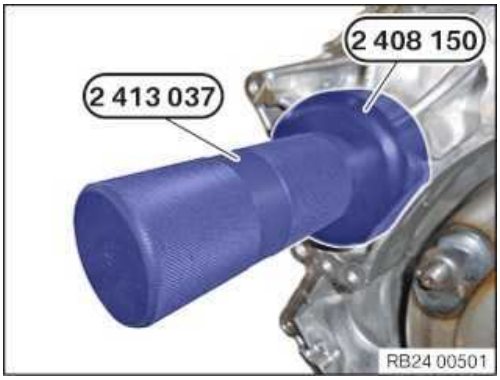


- Screw special tool **2 411 739** into the inner radial shaft seal.
- Turn the screw on the special tool **2 411 739** until the inner radial shaft seal has been pulled out.

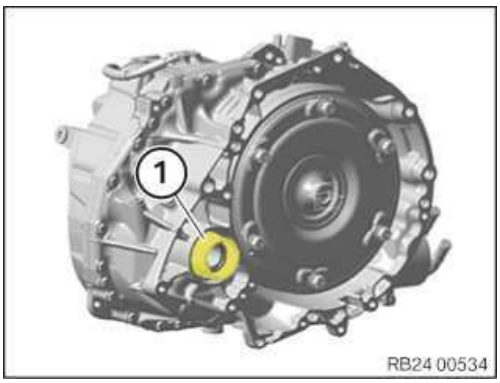
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- Drive in the inner radial shaft seal using special tools **2 408 152** and **2 413 037** up to the limit position.



- Drive in the outer radial shaft seal using special tools **2 413 037** and **2 408 150** up to the limit position.



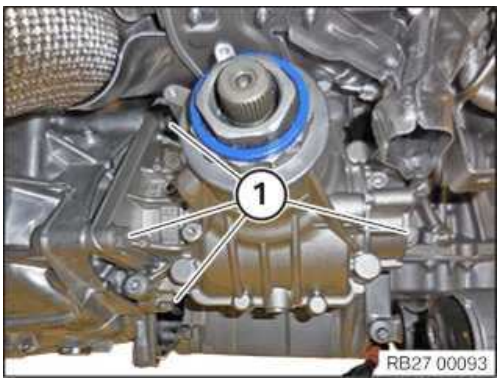
- If necessary, connect the new intermediate shaft (1) to the output flange of the automatic transmission or manual transmission.



- Coat the inside of the output flange (arrows) evenly with approx. 5 g of grease.

Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754

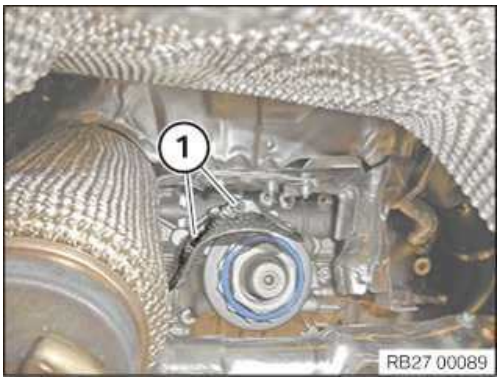


- Install the transfer box (VTG).
- Tighten the screws (1).

Transfer box to transmission

M10		Tightening torque	56 Nm

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- Install heat shield.
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Heat shield to transfer box

M6	Renew screws.	Tightening torque	6 Nm

▸ **Check the transfer box oil level**

RISK OF DAMAGE

Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.



- Check transfer case oil level, correct:
- Open the oil filler plug (1).
- Check transfer box oil level.
- If necessary, top up transmission oil up to the lower edge of the oil filler plug opening (1).

Transmission oil

Technically suitable transfer box and electrical transmission oils	

Main group 27

- Tighten the oil filler plug (1).

Oil filler plug on transfer box (VTG)

M18x1.5		Tightening torque	35 Nm

108 – Install the intermediate shaft with the support tube

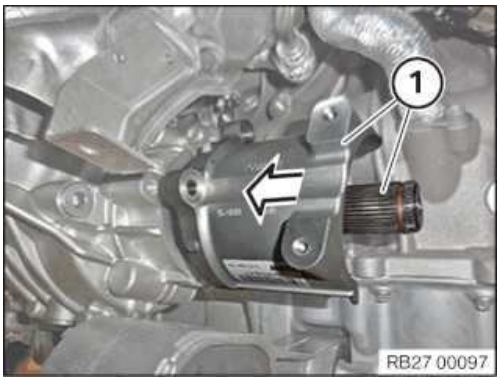


- Coat gearing of the intermediate shaft uniformly with 5 g of grease.

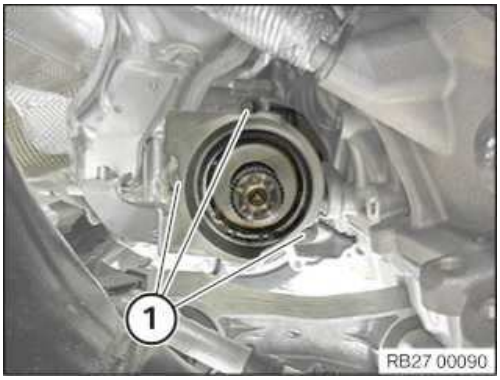
Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754

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- Install the intermediate shaft with support tube (1) in the transfer box.



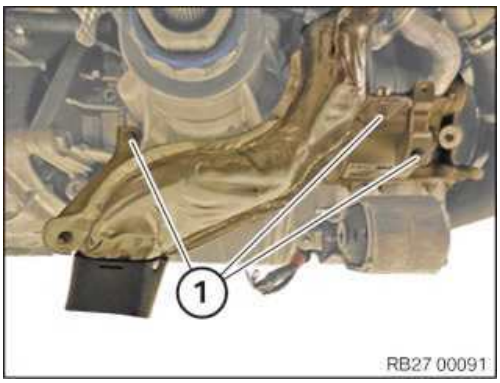
- Position screws (1).

Note: Check for correct screw length! Bolt M8x35 8.8

- Tighten the screws (1).

Intermediate shaft to transfer box

M8x35		Tightening torque	19 Nm



- If installed: Install air duct.
- Tighten the screws (1).

109 – Installing starter motor

CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.



- Insert and install the starter motor .
- Tighten the screws (1).

Starter motor to transmission

M8x45		Tightening torque	19 Nm

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- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

Battery positive lead to starter

M8		Tightening torque	13,5 Nm



- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.

110 – Installing right output shaft partially



- Renew the circlip (1).

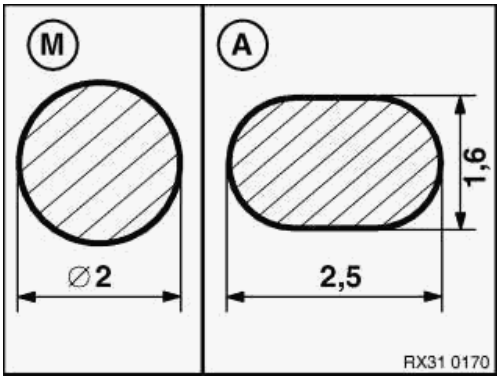
  Parts: Circlip
- Slide output shaft into the transmission as far as the limit position.
- Check for secure seat by levering.

111 – Partially installing the left output shaft



- **With automatic transmission only:**
- Lever out O-ring (1).
- Renew O-ring (1).

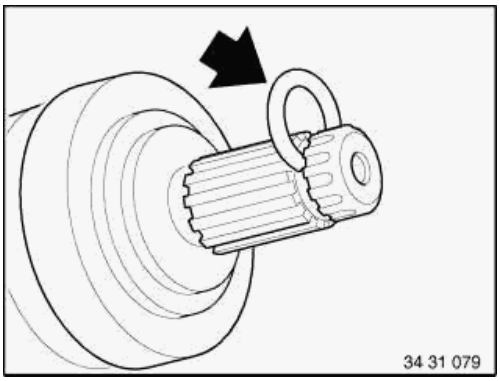
  Parts: O-ring
- Insert new O-ring (1).



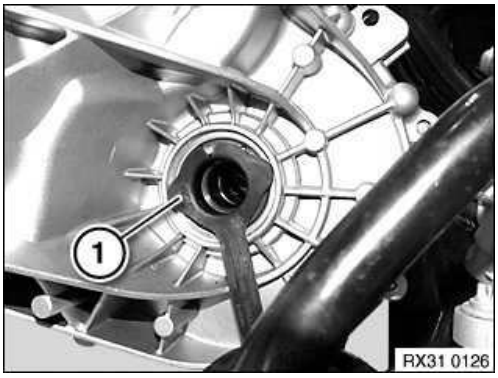
- Do not mix up circlips.

  Different types of output shafts fitted:
  - M: Manual transmission
  - A: Automatic transmission

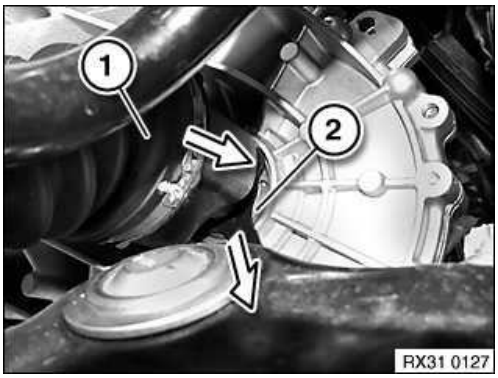
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- Renew circlip (arrow).



- Insert installation protection ring (1) into the radial shaft seal.
- Make sure the tool fits over the lip of the radial shaft seal so there is no damage to sealing ring when the output shaft is inserted.



- Insert output shaft (1) into transmission.
- **Manual gearbox only:** Pull on the handle to remove the installation protection ring (2) and dispose of it.
- Slide output shaft (1) into the transmission as far as the limit position.

  The output shaft (1) must engage audibly.
- Check for secure seat by levering.

112 – Install propeller shaft.

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

RISK OF DAMAGE

Damage to the propeller shaft during installation.

Non-observance of the installation guidelines for the propeller shaft on the rear axle differential may cause severe damage.

- Always renew the recessed nut on the rear axle differential. Screw locking must be available.
- Strictly observe a minimum hardening time of two hours after having screwed in the recessed nut. The hardening time may be longer at lower temperatures.

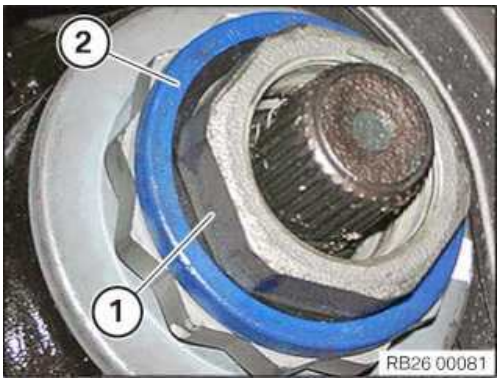
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RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.



- Renew recessed nut (1).

  Parts: Insert nut
- Renew the retaining clip (2) and the seal.

  Parts: Retaining clip, seal
- Insert the seal with the recessed nut (1) and install.
- Insert the retaining clip (2) and install.
- Make sure that recessed nut (1) is screwed in within 5 min.
- Make sure that the hardening time of **minimum** 2 h for the recessed nut is observed.

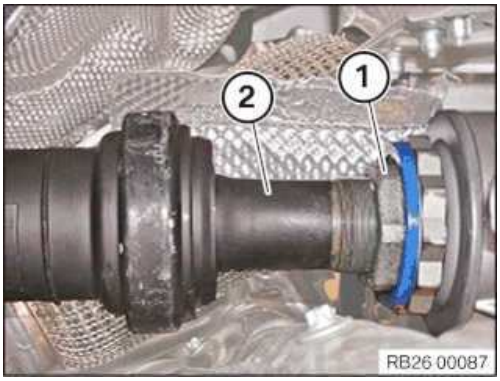
  The hardening time must be extended at lower temperatures.



- Insert the propeller shaft (1) and install.
- Always support the propeller shaft (1) with a conventional jack.

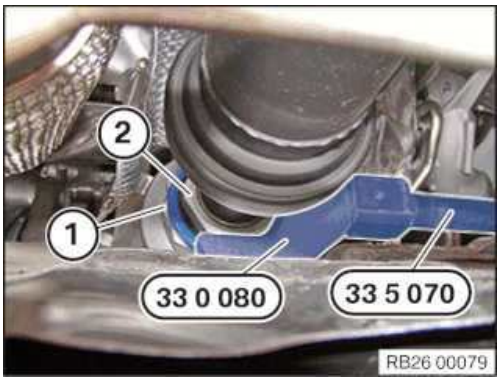


- Hand-tighten the bolts (1).



- Push the propeller shaft (2) against the recessed nut (1) up to the limit position.
- Screw the propeller shaft (2) at least 2 thread starts onto the recessed nut (1) by hand.

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RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.

- Protect the recessed nut (2) on the transfer box from twisting with the special tools **0 495 554 (33 5 070)** and .

  The recessed nut (2) on the transfer box must **not** be used to tighten the propeller shaft.

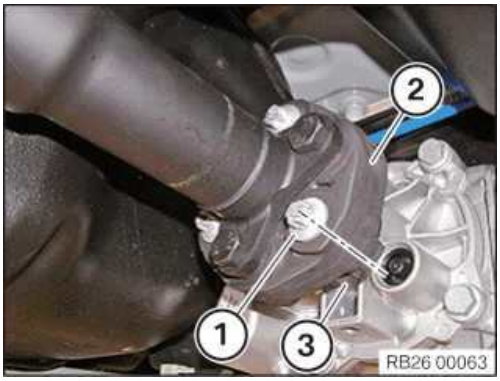
  The double hexagon flange nut (1) must **not** be used for counter support.



- Tighten the front propeller shaft with the special tools **0 495 554 (33 5 070)** and in the direction of the arrow.

Propeller shaft to transfer box

		Tightening torque	80 Nm



TECHNICAL INFORMATION

Compliance with the following instructions is required to avoid a humming noise from the propeller shaft after refitting the propeller shaft.

- Assemble the screw connection (1) of the flexible disc (2) and the three-hole flange (3) according to the mark.
- Renew screws (1).

  Parts: Bolts

- Hand-tighten the bolts (1).



- Protect the propeller shaft (1) with the special tools **0 495 554 (33 5 070)** and from twisting.

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- Tighten the bolts with the special tools **0 490 504 (00 9 120)** and .

Flexible disc to rear axle final drive

M12x1.5	Renew screws.	Tightening torque	55 Nm 90 °



- Tighten the screws (1).

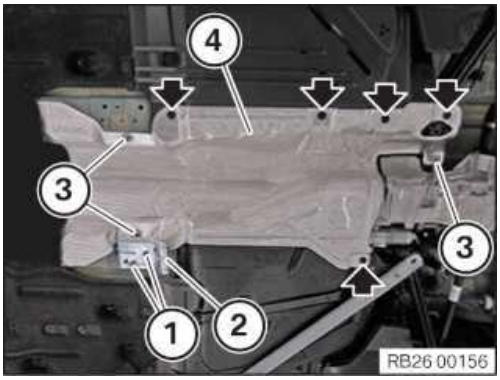
Centre mount to body

M8		Tightening torque	19 Nm



- Guide the special too l out between the front and rear propeller shaft and remove.

113 – Installing the rear heat shield



- Insert and install the heat shield (4).
- Tighten screws (arrows).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

- Tighten nuts (3).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

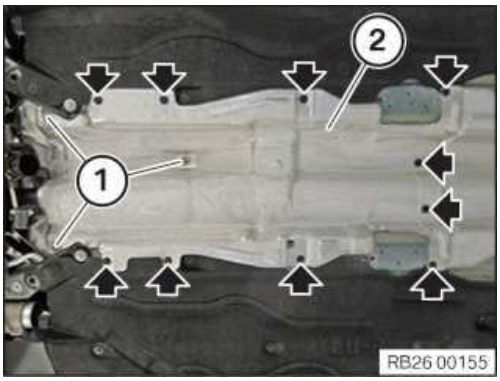
- Insert and install the holder (2).
- Tighten the screws (1).

Bracket to body

M8		Tightening torque	21 Nm

114 – Install the front heat shield

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- Insert and install the heat shield (2).
- Tighten screws (arrows).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

- Tighten nuts (1).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

115 – Install exhaust system

CAUTION

Component with heavy weight.

Danger of injury!

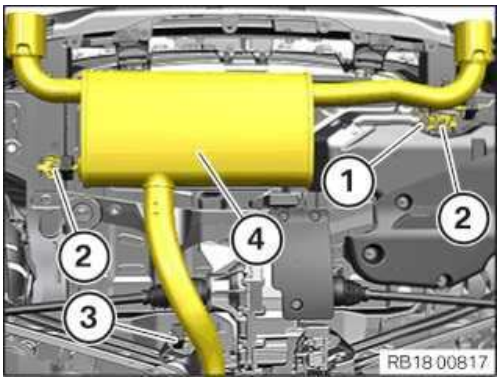
- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Feed in and install the exhaust system (4) with a second person.
- Renew nuts (2).

  Parts: Nuts
- Tighten nuts (2).

Exhaust system to body

M8	Replace nuts.	Tightening torque	19 Nm

- Tighten down screw (1).

Exhaust bracket on body

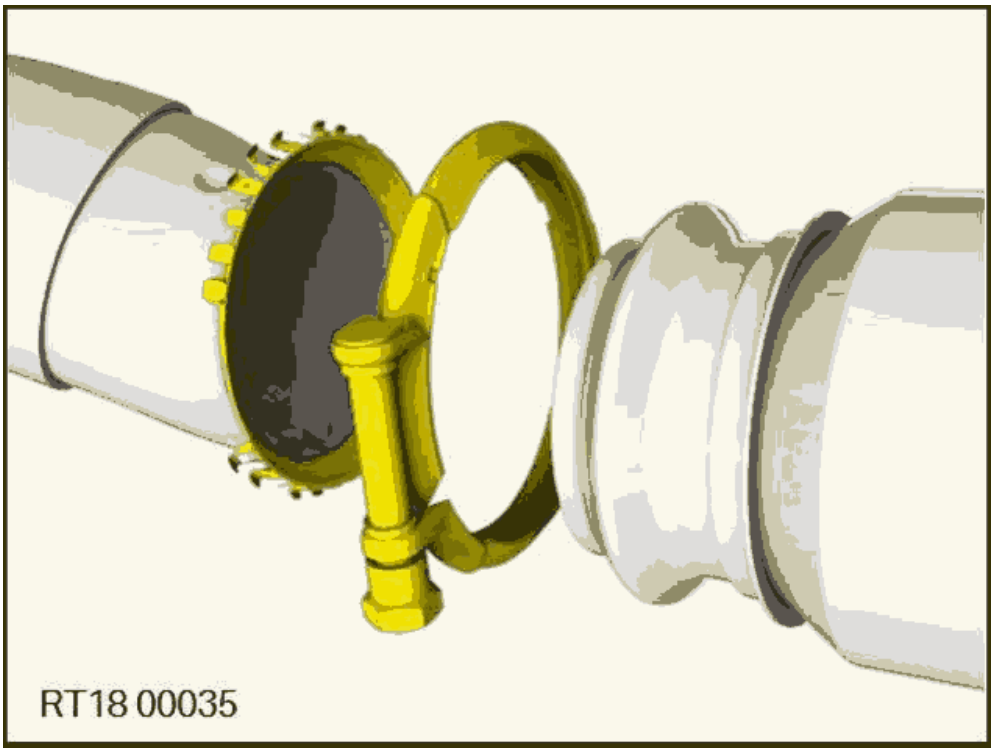
Hexagon screw M8x30		Tightening torque	19 Nm

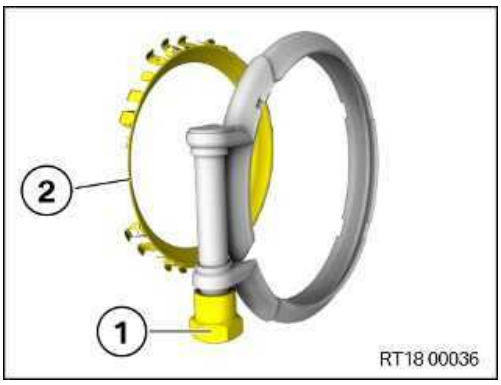
- Check the rubber mount (3) for damage and renew as needed.
- Mount rubber mount (3) on the exhaust system (4).

▸ **Install the V-clip**

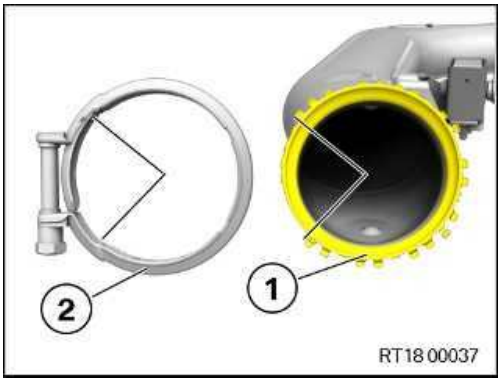
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V-band clamp



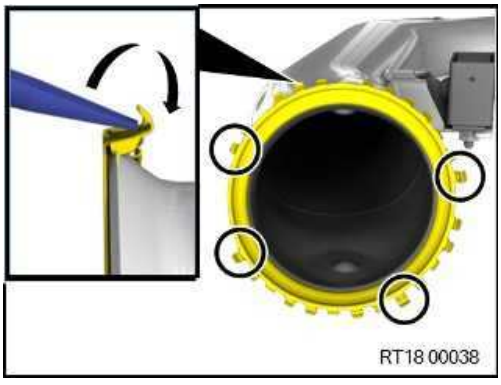


- Unscrew the nut (1) and remove the sealing ring (2).



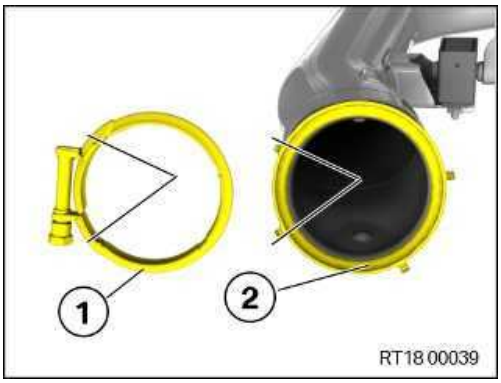
- Renew the V-clip (2).

  Parts: V-band clamp
- Mount the sealing ring (1) on the exhaust system.
- Ensure that the sealing ring (1) for the V-clip (2) is positioned correctly.



- Bend all sheet metal tabs over with a suitable tool, except those in the marked areas.

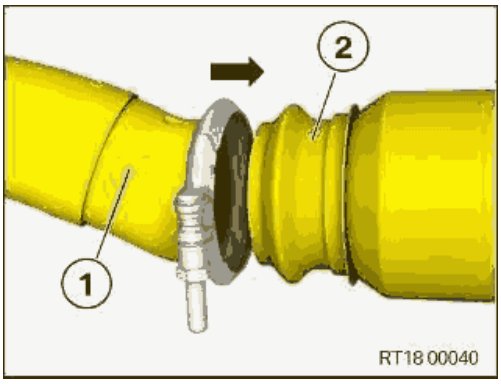
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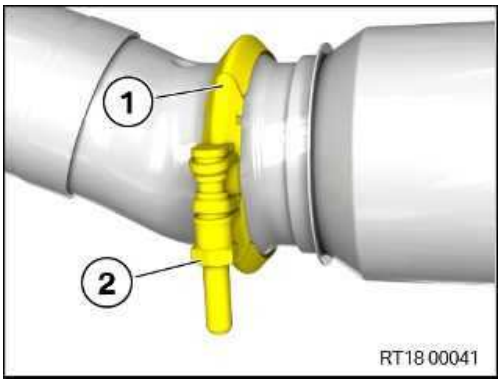
- Mount the V-clip (1) on the sealing ring (2).
- Make sure that the V-clip (1) is positioned correctly on the sealing ring (2).



- Make sure that the V-clip rests against the sheet metal tabs after mounting (marks).



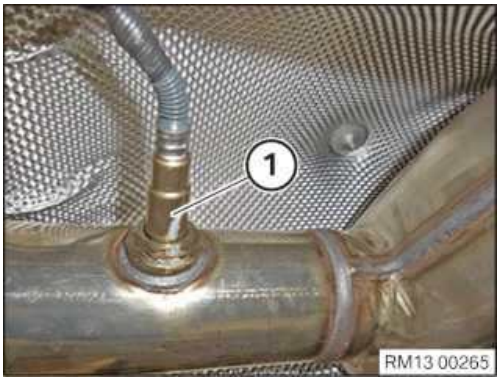
- Connect the exhaust system (1) with the catalytic converter (2) and position correctly.



- Make sure that V-clip (1) is fitted correctly.
- Tighten down screw (2).

V-clip to catalytic converter

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

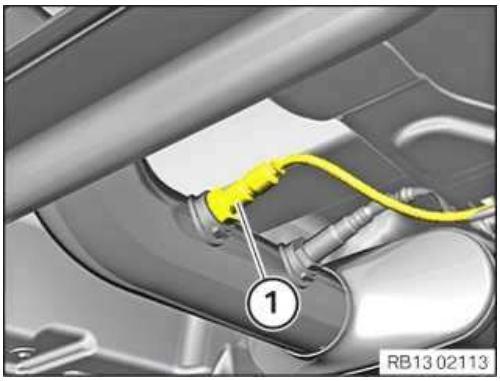


- Feed in, install and tighten diesel particulate sensor (1).

Diesel particulate sensor to exhaust system

Sensor		Tightening torque	50 Nm

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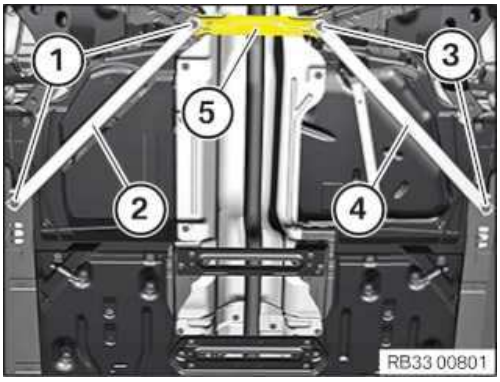


- Feed in, install and tighten nitrogen oxide sensor (1).

Nitrogen oxide sensor downstream of SCR catalytic converter

Sensor		Tightening torque	50 Nm

116 – Install the cross-member with torsion struts



- Insert and install the cross-member (5).
- Thread in torsion strut (4) at right and install.
- Renew screws (3).

  Parts: Bolts
- Tighten down screws (3).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

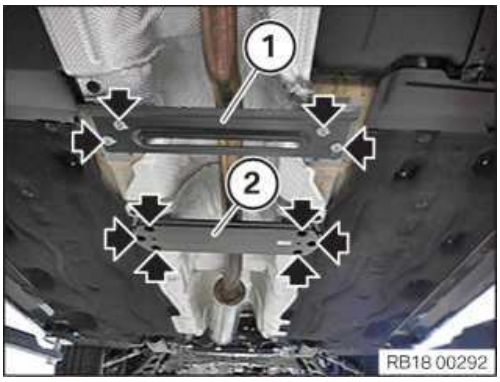
- Guide in and install the left torsion strut (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

117 – Install the connecting support on the tunnel in front and back



- Insert and install connecting supports (2).
- Tighten the screws (arrows) from the connecting support (2).

Front connection carrier to body

M10x18		Tightening torque	56 Nm

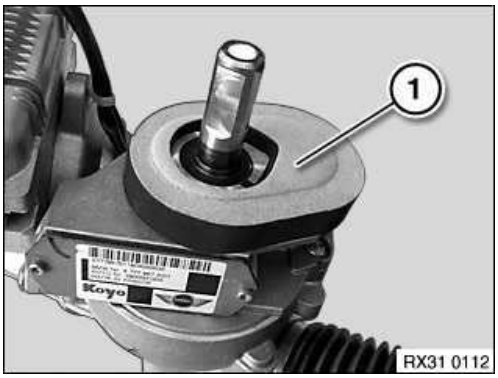
- Insert and install connecting supports (1).
- Tighten the screws (arrows) from the connecting support (1).

Rear connection carrier to body

M8x18		Tightening torque	28 Nm

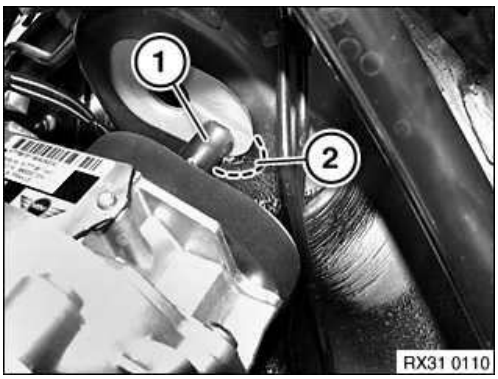
118 – Mount and secure the complete front axle

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- Remove the seal (1).
- Clean surface on steering gear.
- Renew gasket (1).

  Parts: Gasket
- Position the seal (1) and glue it on.

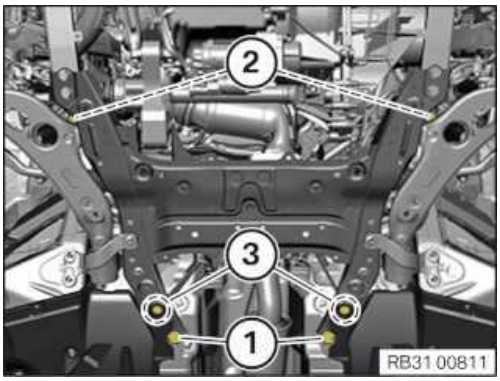


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- Position front axle support.
- Bend underbody panellings in the areas (3) to one side.
- Raise front axle support.
- When raising, insert charge air cooler into the rubber mount of the charge air cooler on cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

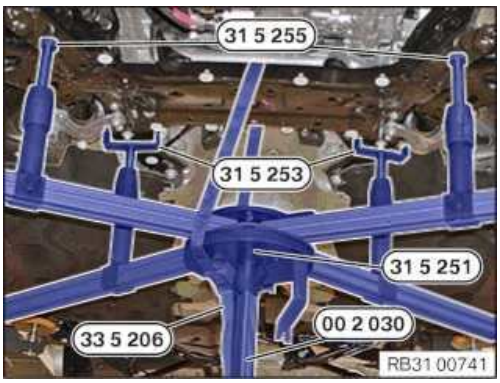
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

- If necessary, tighten the screws in the areas (3).

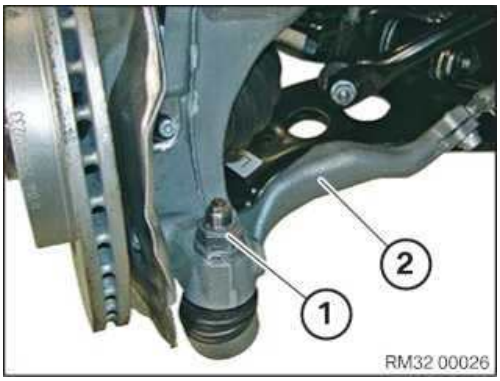
Underbody protection to body

Screw		Tightening torque	3 Nm



- Remove special tool from special tool .
- Lower universal jack **0 490 133 (00 2 030)** with the special tool and place it to the side.

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NOTICE

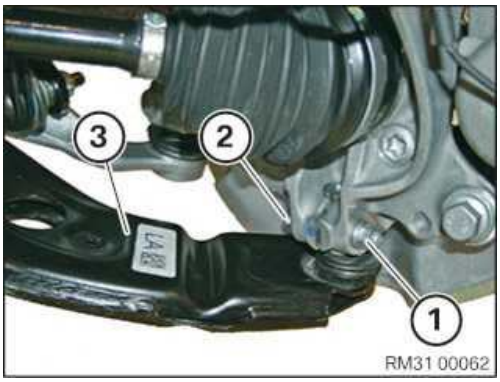
Perform the operations on the left and right side.

- Position the track rod (2) on the swivel bearing .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Track rod end to swivel bearing

M14	Renew nut.	Tightening torque	175 Nm



NOTICE

Perform the operations on the left and right side.

- Position the wishbone (3) on the swivel bearing .
- Renew the bolt (2) and the nut (1).

  Parts: Bolt, nut
- Insert screw (2).
- Tighten nut (1).

Wishbone to swivel bearing

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

119 – Install the mounted parts on the front axle support



NOTICE

Perform the operations on the left and right side.

- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Holder, wishbone rubber mount, to body

M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °

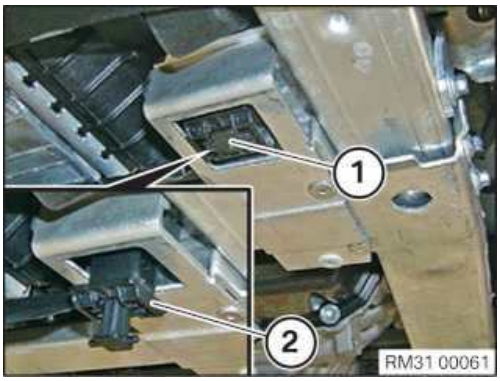


- Position the engine support (3) on the front axle support (1).
- Tighten down screw (2).

Holder with rubber mount to front axle support

M12 screw		100 Nm

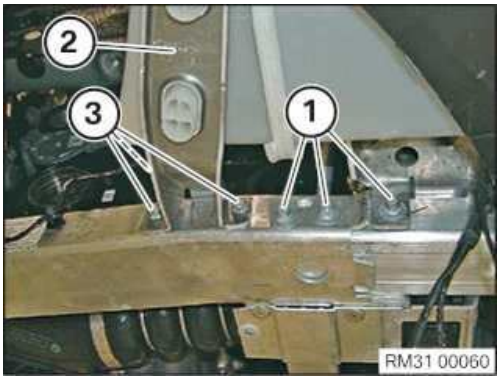
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NOTICE

Perform the operations on the left and right side.

- Position the lock (2).
- Lock the bracket (1) of the lock (2) of the holder for the charge air cooler.



- **Only on right side:** Position the holder for the washer fluid reservoir (2).
- Tighten down screws (3).

Washer fluid reservoir holder to front axle support adapter plate

		Tightening torque	10 Nm

NOTICE

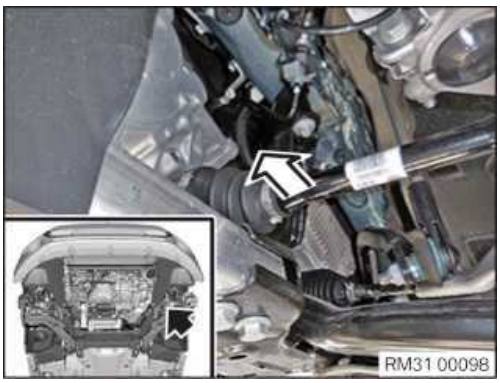
Perform the operations on the left and right side.

- Tighten the screws (1).

Deformation element, bottom, to adapter plate, front axle carrier

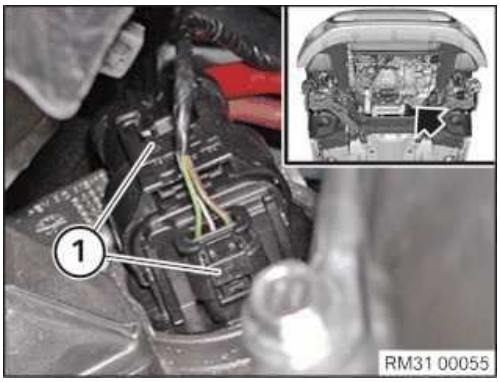
		Tightening torque	11,8 Nm

120 – Attaching connector at steering gear



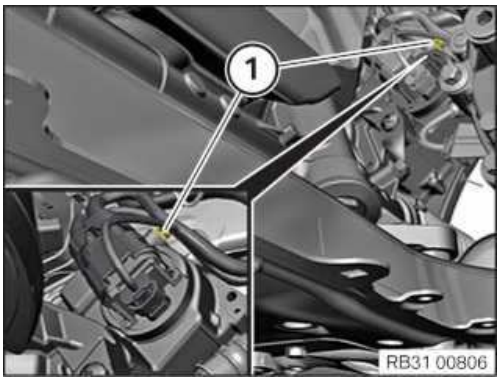
- To connect the connector (see the following step): Connect the connector with the right hand.

  The connectors can be accessed via the left output shaft.



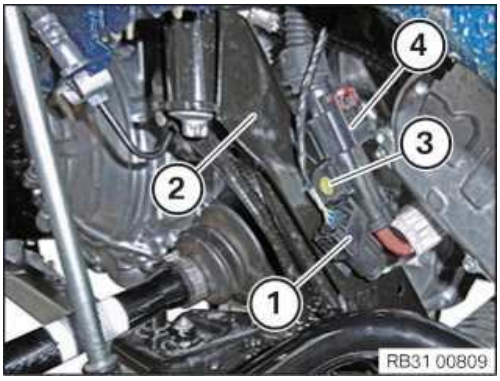
- Connect and lock connector (arrow) (1) with the steering gear.

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- Fasten the wiring harness (1) on the steering gear.

▶ **If installed: Fasten the plug connections at the front axle support**



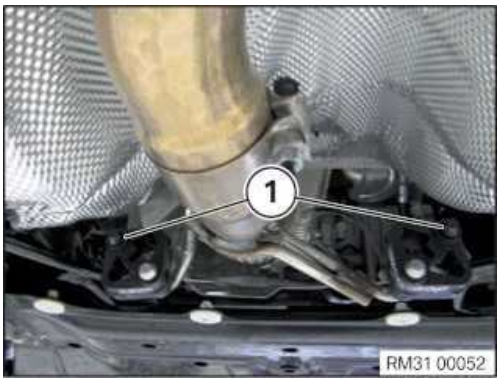
- Position the plug connection (4) at the front axle support (2).
- Tighten down screw (3).

Holder to front axle support

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

- Fasten the plug connection (1) at the front axle support (2).

121 – Securing rubber mount on front axle support



- Check rubber mount (1), replace if necessary.

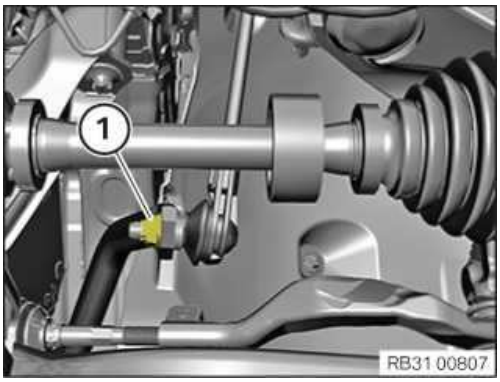
  Parts: Rubber mount
- Spray rubber mount (1) with lubricant and slide onto holder on front axle support.

122 – Securing anti-roll bar on left and right on the anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▶ **Fastening anti-roll bar on the anti-roll bar link**



- Position the anti-roll bar link on the anti-roll bar .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

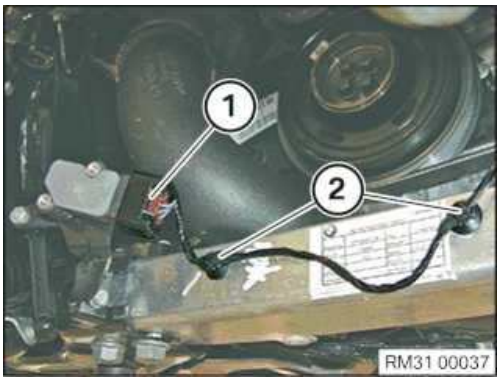
Note: Use the Torx socket for counter support.

Anti-roll bar link to anti-roll bar

M10	Renew nut.	Tightening torque	56 Nm

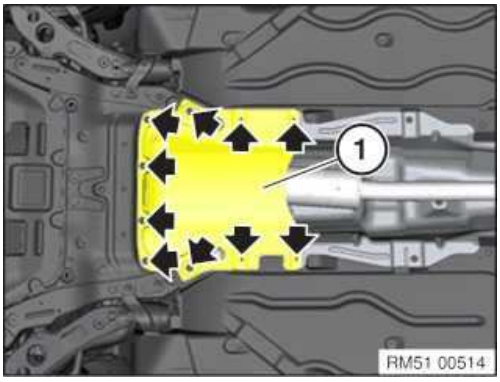
123 – With right installation: Securing the cable for the ride height sensor

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- Secure the cable clip (2) on the adapter of the deformation element.
- Connect connectors (1) and lock.

124 – If installed: Installing underbody protection at rear

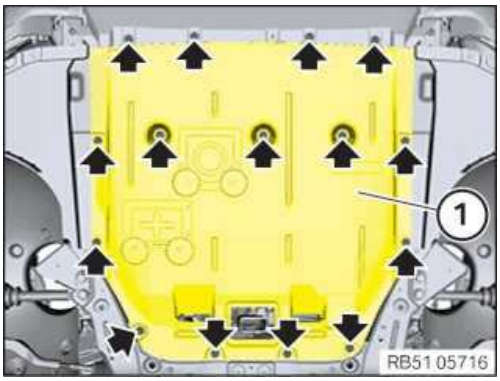


- Position rear underbody protection (1).
- Tighten screws (arrows).

Underbody protection to body

Screw		Tightening torque	3 Nm

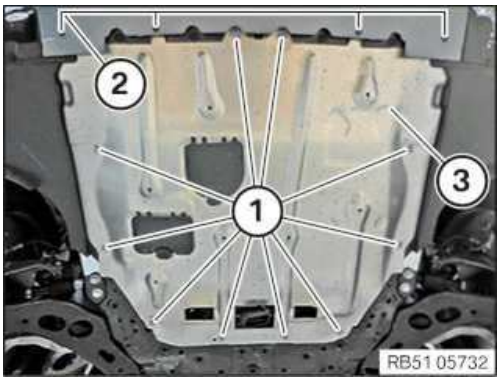
125 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm



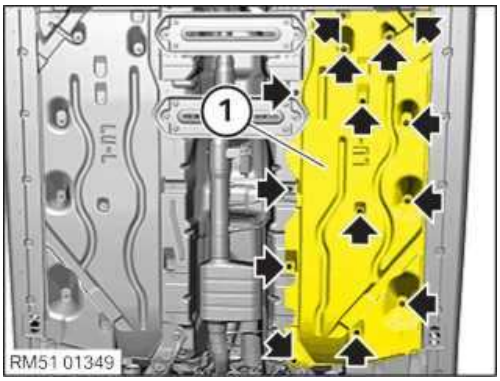
- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

126 – Installing underbody panelling , right

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- Correctly position the underbody panelling (1).
- Tighten all bolts and nuts (arrows).

Underbody panelling, side

Hexagon screw		Tightening torque	2,6 Nm

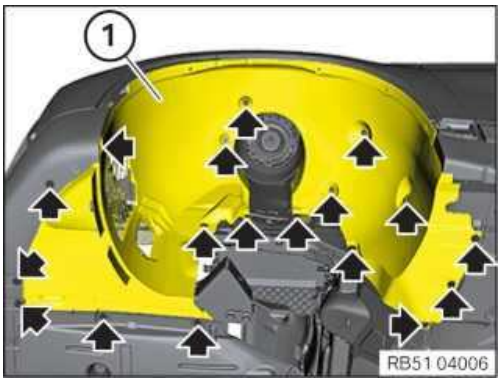
Underbody panelling, side

Plastic nut		Tightening torque	2,6 Nm

127 – Installing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.



▸ **Installing the front wheel arch cover**

- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Plastic nut		Tightening torque	2,6 Nm
Screw		Tightening torque	2,6 Nm

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

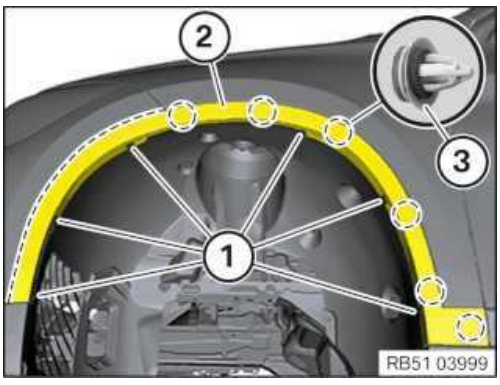
▸ **Installing front wheel arch trim**

NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Check the clips (3) for damage and renew where required.

  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

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▶ Mounting the wheel

▷ Clean the contact surfaces between the brake disc and the wheel rim



TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

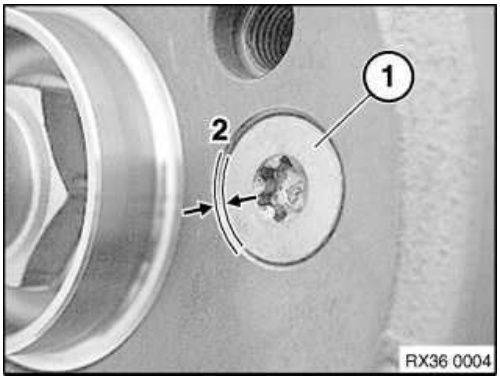
- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue in the area of the wheel bolt holes, remove and clean the brake disc.



- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).



- Renew mounting bolt (1).

  Parts: Mounting bolt
- Check that the mounting bolt (1) for the brake disc is securely seated.

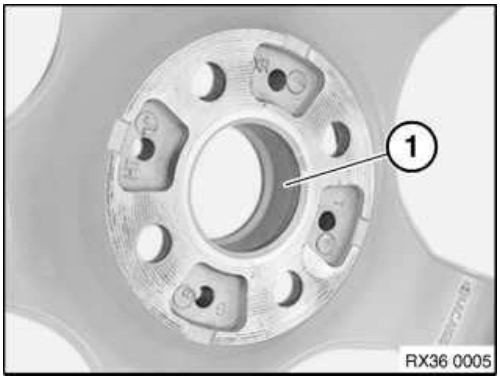
  The mounting bolt (1) for the brake disc may not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to rear wheel hub

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub

M8	Renew screw.	Tightening torque	16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring (1).

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

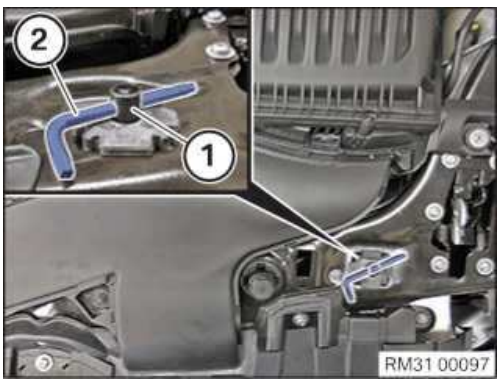
- Renew corroded wheel bolts.

  Parts: Wheel bolts
- Clean the wheel bolts.
- Check the wheel bolts and threads for damage, renew the wheel bolts if necessary.
- Join and tighten the wheel bolts (arrows).

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

129 – Removing fastener for left and right radiator



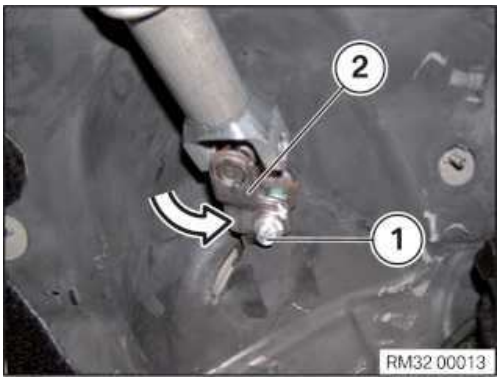
NOTICE

Perform the operations on the left and right side.

- Remove suitable tool (2) from the centering pin (1).

130 – Secure the steering shaft at the bottom on the steering gear

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- Clean the screw lock residue from the screw thread in the universal joint (2).
- Pivot the universal joint (2) in the direction of the arrow to the steering gear.
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Lower steering shaft to steering gear

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm



- **If installed:**
- Position the cover on the steering column (2).
- Tighten nuts (1).

Steering column cover to bulkhead

Plastic nut		Tightening torque	3 Nm

131 – Install the heat shield on the exhaust turbocharger



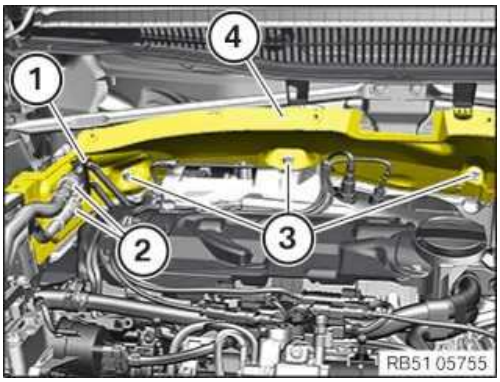
- Feed in and install the heat shield (2).
- Tighten the screws (1) at the top and bottom of the heat shield.

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Fasten the cable at the clips .

132 – Installing rear bulkhead upper part



- Feed in and install the rear bulkhead upper part (4).
- Tighten down screws (3).

Rear bulkhead upper part to lower section of bulkhead

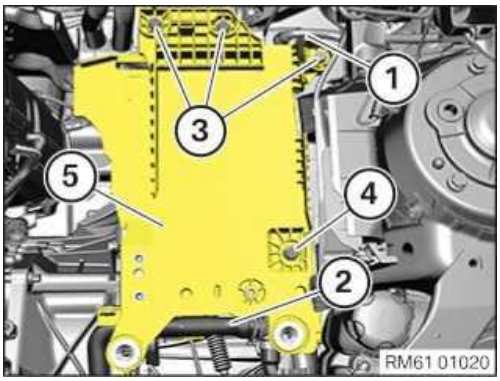
Oval-head screw		Tightening torque	5 Nm

- Feed the fuel line (2) into the holder (1) and install.
- Connect and lock the holder (1).

  The holder (1) must engage audibly.

133 – Install the battery holder

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- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

134 – Install electronics box

Prerequisite

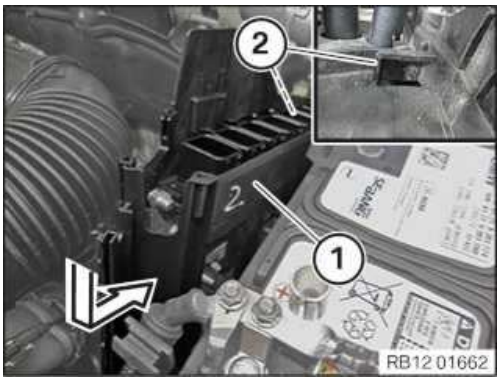
Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.

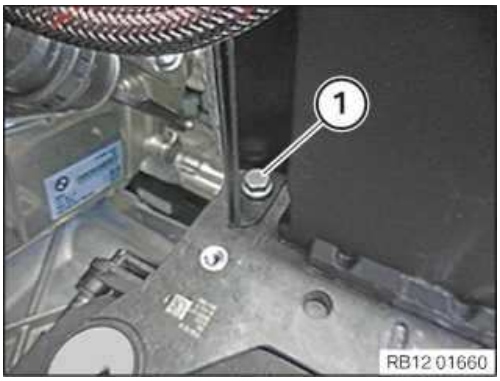


- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.



- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).

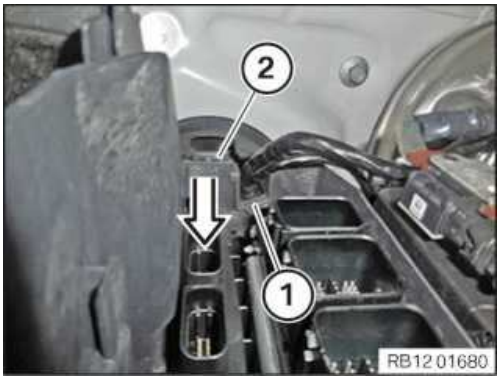
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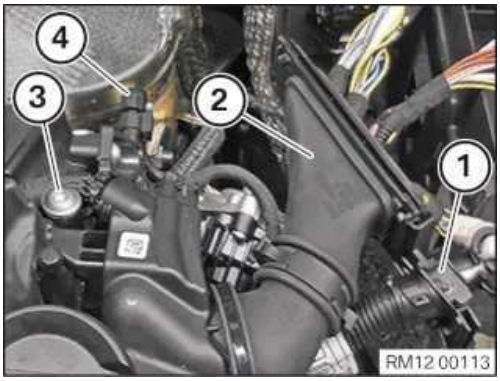
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.

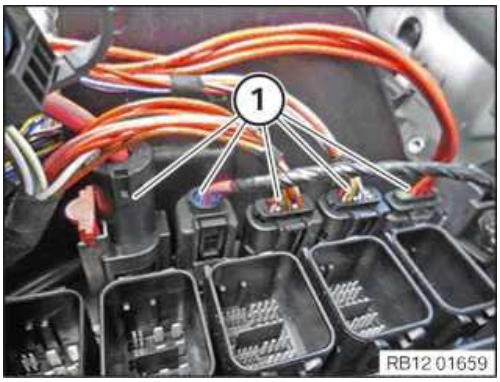


- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

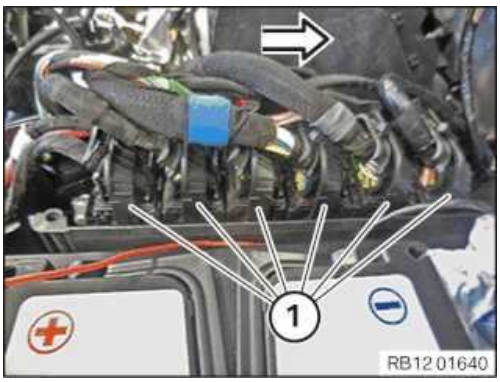
Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.

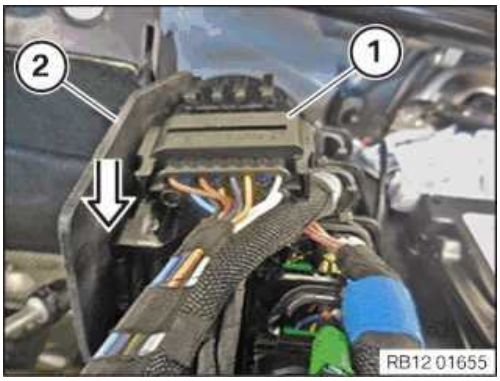


- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.

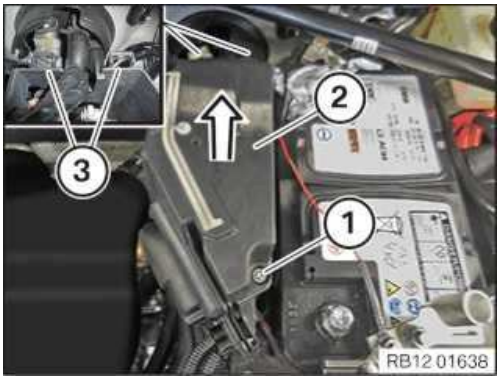


- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.

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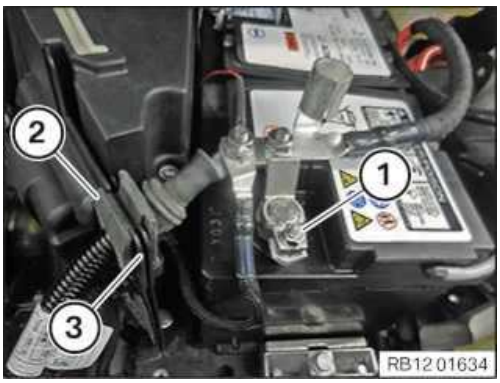
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

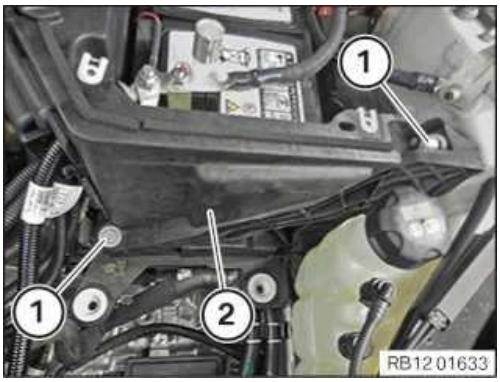
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

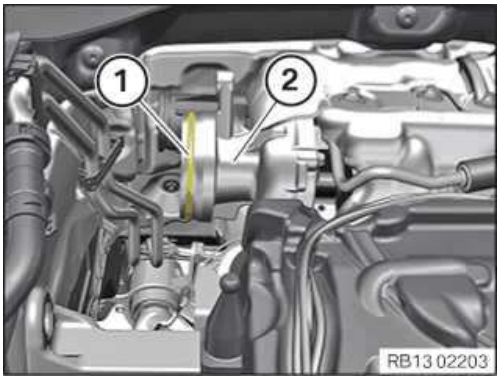


- Feed in and install tension strut (2).
- Tighten the screws (1).

Tension strut to spring strut dome/battery tray

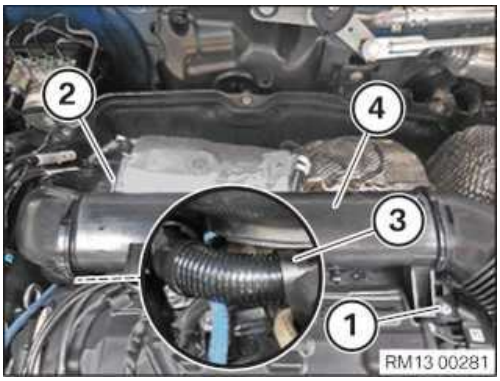
M8		Tightening torque	19 Nm

135 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.

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- Feed in clean air pipe and install.
- Connect clean air pipe to the exhaust turbocharger and lock audibly in the clamps (2).
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Connect ventilation line (3) to the cylinder head cover and lock audibly.

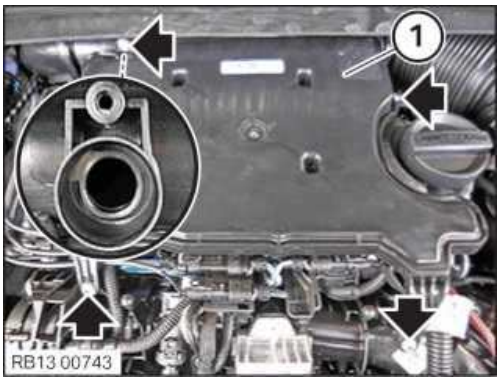


- Mount clean air pipe onto the intake filter housing.
- Tighten clamp (1) on the clean air pipe.

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

136 – Install resonator



- Insert and install the resonator (1).
- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

137 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

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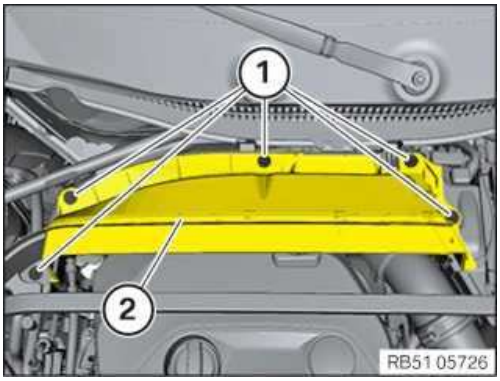


- Check for correct installation of all rubber mounts in the acoustic cover (1).



- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

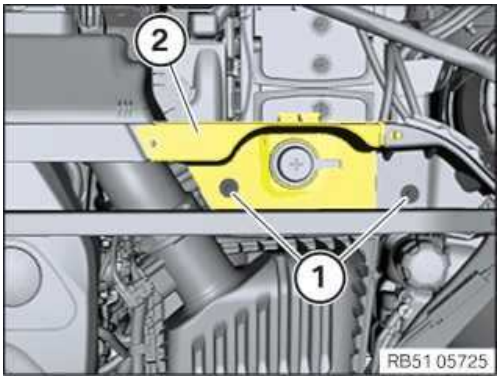
138 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Cover of top bulkhead

Screw		Tightening torque	2,6 Nm

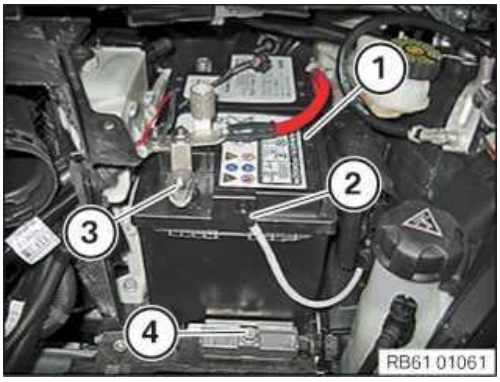


- Guide in and install cover (2).
- Tighten down screw (1).

Cover of remote positive terminal

Screw		Tightening torque	2,6 Nm

139 – Install vehicle battery



- Install vehicle battery (1).
- Position the bracket and tighten with the screw (4) .

Battery terminal rail to battery tray

M8		19 Nm

- Position the vent hose (2) and clip it in.
- Position the positive battery terminal and tighten with the nut (3) .

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

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▶ **Check the vent holes of the battery**

WARNING

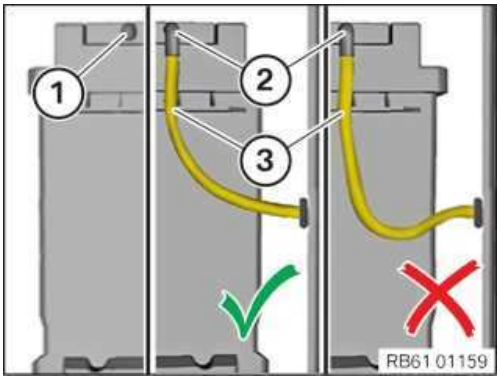
Gas emission.

Danger of injury! Danger of explosion!

- Assign the vent holes correctly.
- Route the vent hose correctly.

TECHNICAL INFORMATION

The battery has two vent holes, opposite:
One vent hole (1) must be closed correctly with a dummy plug.
The vent hose (3) must be correctly connected and routed at the other vent hole (2).



Check

- Check if the vent hole (1) is correctly closed with a dummy plug.

Result

» No dummy plug.

Measure

- Close the vent hole (1) correctly with a dummy plug.

Check

- Check if the vent hole (2) has a correctly connected vent hose (3).

Result

» The vent hose (3) is not correctly connected.

Measure

- At the vent hole (2), connect the vent hose (3) correctly.

Check

- Check if the vent hose (3) is routed to the outside with a downhill gradient (**no siphon formation!**).

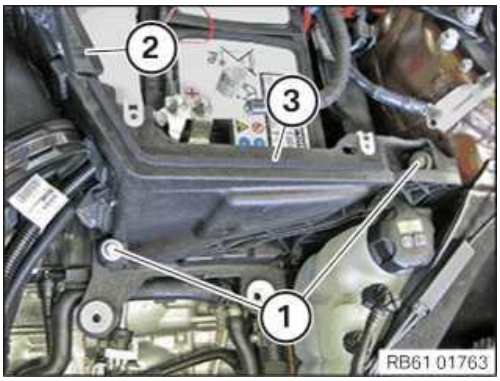
Result

» The vent hose (3) is not correctly routed as shown in the image on the right.

Measure

- Route the vent hose (3) correctly as shown in the centre image.

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- Insert tension strut (3) and tighten with screws (1).

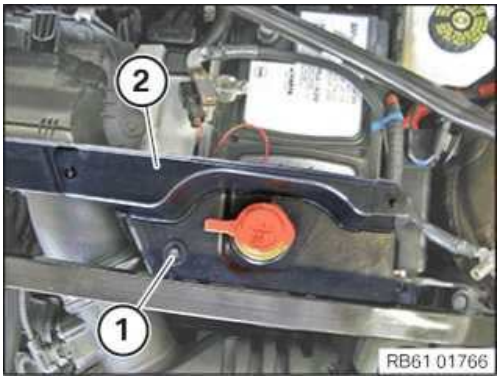
Trailing link

M8		Tightening torque	19 Nm

- Tighten down screw (2).

Battery cover

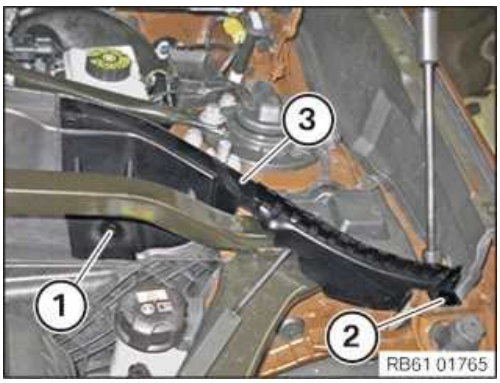
M8		2,8 Nm



- Position the cover (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

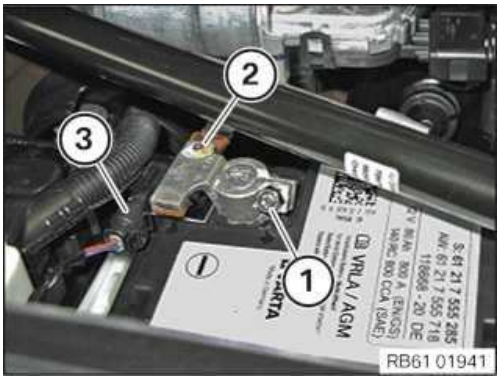
Battery cover

M8		2,8 Nm

140 – Connecting the battery earth lead

TECHNICAL INFORMATION

For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)



- Remove the protective cover of the positive battery terminal.
- Position the battery earth lead (2).
- Tighten nut (1).

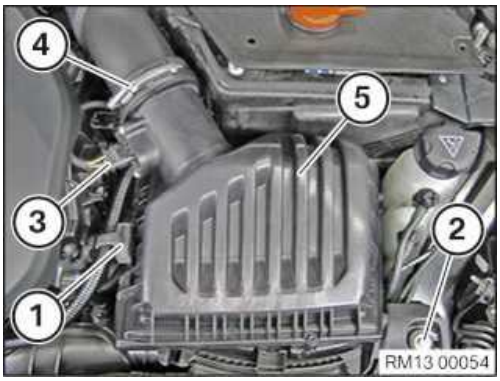
Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

- If required, connect the connector (3).

141 – Installing intake silencer housing

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- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

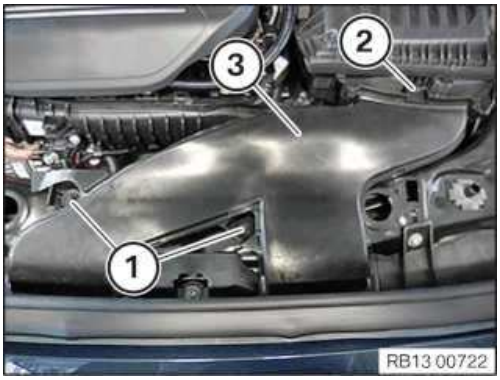
- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

142 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).
  The lock (2) must audibly engage.
- Tighten nuts (1).

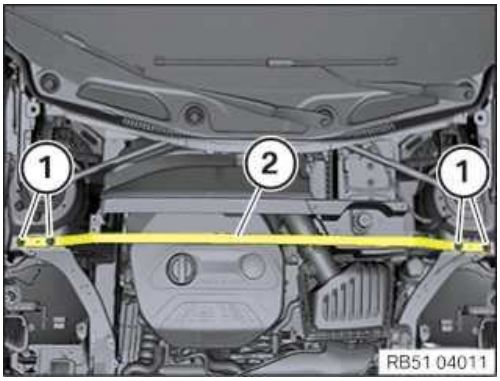
Intake neck to cross connection

M6		Tightening torque	8 Nm

143 – Install strut brace

TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.

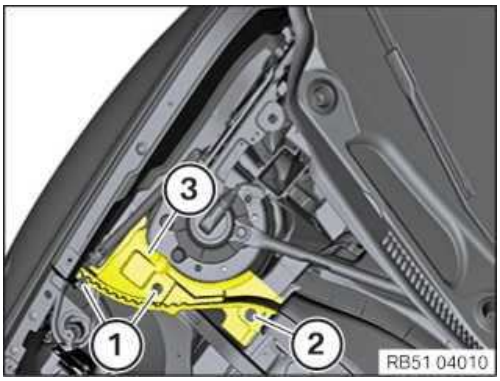


- Install the strut brace (2).
- Renew screws (1).
  Parts: Bolts
- Tighten the screws (1).

Cross-brace to spring strut dome

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

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NOTICE

Description is for right component only. The procedure on the left side is identical.

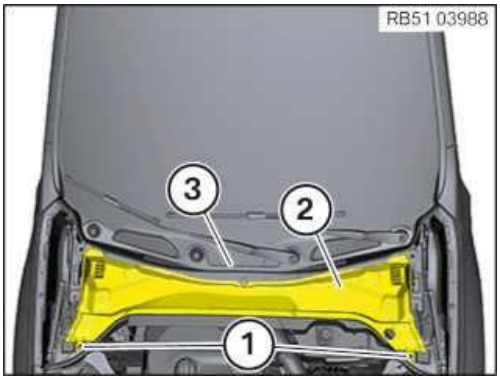
- Install the cover (3).
- Tighten down screw (2).

Cover on body

Hexagon screw		Tightening torque	3 Nm

- Install the expanding rivet (1).

144 – Installing front cowl panel cover

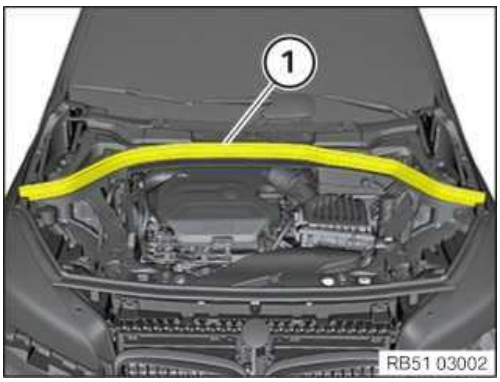


- Insert and install cowl panel cover at front (2) into cowl panel cover at rear (3).
- Check cowl panel cover at front is correctly seated (2).
- Secure expanding rivet (1).

145 – Install the seal for the bonnet

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

146 – Check engine oil level

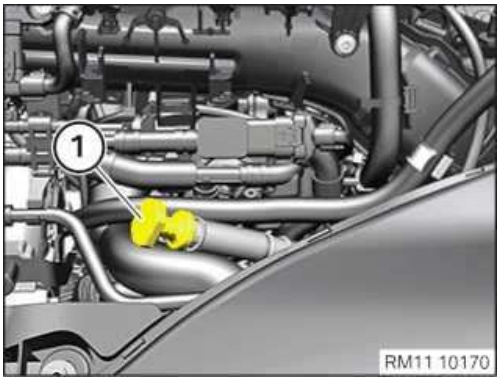
- Park vehicle on a horizontal surface.
- In the case of automatic transmission, shift to selector lever position N or P.
- Accelerator pedal is not pressed.
- Engine is running and is at operating temperature.
- Read off the engine oil level in the instrument cluster (KOMBI) or on the control display.
- Top up engine oil if necessary.

▸ **Check engine oil level**

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TECHNICAL INFORMATION

Always check the engine oil level when the engine is at operating temperature (engine oil temperature > 70°C).

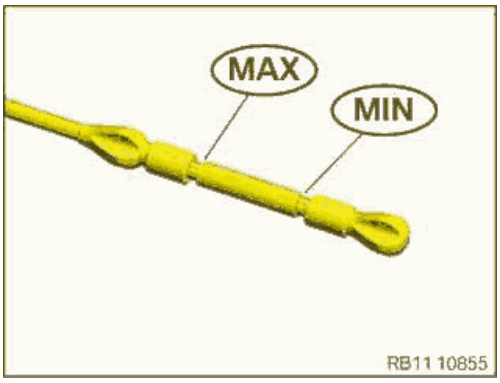


- Park vehicle on a horizontal surface.
- Stop the engine and wait for 5 minutes.
- Pull out the oil dipstick (1) and wipe off using a lint-free cloth.

TECHNICAL INFORMATION

Do not pull out or insert the oil dipstick into the guide tube too quickly or slowly.

- Push the oil dipstick (1) into the guide tube up to the limit position and pull it out again.



TECHNICAL INFORMATION

The engine oil level must be between the minimum mark and the maximum mark of the oil dipstick.

- Read the engine oil level on the oil dipstick.
- Top up engine oil if necessary.

147 – Fill and bleed the coolant circuit

▶ **Filling and bleed the high-temperature coolant circuit**



- See additional information.

Additional Information

Overview of Tightening Torques

Cross connection to carrier support — Used in step 18

Screws M6x20		Tightening torque	11,8 Nm

Screw connection for rubber mount of coolant radiator to coolant radiator — Used in step 18

Bolt to rubber mount		Tightening torque	8 Nm

Air duct to upper connection — Used in step 18

M6x20 screw		Tightening torque	11,8 Nm

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Bracing strut to upper connection

Used in step 18

M8x20 screw		Tightening torque	28 Nm

Rear end of front axle support to body

Used in step 71 118

M14 screw	Renew screw.	Tightening torque	175 Nm

Front axle support, front to body

Used in step 71 118

M12 screw	Renew screw.	Tightening torque	108 Nm

Underbody protection to body

Used in step 71 118 124

Screw		Tightening torque	3 Nm

Special tool to cylinder head

Used in step 71

M8		Tightening torque	21,5 Nm

Cylinder head to crankcase

Used in step 76

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

Cylinder head bolt to timing case cover

Used in step 76

M8x40		Tightening torque	19 Nm

Right engine mount to side member

Used in step 76

M12		Tightening torque	100 Nm

Right engine mount to cylinder head

Used in step 76

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

Heat shield to cylinder head

Used in step 76

M8X16		Tightening torque	10 Nm

Glow elements to cylinder head

Used in step 77

Glow element		Tightening torque	13 Nm

Camshaft carrier to cylinder head

Used in step 80

M7x35		Tightening torque	13 Nm

Bearing journal to cylinder head

Used in step 82

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8

Used in step 82

M8		Tightening torque	19 Nm

Standard screw connection M6

Used in step 82 93

M6			8 Nm

Chain tensioner piston to cylinder head

Used in step 83

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

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Camshaft sprocket to camshaft

Used in step 84

M7x17.			17 Nm

Cylinder head cover to cylinder head

Used in step 86

M6		Tightening torque.	8,5 Nm

Clamping claw facing to cylinder head cover

Used in step 87

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 87

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

High pressure lines between injector and rail

Used in step 89

High pressure lines		Tightening torque	28 Nm

Exhaust-gas recirculation cooler to exhaust manifold

Used in step 91 97

M8x28	Replace screws	Tightening torque	32 Nm

Oil return line to turbocharger

Used in step 91 92

M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase

Used in step 91

M8x16		Tightening torque	22 Nm

Exhaust turbocharger to exhaust manifold

Used in step 92

V-band clamp		Tightening torque	19 Nm

Oil feed line to bracket

Used in step 92

Torx screw M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase

Used in step 92

M8x16		Tightening torque	22 Nm

Heat shield for exhaust turbocharger

Used in step 93

Torx screw BM 6x12		Tightening torque	10 Nm

Banjo bolt for exhaust pressure pipe to exhaust manifold

Used in step 93

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

Charge air duct to oil sump

Used in step 94

M6		Tightening torque	8 Nm

Ride height sensor holder to front axle support

Used in step 94

M6		Tightening torque	8 Nm

Adapter, front axle support to front axle support

Used in step 94

		Tightening torque	100 Nm

Cross connection to front axle support

Used in step 94

M6		Tightening torque	12 Nm

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Washer fluid reservoir to body

Used in step 95

M6x20		Tightening torque	8 Nm

Intake plenum to cylinder head

Used in step 96

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 97

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler

Used in step 97

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 97

M8x20		Tightening torque	19 Nm

Wiring harness to cylinder head cover

Used in step 98 134

TS5x20		Tightening torque	3,5 Nm

Positive battery cable to alternator

Used in step 98

M8		Tightening torque	19 Nm

Fuel line to intake plenum

Used in step 98

TS6x20		Tightening torque	5 Nm

Cover to electronics box

Used in step 98 134

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery

Used in step 98 134

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray

Used in step 98 134

M8		Tightening torque	19 Nm

Diesel particulate filter V-clip to exhaust turbocharger

Used in step 99

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Diesel particle filter to holder

Used in step 99

M8 hexagon nut		Tightening torque	19 Nm

Diesel particulate filter holder to gearbox

Used in step 99

M12x75		Tightening torque	66 Nm

Diesel particulate filter bracket to crankcase

Used in step 99

M10x35		Tightening torque	38 Nm

SCR metering module V-clip to exhaust system

Used in step 99

V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm

Holder for coolant lines to diesel particulate filter

Used in step 99

Torx bolt BM6x16		Tightening torque	8 Nm

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Differential pressure sensor to holder

Used in step 99

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor

Used in step 99

Clamp 15–19mm		Tightening torque	3 Nm

Control sensor

Used in step 100

Control sensor		Tightening torque	50 Nm

Exhaust temperature sensor to diesel particulate filter

Used in step 101 102

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Exhaust-gas temperature sensor to exhaust system

Used in step 103

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Oxygen sensor holder to intermediate shaft

Used in step 104

Hexagon screw M6x16		Tightening torque	8 Nm

Nitrogen oxide sensor before SCR catalytic converter

Used in step 105

Sensor		Tightening torque	50 Nm

Monitoring sensor

Used in step 106

Sensor		Tightening torque	50 Nm

Transfer box to transmission

Used in step 107

M10		Tightening torque	56 Nm

Heat shield to transfer box

Used in step 107

M6	Renew screws.	Tightening torque	6 Nm

Oil filler plug on transfer box (VTG)

Used in step 107

M18x1.5		Tightening torque	35 Nm

Intermediate shaft to transfer box

Used in step 108

M8x35		Tightening torque	19 Nm

Starter motor to transmission

Used in step 109

M8x45		Tightening torque	19 Nm

Battery positive lead to starter

Used in step 109

M8		Tightening torque	13,5 Nm

Propeller shaft to transfer box

Used in step 112

		Tightening torque	80 Nm

Flexible disc to rear axle final drive

Used in step 112

M12x1.5	Renew screws.	Tightening torque	55 Nm 90 °

Centre mount to body

Used in step 112

M8		Tightening torque	19 Nm

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Heat shield to body

Used in step 113 114

Bolts/nut		Tightening torque	3 Nm

Bracket to body

Used in step 113

M8		Tightening torque	21 Nm

Exhaust system to body

Used in step 115

M8	Replace nuts.	Tightening torque	19 Nm

Exhaust bracket on body

Used in step 115

Hexagon screw M8x30		Tightening torque	19 Nm

V-clip to catalytic converter

Used in step 115

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

Diesel particulate sensor to exhaust system

Used in step 115

Sensor		Tightening torque	50 Nm

Nitrogen oxide sensor downstream of SCR catalytic converter

Used in step 115

Sensor		Tightening torque	50 Nm

Cross-member/torsion strut to axle support and mounting

Used in step 116

M12x48	Renew screws.	Jointing torque Angle of rotation	100 Nm 90 °

Front connection carrier to body

Used in step 117

M10x18		Tightening torque	56 Nm

Rear connection carrier to body

Used in step 117

M8x18		Tightening torque	28 Nm

Track rod end to swivel bearing

Used in step 118

M14	Renew nut.	Tightening torque	175 Nm

Wishbone to swivel bearing

Used in step 118

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

Holder, wishbone rubber mount, to body

Used in step 119

M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °

Holder with rubber mount to front axle support

Used in step 119

M12 screw			100 Nm

Washer fluid reservoir holder to front axle support adapter plate

Used in step 119

		Tightening torque	10 Nm

Deformation element, bottom, to adapter plate, front axle carrier

Used in step 119

		Tightening torque	11,8 Nm

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Holder to front axle support

Used in step 120

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

Anti-roll bar link to anti-roll bar

Used in step 122

M10	Renew nut.	Tightening torque	56 Nm

Underbody protection front

Used in step 125

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Underbody panelling, side

Used in step 126

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side

Used in step 126

Plastic nut		Tightening torque	2,6 Nm

Wheel arch cover to body

Used in step 127

Plastic nut		Tightening torque	2,6 Nm
Screw		Tightening torque	2,6 Nm

Wheel arch cover to body

Used in step 127

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Used in step 127

Plastic nut		Tightening torque	3 Nm

Brake disc to rear wheel hub

Used in step 128

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub

Used in step 128

M8	Renew screw.	Tightening torque	16 Nm

Wheel bolts

Used in step 128

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Lower steering shaft to steering gear

Used in step 130

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

Steering column cover to bulkhead

Used in step 130

Plastic nut		Tightening torque	3 Nm

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Heat shield for exhaust turbocharger

Used in step 131

Torx screw BM 6x12		Tightening torque	10 Nm

Rear bulkhead upper part to lower section of bulkhead

Used in step 132

Oval-head screw		Tightening torque	5 Nm

Battery holder to engine support

Used in step 133

Hexagon screw M8x30		Tightening torque	19 Nm

Electronics box to battery tray

Used in step 134

M8X16		Tightening torque	15 Nm

Clean air pipe to cylinder head cover

Used in step 135

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing

Used in step 135 141

Clamp		Tightening torque	3 Nm

Resonator to manifold and clean air pipe

Used in step 136

Screw TS6	Renew screw.	Tightening torque	5 Nm

Cover of top bulkhead

Used in step 138

Screw		Tightening torque	2,6 Nm

Cover of remote positive terminal

Used in step 138

Screw		Tightening torque	2,6 Nm

Battery terminal rail to battery tray

Used in step 139

M8			19 Nm

Battery terminal with IBS positive battery terminal / negative battery terminal

Used in step 139 140

NutM6			5 Nm

Trailing link

Used in step 139

M8		Tightening torque	19 Nm

Battery cover

Used in step 139

M8			2,8 Nm

Intake silencer housing to lock bridge

Used in step 141

M6X30		Tightening torque	8 Nm

Intake neck to cross connection

Used in step 142

M6		Tightening torque	8 Nm

Cross-brace to spring strut dome

Used in step 143

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

Cover on body

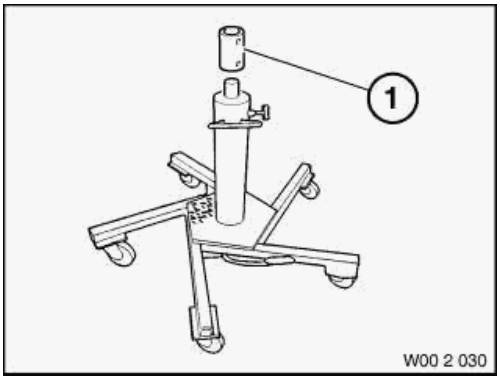
Used in step 143

Hexagon screw		Tightening torque	3 Nm

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Overview of Special Tools

0 490 133 (00 2 030) Device



Common Used in step 31 71 76 118

Usage	(universal hydraulic lifter base unit) Chassis and hydraulic lifter - For removing and installing rear axle supports and gearboxes. Also for soft top mounts. Is replaced by 81 22 2 219 012
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 90 (207)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 490 134 (00 2 031)		**Adapter** (adapter for gearbox holder) Model series: E30, E31, E32, E34, E36	

0 495 554 (33 5 070) Extension



Common Used in step 37 112

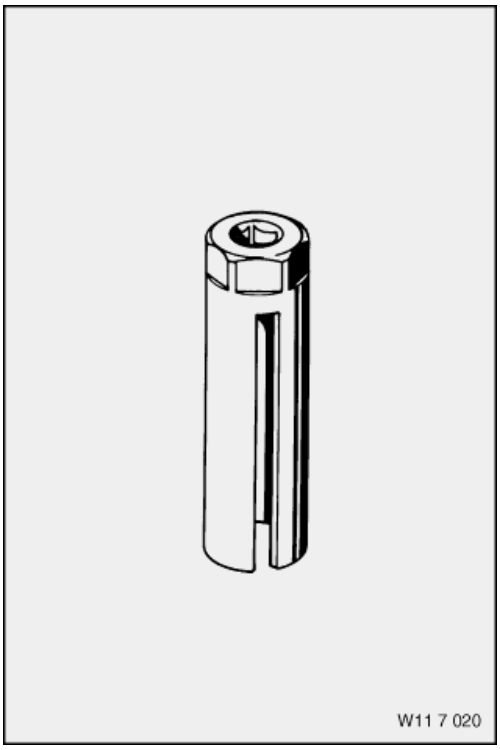
Usage	Pull-out extension for 33 5 040, 33 5 050, 33 5 060.
Included in the tool or work	
Storage location	A18
Replaced by	
In connection with	
SI-Number	01 21 06 (300)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 592 (33 5 071)		**Extension** (Extension (1 item)) discontinued, can only be ordered using complete tool	

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0 491 074 (11 7 020) Socket wrench insert



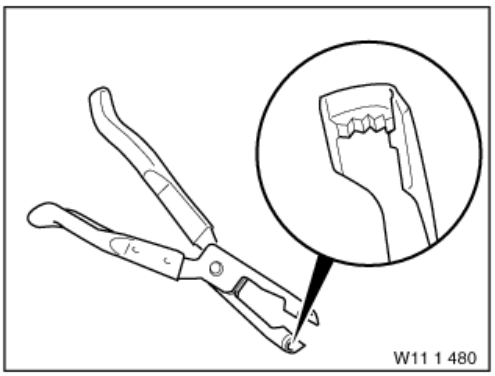
Common

Used in step 43 44 106

Usage	(Socket wrench insert 22 mm) For loosening and tightening the oxygen sensor
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	

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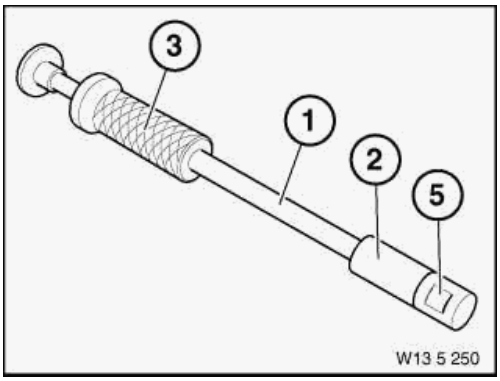
0 490 796 (11 1 480) Pliers



Common Used in step 51 70

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

0 493 321 (13 5 250) Puller



Common Used in step 61

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

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0 493 339 (13 5 252) Bush



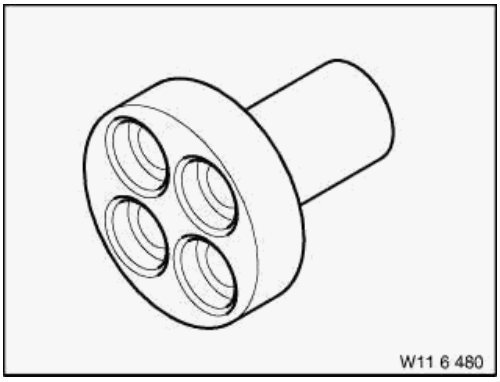
Common	Used in step 61
Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 340 (13 5 253) Weight



Common	Used in step 61
Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 380 (11 6 480) Connector



Common	Used in step 63 85
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

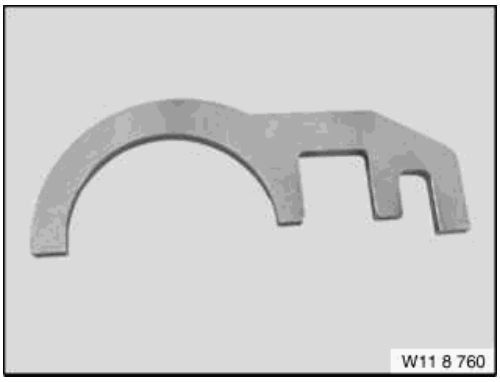
2 288 380 Locating stud



Common	Used in step 63 85
Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

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0 496 112 (11 8 760) Gauge



Common Used in step 63 85

Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 495 105 (11 4 480) oddments tray



Common Used in step 68 69

Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

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2 357 071 Panel



Common Used in step 71 76

Usage	Additional mounting plate for lifting table MHT 1200. Delivery quantity: 1 piece. During the course of the changeover from BMWi to iPerformance, a tool changeover also takes place from campaign to warehouse.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	Table lift MHT 1200 81222184136
SI-Number	01 21 13 (987)

2 459 012 Holder



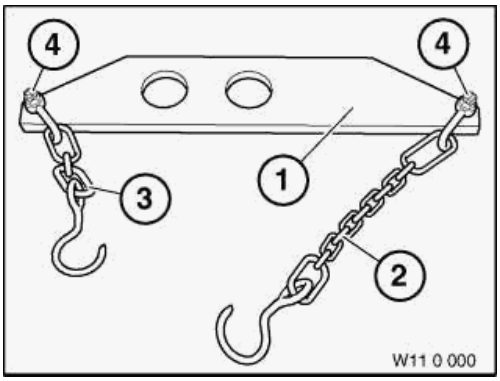
Common Used in step 71 76

Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

0 490 561 (11 0 000) Lifting gear

Used in step 71 76

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Common

Usage	(Hoisting gear) For removing and installing engines. As of 08/2011 only available as a complete set. Delivered with TÜV inspection certificate and operating instructions. No delivery of separate parts.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 13 94 (888)

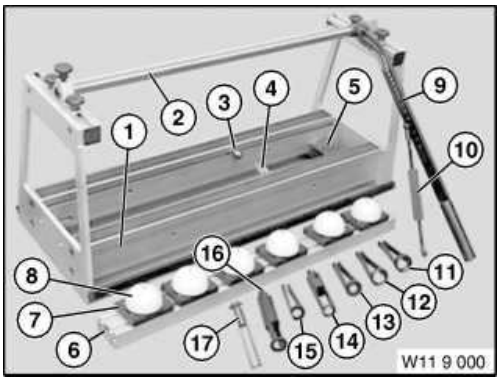
Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
4	0 490 565 (11 0 009)		**Shackle** (Shackle) 2 pieces. As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 562 (11 0 001)		**Lifting gear** (Cross member) As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
2	0 490 563 (11 0 002)		**Chain** (Chain) Version: long As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
3	0 490 564 (11 0 003)		**Chain** (Chain) Version: short As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	

0 494 362 (11 9 000) Device

Used in step 71

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Common

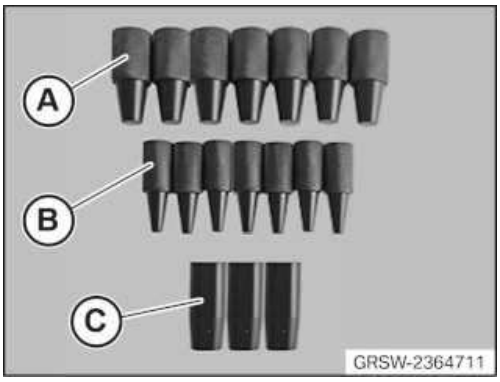
Usage	(Cylinder head expander tool)
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 03 02 (833)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 494 366 (11 9 001)		**Device**	
6	0 494 371 (11 9 006)		**Insert** (Aluminium strip)	
11	0 494 376 (11 9 012)		**Basket** (Valve spring cage) Engine M41, M51, S50	
17	0 495 028 (11 9 017)		**Basket** (Valve spring cage) Engine N52	
2	0 494 367 (11 9 002)		**Rod**	
3	0 494 368 (11 9 003)		**Adapter** (Sliding block)	
4	0 494 369 (11 9 004)		**Tab**	
5	0 494 370 (11 9 005)		**Quick fastener**	
7	0 494 372 (11 9 007)		**Shaped part** (shaped part)	
8	0 494 373 (11 9 008)		**Shaped part** (Shaped part) Shaped part made of plastic	
9	0 494 374 (11 9 009)		**Lever**	
10	0 494 375 (11 9 011)		**Hook**	
12	0 494 377 (11 9 013)		**Basket** (Valve spring cage) Engine M43, M73	
13	0 494 378 (11 9 014)		**Basket** (Valve spring cage) Engine M44, M52, M54, M56, M62, S52, S54, S62	
14	0 494 379 (11 9 015)		**Basket** (Valve spring cage) Engine M47, M47TU, M57, M57TU, N40, N42, N62, N73	
15	0 494 380 (11 9 016)		**Basket** (Valve spring cage) Engine M21, M40	

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2 364 711 Plug



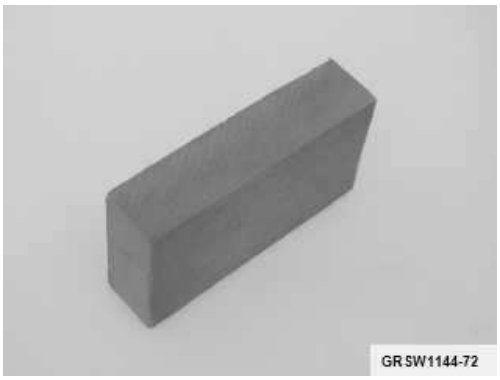
Common	Used in step 72
Usage	For closing the pressure oil holes for cleaning the cylinder head sealing surfaces.
Included in the tool or work	
Storage location	C20
Replaced by	
In connection with	
SI-Number	01 50 14 (203)

0 495 103 (11 4 471) Scraper



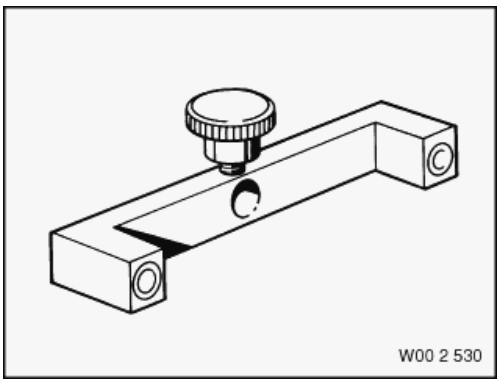
Common	Used in step 72
Usage	
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

0 495 104 (11 4 472) Extractor



Common	Used in step 72
Usage	(grindstone)
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

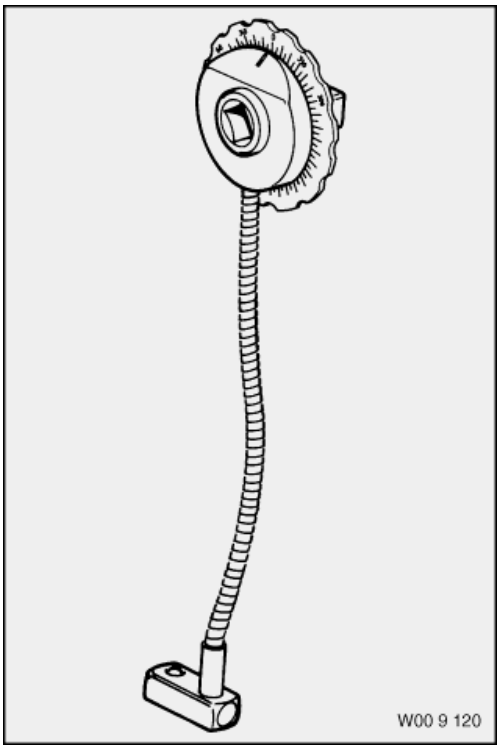
0 490 185 (00 2 530) Bridge



Common	Used in step 75
Usage	(Measuring bridge) For determining the piston projection (Diesel)
Included in the tool or work	
Storage location	A3
Replaced by	
In connection with	
SI-Number	

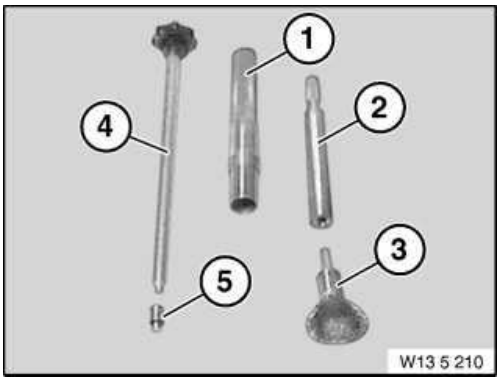
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0 490 504 (00 9 120) Torque angle measuring dial



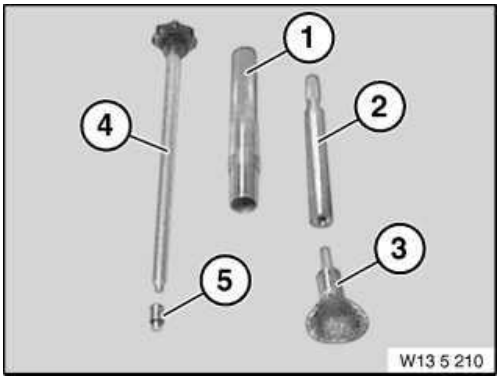
Common	Used in step 76 112
Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

0 493 763 (13 5 215) Plug



Common	Used in step 87
Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

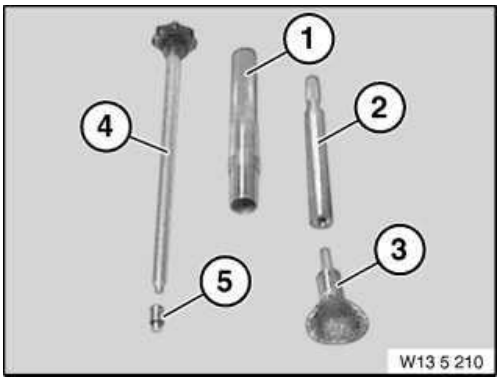
0 493 762 (13 5 214) Rod



Common	Used in step 87
Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 493 758 (13 5 210) Tool



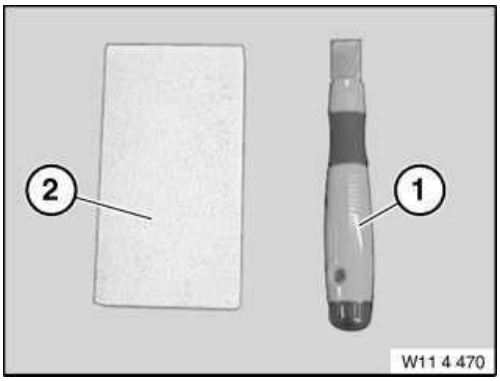
Common Used in step 87

Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

0 495 102 (11 4 470) Tool



Common Used in step 91

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

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2 409 025 Puller



Common Used in step 107

Usage	For disassembly of the outer radial shaft seal of the transmission output shaft, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A76
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 411 739 Puller



Common Used in step 107

Usage	For disassembly of the inner radial shaft seal of the output, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C78
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 408 152 Striking element



Common Used in step 107

Usage	For installation of the right radial shaft seal transmission output shaft (inner). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

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2 413 037 Handle



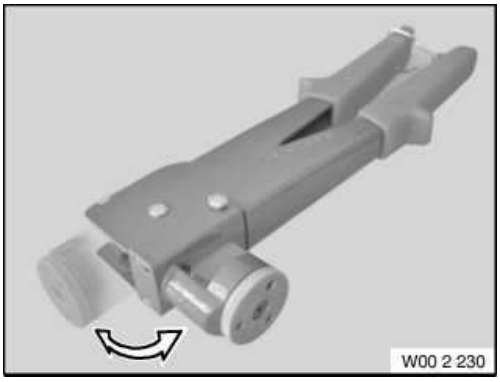
Common	Used in step 107
Usage	Universal drift handle. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C77
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 408 150 Striking element



Common	Used in step 107
Usage	For installing the right radial shaft seal transmission output shaft (outer). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

0 496 521 (00 2 230) Pliers



Common	Used in step 127
Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

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2 344 011 Tool



Common	Used in step 128
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

0 495 221 (36 1 323) Wheel stud



Common	Used in step 22
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud



Common	Used in step 22
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud



Common	Used in step 22
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 226 (36 1 328) Wheel stud



Common	Used in step 22
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud



Common	Used in step 22
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud



Common	Used in step 22
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 229 (36 1 332) Wheel stud



Common Used in step 22

Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud



Common Used in step 22

Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Cylinder head flatness Used in step 74

Maximum lengthwise deviation from flatness	0,10 mm
Maximum transverse deviation from flatness	0,05 mm

Valve underprotrusion Used in step 75

	0,8 (0,7 - 0,9) mm

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Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	53 97
EGR controller	53 97

General repair instructions	Used in step
61 20 ... Notes on AGM battery	140
61 12 ... Notes on intelligent battery sensor (IBS)	140
61 00 ... Notes for disconnecting and connecting battery	140
41 00 ... Notes on repairing threads	
61 00 ... Safety information for handling vehicle battery	

Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	11 43 44 46 47 48 49 50 61 70
17 00 008 Draining and topping up coolant for high-temperature circuit	147
17 00 008 Draining and topping up coolant for high-temperature circuit	147
17 00 008 Draining and topping up coolant for high-temperature circuit	147
17 00 039 Bleed the cooling system and check it for watertightness with the special tool

17 00 039 Bleeding cooling system (B37, B47)	147
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	147
17 00 039 Filling and bleeding the high-temperature cooling system vacuum filler device (B48)	147
17 00 008 Draining and topping up the high-temperature coolant circuit	147
17 00 008 Draining and topping up the high-temperature coolant circuit	147
17 00 016 Draining and topping up coolant circuit for Range Extender \PREMIUM	147
17 00 008 Draining and topping up the high-temperature coolant circuit	147
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	147
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	147
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	147
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	147
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	147
00 .. ... Raising the vehicle using a vehicle hoist	

Operating materials	Used in step
2.0 Grease for wheel centring	128

Operating materials	Used in step

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	83
Exhaust-gas recirculation cooler seal on exhaust manifold	97
Exhaust-gas recirculation cooler seal on intake plenum	97

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11 12 001 Replace the cylinder head cover

PRELIMINARY WORK

1 – Disconnecting all battery earth leads

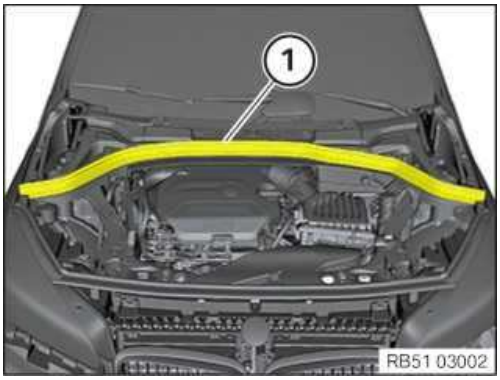


- See additional information.

2 – Remove the seal for the rear bonnet

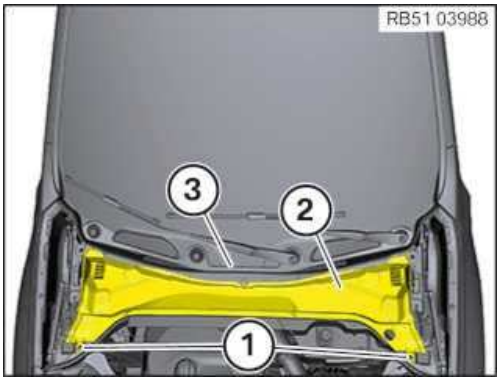
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Pull off rear bonnet seal (1) towards the top and remove.

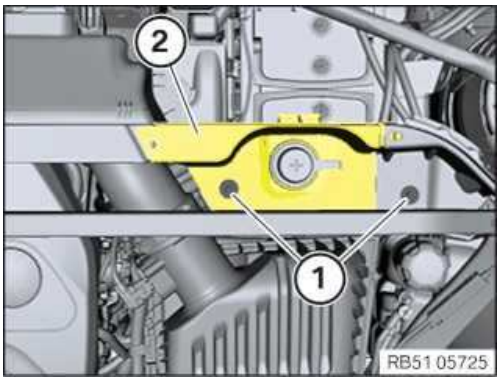
3 – Removing front cowl panel cover



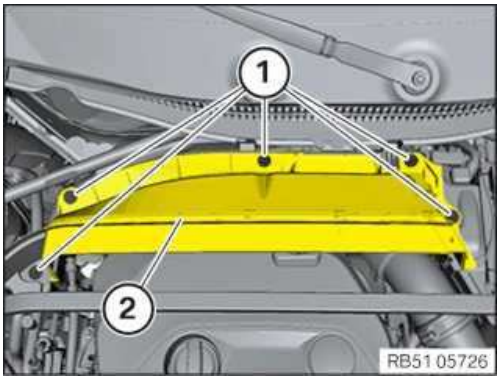
- Loosen the expanding rivet (1).
- Feed out and remove front cowl panel cover (2) from the rear cowl panel cover(3).

4 – Removing the upper bulkhead cover

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- Loosen screws (1).
- Guide out and remove the cover (2).

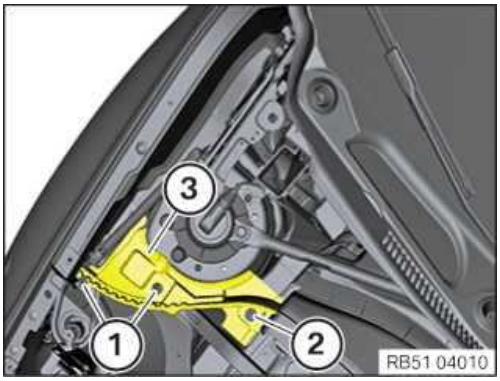


- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

5 – Remove suspension cross-brace

TECHNICAL INFORMATION

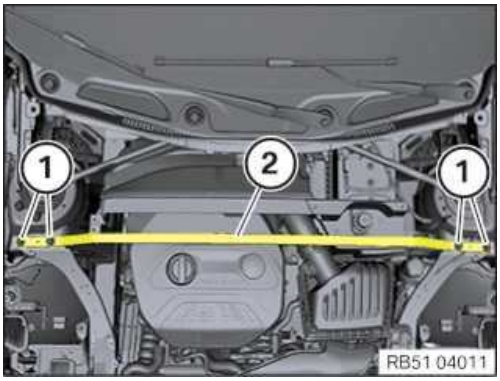
Driving without the strut brace/front end or tension strut is not permitted.



NOTICE

Description is for right component only. The procedure on the left side is identical.

- Loosen expanding rivet (1).
- Loosen screw (2).
- Remove the cover (3).



- Loosen screws (1).
- Remove strut brace (2).

6 – Removing the acoustic cover

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

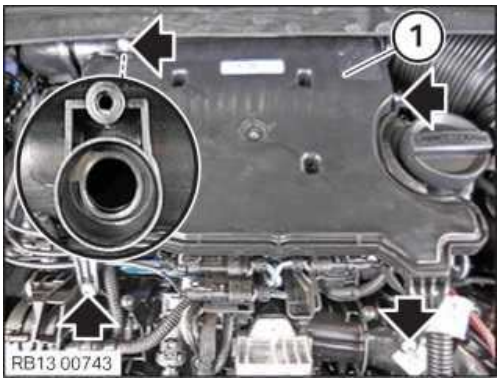
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

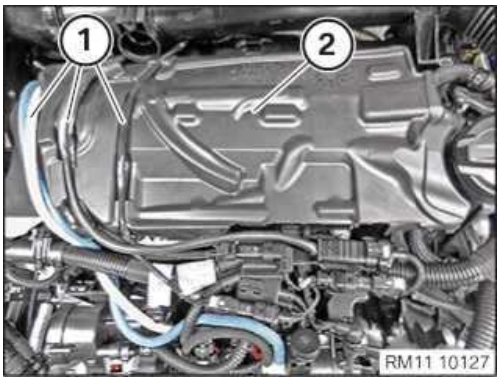
- Unclip the acoustic cover from the marked areas towards the top.

7 – Remove resonator



- Remove screws (arrows).
- Guide out and remove the resonator (1).

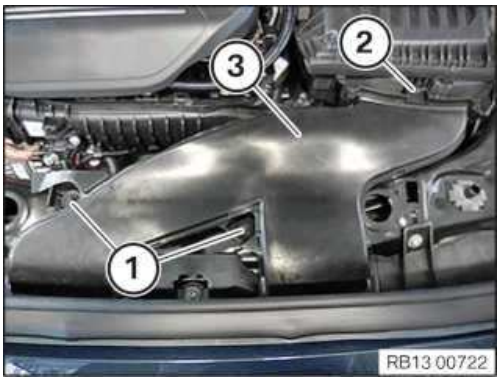
8 – Remove the acoustic cover for the injectors



- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

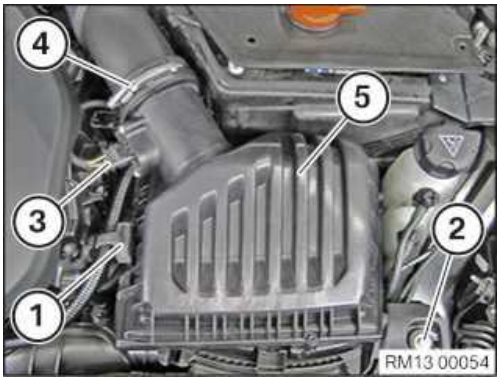
9 – Remove the intake neck for intake silencer housing

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- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

10 – Removing intake silencer housing

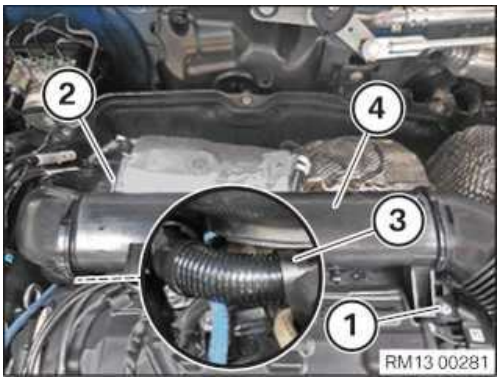


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

11 – Removing clean air pipe



- Detach clamp (1) on the clean air pipe.
- Pull off the clean air pipe from the intake silencer housing.

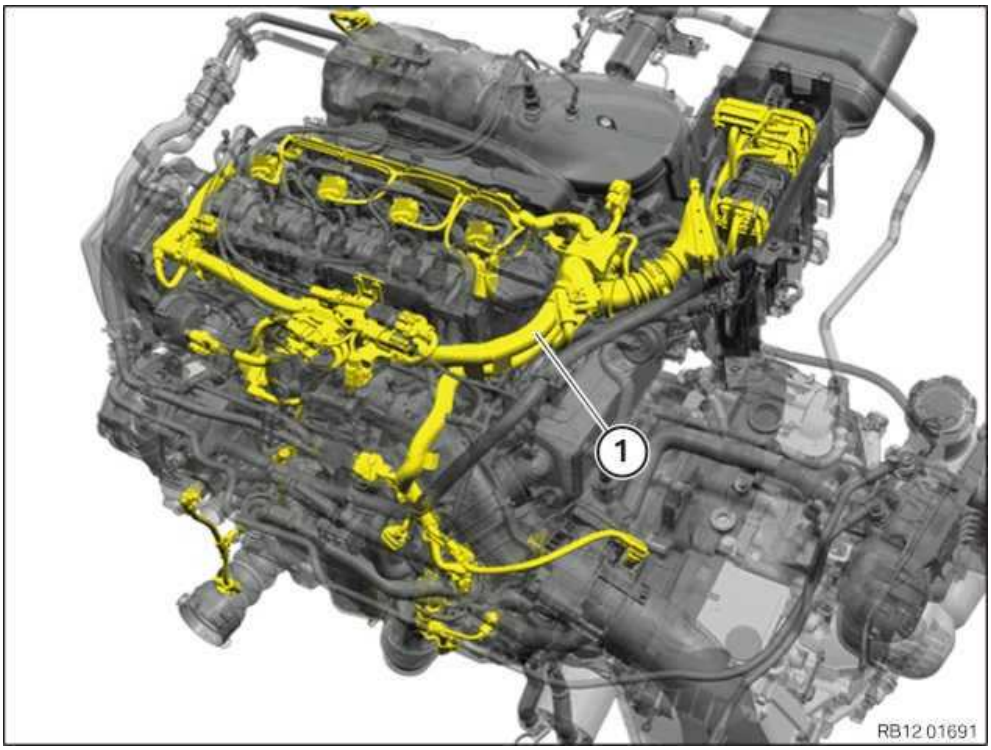


- Loosen screw (1).
- Loosen clamp (2).
- Unlock the ventilation line (3) and pull it off the cylinder head cover.
- Feed out clean air pipe and remove.

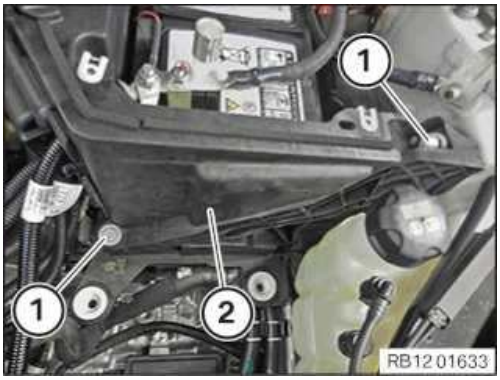
12 – Releasing the wiring harness section for the intake plenum

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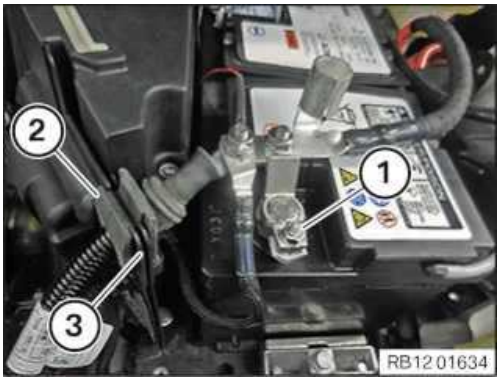
Overview: Wiring harness section for the engine



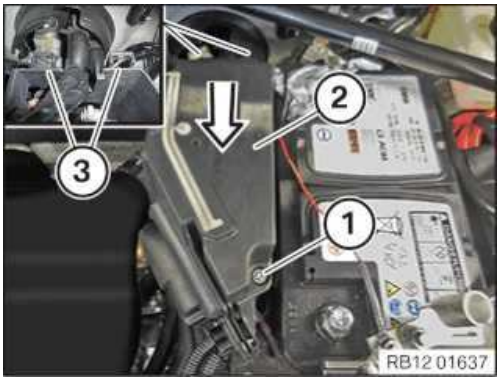
1 Wiring harness section for the engine



- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.

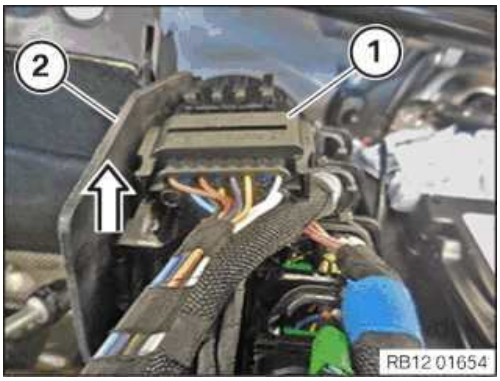


- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

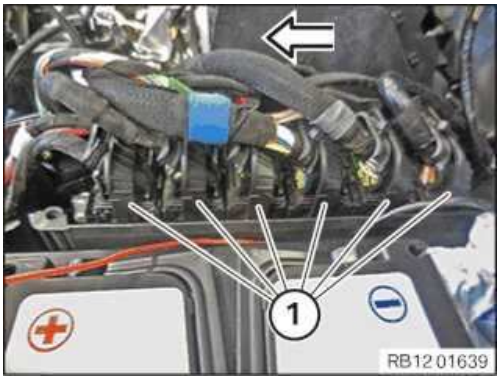


- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.

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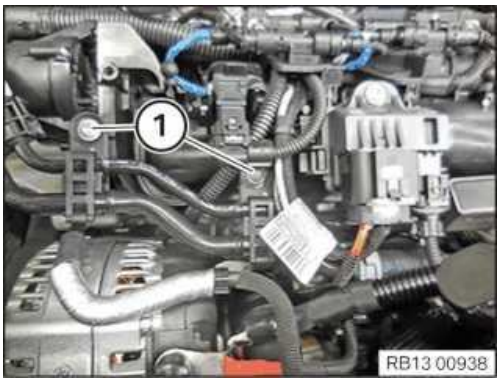
- Guide the connector (1)out of the electronics box (2) in the direction of arrow and remove it.
- Unlock and loosen connector (1).



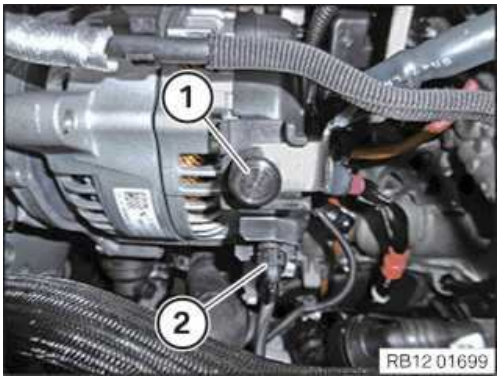
- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



- Unlock and loosen connector (1).

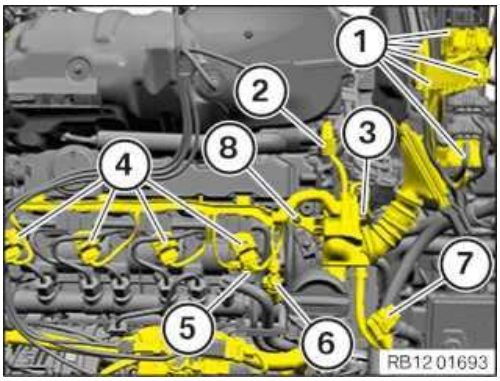


- Loosen screws (1).

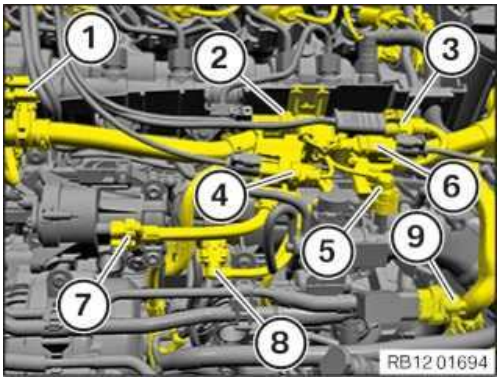


- Release the positive battery cable (1) on the alternator and place to one side.
- Unlock connector (2) and pull off.

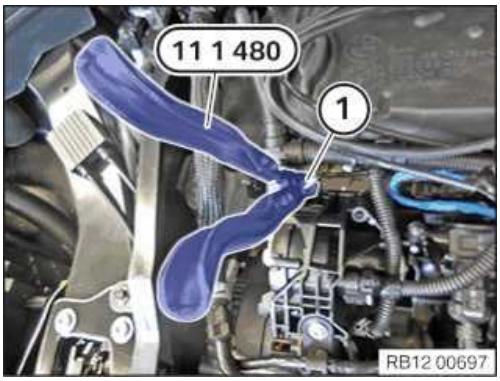
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- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock the connector (2) and disconnect it from the differential pressure sensor.
- Unlock the connector (3) and disconnect it from the exhaust-gas recirculation valve.
- Unlock the connector (4) and pull off from the injectors.
- Unlock the connector (5) and disconnect it from the camshaft sensor.
- Unlock the connector (6) and disconnect it from the fuel pressure regulator.
- Unlock connector (7) and pull off from hot film air mass meter.
- Loosen screw (8).

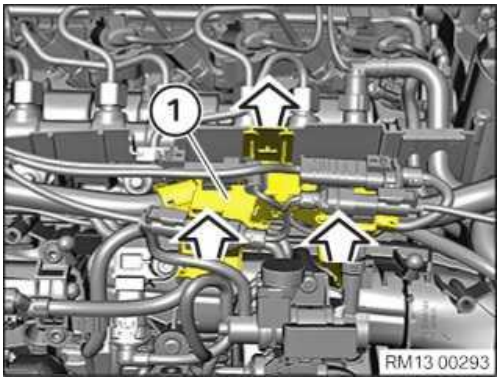


- Unlock connector (1) and pull off from the rail pressure sensor.
- Unlock the connector (2) and disconnect it from the exhaust temperature sensor before the diesel particulate filter.
- Unlock and disconnect the connector (3) from the front oxygen sensor.
- Unlock the connector (4) and disconnect it from the exhaust temperature sensor after the diesel particulate filter.
- Unlock and disconnect the connector (5) from the electric changeover valve.
- Unlock the connector (6) and disconnect it from the exhaust temperature sensor for the exhaust-gas recirculation cooler.
- Unlock the connector (7) and disconnect it from the servomotor for the swirl flaps.
- Unlock the connector (8) and pull it off the charging pressure sensor.
- Unlock the connector (9) and disconnect from the fuel pressure and temperature sensor.



- Unlock the connectors (1) of all glow elements with the special tool **0 490 796 (11 1 480)** and release them.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.

▶ **Removing the cable clips from the intake plenum**



- Detach the cable clip (1) in the direction of the arrow.
- Guide out the cable clip (1) in direction of arrow and set it aside.

13 – Removing the intake plenum

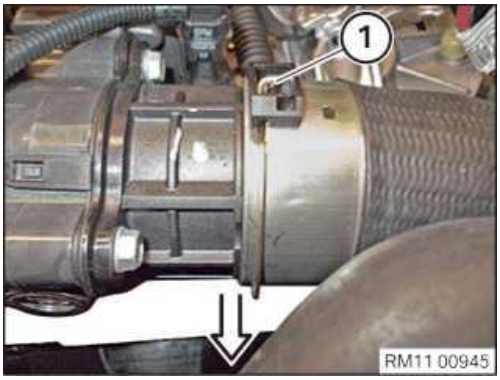
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TECHNICAL INFORMATION

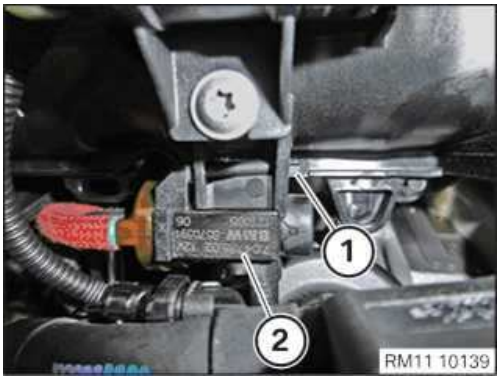
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



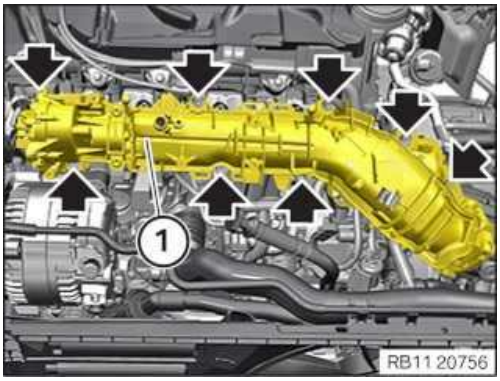
- Unlock the lock (1).



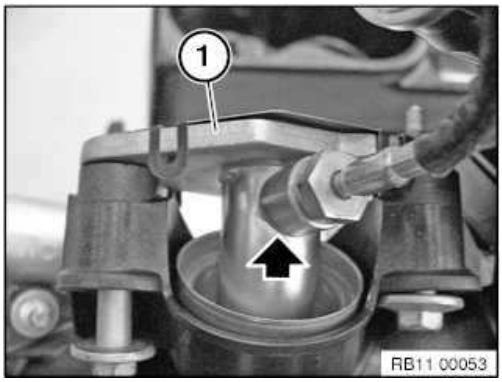
- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.



- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



- Release the screws (arrows) from the intake plenum (1).
- Guide the intake plenum (1) out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

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14 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

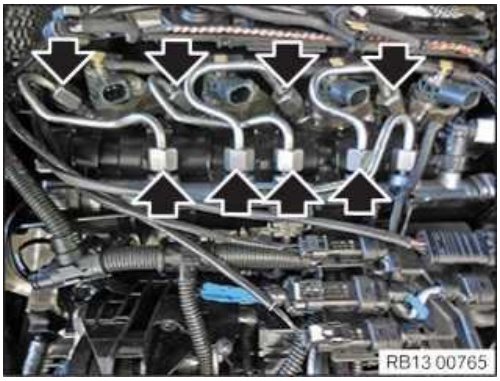
TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release the high pressure lines (arrows) with the special tool .
- Catch and dispose of escaping fuel.
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool .

15 – Detaching leakage oil line from injector

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Contaminant or foreign body.

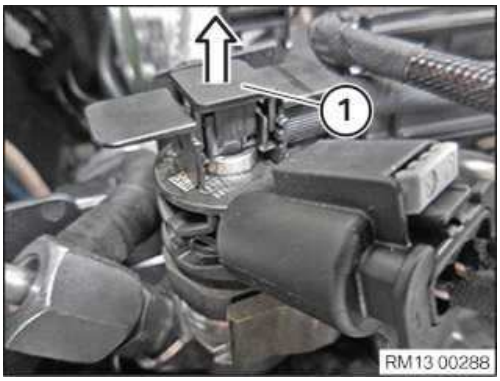
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

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- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

16 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

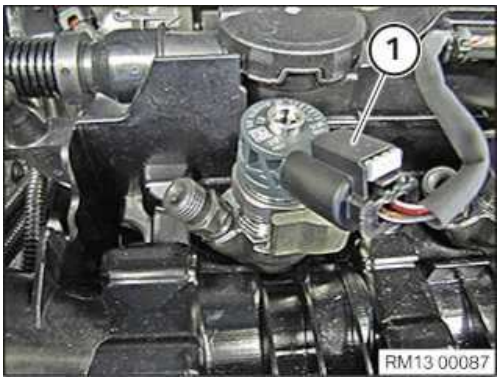
Electrostatic discharge.

Damage to or destruction of electrical components.

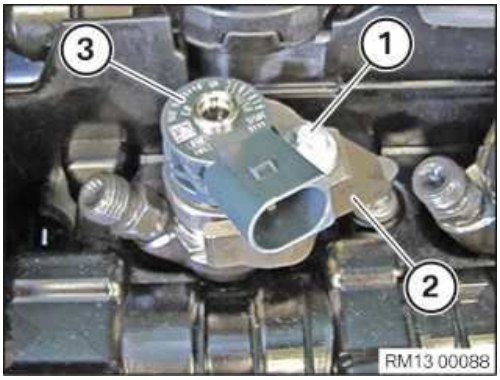
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.



- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

▶ **Loosen stuck injectors**

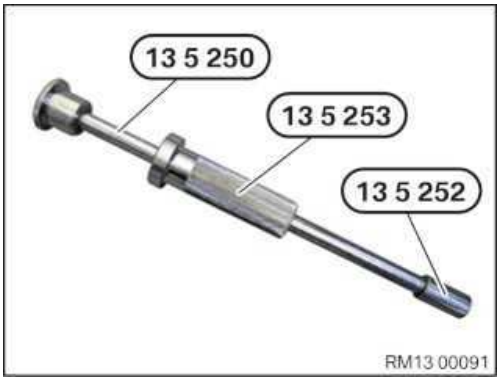
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RISK OF DAMAGE

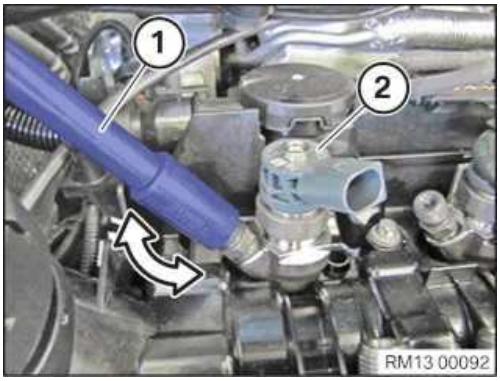
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)**back onto the special tool **0 493 321 (13 5 250)**.



- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

17 – Remove high-pressure rail

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

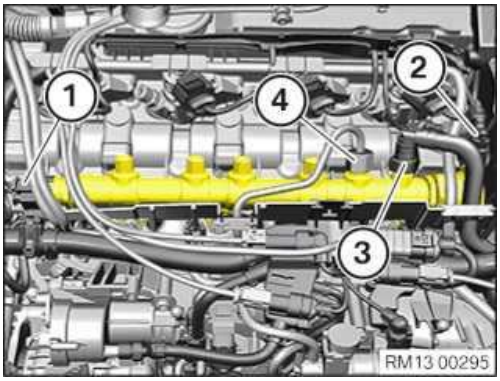
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TECHNICAL INFORMATION

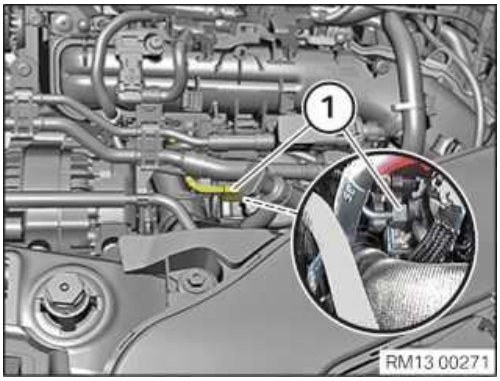
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

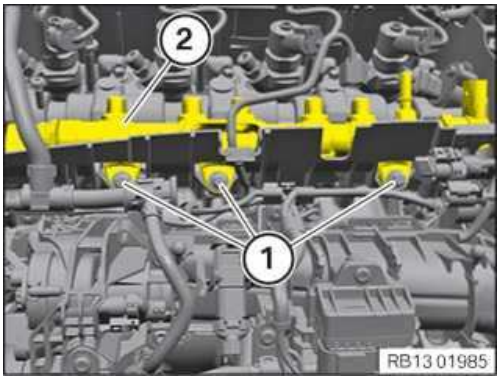
Reset special tool in early to avoid bending pressure lines.



- Unlock and disconnect connector (1).
- Unlock and disconnect connector (2).
- Unlock and release fuel line (3).
- Loosen union nut (4) with special tool .
- Reset special tool early on to avoid bending pressure lines.



- Slacken the union nut (1) on the high pressure pump.



- Loosen screws (1).
- Carefully thread out and remove the rail (2).
- Make sure the pressure line of the high pressure pump is not bent.

18 – Remove differential pressure sensor

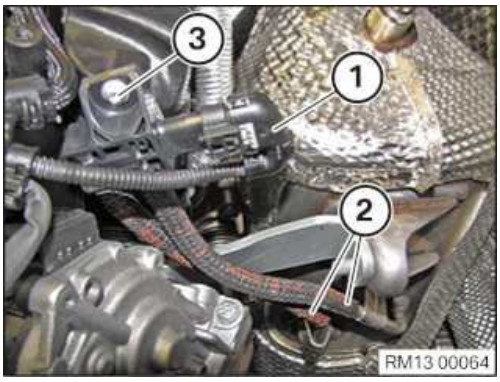
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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

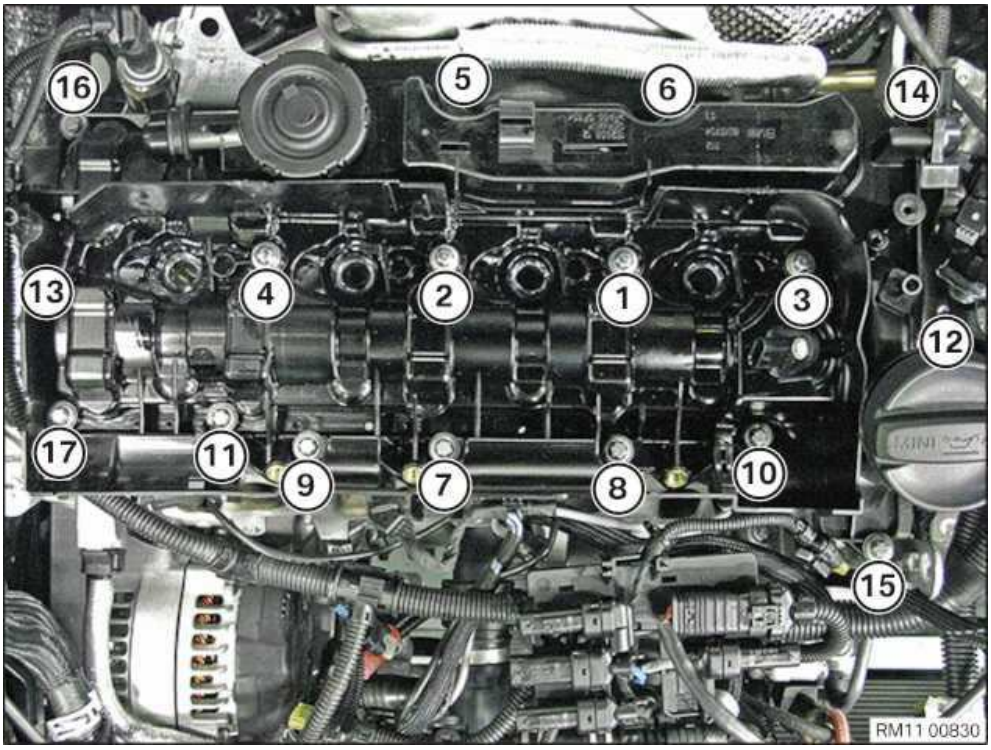
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

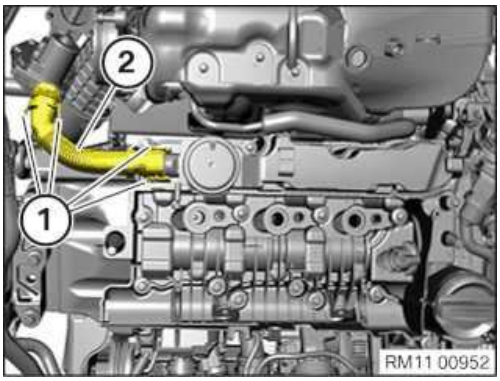
19 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover

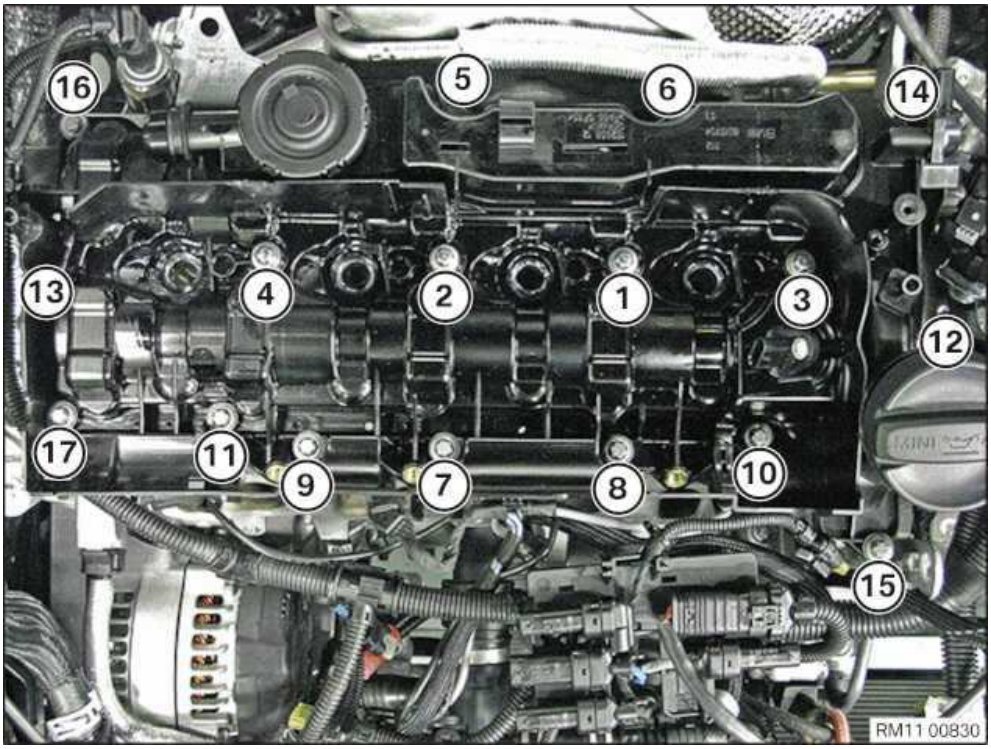


1 to 16 screws of the cylinder head cover.

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- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).



- Loosen screws in the order (17) to (1).
- Remove cylinder head cover by lifting it out.

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20 – Renewing the cylinder head cover

RISK OF DAMAGE

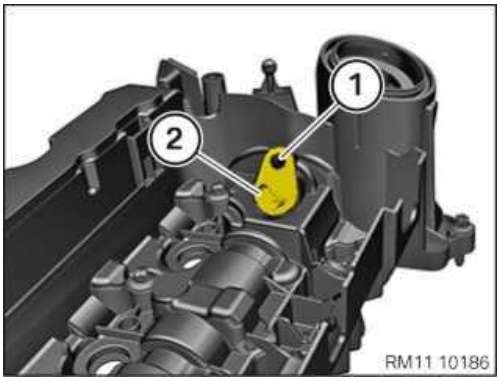
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

NOTICE

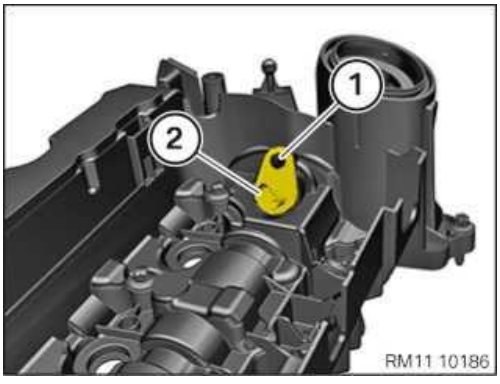
Schematic diagram is for example purposes. Some parts may differ in certain details.



- Loosen screw (1).
- Feed out and remove the camshaft sensor (2).



- Check the sealing ring (1) for damage and renew where required.



- Guide in camshaft sensor (2) into the new cylinder head cover and install it.

  Parts: Cylinder head cover
- Tighten down screw (1).

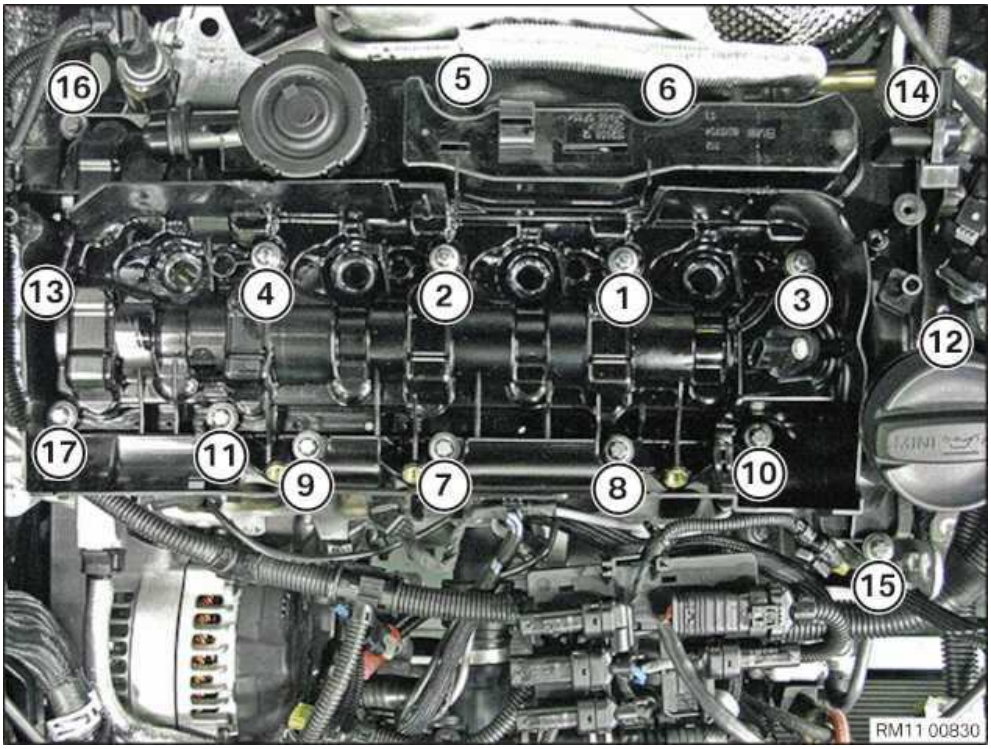
Camshaft sensor to cylinder head cover

TS5x20		Tightening torque	4 Nm

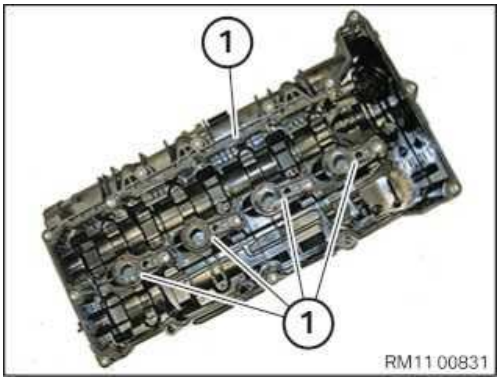
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21 – Installing cylinder head cover

Overview: Screw connection of the cylinder head cover



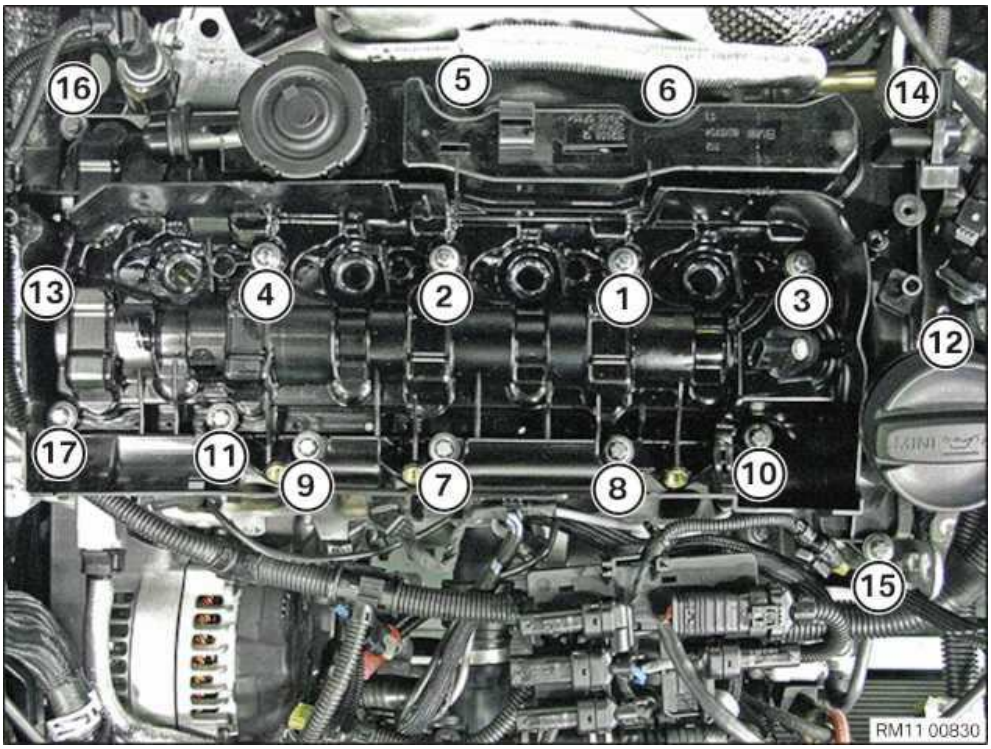
1 to 16 screws of the cylinder head cover.



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket

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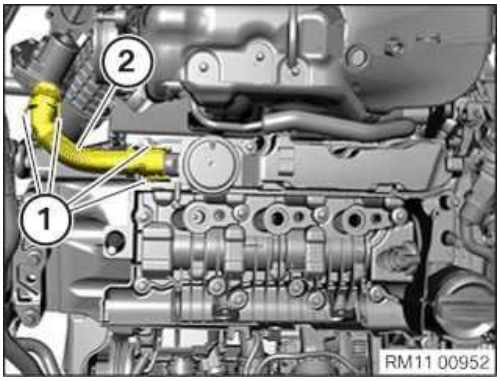


- Install cylinder head cover.
- Tighten screws in the order (1) to (17).

Cylinder head cover to cylinder head

M6		Tightening torque.	8, Nr

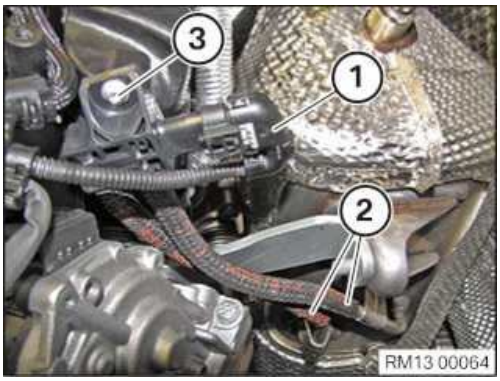
-



- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

22 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

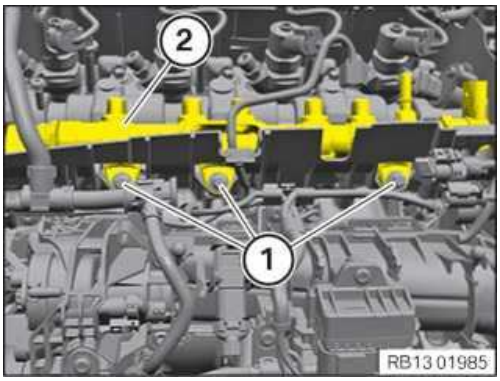
Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

23 – Installing the rail

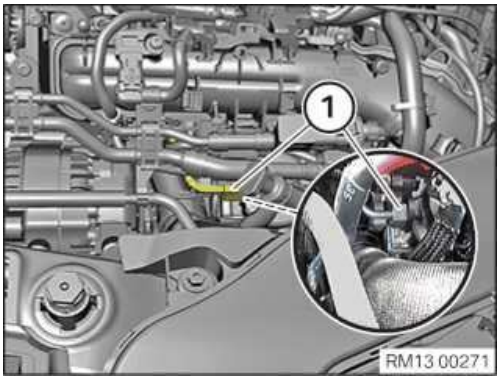
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- Carefully insert and install the rail (2).
- Tighten the screws (1).

Rail on cylinder head cover

Torx screw M8x25		Tightening torque	19 Nm



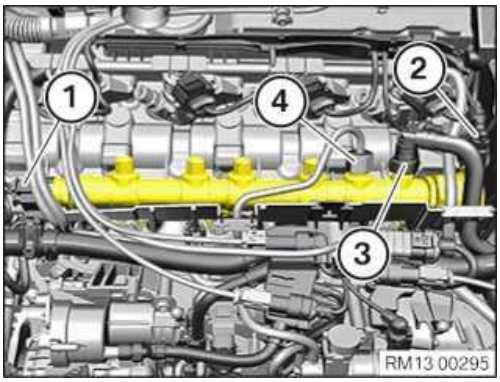
TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten union nut (1).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm



TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten union nut (4) with special tool .

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Connect and lock the fuel line (3).

  Fuel line (3) must engage audibly.
- Connect connectors (2) and lock.

  The connector (2) must engage audibly.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

24 – Installing injectors of injection system

▸ **Cleaning the injector shafts**

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CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.



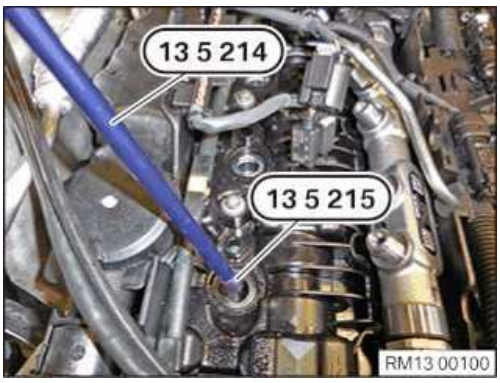
- Wear safety goggles.

RISK OF DAMAGE

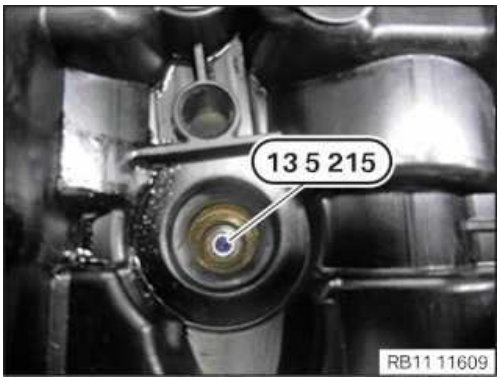
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.



- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.

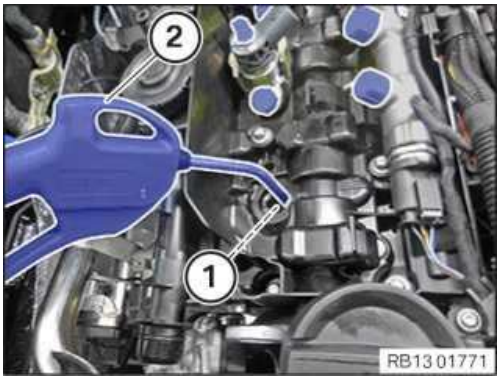


- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.

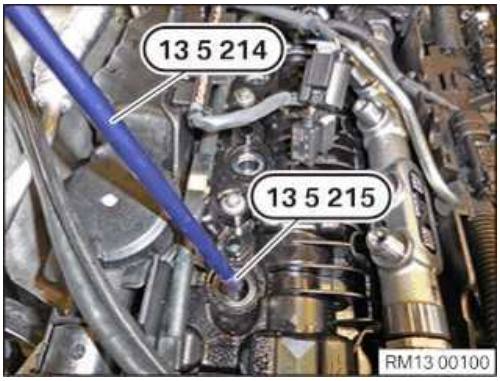
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- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.



- Blow out injector shaft (1) with air gun (2).



- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

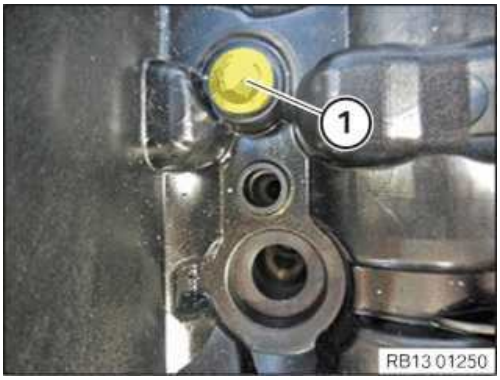
▸ **Check the placement of the clamping claw**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▸ **Prepare the injector for installation**

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



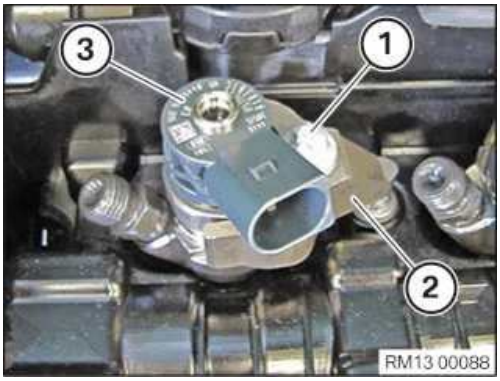
- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring

- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

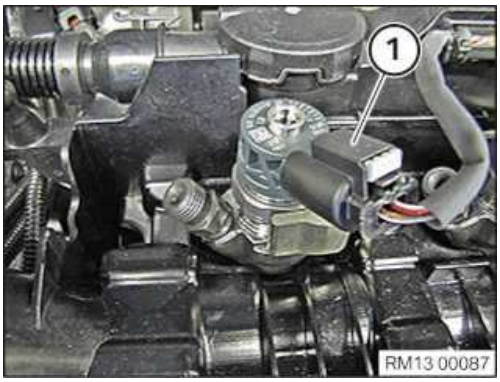
Injector lubricating grease	50 g, Can	83230441070



- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

▸ **Replacement: Perform injection quantity compensation**

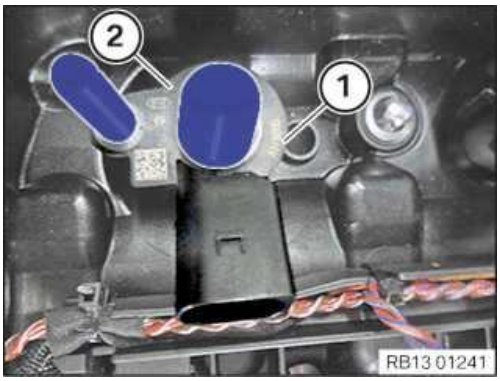
TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

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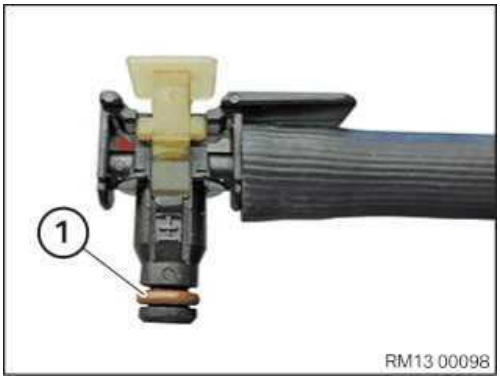


- Read off the adjustment value (1) on the new injector (2).



- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

25 – Connect the leakage oil line on the injector



- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.



- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

26 – Installing high pressure lines between rail and injectors

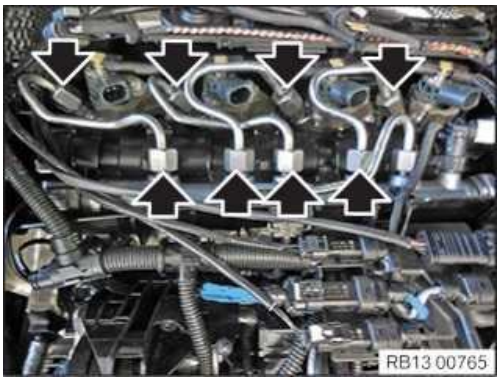
TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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- Remove special tool .
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

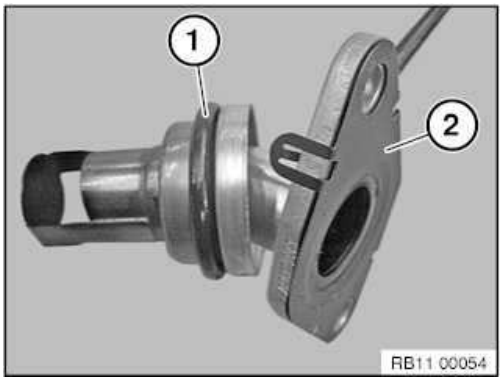
- Tighten the high pressure lines (arrows) with the special tool .

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

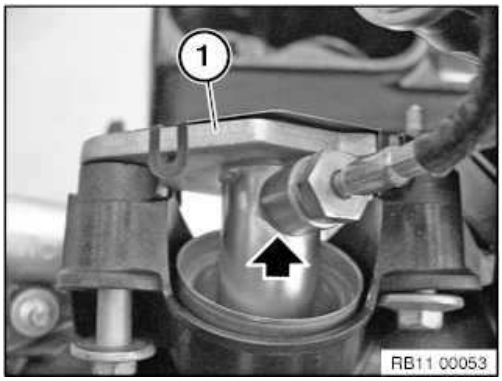
27 – Installing the intake plenum



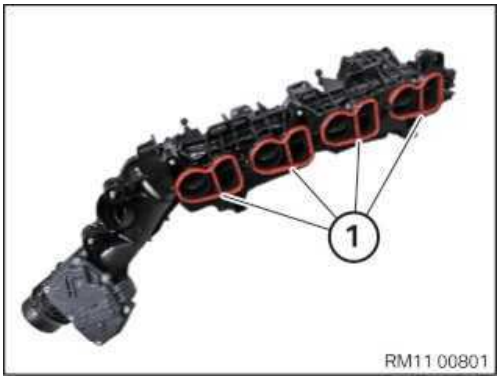
- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position the seal (2) and clip it in.



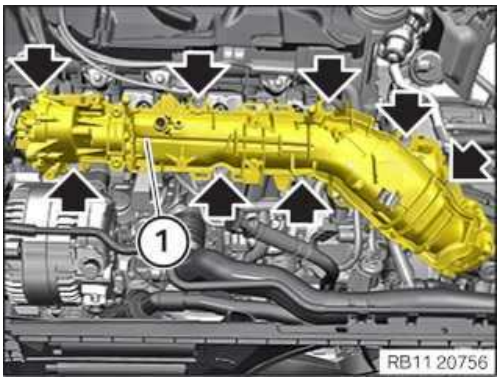
- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (1).

  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.

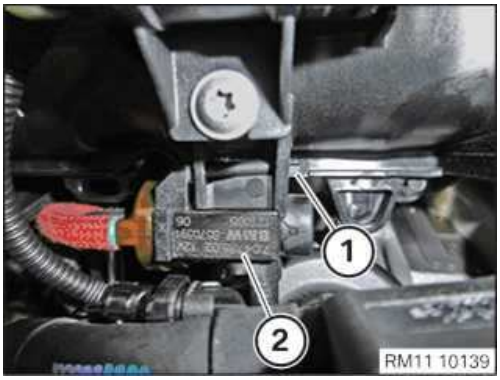
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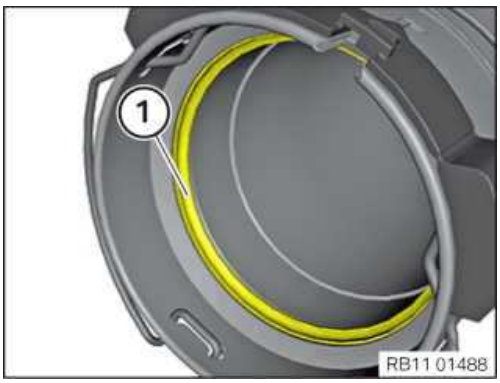
- Guide in and install intake (1) plenum.
- Tighten screws (arrows).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm

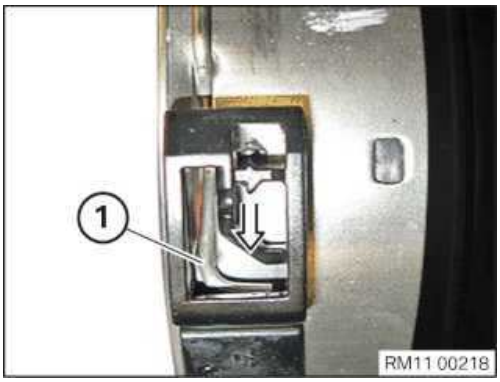


- Install the electric changeover valve (2) in the holder on the plenum from left to right.
- Lock (1) must engage audibly.

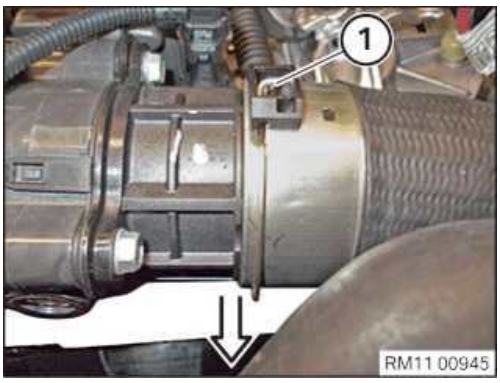


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring



- Engage the lock (1) on the bracket (arrow).



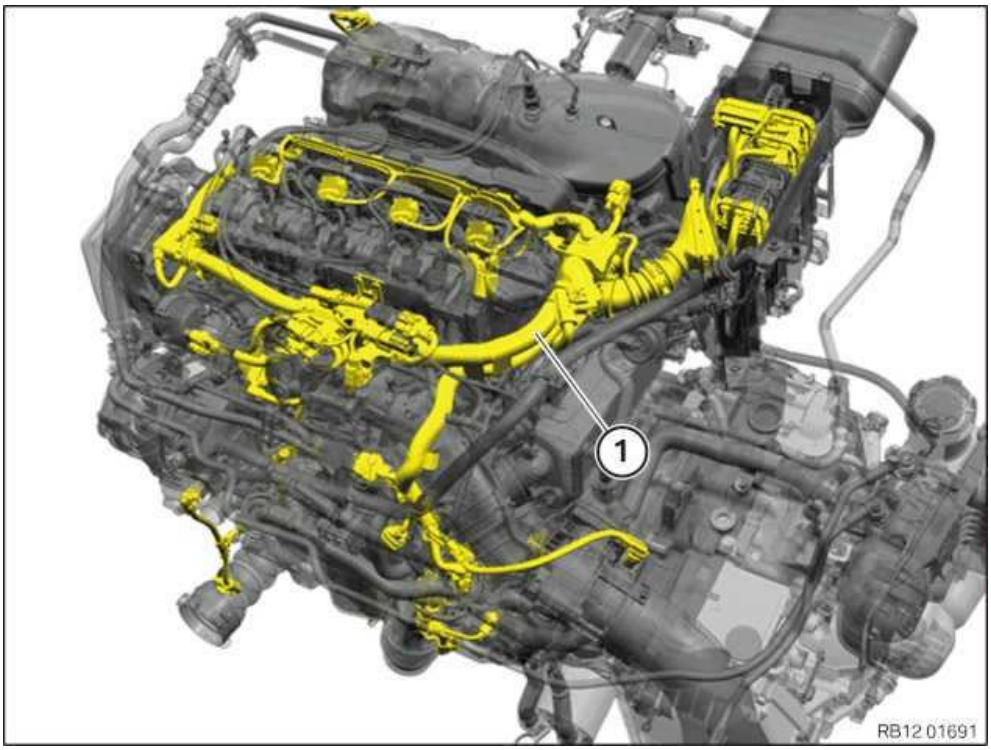
- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

28 – Fastening the wiring harness section for the intake plenum

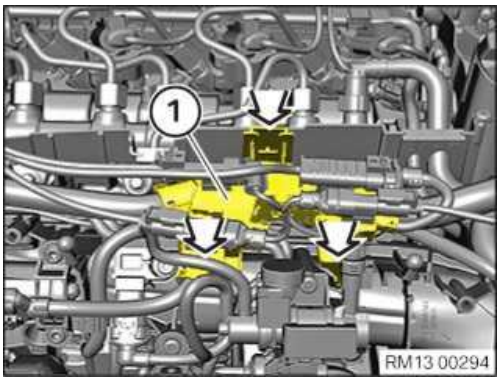
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Overview: Wiring harness section for the engine

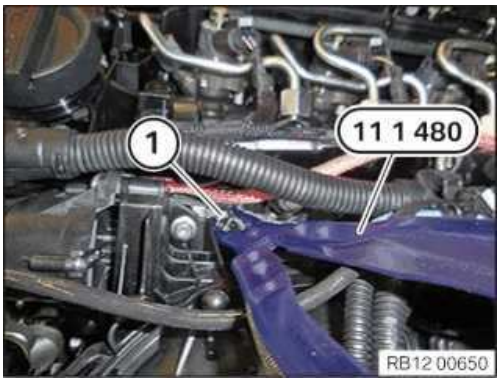


1 Wiring harness section for the engine

▶ **Installing the cable clip for the intake plenum**

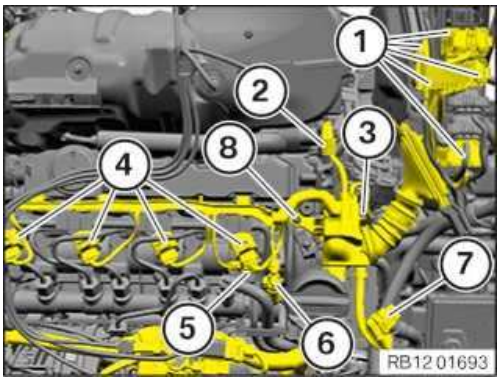


- Insert and install the cable clip (1) in the direction of the arrow.
- Make sure the cable clip (1) is fitted correctly.



- Connect and lock the connector (1) on the glow elements.
  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.

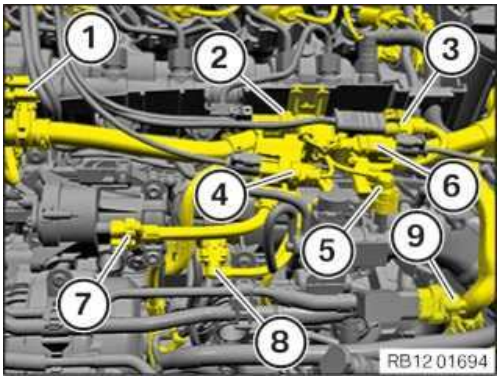
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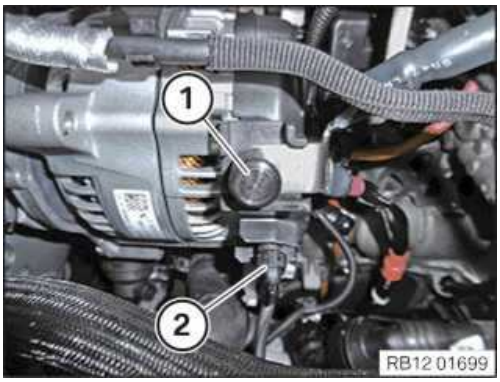
- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the DME control unit and remove the integrated supply module (PDM).
- Attach connector (2) to the differential pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust-gas recirculation valve and lock audibly.
- Attach connector (4) to the injectors and lock it audibly.
- Attach connector (5) to the camshaft sensor and lock it audibly.
- Attach connector (6) to the fuel pressure regulator and lock it audibly.
- Connect and audibly lock the connector (7) to the hot film air mass meter.
- Tighten down screw (8).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm



- Connect the connector (1) to the rail pressure sensor and lock it audibly.
- Attach connector (2) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (3) to the front oxygen sensor and lock audibly.
- Attach connector (4) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Connect the connector (5) to the electric changeover valve and lock audibly.
- Attach connector (6) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (7) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (8) to the charging pressure sensor and lock it audibly.
- Attach connector (9) to the fuel pressure and temperature sensor and lock it audibly.

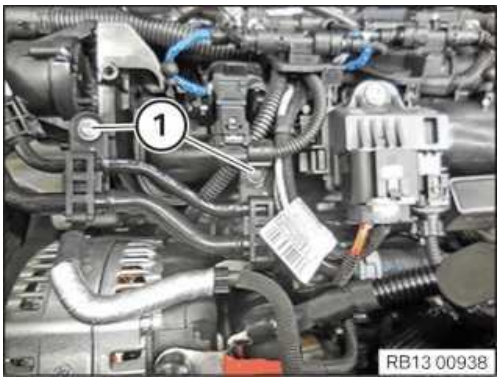


- Connect and lock the connector (2).

  Lock must snap audibly into place.
- Connect the positive battery cable (1) and tighten.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

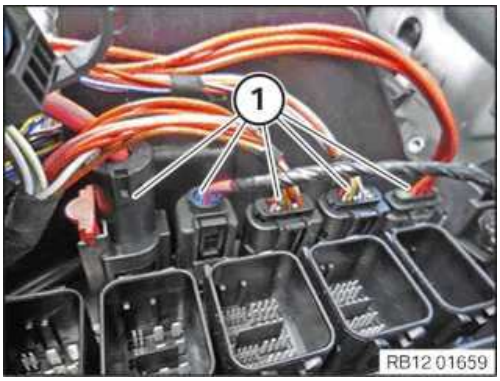


- Position the fuel line.
- Tighten the screws (1).

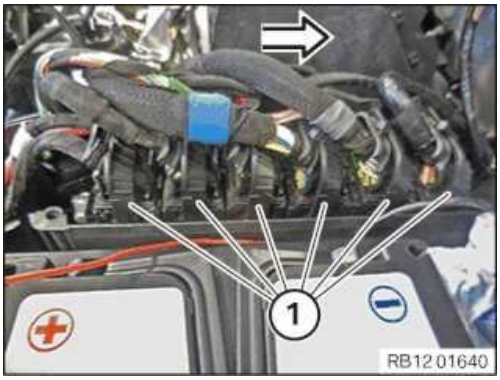
Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

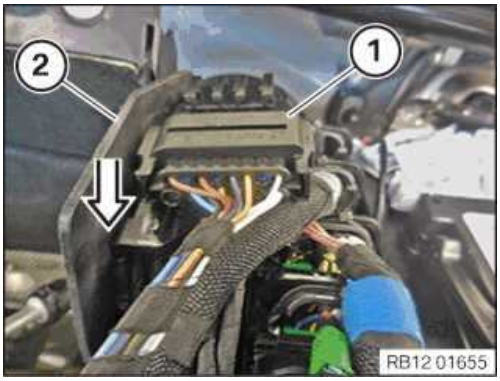
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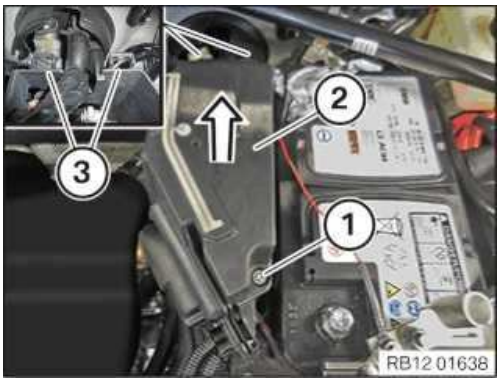
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



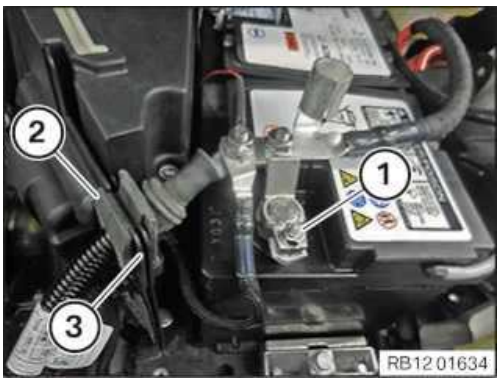
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert and install the cover (2) into the guides (3) in the direction of the arrow.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

RF5x26.5		Tightening torque	2,5 Nm

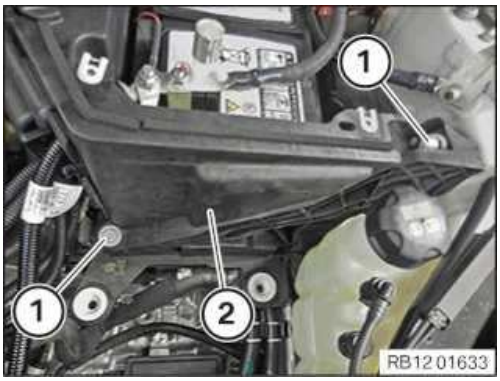


- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

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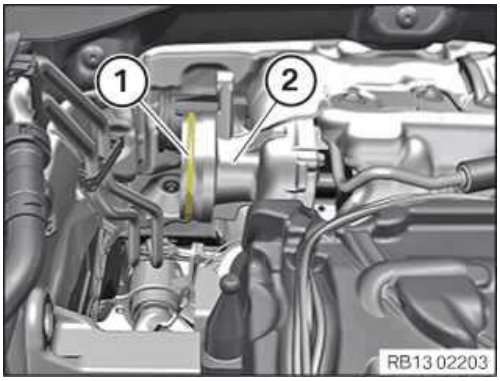


- Feed in and install tension strut (2).
- Tighten the screws (1).

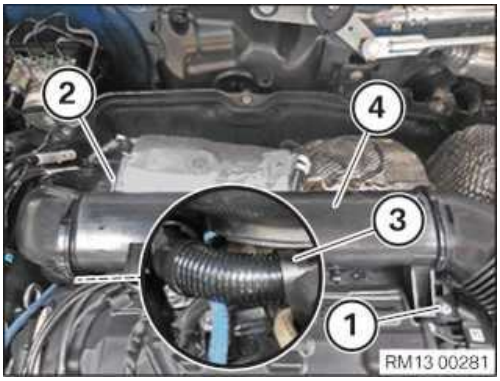
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

29 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.



- Feed in clean air pipe and install.
- Connect clean air pipe to the exhaust turbocharger and lock audibly in the clamps (2).
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Connect ventilation line (3) to the cylinder head cover and lock audibly.



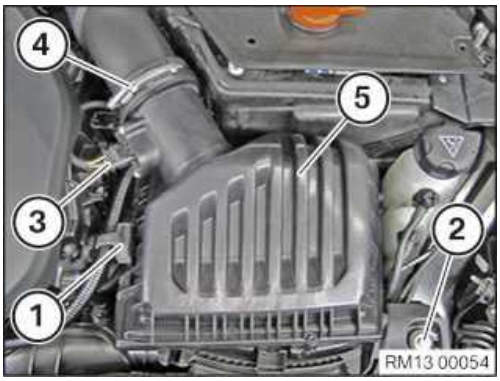
- Mount clean air pipe onto the intake filter housing.
- Tighten clamp (1) on the clean air pipe.

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

30 – Installing intake silencer housing

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- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

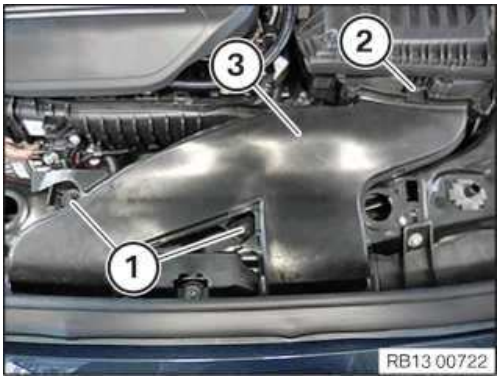
- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

31 – Install the intake neck for the intake filter housing

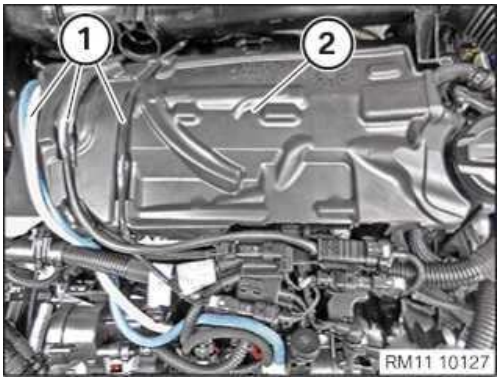


- Insert and install the intake neck (3).
  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

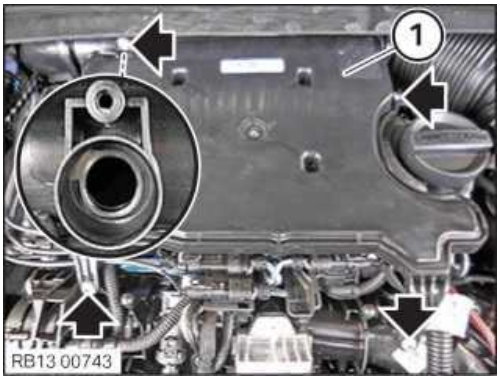
M6		Tightening torque	8 Nm

32 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the vehicle wiring harness (1) in the brackets.

33 – Install resonator



- Insert and install the resonator (1).
- Renew the bolts (arrows).
  Parts: Bolts
- Tighten screws (arrows).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

34 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Check for correct installation of all rubber mounts in the acoustic cover (1).

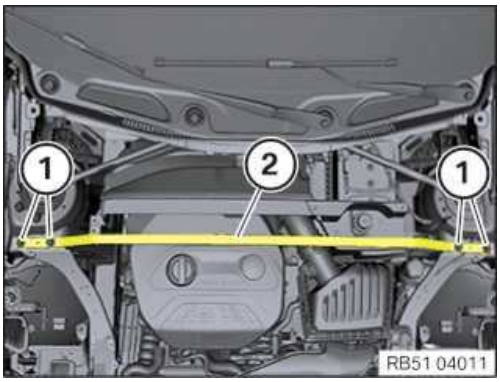


- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

35 – Install strut brace

TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.



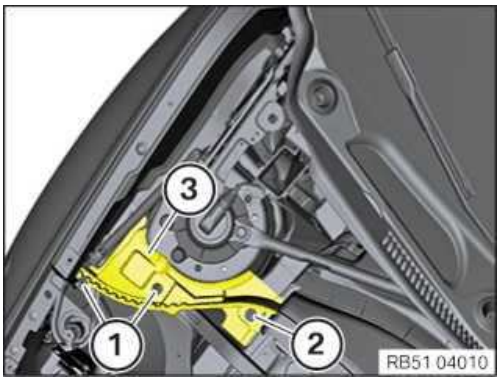
- Install the strut brace (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-brace to spring strut dome

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

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NOTICE

Description is for right component only. The procedure on the left side is identical.

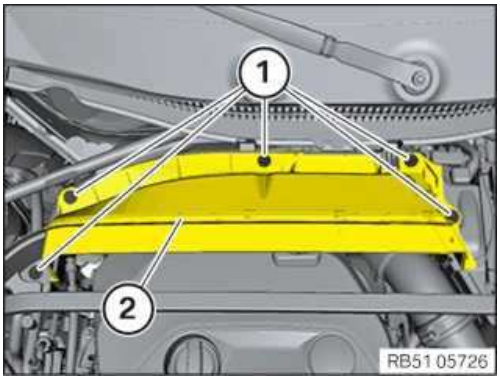
- Install the cover (3).
- Tighten down screw (2).

Cover on body

Hexagon screw		Tightening torque	3 Nm

- Install the expanding rivet (1).

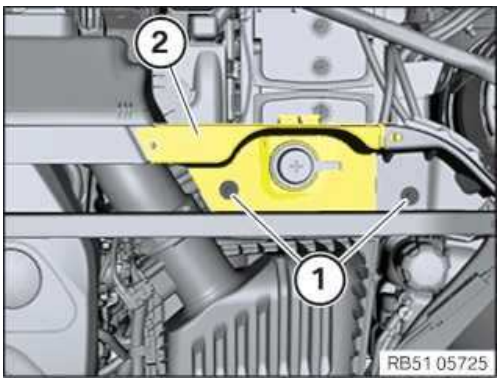
36 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Cover of top bulkhead

Screw		Tightening torque	2,6 Nm

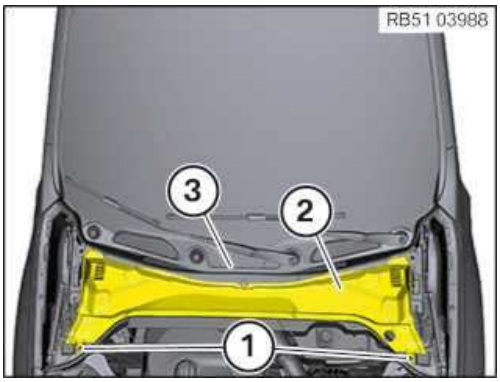


- Guide in and install cover (2).
- Tighten down screw (1).

Cover of remote positive terminal

Screw		Tightening torque	2,6 Nm

37 – Installing front cowl panel cover



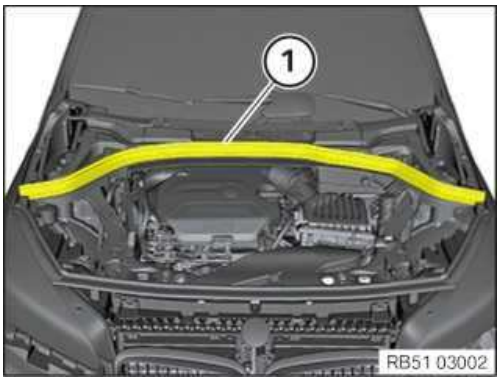
- Insert and install cowl panel cover at front (2) into cowl panel cover at rear (3).
- Check cowl panel cover at front is correctly seated (2).
- Secure expanding rivet (1).

38 – Install the seal for the bonnet

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

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- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

39 – Disconnecting all battery earth leads



- See additional information.

Additional Information

Overview of Tightening Torques

Camshaft sensor to cylinder head cover — Used in step 20

TS5x20		Tightening torque	4 Nm

Cylinder head cover to cylinder head — Used in step 21

M6		Tightening torque.	8,5 Nm

Differential pressure sensor to holder — Used in step 22

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor — Used in step 22

Clamp 15–19mm		Tightening torque	3 Nm

Rail on cylinder head cover — Used in step 23

Torx screw M8x25		Tightening torque	19 Nm

High pressure line between high pressure pump and rail — Used in step 23

High-pressure pipe		Tightening torque	28 Nm

Clamping claw facing to cylinder head cover — Used in step 24

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover — Used in step 24

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

High pressure lines between injector and rail — Used in step 26

High pressure lines		Tightening torque	28 Nm

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Intake plenum to cylinder head — Used in step 27

M6		Tightening torque	11 Nm

Wiring harness to cylinder head cover — Used in step 28

TS5x20		Tightening torque	3,5 Nm

Positive battery cable to alternator — Used in step 28

M8		Tightening torque	19 Nm

Fuel line to intake plenum — Used in step 28

TS6x20		Tightening torque	5 Nm

Cover to electronics box — Used in step 28

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery — Used in step 28

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray — Used in step 28

M8		Tightening torque	19 Nm

Clean air pipe to cylinder head cover — Used in step 29

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 29 30

Clamp		Tightening torque	3 Nm

Intake silencer housing to lock bridge — Used in step 30

M6X30		Tightening torque	8 Nm

Intake neck to cross connection — Used in step 31

M6		Tightening torque	8 Nm

Resonator to manifold and clean air pipe — Used in step 33

Screw TS6	Renew screw.	Tightening torque	5 Nm

Cross-brace to spring strut dome — Used in step 35

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

Cover on body — Used in step 35

Hexagon screw		Tightening torque	3 Nm

Cover of top bulkhead — Used in step 36

Screw		Tightening torque	2,6 Nm

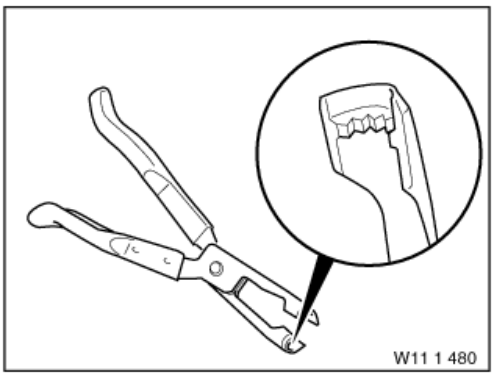
Cover of remote positive terminal — Used in step 36

Screw		Tightening torque	2,6 Nm

Overview of Special Tools

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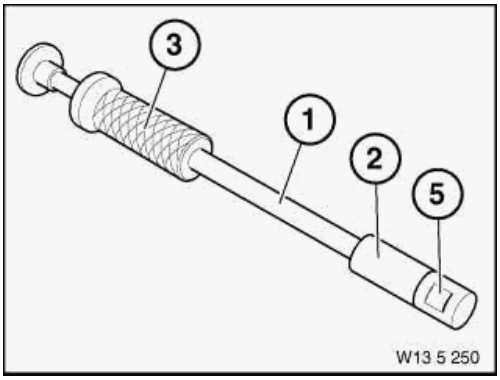
0 490 796 (11 1 480) Pliers



Common Used in step 12

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

0 493 321 (13 5 250) Puller



Common Used in step 16

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

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0 493 339 (13 5 252) Bush



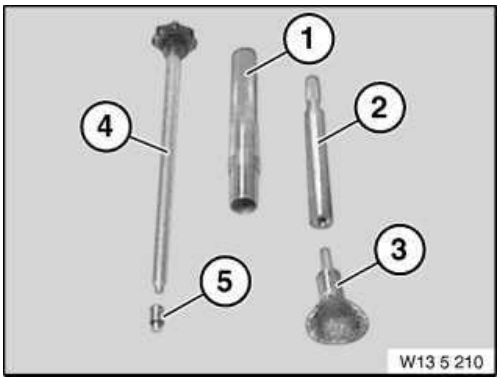
Common	Used in step 16
Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 340 (13 5 253) Weight



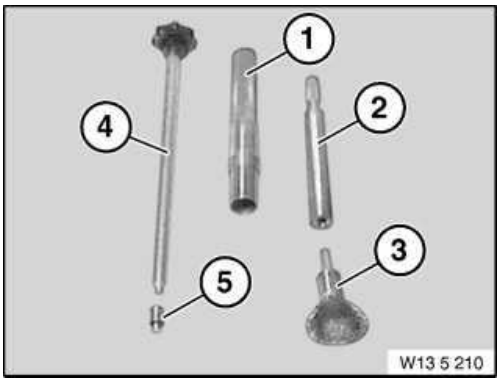
Common	Used in step 16
Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 763 (13 5 215) Plug



Common	Used in step 24
Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

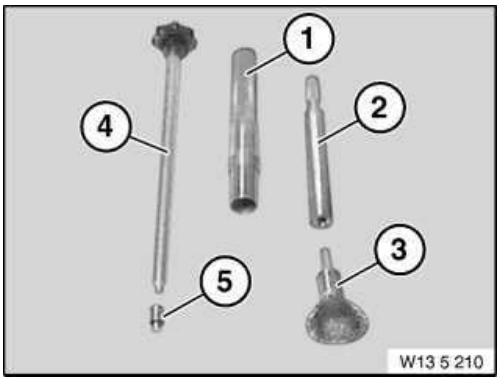
0 493 762 (13 5 214) Rod



Common	Used in step 24
Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 493 758 (13 5 210) Tool



Common		Used in step 24
Usage	(Cleaning set) For injector channels	
Included in the tool or work		
Storage location	B4	
Replaced by		
In connection with		
SI-Number	01 05 00 (574)	

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

Links

Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	1 39
61 20 900 Disconnecting and connecting battery earth lead	1 39
61 20 900 Disconnecting and connecting battery earth lead	1 39
61 20 900 Disconnecting and connecting battery earth lead	1 39
61 20 900 Disconnecting and connecting battery earth lead	1 39
61 20 900 Disconnecting and connecting battery earth lead	1 39
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 39
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 39
61 20 900 Disconnecting and connecting battery earth lead	1 39
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 39
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	1 39
61 20 900 Disconnecting and connecting battery earth lead	1 39
61 20 900 Disconnecting and connecting battery earth lead	1 39
61 20 900 Disconnecting and connecting battery earth lead	1 39
61 20 900 Disconnecting and connecting battery earth lead	1 39
61 20 900 Disconnecting and connecting battery earth lead	1 39
61 20 900 Disconnecting and connecting battery earth lead	1 39

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61 20 900 Disconnecting and connecting battery earth lead 1 39
61 20 900 Disconnecting and connecting battery earth lead 1 39
61 20 900 Disconnecting and connecting battery earth lead 1 39
61 20 900 Disconnecting and connecting battery earth lead 1 39
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads) 1 39
61 20 900 Disconnecting and connecting battery earth lead 1 39
61 20 900 Disconnecting and connecting battery earth lead 1 39
61 20 900 Disconnecting and connecting battery earth lead 1 39
61 20 900 Disconnecting and connecting battery earth lead 1 39
61 20 900 Disconnecting and connecting battery earth lead 1 39
61 20 900 Disconnecting and connecting battery earth lead 1 39
61 20 900 Disconnecting and connecting battery earth lead 1 39
61 35 ... Notes on ESD protection (Electro Static Discharge) 16 18 20

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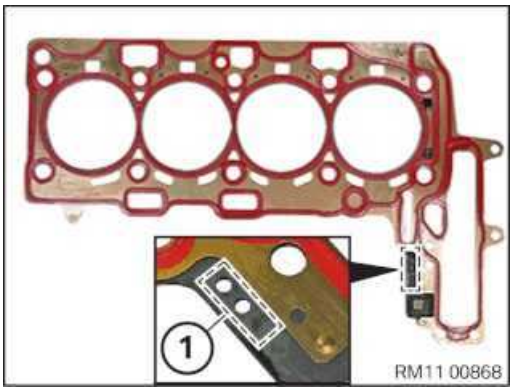
11 12 501 Replacing cylinder head gasket (B47)

Necessary preliminary tasks:

- Remove cylinder head.



Check adapter sleeves (1) for damage and firm seating.



The cylinder head gasket is designed as a beaded metal gasket.

Note gasket thickness (1).

Highest piston protrusion at both measuring points of all 4 pistons determines thickness of cylinder head gasket.

Piston protrusion up to 0.92 mm

- Install 1 hole cylinder head gasket.

Piston protrusion >0.92 ... 1.03 mm

- Install 2 hole cylinder head gasket.

>Piston protrusion greater than 1.03 ... 1.18 mm

- Install 3 hole cylinder head gasket.

Concluding tasks:

- Installing the cylinder head

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This documentation refers to special tools that were not yet available when going to press.

11 13 000 Remove and install, seal or replace oil sump

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Engine damage caused by excessively filling the engine with engine oil.

Filling an excessive quantity of engine oil may cause engine damage.

- Observe the exact engine oil filling capacity.
- Drain the engine oil.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

PRELIMINARY WORK

1 – Disconnecting all battery earth leads

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- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

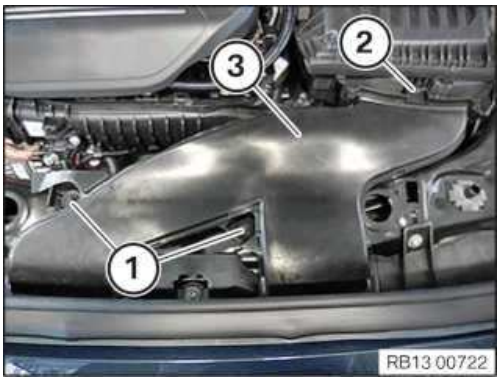
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

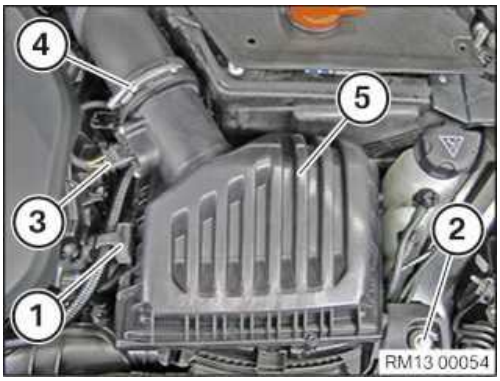
3 – Remove the intake neck for intake silencer housing



- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

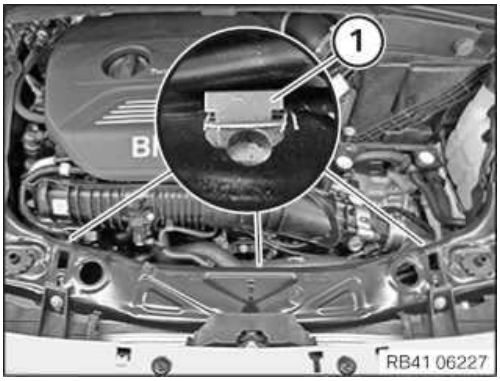
4 – Removing intake silencer housing

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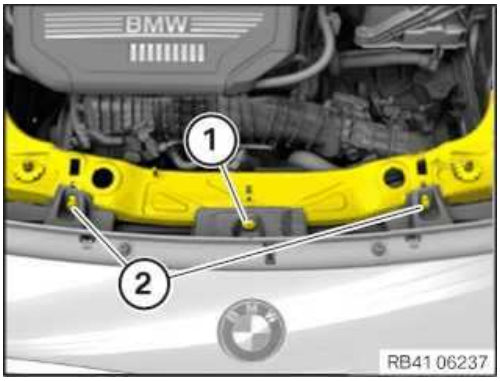


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

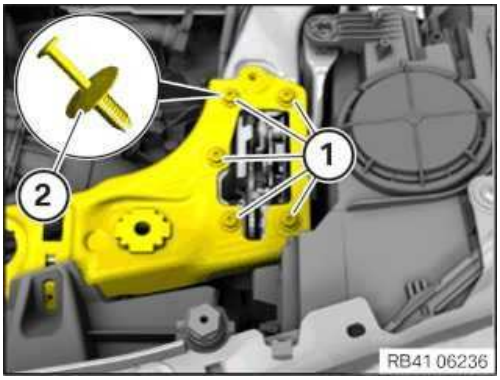
5 – Remove front cross connection



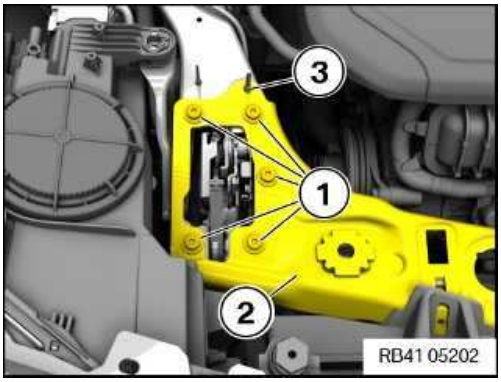
- Detach the clamps (1) for the Bowden cable of the bonnet locks from the cross connection.



- Loosen screw (1).
- Loosen screws (2).



- Loosen screws (1).
- Lever out expanding rivet (2).



- Loosen screws (1).
- Unclip the front cross connection (2) from the rubber retainer (3) and remove it upward.

6 – Removing the fan cowl with electric fan

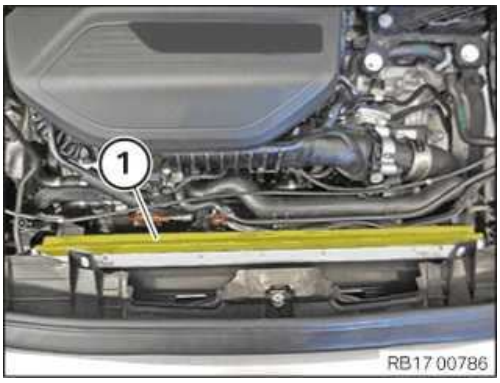
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WARNING

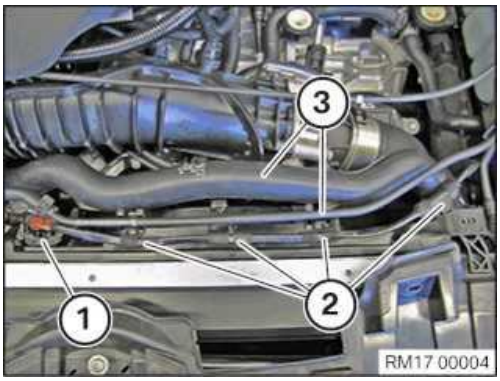
Hot surfaces.

Risk of burning!

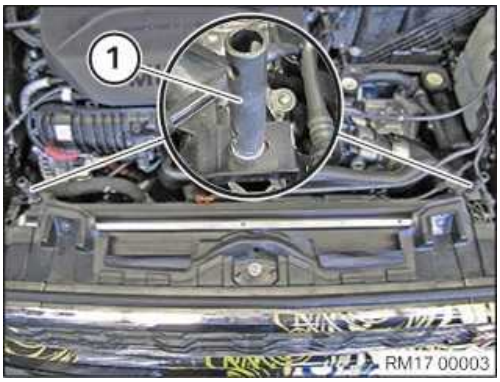
- Perform all work only on components that have cooled down.



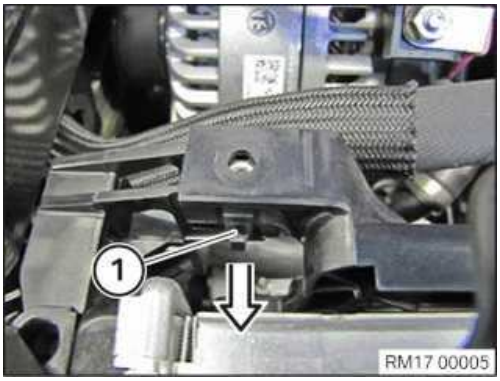
- Feed out and remove the sealing (1) from the radiator.



- Unlock plug connection (1) and disconnect.
- Unlock and loosen the clamps (2).
- Feed out connector (1) and place to one side.
- Thread off coolant line (3) and place to the side.

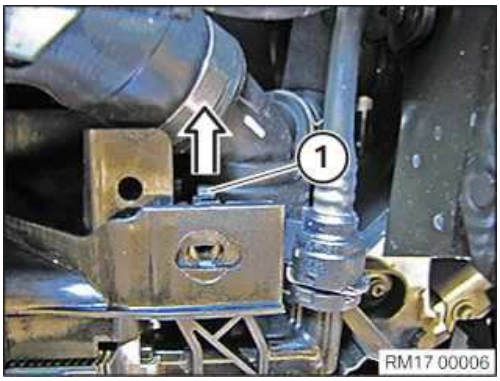


- Loosen screws (1).

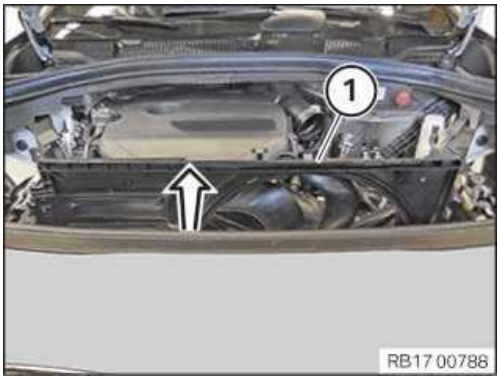


- Unlock the right lock (1) on the fan cowl in the direction of the arrow.

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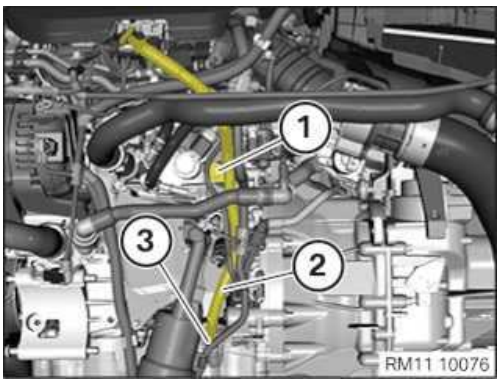


- Unlock the left lock (1) on the fan cowl in the direction of the arrow.



- Guide out fan cowl (1) in direction of arrow and remove.

7 – Removing the guide tube for the oil dipstick



- Unscrew the bolt (1) in the marked area.
- Disconnect the guide tube (2) for the oil dipstick toward the top from the oil sump and remove it.
- Remove sealing ring (3) from oil sump if necessary.

8 – Removing the oil filler cap



- Open oil filler cap (1).

9 – Remove front right wheel

TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

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TECHNICAL INFORMATION

Strictly observe the specified procedure to prevent clamping errors and imbalance.



- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

10 – Removing the front right wheel arch cover

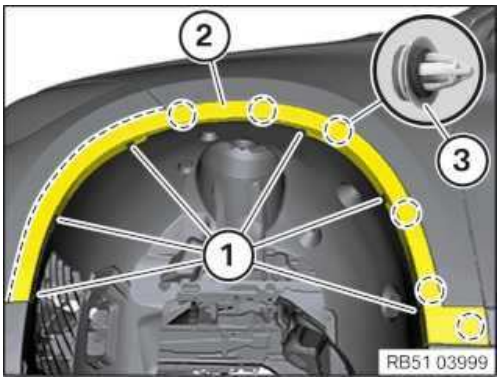
▶ **Remove the front wheel arch trim**

NOTICE

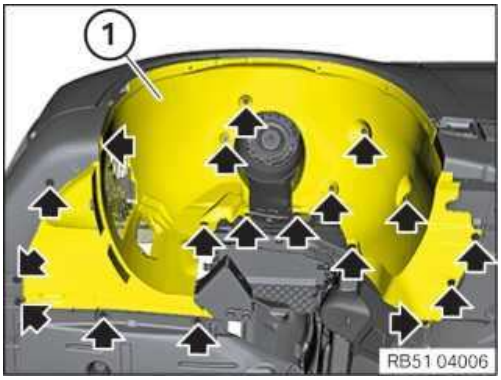
To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.



NOTICE

Description is for left component only. Procedure on the right side is identical.

- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

11 – Partially remove the front wheel arch cover

▶ **Partially removing the front wheel arch trim**

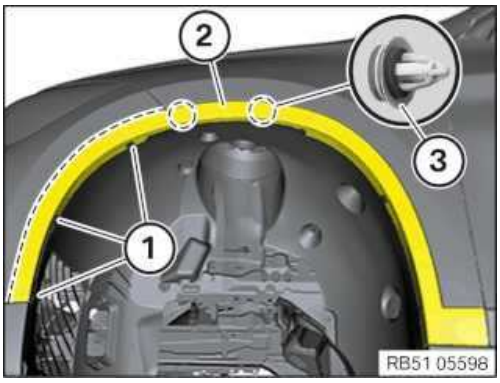
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NOTICE

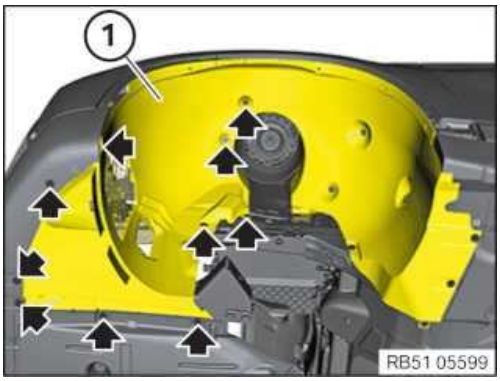
To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.

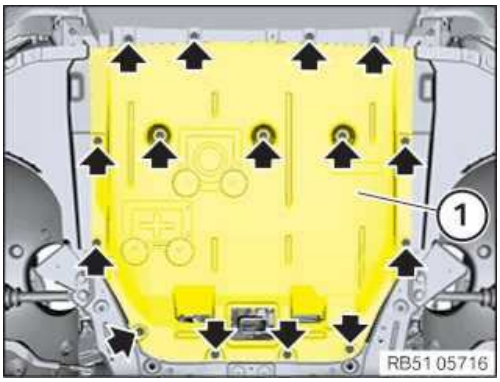


NOTICE

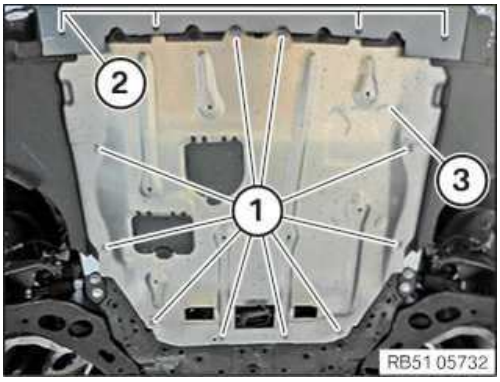
Description is for left component only. Procedure on the right side is identical.

- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (2) out.

12 – Removing the front underbody protection



- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.



- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

13 – Releasing the oil drain plug

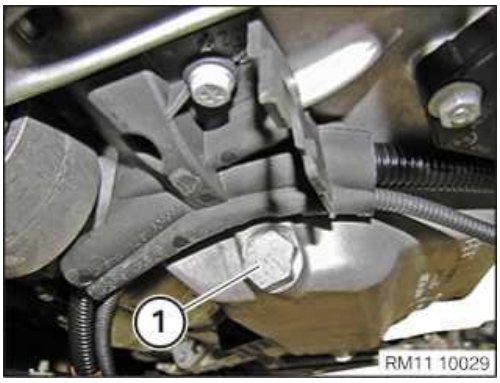
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WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

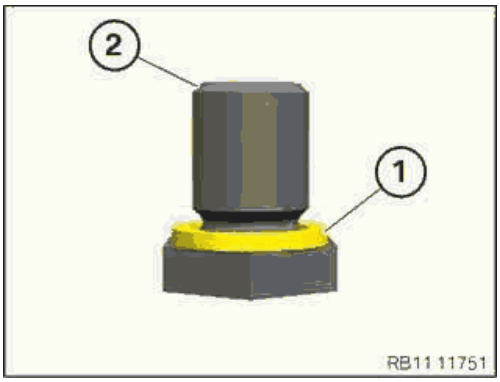


TECHNICAL INFORMATION

Catch and dispose of drained engine oil in a suitable collecting vessel. Observe country-specific waste disposal regulations.

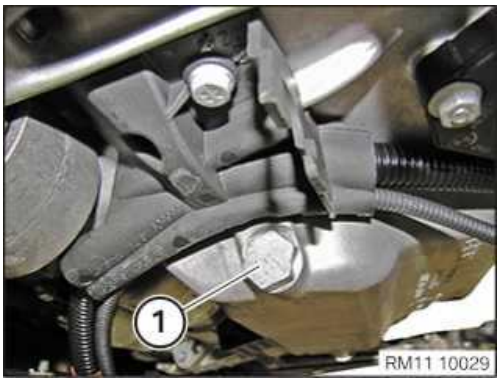
- Release oil drain plug (1).
- Drain engine oil.

14 – Tightening the oil drain plug



- Renew sealing ring (1) on the oil drain plug (2).

  Parts: Sealing ring
- Guide in the sealing ring (1) on the oil drain plug (2) and install.



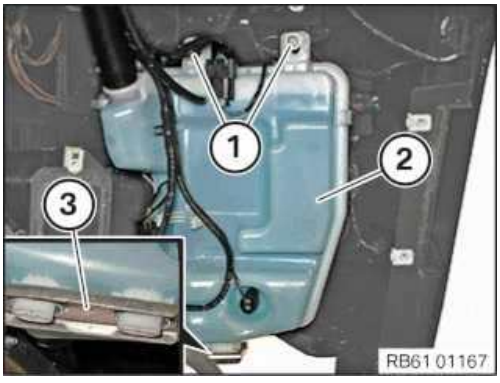
- Renew the sealing ring.

  Parts: Sealing ring
- Position oil drain plug (1) on the oil sump and tighten.

Oil drain plug on oil sump

M12x1.5	Renew the sealing ring.	Tightening torque	25 Nm

15 – Remove the washer fluid reservoir from the fixture



- Loosen screws (1).
- Guide the washer fluid reservoir (2) up and out of the fixture (3) and set it aside.

16 – Removing the right charge air duct between the exhaust turbocharger and the charge air cooler

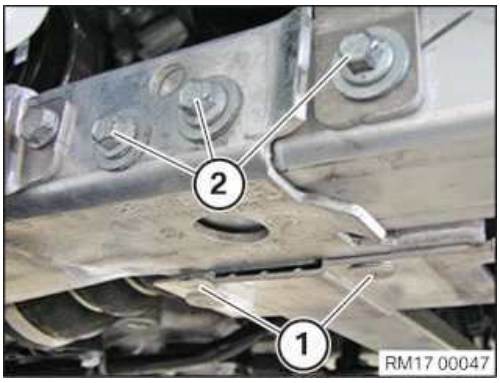
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WARNING

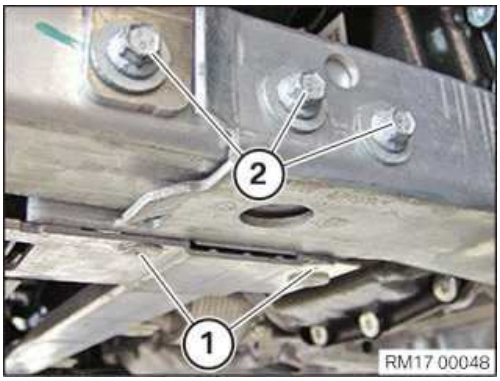
Hot surfaces.

Risk of burning!

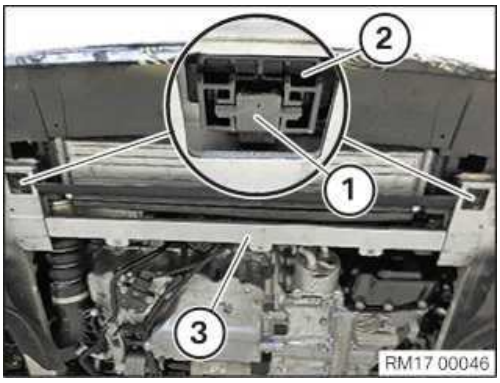
- Perform all work only on components that have cooled down.



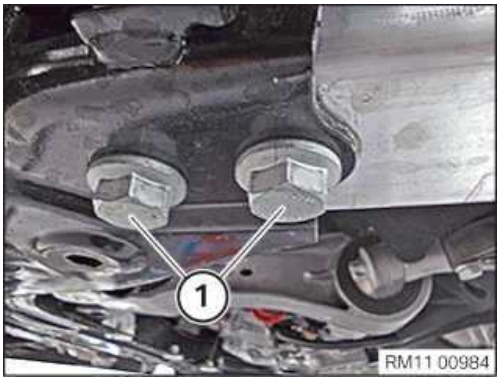
- Undo screws (2) at front left.
- Drill out blind rivets (1) at front left.



- Undo screws (2) at front right.
- Drill out blind rivets (1) at front right.

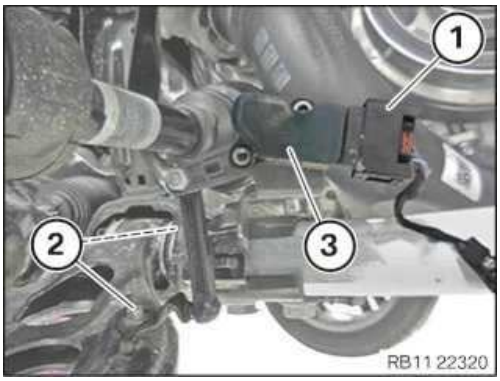


- Unlock locking pins (1).
- Thread out and remove locks (2).
- Thread out and remove cross connection (3).

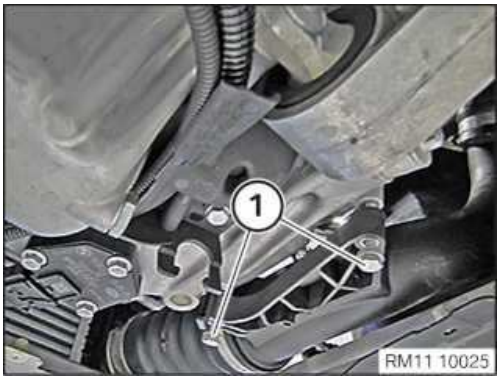


- Release the screws (1) on the right front axle support.

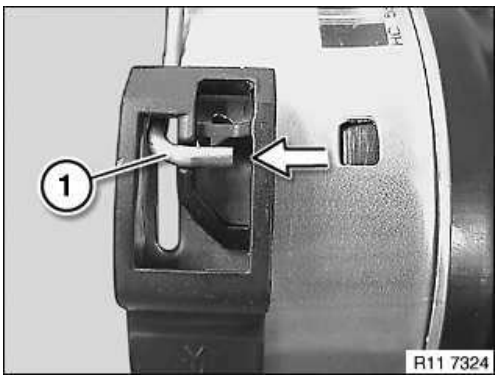
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- **If installed:**
- Unlock and release plug connection (1).
- Loosen screws (2).
- Feed out the ride height sensor (3) and remove.

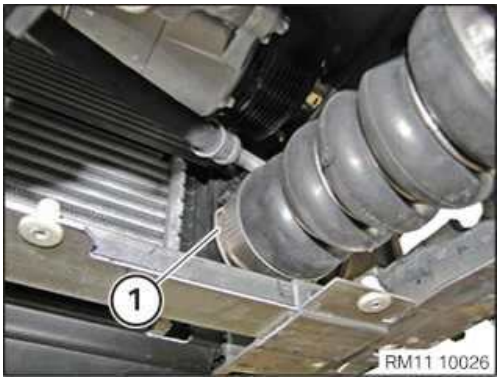


- Release screws (1) of charge air duct on right oil sump.

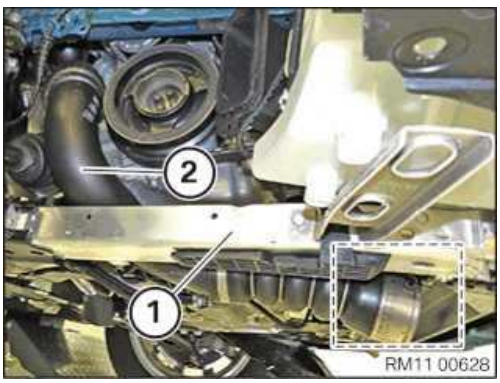


- Unlock lock (1).

  The lock (1) must engage in the bracket during unlocking (arrow).

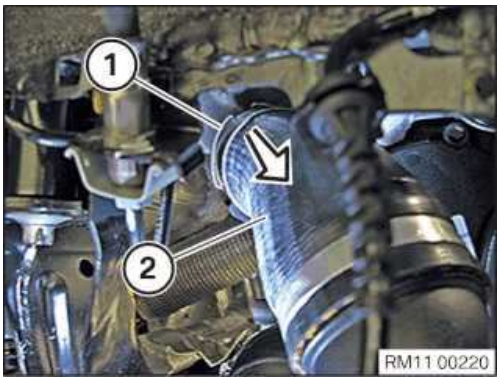


- Unlock and release the charge air duct (1) on the charge air cooler.

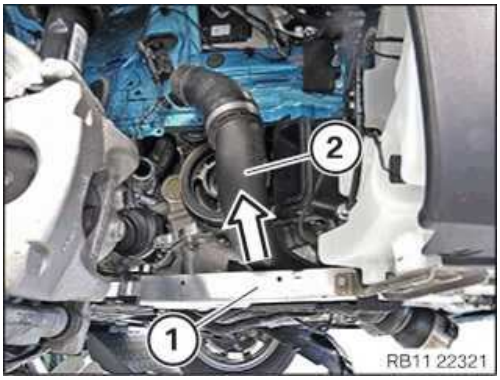


- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed out the charge air duct (2) in the **marked** area towards the bottom and set it aside.

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- Unlock and detach the locks (1) on both sides.
- Feed out the charge air duct (2) on the exhaust turbocharger in the direction of the arrow and set it aside.



- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed out the charge air duct (1) in the direction of arrow between the side member and the deformation element and remove.

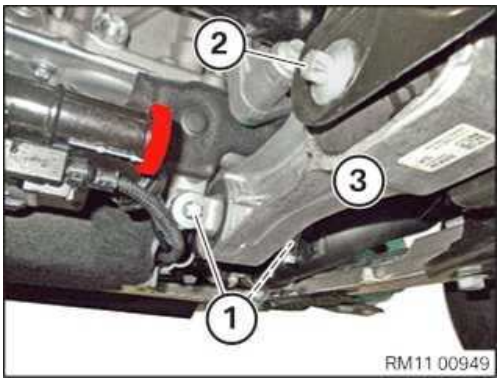
17 – Remove bracket with rubber mount

WARNING

Motor vehicle may slip off the vehicle hoist where components are supported.

Danger! Life-threatening injuries!

- Secure the vehicle hoist against lowering and lifting.



- Support the engine with the jack at a suitable point.
- Loosen screws (1) and (2).
- Guide out and remove holder (3).

18 – Removing the acoustic cover of the oil sump

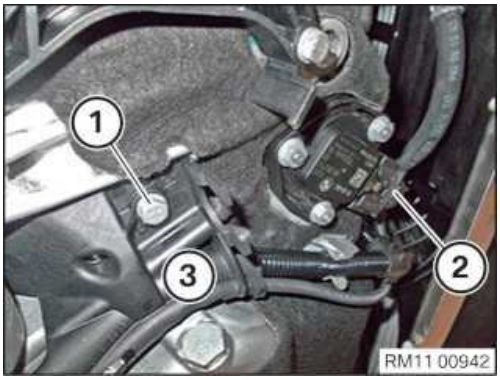


- Unlock connector (1) and pull off.
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).

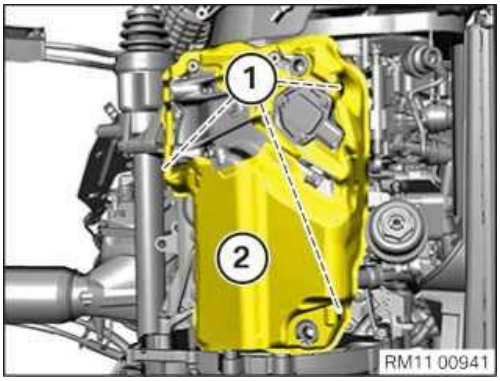
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- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.



- Unscrew the screw (1) on the wiring harness to the oil sump.
- Unlock and pull off connector (2) on the oil-level sensor.
- Place wiring harness (3) to one side.



- Remove the expanding rivets (1) on both sides of the acoustic cover.
- Feed out and remove the acoustic cover (2).

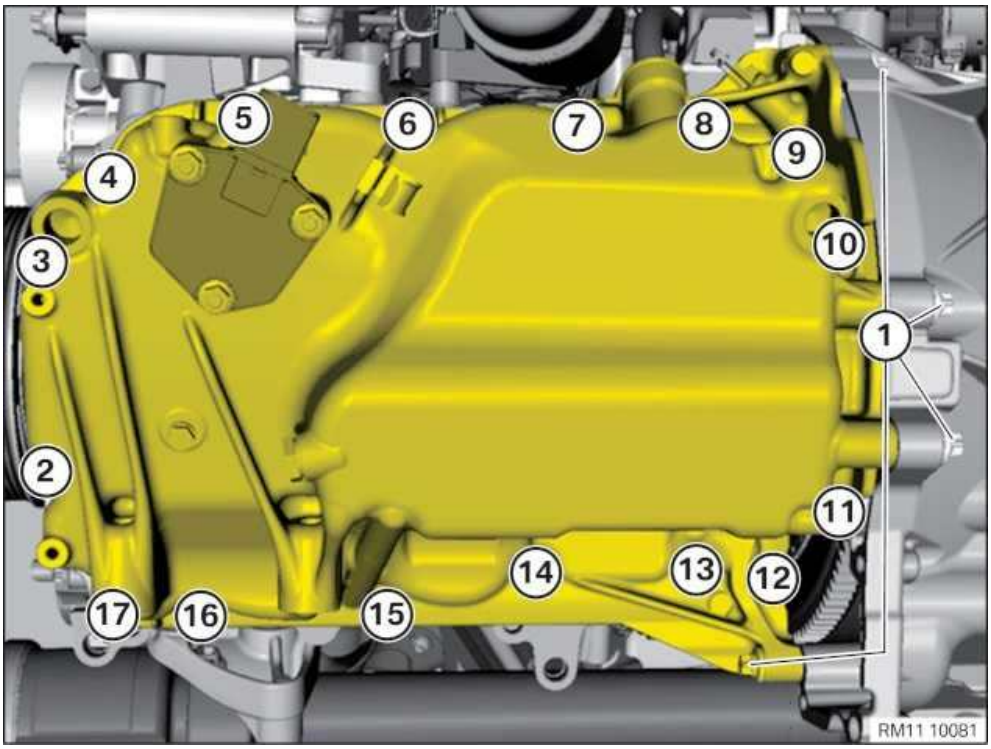
MAIN WORK

19 – Remove oil sump

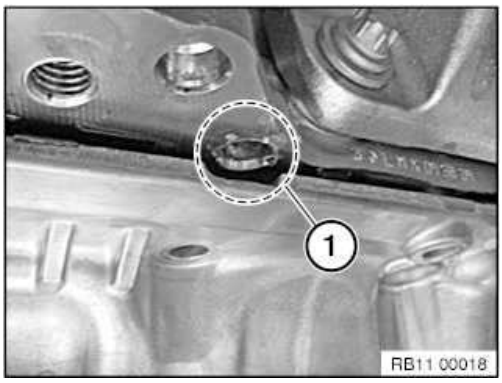


- Loosen screws (1).
- Feed out starter motor and remove.

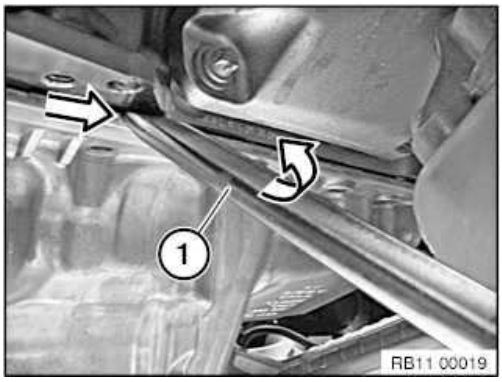
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- Release transmission bolts (1) on the oil sump.
- Loosen screws (2) to (17).

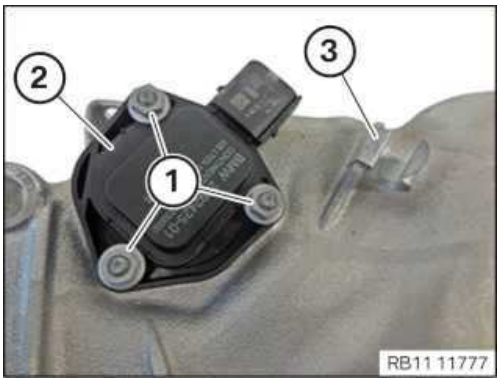


- Release the oil sump only in area (1).



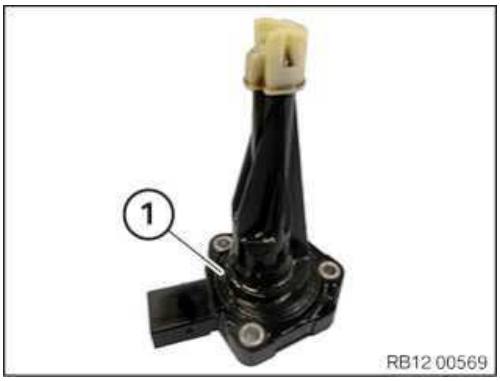
- Release the oil sump carefully using a suitable mounting lever (1) at the appropriate position in the direction of the arrow.
- Secure the oil sump to prevent it from falling.

20 – Renew oil sump



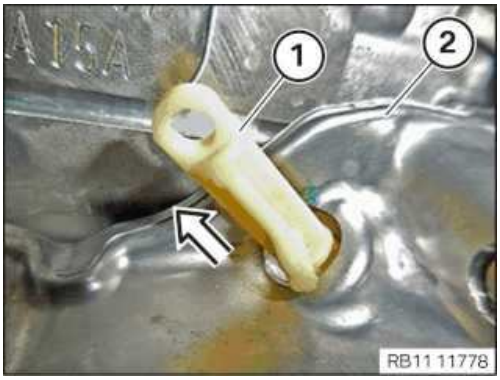
- Loosen nuts (1).
- Remove the oil-level sensor (2).
- Feed out and remove the clamp (3).

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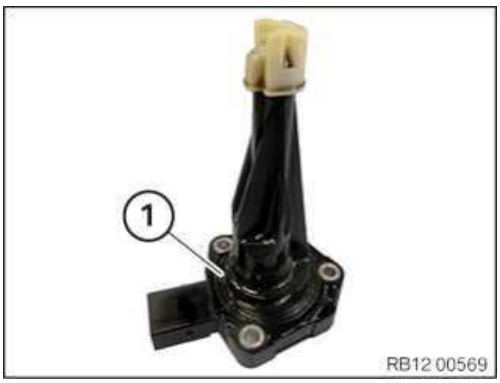


- Renew gasket (1).

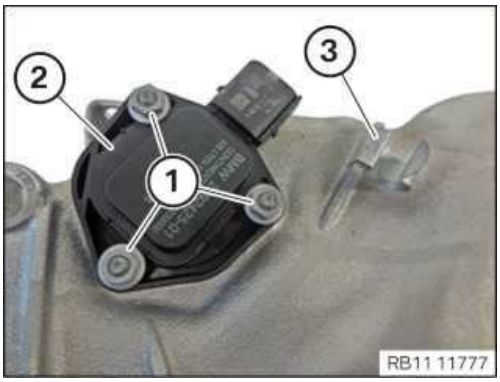
  Parts: Gasket



- Guide the seal plug (1) out of the oil sump (2) in the direction of the arrow and remove.



- Insert and install the new gasket (1).

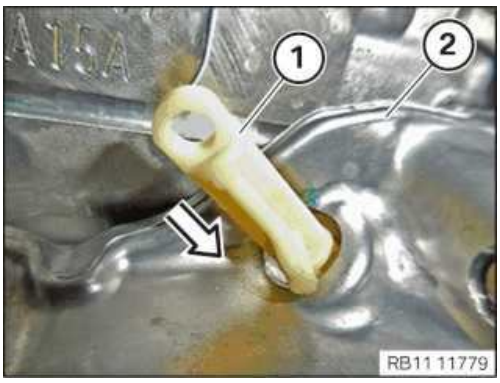


- Insert and install the oil-level sensor (2).
- Tighten nuts (1).

Oil level sensor to oil sump

M6		Jointing torque	2 Nm
		Tightening torque	8 Nm

- Secure clamp (3).



- Guide the seal plug (1) into the oil sump (2) in the direction of the arrow and install.

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TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove fine sealing remains on the sealing surface (1)and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.
- Clean sealing surface (1) with brake cleaner.

Expendable materials

Brake cleaner2.0	500 ml, Spray can	83192365214
	20 , Canister	83192365215



TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove coarse sealing remains on the sealing surface (1)and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.
- Clean sealing surface (1) with brake cleaner.

Expendable materials

Brake cleaner2.0	500 ml, Spray can	83192365214
	20 , Canister	83192365215



- Have the special tool ready.



TECHNICAL INFORMATION

For more information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

- Position the sealing compound (1) on special tool as shown.

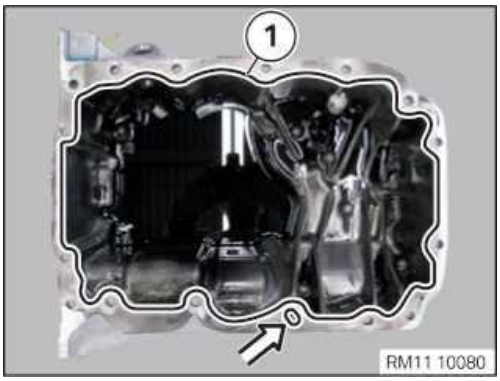
  Parts: Sealing compound

Sealing compound

Loctite 5970 liquid sealing compound	50 ml, Cartridge	83190404517

Overview of consumables (Electronic Parts Catalogue)

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TECHNICAL INFORMATION

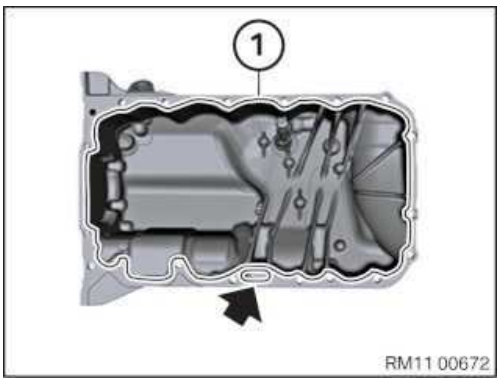
The sealing surfaces must be free from oils, grease and cleaning agents.

TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- The height of the sealing compound must be approx. between **2.0 mm** and **2.5 mm**.
- Apply the sealing bead along the inner edge (1) of the oil sump.
- Completely surround the oil return orifice (arrow) with the sealing compound.

  No sealing compound may enter the oil return orifice.
- Fix oil sump within the prescribed application time of the sealing compound.

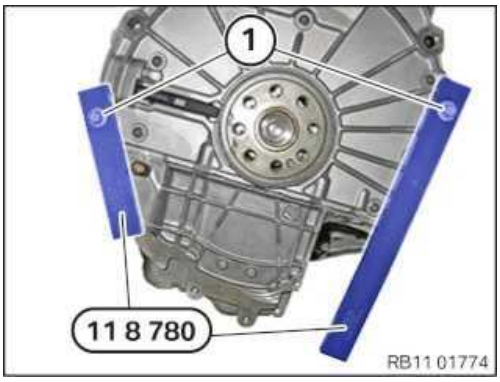


TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- Apply the sealing compound along the line (1) with a thickness of 2 mm to 2.5 mm.

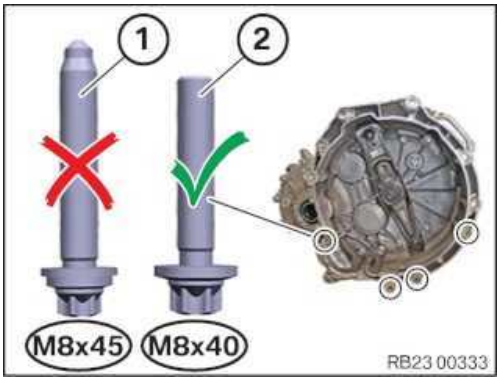
  The sealing compound must be applied along the inner edge.
- Completely encircle the oil return orifice (arrow) with the sealing compound.



TECHNICAL INFORMATION

The special tool 11 8 780 is only required when the transmission is removed.

- Position the special tool **0 496 120 (11 8 780)** with the transmission bolts (1) so that the oil sump is exactly flush with engine block.
- Renew the fitting sleeves if required.



RISK OF DAMAGE

Component damage caused by incorrect screw length.

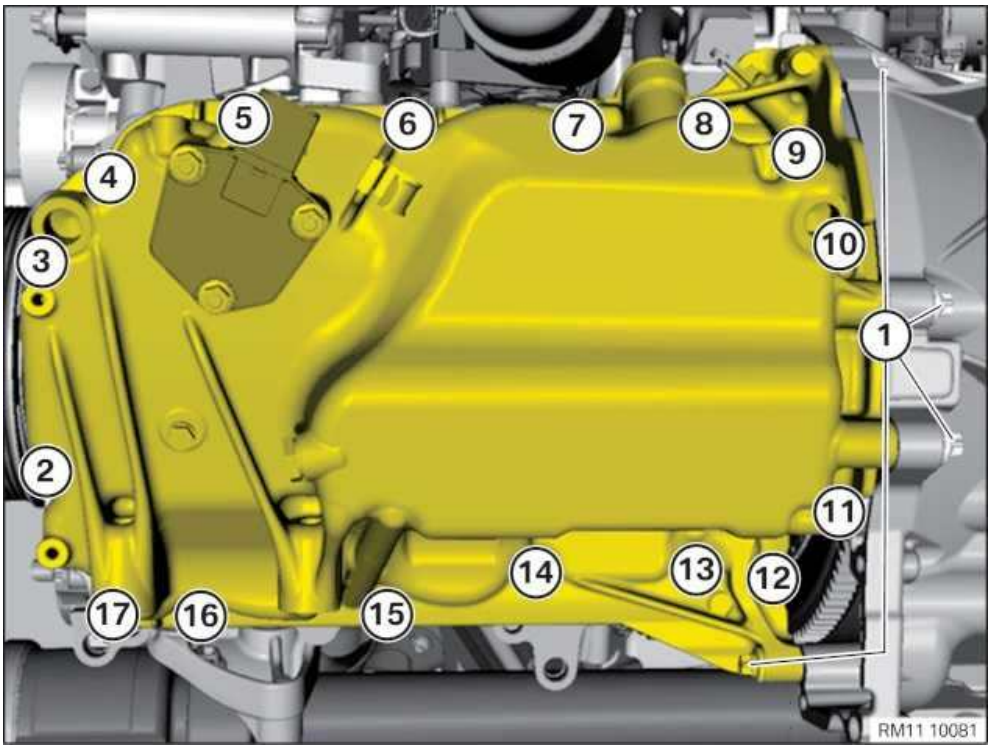
The use of screws with the incorrect screw length can damage the component.

- Check for correct screw length.
- Re-install screws that correspond to the original screw length.

- Ensure that the **correct** screw (2) (M8x40) is used for mounting the oil sump on the transmission.

  The screw (1) (mounting bolt of the starter motor) may **never** be used for mounting the oil sump.

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- Position and install the oil sump.
- Tighten screws (2) to (17) **hand-tight**, do **not** tighten fully.
- Join transmission bolts (1) with 5 Nm.
- Tighten screws (2) to (17) on the oil sump.

Oil sump to crankcase

M8x30		Tightening torque	2 Nr
M8x110		Tightening torque	2 Nr

- Tighten the transmission bolts (1) on the oil sump.

Transmission to oil sump

M8		Tightening torque	1 Nr



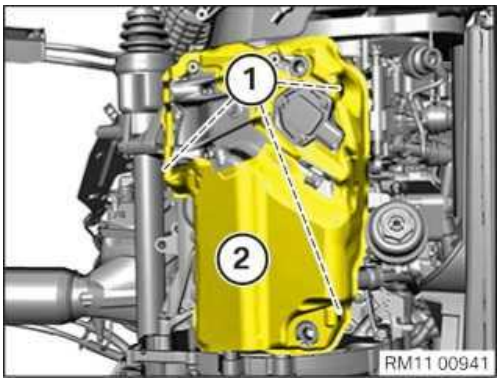
- Insert and install the starter motor .
- Tighten the screws (1).

Starter motor to transmission

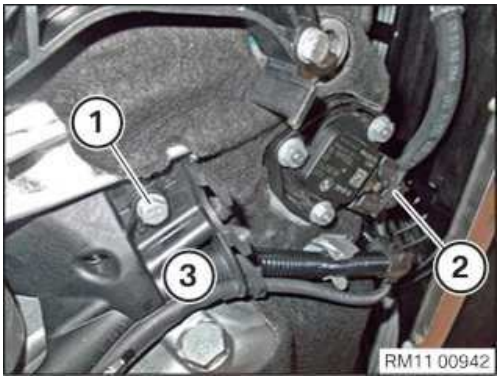
M8x45		Tightening torque	19 Nm

POSTPROCESSES

22 – Installing the acoustic cover for the oil sump



- Thread in and position the acoustic cover (2).
- Install the expanding rivet (1).



- Position wiring harness (3).
- Tighten down screw (1).

Bracket to oil sump

M6		Tightening torque	8 Nm

- Connect and lock the connector (2) on the oil-level sensor.

  The connector must lock audibly.

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CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

Battery positive lead to starter

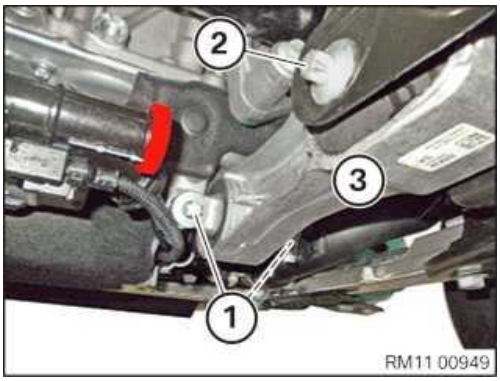
M8		Tightening torque	13,5 Nm



- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).

  The connector must engage audibly.

23 – Install the holder with the rubber mount



- Insert and install the holder (3).
- Tighten the screws (1) and (2) hand-tight.
- Release jack.
- Tighten down screw (2).

Holder to front axle support

M12		Tightening torque	100 Nm

- Tighten the screws (1).

Bracket to oil sump

M12		Tightening torque	100 Nm

24 – Installing the right charge air duct between the exhaust turbocharger and the charge air cooler

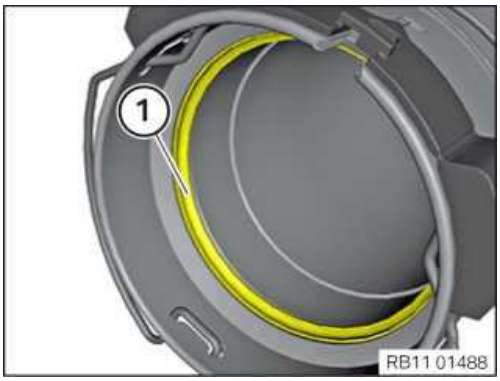
RISK OF DAMAGE

Damage to the exhaust turbocharger.

A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.

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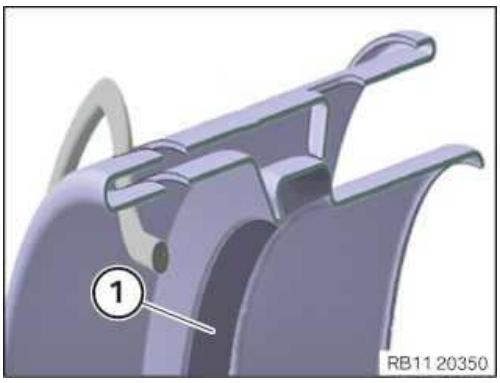
- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Gasket

▶ **Replace damaged gasket**

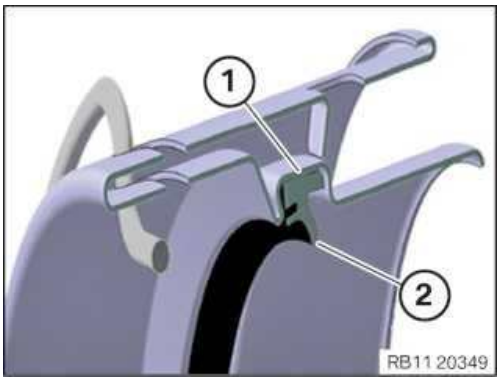
TECHNICAL INFORMATION

Do not use pointed or sharp-edged tools for the installation and/or removal.



- Remove damaged seal.
- Clean gasket groove (1) with a dry towel.

  The gasket groove (1) must be clean.



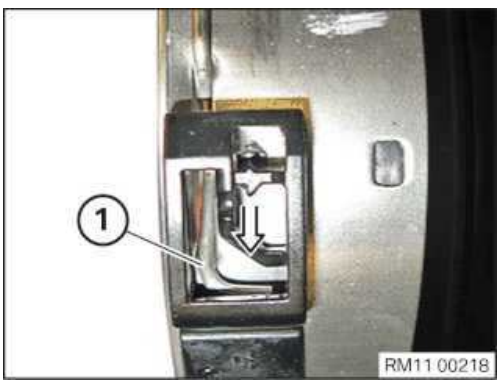
- Renew gasket.

  Parts: Gasket
- Install seal dry without lubricant or mounting agent.

TECHNICAL INFORMATION

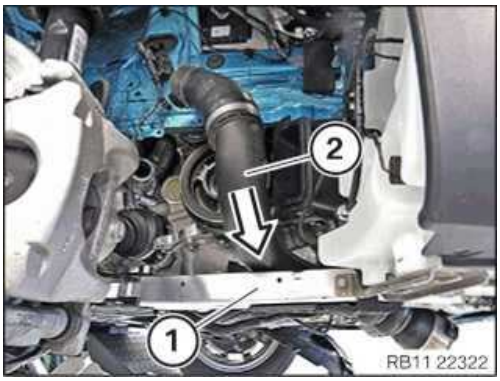
Incorrect assembly is possible. Ensure correct installation position.

- Feed in and install the seal.
- Make sure the seal is correctly installed in the gasket groove (1).
- Make sure that the sealing lip (2) is pointing downwards (see figure).

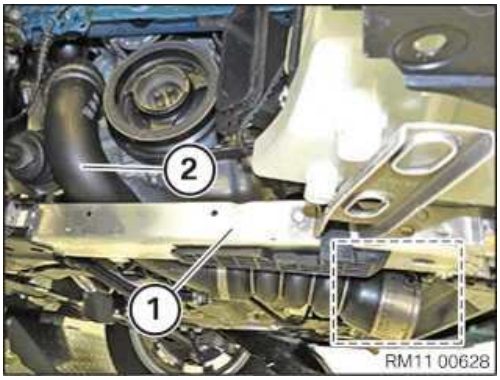


- Detach the locks (1) in the direction of the arrow from the brackets.
- Ensure that the locks (1) engage audibly.

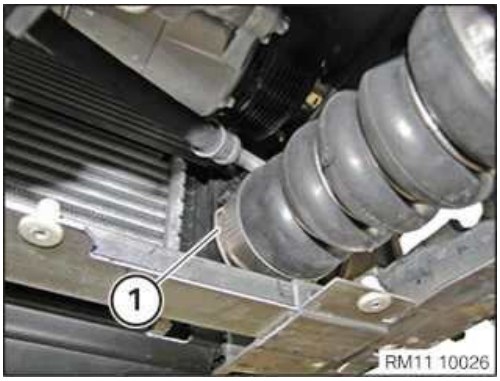
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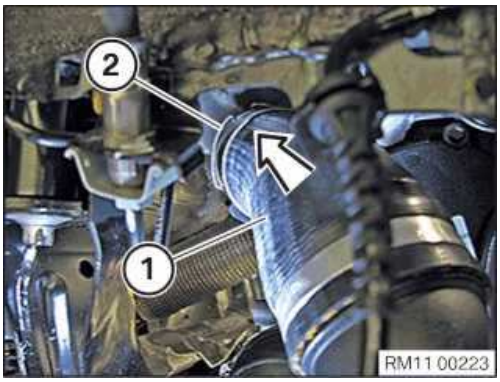
- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed in the charge air duct (1) in the **direction** of arrow between the side member and the deformation element and position.



- Pull the adapter of the front axle support (1) downwards to the front right.
- Position the charge air duct (2) in **marked** area on the charge air cooler.

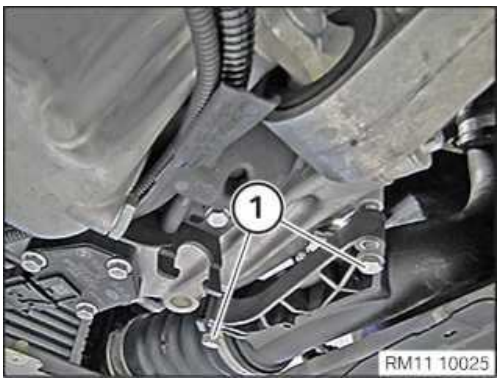


- Feed in and install the charge air duct (1) on the charge air cooler .
- Make sure the charge air duct (1) engages audibly on the charge air cooler.



- Feed in and install charge air duct (1) in the **direction** of the arrow on exhaust turbocharger.

  The locks (2) must engage audibly.

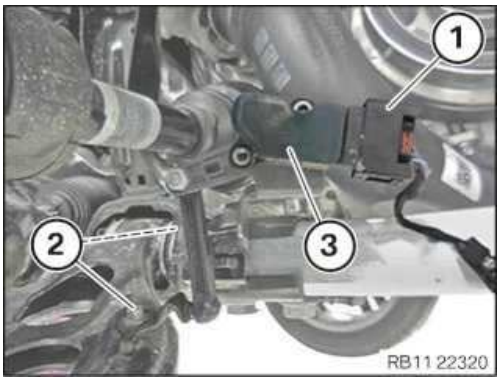


- Tighten the screws (1).

Charge air duct to oil sump

M6		Tightening torque	8 Nm

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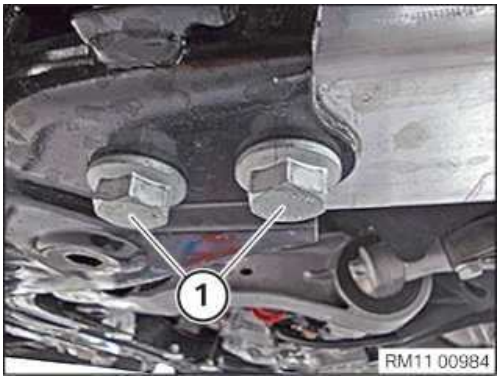
- **If installed:**
- Feed in and install the ride height sensor (3).
- Tighten the screws (2).

Ride height sensor holder to front axle support

M6		Tightening torque	8 Nm

- Connect and lock the connector (1).

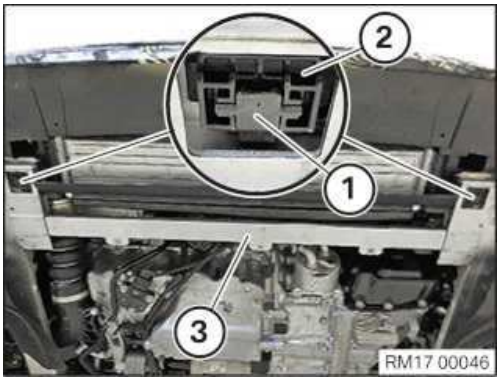
  The connector (1) must engage audibly.



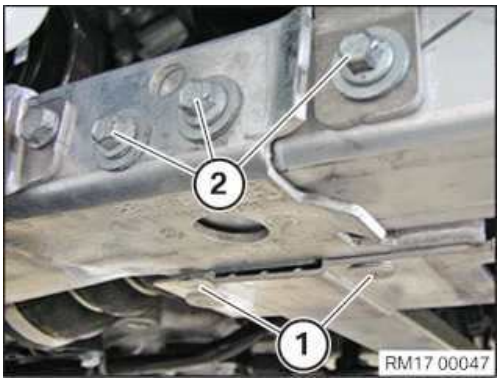
- Tighten the screws (1) on the adapter of the front axle support.

Adapter, front axle support to front axle support

		Tightening torque	100 Nm



- Guide in cross connection (3) and install.
- Guide in locks (2) and install.
- Lock the locking pins (1).
- Ensure that the locking pins (1) audibly engage.



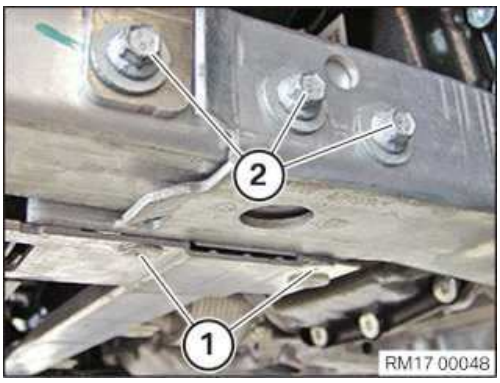
- Tighten the bolts (2) at the front left.

Cross connection to front axle support

M6		Tightening torque	12 Nm

- Renew the blind rivet (1).

  Parts: Blind rivet
- Mount the blind rivets (1) at the front left.



- Tighten the bolts (2) at the front right.

Cross connection to front axle support

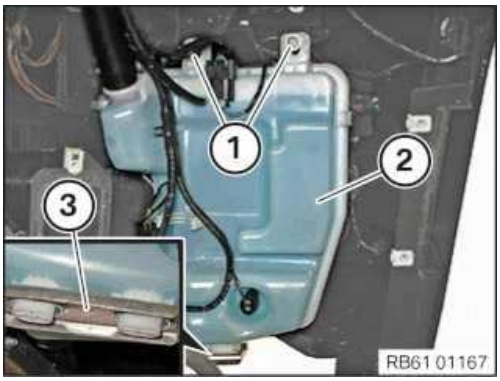
M6		Tightening torque	12 Nm

- Renew the blind rivet (1).

  Parts: Blind rivet
- Mount the blind rivets (1) at the front right.

25 – Install the washer fluid reservoir in the fixture

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- Feed washer fluid reservoir (2) into the mounting (3) and install.
- Tighten the screws (1).

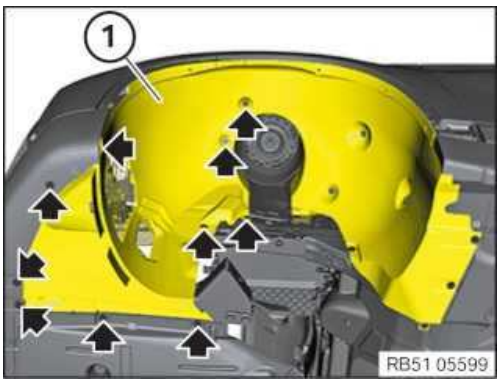
Washer fluid reservoir to body

M6x20		Tightening torque	8 Nm

26 – Partially install the front wheel arch cover

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

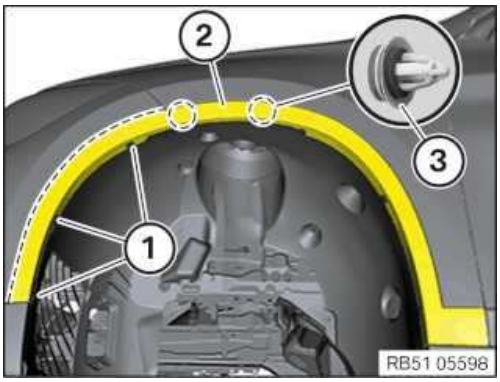
▶ **Partly install the front wheel arch trim**

NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Check the clips (3) for damage and renew where required.

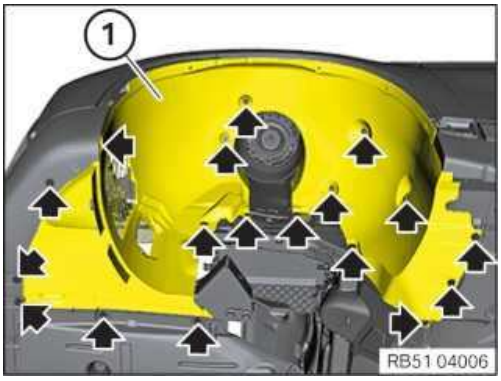
  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

27 – Installing the front right wheel arch cover

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NOTICE

Description is for left component only. Procedure on the right side is identical.



- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

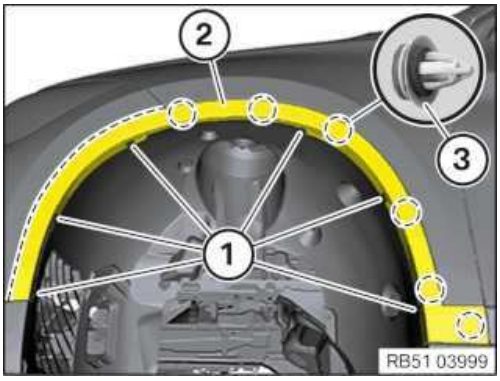
▸ **Installing front wheel arch trim**

NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Check the clips (3) for damage and renew where required.
  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

28 – Installing the front right wheel

▸ **Clean the contact surfaces between the brake disc and the wheel rim**

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TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

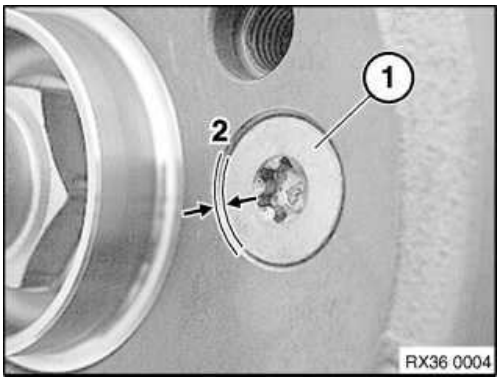
- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.



- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

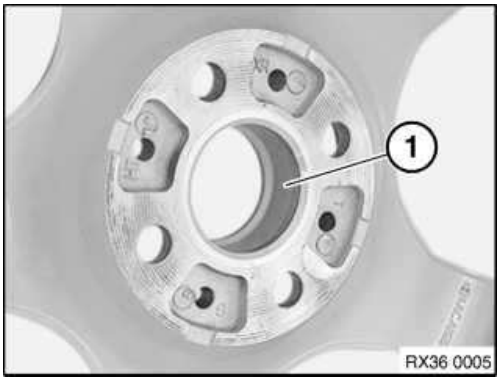


- Check the mounting bolt for the brake disc (1) for secure fit.

  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

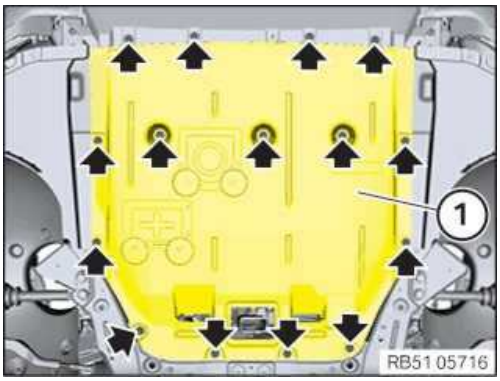
- Renew corroded wheel bolts.

  Parts: Wheel bolts
- Clean the wheel bolts and check the threads for damage. Renew the wheel bolts as needed.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

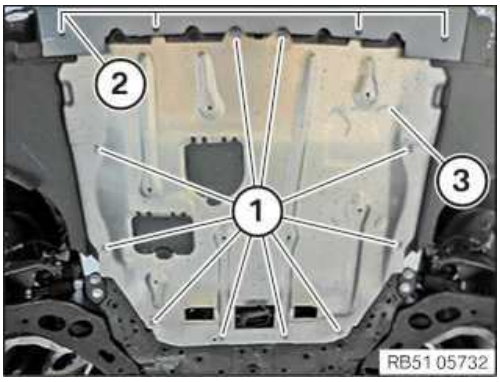
29 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm



- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

30 – Installing guide tube for oil dipstick

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RISK OF DAMAGE

Contaminant or foreign body.

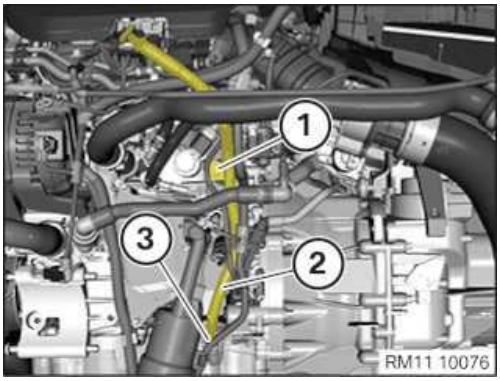
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Renew O-ring (1).

  Parts: O-ring



- Guide in guide tube (2) for oil dipstick and slide it into the oil sump.
- Make sure the sealing ring (3) is positioned correctly in the oil sump.
- Tighten down screw (1).

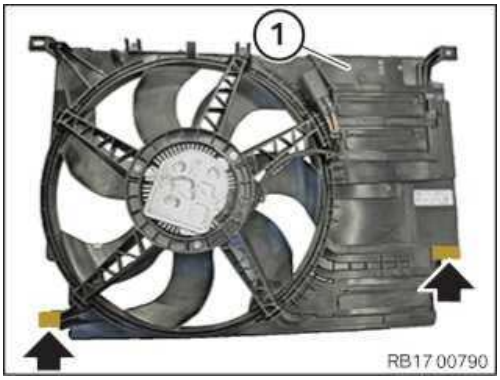
Guide tube for oil dipstick on engine

M8x16		Tightening torque	19 Nm

31 – Installing fan cowl with electric fan

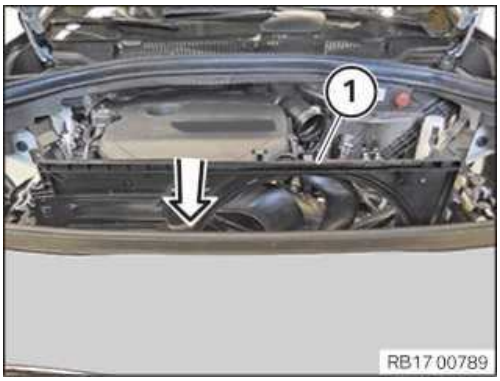
TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Feed the guides (arrows) of the fan cowl (1) into the charge air cooler.

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- Feed in and install the fan cowl (1) in the direction of the arrow.



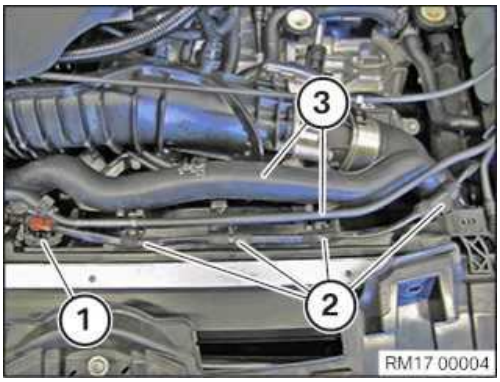
- Lock the left and right locks (arrows).



- Tighten the screws (1).

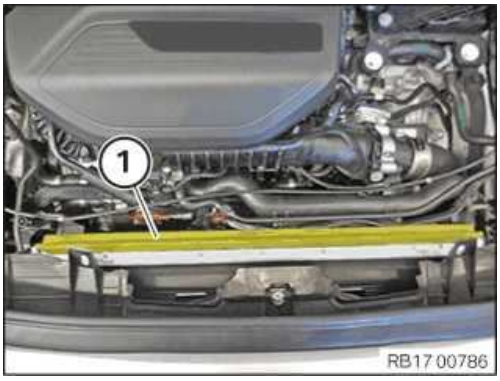
Fan cowl on radiator

M6X12		Tightening torque	6 Nm



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.
- Secure clamps (2).
- Thread in and install coolant line (3).



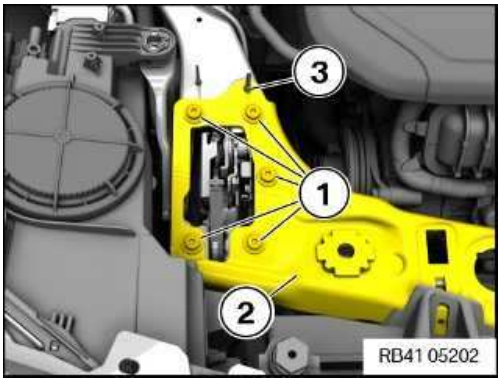
- Guide the sealing (1) on the radiator in and install it.

32 – Install front cross connection

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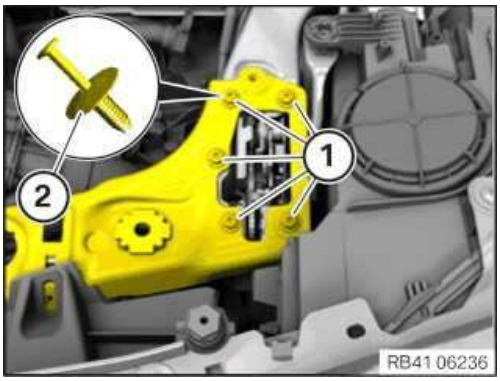
- Right side of vehicle only: Secure spray guard (1) on the cross connection (2) as pictured.



- Position front cross connection (2) and clip front cross connection (2) into the rubber retainer (3) at the same time.
- Tighten the screws (1).

Cross connection to carrier support

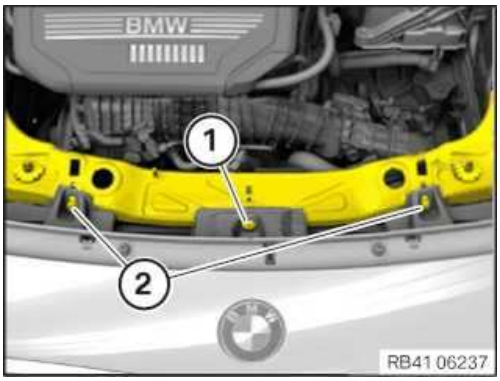
Screws M6x20		Tightening torque	11,8 Nm



- Tighten the screws (1).

Cross connection to carrier support

Screws M6x20		Tightening torque	11,8 Nm



- Position screws (3) on the rubber mounts for the radiator and tighten.

Screw connection for rubber mount of coolant radiator to coolant radiator

Bolt to rubber mount		Tightening torque	8 Nm

- Tighten down screws (2).

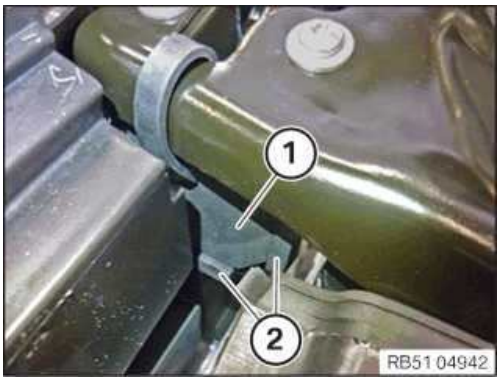
Air duct to upper connection

M6x20 screw		Tightening torque	11,8 Nm

- Tighten down screw (1).

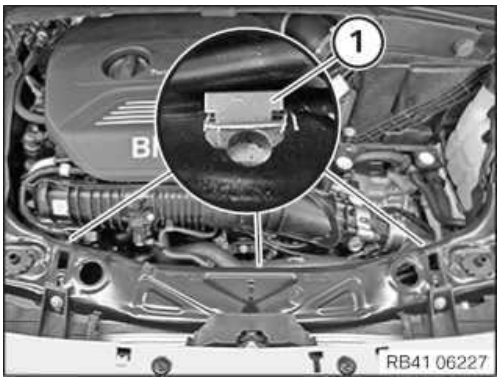
Bracing strut to upper connection

M8x20 screw		Tightening torque	28 Nm



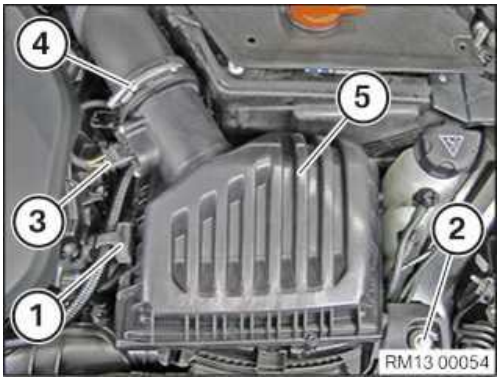
- Right side of vehicle only: Properly mount spray guard (1) to prevent corrosion.
- Secure spray guard (1) to the bridge with retaining tabs (2).

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- Fasten the clamps (1) from the Bowden cable of the bonnet lock on the cross connection.

33 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.

  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

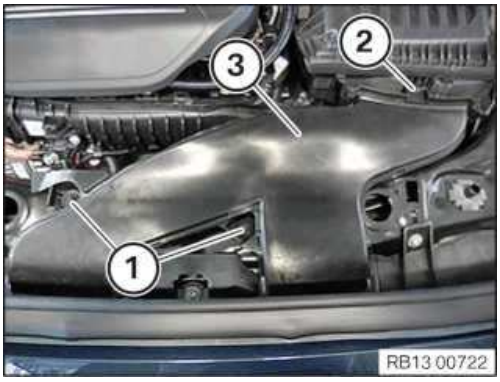
Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Insert and install the holder (1).

34 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

35 – Disconnecting all battery earth leads



- See additional information.

36 – Topping up the engine oil

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RISK OF DAMAGE

Damage to the petrol particulate filter.

Vehicles equipped with a petrol particulate filter must be operated with low-ash engine oil only.

- Use BMW Longlife-04 , BMW Longlife-12 FE or BMW Longlife-17 FE+ engine oils or engine oils approved by BMW matching the same specifications only.
- For additional information see: Overview of approved engine oils for BMW Group engines.

RISK OF DAMAGE

Engine damage caused by excessively filling the engine with engine oil.

Filling an excessive quantity of engine oil may cause engine damage.

- Observe the exact engine oil filling capacity.
- Drain the engine oil.

- Pour in engine oil.

Engine oilB47TÜ1

Capacity of engine oil	5,5 l

Engine oil: Technically suitable engine oils for BMW Group engines

37 – Installing the oil filler cap



- Close oil filler cap (1).

38 – Check engine oil level

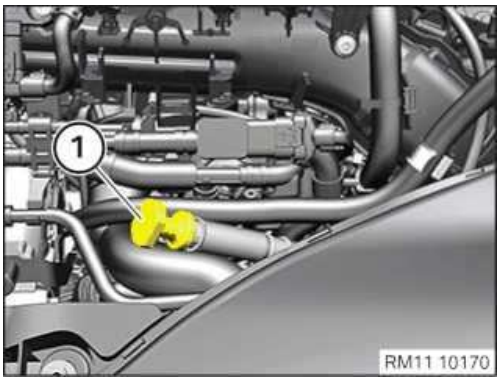
- Park vehicle on a horizontal surface.
- In the case of automatic transmission, shift to selector lever position N or P.
- Accelerator pedal is not pressed.
- Engine is running and is at operating temperature.
- Read off the engine oil level in the instrument cluster (KOMBI) or on the control display.
- Top up engine oil if necessary.

▶ **Check engine oil level**

TECHNICAL INFORMATION

Always check the engine oil level when the engine is at operating temperature (engine oil temperature > 70°C).

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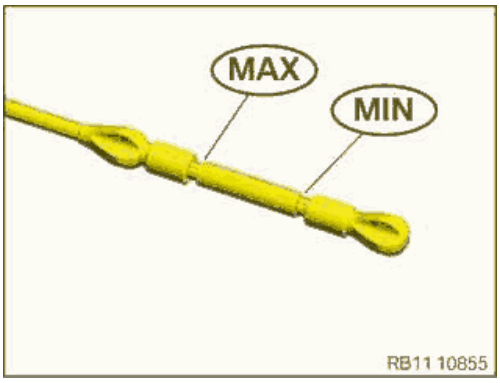


- Park vehicle on a horizontal surface.
- Stop the engine and wait for 5 minutes.
- Pull out the oil dipstick (1) and wipe off using a lint-free cloth.

TECHNICAL INFORMATION

Do not pull out or insert the oil dipstick into the guide tube too quickly or slowly.

- Push the oil dipstick (1) into the guide tube up to the limit position and pull it out again.



TECHNICAL INFORMATION

The engine oil level must be between the minimum mark and the maximum mark of the oil dipstick.

- Read the engine oil level on the oil dipstick.
- Top up engine oil if necessary.

39 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Check for correct installation of all rubber mounts in the acoustic cover (1).

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- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

Additional Information

Overview of Tightening Torques

Oil drain plug on oil sump — Used in step 14

M12x1.5	Renew the sealing ring.	Tightening torque	25 Nm

Oil level sensor to oil sump — Used in step 20

M6		Jointing torque	2 Nm
		Tightening torque	8 Nm

Oil sump to crankcase — Used in step 21

M8x30		Tightening torque	24 Nm
M8x110		Tightening torque	24 Nm

Transmission to oil sump — Used in step 21

M8		Tightening torque	19 Nm

Starter motor to transmission — Used in step 21

M8x45		Tightening torque	19 Nm

Bracket to oil sump — Used in step 22

M6		Tightening torque	8 Nm

Battery positive lead to starter — Used in step 22

M8		Tightening torque	13,5 Nm

Holder to front axle support — Used in step 23

M12		Tightening torque	100 Nm

Bracket to oil sump — Used in step 23

M12		Tightening torque	100 Nm

Charge air duct to oil sump — Used in step 24

M6		Tightening torque	8 Nm

Ride height sensor holder to front axle support — Used in step 24

M6		Tightening torque	8 Nm

Adapter, front axle support to front axle support — Used in step 24

		Tightening torque	100 Nm

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Cross connection to front axle support

Used in step 24

M6		Tightening torque	12 Nm

Washer fluid reservoir to body

Used in step 25

M6x20		Tightening torque	8 Nm

Wheel arch cover to body

Used in step 26 27

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Used in step 26 27

Plastic nut		Tightening torque	3 Nm

Brake disc to front wheel hub

Used in step 28

M8	Renew screw.		16 Nm

Wheel bolts

Used in step 28

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Underbody protection front

Used in step 29

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Guide tube for oil dipstick on engine

Used in step 30

M8x16		Tightening torque	19 Nm

Fan cowl on radiator

Used in step 31

M6X12		Tightening torque	6 Nm

Cross connection to carrier support

Used in step 32

Screws M6x20		Tightening torque	11,8 Nm

Screw connection for rubber mount of coolant radiator to coolant radiator

Used in step 32

Bolt to rubber mount		Tightening torque	8 Nm

Air duct to upper connection

Used in step 32

M6x20 screw		Tightening torque	11,8 Nm

Bracing strut to upper connection

Used in step 32

M8x20 screw		Tightening torque	28 Nm

Intake silencer housing to lock bridge

Used in step 33

M6X30		Tightening torque	8 Nm

Clean air pipe to intake silencer housing

Used in step 33

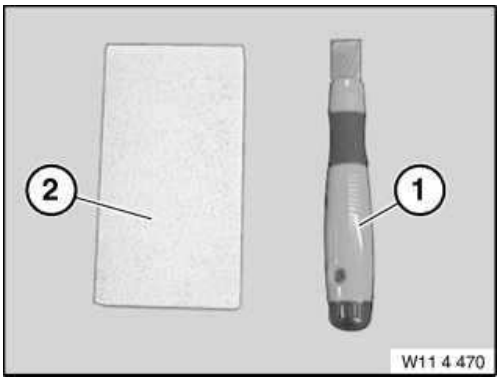
Clamp		Tightening torque	3 Nm

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Intake neck to cross connection			Used in step 34
M6		Tightening torque	8 Nm

Overview of Special Tools

0 495 102 (11 4 470) Tool

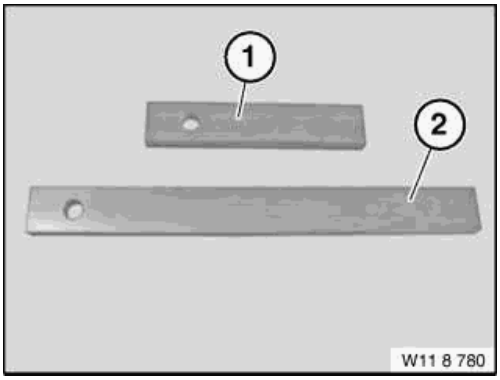


Common	Used in step 21
Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

0 496 120 (11 8 780) Plate



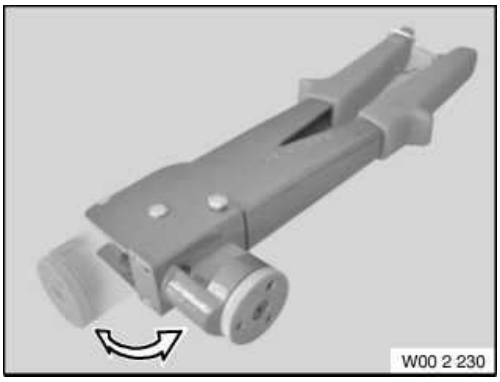
Common	Used in step 21
Usage	(Mounting plates) For securing transmission oil sump when gearbox is removed.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 121 (11 8 781)		**Plate** (Mounting plate, short)Discontinued; only available via set 11 8 780 = 0496120.	
2	0 496 122 (11 8 782)		**Plate** (Mounting plate, long) Discontinued; only available via set 11 8 780 = 0496120.	

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0 496 521 (00 2 230) Pliers



Common	Used in step 26 27
Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

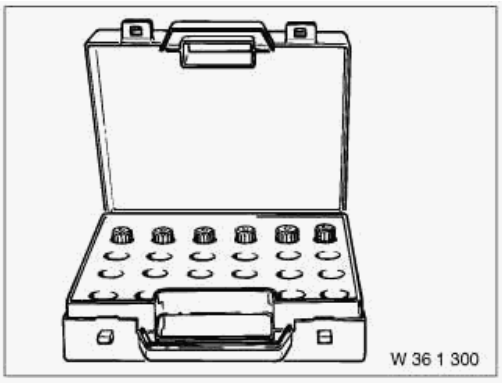
2 344 011 Tool



Common	Used in step 28
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

0 495 221 (36 1 323) Wheel stud



Common	Used in step 9
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud



Common	Used in step 9
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

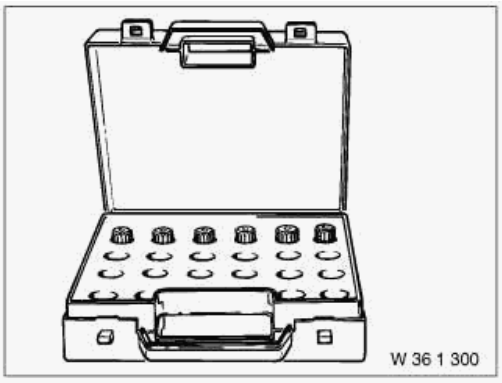
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0 495 225 (36 1 327) Wheel stud



Common	Used in step 9
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud



Common	Used in step 9
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud



Common	Used in step 9
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 228 (36 1 331) Wheel stud



Common Used in step 9

Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 229 (36 1 332) Wheel stud



Common Used in step 9

Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud



Common Used in step 9

Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Engine oilB47TÜ1 Used in step 36

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Capacity of engine oil	5,5 l
Engine oil: Technically suitable engine oils for BMW Group engines	

Links

Functional descriptions	Used in step
Oil supply	30

General repair instructions	Used in step
11 00 ... Overview of consumables (Electronic Parts Catalogue)	21

Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	1 35
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61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 35
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61 20 900 Disconnecting and connecting battery earth lead	1 35
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 35
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	1 35
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61 20 900 Disconnecting and connecting battery earth lead	1 35

Operating materials	Used in step
2.0 Grease for wheel centring	28
3.0 Technically appropriate engine oils for BMW Group engines	36

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Parts

Parts required

Designation	Used in step
Seal, guide tube for oil dipstick on oil sump	30

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11 13 000 Removing and installing, sealing or replacing oil sump (B47)

Special tools required:

- 11 4 472
- 11 4 471
- 11 8 780

Necessary preliminary tasks:

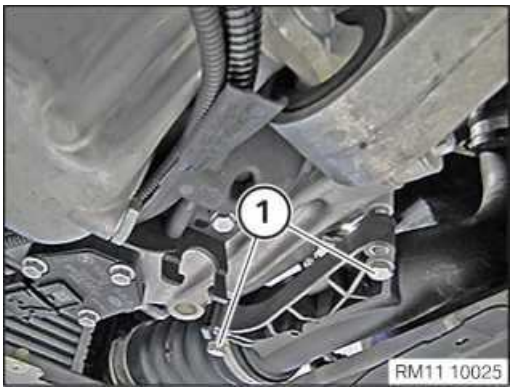
- Remove underbody protection
- Remove oil dipstick guide tube.
- Drain engine oil.
- Remove starter motor.
- Bracket remove.

Important!

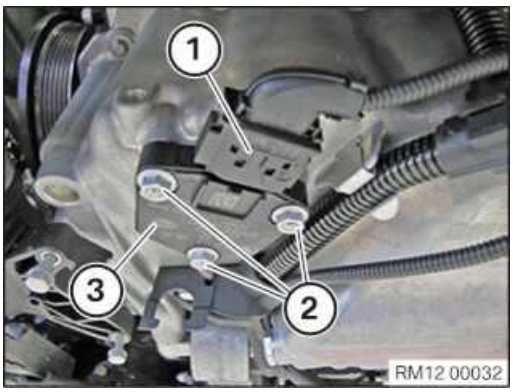
Engines with surface sealant:

Application time of sealing bead max. 12 minutes.

Removal:

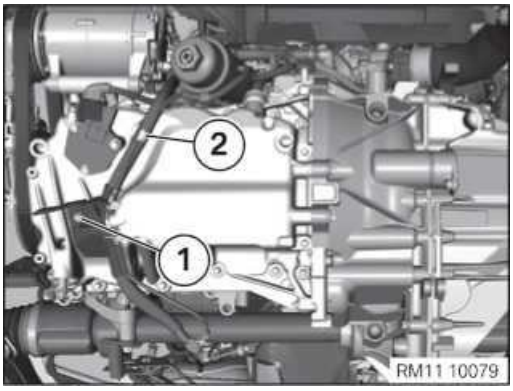


Release screws (1) from pressure pipe.



Unlock connector (1) and remove.

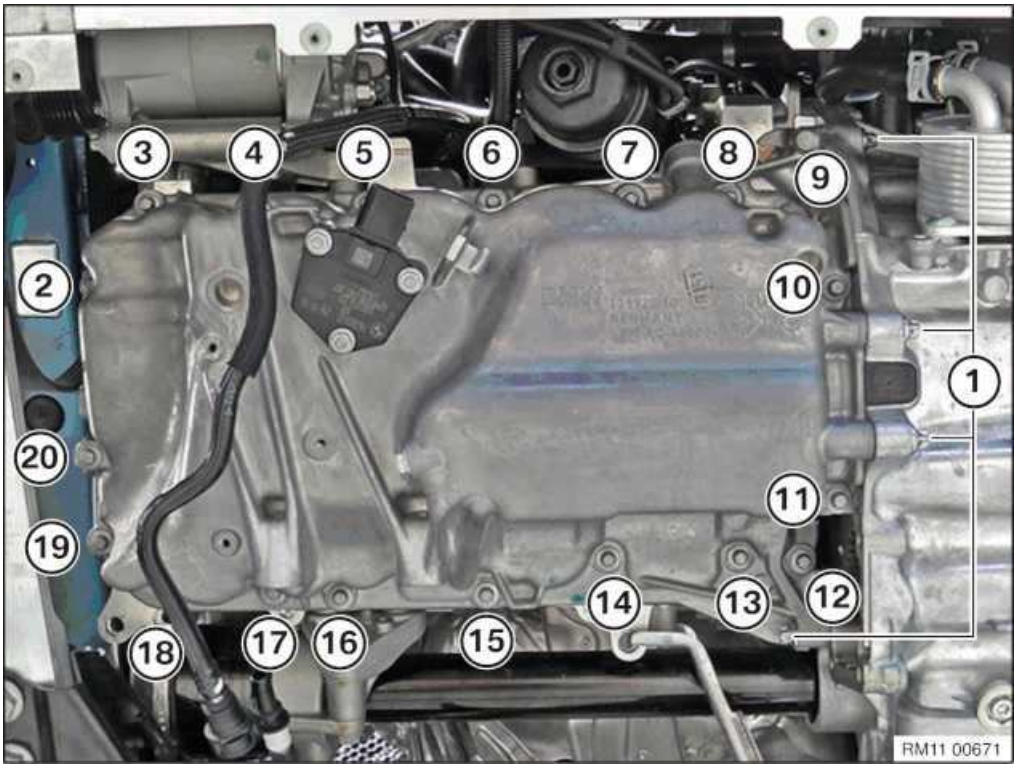
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Release screw (1).

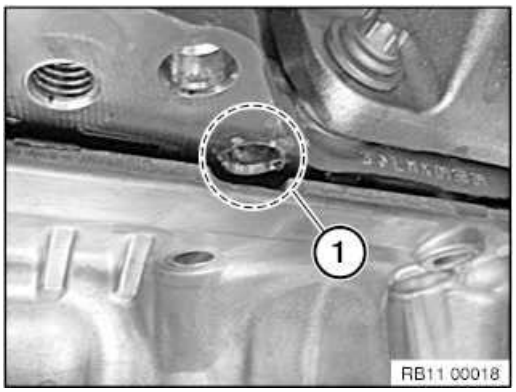
Release positive wire from clip (2).

Place wiring harness to one side.



Release screws (1) from transmission.

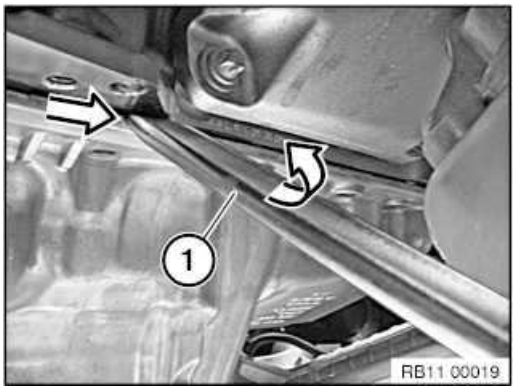
Release screws (2-20).



Engine with liquid gasket: Important!

The oil sump can only be loosened in the areas (1) where an aperture is present in the oil sump.

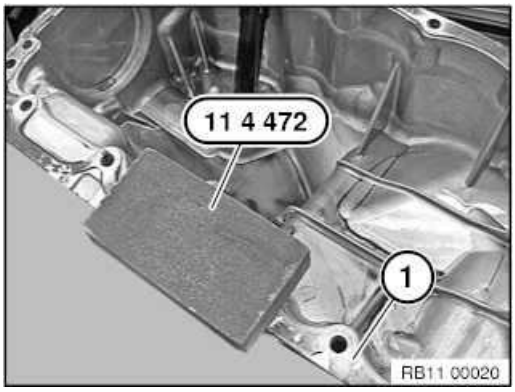
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Use a mounting lever (1) to release oil sump in direction of arrow at the correct location.

Preparation for installation:

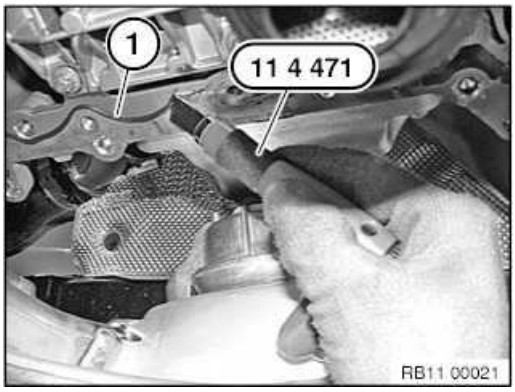
Clean sealing residues from oil sump and crankcase.



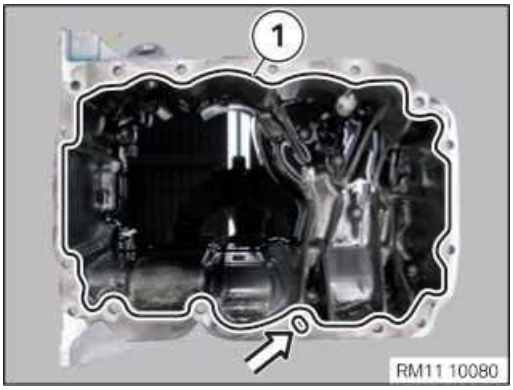
Important!

Do not use any metal-cutting tools (e.g. emery cloth).

Clean sealing surface (1) with special tool 11 4 472 .*Installation note:* Sealing surfaces must be free of oil, grease and cleaning agents.



Clean sealing surface (1) with special tool 11 4 471 .*Installation note:* Sealing surfaces must be free of oil, grease and cleaning agents.



Applying sealing compound without replacing front bottom gear case cover:

Apply the sealing compound 2.2 in area (1).

Make sure that the sealing bead runs along the inner edge.

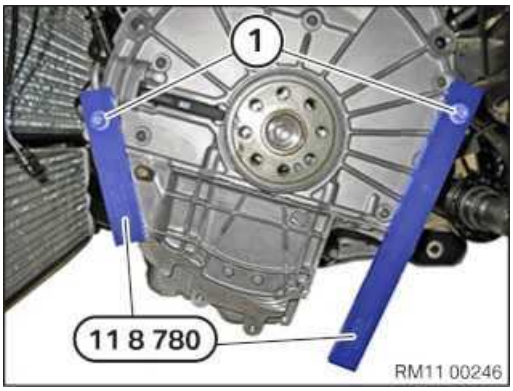
The oil return duct must be completely encircled.

Installation note:
The oil sump must be installed approximately 10 minutes after application of the sealing compound.

Sealant height approximately 2 to 2.5 mm.

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Installation:

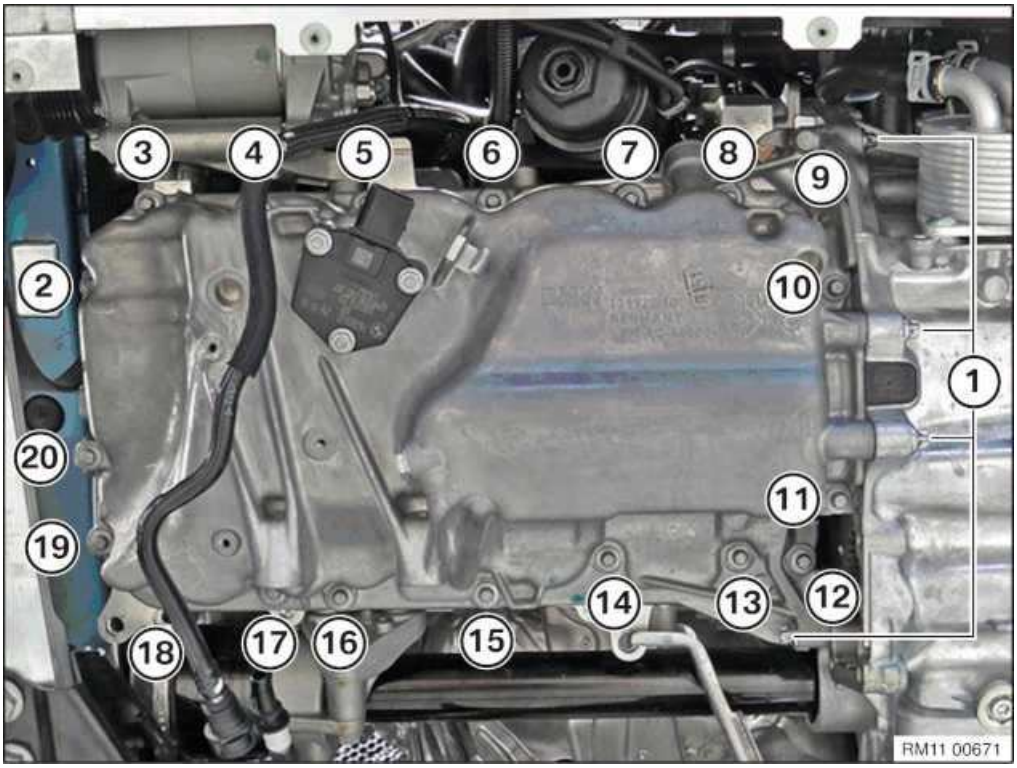


Installation note:
Special tool 11 8 780 is only necessary if the engine or the transmission is removed.

Position special tool 11 8 780 with transmission bolts (1) so that engine oil sump is exactly flush with engine block.

If necessary, replace fitting sleeves.

Attaching the oil sump.



Installation note:
Tighten all screws (2-20) on oil sump to 5 Nm.

Join Torx screws (1) to 5 Nm.

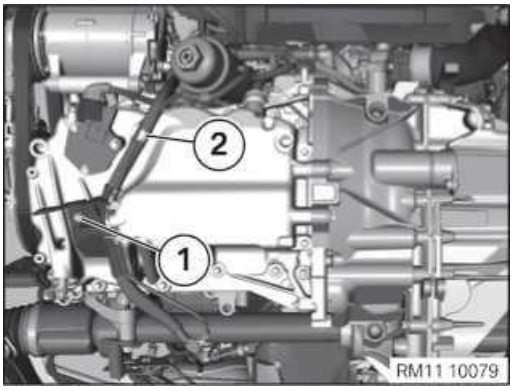
Tighten down all screws on oil sump.

Tightening torque: 11 13 2AZ.

Tighten down Torx screws (1).

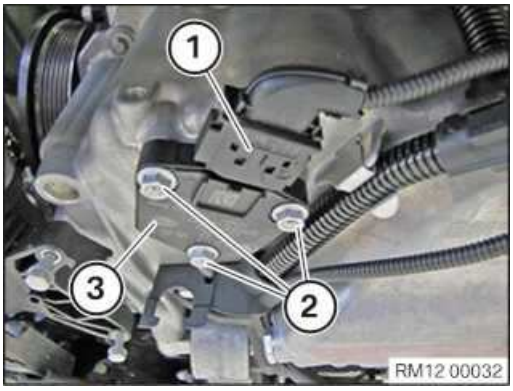
Tightening torque: 11 13 3AZ.

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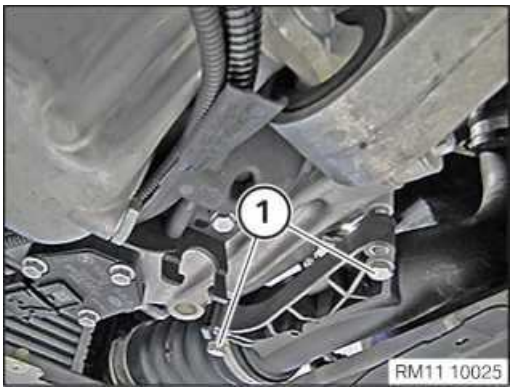


Tighten screw (1).

Clip in positive wire in clip (2).



Attach connector (1).



Tighten screws (1) of pressure pipe.

Required follow-up work:

- Install holder.
- Install starter.
- Install guide tube for oil dipstick.
- Top up engine oil.
- Install underbody protection.

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11 14 295 Remove and install / replace the acoustic cover for the oil sump

PRELIMINARY WORK

1 – Disconnecting all battery earth leads



- See additional information.

2 – Remove front right wheel

TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

TECHNICAL INFORMATION

Strictly observe the specified procedure to prevent clamping errors and imbalance.



- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

3 – Removing the front right wheel arch cover

▸ **Remove the front wheel arch trim**

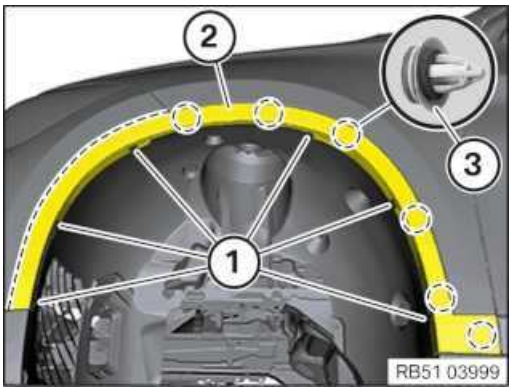
NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

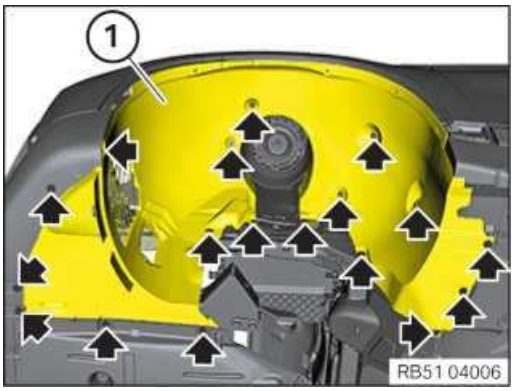
NOTICE

Description is for left component only. Procedure on the right side is identical.

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- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.



NOTICE

Description is for left component only. Procedure on the right side is identical.

- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

4 – Partially remove the front wheel arch cover

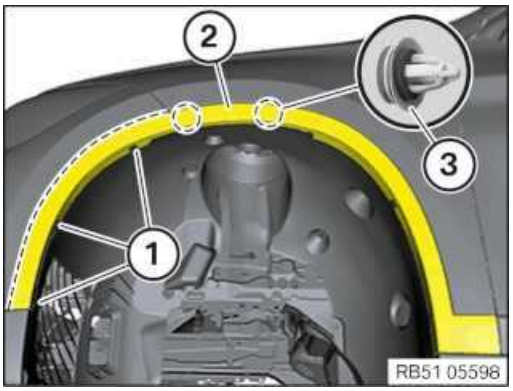
▶ **Partially removing the front wheel arch trim**

NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

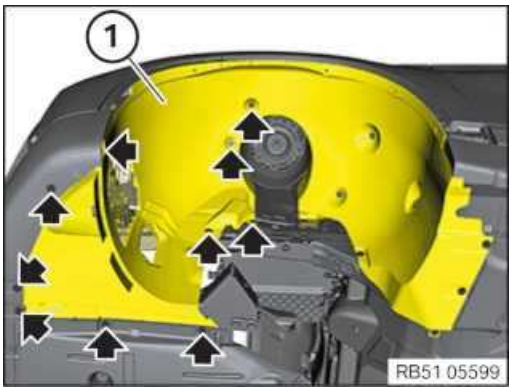
NOTICE

Description is for left component only. Procedure on the right side is identical.



- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.

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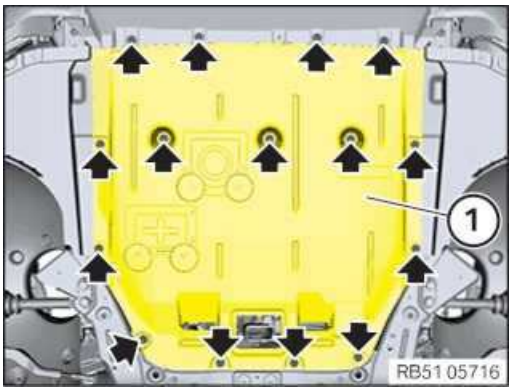


NOTICE

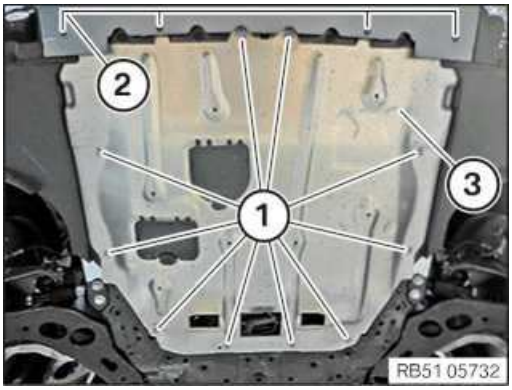
Description is for left component only. Procedure on the right side is identical.

- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (2) out.

5 – Removing the front underbody protection

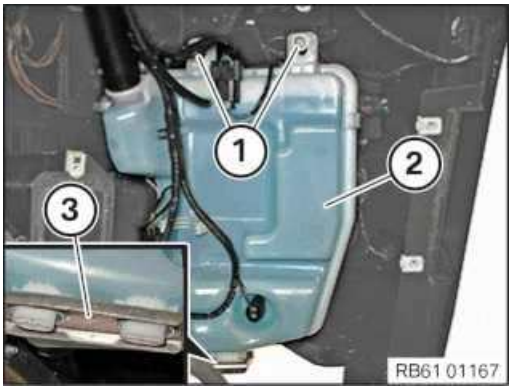


- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.



- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

6 – Remove the washer fluid reservoir from the fixture



- Loosen screws (1).
- Guide the washer fluid reservoir (2) up and out of the fixture (3) and set it aside.

7 – Removing the right charge air duct between the exhaust turbocharger and the charge air cooler

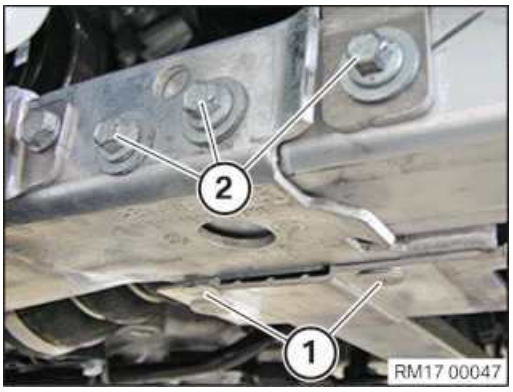
WARNING

Hot surfaces.

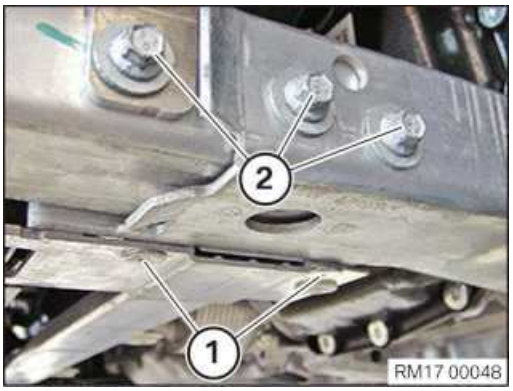
Risk of burning!

- Perform all work only on components that have cooled down.

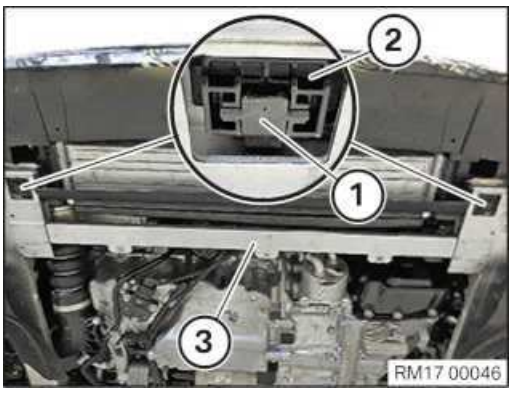
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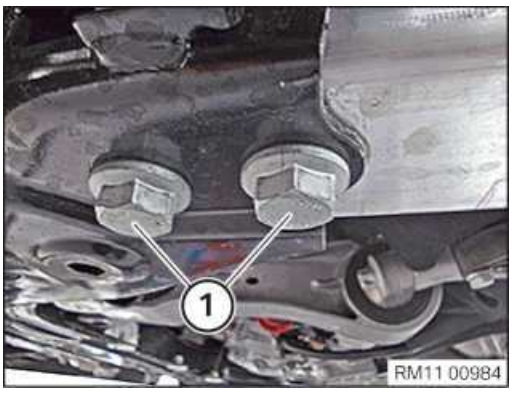
- Undo screws (2) at front left.
- Drill out blind rivets (1) at front left.



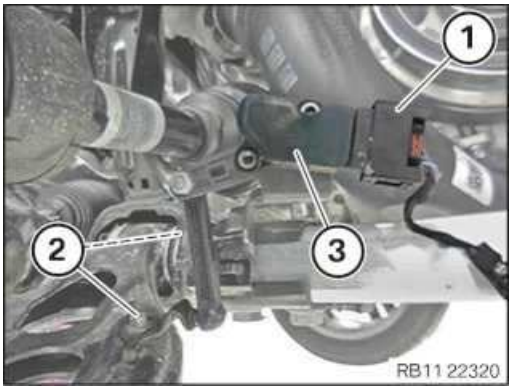
- Undo screws (2) at front right.
- Drill out blind rivets (1) at front right.



- Unlock locking pins (1).
- Thread out and remove locks (2).
- Thread out and remove cross connection (3).

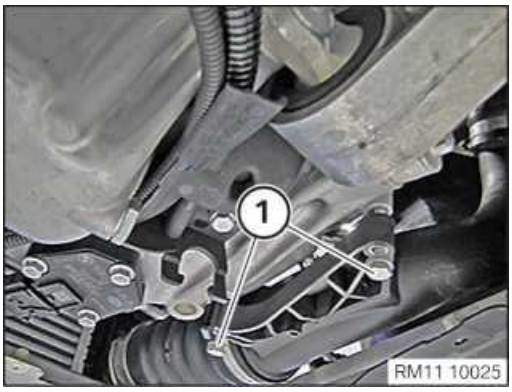


- Release the screws (1) on the right front axle support.

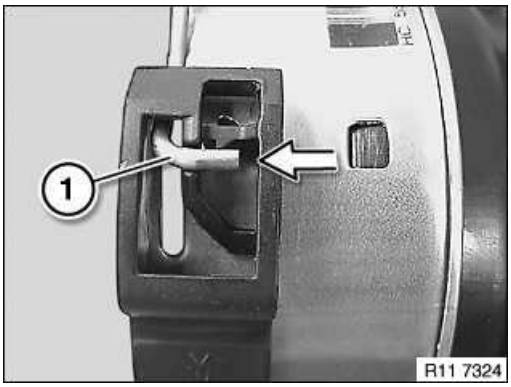


- **If installed:**
- Unlock and release plug connection (1).
- Loosen screws (2).
- Feed out the ride height sensor (3) and remove.

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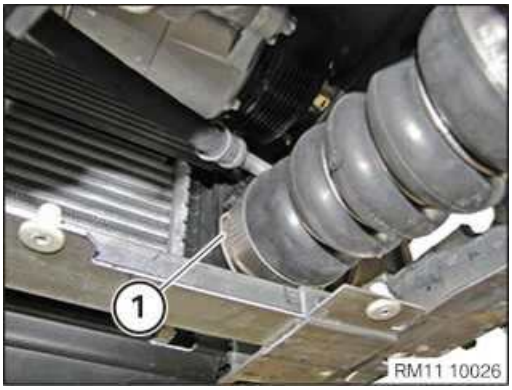


- Release screws (1) of charge air duct on right oil sump.

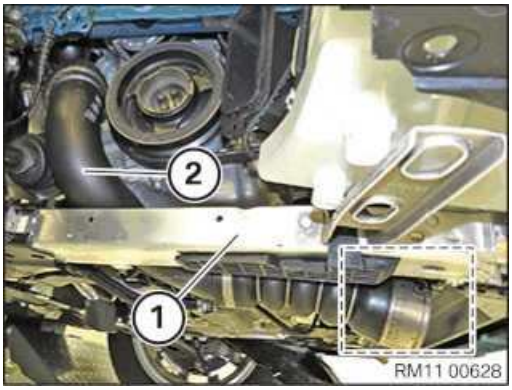


- Unlock lock (1).

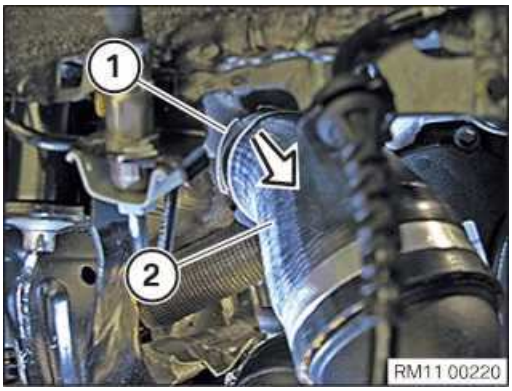
  The lock (1) must engage in the bracket during unlocking (arrow).



- Unlock and release the charge air duct (1) on the charge air cooler.

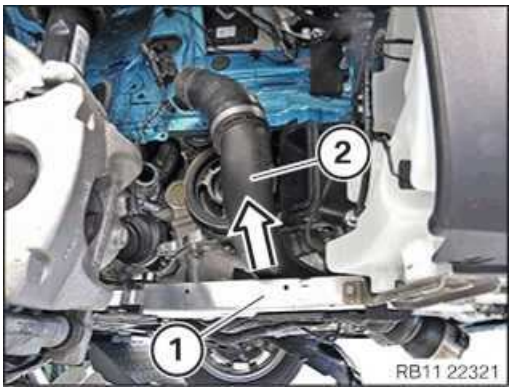


- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed out the charge air duct (2) in the **marked** area towards the bottom and set it aside.



- Unlock and detach the locks (1) on both sides.
- Feed out the charge air duct (2) on the exhaust turbocharger in the direction of the arrow and set it aside.

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- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed out the charge air duct (1) in the direction of arrow between the side member and the deformation element and remove.

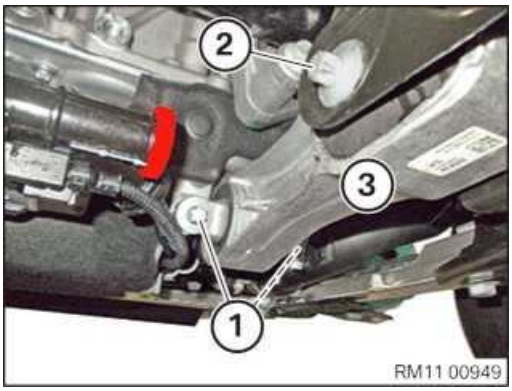
8 – Remove bracket with rubber mount

WARNING

Motor vehicle may slip off the vehicle hoist where components are supported.

Danger! Life-threatening injuries!

- Secure the vehicle hoist against lowering and lifting.



- Support the engine with the jack at a suitable point.
- Loosen screws (1) and (2).
- Guide out and remove holder (3).

MAIN WORK

9 – Removing the acoustic cover of the oil sump

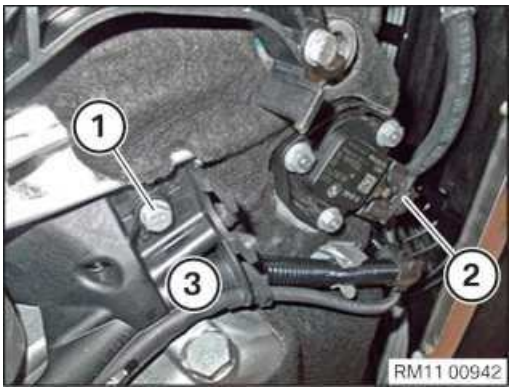


- Unlock connector (1) and pull off.
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).

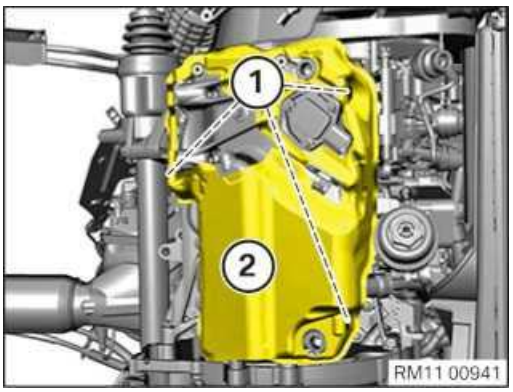
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- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.

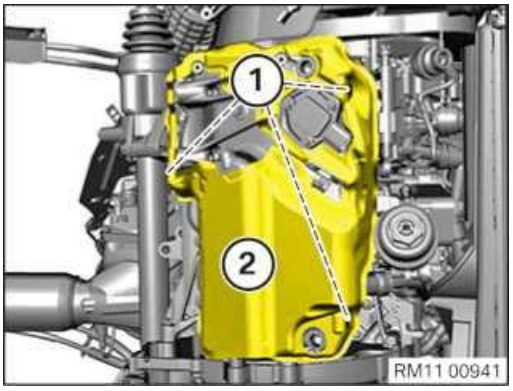


- Unscrew the screw (1) on the wiring harness to the oil sump.
- Unlock and pull off connector (2) on the oil-level sensor.
- Place wiring harness (3) to one side.

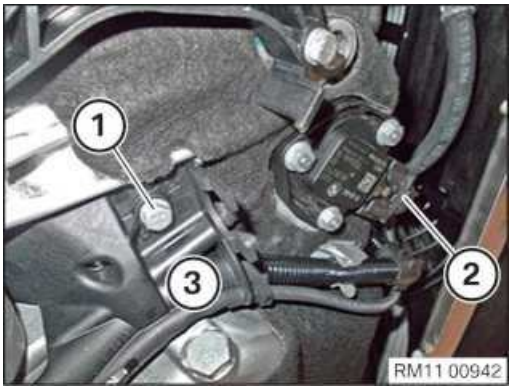


- Remove the expanding rivets (1) on both sides of the acoustic cover.
- Feed out and remove the acoustic cover (2).

10 – Installing the acoustic cover for the oil sump



- Thread in and position the acoustic cover (2).
- Install the expanding rivet (1).



- Position wiring harness (3).
- Tighten down screw (1).

Bracket to oil sump

M6		Tightening torque	8 Nm

- Connect and lock the connector (2) on the oil-level sensor.

  The connector must lock audibly.

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CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

Battery positive lead to starter

M8		Tightening torque	13,5 Nm

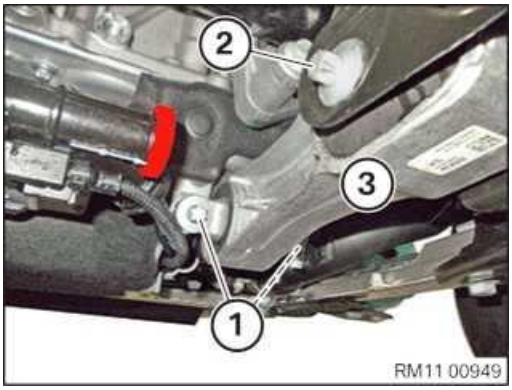


- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).

  The connector must engage audibly.

POSTPROCESSES

11 – Install the holder with the rubber mount



- Insert and install the holder (3).
- Tighten the screws (1) and (2) hand-tight.
- Release jack.
- Tighten down screw (2).

Holder to front axle support

M12		Tightening torque	100 Nm

- Tighten the screws (1).

Bracket to oil sump

M12		Tightening torque	100 Nm

12 – Installing the right charge air duct between the exhaust turbocharger and the charge air cooler

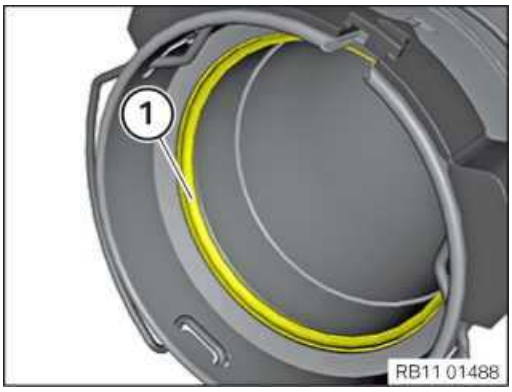
RISK OF DAMAGE

Damage to the exhaust turbocharger.

A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.

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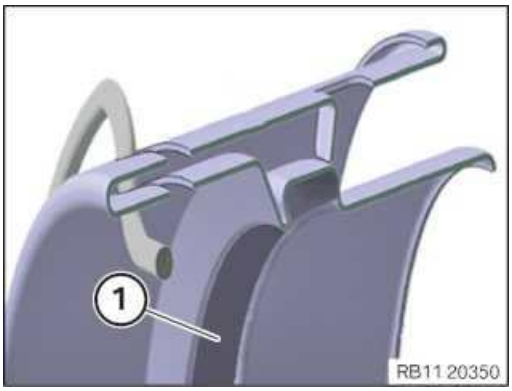
- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Gasket

▶ **Replace damaged gasket**

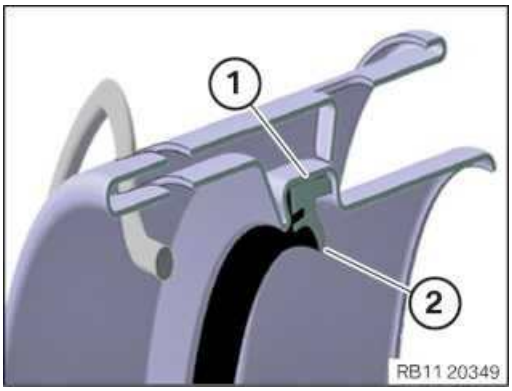
TECHNICAL INFORMATION

Do not use pointed or sharp-edged tools for the installation and/or removal.



- Remove damaged seal.
- Clean gasket groove (1) with a dry towel.

  The gasket groove (1) must be clean.



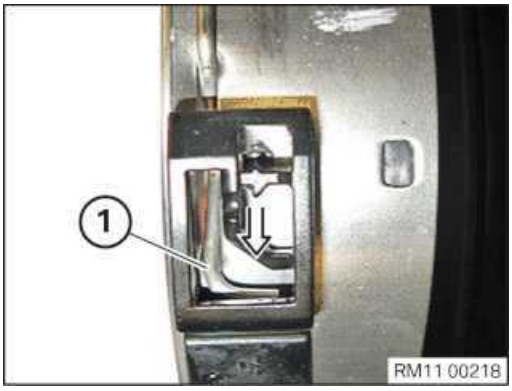
- Renew gasket.

  Parts: Gasket
- Install seal dry without lubricant or mounting agent.

TECHNICAL INFORMATION

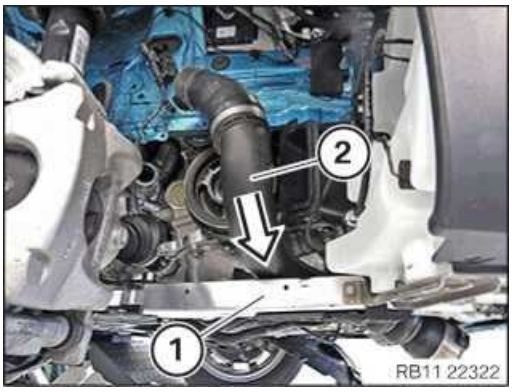
Incorrect assembly is possible. Ensure correct installation position.

- Feed in and install the seal.
- Make sure the seal is correctly installed in the gasket groove (1).
- Make sure that the sealing lip (2) is pointing downwards (see figure).

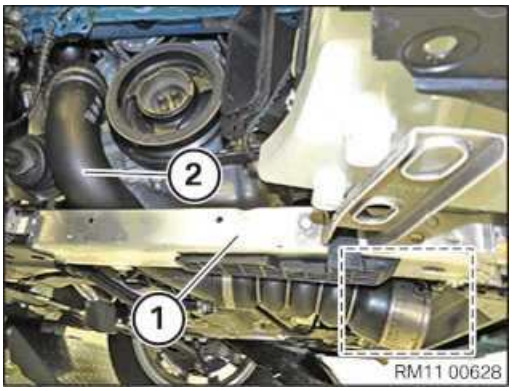


- Detach the locks (1) in the direction of the arrow from the brackets.
- Ensure that the locks (1) engage audibly.

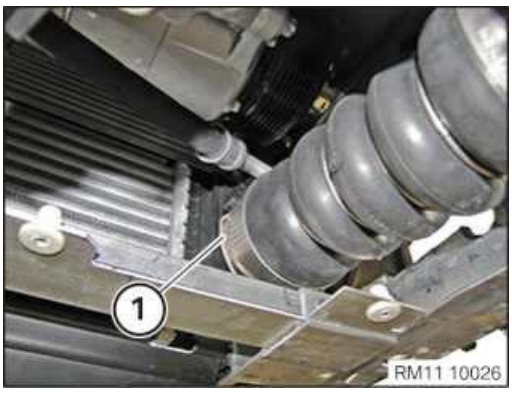
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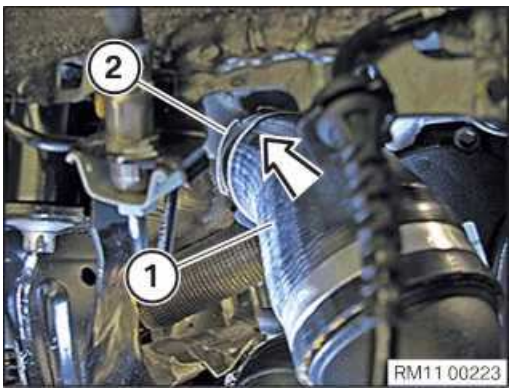
- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed in the charge air duct (1) in the **direction** of arrow between the side member and the deformation element and position.



- Pull the adapter of the front axle support (1) downwards to the front right.
- Position the charge air duct (2) in **marked** area on the charge air cooler.

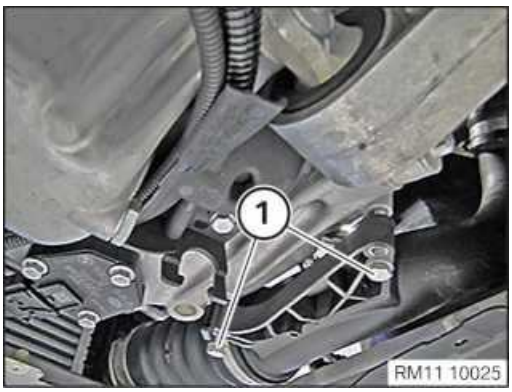


- Feed in and install the charge air duct (1) on the charge air cooler .
- Make sure the charge air duct (1) engages audibly on the charge air cooler.



- Feed in and install charge air duct (1) in the **direction** of the arrow on exhaust turbocharger.

  The locks (2) must engage audibly.

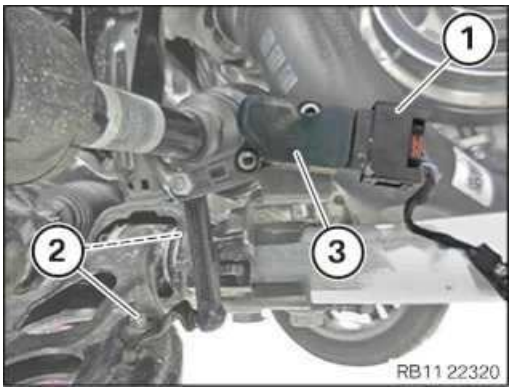


- Tighten the screws (1).

Charge air duct to oil sump

M6		Tightening torque	8 Nm

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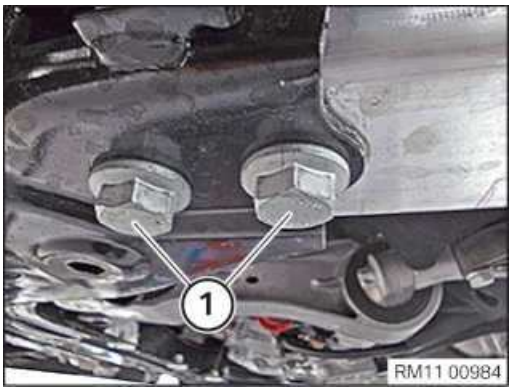
- **If installed:**
- Feed in and install the ride height sensor (3).
- Tighten the screws (2).

Ride height sensor holder to front axle support

M6		Tightening torque	8 Nm

- Connect and lock the connector (1).

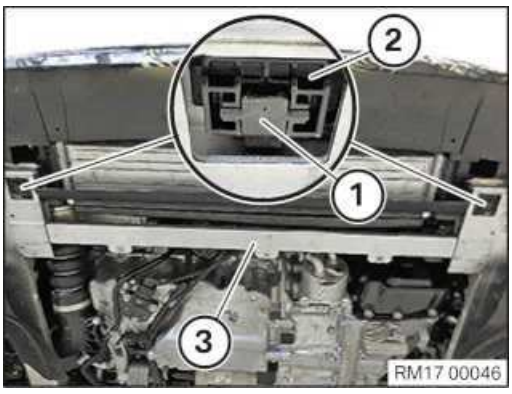
  The connector (1) must engage audibly.



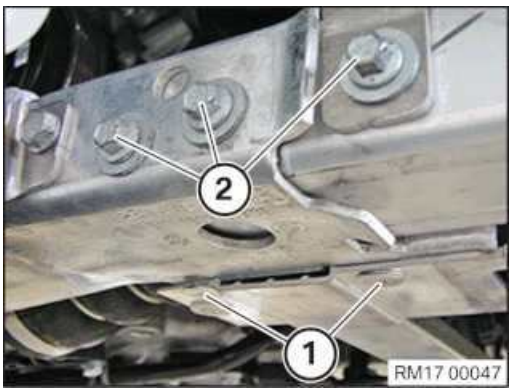
- Tighten the screws (1) on the adapter of the front axle support.

Adapter, front axle support to front axle support

		Tightening torque	100 Nm



- Guide in cross connection (3) and install.
- Guide in locks (2) and install.
- Lock the locking pins (1).
- Ensure that the locking pins (1) audibly engage.



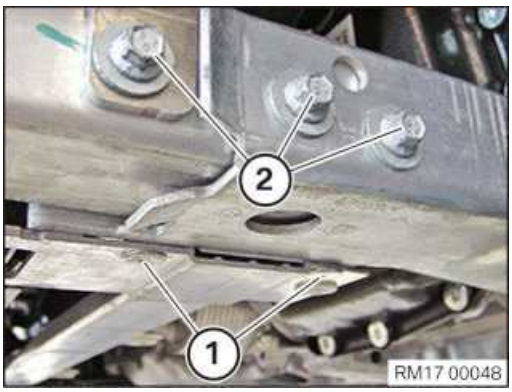
- Tighten the bolts (2) at the front left.

Cross connection to front axle support

M6		Tightening torque	12 Nm

- Renew the blind rivet (1).

  Parts: Blind rivet
- Mount the blind rivets (1) at the front left.



- Tighten the bolts (2) at the front right.

Cross connection to front axle support

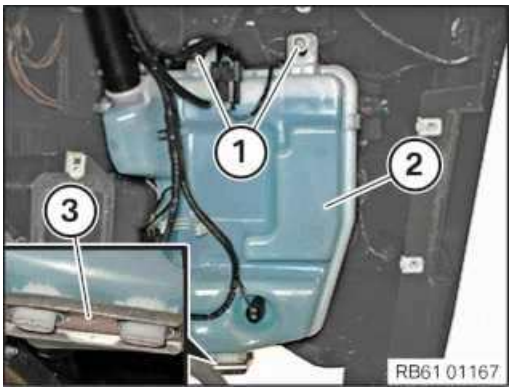
M6		Tightening torque	12 Nm

- Renew the blind rivet (1).

  Parts: Blind rivet
- Mount the blind rivets (1) at the front right.

13 – Install the washer fluid reservoir in the fixture

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- Feed washer fluid reservoir (2) into the mounting (3) and install.
- Tighten the screws (1).

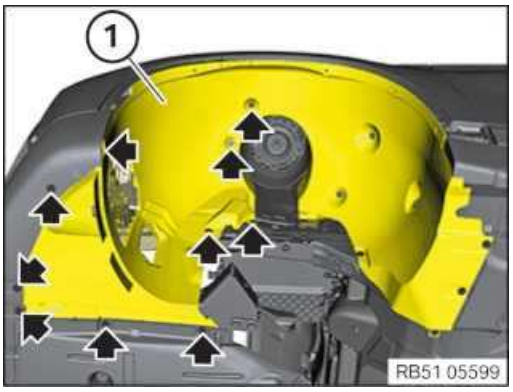
Washer fluid reservoir to body

M6x20		Tightening torque	8 Nm

14 – Partially install the front wheel arch cover

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

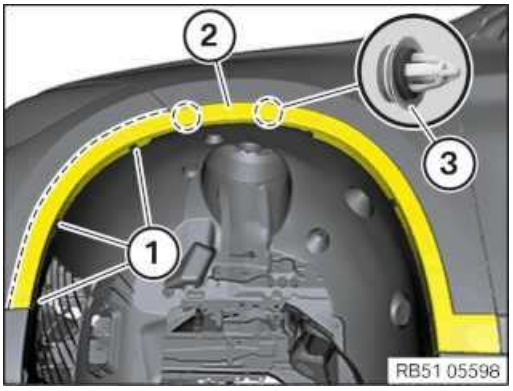
▸ **Partly install the front wheel arch trim**

NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Check the clips (3) for damage and renew where required.

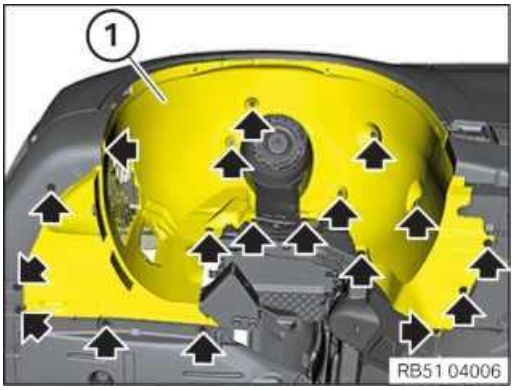
  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

15 – Installing the front right wheel arch cover

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NOTICE

Description is for left component only. Procedure on the right side is identical.



- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

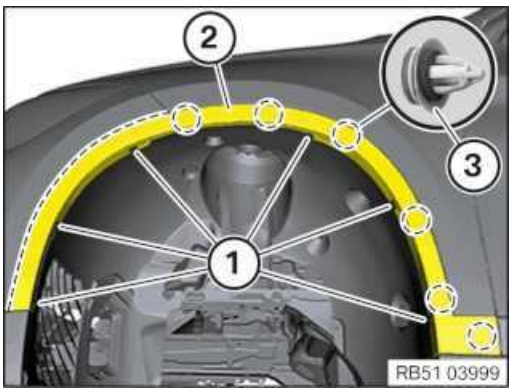
▸ **Installing front wheel arch trim**

NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Check the clips (3) for damage and renew where required.

  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

16 – Installing the front right wheel

▸ **Clean the contact surfaces between the brake disc and the wheel rim**

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TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

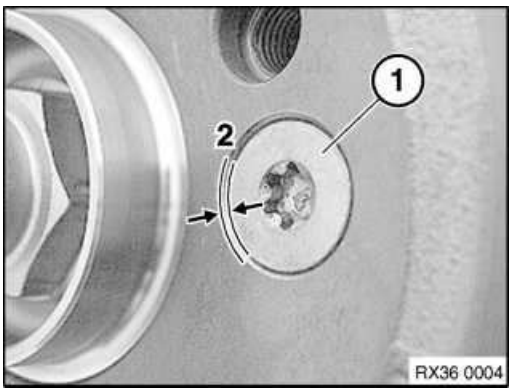
- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.



- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

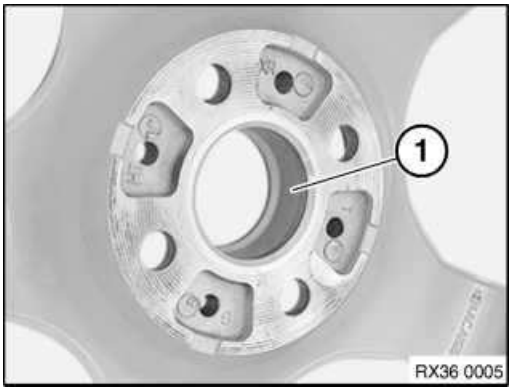


- Check the mounting bolt for the brake disc (1) for secure fit.

  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

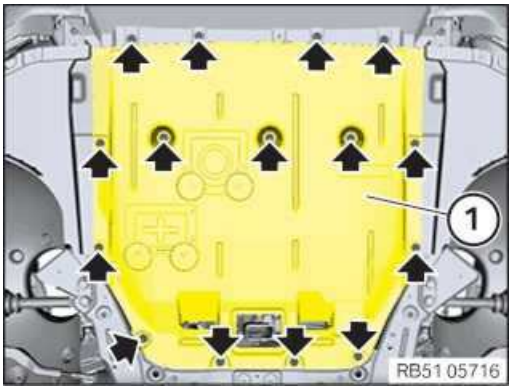
  Parts: Wheel bolts
- Clean the wheel bolts and check the threads for damage. Renew the wheel bolts as needed.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

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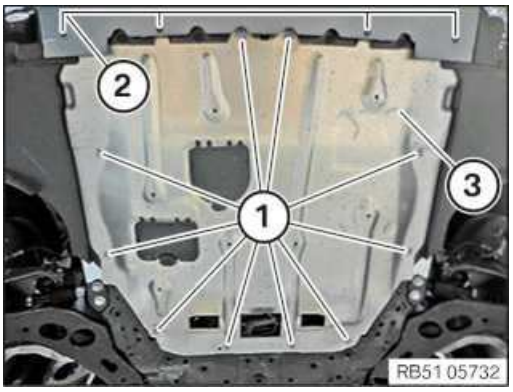
17 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm



- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

18 – Disconnecting all battery earth leads



- See additional information.

Additional Information

Overview of Tightening Torques

Bracket to oil sump Used in step 10

M6		Tightening torque	8 Nm

Battery positive lead to starter Used in step 10

M8		Tightening torque	13,5 Nm

Holder to front axle support Used in step 11

M12		Tightening torque	100 Nm

Bracket to oil sump Used in step 11

M12		Tightening torque	100 Nm

Charge air duct to oil sump Used in step 12

M6		Tightening torque	8 Nm

Ride height sensor holder to front axle support Used in step 12

M6		Tightening torque	8 Nm

Adapter, front axle support to front axle support Used in step 12

		Tightening torque	100 Nm

Cross connection to front axle support Used in step 12

M6		Tightening torque	12 Nm

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Washer fluid reservoir to body — Used in step 13

M6x20		Tightening torque	8 Nm

Wheel arch cover to body — Used in step 14 15

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body — Used in step 14 15

Plastic nut		Tightening torque	3 Nm

Brake disc to front wheel hub — Used in step 16

M8	Renew screw.		16 Nm

Wheel bolts — Used in step 16

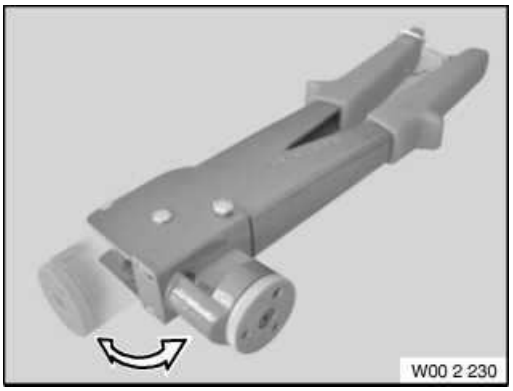
M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Underbody protection front — Used in step 17

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Overview of Special Tools

0 496 521 (00 2 230) Pliers



Common — Used in step 14 15

Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

2 344 011 Tool



Common — Used in step 16

Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

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Replacement tools:

0 495 221 (36 1 323) Wheel stud



Common	Used in step 2
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud



Common	Used in step 2
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud



Common	Used in step 2
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

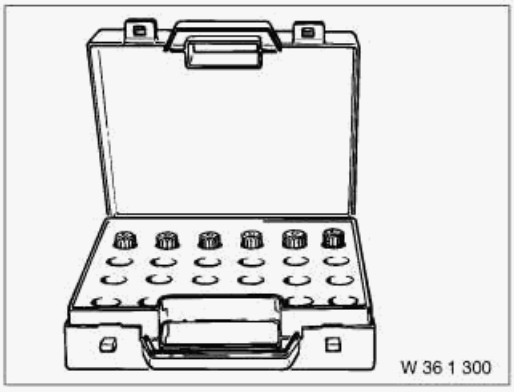
0 495 226 (36 1 328) Wheel stud



Common	Used in step 2
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 227 (36 1 329) Wheel stud



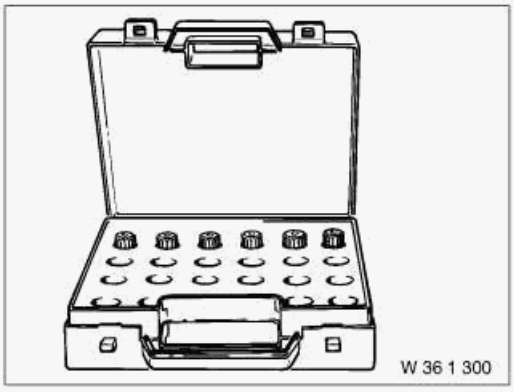
Common	Used in step 2
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud



Common	Used in step 2
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

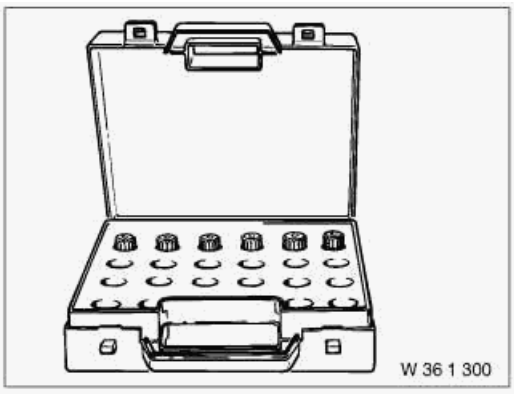
0 495 229 (36 1 332) Wheel stud



Common	Used in step 2
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 230 (36 1 333) Wheel stud



Common	Used in step 2
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Links

Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	1 18
61 20 900 Disconnecting and connecting battery earth lead	1 18
61 20 900 Disconnecting and connecting battery earth lead	1 18
61 20 900 Disconnecting and connecting battery earth lead	1 18
61 20 900 Disconnecting and connecting battery earth lead	1 18
61 20 900 Disconnecting and connecting battery earth lead	1 18
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 18
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 18
61 20 900 Disconnecting and connecting battery earth lead	1 18
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 18
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	1 18
61 20 900 Disconnecting and connecting battery earth lead	1 18
61 20 900 Disconnecting and connecting battery earth lead	1 18
61 20 900 Disconnecting and connecting battery earth lead	1 18
61 20 900 Disconnecting and connecting battery earth lead	1 18
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61 20 900 Disconnecting and connecting battery earth lead	1	18
61 20 900 Disconnecting and connecting battery earth lead	1	18
61 20 900 Disconnecting and connecting battery earth lead	1	18
61 20 900 Disconnecting and connecting battery earth lead	1	18
61 20 900 Disconnecting and connecting battery earth lead	1	18
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1	18
61 20 900 Disconnecting and connecting battery earth lead	1	18
61 20 900 Disconnecting and connecting battery earth lead	1	18
61 20 900 Disconnecting and connecting battery earth lead	1	18
61 20 900 Disconnecting and connecting battery earth lead	1	18
61 20 900 Disconnecting and connecting battery earth lead	1	18
61 20 900 Disconnecting and connecting battery earth lead	1	18
61 20 900 Disconnecting and connecting battery earth lead	1	18

Operating materials	Used in step
2.0 Grease for wheel centring	16

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11 14 110 Removing and installing, sealing/replacing rear timing case cover (B47)

Special tools required:

- 11 4 470
- 11 8 815
- 11 8 811
- 11 8 812
- 11 8 813
- 11 8 814

Important!

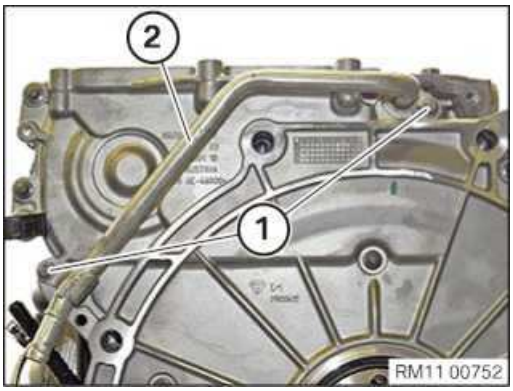
Engines with surface sealant:

Application time of sealing compound max. 12 minutes.

Necessary preliminary tasks:

- Remove engine with gearbox.
- Mount engine on assembly stand.
- Remove flywheel.
- Remove cylinder head.
- Removing oil sump.

REMOVAL:



Release screws (1).

Remove coolant line (2).

Note:
Graphic B48.

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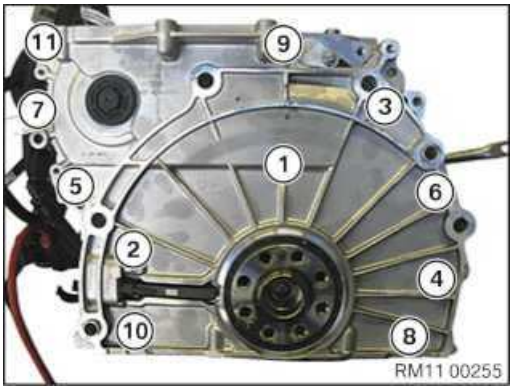


Important!

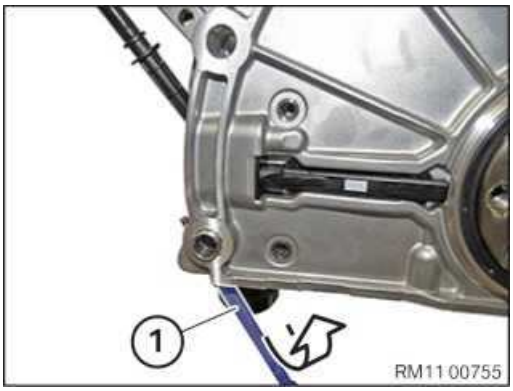
Magnet wheel (1) is magnetic.

Keep magnet wheel (1) in a plastic bag away from swarf.

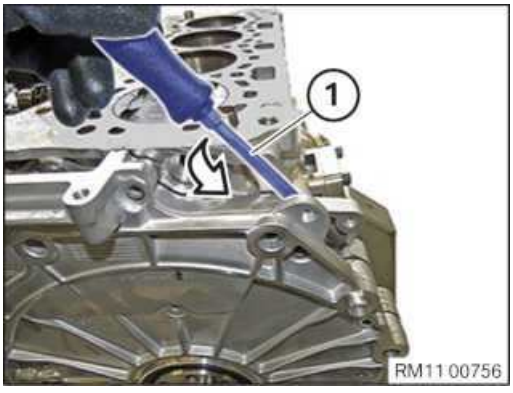
Remove magnet wheel (1) from crankshaft.



Release screws in the sequence **11 to 1**.



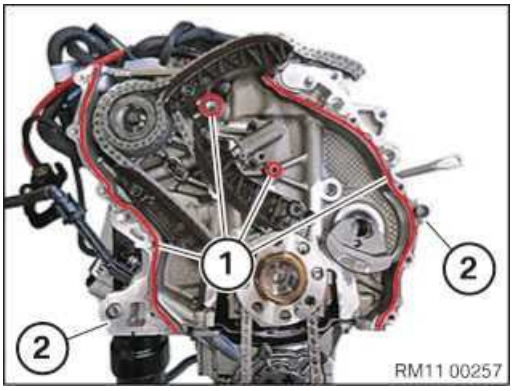
Loosen gear case cover with a screwdriver (1) in direction of arrow.



Loosen gear case cover with a screwdriver (1) in direction of arrow.

Remove gear case cover.

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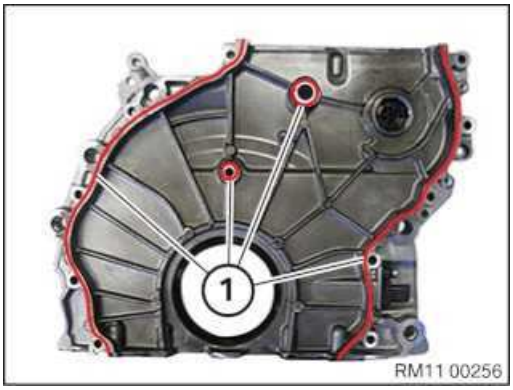
Important!

Do not use any metal-cutting tools (e.g. emery cloth).

Remove gasket remnants from the crankcase with special tool 11 4 470 .

Check that fitting sleeves (2) are correctly fitted, replace if necessary.

INSTALLATION:



When replacing the rear timing case cover:

Note:

Application time of sealing bead (1) max. 12 min.

Thickness of sealing bead: **1.5 to 2.0 mm**.

Apply sealing bead (1) at the positions indicated (see graphic) on the inside of the timing case cover.

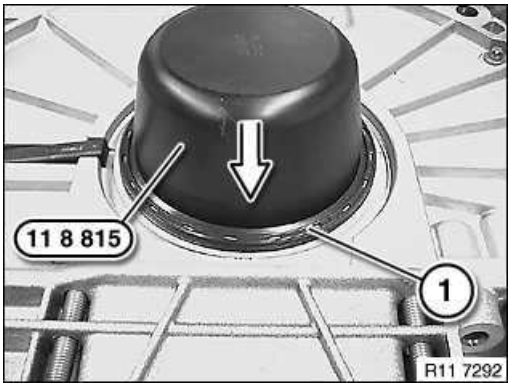
Parts:

Sealing bead (1): sealant 2.2.

Important!

The radial shaft seal must be installed dry.

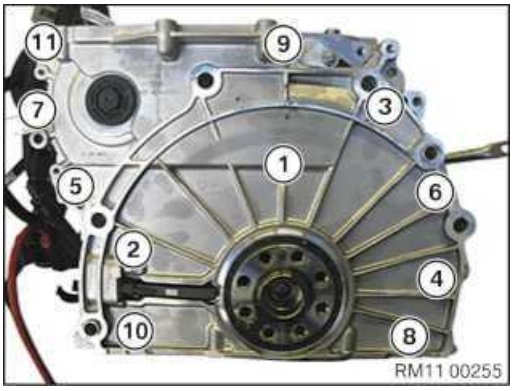
Do not use engine oil or lubricant.



Preassemble special tool 11 8 815 on crankshaft.

Mount the timing case cover with radial shaft seal (1).

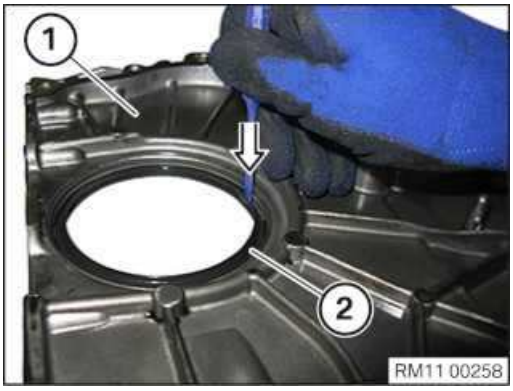
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Insert bolts.

Tighten bolts in the sequence **1 to 11**.

Tightening torque: 11 14 1AZ.

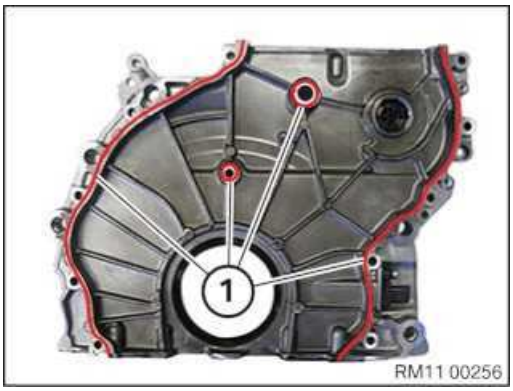


When reinstalling the timing case cover:

Support the timing case cover (1) from below.

Place punch inside in the radial shaft seal (2).

Drive radial shaft seal (2) outwards.



Installation note:
Application time of sealing bead (1) max. 12 minutes.

Thickness of sealing bead **1.5 to 2.0 mm**.

Important!

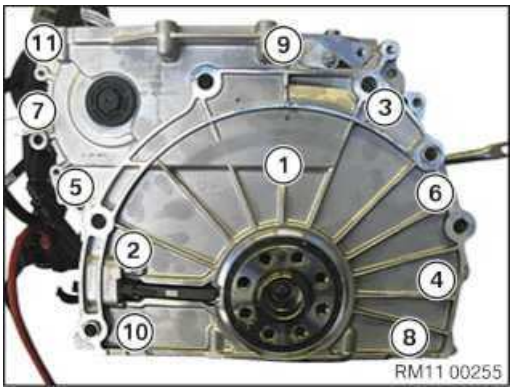
Do not use any metal-cutting tools (e.g. emery cloth).

Remove gasket remnants from the timing case cover using special tool 11 4 470 .

Apply sealing bead (1) at the positions indicated (see graphic) on the inside of the timing case cover.

Parts:

Sealing bead (1): sealant 2.2.



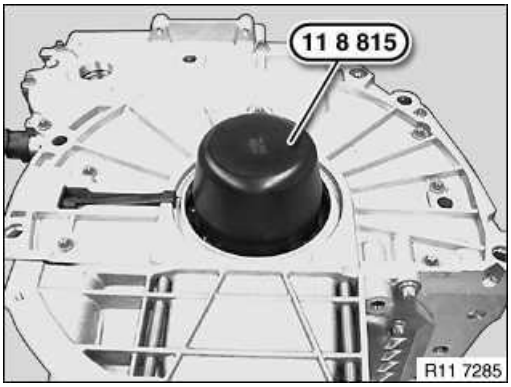
Mount timing case cover without radial shaft seal.

Insert bolts.

Tighten bolts in the sequence **1 to 11**.

Tightening torque: 11 14 1AZ.

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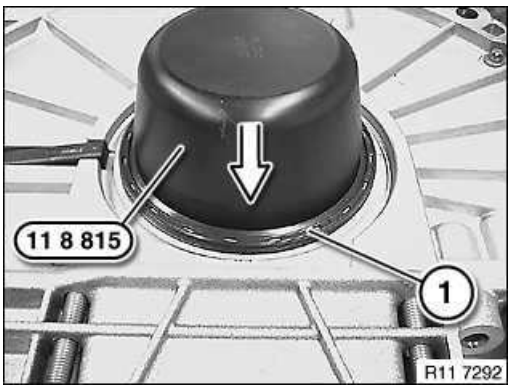


Position special tool 11 8 815 on crankshaft.*Note:*
Graphic shows: N47 D20.

Important!

The radial shaft seal must be installed dry.

Do not use engine oil or lubricant.



Use special tool 11 8 815 to fit the radial shaft seal (1) in the direction of the arrow up to the timing case cover and position.

Remove special tool 11 8 815 .



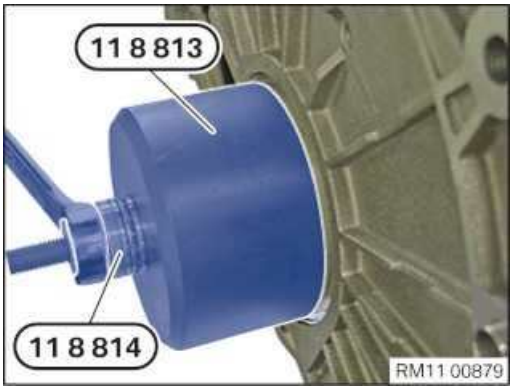
Fasten special tool 11 8 811 with special tool 11 8 812 on the crankshaft.



Slide on special tool 11 8 813 .

Screw down special tool 11 8 814 .

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Press in radial shaft seal with special tool 11 8 813 .

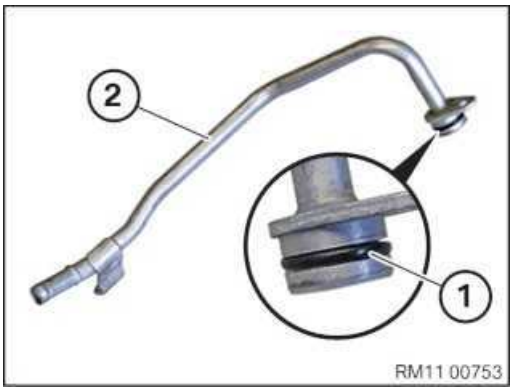
Screw in special tool 11 8 813 up to gear case cover.



Note:
Check the fitting sleeve for damage.

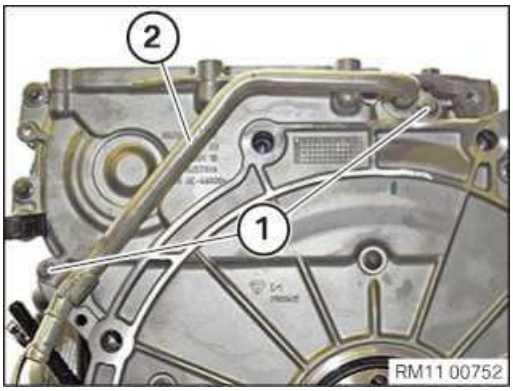
Note the installation position of the magnet wheel.

Position magnet wheel (1) on crankshaft.



Check O-ring (1) of coolant line (2) for damage.

In case the O-ring is faulty, the coolant line (2) needs to be renewed.



Install coolant line (2).

Tighten down screws (1).

Note:
Graphic B48.

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Concluding tasks:

- Install oil sump.
- Install cylinder head.
- Install flywheel.
- Remove engine from assembly stand.
- Install engine with transmission.

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11 14 110 Removing and installing/sealing or replacing bottom timing case cover

PRELIMINARY WORK

1 – Removing engine



- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

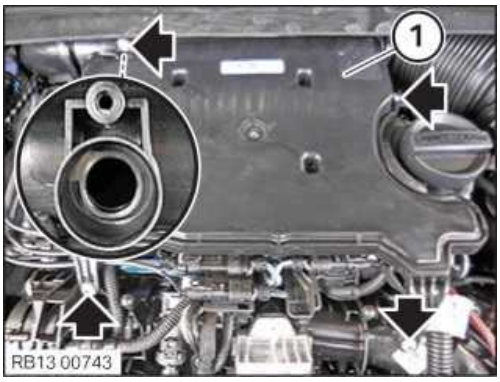
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

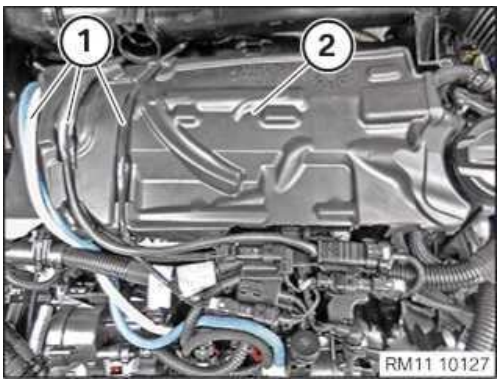
3 – Remove resonator



- Remove screws (arrows).
- Guide out and remove the resonator (1).

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4 – Remove the acoustic cover for the injectors

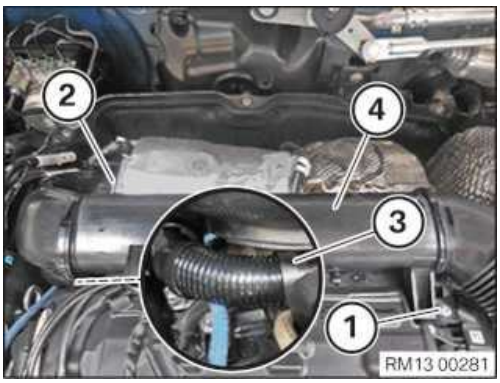


- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

5 – Removing clean air pipe



- Detach clamp (1) on the clean air pipe.
- Pull off the clean air pipe from the intake silencer housing.



- Loosen screw (1).
- Loosen clamp (2).
- Unlock the ventilation line (3) and pull it off the cylinder head cover.
- Feed out clean air pipe and remove.

6 – Remove differential pressure sensor

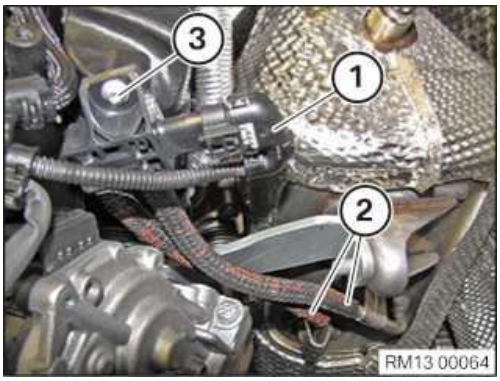
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

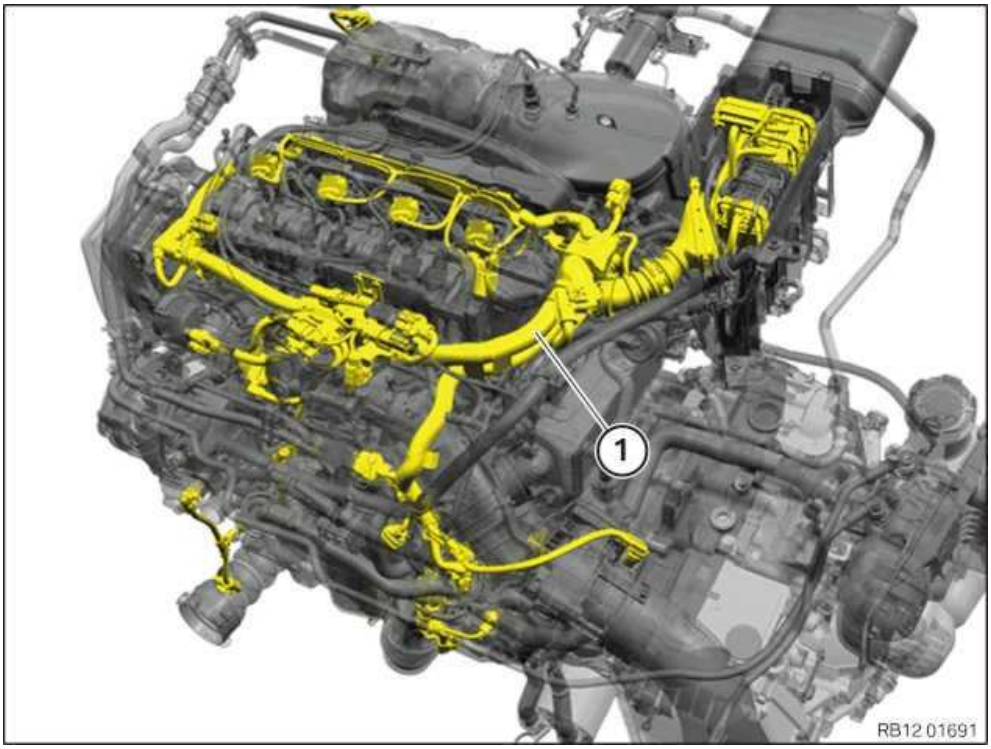
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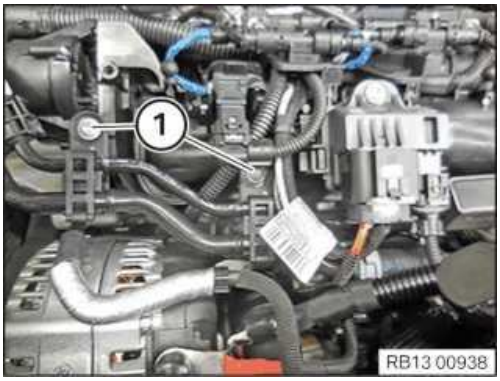
- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

7 – Removing assemblies (on lifting table)

Overview: Wiring harness section for the engine

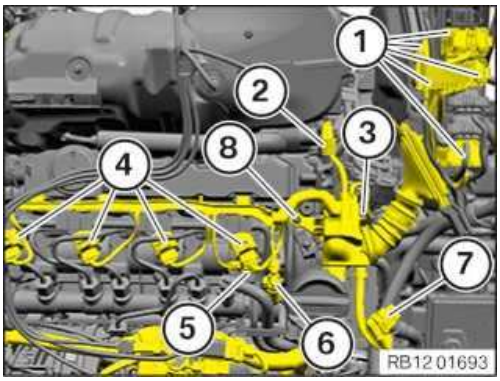


1 Wiring harness section for the engine

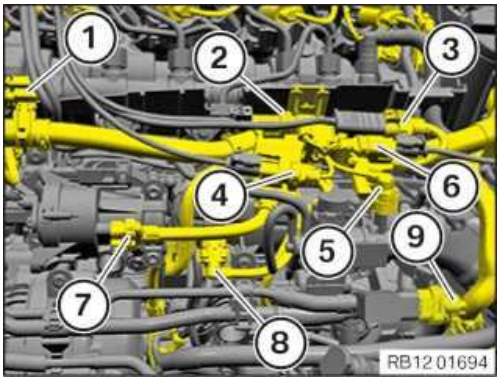


- Loosen screws (1).

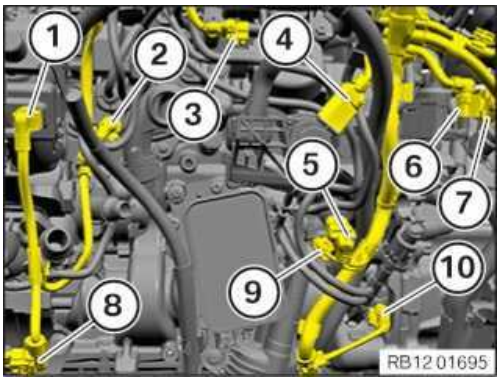
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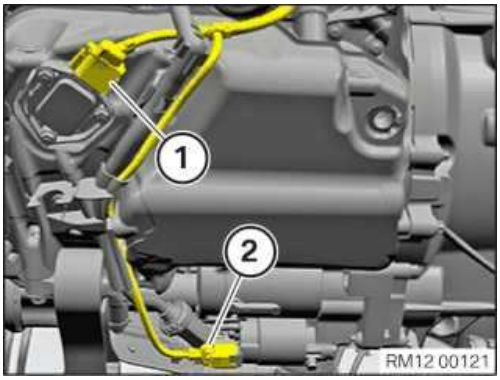
- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock the connector (2) and disconnect it from the differential pressure sensor.
- Unlock the connector (3) and disconnect it from the exhaust-gas recirculation valve.
- Unlock the connector (4) and pull off from the injectors.
- Unlock the connector (5) and disconnect it from the camshaft sensor.
- Unlock the connector (6) and disconnect it from the fuel pressure regulator.
- Unlock connector (7) and pull off from hot film air mass meter.
- Loosen screw (8).



- Unlock connector (1) and pull off from the rail pressure sensor.
- Unlock the connector (2) and disconnect it from the exhaust temperature sensor before the diesel particulate filter.
- Unlock connector (3) and pull it off from the front oxygen sensor.
- Unlock the connector (4) and disconnect it from the exhaust temperature sensor after the diesel particulate filter.
- Unlock and disconnect the connector (5) from the electric changeover valve.
- Unlock the connector (6) and disconnect it from the exhaust temperature sensor for the exhaust-gas recirculation cooler.
- Unlock the connector (7) and disconnect it from the servomotor for the swirl flaps.
- Unlock the connector (8) and pull it off the charging pressure sensor.
- Unlock the connector (9) and disconnect from the fuel pressure and temperature sensor.

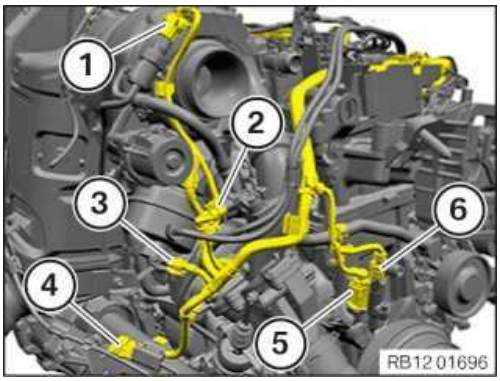


- Unlock and disconnect the connector (1) from the alternator.
- Unlock and disconnect the connector (2) from the electric changeover valve.
- Unlock and disconnect the connector (3) from the electric changeover valve.
- Unlock the connector (4) and pull it off the high pressure pump.
- Unlock the connector (5) and disconnect it from the oil pressure sensor.
- Unlock connector (6) and pull off from throttle body.
- Unlock the connector (7) and disconnect it from the intake air temperature sensor.
- Unlock the connector (8) and disconnect it from the air conditioning compressor.
- Unlock and disconnect the connector (9) from the solenoid valve.
- Unlock the connector (10) and pull it off the crankshaft sensor.



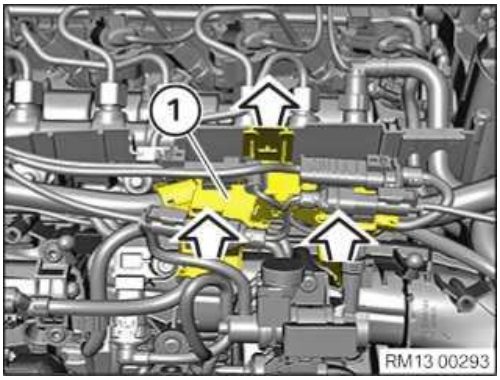
- Unlock the connector (1) and pull off of the oil-level sensor.
- Unlock connector (2) and remove from starter motor.

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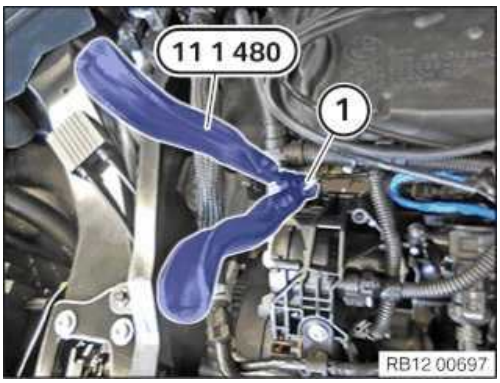


- Unlock the connector (1) and disconnect it from the exhaust gas pressure sensor.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock the connector (3) and pull it off the exhaust turbocharger.
- Unlock the connector (3) and disconnect it from the differential pressure sensor.
- Unlock connector (4) and pull it off from the monitoring oxygen sensor.
- Unlock the connector (5) and pull it off the oil pressure switch .
- Unlock connector (6) and disconnect from switching valve.
- Detach, feed out and remove the wiring harness from the clamps.

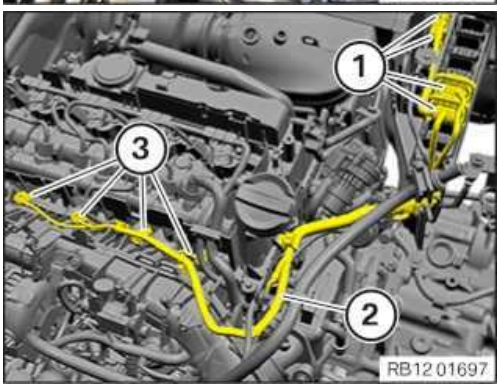
▶ **Removing the cable clips from the intake plenum**



- Detach the cable clip (1) in the direction of the arrow.
- Guide out the cable clip (1) in direction of arrow and set it aside.



- Unlock the connectors (1) of all glow elements with the special tool **0 490 796 (11 1 480)** and release them.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.



- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Pull off all connectors (3) from glow element using special tool **0 490 796 (11 1 480)**.
- Loosen screw (2) and remove the ground strap.
- Detach, feed out and remove the wiring harness from the clamps.

▶ **Removing the drive belt for alternator**

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

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CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

TECHNICAL INFORMATION

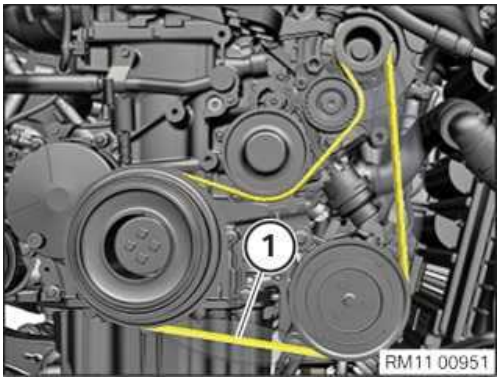
If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

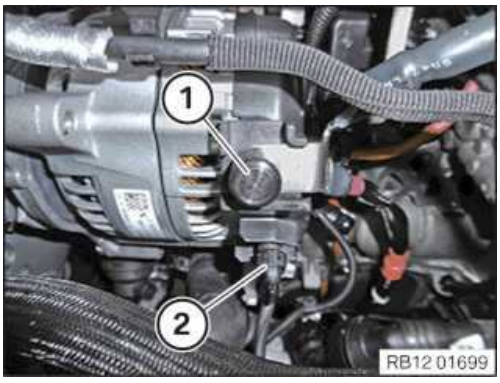
The drive belt must be replaced if contaminated with coolant- and oil residues.



- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool **0 496 268 (11 0 390)**.



- Guide out the drive belt for the alternator (1) and remove it.

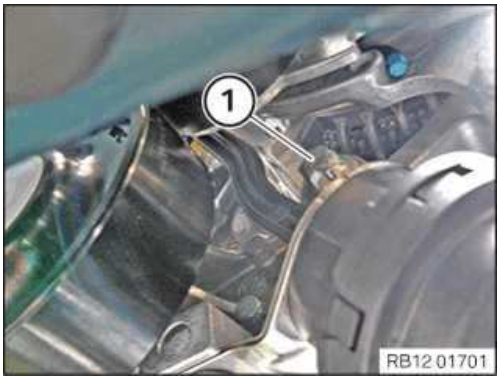


- Remove the cover (1) and loosen the nut below.
- Disconnect positive battery cable from alternator.
- Unlock and disconnect the connector (2) from the alternator.

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- Detach screw (1) on top on the alternator.



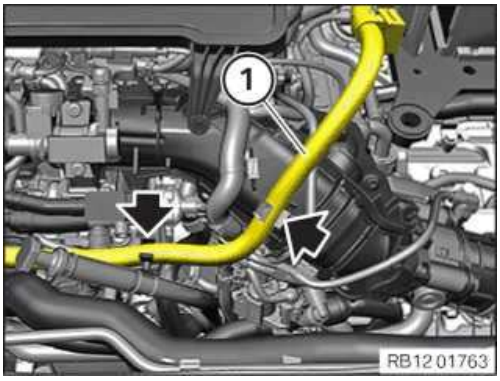
- Detach screw (1) below on the alternator.



- Feed out alternator (1) along with the screw (2) on the bottom of the alternator through the slot on the support and remove.

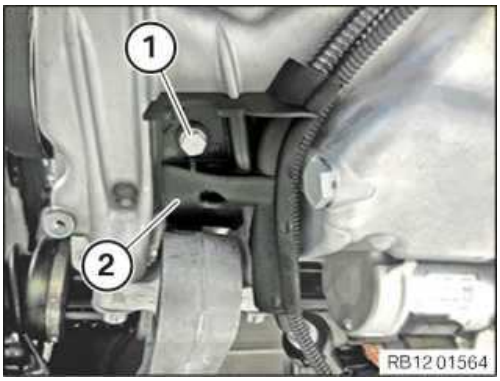


- Loosen screws (1).
- Feed out and remove the air conditioning compressor (2).



- Release the positive battery cable (1) from the clamps (arrows).

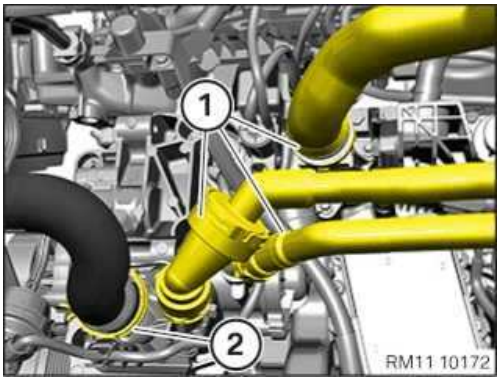
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- Loosen screw (1).
- Guide out and remove holder (2).



- Feed out positive battery cable from the clamps (1) and remove.



- Unlock and disconnect coolant lines (1).
- Guide out the coolant lines (1) and remove it.
- Detach the clamp (2).
- Guide the coolant hose out and remove.

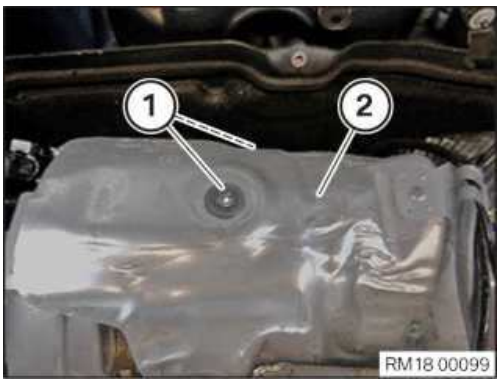
▶ **Removing heat shield from top exhaust turbocharger**

WARNING

Hot surfaces.

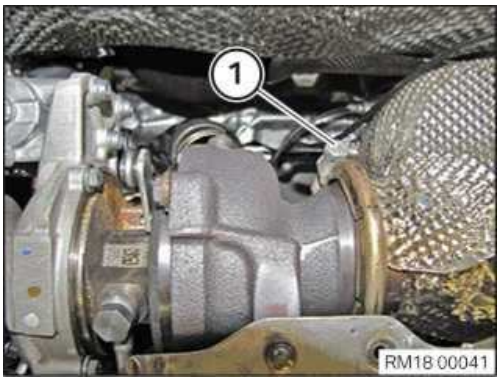
Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from holders.
- Release the screws (1) at the top and bottom of the heat shield.
- Feed out and remove the heat shield (2).

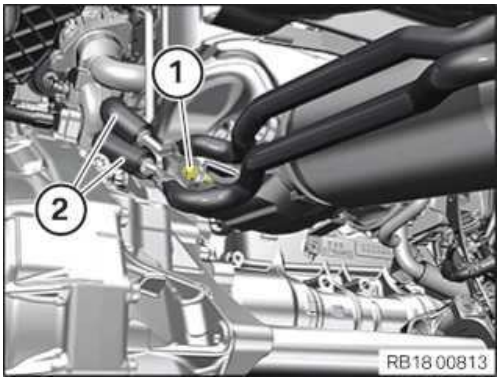
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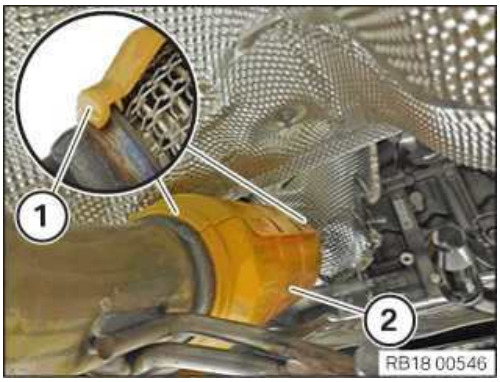
- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.



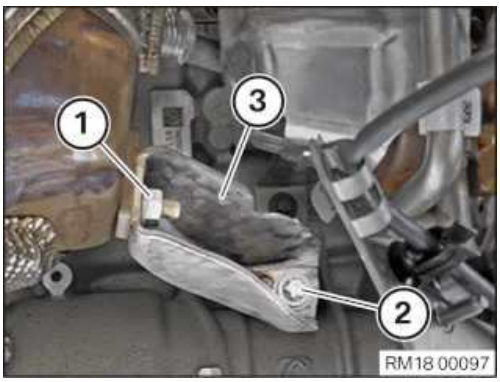
- Loosen nuts (1).



- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.

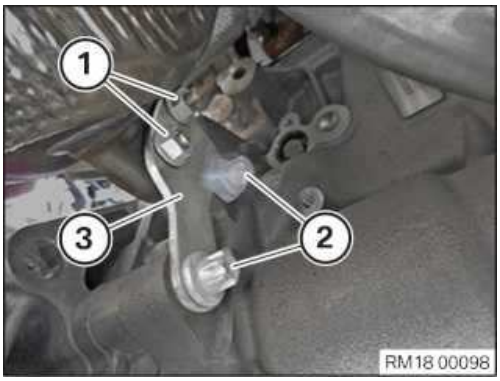


- Mount fitting aid (2).
- Make sure that the fitting aid is correctly position on the edges (1) of the flexible tube.



- Loosen nut (1).
- Loosen screw (2).
- Remove holder (3).

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- Loosen nuts (1).
- Loosen screws (2).
- Remove holder (3).
- Guide out and remove diesel particulate filter .

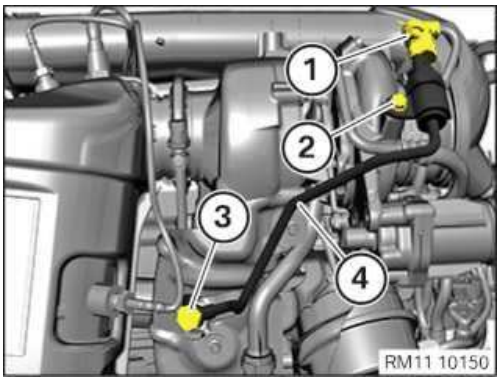
▶ **Remove the heat shield from the exhaust turbocharger at the bottom**

WARNING

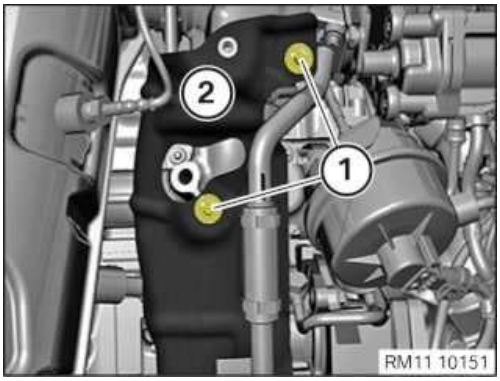
Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Unlock and disconnect connector (1).
- Unscrew the banjo bolt (3).
- The seals of the banjo bolt (3) must be renewed.
- Loosen screw (2).
- Remove the exhaust gas pressure pipe (4).



- Unscrew the bolts (1) on the heat shield .
- Feed out and remove the heat shield (2).

▶ **Removing the exhaust-gas recirculation cooler**

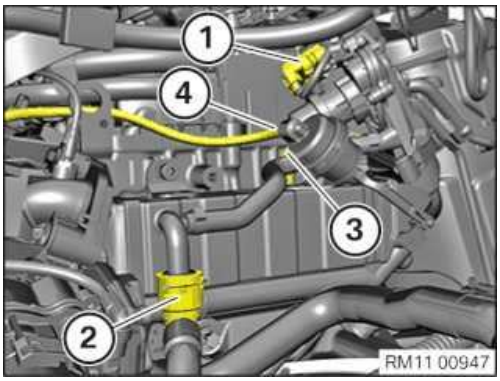
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

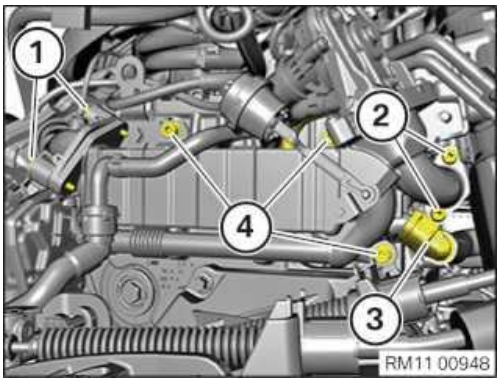
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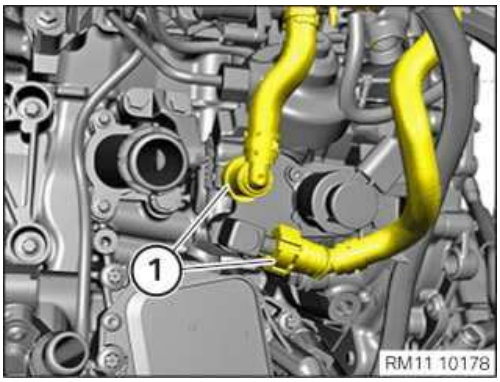
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

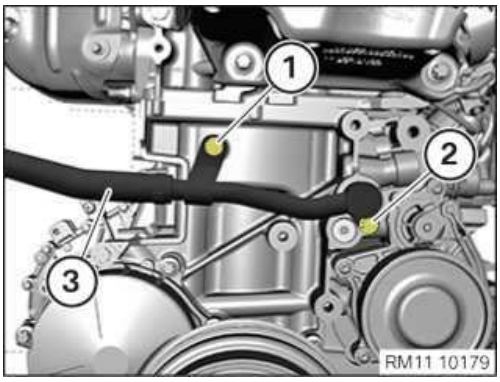
- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.



- Unlock the fuel lines (1) and disconnect from the high pressure pump.
- Remove the fuel lines.



- Loosen screws (1) and (2).
- Remove coolant line (3).

8 – Removing the low-pressure stage turbocharger

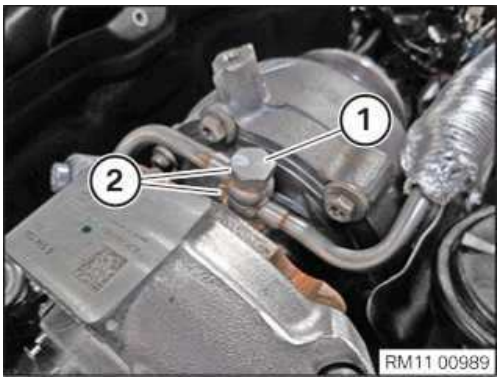
WARNING

Hot surfaces.

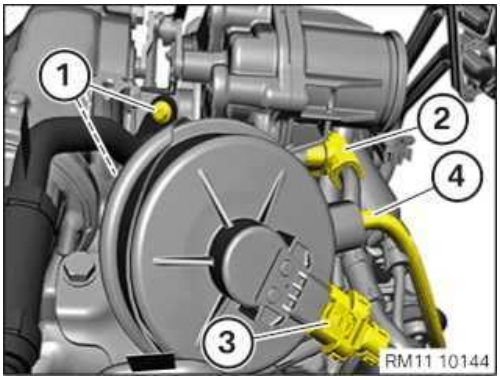
Risk of burning!

- Perform all work only on components that have cooled down.

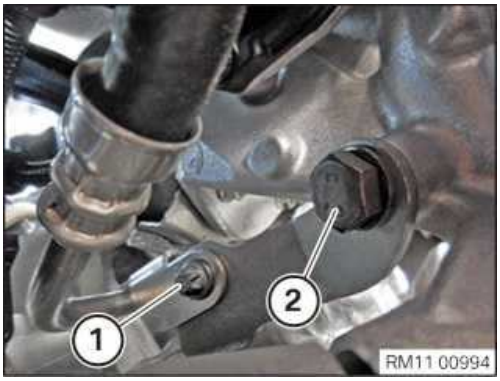
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- Release the banjo bolt (1) of the oil feed lines.
- Remove sealing rings (2).
- Place oil feed lines to one side.



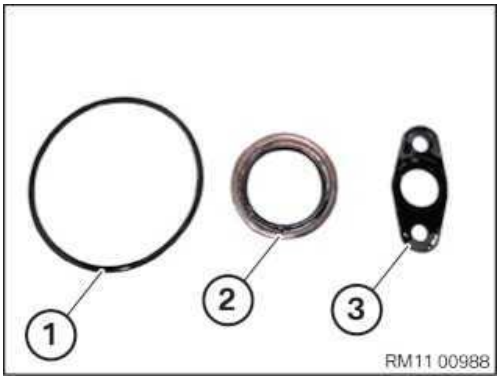
- Release the screws (1) of the oil return line.
- Unlock and disconnect the plug connections (2) and (3).
- Pull off the vacuum hose (4) carefully.



- Undo the bolt (1) of the oil feed line.
- Loosen screw (2).

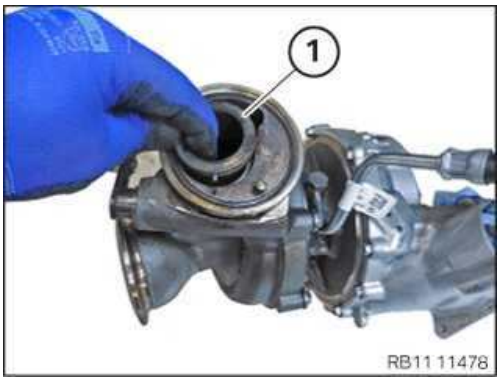


- Loosen screw (1).
- Remove the V hose clamp.
- Guide the low-pressure stage turbocharger out towards the top and remove.



- Remove seals (1), (2) and (3).

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- Remove the spacer ring (1).

9 – Removing the high-pressure stage exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

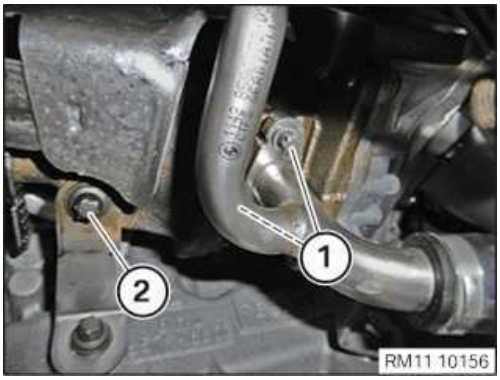
- Perform all work only on components that have cooled down.

CAUTION

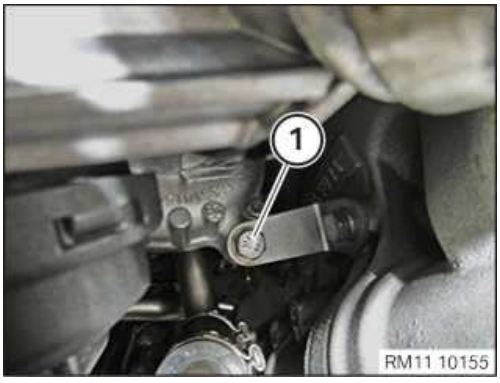
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

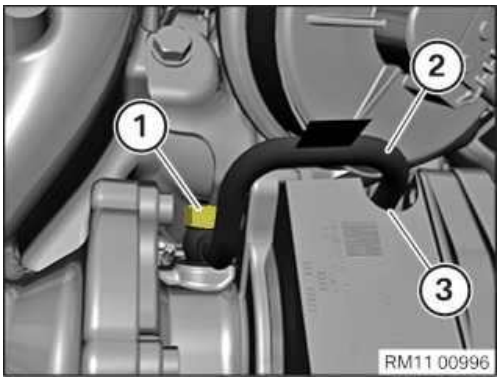


- Unscrew the bolts (1) on the oil return line .
- Loosen screw (2).

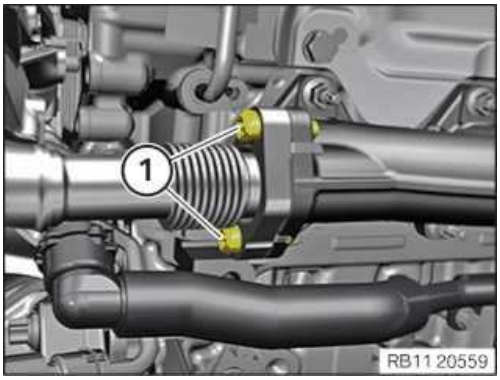


- Release screw (1) from the right wheel arch.

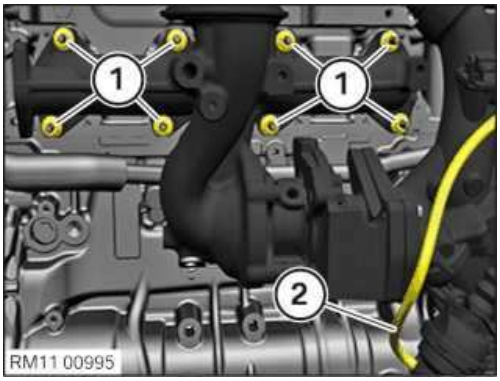
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- Unscrew the banjo bolt (1).
- Guide out oil feed line (2) from holder (3).

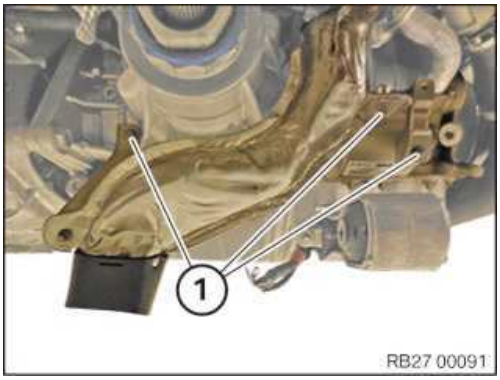


- Loosen screws (1).

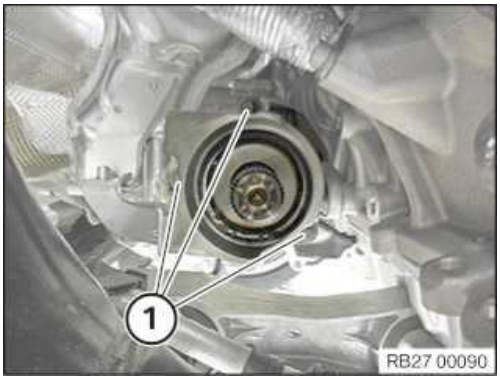


- Pull off the vacuum hose (2).
- Loosen nuts (1).
- Guide out the exhaust manifold and the high-pressure stage exhaust turbocharger to the top and remove them.

10 – Remove the intermediate shaft with the support tube

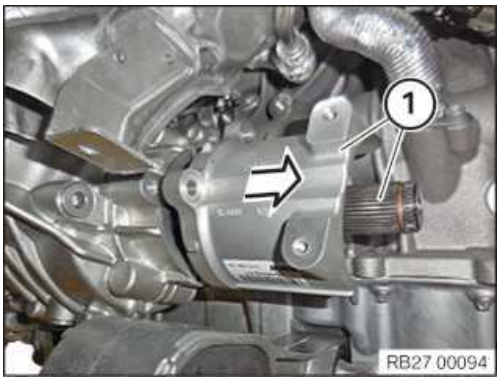


- With air duct installation: Loosen screws (1).
- Remove air duct



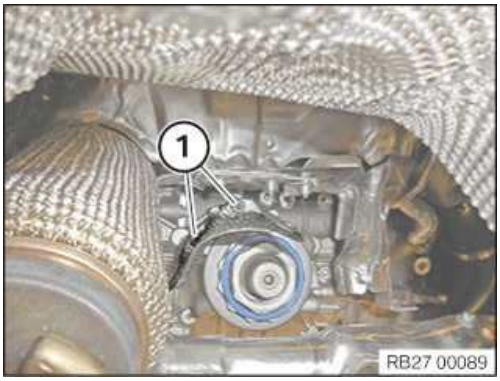
- Loosen screws (1).

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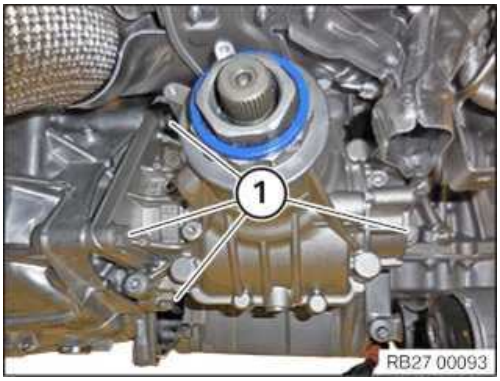


- Pull the intermediate shaft with the support tube (1) out of the transfer box.

11 – Remove transfer box (VTG)



- Loosen screws (1).
- Remove heat shield.



- Loosen screws (1).
- Remove the transfer box (VTG).

12 – Detach the engine from the manual gearbox

Prerequisite

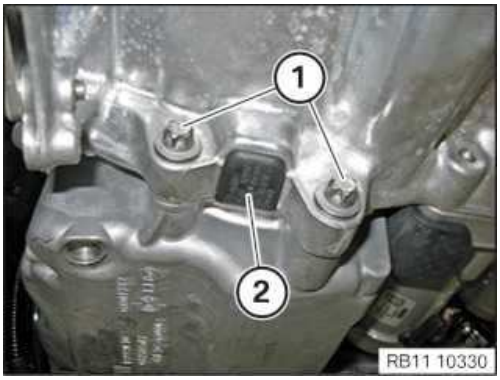
Engine has been removed.

CAUTION

Heavy component.

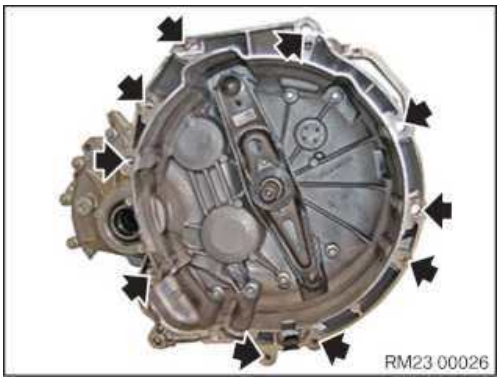
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

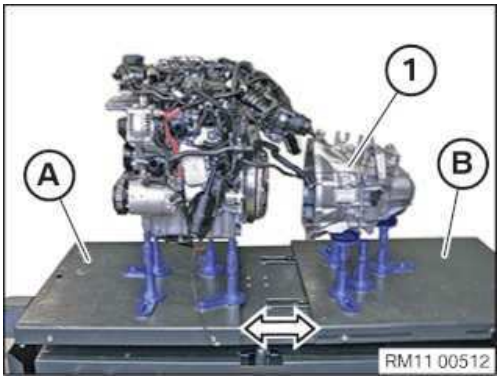


- Loosen screws (1).
- Remove protective cap (2).

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- Remove screws (arrows).



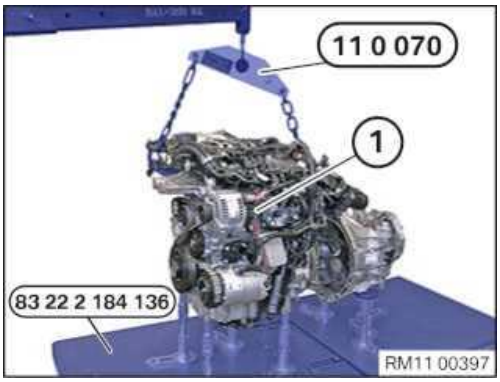
- Slide the table top (B) in the direction of the arrow and slide the manual gearbox (1) to the side.



- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

M8		Tightening torque	21,5 Nm



- Attach engine lifter to special tool and lift engine (1) off lifting table.

13 – Mount engine on assembly stand

CAUTION

Heavy component.

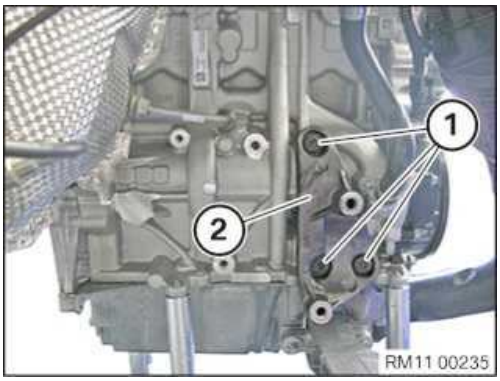
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

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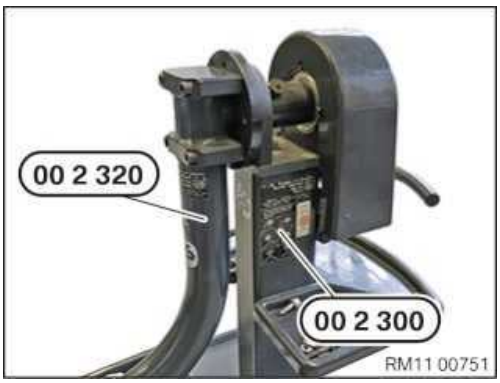
- Loosen screws (1).
- Guide out and remove holder (2).



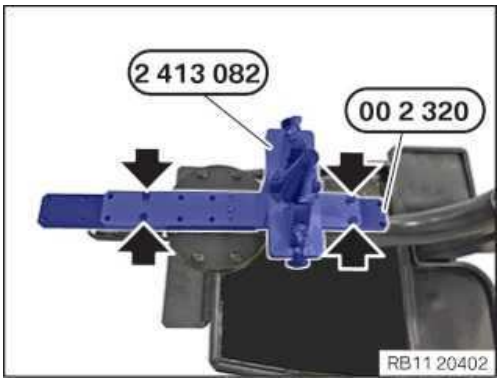
- Position the special tool **2 455 010** on the engine (1).
- Position the standard bolts **M10x30**.
- Tighten the standard bolts (arrows).
-

Special tool 2 455 010 to crankcase

M10x30		Tightening torque	38 Nm



- Prepare the assembly stand **0 495 187 (00 2 300)** with the special tool **0 495 196 (00 2 320)**.



- Screw the special tool to the **0 495 196 (00 2 320)** special tool.
- Tighten screws (arrows).
-

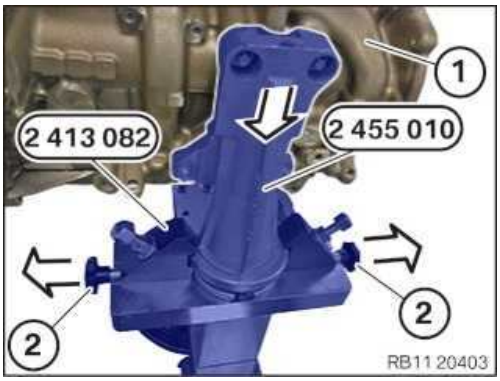
Special tool 11 8 930 to special tool 00 2 320

M14x35		Tightening torque	160 Nm

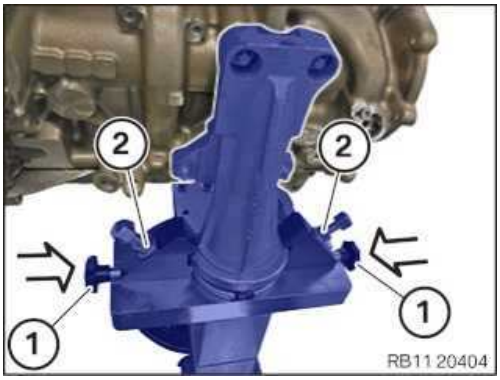


- Position the engine lifter with the special tool and the engine on the special tool **0 495 187 (00 2 300)**.

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- Detach the holder (2) in the direction of the arrow.
- Position the engine (1) with the special tool **2 455 010** in the direction of the arrow on the special tool .



- Lock the holder (1) in direction of arrow.
- Tighten nuts (2).

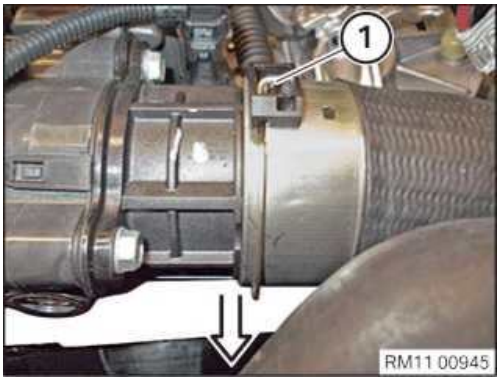
14 – Removing the intake plenum

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

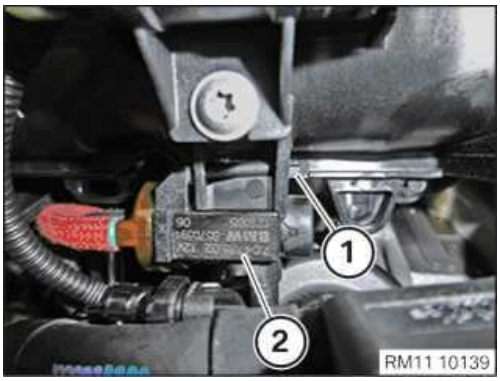


- Unlock the lock (1).

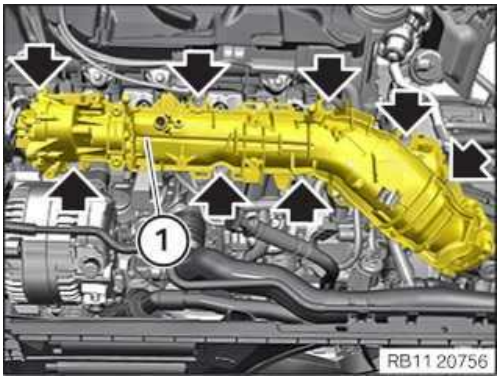


- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.

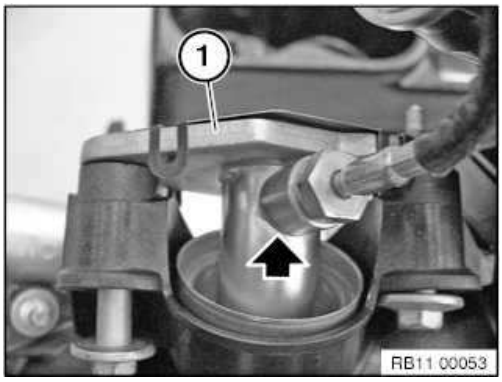
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- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



- Release the screws (arrows) from the intake plenum (1).
- Guide the intake plenum (1) out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

15 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

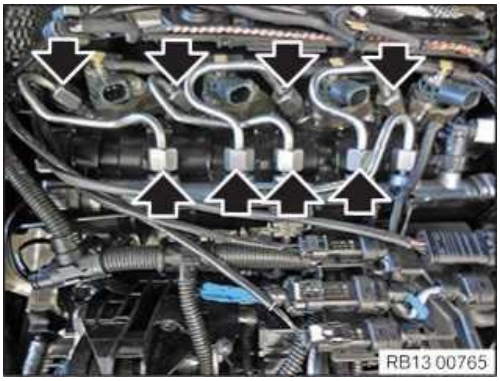
If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release the high pressure lines (arrows) with the special tool .
- Catch and dispose of escaping fuel.
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool .

16 – Detaching leakage oil line from injector

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

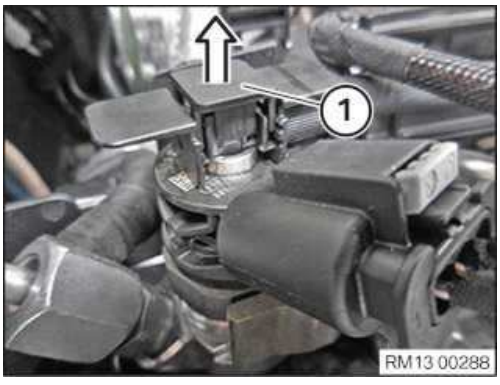
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

17 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

 **Electrostatic discharge.**

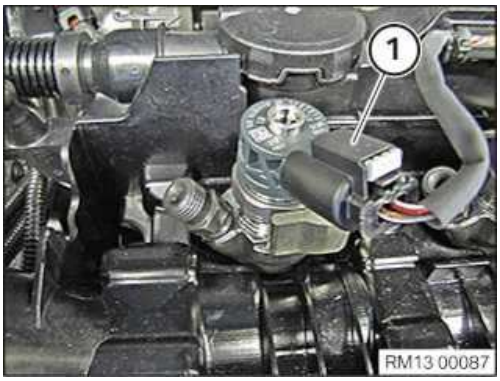
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

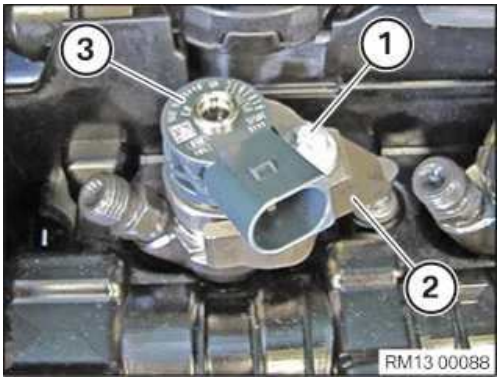
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TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.



- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

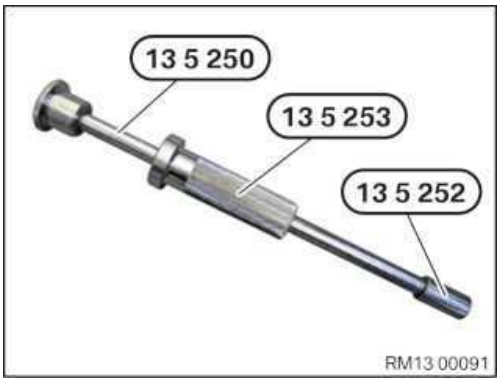
▶ **Loosen stuck injectors**

RISK OF DAMAGE

Contaminant or foreign body.

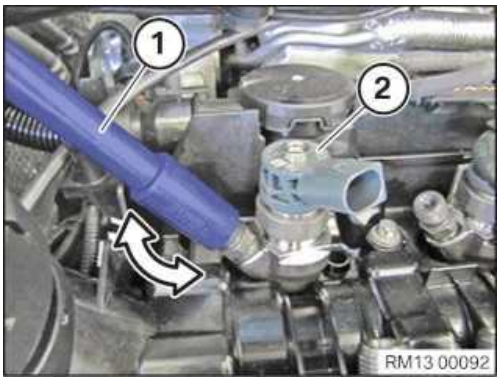
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)** back onto the special tool **0 493 321 (13 5 250)**.

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- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

18 – Remove high-pressure rail

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

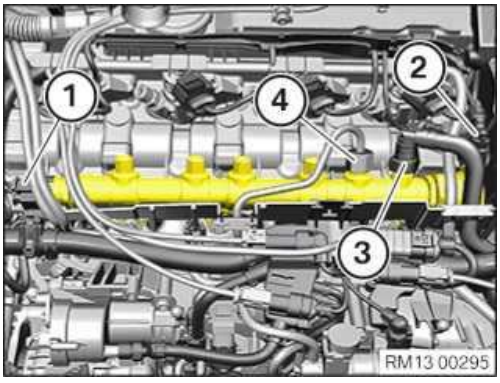
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

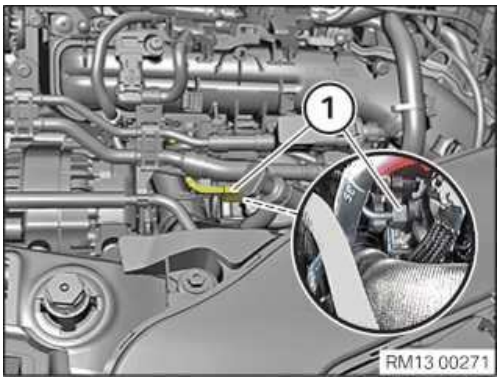
TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

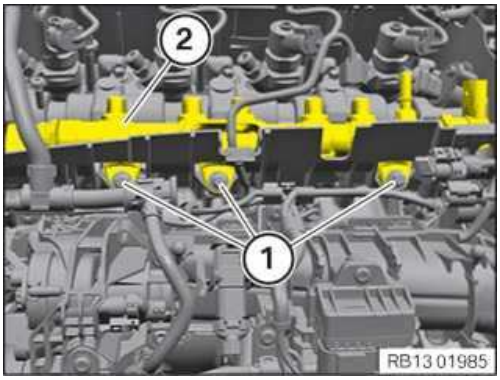


- Unlock and disconnect connector (1).
- Unlock and disconnect connector (2).
- Unlock and release fuel line (3).
- Loosen union nut (4) with special tool .
- Reset special tool early on to avoid bending pressure lines.

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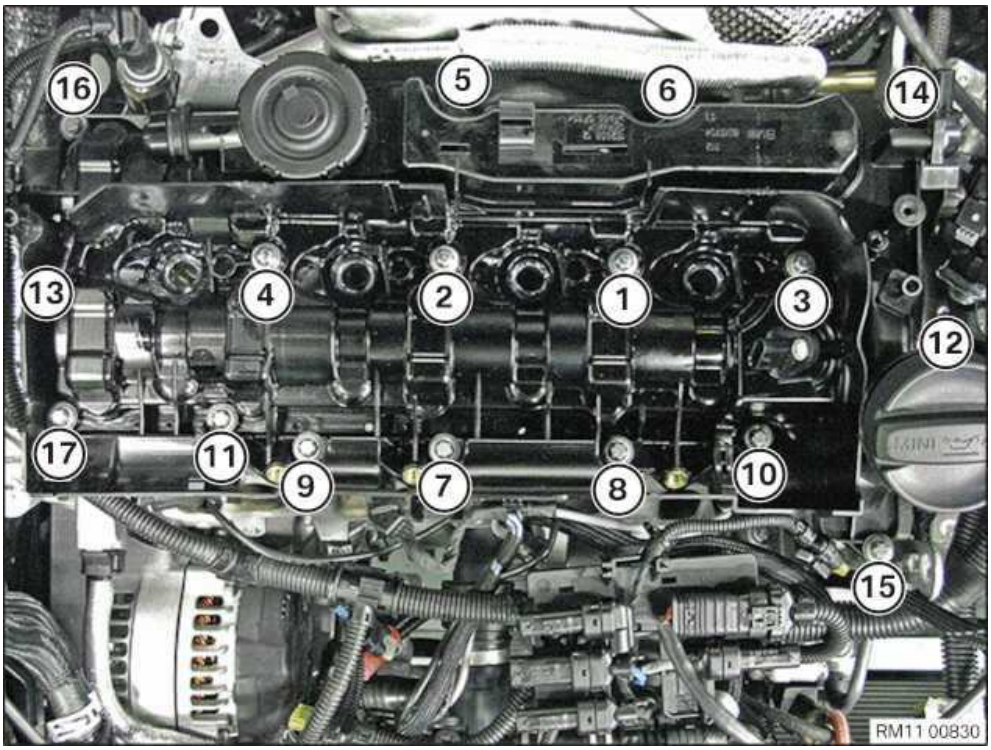
- Slacken the union nut (1) on the high pressure pump.



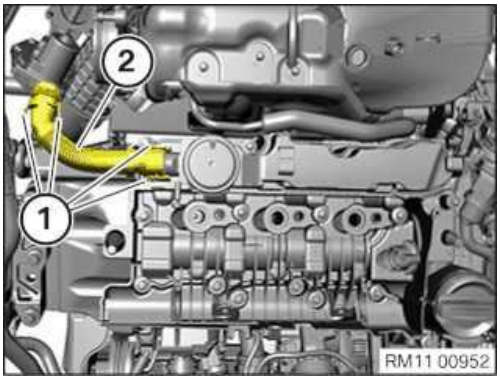
- Loosen screws (1).
- Carefully thread out and remove the rail (2).
- Make sure the pressure line of the high pressure pump is not bent.

19 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover

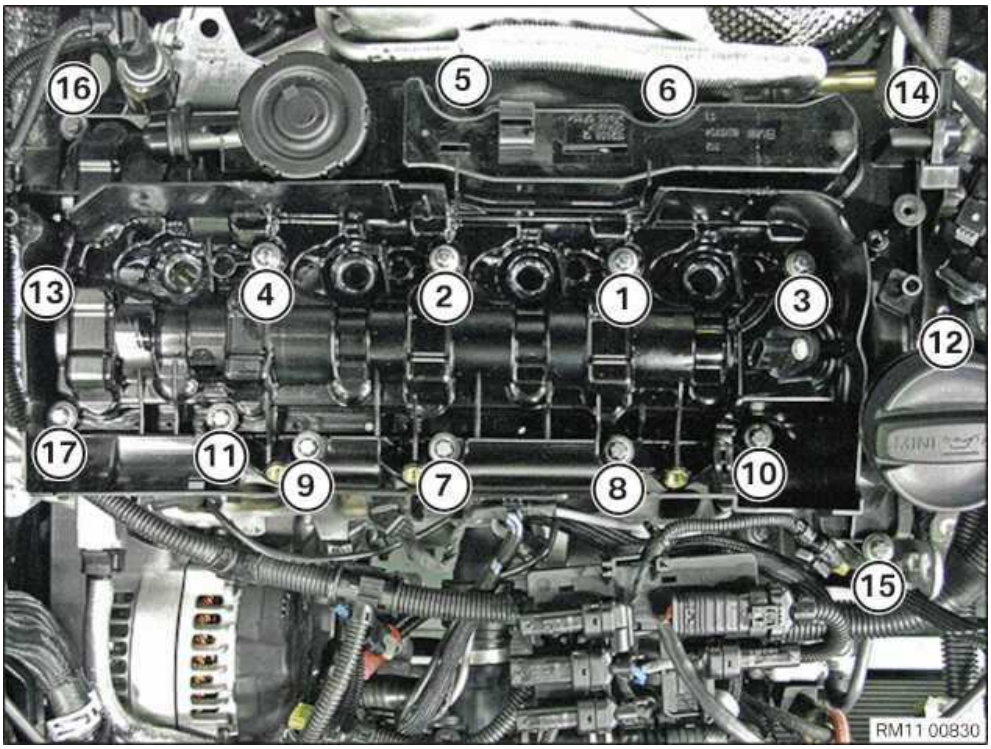


1 to 16 screws of the cylinder head cover.



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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- Loosen screws in the order (17) to (1).
- Remove cylinder head cover by lifting it out.

20 – Checking camshaft timing



- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

Damage to the engine.

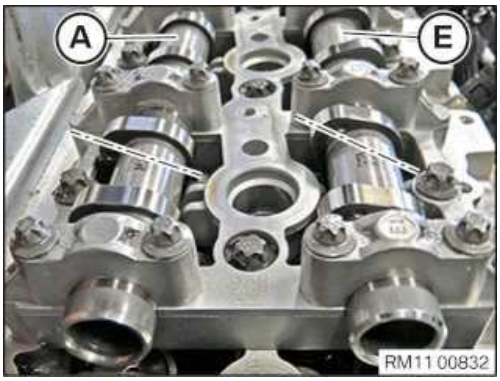
The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

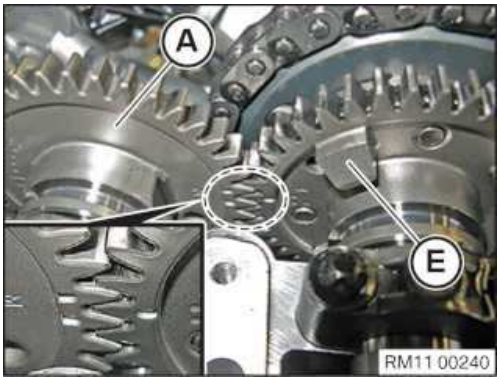
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- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.



- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

21 – Remove chain tensioner piston

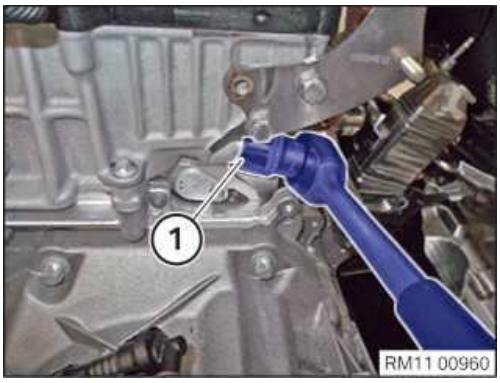
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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

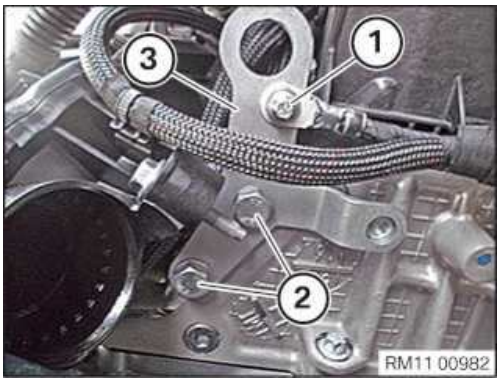


TECHNICAL INFORMATION

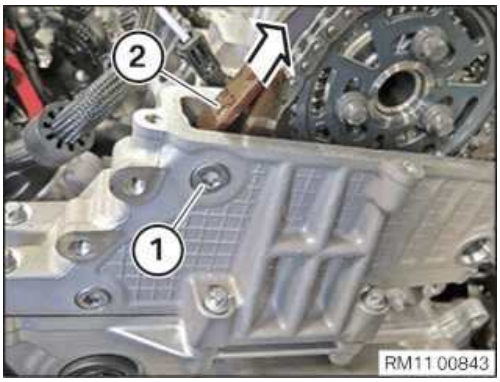
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

22 – Remove the timing chain guide rail

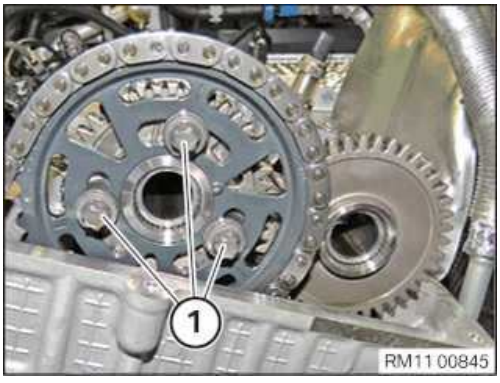


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

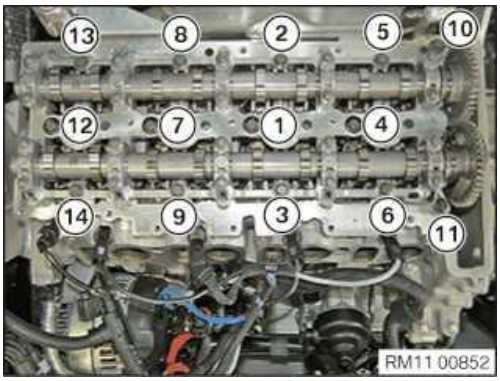
23 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

24 – Removing the camshaft support

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- Evenly loosen all screws in a sequence from (14) to (1).
- Loosen and remove all screws in a sequence from (14) to (1).
  Both camshafts can be removed with the camshaft carrier.
- Remove the camshaft support including camshafts towards the top.

25 – Removing glow elements

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Damage to the glow elements.

Excessive force may damage the glow elements and they may then have to be renewed.

- Handle glow elements with care and do not drop.
- Do not rest the cylinder head on glow elements. Glow elements protrude from the sealing surface of the cylinder head.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

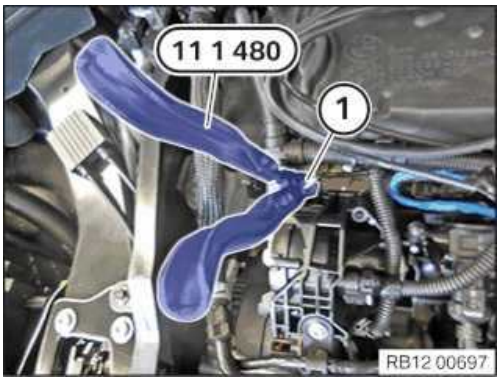
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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

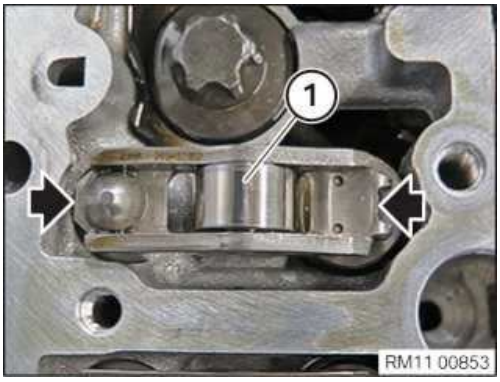


- Unlock and disconnect plug connection (1) using special tool **0 490 796 (11 1 480)**.



- Release the glow elements with the special tool or conventional tools.
- Feed out preheating elements and remove.

26 – Remove roller cam followers



- Guide out and remove all roller cam followers (1) (arrows).
- Place all roller cam followers (1) in order in special tool **0 495 105 (11 4 480)**.

  Roller cam followers that have already been used must be installed in same position again.

27 – Removing the hydraulic valve clearance compensating element

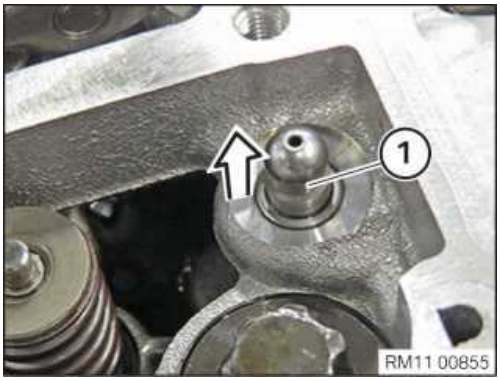
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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Remove the hydraulic valve clearance compensating element (1) in the direction of the arrow and place on the special tool **0 495 105 (11 4 480)**.
- Repeat the process on all hydraulic valve clearance compensating elements.

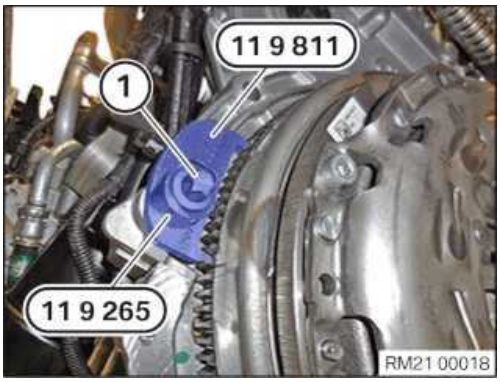
28 – Remove clutch

CAUTION

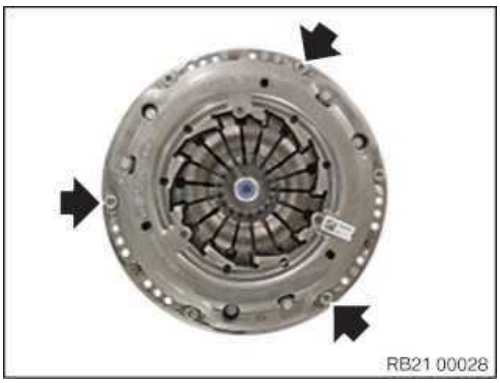
Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

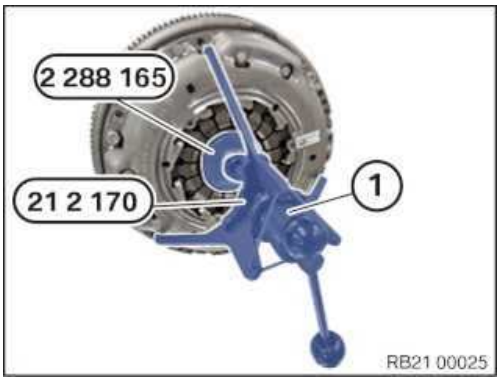


- Block flywheel with transmission bolt (1) and special tools **0 496 171 (11 9 811)** and **0 494 793 (11 9 265)**.

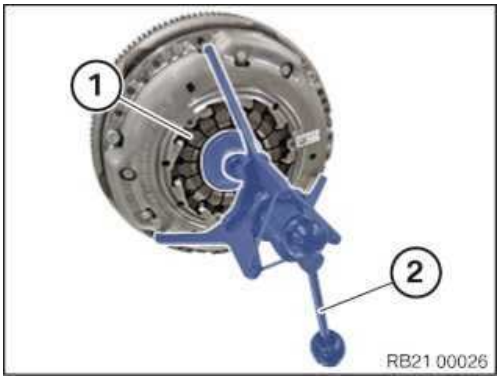


- Detach 3 screws to attach special tool and **2 288 165**.

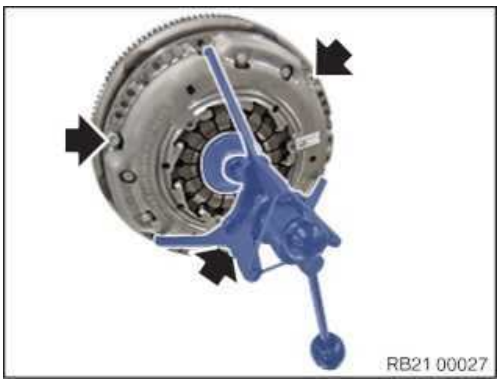
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- Position special tool and **2 288 165** and tighten on the knurled screw (1).



- Screw in the spindle (2) until the diaphragm spring (1) is preloaded and the clutch disc is free of tension.



- Loosen the remaining 3 screws and remove the clutch with clutch disc from the flywheel.

29 – Removing flywheel

CAUTION

Heavy component.

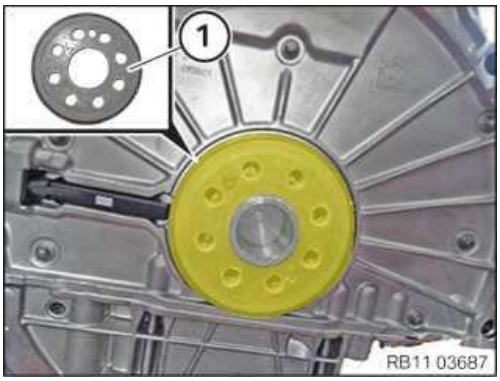
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Secure the flywheel with a transmission bolt (1) and with special tools **0 496 171 (11 9 811)** and **0 494 793 (11 9 265)**.
- Unscrew the flywheel bolts with the special tool **0 491 018 (11 4 180)**.
- Remove flywheel.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

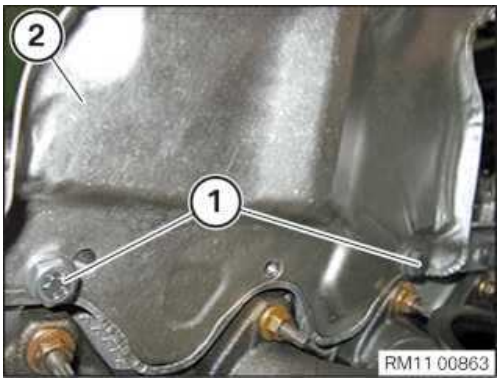
- Remove the increment wheel (1) from the crankshaft and lay it down correctly.

MAIN WORK

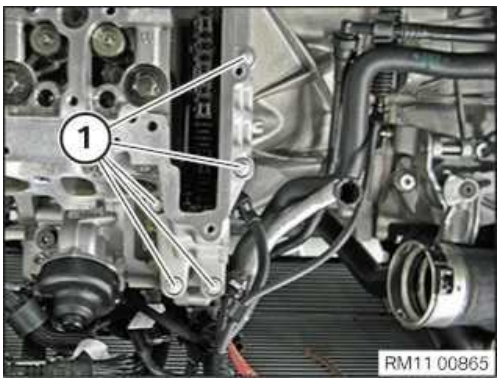
30 – Remove rear timing case cover

Prerequisite

Transmission is removed.



- Loosen screws (1).
- Feed out the heat shield (2) and place to one side.

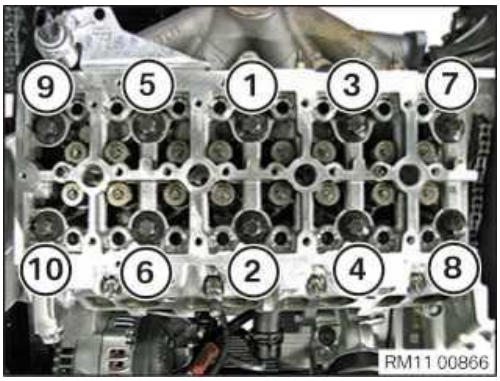


TECHNICAL INFORMATION

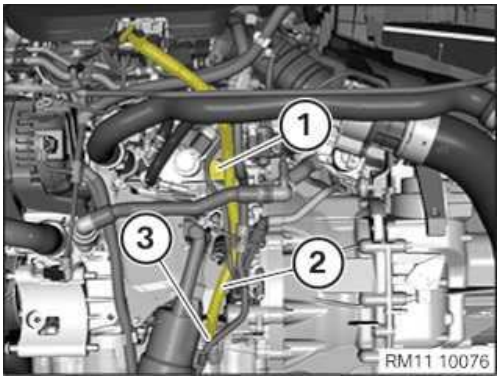
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screws (1).

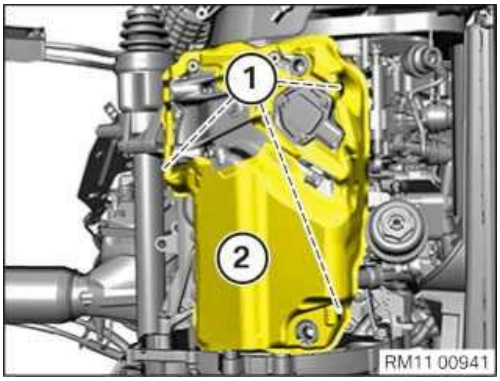
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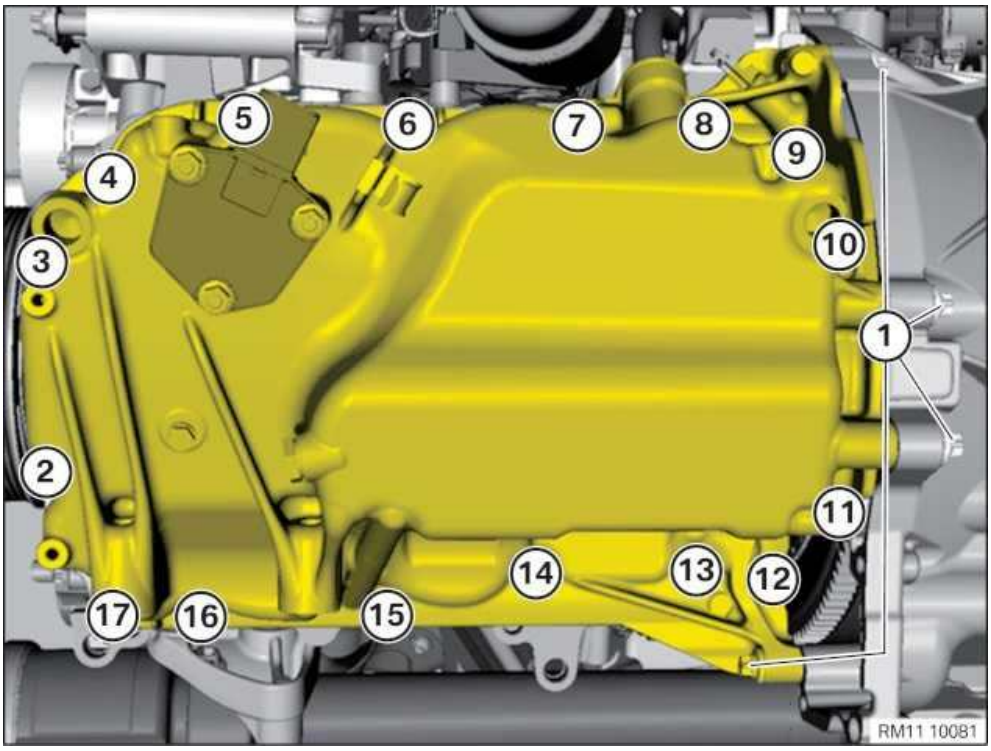
- Loosen the cylinder head bolts in the sequence from (10) to (1).
- Remove cylinder head bolts (1) to (10) with washers.
- Remove cylinder head.



- Loosen screw (1).
- Disconnect the guide tube (2) for the oil dipstick toward the top from the oil sump and remove it.
- Remove sealing ring (3) from oil sump if necessary.

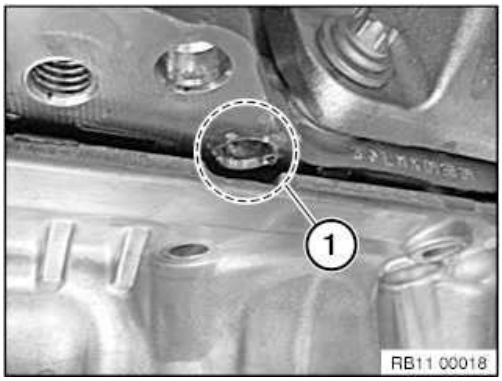


- Expanding rivets (1) on both sides of the acoustic cover (2).
- Feed out and remove the acoustic cover (2).

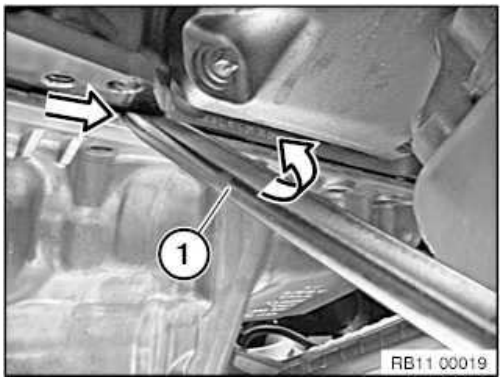


- Loosen the transmission bolts (1) on the oil sump.
- Loosen screws (2) to (17).

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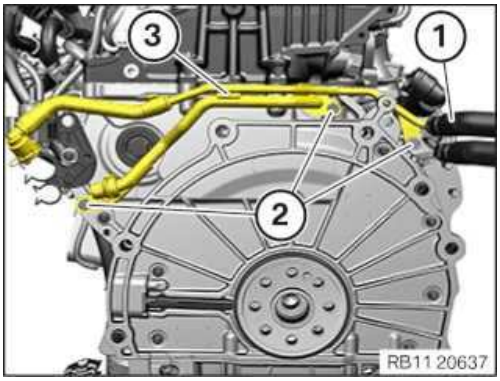


- Release oil sump only in area (1).

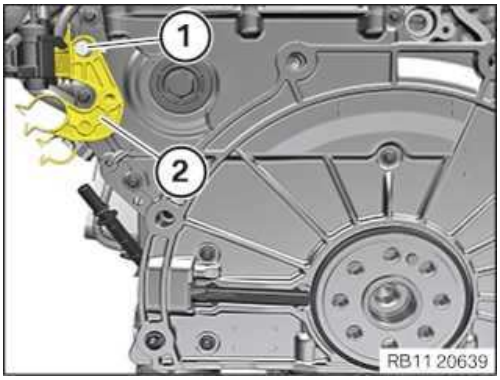


- Detach the oil sump with a suitable mounting lever (1) carefully at the point provided.
- Secure the oil sump against falling.

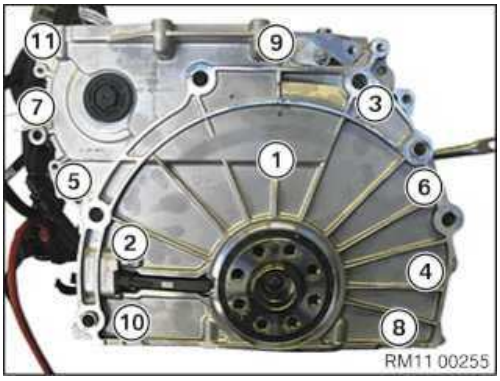
▶ **If installed: Remove coolant line of the SCR metering module**



- Unlock and disconnect the coolant hose (1).
- Loosen screws (2).
- Remove the coolant line (3).

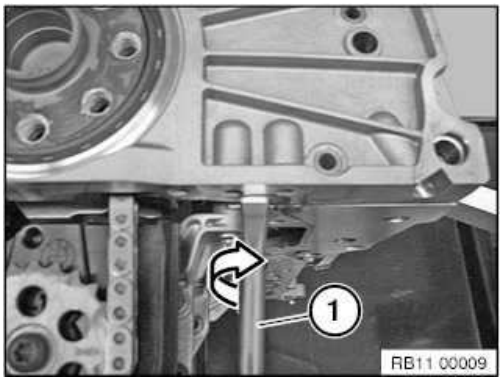


- Loosen screw (1).
- Guide out and remove holder (2).

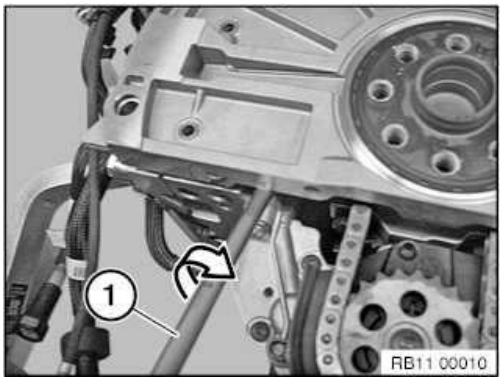


- Loosen screws in the order (11) to (1).

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- Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.

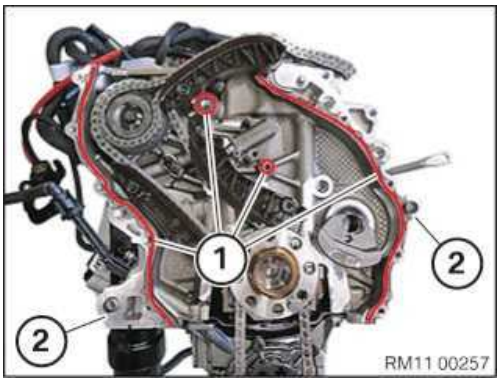


- Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.
- Remove the timing case cover.

31 – Install the rear timing case cover

Prerequisite

Transmission is removed.



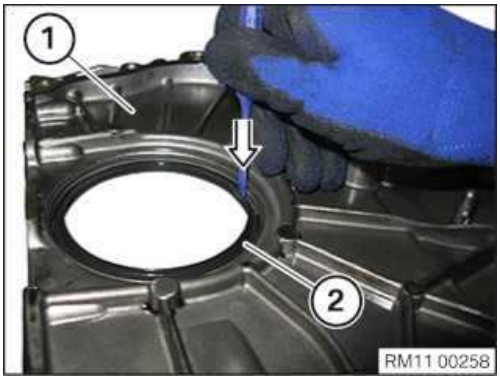
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

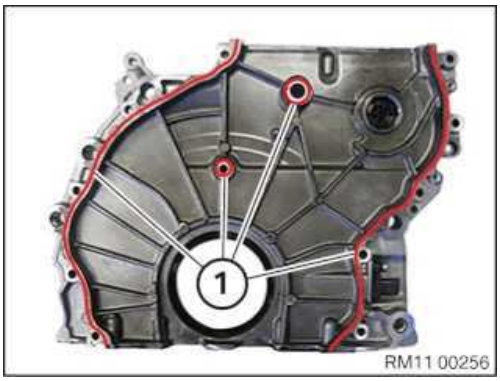
- Do not use any metal-cutting tools.

- Remove seal residue from the sealing surfaces (1) using special tool **0 495 102 (11 4 470)**.
- Check fitting sleeves (2) for damage and for tight fit; renew if necessary.

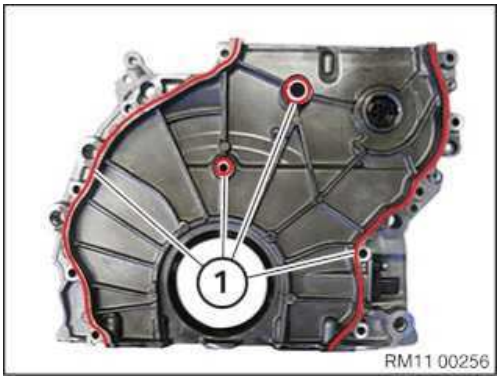


- Position the timing case cover (1) underneath.
- Position punch on inner side of crankshaft seal (2).
- Drive out crankshaft seal (2) outwards.

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- Remove seal residue from the sealing surfaces (1) using special tool **0 495 102 (11 4 470)**.

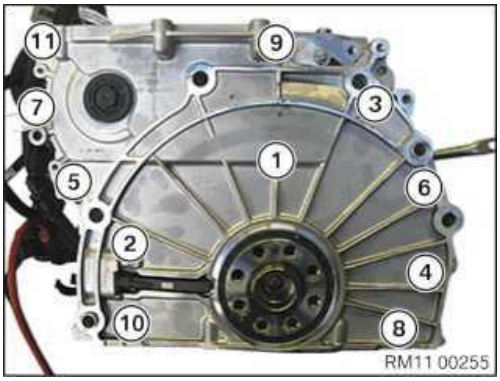


TECHNICAL INFORMATION

For more information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

- Apply sealing bead (1) with a height of approx. 1.5 mm to 2.0 mm on inner side of timing case cover in marked locations. Use liquid sealing compound for this.

  Application time of sealing bead (1) must not exceed 12 minutes.



- Mount the timing case cover without the crankshaft seal.
- Renew screws (1) to (11).

  Parts: Bolts
- Join the bolts in with the sequence (1) to (11).
- Tighten screws in the order (1) to (11).

Rear timing case cover to crankcase

M6	Renew screws.	Jointing torque	8 Nm
		Angle of rotation	90 °

▸ **Installing the rear crankshaft seal**

RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) on the radial shaft seal with the sharp-edged connector gearing of the output shaft will result in destruction and/or leaks.

- When inserting the output shaft, make sure that the connector gearing of the output shaft does not touch the sealing lip (inner) of the radial shaft seal.

RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) and applying oil to the radial shaft seal will lead to its destruction.

- Do not touch the sealing lip (inner) of the radial shaft seal.
- Do not apply oil to the radial shaft seal.
- Install the radial shaft seal dry.

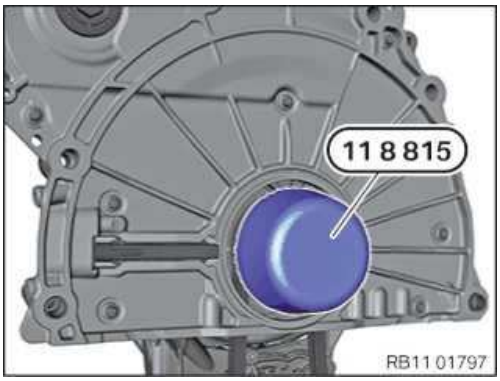
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RISK OF DAMAGE

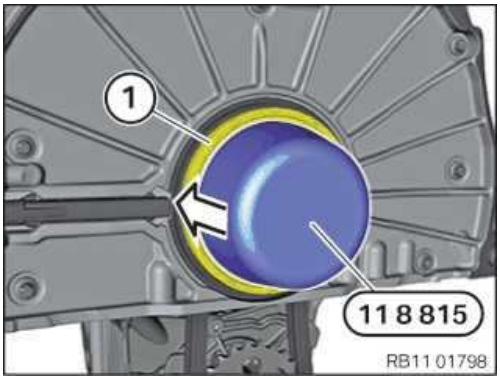
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Position special tool **0 496 137 (11 8 815)** on crankshaft. Make sure that the crankshaft sensor is not damaged.



- Fit the crankshaft seal (1) up to the timing case cover in the direction of the arrow using special tool **0 496 137 (11 8 815)** and position.
- Remove special tool **0 496 137 (11 8 815)**.



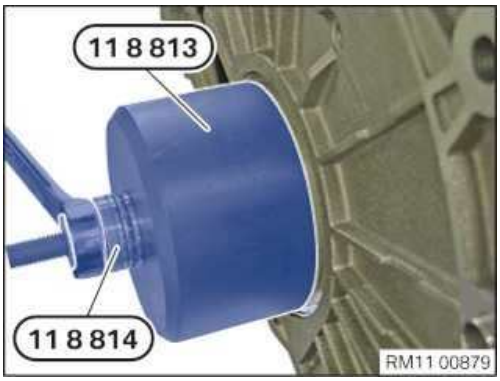
- Secure special tool **0 496 133 (11 8 811)** to the crankshaft using special tool **0 496 134 (11 8 812)**.



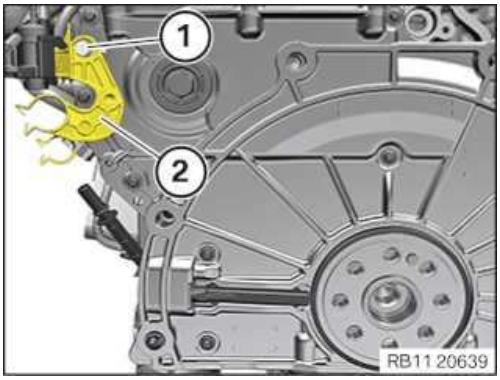
- Check the freedom of movement between the special tool **0 496 135 (11 8 813)** and the crankshaft sensor during installation.

  Otherwise there is a risk that the crankshaft sensor will be damaged.
- Slide on special tool **0 496 135 (11 8 813)**.
- Screw down special tool **0 496 136 (11 8 814)**.

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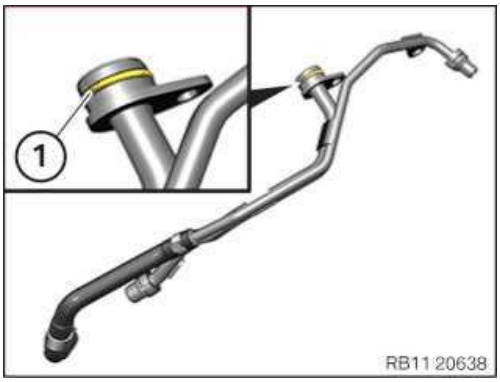


- Press in crankshaft seal with special tool **0 496 135 (11 8 813)**.
- Screw in special tool **0 496 135 (11 8 813)** up to timing case cover.



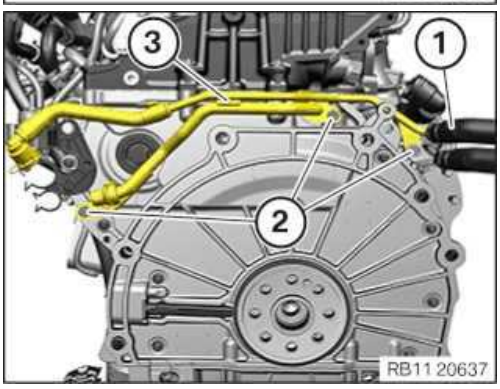
- Insert and install the holder (2).

▶ **If installed: Installing the coolant line of the SCR metering module**



- Renew the O-ring 1.

  Parts: O-ring



- Feed in and install coolant line (3).
- Tighten down screws (2).

SCR coolant lines to crankcase end cover

Hexagon screw M6x16		Tightening torque	8 Nm

- Connect and lock the coolant line (1).

  Coolant line (1) must audibly engage.

▶ **Cleaning the sealing surface**

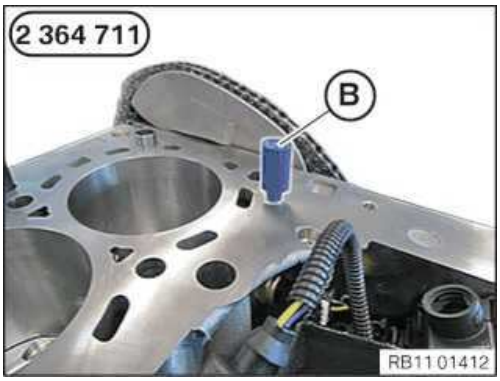
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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- Lock the front oil duct using special tool (B) from special tool **2 364 711**.



RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 103 (11 4 471)**.



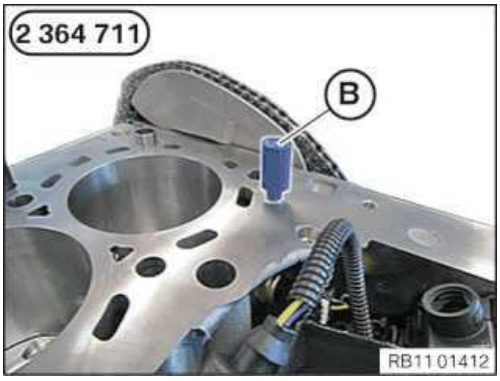
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

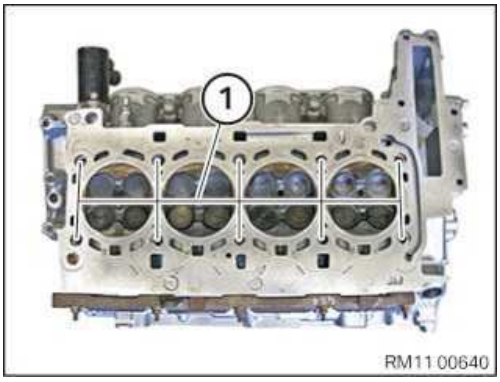
- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 104 (11 4 472)**.



- Remove special tool (B).

▸ **Renewing the cylinder head gasket**



RISK OF DAMAGE

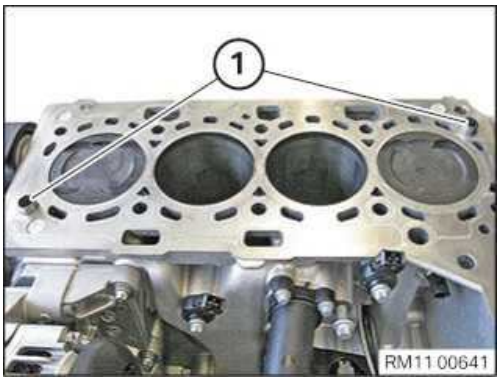
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

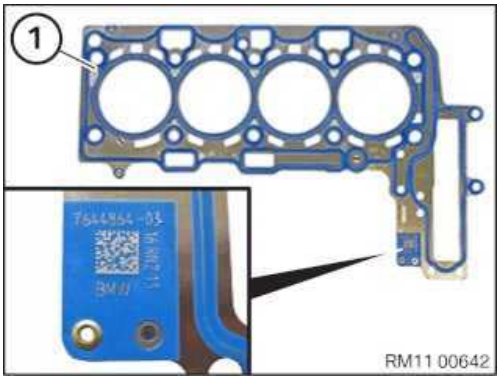
- Do not use any metal-cutting tools.

- Remove oil and dirt residue from the blind holes (1).

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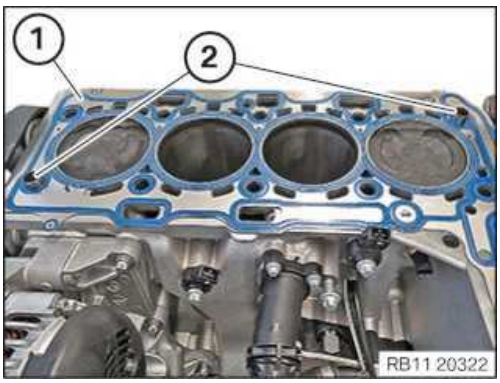


- Check the fitting sleeves (1) for secure fit and damage.



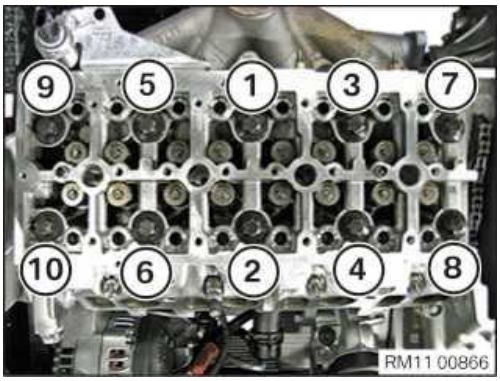
- Identify the cylinder head gasket (1) using the part number.

Note: If the cylinder head is reworked, an additional thicker gasket 0.3 mm is available for service personnel.



- Guide in the cylinder head gasket (1) and install.
- Ensure that the cylinder head gasket (1) is installed correctly in the fitting sleeves (2).

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CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Damage to threads.

Fluid in the threaded hole may damage the thread when screws are tightened in the threads.

- Dry threaded holes (e.g. using compressed air).

TECHNICAL INFORMATION

Do not remove bolt coating.

- Renew the cylinder head bolts (1).

  Parts: Cylinder head bolts
- Do **not** wash off coating of cylinder head bolts.
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

  No coolant, water or engine oil must be present in threaded holes of engine block.

TECHNICAL INFORMATION

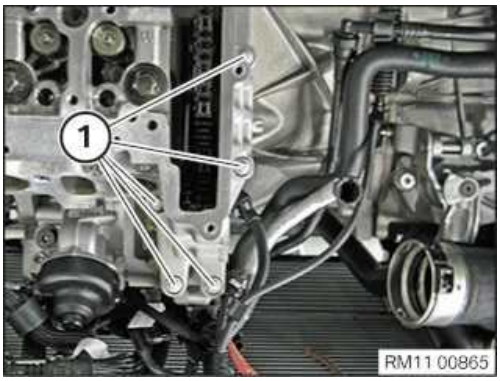
When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Feed in cylinder head bolts and install.
- Screw in cylinder head bolts in sequence (1) to (10).
- Tighten cylinder head bolts using special tools **0 490 504 (00 9 120)** and in sequence (1) to (10).

Cylinder head to crankcase

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

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- Tighten the cylinder head bolts (1).

Cylinder head bolt to timing case cover

M8x40		Tightening torque	19 Nm

-



TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

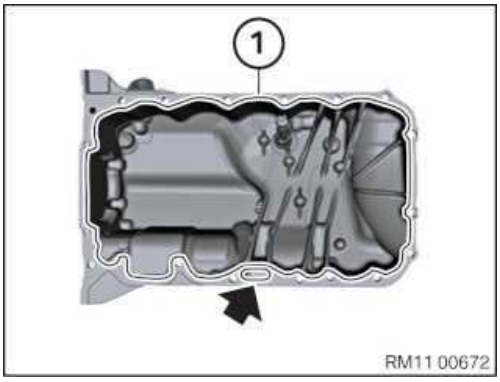
- Remove fine sealing remains on the sealing surface (1)and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.



TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove coarse sealing remains on the sealing surface (1)and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.



TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- Apply the sealing compound along the line (1) with a thickness of 2 mm to 2.5 mm.

  Apply the sealing compound along the inner edge.

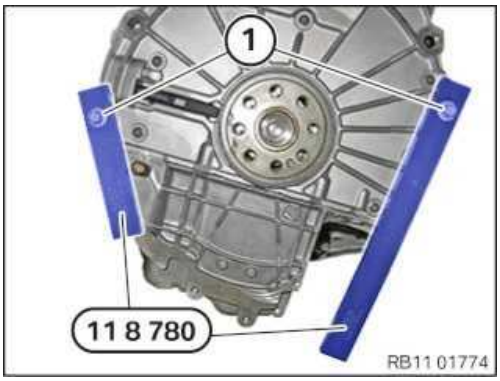
Sealing compound

Loctite 5970 liquid sealing compound	50 ml, Cartridge	83190404517

Overview of consumables (Electronic Parts Catalogue)

- Completely encircle the oil return orifice (arrow) with the sealing compound.

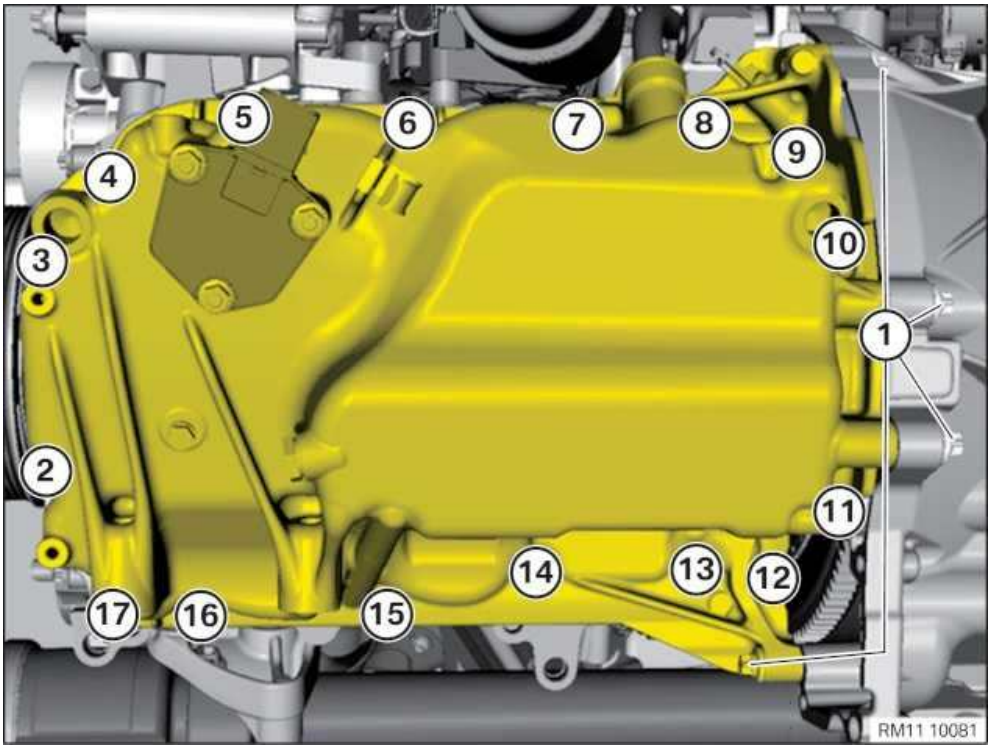
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TECHNICAL INFORMATION

The special tool 11 8 780 is only required when the transmission is removed.

- Position the special tool **0 496 120 (11 8 780)** with the transmission bolts (1) so that the oil sump is exactly flush with engine block.
- If necessary, renew fitting sleeves.



- Position and install oil sump.
- **Hand-tighten** oil sump screws (2) to (17) but do **not** tighten completely.
- Join transmission bolts (1) with 5 Nm.
- Tighten screws(2) to (17) of the oil sump.

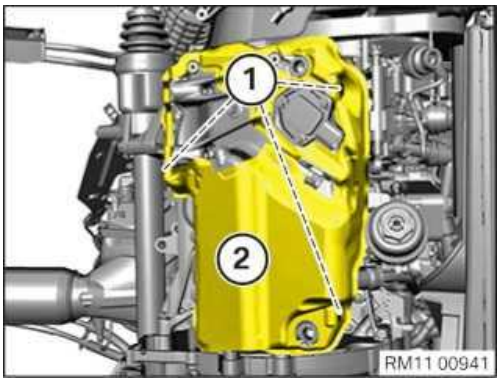
Oil sump to crankcase

M8x30		Tightening torque	2 Nr
M8x110		Tightening torque	2 Nr

- Tighten transmission bolts (1) on oil sump.

Transmission to oil sump

M8		Tightening torque	1 Nr



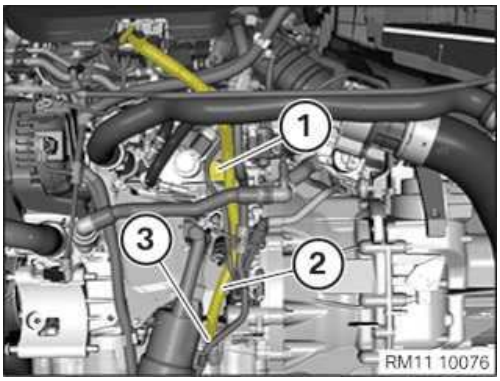
- Thread in and position the acoustic cover (2).
- Install the expanding rivet (1).



- Renew O-ring (1).

  Parts: O-ring

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- Guide in guide tube (2) for oil dipstick and insert it into oil sump.
- Make sure the sealing ring (3) is positioned correctly in the oil sump.
- Tighten down screw (1).

Guide tube for oil dipstick on engine

M8x16		Tightening torque	19 Nm

POSTPROCESSES

32 – Installing the flywheel

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



TECHNICAL INFORMATION

Clean all threads with a screw tap.

- Clean all screw threads (1).

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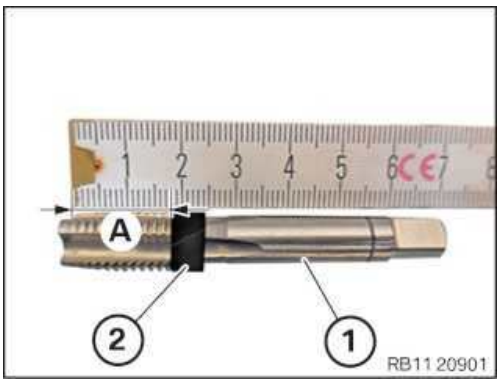
- Use the set of special tools **2 285 058**.

Description
Twist drill
Thread cutter M12x1.5
Depth
Insertion tool



- Assemble tool set.

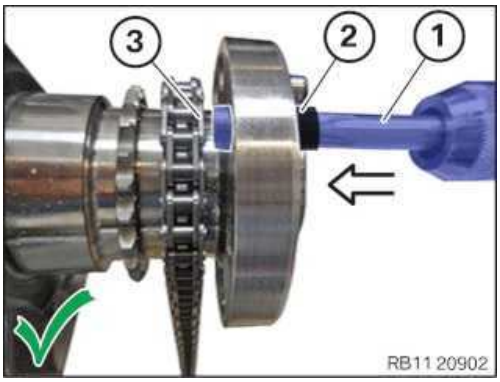
Number	Description
1	Tool holder
2	Thread cutter M12X1,5



- Mark the screw-in depth (A) on thread cutter (1) from the set of special tools **2 285 058** with a standard tool (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm



NOTICE

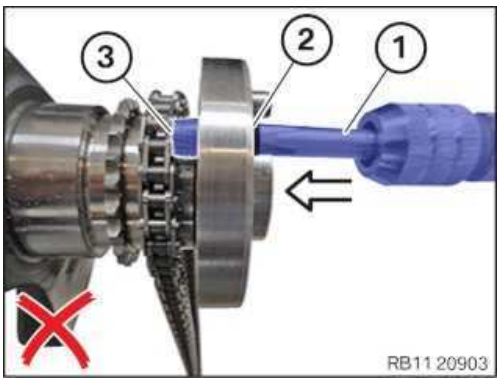
To provide a better overview: Shown with engine removed.

- Screw in the thread cutter (1) from the set of special tools **2 285 058** in direction of arrow up to the screw-in depth (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm

- Make sure that the thread cutter does (1) **not** rest on the timing chain (3).



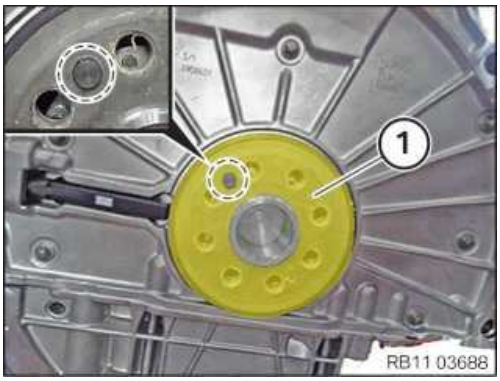
TECHNICAL INFORMATION

- **Carefully** handle the timing chain, to protect the timing chain and timing chain drive against damage.

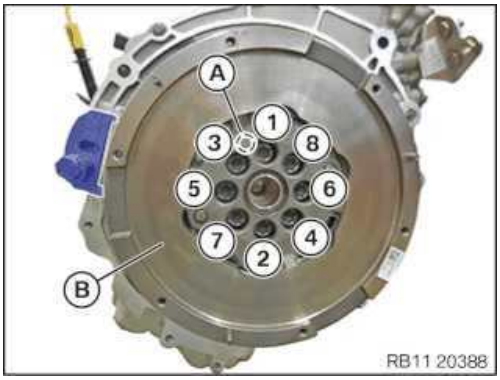
- Make sure that the screw-in depth (2) of the screw tap (1) is not exceeded.

  The thread cutter (1) may not rest on the timing chain (3).

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- During the installation, note the mark shown without fail.
- Install special tool (1) on the crankshaft as shown.

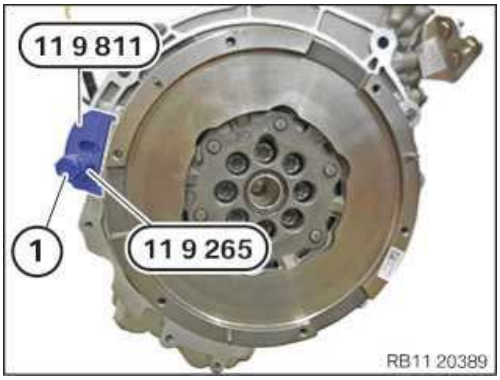


- Position flywheel (B) .
- Renew flywheel bolts (1) to (8).

  Parts: Flywheel bolts
- Tighten flywheel bolts hand-tight with special tool **0 491 018 (11 4 180)**.
- Observe tightening sequence. While doing so, begin with dowel pin (A).
- Tighten the flywheel bolts using the special tool **0 491 018 (11 4 180)** in sequence (1) to (8).

Flywheel to crankshaft

M12x1.5	Renew screws.	Tightening torque	120 Nm



- Loosen the transmission bolt (1).
- Feed out and remove special tools **0 494 793 (11 9 265)** and **0 496 171 (11 9 811)** with the **standard** (5 mm) washer.

33 – Install clutch

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

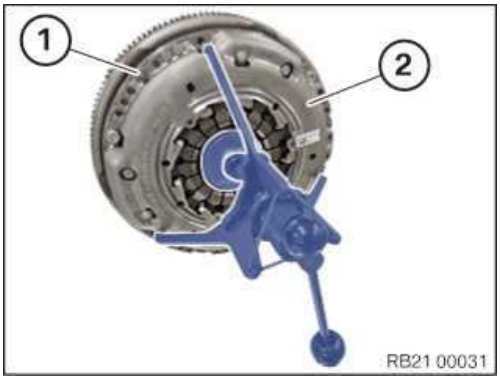
TECHNICAL INFORMATION

Handle the clutch disc carefully. Install the surfaces of the clutch disc in the correct mounting orientation.
Clean friction surfaces of the flywheel and the pressure plate with BMW-approved brake cleaner.
Note designation for ”engine side” / ”transmission side”.

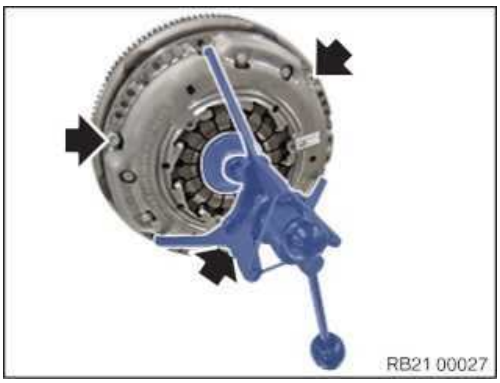
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- Centre the clutch disc (1) using special tool .



- Mount the clutch (2) together with the special tool to the flywheel.
- Observe the dowel pins (1).
- The clutch (2) must be secured via the dowel pins (1).

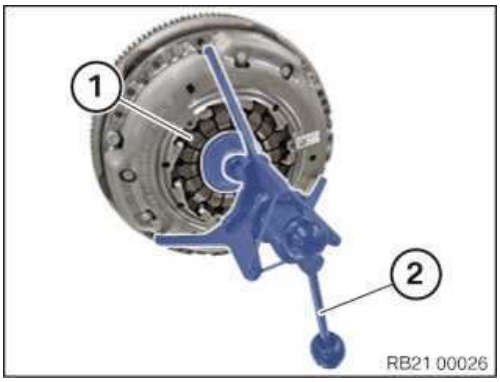


- Renew the bolts (arrows).

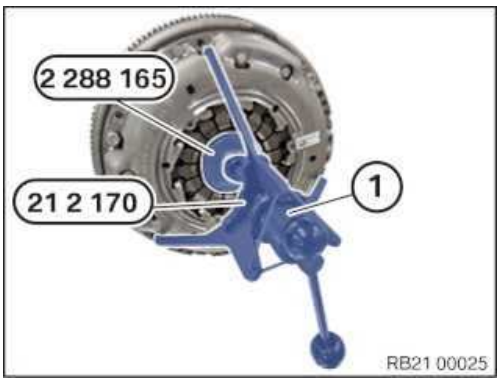
  Parts: Bolts
- Install and tighten screws (arrows).

Clutch to flywheel

M8	Renew screws.	Jointing torque	15 Nm
		Angle of rotation	90 °

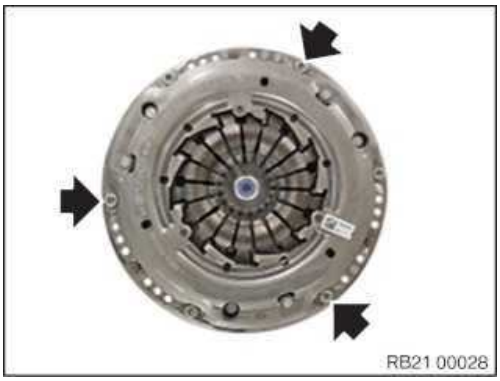


- Loosen the spindle (2) until the diaphragm spring (1) is fully relieved.



- Unscrew the knurled screw (1) and remove the special tool with **2 288 165** from the clutch.

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- Renew the bolts (arrows).

  Parts: Bolts

- Tighten screws (arrows).

Clutch to flywheel

M8	Renew screws.	Jointing torque	15 Nm
		Angle of rotation	90 °



- Withdraw special tool from clutch disc with aid of accompanying screw.

34 – Installing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



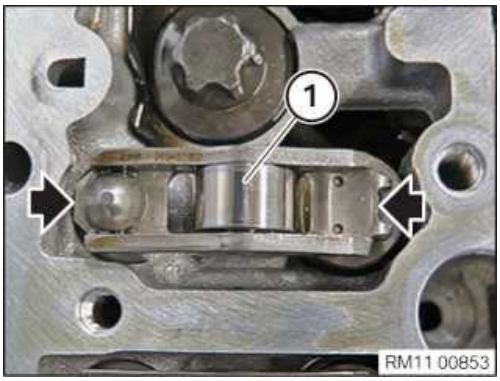
- Install the hydraulic valve clearance compensating element (1) in the direction of the arrow.
- Repeat the process on all hydraulic valve clearance compensating elements.

35 – Install the roller cam followers

TECHNICAL INFORMATION

- Note the installation position of the component. The component may be installed in various installation positions.

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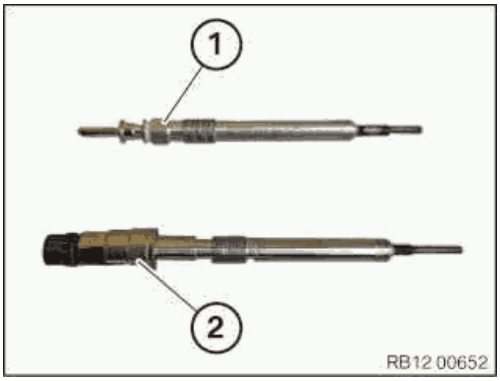


- Check all roller cam followers (1) for damage and replace if necessary.

  Parts: Roller cam followers
- Insert and install all roller cam followers (1).

  Roller cam followers (1) that have already been used must be installed in the same place.
- Note the mounting orientation of the roller cam followers (1).
- Oil all roller cam followers (1).

36 – Install glow elements



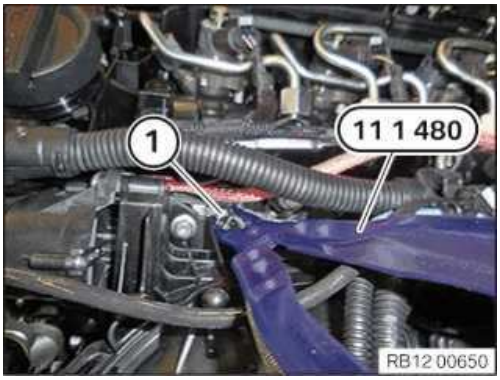
- Install glow elements (1) in cylinders 1, 2, 3 and 4.
- If fitted: Glow element (2) with the **combustion chamber pressure sensor** must be installed in cylinder **2**.



- Tighten the glow element with the special tool or conventional tools.

Glow elements to cylinder head

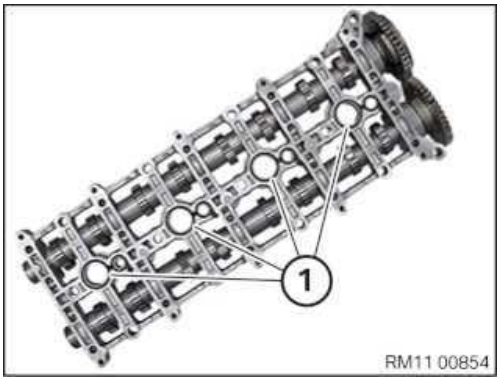
Glow element		Tightening torque	13 Nm



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

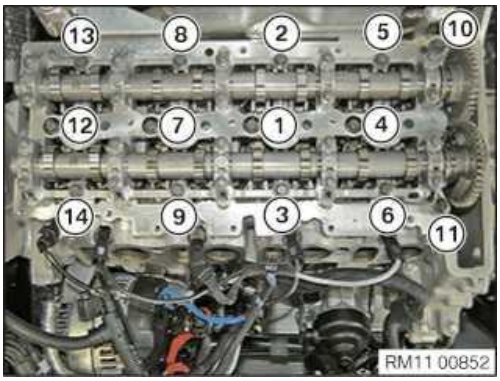
37 – Installing the camshaft support



- Renew gaskets (1).

  Parts: gaskets

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- Position the camshaft support including the camshafts.
- Tighten the screws in a sequence from (1) to (14) in several steps.

Camshaft carrier to cylinder head

M7x35		Tightening torque	13 Nm

38 – Adjusting the timing of the camshafts

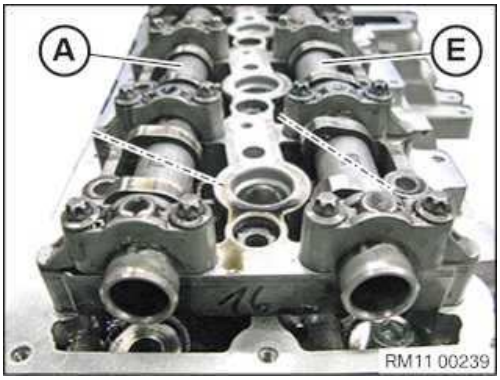


- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.



- Slide the special tool **2 288 380** completely into the bore hole of the oil sump.
- Use the special tool to block **2 288 380** the crankshaft in the TDC firing position at the first cylinder.



- The cam of the intake camshaft (E) at the first cylinder points up at an angle.
- The cam of the exhaust camshaft (A) at the first cylinder points outward at an angle.

▶ **Remove exhaust camshaft.**

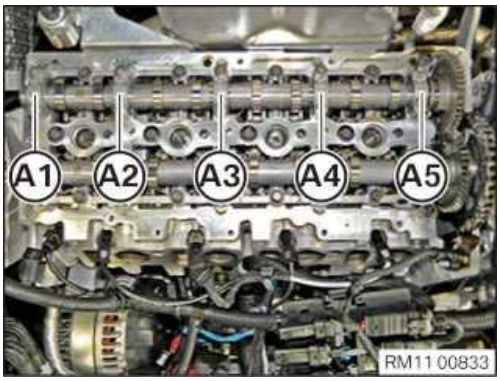
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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TECHNICAL INFORMATION

The camshaft is tensioned by the valve springs. Tighten or loosen each screw on the camshaft bearing caps one at a time in the specified sequence and by half a turn only. Repeat procedure.

- Loosen all screws of the exhaust camshaft bearing caps (A1) to (A5) from the outside to the inside, step by step in 1/2 turns.
- Remove exhaust camshaft in upward direction.
- Place all components on special tool **0 495 105 (11 4 480)** in a tidy and orderly fashion.

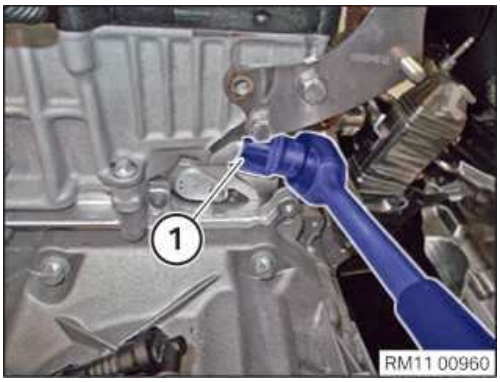
▸ **Remove chain tensioner piston**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

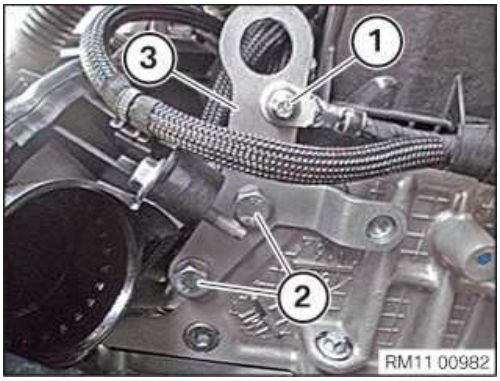


TECHNICAL INFORMATION

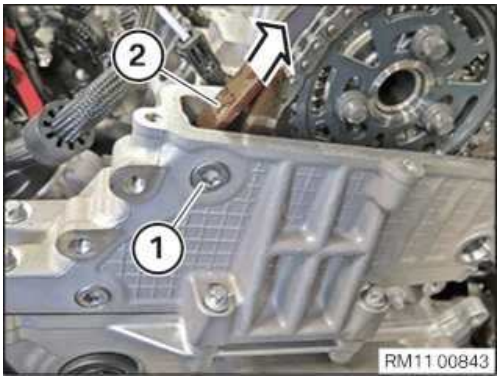
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

▸ **Remove the timing chain guide rail**



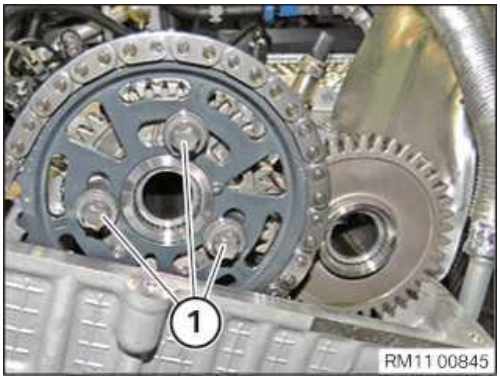
- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

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▶ **Removing the camshaft sprocket on the intake camshaft**



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

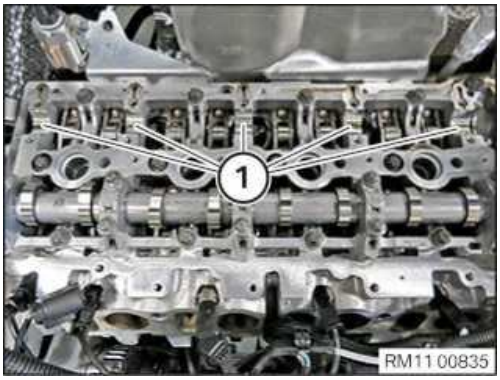
▶ **Install exhaust camshaft**

RISK OF DAMAGE

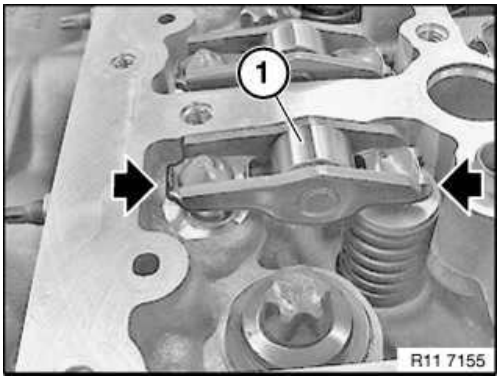
Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

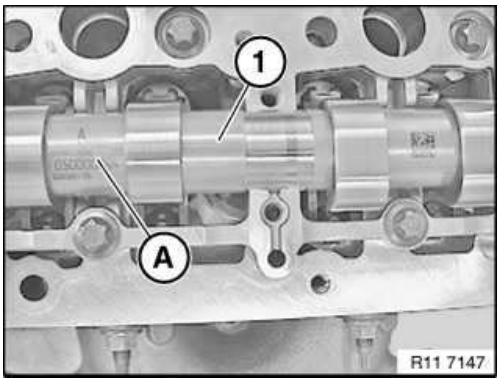
- Comply with the regulations for the installation and disassembly.
- Perform work with care.



- Oil all bearing positions (1).

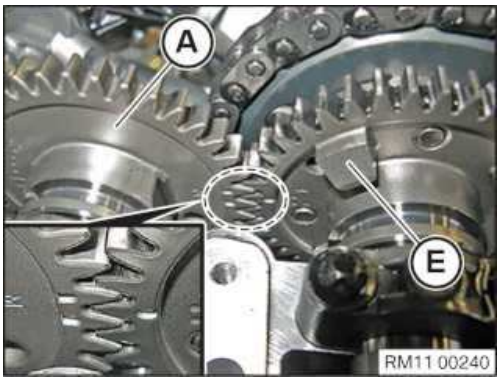


- Make sure the roller cam followers (1) have the correct mounting orientation.

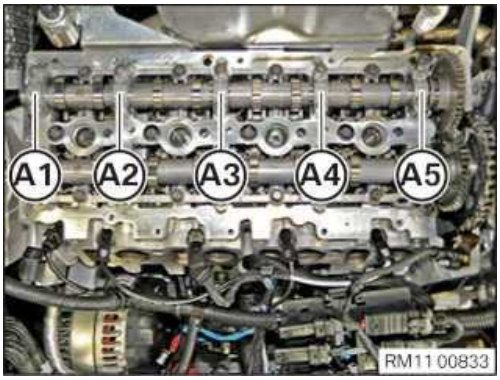


- Insert exhaust camshaft (1) so that the identification (A) points upwards.

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- Insert the exhaust camshaft (A) so that the marks on the camshafts (A) and (E) correspond in the highlighted area.
- Position the camshafts (A) and (E) accordingly.



- Tighten all exhaust camshaft bearing caps (A1) to (A5) from the inside to the outside by 1/2 a turn at a time.

Intake and exhaust camshaft in camshaft support

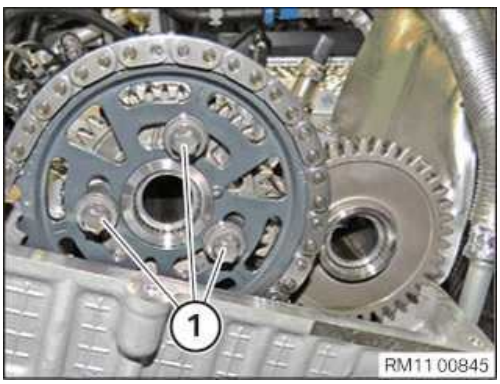
M6x31		Tightening torque	10 Nm



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

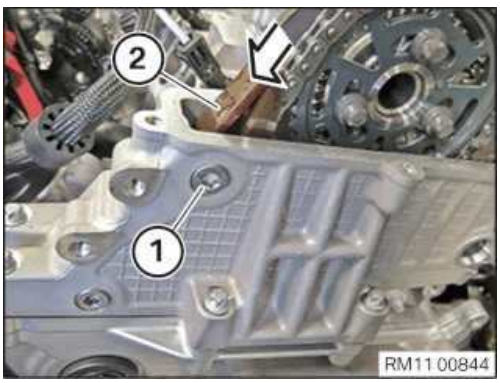
  Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

▶ **Installing the camshaft sprocket on the intake camshaft**



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

▶ **Install the timing chain guide rail**



- Position the guide rail (2) in the direction of the arrow.

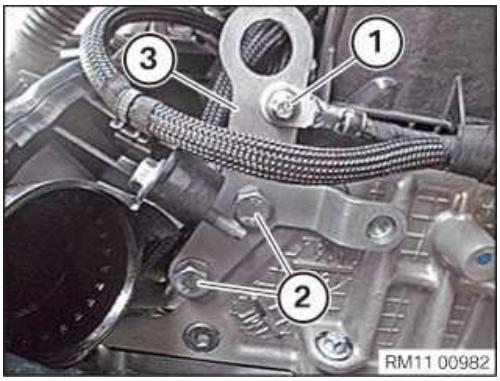
  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

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- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6		8 Nm

▸ **Installing the chain tensioner piston**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Renew sealing ring (1).

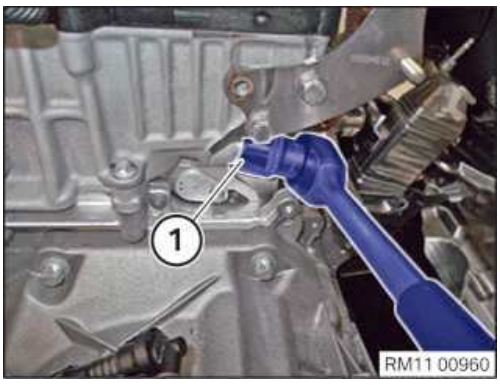
  Parts: Sealing ring



TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.



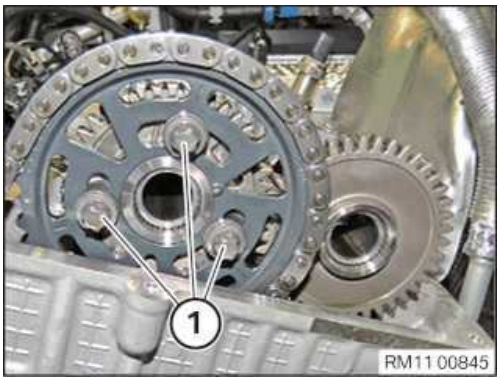
- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

▸ **Tightening the camshaft sprocket on the intake camshaft**

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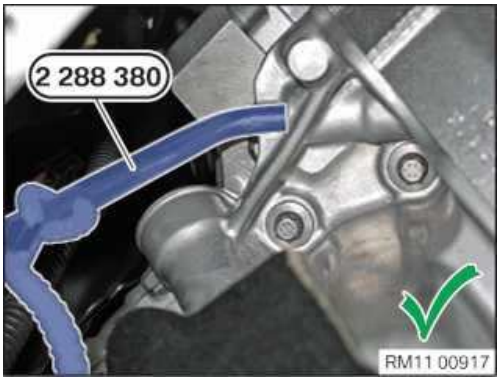


- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

39 – Removing the special tool to disconnect the crankshaft



- Remove special tool **2 288 380**.

40 – Removing the special tool to secure the exhaust camshaft



- Remove the special tool **0 496 112 (11 8 760)** to fix the exhaust camshaft.

41 – Checking camshaft timing



- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**

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RISK OF DAMAGE

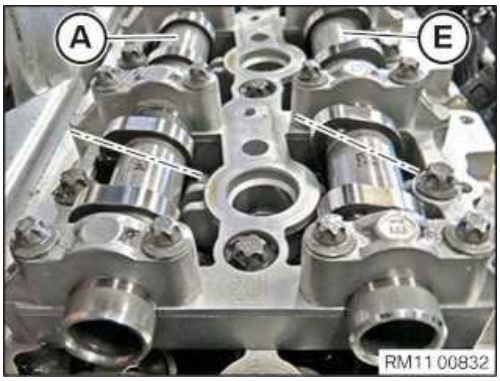
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

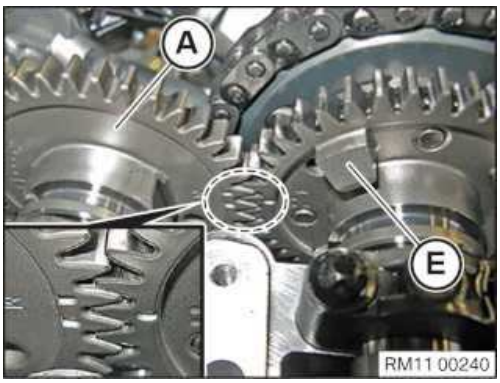
  Do **not** crank the engine in reverse.



- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

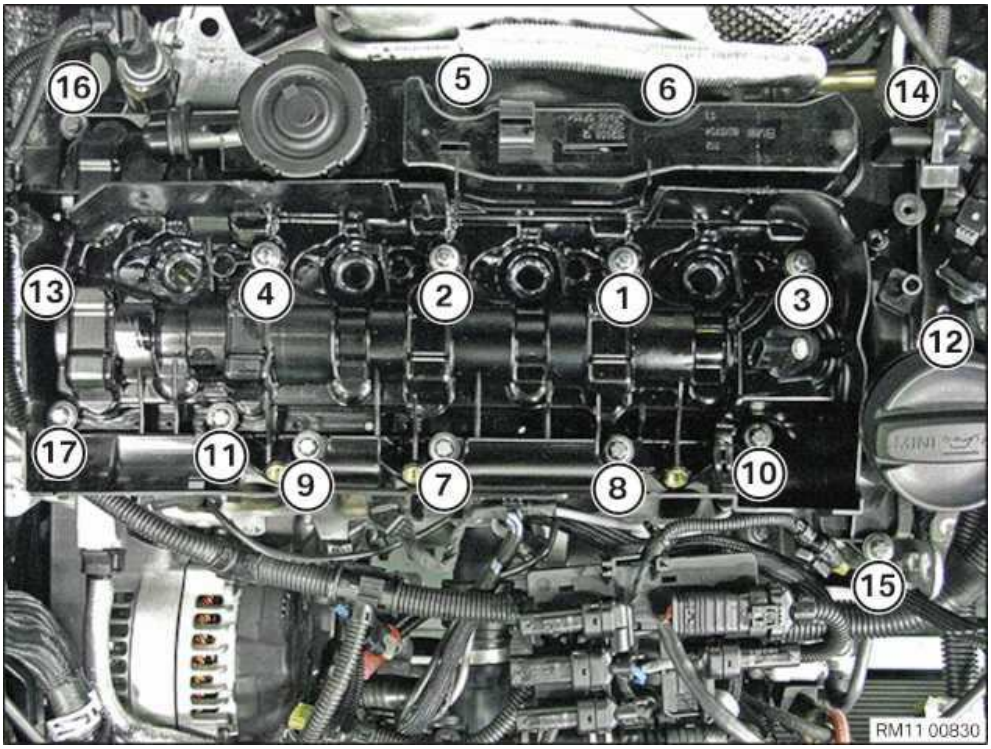
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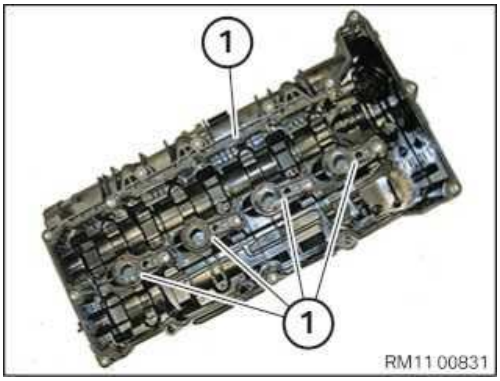
- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

42 – Installing cylinder head cover

Overview: Screw connection of the cylinder head cover



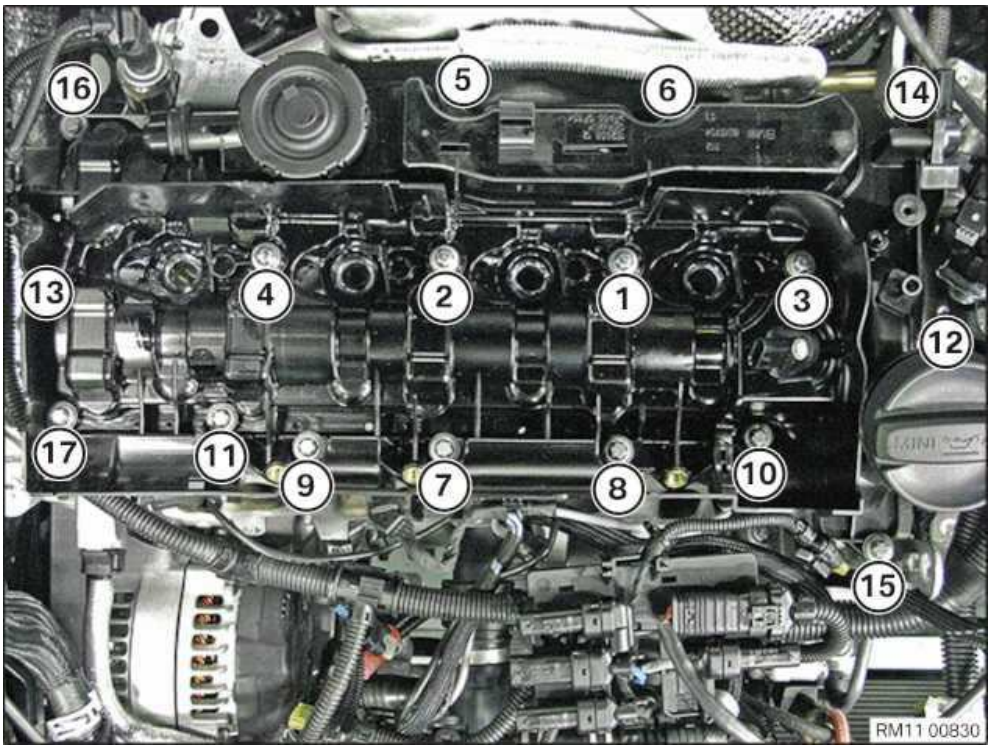
1 to 16 screws of the cylinder head cover.



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket

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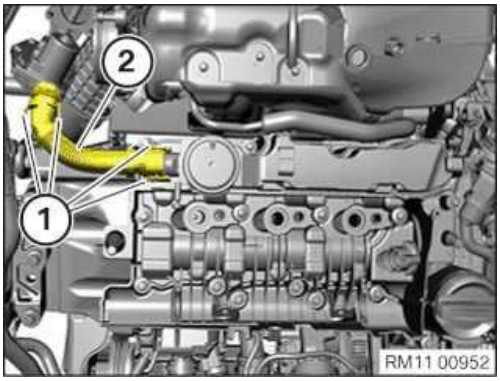


- Install cylinder head cover.
- Tighten screws in the order (1) to (17).

Cylinder head cover to cylinder head

M6		Tightening torque.	8, Nr

-



- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

43 – Installing injectors of injection system

▶ Cleaning the injector shafts

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

- Wear safety goggles.

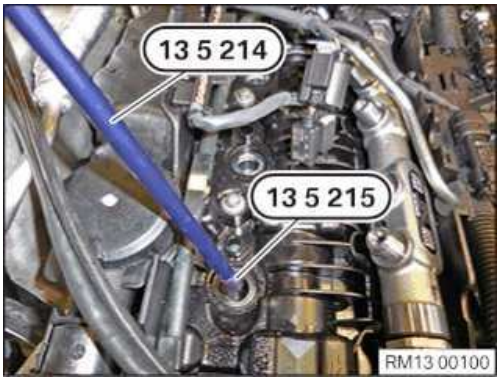
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RISK OF DAMAGE

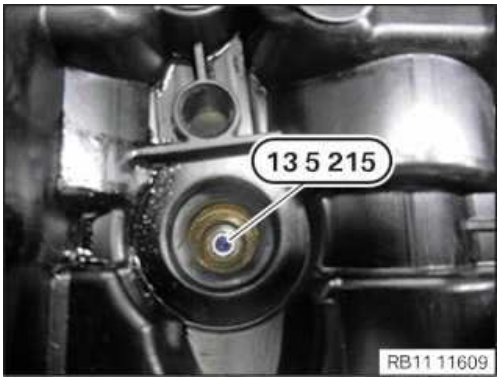
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.



- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.

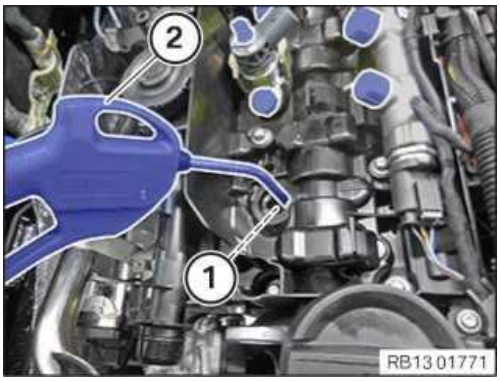


- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.

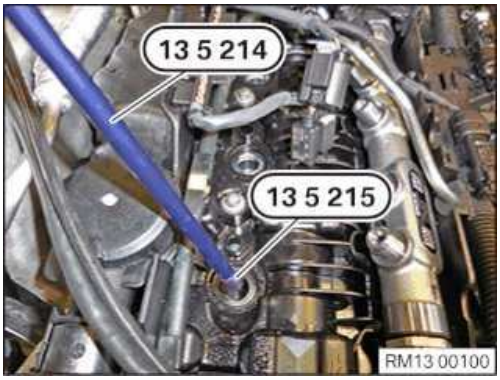


- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.

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- Blow out injector shaft (1) with air gun (2).



- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

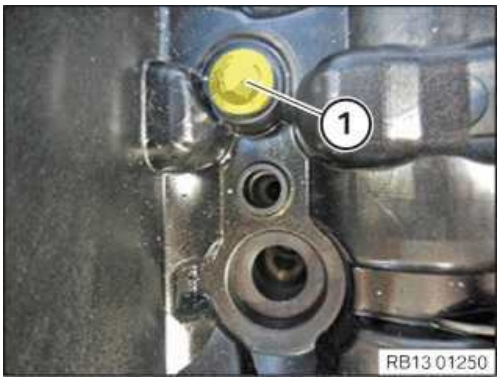
▸ **Check the placement of the clamping claw**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▸ **Prepare the injector for installation**

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



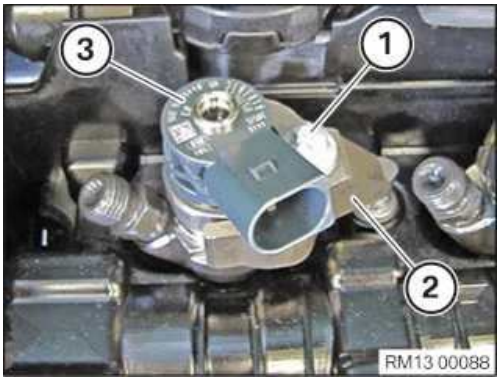
- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring

- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

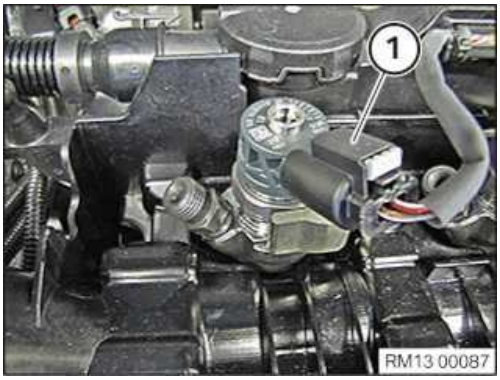
Injector lubricating grease	50 g, Can	83230441070



- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

▸ **Replacement: Perform injection quantity compensation**

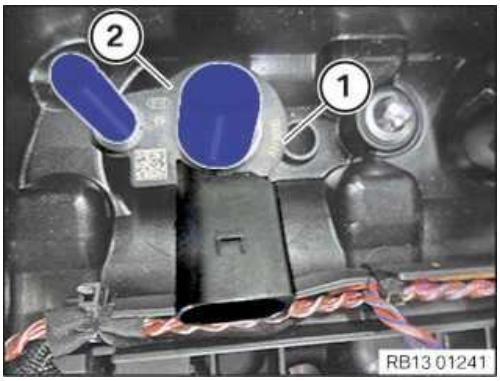
TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

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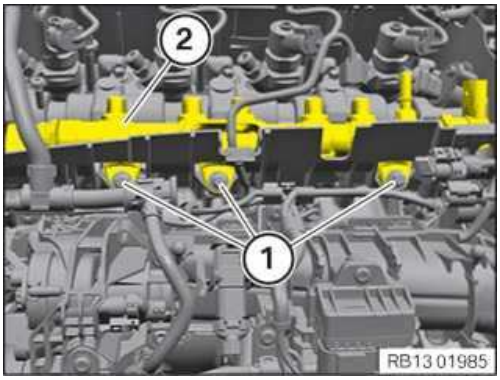


- Read off the adjustment value (1) on the new injector (2).



- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

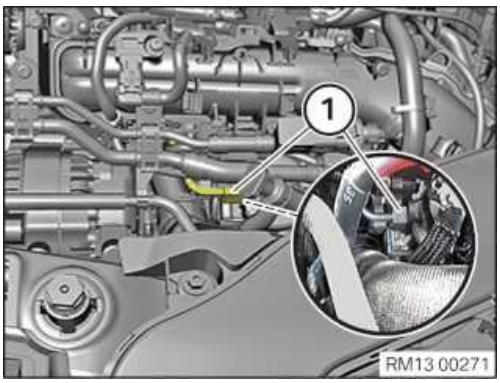
44 – Installing the rail



- Carefully insert and install the rail (2).
- Tighten the screws (1).

Rail on cylinder head cover

Torx screw M8x25		Tightening torque	19 Nm



TECHNICAL INFORMATION

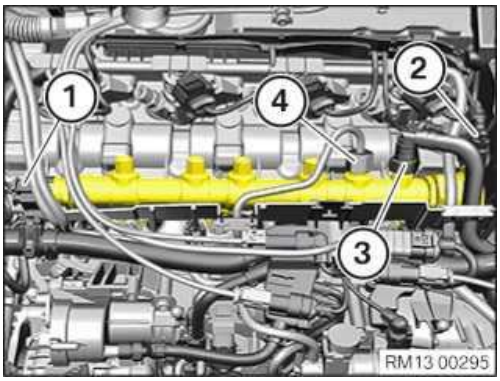
Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten union nut (1).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

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TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten union nut (4) with special tool .

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

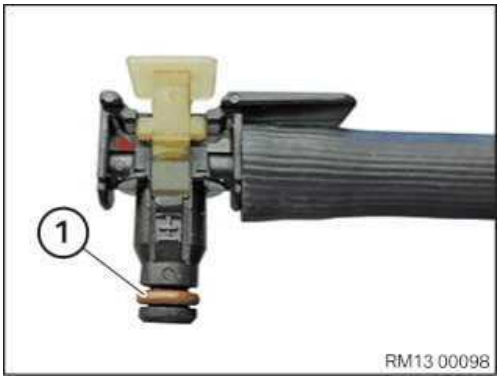
- Connect and lock the fuel line (3).

  Fuel line (3) must engage audibly.
- Connect connectors (2) and lock.

  The connector (2) must engage audibly.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

45 – Connect the leakage oil line on the injector



- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.



- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

46 – Installing high pressure lines between rail and injectors

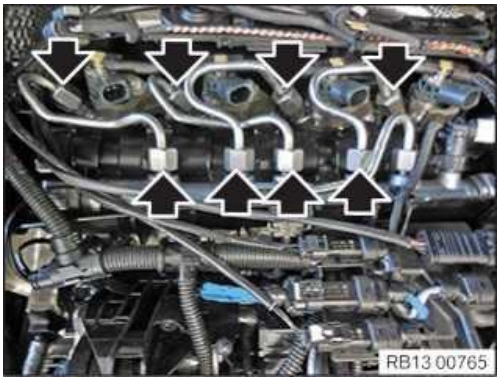
TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

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TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Remove special tool .
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

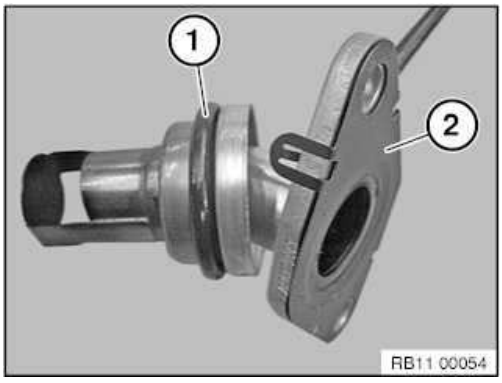
- Tighten the high pressure lines (arrows) with the special tool .

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

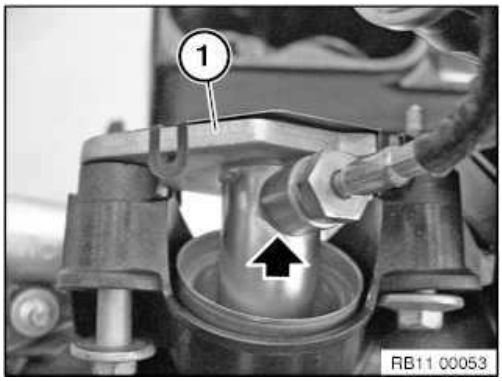
47 – Installing the intake plenum



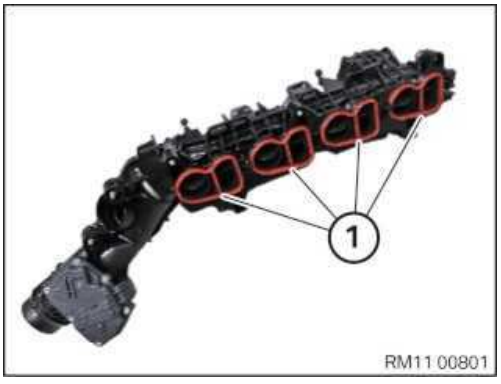
- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position the seal (2) and clip it in.



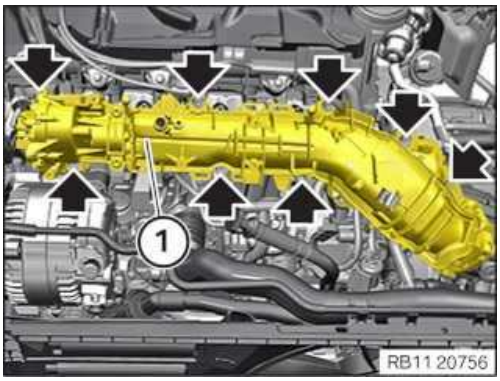
- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (1).

  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.

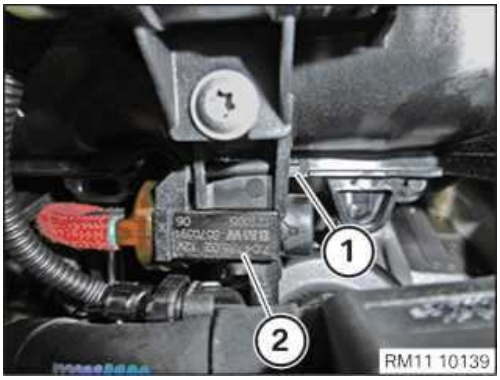
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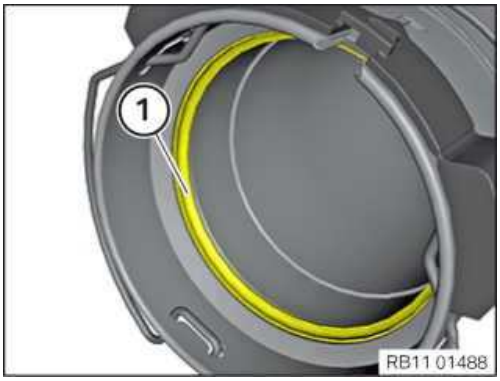
- Guide in and install intake (1) plenum.
- Tighten screws (arrows).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm

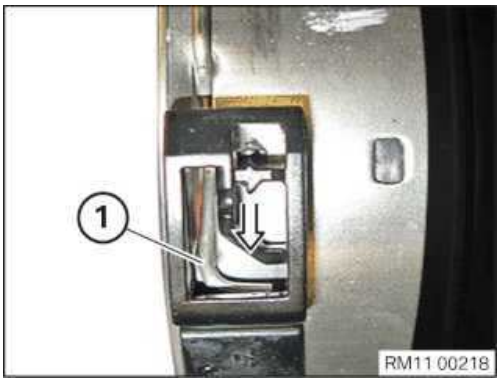


- Install the electric changeover valve (2) in the holder on the plenum from left to right.
- Lock (1) must engage audibly.

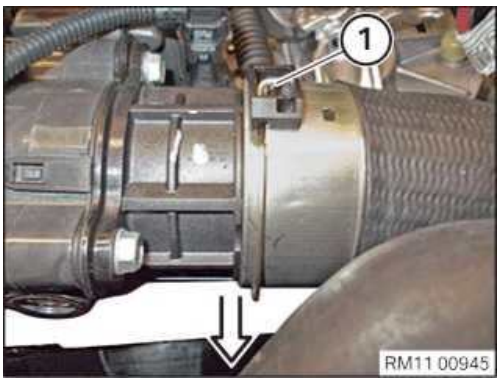


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring



- Engage the lock (1) on the bracket (arrow).



- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

48 – Remove the engine from the assembly stand

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CAUTION

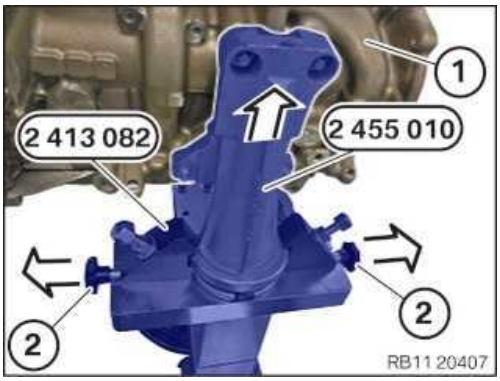
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



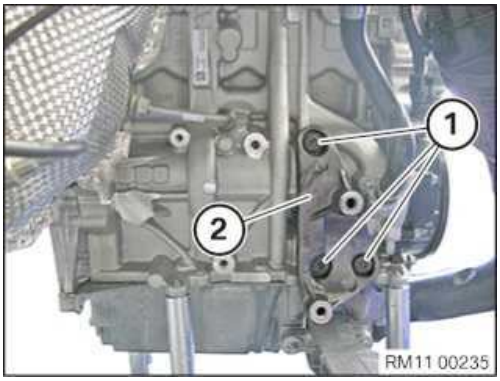
- Insert engine lifter with special tool and position engine (1).



- Unscrew the nuts on special tool .
- Detach the holder (2) in the direction of the arrow.
- Detach the engine (1) with special tool **2 455 010** out of the special tool in the direction of arrow.



- Remove conventional screws (arrows).
- Feed out the special tool **2 455 010** on the engine (1) and remove.



- Insert and install the holder (2).
- Tighten the screws (1).

Holder to crankcase

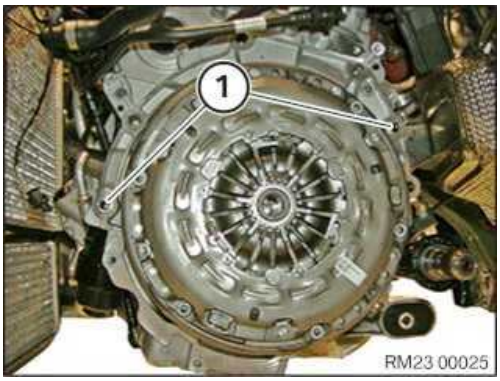
M10		Tightening torque	38 Nm

49 – Mounting engine on manual gearbox

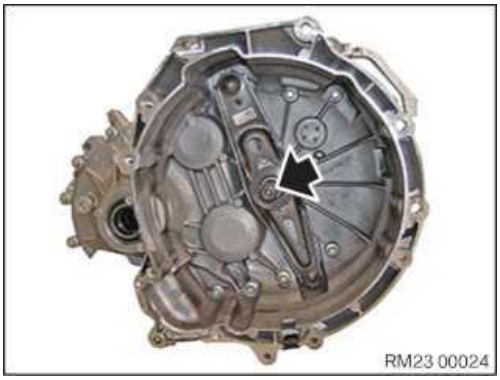
Prerequisite

Engine has been removed.

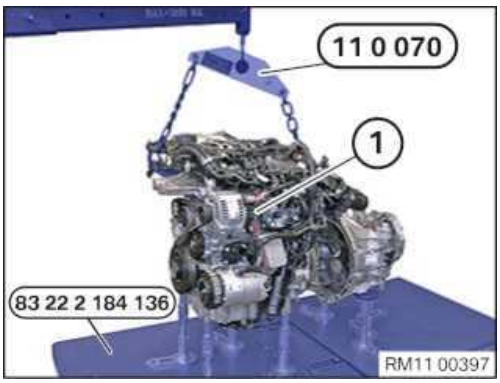
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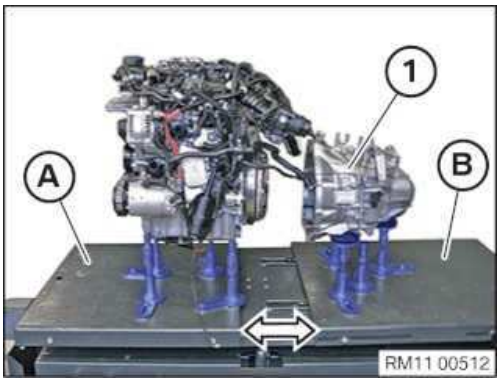
- Check for correct fit of fitting sleeves(1).
- Replace damaged fitting sleeves.



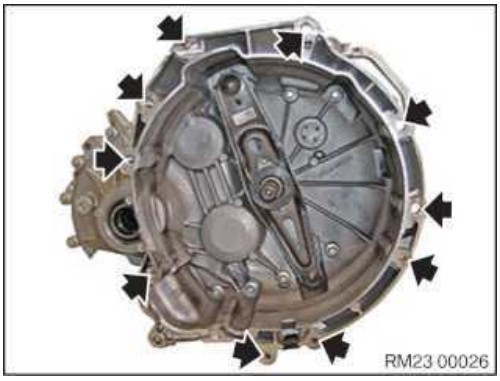
- Remove any grease from the transmission input shaft (arrow) and clean the shaft.
- Do not grease transmission input shaft.
- Check the clutch disc for frictional corrosion in the gearing and renew if necessary.



- Position the engine (1) on the lifting table **2 184 136** using the engine lifter and the special tool .
- Feed out engine lifter from engine (1) with special tool and push aside.



- Push table top (B) in direction of arrow and position manual gearbox (1) on engine.

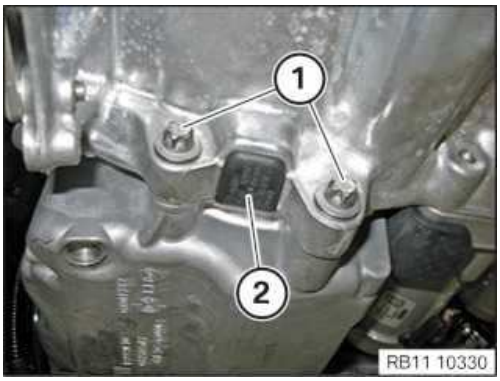


- Tighten screws (arrows).

Transmission to engine

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

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- Tighten the screws (1).

Transmission to oil sump

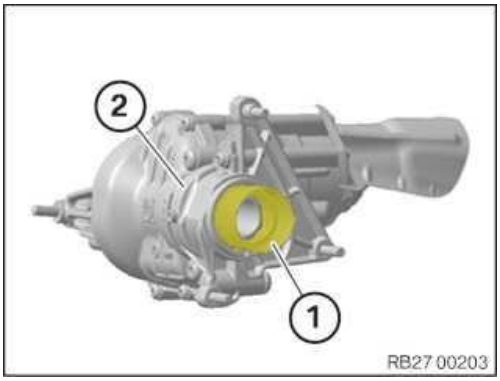
M8		Tightening torque	19 Nm

- Install the protective cap (2).



- Unscrew the bolts (1) of the special tool **2 459 012**.
- Feed out the special tool **2 459 012** at the cylinder head and remove.

50 – Install the transfer box (VTG)



- If intermediate shaft (1) gets caught on transfer box (VTG) (2), renew intermediate shaft (1) and the radial shaft seals in the automatic or manual transmission.



- Screw special tool **2 409 025** into the outer radial shaft seal.
- Turn the screw on the special tool **2 409 025** until the outer radial shaft seal has been pulled out.

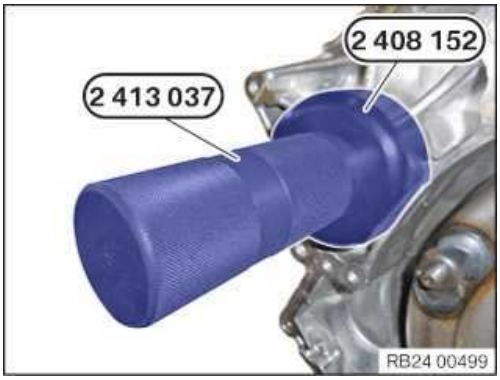


- Insert special tool **2 411 739** into the inner radial shaft seal.

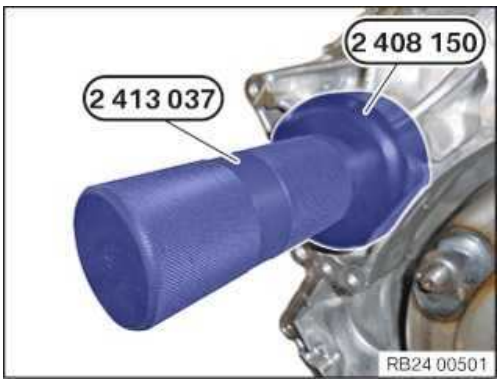
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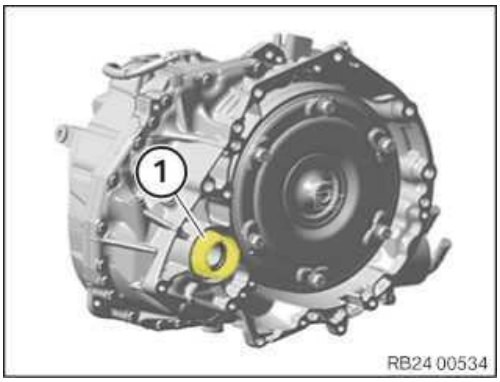
- Screw special tool **2 411 739** into the inner radial shaft seal.
- Turn the screw on the special tool **2 411 739** until the inner radial shaft seal has been pulled out.



- Drive in the inner radial shaft seal using special tools **2 408 152** and **2 413 037** up to the limit position.



- Drive in the outer radial shaft seal using special tools **2 413 037** and **2 408 150** up to the limit position.



- If necessary, connect the new intermediate shaft (1) to the output flange of the automatic transmission or manual transmission.

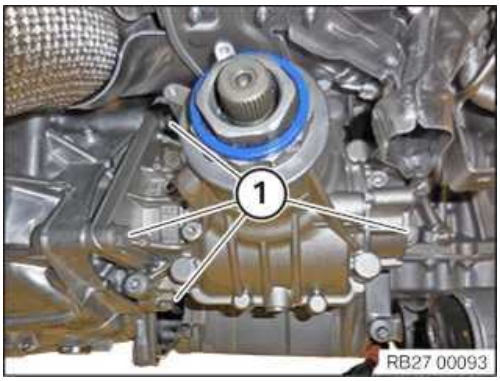


- Coat the inside of the output flange (arrows) evenly with approx. 5 g of grease.

Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754

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- Install the transfer box (VTG).
- Tighten the screws (1).

Transfer box to transmission

M10		Tightening torque	56 Nm



- Install heat shield.
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Heat shield to transfer box

M6	Renew screws.	Tightening torque	6 Nm

▸ **Check the transfer box oil level**

RISK OF DAMAGE

Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.



- Check transfer case oil level, correct:
- Open the oil filler plug (1).
- Check transfer box oil level.
- If necessary, top up transmission oil up to the lower edge of the oil filler plug opening (1).

Transmission oil

Technically suitable transfer box and electrical transmission oils	

Main group 27

- Tighten the oil filler plug (1).

Oil filler plug on transfer box (VTG)

M18x1.5		Tightening torque	35 Nm

51 – Install the intermediate shaft with the support tube

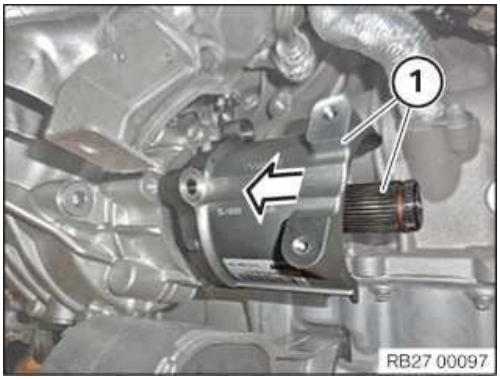
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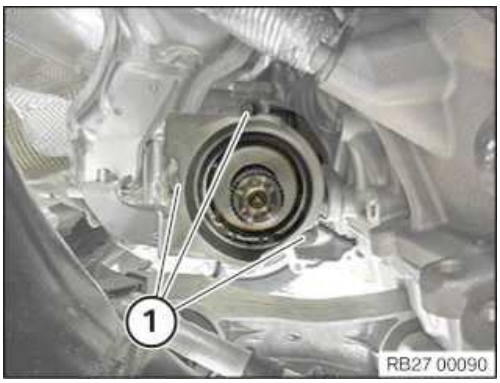
- Coat gearing of the intermediate shaft uniformly with 5 g of grease.

Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the intermediate shaft with support tube (1) in the transfer box.



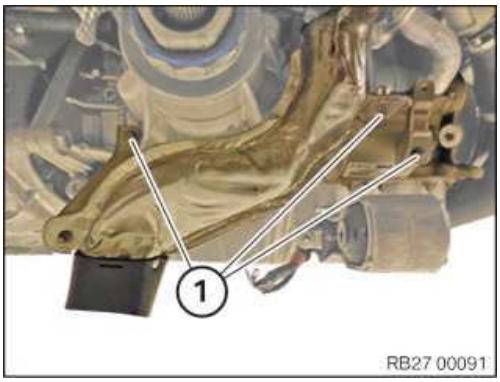
- Position screws (1).

Note: Check for correct screw length! Bolt M8x35 8.8

- Tighten the screws (1).

Intermediate shaft to transfer box

M8x35		Tightening torque	19 Nm



- If installed: Install air duct.
- Tighten the screws (1).

52 – Installing the high-pressure stage exhaust turbocharger

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

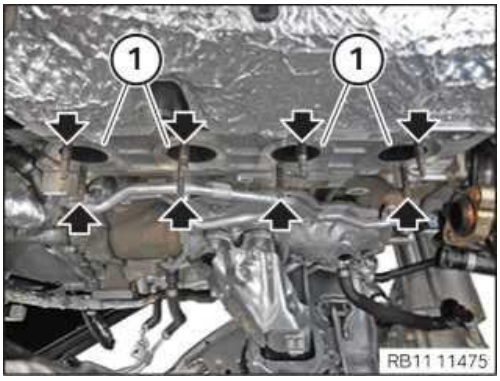
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

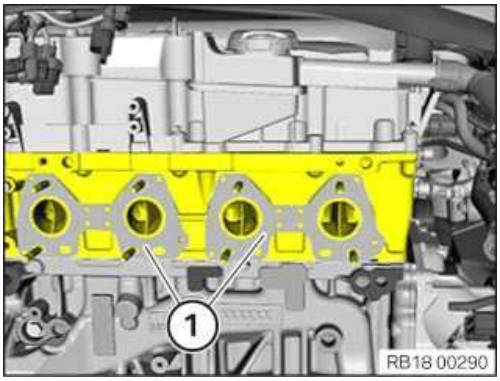
The sealing surfaces must be free from oils, grease and cleaning agents.



- Clean the sealing surfaces (1) on the cylinder head using special tool **0 495 102 (11 4 470)**.
- Check the stud bolts (arrows) on the cylinder head for correct fit.



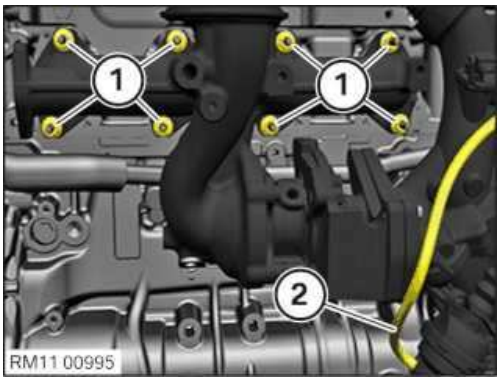
- Clean the sealing surfaces on the exhaust manifold using special tool **0 495 102 (11 4 470)**.



- Renew gasket (1).

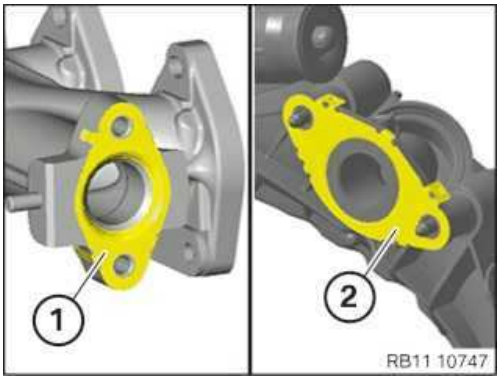
  Parts: Gasket
- Install new gasket (1).

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- Feed in and install the exhaust manifold and the high-pressure stage exhaust turbocharger.
- Tighten nuts (1).

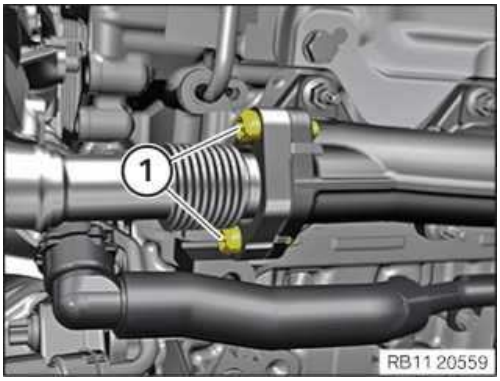
  Parts: Nuts
- Connect vacuum hose(2).



- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket
- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

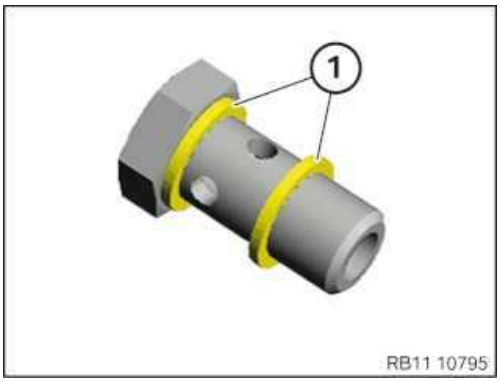
  Parts: Gasket



- Tighten the screws (1).

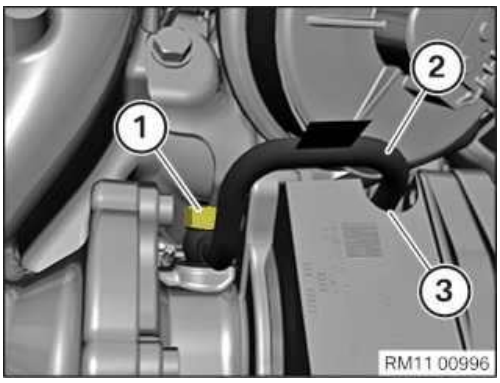
Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm



- Renew sealing rings (1) of banjo bolt.

  Parts: Sealing ring

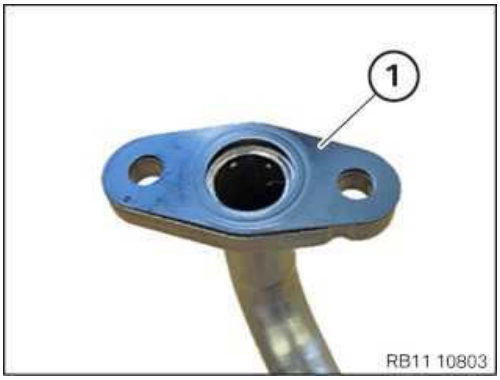


- Guide the oil feed line into the holder (3) and install it.
- Tighten down screw (1).

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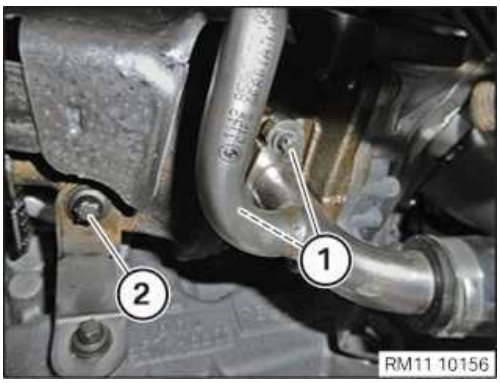


- Tighten bolt (1) from the right wheel arch.



- Renew seal (1) of oil return line.

  Parts: Gasket



- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

53 – Installing the low-pressure stage turbocharger

RISK OF DAMAGE

Damage to the surface.

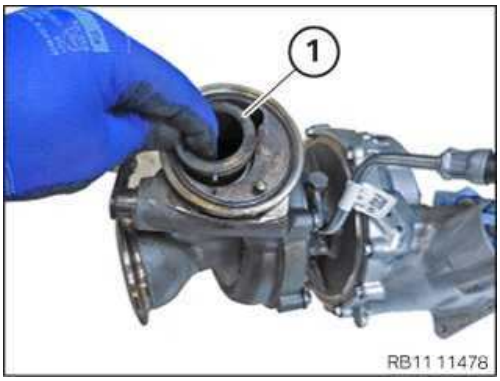
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

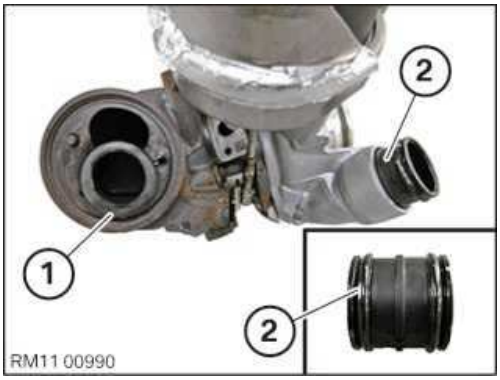
The sealing surfaces must be free from oils, grease and cleaning agents.

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- Check the spacer plug (1) for damage, renew if necessary.

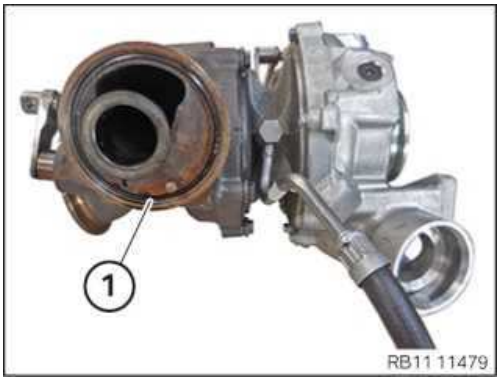
  Parts: Spacer ring
- Insert and install the spacer ring (1).
- Position spacer ring (1) correctly.



- Renew gasket (1).

  Parts: Gasket
- Position the seal (1).
- Renew the sleeve(2).

  Parts: Holding sleeve



- Renew sealing ring (1).

  Parts: Sealing ring
- Affix the sealing rings on the exhaust turbocharger.

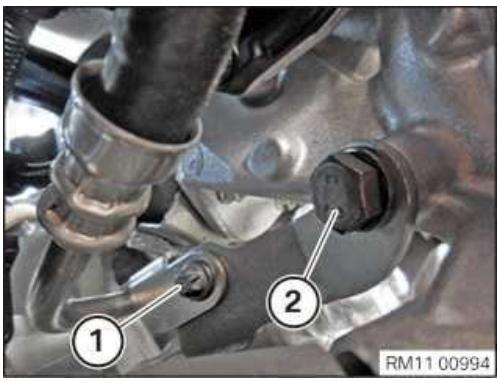


- Insert and install the low-pressure stage exhaust turbocharger on the exhaust manifold .
- Feed in and install V-band clamp .
- Tighten V-band clamp (2).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Screw in nut (1) with 2 **revolutions**.



- Tighten down screw (1).

Oil feed line to bracket

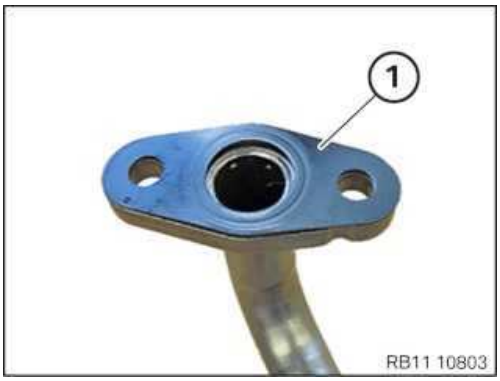
Torx screw M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

Holder to exhaust turbocharger and crankcase

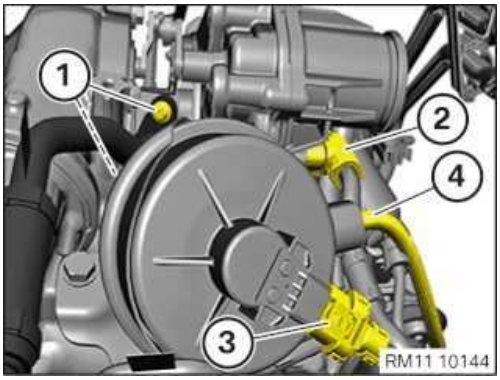
M8x16		Tightening torque	22 Nm

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- Renew seal (1) on the oil return line.

  Parts: Gasket



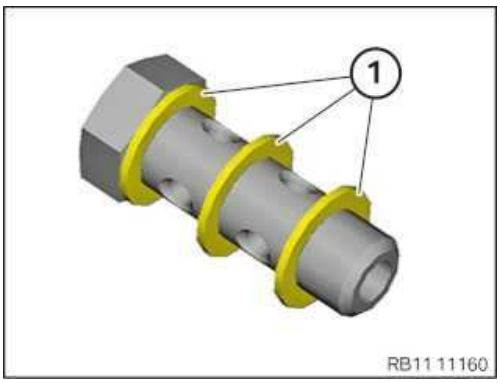
- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

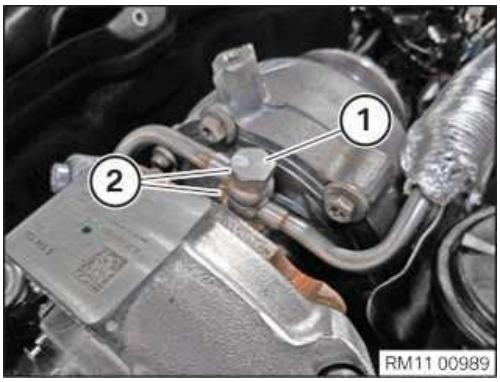
M6x12		Tightening torque	8 Nm

- Connect and lock connectors (2) and (3).

  The locks must engage audibly.
- Connect vacuum hose (4).

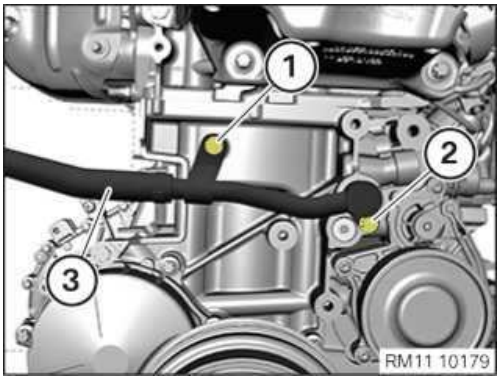


- Renew banjo bolt and sealing rings (1).
- **Parts:** Banjo bolt, sealing rings



- Install sealing rings (1).
- Tighten the banjo bolt (1).
- Ensure that the lines do not rest against the adjacent components.

54 – Attaching assemblies (on lifting table)



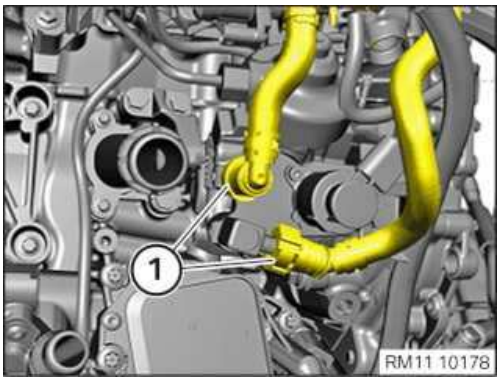
- Renew sealing ring of the coolant line (3).

  Parts: Sealing ring
- Coat the sealing ring and install the coolant line (3) .
- Tighten down screws (1) and (2).

Standard screw connection M6

M6		8 Nm

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- Connect and lock fuel lines (1).

  The fuel lines (1) must audibly engage.

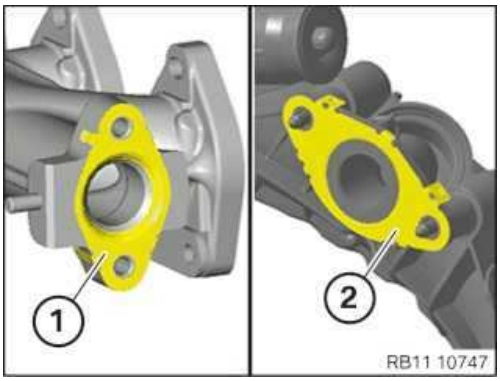
▶ **Installing the exhaust-gas recirculation cooler**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



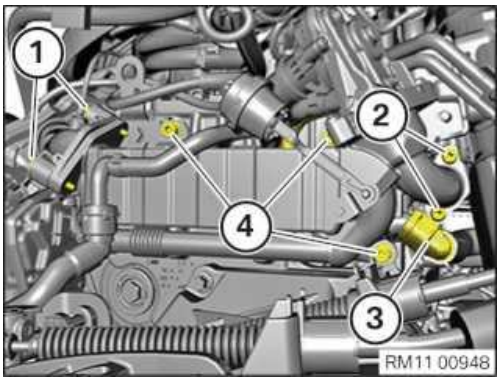
- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket

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- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts
- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

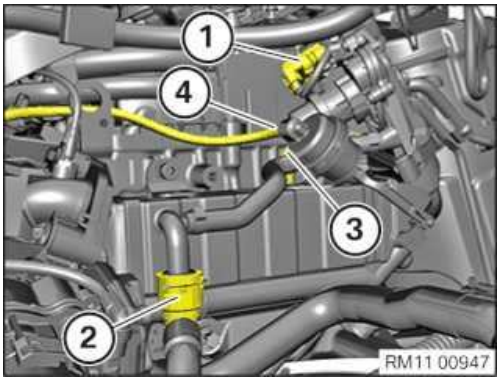
M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.
- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm



TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

▸ **Installing heat shield on exhaust turbocharger at bottom**

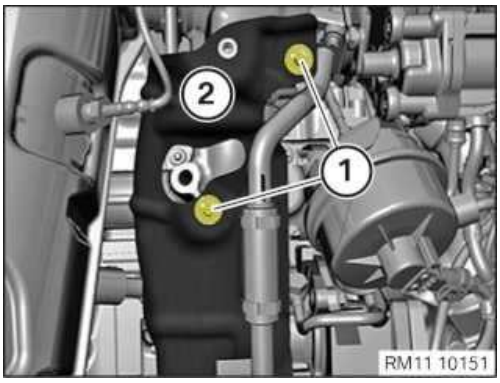
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WARNING

Hot surfaces.

Risk of burning!

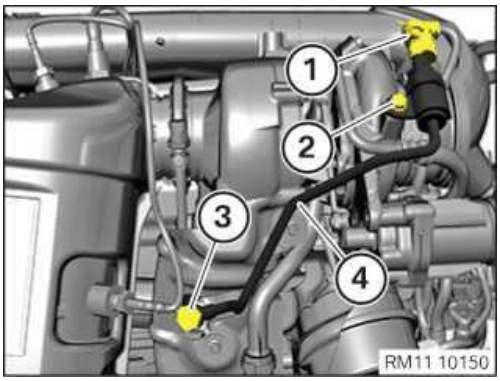
- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (2).
- Tighten the bolts (1) on the heat shield .

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm



- Position the exhaust gas pressure pipe (4).
- Hand-tighten the bolt (2).
- Renew sealing rings on the banjo bolt (3).

  Parts: Sealing ring
- Tighten the banjo bolt (3).

Banjo bolt for exhaust pressure pipe to exhaust manifold

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

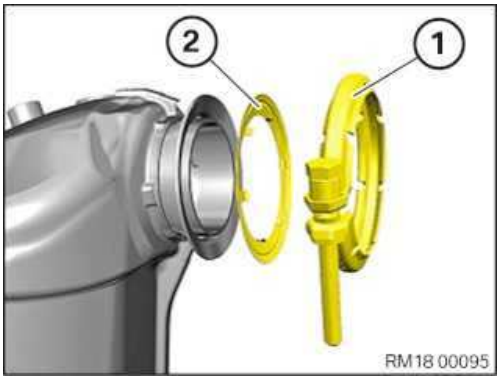
- Tighten down screw (2).

Standard screw connection M6

M6		8 Nm

- Connect connectors (1) and lock.

  Lock must audibly engage.



CAUTION

Heavy component.

Heavy components can lead to injury or damage.

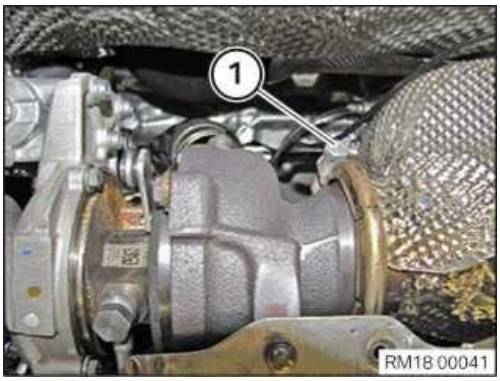
- Remove and install heavy components with the aid of another person/other persons.

- Renew the V-clip (1).

  Parts: V-band clamp
- Renew the gasket (2).

  Parts: Gasket

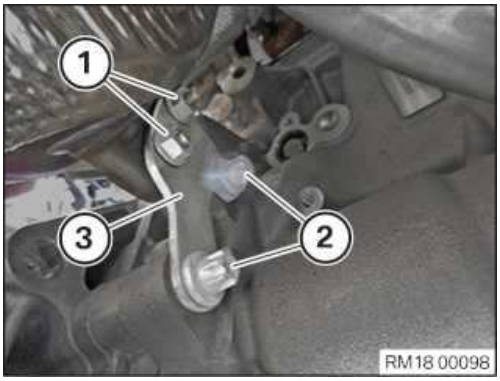
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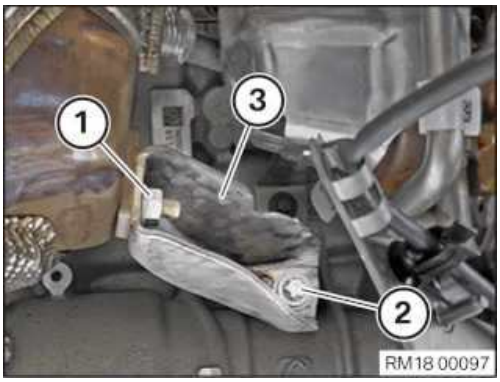
- Carefully insert and install the diesel particulate filter .
- Feed in and install V-band clamp (1).
- Make sure that the seal between the diesel particulate filter and the exhaust turbocharger is installed correctly.
- Align the diesel particulate filter on the exhaust turbocharger.
- Position V-clip (1).
- Hand-tighten the V-clip (1).



- Tighten nuts (1) by hand.



- Install holder (3).
- Hand-tighten the bolts (2).
- Tighten nuts (1) by hand.



- Install holder (3).
- Tighten the nut (1) hand-tight.
- Hand-tighten the bolt (2).



- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

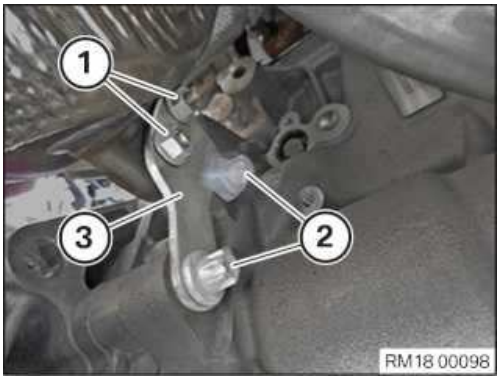
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- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screws (2).

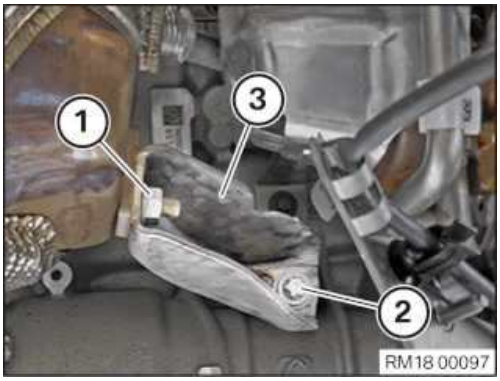
Diesel particulate filter holder to gearbox

M12x75		Tightening torque	66 Nm

- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screw (2).

Diesel particulate filter bracket to crankcase

M10x35		Tightening torque	38 Nm

- Tighten nut (1).

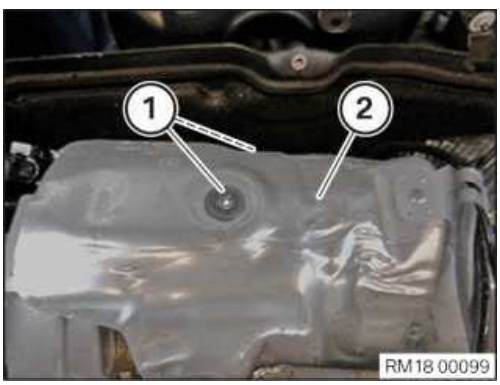
Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Remove fitting aid (1) for the flexible tube.

▶ **Install the heat shield on the exhaust turbocharger**



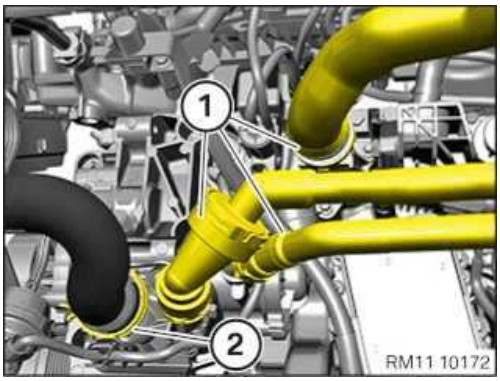
- Feed in and install the heat shield (2).
- Tighten the screws (1) at the top and bottom of the heat shield.

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

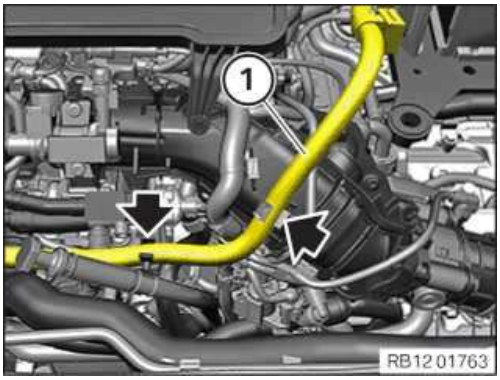
- Fasten the cable at the clips .

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- Install the coolant hose and secure with the clamp (2) .
- Connect and lock the coolant lines (1).

  The coolant lines (1) must engage audibly.



CAUTION

Improper routing of the positive battery cable.

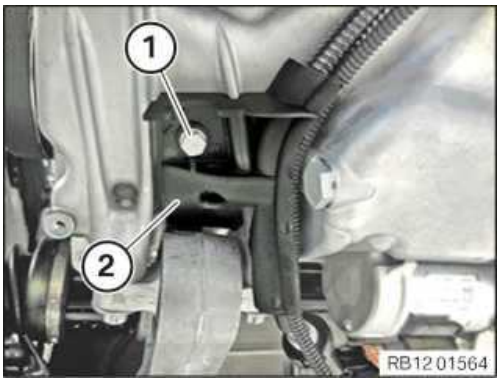
Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

- Insert the positive battery cable (1) into the clamps (arrows).



- Feed in and install positive battery cable at the clamps (1).



- Insert and install the holder (2).
- Tighten down screw (1).

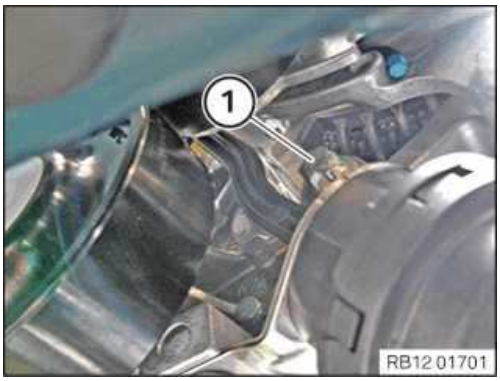
Bracket to oil sump

M6		Tightening torque	8 Nm



- Insert and install alternator (1) along with the screw (2) on the bottom of the alternator through the slot on the support.

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- Tighten the screw (1) below on the alternator.

Alternator to component carrier

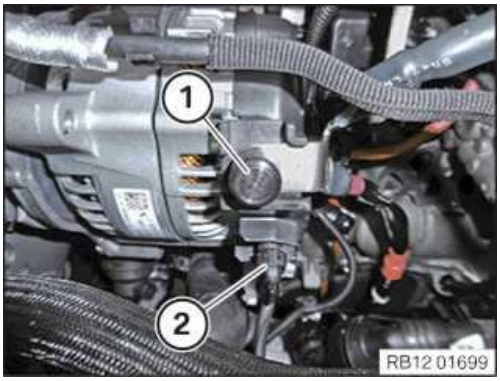
M10x75 / M10x125		Tightening torque	38 Nm



- Tighten the bolt (1) on top on the alternator.

Alternator to component carrier

M10x75 / M10x125		Tightening torque	38 Nm



- Mount positive battery cable to the alternator.
- Tighten nut.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

- Mount the cover (1).
- Connect the connector (2) to the alternator and lock audibly.



- Install air conditioning compressor (2) and position it correctly.
- Tighten the screws (1).

Air conditioning compressor in component carrier

M10		Tightening torque	38 Nm

▸ **Installing the drive belt for alternator**

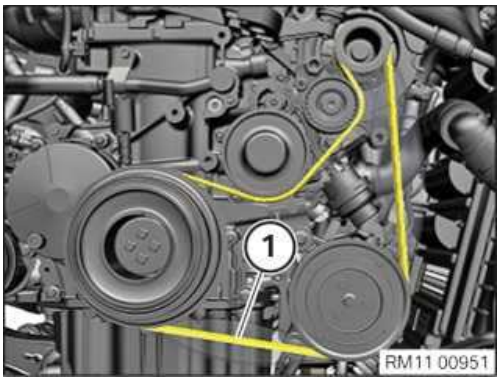
TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

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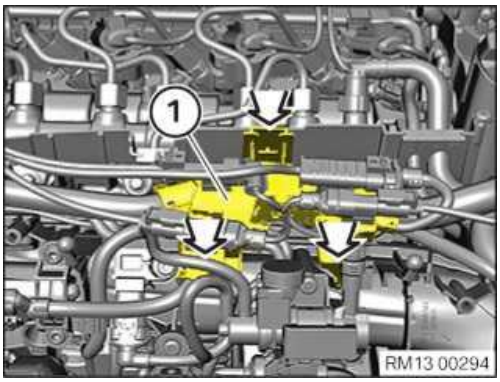


- Feed in the drive belt for the alternator (1) and install it.

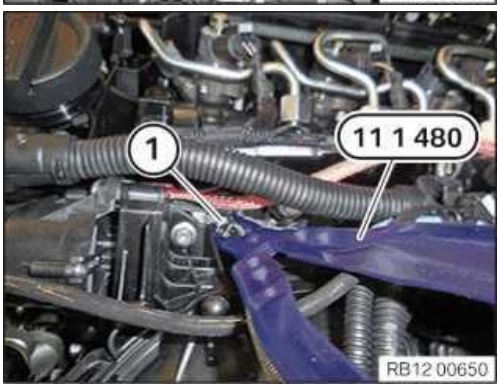


- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool **0 496 268 (11 0 390)** out of the belt tensioner and remove it.

▶ **Installing the cable clip for the intake plenum**

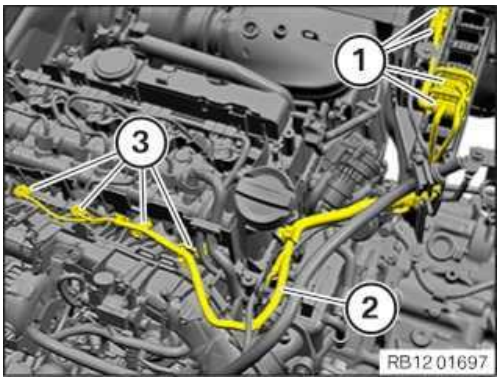


- Insert and install the cable clip (1) in the direction of the arrow.
- Make sure the cable clip (1) is fitted correctly.



- Connect and lock the connector (1) on the glow elements.

  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.

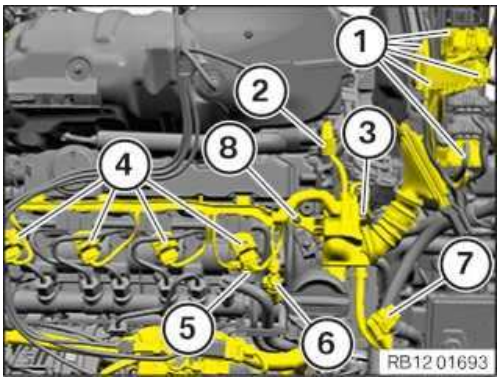


- Lay vehicle wiring harness and fasten with clamps.
- Route all connectors (1) to the integrated supply module (PDM) and to the DME control unit.
- Connect all connectors (3) to the glow elements and engage them audibly.
- Mount ground strap and tighten screw (2).

Ground cable to cylinder head

M6x12		Tightening torque	8 Nm

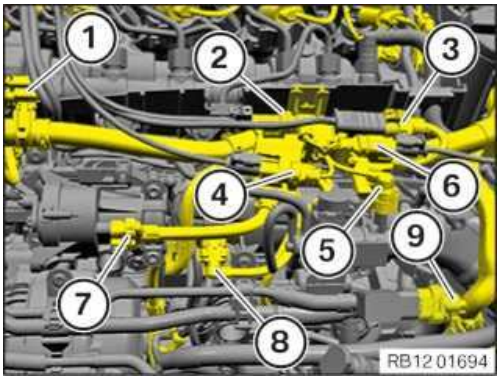
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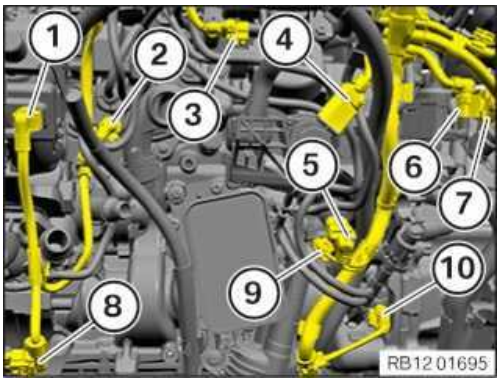
- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the integrated supply module (PDM) and to the DME control unit.
- Attach connector (2) to the differential pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust-gas recirculation valve and lock audibly.
- Attach connector (4) to the injectors and lock it audibly.
- Attach connector (5) to the camshaft sensor and lock it audibly.
- Attach connector (6) to the fuel pressure regulator and lock it audibly.
- Connect and audibly lock the connector (7) to the hot film air mass meter.
- Tighten down screw (8).

Wiring harness to cylinder head cover

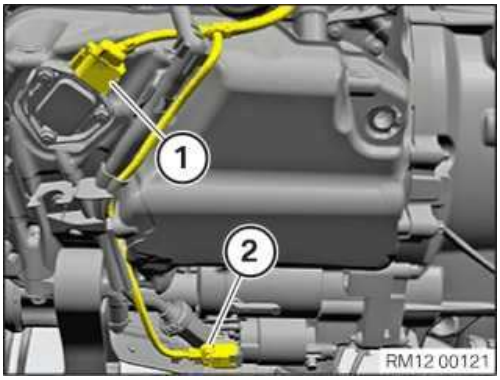
TS5x20		Tightening torque	3,5 Nm



- Connect the connector (1) to the rail pressure sensor and lock it audibly.
- Attach connector (2) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (3) to the front oxygen sensor and lock audibly.
- Attach connector (4) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Connect the connector (5) to the electric changeover valve and lock audibly.
- Attach connector (6) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (7) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (8) to the charging pressure sensor and lock it audibly.
- Attach connector (9) to the fuel pressure and temperature sensor and lock it audibly.

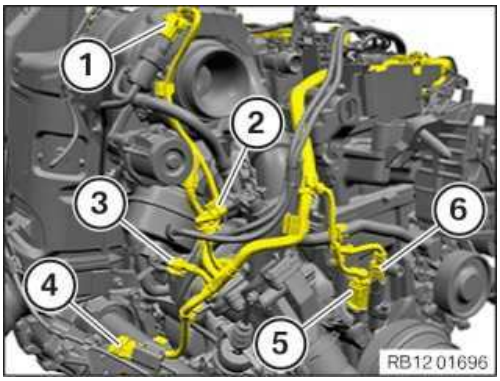


- Connect the connector (1) to the alternator and lock audibly.
- Connect the connector (2) to the electric changeover valve and lock audibly.
- Connect the connector (3) to the electric changeover valve and lock audibly.
- Connect the connector (4) to the high pressure pump and lock audibly.
- Connect the connector (5) to the oil pressure sensor and lock it audibly.
- Attach connector (6) to the throttle bodies and lock it audibly.
- Attach connector (7) to the intake air temperature sensor and lock it audibly.
- Connect the connector (8) to the air conditioning compressor and lock audibly.
- Connect the connector (9) to the solenoid valve and lock audibly.
- Connect the connector (10) to the crankshaft sensor and lock it audibly.

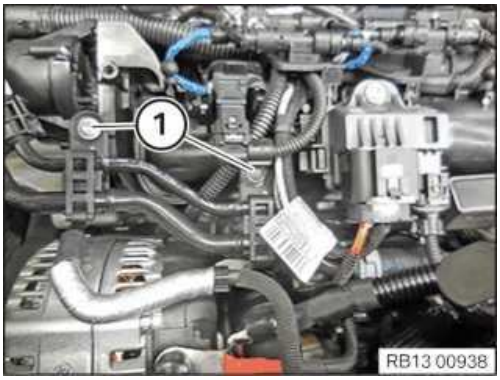


- Connect the connector (1) to the oil-level sensor and lock it audibly.
- Connect connector (2) to the starter motor and lock audibly.

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- Attach connector (1) to the exhaust turbocharger and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust gas pressure sensor and lock it audibly.
- Connect the connector (4) to the monitoring oxygen sensor and lock audibly.
- Attach connector (5) to the oil pressure switch and lock it audibly.
- Attach connector (6) to the switching valve and lock it audibly.

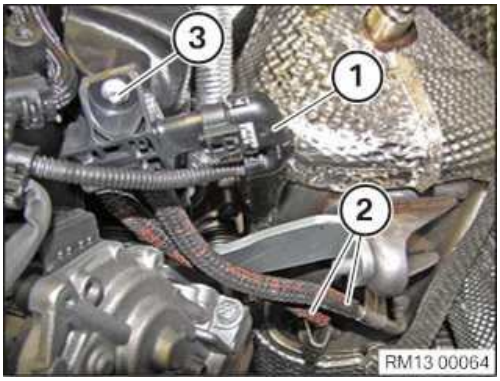


- Position the fuel line.
- Tighten the screws (1).

Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

55 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

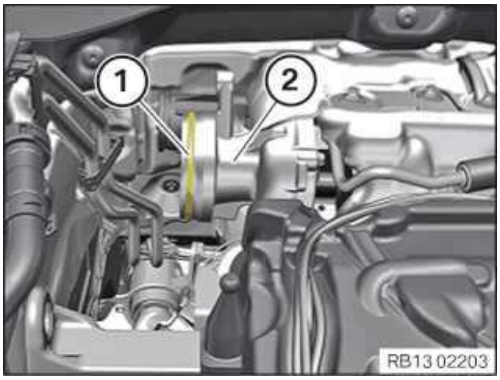
Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

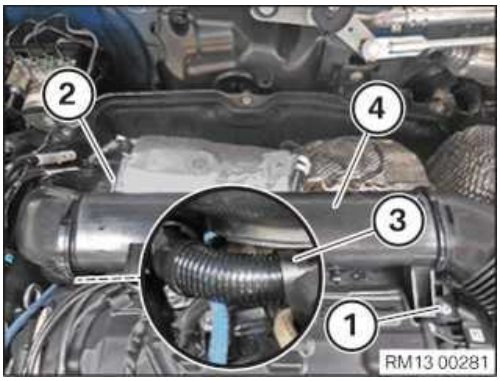
  The connector (1) must engage audibly.

56 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.

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- Feed in clean air pipe and install.
- Connect clean air pipe to the exhaust turbocharger and lock audibly in the clamps (2).
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Connect ventilation line (3) to the cylinder head cover and lock audibly.

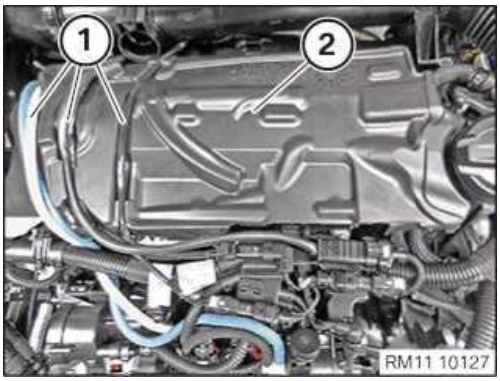


- Mount clean air pipe onto the intake filter housing.
- Tighten clamp (1) on the clean air pipe.

Clean air pipe to intake silencer housing

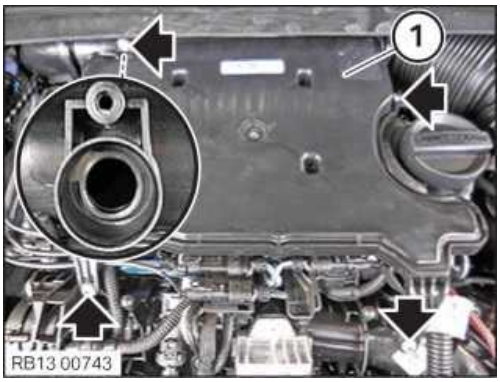
Clamp		Tightening torque	3 Nm

57 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the vehicle wiring harness (1) in the brackets.

58 – Install resonator



- Insert and install the resonator (1).
- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

59 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Check for correct installation of all rubber mounts in the acoustic cover (1).



- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

60 – Install engine



- See additional information.

Additional Information

Overview of Tightening Torques

Special tool to cylinder head Used in step 12

M8		Tightening torque	21,5 Nm

Special tool 2 455 010 to crankcase Used in step 13

M10x30		Tightening torque	38 Nm

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Special tool 11 8 930 to special tool 00 2 320

Used in step 13

M14x35		Tightening torque	160 Nm

Rear timing case cover to crankcase

Used in step 31

M6	Renew screws.	Jointing torque	8 Nm
		Angle of rotation	90 °

SCR coolant lines to crankcase end cover

Used in step 31

Hexagon screw M6x16		Tightening torque	8 Nm

Cylinder head to crankcase

Used in step 31

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

Cylinder head bolt to timing case cover

Used in step 31

M8x40		Tightening torque	19 Nm

Oil sump to crankcase

Used in step 31

M8x30		Tightening torque	24 Nm
M8x110		Tightening torque	24 Nm

Transmission to oil sump

Used in step 31 49

M8		Tightening torque	19 Nm

Guide tube for oil dipstick on engine

Used in step 31

M8x16		Tightening torque	19 Nm

Flywheel to crankshaft

Used in step 32

M12x1.5	Renew screws.	Tightening torque	120 Nm

Clutch to flywheel

Used in step 33

M8	Renew screws.	Jointing torque	15 Nm
		Angle of rotation	90 °

Glow elements to cylinder head

Used in step 36

Glow element		Tightening torque	13 Nm

Camshaft carrier to cylinder head

Used in step 37

M7x35		Tightening torque	13 Nm

Intake and exhaust camshaft in camshaft support

Used in step 38

M6x31		Tightening torque	10 Nm

Bearing journal to cylinder head

Used in step 38

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8

Used in step 38

M8		Tightening torque	19 Nm

Standard screw connection M6

Used in step 38 54

M6			8 Nm

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Chain tensioner piston to cylinder head

Used in step 38

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft

Used in step 38

M7x17.			17 Nm

Cylinder head cover to cylinder head

Used in step 42

M6		Tightening torque.	8,5 Nm

Clamping claw facing to cylinder head cover

Used in step 43

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 43

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

Rail on cylinder head cover

Used in step 44

Torx screw M8x25		Tightening torque	19 Nm

High pressure line between high pressure pump and rail

Used in step 44

High-pressure pipe		Tightening torque	28 Nm

High pressure lines between injector and rail

Used in step 46

High pressure lines		Tightening torque	28 Nm

Intake plenum to cylinder head

Used in step 47

M6		Tightening torque	11 Nm

Holder to crankcase

Used in step 48

M10		Tightening torque	38 Nm

Transmission to engine

Used in step 49

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

Transfer box to transmission

Used in step 50

M10		Tightening torque	56 Nm

Heat shield to transfer box

Used in step 50

M6	Renew screws.	Tightening torque	6 Nm

Oil filler plug on transfer box (VTG)

Used in step 50

M18x1.5		Tightening torque	35 Nm

Intermediate shaft to transfer box

Used in step 51

M8x35		Tightening torque	19 Nm

Exhaust-gas recirculation cooler to exhaust manifold

Used in step 52 54

M8x28	Replace screws	Tightening torque	32 Nm

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Oil return line to turbocharger

Used in step 52 53

M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase

Used in step 52

M8x16		Tightening torque	22 Nm

Exhaust turbocharger to exhaust manifold

Used in step 53

V-band clamp		Tightening torque	19 Nm

Oil feed line to bracket

Used in step 53

Torx screw M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase

Used in step 53

M8x16		Tightening torque	22 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 54

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler

Used in step 54

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 54

M8x20		Tightening torque	19 Nm

Heat shield for exhaust turbocharger

Used in step 54

Torx screw BM 6x12		Tightening torque	10 Nm

Banjo bolt for exhaust pressure pipe to exhaust manifold

Used in step 54

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

Diesel particulate filter V-clip to exhaust turbocharger

Used in step 54

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Diesel particle filter to holder

Used in step 54

M8 hexagon nut		Tightening torque	19 Nm

Diesel particulate filter holder to gearbox

Used in step 54

M12x75		Tightening torque	66 Nm

Diesel particulate filter bracket to crankcase

Used in step 54

M10x35		Tightening torque	38 Nm

Heat shield for exhaust turbocharger

Used in step 54

Torx screw BM 6x12		Tightening torque	10 Nm

Bracket to oil sump

Used in step 54

M6		Tightening torque	8 Nm

Alternator to component carrier

Used in step 54

M10x75 / M10x125		Tightening torque	38 Nm

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Positive battery cable to alternator — Used in step 54

M8		Tightening torque	19 Nm

Air conditioning compressor in component carrier — Used in step 54

M10		Tightening torque	38 Nm

Ground cable to cylinder head — Used in step 54

M6x12		Tightening torque	8 Nm

Wiring harness to cylinder head cover — Used in step 54

TS5x20		Tightening torque	3,5 Nm

Fuel line to intake plenum — Used in step 54

TS6x20		Tightening torque	5 Nm

Differential pressure sensor to holder — Used in step 55

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor — Used in step 55

Clamp 15–19mm		Tightening torque	3 Nm

Clean air pipe to cylinder head cover — Used in step 56

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 56

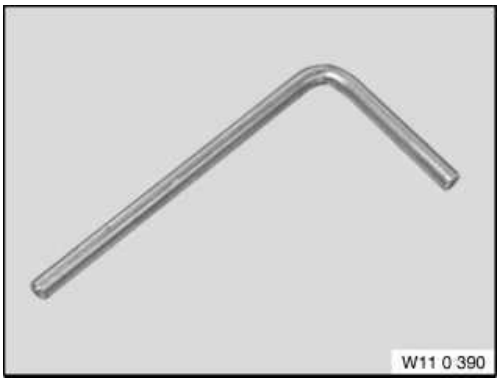
Clamp		Tightening torque	3 Nm

Resonator to manifold and clean air pipe — Used in step 58

Screw TS6	Renew screw.	Tightening torque	5 Nm

Overview of Special Tools

0 496 268 (11 0 390) Pin

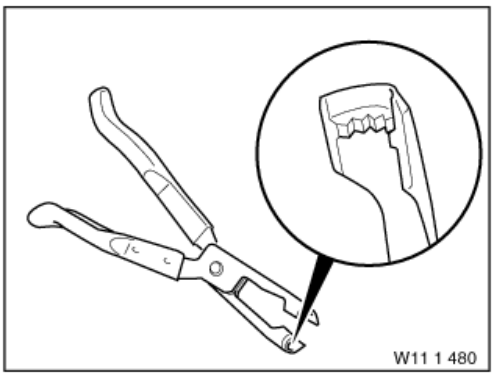


Common — Used in step 7 54

Usage	(roll pin) For securing new tensioning pulley (poly-V belt)
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 15 07 (390)

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0 490 796 (11 1 480) Pliers



Common Used in step 7 25

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

2 459 012 Holder



Common Used in step 12 49

Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

2 455 010 Engine support

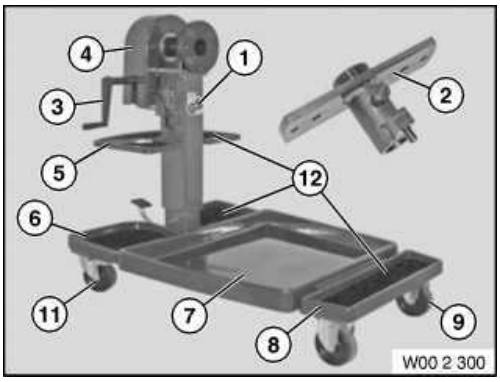


Common Used in step 13 48

Usage	For accommodating engine on assembly stand. Engine: B3x, B4x, N47.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

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0 495 187 (00 2 300) Assembly stand



Common

Used in step 13

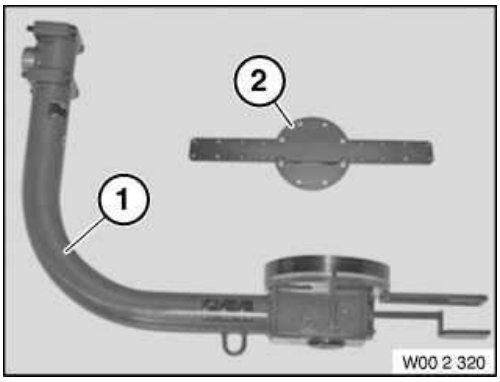
Usage	Assembly stand with universal flange for mounting engines from S85
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 188 (00 2 301)		**Assembly stand** available only as complete assembly stand 83 30 0 495 187.	
2	0 495 189 (00 2 302)	**2 299 563**	**Tool** (Universal flange). Do not use any more!!! Technically locked. Replaced with a new flange with material number 83 30 2 299 563. All flanges delivered until the end of 2011 will be replaced at no charge. From 2012, only the new flange will be supplied. Also applies to the complete engine mounting stand 00 2 300.	
3	0 495 200 (00 2 303)		**Crank**	
4	0 495 201 (00 2 304)		**Cover** (Protective hood)	
5	0 495 202 (00 2 305)		**oddments tray** (Oddments tray for small parts)	
6	0 495 203 (00 2 306)		**Shaped element** (Rear shaped pan)	
7	0 495 204 (00 2 307)		**Collection pan** (Oil collection pan)	
8	0 495 205 (00 2 308)		**Shaped element** (Front shaped pan)	
9	0 495 206 (00 2 309)		**Wheel** (Front wheel (without stop))	
10	0 495 207 (00 2 311)		**Wheel** (Rear wheel (with stop))	
11	0 495 208 (00 2 312)		**Mat** (Checker mat set)	
2	2 299 563		**Adapter** New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.	

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0 495 196 (00 2 320) Support arm



Common

Used in step 13

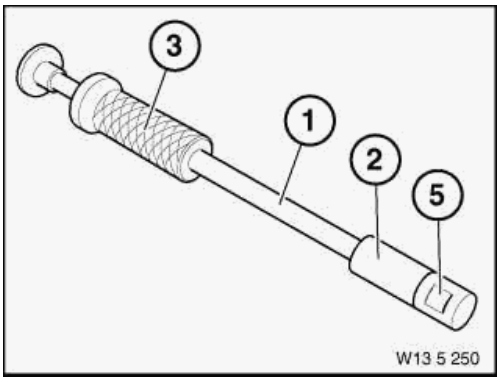
Usage	(Support arm with fixture) For mounting engines using the engine mounting bracket.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 197 (00 2 321)		**Support arm**	
2	0 495 198 (00 2 322)		**Panel** (take-up plate)	
3	0 495 380 (00 2 323)		**Panel** (fixture) Engine N73	
6	0 496 287 (00 2 326)		**Panel** (fixture) Engine: M73	
5	0 496 288 (00 2 327)	**0 496 373**	**Panel** (fixture) Engine: S62 Replaced by 11 5 420 (0 496 373)	
8	0 496 533 (00 2 328)		**Support** (Engine mount) Engine: N57, N57Top	
9	0 496 579 (00 2 329)	**0 496 680**	**Support** (Engine mount) Engine: N74 Replaced by 116160 (0 496 680)	
4	0 495 379 (00 2 324)		**Panel** (fixture) Engine M67TU	
5	0 495 381 (00 2 325)		**Panel** (fixture) Engine N62, N62TU	

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0 493 321 (13 5 250) Puller



Common

Used in step 17

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

0 493 339 (13 5 252) Bush



Common

Used in step 17

Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

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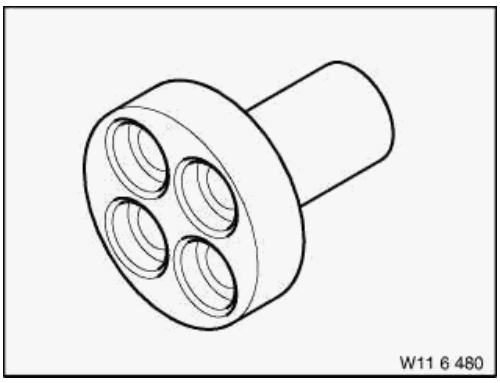
0 493 340 (13 5 253) Weight



Common Used in step 17

Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 380 (11 6 480) Connector



Common Used in step 20 38 41

Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

2 288 380 Locating stud

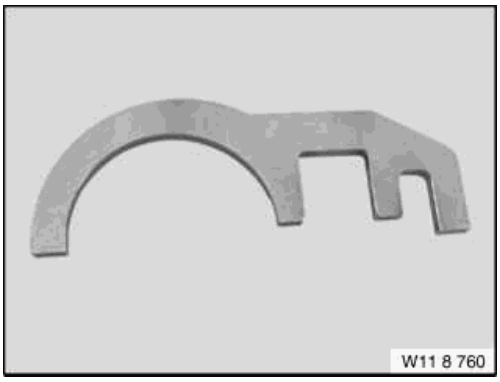


Common Used in step 20 38 39 41

Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

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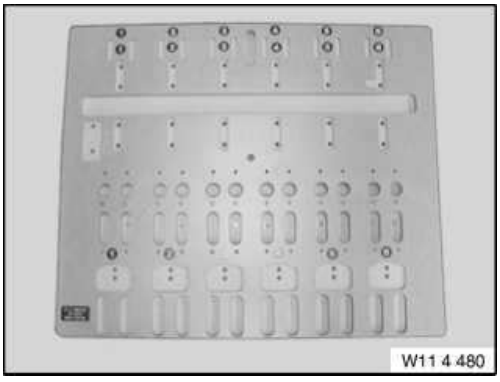
0 496 112 (11 8 760) Gauge



Common Used in step 20 38 40 41

Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 495 105 (11 4 480) oddments tray



Common Used in step 26 27 38

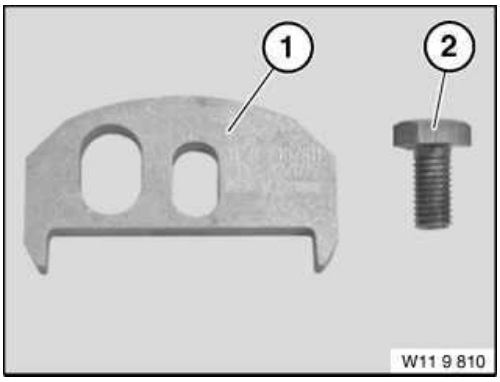
Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

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0 496 171 (11 9 811) Holder



Common	Used in step 28 29 32
Usage	Available only as a complete tool set 11 9 810 (83 30 0 496 170) - as of 13.01.12
Included in the tool or work	0 496 170
Storage location	C86
Replaced by	
In connection with	
SI-Number	01 07 07 (355)

0 494 793 (11 9 265) Bush



Common	Used in step 28 29 32
Usage	
Included in the tool or work	0 493 938
Storage location	A44
Replaced by	
In connection with	
SI-Number	

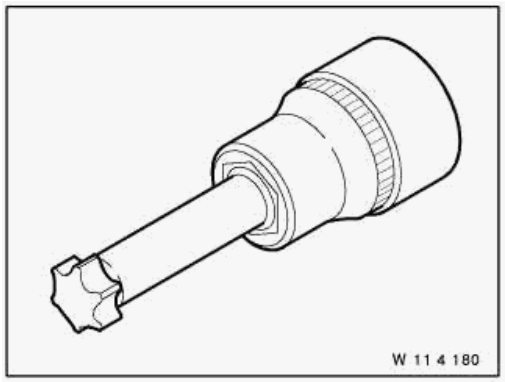
2 288 165 Synchronising key



Common	Used in step 28 33
Usage	Conversion kit for 21 2 170, for orders till 02.2014. Orders as of March 2014 do not require the conversion, as the new thrust piece has been accounted for.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 09 14 (088)

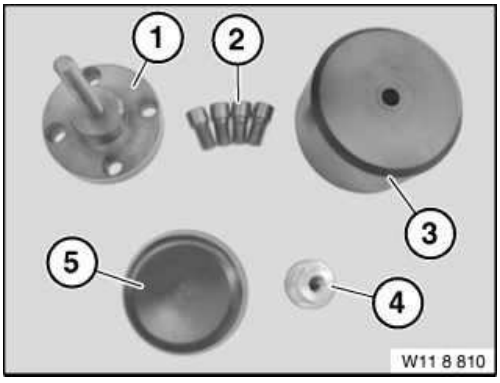
cardiagn.com

0 491 018 (11 4 180) Socket WAF 46



Common	Used in step 29 32
Usage	(screwdriver bit Torx T60) For releasing and tightening down dual-mass flywheel - model year: from Jan 94
Included in the tool or work	
Storage location	C9
Replaced by	
In connection with	
SI-Number	01 02 94 (777)

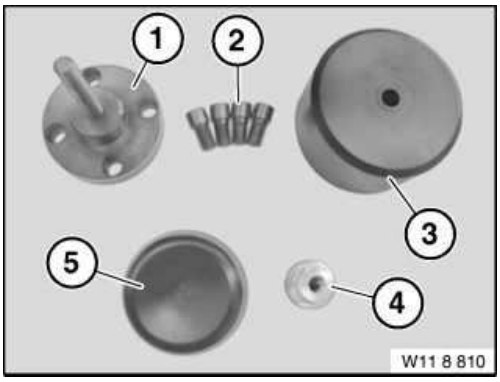
0 496 137 (11 8 815) Holding sleeve



Common	Used in step 31
Usage	(Slip sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

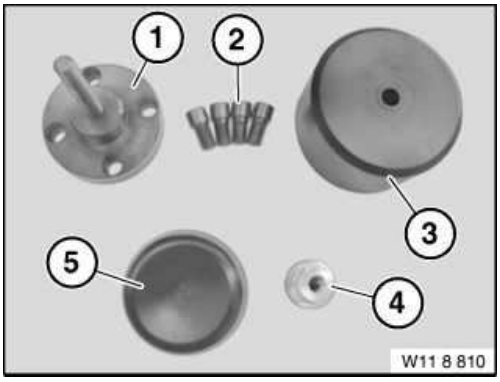
cardiagn.com

0 496 133 (11 8 811) Basic body



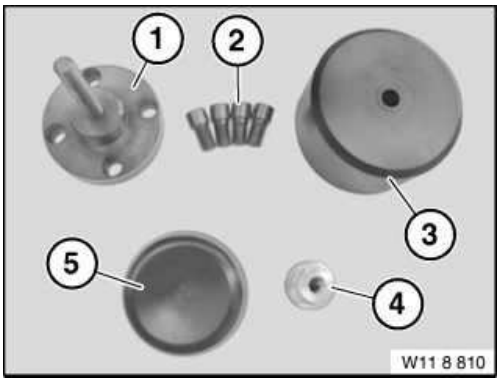
Common	Used in step 31
Usage	Liquidation of existing inventory and then available only as a complete tool set 11 8 810 = 83 30 0 496 132 - as of 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 134 (11 8 812) Screw



Common	Used in step 31
Usage	(Screw set) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

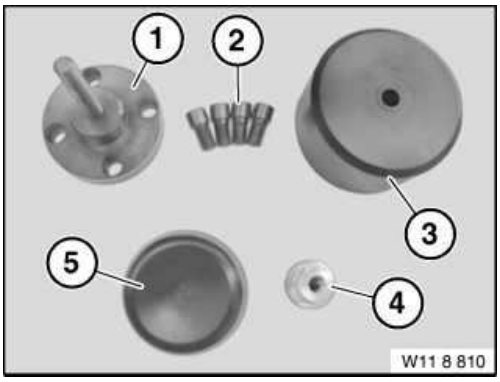
0 496 135 (11 8 813) Holding sleeve



Common	Used in step 31
Usage	(Thrust sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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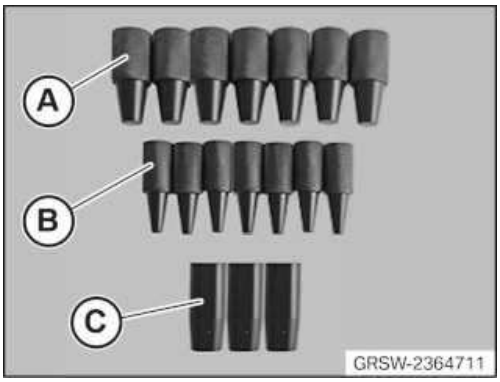
0 496 136 (11 8 814) Nut



Common Used in step 31

Usage	(Nut with bearing) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

2 364 711 Plug



Common Used in step 31

Usage	For closing the pressure oil holes for cleaning the cylinder head sealing surfaces.
Included in the tool or work	
Storage location	C20
Replaced by	
In connection with	
SI-Number	01 50 14 (203)

0 495 103 (11 4 471) Scraper

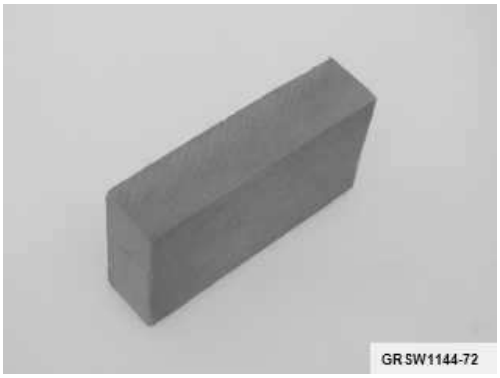


Common Used in step 31

Usage	
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

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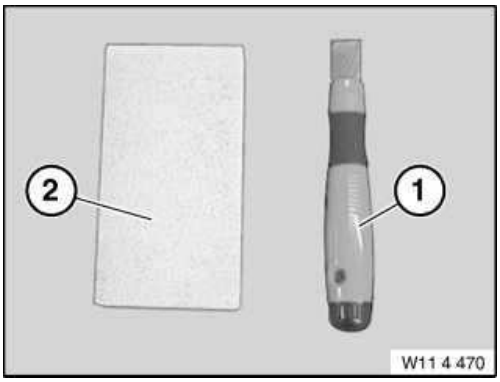
0 495 104 (11 4 472) Extractor



Common Used in step 31

Usage	(grindstone)
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

0 495 102 (11 4 470) Tool



Common Used in step 31 52

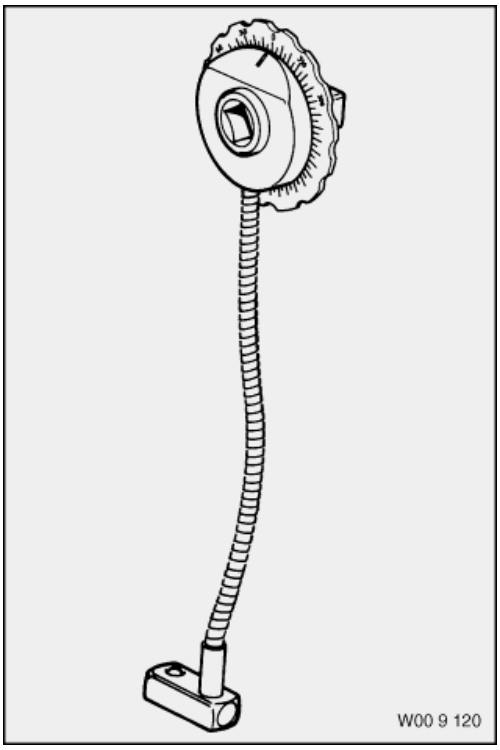
Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

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0 490 504 (00 9 120) Torque angle measuring dial



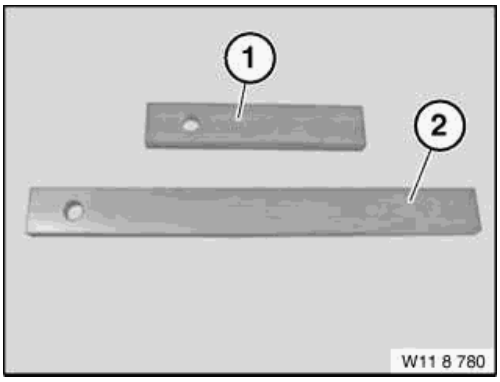
Common

Used in step 31

Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

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0 496 120 (11 8 780) Plate



Common

Used in step 31

Usage	(Mounting plates) For securing transmission oil sump when gearbox is removed.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 121 (11 8 781)		**Plate** (Mounting plate, short)Discontinued; only available via set 11 8 780 = 0496120.	
2	0 496 122 (11 8 782)		**Plate** (Mounting plate, long) Discontinued; only available via set 11 8 780 = 0496120.	

2 285 058 Tool set



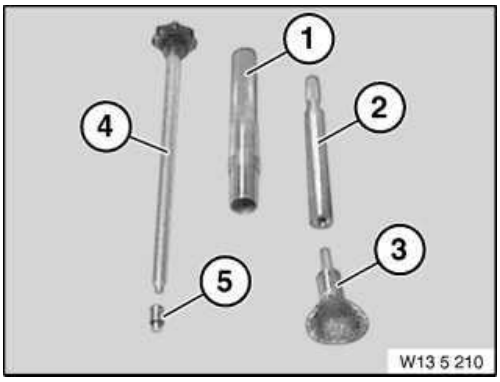
Common

Used in step 32

Usage	
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 02 14 (069)

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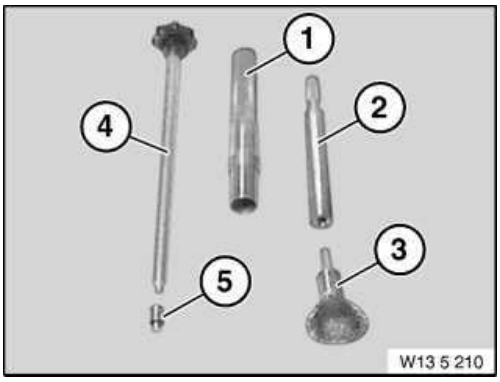
0 493 763 (13 5 215) Plug



Common Used in step 43

Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 762 (13 5 214) Rod

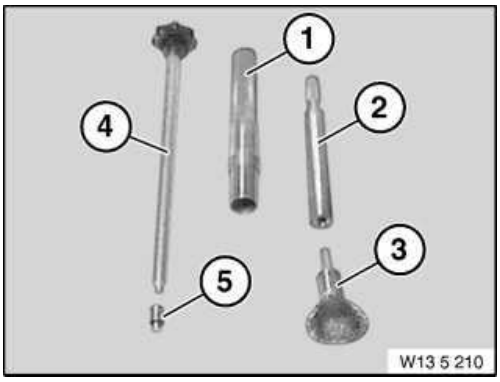


Common Used in step 43

Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 493 758 (13 5 210) Tool



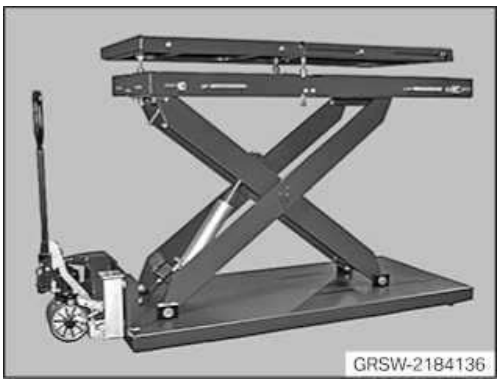
Common Used in step 43

Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

2 184 136 Mobile equipment table lift



Common Used in step 49

Usage	Table lift MHT 1200
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	06 01 10 (649)

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2 409 025 Puller



Common Used in step 50

Usage	For disassembly of the outer radial shaft seal of the transmission output shaft, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A76
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 411 739 Puller



Common Used in step 50

Usage	For disassembly of the inner radial shaft seal of the output, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C78
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 408 152 Striking element



Common Used in step 50

Usage	For installation of the right radial shaft seal transmission output shaft (inner). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

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2 413 037 Handle



Common	Used in step 50
Usage	Universal drift handle. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C77
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

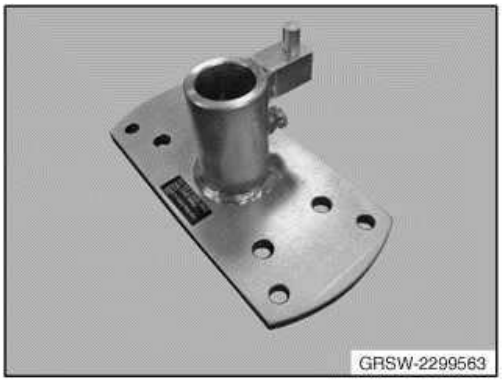
2 408 150 Striking element



Common	Used in step 50
Usage	For installing the right radial shaft seal transmission output shaft (outer). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

Replacement tools:

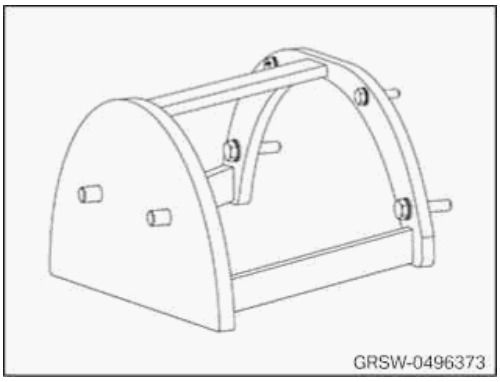
2 299 563 Adapter



Common	Used in step 13
Usage	New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.
Included in the tool or work	0 495 187
Storage location	
Replaced by	
In connection with	
SI-Number	

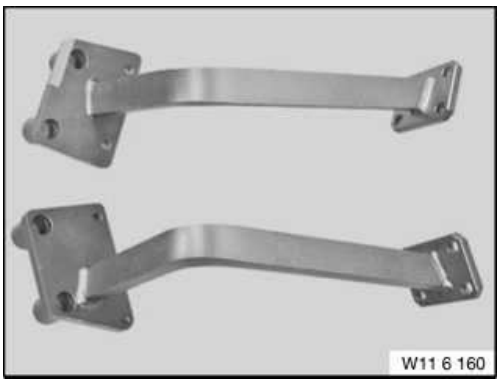
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0 496 373 (11 5 420) Plate



Common	Used in step 13
Usage	(Fixture) Engine S62
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	

0 496 680 (11 6 160) Support



Common	Used in step 13
Usage	For mounting N74 engine on the assembly stand. In combination with 00 2 300, 00 2 320
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	00 2 300; 00 2 320 = 0495196
SI-Number	01 31 09 (604)

Overview Technical Data

Screw-in depth of thread cutter	Used in step 32
Screw-in depth	18 mm

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	7 54
EGR controller	7 54

General repair instructions	Used in step
11 00 ... Overview of consumables (Electronic Parts Catalogue)	31

Repair instructions	Used in step
11 00 050 Removing and installing engine	1 60
11 00 050 Removing and installing engine	1 60
11 00 050 Removing and installing engine	1 60
11 00 050 Removing and installing engine	1 60
11 00 050 Removing and installing engine	1 60
11 00 050 Removing and installing engine	1 60
11 00 050 Removing and installing engine	1 60
11 00 050 Removing and installing engine	1 60
11 00 050 Removing and installing engine	1 60
31 10 001 Completely removing and installing front axle with engine and transmission	1 60
11 00 050 Removing and installing engine	1 60

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11 00 050 Removing and installing engine	1	60
11 00 050 Removing and installing engine	1	60
11 00 050 Removing and installing engine	1	60
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11 00 050 Remove and install engine	1	60
11 00 050 Remove and install engine	1	60
11 00 050 Remove and install engine	1	60
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG)	1	60
11 00 050 Remove and install engine	1	60
11 00 050 Remove and install engine	1	60
11 00 050 Remove and install engine	1	60
11 00 050 Remove and install engine	1	60
11 00 050 Removing and installing the engine (manual gearbox)	1	60
11 00 050 Remove and install engine (Automatic)	1	60
11 00 050 Remove and install engine	1	60
11 00 050 Remove and install engine	1	60
11 00 050 Remove and install engine	1	60
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11 00 050 Removing and installing engine	1	60
11 00 050 Remove and install engine	1	60
11 00 050 Removing and installing engine	1	60
11 00 050 Removing and installing engine \PREMIUM	1	60
11 00 050 Removing and installing/replacing engine (N63)	1	60
11 00 050 Removing and installing engine	1	60
11 00 050 Removing and installing engine	1	60
11 00 050 Removing and installing engine	1	60
11 00 050 Remove and install engine	1	60
11 00 050 Remove and install engine (Automatic)	1	60
11 00 050 Remove and install engine (Automatic)	1	60
11 00 050 Remove and install engine	1	60

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11 00 050 Remove and install engine	1 60
11 00 050 Remove and install engine (Automatic)	1 60
11 00 050 Remove and install engine (Automatic)	1 60
11 00 050 Remove and install engine	1 60
11 00 050 Remove and install engine	1 60
11 00 050 Remove and install engine	1 60
11 00 050 Remove and install engine	1 60
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG)	1 60
11 00 050 Remove and install engine	1 60
61 35 ... Notes on ESD protection (Electro Static Discharge)	6 17 25 31
61 35 ... Notes on ESD protection (Electro Static Discharge)	31

Operating materials	Used in step

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	38
Exhaust-gas recirculation cooler seal on exhaust manifold	54
Exhaust-gas recirculation cooler seal on intake plenum	54

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11 14 110 Removing and installing/sealing or replacing bottom timing case cover

PRELIMINARY WORK

1 – Removing engine



- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

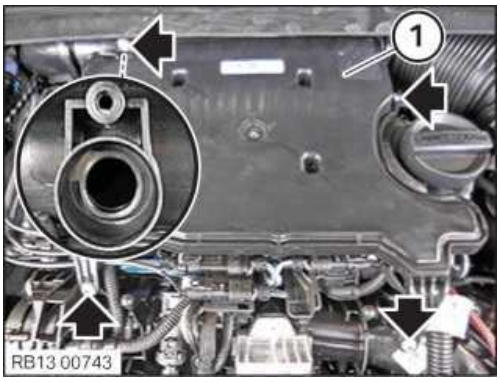
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

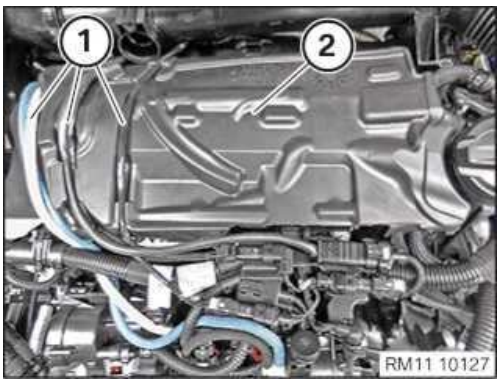
3 – Remove resonator



- Remove screws (arrows).
- Guide out and remove the resonator (1).

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4 – Remove the acoustic cover for the injectors

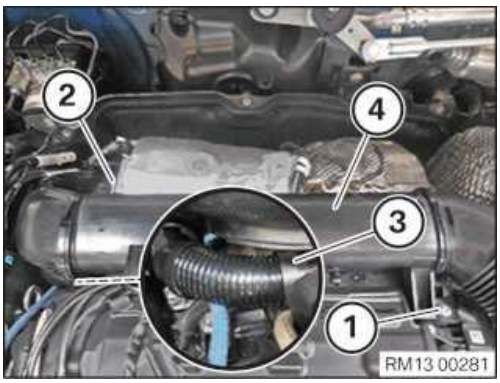


- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

5 – Removing clean air pipe



- Detach clamp (1) on the clean air pipe.
- Pull off the clean air pipe from the intake silencer housing.



- Loosen screw (1).
- Loosen clamp (2).
- Unlock the ventilation line (3) and pull it off the cylinder head cover.
- Feed out clean air pipe and remove.

6 – Remove differential pressure sensor

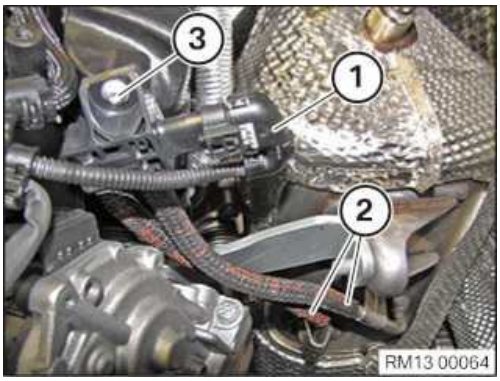
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

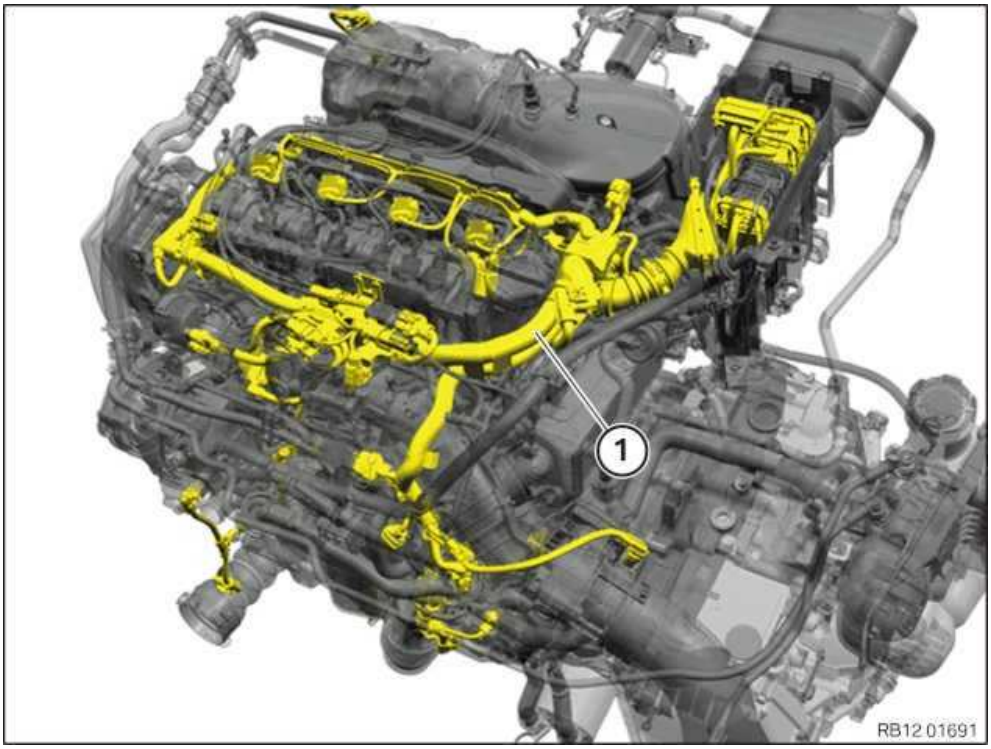
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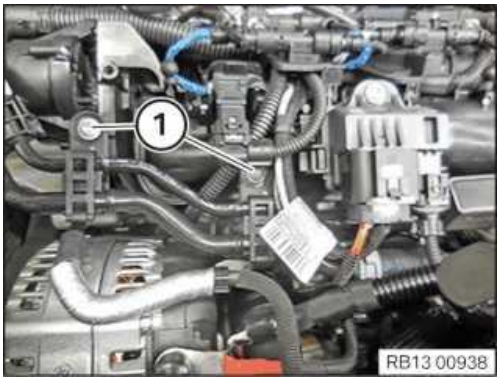
- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

7 – Removing assemblies (on lifting table)

Overview: Wiring harness section for the engine

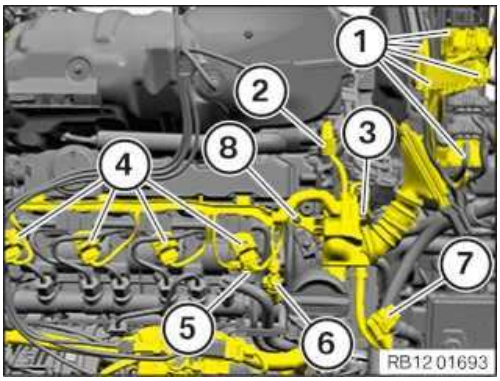


1 Wiring harness section for the engine

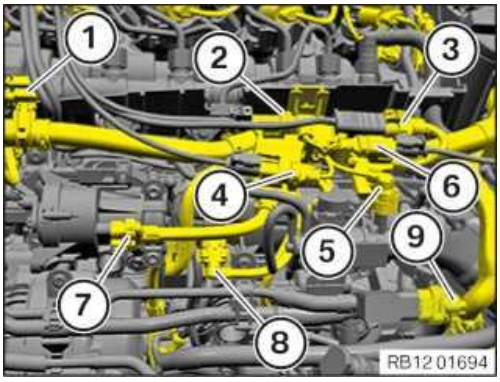


- Loosen screws (1).

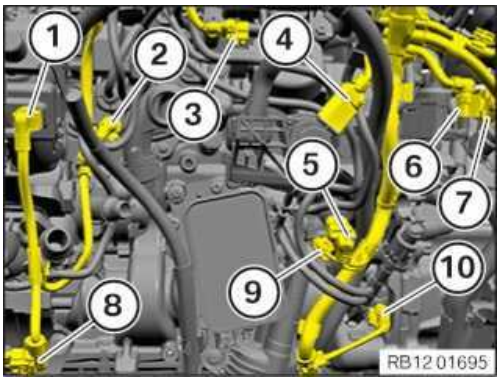
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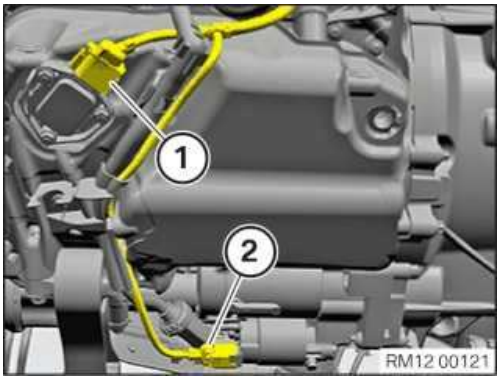
- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock the connector (2) and disconnect it from the differential pressure sensor.
- Unlock the connector (3) and disconnect it from the exhaust-gas recirculation valve.
- Unlock the connector (4) and pull off from the injectors.
- Unlock the connector (5) and disconnect it from the camshaft sensor.
- Unlock the connector (6) and disconnect it from the fuel pressure regulator.
- Unlock connector (7) and pull off from hot film air mass meter.
- Loosen screw (8).



- Unlock connector (1) and pull off from the rail pressure sensor.
- Unlock the connector (2) and disconnect it from the exhaust temperature sensor before the diesel particulate filter.
- Unlock connector (3) and pull it off from the front oxygen sensor.
- Unlock the connector (4) and disconnect it from the exhaust temperature sensor after the diesel particulate filter.
- Unlock and disconnect the connector (5) from the electric changeover valve.
- Unlock the connector (6) and disconnect it from the exhaust temperature sensor for the exhaust-gas recirculation cooler.
- Unlock the connector (7) and disconnect it from the servomotor for the swirl flaps.
- Unlock the connector (8) and pull it off the charging pressure sensor.
- Unlock the connector (9) and disconnect from the fuel pressure and temperature sensor.

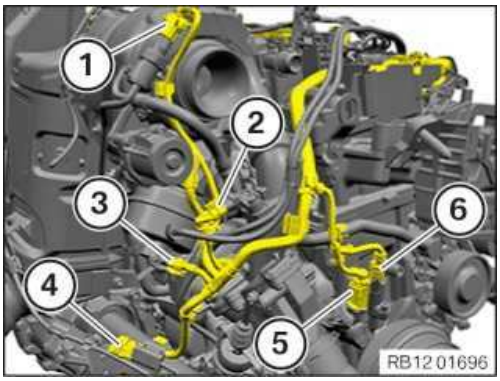


- Unlock and disconnect the connector (1) from the alternator.
- Unlock and disconnect the connector (2) from the electric changeover valve.
- Unlock and disconnect the connector (3) from the electric changeover valve.
- Unlock the connector (4) and pull it off the high pressure pump.
- Unlock the connector (5) and disconnect it from the oil pressure sensor.
- Unlock connector (6) and pull off from throttle body.
- Unlock the connector (7) and disconnect it from the intake air temperature sensor.
- Unlock the connector (8) and disconnect it from the air conditioning compressor.
- Unlock and disconnect the connector (9) from the solenoid valve.
- Unlock the connector (10) and pull it off the crankshaft sensor.



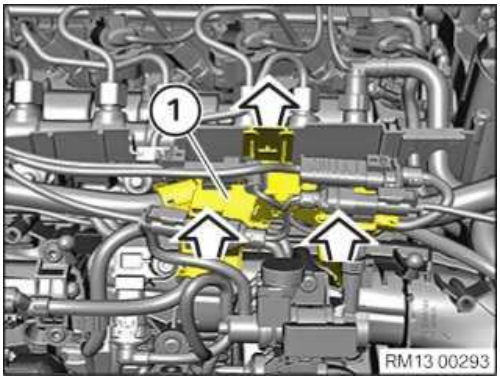
- Unlock the connector (1) and pull off of the oil-level sensor.
- Unlock connector (2) and remove from starter motor.

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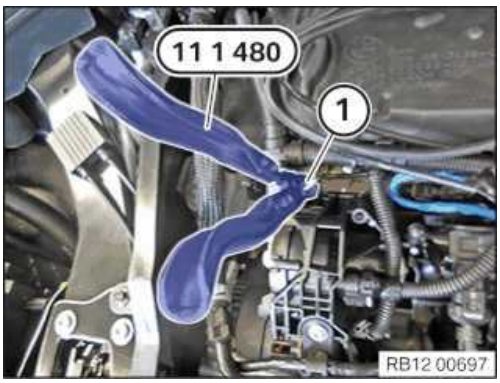


- Unlock the connector (1) and disconnect it from the exhaust gas pressure sensor.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock the connector (3) and pull it off the exhaust turbocharger.
- Unlock the connector (3) and disconnect it from the differential pressure sensor.
- Unlock connector (4) and pull it off from the monitoring oxygen sensor.
- Unlock the connector (5) and pull it off the oil pressure switch .
- Unlock connector (6) and disconnect from switching valve.
- Detach, feed out and remove the wiring harness from the clamps.

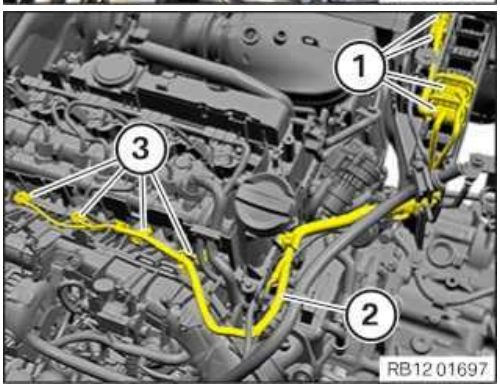
▶ **Removing the cable clips from the intake plenum**



- Detach the cable clip (1) in the direction of the arrow.
- Guide out the cable clip (1) in direction of arrow and set it aside.



- Unlock the connectors (1) of all glow elements with the special tool **0 490 796 (11 1 480)** and release them.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.



- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Pull off all connectors (3) from glow element using special tool **0 490 796 (11 1 480)**.
- Loosen screw (2) and remove the ground strap.
- Detach, feed out and remove the wiring harness from the clamps.

▶ **Removing the drive belt for alternator**

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

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CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

TECHNICAL INFORMATION

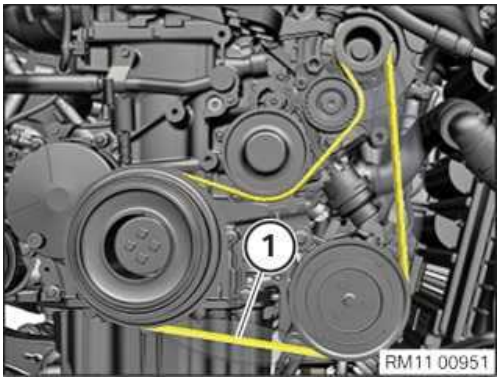
If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

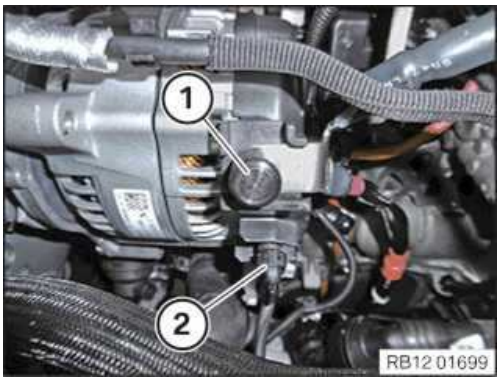
The drive belt must be replaced if contaminated with coolant- and oil residues.



- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool **0 496 268 (11 0 390)**.



- Guide out the drive belt for the alternator (1) and remove it.

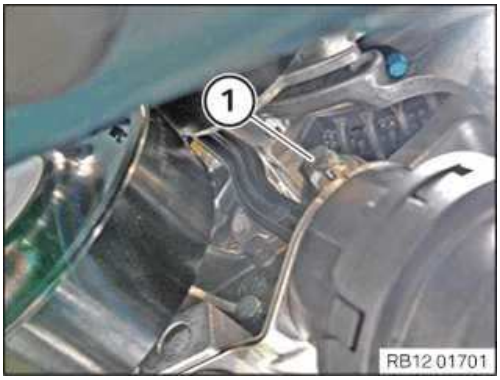


- Remove the cover (1) and loosen the nut below.
- Disconnect positive battery cable from alternator.
- Unlock and disconnect the connector (2) from the alternator.

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- Detach screw (1) on top on the alternator.



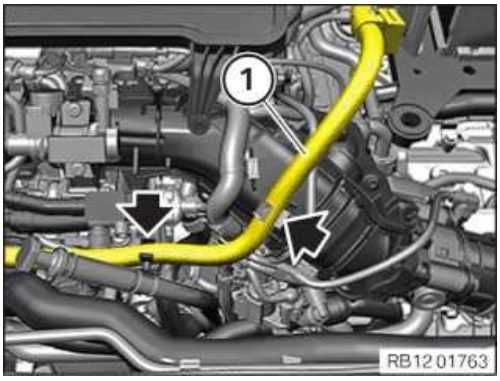
- Detach screw (1) below on the alternator.



- Feed out alternator (1) along with the screw (2) on the bottom of the alternator through the slot on the support and remove.

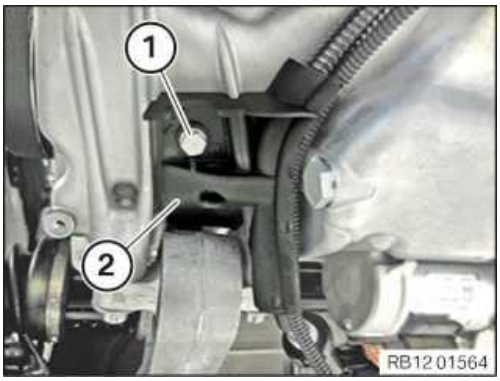


- Loosen screws (1).
- Feed out and remove the air conditioning compressor (2).



- Release the positive battery cable (1) from the clamps (arrows).

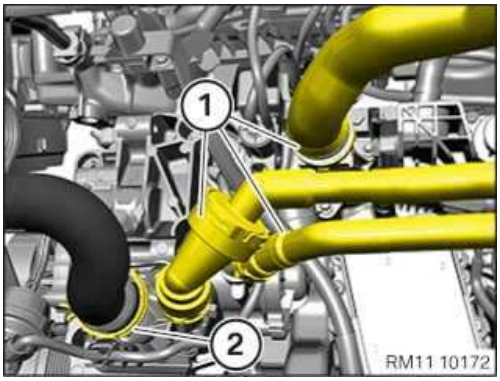
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- Loosen screw (1).
- Guide out and remove holder (2).



- Feed out positive battery cable from the clamps (1) and remove.



- Unlock and disconnect coolant lines (1).
- Guide out the coolant lines (1) and remove it.
- Detach the clamp (2).
- Guide the coolant hose out and remove.

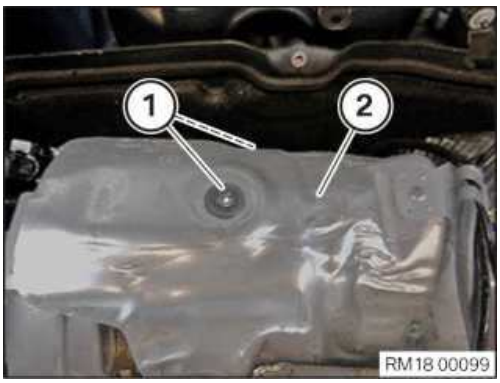
▶ **Removing heat shield from top exhaust turbocharger**

WARNING

Hot surfaces.

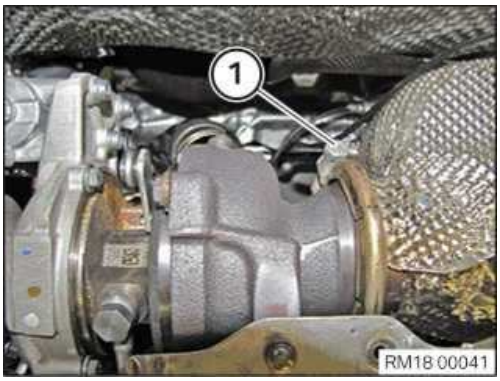
Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from holders.
- Release the screws (1) at the top and bottom of the heat shield.
- Feed out and remove the heat shield (2).

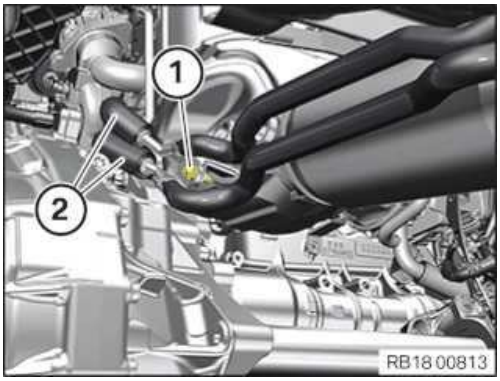
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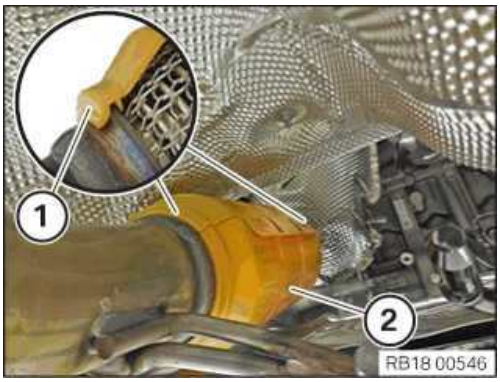
- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.



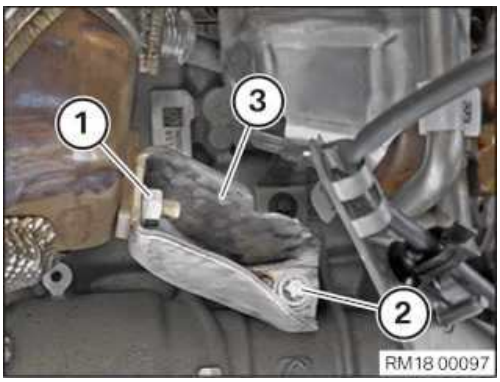
- Loosen nuts (1).



- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.

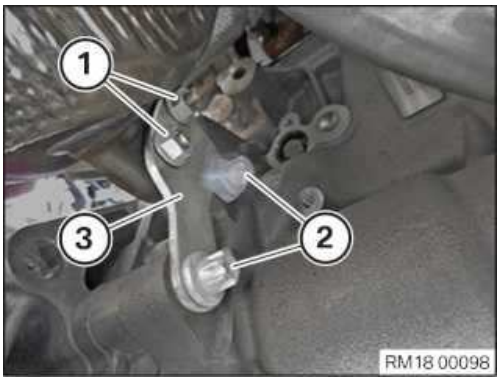


- Mount fitting aid (2).
- Make sure that the fitting aid is correctly position on the edges (1) of the flexible tube.



- Loosen nut (1).
- Loosen screw (2).
- Remove holder (3).

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- Loosen nuts (1).
- Loosen screws (2).
- Remove holder (3).
- Guide out and remove diesel particulate filter .

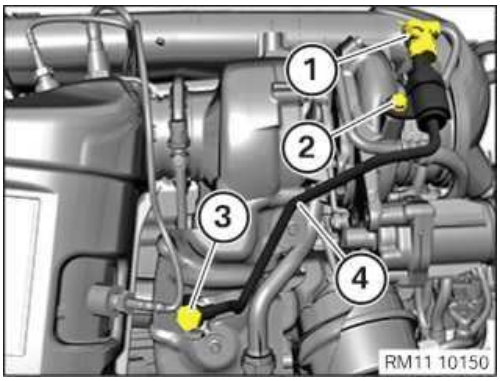
▶ **Remove the heat shield from the exhaust turbocharger at the bottom**

WARNING

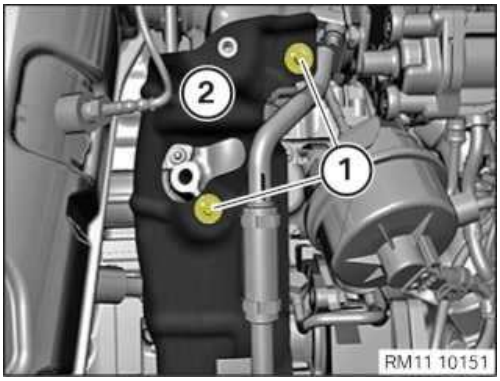
Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Unlock and disconnect connector (1).
- Unscrew the banjo bolt (3).
- The seals of the banjo bolt (3) must be renewed.
- Loosen screw (2).
- Remove the exhaust gas pressure pipe (4).



- Unscrew the bolts (1) on the heat shield .
- Feed out and remove the heat shield (2).

▶ **Removing the exhaust-gas recirculation cooler**

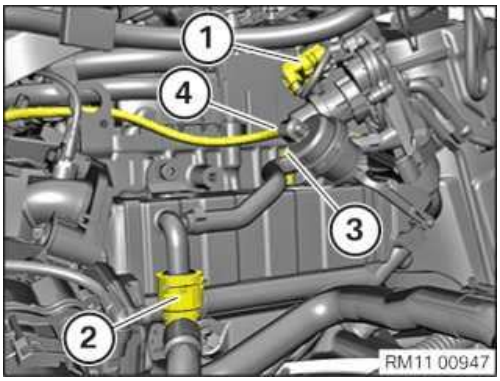
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

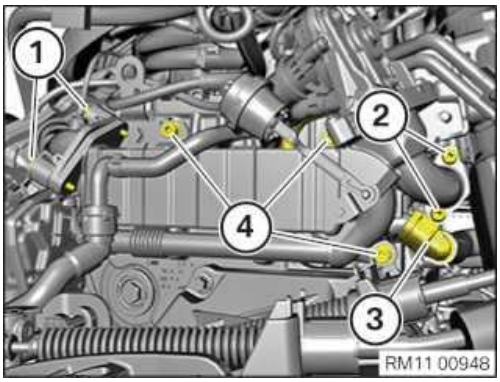
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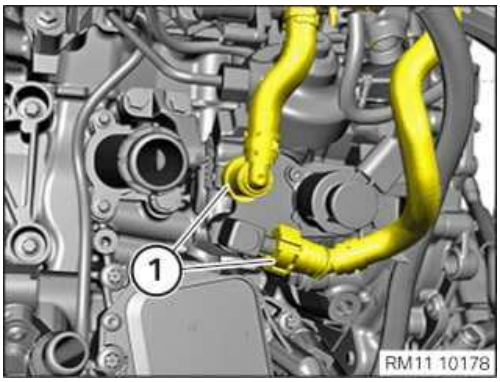
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

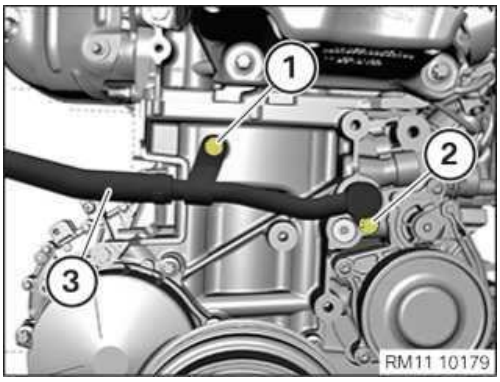
- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.



- Unlock the fuel lines (1) and disconnect from the high pressure pump.
- Remove the fuel lines.



- Loosen screws (1) and (2).
- Remove coolant line (3).

8 – Removing the low-pressure stage turbocharger

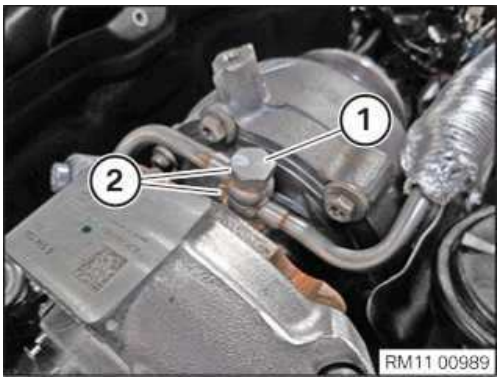
WARNING

Hot surfaces.

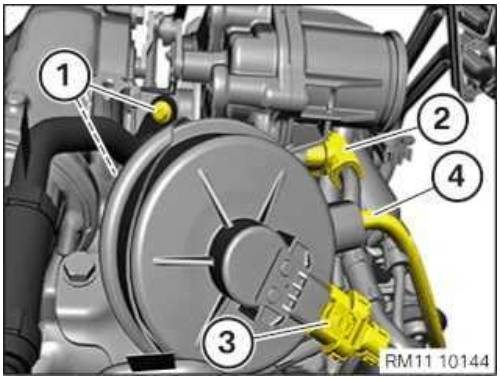
Risk of burning!

- Perform all work only on components that have cooled down.

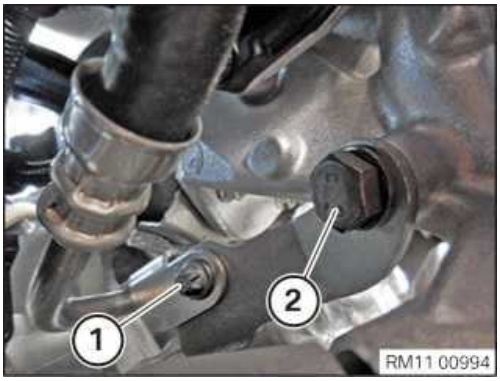
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- Release the banjo bolt (1) of the oil feed lines.
- Remove sealing rings (2).
- Place oil feed lines to one side.



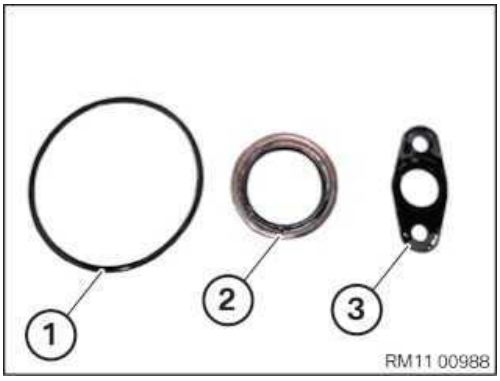
- Release the screws (1) of the oil return line.
- Unlock and disconnect the plug connections (2) and (3).
- Pull off the vacuum hose (4) carefully.



- Undo the bolt (1) of the oil feed line.
- Loosen screw (2).

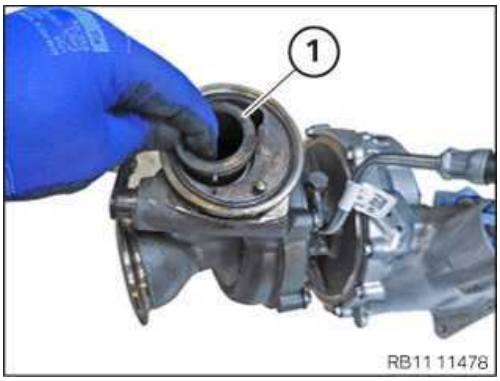


- Loosen screw (1).
- Remove the V hose clamp.
- Guide the low-pressure stage turbocharger out towards the top and remove.



- Remove seals (1), (2) and (3).

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- Remove the spacer ring (1).

9 – Removing the high-pressure stage exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

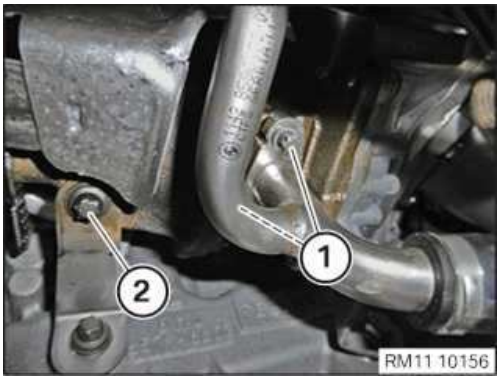
- Perform all work only on components that have cooled down.

CAUTION

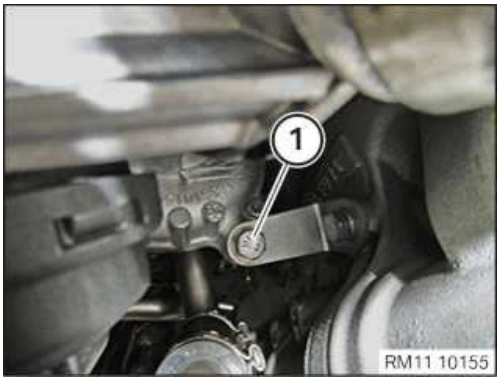
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

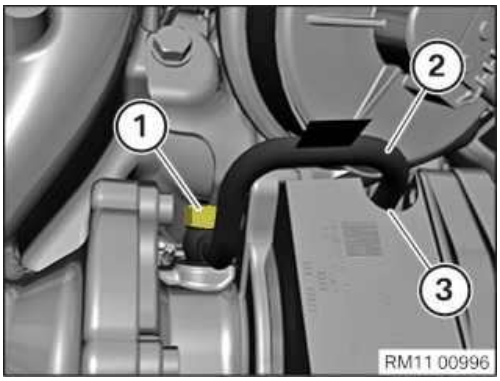


- Unscrew the bolts (1) on the oil return line .
- Loosen screw (2).

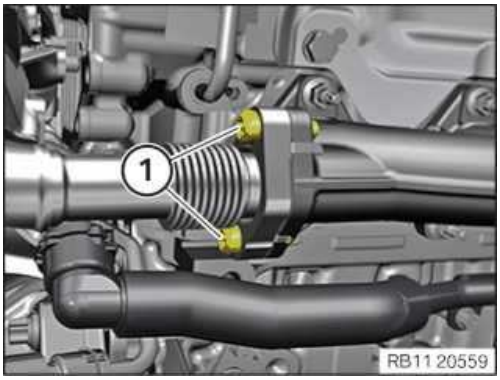


- Release screw (1) from the right wheel arch.

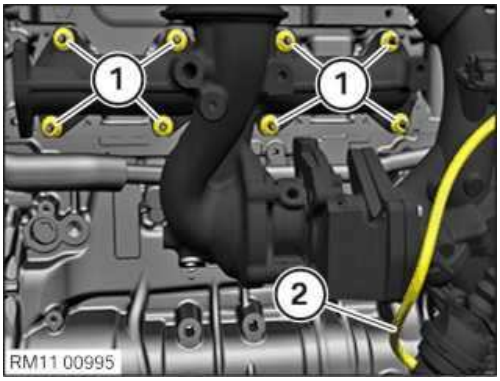
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- Unscrew the banjo bolt (1).
- Guide out oil feed line (2) from holder (3).

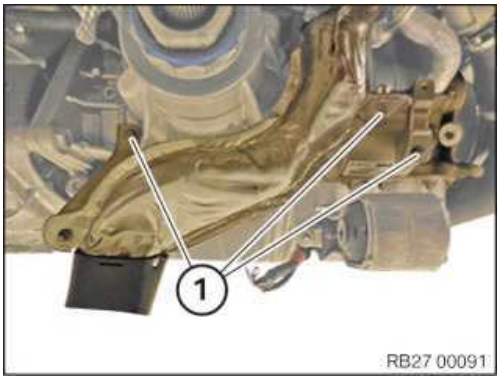


- Loosen screws (1).

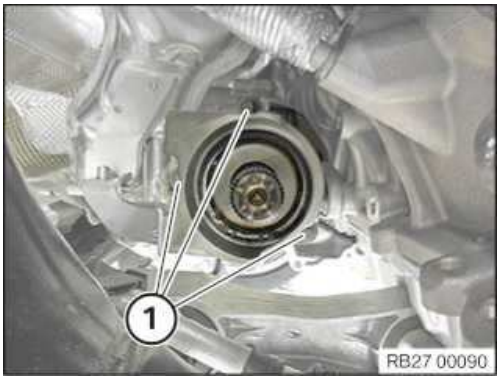


- Pull off the vacuum hose (2).
- Loosen nuts (1).
- Guide out the exhaust manifold and the high-pressure stage exhaust turbocharger to the top and remove them.

10 – Remove the intermediate shaft with the support tube

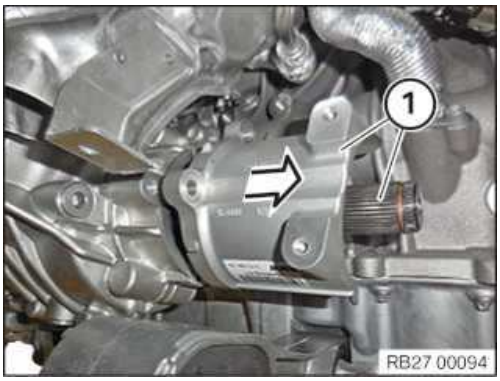


- With air duct installation: Loosen screws (1).
- Remove air duct



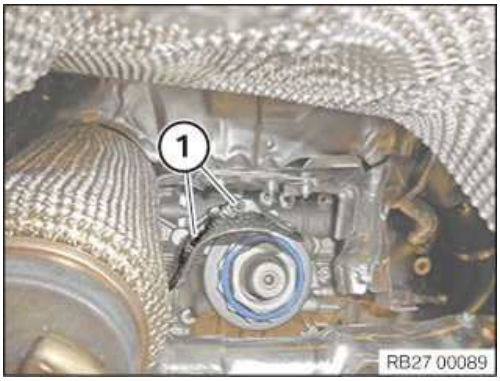
- Loosen screws (1).

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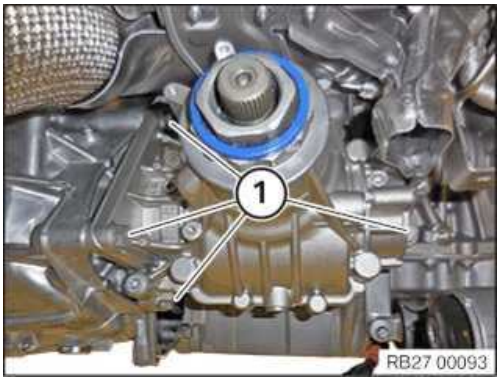


- Pull the intermediate shaft with the support tube (1) out of the transfer box.

11 – Remove transfer box (VTG)



- Loosen screws (1).
- Remove heat shield.



- Loosen screws (1).
- Remove the transfer box (VTG).

12 – Detach the engine from the automatic transmission

Prerequisite

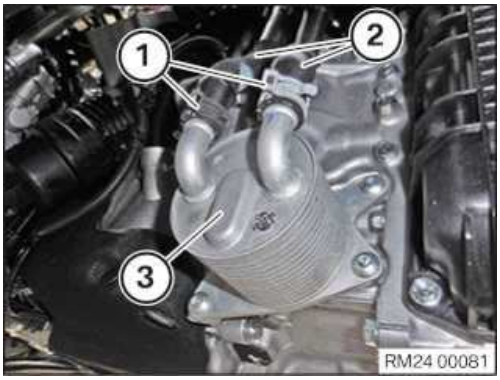
Engine has been removed.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Unfasten hose clamps (1).
- Disconnect coolant hoses (2) from transmission oil cooler (3).
- Catch the emerging coolant.

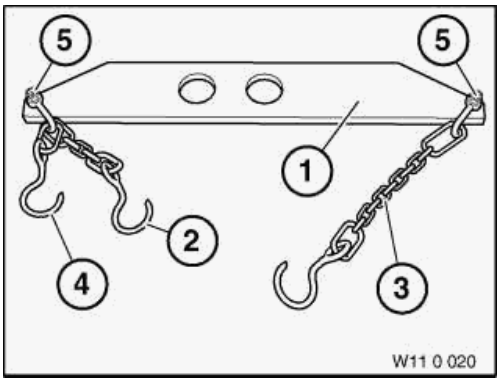
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- Crank engine with special tool **0 493 380 (11 6 480)** at vibration damper in direction of rotation.
- Unscrew the nut (1) of the torque converter.
- Crank engine further and release remaining 5 nuts.



- Stage the workshop crane **2 220 718**.



- Stage the lifting gear .



TECHNICAL INFORMATION

Conduct the following operation with the assistance of a second person.

- Secure the automatic transmission against dropping using a workshop crane **2 220 718** and lifting gear .
- Remove screws (arrows).
- Remove the automatic transmission with help from an auxiliary person and using the workshop crane **2 220 718** including lifting gear and put it to one side.

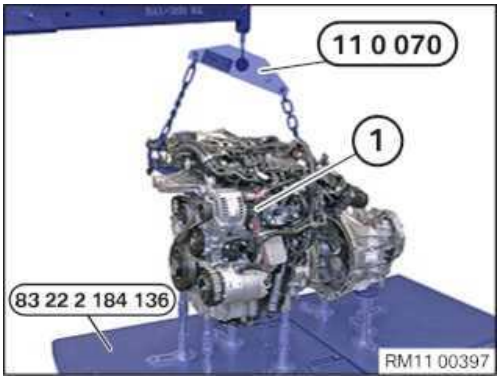
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- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

M8		Tightening torque	21,5 Nm



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Attach engine lifter to special tool and lift engine (1) off lifting table.

13 – Mount engine on assembly stand

CAUTION

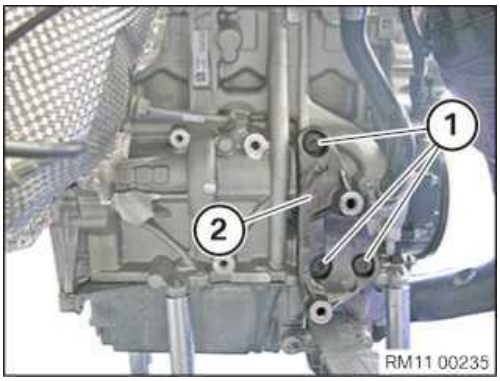
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Loosen screws (1).
- Guide out and remove holder (2).

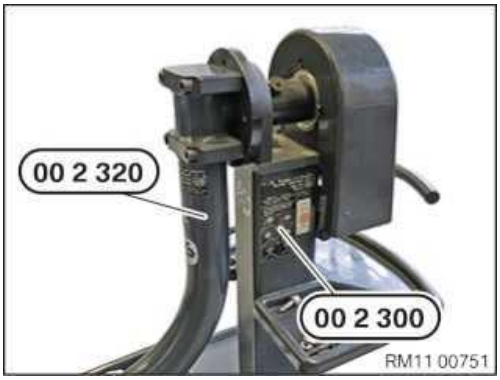
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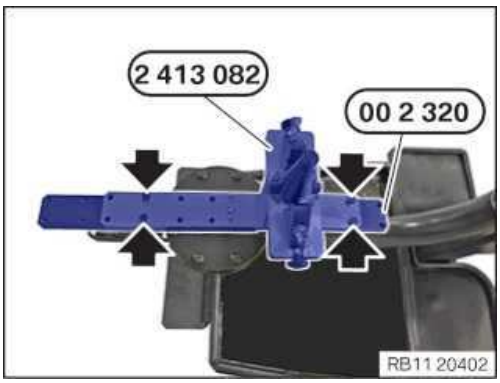
- Position the special tool **2 455 010** on the engine (1).
- Position the standard bolts **M10x30**.
- Tighten the standard bolts (arrows).
-

Special tool 2 455 010 to crankcase

M10x30		Tightening torque	38 Nm



- Prepare the assembly stand **0 495 187 (00 2 300)** with the special tool **0 495 196 (00 2 320)**.



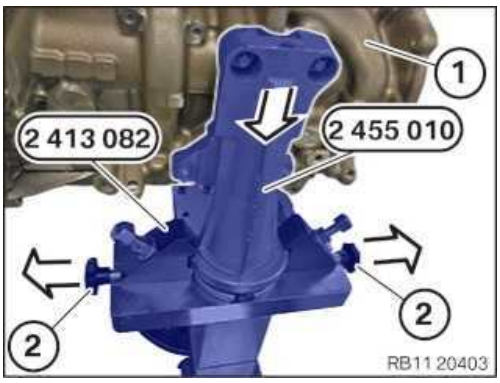
- Screw the special tool to the **0 495 196 (00 2 320)** special tool.
- Tighten screws (arrows).
-

Special tool 11 8 930 to special tool 00 2 320

M14x35		Tightening torque	160 Nm

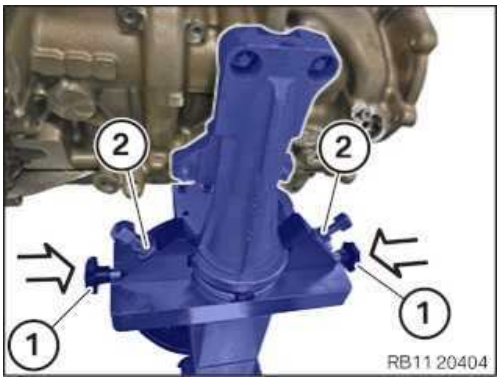


- Position the engine lifter with the special tool and the engine on the special tool **0 495 187 (00 2 300)**.



- Detach the holder (2) in the direction of the arrow.
- Position the engine (1) with the special tool **2 455 010** in the direction of the arrow on the special tool .

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- Lock the holder (1) in direction of arrow.
- Tighten nuts (2).

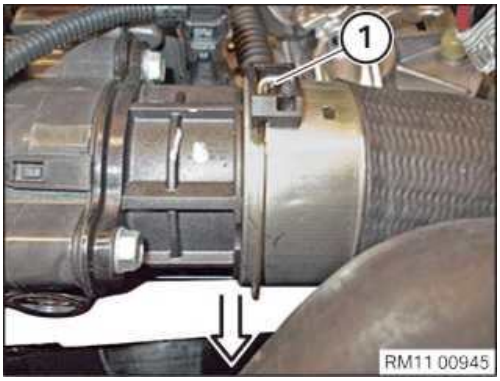
14 – Removing the intake plenum

TECHNICAL INFORMATION

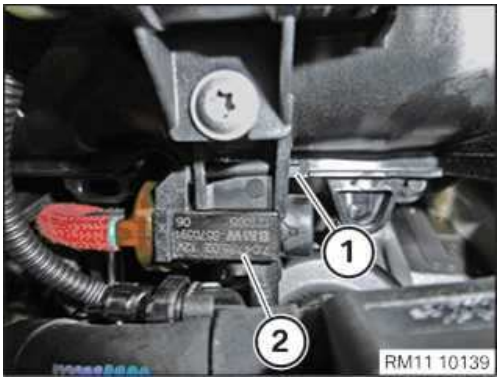
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Unlock the lock (1).

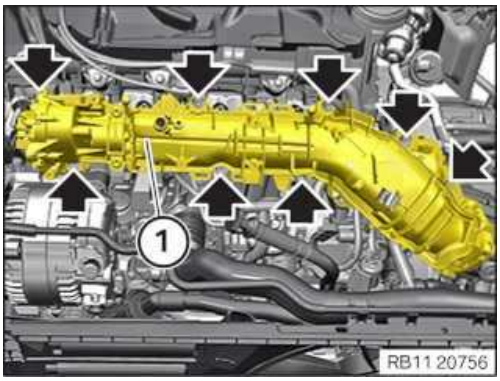


- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.

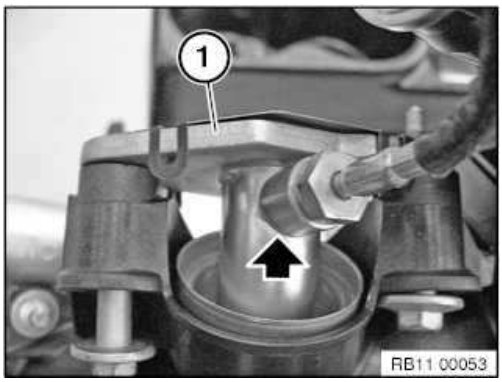


- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.

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- Release the screws (arrows) from the intake plenum (1).
- Guide the intake plenum (1) out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

15 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

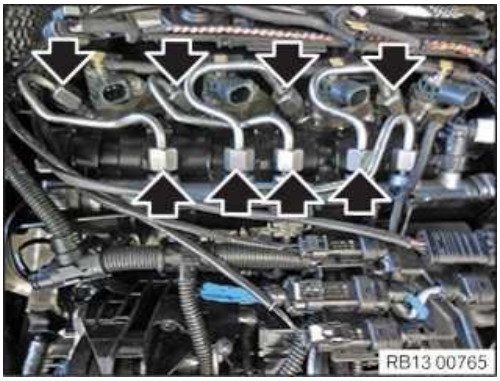
If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release the high pressure lines (arrows) with the special tool .
- Catch and dispose of escaping fuel.
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool .

16 – Detaching leakage oil line from injector

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

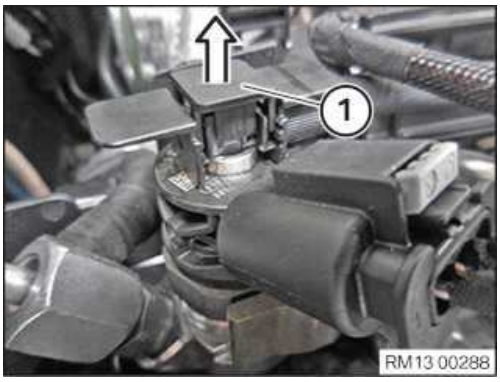
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

17 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

 **Electrostatic discharge.**

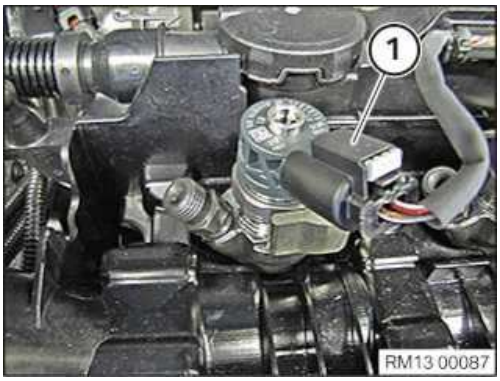
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

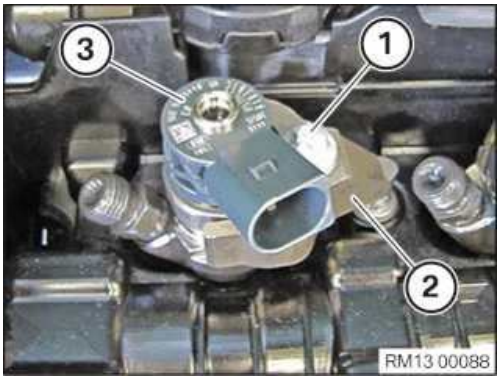
TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.

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- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

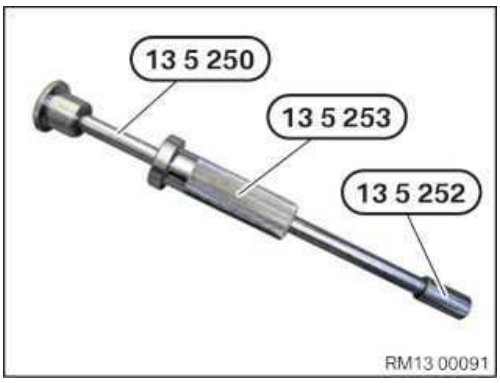
▶ **Loosen stuck injectors**

RISK OF DAMAGE

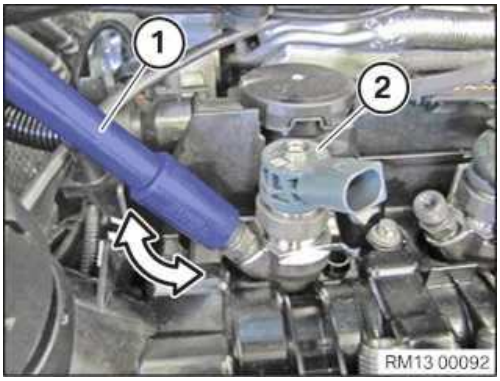
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)** back onto the special tool **0 493 321 (13 5 250)**.



- Screw the special tool (1) **0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1) **0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

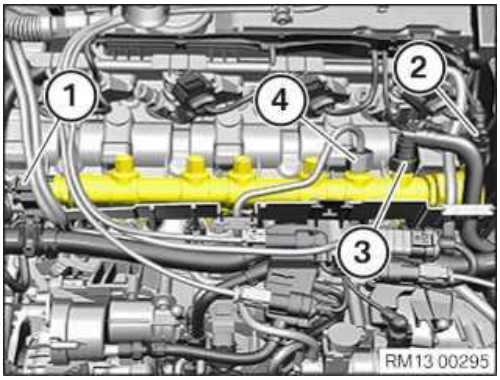
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

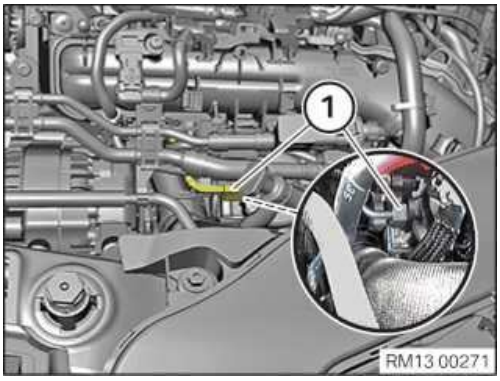
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

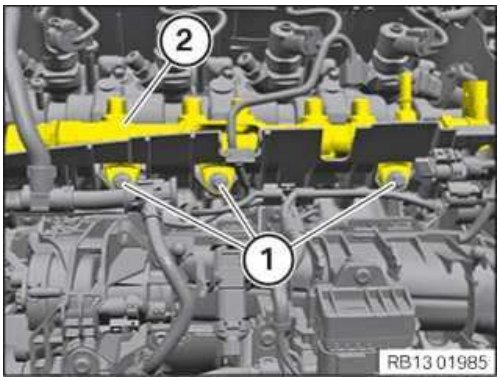


- Unlock and disconnect connector (1).
- Unlock and disconnect connector (2).
- Unlock and release fuel line (3).
- Loosen union nut (4) with special tool .
- Reset special tool early on to avoid bending pressure lines.



- Slacken the union nut (1) on the high pressure pump.

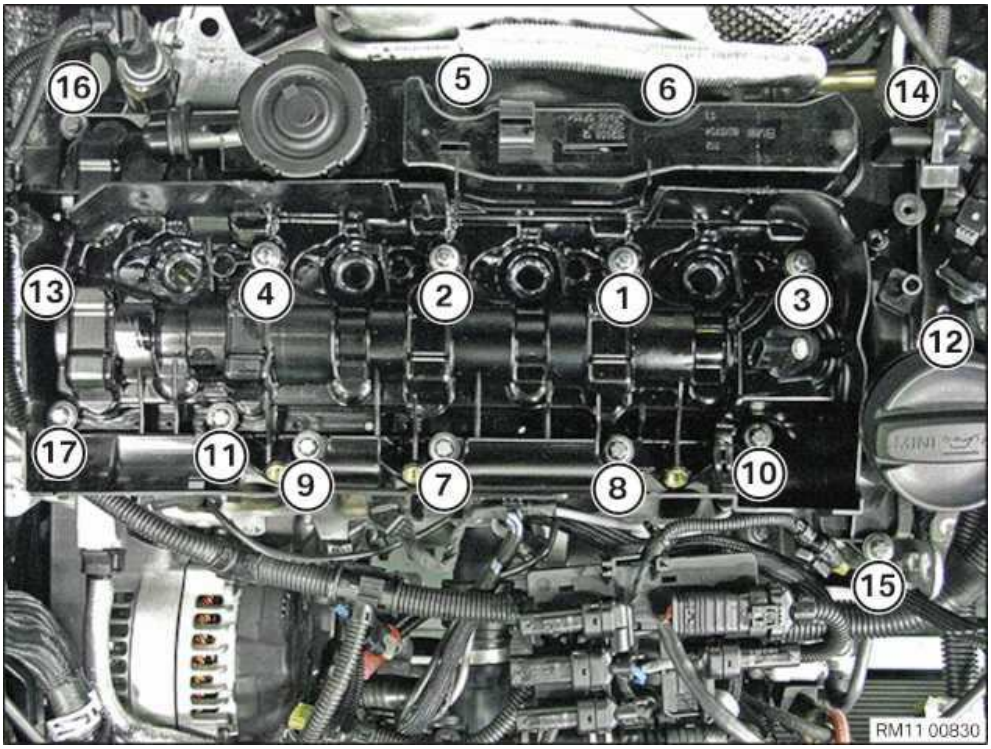
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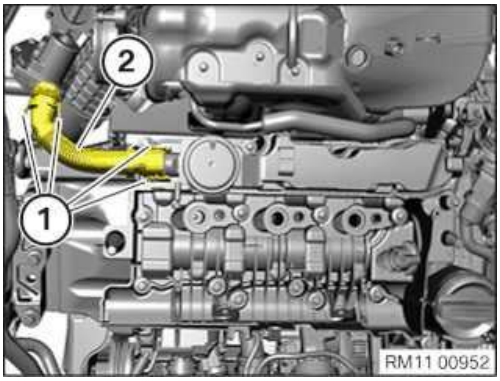
- Loosen screws (1).
- Carefully thread out and remove the rail (2).
- Make sure the pressure line of the high pressure pump is not bent.

19 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover

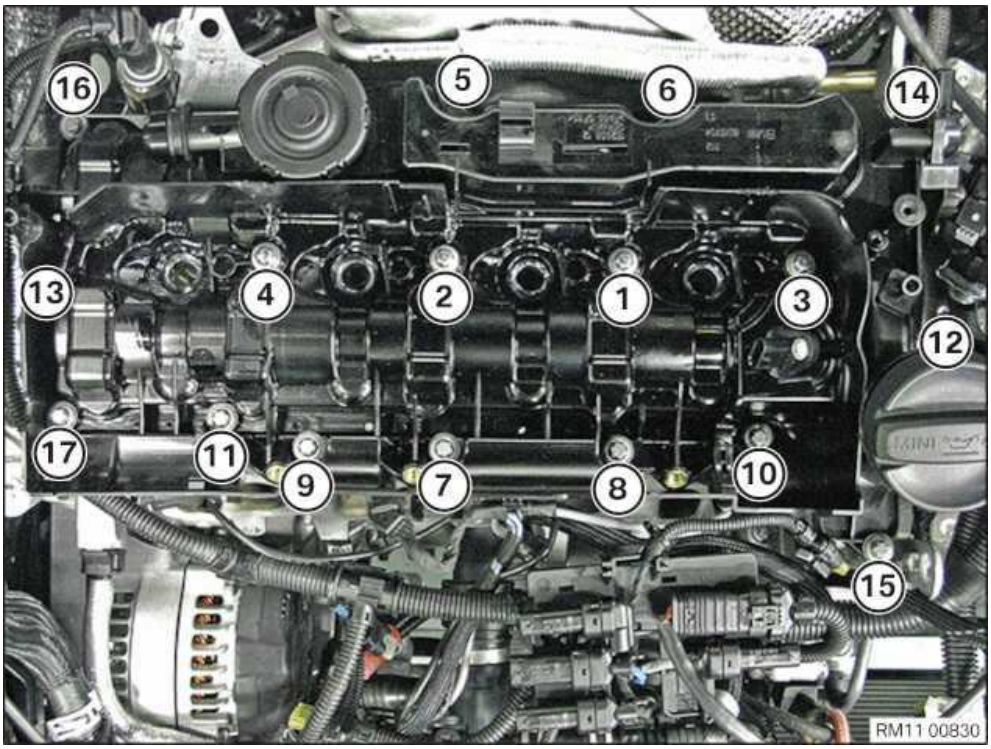


1 to 16 screws of the cylinder head cover.



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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- Loosen screws in the order (17) to (1).
- Remove cylinder head cover by lifting it out.

20 – Checking camshaft timing



- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

Damage to the engine.

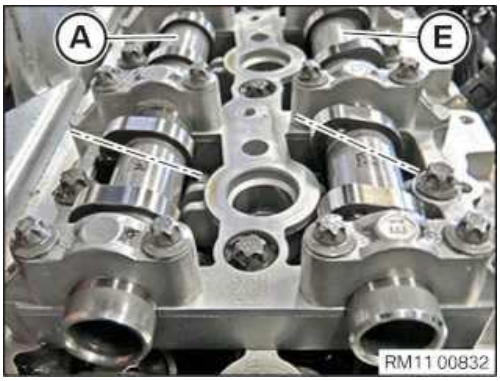
The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

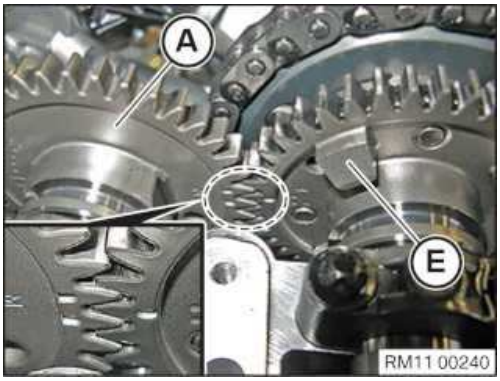
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- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.



- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

21 – Remove chain tensioner piston

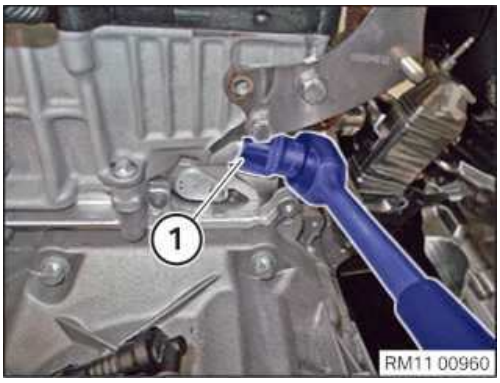
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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

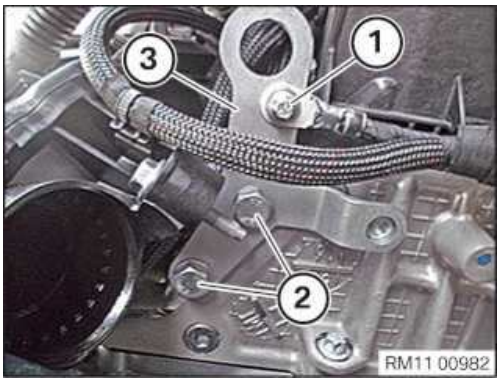


TECHNICAL INFORMATION

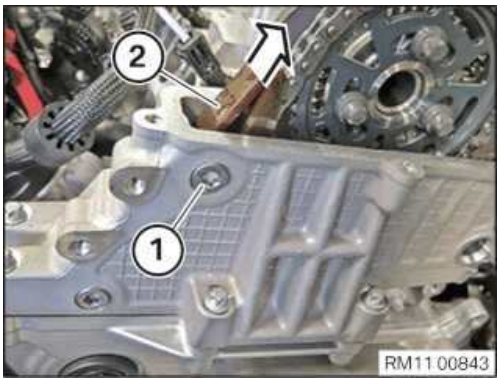
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

22 – Remove the timing chain guide rail

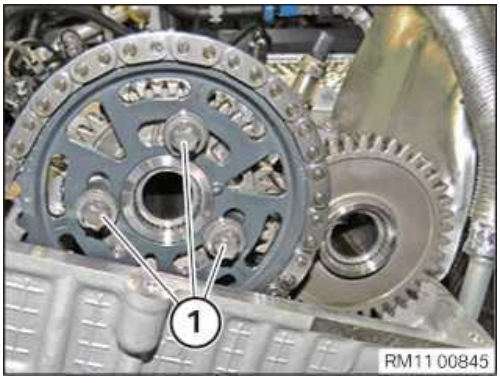


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

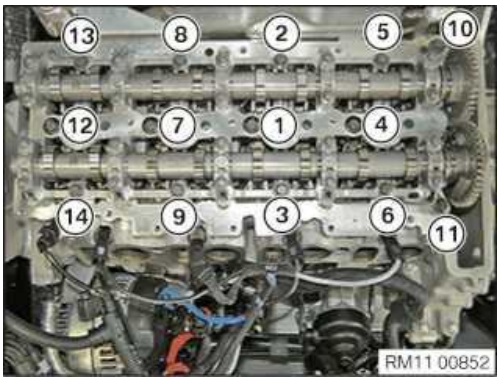
23 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

24 – Removing the camshaft support

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- Evenly loosen all screws in a sequence from (14) to (1).
- Loosen and remove all screws in a sequence from (14) to (1).
  Both camshafts can be removed with the camshaft carrier.
- Remove the camshaft support including camshafts towards the top.

25 – Removing glow elements

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Damage to the glow elements.

Excessive force may damage the glow elements and they may then have to be renewed.

- Handle glow elements with care and do not drop.
- Do not rest the cylinder head on glow elements. Glow elements protrude from the sealing surface of the cylinder head.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

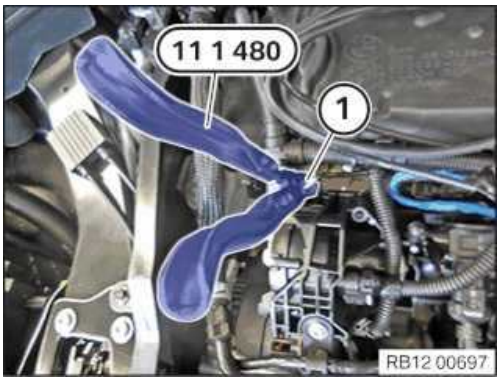
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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

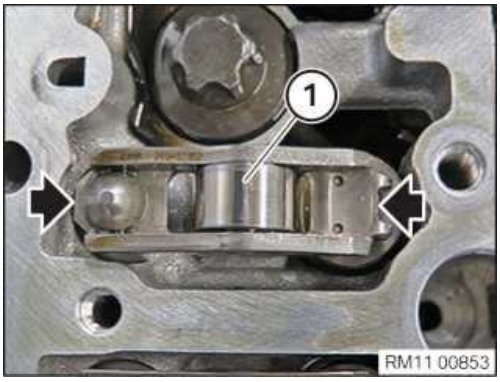


- Unlock and disconnect plug connection (1) using special tool **0 490 796 (11 1 480)**.



- Release the glow elements with the special tool or conventional tools.
- Feed out preheating elements and remove.

26 – Remove roller cam followers



- Guide out and remove all roller cam followers (1) (arrows).
- Place all roller cam followers (1) in order in special tool **0 495 105 (11 4 480)**.

  Roller cam followers that have already been used must be installed in same position again.

27 – Removing the hydraulic valve clearance compensating element

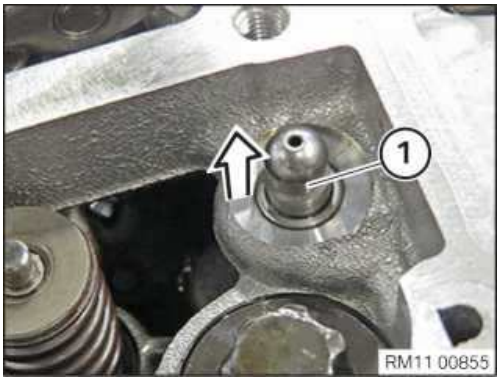
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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Remove the hydraulic valve clearance compensating element (1) in the direction of the arrow and place on the special tool **0 495 105 (11 4 480)**.
- Repeat the process on all hydraulic valve clearance compensating elements.

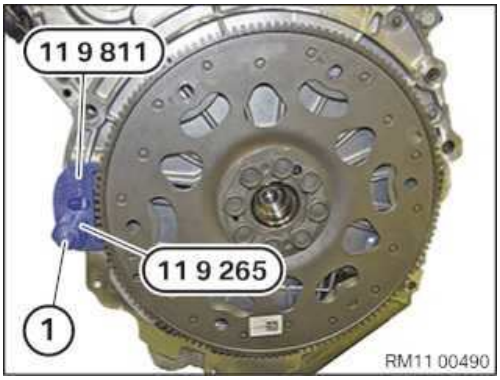
28 – Removing flywheel

CAUTION

Heavy component.

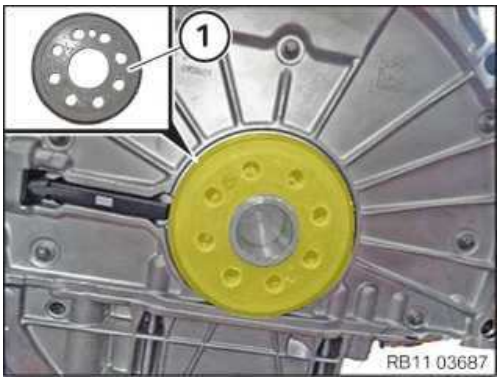
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Secure flywheel with a transmission bolt (1) and the special tools **0 496 171 (11 9 811)** and **0 494 793 (11 9 265)**.
- Unfasten flywheel bolts.
- Remove flywheel.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

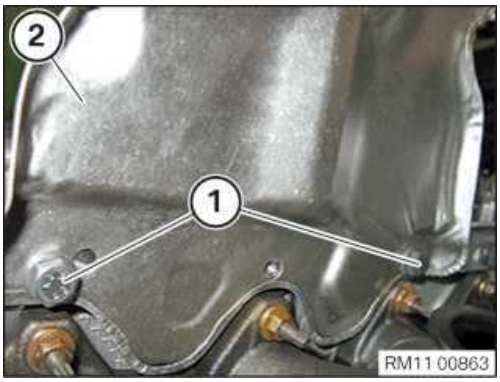
- Remove the increment wheel (1) from the crankshaft and set correctly.

MAIN WORK

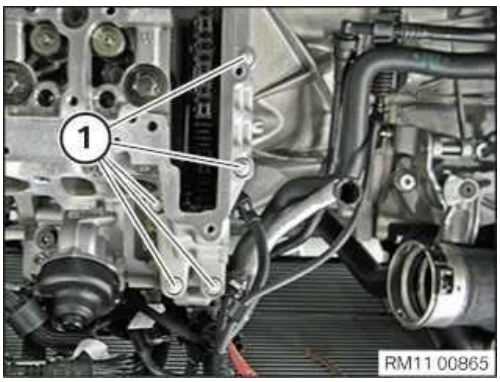
29 – Remove rear timing case cover

Prerequisite

Transmission is removed.



- Loosen screws (1).
- Feed out the heat shield (2) and place to one side.

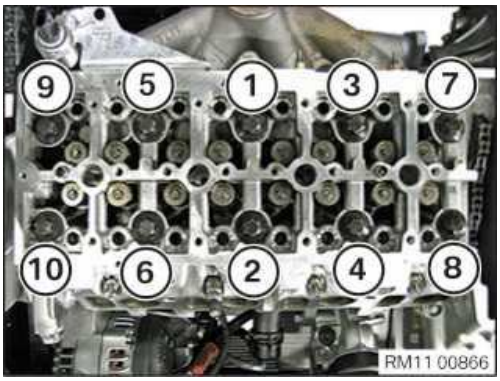


TECHNICAL INFORMATION

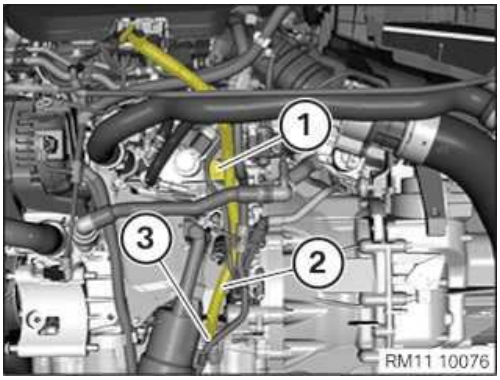
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screws (1).

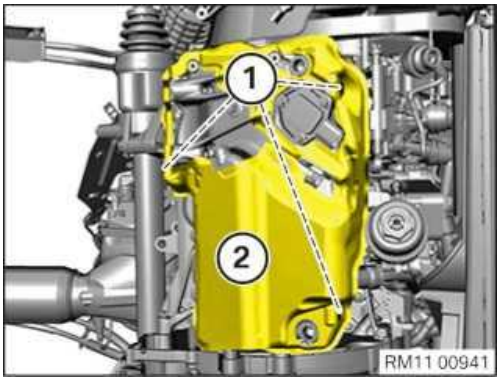
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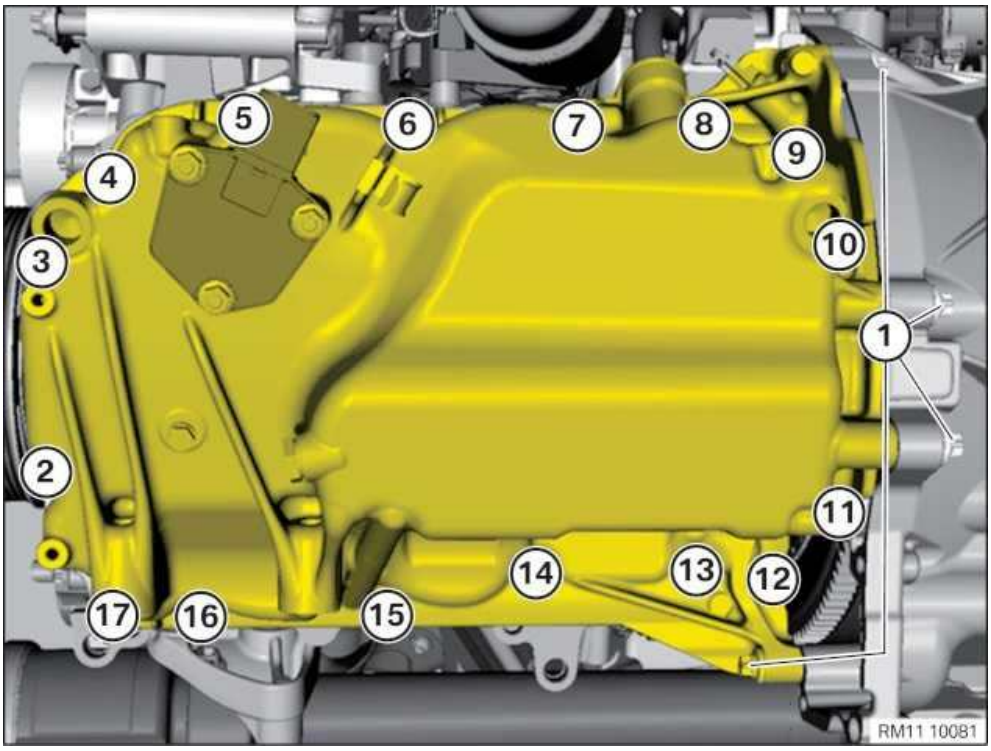
- Loosen the cylinder head bolts in the sequence from (10) to (1).
- Remove cylinder head bolts (1) to (10) with washers.
- Remove cylinder head.



- Loosen screw (1).
- Disconnect the guide tube (2) for the oil dipstick toward the top from the oil sump and remove it.
- Remove sealing ring (3) from oil sump if necessary.

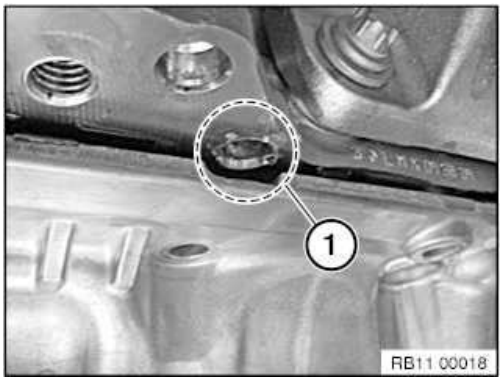


- Expanding rivets (1) on both sides of the acoustic cover (2).
- Feed out and remove the acoustic cover (2).

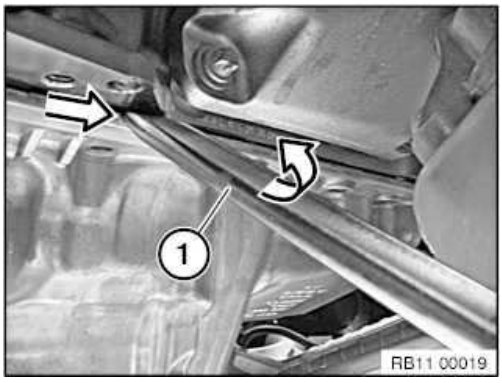


- Loosen the transmission bolts (1) on the oil sump.
- Loosen screws (2) to (17).

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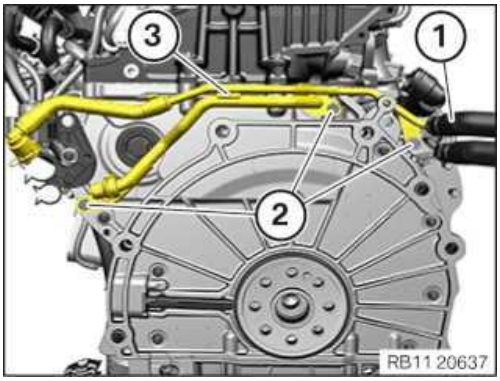


- Release oil sump only in area (1).

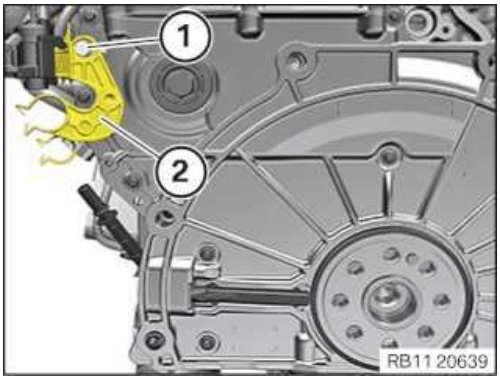


- Detach the oil sump with a suitable mounting lever (1) carefully at the point provided.
- Secure the oil sump against falling.

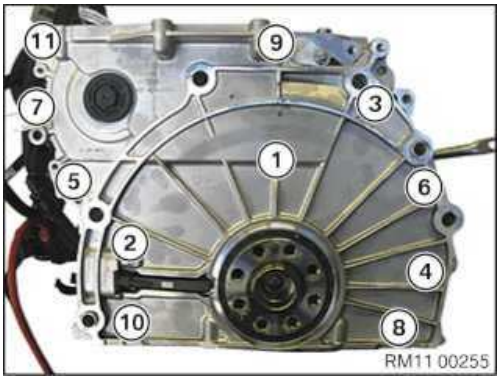
▶ **If installed: Remove coolant line of the SCR metering module**



- Unlock and disconnect the coolant hose (1).
- Loosen screws (2).
- Remove the coolant line (3).

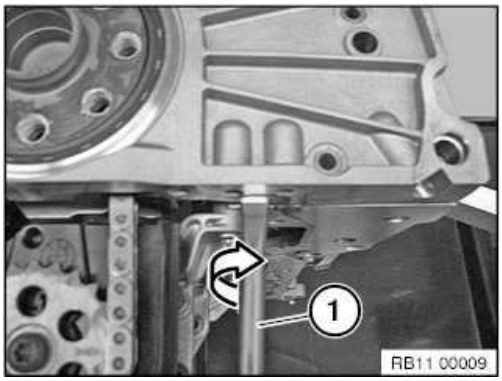


- Loosen screw (1).
- Guide out and remove holder (2).

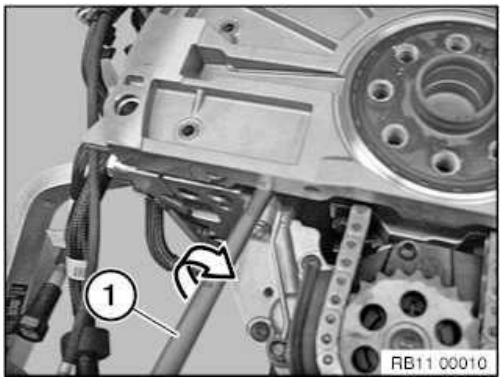


- Loosen screws in the order (11) to (1).

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- Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.

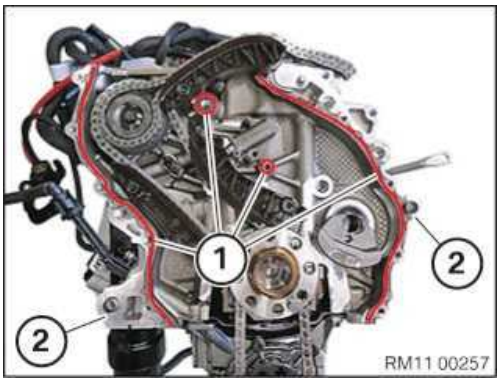


- Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.
- Remove the timing case cover.

30 – Install the rear timing case cover

Prerequisite

Transmission is removed.



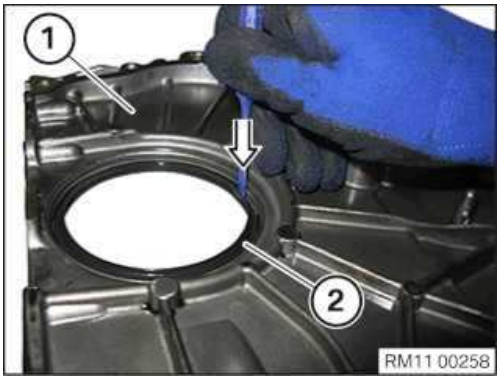
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

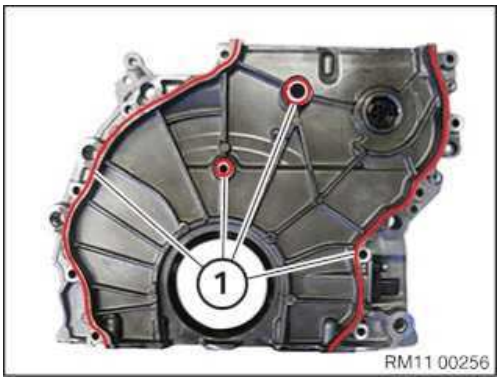
- Do not use any metal-cutting tools.

- Remove seal residue from the sealing surfaces (1) using special tool **0 495 102 (11 4 470)**.
- Check fitting sleeves (2) for damage and for tight fit; renew if necessary.

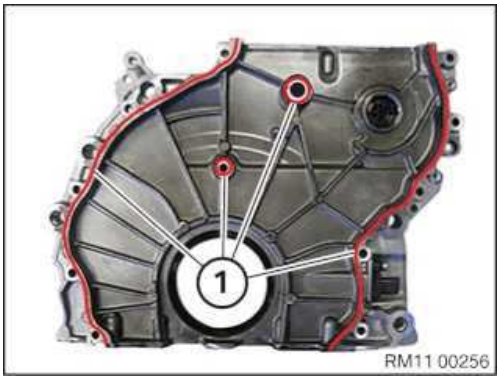


- Position the timing case cover (1) underneath.
- Position punch on inner side of crankshaft seal (2).
- Drive out crankshaft seal (2) outwards.

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- Remove seal residue from the sealing surfaces (1) using special tool **0 495 102 (11 4 470)**.

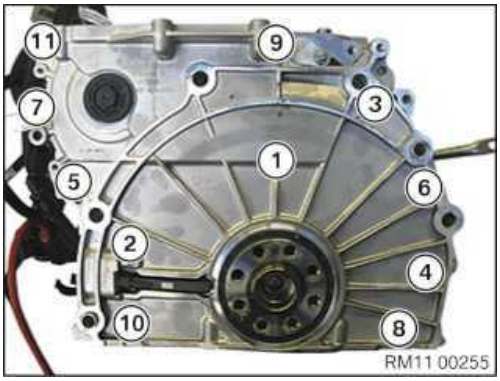


TECHNICAL INFORMATION

For more information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

- Apply sealing bead (1) with a height of approx. 1.5 mm to 2.0 mm on inner side of timing case cover in marked locations. Use liquid sealing compound for this.

  Application time of sealing bead (1) must not exceed 12 minutes.



- Mount the timing case cover without the crankshaft seal.
- Renew screws (1) to (11).

  Parts: Bolts
- Join the bolts in with the sequence (1) to (11).
- Tighten screws in the order (1) to (11).

Rear timing case cover to crankcase

M6	Renew screws.	Jointing torque	8 Nm
		Angle of rotation	90 °

▸ **Installing the rear crankshaft seal**

RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) on the radial shaft seal with the sharp-edged connector gearing of the output shaft will result in destruction and/or leaks.

- When inserting the output shaft, make sure that the connector gearing of the output shaft does not touch the sealing lip (inner) of the radial shaft seal.

RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) and applying oil to the radial shaft seal will lead to its destruction.

- Do not touch the sealing lip (inner) of the radial shaft seal.
- Do not apply oil to the radial shaft seal.
- Install the radial shaft seal dry.

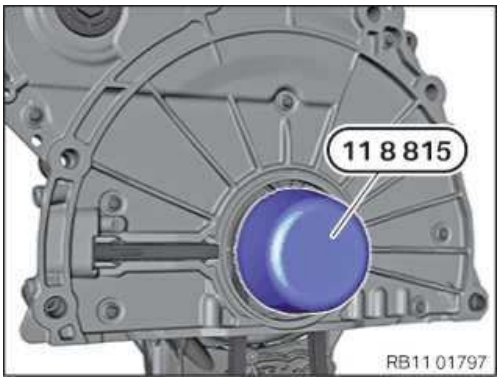
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RISK OF DAMAGE

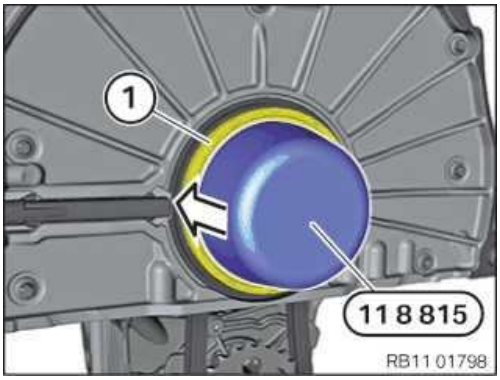
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Position special tool **0 496 137 (11 8 815)** on crankshaft. Make sure that the crankshaft sensor is not damaged.



- Fit the crankshaft seal (1) up to the timing case cover in the direction of the arrow using special tool **0 496 137 (11 8 815)** and position.
- Remove special tool **0 496 137 (11 8 815)**.



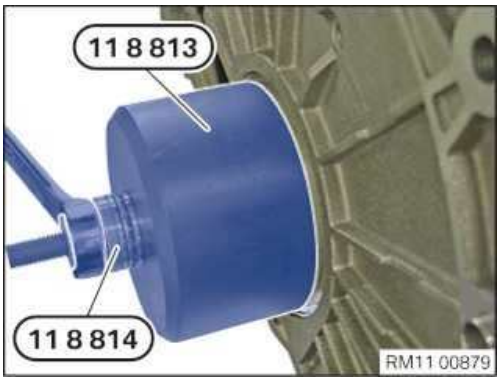
- Secure special tool **0 496 133 (11 8 811)** to the crankshaft using special tool **0 496 134 (11 8 812)**.



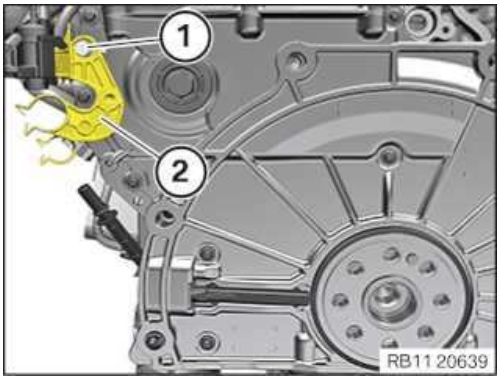
- Check the freedom of movement between the special tool **0 496 135 (11 8 813)** and the crankshaft sensor during installation.

  Otherwise there is a risk that the crankshaft sensor will be damaged.
- Slide on special tool **0 496 135 (11 8 813)**.
- Screw down special tool **0 496 136 (11 8 814)**.

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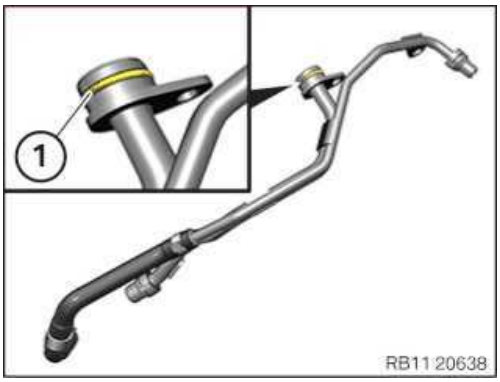


- Press in crankshaft seal with special tool **0 496 135 (11 8 813)**.
- Screw in special tool **0 496 135 (11 8 813)** up to timing case cover.



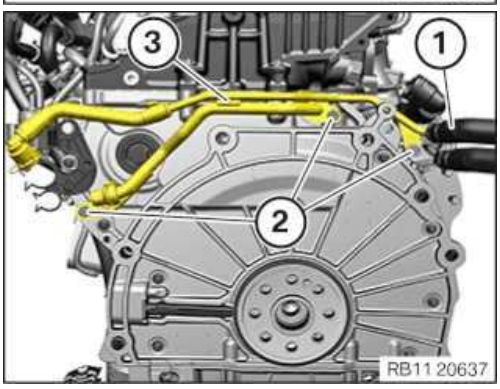
- Insert and install the holder (2).

▶ **If installed: Installing the coolant line of the SCR metering module**



- Renew the O-ring 1.

  Parts: O-ring



- Feed in and install coolant line (3).
- Tighten down screws (2).

SCR coolant lines to crankcase end cover

Hexagon screw M6x16		Tightening torque	8 Nm

- Connect and lock the coolant line (1).

  Coolant line (1) must audibly engage.

▶ **Cleaning the sealing surface**

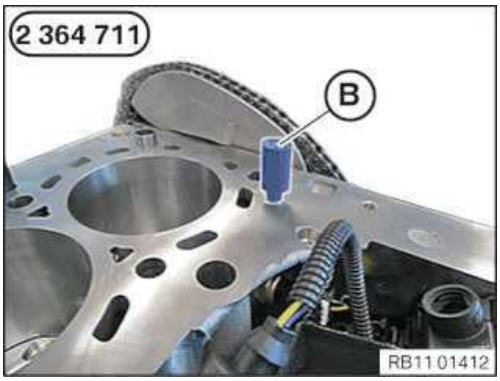
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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- Lock the front oil duct using special tool (B) from special tool **2 364 711**.



RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 103 (11 4 471)**.



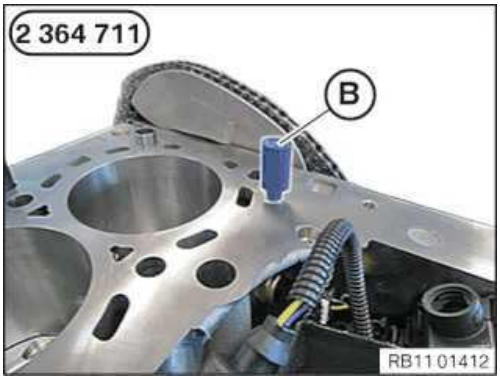
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

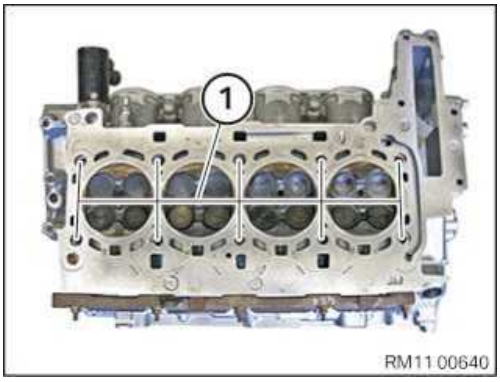
- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 104 (11 4 472)**.



- Remove special tool (B).

▸ **Renewing the cylinder head gasket**



RISK OF DAMAGE

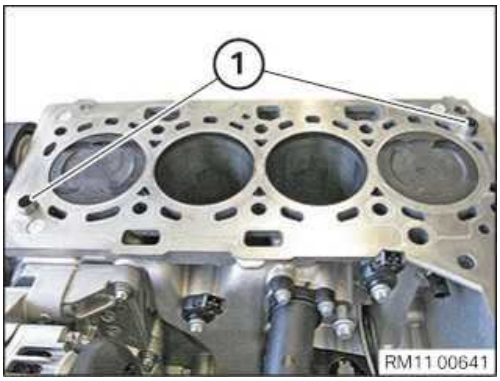
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

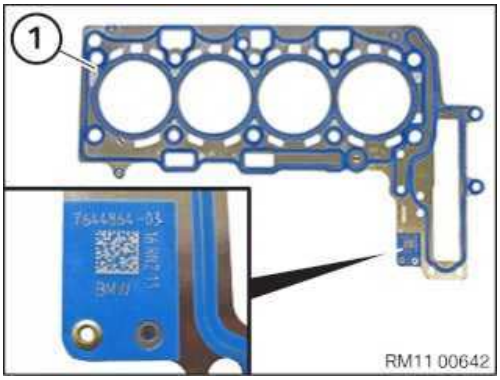
- Do not use any metal-cutting tools.

- Remove oil and dirt residue from the blind holes (1).

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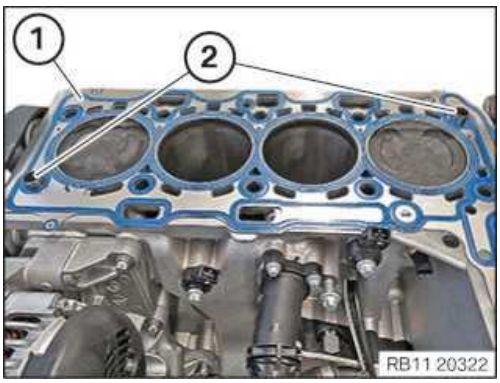


- Check the fitting sleeves (1) for secure fit and damage.



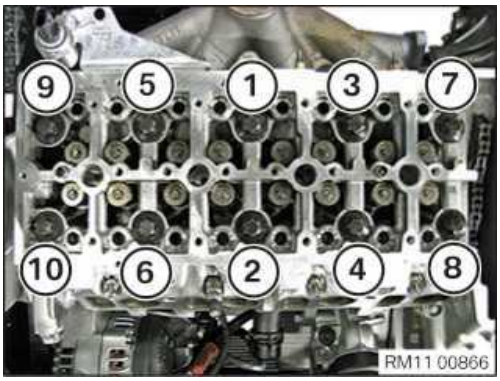
- Identify the cylinder head gasket (1) using the part number.

Note: If the cylinder head is reworked, an additional thicker gasket 0.3 mm is available for service personnel.



- Guide in the cylinder head gasket (1) and install.
- Ensure that the cylinder head gasket (1) is installed correctly in the fitting sleeves (2).

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CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Damage to threads.

Fluid in the threaded hole may damage the thread when screws are tightened in the threads.

- Dry threaded holes (e.g. using compressed air).

TECHNICAL INFORMATION

Do not remove bolt coating.

- Renew the cylinder head bolts (1).

  Parts: Cylinder head bolts
- Do **not** wash off coating of cylinder head bolts.
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

  No coolant, water or engine oil must be present in threaded holes of engine block.

TECHNICAL INFORMATION

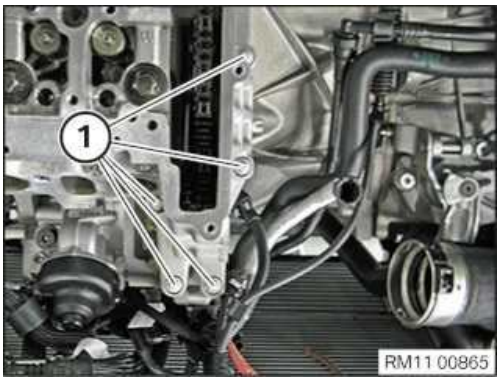
When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Feed in cylinder head bolts and install.
- Screw in cylinder head bolts in sequence (1) to (10).
- Tighten cylinder head bolts using special tools **0 490 504 (00 9 120)** and in sequence (1) to (10).

Cylinder head to crankcase

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

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- Tighten the cylinder head bolts (1).

Cylinder head bolt to timing case cover

M8x40		Tightening torque	19 Nm

-



TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

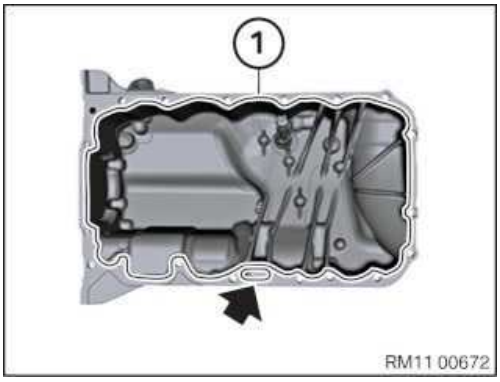
- Remove fine sealing remains on the sealing surface (1)and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.



TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove coarse sealing remains on the sealing surface (1)and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.



TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- Apply the sealing compound along the line (1) with a thickness of 2 mm to 2.5 mm.

  Apply the sealing compound along the inner edge.

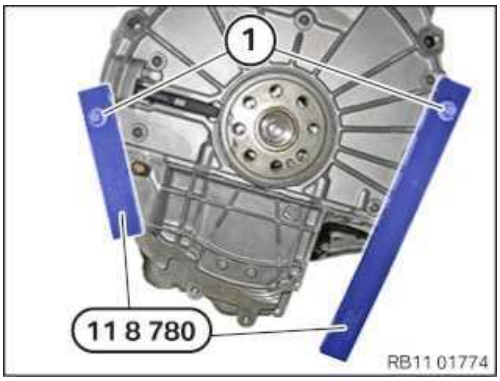
Sealing compound

Loctite 5970 liquid sealing compound	50 ml, Cartridge	83190404517

Overview of consumables (Electronic Parts Catalogue)

- Completely encircle the oil return orifice (arrow) with the sealing compound.

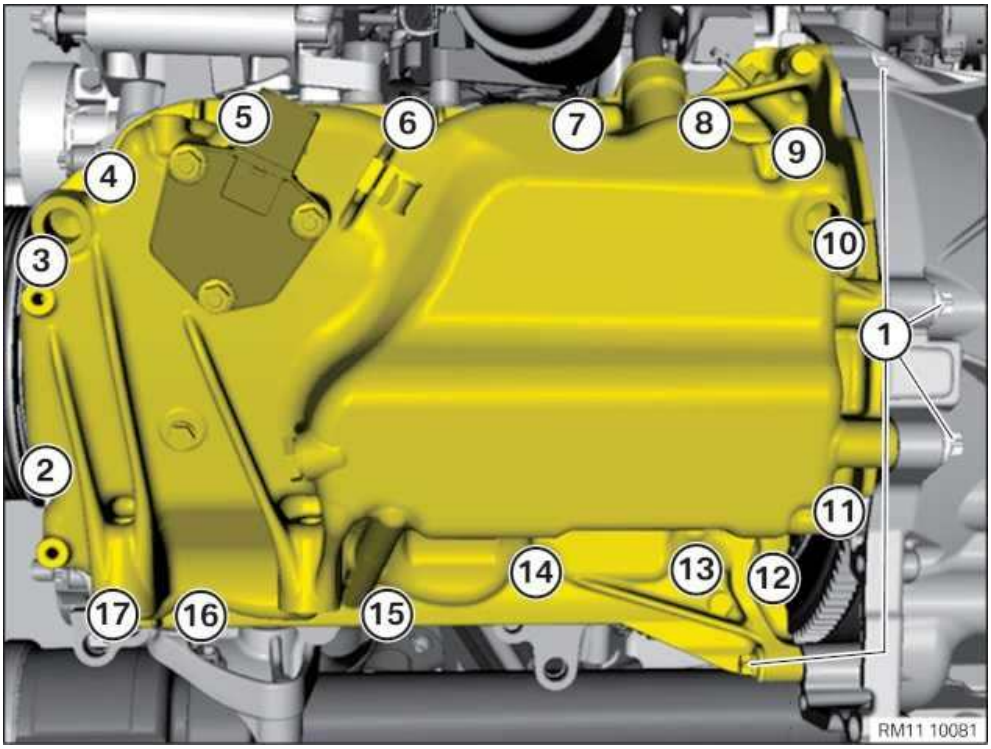
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TECHNICAL INFORMATION

The special tool 11 8 780 is only required when the transmission is removed.

- Position the special tool **0 496 120 (11 8 780)** with the transmission bolts (1) so that the oil sump is exactly flush with engine block.
- If necessary, renew fitting sleeves.



- Position and install oil sump.
- **Hand-tighten** oil sump screws (2) to (17) but do **not** tighten completely.
- Join transmission bolts (1) with 5 Nm.
- Tighten screws(2) to (17) of the oil sump.

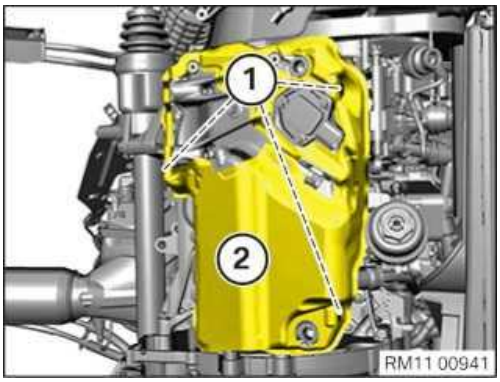
Oil sump to crankcase

M8x30		Tightening torque	2 Nr
M8x110		Tightening torque	2 Nr

- Tighten transmission bolts (1) on oil sump.

Transmission to oil sump

M8		Tightening torque	1 Nr



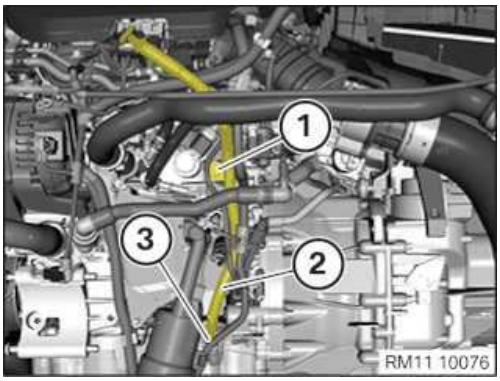
- Thread in and position the acoustic cover (2).
- Install the expanding rivet (1).



- Renew O-ring (1).

  Parts: O-ring

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- Guide in guide tube (2) for oil dipstick and insert it into oil sump.
- Make sure the sealing ring (3) is positioned correctly in the oil sump.
- Tighten down screw (1).

Guide tube for oil dipstick on engine

M8x16		Tightening torque	19 Nm

POSTPROCESSES

31 – Installing the flywheel

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Check fitting sleeve on the crankshaft for damage and replace if necessary.

TECHNICAL INFORMATION

Clean all threads with a screw tap.

- Clean all the screw threads (1).

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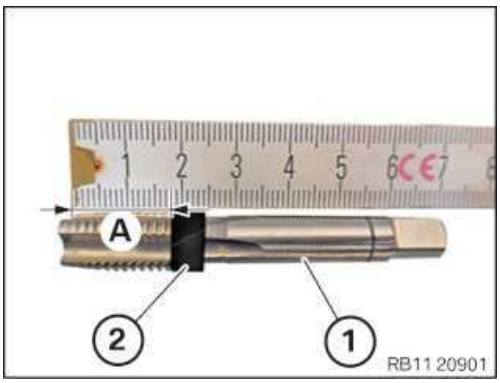
- Use the set of special tools **2 285 058**.

Description
Twist drill
Thread cutter M12x1.5
Depth
Insertion tool



- Assemble tool set.

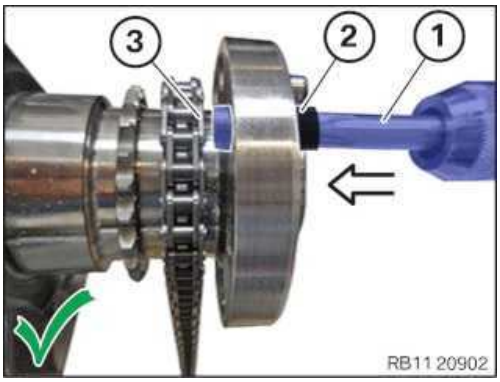
Number	Description
1	Tool holder
2	Thread cutter M12X1,5



- Mark the installation dimension (A) on thread cutter (1) from the set of special tools **2 285 058** using a commonly-available tool (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm



NOTICE

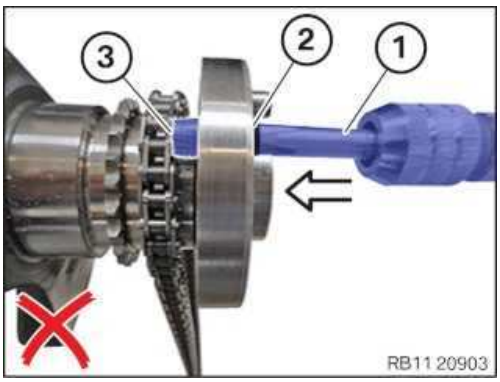
To provide a better overview: Shown with engine removed.

- Screw in the thread cutter (1) from the set of special tools **2 285 058** in direction of arrow up to the installation dimension (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm

- Make sure that the thread cutter does (1) **not** rest on the timing chain (3).



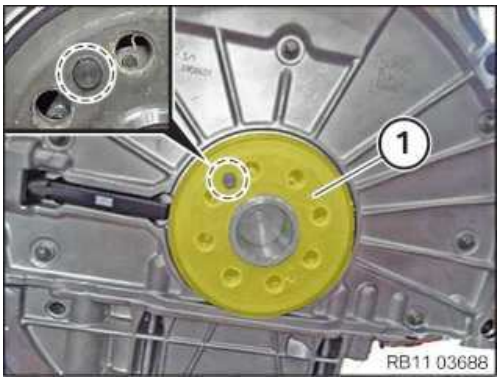
TECHNICAL INFORMATION

- **Carefully** handle the timing chain, to protect the timing chain and timing chain drive against damage.

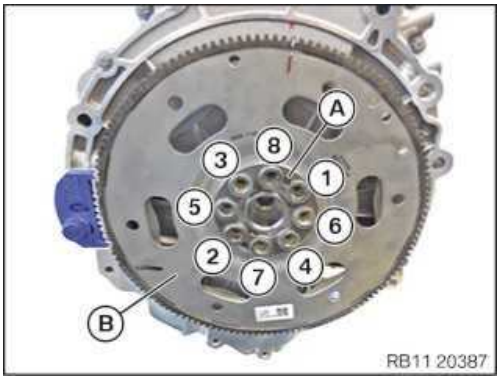
- Make sure the installation dimension (2) of the screw bore (1) is not exceeded.

  The thread cutter (1) may not rest on the timing chain (3).

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- Important! Observe the marking shown during installation.
- Install special tool (1) on the crankshaft as shown.

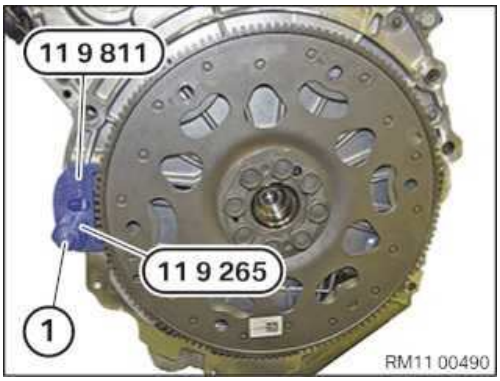


- Position flywheel (B) .
- Renew flywheel bolts (1) to (8).

  Parts: Flywheel bolts
- Screw in flywheel bolt (1) to (8) by hand.
- Observe tightening sequence. Begin at the dowel pin (A).
- Tighten flywheel bolts in sequence (1) to (8).

Flywheel to crankshaft

M12x1.5	Renew screws.	Tightening torque	120 Nm



- Loosen the transmission bolt (1).
- Guide out and remove the special tool **0 494 793 (11 9 265)** and **0 496 171 (11 9 811)** with the **standard** washer (5 mm).

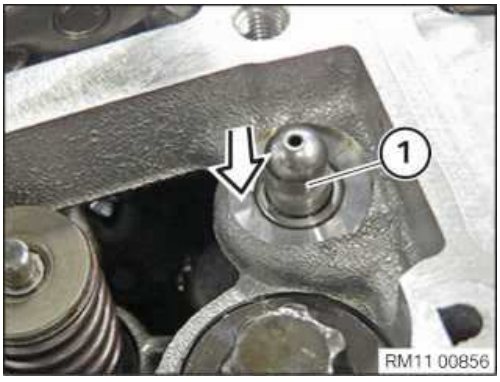
32 – Installing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



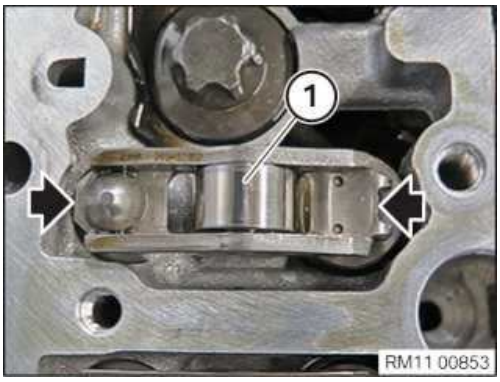
- Install the hydraulic valve clearance compensating element (1) in the direction of the arrow.
- Repeat the process on all hydraulic valve clearance compensating elements.

33 – Install the roller cam followers

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TECHNICAL INFORMATION

- Note the installation position of the component. The component may be installed in various installation positions.

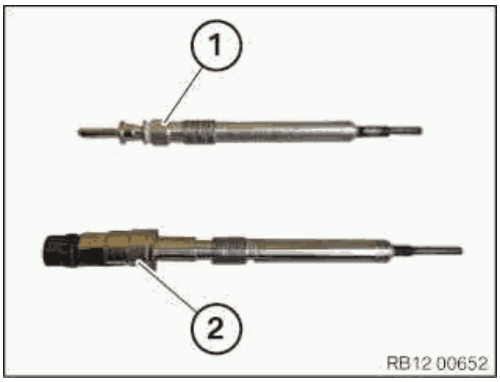


- Check all roller cam followers (1) for damage and replace if necessary.

  Parts: Roller cam followers
- Insert and install all roller cam followers (1).

  Roller cam followers (1) that have already been used must be installed in the same place.
- Note the mounting orientation of the roller cam followers (1).
- Oil all roller cam followers (1).

34 – Install glow elements



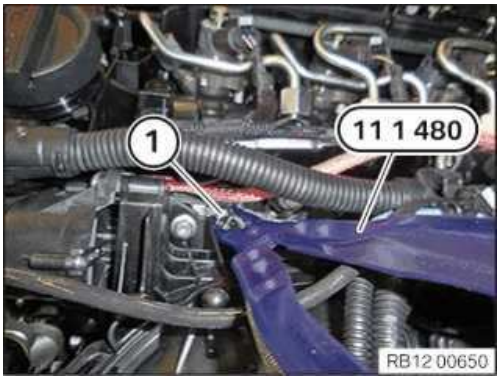
- Install glow elements (1) in cylinders 1, 2, 3 and 4.
- If fitted: Glow element (2) with the **combustion chamber pressure sensor** must be installed in cylinder **2**.



- Tighten the glow element with the special tool or conventional tools.

Glow elements to cylinder head

Glow element		Tightening torque	13 Nm

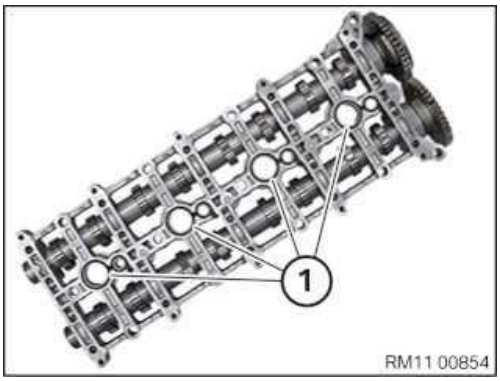


- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

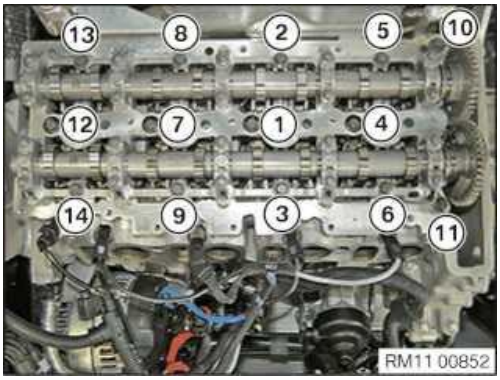
35 – Installing the camshaft support

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- Renew gaskets (1).

  Parts: gaskets



- Position the camshaft support including the camshafts.
- Tighten the screws in a sequence from (1) to (14) in several steps.

Camshaft carrier to cylinder head

M7x35		Tightening torque	13 Nm

36 – Adjusting the timing of the camshafts

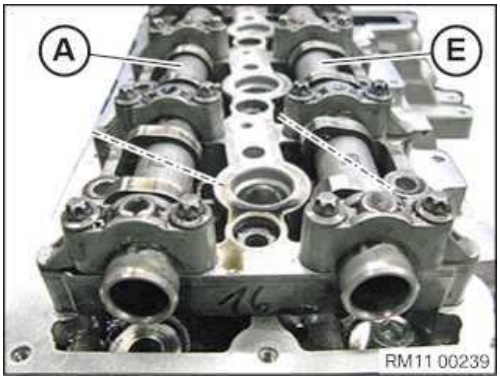


- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.



- Slide the special tool **2 288 380** completely into the bore hole of the oil sump.
- Use the special tool to block **2 288 380** the crankshaft in the TDC firing position at the first cylinder.



- The cam of the intake camshaft (E) at the first cylinder points up at an angle.
- The cam of the exhaust camshaft (A) at the first cylinder points outward at an angle.

▸ **Remove exhaust camshaft.**

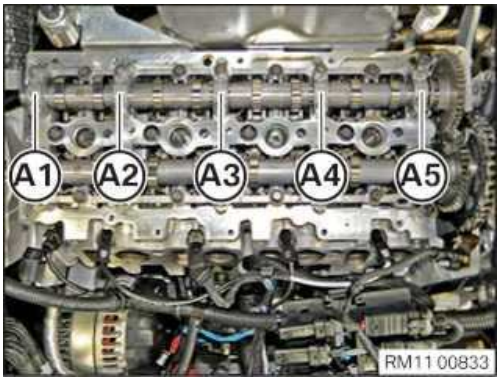
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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



TECHNICAL INFORMATION

The camshaft is tensioned by the valve springs. Tighten or loosen each screw on the camshaft bearing caps one at a time in the specified sequence and by half a turn only. Repeat procedure.

- Loosen all screws of the exhaust camshaft bearing caps (A1) to (A5) from the outside to the inside, step by step in 1/2 turns.
- Remove exhaust camshaft in upward direction.
- Place all components on special tool **0 495 105 (11 4 480)** in a tidy and orderly fashion.

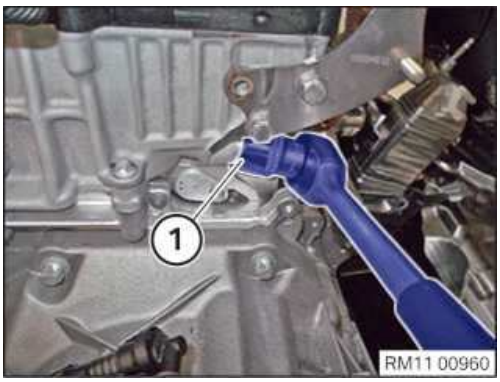
▸ **Remove chain tensioner piston**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

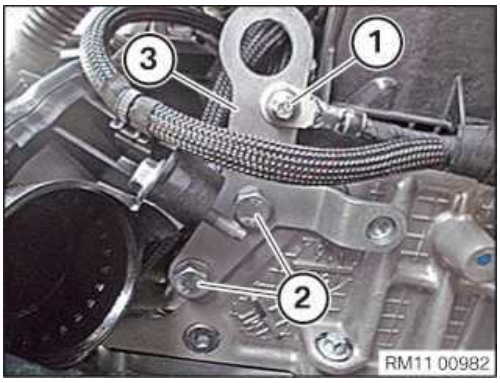


TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

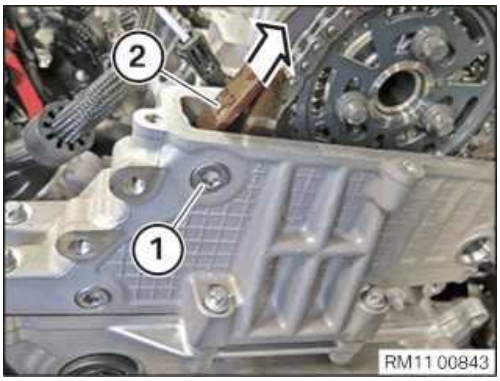
- Remove the chain tensioner piston (1).

▸ **Remove the timing chain guide rail**



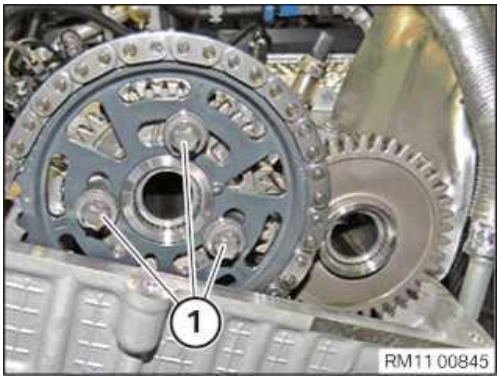
- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).

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- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

▸ **Removing the camshaft sprocket on the intake camshaft**



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

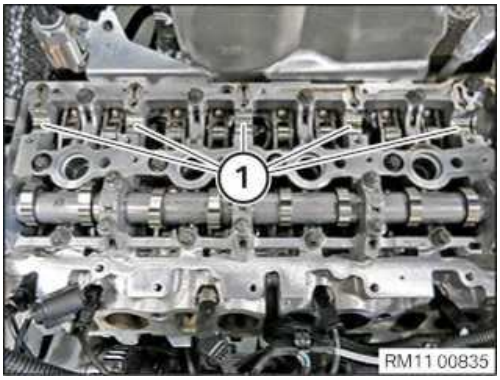
▸ **Install exhaust camshaft**

RISK OF DAMAGE

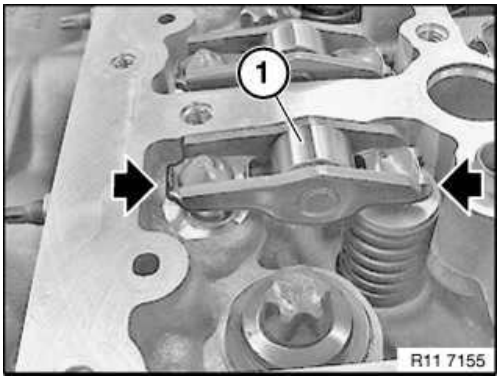
Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

- Comply with the regulations for the installation and disassembly.
- Perform work with care.

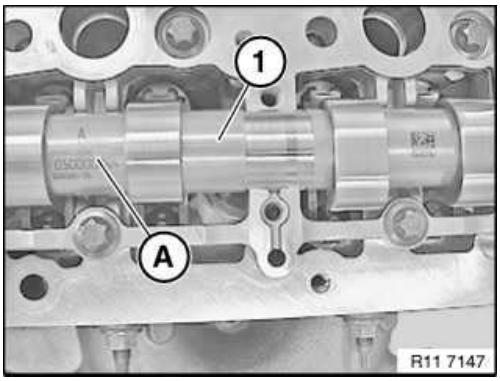


- Oil all bearing positions (1).

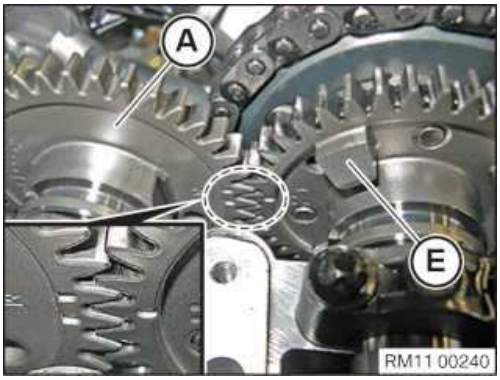


- Make sure the roller cam followers (1) have the correct mounting orientation.

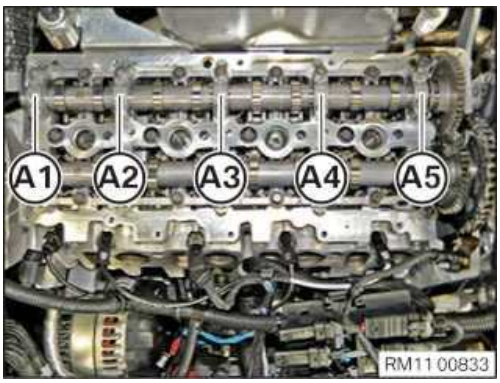
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- Insert exhaust camshaft (1) so that the identification (A) points upwards.



- Insert the exhaust camshaft (A) so that the marks on the camshafts (A) and (E) correspond in the highlighted area.
- Position the camshafts (A) and (E) accordingly.



- Tighten all exhaust camshaft bearing caps (A1) to (A5) from the inside to the outside by 1/2 a turn at a time.

Intake and exhaust camshaft in camshaft support

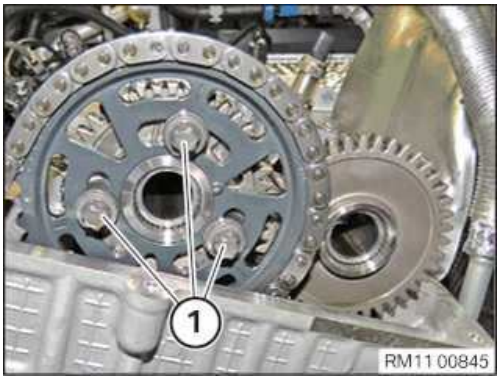
M6x31		Tightening torque	10 Nm



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

  Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

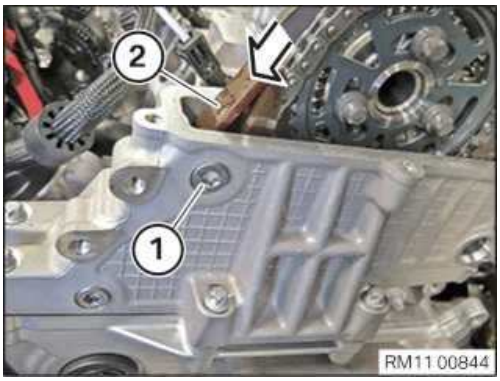
▶ **Installing the camshaft sprocket on the intake camshaft**



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

▶ **Install the timing chain guide rail**

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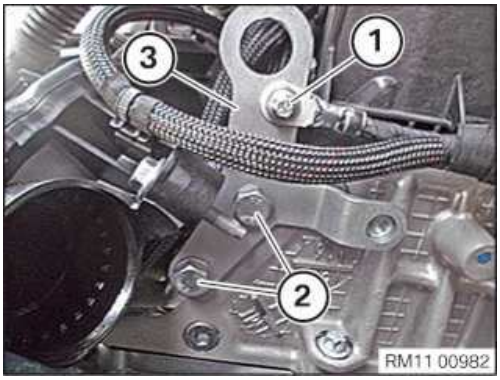
- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm



- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6		8 Nm

▸ Installing the chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Renew sealing ring (1).

  Parts: Sealing ring

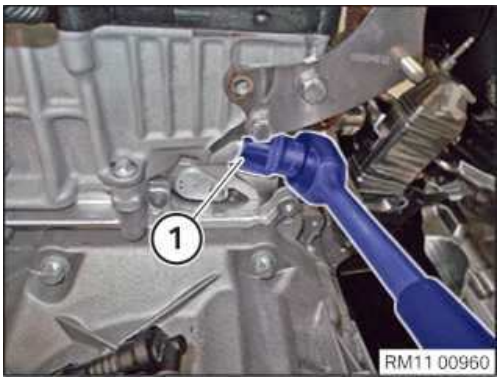


TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.

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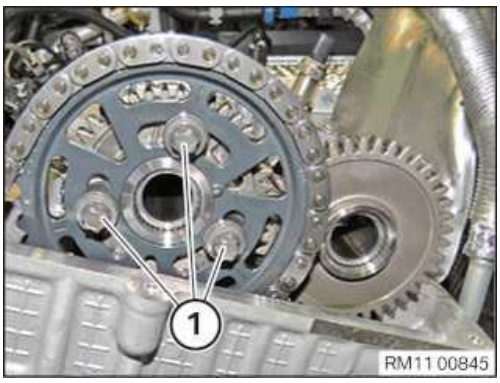


- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

▸ **Tightening the camshaft sprocket on the intake camshaft**



- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

37 – Removing the special tool to disconnect the crankshaft



- Remove special tool **2 288 380**.

38 – Removing the special tool to secure the exhaust camshaft



- Remove the special tool **0 496 112 (11 8 760)** to fix the exhaust camshaft.

39 – Checking camshaft timing

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- Remove protective cap (1) from oil sump.

- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

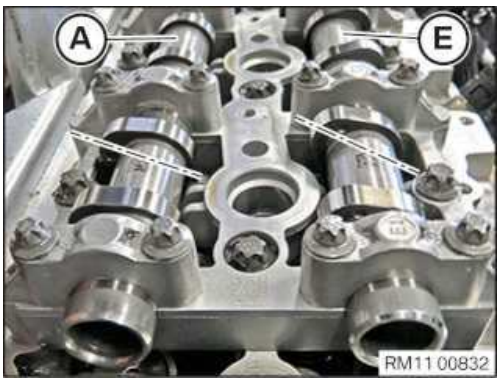
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

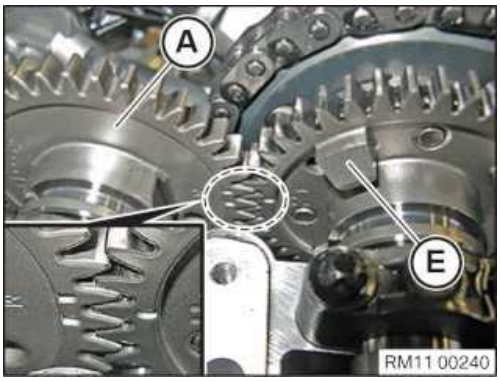


- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.

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- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

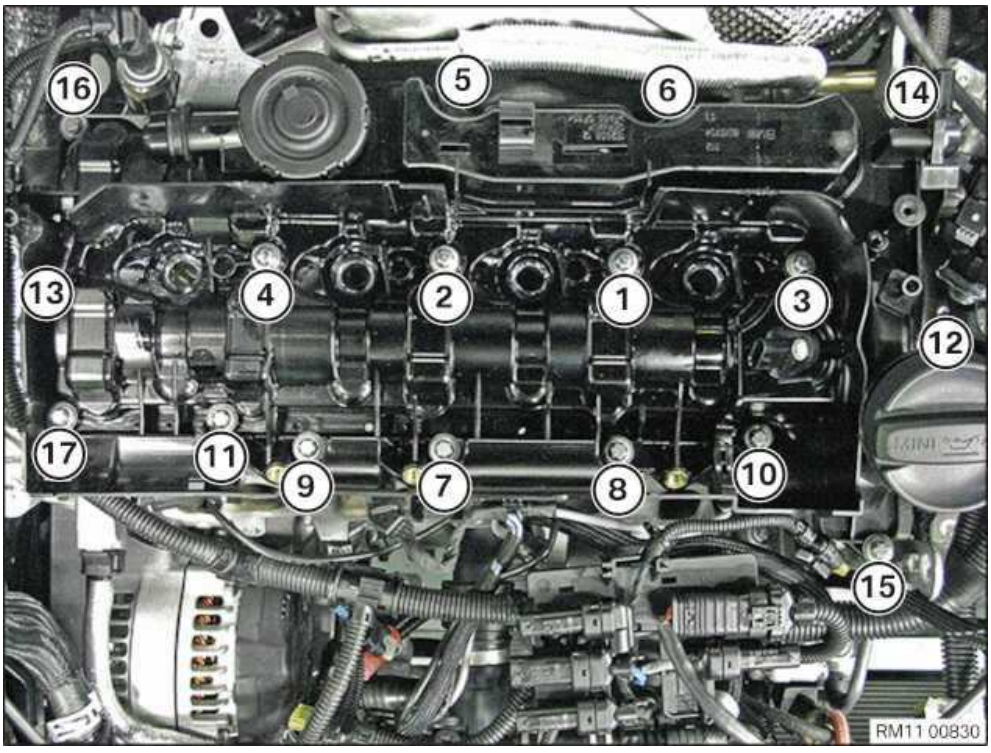
- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.



- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

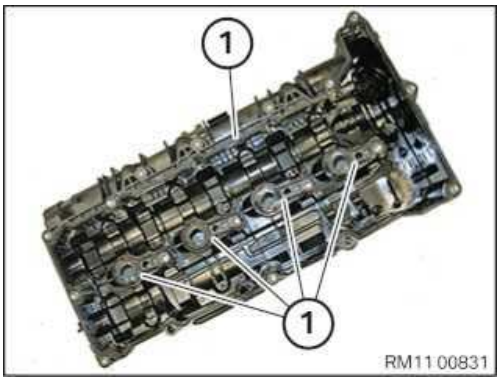
40 – Installing cylinder head cover

Overview: Screw connection of the cylinder head cover



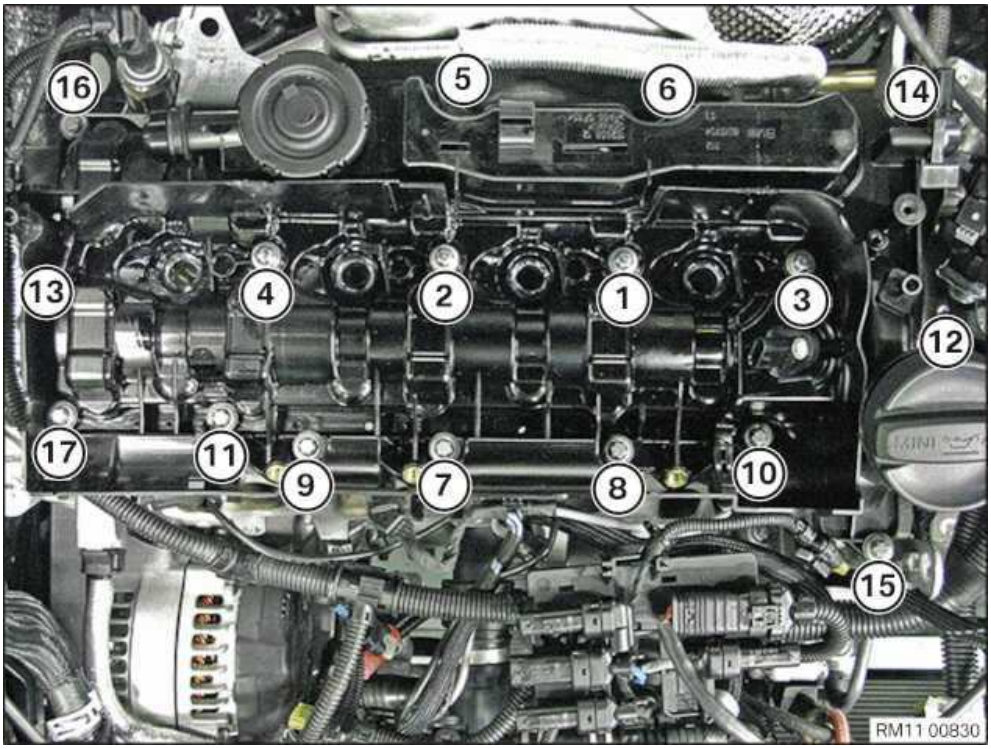
1 to 16 screws of the cylinder head cover.

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- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket

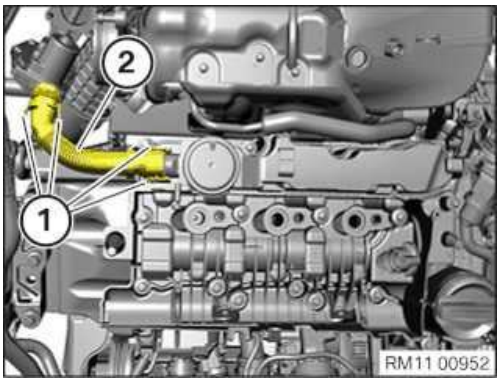


- Install cylinder head cover.
- Tighten screws in the order (1) to (17).

Cylinder head cover to cylinder head

M6		Tightening torque.	8, Nr

-



- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

41 – Installing injectors of injection system

▶ **Cleaning the injector shafts**

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.



- Wear safety goggles.

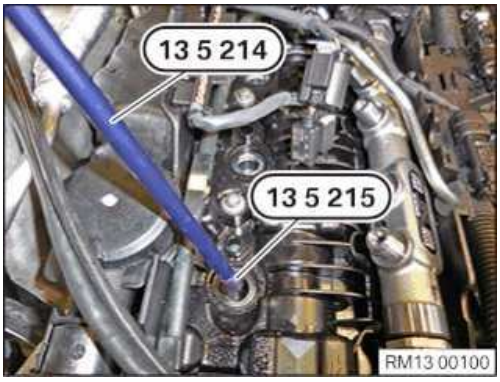
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RISK OF DAMAGE

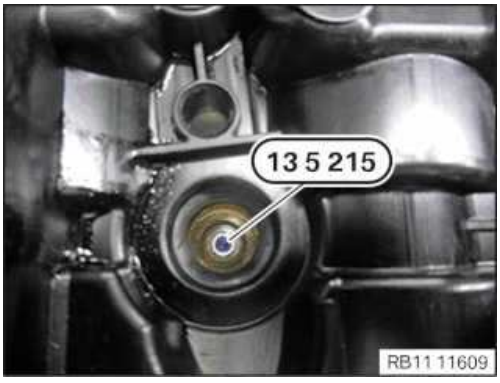
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.



- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.

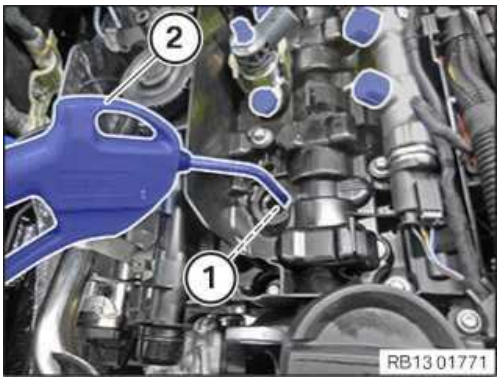


- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.

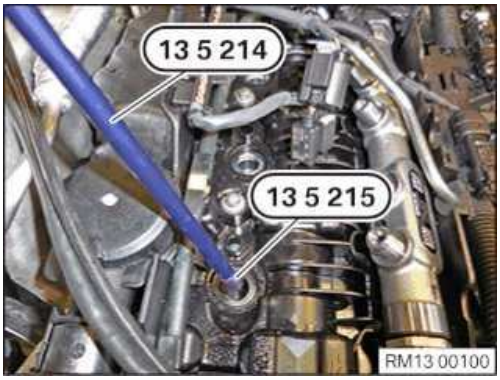


- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.

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- Blow out injector shaft (1) with air gun (2).



- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

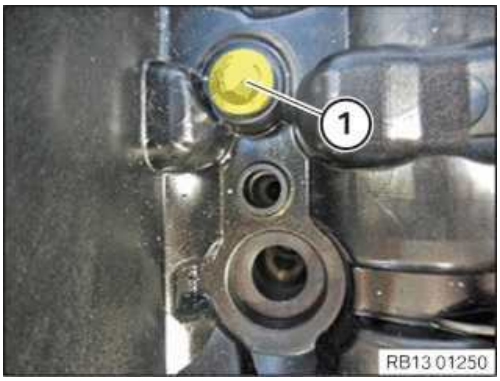
▸ **Check the placement of the clamping claw**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▸ **Prepare the injector for installation**

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

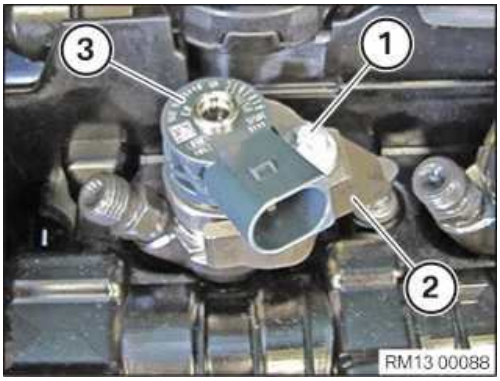


- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring
- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

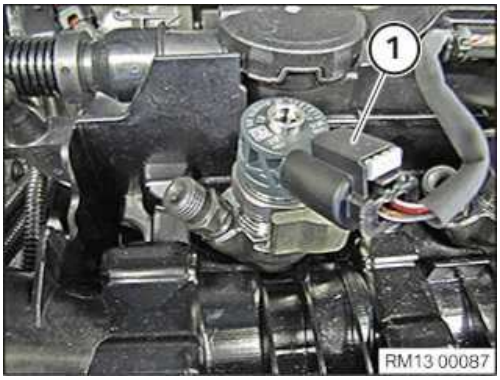
Injector lubricating grease	50 g, Can	83230441070



- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

▸ **Replacement: Perform injection quantity compensation**

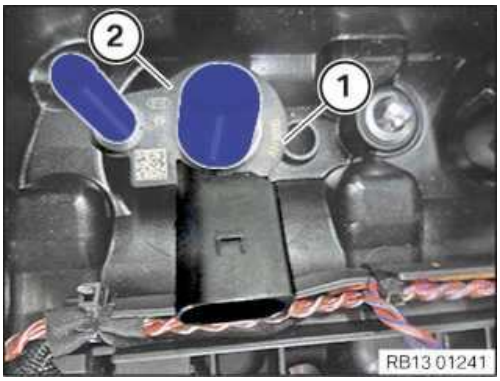
TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

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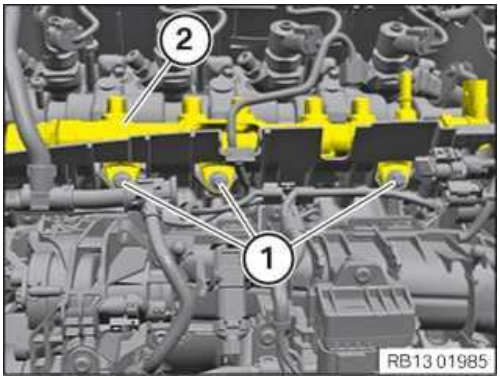


- Read off the adjustment value (1) on the new injector (2).



- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

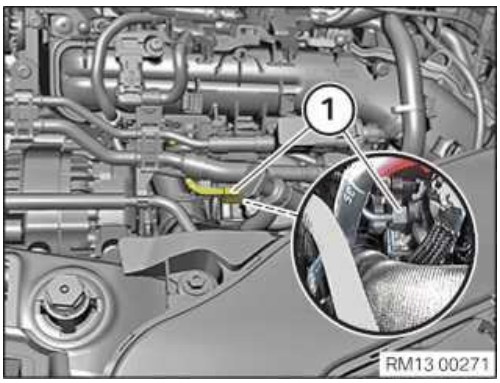
42 – Installing the rail



- Carefully insert and install the rail (2).
- Tighten the screws (1).

Rail on cylinder head cover

Torx screw M8x25		Tightening torque	19 Nm



TECHNICAL INFORMATION

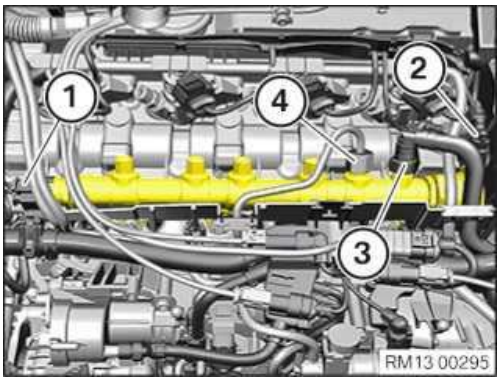
Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten union nut (1).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

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TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten union nut (4) with special tool .

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

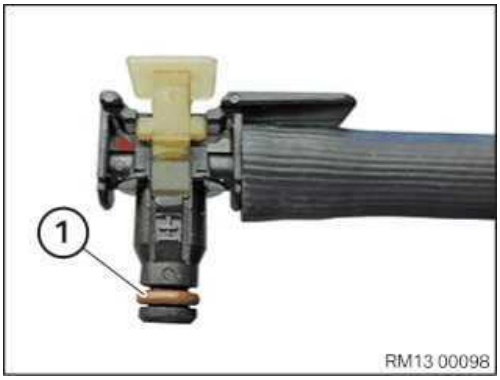
- Connect and lock the fuel line (3).

  Fuel line (3) must engage audibly.
- Connect connectors (2) and lock.

  The connector (2) must engage audibly.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

43 – Connect the leakage oil line on the injector



- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.



- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

44 – Installing high pressure lines between rail and injectors

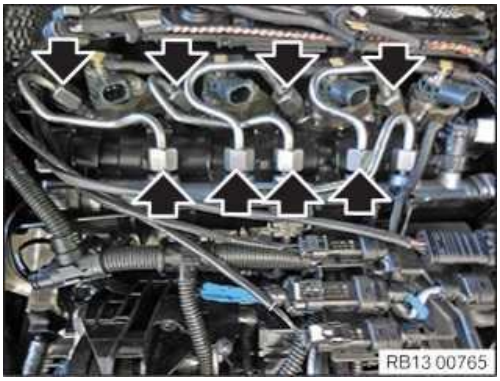
TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

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TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Remove special tool .
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

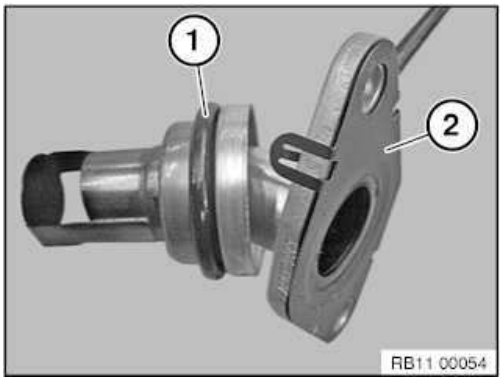
- Tighten the high pressure lines (arrows) with the special tool .

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

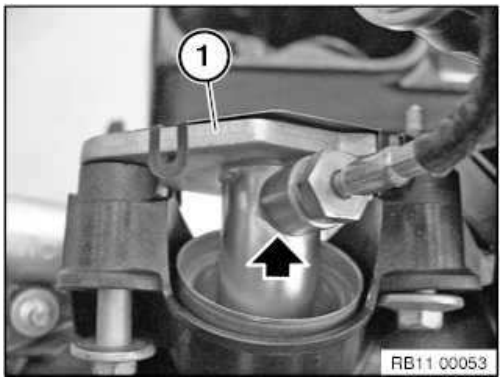
45 – Installing the intake plenum



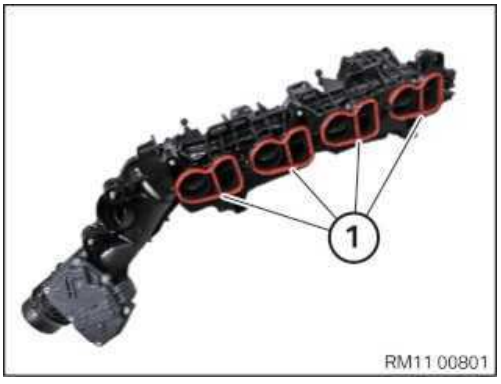
- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position the seal (2) and clip it in.



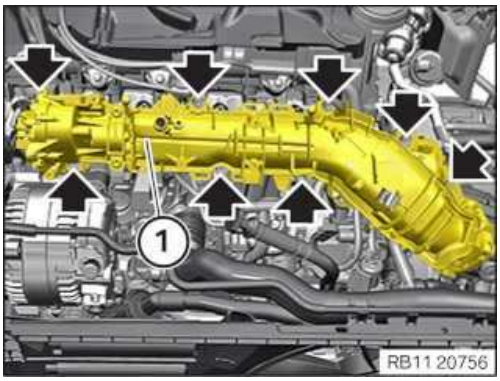
- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (1).

  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.

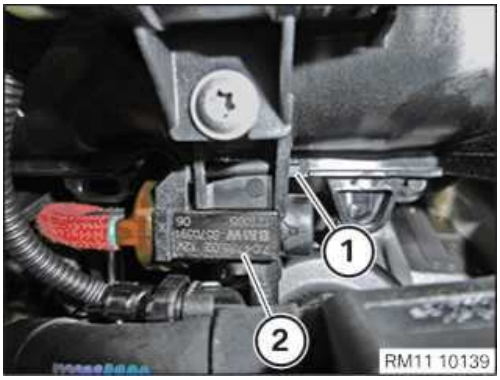
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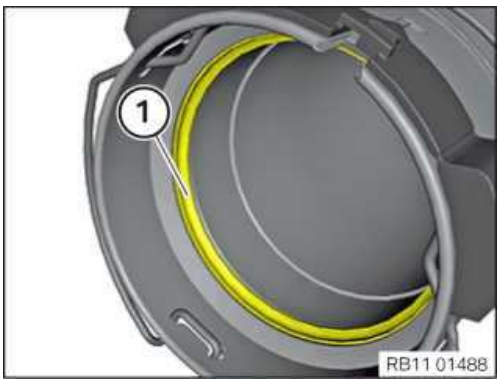
- Guide in and install intake (1) plenum.
- Tighten screws (arrows).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm

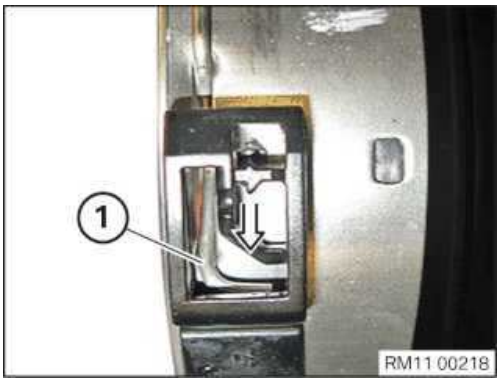


- Install the electric changeover valve (2) in the holder on the plenum from left to right.
- Lock (1) must engage audibly.

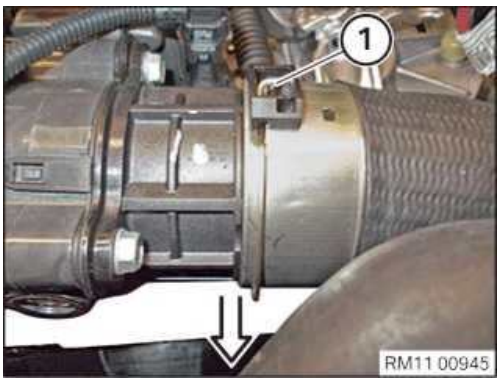


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring



- Engage the lock (1) on the bracket (arrow).



- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

46 – Remove the engine from the assembly stand

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CAUTION

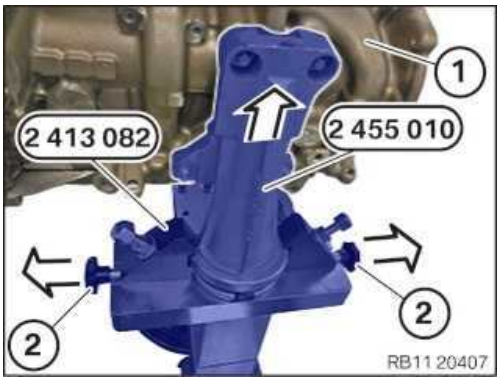
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



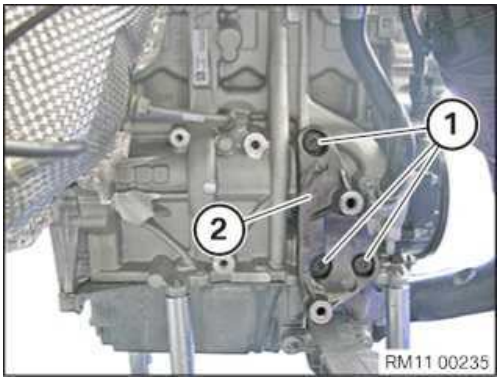
- Insert engine lifter with special tool and position engine (1).



- Unscrew the nuts on special tool .
- Detach the holder (2) in the direction of the arrow.
- Detach the engine (1) with special tool **2 455 010** out of the special tool in the direction of arrow.



- Remove conventional screws (arrows).
- Feed out the special tool **2 455 010** on the engine (1) and remove.



- Insert and install the holder (2).
- Tighten the screws (1).

Holder to crankcase

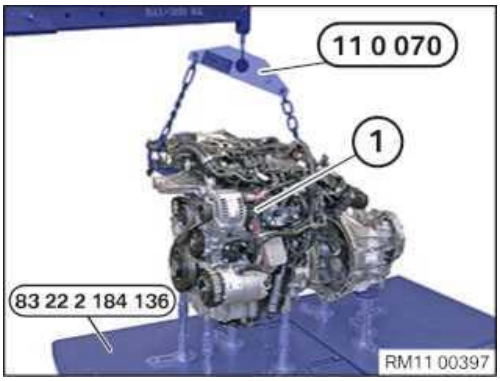
M10		Tightening torque	38 Nm

47 – Mount engine on the automatic transmission

Prerequisite

Engine has been removed.

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NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

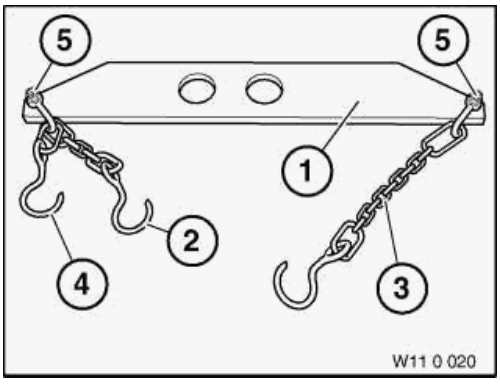
- Position the engine (1) on the lifting table **2 184 136** using the engine lifter and the special tool .
- Feed out engine lifter from engine (1) with special tool and push aside.



- Unscrew the bolts (1) of the special tool **2 459 012**.
- Feed out the special tool **2 459 012** at the cylinder head and remove.

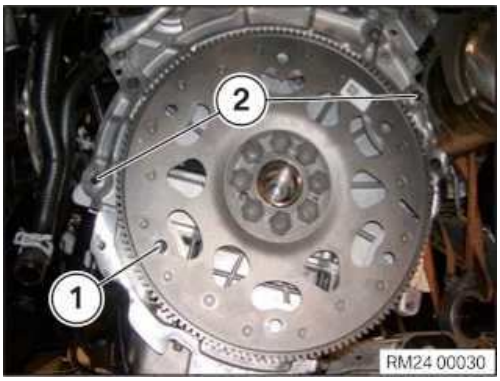


- Stage the workshop crane **2 220 718**.



- Stage the lifting gear .

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- The bore hole (1) of the flywheel must be accessible from the recess on the oil sump.
- Check for correct fit of fitting sleeves(2).



TECHNICAL INFORMATION

Conduct the following operation with the assistance of a second person.

- Twist torque converter until bore hole in torque converter is flush with bore hole of flywheel.
- Flange-mount and screw automatic transmission on the engine with an auxiliary person and the workshop crane **2 220 718** with the lifting gear .
- Tighten screws (arrows).

Transmission to engine

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

- Feed out workshop crane **2 220 718** with the lifting gear from the automatic transmission and push it aside.

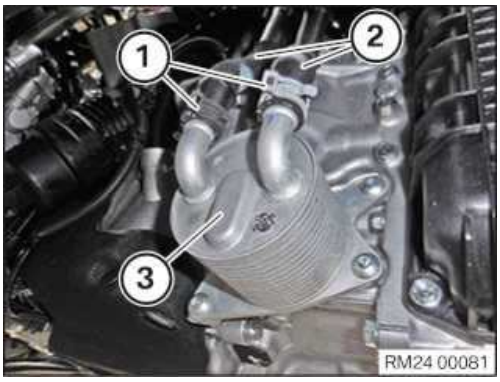


- Crank engine with special tool **0 493 380 (11 6 480)** at vibration damper in direction of rotation.
- Renew nuts (1).

  Parts: Nuts
- Tighten all 6 nuts (1) of the torque converter.

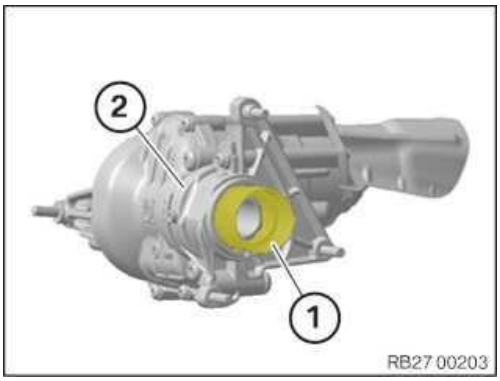
Torque converter to flywheel

M10	Replace nuts. Remove any adhesive residue from the threads.	Tightening torque	56 Nm



- Slide coolant hoses (1) onto transmission oil cooler (3).
- Secure hose clamps (1).

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- If intermediate shaft (1) gets caught on transfer box (VTG) (2), renew intermediate shaft (1) and the radial shaft seals in the automatic or manual transmission.



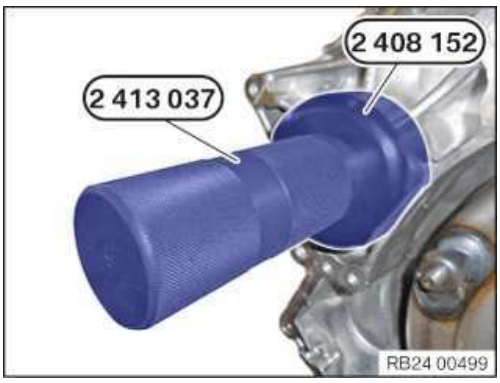
- Screw special tool **2 409 025** into the outer radial shaft seal.
- Turn the screw on the special tool **2 409 025** until the outer radial shaft seal has been pulled out.



- Insert special tool **2 411 739** into the inner radial shaft seal.

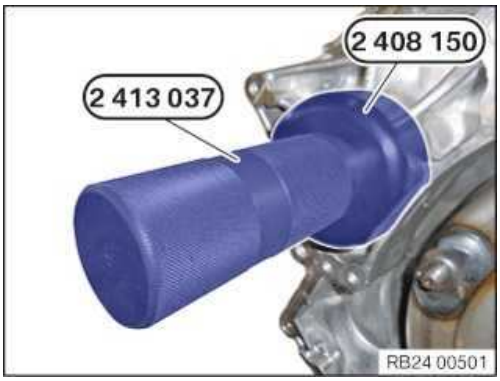


- Screw special tool **2 411 739** into the inner radial shaft seal.
- Turn the screw on the special tool **2 411 739** until the inner radial shaft seal has been pulled out.

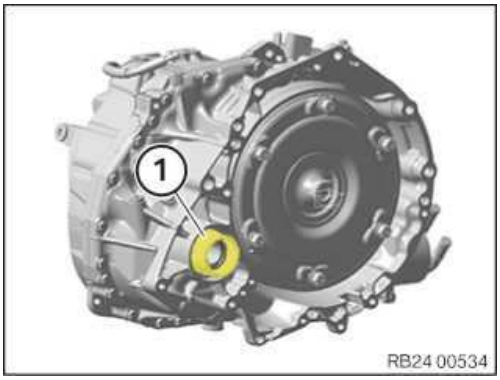


- Drive in the inner radial shaft seal using special tools **2 408 152** and **2 413 037** up to the limit position.

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- Drive in the outer radial shaft seal using special tools **2 413 037** and **2 408 150** up to the limit position.



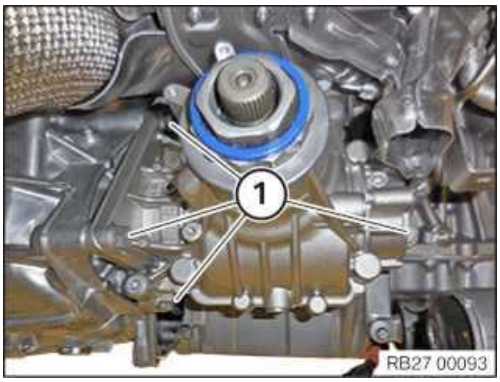
- If necessary, connect the new intermediate shaft (1) to the output flange of the automatic transmission or manual transmission.



- Coat the inside of the output flange (arrows) evenly with approx. 5 g of grease.

Expendable materials

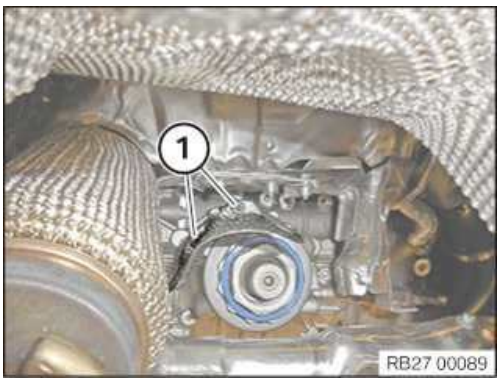
Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the transfer box (VTG).
- Tighten the screws (1).

Transfer box to transmission

M10		Tightening torque	56 Nm



- Install heat shield.
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Heat shield to transfer box

M6	Renew screws.	Tightening torque	6 Nm

▸ **Check the transfer box oil level**

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RISK OF DAMAGE

Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.



- Check transfer case oil level, correct:
- Open the oil filler plug (1).
- Check transfer box oil level.
- If necessary, top up transmission oil up to the lower edge of the oil filler plug opening (1).

Transmission oil

Technically suitable transfer box and electrical transmission oils	

Main group 27

- Tighten the oil filler plug (1).

Oil filler plug on transfer box (VTG)

M18x1.5		Tightening torque	35 Nm

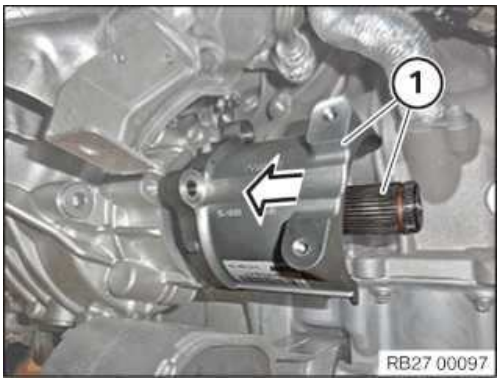
49 – Install the intermediate shaft with the support tube



- Coat gearing of the intermediate shaft uniformly with 5 g of grease.

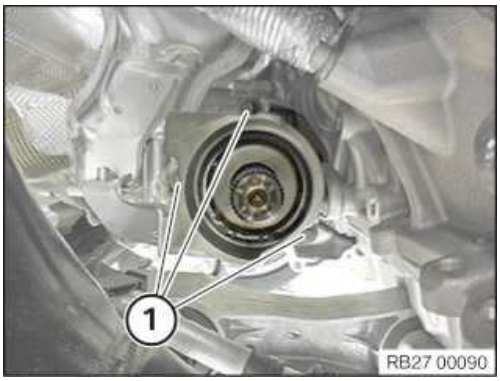
Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the intermediate shaft with support tube (1) in the transfer box.

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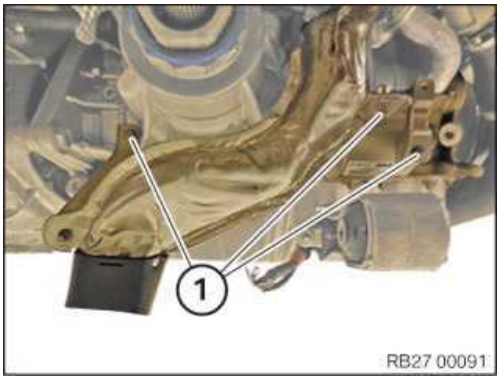
- Position screws (1).

Note: Check for correct screw length! Bolt M8x35 8.8

- Tighten the screws (1).

Intermediate shaft to transfer box

M8x35		Tightening torque	19 Nm



- If installed: Install air duct.
- Tighten the screws (1).

50 – Installing the high-pressure stage exhaust turbocharger

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to the surface.

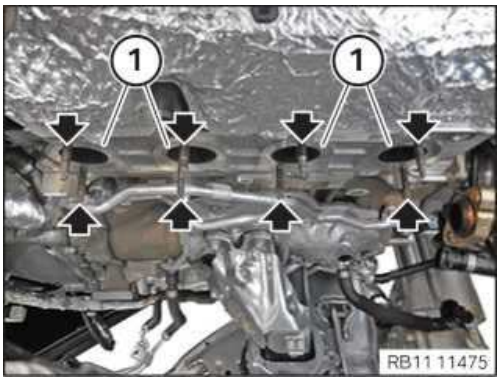
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

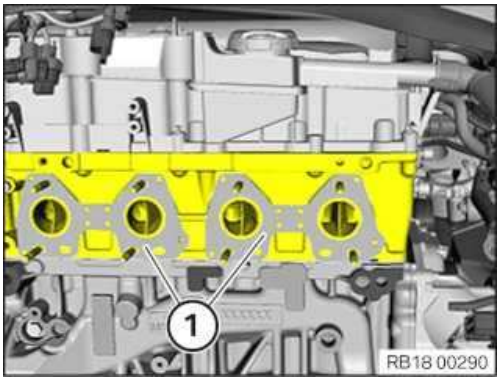
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- Clean the sealing surfaces (1) on the cylinder head using special tool **0 495 102 (11 4 470)**.
- Check the stud bolts (arrows) on the cylinder head for correct fit.

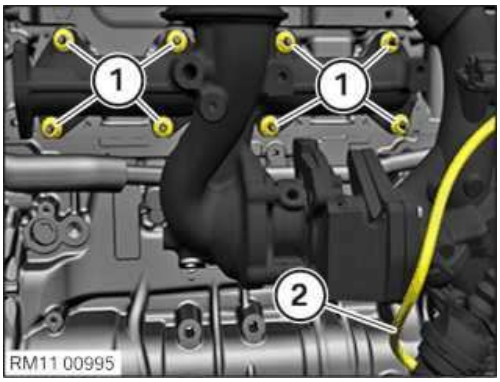


- Clean the sealing surfaces on the exhaust manifold using special tool **0 495 102 (11 4 470)**.



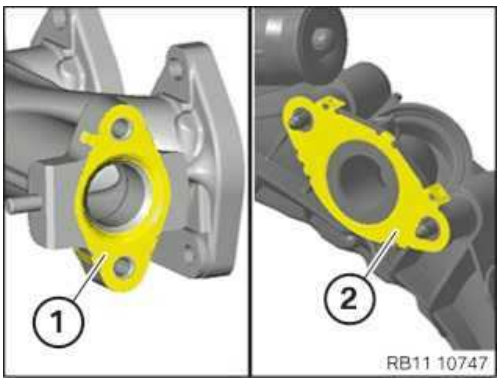
- Renew gasket (1).

  Parts: Gasket
- Install new gasket (1).



- Feed in and install the exhaust manifold and the high-pressure stage exhaust turbocharger.
- Tighten nuts (1).

  Parts: Nuts
- Connect vacuum hose(2).

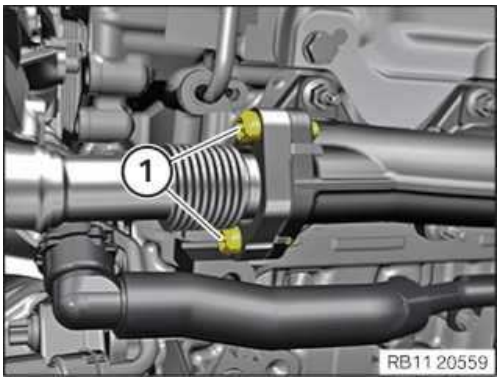


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket
- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket

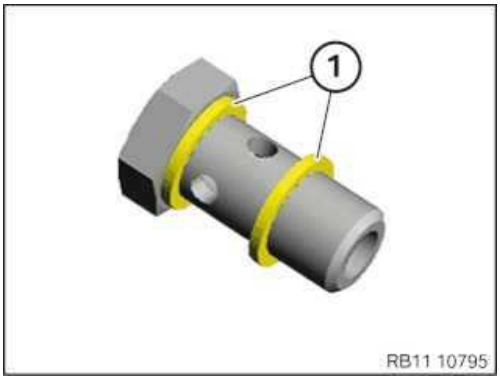
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- Tighten the screws (1).

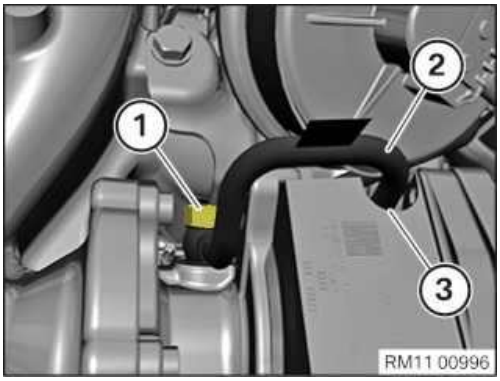
Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm



- Renew sealing rings (1) of banjo bolt.

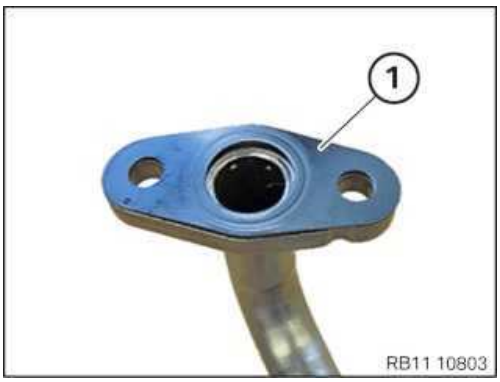
  Parts: Sealing ring



- Guide the oil feed line into the holder (3) and install it.
- Tighten down screw (1).



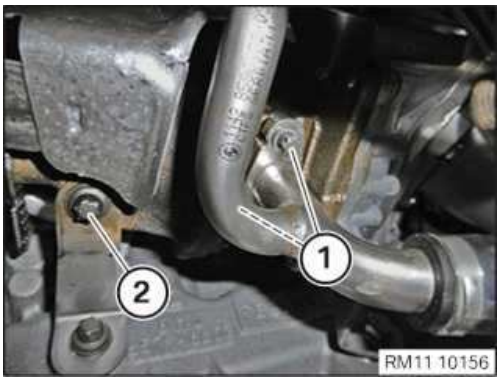
- Tighten bolt (1) from the right wheel arch.



- Renew seal (1) of oil return line.

  Parts: Gasket

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- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

51 – Installing the low-pressure stage turbocharger

RISK OF DAMAGE

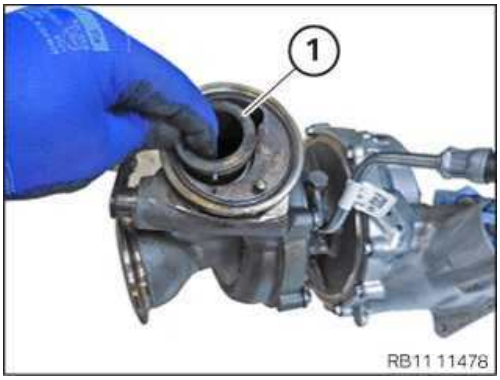
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.



- Check the spacer plug (1) for damage, renew if necessary.

  Parts: Spacer ring
- Insert and install the spacer ring (1).
- Position spacer ring (1) correctly.

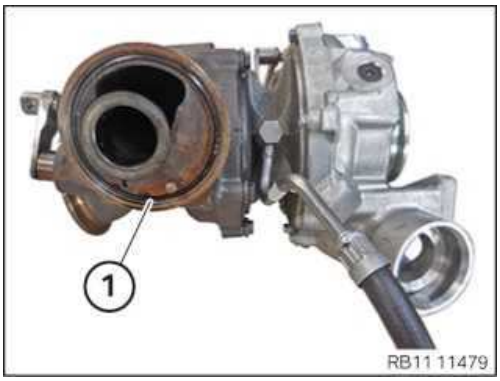


- Renew gasket (1).

  Parts: Gasket
- Position the seal (1).
- Renew the sleeve(2).

  Parts: Holding sleeve

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- Renew sealing ring (1).

  Parts: Sealing ring
- Affix the sealing rings on the exhaust turbocharger.

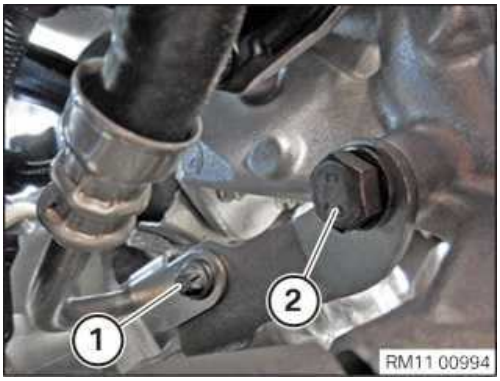


- Insert and install the low-pressure stage exhaust turbocharger on the exhaust manifold .
- Feed in and install V-band clamp .
- Tighten V-band clamp (2).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Screw in nut (1) with 2 **revolutions**.



- Tighten down screw (1).

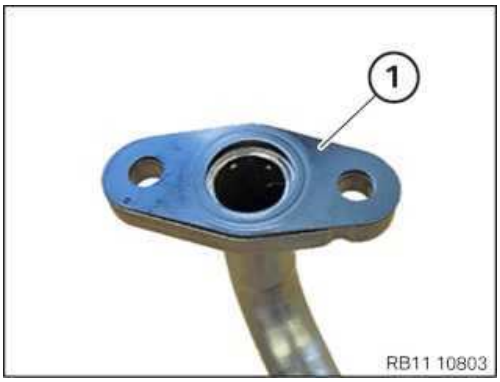
Oil feed line to bracket

Torx screw M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

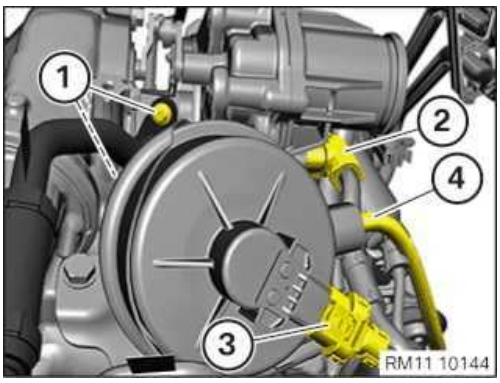
Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm



- Renew seal (1) on the oil return line.

  Parts: Gasket



- Position the oil return line with the seal.
- Tighten the screws (1).

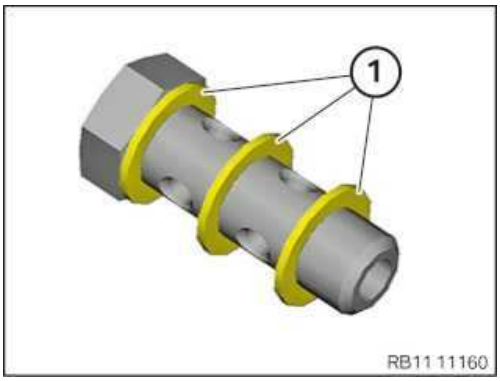
Oil return line to turbocharger

M6x12		Tightening torque	8 Nm

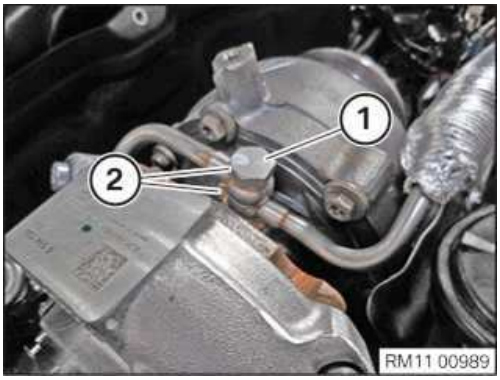
- Connect and lock connectors (2) and (3).

  The locks must engage audibly.
- Connect vacuum hose (4).

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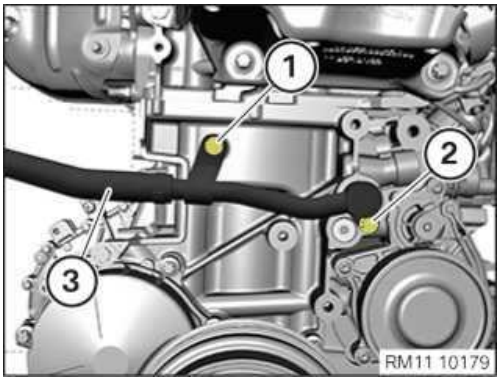


- Renew banjo bolt and sealing rings (1).
- **Parts:** Banjo bolt, sealing rings



- Install sealing rings (1).
- Tighten the banjo bolt (1).
- Ensure that the lines do not rest against the adjacent components.

52 – Attaching assemblies (on lifting table)

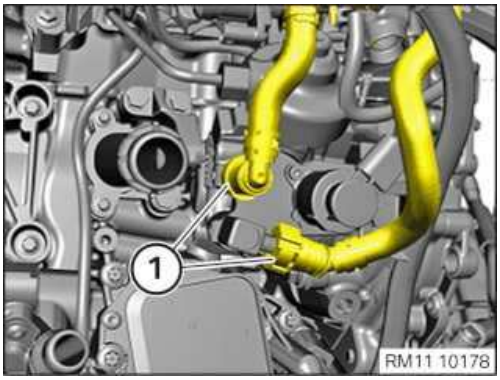


- Renew sealing ring of the coolant line (3).

  Parts: Sealing ring
- Coat the sealing ring and install the coolant line (3) .
- Tighten down screws (1) and (2).

Standard screw connection M6

M6		8 Nm



- Connect and lock fuel lines (1).

  The fuel lines (1) must audibly engage.

▸ **Installing the exhaust-gas recirculation cooler**

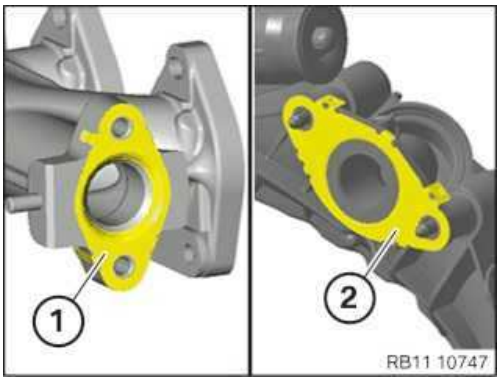
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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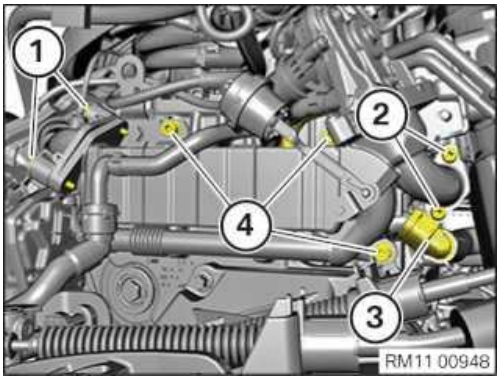


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket



- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts

- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

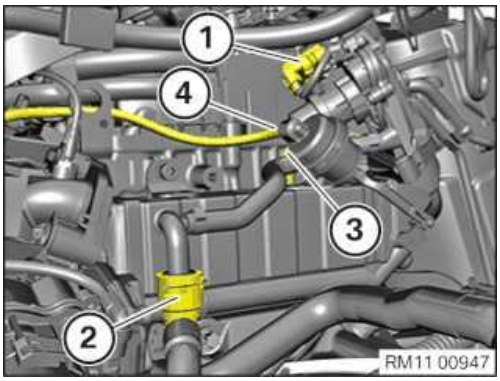
  The coolant hose (3) must audibly engage.

- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm

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TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

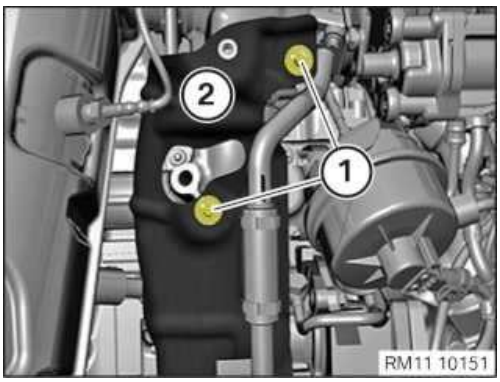
▶ **Installing heat shield on exhaust turbocharger at bottom**

WARNING

Hot surfaces.

Risk of burning!

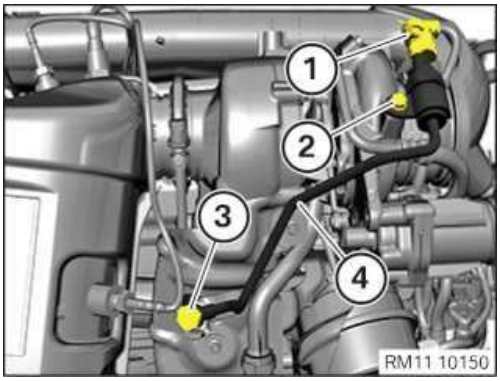
- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (2).
- Tighten the bolts (1) on the heat shield .

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm



- Position the exhaust gas pressure pipe (4).
- Hand-tighten the bolt (2).
- Renew sealing rings on the banjo bolt (3).

  Parts: Sealing ring
- Tighten the banjo bolt (3).

Banjo bolt for exhaust pressure pipe to exhaust manifold

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

- Tighten down screw (2).

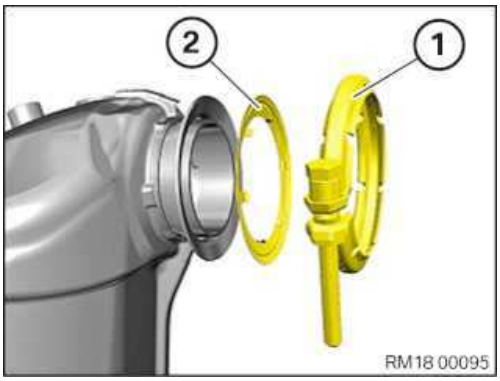
Standard screw connection M6

M6		8 Nm

- Connect connectors (1) and lock.

  Lock must audibly engage.

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CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

- Renew the V-clip (1).

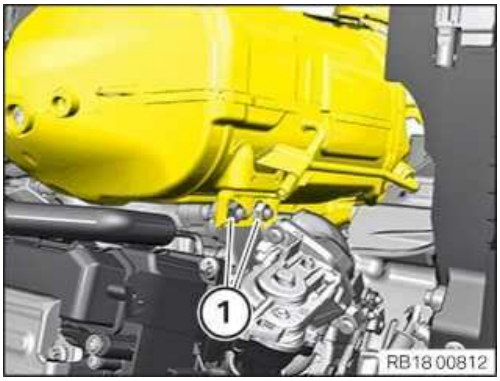
  Parts: V-band clamp

- Renew the gasket (2).

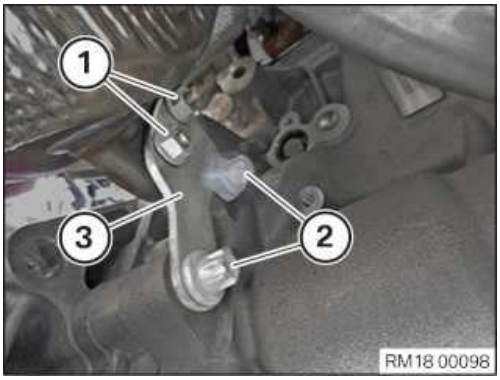
  Parts: Gasket



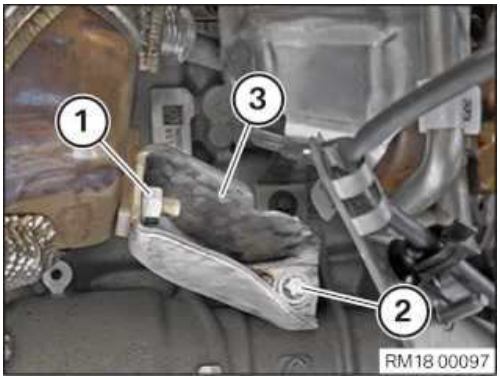
- Carefully insert and install the diesel particulate filter .
- Feed in and install V-band clamp (1).
- Make sure that the seal between the diesel particulate filter and the exhaust turbocharger is installed correctly.
- Align the diesel particulate filter on the exhaust turbocharger.
- Position V-clip (1).
- Hand-tighten the V-clip (1).



- Tighten nuts (1) by hand.

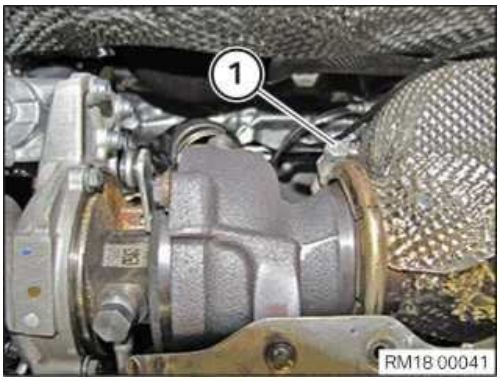


- Install holder (3).
- Hand-tighten the bolts (2).
- Tighten nuts (1) by hand.



- Install holder (3).
- Tighten the nut (1) hand-tight.
- Hand-tighten the bolt (2).

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- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

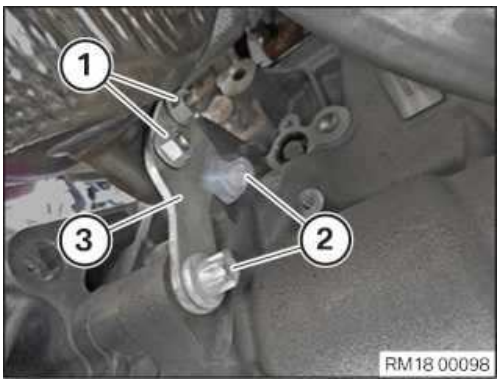
V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm



- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screws (2).

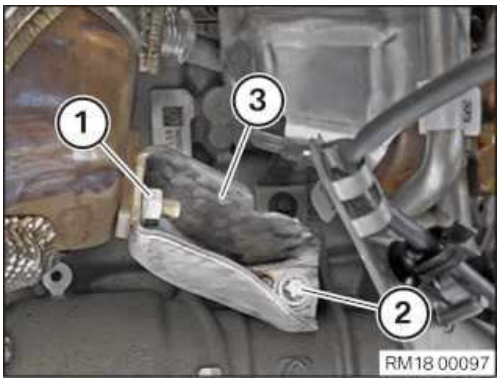
Diesel particulate filter holder to gearbox

M12x75		Tightening torque	66 Nm

- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screw (2).

Diesel particulate filter bracket to crankcase

M10x35		Tightening torque	38 Nm

- Tighten nut (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Remove fitting aid (1) for the flexible tube.

▸ **Install the heat shield on the exhaust turbocharger**

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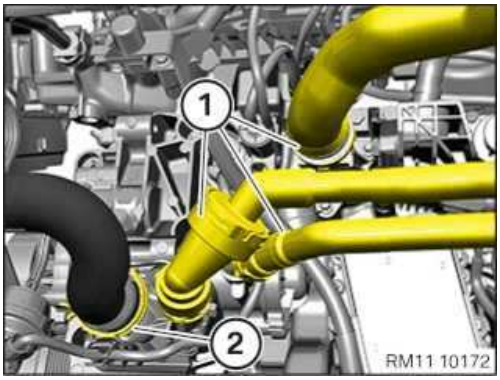


- Feed in and install the heat shield (2).
- Tighten the screws (1) at the top and bottom of the heat shield.

Heat shield for exhaust turbocharger

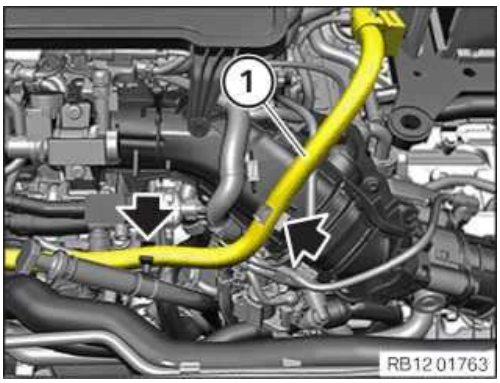
Torx screw BM 6x12		Tightening torque	10 Nm

- Fasten the cable at the clips .



- Install the coolant hose and secure with the clamp (2) .
- Connect and lock the coolant lines (1).

  The coolant lines (1) must engage audibly.



CAUTION

Improper routing of the positive battery cable.

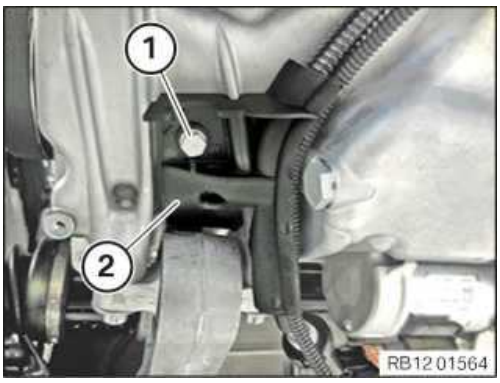
Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

- Insert the positive battery cable (1) into the clamps (arrows).



- Feed in and install positive battery cable at the clamps (1).



- Insert and install the holder (2).
- Tighten down screw (1).

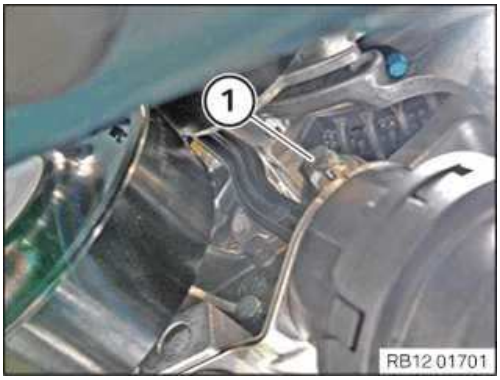
Bracket to oil sump

M6		Tightening torque	8 Nm

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- Insert and install alternator (1) along with the screw (2) on the bottom of the alternator through the slot on the support.



- Tighten the screw (1) below on the alternator.

Alternator to component carrier

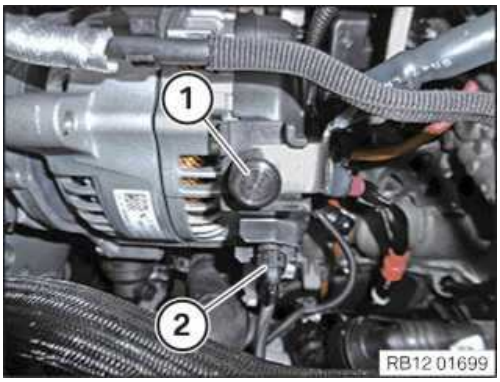
M10x75 / M10x125		Tightening torque	38 Nm



- Tighten the bolt (1) on top on the alternator.

Alternator to component carrier

M10x75 / M10x125		Tightening torque	38 Nm

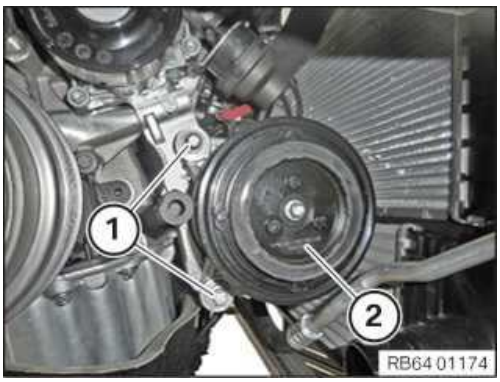


- Mount positive battery cable to the alternator.
- Tighten nut.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

- Mount the cover (1).
- Connect the connector (2) to the alternator and lock audibly.



- Install air conditioning compressor (2) and position it correctly.
- Tighten the screws (1).

Air conditioning compressor in component carrier

M10		Tightening torque	38 Nm

▸ **Installing the drive belt for alternator**

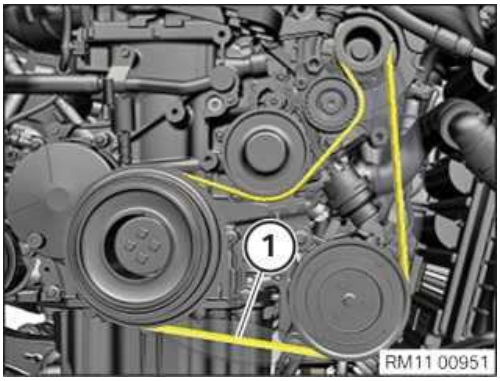
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TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

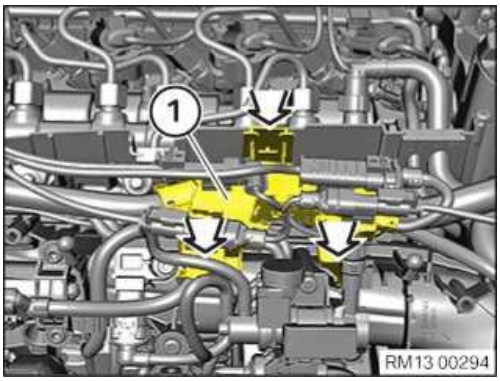


- Feed in the drive belt for the alternator (1) and install it.

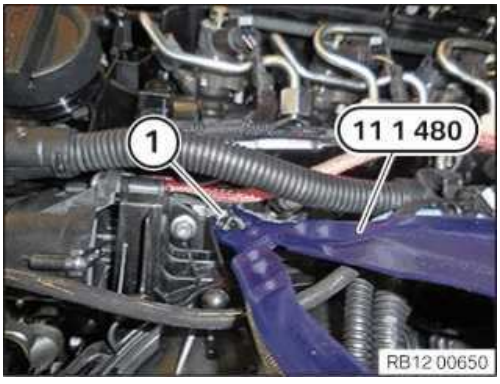


- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool **0 496 268 (11 0 390)** out of the belt tensioner and remove it.

▶ **Installing the cable clip for the intake plenum**



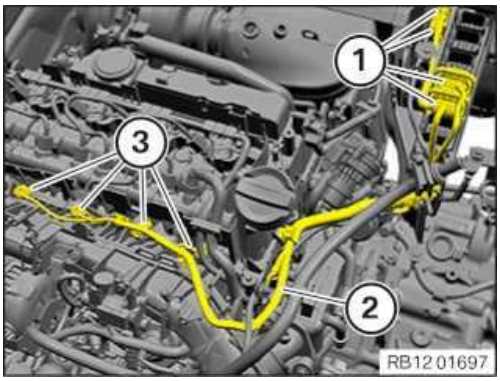
- Insert and install the cable clip (1) in the direction of the arrow.
- Make sure the cable clip (1) is fitted correctly.



- Connect and lock the connector (1) on the glow elements.

  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.

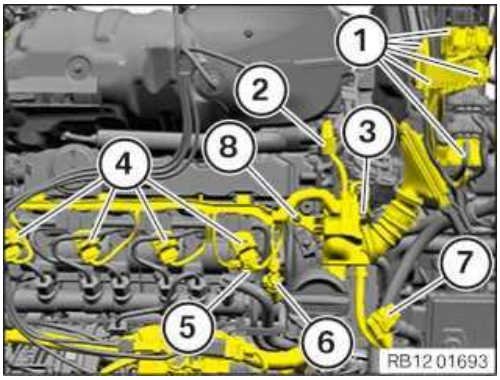
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- Lay vehicle wiring harness and fasten with clamps.
- Route all connectors (1) to the integrated supply module (PDM) and to the DME control unit.
- Connect all connectors (3) to the glow elements and engage them audibly.
- Mount ground strap and tighten screw (2).

Ground cable to cylinder head

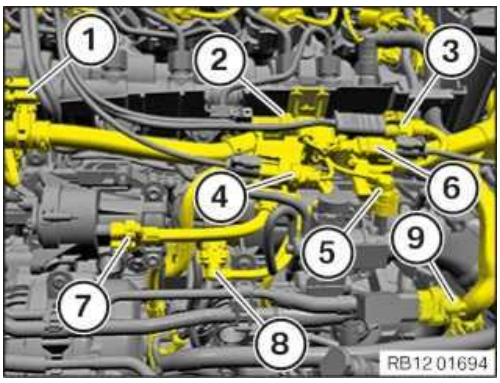
M6x12		Tightening torque	8 Nm



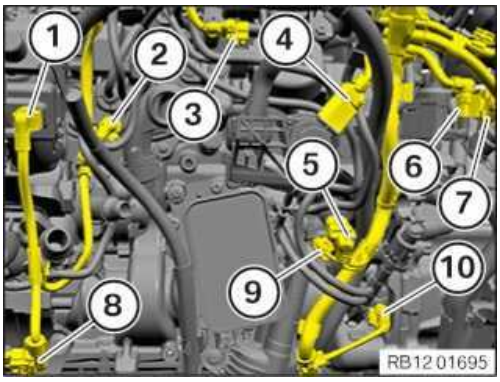
- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the integrated supply module (PDM) and to the DME control unit.
- Attach connector (2) to the differential pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust-gas recirculation valve and lock audibly.
- Attach connector (4) to the injectors and lock it audibly.
- Attach connector (5) to the camshaft sensor and lock it audibly.
- Attach connector (6) to the fuel pressure regulator and lock it audibly.
- Connect and audibly lock the connector (7) to the hot film air mass meter.
- Tighten down screw (8).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

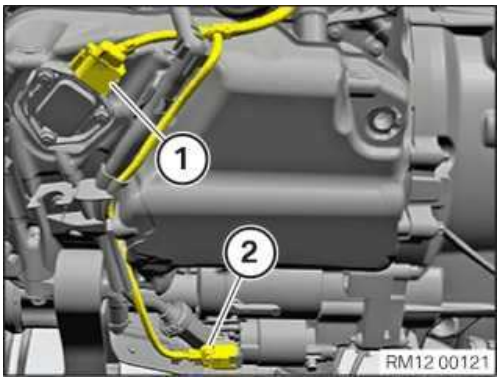


- Connect the connector (1) to the rail pressure sensor and lock it audibly.
- Attach connector (2) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (3) to the front oxygen sensor and lock audibly.
- Attach connector (4) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Connect the connector (5) to the electric changeover valve and lock audibly.
- Attach connector (6) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (7) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (8) to the charging pressure sensor and lock it audibly.
- Attach connector (9) to the fuel pressure and temperature sensor and lock it audibly.

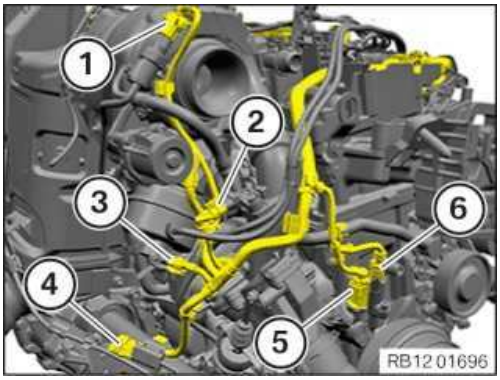


- Connect the connector (1) to the alternator and lock audibly.
- Connect the connector (2) to the electric changeover valve and lock audibly.
- Connect the connector (3) to the electric changeover valve and lock audibly.
- Connect the connector (4) to the high pressure pump and lock audibly.
- Connect the connector (5) to the oil pressure sensor and lock it audibly.
- Attach connector (6) to the throttle bodies and lock it audibly.
- Attach connector (7) to the intake air temperature sensor and lock it audibly.
- Connect the connector (8) to the air conditioning compressor and lock audibly.
- Connect the connector (9) to the solenoid valve and lock audibly.
- Connect the connector (10) to the crankshaft sensor and lock it audibly.

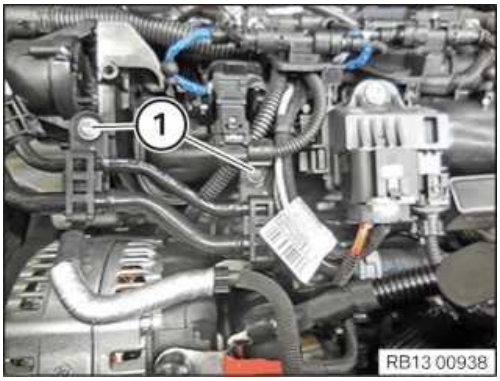
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- Connect the connector (1) to the oil-level sensor and lock it audibly.
- Connect connector (2) to the starter motor and lock audibly.



- Attach connector (1) to the exhaust turbocharger and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust gas pressure sensor and lock it audibly.
- Connect the connector (4) to the monitoring oxygen sensor and lock audibly.
- Attach connector (5) to the oil pressure switch and lock it audibly.
- Attach connector (6) to the switching valve and lock it audibly.

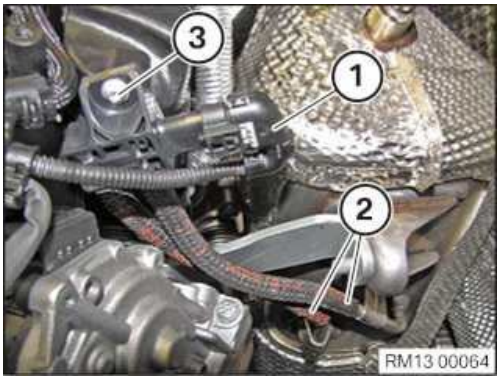


- Position the fuel line.
- Tighten the screws (1).

Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

53 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

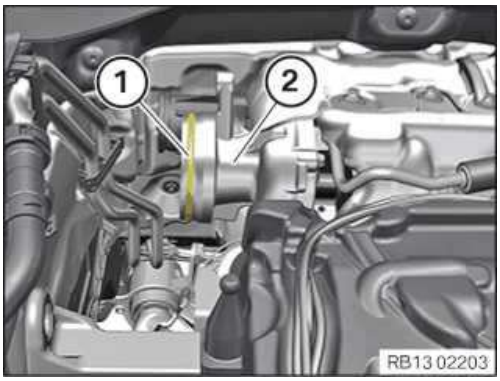
Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

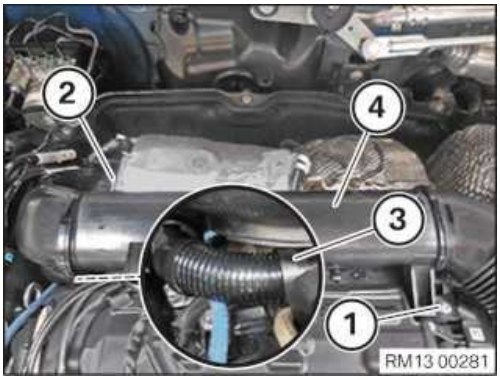
  The connector (1) must engage audibly.

54 – Installing clean air pipe

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- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.



- Feed in clean air pipe and install.
- Connect clean air pipe to the exhaust turbocharger and lock audibly in the clamps (2).
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Connect ventilation line (3) to the cylinder head cover and lock audibly.

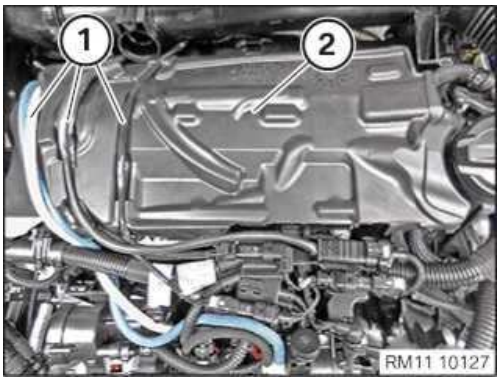


- Mount clean air pipe onto the intake filter housing.
- Tighten clamp (1) on the clean air pipe.

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

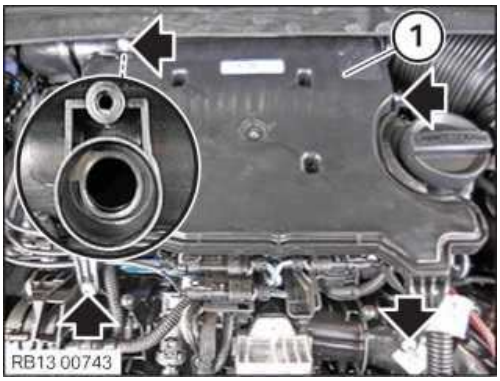
55 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the vehicle wiring harness (1) in the brackets.

56 – Install resonator

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- Insert and install the resonator (1).
- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

57 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Check for correct installation of all rubber mounts in the acoustic cover (1).



- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

58 – Install engine

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- See additional information.

Additional Information

Overview of Tightening Torques

Special tool to cylinder head — Used in step 12

M8		Tightening torque	21,5 Nm

Special tool 2 455 010 to crankcase — Used in step 13

M10x30		Tightening torque	38 Nm

Special tool 11 8 930 to special tool 00 2 320 — Used in step 13

M14x35		Tightening torque	160 Nm

Rear timing case cover to crankcase — Used in step 30

M6	Renew screws.	Jointing torque	8 Nm
		Angle of rotation	90 °

SCR coolant lines to crankcase end cover — Used in step 30

Hexagon screw M6x16		Tightening torque	8 Nm

Cylinder head to crankcase — Used in step 30

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

Cylinder head bolt to timing case cover — Used in step 30

M8x40		Tightening torque	19 Nm

Oil sump to crankcase — Used in step 30

M8x30		Tightening torque	24 Nm
M8x110		Tightening torque	24 Nm

Transmission to oil sump — Used in step 30

M8		Tightening torque	19 Nm

Guide tube for oil dipstick on engine — Used in step 30

M8x16		Tightening torque	19 Nm

Flywheel to crankshaft — Used in step 31

M12x1.5	Renew screws.	Tightening torque	120 Nm

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Glow elements to cylinder head

Used in step 34

Glow element		Tightening torque	13 Nm

Camshaft carrier to cylinder head

Used in step 35

M7x35		Tightening torque	13 Nm

Intake and exhaust camshaft in camshaft support

Used in step 36

M6x31		Tightening torque	10 Nm

Bearing journal to cylinder head

Used in step 36

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8

Used in step 36

M8		Tightening torque	19 Nm

Standard screw connection M6

Used in step 36 52

M6			8 Nm

Chain tensioner piston to cylinder head

Used in step 36

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft

Used in step 36

M7x17.			17 Nm

Cylinder head cover to cylinder head

Used in step 40

M6		Tightening torque.	8,5 Nm

Clamping claw facing to cylinder head cover

Used in step 41

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 41

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

Rail on cylinder head cover

Used in step 42

Torx screw M8x25		Tightening torque	19 Nm

High pressure line between high pressure pump and rail

Used in step 42

High-pressure pipe		Tightening torque	28 Nm

High pressure lines between injector and rail

Used in step 44

High pressure lines		Tightening torque	28 Nm

Intake plenum to cylinder head

Used in step 45

M6		Tightening torque	11 Nm

Holder to crankcase

Used in step 46

M10		Tightening torque	38 Nm

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Transmission to engine

Used in step 47

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

Torque converter to flywheel

Used in step 47

M10	Replace nuts. Remove any adhesive residue from the threads.	Tightening torque	56 Nm

Transfer box to transmission

Used in step 48

M10		Tightening torque	56 Nm

Heat shield to transfer box

Used in step 48

M6	Renew screws.	Tightening torque	6 Nm

Oil filler plug on transfer box (VTG)

Used in step 48

M18x1.5		Tightening torque	35 Nm

Intermediate shaft to transfer box

Used in step 49

M8x35		Tightening torque	19 Nm

Exhaust-gas recirculation cooler to exhaust manifold

Used in step 50 52

M8x28	Replace screws	Tightening torque	32 Nm

Oil return line to turbocharger

Used in step 50 51

M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase

Used in step 50

M8x16		Tightening torque	22 Nm

Exhaust turbocharger to exhaust manifold

Used in step 51

V-band clamp		Tightening torque	19 Nm

Oil feed line to bracket

Used in step 51

Torx screw M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase

Used in step 51

M8x16		Tightening torque	22 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 52

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler

Used in step 52

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 52

M8x20		Tightening torque	19 Nm

Heat shield for exhaust turbocharger

Used in step 52

Torx screw BM 6x12		Tightening torque	10 Nm

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Banjo bolt for exhaust pressure pipe to exhaust manifold — Used in step 52

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

Diesel particulate filter V-clip to exhaust turbocharger — Used in step 52

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Diesel particle filter to holder — Used in step 52

M8 hexagon nut		Tightening torque	19 Nm

Diesel particulate filter holder to gearbox — Used in step 52

M12x75		Tightening torque	66 Nm

Diesel particulate filter bracket to crankcase — Used in step 52

M10x35		Tightening torque	38 Nm

Heat shield for exhaust turbocharger — Used in step 52

Torx screw BM 6x12		Tightening torque	10 Nm

Bracket to oil sump — Used in step 52

M6		Tightening torque	8 Nm

Alternator to component carrier — Used in step 52

M10x75 / M10x125		Tightening torque	38 Nm

Positive battery cable to alternator — Used in step 52

M8		Tightening torque	19 Nm

Air conditioning compressor in component carrier — Used in step 52

M10		Tightening torque	38 Nm

Ground cable to cylinder head — Used in step 52

M6x12		Tightening torque	8 Nm

Wiring harness to cylinder head cover — Used in step 52

TS5x20		Tightening torque	3,5 Nm

Fuel line to intake plenum — Used in step 52

TS6x20		Tightening torque	5 Nm

Differential pressure sensor to holder — Used in step 53

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor — Used in step 53

Clamp 15–19mm		Tightening torque	3 Nm

Clean air pipe to cylinder head cover — Used in step 54

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 54

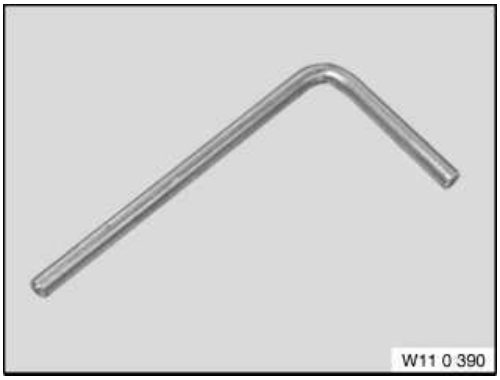
Clamp		Tightening torque	3 Nm

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Resonator to manifold and clean air pipe			Used in step 56
Screw TS6	Renew screw.	Tightening torque	5 Nm

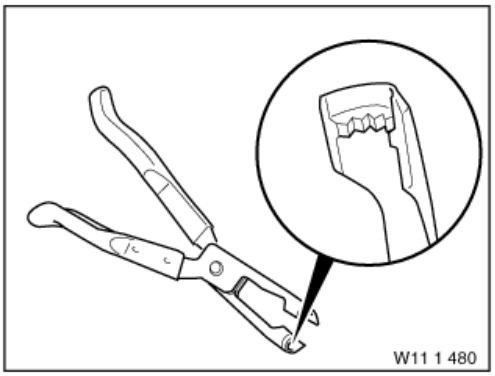
Overview of Special Tools

0 496 268 (11 0 390) Pin



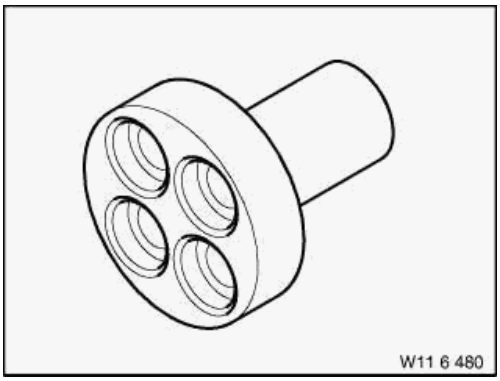
Common	Used in step 7 52
Usage	(roll pin) For securing new tensioning pulley (poly-V belt)
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 15 07 (390)

0 490 796 (11 1 480) Pliers



Common	Used in step 7 25
Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

0 493 380 (11 6 480) Connector



Common	Used in step 12 20 36 39 47
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

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2 220 718 Workshop crane



Common	Used in step 12 47
Usage	WSK 1000
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	06 01 11 (701)

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2 459 012 Holder



Common Used in step 12 47

Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

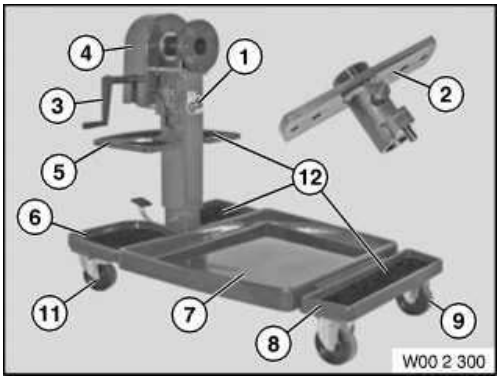
2 455 010 Engine support



Common Used in step 13 46

Usage	For accommodating engine on assembly stand. Engine: B3x, B4x, N47.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

0 495 187 (00 2 300) Assembly stand



Common Used in step 13

Usage	Assembly stand with universal flange for mounting engines from S85
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 25 04 (155)

Consisting of

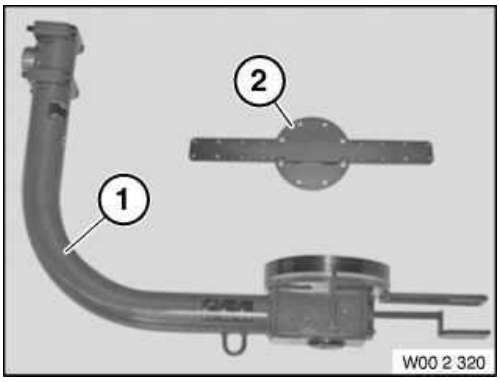
Pos	BMW Order number	Replaced by	Designation	In Connection with

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1	0 495 188 (00 2 301)		**Assembly stand** available only as complete assembly stand 83 30 0 495 187.	
2	0 495 189 (00 2 302)	**2 299 563**	**Tool** (Universal flange). Do not use any more!!! Technically locked. Replaced with a new flange with material number 83 30 2 299 563. All flanges delivered until the end of 2011 will be replaced at no charge. From 2012, only the new flange will be supplied. Also applies to the complete engine mounting stand 00 2 300.	
3	0 495 200 (00 2 303)		**Crank**	
4	0 495 201 (00 2 304)		**Cover** (Protective hood)	
5	0 495 202 (00 2 305)		**oddments tray** (Oddments tray for small parts)	
6	0 495 203 (00 2 306)		**Shaped element** (Rear shaped pan)	
7	0 495 204 (00 2 307)		**Collection pan** (Oil collection pan)	
8	0 495 205 (00 2 308)		**Shaped element** (Front shaped pan)	
9	0 495 206 (00 2 309)		**Wheel** (Front wheel (without stop))	
10	0 495 207 (00 2 311)		**Wheel** (Rear wheel (with stop))	
11	0 495 208 (00 2 312)		**Mat** (Checker mat set)	
2	2 299 563		**Adapter** New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.	

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0 495 196 (00 2 320) Support arm



Common

Used in step 13

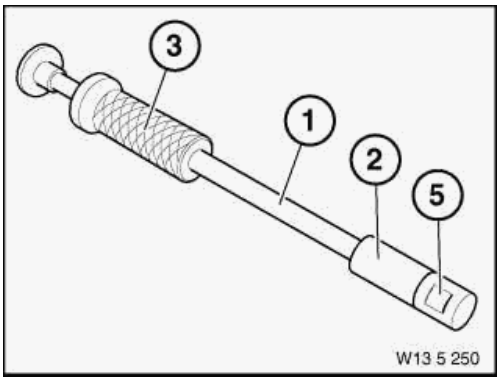
Usage	(Support arm with fixture) For mounting engines using the engine mounting bracket.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 197 (00 2 321)		**Support arm**	
2	0 495 198 (00 2 322)		**Panel** (take-up plate)	
3	0 495 380 (00 2 323)		**Panel** (fixture) Engine N73	
6	0 496 287 (00 2 326)		**Panel** (fixture) Engine: M73	
5	0 496 288 (00 2 327)	**0 496 373**	**Panel** (fixture) Engine: S62 Replaced by 11 5 420 (0 496 373)	
8	0 496 533 (00 2 328)		**Support** (Engine mount) Engine: N57, N57Top	
9	0 496 579 (00 2 329)	**0 496 680**	**Support** (Engine mount) Engine: N74 Replaced by 116160 (0 496 680)	
4	0 495 379 (00 2 324)		**Panel** (fixture) Engine M67TU	
5	0 495 381 (00 2 325)		**Panel** (fixture) Engine N62, N62TU	

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0 493 321 (13 5 250) Puller



Common

Used in step 17

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

0 493 339 (13 5 252) Bush



Common

Used in step 17

Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 340 (13 5 253) Weight



Common

Used in step 17

Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

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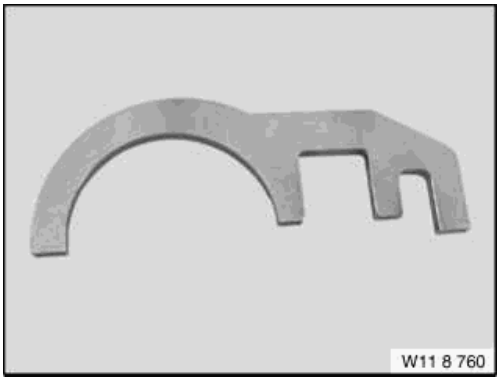
2 288 380 Locating stud



Common Used in step 20 36 37 39

Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 112 (11 8 760) Gauge



Common Used in step 20 36 38 39

Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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0 495 105 (11 4 480) oddments tray



Common

Used in step 26 27 36

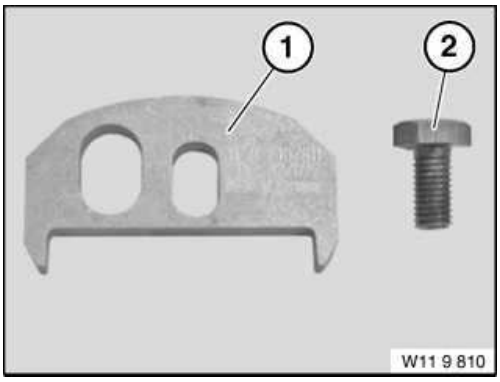
Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

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0 496 171 (11 9 811) Holder



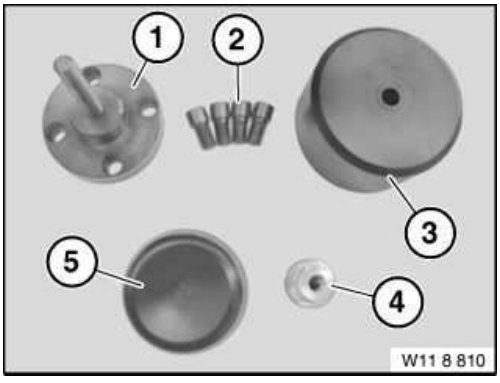
Common	Used in step 28 31
Usage	Available only as a complete tool set 11 9 810 (83 30 0 496 170) - as of 13.01.12
Included in the tool or work	0 496 170
Storage location	C86
Replaced by	
In connection with	
SI-Number	01 07 07 (355)

0 494 793 (11 9 265) Bush



Common	Used in step 28 31
Usage	
Included in the tool or work	0 493 938
Storage location	A44
Replaced by	
In connection with	
SI-Number	

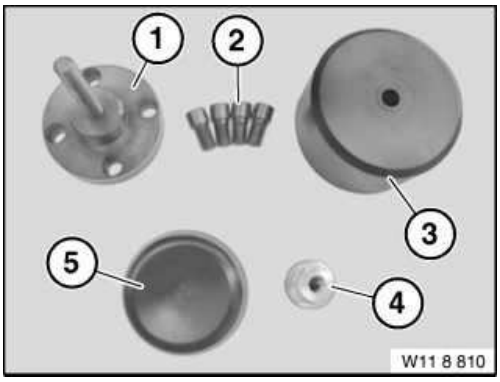
0 496 137 (11 8 815) Holding sleeve



Common	Used in step 30
Usage	(Slip sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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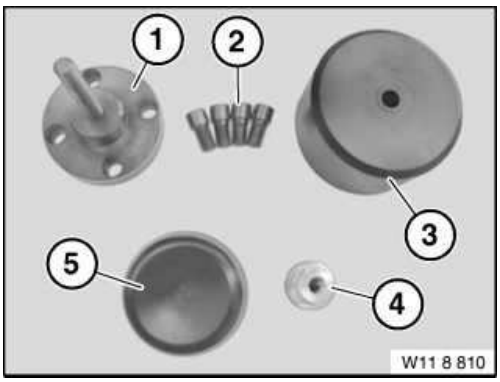
0 496 133 (11 8 811) Basic body



Common Used in step 30

Usage	Liquidation of existing inventory and then available only as a complete tool set 11 8 810 = 83 30 0 496 132 - as of 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

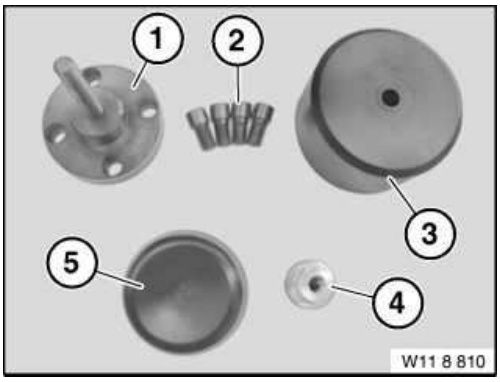
0 496 134 (11 8 812) Screw



Common Used in step 30

Usage	(Screw set) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 135 (11 8 813) Holding sleeve

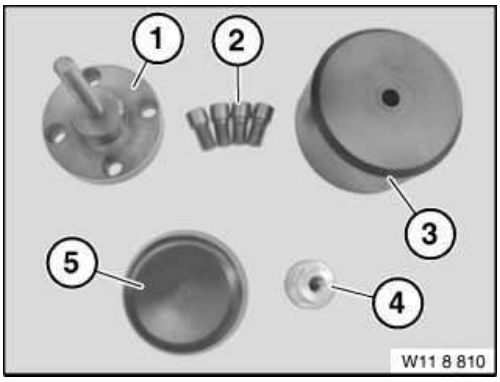


Common Used in step 30

Usage	(Thrust sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

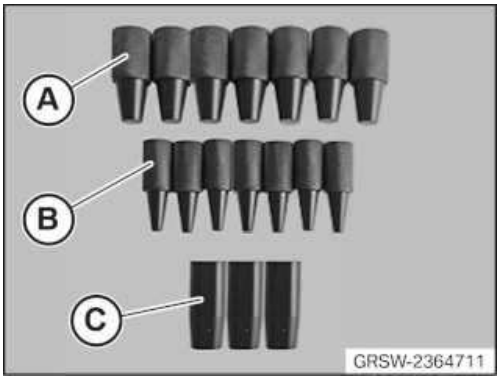
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0 496 136 (11 8 814) Nut



Common	Used in step 30
Usage	(Nut with bearing) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

2 364 711 Plug



Common	Used in step 30
Usage	For closing the pressure oil holes for cleaning the cylinder head sealing surfaces.
Included in the tool or work	
Storage location	C20
Replaced by	
In connection with	
SI-Number	01 50 14 (203)

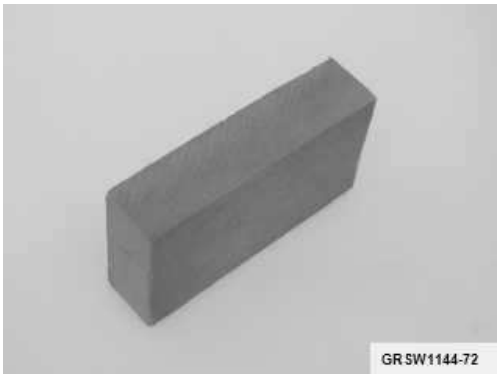
0 495 103 (11 4 471) Scraper



Common	Used in step 30
Usage	
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

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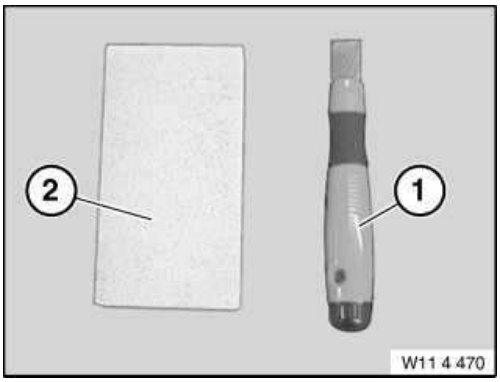
0 495 104 (11 4 472) Extractor



Common Used in step 30

Usage	(grindstone)
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

0 495 102 (11 4 470) Tool



Common Used in step 30 50

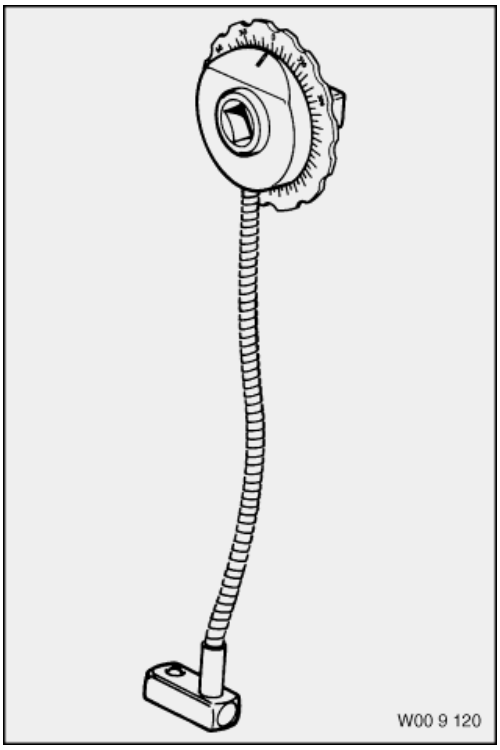
Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

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0 490 504 (00 9 120) Torque angle measuring dial



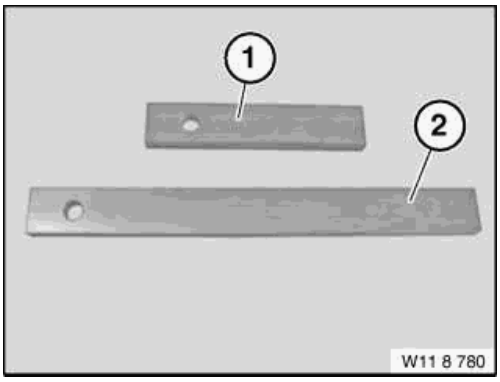
Common

Used in step 30

Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

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0 496 120 (11 8 780) Plate



Common

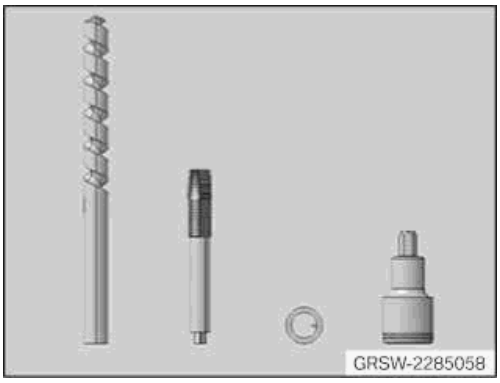
Used in step 30

Usage	(Mounting plates) For securing transmission oil sump when gearbox is removed.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 121 (11 8 781)		**Plate** (Mounting plate, short)Discontinued; only available via set 11 8 780 = 0496120.	
2	0 496 122 (11 8 782)		**Plate** (Mounting plate, long) Discontinued; only available via set 11 8 780 = 0496120.	

2 285 058 Tool set



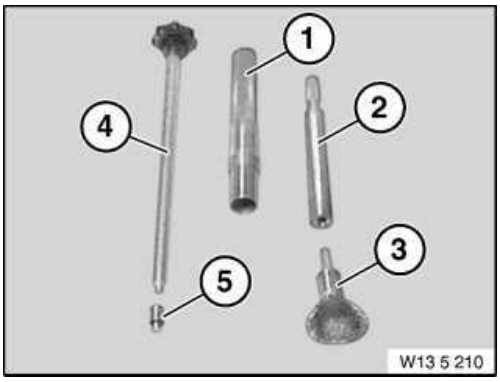
Common

Used in step 31

Usage	
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 02 14 (069)

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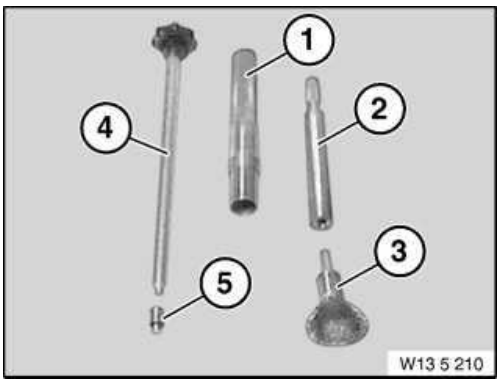
0 493 763 (13 5 215) Plug



Common Used in step 41

Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 762 (13 5 214) Rod

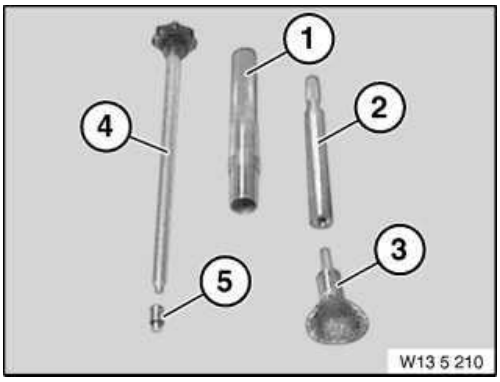


Common Used in step 41

Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 493 758 (13 5 210) Tool



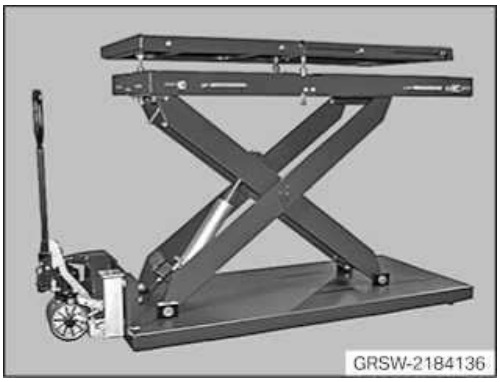
Common Used in step 41

Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

2 184 136 Mobile equipment table lift



Common Used in step 47

Usage	Table lift MHT 1200
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	06 01 10 (649)

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2 409 025 Puller



Common	Used in step 48
Usage	For disassembly of the outer radial shaft seal of the transmission output shaft, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A76
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 411 739 Puller



Common	Used in step 48
Usage	For disassembly of the inner radial shaft seal of the output, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C78
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 408 152 Striking element



Common	Used in step 48
Usage	For installation of the right radial shaft seal transmission output shaft (inner). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

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2 413 037 Handle



Common	Used in step 48
Usage	Universal drift handle. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C77
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

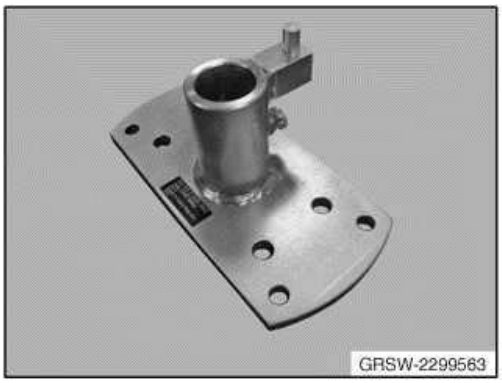
2 408 150 Striking element



Common	Used in step 48
Usage	For installing the right radial shaft seal transmission output shaft (outer). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

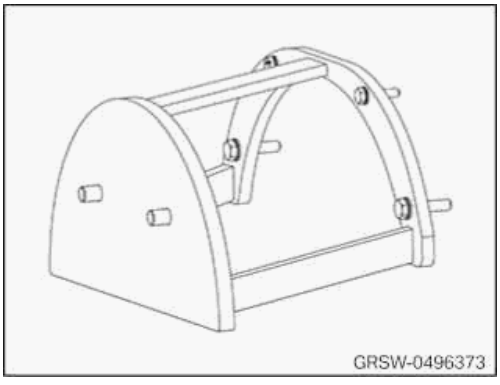
Replacement tools:

2 299 563 Adapter



Common	Used in step 13
Usage	New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.
Included in the tool or work	0 495 187
Storage location	
Replaced by	
In connection with	
SI-Number	

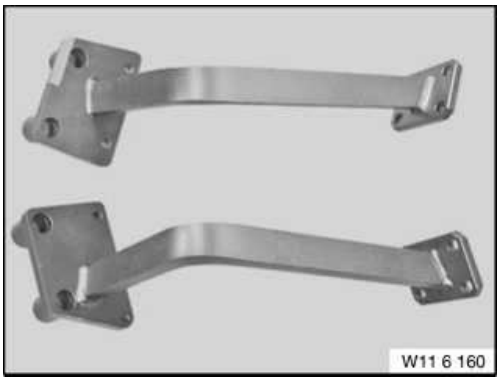
0 496 373 (11 5 420) Plate



Common	Used in step 13
Usage	(Fixture) Engine S62
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	

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0 496 680 (11 6 160) Support



Common	Used in step 13
Usage	For mounting N74 engine on the assembly stand. In combination with 00 2 300, 00 2 320
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	00 2 300; 00 2 320 = 0495196
SI-Number	01 31 09 (604)

Overview Technical Data

Screw-in depth of thread cutter	Used in step 31
Screw-in depth	18 mm

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	7 52
EGR controller	7 52

General repair instructions	Used in step
11 00 ... Overview of consumables (Electronic Parts Catalogue)	30

Repair instructions	Used in step
11 00 050 Removing and installing engine	1 58
11 00 050 Removing and installing engine	1 58
11 00 050 Removing and installing engine	1 58
11 00 050 Removing and installing engine	1 58
11 00 050 Removing and installing engine	1 58
11 00 050 Removing and installing engine	1 58
11 00 050 Removing and installing engine	1 58
11 00 050 Removing and installing engine	1 58
11 00 050 Removing and installing engine	1 58
31 10 001 Completely removing and installing front axle with engine and transmission	1 58
11 00 050 Removing and installing engine	1 58
11 00 050 Removing and installing engine	1 58
11 00 050 Removing and installing engine	1 58
11 00 050 Removing and installing engine	1 58
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11 00 050 Remove and install engine 1 58
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG) 1 58
11 00 050 Remove and install engine 1 58
11 00 050 Remove and install engine 1 58
11 00 050 Remove and install engine 1 58
11 00 050 Remove and install engine 1 58
11 00 050 Removing and installing the engine (manual gearbox) 1 58
11 00 050 Remove and install engine (Automatic) 1 58
11 00 050 Remove and install engine 1 58
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11 00 050 Removing and installing engine 1 58
11 00 050 Removing and installing engine \PREMIUM 1 58
11 00 050 Removing and installing/replacing engine (N63) 1 58
11 00 050 Removing and installing engine 1 58
11 00 050 Removing and installing engine 1 58
11 00 050 Removing and installing engine 1 58
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11 00 050 Remove and install engine 1 58
11 00 050 Remove and install engine 1 58
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG) 1 58
11 00 050 Remove and install engine 1 58
61 35 ... Notes on ESD protection (Electro Static Discharge) 6 17 25 30

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Operating materials	Used in step

Parts

Parts required

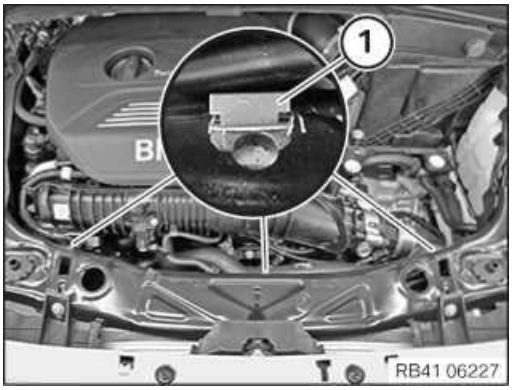
Designation	Used in step
Chain tensioner piston seal on cylinder head	36
Exhaust-gas recirculation cooler seal on exhaust manifold	52
Exhaust-gas recirculation cooler seal on intake plenum	52

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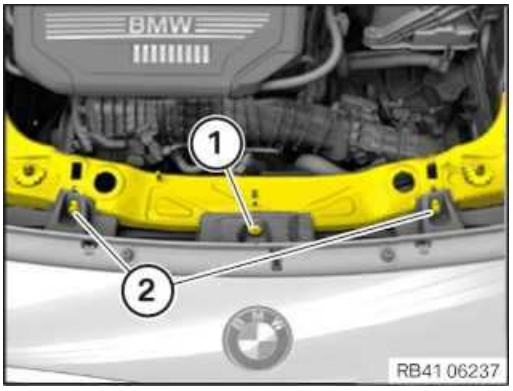
11 14 005 Replacing front crankshaft seal

PRELIMINARY WORK

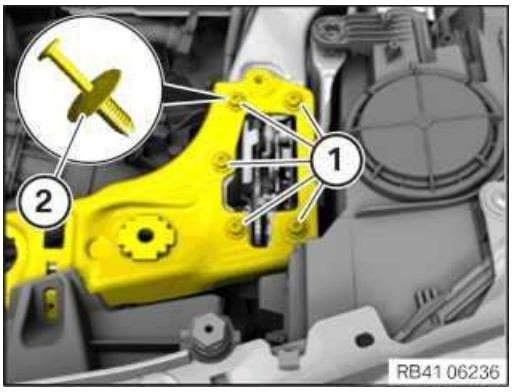
1 – Remove front cross connection



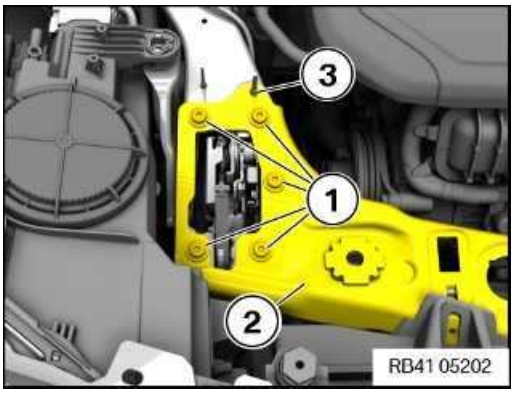
- Detach the clamps (1) for the Bowden cable of the bonnet locks from the cross connection.



- Loosen screw (1).
- Loosen screws (2).



- Loosen screws (1).
- Lever out expanding rivet (2).



- Loosen screws (1).
- Unclip the front cross connection (2) from the rubber retainer (3) and remove it upward.

2 – Remove front right wheel

TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

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TECHNICAL INFORMATION

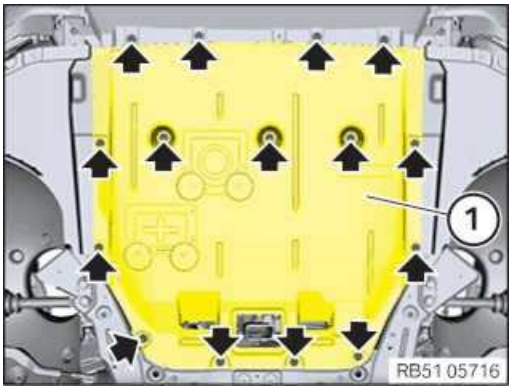
Strictly observe the specified procedure to prevent clamping errors and imbalance.



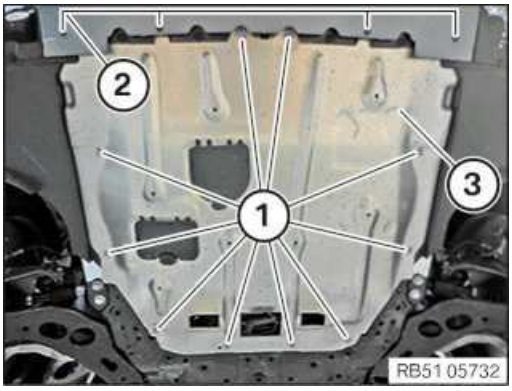
- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

3 – Removing the front underbody protection



- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.



- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

4 – Removing the front right wheel arch cover

▶ **Remove the front wheel arch trim**

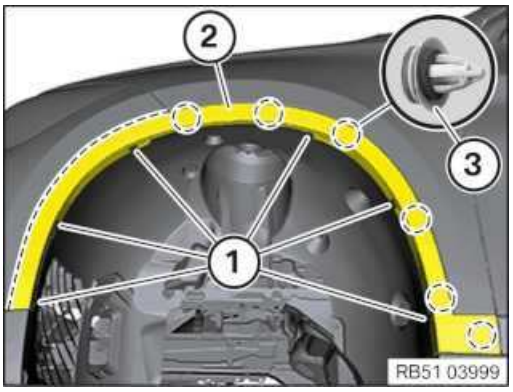
NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

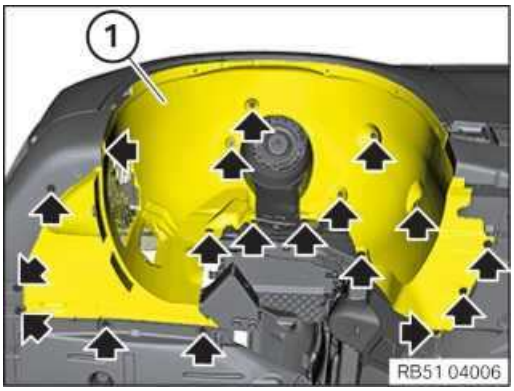
NOTICE

Description is for left component only. Procedure on the right side is identical.

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- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.



NOTICE

Description is for left component only. Procedure on the right side is identical.

- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

5 – Removing the drive belt for alternator

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

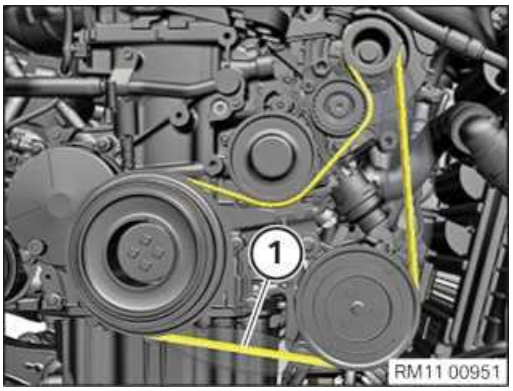
TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

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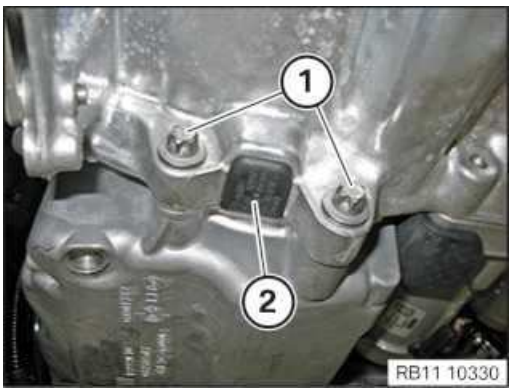


- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool **0 496 268 (11 0 390)**.

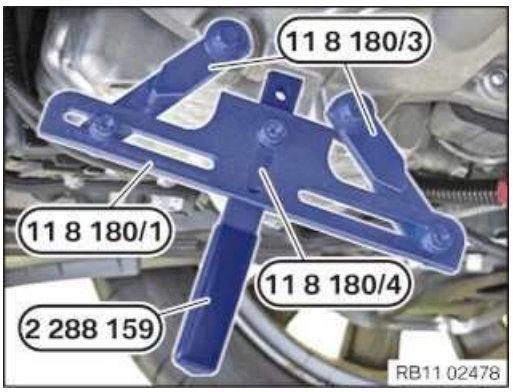


- Guide out the drive belt for the alternator (1) and remove it.

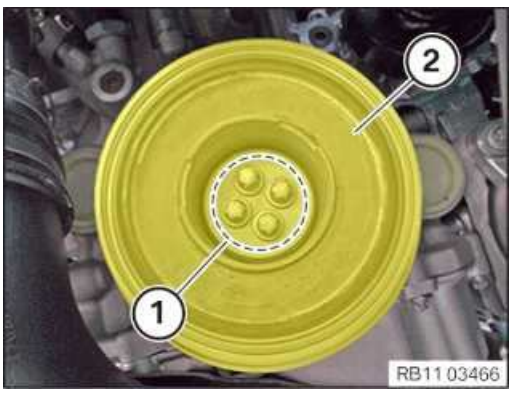
6 – Removing the vibration damper



- Release the transmission bolts (1).
- Remove the protective cap (2).



- Position special tool **0 493 587 (11 8 180)** as illustrated.
- Fasten the special tool **0 493 587 (11 8 180)** to the transmission with transmission bolts.

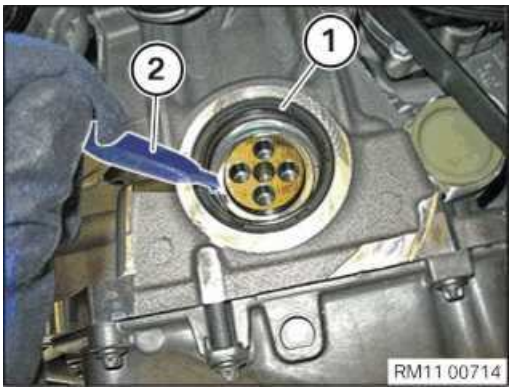


- Loosen screws in the area (1).
- Remove the vibration damper (2).

MAIN WORK

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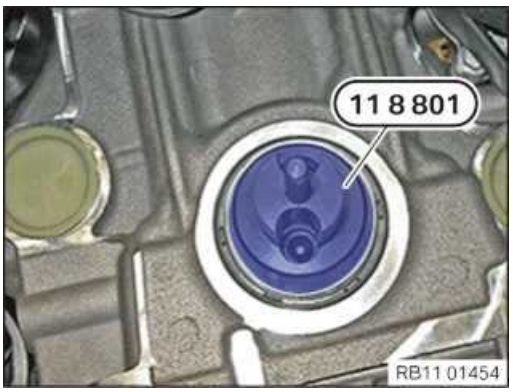
7 – Remove the crankshaft seal



- Lift the crankshaft sealing ring (1) with the special tool (2) **2 298 505**.

  Do not scratch the sealing surface on the engine block.

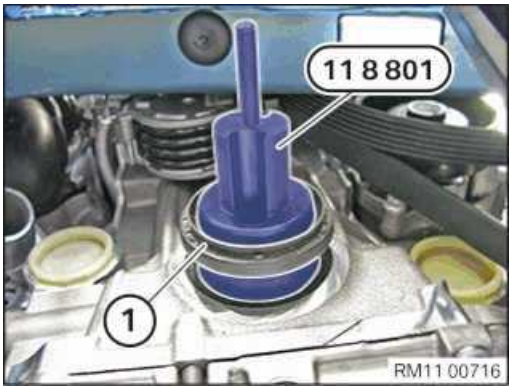
8 – Install the crankshaft seal



TECHNICAL INFORMATION

The radial shaft seal must be installed dry. Do not use engine oil or lubricant.

- Secure special tool **0 496 128 (11 8 801)** with special tool **0 496 129 (11 8 802)** to the crankshaft.



- Renew the crankshaft sealing ring (1).

  Parts: Crankshaft seal

- Position the crankshaft seal (1) on the special tool **0 496 128 (11 8 801)**.



- Draw in the crankshaft sealing ring with the special tools **0 496 130 (11 8 803)** and **0 496 131 (11 8 804)**.
- Screw in special tool **0 496 130 (11 8 803)** until it is flush with the crankcase.
- Remove special tools **0 496 130 (11 8 803)** and **0 496 131 (11 8 804)**.

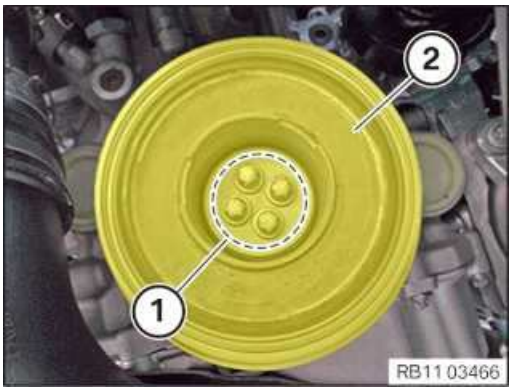
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- Remove special tool **0 496 128 (11 8 801)**.

POSTPROCESSES

9 – Installing the vibration damper

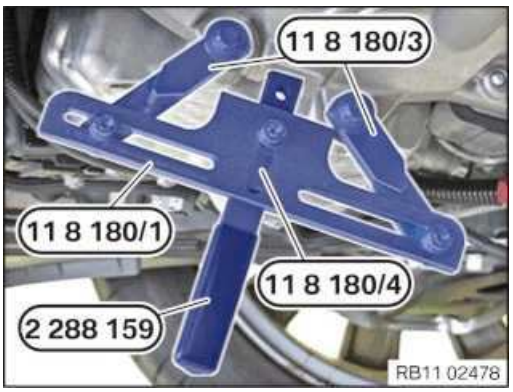


- Position vibration damper (2).
- Renew screws (1).

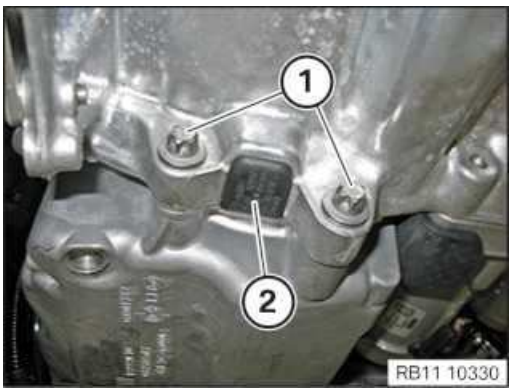
  Parts: Bolts
- Fasten the vibration damper (2) with the bolts (1).
- Tighten the screws (1).

Vibration damper with belt pulley to crankshaft

M10x65	Renew screws. Tighten screws crosswise.	1. Jointing torque 2. Angle of rotation	40 Nm 60 °
		3. Angle of rotation	60 °



- Release the transmission bolts and remove the special tool **0 493 587 (11 8 180)**.



- Tighten transmission screws (1).

Transmission to engine

M8		Tightening torque	19 Nm

- Install protective cap (2).

10 – Installing the drive belt for alternator

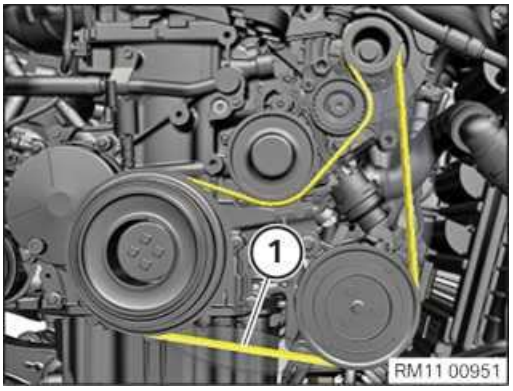
TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

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TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.



- Feed in the drive belt for the alternator (1) and install it.

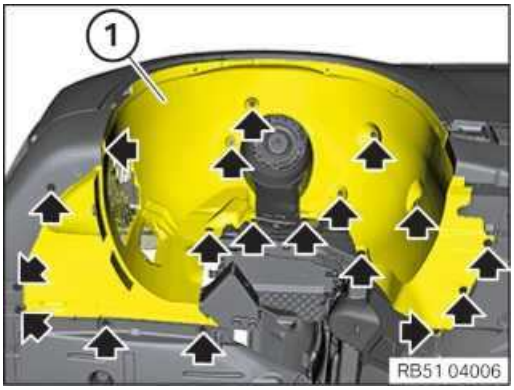


- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool **0 496 268 (11 0 390)** out of the belt tensioner and remove it.

11 – Installing the front right wheel arch cover

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

▸ **Installing front wheel arch trim**

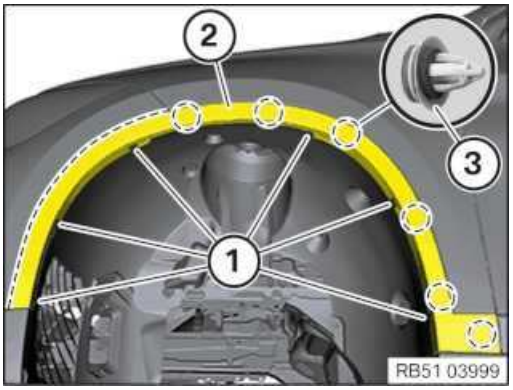
NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

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NOTICE

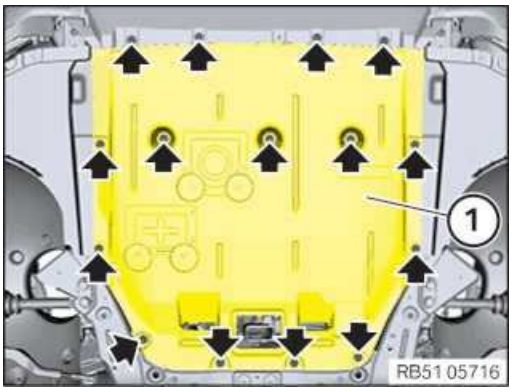
Description is for left component only. Procedure on the right side is identical.



- Check the clips (3) for damage and renew where required.

  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

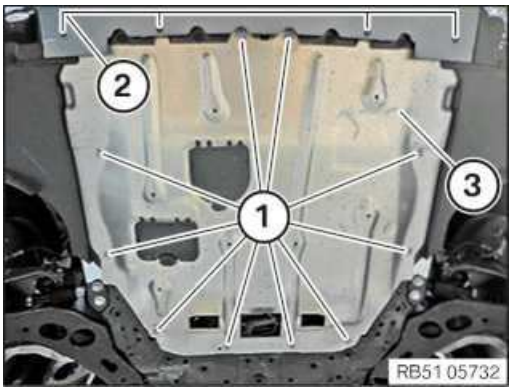
12 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm



- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

13 – Installing the front right wheel

▸ **Clean the contact surfaces between the brake disc and the wheel rim**

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TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

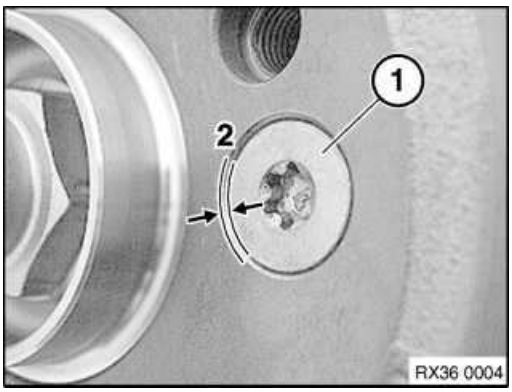
- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.



- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

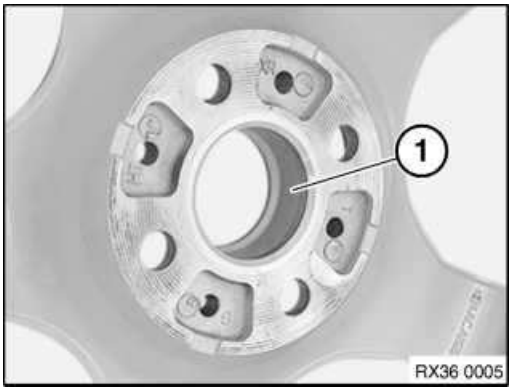


- Check the mounting bolt for the brake disc (1) for secure fit.

  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

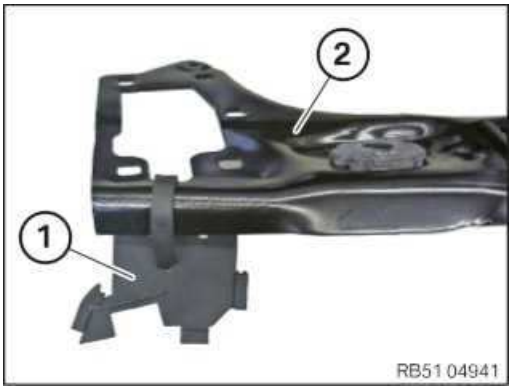
  Parts: Wheel bolts
- Clean the wheel bolts and check the threads for damage. Renew the wheel bolts as needed.
- Mount wheel bolts and tighten.

Wheel bolts

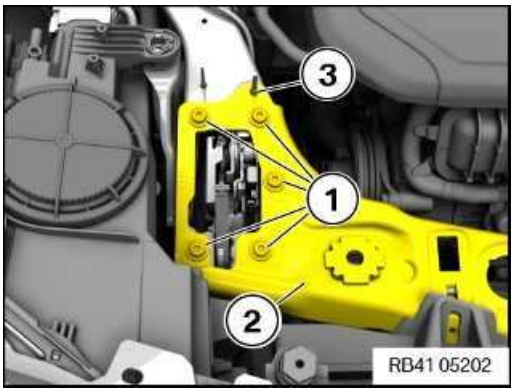
M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

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14 – Install front cross connection



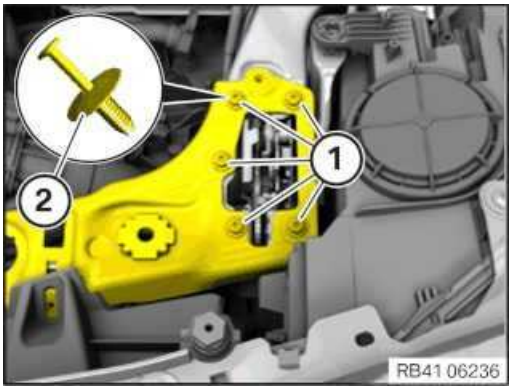
- Right side of vehicle only: Secure spray guard (1) on the cross connection (2) as pictured.



- Position front cross connection (2) and clip front cross connection (2) into the rubber retainer (3) at the same time.
- Tighten the screws (1).

Cross connection to carrier support

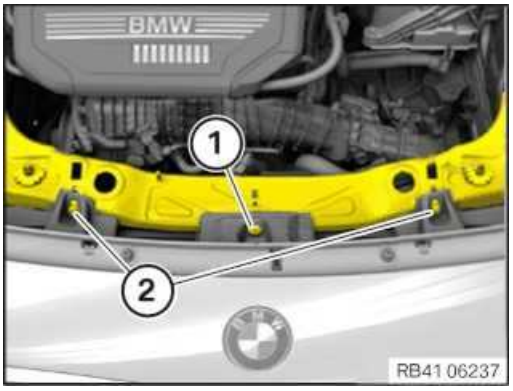
Screws M6x20		Tightening torque	11,8 Nm



- Tighten the screws (1).

Cross connection to carrier support

Screws M6x20		Tightening torque	11,8 Nm



- Position screws (3) on the rubber mounts for the radiator and tighten.

Screw connection for rubber mount of coolant radiator to coolant radiator

Bolt to rubber mount		Tightening torque	8 Nm

- Tighten down screws (2).

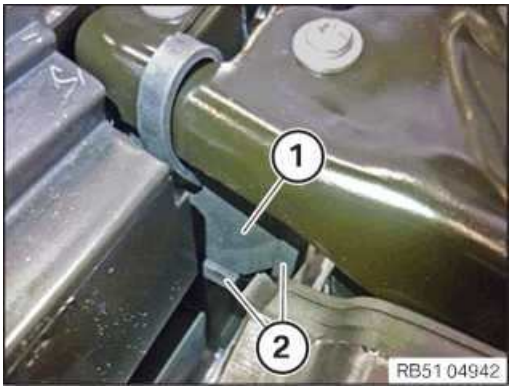
Air duct to upper connection

M6x20 screw		Tightening torque	11,8 Nm

- Tighten down screw (1).

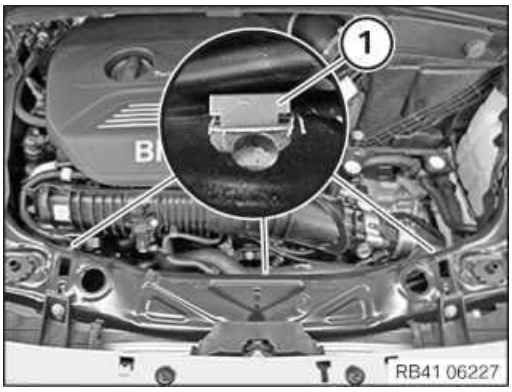
Bracing strut to upper connection

M8x20 screw		Tightening torque	28 Nm



- Right side of vehicle only: Properly mount spray guard (1) to prevent corrosion.
- Secure spray guard (1) to the bridge with retaining tabs (2).

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- Fasten the clamps (1) from the Bowden cable of the bonnet lock on the cross connection.

Additional Information

Overview of Tightening Torques

Vibration damper with belt pulley to crankshaft — Used in step 9

M10x65	Renew screws. Tighten screws crosswise.	1. Jointing torque 2. Angle of rotation 3. Angle of rotation	40 Nm 60 ° 60 °

Transmission to engine — Used in step 9

M8		Tightening torque	19 Nm

Wheel arch cover to body — Used in step 11

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body — Used in step 11

Plastic nut		Tightening torque	3 Nm

Underbody protection front — Used in step 12

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Brake disc to front wheel hub — Used in step 13

M8	Renew screw.		16 Nm

Wheel bolts — Used in step 13

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Cross connection to carrier support — Used in step 14

Screws M6x20		Tightening torque	11,8 Nm

Screw connection for rubber mount of coolant radiator to coolant radiator — Used in step 14

Bolt to rubber mount		Tightening torque	8 Nm

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Air duct to upper connection

Used in step 14

M6x20 screw		Tightening torque	11,8 Nm

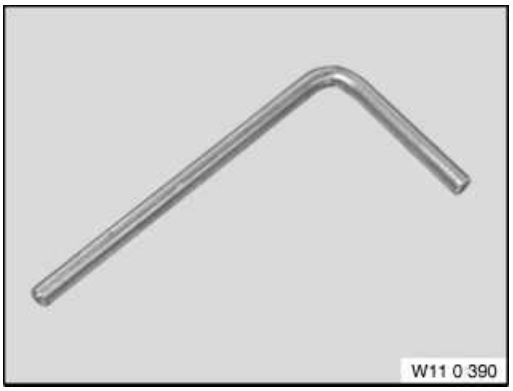
Bracing strut to upper connection

Used in step 14

M8x20 screw		Tightening torque	28 Nm

Overview of Special Tools

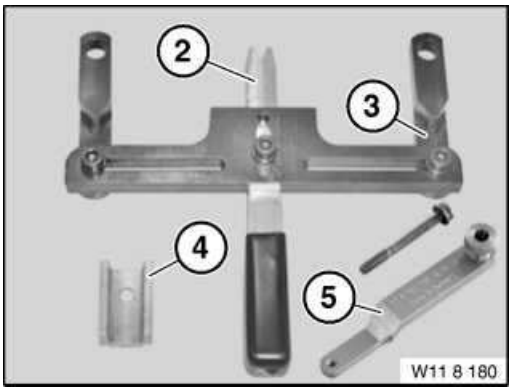
0 496 268 (11 0 390) Pin



Common Used in step 5 10

Usage	(roll pin) For securing new tensioning pulley (poly-V belt)
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 15 07 (390)

0 493 587 (11 8 180) Holder



Common Used in step 6 9

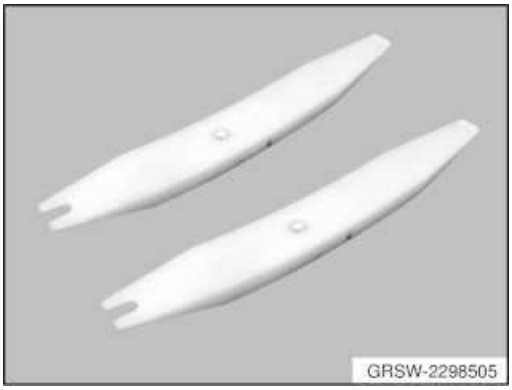
Usage	(Counter support) Blocking flywheel when releasing and tightening down central bolts on vibration absorber
Included in the tool or work	
Storage location	B45
Replaced by	
In connection with	
SI-Number	01 12 99 (452)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
2	0 494 433 (11 8 182)		**Shaped part** (shaped part)	
5	0 494 716 (11 8 185)		**Adapter** (Adapter with adjusting sleeve) E46 M47TU	
1	0 494 432 (11 8 181)	**0 494 434**	**Basic body** (Basic body) E65/M67, E38/M67 Discontinuation Replaced by 11 8 183 (0 494 434)	
3	0 494 434 (11 8 183)		**Basic body**	
4	0 494 435 (11 8 184)		**Adapter** E65 / M67	

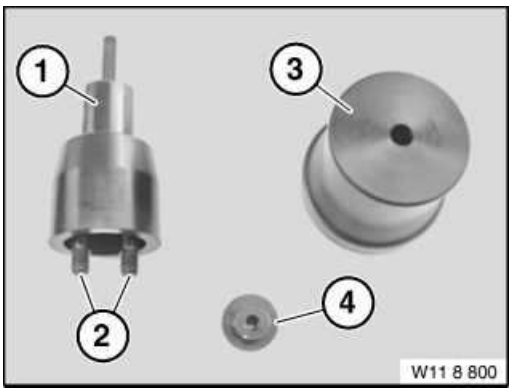
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2 298 505 Wedge



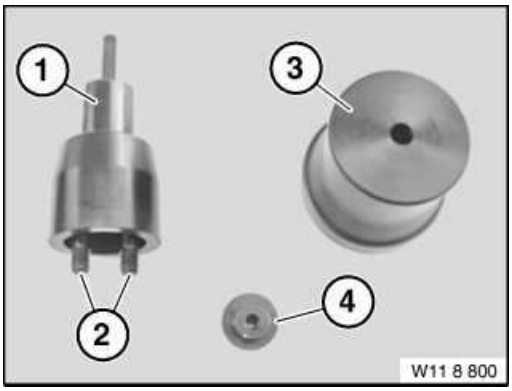
Common	Used in step 7
Usage	Set (delivery of 2 pieces)
Included in the tool or work	
Storage location	C34
Replaced by	
In connection with	
SI-Number	01 03 12 (792)

0 496 128 (11 8 801) Basic body



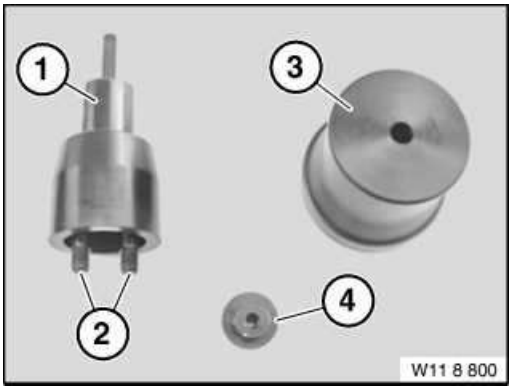
Common	Used in step 8
Usage	Available only as a complete tool set 11 8 800 = 83 30 0 496 127 - as of 30.11.2011
Included in the tool or work	0 496 127
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 129 (11 8 802) Screw



Common	Used in step 8
Usage	(Set of screws) Can only be ordered as part of complete tool 11 9 660 = 0495955
Included in the tool or work	0 496 127
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

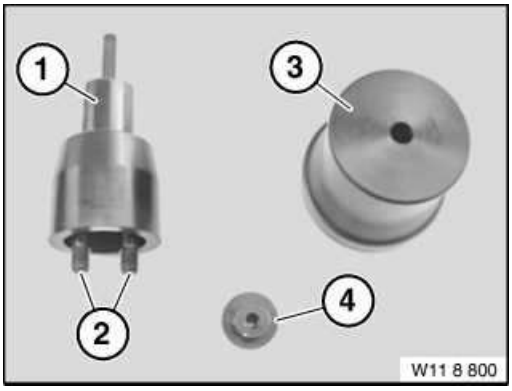
0 496 130 (11 8 803) Holding sleeve



Common	Used in step 8
Usage	(Thrust piece) sale of existing inventory and then available as part of complete tool set 11 8 800 = 83 30 0 496 127 only - as of 30.11.2011
Included in the tool or work	0 496 127
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

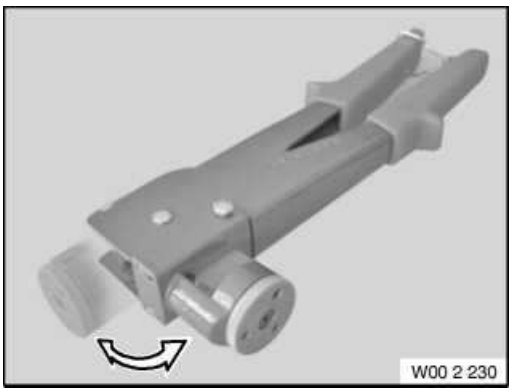
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0 496 131 (11 8 804) Nut



Common	Used in step 8
Usage	(Nut with collar) available as part of set of tools 11 8 800 = 83 30 0 496 127 only - as of 30.11.2011
Included in the tool or work	0 496 127
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 521 (00 2 230) Pliers



Common	Used in step 11
Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

2 344 011 Tool



Common	Used in step 13
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

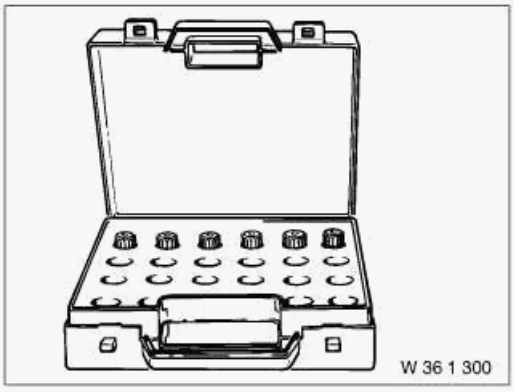
0 495 221 (36 1 323) Wheel stud



Common	Used in step 2
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 224 (36 1 326) Wheel stud



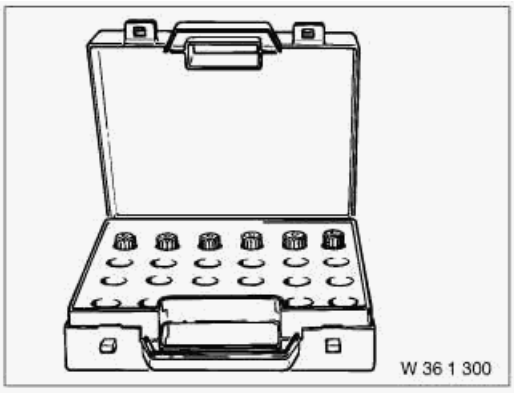
Common	Used in step 2
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud



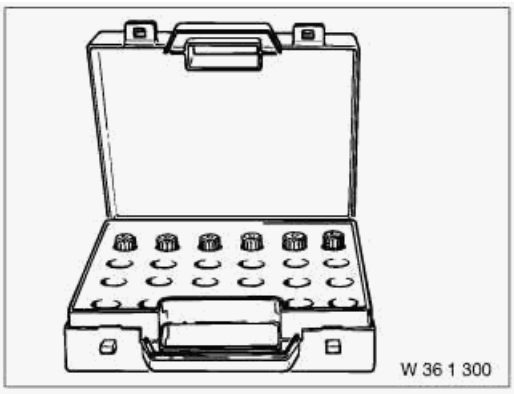
Common	Used in step 2
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud



Common	Used in step 2
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

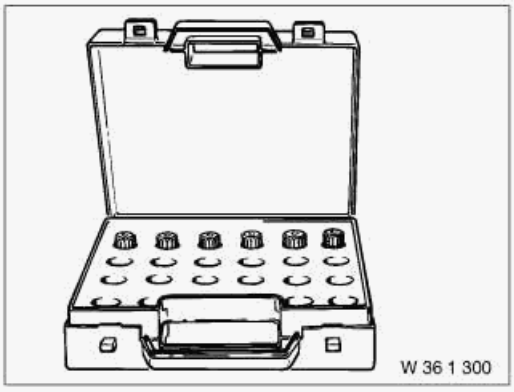
0 495 227 (36 1 329) Wheel stud



Common	Used in step 2
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 228 (36 1 331) Wheel stud



Common	Used in step 2
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 229 (36 1 332) Wheel stud



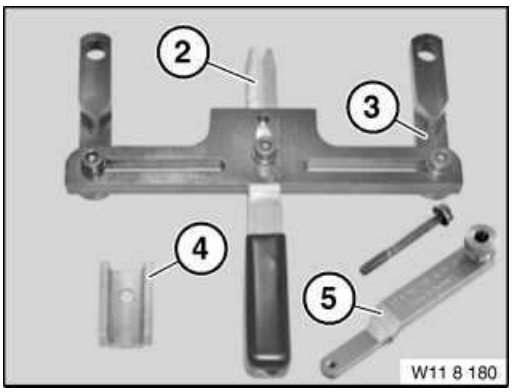
Common	Used in step 2
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud



Common	Used in step 2
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 434 (11 8 183) Basic body



Common	Used in step 6 9
Usage	
Included in the tool or work	0 493 587
Storage location	
Replaced by	
In connection with	
SI-Number	

Links

Operating materials	Used in step
2.0 Grease for wheel centring	13

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11 14 005 Replacing front crankshaft seal (B47)

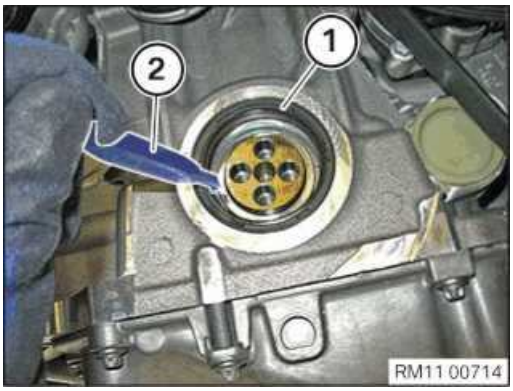
Special tools required:

- 11 8 801
- 11 8 802
- 11 8 803
- 11 8 804

Necessary preliminary tasks:

- Remove vibration damper

Removal:



Lift out crankshaft seal (1) using suitable tool.
Do not scratch sealing surface against engine block.

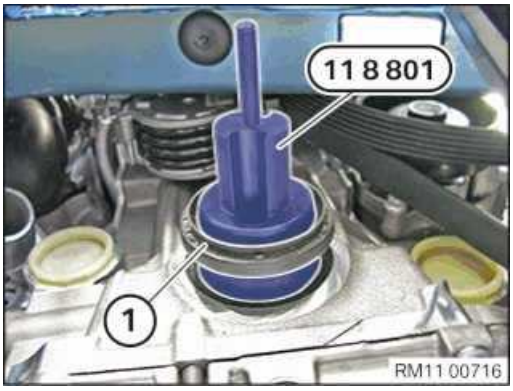
Installation:

Important!
The radial shaft seal must be installed dry.
Do not use engine oil or lubricant.

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Fasten special tool 11 8 801 with11 8 802 on the crankshaft.



Position the radial shaft seal (1) on special tool 11 8 801 .



Draw in radial shaft seal with special tools 11 8 803 and 11 8 804 .
Screw in special tool 11 8 803 until it is flush with the crankcase.

Required follow-up work:

- Install vibration damper
- Check engine for leak tightness

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11 14 151 Replacing rear crankshaft seal (B47)

Special tools required:

- 23 0 490
- 11 8 815
- 11 8 811
- 11 8 812
- 11 8 813
- 11 8 814
- 11 8 810

Necessary preliminary tasks:

- Remove transmission.
- Remove flywheel.

Important!

Before the radial shaft seal is removed, the engine must be moved to the installation position using suitable lifting gear.

Engine oil may escape.

The radial shaft seal must be installed dry.

Do not use engine oil or lubricant.

Removal:



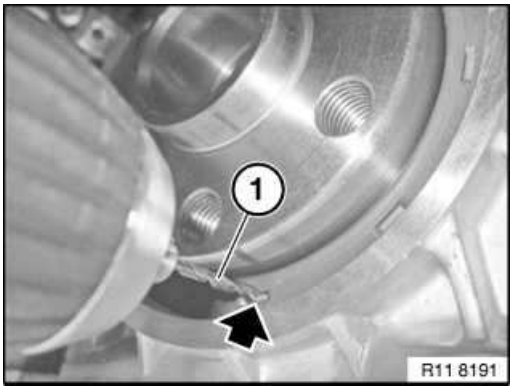
Important!

Magnet wheel (1) is magnetic.

Keep magnet wheel (1) in a plastic bag away from swarf.

Remove magnet wheel (1) from crankshaft.

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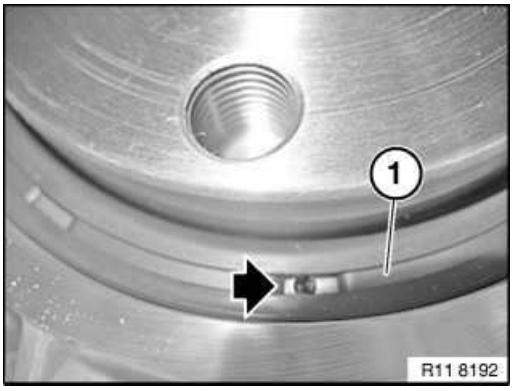
Important!

Drill size maximum 2,5 mm.

Remove swarf immediately with vacuum cleaner.

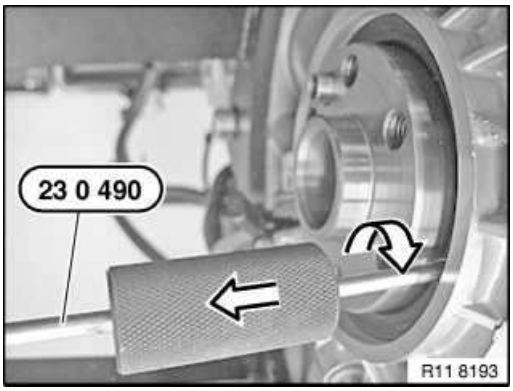
Do not remove swarf with compressed air!

Drill a hole with a drill (1) in the radial shaft seal (see arrow).



Important!

Remove swarf from the radial shaft seal (1).



Important!

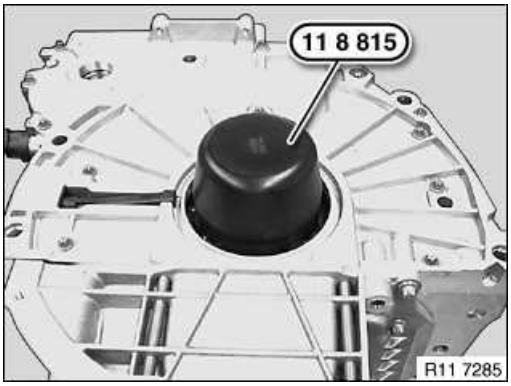
Risk of damage at the crankcase and on the running surface of the crankshaft.

Immediately carefully remove residual swarf.

Screw in special tool23 0 490 in direction of arrow.

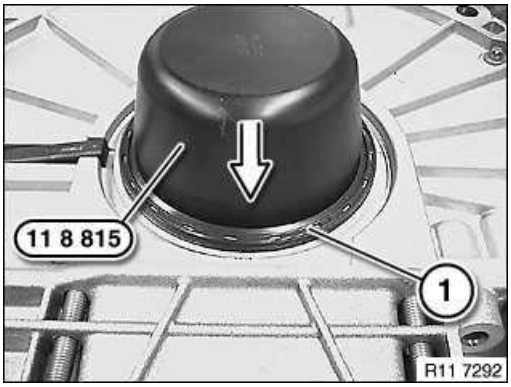
Drive out radial shaft seal with impact weight in direction of arrow.

Installation:



Position special tool11 8 815 on crankshaft.*Note:*
Graphic :N47 D20

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Use special tool 11 8 815 to fit the radial shaft seal (1) in the direction of the arrow up to the timing case cover and position.

Remove special tool 11 8 815 .

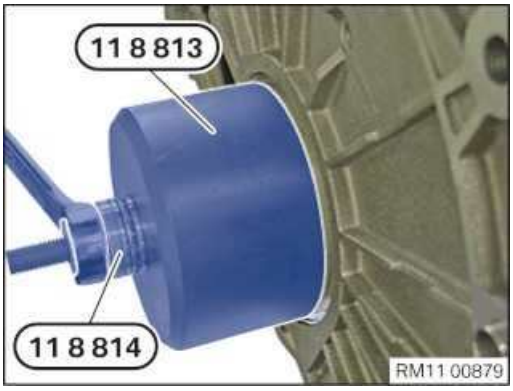


Fasten special tool 11 8 811 with special tool 11 8 812 on the crankshaft.



Slide on special tool 11 8 813 .

Screw down special tool 11 8 814 .



Press in radial shaft seal with special tool 11 8 813 .

Screw in special tool 11 8 813 up to gear case cover.

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Note:
Check the fitting sleeve for damage.

Note the installation position of the magnet wheel.

Position magnet wheel (1) on crankshaft.

Remove all special tools 11 8 810 .

Required follow-up work:

- Install flywheel.
- Install transmission.

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11 14 151 Replacing the crankshaft seal

WARNING

Motor vehicle may slip off the vehicle hoist where components are supported.

Danger! Life-threatening injuries!

- Secure the vehicle hoist against lowering and lifting.

WARNING

Motor vehicle may slip off the vehicle hoist if the weight is distributed unevenly.

Danger! Life-threatening injuries!

- Ensure there is a specific weight compensation on the motor vehicle.

WARNING

Vehicle may slip off the vehicle hoist if the vehicle hoist is handled incorrectly.

Danger! Life-threatening injuries!

- Observe safety information on raising the vehicle using a vehicle hoist.
- For additional information see: 00 ... Raising the vehicle using a vehicle hoist.

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

PRELIMINARY WORK

1 – Bring front compartment lid in the service position

Prerequisite

Engine compartment lid is open.

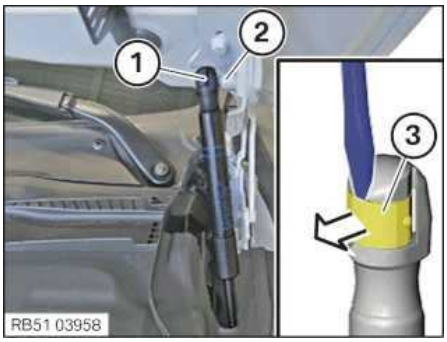
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CAUTION

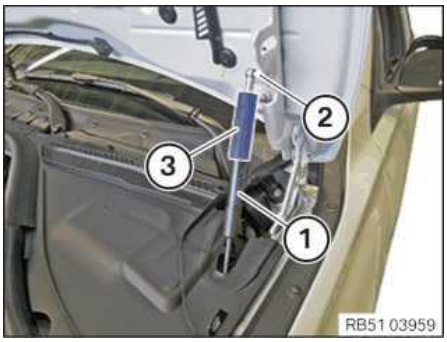
Shutting bonnet or tailgate.

Danger of injury!

- Support bonnet/tailgate in fully open position with the aid of a suitable device.



- Lift clamp (3) slightly using a screwdriver, in the direction of the arrow.
- Lift off ball socket (1) from ball pin (2).
- Repeat the operation on the other side of vehicle.



TECHNICAL INFORMATION

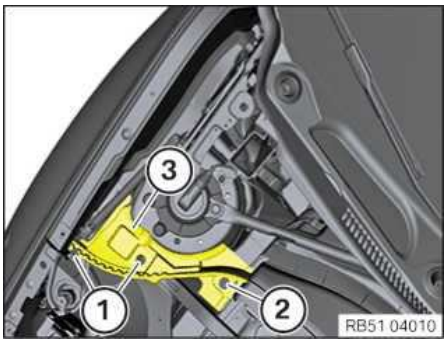
Conduct the following operation with the assistance of a second person.

- Remove the bonnet support and open the bonnet further.
- Push special tool (3) over gas pressure spring (1).
- Place special tool on the ball pin (2) and engage using force.
- Repeat the operation on the other side of vehicle.

2 – Remove suspension cross-brace

TECHNICAL INFORMATION

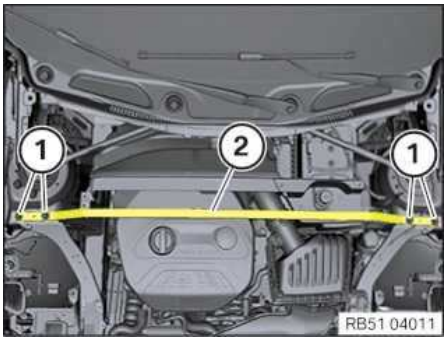
Driving without the strut brace/front end or tension strut is not permitted.



NOTICE

Description is for right component only. The procedure on the left side is identical.

- Loosen expanding rivet (1).
- Loosen screw (2).
- Remove the cover (3).



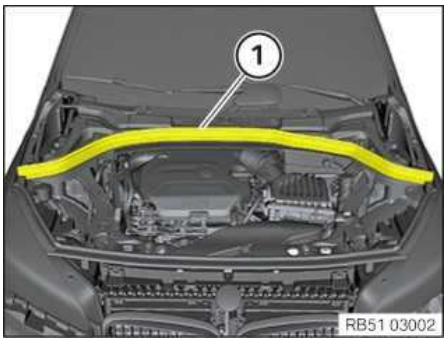
- Loosen screws (1).
- Remove strut brace (2).

3 – Remove the seal for the rear bonnet

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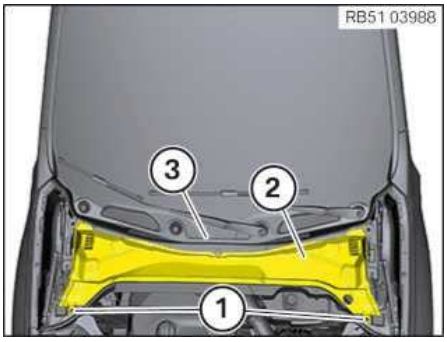
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



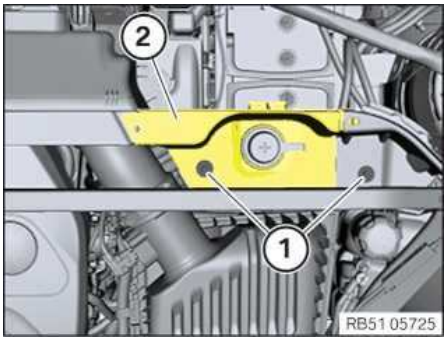
- Pull off rear bonnet seal (1) towards the top and remove.

4 – Removing front cowl panel cover

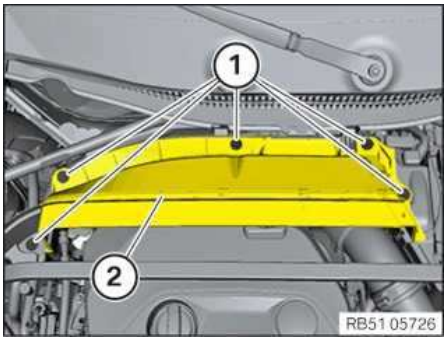


- Loosen the expanding rivet (1).
- Feed out and remove front cowl panel cover (2) from the rear cowl panel cover(3).

5 – Removing the upper bulkhead cover



- Loosen screws (1).
- Guide out and remove the cover (2).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

6 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

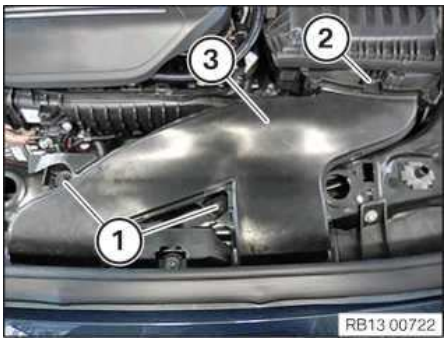
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

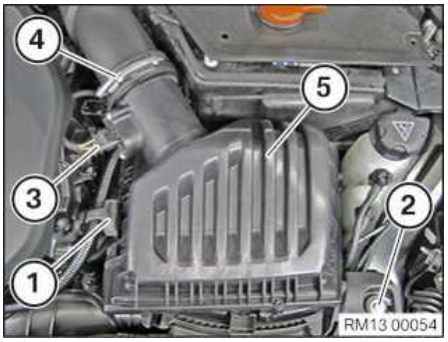
- Unclip the acoustic cover from the marked areas towards the top.

7 – Remove the intake neck for intake silencer housing



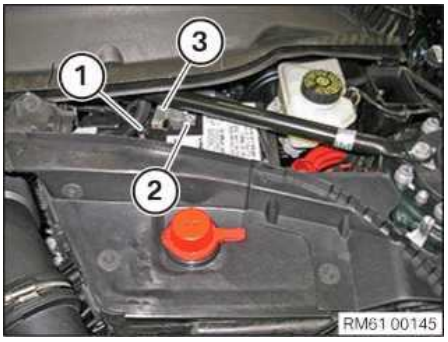
- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

8 – Removing intake silencer housing



- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

9 – Disconnecting the battery earth lead



- Unlock plug connection (1) and disconnect.
- Unfasten nut (2).
- Remove the battery earth lead (3) and secure to one side.

10 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

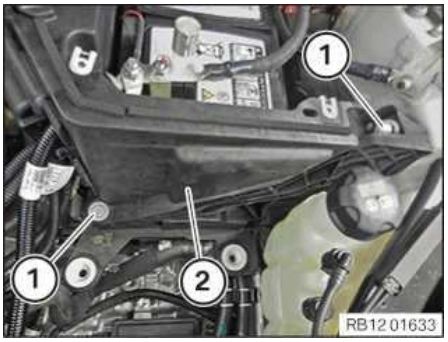
- Do not pull on the wires when disconnecting connectors and plug connections.

TECHNICAL INFORMATION

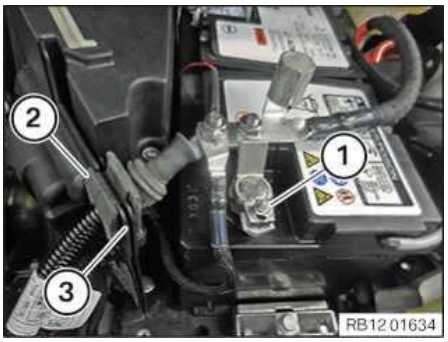
Follow instructions for removing and installing control units.
For additional information see: 12 00 ... Notes on removal and installation of control units

TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.

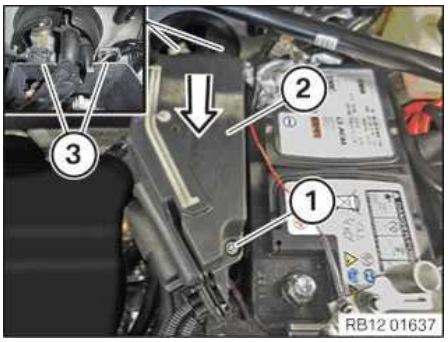


- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.

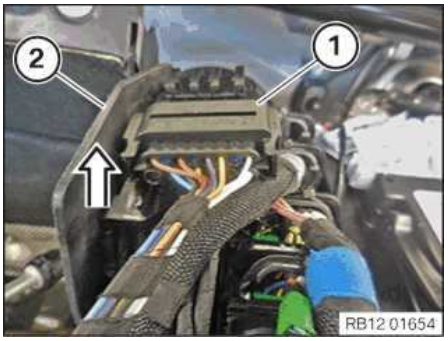


- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

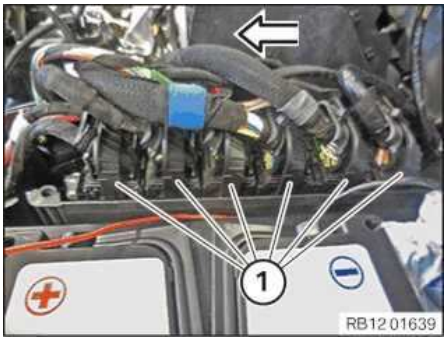
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- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



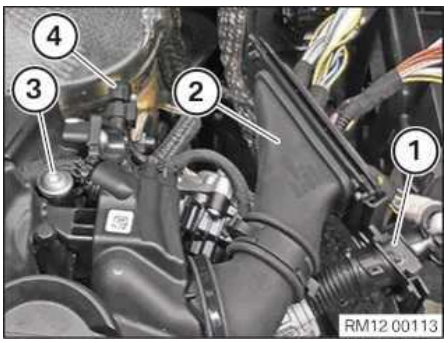
- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).



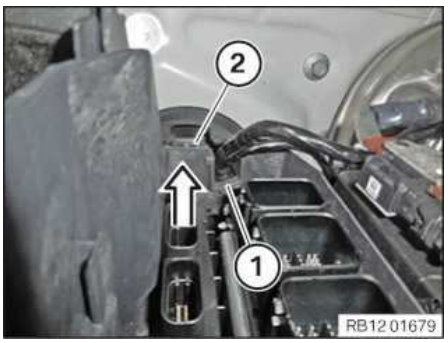
- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



- Unlock and loosen connector (1).

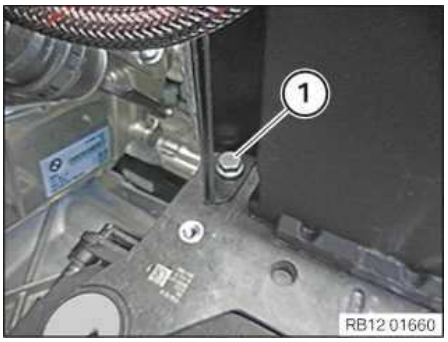


- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.

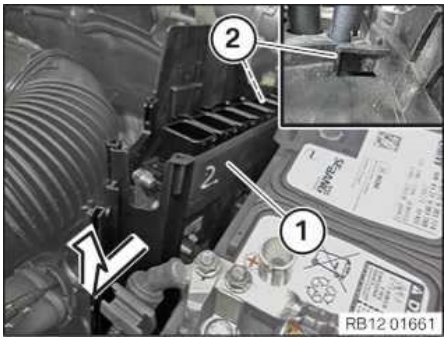


- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.

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- Loosen screw (1).



- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

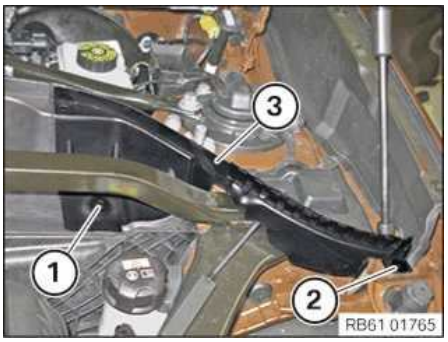
11 – Remove vehicle battery

WARNING

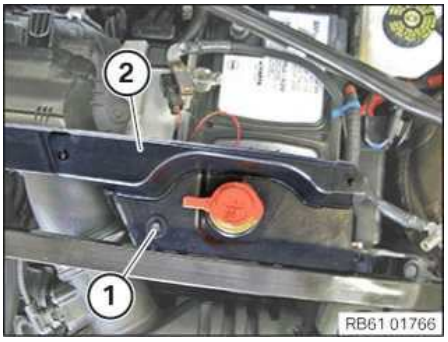
Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

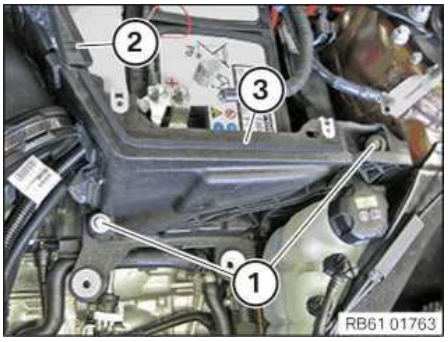
- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.



- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

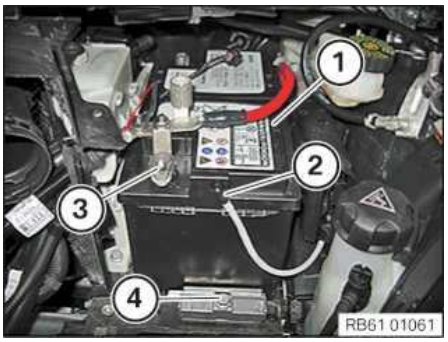


- Loosen screw (1).
- Remove the cover (2).



- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.

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- Pull off the vent hose (2).
- Slacken the nut (3) on the positive battery terminal and remove the positive battery terminal.

WARNING

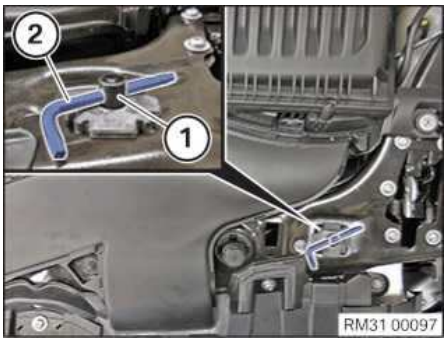
Unprotected battery terminals.

Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

12 – Securing radiator on left and right



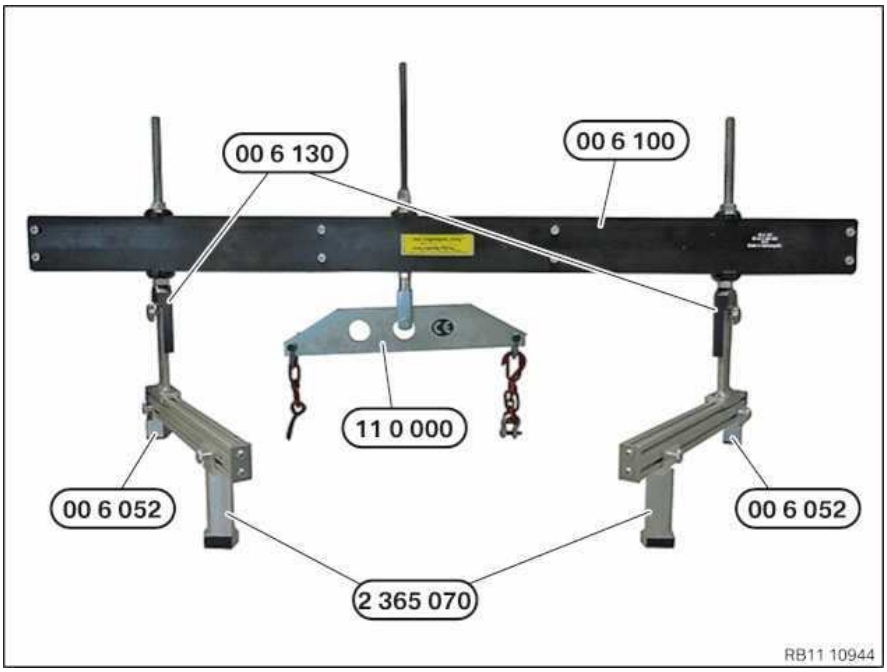
NOTICE

Perform the operations on the left and right side.

- Fasten radiator at centring pin (1) with suitable tool (2).

13 – Installing the engine bridge

Overview: Prepared engine bridge



Prerequisite

Front compartment lid is in service position.

CAUTION

Components connected to the engine joint or cross member.

Danger of injury!

- Check lifting eyes and engine mounting brackets for damage, e.g. cracks.
- Attach the component to correctly mounted engine joints or cross members only.
- Exclusively lift the component, do not move it forwards, backwards or in transverse direction.

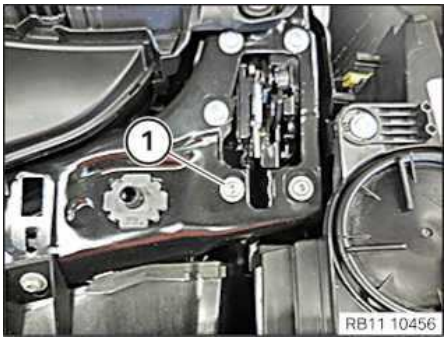
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- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

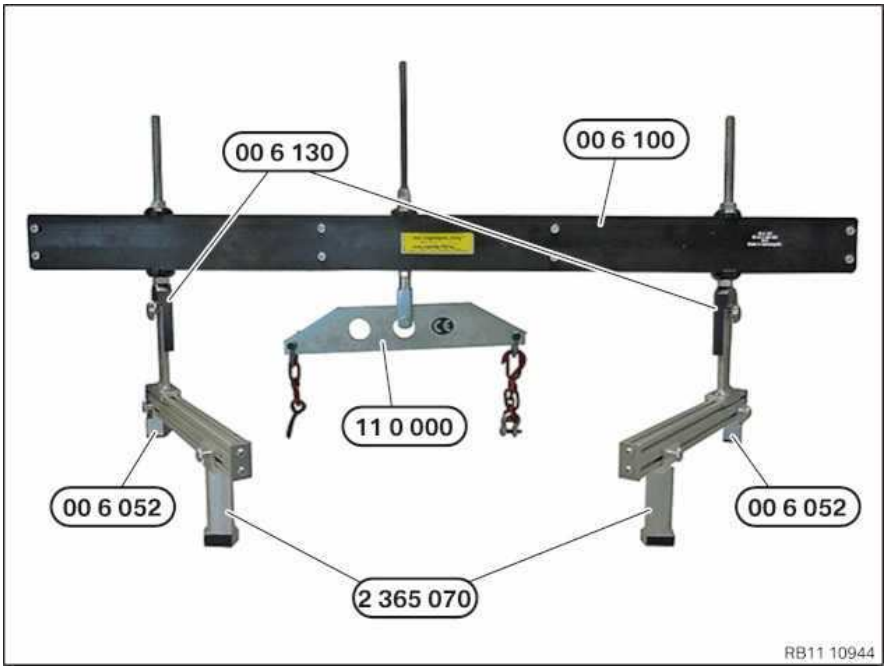
M8		Tightening torque	21,5 Nm



- Loosen screw (1) of the left bonnet catch.



- Loosen screw (1) of the right bonnet catch.



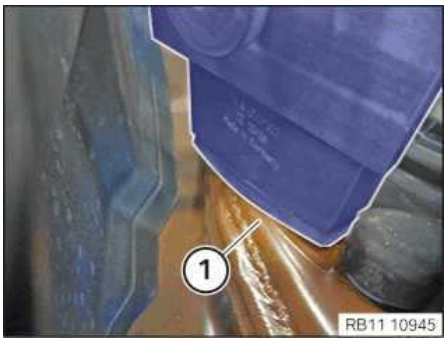
CAUTION

Heavy component.

Heavy components can lead to injury or damage.

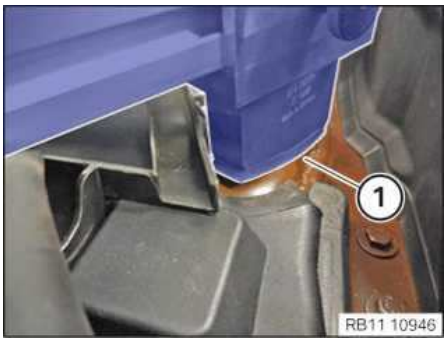
- Remove and install heavy components with the aid of another person/other persons.

- Set entire cross member **0 496 852 (00 6 100)** on the vehicle and position with the help of an auxiliary person.

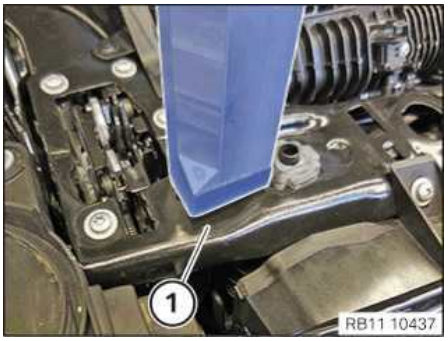


- Position the special tool at the rear mounting point (1) on the **right**.

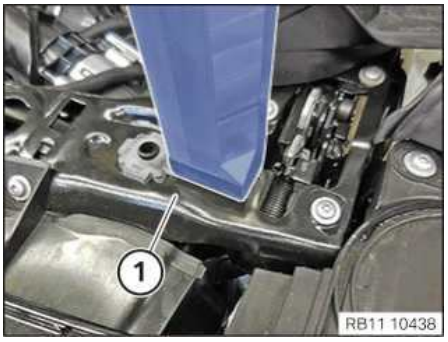
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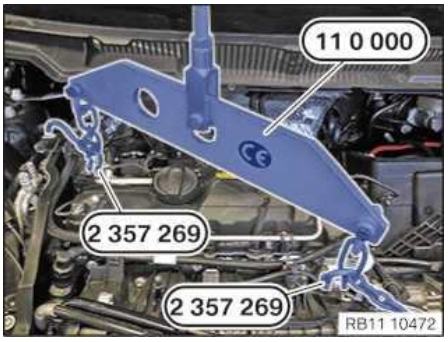
- Position the special tool at the rear mounting point (1) on the **left**.



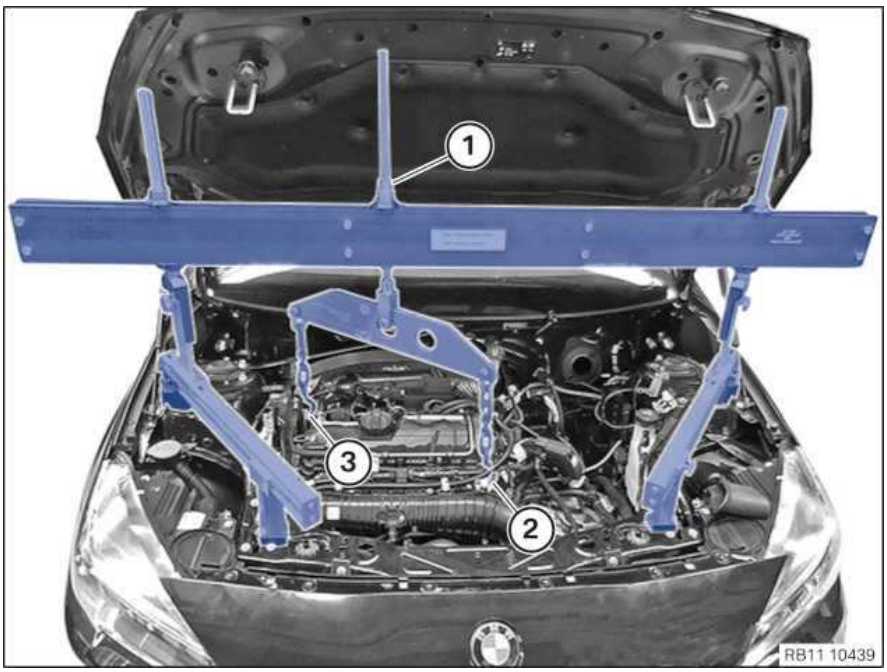
- Position the special tool at the front mounting point (1) on the **right**.



- Position the special tool at the front mounting point (1) on the **left**.



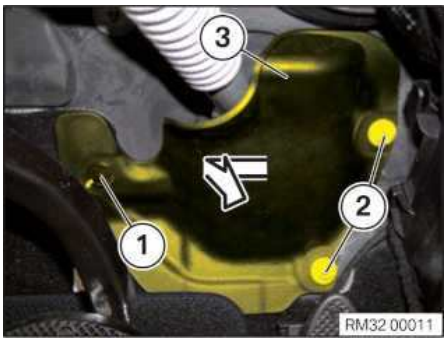
- Position special tool **0 490 561 (11 0 000)** above the engine.
- Attach special tools to the mounting lugs of the engine.



- Tighten side screws (2) and (3).
- Slightly pretension the spindle screw (1) of the engine support beams.
- Tighten down all adjusting screws, knurled screws and nuts on cross member **0 496 852 (00 6 100)** and on special tool .

14 – Releasing lower steering shaft from steering gear

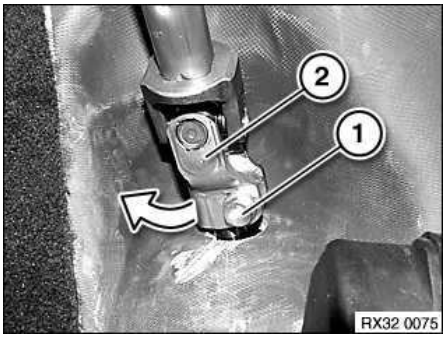
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- **If installed:**
- Unfasten nut (1).
- Unscrew the nuts (2) by 1 rotation.

  Do not remove the nuts (2) !
- Remove the cover (3) on the steering column in the direction of the arrow.

  The side footwell trim must not be disassembled!



- Loosen screw (1).
- Swivel out the universal joint (2) of the bottom steering shaft from the steering gear in the direction of the arrow.

15 – Removing both front wheels



▸ **Removing the wheel**

- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Unscrew the wheel bolts (arrows) and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

16 – Removing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

▸ **Remove the front wheel arch trim**

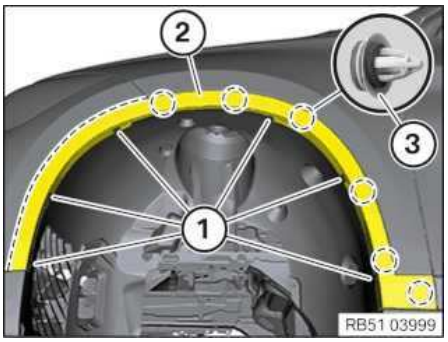
NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

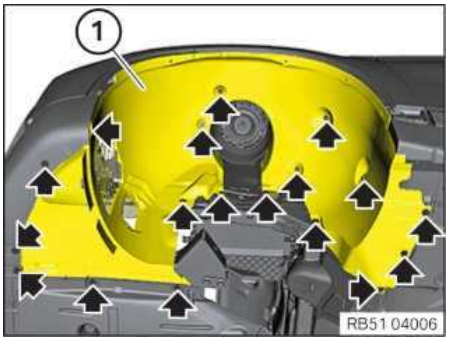
Description is for left component only. Procedure on the right side is identical.

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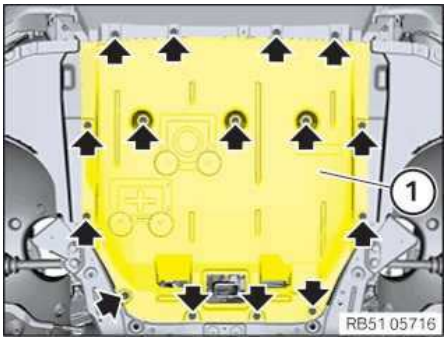
- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.

▸ **Remove front wheel arch cover**

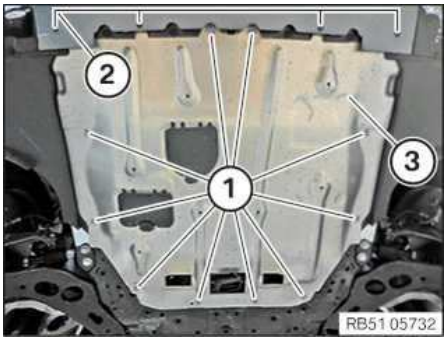


- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

17 – Removing the front underbody protection

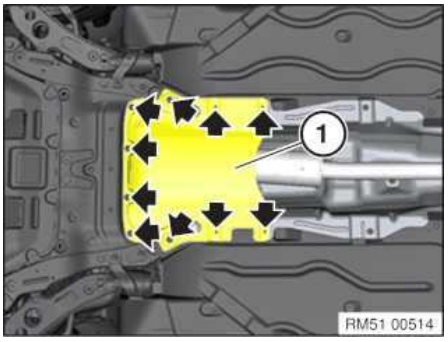


- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.



- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

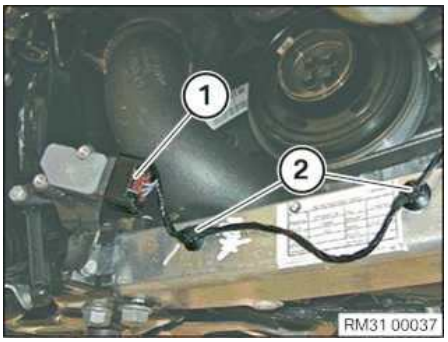
18 – If installed: Removing rear underbody protection



- Remove screws (arrows).
- Remove the rear underbody protection (1).

19 – With right installation: Detaching ride height sensor cable

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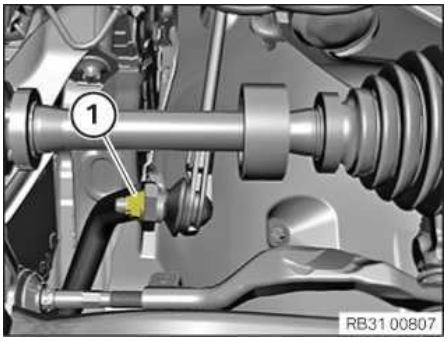
- Unlock plug connection (1) and disconnect.
- Release cable clip (2) from deformation element adapter.

20 – Releasing anti-roll bar on left and right from anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▶ **Detach the anti-roll bar from the anti-roll bar link**

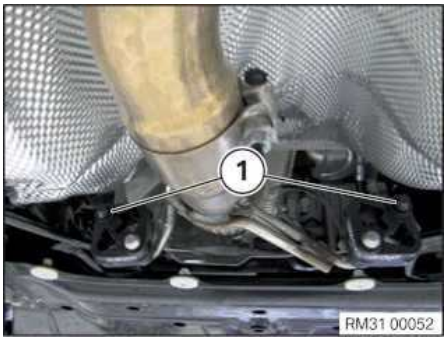


- Unfasten nut (1).

Note: Use the Torx socket for counter support.

- Loosen the anti-roll bar link from the anti-roll bar .

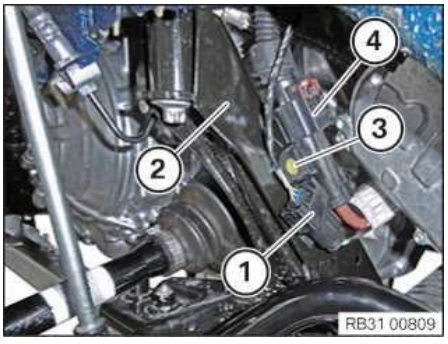
21 – Detaching rubber mount from front axle support



- Spray rubber mount (1) with lubricant and release from holder on front axle support.

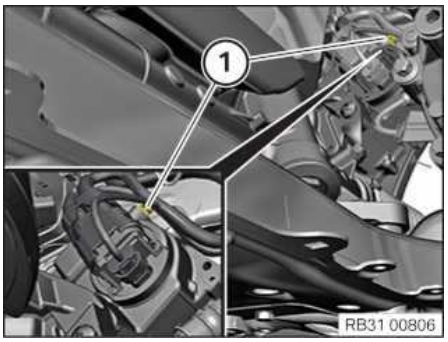
22 – Disconnecting plug connections from steering gear

▶ **If installed: Detach connectors from the front axle carrier**

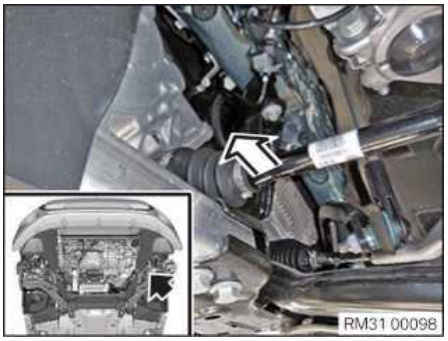


- Release the plug connection (1) from the front axle support (2).
- Loosen screw (3).
- Release the plug connection (4) from the front axle support (2).

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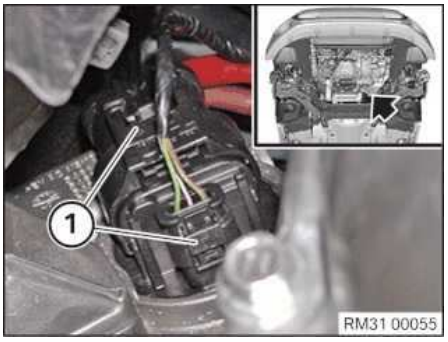


- Disconnect wiring harness (1) from steering gear.



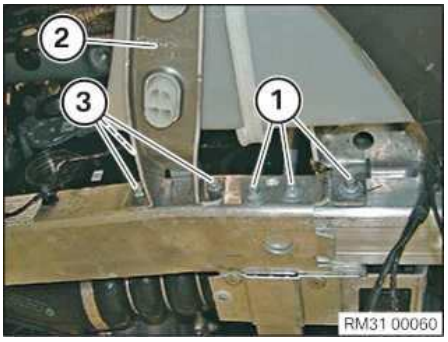
- To unlock the plug connections (see the following work step): unlock plug connections (arrow) with the right hand.

  The plug connections can be reached via the left-hand output shaft.



- Unlock plug connections (arrow) (1)and disconnect from the steering gear.
- Make sure when lowering the front axle that the cables are not damaged!

23 – Releasing the mounted part from the front axle support

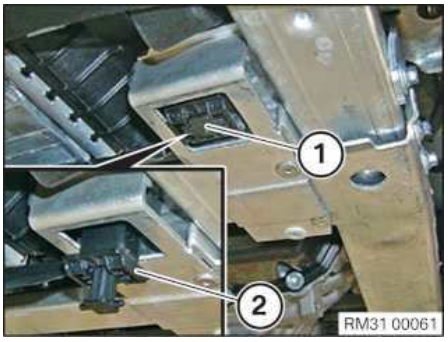


- **Only on right side:** Loosen screws (3) and remove holder for washer fluid reservoir (2).

NOTICE

Perform the operations on the left and right side.

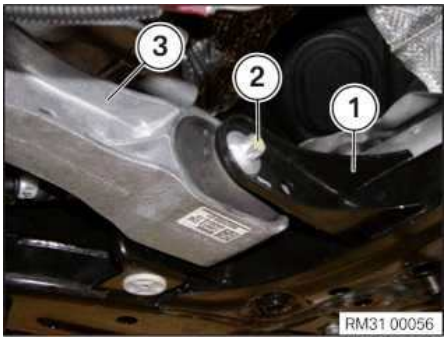
- Loosen screws (1).



NOTICE

Perform the operations on the left and right side.

- Unlock safety catch (1) of the lock (2) from the holder for the charge air cooler.
- Completely remove locks (2).



- Loosen screw (2) of the engine support (3) on the front axle (1).

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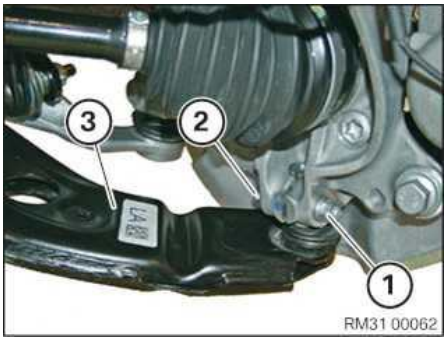


NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

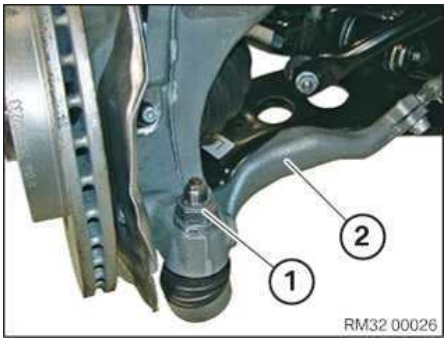
24 – Detaching and removing front axle completely



NOTICE

Perform the operations on the left and right side.

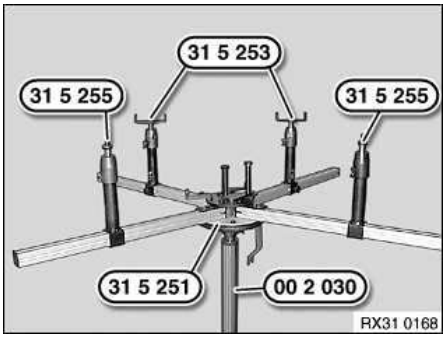
- Unfasten nut (1).
- (2)Pull out screw.
- Detach the wishbone (3) from the swivel bearing .



NOTICE

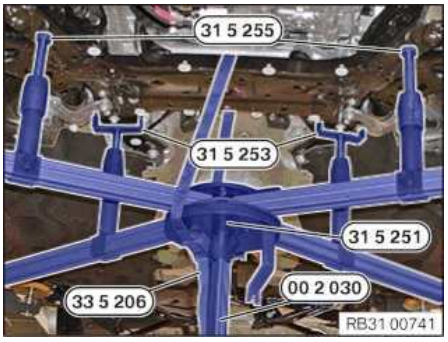
Perform the operations on the left and right side.

- Unfasten nut (1).
- Detach the track rod (2) from the swivel bearing.



- Fit the special tool completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools in telescopic supports of a profile rail pair.
- Insert special tools in telescopic supports of other profile rail pair.

Note: In a profile rail pair, two profile rails are connected to one another by gearing.

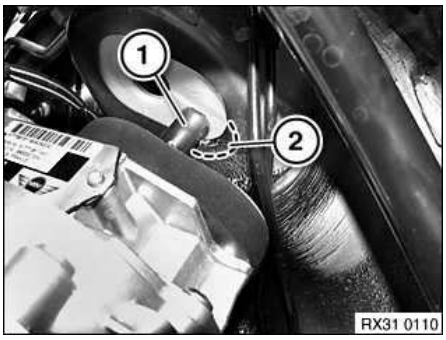


- Align special tools and to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool to special tool .

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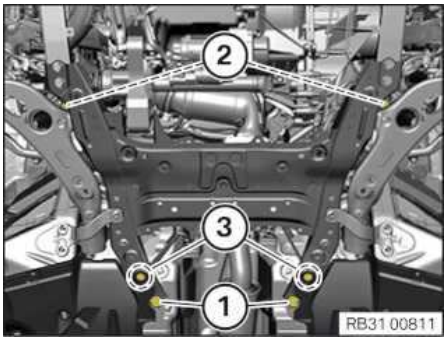


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and remove the front axle.

TECHNICAL INFORMATION

Note the information on thread repairs using Helicoil thread inserts.
For more information see: 41 00 ... Notes on repairing threads

- Check threads for damage; if necessary, repair with Helicoil thread inserts.

25 – Removing starter motor

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and loosen connector (1).
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).

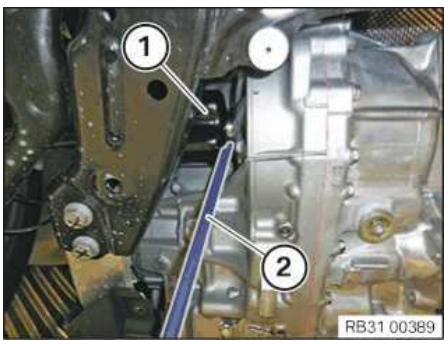


- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.



- Loosen screws (1).
- Feed out starter motor and remove.

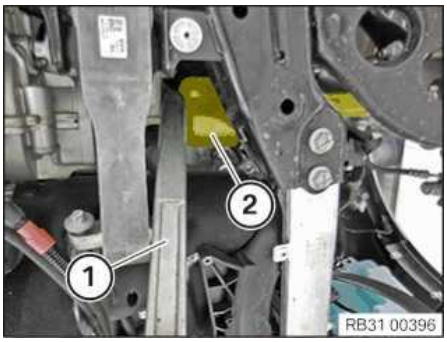
26 – Partially removing the left output shaft



- Protect the output shaft (1) from falling.
- Lever out the output shaft (1) with a mounting lever (2) from the transmission.
- Tie up output shaft (1).

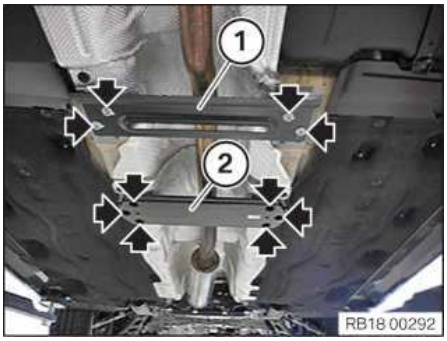
27 – Partially removing right output shaft

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- Lever out the output shaft (2) with a mounting lever (1).
- Tie up output shaft (1).

28 – Removing the connecting support from the tunnel in front and back

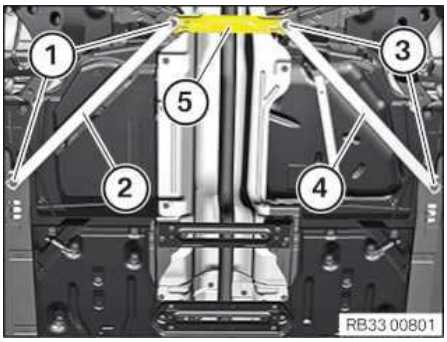


- Unscrew the bolts (arrows) from the connecting support (1).
- Feed out and remove the crossbeam (1).
- Unscrew the bolts (arrows) from the connecting support (2).
- Feed out and remove the crossbeam (2).

29 – Remove the cross strut with the torsion strut

TECHNICAL INFORMATION

Driving without a torsion strut is not permitted.



- Loosen screws (1).
- Thread out torsion strut (2) at left and remove.
- Loosen screws (3).
- Thread out torsion strut (4) at right and remove.
- Feed out and remove the cross-member (5).

30 – Remove exhaust system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

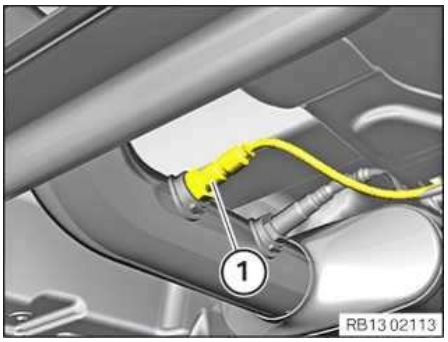
CAUTION

Heavy component.

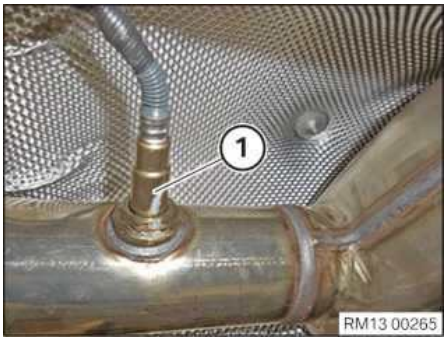
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

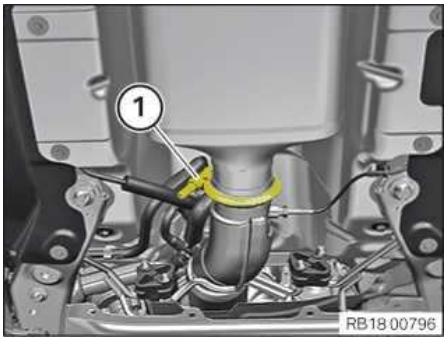
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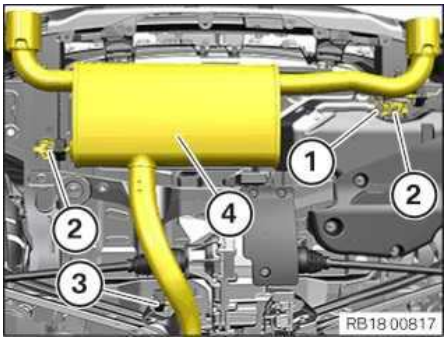
- Release the nitrogen oxide sensor (1) downstream of the SCR catalytic converter, guide it out and set it aside.



- Release the diesel particulate sensor (1), guide it out and set it aside.

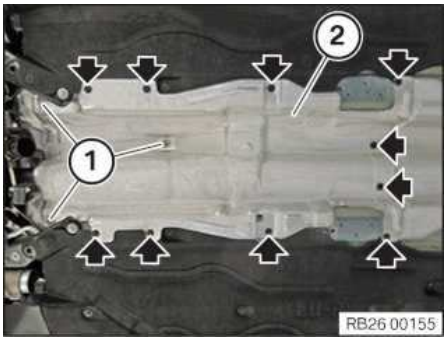


- Loosen V-band clamp (1).



- Loosen screw (1).
- Loosen nuts (2).
- Release the rubber mount (3) of the exhaust system (4).
- Lower and guide out the exhaust system (4) with assistance of a second person and remove it.

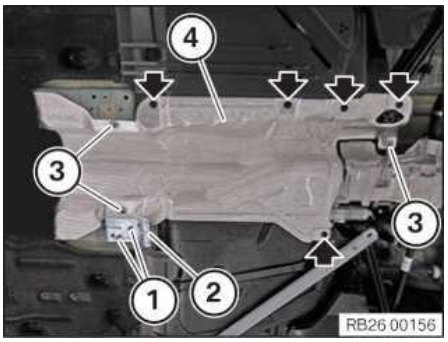
31 – Remove front heat shield



- Remove screws (arrows).
- Loosen nuts (1).
- Guide the heat shield (2) out and remove it.

32 – Remove heat shield at rear.

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- Loosen screws (1).
- Guide out and remove holder (2).
- Remove screws (arrows).
- Loosen nuts (3).
- Guide the heat shield (4) out and remove it.

33 – Remove propeller shaft

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

RISK OF DAMAGE

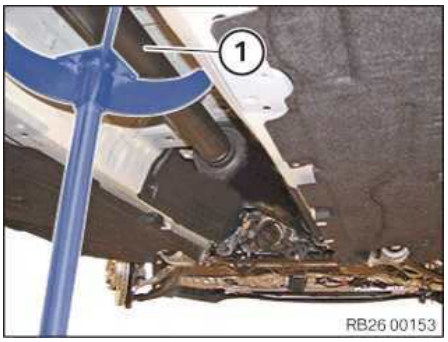
Damage to propeller shaft during removal.

Non-observance of the removal guidelines for the propeller shaft on the rear axle differential may cause severe damage.

- Do not disassemble the three-hole flange, flexible disc and propeller shaft. The three-hole flange to the rear axle differential is balanced with the flexible disc and propeller shaft.
- Loosen the recessed nut against the direction of travel in clockwise direction. The propeller shaft must be loosened on the recessed nut only and exclusively in the direction of rotation otherwise the anti-twist lock of the bi-hexagonal flange nut is damaged.
- In the event of a damaged anti-twist lock on the bi-hexagonal flange nut: Replace the rear axle differential.



- Install the special too l between the front and rear propeller shaft.
- Make sure that the arrows on the special tool point forward in the direction of travel.

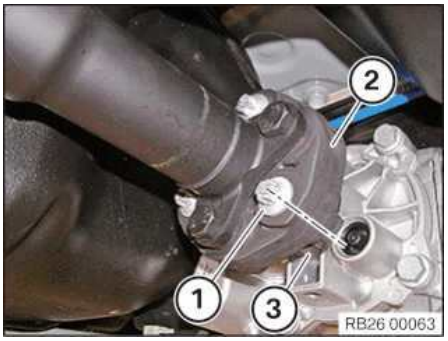


- Always support the propeller shaft (1) with a conventional jack.

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- Protect the propeller shaft (1) with the special tools **0 495 554 (33 5 070)** and from twisting.



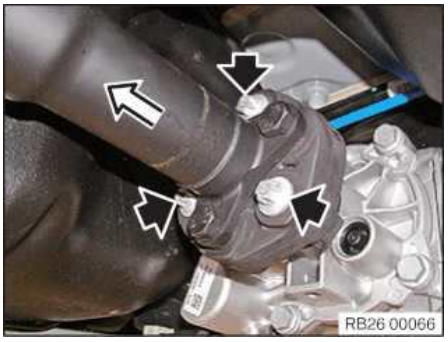
TECHNICAL INFORMATION

Compliance with the following instructions is required to avoid a humming noise from the propeller shaft after refitting the propeller shaft.

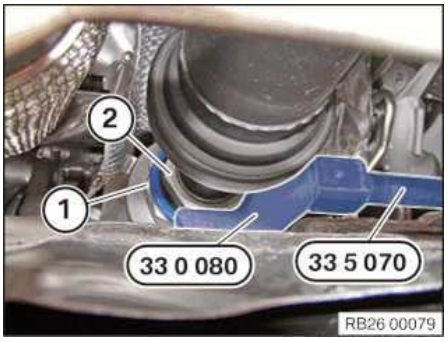
- Mark the installation position of the screw connection (1), the flexible disc (2) and the three-hole flange (3) on the same level.
- Loosen the screw connection (1).



- Loosen screws (1).



- Remove screws (arrows).
- Guide the propeller shaft out in the direction of the arrow and set it aside.



RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.

- Protect the recessed nut (2) on the transfer box from twisting with the special tools **0 495 554 (33 5 070)** and .

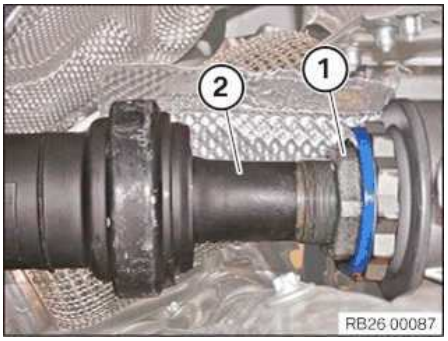
  The recessed nut (2) on the transfer box must **not** be used to detach the propeller shaft.

  The double hexagon flange nut (1) must **not** be used for counter support.

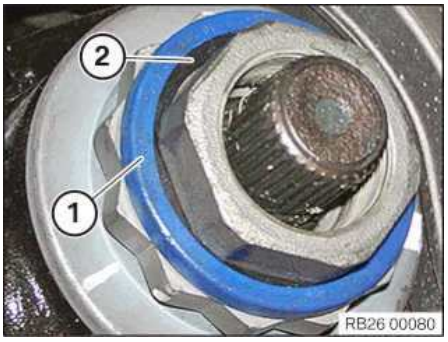
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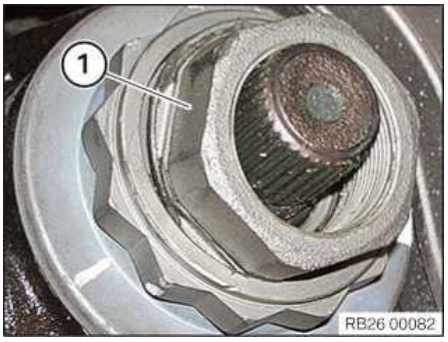
- Release the front propeller shaft with the special tools **0 495 554 (33 5 070)** and in the direction of the arrow.



- Thread the propeller shaft (2) out of the recessed nut (1) and remove.



- Thread the retaining clip (1) and the seal (2) out and remove.



- Thread out and remove the recessed nut (1).

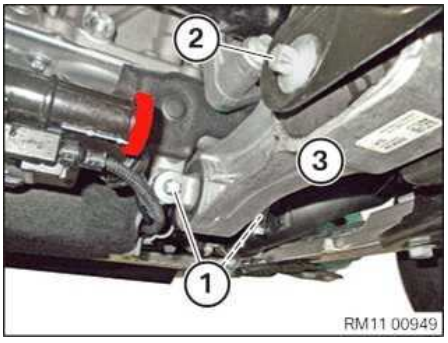
34 – Remove bracket with rubber mount

WARNING

Motor vehicle may slip off the vehicle hoist where components are supported.

Danger! Life-threatening injuries!

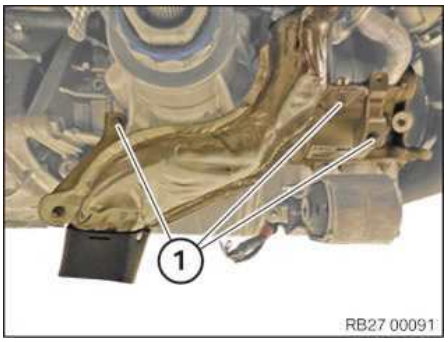
- Secure the vehicle hoist against lowering and lifting.



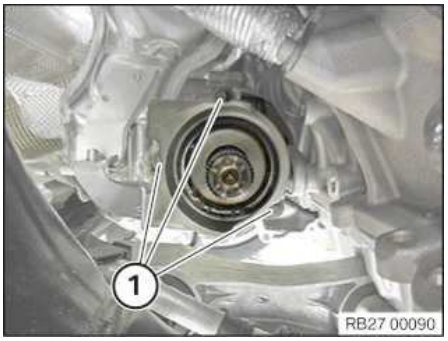
- Support the engine with the jack at a suitable point.
- Loosen screws (1) and (2).
- Guide out and remove holder (3).

35 – Remove the intermediate shaft with the support tube

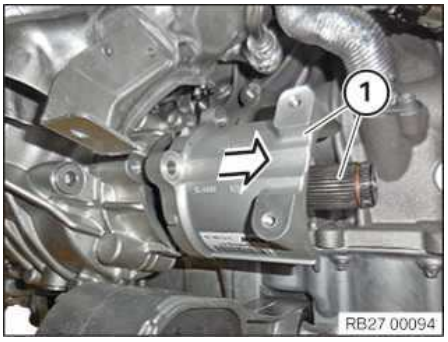
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- With air duct installation: Loosen screws (1).
- Remove air duct



- Loosen screws (1).



- Pull the intermediate shaft with the support tube (1) out of the transfer box.

36 – Drain oil level in the manual gearbox (GS6X60DA)

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.



- Draining transmission oil:
  - Unscrew oil drain plug (1) and allow oil to flow out completely.
  - Clean oil drain plug (1) and screw in.

Oil drain plug / oil filler plug

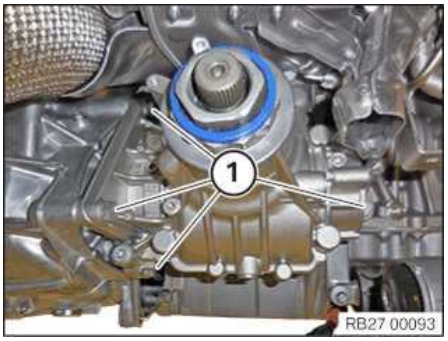
Hexagon socket		Tightening torque	43 Nm

37 – Remove transfer box (VTG)

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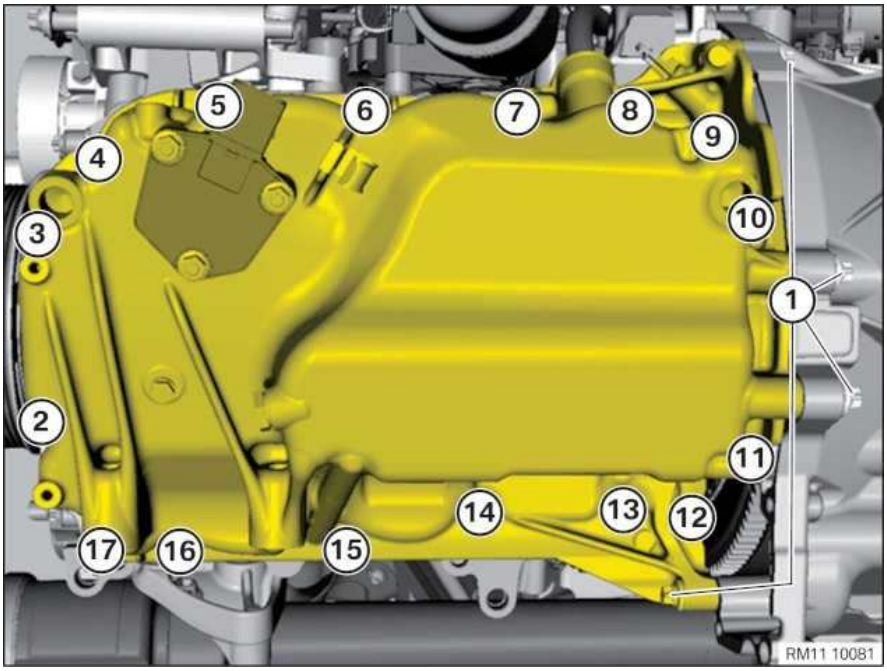


- Loosen screws (1).
- Remove heat shield.



- Loosen screws (1).
- Remove the transfer box (VTG).

38 – Release transmission-side bolting connection oil sump



- Unscrew the bolts (1) from the transmission.

39 – Removing the manual gearbox (GS6-59DG, GS6X60DA)

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

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RISK OF DAMAGE

Damage to the engine block.

Damaged and corroded bolts will lead to major damage in the engine block and the transmission.

- It is imperative that protruding threads of the transmission bolts are checked for corrosion and damage prior to removal.
- It is imperative that all rust is removed from corroded threads and that they are cleaned prior to removal.
- Renew rusted and damaged bolts.

▸ **Remove electronics box**

Prerequisite

Battery earth lead is disconnected.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

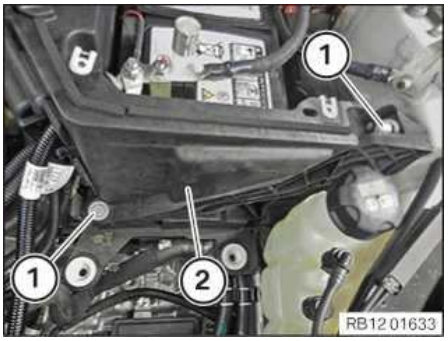
TECHNICAL INFORMATION

Follow instructions for removing and installing control units.

For additional information see: 12 00 ... Notes on removal and installation of control units

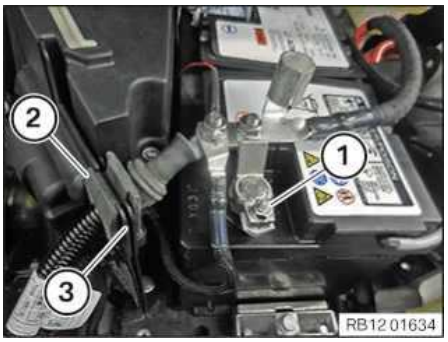
TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.

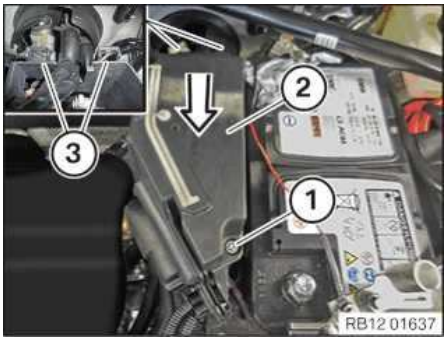


- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.

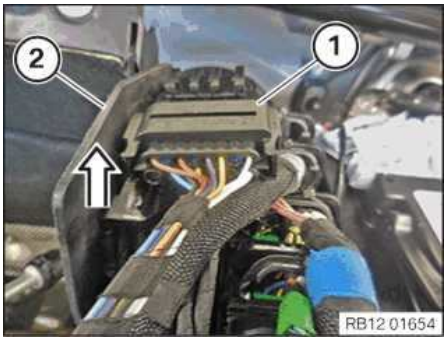
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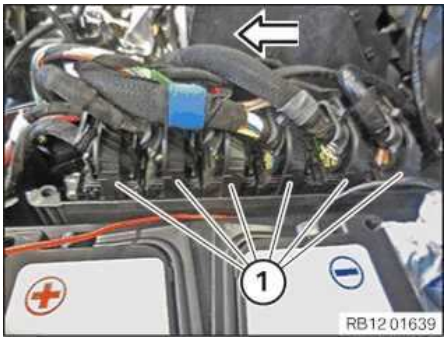
- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



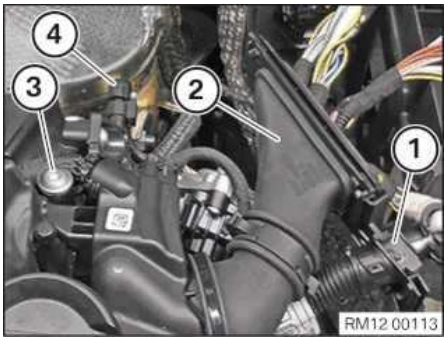
- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).



- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

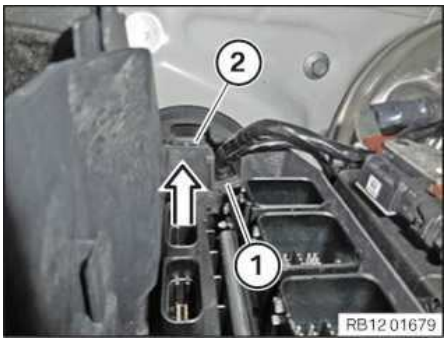


- Unlock and loosen connector (1).

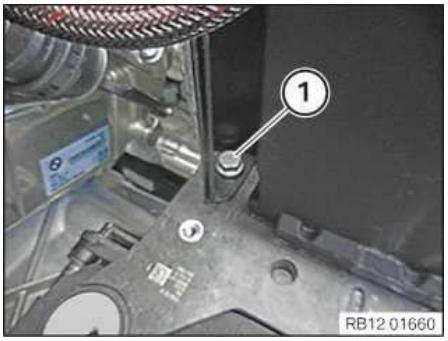


- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.

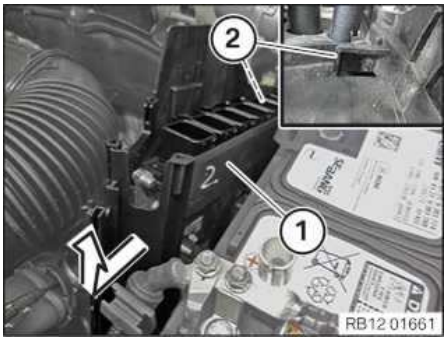
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- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.

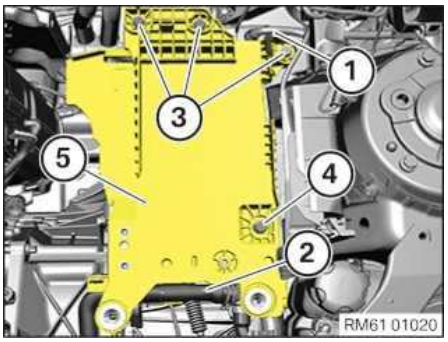


- Loosen screw (1).

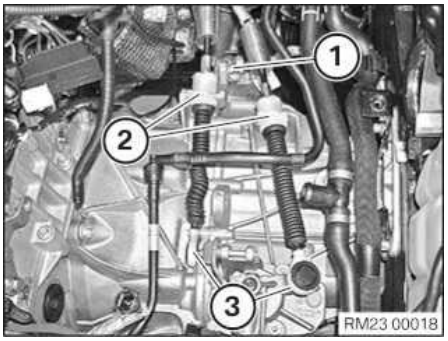


- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

▶ **Remove battery holder**

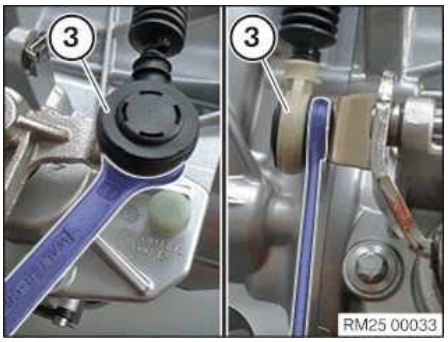


- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

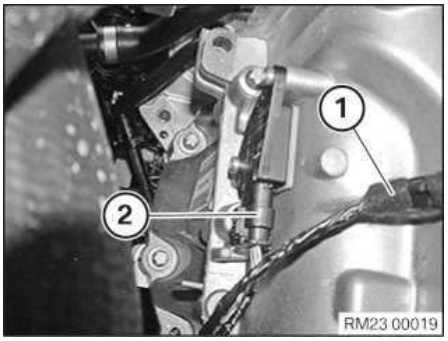


- Release the clip on the limit position/bracket (2) and bend the tabs slightly away from the limit position/bracket (2).
- Unscrew the bolt (1) and detach the ground strap from the transmission.

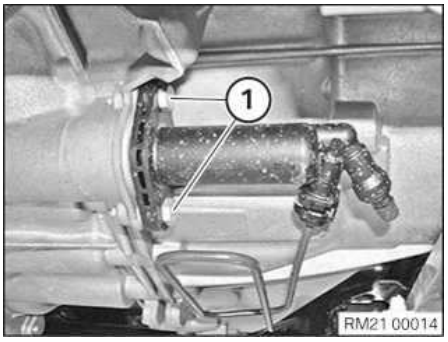
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- Lever the fixtures (3) of the selector lever cables away from the ball joints with an open-end spanner SW13.

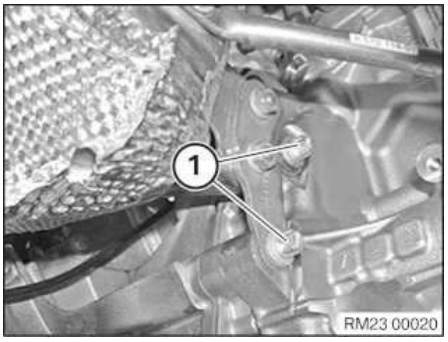


- Disconnect the plug connection (2) of the gear sensor.
- Detach the cable (1) with the holder from the transmission.

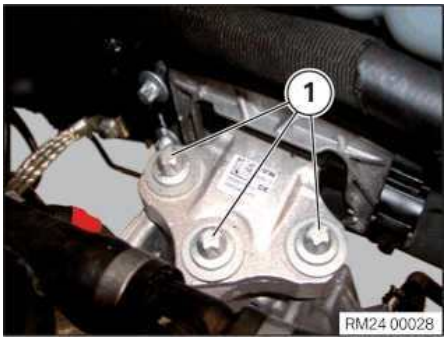


- Relieve tension on clutch slave cylinder slowly; otherwise air will be drawn in through sealing cup.

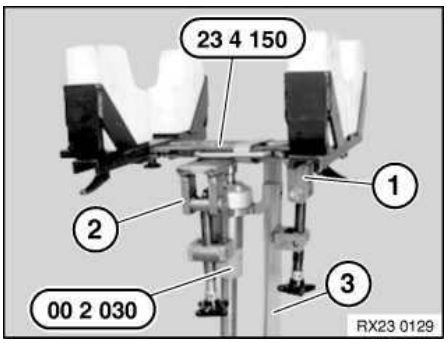
  Pressure line of clutch slave cylinder remains connected.
- Unscrew the bolts (1) and remove the clutch slave cylinder.



- Loosen screws (1).

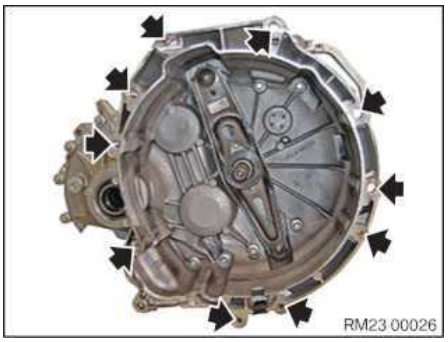


- Loosen screws (1).

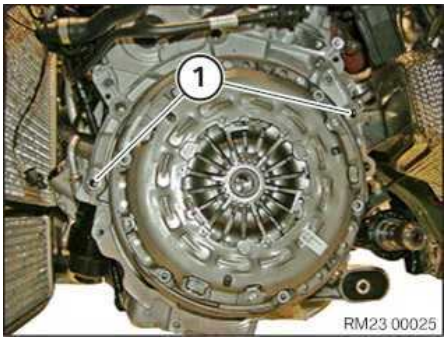


- Support the transmission with special tool **0 490 133 (00 2 030)**and .
- Secure the transmission with the tensioning strap (3).

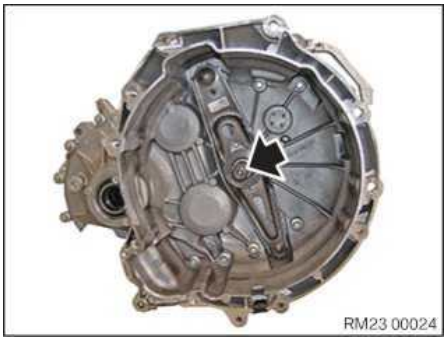
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- Remove screws (arrows).
- Pull transmission downwards and remove.



- Check for correct fit of fitting sleeves(1).
- Replace damaged fitting sleeves.



- Remove any grease from the transmission input shaft (arrow) and clean the shaft.
- Do not grease transmission input shaft.
- Check clutch disc for frictional corrosion in gearing and replace if necessary.

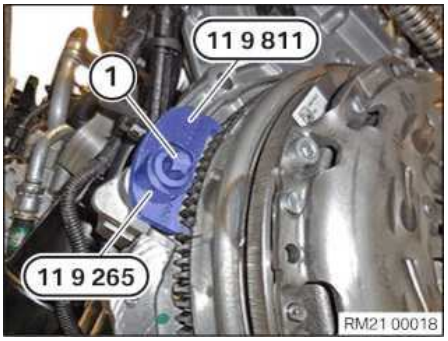
40 – Remove clutch

CAUTION

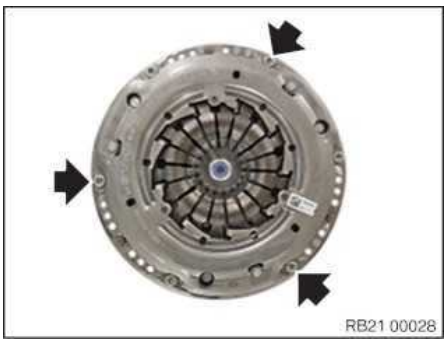
Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

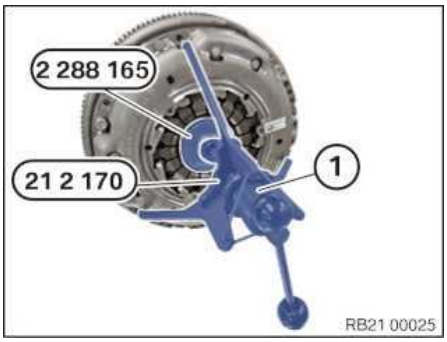


- Block flywheel with transmission bolt (1) and special tools **0 496 171 (11 9 811)** and **0 494 793 (11 9 265)**.

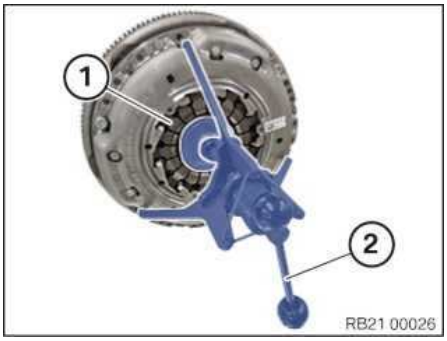


- Detach 3 screws to attach special tool and **2 288 165**.

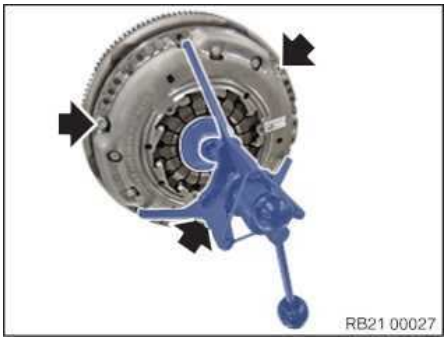
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- Position special tool and **2 288 165** and tighten on the knurled screw (1).



- Screw in the spindle (2) until the diaphragm spring (1) is preloaded and the clutch disc is free of tension.



- Loosen the remaining 3 screws and remove the clutch with clutch disc from the flywheel.

41 – Removing flywheel

CAUTION

Heavy component.

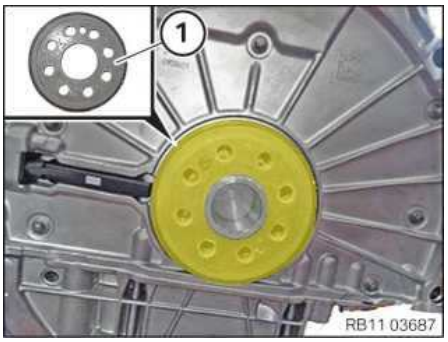
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Secure the flywheel with a transmission bolt (1) and with special tools **0 496 171 (11 9 811)** and **0 494 793 (11 9 265)**.
- Unscrew the flywheel bolts with the special tool **0 491 018 (11 4 180)**.
- Remove flywheel.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Remove the increment wheel (1) from the crankshaft and lay it down correctly.

MAIN WORK

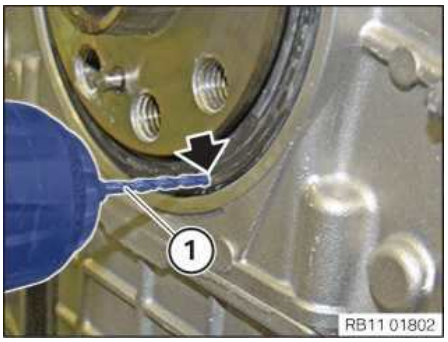
42 – Removing the rear crankshaft seal

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



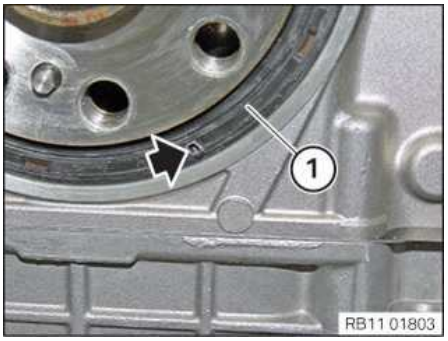
RISK OF DAMAGE

Damage due to swarf.

Contamination can lead to malfunctions and damage.

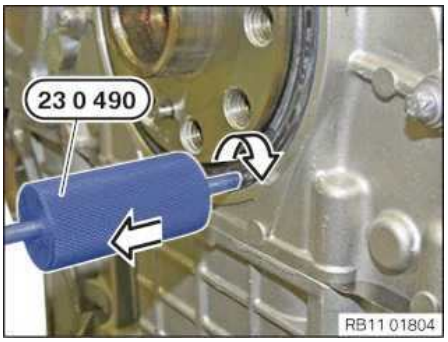
- Cover working area.
- Draw off swarf during drilling using a vacuum cleaner.

- Drill a hole (arrow) into the crankshaft seal with using a 2.5 mm drill (1).
- Do not remove swarf with compressed air!



- Remove swarf in the bore hole (arrow) on the crankshaft sealing ring (1).

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- Screw in special tool **0 491 454 (23 0 490)** in direction of arrow.
- Drive out crankshaft seal with the impact weight in direction of arrow.

43 – Installing the rear crankshaft seal

RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) on the radial shaft seal with the sharp-edged connector gearing of the output shaft will result in destruction and/or leaks.

- When inserting the output shaft, make sure that the connector gearing of the output shaft does not touch the sealing lip (inner) of the radial shaft seal.

RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) and applying oil to the radial shaft seal will lead to its destruction.

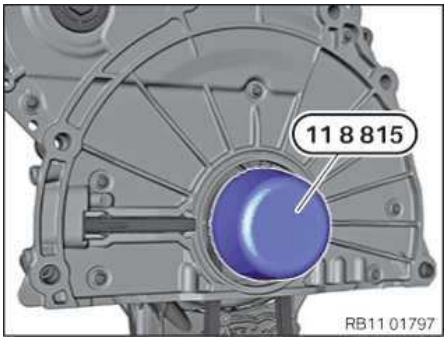
- Do not touch the sealing lip (inner) of the radial shaft seal.
- Do not apply oil to the radial shaft seal.
- Install the radial shaft seal dry.

RISK OF DAMAGE

Electrostatic discharge.

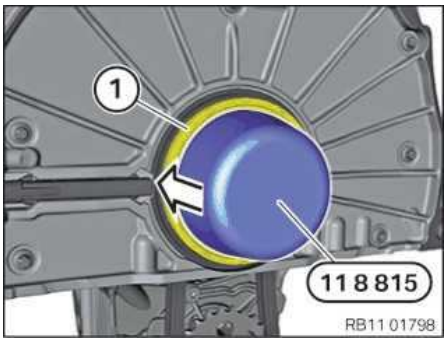
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Position special tool **0 496 137 (11 8 815)** on crankshaft. Make sure that the crankshaft sensor is not damaged.

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- Fit the crankshaft seal (1) up to the timing case cover in the direction of the arrow using special tool **0 496 137 (11 8 815)** and position.
- Remove special tool **0 496 137 (11 8 815)**.

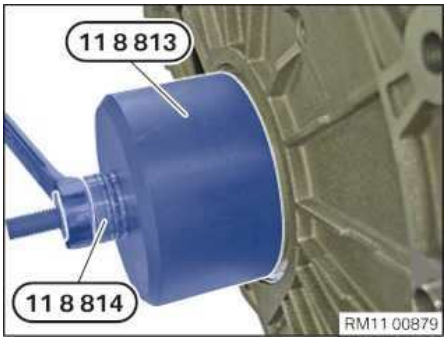


- Secure special tool **0 496 133 (11 8 811)** to the crankshaft using special tool **0 496 134 (11 8 812)**.



- Check the freedom of movement between the special tool **0 496 135 (11 8 813)** and the crankshaft sensor during installation.

  Otherwise there is a risk that the crankshaft sensor will be damaged.
- Slide on special tool **0 496 135 (11 8 813)**.
- Screw down special tool **0 496 136 (11 8 814)**.



- Press in crankshaft seal with special tool **0 496 135 (11 8 813)**.
- Screw in special tool **0 496 135 (11 8 813)** up to timing case cover.

POSTPROCESSES

44 – Installing the flywheel

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

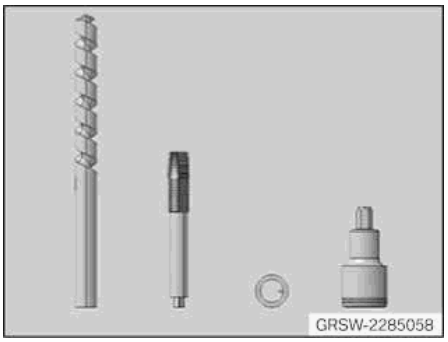
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- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



TECHNICAL INFORMATION

Clean all threads with a screw tap.

- Clean all screw threads (1).



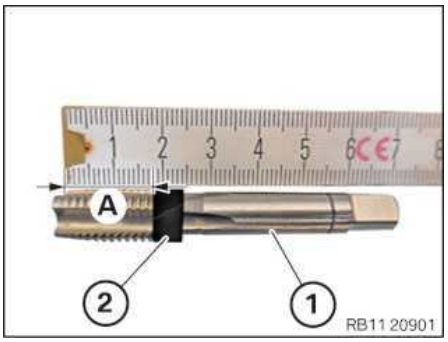
- Use the set of special tools **2 285 058**.

Description
Twist drill
Thread cutter M12x1.5
Depth
Insertion tool



- Assemble tool set.

Number	Description
1	Tool holder
2	Thread cutter M12X1,5

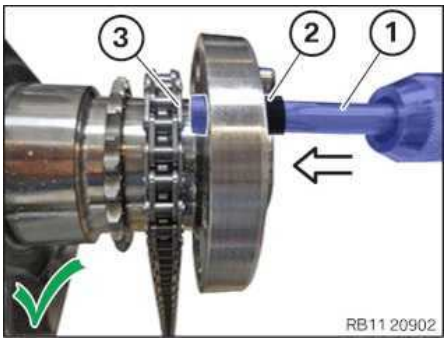


- Mark the screw-in depth (A) on thread cutter (1) from the set of special tools **2 285 058** with a standard tool (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm

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NOTICE

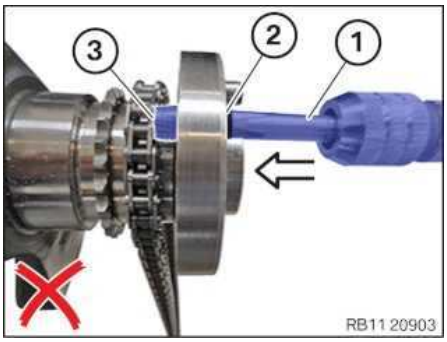
To provide a better overview: Shown with engine removed.

- Screw in the thread cutter (1) from the set of special tools **2 285 058** in direction of arrow up to the screw-in depth (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm

- Make sure that the thread cutter does (1) **not** rest on the timing chain (3).

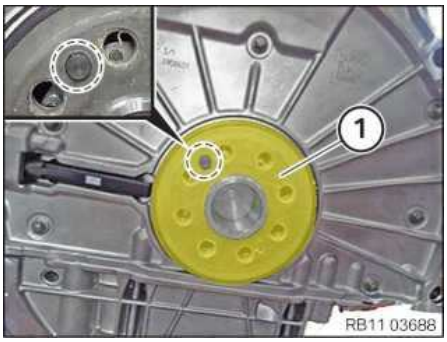


TECHNICAL INFORMATION

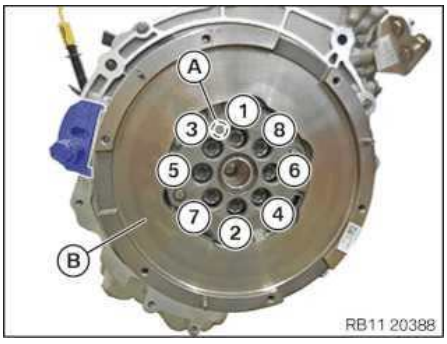
- **Carefully** handle the timing chain, to protect the timing chain and timing chain drive against damage.

- Make sure that the screw-in depth (2) of the screw tap (1) is not exceeded.

  The thread cutter (1) may not rest on the timing chain (3).



- During the installation, note the mark shown without fail.
- Install special tool (1) on the crankshaft as shown.

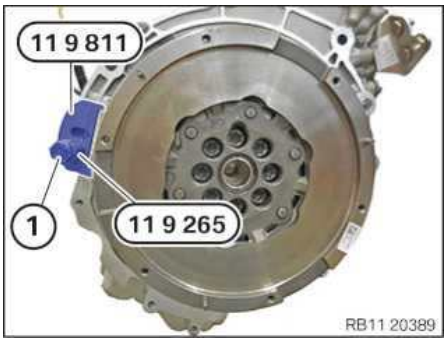


- Position flywheel (B) .
- Renew flywheel bolts (1) to (8).

  Parts: Flywheel bolts
- Tighten flywheel bolts hand-tight with special tool **0 491 018 (11 4 180)**.
- Observe tightening sequence. While doing so, begin with dowel pin (A).
- Tighten the flywheel bolts using the special tool **0 491 018 (11 4 180)** in sequence (1) to (8).

Flywheel to crankshaft

M12x1.5	Renew screws.	Tightening torque	120 Nm



- Loosen the transmission bolt (1).
- Feed out and remove special tools **0 494 793 (11 9 265)** and **0 496 171 (11 9 811)** with the **standard** (5 mm) washer.

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CAUTION

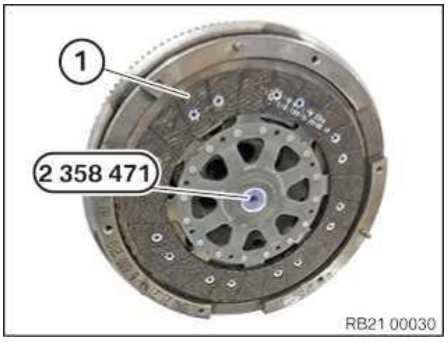
Materials harmful to health.

Contact with fluids harmful to health!

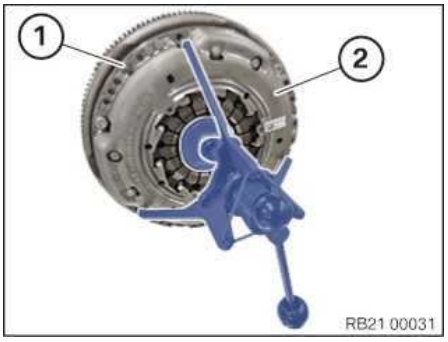
- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

TECHNICAL INFORMATION

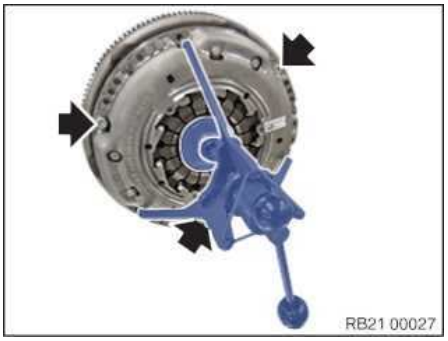
Handle the clutch disc carefully. Install the surfaces of the clutch disc in the correct mounting orientation.
Clean friction surfaces of the flywheel and the pressure plate with BMW-approved brake cleaner.
Note designation for "engine side" / "transmission side".



- Centre the clutch disc (1) using special tool .



- Mount the clutch (2) together with the special tool to the flywheel.
- Observe the dowel pins (1).
- The clutch (2) must be secured via the dowel pins (1).

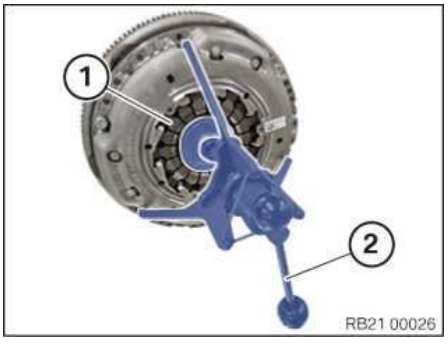


- Renew the bolts (arrows).

  Parts: Bolts
- Install and tighten screws (arrows).

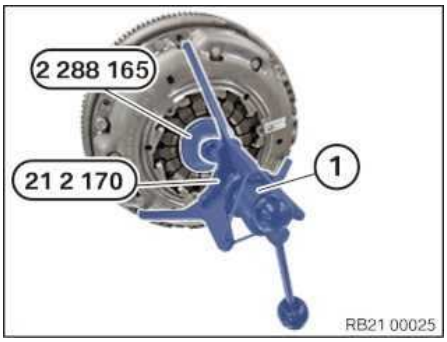
Clutch to flywheel

M8	Renew screws.	Jointing torque	15 Nm
		Angle of rotation	90 °

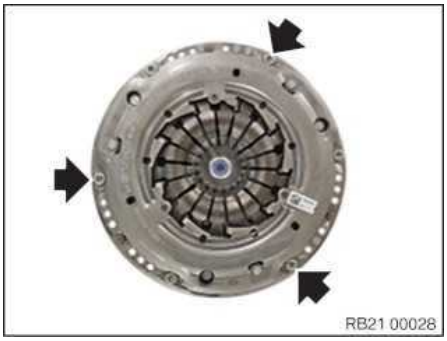


- Loosen the spindle (2) until the diaphragm spring (1) is fully relieved.

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- Unscrew the knurled screw (1) and remove the special tool with **2 288 165** from the clutch.



- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Clutch to flywheel

M8	Renew screws.	Jointing torque	15 Nm
		Angle of rotation	90 °



- Withdraw special tool from clutch disc with aid of accompanying screw.

46 – Installing the manual gearbox (GS6-59DG, GS6X60DA)

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

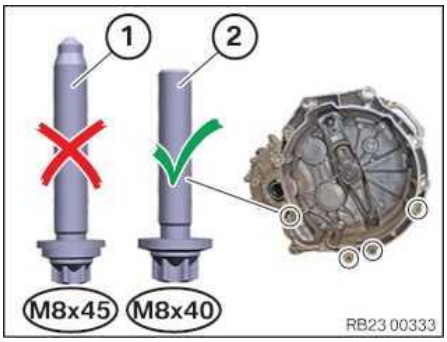
RISK OF DAMAGE

Damage to the engine block.

Damaged and corroded bolts will lead to major damage in the engine block and the transmission.

- It is imperative that protruding threads of the transmission bolts are checked for corrosion and damage prior to removal.
- It is imperative that all rust is removed from corroded threads and that they are cleaned prior to removal.
- Renew rusted and damaged bolts.

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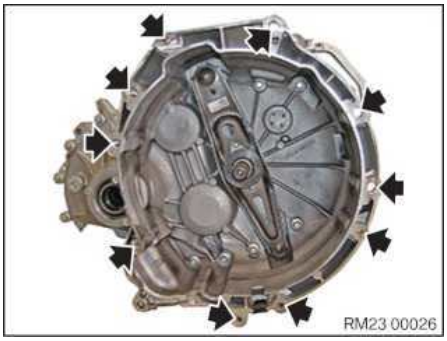
RISK OF DAMAGE

Component damage caused by incorrect screw length.

The use of screws with the incorrect screw length can damage the component.

- Check for correct screw length.
- Re-install screws that correspond to the original screw length.

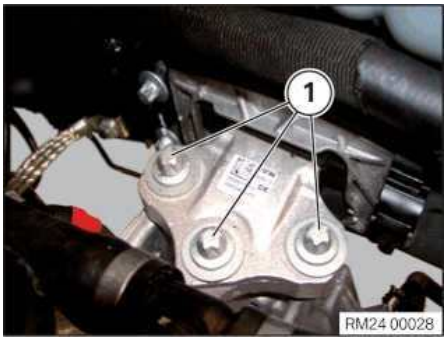
- **Wrong:** The screw (1) (starter motor screw connection) must **not** be used for the bottom screw connection of the transmission.
- **Correct:** It is imperative to use the bolt (2) (M8x40) for the lower screw connection of the transmission and flange-mount the transmission.



- Tighten screws (arrows).

Transmission to engine

M8x40		Tightening torque	19 Nm
M12x75		Tightening torque	66 Nm

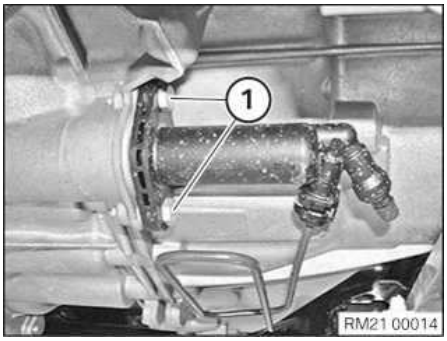


- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Transmission mounting

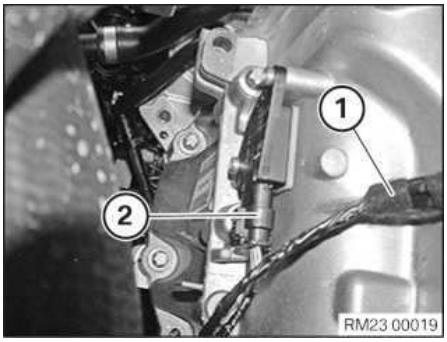
M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °



- Install clutch slave cylinder.
- Tighten the screws (1).

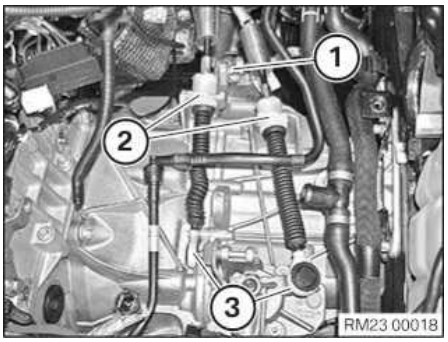
Clutch slave cylinder to transmission housing

M8		Tightening torque	19 Nm



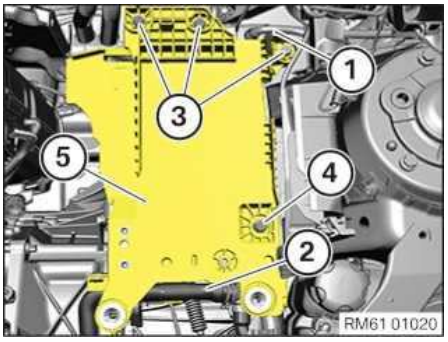
- Connect the plug connection (2) of the gear sensor.
- Clamp the cable (1) with the holder to the transmission.

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- Tighten the ground strap on the transmission with the screw (1).
- Clip in the clip on the stop/holder (2).
- Attach the selector lever cables (3) on the ball joints.

▶ **Install the battery holder**



- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

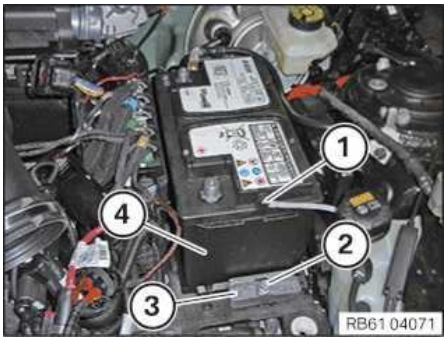
- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

▶ **Partially install vehicle battery**



- Install vehicle battery (4).
- Correctly position the holder (3).
- Tighten down screw (2).

Battery terminal rail to battery tray

M8		19 Nm

- Fit and clip the vent hose (1) in.

▷ **Check the vent holes of the battery**

WARNING

Gas emission.

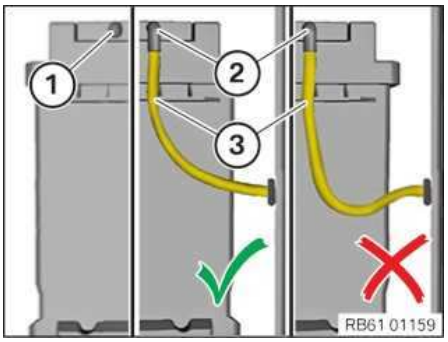
Danger of injury! Danger of explosion!

- Assign the vent holes correctly.
- Route the vent hose correctly.

TECHNICAL INFORMATION

The battery has two vent holes, opposite:
One vent hole (1) must be closed correctly with a dummy plug.
The vent hose (3) must be correctly connected and routed at the other vent hole (2).

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Check
- Check if the vent hole (1) is correctly closed with a dummy plug.

Result

» No dummy plug.

Measure
- Close the vent hole (1) correctly with a dummy plug.

Check
- Check if the vent hole (2) has a correctly connected vent hose (3).

Result

» The vent hose (3) is not correctly connected.

Measure
- At the vent hole (2), connect the vent hose (3) correctly.

Check
- Check if the vent hose (3) is routed to the outside with a downhill gradient (**no siphon formation!**).

Result

» The vent hose (3) is not correctly routed as shown in the image on the right.

Measure
- Route the vent hose (3) correctly as shown in the centre image.

◁

▸ **Install electronics box**

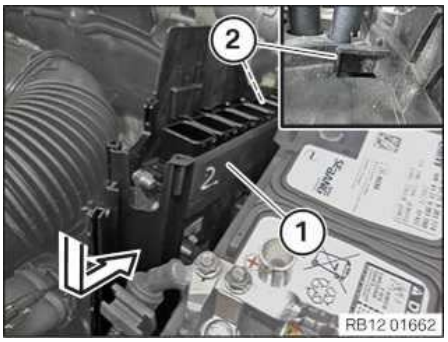
Prerequisite

Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.
- Route all cables without abrasions, do not trap and crush.

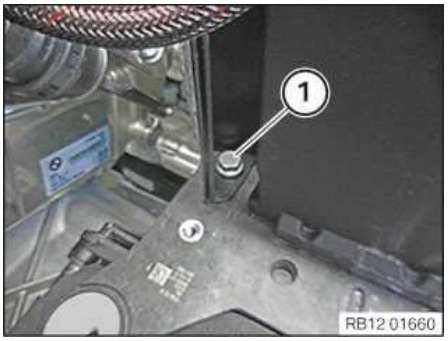


- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.

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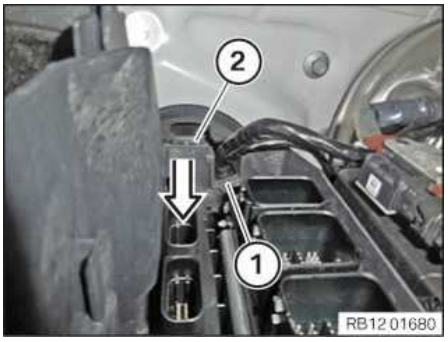
- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).



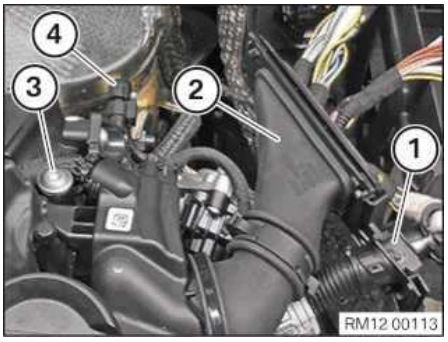
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.



- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

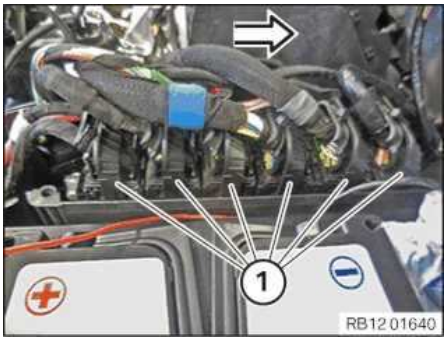
Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.

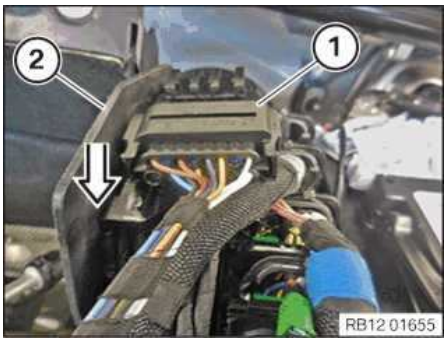


- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.

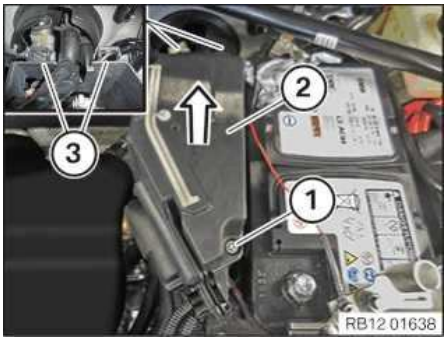


- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.

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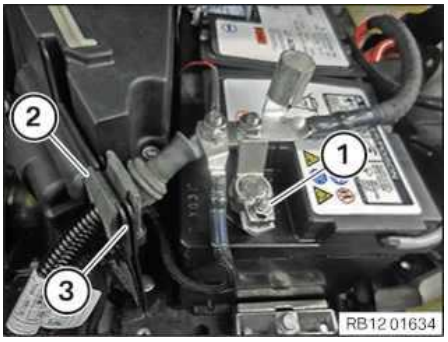
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

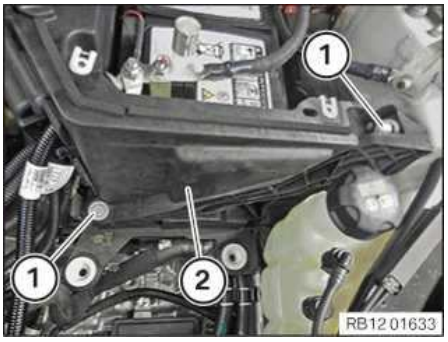
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

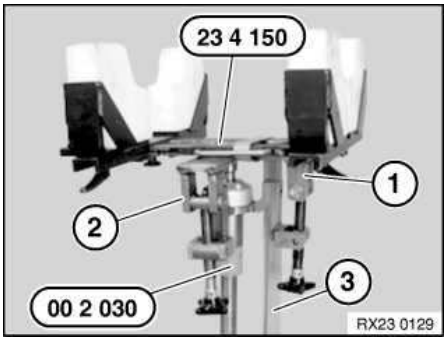
NutM6		Tightening torque	5 Nm



- Feed in and install tension strut (2).
- Tighten the screws (1).

Tension strut to spring strut dome/battery tray

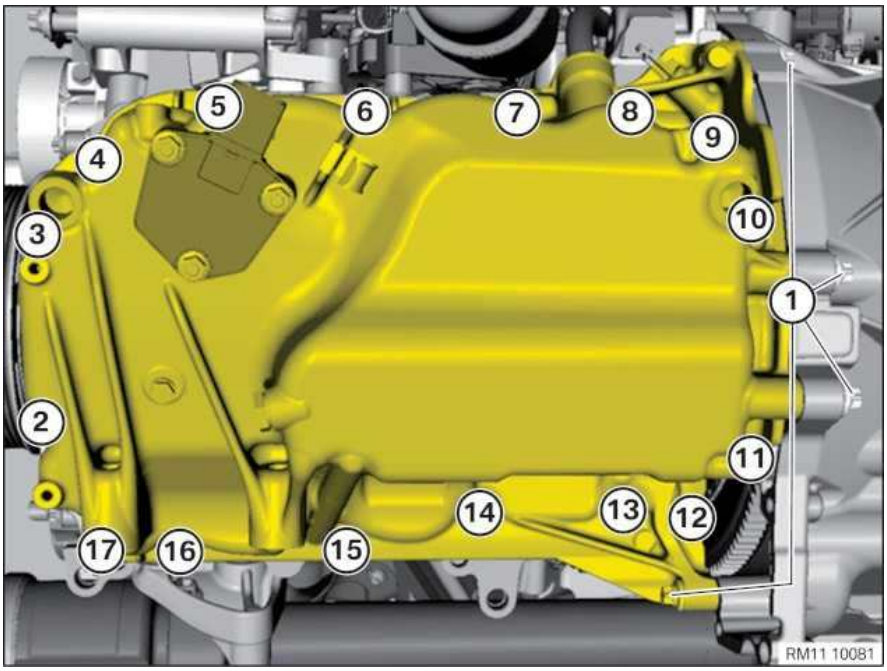
M8		Tightening torque	19 Nm



- Loosening the tensioning strap (3).
- Remove special tools **0 490 133 (00 2 030)** and .

47 – Tighten down transmission-side bolting connection oil sump

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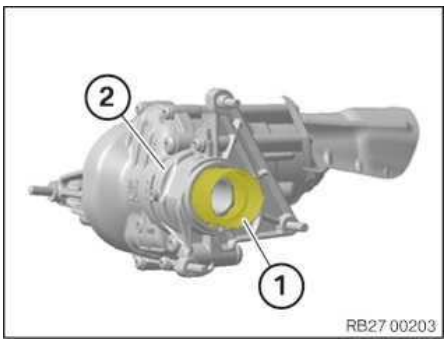


- Join transmission bolts (1) with 5 Nm.
- Tighten the transmission bolts (1) on the transmission.

Transmission to oil sump

M8			19 Nm

48 – Install the transfer box (VTG)



- If intermediate shaft (1) gets caught on transfer box (VTG) (2), renew intermediate shaft (1) and the radial shaft seals in the automatic or manual transmission.



- Screw special tool **2 409 025** into the outer radial shaft seal.
- Turn the screw on the special tool **2 409 025** until the outer radial shaft seal has been pulled out.

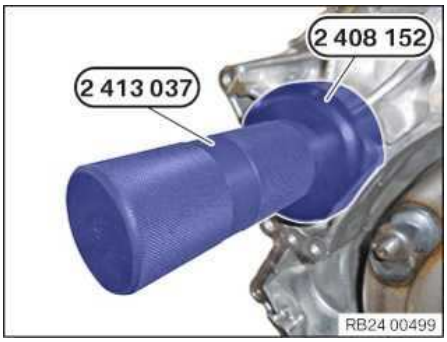


- Insert special tool **2 411 739** into the inner radial shaft seal.

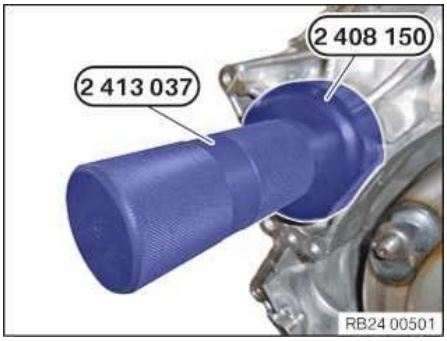


- Screw special tool **2 411 739** into the inner radial shaft seal.
- Turn the screw on the special tool **2 411 739** until the inner radial shaft seal has been pulled out.

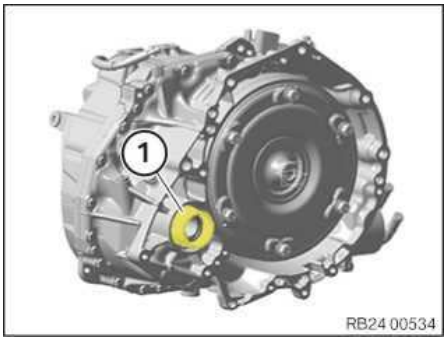
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- Drive in the inner radial shaft seal using special tools **2 408 152** and **2 413 037** up to the limit position.



- Drive in the outer radial shaft seal using special tools **2 413 037** and **2 408 150** up to the limit position.



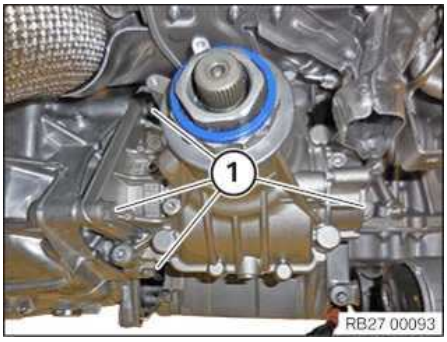
- If necessary, connect the new intermediate shaft (1) to the output flange of the automatic transmission or manual transmission.



- Coat the inside of the output flange (arrows) evenly with approx. 5 g of grease.

Expendable materials

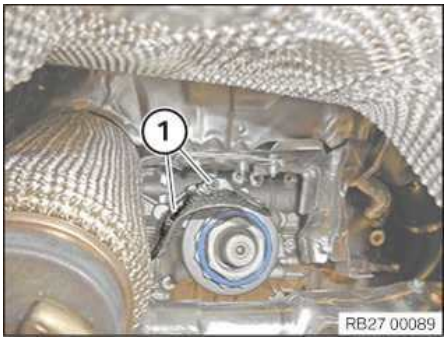
Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the transfer box (VTG).
- Tighten the screws (1).

Transfer box to transmission

M10		Tightening torque	56 Nm



- Install heat shield.
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Heat shield to transfer box

M6	Renew screws.	Tightening torque	6 Nm

▸ **Check the transfer box oil level**

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RISK OF DAMAGE

Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.



- Check transfer case oil level, correct:
- Open the oil filler plug (1).
- Check transfer box oil level.
- If necessary, top up transmission oil up to the lower edge of the oil filler plug opening (1).

Transmission oil

Technically suitable transfer box and electrical transmission oils	

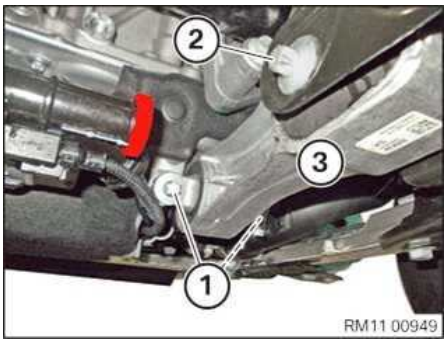
Main group 27

- Tighten the oil filler plug (1).

Oil filler plug on transfer box (VTG)

M18x1.5		Tightening torque	35 Nm

49 – Install the holder with the rubber mount



- Insert and install the holder (3).
- Tighten the screws (1) and (2) hand-tight.
- Release jack.
- Tighten down screw (2).

Holder to front axle support

M12		Tightening torque	100 Nm

- Tighten the screws (1).

Bracket to oil sump

M12		Tightening torque	100 Nm

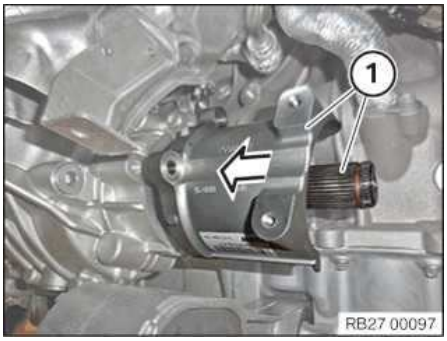
50 – Install the intermediate shaft with the support tube



- Coat gearing of the intermediate shaft uniformly with 5 g of grease.

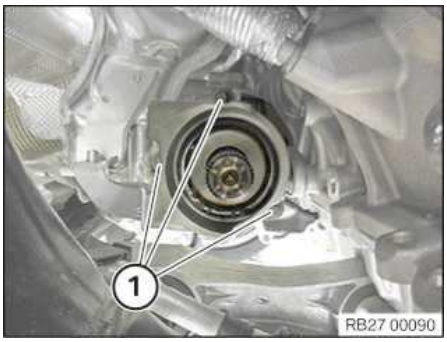
Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the intermediate shaft with support tube (1) in the transfer box.

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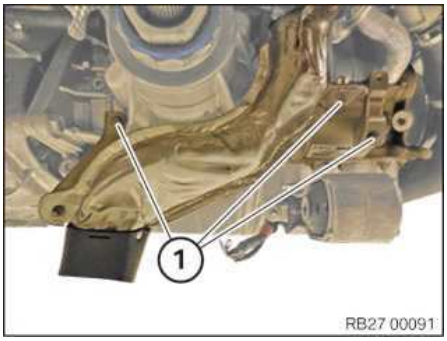
- Position screws (1).

Note: Check for correct screw length! Bolt M8x35 8.8

- Tighten the screws (1).

Intermediate shaft to transfer box

M8x35		Tightening torque	19 Nm



- If installed: Install air duct.
- Tighten the screws (1).

51 – Install propeller shaft.

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

RISK OF DAMAGE

Damage to the propeller shaft during installation.

Non-observance of the installation guidelines for the propeller shaft on the rear axle differential may cause severe damage.

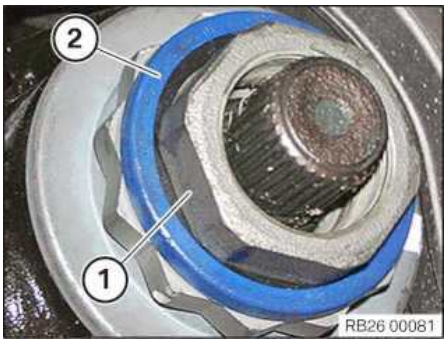
- Always renew the recessed nut on the rear axle differential. Screw locking must be available.
- Strictly observe a minimum hardening time of two hours after having screwed in the recessed nut. The hardening time may be longer at lower temperatures.

RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.



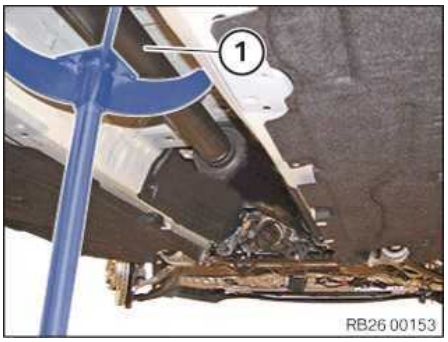
- Renew recessed nut (1).

  Parts: Insert nut
- Renew the retaining clip (2) and the seal.

  Parts: Retaining clip, seal
- Insert the seal with the recessed nut (1) and install.
- Insert the retaining clip (2) and install.
- Make sure that recessed nut (1) is screwed in within 5 min.
- Make sure that the hardening time of **minimum** 2 h for the recessed nut is observed.

  The hardening time must be extended at lower temperatures.

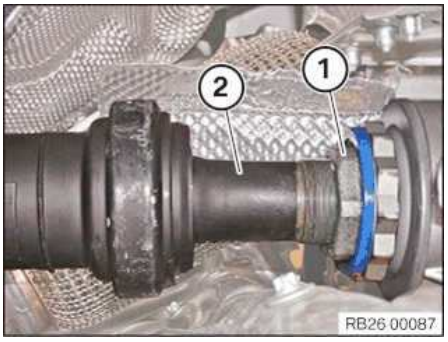
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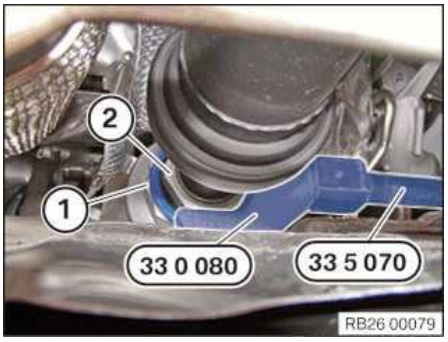
- Insert the propeller shaft (1) and install.
- Always support the propeller shaft (1) with a conventional jack.



- Hand-tighten the bolts (1).



- Push the propeller shaft (2) against the recessed nut (1) up to the limit position.
- Screw the propeller shaft (2) at least 2 thread starts onto the recessed nut (1) by hand.



RISK OF DAMAGE

Damage to the transfer box.

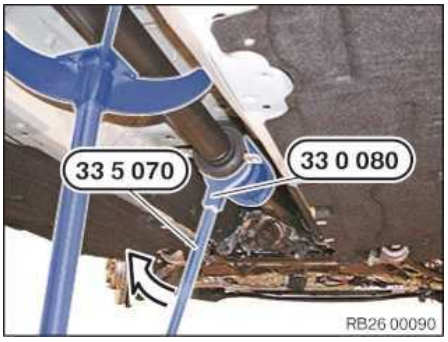
Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.

- Protect the recessed nut (2) on the transfer box from twisting with the special tools **0 495 554 (33 5 070)** and .

  The recessed nut (2) on the transfer box must **not** be used to tighten the propeller shaft.

  The double hexagon flange nut (1) must **not** be used for counter support.

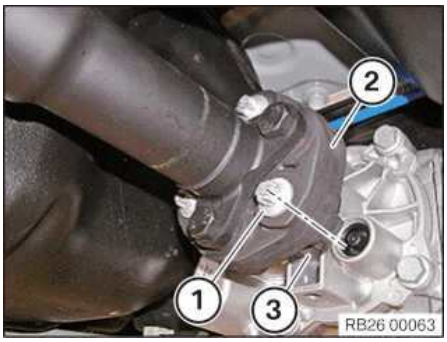


- Tighten the front propeller shaft with the special tools **0 495 554 (33 5 070)** and in the direction of the arrow.

Propeller shaft to transfer box

		Tightening torque	80 Nm

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TECHNICAL INFORMATION

Compliance with the following instructions is required to avoid a humming noise from the propeller shaft after refitting the propeller shaft.

- Assemble the screw connection (1) of the flexible disc (2) and the three-hole flange (3) according to the mark.
- Renew screws (1).

  Parts: Bolts
- Hand-tighten the bolts (1).



- Protect the propeller shaft (1) with the special tools **0 495 554 (33 5 070)** and from twisting.



- Tighten the bolts with the special tools **0 490 504 (00 9 120)** and .

Flexible disc to rear axle final drive

M12x1.5	Renew screws.	Tightening torque	55 Nm 90 °



- Tighten the screws (1).

Centre mount to body

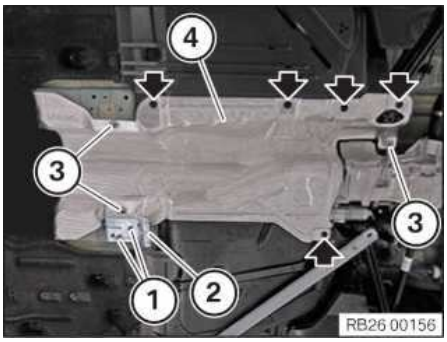
M8		Tightening torque	19 Nm



- Guide the special too l out between the front and rear propeller shaft and remove.

52 – Installing the rear heat shield

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- Insert and install the heat shield (4).
- Tighten screws (arrows).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

- Tighten nuts (3).

Heat shield to body

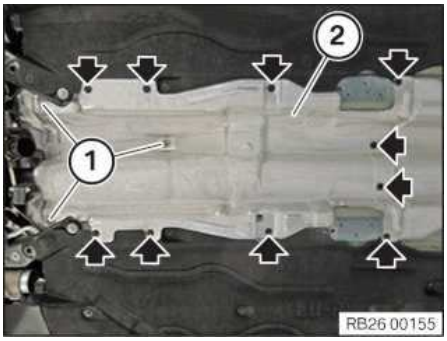
Bolts/nut		Tightening torque	3 Nm

- Insert and install the holder (2).
- Tighten the screws (1).

Bracket to body

M8		Tightening torque	21 Nm

53 – Install the front heat shield



- Insert and install the heat shield (2).
- Tighten screws (arrows).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

- Tighten nuts (1).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

54 – Install exhaust system

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

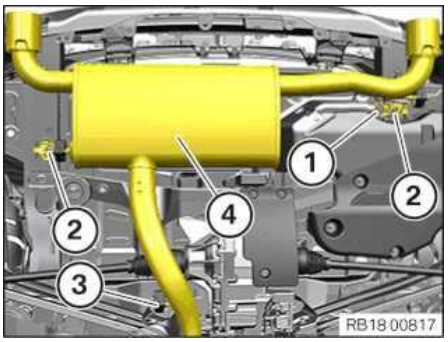
CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

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- Feed in and install the exhaust system (4) with a second person.
- Renew nuts (2).

  Parts: Nuts
- Tighten nuts (2).

Exhaust system to body

M8	Replace nuts.	Tightening torque	19 Nm

- Tighten down screw (1).

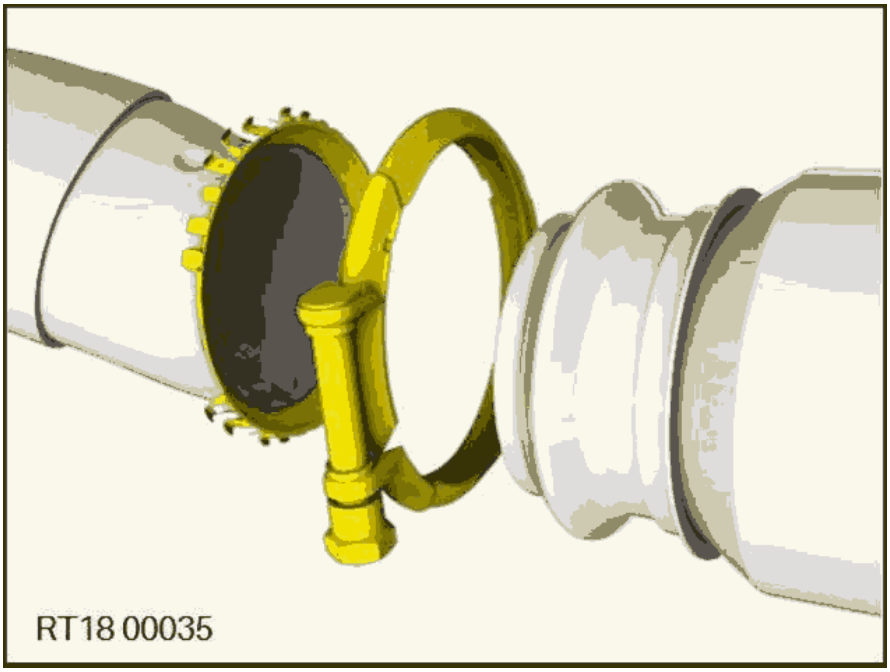
Exhaust bracket on body

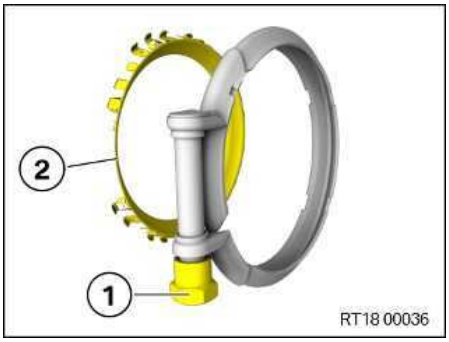
Hexagon screw M8x30		Tightening torque	19 Nm

- Check the rubber mount (3) for damage and renew as needed.
- Mount rubber mount (3) on the exhaust system (4).

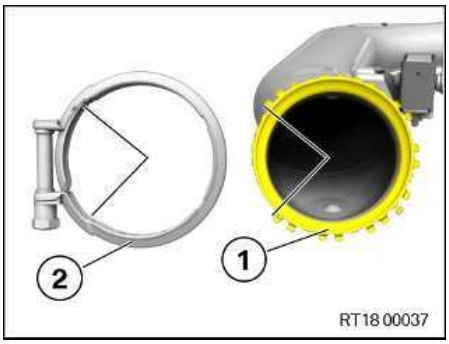
▸ **Install the V-clip**

V-band clamp





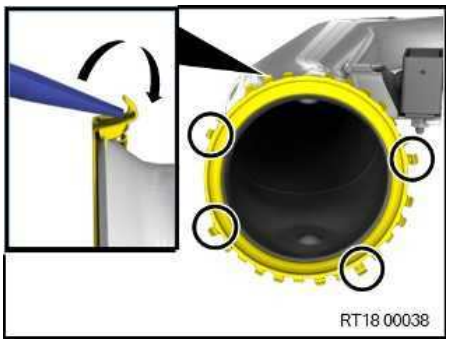
- Unscrew the nut (1) and remove the sealing ring (2).



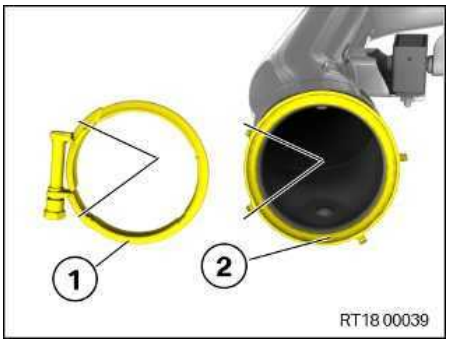
- Renew the V-clip (2).

  Parts: V-band clamp
- Mount the sealing ring (1) on the exhaust system.
- Ensure that the sealing ring (1) for the V-clip (2) is positioned correctly.

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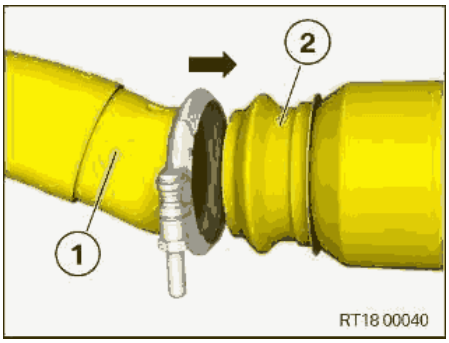
- Bend all sheet metal tabs over with a suitable tool, except those in the marked areas.



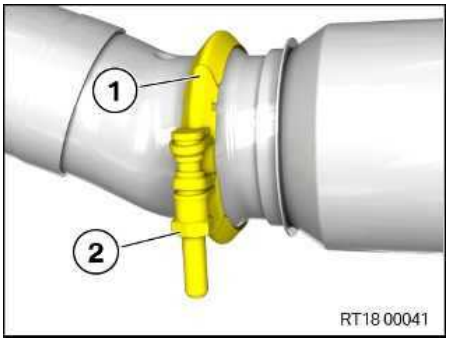
- Mount the V-clip (1) on the sealing ring (2).
- Make sure that the V-clip (1) is positioned correctly on the sealing ring (2).



- Make sure that the V-clip rests against the sheet metal tabs after mounting (marks).



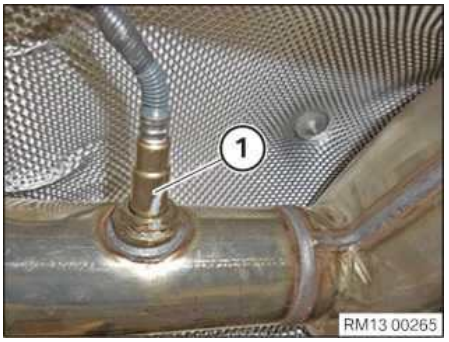
- Connect the exhaust system (1) with the catalytic converter (2) and position correctly.



- Make sure that V-clip (1) is fitted correctly.
- Tighten down screw (2).

V-clip to catalytic converter

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

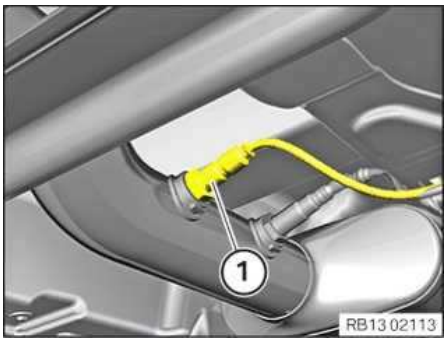


- Feed in, install and tighten diesel particulate sensor (1).

Diesel particulate sensor to exhaust system

Sensor		Tightening torque	50 Nm

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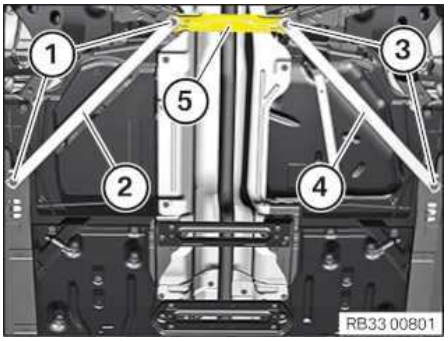


- Feed in, install and tighten nitrogen oxide sensor (1).

Nitrogen oxide sensor downstream of SCR catalytic converter

Sensor		Tightening torque	50 Nm

55 – Install the cross-member with torsion struts



- Insert and install the cross-member (5).
- Thread in torsion strut (4) at right and install.
- Renew screws (3).

  Parts: Bolts
- Tighten down screws (3).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

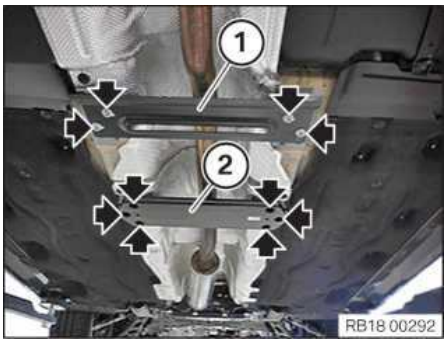
- Guide in and install the left torsion strut (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

56 – Install the connecting support on the tunnel in front and back



- Insert and install connecting supports (2).
- Tighten the screws (arrows) from the connecting support (2).

Front connection carrier to body

M10x18		Tightening torque	56 Nm

- Insert and install connecting supports (1).
- Tighten the screws (arrows) from the connecting support (1).

Rear connection carrier to body

M8x18		Tightening torque	28 Nm

57 – Installing right output shaft partially



- Renew the circlip (1).

  Parts: Circlip
- Slide output shaft into the transmission as far as the limit position.
- Check for secure seat by levering.

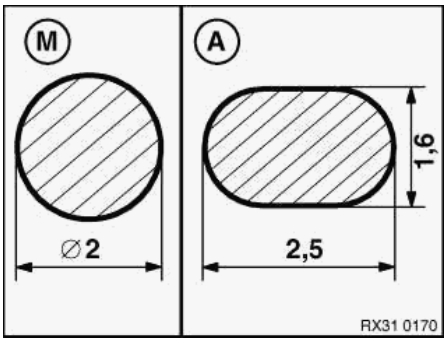
58 – Partially installing the left output shaft

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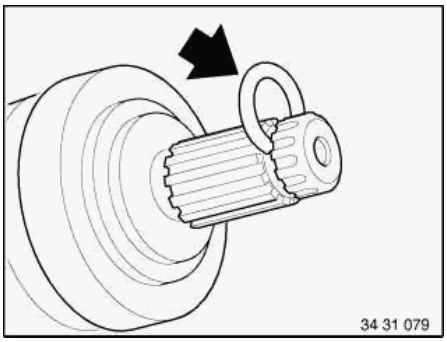
- **With automatic transmission only:**
- Lever out O-ring (1).
- Renew O-ring (1).

  Parts: O-ring
- Insert new O-ring (1).

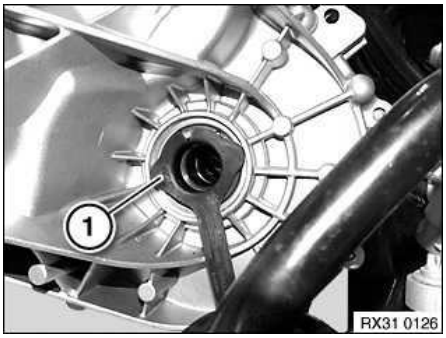


- Do not mix up circlips.

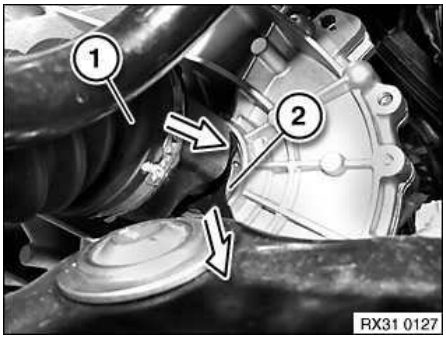
  Different types of output shafts fitted:
  - M: Manual transmission
  - A: Automatic transmission



- Renew circlip (arrow).



- Insert installation protection ring (1) into the radial shaft seal.
- Make sure the tool fits over the lip of the radial shaft seal so there is no damage to sealing ring when the output shaft is inserted.



- Insert output shaft (1) into transmission.
- **Manual gearbox only:** Pull on the handle to remove the installation protection ring (2) and dispose of it.
- Slide output shaft (1) into the transmission as far as the limit position.

  The output shaft (1) must engage audibly.
- Check for secure seat by levering.

59 – Installing starter motor

CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

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- Insert and install the starter motor .
- Tighten the screws (1).

Starter motor to transmission

M8x45		Tightening torque	19 Nm



- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

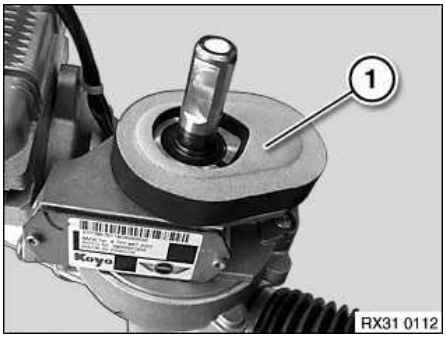
Battery positive lead to starter

M8		Tightening torque	13,5 Nm



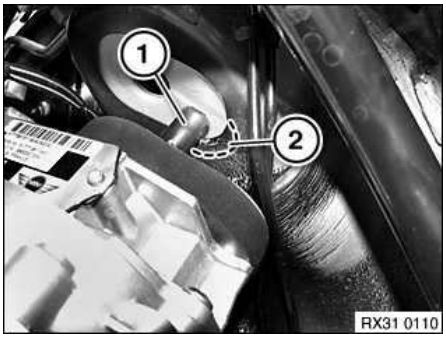
- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.

60 – Mount and secure the complete front axle



- Remove the seal (1).
- Clean surface on steering gear.
- Renew gasket (1).

  Parts: Gasket
- Position the seal (1) and glue it on.



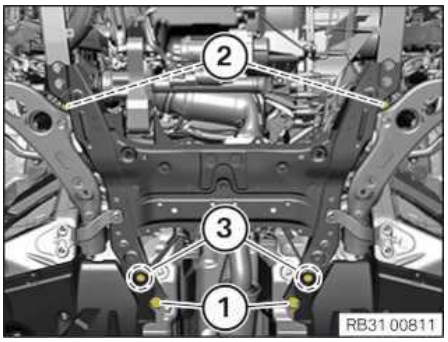
TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!

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- Position front axle support.
- Bend underbody panellings in the areas (3) to one side.
- Raise front axle support.
- When raising, insert charge air cooler into the rubber mount of the charge air cooler on cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

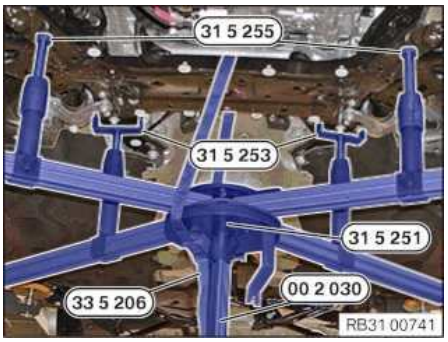
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

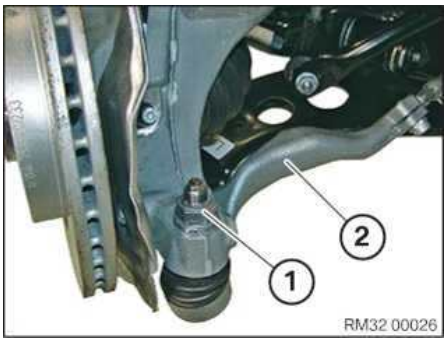
- If necessary, tighten the screws in the areas (3).

Underbody protection to body

Screw		Tightening torque	3 Nm



- Remove special tool from special tool .
- Lower universal jack **0 490 133 (00 2 030)** with the special tool and place it to the side.



NOTICE

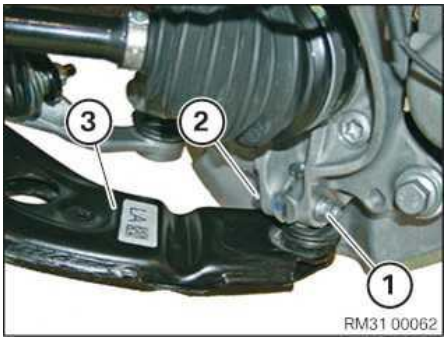
Perform the operations on the left and right side.

- Position the track rod (2) on the swivel bearing .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Track rod end to swivel bearing

M14	Renew nut.	Tightening torque	175 Nm



NOTICE

Perform the operations on the left and right side.

- Position the wishbone (3) on the swivel bearing .
- Renew the bolt (2) and the nut (1).

  Parts: Bolt, nut
- Insert screw (2).
- Tighten nut (1).

Wishbone to swivel bearing

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

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61 – Install the mounted parts on the front axle support



NOTICE

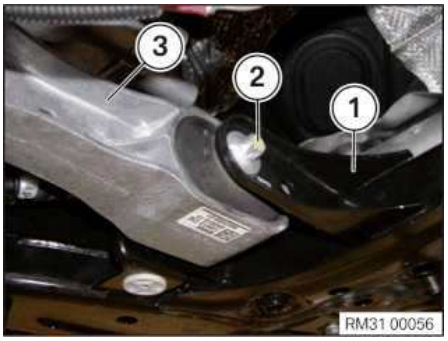
Perform the operations on the left and right side.

- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Holder, wishbone rubber mount, to body

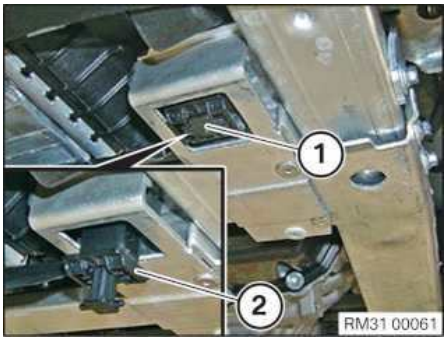
M10 screw	Renew screw.	Jointing torque	56 Nm
		Angle of rotation	90 °



- Position the engine support (3) on the front axle support (1).
- Tighten down screw (2).

Holder with rubber mount to front axle support

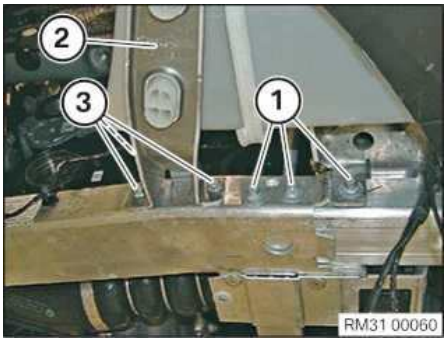
M12 screw		100 Nm



NOTICE

Perform the operations on the left and right side.

- Position the lock (2).
- Lock the bracket (1) of the lock (2) of the holder for the charge air cooler.



- **Only on right side:** Position the holder for the washer fluid reservoir (2).
- Tighten down screws (3).

Washer fluid reservoir holder to front axle support adapter plate

		Tightening torque	10 Nm

NOTICE

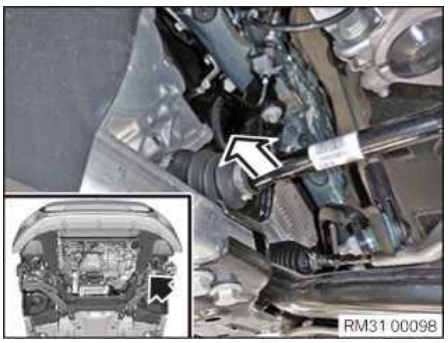
Perform the operations on the left and right side.

- Tighten the screws (1).

Deformation element, bottom, to adapter plate, front axle carrier

		Tightening torque	11,8 Nm

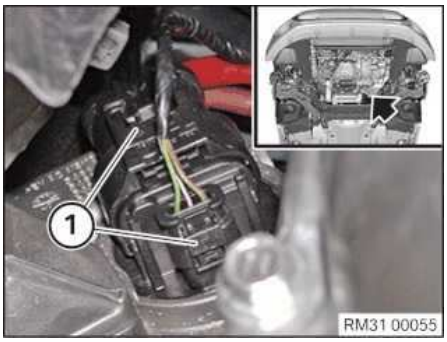
62 – Attaching connector at steering gear



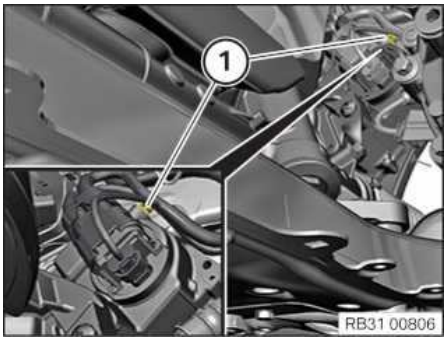
- To connect the connector (see the following step): Connect the connector with the right hand.

  The connectors can be accessed via the left output shaft.

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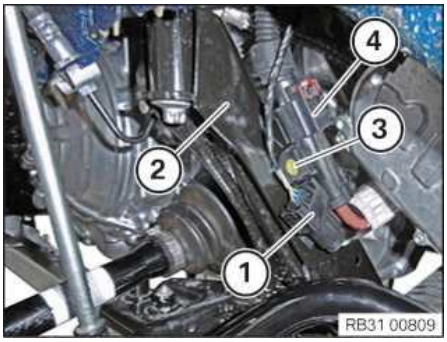


- Connect and lock connector (arrow) (1) with the steering gear.



- Fasten the wiring harness (1) on the steering gear.

▸ **If installed: Fasten the plug connections at the front axle support**



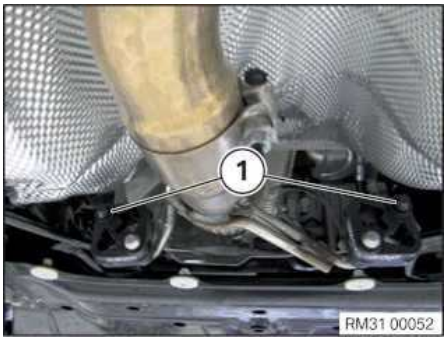
- Position the plug connection (4) at the front axle support (2).
- Tighten down screw (3).

Holder to front axle support

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

- Fasten the plug connection (1) at the front axle support (2).

63 – Securing rubber mount on front axle support



- Check rubber mount (1), replace if necessary.

  Parts: Rubber mount
- Spray rubber mount (1) with lubricant and slide onto holder on front axle support.

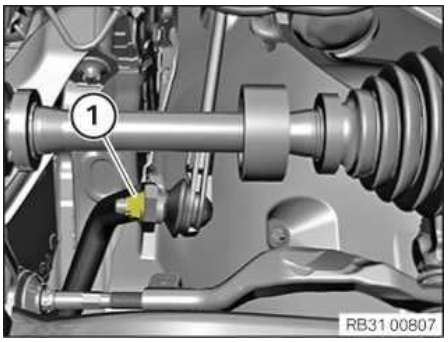
64 – Securing anti-roll bar on left and right on the anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▸ **Fastening anti-roll bar on the anti-roll bar link**

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- Position the anti-roll bar link on the anti-roll bar .
- Renew nut (1).

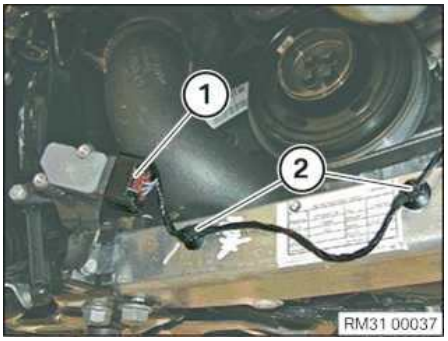
  Parts: Nut
- Tighten nut (1).

Note: Use the Torx socket for counter support.

Anti-roll bar link to anti-roll bar

M10	Renew nut.	Tightening torque	56 Nm

65 – With right installation: Securing the cable for the ride height sensor



- Secure the cable clip (2) on the adapter of the deformation element.
- Connect connectors (1) and lock.

66 – Topping up oil level in the manual gearbox (GS6X60DA)

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.



TECHNICAL INFORMATION

Make sure during removal of the filling/level control screw to note the installed filling/level control screw variant.

It is **mandatory** to use variant 1 in transmissions up to production date 08/2015.

It is **mandatory** to use variant 2 in transmissions from production date 08/2015.

Failure to observe will result in a leak on the transmission.

- Variant 1 **until** production date 08/2015.
- Variant 2 **from** production date 08/2015.



- Unscrew filling/level control screw (1) and fill the transmission until the oil overflows.

Transmission oil capacity

Transmission oil GS6-60DA, GS6X60DA/Owner's Handbook	2,2 l

Transmission oil: Technically suitable manual gearbox oil

- Allow surplus oil to drain off.
- Renew the filling/level control screw (1).

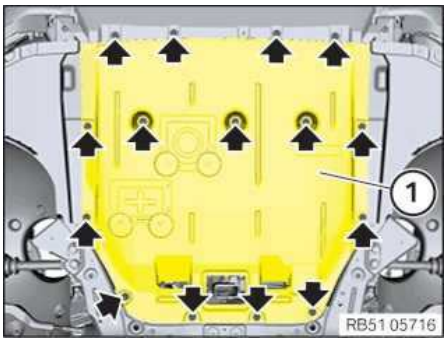
  Parts: Filling/level control screw
- Tighten filling/level control screw (1).

Oil drain plug / oil filler plug

Hexagon socket		Tightening torque	43 Nm

67 – Installing the front underbody protection

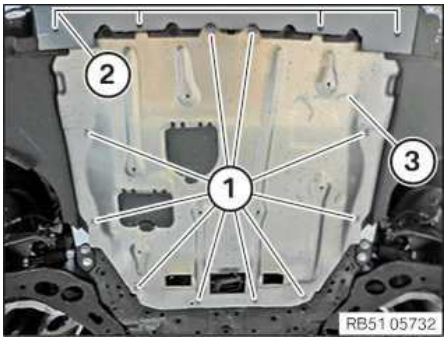
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- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

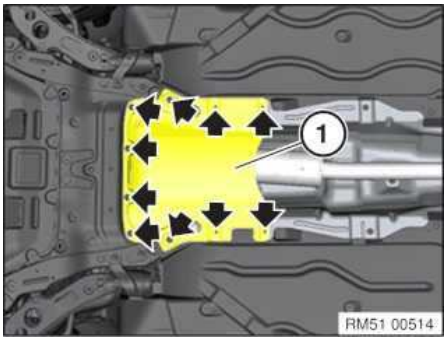


- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

68 – If installed: Installing underbody protection at rear



- Position rear underbody protection (1).
- Tighten screws (arrows).

Underbody protection to body

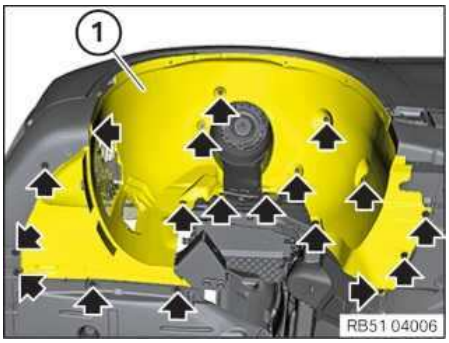
Screw		Tightening torque	3 Nm

69 – Installing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

▸ **Installing the front wheel arch cover**



- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Plastic nut		Tightening torque	2,6 Nm
Screw		Tightening torque	2,6 Nm

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

▸ **Installing front wheel arch trim**

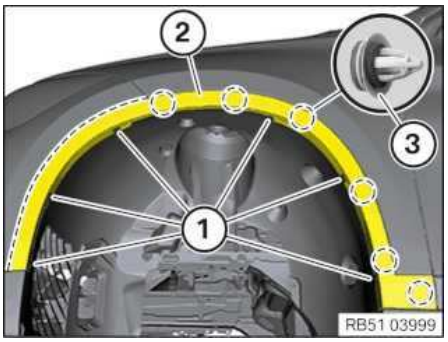
NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

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NOTICE

Description is for left component only. Procedure on the right side is identical.



- Check the clips (3) for damage and renew where required.

  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

70 – Installing both front wheels

▶ **Mounting the wheel**

▷ **Clean the contact surfaces between the brake disc and the wheel rim**



TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

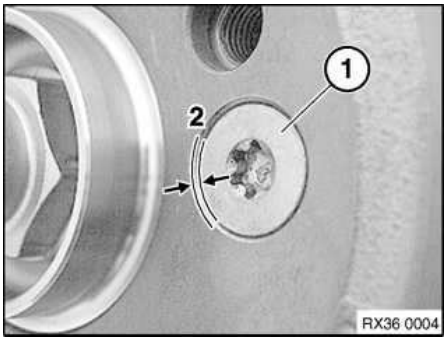
- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue in the area of the wheel bolt holes, remove and clean the brake disc.



- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).



- Renew mounting bolt (1).

  Parts: Mounting bolt
- Check that the mounting bolt (1) for the brake disc is securely seated.

  The mounting bolt (1) for the brake disc may not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

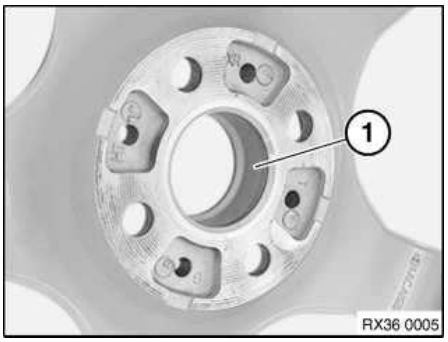
Brake disc to rear wheel hub

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub

M8	Renew screw.	Tightening torque	16 Nm

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- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring (1).

◁



TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

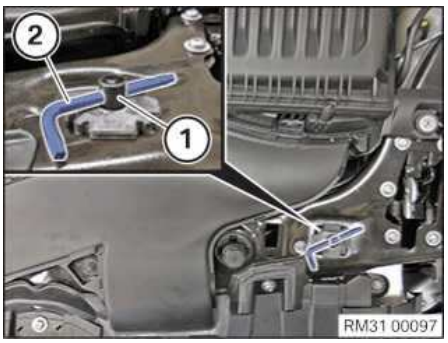
- Renew corroded wheel bolts.

  Parts: Wheel bolts
- Clean the wheel bolts.
- Check the wheel bolts and threads for damage, renew the wheel bolts if necessary.
- Join and tighten the wheel bolts (arrows).

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

71 – Removing fastener for left and right radiator



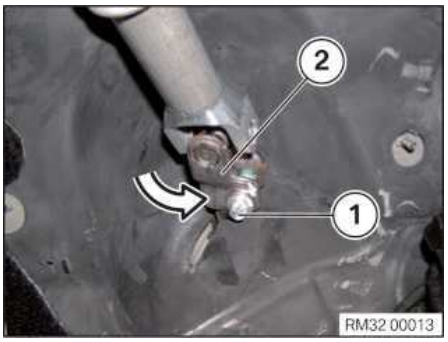
NOTICE

Perform the operations on the left and right side.

- Remove suitable tool (2) from the centering pin (1).

72 – Secure the steering shaft at the bottom on the steering gear

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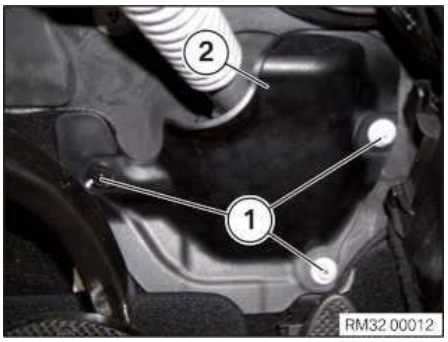


- Clean the screw lock residue from the screw thread in the universal joint (2).
- Pivot the universal joint (2) in the direction of the arrow to the steering gear.
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Lower steering shaft to steering gear

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm



- **If installed:**
- Position the cover on the steering column (2).
- Tighten nuts (1).

Steering column cover to bulkhead

Plastic nut		Tightening torque	3 Nm

73 – Remove the engine bridge

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

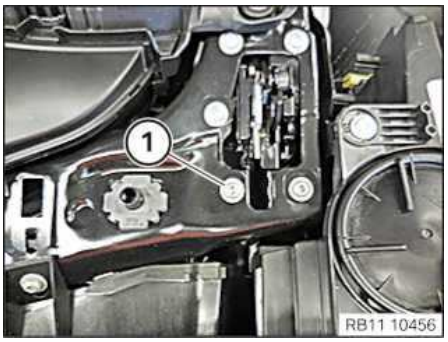


- Detach the spindle screw (1) from the engine bridge.
- Unscrew the leg screws (2) and (3).
- Guide the engine bridge out of the vehicle with the help of another person and remove.



- Unscrew the bolts (1) of the special tool **2 459 012**.
- Feed out the special tool **2 459 012** at the cylinder head and remove.

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- Tighten the screw (1) of the bonnet catch.

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm



- Tighten the screw (1) of the bonnet catch.

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

74 – Install electronics box

Prerequisite

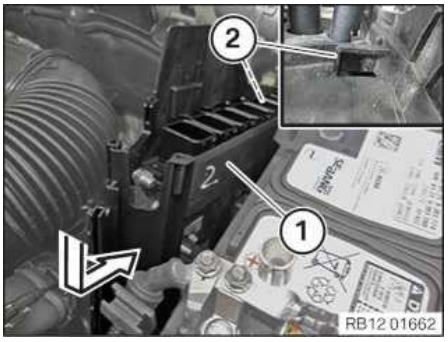
Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.

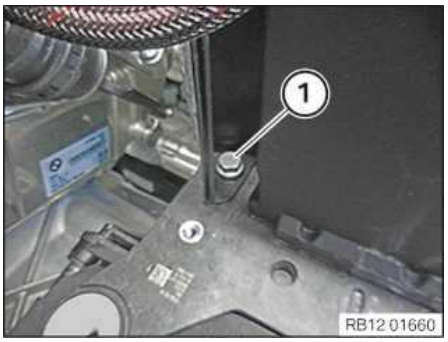


- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.



- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).

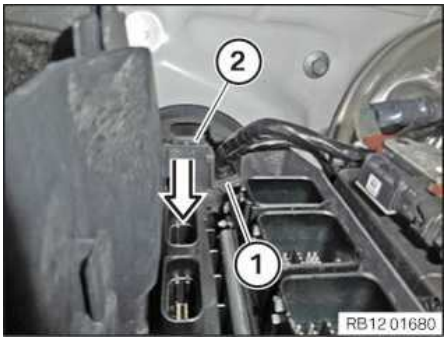
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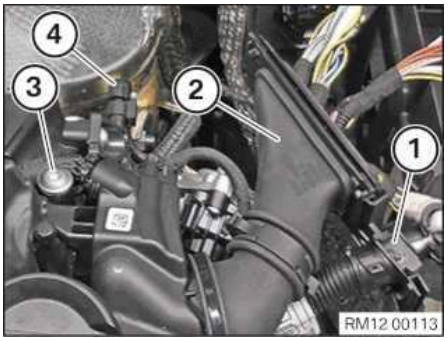
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.



- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

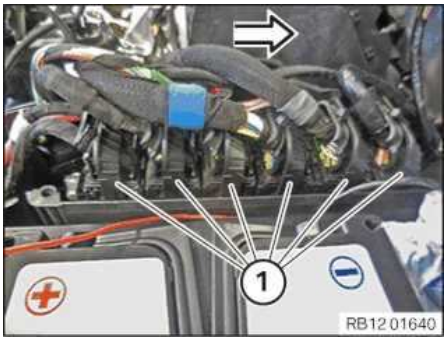
Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

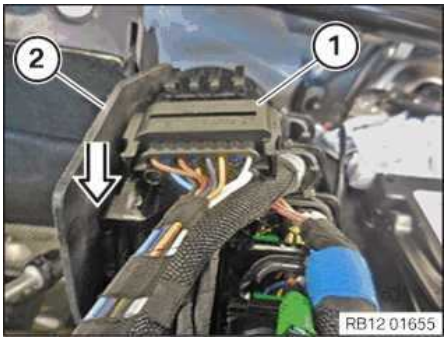
- Attach connector (4) to the differential pressure sensor and lock it audibly.



- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.

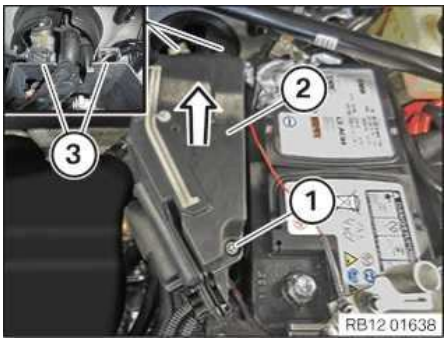


- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.

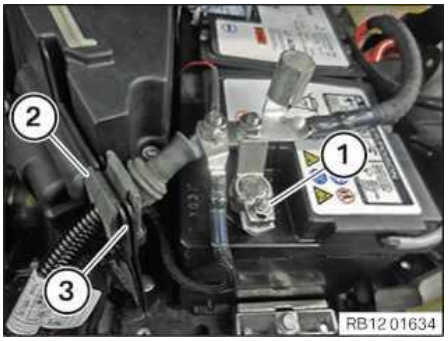
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- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

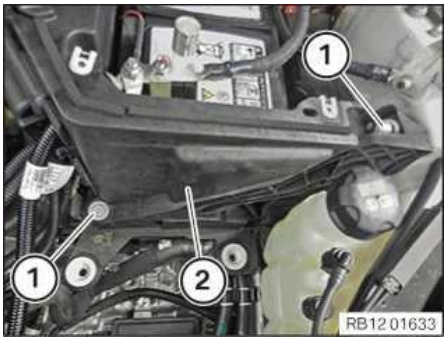
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

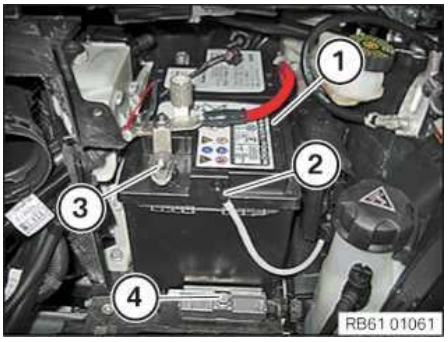


- Feed in and install tension strut (2).
- Tighten the screws (1).

Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

75 – Install vehicle battery



- Install vehicle battery (1).
- Position the bracket and tighten with the screw (4) .

Battery terminal rail to battery tray

M8		19 Nm

- Position the vent hose (2) and clip it in.
- Position the positive battery terminal and tighten with the nut (3) .

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

▸ **Check the vent holes of the battery**

WARNING

Gas emission.

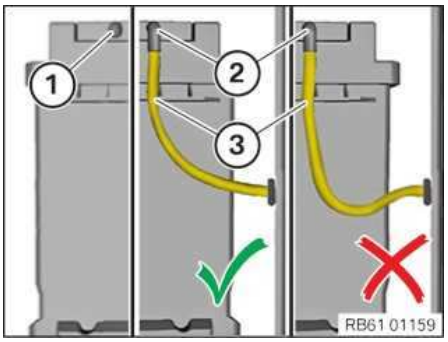
Danger of injury! Danger of explosion!

- Assign the vent holes correctly.
- Route the vent hose correctly.

TECHNICAL INFORMATION

The battery has two vent holes, opposite:
One vent hole (1) must be closed correctly with a dummy plug.
The vent hose (3) must be correctly connected and routed at the other vent hole (2).

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Check
- Check if the vent hole (1) is correctly closed with a dummy plug.

Result

» No dummy plug.

Measure
- Close the vent hole (1) correctly with a dummy plug.

Check
- Check if the vent hole (2) has a correctly connected vent hose (3).

Result

» The vent hose (3) is not correctly connected.

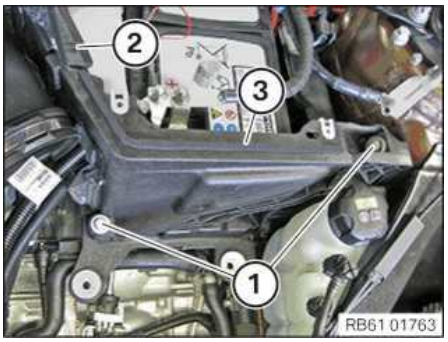
Measure
- At the vent hole (2), connect the vent hose (3) correctly.

Check
- Check if the vent hose (3) is routed to the outside with a downhill gradient (**no siphon formation!**).

Result

» The vent hose (3) is not correctly routed as shown in the image on the right.

Measure
- Route the vent hose (3) correctly as shown in the centre image.



- Insert tension strut (3) and tighten with screws (1).

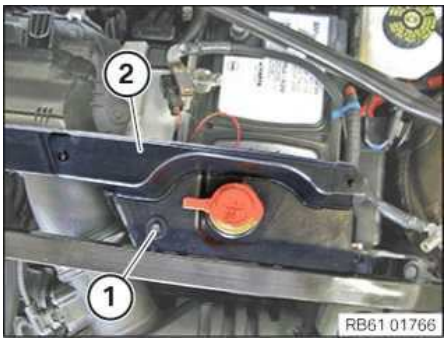
Trailing link

M8		Tightening torque	19 Nm

- Tighten down screw (2).

Battery cover

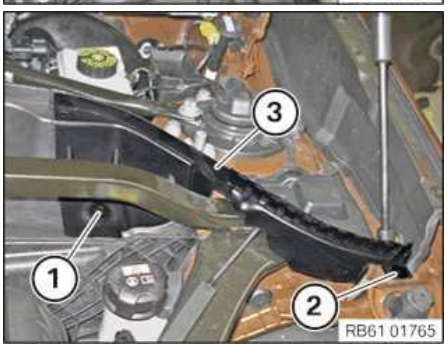
M8		2,8 Nm



- Position the cover (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

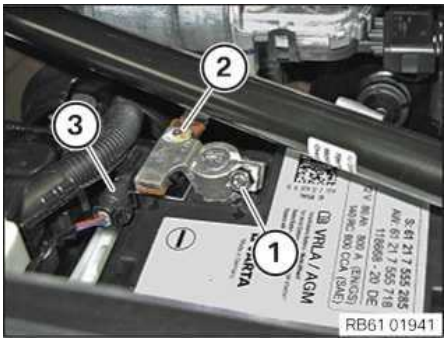
M8		2,8 Nm

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76 – Connecting the battery earth lead

TECHNICAL INFORMATION

For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)



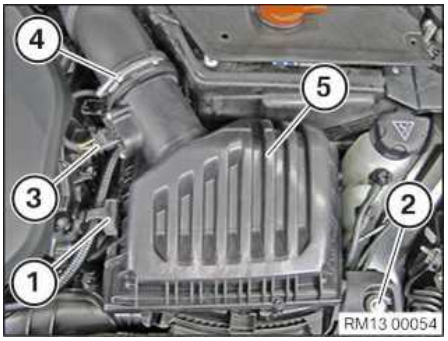
- Remove the protective cover of the positive battery terminal.
- Position the battery earth lead (2).
- Tighten nut (1).

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6			5 Nm

- If required, connect the connector (3).

77 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

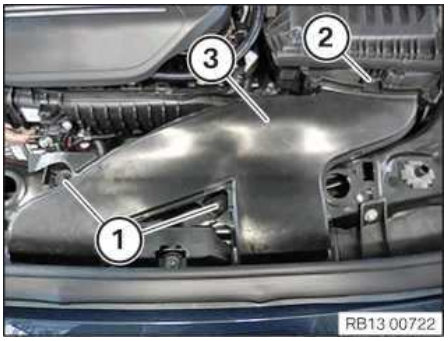
- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

78 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).
  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

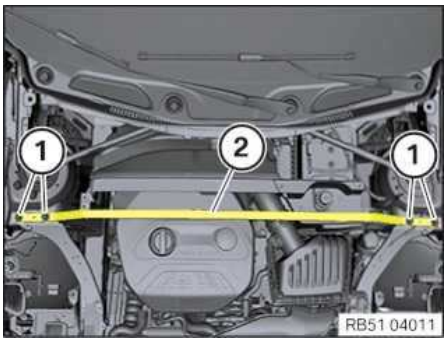
M6		Tightening torque	8 Nm

79 – Install strut brace

TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.

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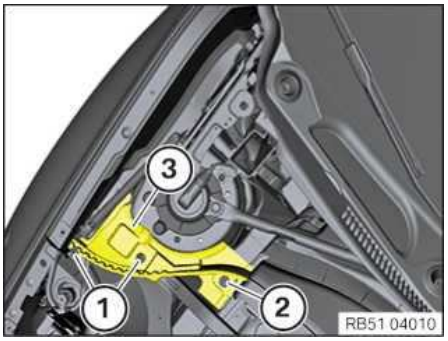


- Install the strut brace (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-brace to spring strut dome

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °



NOTICE

Description is for right component only. The procedure on the left side is identical.

- Install the cover (3).
- Tighten down screw (2).

Cover on body

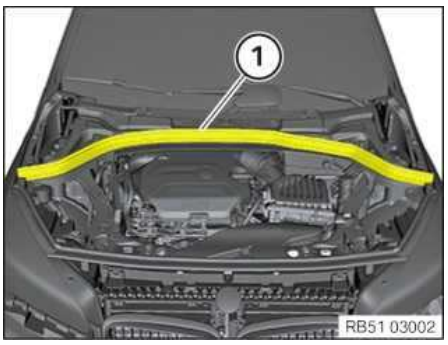
Hexagon screw		Tightening torque	3 Nm

- Install the expanding rivet (1).

80 – Install the seal for the bonnet

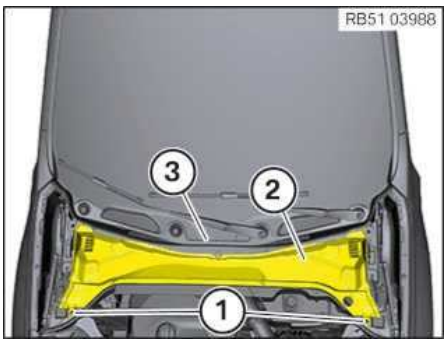
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

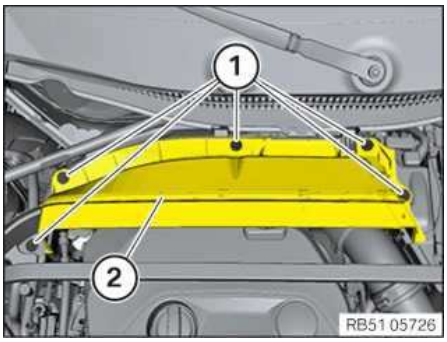
81 – Installing front cowl panel cover



- Insert and install cowl panel cover at front (2) into cowl panel cover at rear (3).
- Check cowl panel cover at front is correctly seated (2).
- Secure expanding rivet (1).

82 – Installing the upper bulkhead cover

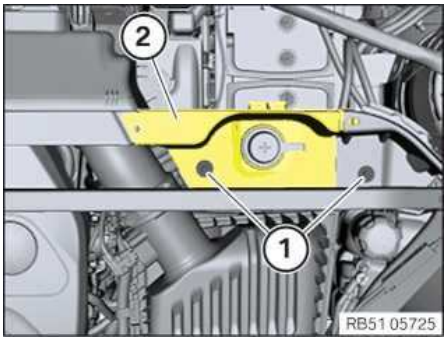
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- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Cover of top bulkhead

Screw		Tightening torque	2,6 Nm



- Guide in and install cover (2).
- Tighten down screw (1).

Cover of remote positive terminal

Screw		Tightening torque	2,6 Nm

83 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



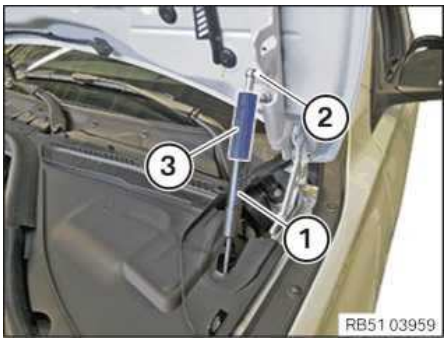
- Check for correct installation of all rubber mounts in the acoustic cover (1).



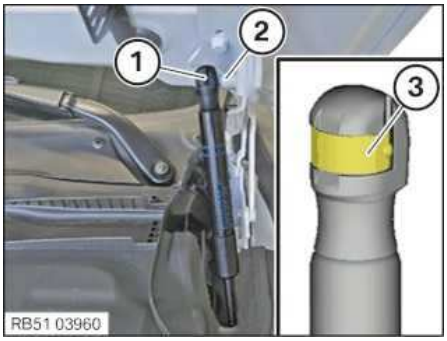
- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

84 – Take bonnet out of the service position

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- Support the bonnet by hand.
- Remove the special tool (3) from the ball pin (2).
- Pull off the special tool (3) from the gas pressure spring (1).
- Continue to support the bonnet and repeat the operation on the other side of vehicle.



CAUTION

Shutting bonnet or tailgate.

Danger of injury!

- Support bonnet/tailgate in fully open position with the aid of a suitable device.

- Check the clamp (3) is fitted correctly.
- Connect ball socket (1) to ball pin (2).
- Continue to support the bonnet and repeat the operation on the other side of vehicle.

Additional Information

Overview of Tightening Torques

Special tool to cylinder head			Used in step 13
M8		Tightening torque	21,5 Nm

Oil drain plug / oil filler plug			Used in step 36 66
Hexagon socket		Tightening torque	43 Nm

Flywheel to crankshaft			Used in step 44
M12x1.5	Renew screws.	Tightening torque	120 Nm

Clutch to flywheel			Used in step 45
M8	Renew screws.	Jointing torque	15 Nm
		Angle of rotation	90 °

Transmission to engine			Used in step 46
M8x40		Tightening torque	19 Nm
M12x75		Tightening torque	66 Nm

Transmission mounting			Used in step 46
M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

Clutch slave cylinder to transmission housing			Used in step 46
M8		Tightening torque	19 Nm

Battery holder to engine support			Used in step 46
Hexagon screw M8x30		Tightening torque	19 Nm

Battery terminal rail to battery tray			Used in step 46 75
M8			19 Nm

Electronics box to battery tray			Used in step 46 74
M8X16		Tightening torque	15 Nm

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Wiring harness to cylinder head cover			Used in step 46 74
TS5x20		Tightening torque	3,5 Nm

Cover to electronics box			Used in step 46 74
RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery			Used in step 46 74
NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray			Used in step 46 74
M8		Tightening torque	19 Nm

Transmission to oil sump			Used in step 47
M8			19 Nm

Transfer box to transmission			Used in step 48
M10		Tightening torque	56 Nm

Heat shield to transfer box			Used in step 48
M6	Renew screws.	Tightening torque	6 Nm

Oil filler plug on transfer box (VTG)			Used in step 48
M18x1.5		Tightening torque	35 Nm

Holder to front axle support			Used in step 49
M12		Tightening torque	100 Nm

Bracket to oil sump			Used in step 49
M12		Tightening torque	100 Nm

Intermediate shaft to transfer box			Used in step 50
M8x35		Tightening torque	19 Nm

Propeller shaft to transfer box			Used in step 51
		Tightening torque	80 Nm

Flexible disc to rear axle final drive			Used in step 51
M12x1.5	Renew screws.	Tightening torque	55 Nm 90 °

Centre mount to body			Used in step 51
M8		Tightening torque	19 Nm

Heat shield to body			Used in step 52 53
Bolts/nut		Tightening torque	3 Nm

Bracket to body			Used in step 52
M8		Tightening torque	21 Nm

Exhaust system to body			Used in step 54
M8	Replace nuts.	Tightening torque	19 Nm

Exhaust bracket on body			Used in step 54
Hexagon screw M8x30		Tightening torque	19 Nm

V-clip to catalytic converter			Used in step 54
V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

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Diesel particulate sensor to exhaust system — Used in step 54

Sensor		Tightening torque	50 Nm

Nitrogen oxide sensor downstream of SCR catalytic converter — Used in step 54

Sensor		Tightening torque	50 Nm

Cross-member/torsion strut to axle support and mounting — Used in step 55

M12x48	Renew screws.	Jointing torque Angle of rotation	100 Nm 90 °

Front connection carrier to body — Used in step 56

M10x18		Tightening torque	56 Nm

Rear connection carrier to body — Used in step 56

M8x18		Tightening torque	28 Nm

Starter motor to transmission — Used in step 59

M8x45		Tightening torque	19 Nm

Battery positive lead to starter — Used in step 59

M8		Tightening torque	13,5 Nm

Rear end of front axle support to body — Used in step 60

M14 screw	Renew screw.	Tightening torque	175 Nm

Front axle support, front to body — Used in step 60

M12 screw	Renew screw.	Tightening torque	108 Nm

Underbody protection to body — Used in step 60 68

Screw		Tightening torque	3 Nm

Track rod end to swivel bearing — Used in step 60

M14	Renew nut.	Tightening torque	175 Nm

Wishbone to swivel bearing — Used in step 60

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

Holder, wishbone rubber mount, to body — Used in step 61

M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °

Holder with rubber mount to front axle support — Used in step 61

M12 screw			100 Nm

Washer fluid reservoir holder to front axle support adapter plate — Used in step 61

		Tightening torque	10 Nm

Deformation element, bottom, to adapter plate, front axle carrier — Used in step 61

		Tightening torque	11,8 Nm

Holder to front axle support — Used in step 62

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

Anti-roll bar link to anti-roll bar — Used in step 64

M10	Renew nut.	Tightening torque	56 Nm

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Underbody protection front — Used in step 67

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Wheel arch cover to body — Used in step 69

Plastic nut		Tightening torque	2,6 Nm
Screw		Tightening torque	2,6 Nm

Wheel arch cover to body — Used in step 69

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body — Used in step 69

Plastic nut		Tightening torque	3 Nm

Brake disc to rear wheel hub — Used in step 70

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub — Used in step 70

M8	Renew screw.	Tightening torque	16 Nm

Wheel bolts — Used in step 70

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Lower steering shaft to steering gear — Used in step 72

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

Steering column cover to bulkhead — Used in step 72

Plastic nut		Tightening torque	3 Nm

Cross connection on support for cross connection — Used in step 73

M6x20		Tightening torque	12 Nm

Battery terminal with IBS positive battery terminal / negative battery terminal — Used in step 75 76

NutM6			5 Nm

Trailing link — Used in step 75

M8		Tightening torque	19 Nm

Battery cover — Used in step 75

M8			2,8 Nm

Intake silencer housing to lock bridge — Used in step 77

M6X30		Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 77

Clamp		Tightening torque	3 Nm

Intake neck to cross connection — Used in step 78

M6		Tightening torque	8 Nm

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Cross-brace to spring strut dome Used in step 79

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

Cover on body Used in step 79

Hexagon screw		Tightening torque	3 Nm

Cover of top bulkhead Used in step 82

Screw		Tightening torque	2,6 Nm

Cover of remote positive terminal Used in step 82

Screw		Tightening torque	2,6 Nm

Overview of Special Tools

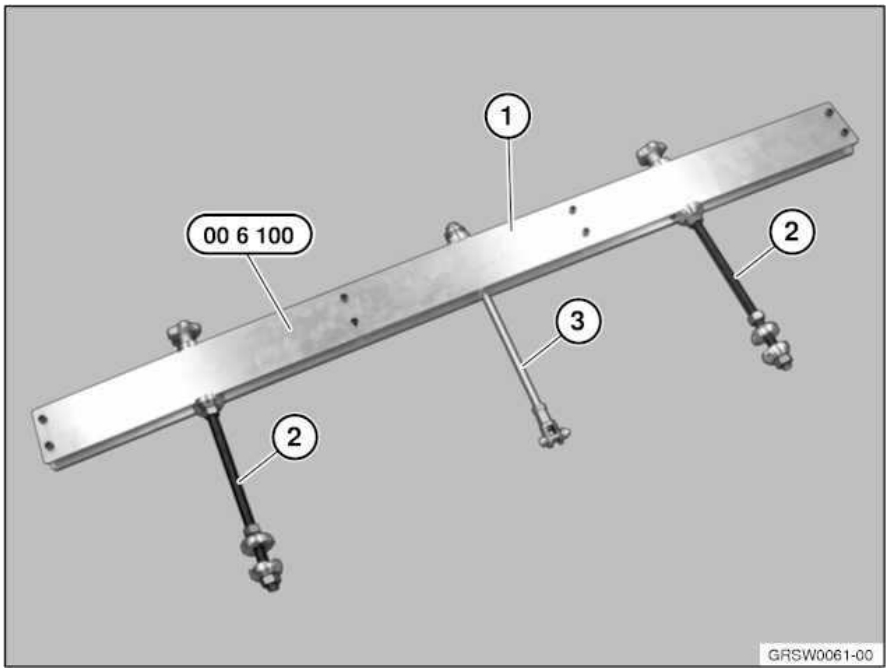
2 459 012 Holder



Common Used in step 13 73

Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

0 496 852 (00 6 100) Device



Common Used in step 13

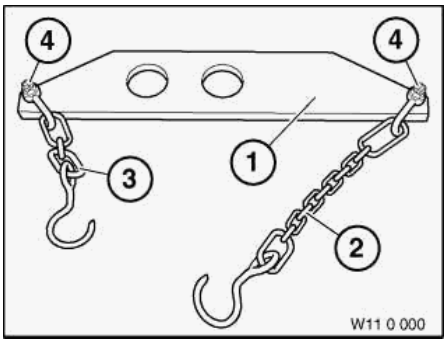
Usage	Engine bridge (device) 006000
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 10 (659)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
2	2 361 507 (00 6 102)		**Spindle** Set (2 pieces) in connection with 00 6 100.	
3	2 361 506 (00 6 103)		**Spindle** Spindle (central spindle) for Traverse 00 6 100.	

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0 490 561 (11 0 000) Lifting gear



Common

Used in step 13

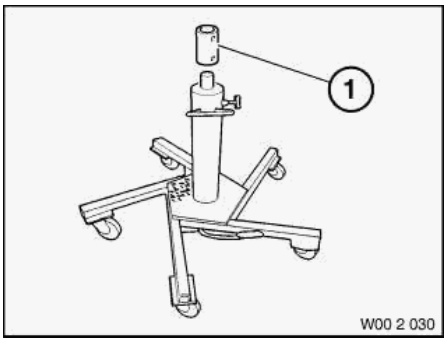
Usage	(Hoisting gear) For removing and installing engines. As of 08/2011 only available as a complete set. Delivered with TÜV inspection certificate and operating instructions. No delivery of separate parts.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 13 94 (888)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
4	0 490 565 (11 0 009)		**Shackle** (Shackle) 2 pieces. As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 562 (11 0 001)		**Lifting gear** (Cross member) As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
2	0 490 563 (11 0 002)		**Chain** (Chain) Version: long As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
3	0 490 564 (11 0 003)		**Chain** (Chain) Version: short As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	

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0 490 133 (00 2 030) Device



Common

Used in step 24 39 46 60

Usage	(universal hydraulic lifter base unit) Chassis and hydraulic lifter - For removing and installing rear axle supports and gearboxes. Also for soft top mounts. Is replaced by 81 22 2 219 012
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 90 (207)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 490 134 (00 2 031)		**Adapter** (adapter for gearbox holder) Model series: E30, E31, E32, E34, E36	

0 495 554 (33 5 070) Extension



Common

Used in step 33 51

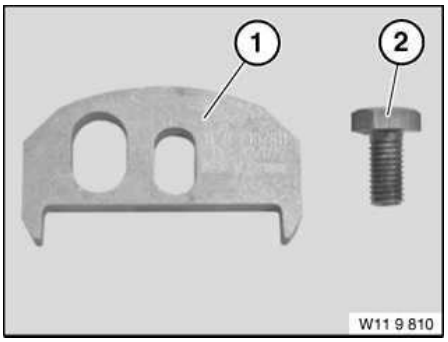
Usage	Pull-out extension for 33 5 040, 33 5 050, 33 5 060.
Included in the tool or work	
Storage location	A18
Replaced by	
In connection with	
SI-Number	01 21 06 (300)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 592 (33 5 071)		**Extension** (Extension (1 item)) discontinued, can only be ordered using complete tool	

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0 496 171 (11 9 811) Holder



Common	Used in step 40 41 44
Usage	Available only as a complete tool set 11 9 810 (83 30 0 496 170) - as of 13.01.12
Included in the tool or work	0 496 170
Storage location	C86
Replaced by	
In connection with	
SI-Number	01 07 07 (355)

0 494 793 (11 9 265) Bush



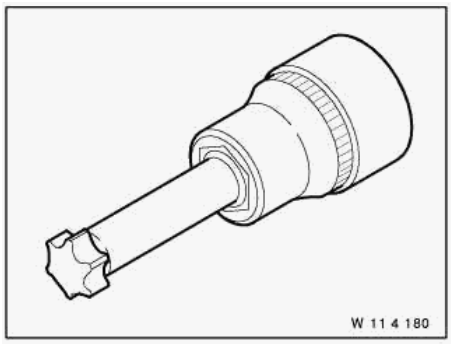
Common	Used in step 40 41 44
Usage	
Included in the tool or work	0 493 938
Storage location	A44
Replaced by	
In connection with	
SI-Number	

2 288 165 Synchronising key



Common	Used in step 40 45
Usage	Conversion kit for 21 2 170, for orders till 02.2014. Orders as of March 2014 do not require the conversion, as the new thrust piece has been accounted for.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 09 14 (088)

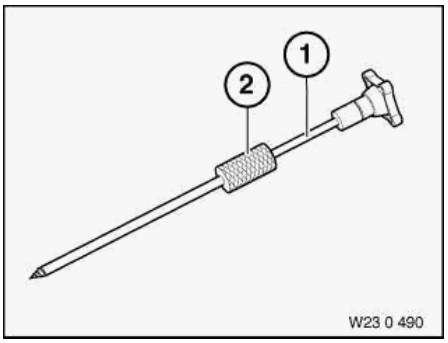
0 491 018 (11 4 180) Socket WAF 46



Common	Used in step 41 44
Usage	(screwdriver bit Torx T60) For releasing and tightening down dual-mass flywheel - model year: from Jan 94
Included in the tool or work	
Storage location	C9
Replaced by	
In connection with	
SI-Number	01 02 94 (777)

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0 491 454 (23 0 490) Puller



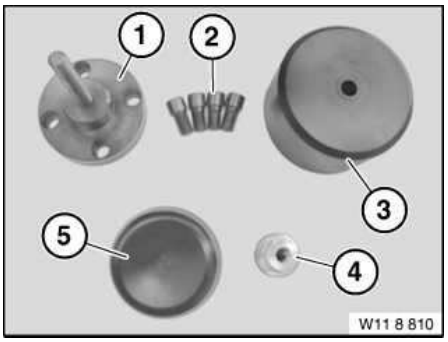
Common Used in step 42

Usage	For removing shaft seal
Included in the tool or work	
Storage location	A13
Replaced by	
In connection with	
SI-Number	01 15 96 (106)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 491 455 (23 0 491)		**Rod** With self-tapping screw Deletion, only available via tool set	
2	0 491 456 (23 0 492)		**Weight** (Weight)	

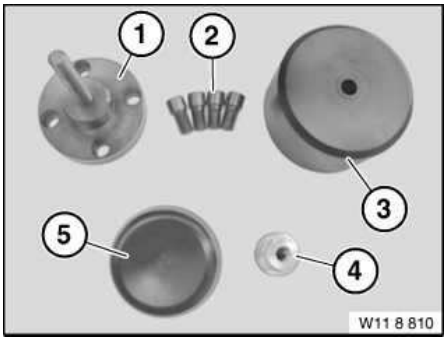
0 496 137 (11 8 815) Holding sleeve



Common Used in step 43

Usage	(Slip sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 133 (11 8 811) Basic body

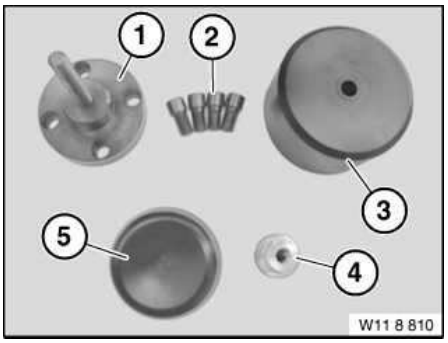


Common Used in step 43

Usage	Liquidation of existing inventory and then available only as a complete tool set 11 8 810 = 83 30 0 496 132 - as of 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

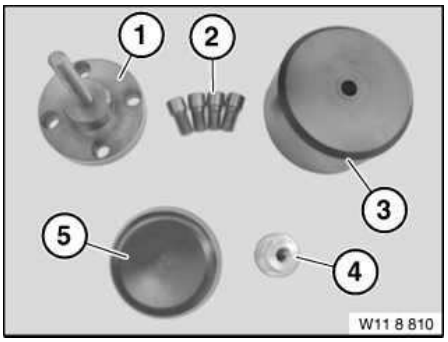
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0 496 134 (11 8 812) Screw



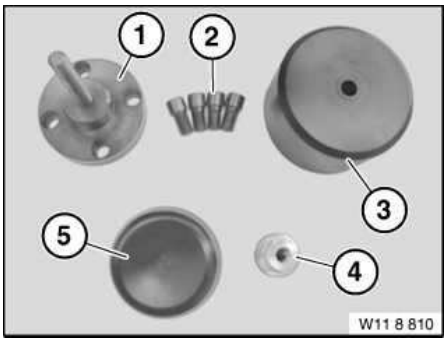
Common	Used in step 43
Usage	(Screw set) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 135 (11 8 813) Holding sleeve



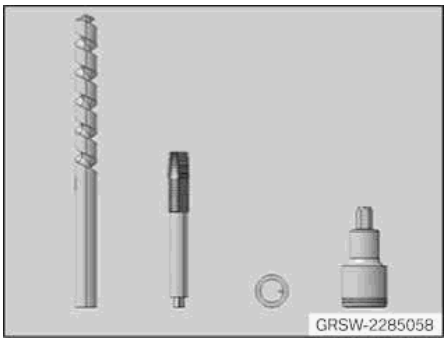
Common	Used in step 43
Usage	(Thrust sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 136 (11 8 814) Nut



Common	Used in step 43
Usage	(Nut with bearing) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

2 285 058 Tool set



Common	Used in step 44
Usage	
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 02 14 (069)

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2 409 025 Puller



Common	Used in step 48
Usage	For disassembly of the outer radial shaft seal of the transmission output shaft, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A76
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 411 739 Puller



Common	Used in step 48
Usage	For disassembly of the inner radial shaft seal of the output, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C78
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 408 152 Striking element



Common	Used in step 48
Usage	For installation of the right radial shaft seal transmission output shaft (inner). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

2 413 037 Handle



Common	Used in step 48
Usage	Universal drift handle. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C77
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

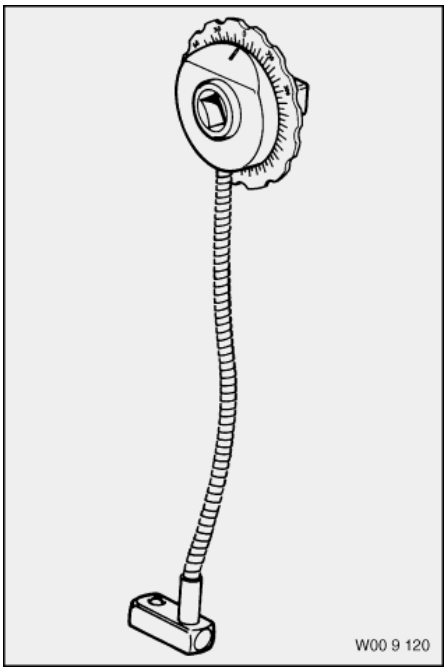
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2 408 150 Striking element



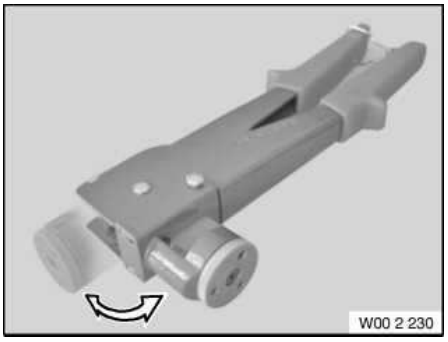
Common	Used in step 48
Usage	For installing the right radial shaft seal transmission output shaft (outer). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

0 490 504 (00 9 120) Torque angle measuring dial



Common	Used in step 51
Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

0 496 521 (00 2 230) Pliers



Common	Used in step 69
Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

2 344 011 Tool



Common	Used in step 70
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

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0 495 221 (36 1 323) Wheel stud



Common	Used in step 15
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud



Common	Used in step 15
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud



Common	Used in step 15
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud



Common	Used in step 15
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud



Common	Used in step 15
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 228 (36 1 331) Wheel stud



Common	Used in step 15
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 229 (36 1 332) Wheel stud



Common	Used in step 15
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud



Common	Used in step 15
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Transmission oil capacity	Used in step 66
Transmission oil GS6-60DA, GS6X60DA/Owner's Handbook	2,2 l
Transmission oil: Technically suitable manual gearbox oil	

Screw-in depth of thread cutter	Used in step 44
Screw-in depth	18 mm

Links

General repair instructions	Used in step
61 20 ... Notes on AGM battery	76
61 12 ... Notes on intelligent battery sensor (IBS)	76
61 00 ... Notes for disconnecting and connecting battery	76

Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	10 39 42 43
61 35 ... Notes on ESD protection (Electro Static Discharge)	42 43

Operating materials	Used in step
14.0 Automatic transmission fluid for ZF-transmission GA8HP45Z / GA8HP50Z / GA8HP70Z / GA8HP90Z / GA8P70H / GA8P75H / GA8HP75Z	36

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Operating materials	Used in step

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11 14 151 Replacing the crankshaft seal

WARNING

Motor vehicle may slip off the vehicle hoist where components are supported.

Danger! Life-threatening injuries!

- Secure the vehicle hoist against lowering and lifting.

WARNING

Motor vehicle may slip off the vehicle hoist if the weight is distributed unevenly.

Danger! Life-threatening injuries!

- Ensure there is a specific weight compensation on the motor vehicle.

WARNING

Vehicle may slip off the vehicle hoist if the vehicle hoist is handled incorrectly.

Danger! Life-threatening injuries!

- Observe safety information on raising the vehicle using a vehicle hoist.
- For additional information see: 00 ... Raising the vehicle using a vehicle hoist.

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

PRELIMINARY WORK

1 – Bring front compartment lid in the service position

Prerequisite

Engine compartment lid is open.

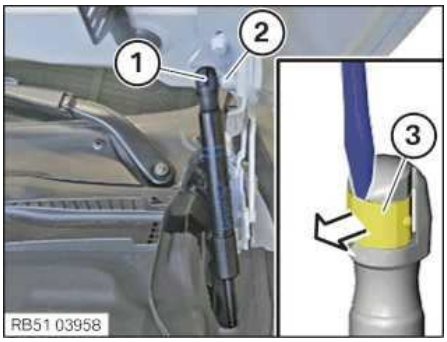
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CAUTION

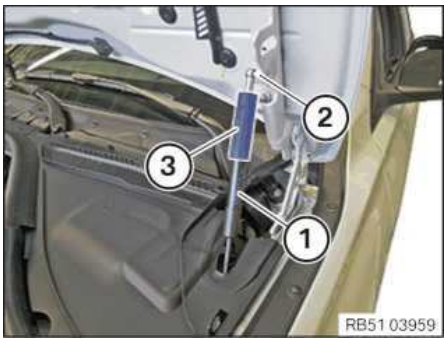
Shutting bonnet or tailgate.

Danger of injury!

- Support bonnet/tailgate in fully open position with the aid of a suitable device.



- Lift clamp (3) slightly using a screwdriver, in the direction of the arrow.
- Lift off ball socket (1) from ball pin (2).
- Repeat the operation on the other side of vehicle.



TECHNICAL INFORMATION

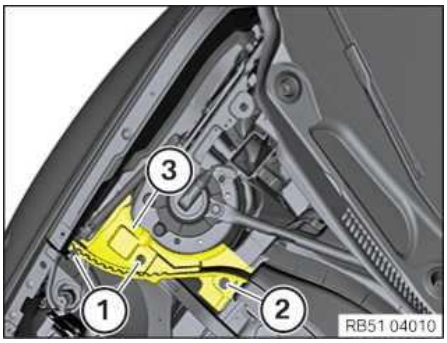
Conduct the following operation with the assistance of a second person.

- Remove the bonnet support and open the bonnet further.
- Push special tool (3) over gas pressure spring (1).
- Place special tool on the ball pin (2) and engage using force.
- Repeat the operation on the other side of vehicle.

2 – Remove suspension cross-brace

TECHNICAL INFORMATION

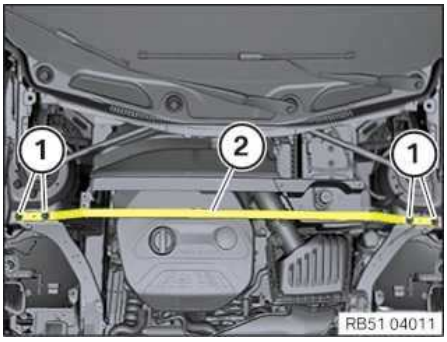
Driving without the strut brace/front end or tension strut is not permitted.



NOTICE

Description is for right component only. The procedure on the left side is identical.

- Loosen expanding rivet (1).
- Loosen screw (2).
- Remove the cover (3).



- Loosen screws (1).
- Remove strut brace (2).

3 – Removing the acoustic cover

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

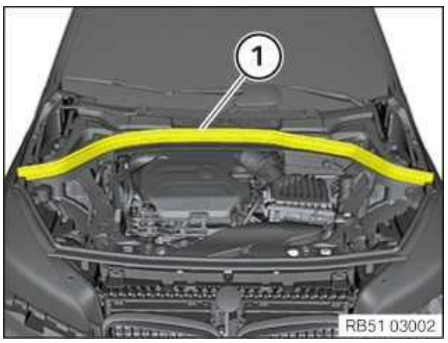
- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

4 – Remove the seal for the rear bonnet

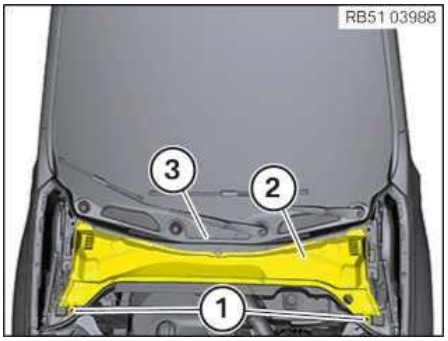
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Pull off rear bonnet seal (1) towards the top and remove.

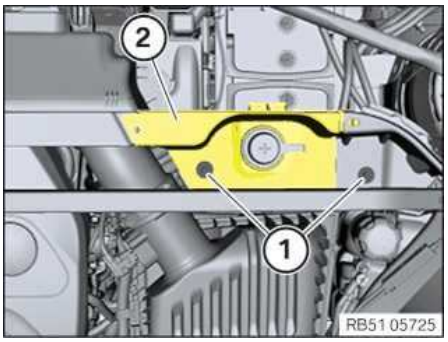
5 – Removing front cowl panel cover



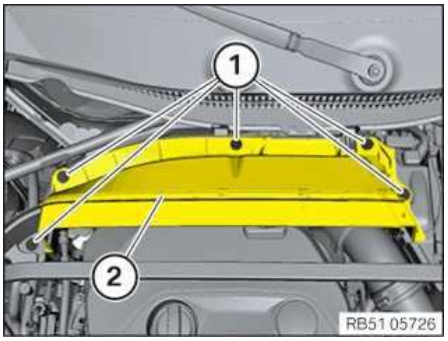
- Loosen the expanding rivet (1).
- Feed out and remove front cowl panel cover (2) from the rear cowl panel cover(3).

6 – Removing the upper bulkhead cover

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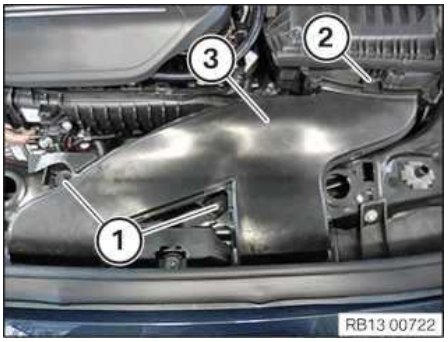


- Loosen screws (1).
- Guide out and remove the cover (2).



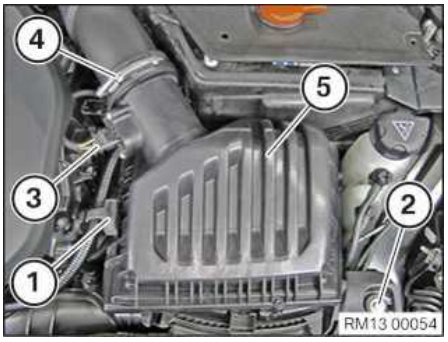
- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

7 – Remove the intake neck for intake silencer housing



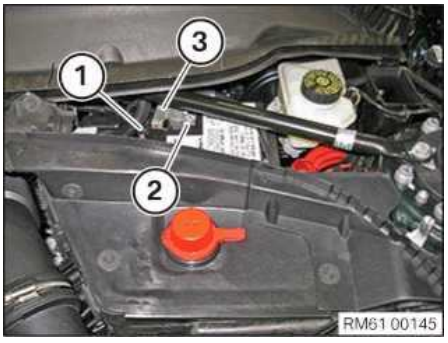
- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

8 – Removing intake silencer housing



- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

9 – Disconnecting the battery earth lead



- Unlock plug connection (1) and disconnect.
- Unfasten nut (2).
- Remove the battery earth lead (3) and secure to one side.

10 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

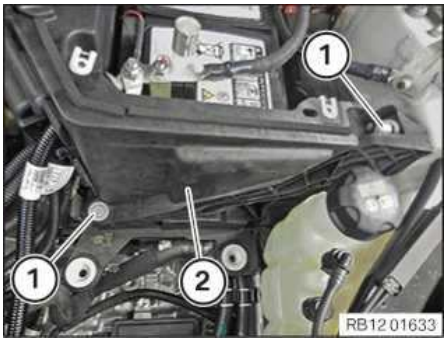
- Do not pull on the wires when disconnecting connectors and plug connections.

TECHNICAL INFORMATION

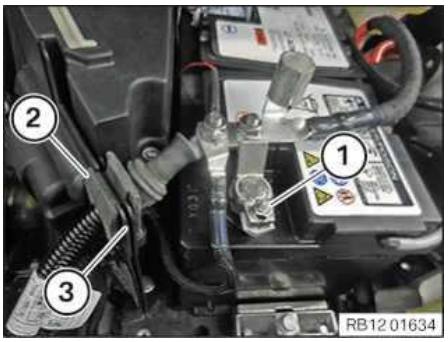
Follow instructions for removing and installing control units.
For additional information see: 12 00 ... Notes on removal and installation of control units

TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.

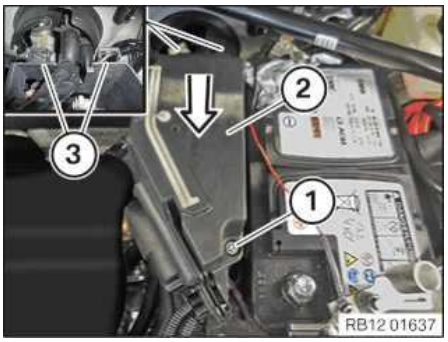


- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.

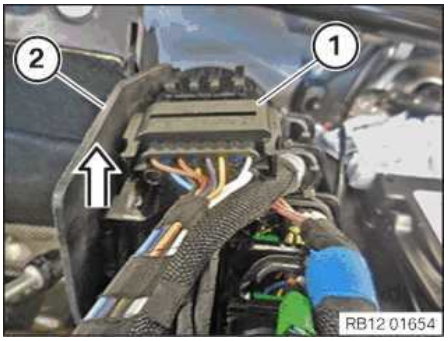


- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

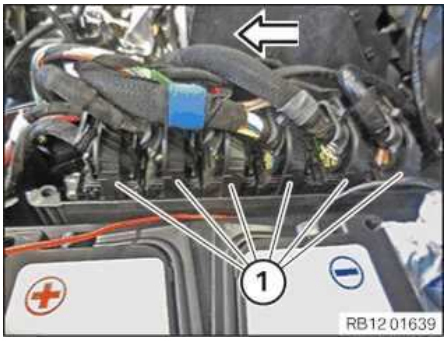
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- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



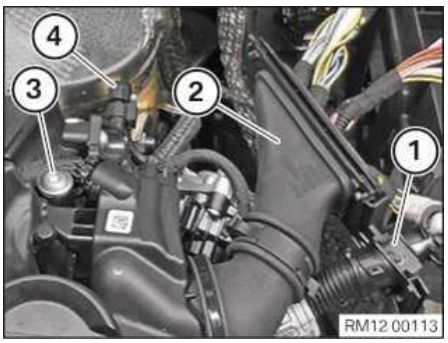
- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).



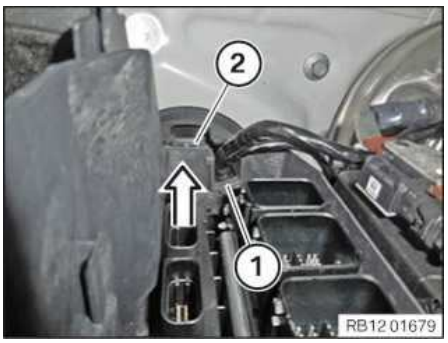
- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



- Unlock and loosen connector (1).

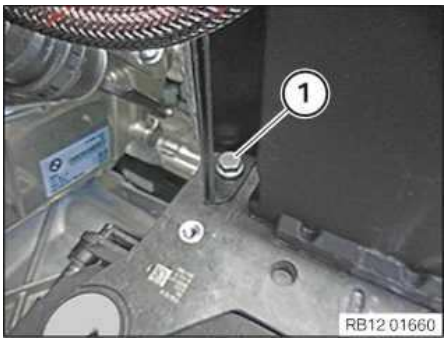


- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.

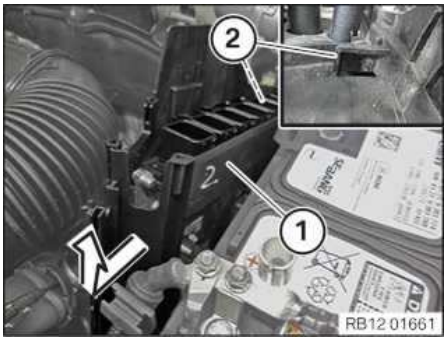


- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.

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- Loosen screw (1).



- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

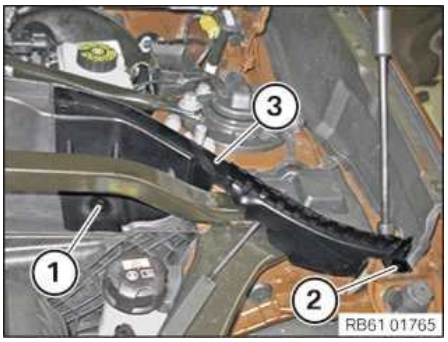
11 – Remove vehicle battery

WARNING

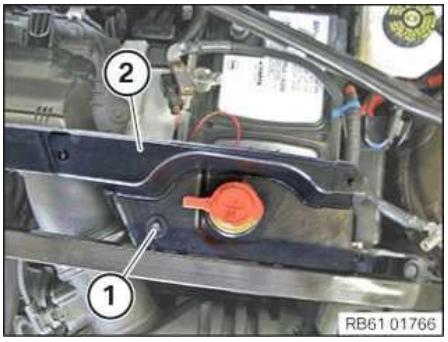
Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

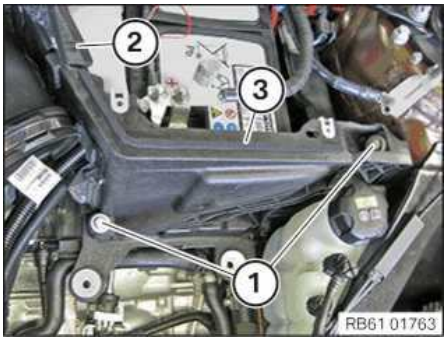
- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.



- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

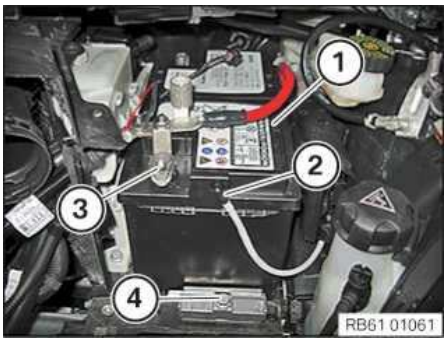


- Loosen screw (1).
- Remove the cover (2).



- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.

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- Pull off the vent hose (2).
- Slacken the nut (3) on the positive battery terminal and remove the positive battery terminal.

WARNING

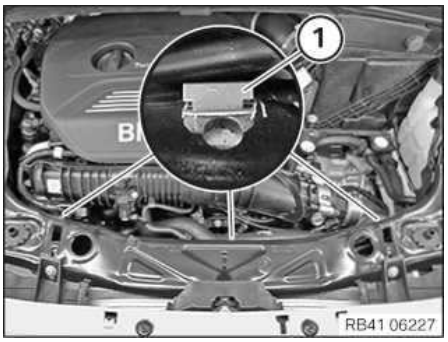
Unprotected battery terminals.

Risk of short circuits! Risk of fire!

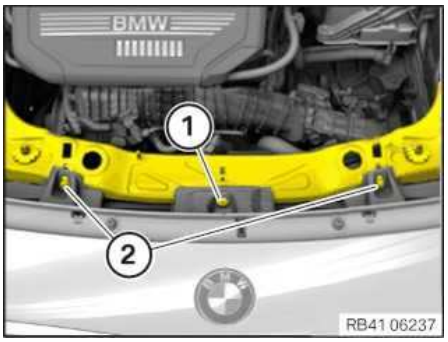
- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

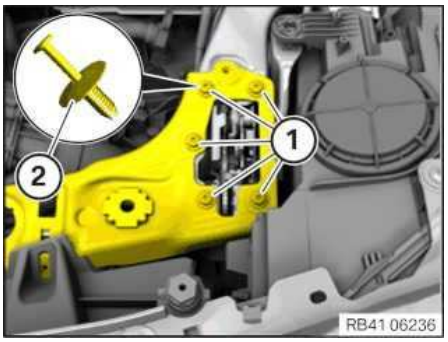
12 – Remove front cross connection



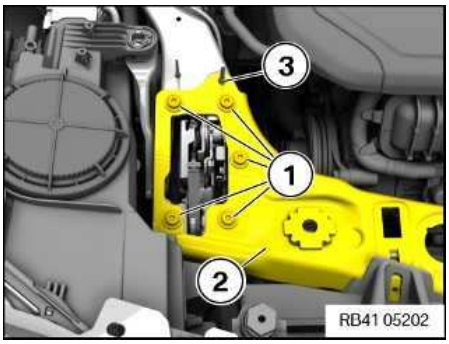
- Detach the clamps (1) for the Bowden cable of the bonnet locks from the cross connection.



- Loosen screw (1).
- Loosen screws (2).



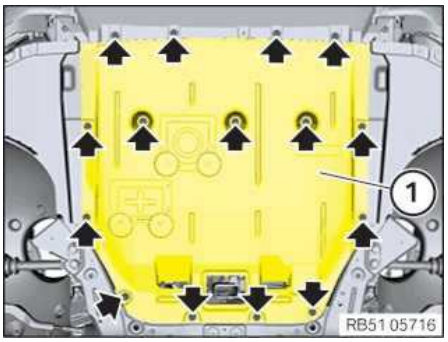
- Loosen screws (1).
- Lever out expanding rivet (2).



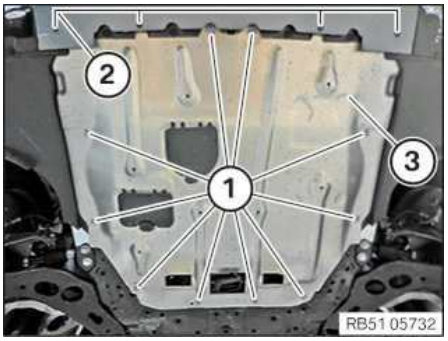
- Loosen screws (1).
- Unclip the front cross connection (2) from the rubber retainer (3) and remove it upward.

13 – Removing the front underbody protection

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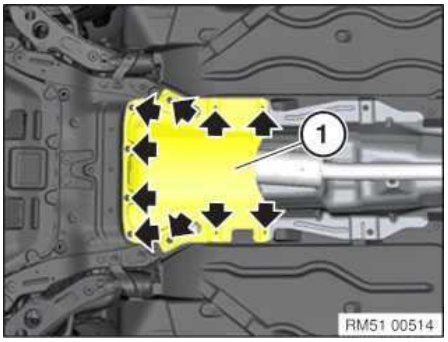


- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.



- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

14 – If installed: Removing rear underbody protection



- Remove screws (arrows).
- Remove the rear underbody protection (1).

15 – Draining coolant

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

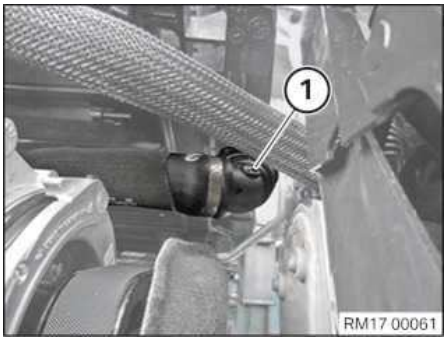
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

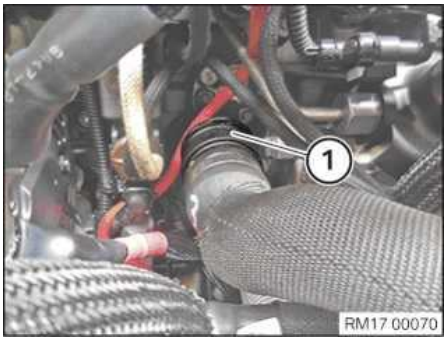
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- Loosen sealing cap (1).



- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.

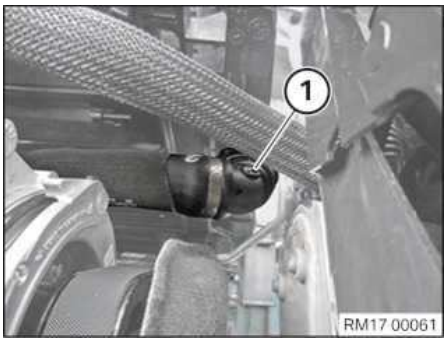


- Unlock the coolant line (1) and pull it off the connecting branch.
- Catch and dispose of escaping coolant.

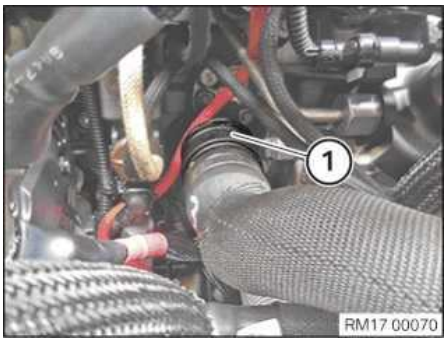
16 – Connect the coolant line

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



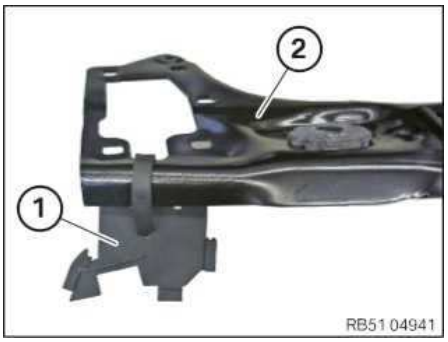
- Connect the right coolant line (1) to the radiator and lock audibly.



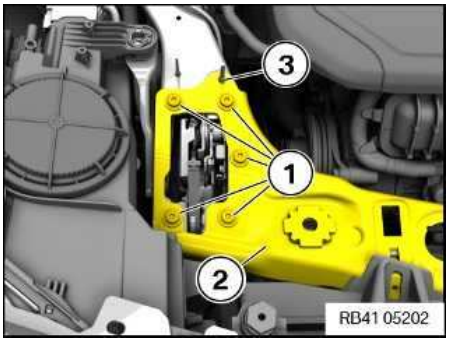
- Connect the coolant line (1) to the connecting branch and lock audibly.

17 – Install front cross connection

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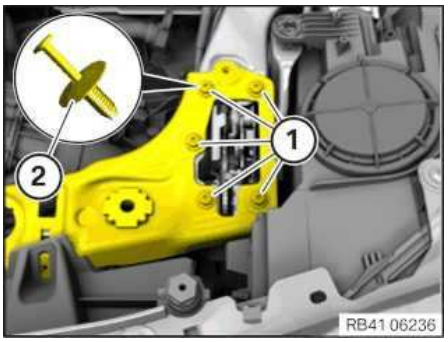
- Right side of vehicle only: Secure spray guard (1) on the cross connection (2) as pictured.



- Position front cross connection (2) and clip front cross connection (2) into the rubber retainer (3) at the same time.
- Tighten the screws (1).

Cross connection to carrier support

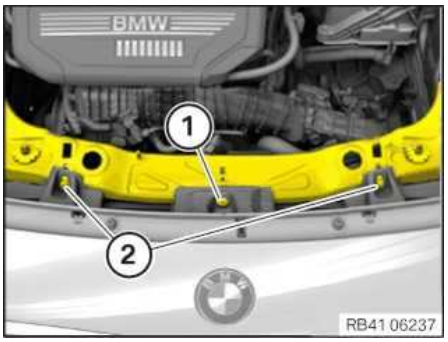
Screws M6x20		Tightening torque	11,8 Nm



- Tighten the screws (1).

Cross connection to carrier support

Screws M6x20		Tightening torque	11,8 Nm



- Position screws (3) on the rubber mounts for the radiator and tighten.

Screw connection for rubber mount of coolant radiator to coolant radiator

Bolt to rubber mount		Tightening torque	8 Nm

- Tighten down screws (2).

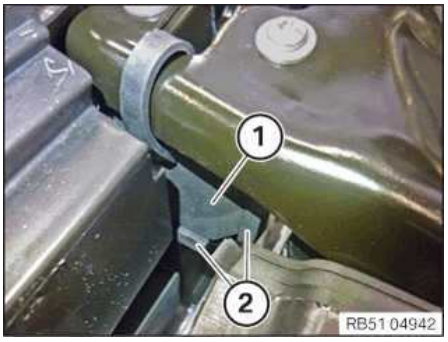
Air duct to upper connection

M6x20 screw		Tightening torque	11,8 Nm

- Tighten down screw (1).

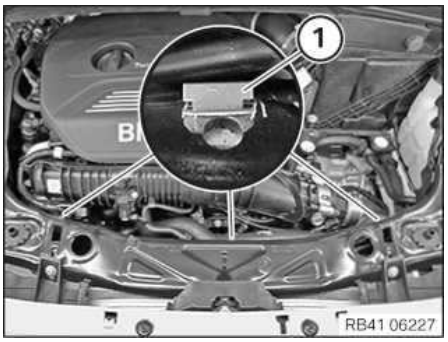
Bracing strut to upper connection

M8x20 screw		Tightening torque	28 Nm



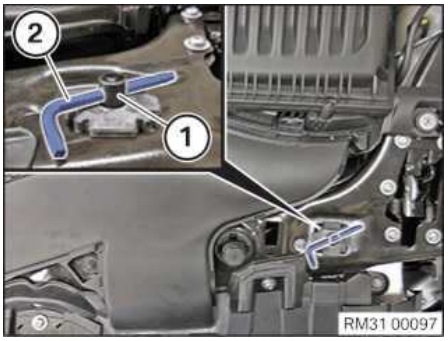
- Right side of vehicle only: Properly mount spray guard (1) to prevent corrosion.
- Secure spray guard (1) to the bridge with retaining tabs (2).

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- Fasten the clamps (1) from the Bowden cable of the bonnet lock on the cross connection.

18 – Securing radiator on left and right



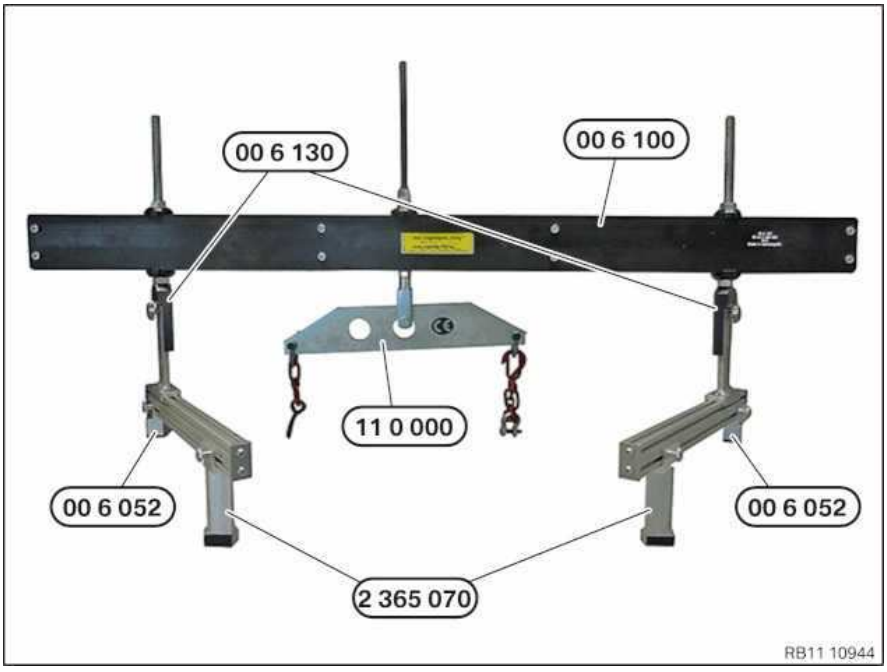
NOTICE

Perform the operations on the left and right side.

- Fasten radiator at centring pin (1) with suitable tool (2).

19 – Installing the engine bridge

Overview: Prepared engine bridge



Prerequisite

Front compartment lid is in service position.

CAUTION

Components connected to the engine joint or cross member.

Danger of injury!

- Check lifting eyes and engine mounting brackets for damage, e.g. cracks.
- Attach the component to correctly mounted engine joints or cross members only.
- Exclusively lift the component, do not move it forwards, backwards or in transverse direction.

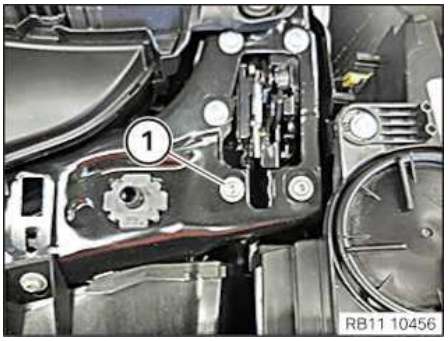
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- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

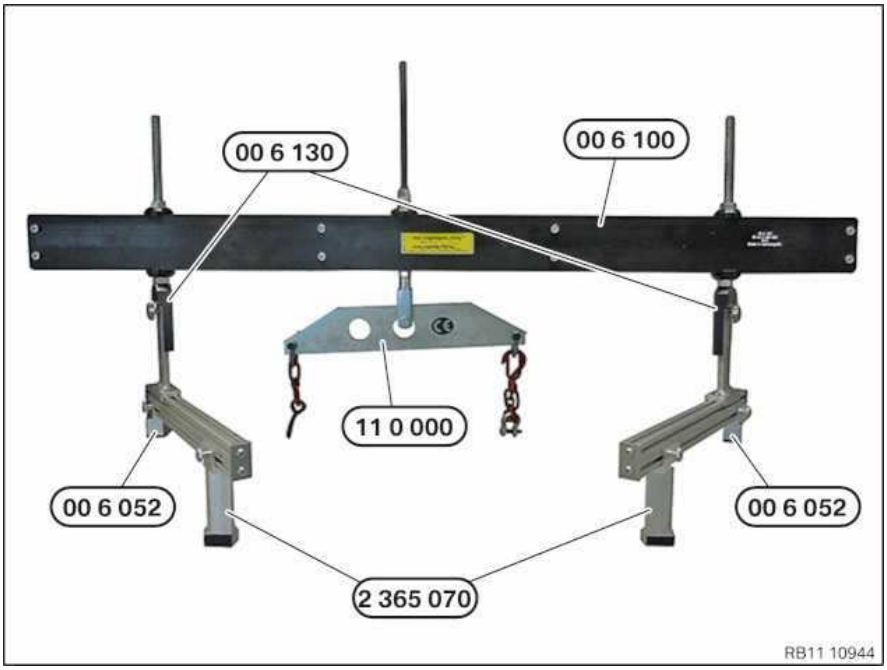
M8		Tightening torque	21,5 Nm



- Loosen screw (1) of the left bonnet catch.



- Loosen screw (1) of the right bonnet catch.



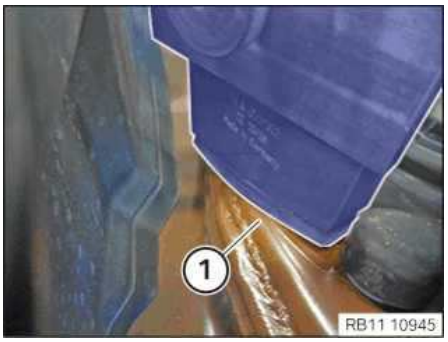
CAUTION

Heavy component.

Heavy components can lead to injury or damage.

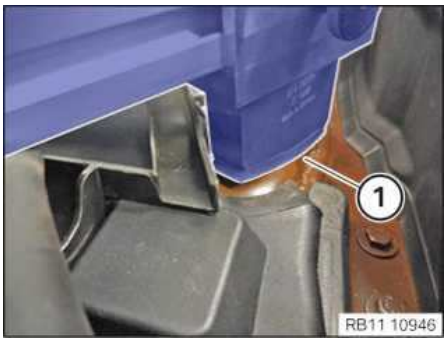
- Remove and install heavy components with the aid of another person/other persons.

- Set entire cross member **0 496 852 (00 6 100)** on the vehicle and position with the help of an auxiliary person.

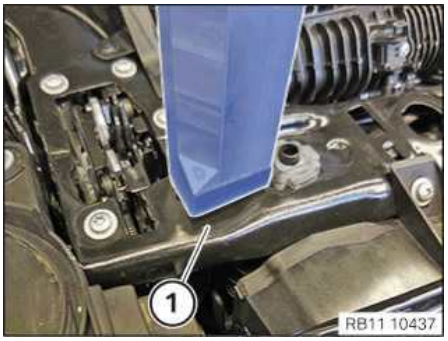


- Position the special tool at the rear mounting point (1) on the **right**.

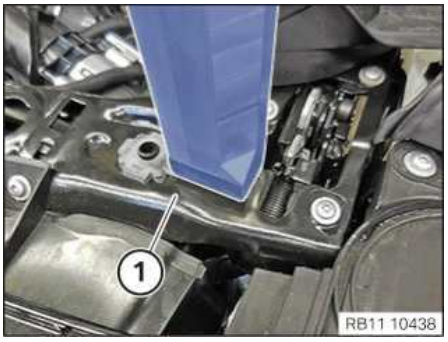
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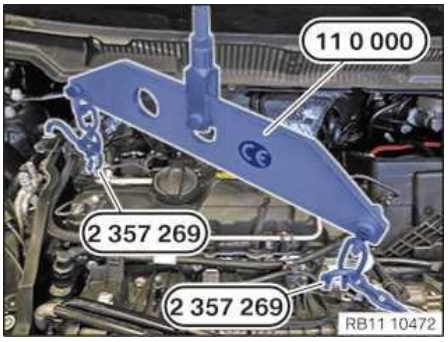
- Position the special tool at the rear mounting point (1) on the **left**.



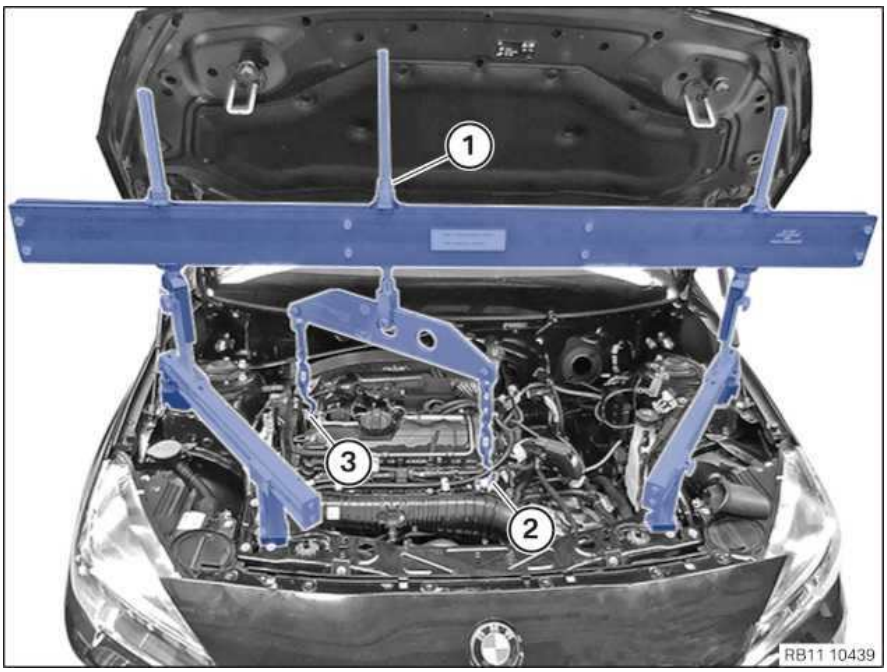
- Position the special tool at the front mounting point (1) on the **right**.



- Position the special tool at the front mounting point (1) on the **left**.



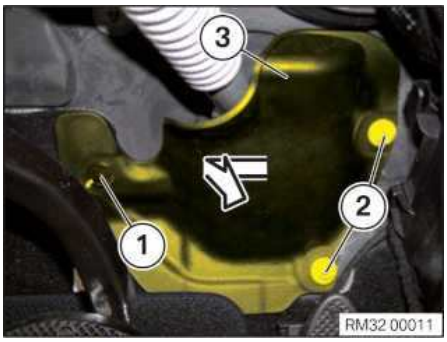
- Position special tool **0 490 561 (11 0 000)** above the engine.
- Attach special tools to the mounting lugs of the engine.



- Tighten side screws (2) and (3).
- Slightly pretension the spindle screw (1) of the engine support beams.
- Tighten down all adjusting screws, knurled screws and nuts on cross member **0 496 852 (00 6 100)** and on special tool .

20 – Releasing lower steering shaft from steering gear

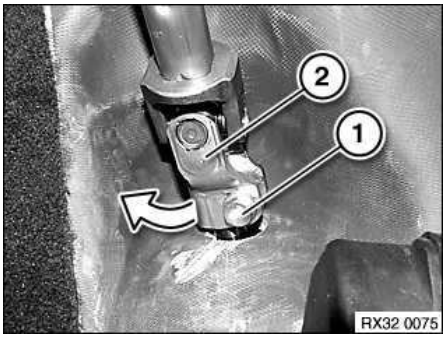
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- **If installed:**
- Unfasten nut (1).
- Unscrew the nuts (2) by 1 rotation.

  Do not remove the nuts (2) !
- Remove the cover (3) on the steering column in the direction of the arrow.

  The side footwell trim must not be disassembled!



- Loosen screw (1).
- Swivel out the universal joint (2) of the bottom steering shaft from the steering gear in the direction of the arrow.

21 – Removing both front wheels



▸ **Removing the wheel**

- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Unscrew the wheel bolts (arrows) and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

22 – Removing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

▸ **Remove the front wheel arch trim**

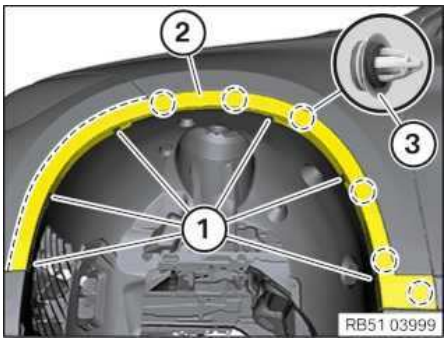
NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

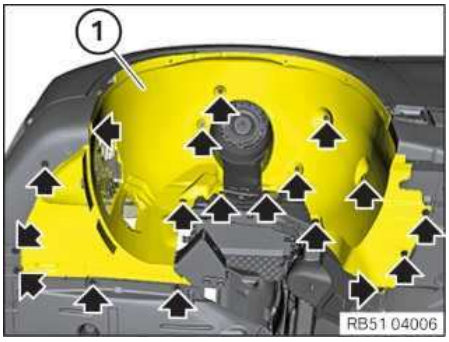
Description is for left component only. Procedure on the right side is identical.

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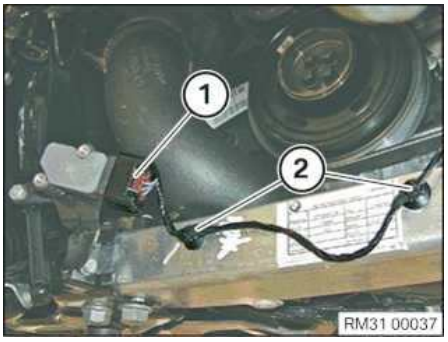
- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.

▸ **Remove front wheel arch cover**



- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

23 – With right installation: Detaching ride height sensor cable



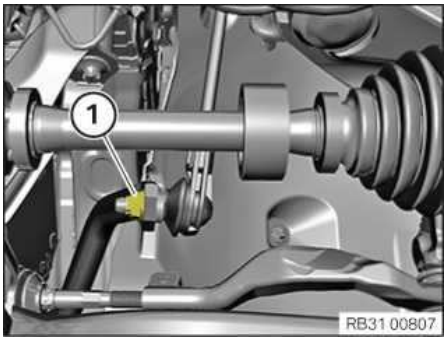
- Unlock plug connection (1) and disconnect.
- Release cable clip (2) from deformation element adapter.

24 – Releasing anti-roll bar on left and right from anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▸ **Detach the anti-roll bar from the anti-roll bar link**



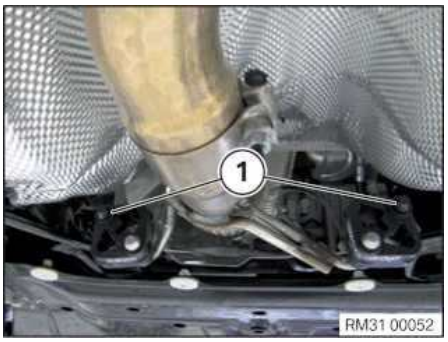
- Unfasten nut (1).

Note: Use the Torx socket for counter support.

- Loosen the anti-roll bar link from the anti-roll bar .

25 – Detaching rubber mount from front axle support

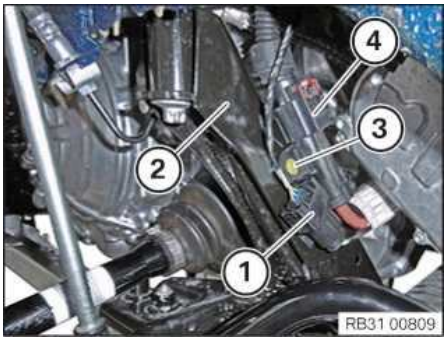
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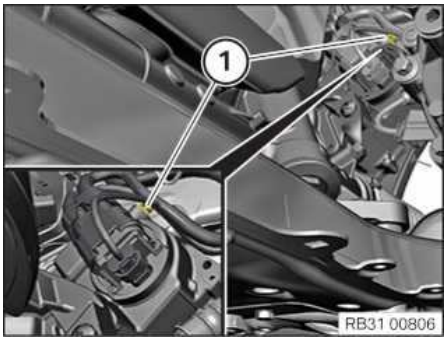
- Spray rubber mount (1) with lubricant and release from holder on front axle support.

26 – Disconnecting plug connections from steering gear

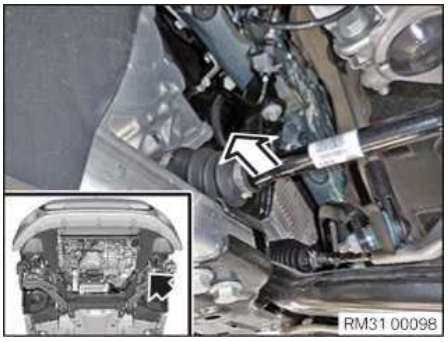
▶ **If installed: Detach connectors from the front axle carrier**



- Release the plug connection (1) from the front axle support (2).
- Loosen screw (3).
- Release the plug connection (4) from the front axle support (2).

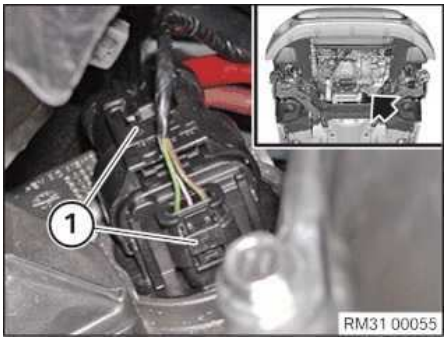


- Disconnect wiring harness (1) from steering gear.



- To unlock the plug connections (see the following work step): unlock plug connections (arrow) with the right hand.

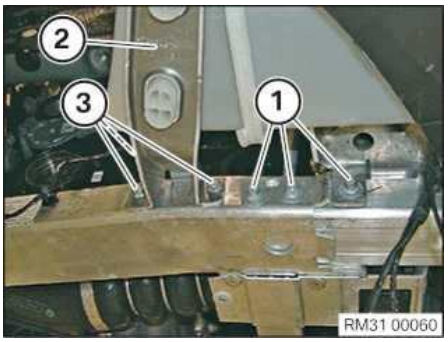
  The plug connections can be reached via the left-hand output shaft.



- Unlock plug connections (arrow) (1)and disconnect from the steering gear.
- Make sure when lowering the front axle that the cables are not damaged!

27 – Releasing the mounted part from the front axle support

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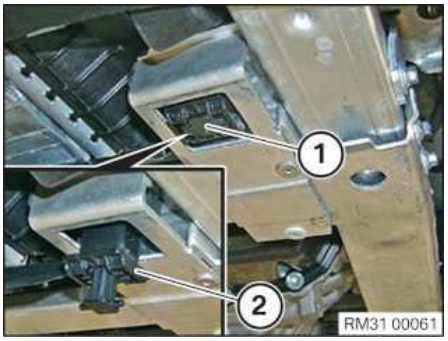


- **Only on right side:** Loosen screws (3) and remove holder for washer fluid reservoir (2).

NOTICE

Perform the operations on the left and right side.

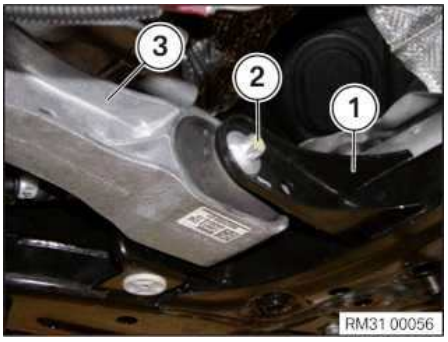
- Loosen screws (1).



NOTICE

Perform the operations on the left and right side.

- Unlock safety catch (1) of the lock (2) from the holder for the charge air cooler.
- Completely remove locks (2).



- Loosen screw (2) of the engine support (3) on the front axle (1).

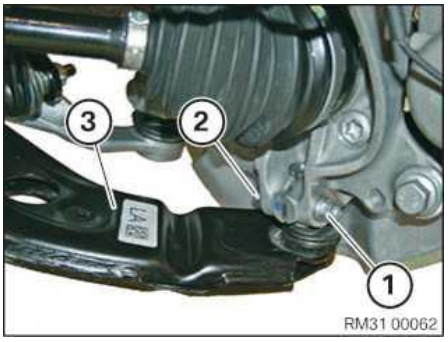


NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

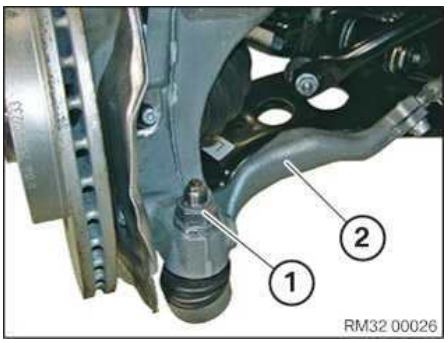
28 – Detaching and removing front axle completely



NOTICE

Perform the operations on the left and right side.

- Unfasten nut (1).
- (2)Pull out screw.
- Detach the wishbone (3) from the swivel bearing .

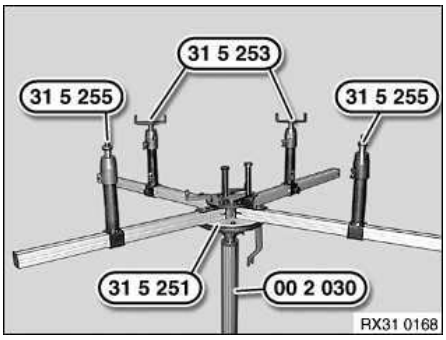


NOTICE

Perform the operations on the left and right side.

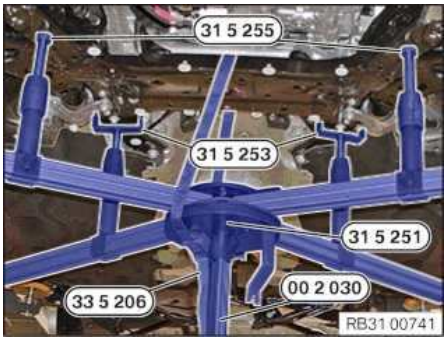
- Unfasten nut (1).
- Detach the track rod (2) from the swivel bearing.

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- Fit the special tool completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools in telescopic supports of a profile rail pair.
- Insert special tools in telescopic supports of other profile rail pair.

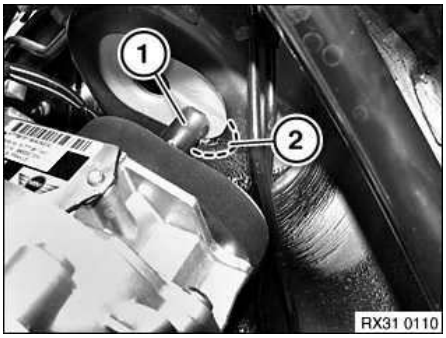
Note: In a profile rail pair, two profile rails are connected to one another by gearing.



- Align special tools and to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool to special tool .

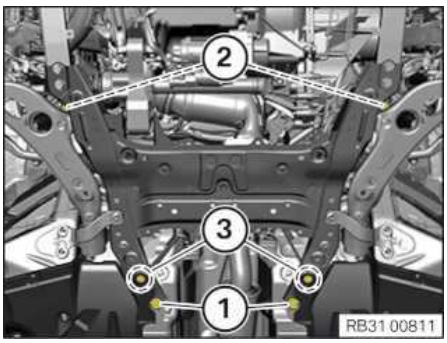


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and remove the front axle.

TECHNICAL INFORMATION

Note the information on thread repairs using Helicoil thread inserts.
For more information see: 41 00 ... Notes on repairing threads

- Check threads for damage; if necessary, repair with Helicoil thread inserts.

29 – Removing starter motor

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and loosen connector (1).
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).



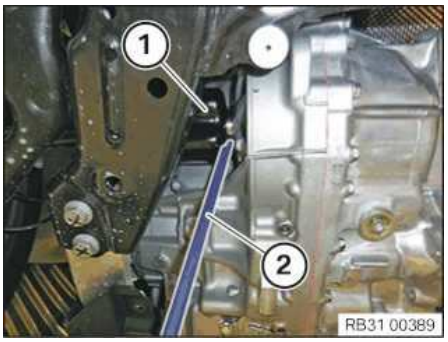
- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.



- Loosen screws (1).
- Feed out starter motor and remove.

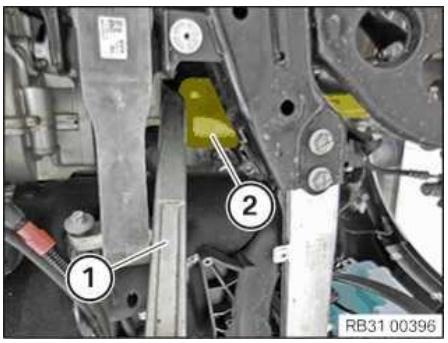
30 – Partially removing the left output shaft

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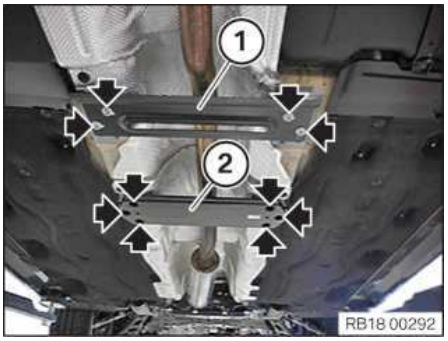
- Protect the output shaft (1) from falling.
- Lever out the output shaft (1) with a mounting lever (2) from the transmission.
- Tie up output shaft (1).

31 – Partially removing right output shaft



- Lever out the output shaft (2) with a mounting lever (1).
- Tie up output shaft (1).

32 – Removing the connecting support from the tunnel in front and back

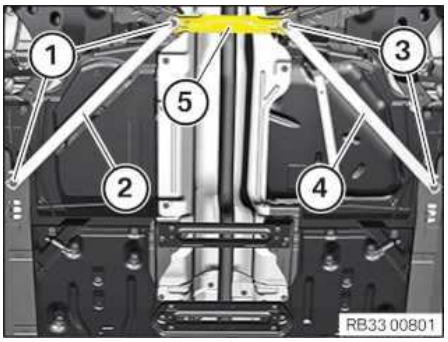


- Unscrew the bolts (arrows) from the connecting support (1).
- Feed out and remove the crossbeam (1).
- Unscrew the bolts (arrows) from the connecting support (2).
- Feed out and remove the crossbeam (2).

33 – Remove the cross strut with the torsion strut

TECHNICAL INFORMATION

Driving without a torsion strut is not permitted.



- Loosen screws (1).
- Thread out torsion strut (2) at left and remove.
- Loosen screws (3).
- Thread out torsion strut (4) at right and remove.
- Feed out and remove the cross-member (5).

34 – Remove exhaust system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

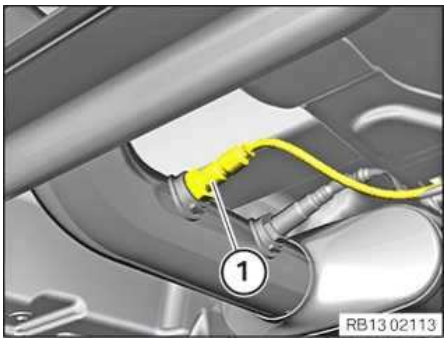
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CAUTION

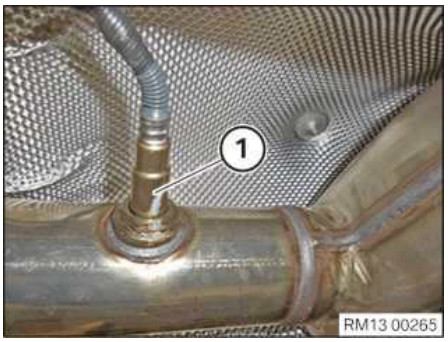
Heavy component.

Heavy components can lead to injury or damage.

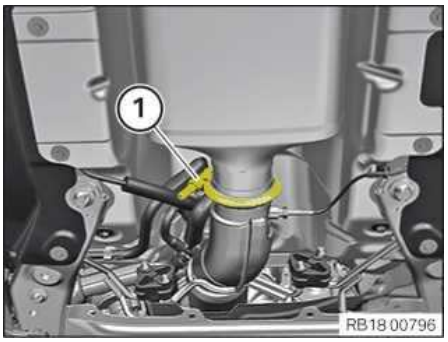
- Remove and install heavy components with the aid of another person/other persons.



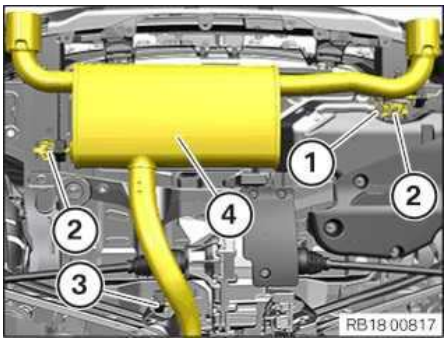
- Release the nitrogen oxide sensor (1) downstream of the SCR catalytic converter, guide it out and set it aside.



- Release the diesel particulate sensor (1), guide it out and set it aside.

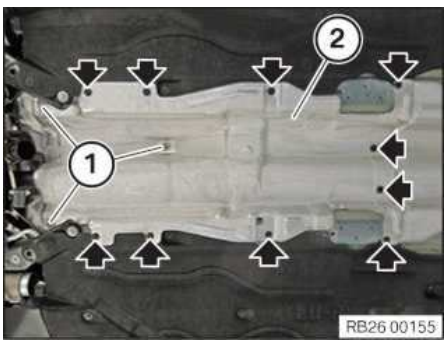


- Loosen V-band clamp (1).



- Loosen screw (1).
- Loosen nuts (2).
- Release the rubber mount (3) of the exhaust system (4).
- Lower and guide out the exhaust system (4) with assistance of a second person and remove it.

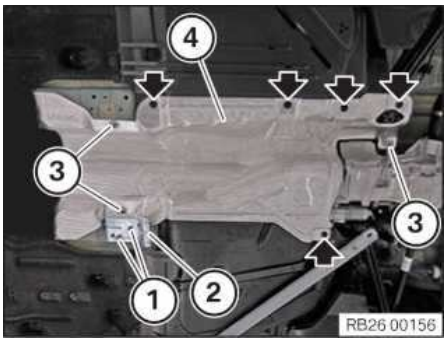
35 – Remove front heat shield



- Remove screws (arrows).
- Loosen nuts (1).
- Guide the heat shield (2) out and remove it.

36 – Remove heat shield at rear.

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- Loosen screws (1).
- Guide out and remove holder (2).
- Remove screws (arrows).
- Loosen nuts (3).
- Guide the heat shield (4) out and remove it.

37 – Remove propeller shaft

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

RISK OF DAMAGE

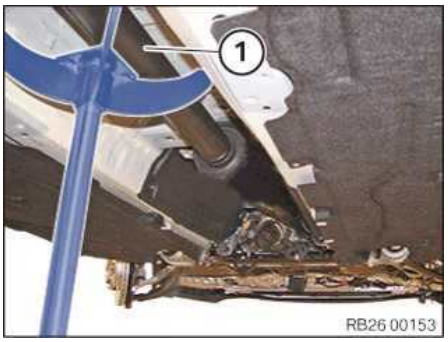
Damage to propeller shaft during removal.

Non-observance of the removal guidelines for the propeller shaft on the rear axle differential may cause severe damage.

- Do not disassemble the three-hole flange, flexible disc and propeller shaft. The three-hole flange to the rear axle differential is balanced with the flexible disc and propeller shaft.
- Loosen the recessed nut against the direction of travel in clockwise direction. The propeller shaft must be loosened on the recessed nut only and exclusively in the direction of rotation otherwise the anti-twist lock of the bi-hexagonal flange nut is damaged.
- In the event of a damaged anti-twist lock on the bi-hexagonal flange nut: Replace the rear axle differential.



- Install the special too l between the front and rear propeller shaft.
- Make sure that the arrows on the special tool point forward in the direction of travel.

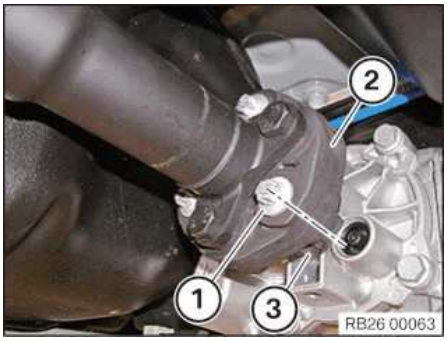


- Always support the propeller shaft (1) with a conventional jack.

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- Protect the propeller shaft (1) with the special tools **0 495 554 (33 5 070)** and from twisting.



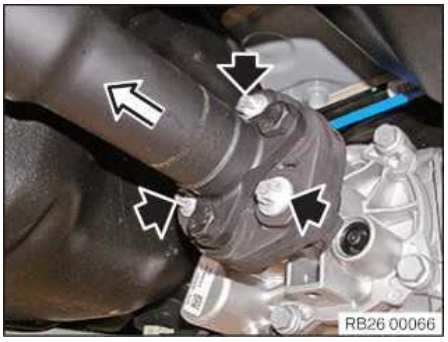
TECHNICAL INFORMATION

Compliance with the following instructions is required to avoid a humming noise from the propeller shaft after refitting the propeller shaft.

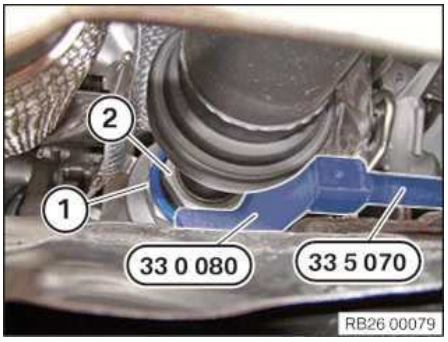
- Mark the installation position of the screw connection (1), the flexible disc (2) and the three-hole flange (3) on the same level.
- Loosen the screw connection (1).



- Loosen screws (1).



- Remove screws (arrows).
- Guide the propeller shaft out in the direction of the arrow and set it aside.



RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.

- Protect the recessed nut (2) on the transfer box from twisting with the special tools **0 495 554 (33 5 070)** and .

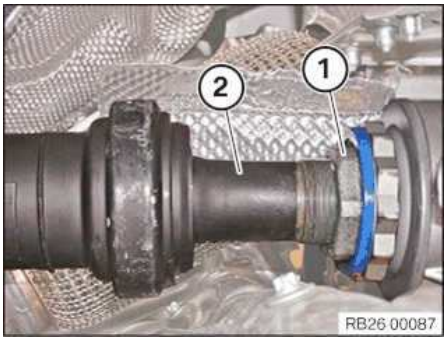
  The recessed nut (2) on the transfer box must **not** be used to detach the propeller shaft.

  The double hexagon flange nut (1) must **not** be used for counter support.

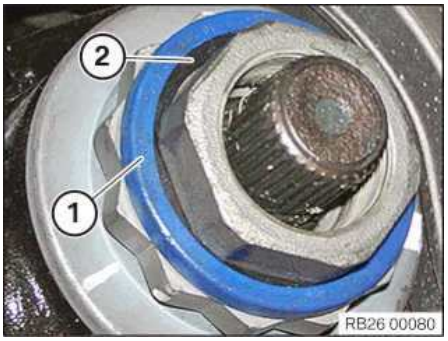
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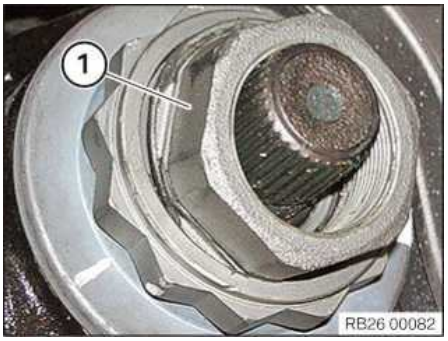
- Release the front propeller shaft with the special tools **0 495 554 (33 5 070)** and in the direction of the arrow.



- Thread the propeller shaft (2) out of the recessed nut (1) and remove.

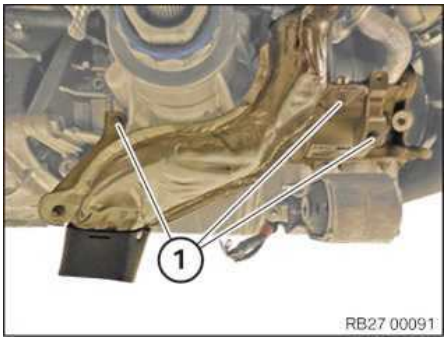


- Thread the retaining clip (1) and the seal (2) out and remove.

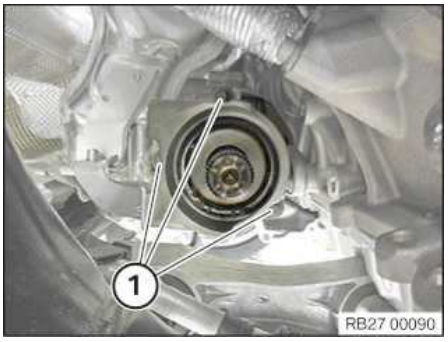


- Thread out and remove the recessed nut (1).

38 – Remove the intermediate shaft with the support tube

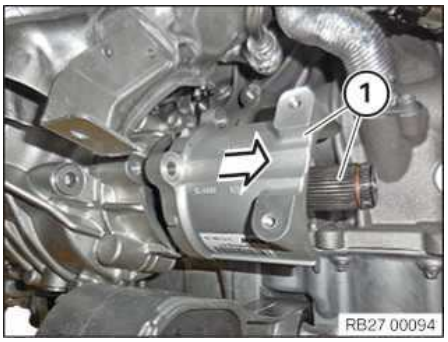


- With air duct installation: Loosen screws (1).
- Remove air duct



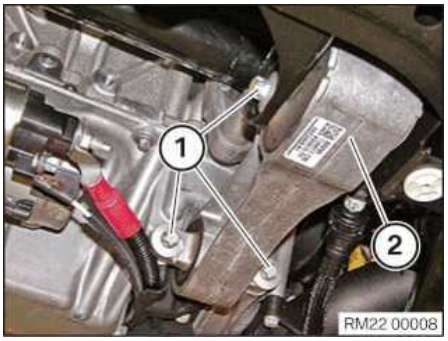
- Loosen screws (1).

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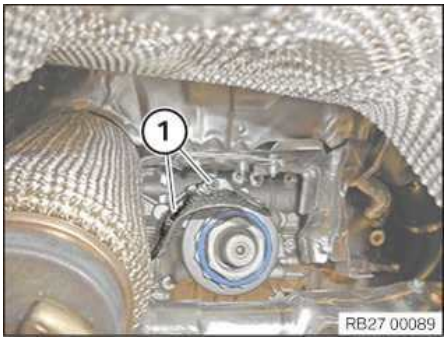
- Pull the intermediate shaft with the support tube (1) out of the transfer box.

39 – Remove bracket with rubber mount

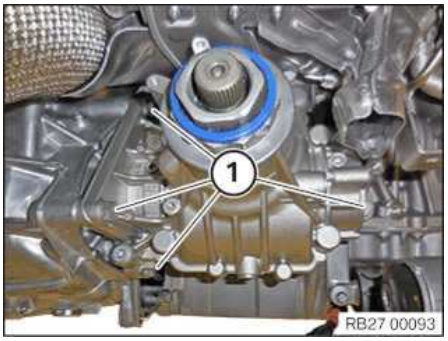


- Release screws (1) and remove holder (2) with rubber mount.

40 – Remove transfer box (VTG)



- Loosen screws (1).
- Remove heat shield.



- Loosen screws (1).
- Remove the transfer box (VTG).

41 – Remove the automatic transmission (AISIN GA8G45)

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

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RISK OF DAMAGE

Damage to the engine block.

Damaged and corroded bolts will lead to major damage in the engine block and the transmission.

- It is imperative that protruding threads of the transmission bolts are checked for corrosion and damage prior to removal.
- It is imperative that all rust is removed from corroded threads and that they are cleaned prior to removal.
- Renew rusted and damaged bolts.

▸ **Remove electronics box**

Prerequisite

Battery earth lead is disconnected.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

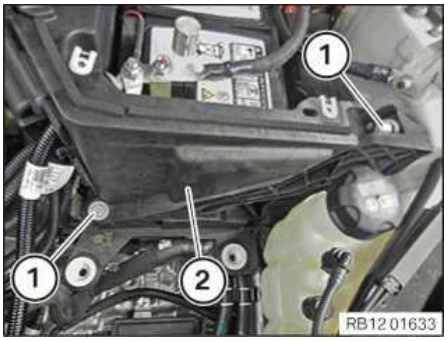
TECHNICAL INFORMATION

Follow instructions for removing and installing control units.

For additional information see: 12 00 ... Notes on removal and installation of control units

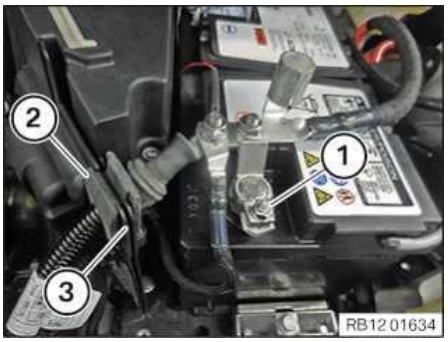
TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.

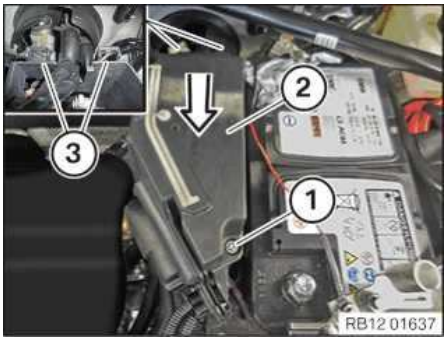


- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.

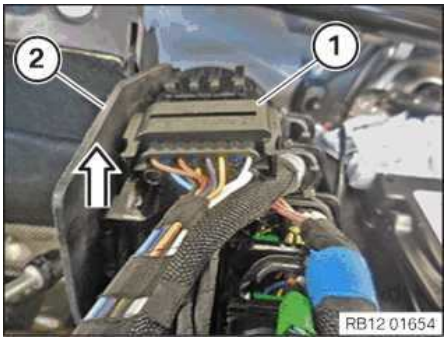
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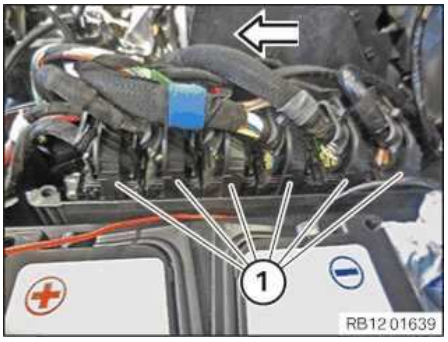
- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



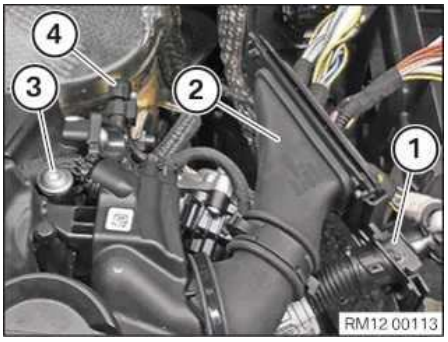
- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).



- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

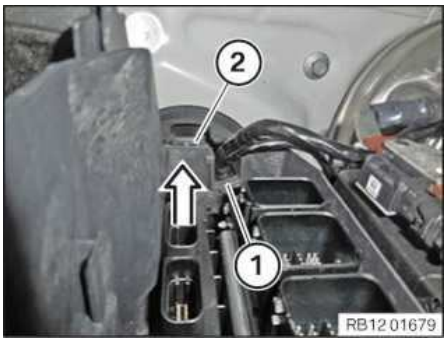


- Unlock and loosen connector (1).

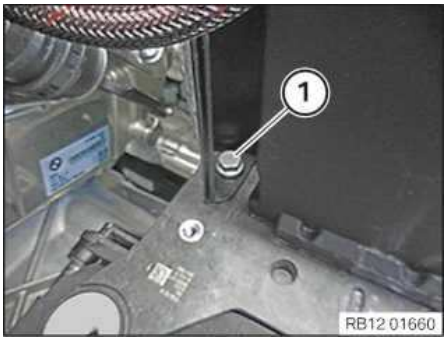


- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.

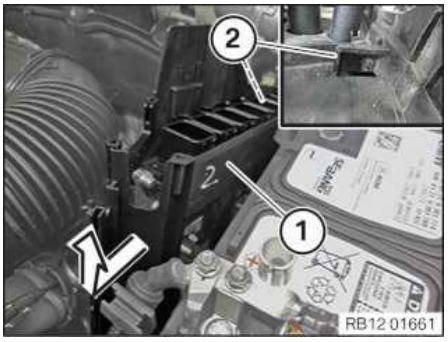
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- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.



- Loosen screw (1).



- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

▶ **Removing integrated supply module (PDM)**

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

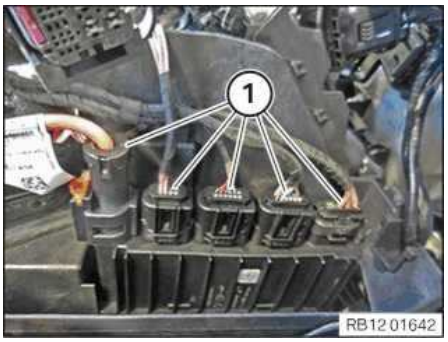
RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

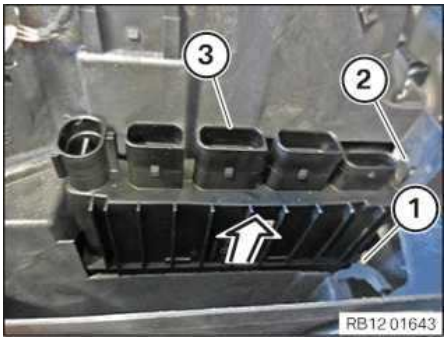
Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

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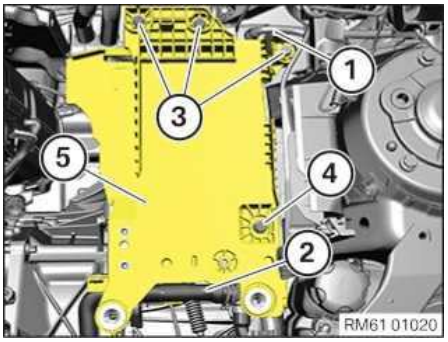


- Unlock and disconnect the plug connection (1).

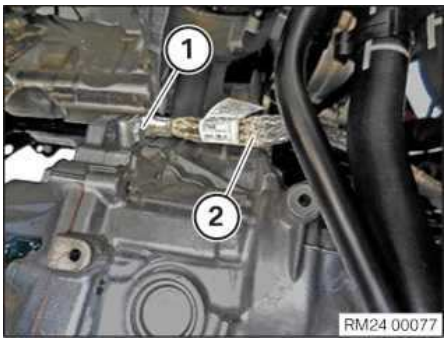


- Disengage locks (1) and (2).
- Guide out and remove the integrated supply module (3) in the direction of the arrow.

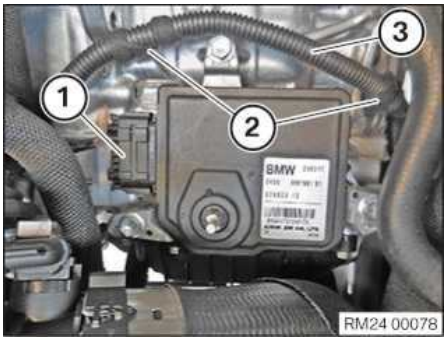
▶ **Remove battery holder**



- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

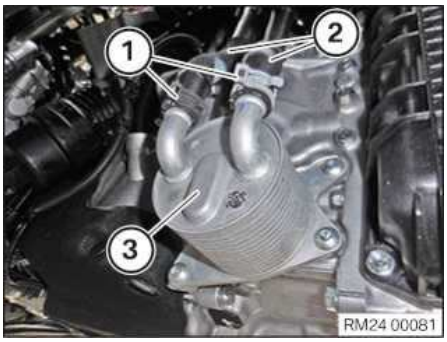


- Loosen screw (1).
- Detach the ground strap (2) from the transmission and set it aside.



- Unlock plug connection (1) and disconnect.
- Detach the clamps (2) with the wiring harness (3) from the transmission and set it aside.

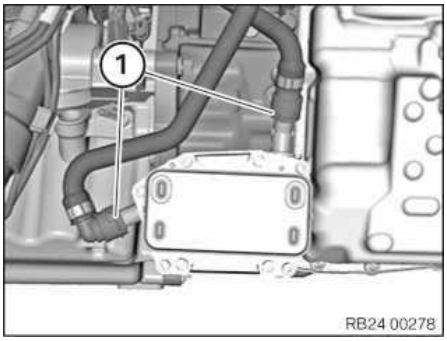
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TECHNICAL INFORMATION

The figure shows transmission oil cooler on vehicles with the B47 engine.

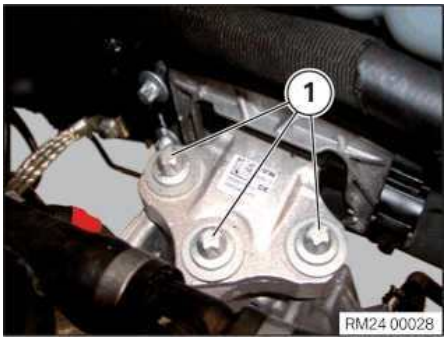
- Unfasten hose clamps (1).
- Disconnect coolant hoses (2) from transmission oil cooler (3).
- Catch and dispose of escaping coolant.



TECHNICAL INFORMATION

The figure shows transmission oil cooler on vehicles with the B48O engine.

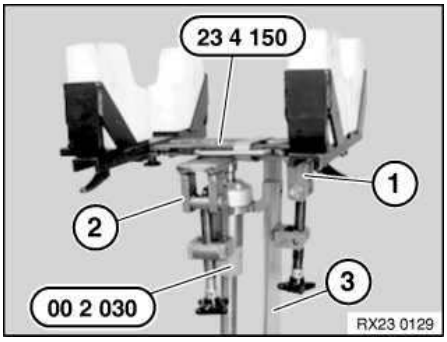
- Release locks (1).
- Disconnect coolant hoses from transmission oil cooler.
- Catch and dispose of escaping coolant.



- Loosen screws (1).



- Turn the engine using the special tool **0 493 380 (11 6 480)** on the vibration damper in the direction of rotation.
- Unscrew the nut (1) of the torque converter.
- Crank engine further and release remaining 5 nuts.



- Support the transmission using special tools **0 490 133 (00 2 030)** and .
- Secure the transmission with the tensioning strap (3).



- Unscrew the bolts (arrows) and remove the transmission.

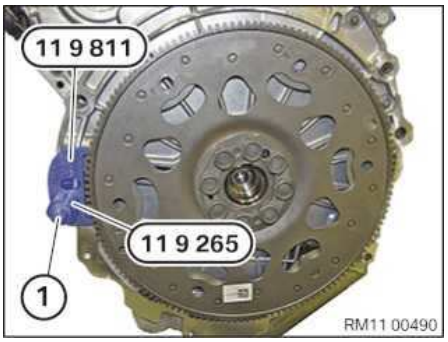
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CAUTION

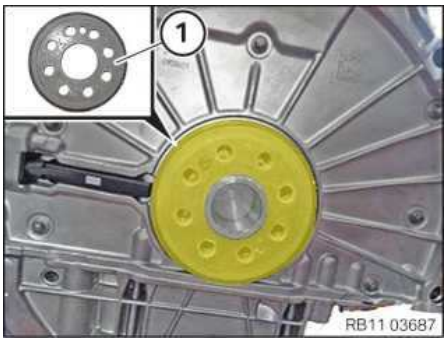
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Secure flywheel with a transmission bolt (1) and the special tools **0 496 171 (11 9 811)** and **0 494 793 (11 9 265)**.
- Unfasten flywheel bolts.
- Remove flywheel.



RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Remove the increment wheel (1) from the crankshaft and set correctly.

MAIN WORK

43 – Removing the rear crankshaft seal

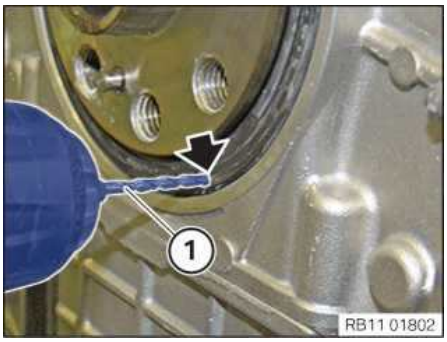
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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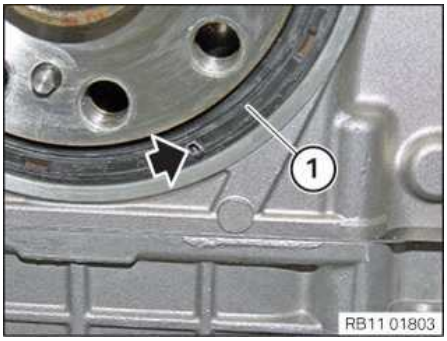
RISK OF DAMAGE

Damage due to swarf.

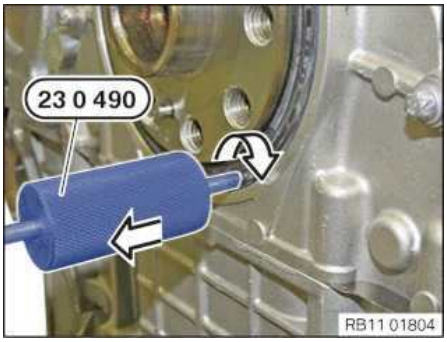
Contamination can lead to malfunctions and damage.

- Cover working area.
- Draw off swarf during drilling using a vacuum cleaner.

- Drill a hole (arrow) into the crankshaft seal with using a 2.5 mm drill (1).
- Do not remove swarf with compressed air!



- Remove swarf in the bore hole (arrow) on the crankshaft sealing ring (1).



- Screw in special tool **0 491 454 (23 0 490)** in direction of arrow.
- Drive out crankshaft seal with the impact weight in direction of arrow.

44 – Installing the rear crankshaft seal

RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) on the radial shaft seal with the sharp-edged connector gearing of the output shaft will result in destruction and/or leaks.

- When inserting the output shaft, make sure that the connector gearing of the output shaft does not touch the sealing lip (inner) of the radial shaft seal.

RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) and applying oil to the radial shaft seal will lead to its destruction.

- Do not touch the sealing lip (inner) of the radial shaft seal.
- Do not apply oil to the radial shaft seal.
- Install the radial shaft seal dry.

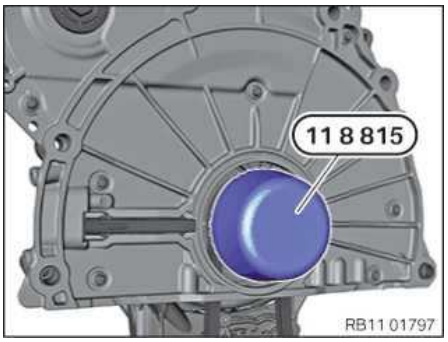
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RISK OF DAMAGE

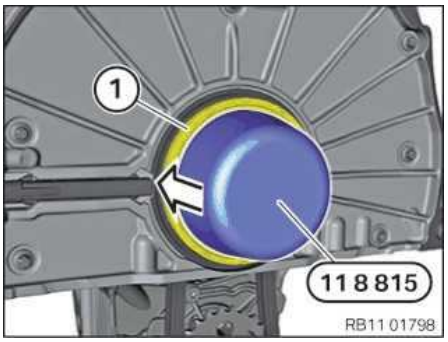
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Position special tool **0 496 137 (11 8 815)** on crankshaft. Make sure that the crankshaft sensor is not damaged.



- Fit the crankshaft seal (1) up to the timing case cover in the direction of the arrow using special tool **0 496 137 (11 8 815)** and position.
- Remove special tool **0 496 137 (11 8 815)**.



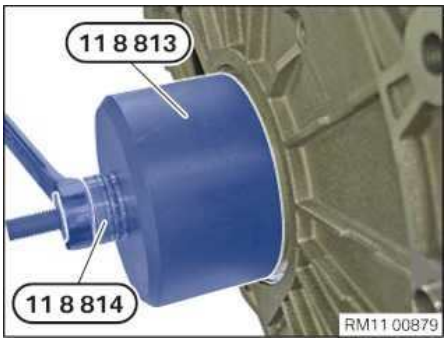
- Secure special tool **0 496 133 (11 8 811)** to the crankshaft using special tool **0 496 134 (11 8 812)**.



- Check the freedom of movement between the special tool **0 496 135 (11 8 813)** and the crankshaft sensor during installation.

  Otherwise there is a risk that the crankshaft sensor will be damaged.
- Slide on special tool **0 496 135 (11 8 813)**.
- Screw down special tool **0 496 136 (11 8 814)**.

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- Press in crankshaft seal with special tool **0 496 135 (11 8 813)**.
- Screw in special tool **0 496 135 (11 8 813)** up to timing case cover.

POSTPROCESSES

45 – Installing the flywheel

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

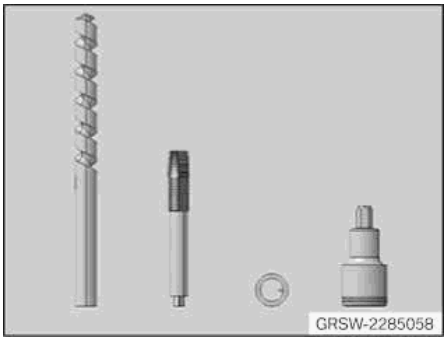


- Check fitting sleeve on the crankshaft for damage and replace if necessary.

TECHNICAL INFORMATION

Clean all threads with a screw tap.

- Clean all the screw threads (1).



- Use the set of special tools **2 285 058**.

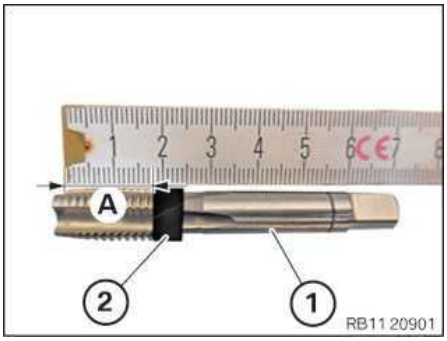
Description
Twist drill
Thread cutter M12x1.5
Depth
Insertion tool

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- Assemble tool set.

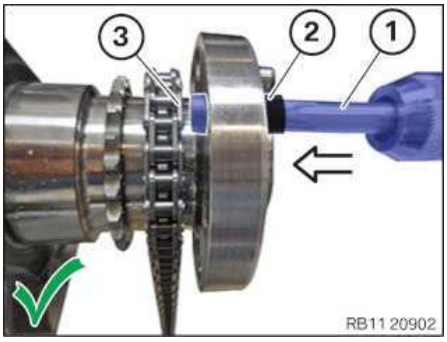
Number	Description
1	Tool holder
2	Thread cutter M12X1,5



- Mark the installation dimension (A) on thread cutter (1) from the set of special tools **2 285 058** using a commonly-available tool (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm



NOTICE

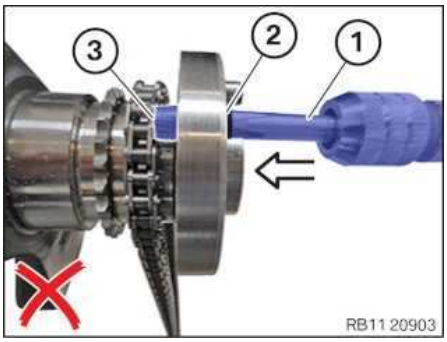
To provide a better overview: Shown with engine removed.

- Screw in the thread cutter (1) from the set of special tools **2 285 058** in direction of arrow up to the installation dimension (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm

- Make sure that the thread cutter does (1) **not** rest on the timing chain (3).

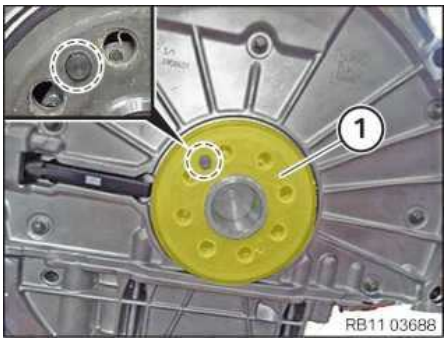


TECHNICAL INFORMATION

- **Carefully** handle the timing chain, to protect the timing chain and timing chain drive against damage.

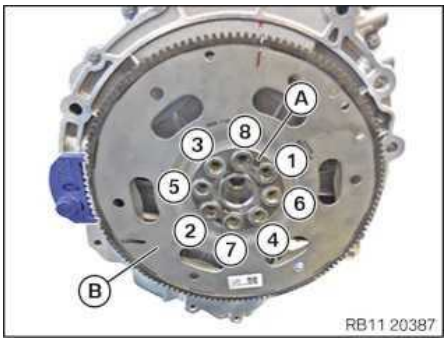
- Make sure the installation dimension (2) of the screw bore (1) is not exceeded.

  The thread cutter (1) may not rest on the timing chain (3).



- Important! Observe the marking shown during installation.
- Install special tool (1) on the crankshaft as shown.

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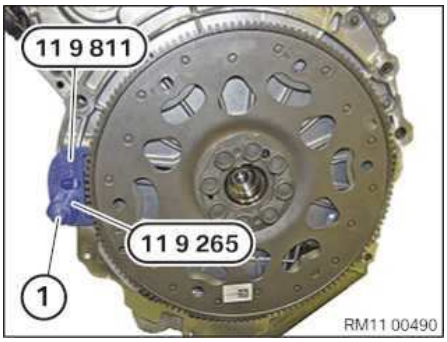


- Position flywheel (B) .
- Renew flywheel bolts (1) to (8).

  Parts: Flywheel bolts
- Screw in flywheel bolt (1) to (8) by hand.
- Observe tightening sequence. Begin at the dowel pin (A).
- Tighten flywheel bolts in sequence (1) to (8).

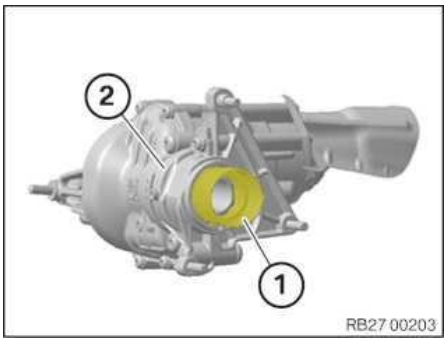
Flywheel to crankshaft

M12x1.5	Renew screws.	Tightening torque	120 Nm



- Loosen the transmission bolt (1).
- Guide out and remove the special tool **0 494 793 (11 9 265)** and **0 496 171 (11 9 811)** with the **standard** washer (5 mm).

46 – Install the transfer box (VTG)



- If intermediate shaft (1) gets caught on transfer box (VTG) (2), renew intermediate shaft (1) and the radial shaft seals in the automatic or manual transmission.



- Screw special tool **2 409 025** into the outer radial shaft seal.
- Turn the screw on the special tool **2 409 025** until the outer radial shaft seal has been pulled out.

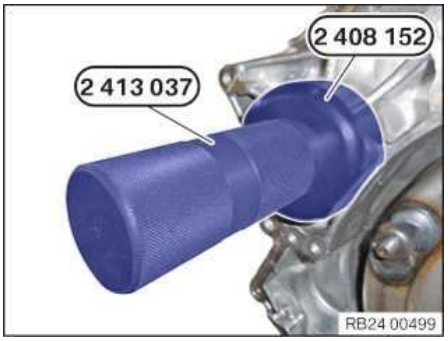


- Insert special tool **2 411 739** into the inner radial shaft seal.

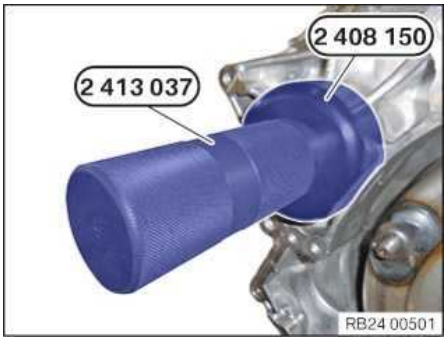
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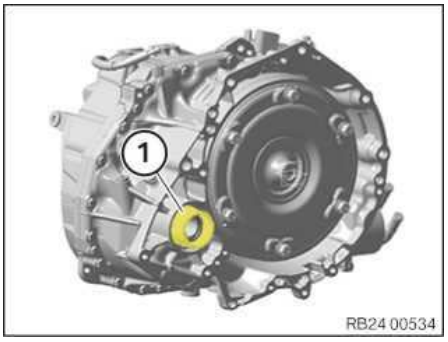
- Screw special tool **2 411 739** into the inner radial shaft seal.
- Turn the screw on the special tool **2 411 739** until the inner radial shaft seal has been pulled out.



- Drive in the inner radial shaft seal using special tools **2 408 152** and **2 413 037** up to the limit position.



- Drive in the outer radial shaft seal using special tools **2 413 037** and **2 408 150** up to the limit position.



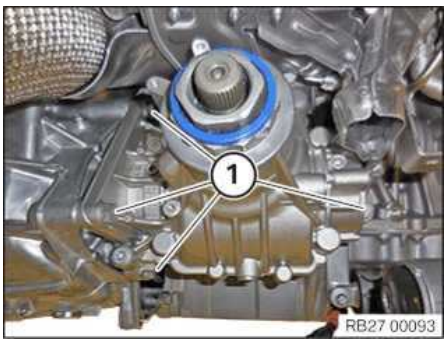
- If necessary, connect the new intermediate shaft (1) to the output flange of the automatic transmission or manual transmission.



- Coat the inside of the output flange (arrows) evenly with approx. 5 g of grease.

Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the transfer box (VTG).
- Tighten the screws (1).

Transfer box to transmission

M10		Tightening torque	56 Nm

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- Install heat shield.
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Heat shield to transfer box

M6	Renew screws.	Tightening torque	6 Nm

▸ **Check the transfer box oil level**

RISK OF DAMAGE

Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.



- Check transfer case oil level, correct:
- Open the oil filler plug (1).
- Check transfer box oil level.
- If necessary, top up transmission oil up to the lower edge of the oil filler plug opening (1).

Transmission oil

Technically suitable transfer box and electrical transmission oils	

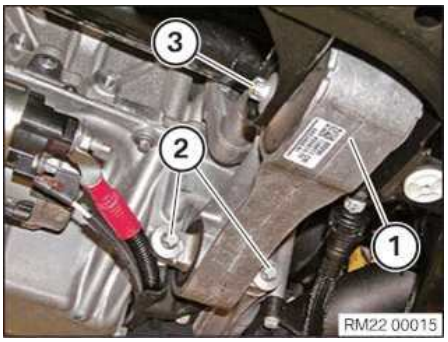
Main group 27

- Tighten the oil filler plug (1).

Oil filler plug on transfer box (VTG)

M18x1.5		Tightening torque	35 Nm

47 – Install the holder with rubber mount



- Install holder (1) with rubber mount.
- Tighten down screw (3).

Holder with rubber mount to front axle support

M12		Tightening torque	100 Nm

- Tighten down screws (2).

Holder with rubber mount to oil sump

M12		Tightening torque	100 Nm

48 – Install the intermediate shaft with the support tube

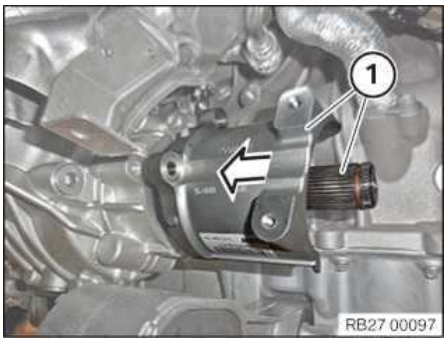


- Coat gearing of the intermediate shaft uniformly with 5 g of grease.

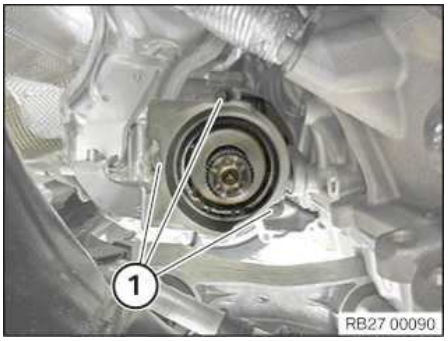
Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754

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- Install the intermediate shaft with support tube (1) in the transfer box.



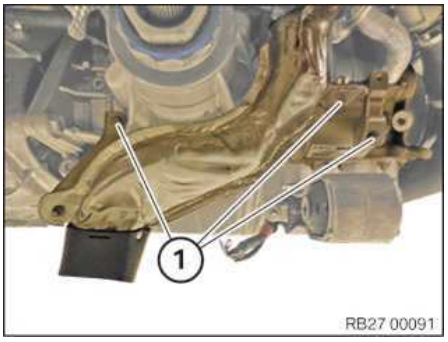
- Position screws (1).

Note: Check for correct screw length! Bolt M8x35 8.8

- Tighten the screws (1).

Intermediate shaft to transfer box

M8x35		Tightening torque	19 Nm



- If installed: Install air duct.
- Tighten the screws (1).

49 – Install propeller shaft.

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

RISK OF DAMAGE

Damage to the propeller shaft during installation.

Non-observance of the installation guidelines for the propeller shaft on the rear axle differential may cause severe damage.

- Always renew the recessed nut on the rear axle differential. Screw locking must be available.
- Strictly observe a minimum hardening time of two hours after having screwed in the recessed nut. The hardening time may be longer at lower temperatures.

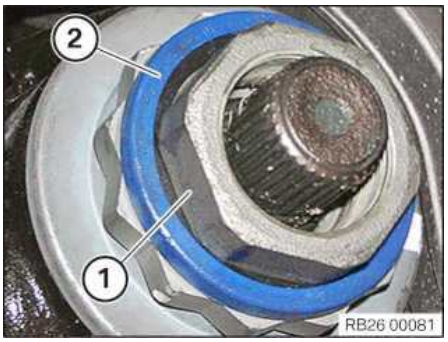
RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.

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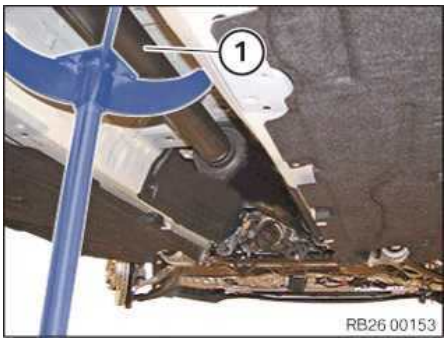


- Renew recessed nut (1).

  Parts: Insert nut
- Renew the retaining clip (2) and the seal.

  Parts: Retaining clip, seal
- Insert the seal with the recessed nut (1) and install.
- Insert the retaining clip (2) and install.
- Make sure that recessed nut (1) is screwed in within 5 min.
- Make sure that the hardening time of **minimum** 2 h for the recessed nut is observed.

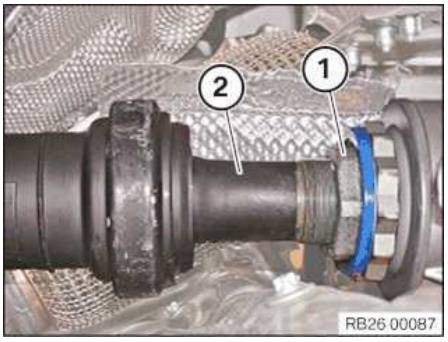
  The hardening time must be extended at lower temperatures.



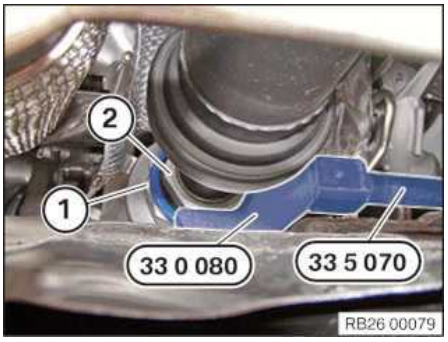
- Insert the propeller shaft (1) and install.
- Always support the propeller shaft (1) with a conventional jack.



- Hand-tighten the bolts (1).



- Push the propeller shaft (2) against the recessed nut (1) up to the limit position.
- Screw the propeller shaft (2) at least 2 thread starts onto the recessed nut (1) by hand.



RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

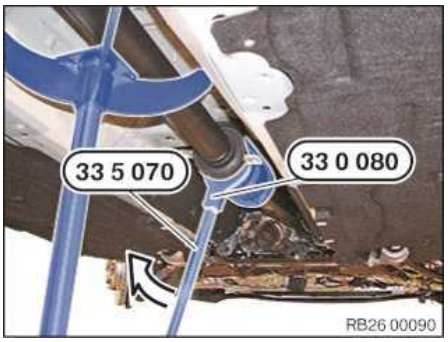
- Do not use the double hexagon head flange nut as counter support.

- Protect the recessed nut (2) on the transfer box from twisting with the special tools **0 495 554 (33 5 070)** and .

  The recessed nut (2) on the transfer box must **not** be used to tighten the propeller shaft.

  The double hexagon flange nut (1) must **not** be used for counter support.

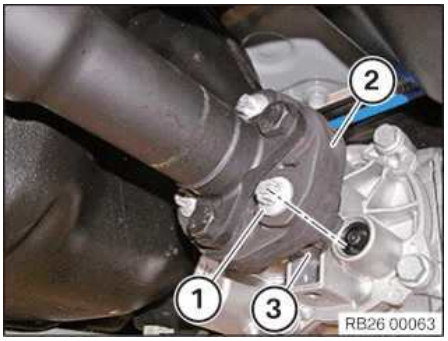
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- Tighten the front propeller shaft with the special tools **0 495 554 (33 5 070)** and in the direction of the arrow.

Propeller shaft to transfer box

		Tightening torque	80 Nm



TECHNICAL INFORMATION

Compliance with the following instructions is required to avoid a humming noise from the propeller shaft after refitting the propeller shaft.

- Assemble the screw connection (1) of the flexible disc (2) and the three-hole flange (3) according to the mark.
- Renew screws (1).

  Parts: Bolts
- Hand-tighten the bolts (1).



- Protect the propeller shaft (1) with the special tools **0 495 554 (33 5 070)** and from twisting.



- Tighten the bolts with the special tools **0 490 504 (00 9 120)** and .

Flexible disc to rear axle final drive

M12x1.5	Renew screws.	Tightening torque	55 Nm 90 °



- Tighten the screws (1).

Centre mount to body

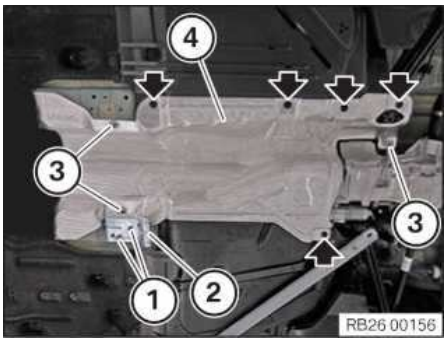
M8		Tightening torque	19 Nm



- Guide the special too l out between the front and rear propeller shaft and remove.

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50 – Installing the rear heat shield



- Insert and install the heat shield (4).
- Tighten screws (arrows).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

- Tighten nuts (3).

Heat shield to body

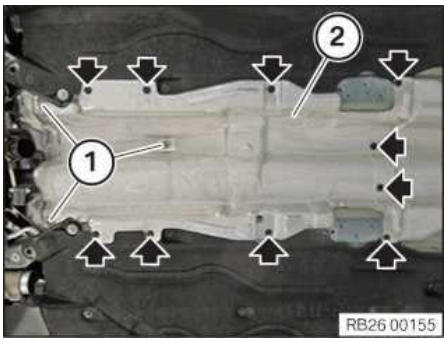
Bolts/nut		Tightening torque	3 Nm

- Insert and install the holder (2).
- Tighten the screws (1).

Bracket to body

M8		Tightening torque	21 Nm

51 – Install the front heat shield



- Insert and install the heat shield (2).
- Tighten screws (arrows).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

- Tighten nuts (1).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

52 – Install exhaust system

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

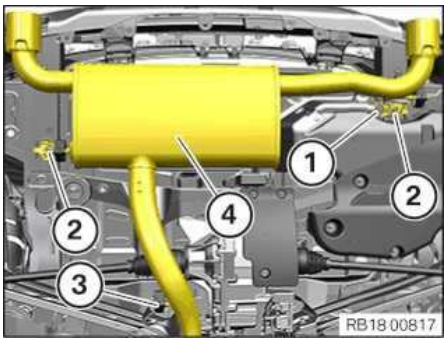
CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

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- Feed in and install the exhaust system (4) with a second person.
- Renew nuts (2).

  Parts: Nuts
- Tighten nuts (2).

Exhaust system to body

M8	Replace nuts.	Tightening torque	19 Nm

- Tighten down screw (1).

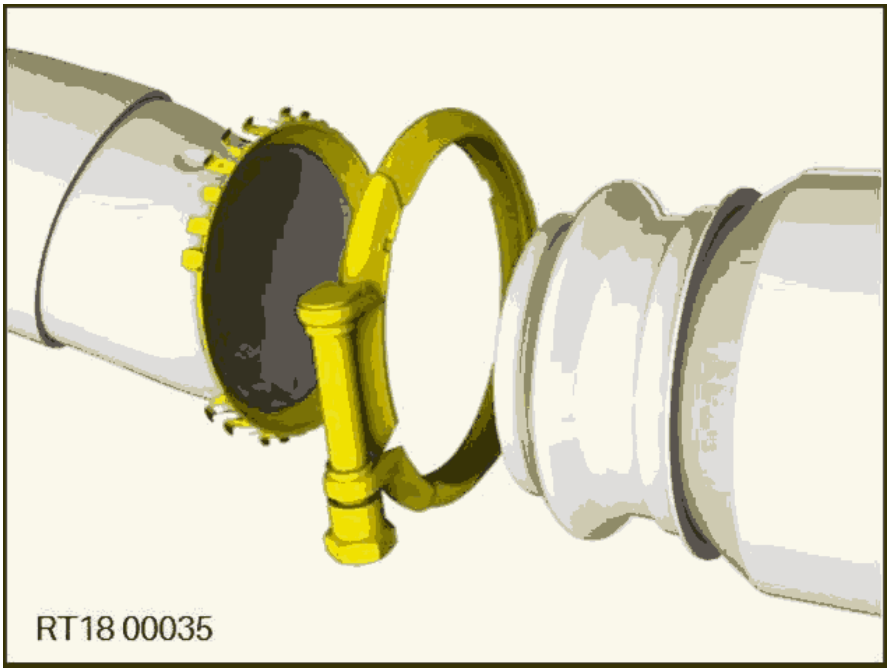
Exhaust bracket on body

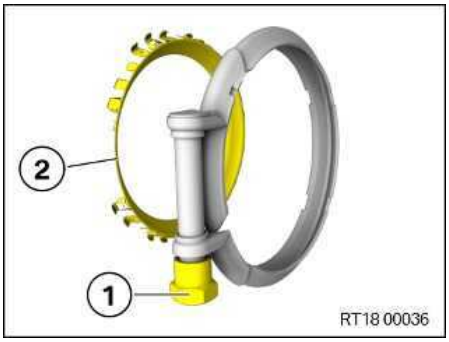
Hexagon screw M8x30		Tightening torque	19 Nm

- Check the rubber mount (3) for damage and renew as needed.
- Mount rubber mount (3) on the exhaust system (4).

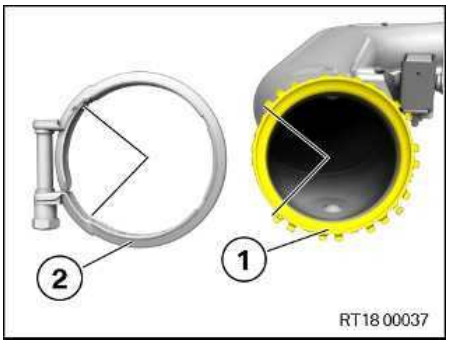
▸ **Install the V-clip**

V-band clamp





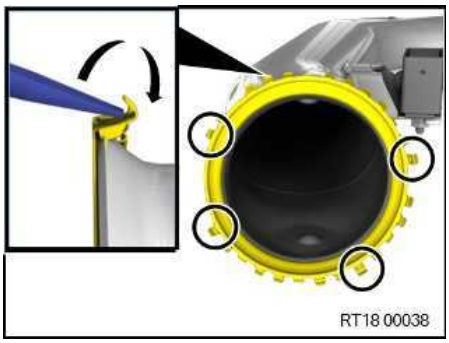
- Unscrew the nut (1) and remove the sealing ring (2).



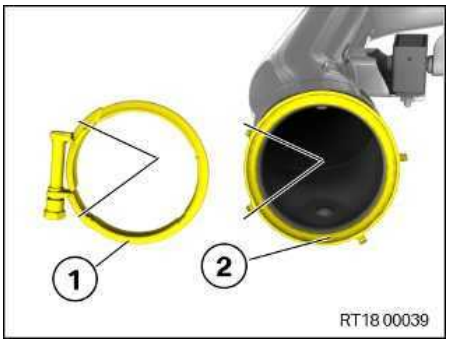
- Renew the V-clip (2).

  Parts: V-band clamp
- Mount the sealing ring (1) on the exhaust system.
- Ensure that the sealing ring (1) for the V-clip (2) is positioned correctly.

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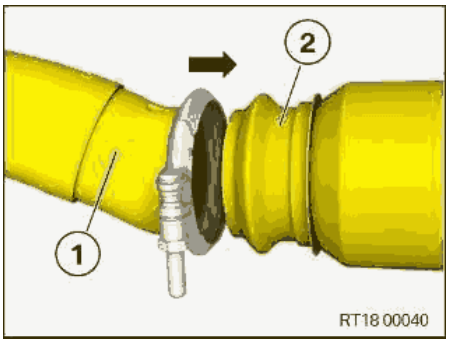
- Bend all sheet metal tabs over with a suitable tool, except those in the marked areas.



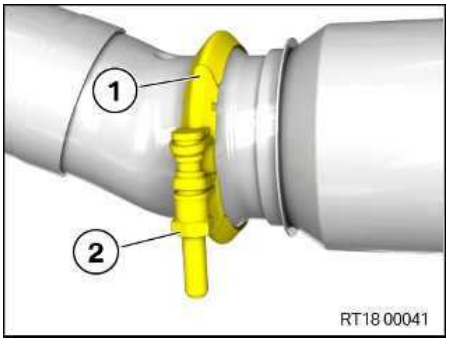
- Mount the V-clip (1) on the sealing ring (2).
- Make sure that the V-clip (1) is positioned correctly on the sealing ring (2).



- Make sure that the V-clip rests against the sheet metal tabs after mounting (marks).



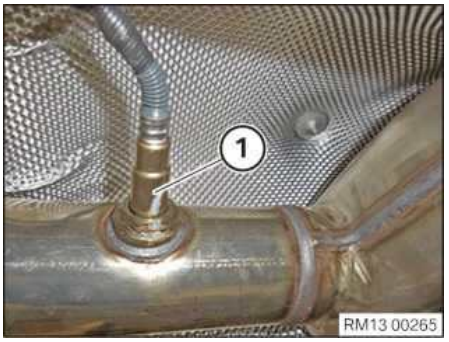
- Connect the exhaust system (1) with the catalytic converter (2) and position correctly.



- Make sure that V-clip (1) is fitted correctly.
- Tighten down screw (2).

V-clip to catalytic converter

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

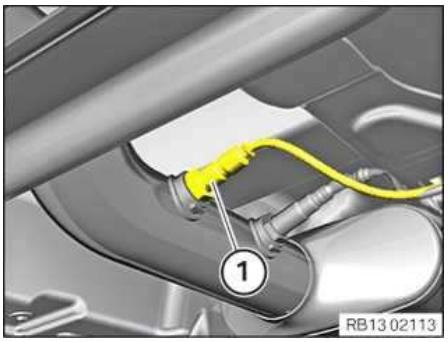


- Feed in, install and tighten diesel particulate sensor (1).

Diesel particulate sensor to exhaust system

Sensor		Tightening torque	50 Nm

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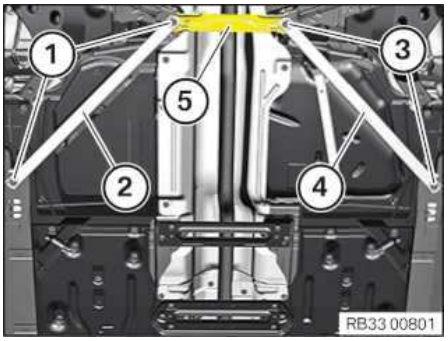


- Feed in, install and tighten nitrogen oxide sensor (1).

Nitrogen oxide sensor downstream of SCR catalytic converter

Sensor		Tightening torque	50 Nm

53 – Install the cross-member with torsion struts



- Insert and install the cross-member (5).
- Thread in torsion strut (4) at right and install.
- Renew screws (3).

  Parts: Bolts
- Tighten down screws (3).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

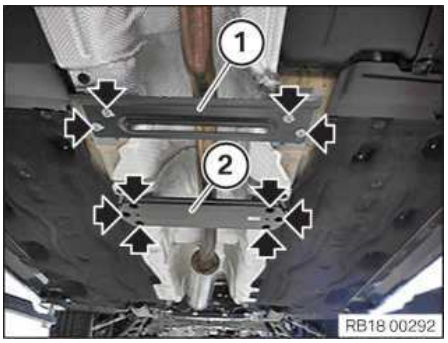
- Guide in and install the left torsion strut (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

54 – Install the connecting support on the tunnel in front and back



- Insert and install connecting supports (2).
- Tighten the screws (arrows) from the connecting support (2).

Front connection carrier to body

M10x18		Tightening torque	56 Nm

- Insert and install connecting supports (1).
- Tighten the screws (arrows) from the connecting support (1).

Rear connection carrier to body

M8x18		Tightening torque	28 Nm

55 – Installing right output shaft partially



- Renew the circlip (1).

  Parts: Circlip
- Slide output shaft into the transmission as far as the limit position.
- Check for secure seat by levering.

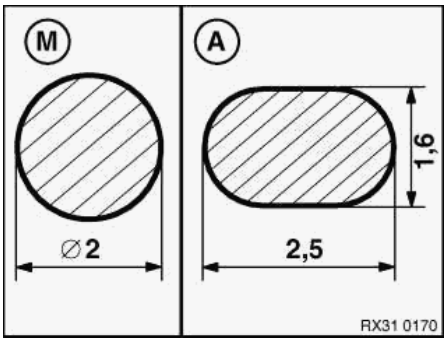
56 – Partially installing the left output shaft

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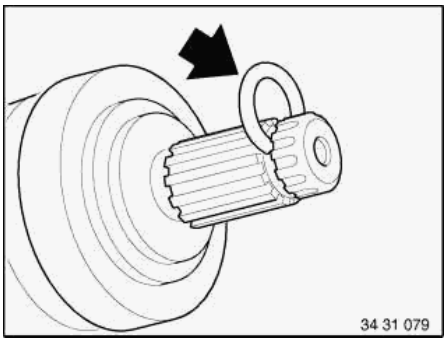
- **With automatic transmission only:**
- Lever out O-ring (1).
- Renew O-ring (1).

  Parts: O-ring
- Insert new O-ring (1).

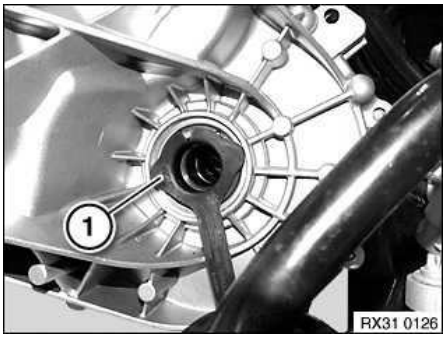


- Do not mix up circlips.

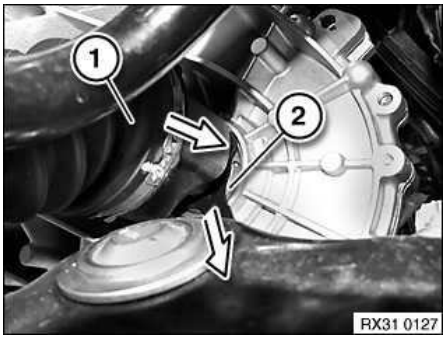
  Different types of output shafts fitted:
  - M: Manual transmission
  - A: Automatic transmission



- Renew circlip (arrow).



- Insert installation protection ring (1) into the radial shaft seal.
- Make sure the tool fits over the lip of the radial shaft seal so there is no damage to sealing ring when the output shaft is inserted.



- Insert output shaft (1) into transmission.
- **Manual gearbox only:** Pull on the handle to remove the installation protection ring (2) and dispose of it.
- Slide output shaft (1) into the transmission as far as the limit position.

  The output shaft (1) must engage audibly.
- Check for secure seat by levering.

57 – Installing starter motor

CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

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- Insert and install the starter motor .
- Tighten the screws (1).

Starter motor to transmission

M8x45		Tightening torque	19 Nm



- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

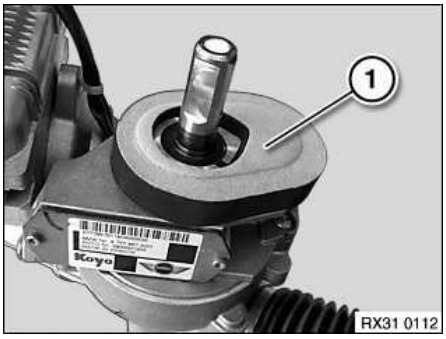
Battery positive lead to starter

M8		Tightening torque	13,5 Nm



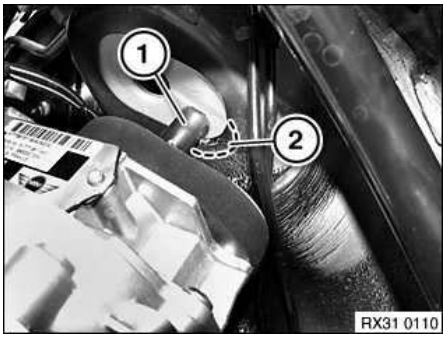
- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.

58 – Mount and secure the complete front axle



- Remove the seal (1).
- Clean surface on steering gear.
- Renew gasket (1).

  Parts: Gasket
- Position the seal (1) and glue it on.



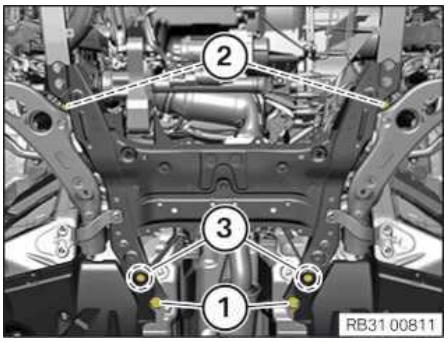
TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!

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- Position front axle support.
- Bend underbody panellings in the areas (3) to one side.
- Raise front axle support.
- When raising, insert charge air cooler into the rubber mount of the charge air cooler on cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

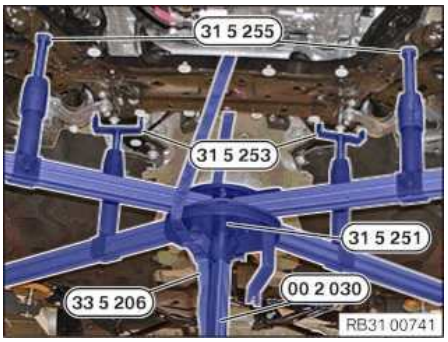
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

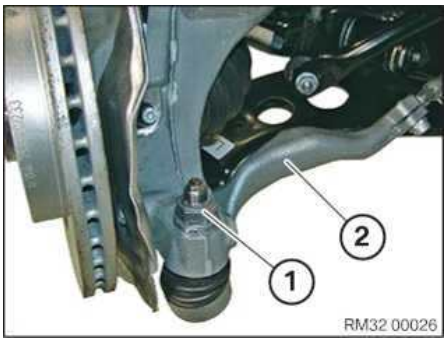
- If necessary, tighten the screws in the areas (3).

Underbody protection to body

Screw		Tightening torque	3 Nm



- Remove special tool from special tool .
- Lower universal jack **0 490 133 (00 2 030)** with the special tool and place it to the side.



NOTICE

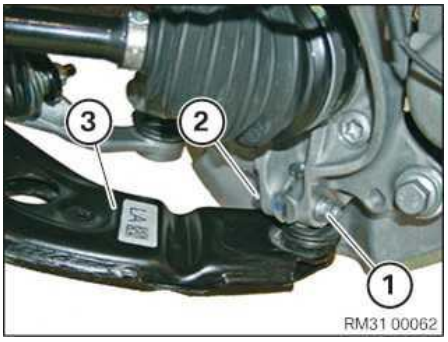
Perform the operations on the left and right side.

- Position the track rod (2) on the swivel bearing .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Track rod end to swivel bearing

M14	Renew nut.	Tightening torque	175 Nm



NOTICE

Perform the operations on the left and right side.

- Position the wishbone (3) on the swivel bearing .
- Renew the bolt (2) and the nut (1).

  Parts: Bolt, nut
- Insert screw (2).
- Tighten nut (1).

Wishbone to swivel bearing

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

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59 – Install the mounted parts on the front axle support



NOTICE

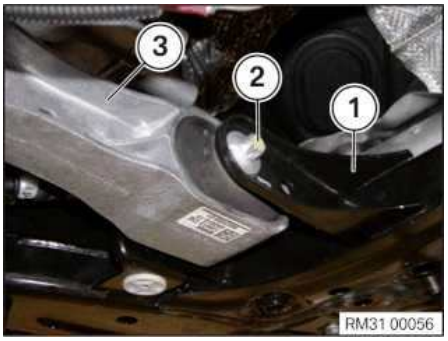
Perform the operations on the left and right side.

- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Holder, wishbone rubber mount, to body

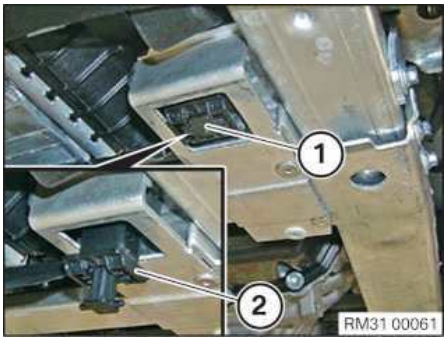
M10 screw	Renew screw.	Jointing torque	56 Nm
		Angle of rotation	90 °



- Position the engine support (3) on the front axle support (1).
- Tighten down screw (2).

Holder with rubber mount to front axle support

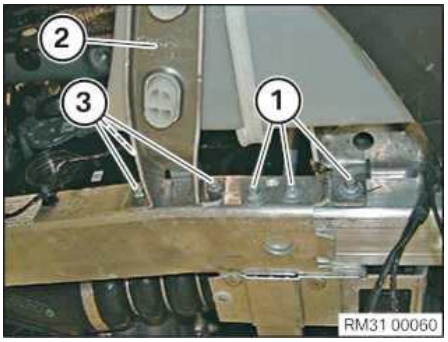
M12 screw		100 Nm



NOTICE

Perform the operations on the left and right side.

- Position the lock (2).
- Lock the bracket (1) of the lock (2) of the holder for the charge air cooler.



- **Only on right side:** Position the holder for the washer fluid reservoir (2).
- Tighten down screws (3).

Washer fluid reservoir holder to front axle support adapter plate

		Tightening torque	10 Nm

NOTICE

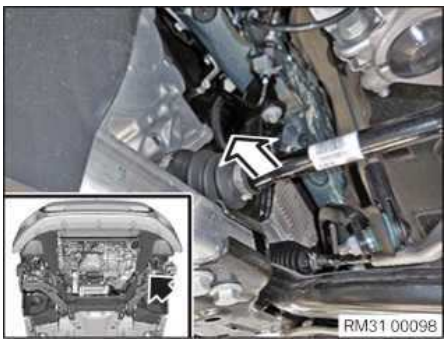
Perform the operations on the left and right side.

- Tighten the screws (1).

Deformation element, bottom, to adapter plate, front axle carrier

		Tightening torque	11,8 Nm

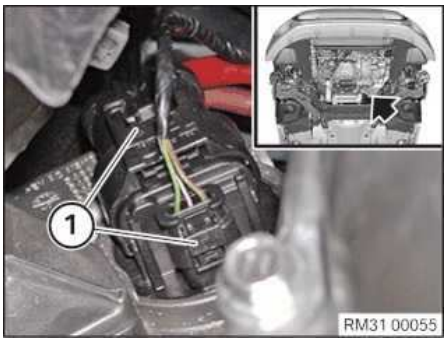
60 – Attaching connector at steering gear



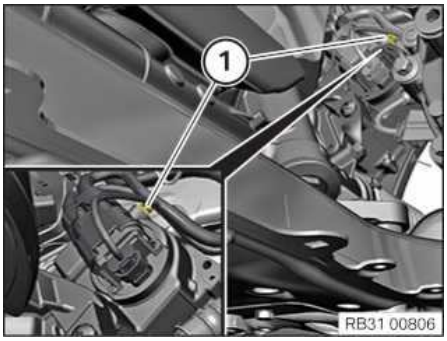
- To connect the connector (see the following step): Connect the connector with the right hand.

  The connectors can be accessed via the left output shaft.

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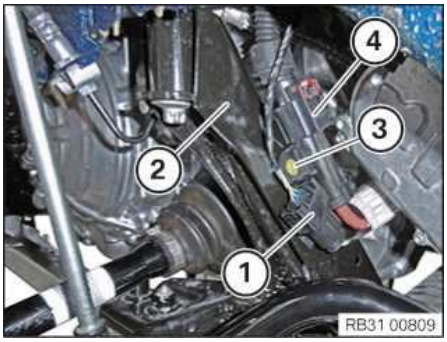


- Connect and lock connector (arrow) (1) with the steering gear.



- Fasten the wiring harness (1) on the steering gear.

▸ **If installed: Fasten the plug connections at the front axle support**



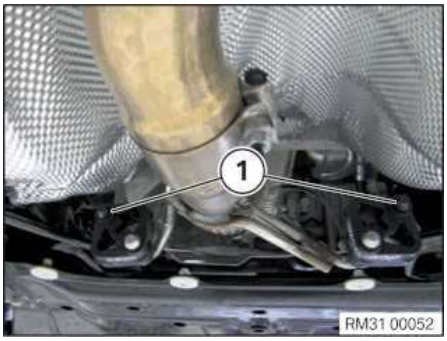
- Position the plug connection (4) at the front axle support (2).
- Tighten down screw (3).

Holder to front axle support

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

- Fasten the plug connection (1) at the front axle support (2).

61 – Securing rubber mount on front axle support



- Check rubber mount (1), replace if necessary.

  Parts: Rubber mount
- Spray rubber mount (1) with lubricant and slide onto holder on front axle support.

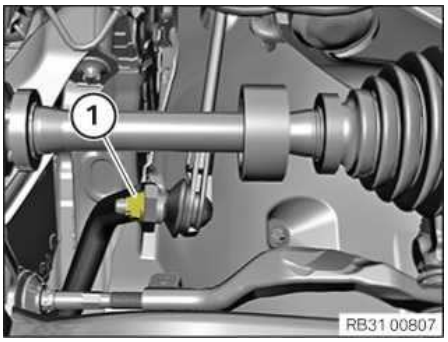
62 – Securing anti-roll bar on left and right on the anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▸ **Fastening anti-roll bar on the anti-roll bar link**

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- Position the anti-roll bar link on the anti-roll bar .
- Renew nut (1).

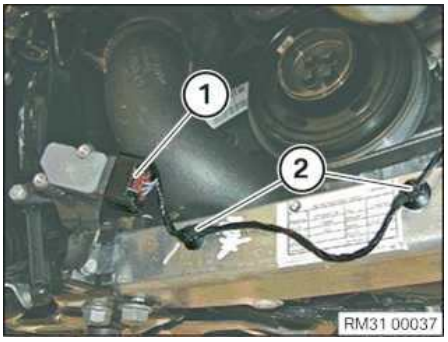
  Parts: Nut
- Tighten nut (1).

Note: Use the Torx socket for counter support.

Anti-roll bar link to anti-roll bar

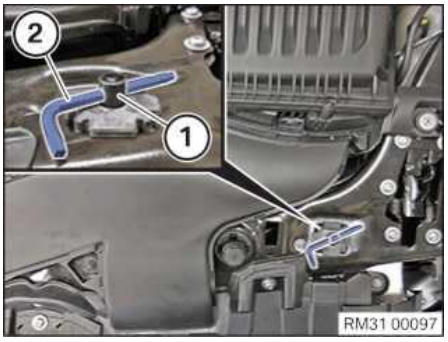
M10	Renew nut.	Tightening torque	56 Nm

63 – With right installation: Securing the cable for the ride height sensor



- Secure the cable clip (2) on the adapter of the deformation element.
- Connect connectors (1) and lock.

64 – Removing fastener for left and right radiator

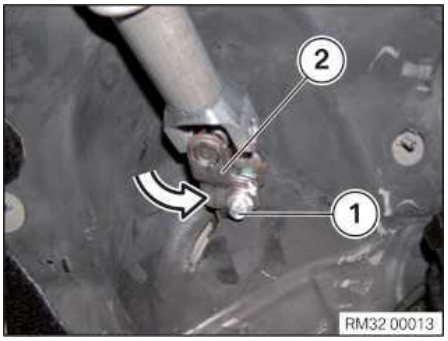


NOTICE

Perform the operations on the left and right side.

- Remove suitable tool (2) from the centering pin (1).

65 – Secure the steering shaft at the bottom on the steering gear



- Clean the screw lock residue from the screw thread in the universal joint (2).
- Pivot the universal joint (2) in the direction of the arrow to the steering gear.
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Lower steering shaft to steering gear

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm



- **If installed:**
- Position the cover on the steering column (2).
- Tighten nuts (1).

Steering column cover to bulkhead

Plastic nut		Tightening torque	3 Nm

66 – Remove the engine bridge

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CAUTION

Heavy component.

Heavy components can lead to injury or damage.

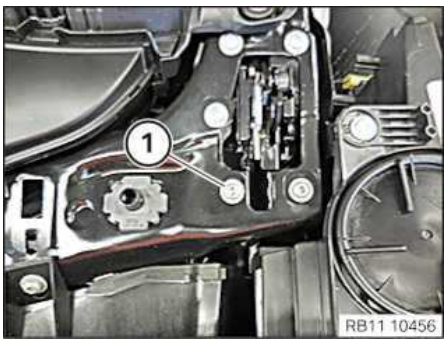
- Remove and install heavy components with the aid of another person/other persons.



- Detach the spindle screw (1) from the engine bridge.
- Unscrew the leg screws (2) and (3).
- Guide the engine bridge out of the vehicle with the help of another person and remove.



- Unscrew the bolts (1) of the special tool **2 459 012**.
- Feed out the special tool **2 459 012** at the cylinder head and remove.



- Tighten the screw (1) of the bonnet catch.

Cross connection on support for cross connection

M6x20		Tighten torque	12 Nm



- Tighten the screw (1) of the bonnet catch.

Cross connection on support for cross connection

M6x20		Tighten torque	12 Nm

67 – Install electronics box

Prerequisite

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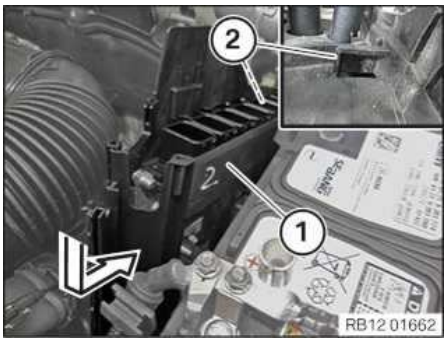
Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

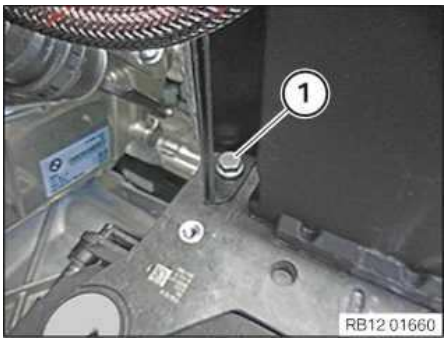
- Route all cables without abrasions, do not trap and crush.



- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.



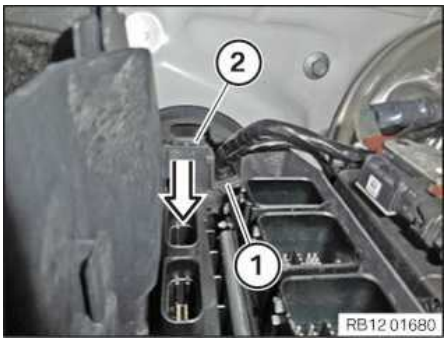
- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).



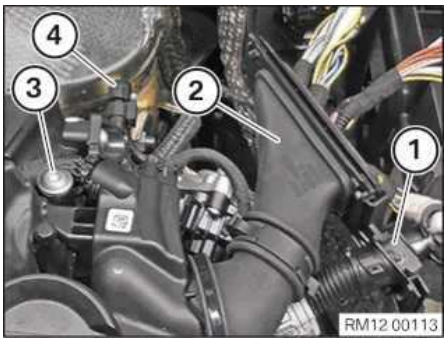
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.



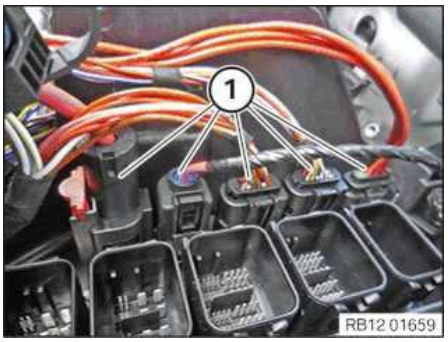
- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

Wiring harness to cylinder head cover

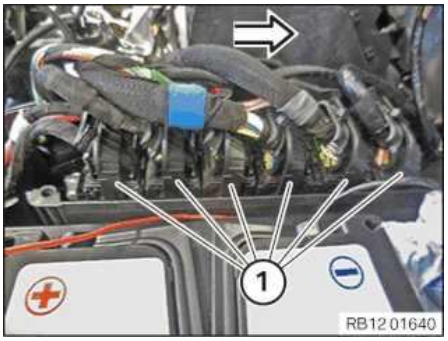
TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.

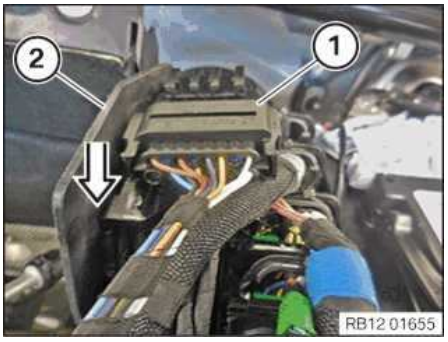
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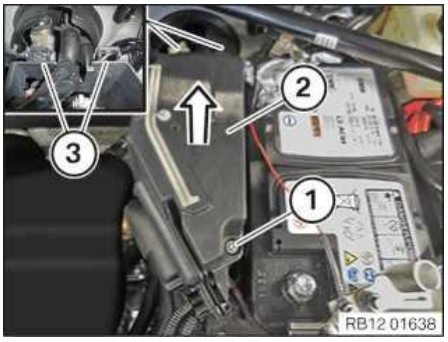
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



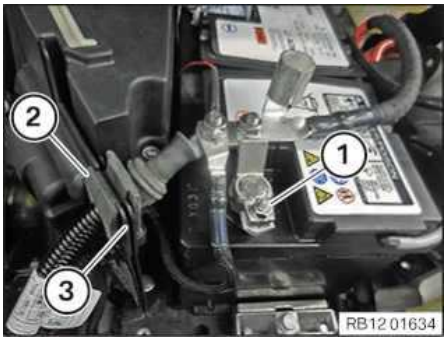
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

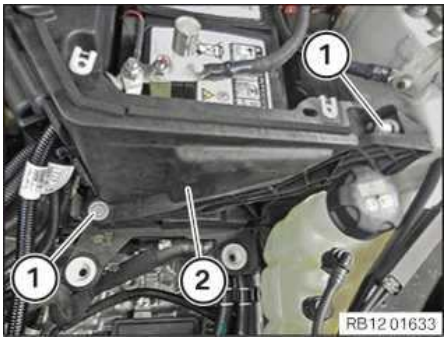
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

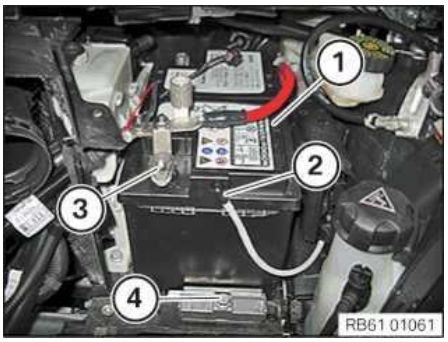


- Feed in and install tension strut (2).
- Tighten the screws (1).

Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

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- Install vehicle battery (1).
- Position the bracket and tighten with the screw (4) .

Battery terminal rail to battery tray

M8		19 Nm

- Position the vent hose (2) and clip it in.
- Position the positive battery terminal and tighten with the nut (3) .

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

▸ **Check the vent holes of the battery**

WARNING

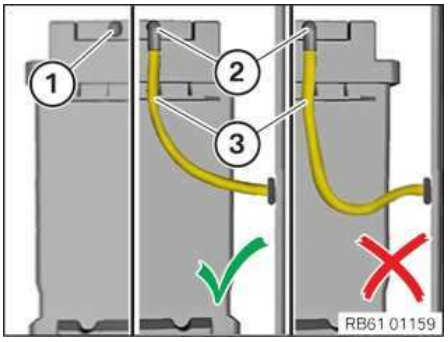
Gas emission.

Danger of injury! Danger of explosion!

- Assign the vent holes correctly.
- Route the vent hose correctly.

TECHNICAL INFORMATION

The battery has two vent holes, opposite:
One vent hole (1) must be closed correctly with a dummy plug.
The vent hose (3) must be correctly connected and routed at the other vent hole (2).



Check
- Check if the vent hole (1) is correctly closed with a dummy plug.

Result
» No dummy plug.

Measure
- Close the vent hole (1) correctly with a dummy plug.

Check
- Check if the vent hole (2) has a correctly connected vent hose (3).

Result
» The vent hose (3) is not correctly connected.

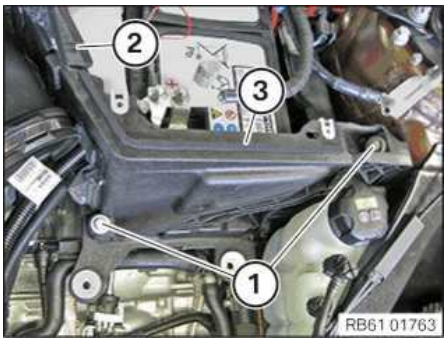
Measure
- At the vent hole (2), connect the vent hose (3) correctly.

Check
- Check if the vent hose (3) is routed to the outside with a downhill gradient (**no siphon formation!**).

Result
» The vent hose (3) is not correctly routed as shown in the image on the right.

Measure
- Route the vent hose (3) correctly as shown in the centre image.

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- Insert tension strut (3) and tighten with screws (1).

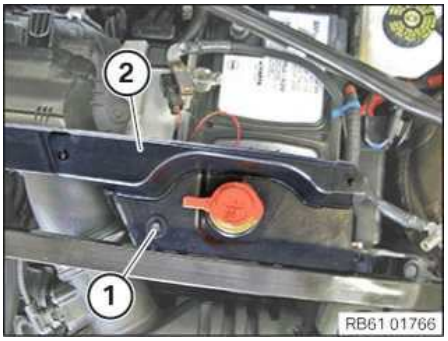
Trailing link

M8		Tightening torque	19 Nm

- Tighten down screw (2).

Battery cover

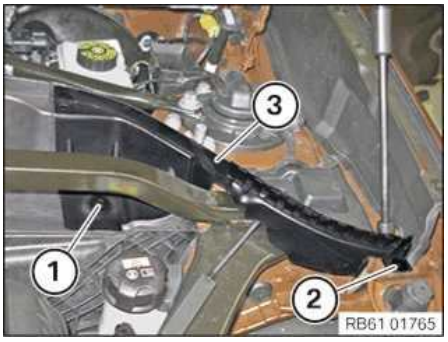
M8		2,8 Nm



- Position the cover (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

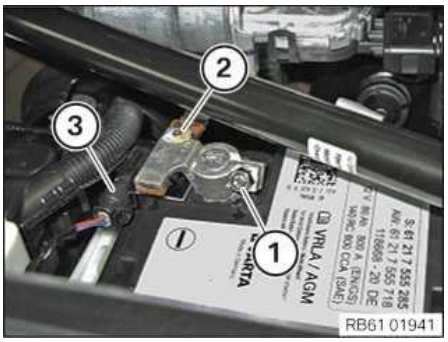
Battery cover

M8		2,8 Nm

69 – Connecting the battery earth lead

TECHNICAL INFORMATION

For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)



- Remove the protective cover of the positive battery terminal.
- Position the battery earth lead (2).
- Tighten nut (1).

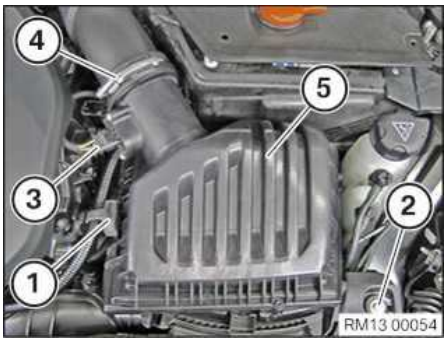
Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

- If required, connect the connector (3).

70 – Installing intake silencer housing

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- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

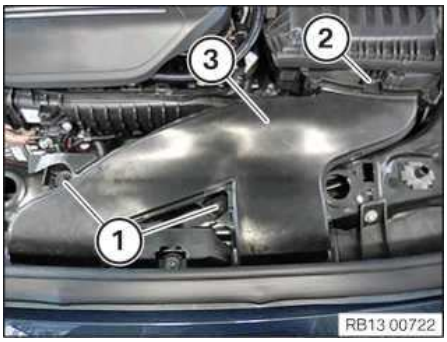
- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

71 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).
  The lock (2) must audibly engage.
- Tighten nuts (1).

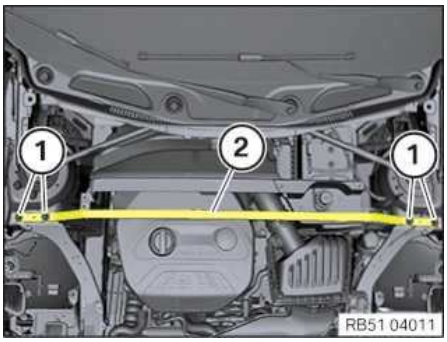
Intake neck to cross connection

M6		Tightening torque	8 Nm

72 – Install strut brace

TECHNICAL INFORMATION

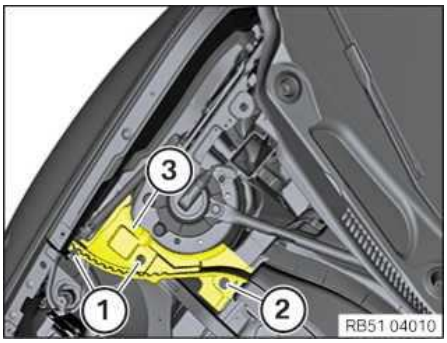
Driving without the strut brace/front end or tension strut is not permitted.



- Install the strut brace (2).
- Renew screws (1).
  Parts: Bolts
- Tighten the screws (1).

Cross-brace to spring strut dome

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °



NOTICE

Description is for right component only. The procedure on the left side is identical.

- Install the cover (3).
- Tighten down screw (2).

Cover on body

Hexagon screw		Tightening torque	3 Nm

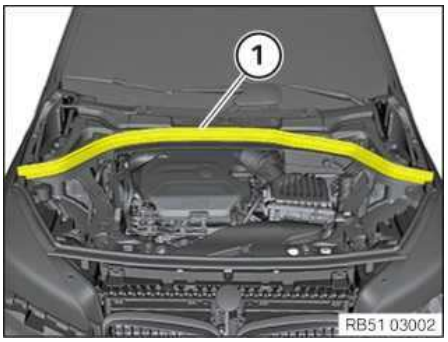
- Install the expanding rivet (1).

73 – Install the seal for the bonnet

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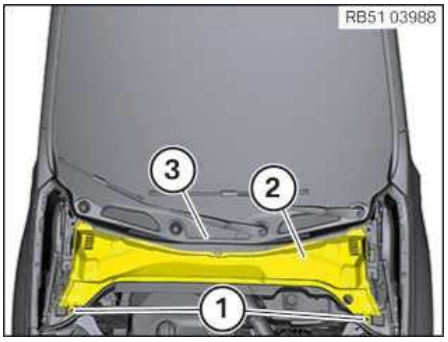
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



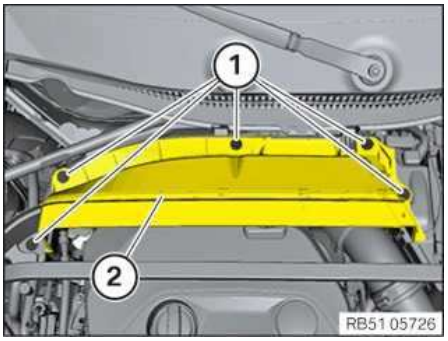
- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

74 – Installing front cowl panel cover



- Insert and install cowl panel cover at front (2) into cowl panel cover at rear (3).
- Check cowl panel cover at front is correctly seated (2).
- Secure expanding rivet (1).

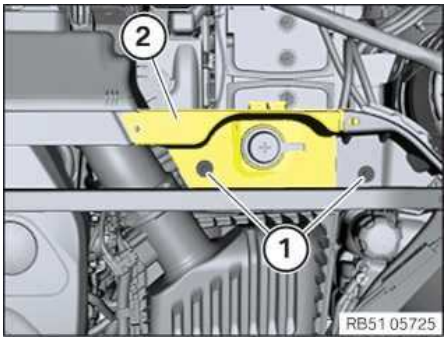
75 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Cover of top bulkhead

Screw		Tightening torque	2,6 Nm



- Guide in and install cover (2).
- Tighten down screw (1).

Cover of remote positive terminal

Screw		Tightening torque	2,6 Nm

76 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

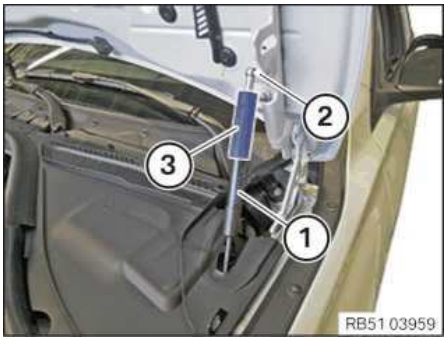


- Check for correct installation of all rubber mounts in the acoustic cover (1).

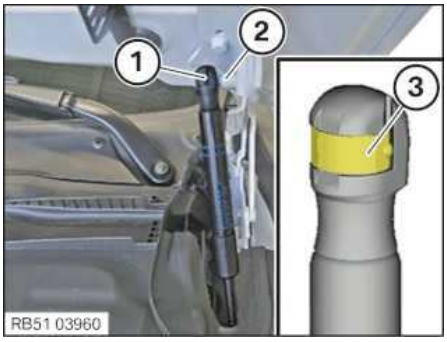


- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

77 – Take bonnet out of the service position



- Support the bonnet by hand.
- Remove the special tool (3) from the ball pin (2).
- Pull off the special tool (3) from the gas pressure spring (1).
- Continue to support the bonnet and repeat the operation on the other side of vehicle.



CAUTION

Shutting bonnet or tailgate.

Danger of injury!

- Support bonnet/tailgate in fully open position with the aid of a suitable device.

- Check the clamp (3) is fitted correctly.
- Connect ball socket (1) to ball pin (2).
- Continue to support the bonnet and repeat the operation on the other side of vehicle.

78 – Fill and bleed the coolant circuit

▸ **Filling and bleed the high-temperature coolant circuit**

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- See additional information.

79 – Checking/topping up oil level in automatic gearbox (AISIN GA8G45)

Prerequisite

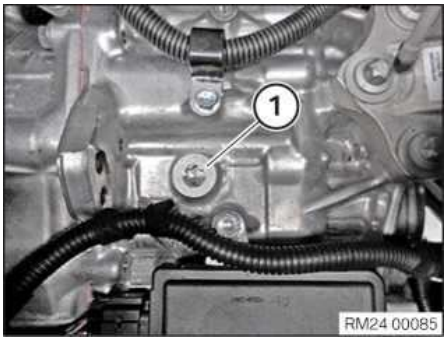
Vehicle in horizontal position.

CAUTION

Materials harmful to health.

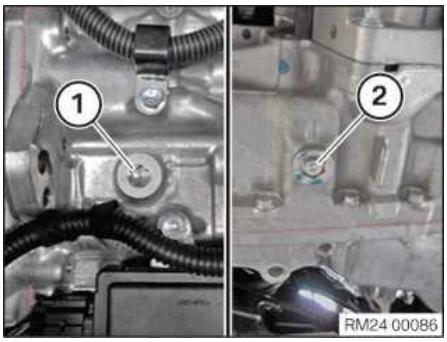
Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.



- Move the selector lever to the "P" position.
- Secure vehicle to prevent it rolling.
- Connect diagnosis system.
- Release the oil filler plug (1) using the Torx T55 .

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- **Topping up the automatic transmission fluid (the automatic transmission fluid was drained):**
- Release oil filler plug (1) from engine compartment.
- Loosen the overflow plug (2) below at the transmission.
- Top up automatic transmission fluid at oil filler plug (1) until oil emerges at overflow plug (2).
- Start engine and run at idle speed.
- Check whether the automatic transmission fluid is leaking at the overflow plug (2) .
- If there is no automatic transmission fluid leaking at the overflow plug (2) , fill in the automatic transmission fluid to the oil filler plug (1) .
- Press the footbrake and, when idle, shift through all the gears from "P" to "D" 2 times for more than 2 seconds .
- Move the selector lever to the "P" position.
- Check again whether the automatic transmission fluid is leaking at the overflow plug(2) .
- Read the temperature of the automatic transmission fluid with the diagnosis system.
- Increase temperature of automatic transmission fluid to 35 °C to 45 °C.
- Top up automatic transmission fluid until it flows over.
- Renew sealing rings.

  Parts: Sealing ring
- Screw in and fasten oil filler plug (1) and overflow plug (2).

Oil filler plug to transmission housing

M14	Renew the sealing ring.	Tightening torque	45 Nm

Overflow screw in oil drain plug

M6	Renew the sealing ring.		8 Nm

- **Check oil level (transmission oil temperature must be between** 35 °C **and** 45 °C **):**
- Open the oil filler plug (1).
- Slacken overflow plug (2).
- Start engine and run at idle speed.
- Unscrew and remove overflow plug (2).
- Check whether the automatic transmission fluid is leaking at the overflow plug (2) .
- If there is no automatic transmission fluid leaking at the overflow plug (2) , fill in the automatic transmission fluid to the oil filler plug (1) .
- Top up the automatic transmission fluid until it overflows at the overflow plug (2) .
- Press the footbrake and, when idle, shift through all the gears from "P" to "D" 2 times for more than 2 seconds .
- Move the selector lever to the "P" position.
- Check the oil level again.
- Renew sealing rings.

  Parts: Sealing ring
- If the oil escapes slightly from the overflow plug (2) , tighten the overflow plug (2) and the oil filler plug (1) .

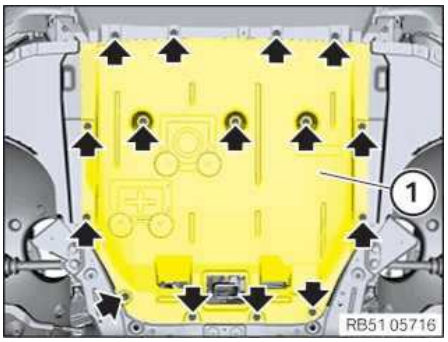
Overflow screw in oil drain plug

M6	Renew the sealing ring.		8 Nm

Oil filler plug to transmission housing

M14	Renew the sealing ring.	Tightening torque	45 Nm

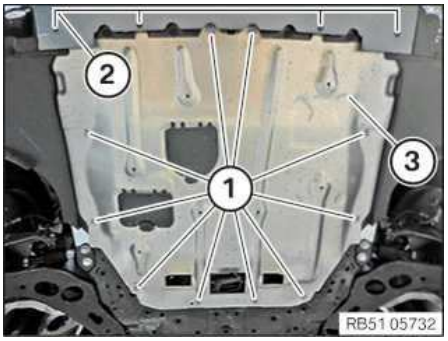
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- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

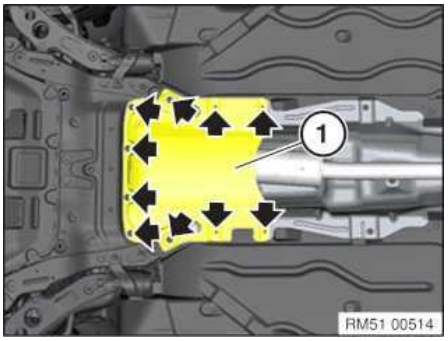


- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

81 – If installed: Installing underbody protection at rear



- Position rear underbody protection (1).
- Tighten screws (arrows).

Underbody protection to body

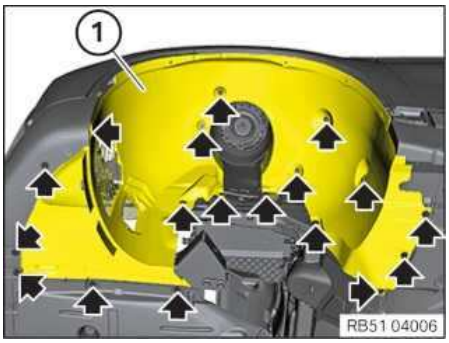
Screw		Tightening torque	3 Nm

82 – Installing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

▸ **Installing the front wheel arch cover**



- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Plastic nut		Tightening torque	2,6 Nm
Screw		Tightening torque	2,6 Nm

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

▸ **Installing front wheel arch trim**

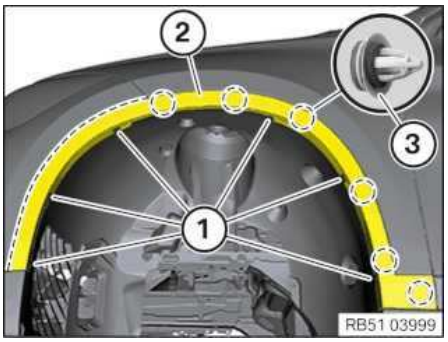
NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

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NOTICE

Description is for left component only. Procedure on the right side is identical.



- Check the clips (3) for damage and renew where required.

  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

83 – Installing both front wheels

▶ **Mounting the wheel**

▷ **Clean the contact surfaces between the brake disc and the wheel rim**



TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

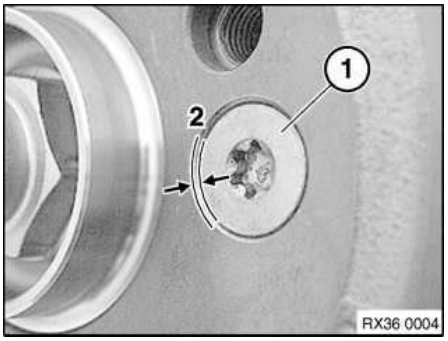
- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue in the area of the wheel bolt holes, remove and clean the brake disc.



- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).



- Renew mounting bolt (1).

  Parts: Mounting bolt
- Check that the mounting bolt (1) for the brake disc is securely seated.

  The mounting bolt (1) for the brake disc may not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

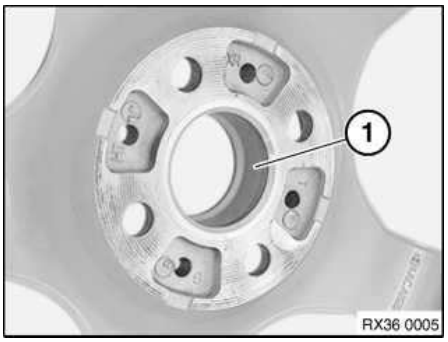
Brake disc to rear wheel hub

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub

M8	Renew screw.	Tightening torque	16 Nm

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- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring (1).

◁



TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

  Parts: Wheel bolts
- Clean the wheel bolts.
- Check the wheel bolts and threads for damage, renew the wheel bolts if necessary.
- Join and tighten the wheel bolts (arrows).

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

Additional Information

Overview of Tightening Torques

Cross connection to carrier support — Used in step 17

Screws M6x20		Tightening torque	11,8 Nm

Screw connection for rubber mount of coolant radiator to coolant radiator — Used in step 17

Bolt to rubber mount		Tightening torque	8 Nm

Air duct to upper connection — Used in step 17

M6x20 screw		Tightening torque	11,8 Nm

Bracing strut to upper connection — Used in step 17

M8x20 screw		Tightening torque	28 Nm

Special tool to cylinder head — Used in step 19

M8		Tightening torque	21,5 Nm

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Flywheel to crankshaft — Used in step 45

M12x1.5	Renew screws.	Tightening torque	120 Nm

Transfer box to transmission — Used in step 46

M10		Tightening torque	56 Nm

Heat shield to transfer box — Used in step 46

M6	Renew screws.	Tightening torque	6 Nm

Oil filler plug on transfer box (VTG) — Used in step 46

M18x1.5		Tightening torque	35 Nm

Holder with rubber mount to front axle support — Used in step 47

M12		Tightening torque	100 Nm

Holder with rubber mount to oil sump — Used in step 47

M12		Tightening torque	100 Nm

Intermediate shaft to transfer box — Used in step 48

M8x35		Tightening torque	19 Nm

Propeller shaft to transfer box — Used in step 49

		Tightening torque	80 Nm

Flexible disc to rear axle final drive — Used in step 49

M12x1.5	Renew screws.	Tightening torque	55 Nm 90 °

Centre mount to body — Used in step 49

M8		Tightening torque	19 Nm

Heat shield to body — Used in step 50 51

Bolts/nut		Tightening torque	3 Nm

Bracket to body — Used in step 50

M8		Tightening torque	21 Nm

Exhaust system to body — Used in step 52

M8	Replace nuts.	Tightening torque	19 Nm

Exhaust bracket on body — Used in step 52

Hexagon screw M8x30		Tightening torque	19 Nm

V-clip to catalytic converter — Used in step 52

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

Diesel particulate sensor to exhaust system — Used in step 52

Sensor		Tightening torque	50 Nm

Nitrogen oxide sensor downstream of SCR catalytic converter — Used in step 52

Sensor		Tightening torque	50 Nm

Cross-member/torsion strut to axle support and mounting — Used in step 53

M12x48	Renew screws.	Jointing torque Angle of rotation	100 Nm 90 °

Front connection carrier to body — Used in step 54

M10x18		Tightening torque	56 Nm

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Rear connection carrier to body — Used in step 54

M8x18		Tightening torque	28 Nm

Starter motor to transmission — Used in step 57

M8x45		Tightening torque	19 Nm

Battery positive lead to starter — Used in step 57

M8		Tightening torque	13,5 Nm

Rear end of front axle support to body — Used in step 58

M14 screw	Renew screw.	Tightening torque	175 Nm

Front axle support, front to body — Used in step 58

M12 screw	Renew screw.	Tightening torque	108 Nm

Underbody protection to body — Used in step 58 81

Screw		Tightening torque	3 Nm

Track rod end to swivel bearing — Used in step 58

M14	Renew nut.	Tightening torque	175 Nm

Wishbone to swivel bearing — Used in step 58

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

Holder, wishbone rubber mount, to body — Used in step 59

M10 screw	Renew screw.	Jointing torque	56 Nm
		Angle of rotation	90 °

Holder with rubber mount to front axle support — Used in step 59

M12 screw			100 Nm

Washer fluid reservoir holder to front axle support adapter plate — Used in step 59

		Tightening torque	10 Nm

Deformation element, bottom, to adapter plate, front axle carrier — Used in step 59

		Tightening torque	11,8 Nm

Holder to front axle support — Used in step 60

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

Anti-roll bar link to anti-roll bar — Used in step 62

M10	Renew nut.	Tightening torque	56 Nm

Lower steering shaft to steering gear — Used in step 65

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

Steering column cover to bulkhead — Used in step 65

Plastic nut		Tightening torque	3 Nm

Cross connection on support for cross connection — Used in step 66

M6x20		Tightening torque	12 Nm

Electronics box to battery tray — Used in step 67

M8X16		Tightening torque	15 Nm

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Wiring harness to cylinder head cover — Used in step 67

TS5x20		Tightening torque	3,5 Nm

Cover to electronics box — Used in step 67

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery — Used in step 67

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray — Used in step 67

M8		Tightening torque	19 Nm

Battery terminal rail to battery tray — Used in step 68

M8			19 Nm

Battery terminal with IBS positive battery terminal / negative battery terminal — Used in step 68 69

NutM6			5 Nm

Trailing link — Used in step 68

M8		Tightening torque	19 Nm

Battery cover — Used in step 68

M8			2,8 Nm

Intake silencer housing to lock bridge — Used in step 70

M6X30		Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 70

Clamp		Tightening torque	3 Nm

Intake neck to cross connection — Used in step 71

M6		Tightening torque	8 Nm

Cross-brace to spring strut dome — Used in step 72

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

Cover on body — Used in step 72

Hexagon screw		Tightening torque	3 Nm

Cover of top bulkhead — Used in step 75

Screw		Tightening torque	2,6 Nm

Cover of remote positive terminal — Used in step 75

Screw		Tightening torque	2,6 Nm

Oil filler plug to transmission housing — Used in step 79

M14	Renew the sealing ring.	Tightening torque	45 Nm

Overflow screw in oil drain plug — Used in step 79

M6	Renew the sealing ring.		8 Nm

Underbody protection front — Used in step 80

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

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Wheel arch cover to body — Used in step 82

Plastic nut		Tightening torque	2,6 Nm
Screw		Tightening torque	2,6 Nm

Wheel arch cover to body — Used in step 82

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body — Used in step 82

Plastic nut		Tightening torque	3 Nm

Brake disc to rear wheel hub — Used in step 83

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub — Used in step 83

M8	Renew screw.	Tightening torque	16 Nm

Wheel bolts — Used in step 83

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Overview of Special Tools

2 459 012 Holder

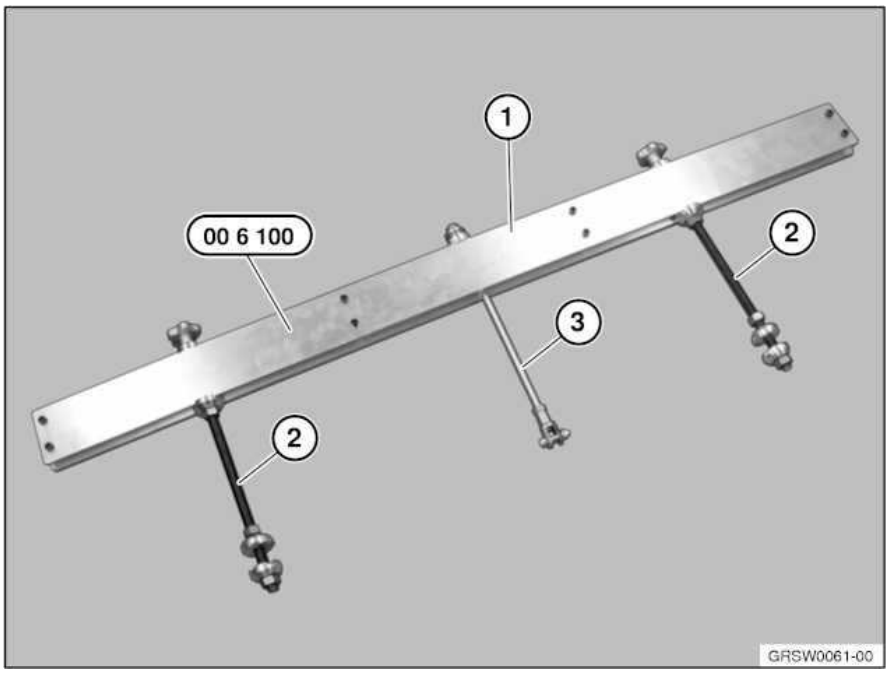


Common — Used in step 19 66

Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

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0 496 852 (00 6 100) Device



Common

Used in step 19

Usage	Engine bridge (device) 006000
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 10 (659)

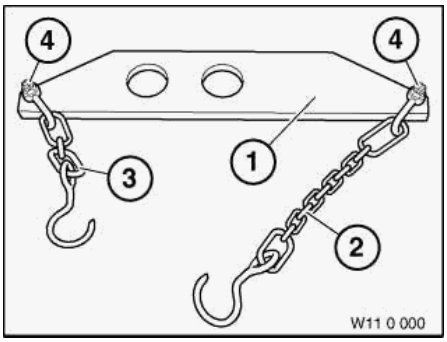
Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
2	2 361 507 (00 6 102)		**Spindle** Set (2 pieces) in connection with 00 6 100.	
3	2 361 506 (00 6 103)		**Spindle** Spindle (central spindle) for Traverse 00 6 100.	

0 490 561 (11 0 000) Lifting gear

Used in step 19

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Common

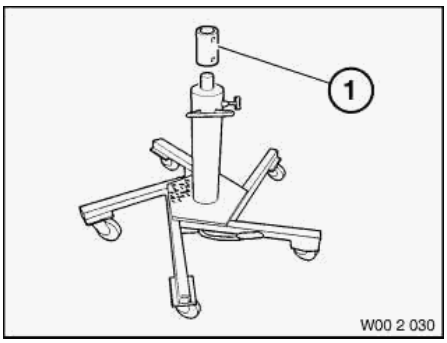
Usage	(Hoisting gear) For removing and installing engines. As of 08/2011 only available as a complete set. Delivered with TÜV inspection certificate and operating instructions. No delivery of separate parts.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 13 94 (888)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
4	0 490 565 (11 0 009)		**Shackle** (Shackle) 2 pieces. As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 562 (11 0 001)		**Lifting gear** (Cross member) As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
2	0 490 563 (11 0 002)		**Chain** (Chain) Version: long As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
3	0 490 564 (11 0 003)		**Chain** (Chain) Version: short As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	

Used in step 28 41 58

0 490 133 (00 2 030) Device



Common

Usage	(universal hydraulic lifter base unit) Chassis and hydraulic lifter - For removing and installing rear axle supports and gearboxes. Also for soft top mounts. Is replaced by 81 22 2 219 012
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 90 (207)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 490 134 (00 2 031)		**Adapter** (adapter for gearbox holder) Model series: E30, E31, E32, E34, E36	

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0 495 554 (33 5 070) Extension



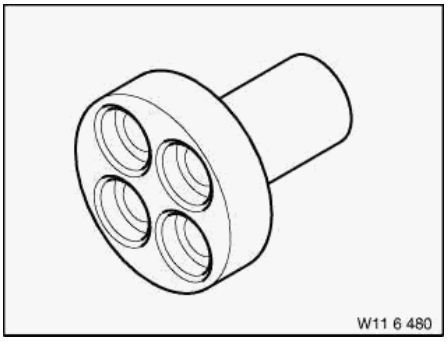
Common Used in step 37 49

Usage	Pull-out extension for 33 5 040, 33 5 050, 33 5 060.
Included in the tool or work	
Storage location	A18
Replaced by	
In connection with	
SI-Number	01 21 06 (300)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 592 (33 5 071)		**Extension** (Extension (1 item)) discontinued, can only be ordered using complete tool	

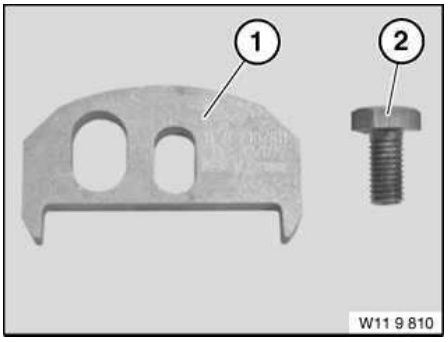
0 493 380 (11 6 480) Connector



Common Used in step 41

Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

0 496 171 (11 9 811) Holder



Common Used in step 42 45

Usage	Available only as a complete tool set 11 9 810 (83 30 0 496 170) - as of 13.01.12
Included in the tool or work	0 496 170
Storage location	C86
Replaced by	
In connection with	
SI-Number	01 07 07 (355)

0 494 793 (11 9 265) Bush

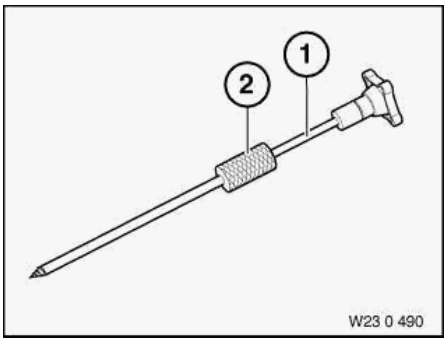


Common Used in step 42 45

Usage	
Included in the tool or work	0 493 938
Storage location	A44
Replaced by	
In connection with	
SI-Number	

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0 491 454 (23 0 490) Puller



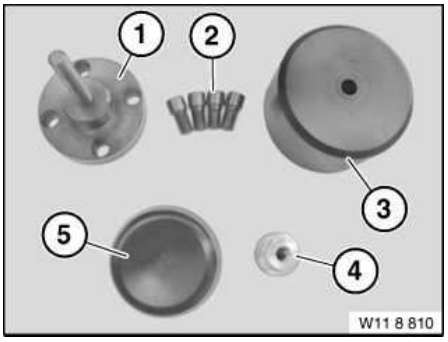
Common Used in step 43

Usage	For removing shaft seal
Included in the tool or work	
Storage location	A13
Replaced by	
In connection with	
SI-Number	01 15 96 (106)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 491 455 (23 0 491)		**Rod** With self-tapping screw Deletion, only available via tool set	
2	0 491 456 (23 0 492)		**Weight** (Weight)	

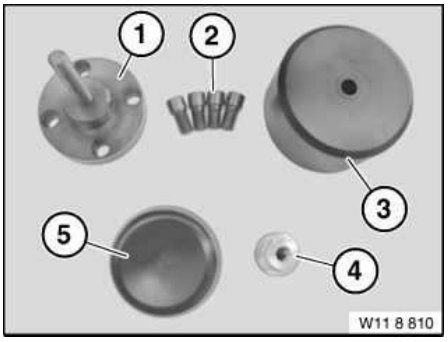
0 496 137 (11 8 815) Holding sleeve



Common Used in step 44

Usage	(Slip sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

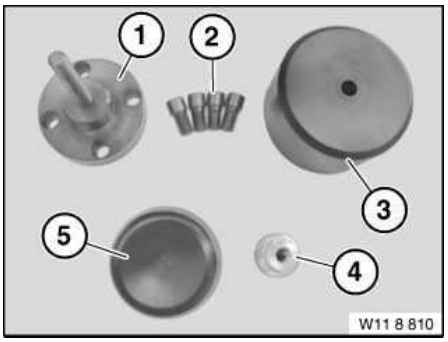
0 496 133 (11 8 811) Basic body



Common Used in step 44

Usage	Liquidation of existing inventory and then available only as a complete tool set 11 8 810 = 83 30 0 496 132 - as of 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 134 (11 8 812) Screw

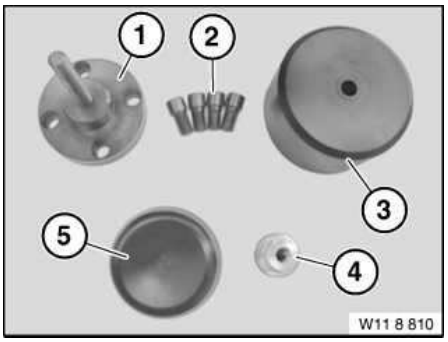


Common Used in step 44

Usage	(Screw set) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

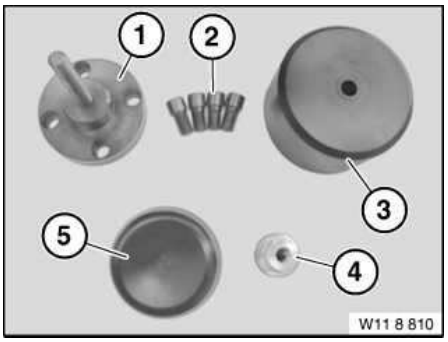
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0 496 135 (11 8 813) Holding sleeve



Common	Used in step 44
Usage	(Thrust sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 136 (11 8 814) Nut



Common	Used in step 44
Usage	(Nut with bearing) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

2 285 058 Tool set



Common	Used in step 45
Usage	
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 02 14 (069)

2 409 025 Puller



Common	Used in step 46
Usage	For disassembly of the outer radial shaft seal of the transmission output shaft, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A76
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

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2 411 739 Puller



Common	Used in step 46
Usage	For disassembly of the inner radial shaft seal of the output, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C78
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 408 152 Striking element



Common	Used in step 46
Usage	For installation of the right radial shaft seal transmission output shaft (inner). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

2 413 037 Handle



Common	Used in step 46
Usage	Universal drift handle. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C77
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

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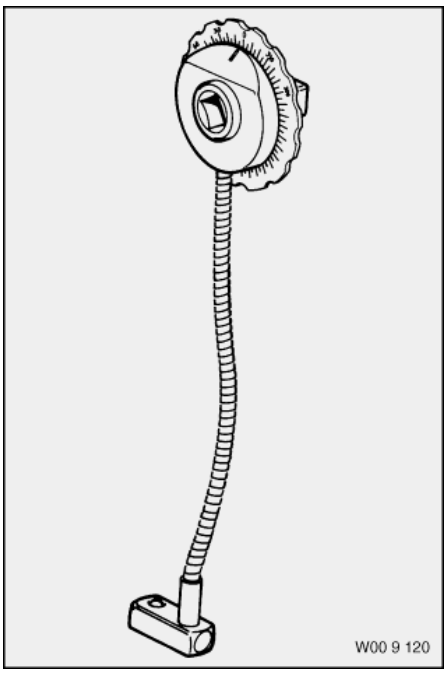
2 408 150 Striking element



Common Used in step 46

Usage	For installing the right radial shaft seal transmission output shaft (outer). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

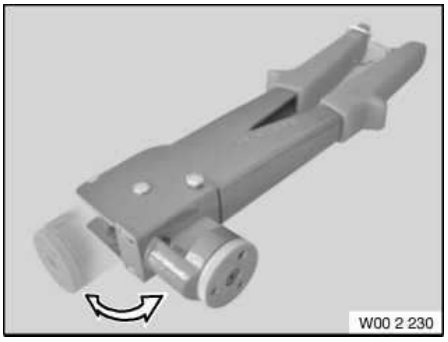
0 490 504 (00 9 120) Torque angle measuring dial



Common Used in step 49

Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

0 496 521 (00 2 230) Pliers



Common Used in step 82

Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

2 344 011 Tool



Common Used in step 83

Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

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Replacement tools:

0 495 221 (36 1 323) Wheel stud



Common	Used in step 21
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud



Common	Used in step 21
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud



Common	Used in step 21
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud



Common	Used in step 21
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud



Common	Used in step 21
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 228 (36 1 331) Wheel stud



Common	Used in step 21
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 229 (36 1 332) Wheel stud



Common	Used in step 21
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud



Common	Used in step 21
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Screw-in depth of thread cutter	Used in step 45
Screw-in depth	18 mm

Links

General repair instructions	Used in step
61 20 ... Notes on AGM battery	69
61 12 ... Notes on intelligent battery sensor (IBS)	69
61 00 ... Notes for disconnecting and connecting battery	69

Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	10 41 43 44
61 13 ... Unlocking and disconnecting different plug connections	41
61 35 ... Notes on ESD protection (Electro Static Discharge)	43 44
17 00 008 Draining and topping up coolant for high-temperature circuit	78
17 00 008 Draining and topping up coolant for high-temperature circuit	78
17 00 008 Draining and topping up coolant for high-temperature circuit	78
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	78
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	78
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	78

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17 00 039 Bleed the cooling system and check it for watertightness with the special tool	78
17 00 039 Bleed the cooling system and check for watertightness with the special tool (coolant circuit for low temperature)	78
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	78
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	78
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	78
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	78
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	78
17 00 039 Bleeding the cooling system (B36, B38, B46, B48)	78
17 00 039 Bleeding cooling system (B37, B47)	78
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	78
17 00 039 Filling and bleeding the high-temperature cooling system vacuum filler device (B48)	78
17 00 008 Draining and topping up the high-temperature coolant circuit	78
17 00 008 Draining and topping up the high-temperature coolant circuit	78
17 00 016 Draining and topping up coolant circuit for Range Extender \PREMIUM	78
17 00 008 Draining and topping up the high-temperature coolant circuit	78
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	78
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	78
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	78
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	78
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	78

Operating materials	Used in step
14.0 Automatic transmission fluid for ZF-transmission GA8HP45Z / GA8HP50Z / GA8HP70Z / GA8HP90Z / GA8P70H / GA8P75H / GA8HP75Z	79
2.0 Grease for wheel centring	83

Operating materials	Used in step

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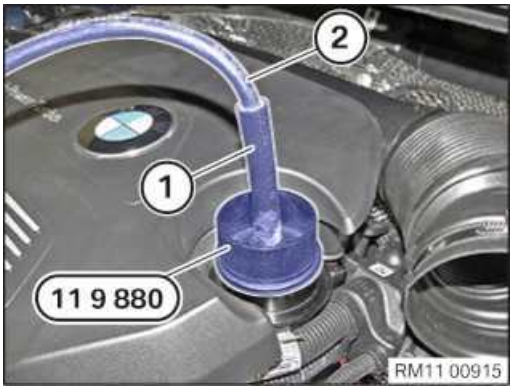
11 15 510 Measuring the internal engine pressure (B47C)

Special tools required:

- 11 9 880
- 81 31 2 357 800

Note:

- Follow the diagnosis instruction for pressure testing.
- Check engine oil level.



Note:
Create hose piece (1), Ø = 8 x 13 mm, length = 70 mm.

Create hose piece of low pressure line (2), length = 300 mm.

Connect hose piece (1) with low pressure line (2).

Connect low pressure line (2) with the diagnosis connection of the Integrated Measurement Interface Speaker (IMIB).

Connect tube (1) to special tool 11 9 880 .

Open oil filler cap .

Insert special tool 11 9 880 **hand-tight** into oil filler neck opening.

Start engine and run at idle speed.

Note:
Order number for low-pressure hose: 81 31 2 357 800 (previously: 81 38 2 201 924)

Different fault patterns as example:

0.97 bar	Ambient pressure.
0.95 bar	Engine internal pressure normal.

If the deviation is significantly greater than -0.04 bar, the engine ventilation system is faulty.

0.80 bar	Pressure control valve faulty.

If the deviation is significantly greater than +0.04 bar, the engine ventilation system is clogged.

1.07 bar	Clogged ventilation system, e.g. iced up, contaminated or kinked vent line.

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11 16 550 Removing and installing alternator bracket (B47)

Special tools required:

- 11 4 470

Warning!

Risk of scalding!

Only perform these tasks on an engine that has cooled down.

Recycling:

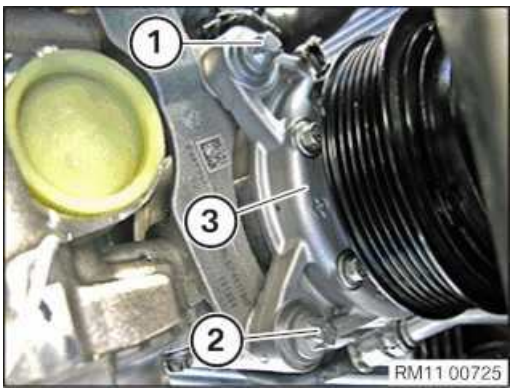
Catch and dispose of drained coolant.

Observe country-specific waste disposal regulations.

Necessary preliminary work:

- Remove alternator.
- Remove air conditioning compressor.
- Remove alternator drive belt.
- Drain coolant.
- Remove holder.

Removal:



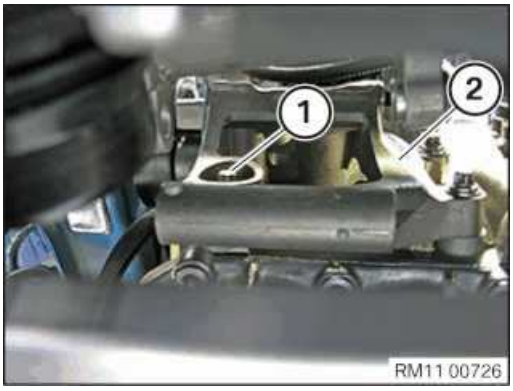
Release and remove screw (1) from air conditioning compressor (3).

Release screw (2) of air conditioning compressor (3).

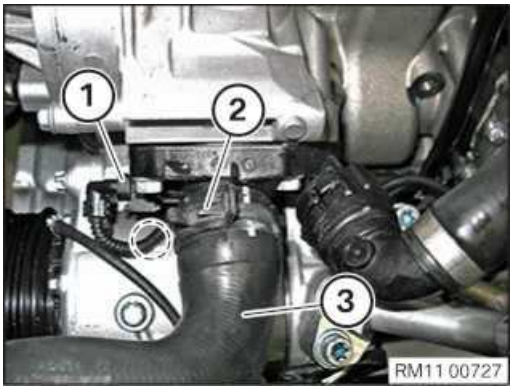
Slightly tip engine backwards and remove screw (2).

Set the air conditioning compressor (3) to the side.

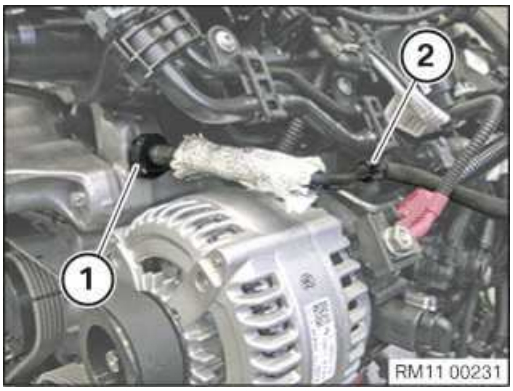
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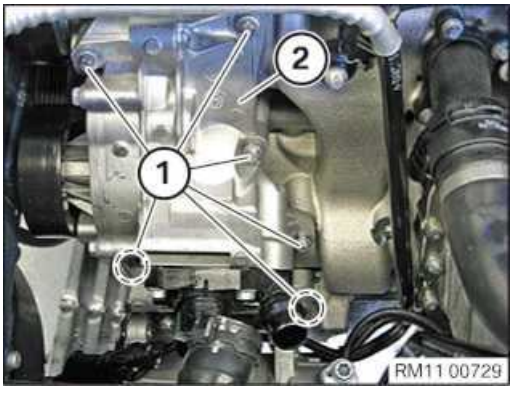
Release screw (1) on alternator bracket (2) from bottom.



Unlock connector (1) and pull off.
Release clamp (2) and pull off coolant hose (3).



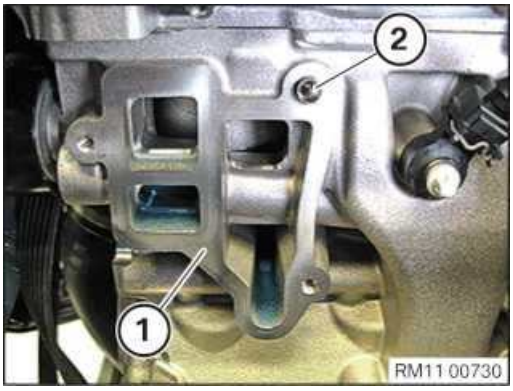
Unlock coolant line (1) and pull off.
Unclip coolant line (1) from holder (2).



Release screws (1).
Remove alternator support (2).

Installation:

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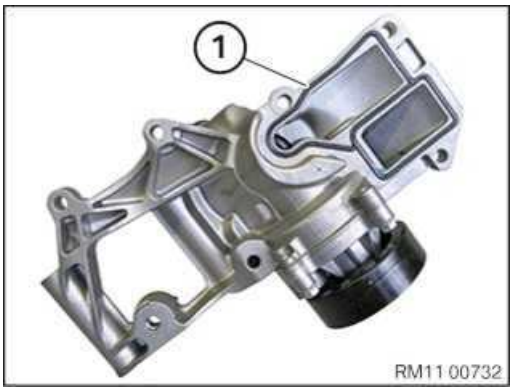


Clean sealing surface (1) with special tool 11 4 470 .

Check centering bush (2) for damage and replace if necessary.



Check centering bush (1) for damage and replace if necessary.



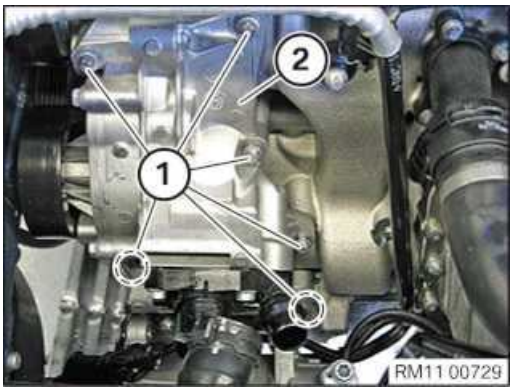
Note:
Sealing bead (1) is bonded to housing of the new alternator support.

Installation note:
If the sealing bead (1) protrudes slightly and if the sealing bead (1) is not damaged, the alternator support can be reinstalled.

If damaged: remove sealing bead (1) using suitable tool.

Replacing the sealing bead (1) sealant 2 2 (Loctite 5970).

Sealant height approximately 2 to 2.5 mm.

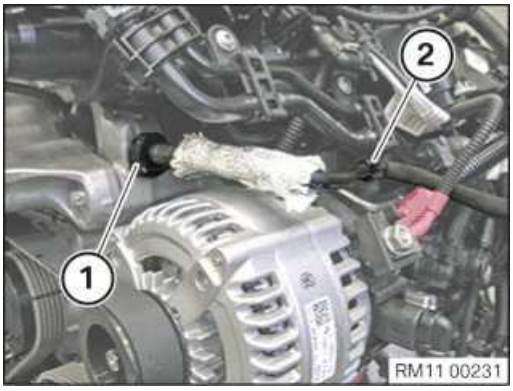


Mount alternator support (2).

Tighten down screws (1).

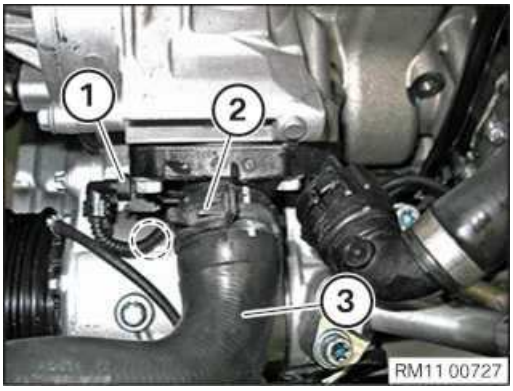
Tightening torque 11 51 3AZ.

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Connect and lock coolant line (1).

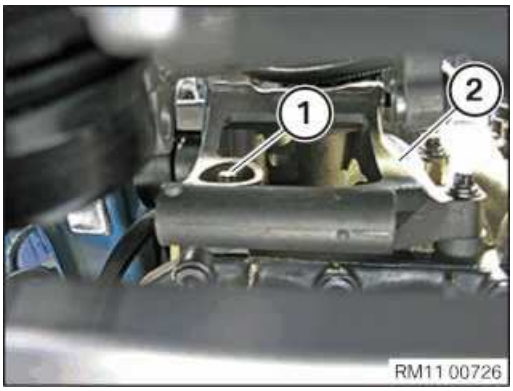
Clip coolant line (1) into holder (2).



Mount coolant hose (3) and secure with clamp (2).

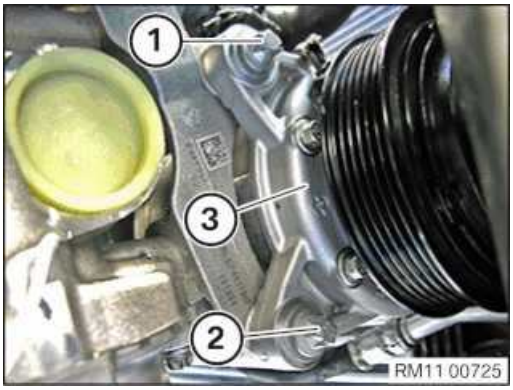
Connect the connector (1).

Note:
Make sure the cable is laid correctly in the marked area.



Attach screw (1) to alternator bracket (2).

Tightening torque 11 51 3AZ.



Position air conditioning compressor (3) at alternator bracket.

Insert and tighten screw (1).

Tightening torque 64 52 3AZ.

Slightly tip engine backwards and insert screw (2).

Tighten screw (2).

Tightening torque 64 52 3AZ.

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Required follow-up work:

- Install holder
- Install drive belt for alternator
- Install alternator
- Add coolant

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11 16 550 Removing and installing/replacing component carrier

TECHNICAL INFORMATION

- When the engine is stopped after the end of the journey, it may be necessary to run the electric fan. In rare cases, operation of the electric fan can last up to 11 min. This protects the components. In this case, replacing the electric fan will not remedy the problem!

PRELIMINARY WORK

1 – Disconnecting all battery earth leads



- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

Damage to the acoustic cover.

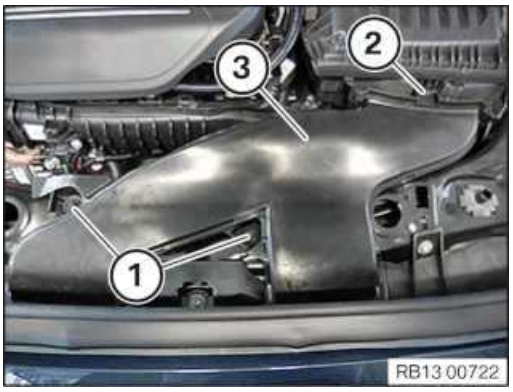
Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

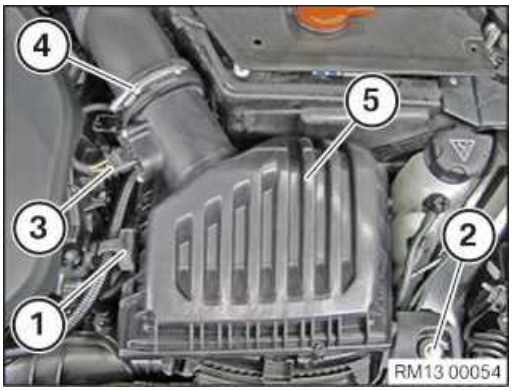
3 – Remove the intake neck for intake silencer housing

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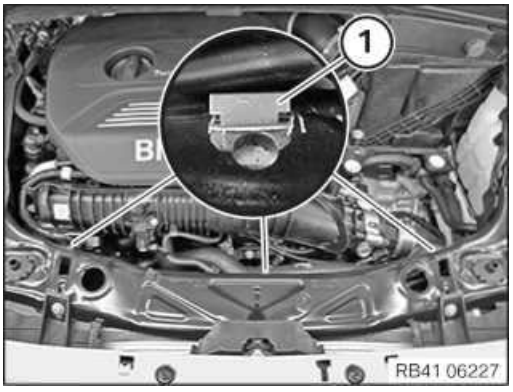
- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

4 – Removing intake silencer housing

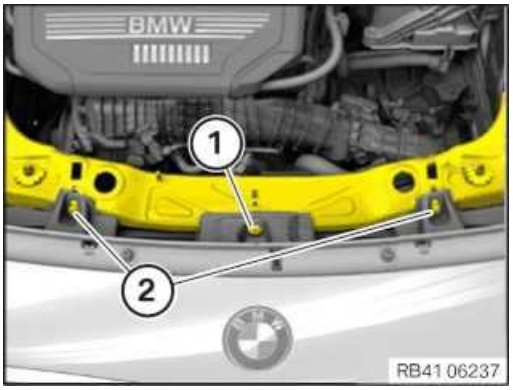


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

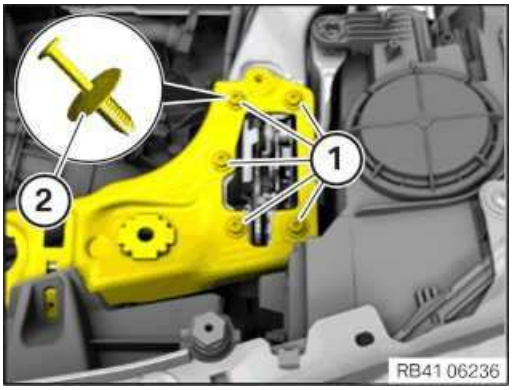
5 – Remove front cross connection



- Detach the clamps (1) for the Bowden cable of the bonnet locks from the cross connection.

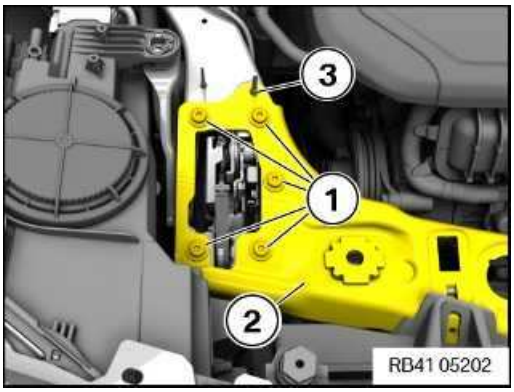


- Loosen screw (1).
- Loosen screws (2).



- Loosen screws (1).
- Lever out expanding rivet (2).

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- Loosen screws (1).
- Unclip the front cross connection (2) from the rubber retainer (3) and remove it upward.

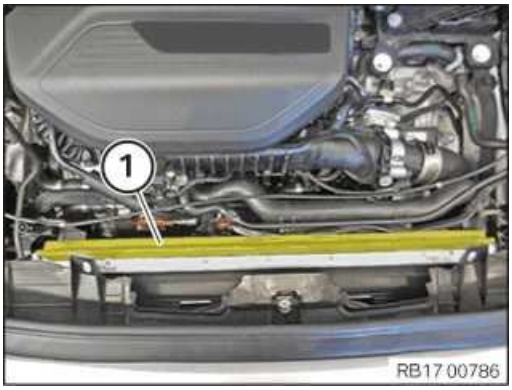
6 – Removing the fan cowl with electric fan

WARNING

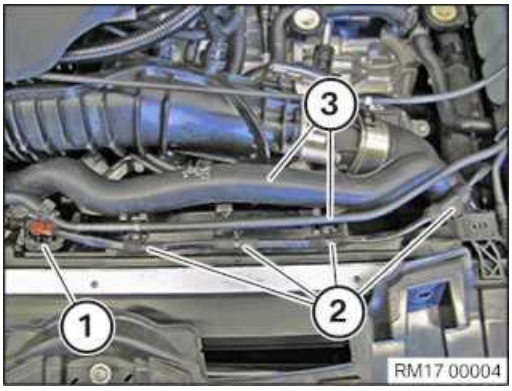
Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Feed out and remove the sealing (1) from the radiator.

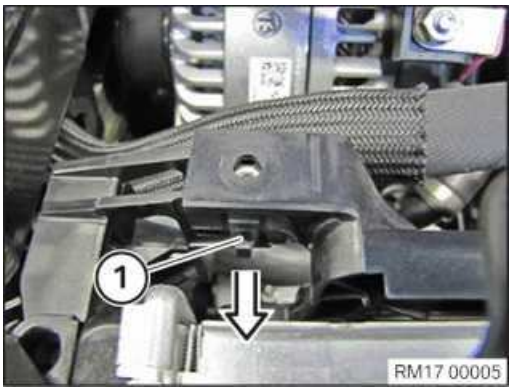


- Unlock plug connection (1) and disconnect.
- Unlock and loosen the clamps (2).
- Feed out connector (1) and place to one side.
- Thread off coolant line (3) and place to the side.

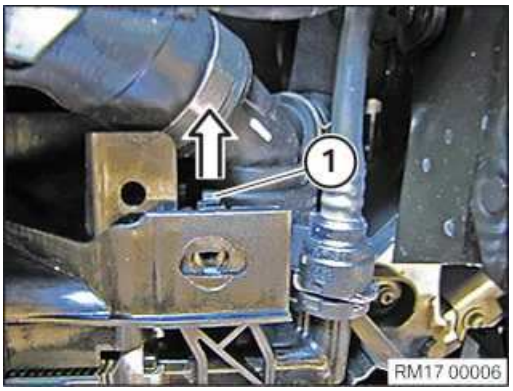


- Loosen screws (1).

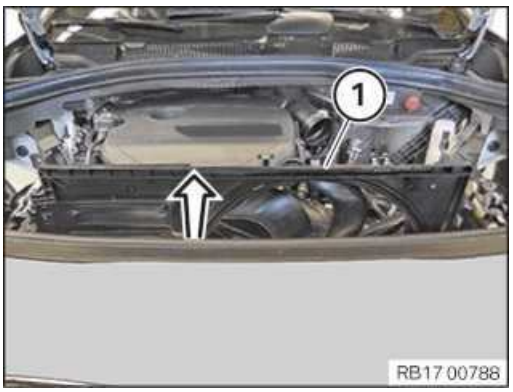
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- Unlock the right lock (1) on the fan cowl in the direction of the arrow.

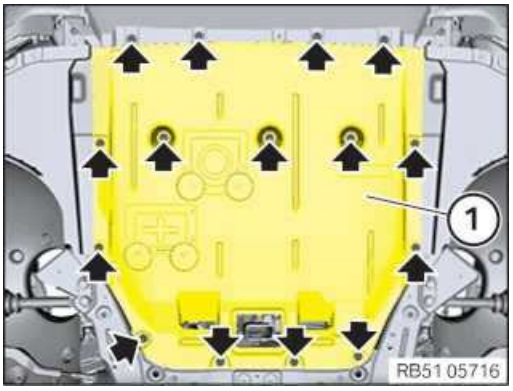


- Unlock the left lock (1) on the fan cowl in the direction of the arrow.

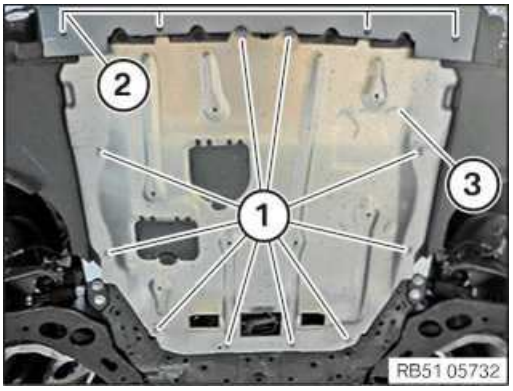


- Guide out fan cowl (1) in direction of arrow and remove.

7 – Removing the front underbody protection



- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.



- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

8 – Draining coolant

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WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

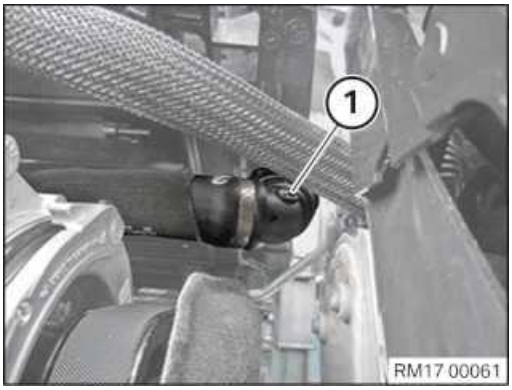
In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

TECHNICAL INFORMATION

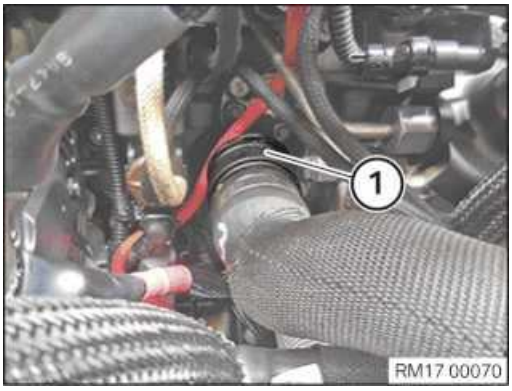
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Loosen sealing cap (1).



- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.



- Unlock the coolant line (1) and pull it off the connecting branch.
- Catch and dispose of escaping coolant.

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9 – Remove front right wheel

TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

TECHNICAL INFORMATION

Strictly observe the specified procedure to prevent clamping errors and imbalance.



- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

10 – Removing the front right wheel arch cover

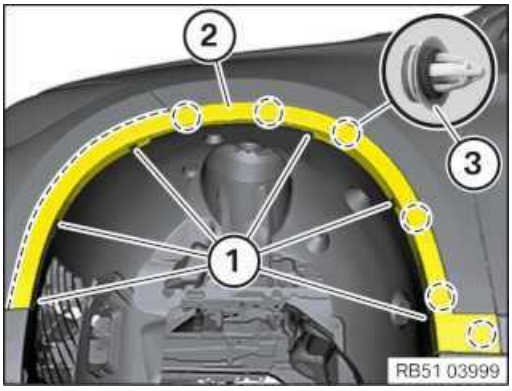
▸ **Remove the front wheel arch trim**

NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

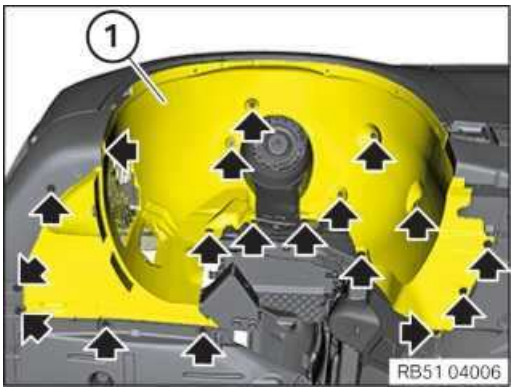
NOTICE

Description is for left component only. Procedure on the right side is identical.



- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.

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NOTICE

Description is for left component only. Procedure on the right side is identical.

- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

11 – Removing the drive belt for alternator

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

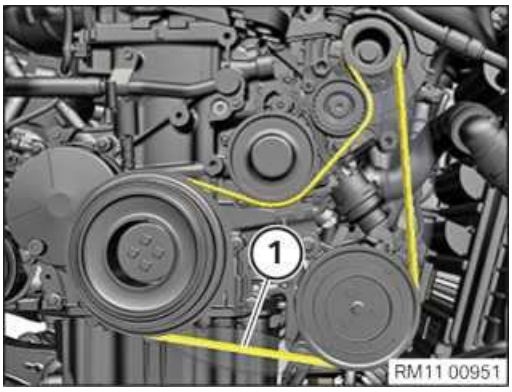
TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.



- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool **0 496 268 (11 0 390)**.

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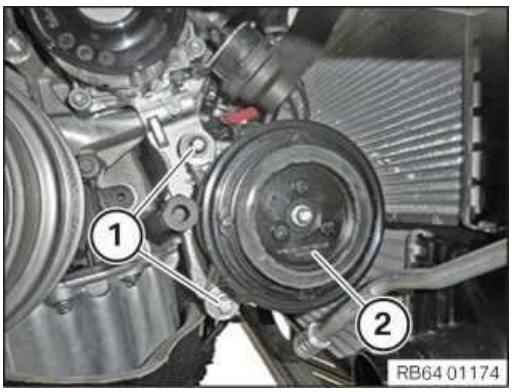


- Guide out the drive belt for the alternator (1) and remove it.

12 – Removing the alternator

Prerequisite

Battery earth lead is disconnected.

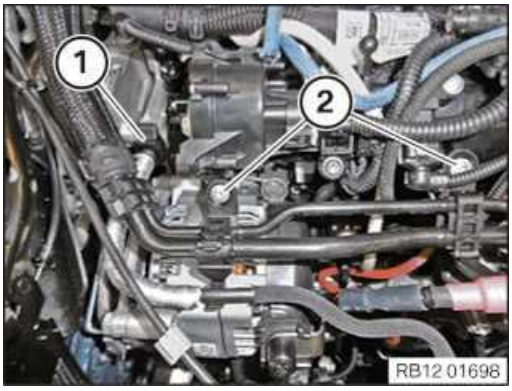


TECHNICAL INFORMATION

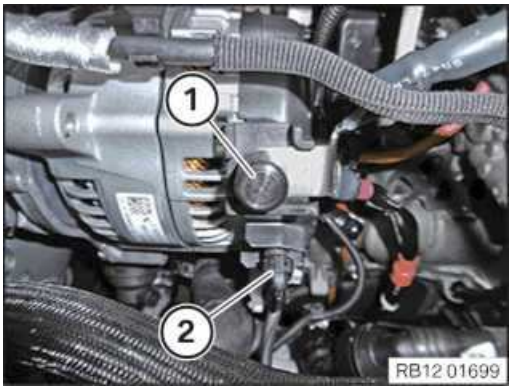
Secure component against falling.

- Loosen screws (1).
- Detach the air conditioning compressor (2) from the component carrier and protect it from falling.

Note: Tie the air conditioning compressor up.



- Unlock the coolant ventilation line (1) and pull it off the cylinder head.
- Catch and dispose of escaping coolant.
- Loosen screws (2).
- Place fuel feed and return line to one side.

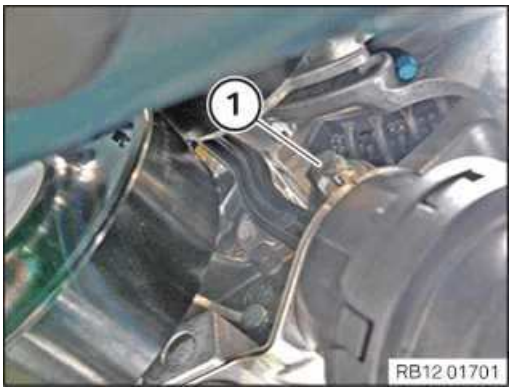


- Remove the cover (1) and loosen the nut below.
- Disconnect positive battery cable from alternator.
- Unlock and disconnect the connector (2) from the alternator.

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- Detach screw (1) on top on the alternator.



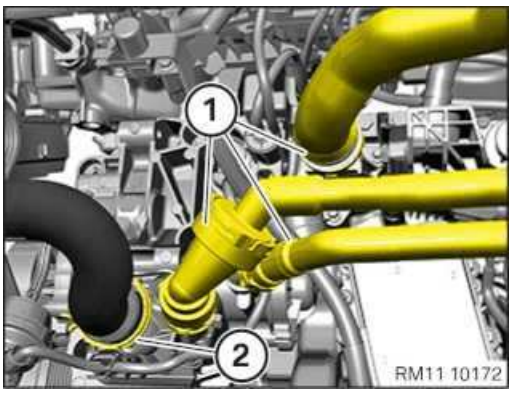
- Detach screw (1) below on the alternator.



- Feed out alternator (1) along with the screw (2) on the bottom of the alternator through the slot on the support and remove.

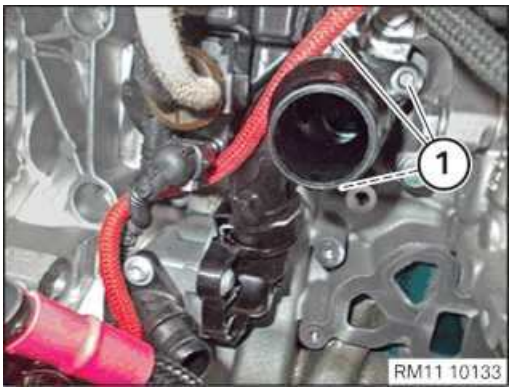
MAIN WORK

13 – Removing the component carrier

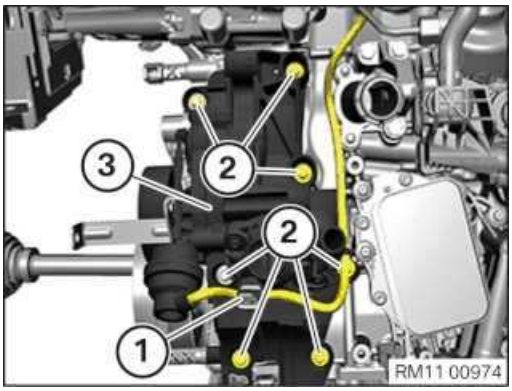


- Unlock the lock of the coolant lines.
- Pull off coolant lines (1) and place to one side.
- Loosen hose clamp (2).
- Remove coolant hose.

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- Loosen screws (1).



- Disconnect the vacuum line (1) from the vacuum unit and detach it from the clamp on the component carrier.
- Loosen screws (2).
- Lift off and remove the component carrier (3) from the crankcase.

14 – Installing the component carrier



RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

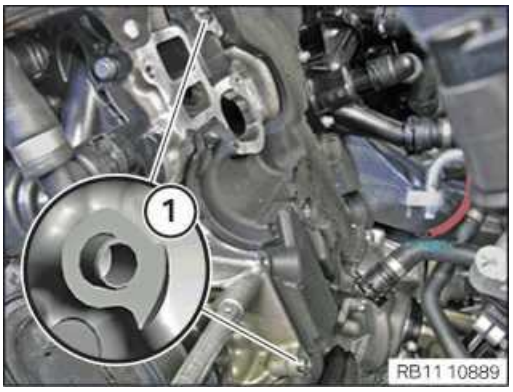
- Clean the sealing surface using special tool **0 495 102 (11 4 470)**.



- Clean the sealing surface (1) using special tool **0 495 102 (11 4 470)**.

Check

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- Check the fitting sleeves (1) for damage.

desired state

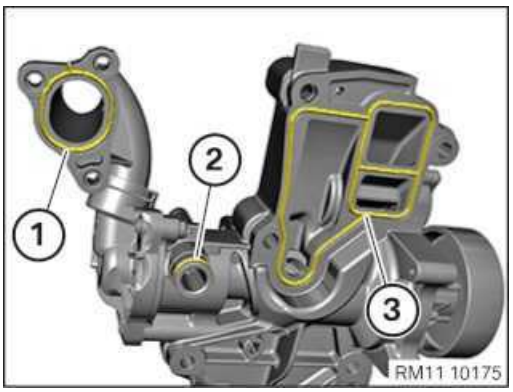
- Fitting sleeves must not be scratched or deformed.

Result

» Fitting sleeves are damaged.

Measure

- Renew fitting sleeves.



- Renew gasket (1).

  Parts: Gasket

- Replace O-ring (2).

  Parts: O-ring

- Check the sealing bead (3) for damage.
- Check the height of the sealing bead in reference to the surface.

Height of the sealing bead

	2,0 mm ... 2,5 mm

- If necessary, reapply the sealing bead.

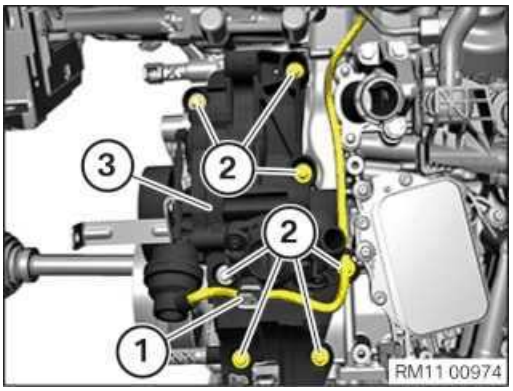
Sealing compound

Loctite 5970 liquid sealing compound	50 ml, Cartridge	83190404517

Overview of consumables (Electronic Parts Catalogue)

Processing time of liquid sealing compound

	< 12 min



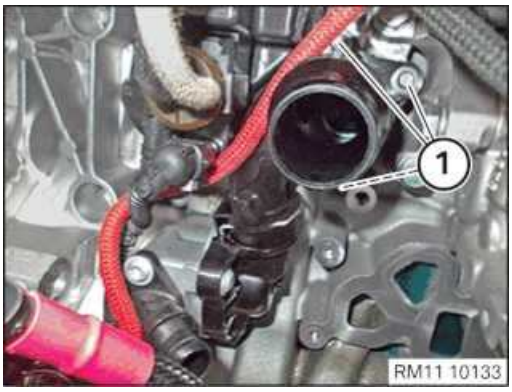
- Position the component carrier (3) on the crankcase.
- Tighten down screws (2).

Component carrier to crankcase

M8x35		Tightening torque	19 Nm

- Connect the vacuum line (1) on the vacuum unit and attach it in the clamp on the component carrier.

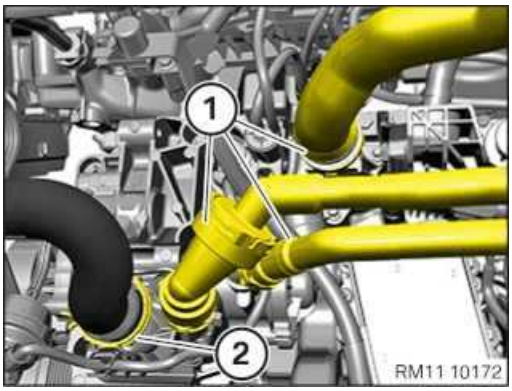
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- Tighten the screws (1).

Connecting branch to engine block

M6x25		Tightening torque	8 Nm



- Connect and lock the coolant lines (1).

  The locks must engage audibly.
- Connect the coolant hose and fasten the hose clamp (2).

POSTPROCESSES

15 – Installing the alternator

Prerequisite

Battery earth lead is disconnected.

CAUTION

Improper routing of the positive battery cable.

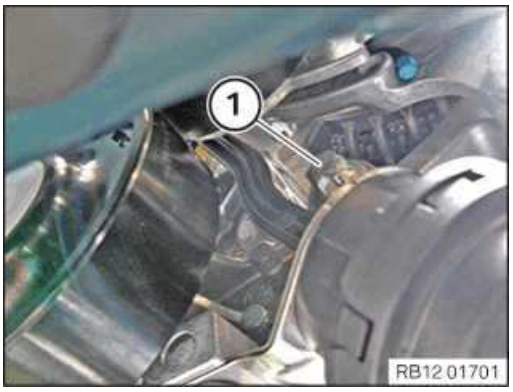
Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.



- Insert and install alternator (1) along with the screw (2) on the bottom of the alternator through the slot on the support.

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- Tighten the screw (1) below on the alternator.

Alternator to component carrier

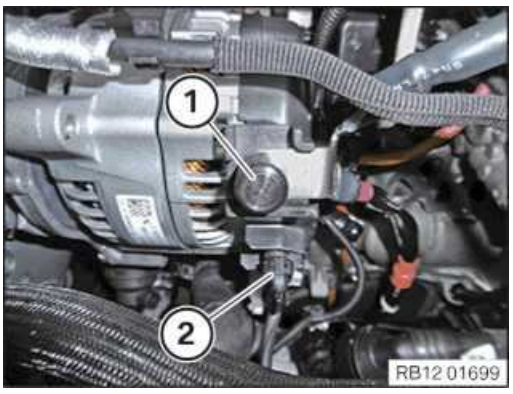
M10x75 / M10x125		Tightening torque	38 Nm



- Tighten the bolt (1) on top on the alternator.

Alternator to component carrier

M10x75 / M10x125		Tightening torque	38 Nm

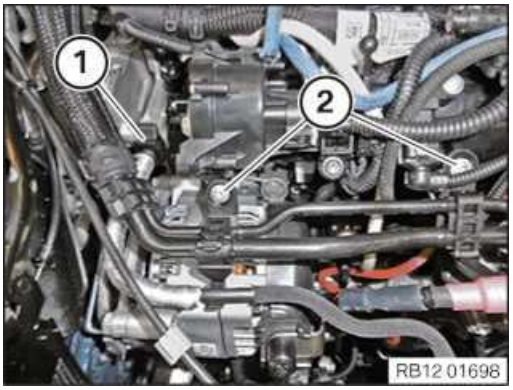


- Mount positive battery cable to the alternator.
- Tighten nut.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

- Mount the cover (1).
- Connect the connector (2) to the alternator and lock audibly.

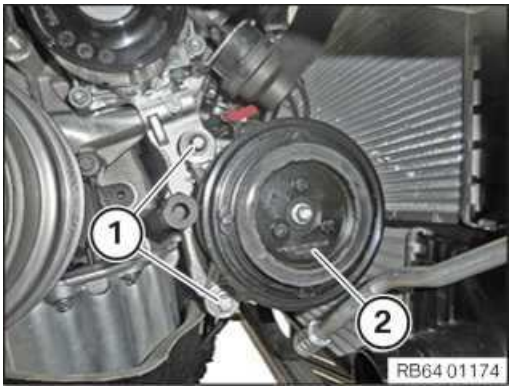


- Mount fuel supply and return line.
- Tighten down screws (2).

Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

- Connect the coolant ventilation line (1) to the cylinder head and audibly lock.



- Correctly position the air conditioning compressor (2).
- Tighten the screws (1).

Air conditioning compressor in component carrier

M10		Tightening torque	38 Nm

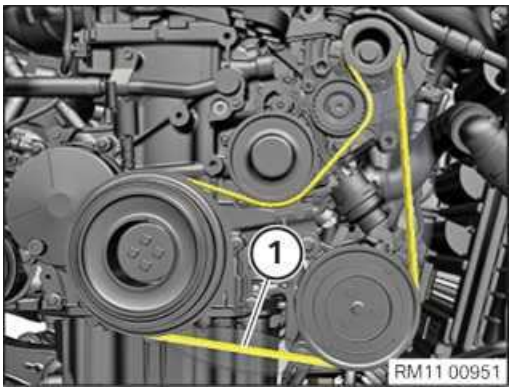
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TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.



- Feed in the drive belt for the alternator (1) and install it.

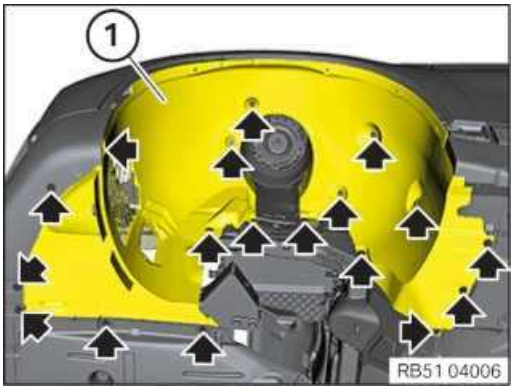


- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool **0 496 268 (11 0 390)** out of the belt tensioner and remove it.

17 – Installing the front right wheel arch cover

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

▸ **Installing front wheel arch trim**

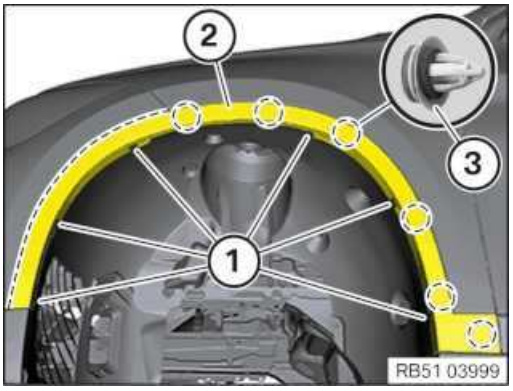
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NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Check the clips (3) for damage and renew where required.

  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

18 – Installing the front right wheel

▸ **Clean the contact surfaces between the brake disc and the wheel rim**



TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

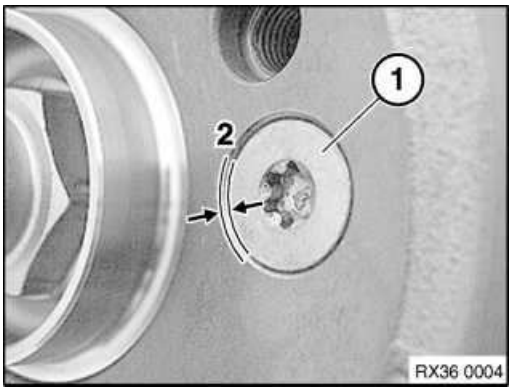
  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.



- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

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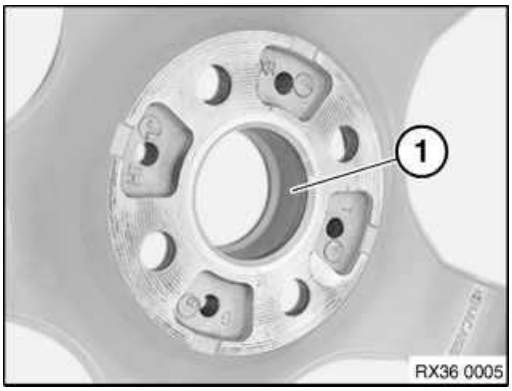


- Check the mounting bolt for the brake disc (1) for secure fit.

  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.



TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

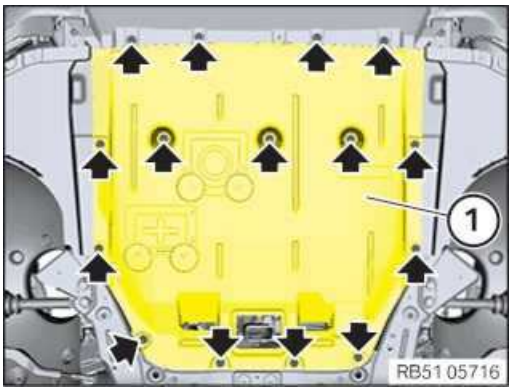
  Parts: Wheel bolts

- Clean the wheel bolts and check the threads for damage. Renew the wheel bolts as needed.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

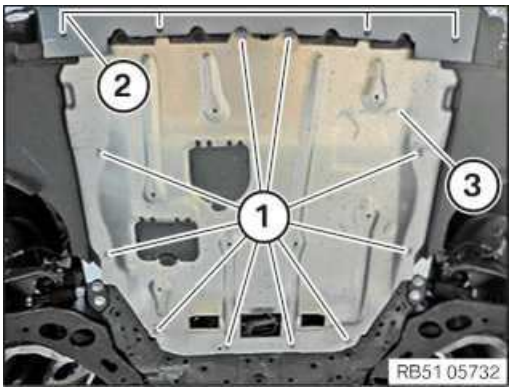
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- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm



- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

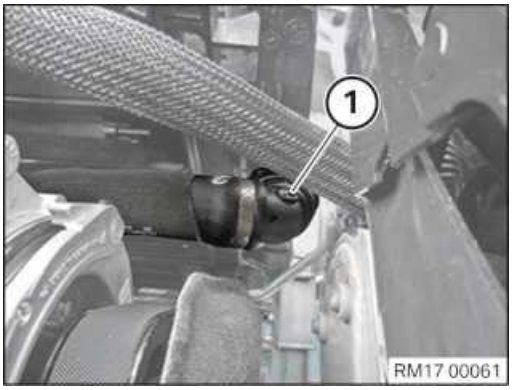
Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

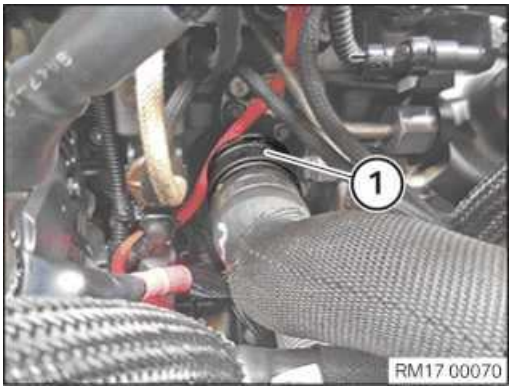
20 – Connect the coolant line

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Connect the right coolant line (1) to the radiator and lock audibly.



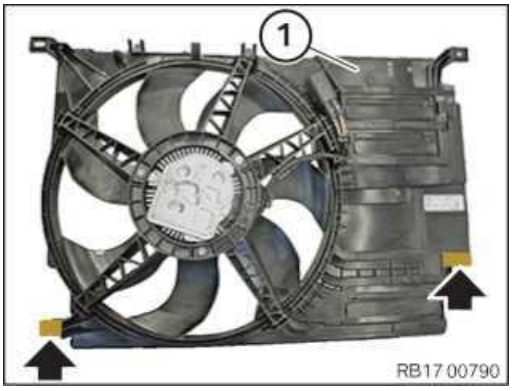
- Connect the coolant line (1) to the connecting branch and lock audibly.

21 – Installing fan cowl with electric fan

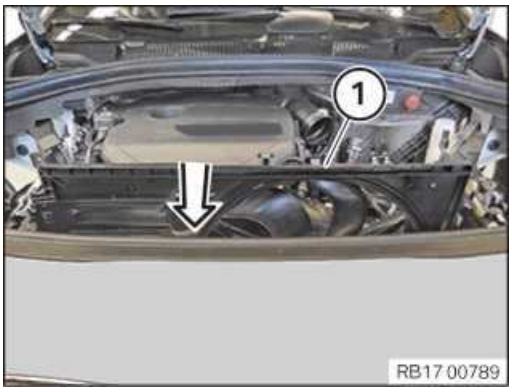
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TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Feed the guides (arrows) of the fan cowl (1) into the charge air cooler.



- Feed in and install the fan cowl (1) in the direction of the arrow.



- Lock the left and right locks (arrows).

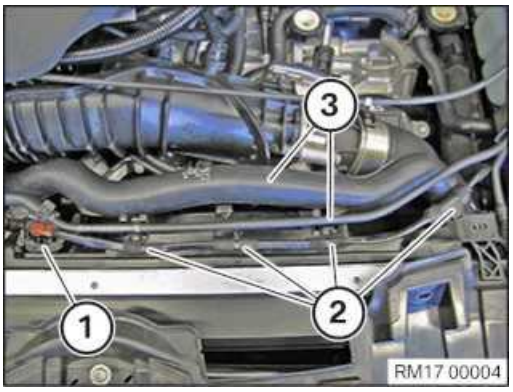


- Tighten the screws (1).

Fan cowl on radiator

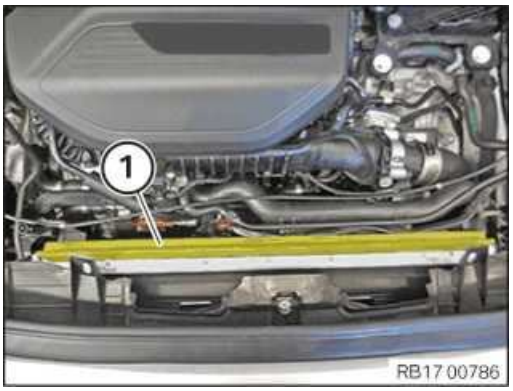
M6X12		Tightening torque	6 Nm

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- Connect connectors (1) and lock.

  The connector (1) must engage audibly.
- Secure clamps (2).
- Thread in and install coolant line (3).

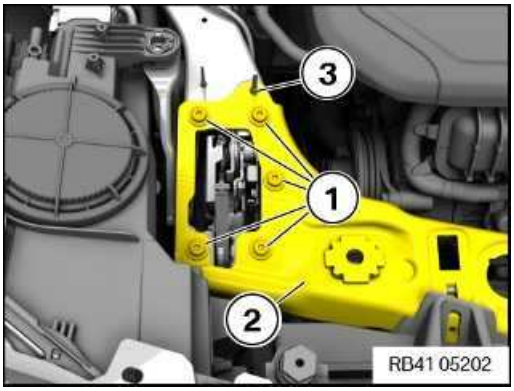


- Guide the sealing (1) on the radiator in and install it.

22 – Install front cross connection



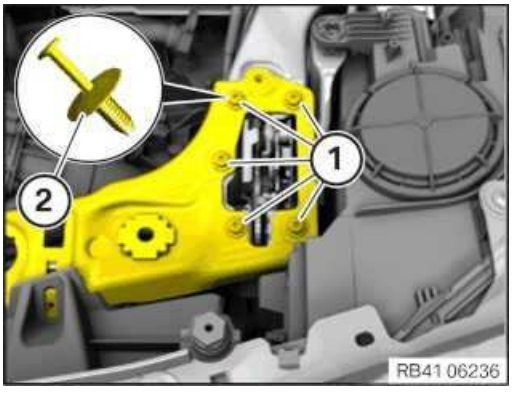
- Right side of vehicle only: Secure spray guard (1) on the cross connection (2) as pictured.



- Position front cross connection (2) and clip front cross connection (2) into the rubber retainer (3) at the same time.
- Tighten the screws (1).

Cross connection to carrier support

Screws M6x20		Tightening torque	11,8 Nm

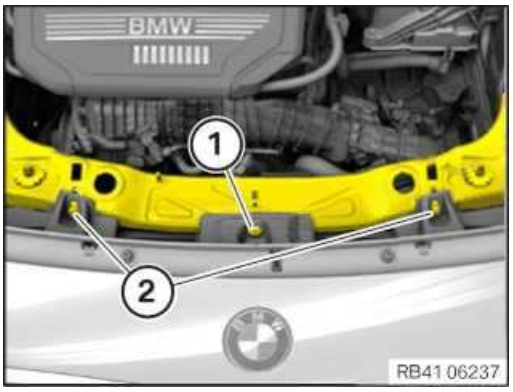


- Tighten the screws (1).

Cross connection to carrier support

Screws M6x20		Tightening torque	11,8 Nm

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- Position screws (3) on the rubber mounts for the radiator and tighten.

Screw connection for rubber mount of coolant radiator to coolant radiator

Bolt to rubber mount		Tightening torque	8 Nm

- Tighten down screws (2).

Air duct to upper connection

M6x20 screw		Tightening torque	11,8 Nm

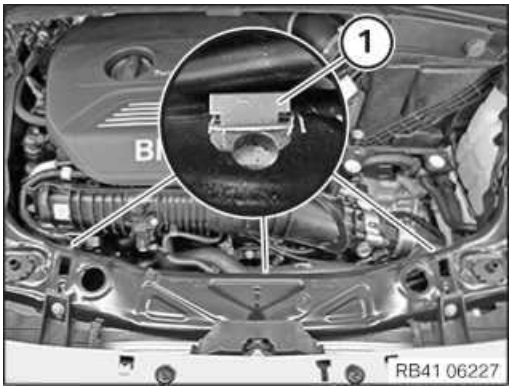
- Tighten down screw (1).

Bracing strut to upper connection

M8x20 screw		Tightening torque	28 Nm

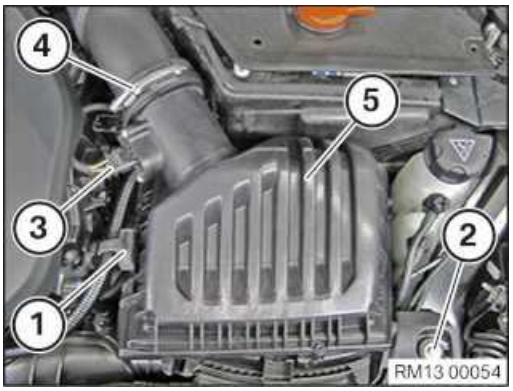


- Right side of vehicle only: Properly mount spray guard (1) to prevent corrosion.
- Secure spray guard (1) to the bridge with retaining tabs (2).



- Fasten the clamps (1) from the Bowden cable of the bonnet lock on the cross connection.

23 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.

  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

Clean air pipe to intake silencer housing

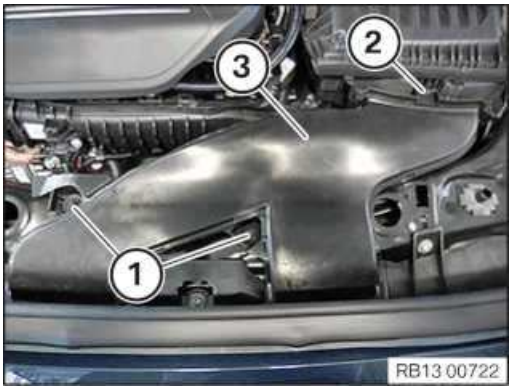
Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Insert and install the holder (1).

24 – Install the intake neck for the intake filter housing

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- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

25 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Check for correct installation of all rubber mounts in the acoustic cover (1).



- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

26 – Disconnecting all battery earth leads

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- See additional information.

27 – Fill and bleed the coolant circuit

▶ **Filling and bleed the high-temperature coolant circuit**



- See additional information.

Additional Information

Overview of Tightening Torques

Component carrier to crankcase			Used in step 14
M8x35		Tightening torque	19 Nm

Connecting branch to engine block			Used in step 14
M6x25		Tightening torque	8 Nm

Alternator to component carrier			Used in step 15
M10x75 / M10x125		Tightening torque	38 Nm

Positive battery cable to alternator			Used in step 15
M8		Tightening torque	19 Nm

Fuel line to intake plenum			Used in step 15
TS6x20		Tightening torque	5 Nm

Air conditioning compressor in component carrier			Used in step 15
M10		Tightening torque	38 Nm

Wheel arch cover to body			Used in step 17
Screw		Tightening torque	2,5 Nm

Wheel arch cover to body			Used in step 17
Plastic nut		Tightening torque	3 Nm

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Brake disc to front wheel hub

Used in step 18

M8	Renew screw.		16 Nm

Wheel bolts

Used in step 18

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Underbody protection front

Used in step 19

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Fan cowl on radiator

Used in step 21

M6X12		Tightening torque	6 Nm

Cross connection to carrier support

Used in step 22

Screws M6x20		Tightening torque	11,8 Nm

Screw connection for rubber mount of coolant radiator to coolant radiator

Used in step 22

Bolt to rubber mount		Tightening torque	8 Nm

Air duct to upper connection

Used in step 22

M6x20 screw		Tightening torque	11,8 Nm

Bracing strut to upper connection

Used in step 22

M8x20 screw		Tightening torque	28 Nm

Intake silencer housing to lock bridge

Used in step 23

M6X30		Tightening torque	8 Nm

Clean air pipe to intake silencer housing

Used in step 23

Clamp		Tightening torque	3 Nm

Intake neck to cross connection

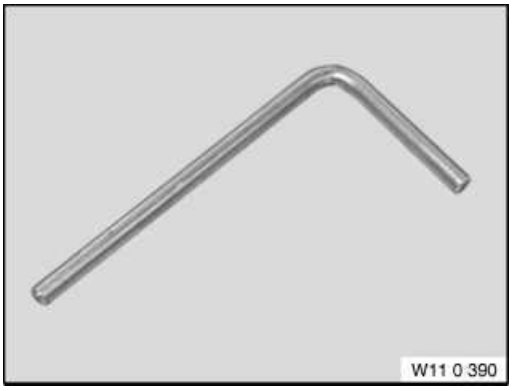
Used in step 24

M6		Tightening torque	8 Nm

Overview of Special Tools

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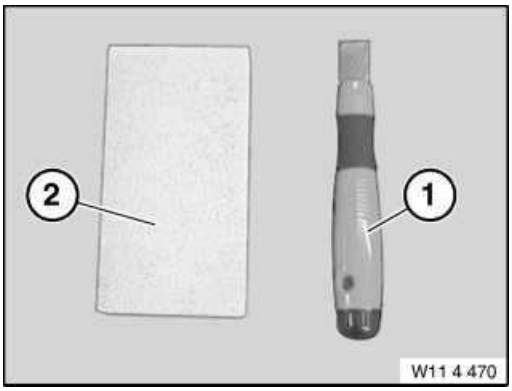
0 496 268 (11 0 390) Pin



Common Used in step 11 16

Usage	(roll pin) For securing new tensioning pulley (poly-V belt)
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 15 07 (390)

0 495 102 (11 4 470) Tool



Common Used in step 14

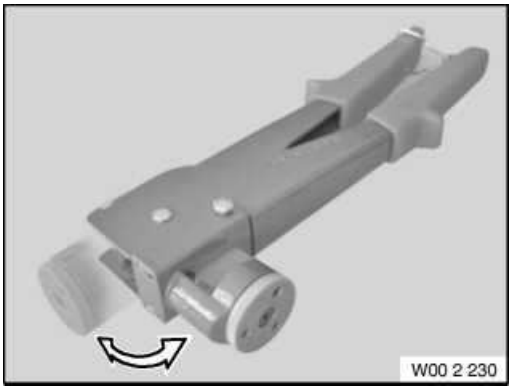
Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

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0 496 521 (00 2 230) Pliers



Common	Used in step 17
Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

2 344 011 Tool



Common	Used in step 18
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

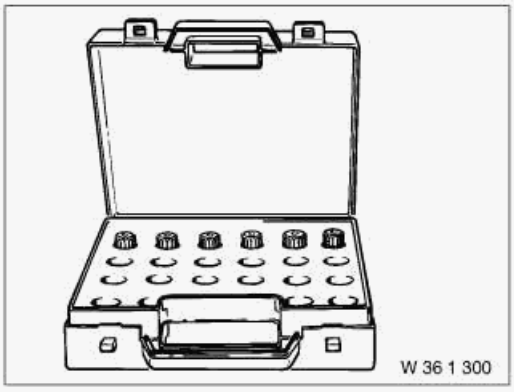
0 495 221 (36 1 323) Wheel stud



Common	Used in step 9
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 224 (36 1 326) Wheel stud



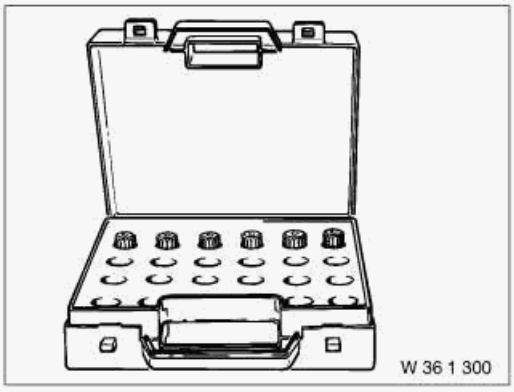
Common	Used in step 9
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud



Common	Used in step 9
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

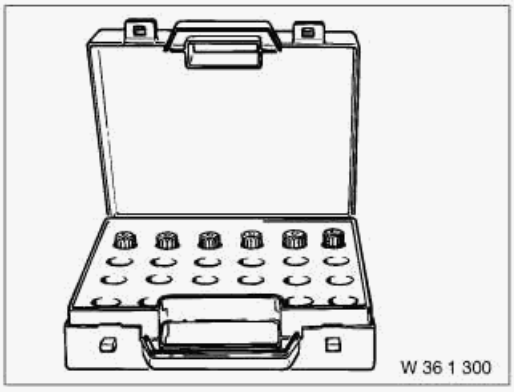
0 495 226 (36 1 328) Wheel stud



Common	Used in step 9
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 227 (36 1 329) Wheel stud



Common	Used in step 9
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud



Common	Used in step 9
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

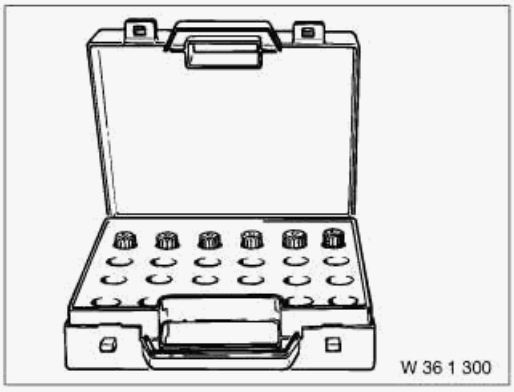
0 495 229 (36 1 332) Wheel stud



Common	Used in step 9
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 230 (36 1 333) Wheel stud



Common	Used in step 9
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Height of the sealing bead	Used in step 14
	2,0 mm ... 2,5 mm

Processing time of liquid sealing compound	Used in step 14
	< 12 min

Links

General repair instructions	Used in step

Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	1 26
61 20 900 Disconnecting and connecting battery earth lead	1 26
61 20 900 Disconnecting and connecting battery earth lead	1 26
61 20 900 Disconnecting and connecting battery earth lead	1 26
61 20 900 Disconnecting and connecting battery earth lead	1 26
61 20 900 Disconnecting and connecting battery earth lead	1 26
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 26
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 26
61 20 900 Disconnecting and connecting battery earth lead	1 26
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 26
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	1 26
61 20 900 Disconnecting and connecting battery earth lead	1 26
61 20 900 Disconnecting and connecting battery earth lead	1 26
61 20 900 Disconnecting and connecting battery earth lead	1 26
61 20 900 Disconnecting and connecting battery earth lead	1 26
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61 20 900 Disconnecting and connecting battery earth lead	1 26
61 20 900 Disconnecting and connecting battery earth lead	1 26
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 26

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61 20 900 Disconnecting and connecting battery earth lead 1 26
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61 20 900 Disconnecting and connecting battery earth lead 1 26
61 20 900 Disconnecting and connecting battery earth lead 1 26
61 20 900 Disconnecting and connecting battery earth lead 1 26
61 20 900 Disconnecting and connecting battery earth lead 1 26
17 00 008 Draining and topping up coolant for high-temperature circuit 27
17 00 008 Draining and topping up coolant for high-temperature circuit 27
17 00 008 Draining and topping up coolant for high-temperature circuit 27
17 00 039 Bleed the cooling system and check it for watertightness with the special tool

17 00 008 Draining and topping up the high-temperature coolant circuit	27
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	27
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	27
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	27
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	27
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	27

Operating materials	Used in step
2.0 Grease for wheel centring	18

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11 21 531 Replacing all crankshaft main bearing shells (B47)

Special tools required:

- 00 2 010

Caution!

Replace main bearing bolts.

There must be no oil in the blind holes **(risk of cracking)**.

Do not wash off bolt coating.

Incorrect assembly of the bearing caps will result in damage to the crankcase.

The code letter **K** on the crankcase stands for "Kupplungsseite" (German = clutch end).

Installation note:

Bearing classification from **1** to **3** (bearing cap) and **A** to **C** (crankcase) possible.

The new main bearing shells and guide bearing shells are indicated in colour or with numbers.

- Bearing colour **blue = 1**
- Bearing colour **green = 2**
- Bearing colour **brown = 3**

Necessary preliminary work:

- Remove crankshaft

Pay attention to the different bearing classification sequences in the crankcase and the bearing caps!

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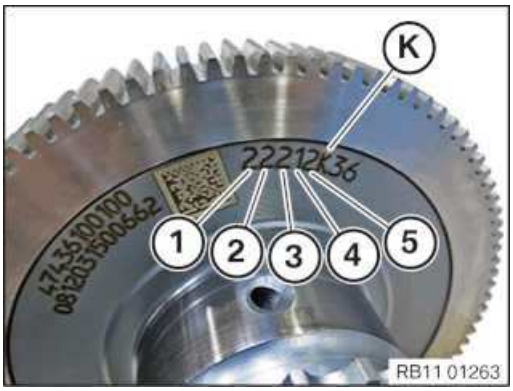
Bearing classification in crankcase: A / B / C

The code letter **K** on the crankcase stands for "Kupplungsseite" (German = clutch end).

The following code letters (5 - 1) describe the bearing positions **5** to **1** from left to right.

Example (see graphic):

Bearing seat **5**:	Code letter **B**= green bearing shell with lubricating groove.
Bearing seat **4**:	Code letter **B**= green bearing shell with lubricating groove.
Bearing seat **3**:	Code letter **B**= green bearing shell with lubricating groove (thrust bearing).
Bearing seat **2**:	Code letter **B**= green bearing shell with lubricating groove.
Bearing seat **1**:	Code letter **B**= green bearing shell with lubricating groove.



Bearing classification in bearing cap: 1 / 2 / 3

Code letter (K) stands for clutch side.

The coefficients (1- 5) describe the bearing positions **1** to **5** from left to right.

Example (see graphic):

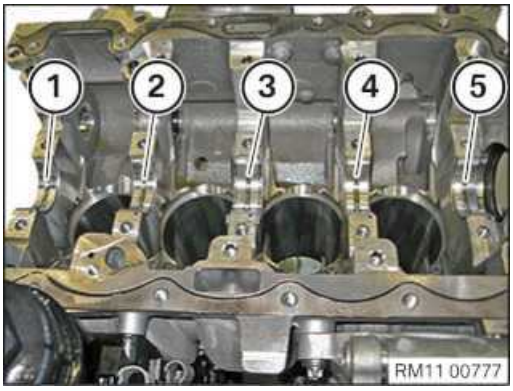
Bearing cap **1**:	ID code **2**= bearing shell, blue, without lubricating groove.
Bearing cap **2**:	ID code **2**= green bearing shell without lubricating groove.
Bearing cap **3**:	ID code **2**= green bearing shell without lubricating groove (axial guide bearing).
Bearing cap **4**:	ID code **1**= yellow bearing shell without lubricating groove.
Bearing cap **5**:	ID code **2**= green bearing shell without lubricating groove.

(A/1) Bearing cap / Blue	**(A/2)** Bearing cap / Green	**(A/3)** Bearing cap / Brown
(A/1) Crankcase / Blue	**(A/2)** Crankcase / Blue	**(A/3)** Crankcase / Blue
(B/1) Bearing cap / Blue	**(B/2)** Bearing cap / Green	**(B/3)** Bearing cap / Brown
(B/1) Crankcase / Green	**(B/2)** Crankcase / Green	**(B/3)** Crankcase / Green
(C/1) Bearing cap / Blue	**(C/2)** Bearing cap / Green	**(C/3)** Bearing cap / Brown
(C/1) Crankcase / Brown	**(C/2)** Crankcase / Brown	**(C/3)** Crankcase / Brown

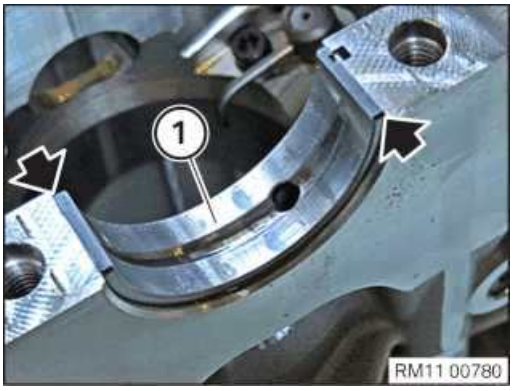
Enter code letters and numbers for crankcase and crankshaft

Code letters/numbers	Bearing seat **1**	Bearing seat **2**	Bearing seat **3**	Bearing seat **4**	Bearing seat **5**		
Crankcase at top **code letter**							
Crankshaft at bottom **code number**							

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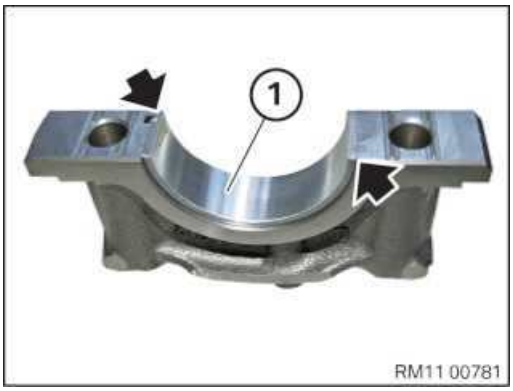


Remove bearing shells 1 to 5.



Place main bearing shell (1) with lubricating groove in crankcase (see arrows).

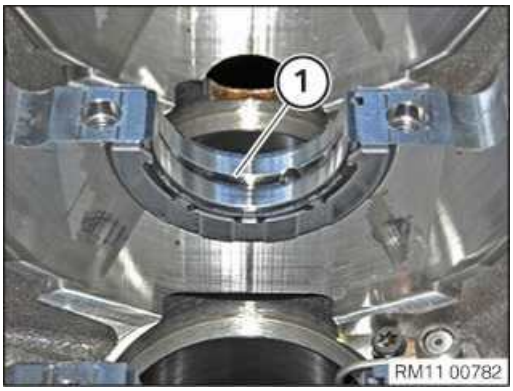
Observe combination of bearing colours according to the table.



Place main bearing shell (1) with no lubricating groove in the bearing cap (see arrows).

Note:
Pay attention to guide lug on main bearing shell (1).

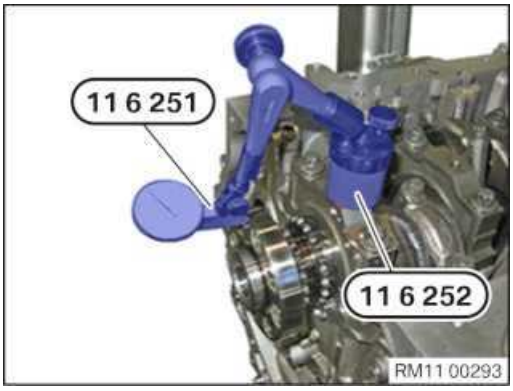
Observe combination of bearing colours according to the table.



Note:
Thrust bearing (1) on the crankshaft is installed at bearing position 3.

Observe combination of bearing colours according to the table.

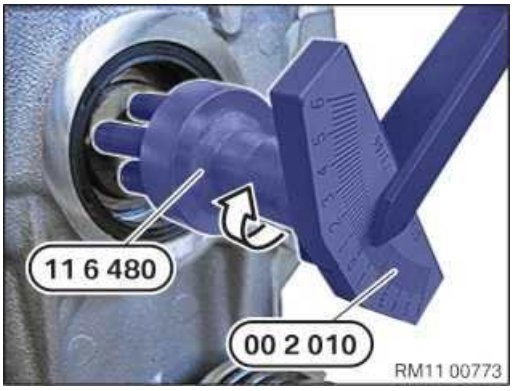
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Install crankshaft.

Check side clearance.

If necessary, check guide bearing shells, crankshaft and engine block.



Rotate crankshaft (1) with special tool 00 2 010 in direction of arrow.

Check crankshaft coefficient of friction.

Required follow-up work:

Assemble engine.

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11 21 001 Replacing crankshaft

PRELIMINARY WORK

1 – Removing engine



- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

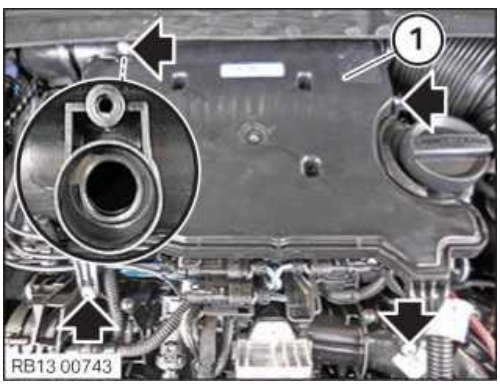
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

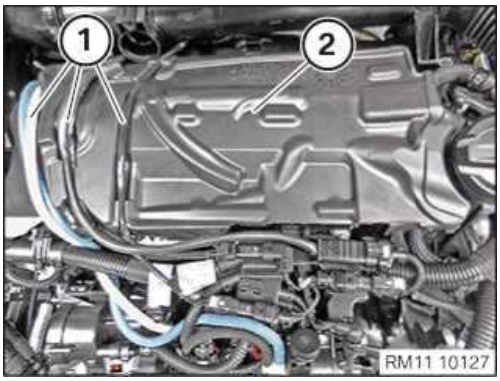
3 – Remove resonator



- Remove screws (arrows).
- Guide out and remove the resonator (1).

4 – Remove the acoustic cover for the injectors

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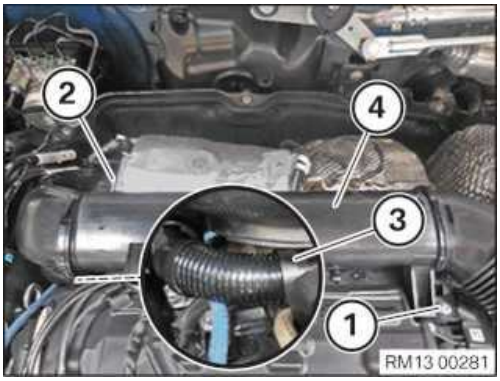


- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

5 – Removing clean air pipe



- Detach clamp (1) on the clean air pipe.
- Pull off the clean air pipe from the intake silencer housing.



- Loosen screw (1).
- Loosen clamp (2).
- Unlock the ventilation line (3) and pull it off the cylinder head cover.
- Feed out clean air pipe and remove.

6 – Remove differential pressure sensor

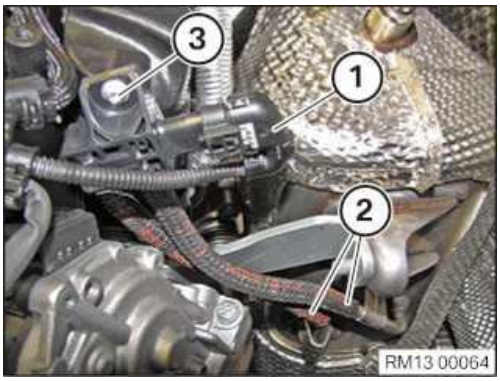
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

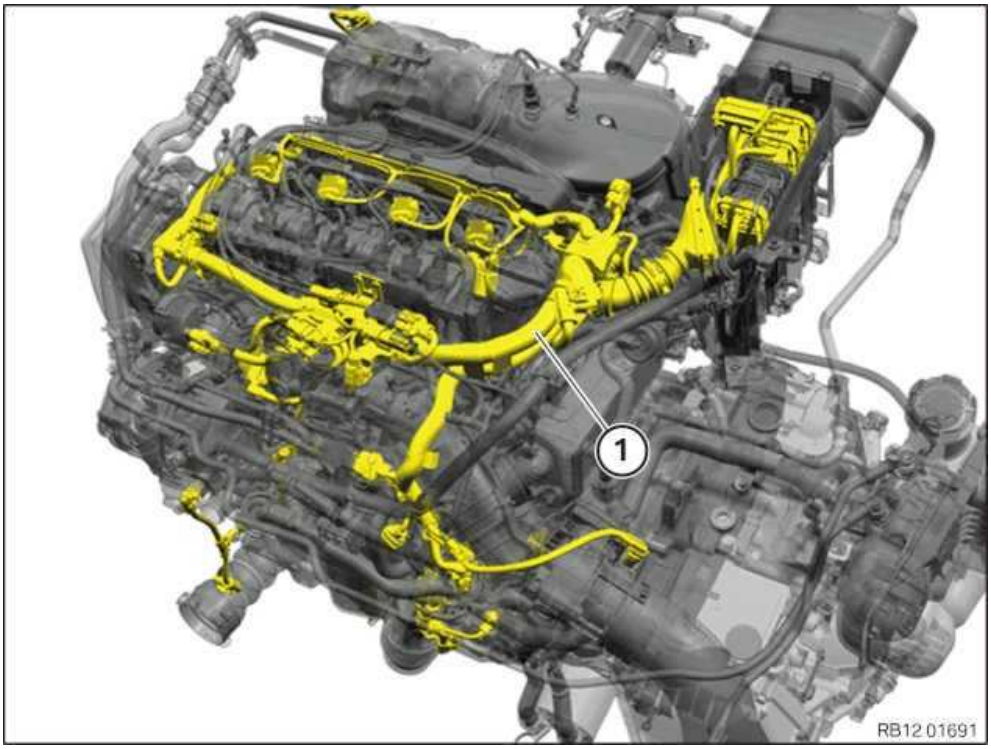
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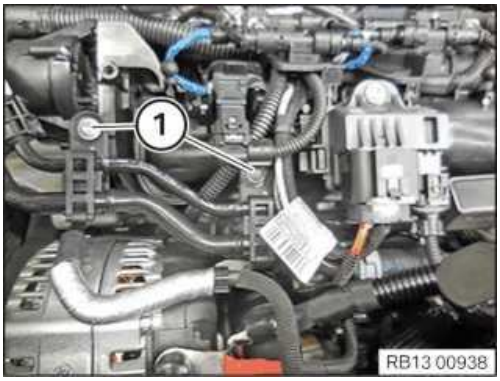
- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

7 – Removing assemblies (on lifting table)

Overview: Wiring harness section for the engine

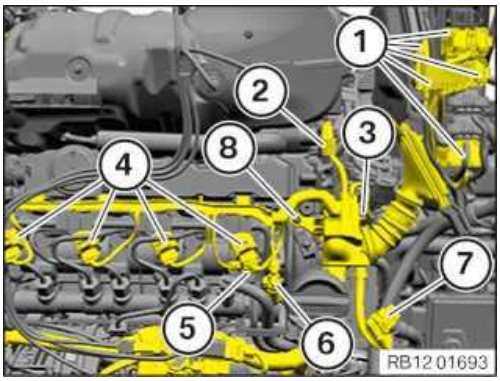


1 Wiring harness section for the engine

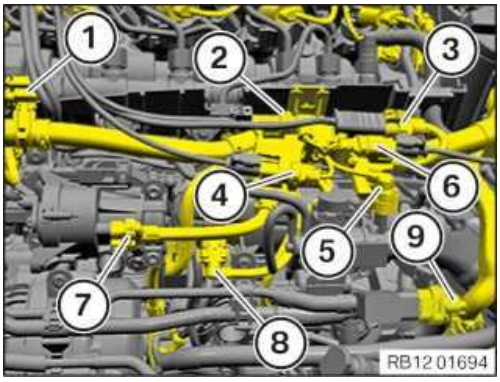


- Loosen screws (1).

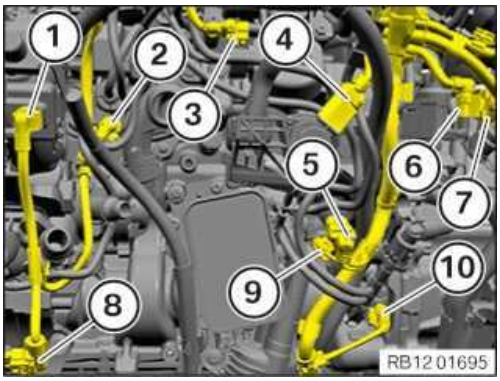
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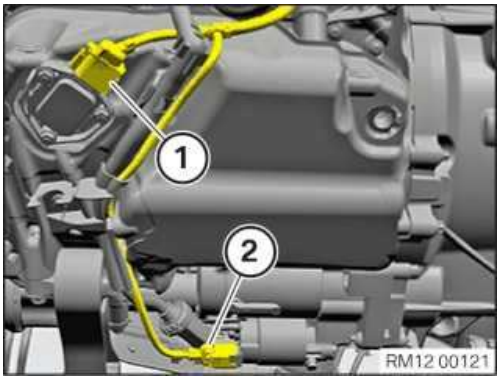
- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock the connector (2) and disconnect it from the differential pressure sensor.
- Unlock the connector (3) and disconnect it from the exhaust-gas recirculation valve.
- Unlock the connector (4) and pull off from the injectors.
- Unlock the connector (5) and disconnect it from the camshaft sensor.
- Unlock the connector (6) and disconnect it from the fuel pressure regulator.
- Unlock connector (7) and pull off from hot film air mass meter.
- Loosen screw (8).



- Unlock connector (1) and pull off from the rail pressure sensor.
- Unlock the connector (2) and disconnect it from the exhaust temperature sensor before the diesel particulate filter.
- Unlock connector (3) and pull it off from the front oxygen sensor.
- Unlock the connector (4) and disconnect it from the exhaust temperature sensor after the diesel particulate filter.
- Unlock and disconnect the connector (5) from the electric changeover valve.
- Unlock the connector (6) and disconnect it from the exhaust temperature sensor for the exhaust-gas recirculation cooler.
- Unlock the connector (7) and disconnect it from the servomotor for the swirl flaps.
- Unlock the connector (8) and pull it off the charging pressure sensor.
- Unlock the connector (9) and disconnect from the fuel pressure and temperature sensor.

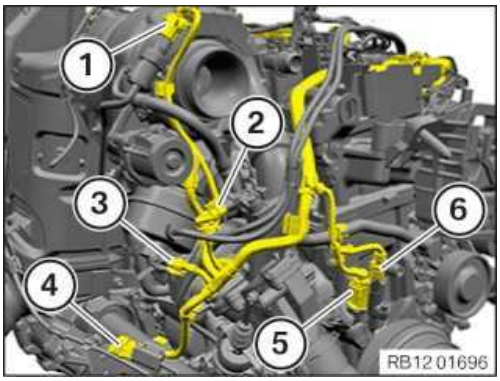


- Unlock and disconnect the connector (1) from the alternator.
- Unlock and disconnect the connector (2) from the electric changeover valve.
- Unlock and disconnect the connector (3) from the electric changeover valve.
- Unlock the connector (4) and pull it off the high pressure pump.
- Unlock the connector (5) and disconnect it from the oil pressure sensor.
- Unlock connector (6) and pull off from throttle body.
- Unlock the connector (7) and disconnect it from the intake air temperature sensor.
- Unlock the connector (8) and disconnect it from the air conditioning compressor.
- Unlock and disconnect the connector (9) from the solenoid valve.
- Unlock the connector (10) and pull it off the crankshaft sensor.



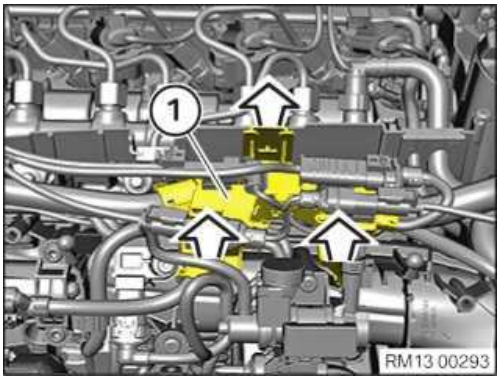
- Unlock the connector (1) and pull off of the oil-level sensor.
- Unlock connector (2) and remove from starter motor.

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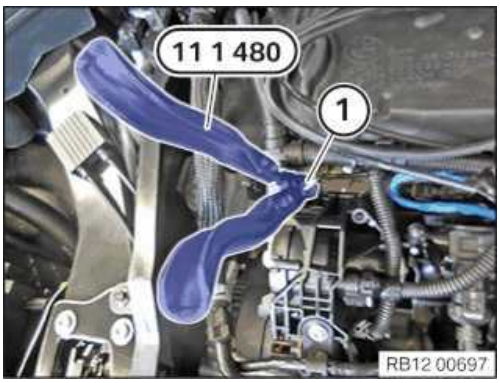


- Unlock the connector (1) and disconnect it from the exhaust gas pressure sensor.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock the connector (3) and pull it off the exhaust turbocharger.
- Unlock the connector (3) and disconnect it from the differential pressure sensor.
- Unlock connector (4) and pull it off from the monitoring oxygen sensor.
- Unlock the connector (5) and pull it off the oil pressure switch .
- Unlock connector (6) and disconnect from switching valve.
- Detach, feed out and remove the wiring harness from the clamps.

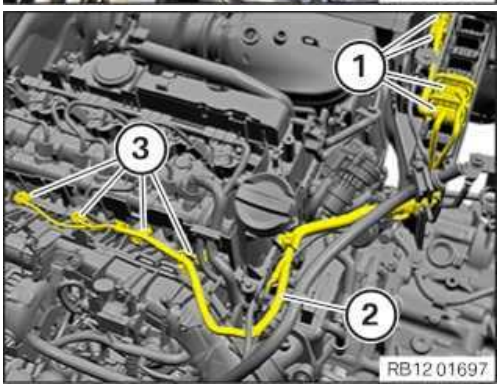
▶ **Removing the cable clips from the intake plenum**



- Detach the cable clip (1) in the direction of the arrow.
- Guide out the cable clip (1) in direction of arrow and set it aside.



- Unlock the connectors (1) of all glow elements with the special tool **0 490 796 (11 1 480)** and release them.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.



- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Pull off all connectors (3) from glow element using special tool **0 490 796 (11 1 480)**.
- Loosen screw (2) and remove the ground strap.
- Detach, feed out and remove the wiring harness from the clamps.

▶ **Removing the drive belt for alternator**

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

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CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

TECHNICAL INFORMATION

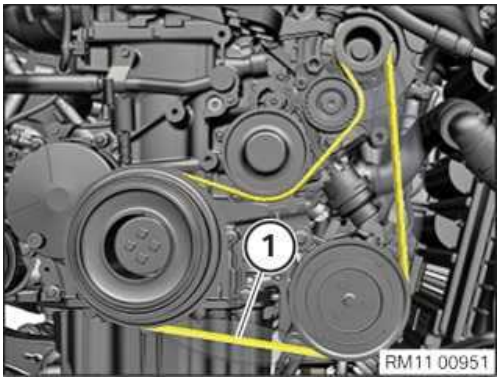
If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

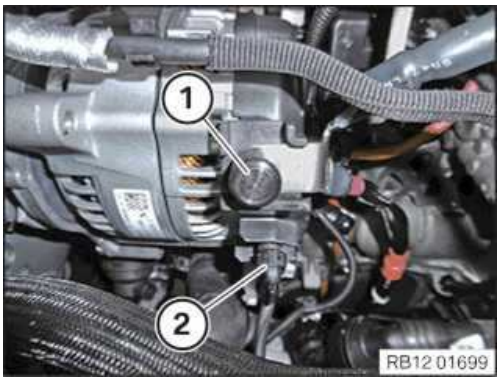
The drive belt must be replaced if contaminated with coolant- and oil residues.



- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool **0 496 268 (11 0 390)**.



- Guide out the drive belt for the alternator (1) and remove it.

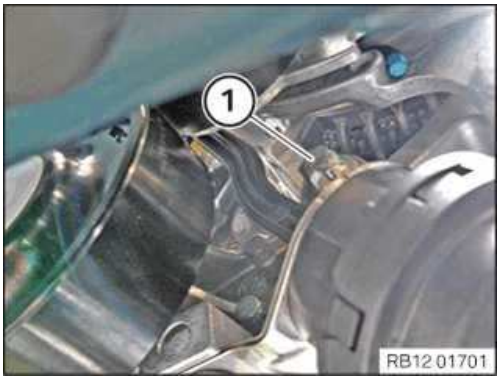


- Remove the cover (1) and loosen the nut below.
- Disconnect positive battery cable from alternator.
- Unlock and disconnect the connector (2) from the alternator.

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- Detach screw (1) on top on the alternator.



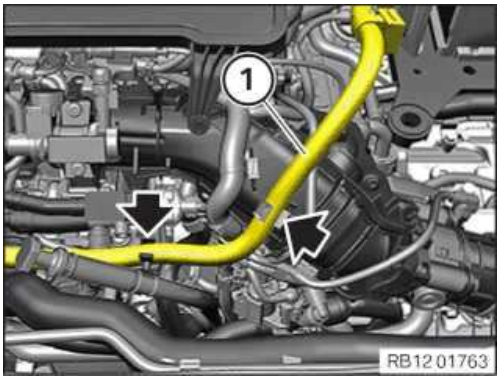
- Detach screw (1) below on the alternator.



- Feed out alternator (1) along with the screw (2) on the bottom of the alternator through the slot on the support and remove.

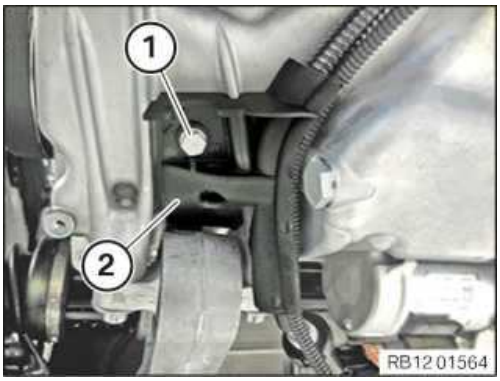


- Loosen screws (1).
- Feed out and remove the air conditioning compressor (2).



- Release the positive battery cable (1) from the clamps (arrows).

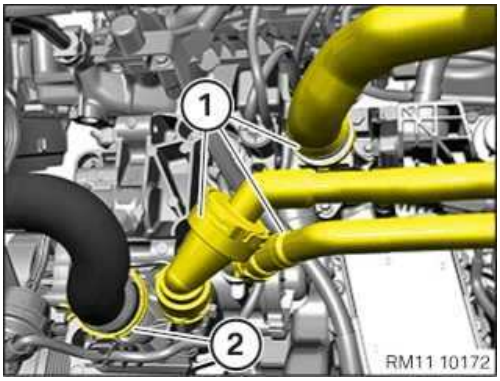
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- Loosen screw (1).
- Guide out and remove holder (2).



- Feed out positive battery cable from the clamps (1) and remove.



- Unlock and disconnect coolant lines (1).
- Guide out the coolant lines (1) and remove it.
- Detach the clamp (2).
- Guide the coolant hose out and remove.

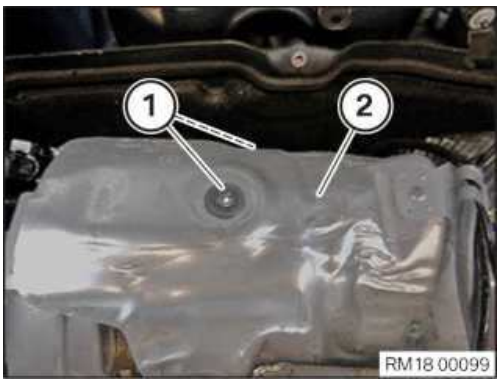
▶ **Removing heat shield from top exhaust turbocharger**

WARNING

Hot surfaces.

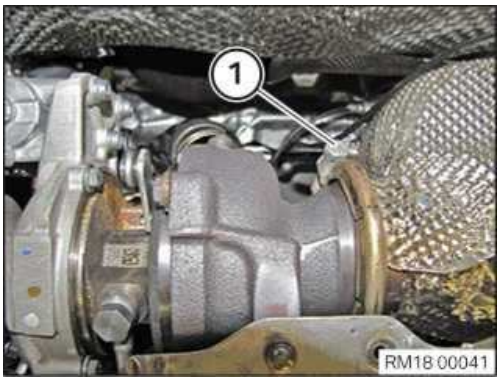
Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from holders.
- Release the screws (1) at the top and bottom of the heat shield.
- Feed out and remove the heat shield (2).

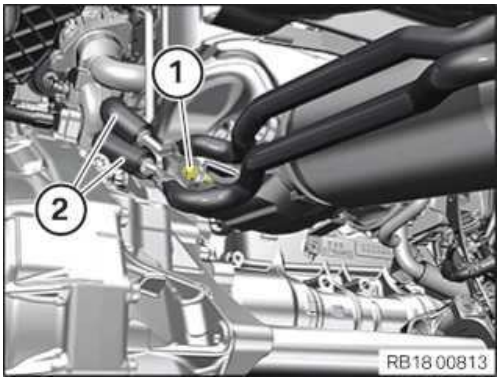
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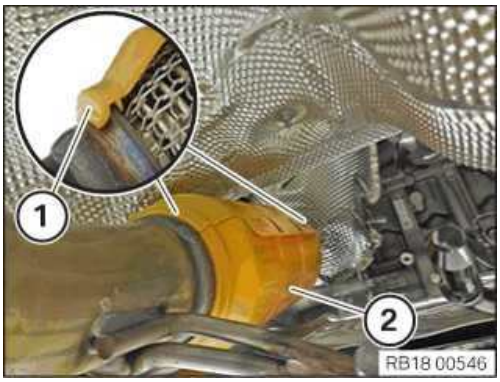
- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.



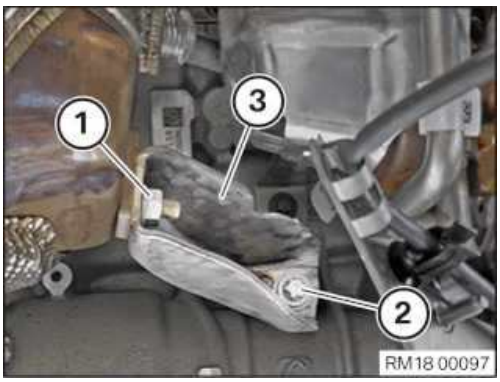
- Loosen nuts (1).



- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.

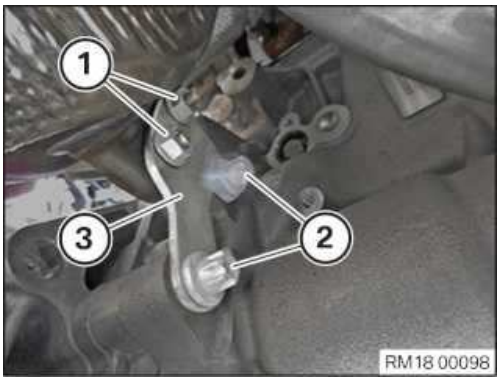


- Mount fitting aid (2).
- Make sure that the fitting aid is correctly position on the edges (1) of the flexible tube.



- Loosen nut (1).
- Loosen screw (2).
- Remove holder (3).

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- Loosen nuts (1).
- Loosen screws (2).
- Remove holder (3).
- Guide out and remove diesel particulate filter .

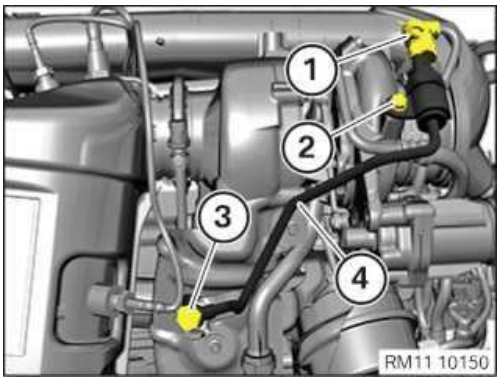
▶ **Remove the heat shield from the exhaust turbocharger at the bottom**

WARNING

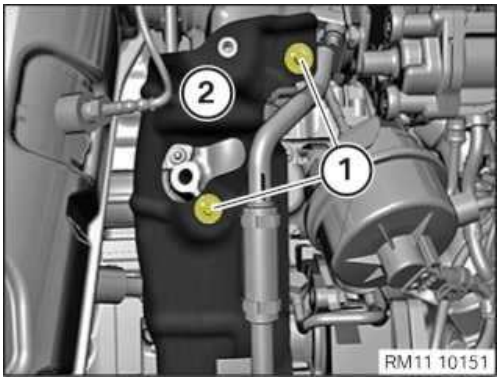
Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Unlock and disconnect connector (1).
- Unscrew the banjo bolt (3).
- The seals of the banjo bolt (3) must be renewed.
- Loosen screw (2).
- Remove the exhaust gas pressure pipe (4).



- Unscrew the bolts (1) on the heat shield .
- Feed out and remove the heat shield (2).

▶ **Removing the exhaust-gas recirculation cooler**

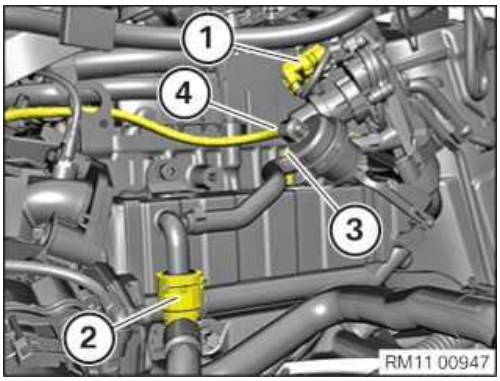
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

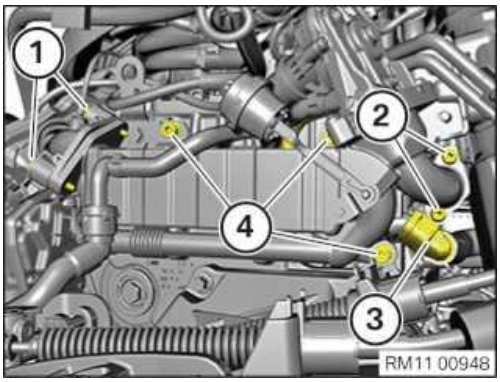
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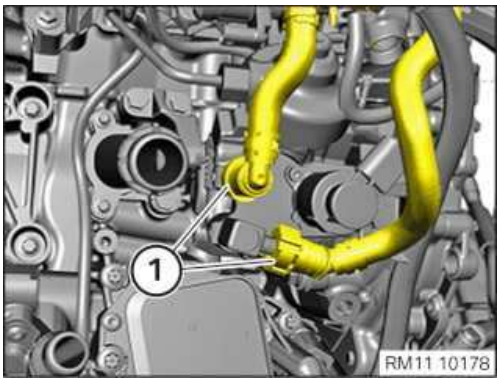
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

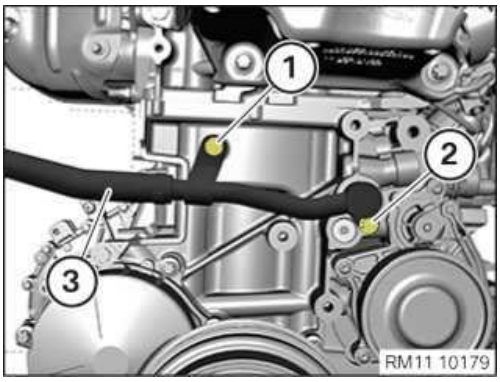
- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.



- Unlock the fuel lines (1) and disconnect from the high pressure pump.
- Remove the fuel lines.



- Loosen screws (1) and (2).
- Remove coolant line (3).

8 – Removing the low-pressure stage turbocharger

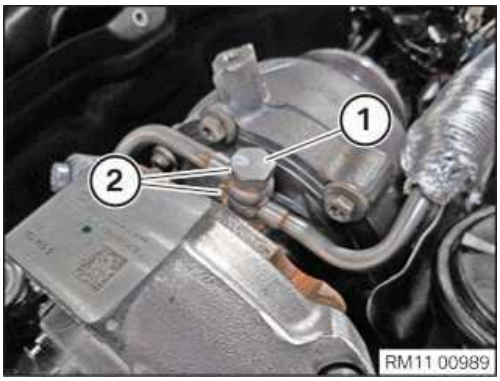
WARNING

Hot surfaces.

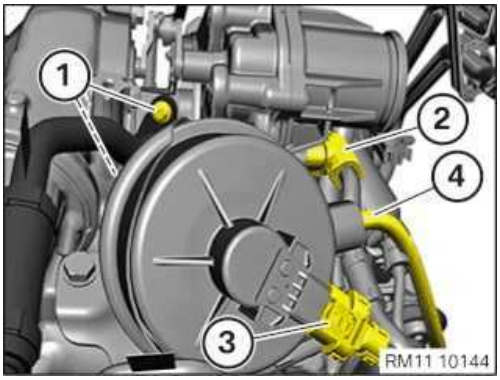
Risk of burning!

- Perform all work only on components that have cooled down.

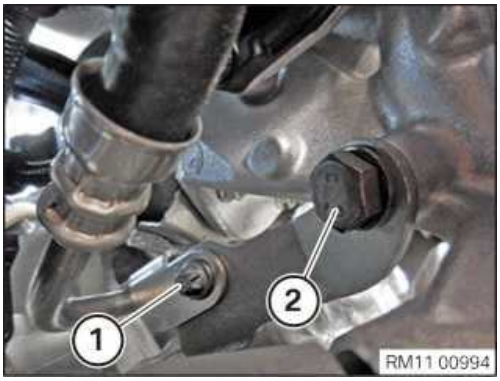
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- Release the banjo bolt (1) of the oil feed lines.
- Remove sealing rings (2).
- Place oil feed lines to one side.



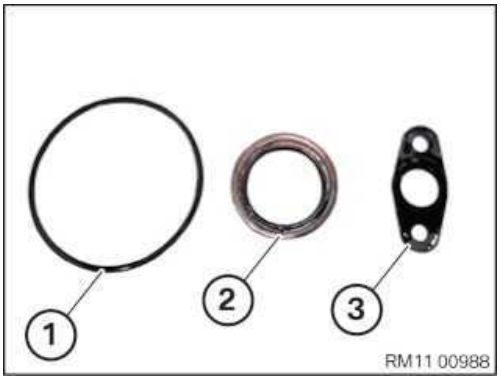
- Release the screws (1) of the oil return line.
- Unlock and disconnect the plug connections (2) and (3).
- Pull off the vacuum hose (4) carefully.



- Undo the bolt (1) of the oil feed line.
- Loosen screw (2).

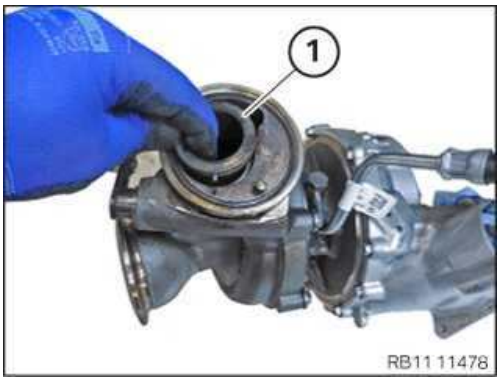


- Loosen screw (1).
- Remove the V hose clamp.
- Guide the low-pressure stage turbocharger out towards the top and remove.



- Remove seals (1), (2) and (3).

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- Remove the spacer ring (1).

9 – Removing the high-pressure stage exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

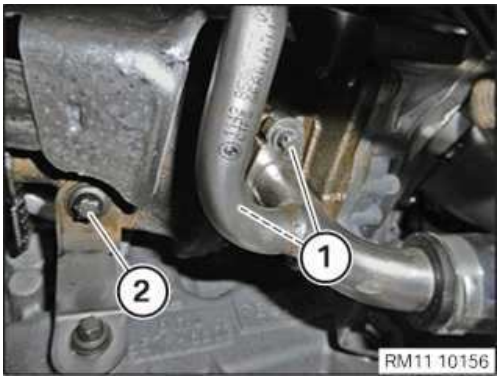
- Perform all work only on components that have cooled down.

CAUTION

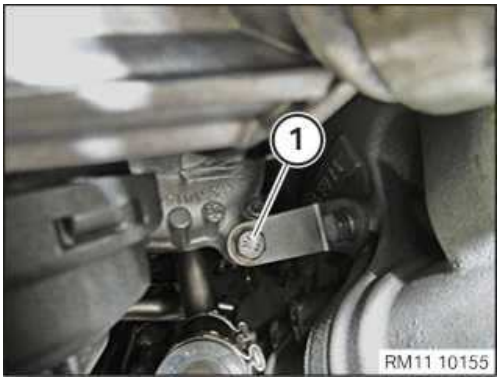
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

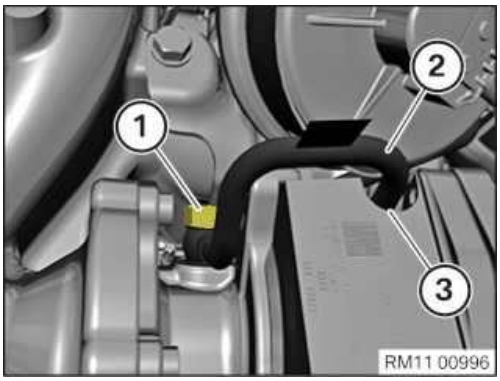


- Unscrew the bolts (1) on the oil return line .
- Loosen screw (2).

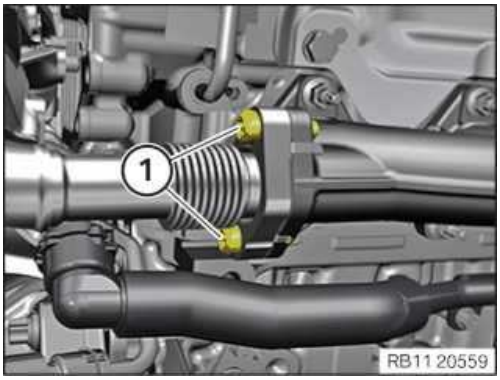


- Release screw (1) from the right wheel arch.

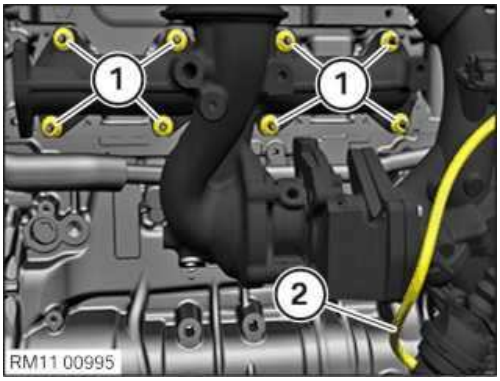
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- Unscrew the banjo bolt (1).
- Guide out oil feed line (2) from holder (3).

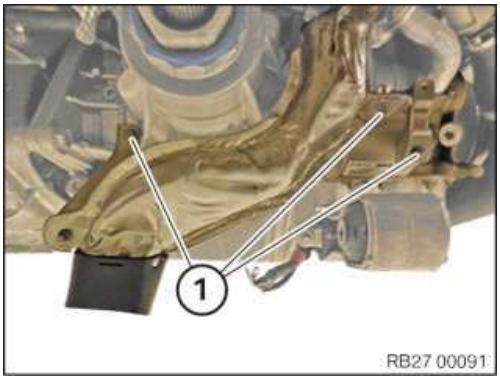


- Loosen screws (1).

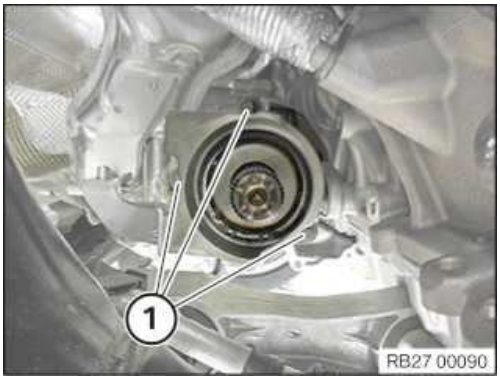


- Pull off the vacuum hose (2).
- Loosen nuts (1).
- Guide out the exhaust manifold and the high-pressure stage exhaust turbocharger to the top and remove them.

10 – Remove the intermediate shaft with the support tube

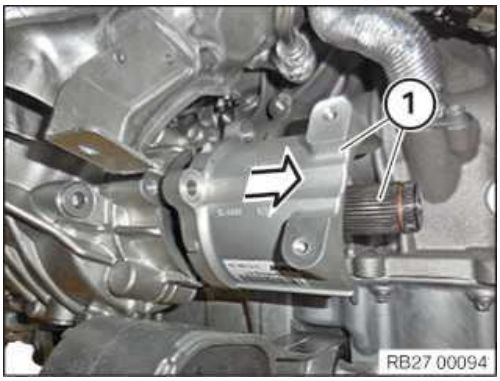


- With air duct installation: Loosen screws (1).
- Remove air duct



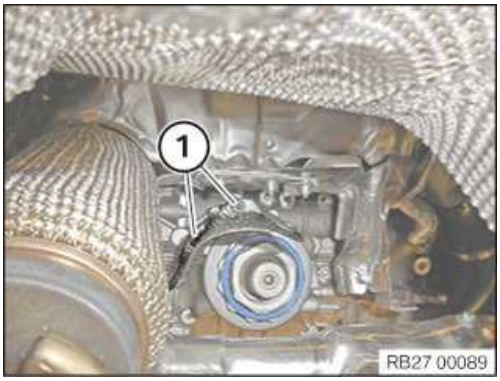
- Loosen screws (1).

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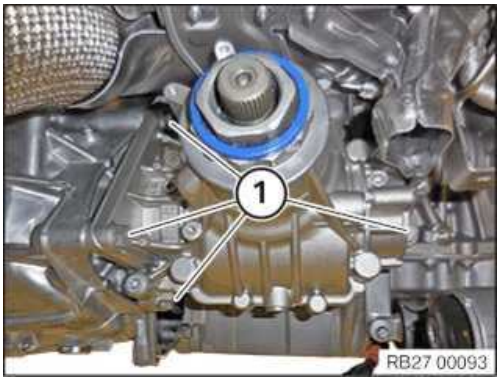


- Pull the intermediate shaft with the support tube (1) out of the transfer box.

11 – Remove transfer box (VTG)



- Loosen screws (1).
- Remove heat shield.



- Loosen screws (1).
- Remove the transfer box (VTG).

12 – Detach the engine from the manual gearbox

Prerequisite

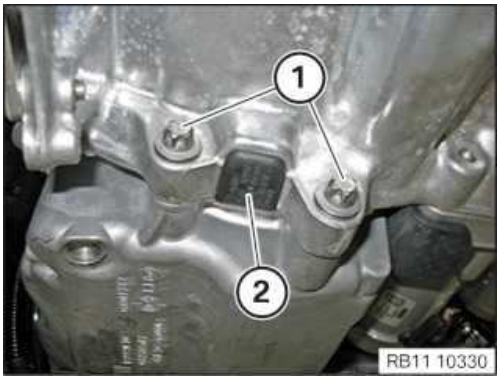
Engine has been removed.

CAUTION

Heavy component.

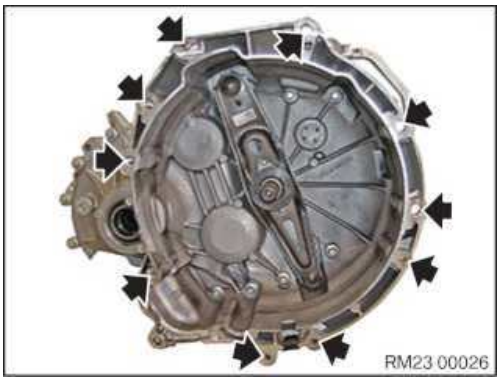
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

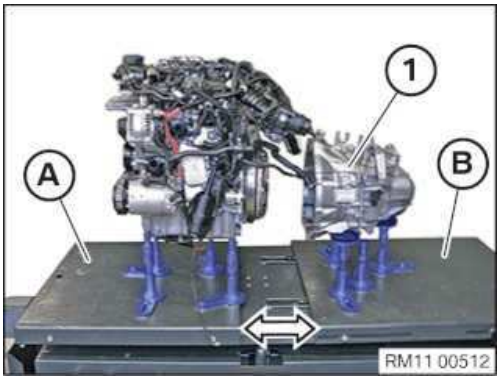


- Loosen screws (1).
- Remove protective cap (2).

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- Remove screws (arrows).



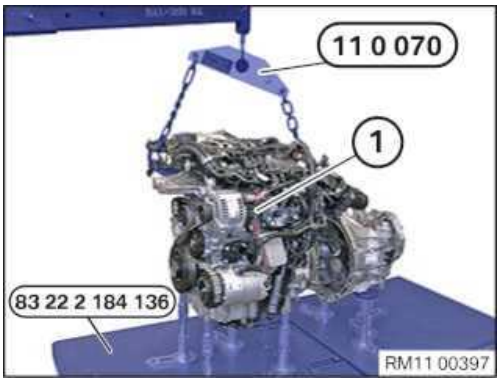
- Slide the table top (B) in the direction of the arrow and slide the manual gearbox (1) to the side.



- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

M8		Tightening torque	21,5 Nm



- Attach engine lifter to special tool and lift engine (1) off lifting table.

13 – Mount engine on assembly stand

CAUTION

Heavy component.

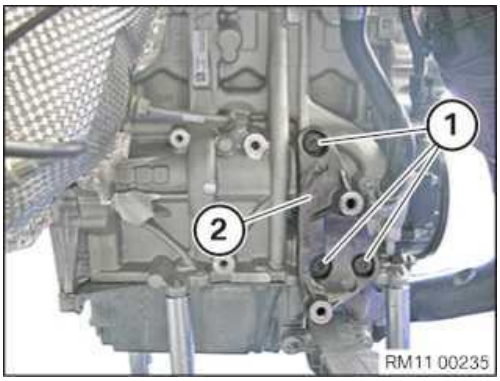
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

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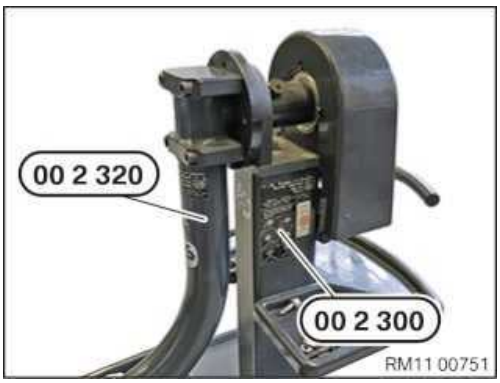
- Loosen screws (1).
- Guide out and remove holder (2).



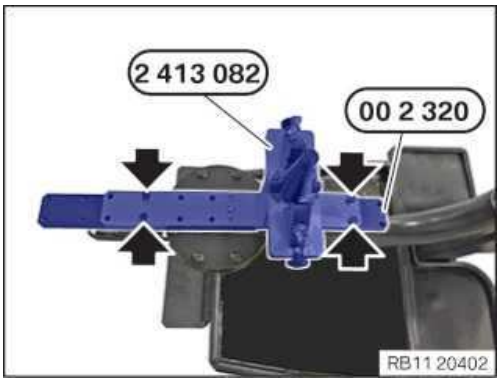
- Position the special tool **2 455 010** on the engine (1).
- Position the standard bolts **M10x30**.
- Tighten the standard bolts (arrows).
-

Special tool 2 455 010 to crankcase

M10x30		Tightening torque	38 Nm



- Prepare the assembly stand **0 495 187 (00 2 300)** with the special tool **0 495 196 (00 2 320)**.



- Screw the special tool to the **0 495 196 (00 2 320)** special tool.
- Tighten screws (arrows).
-

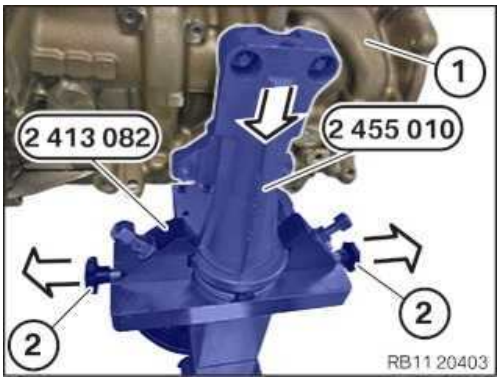
Special tool 11 8 930 to special tool 00 2 320

M14x35		Tightening torque	160 Nm

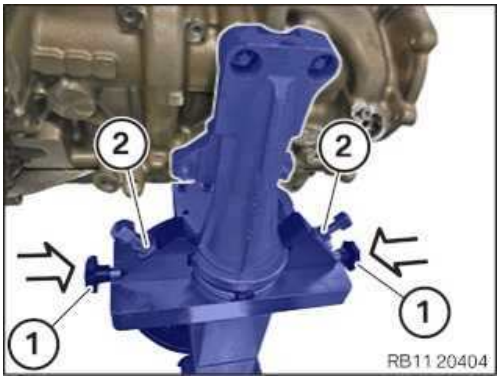


- Position the engine lifter with the special tool and the engine on the special tool **0 495 187 (00 2 300)**.

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- Detach the holder (2) in the direction of the arrow.
- Position the engine (1) with the special tool **2 455 010** in the direction of the arrow on the special tool .



- Lock the holder (1) in direction of arrow.
- Tighten nuts (2).

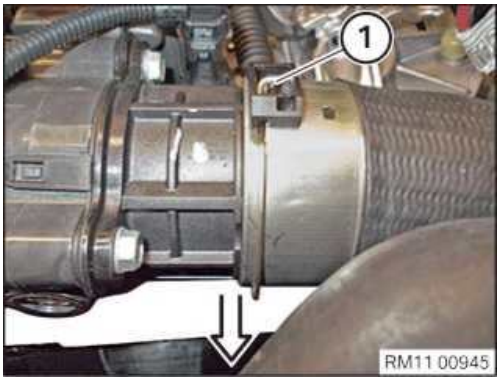
14 – Removing the intake plenum

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

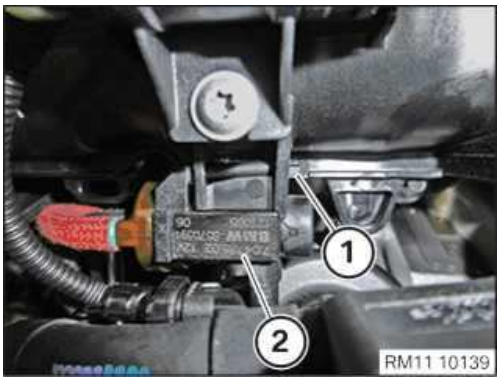


- Unlock the lock (1).

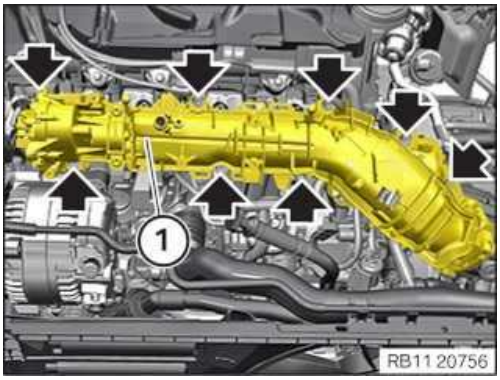


- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.

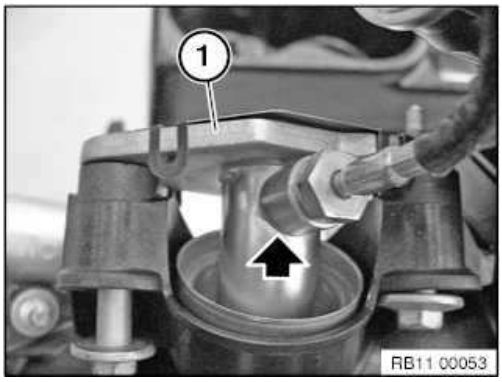
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- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



- Release the screws (arrows) from the intake plenum (1).
- Guide the intake plenum (1) out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

15 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

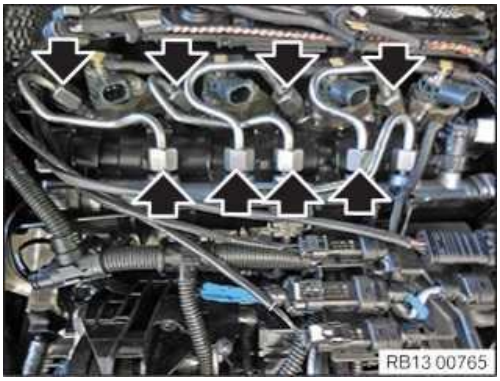
If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release the high pressure lines (arrows) with the special tool .
- Catch and dispose of escaping fuel.
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool .

16 – Detaching leakage oil line from injector

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

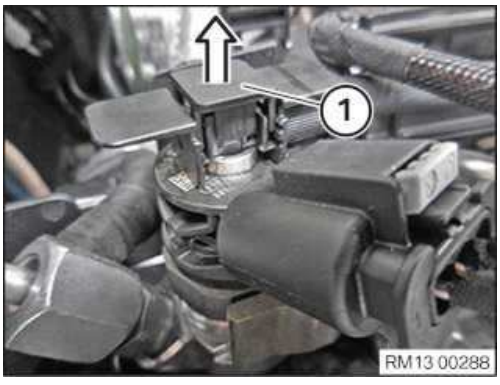
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

17 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

 **Electrostatic discharge.**

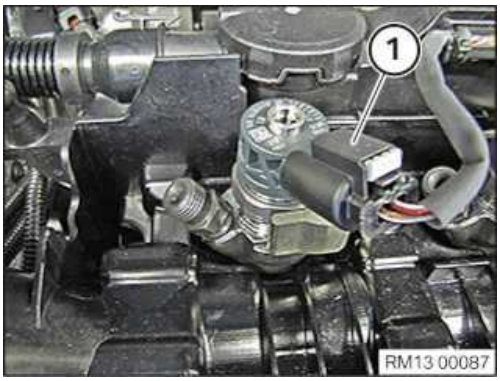
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

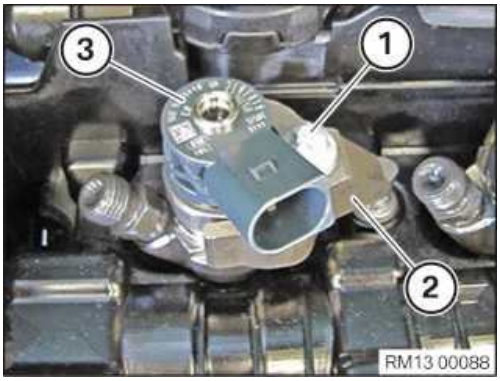
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TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.



- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

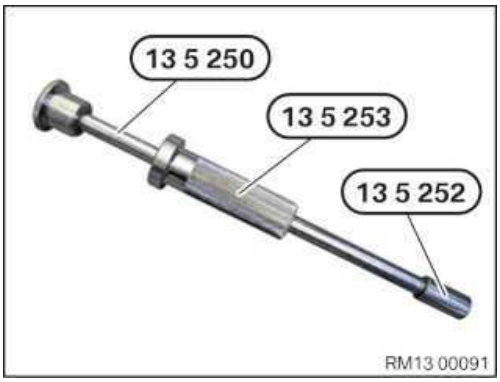
▶ **Loosen stuck injectors**

RISK OF DAMAGE

Contaminant or foreign body.

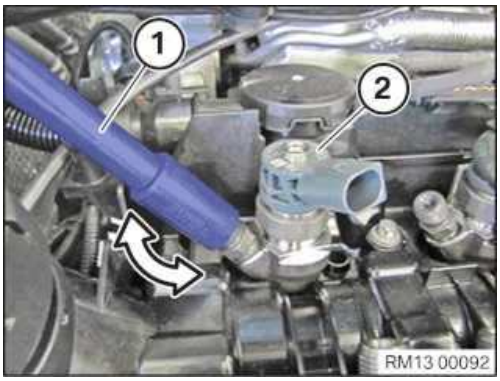
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)** back onto the special tool **0 493 321 (13 5 250)**.

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- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

18 – Remove high-pressure rail

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

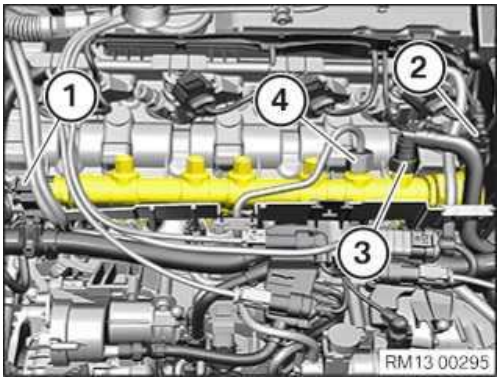
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

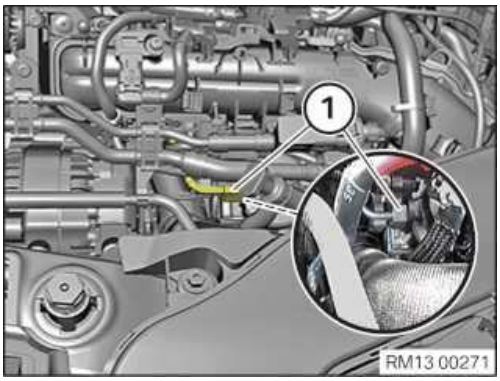
TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

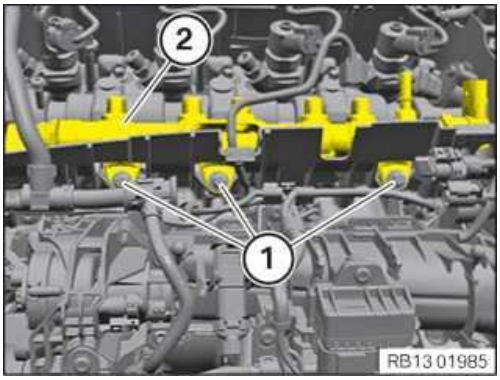


- Unlock and disconnect connector (1).
- Unlock and disconnect connector (2).
- Unlock and release fuel line (3).
- Loosen union nut (4) with special tool .
- Reset special tool early on to avoid bending pressure lines.

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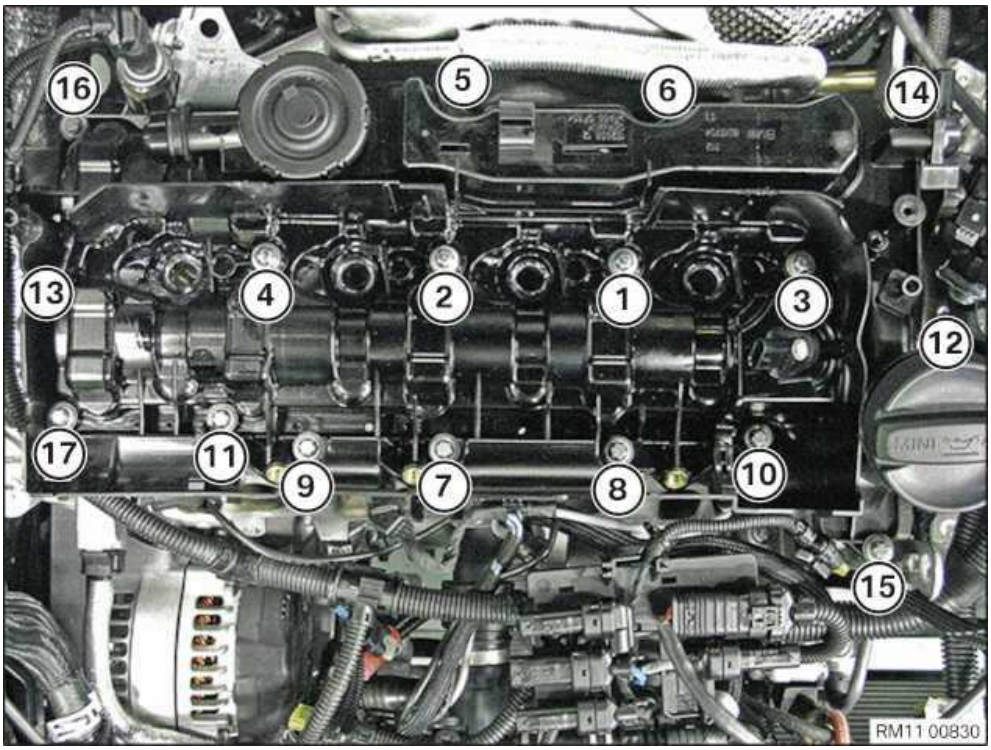
- Slacken the union nut (1) on the high pressure pump.



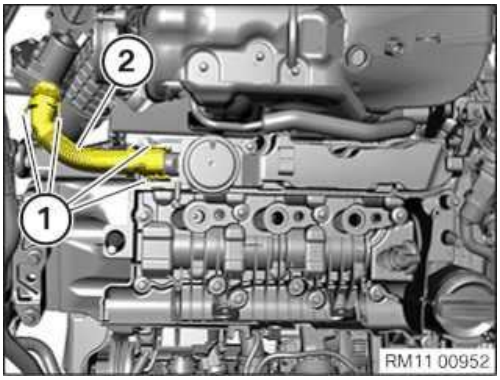
- Loosen screws (1).
- Carefully thread out and remove the rail (2).
- Make sure the pressure line of the high pressure pump is not bent.

19 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover

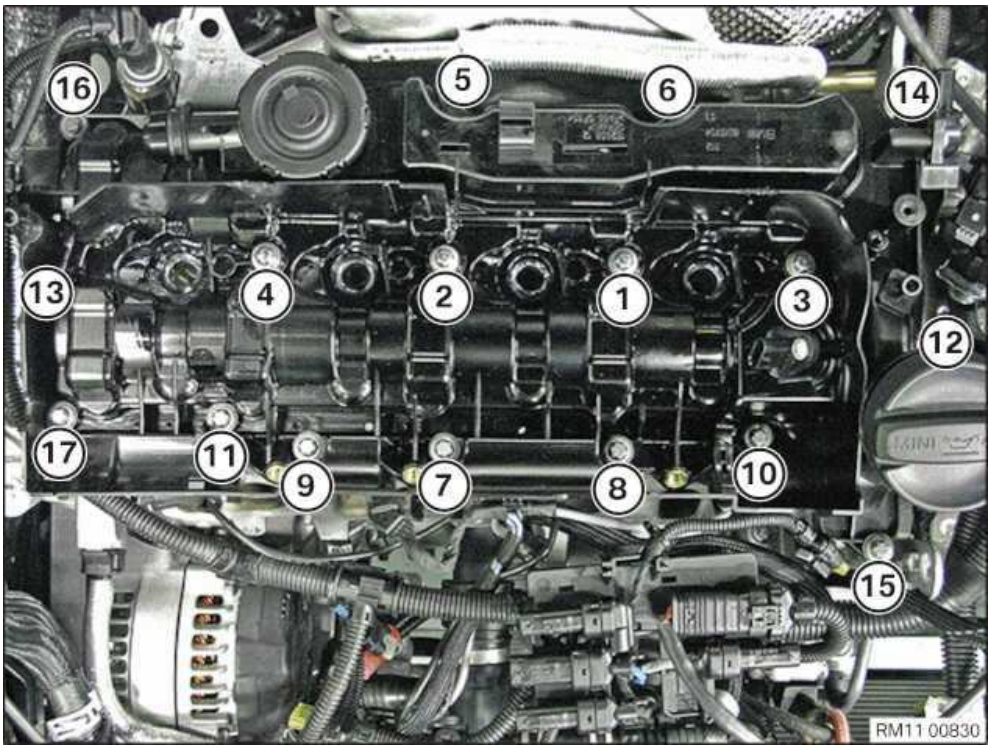


1 to 16 screws of the cylinder head cover.



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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- Loosen screws in the order (17) to (1).
- Remove cylinder head cover by lifting it out.

20 – Checking camshaft timing



- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

Damage to the engine.

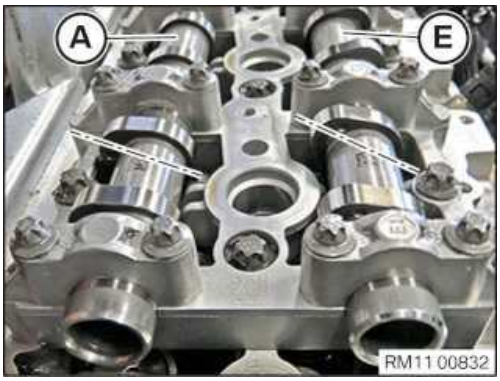
The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

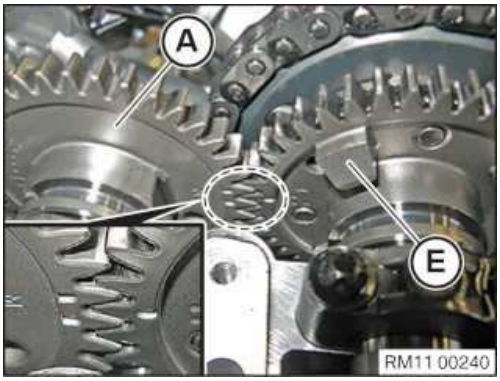
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- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.



- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

21 – Remove chain tensioner piston

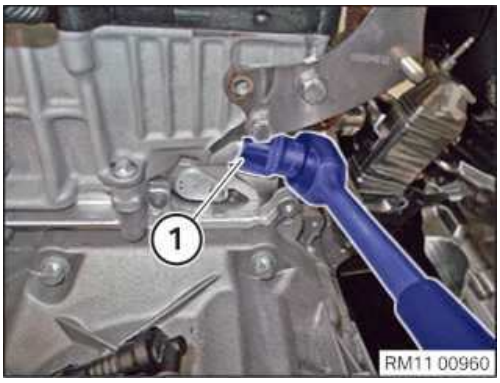
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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

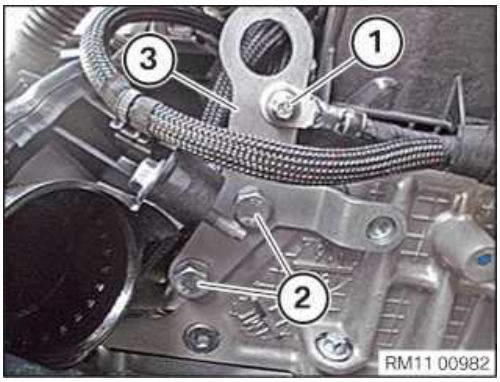


TECHNICAL INFORMATION

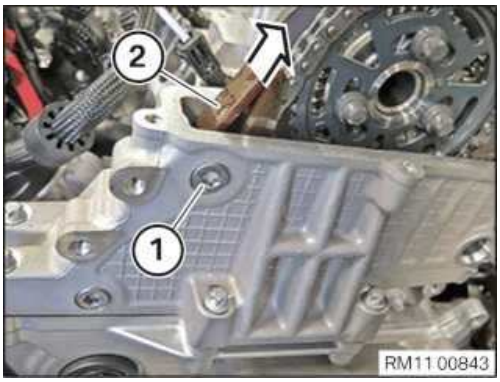
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

22 – Remove the timing chain guide rail

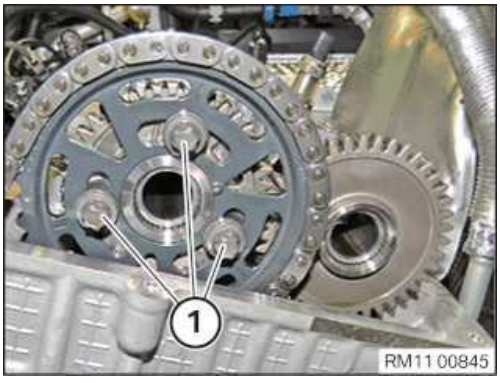


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

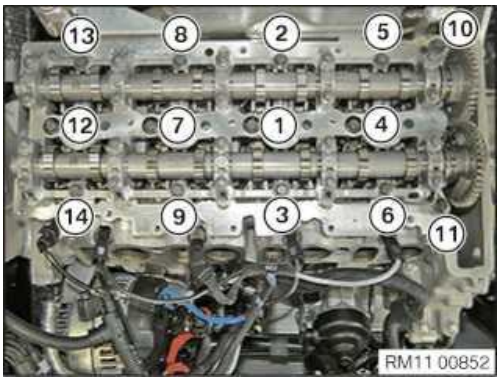
23 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

24 – Removing the camshaft support

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- Evenly loosen all screws in a sequence from (14) to (1).
- Loosen and remove all screws in a sequence from (14) to (1).
  Both camshafts can be removed with the camshaft carrier.
- Remove the camshaft support including camshafts towards the top.

25 – Removing glow elements

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Damage to the glow elements.

Excessive force may damage the glow elements and they may then have to be renewed.

- Handle glow elements with care and do not drop.
- Do not rest the cylinder head on glow elements. Glow elements protrude from the sealing surface of the cylinder head.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

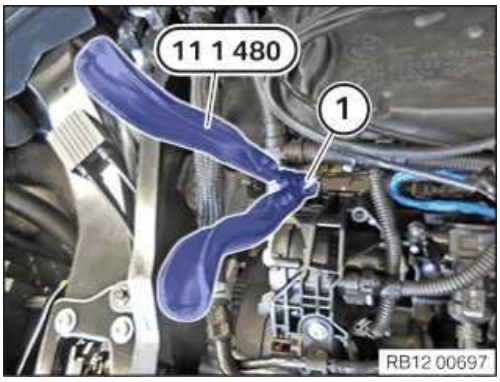
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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

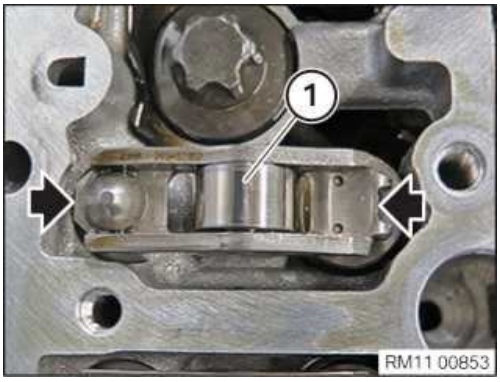


- Unlock and disconnect plug connection (1) using special tool **0 490 796 (11 1 480)**.



- Release the glow elements with the special tool or conventional tools.
- Feed out preheating elements and remove.

26 – Remove roller cam followers



- Guide out and remove all roller cam followers (1) (arrows).
- Place all roller cam followers (1) in order in special tool **0 495 105 (11 4 480)**.

  Roller cam followers that have already been used must be installed in same position again.

27 – Removing the hydraulic valve clearance compensating element

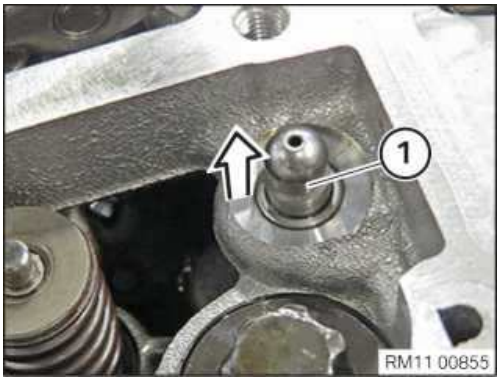
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RISK OF DAMAGE

Contaminant or foreign body.

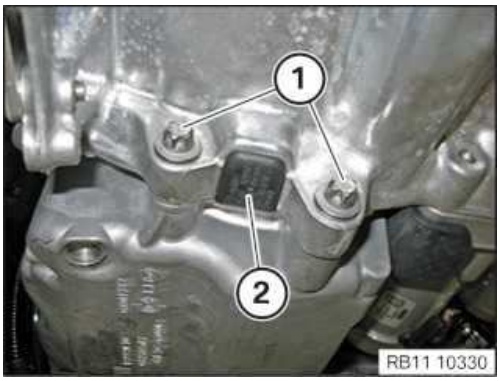
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

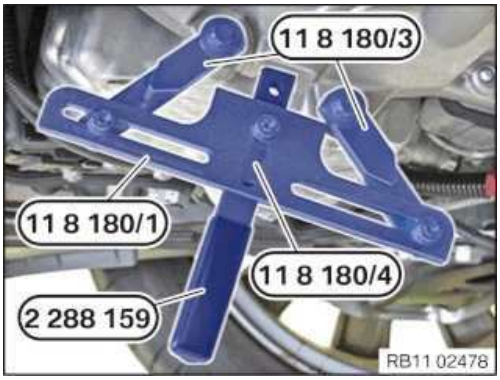


- Remove the hydraulic valve clearance compensating element (1) in the direction of the arrow and place on the special tool **0 495 105 (11 4 480)**.
- Repeat the process on all hydraulic valve clearance compensating elements.

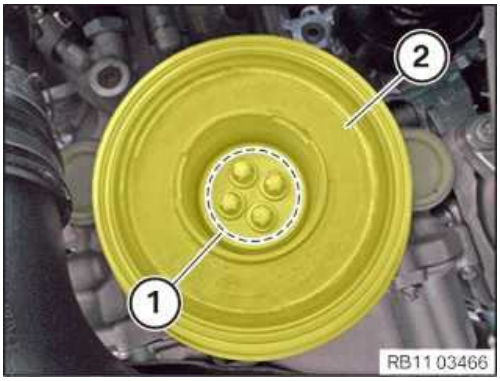
28 – Removing the vibration damper



- Release the transmission bolts (1).
- Remove the protective cap (2).



- Position special tool **0 493 587 (11 8 180)** as illustrated.
- Fasten the special tool **0 493 587 (11 8 180)** to the transmission with transmission bolts.



- Loosen screws in the area (1).
- Remove the vibration damper (2).

29 – Remove clutch

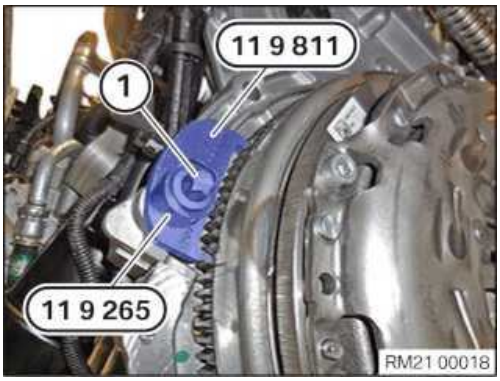
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CAUTION

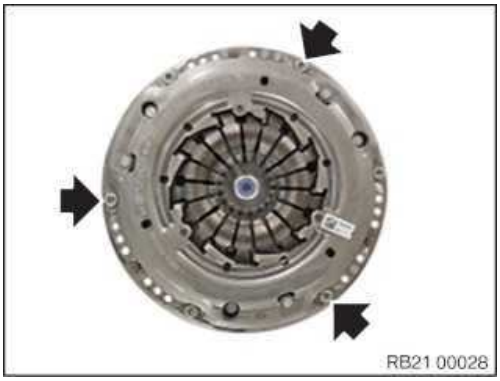
Materials harmful to health.

Contact with fluids harmful to health!

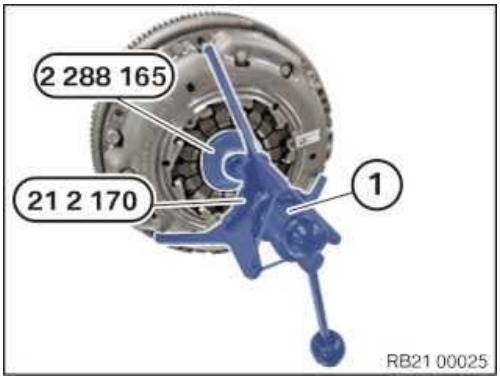
- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.



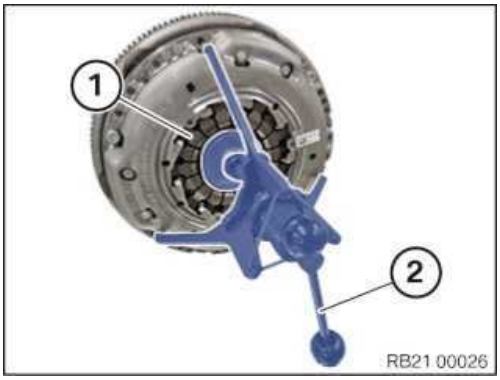
- Block flywheel with transmission bolt (1) and special tools **0 496 171 (11 9 811)** and **0 494 793 (11 9 265)**.



- Detach 3 screws to attach special tool and **2 288 165**.

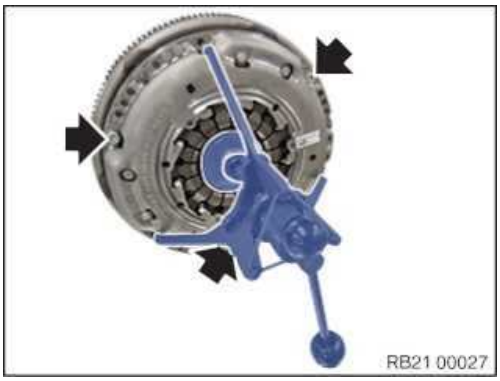


- Position special tool and **2 288 165** and tighten on the knurled screw (1).



- Screw in the spindle (2) until the diaphragm spring (1) is preloaded and the clutch disc is free of tension.

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- Loosen the remaining 3 screws and remove the clutch with clutch disc from the flywheel.

30 – Removing flywheel

CAUTION

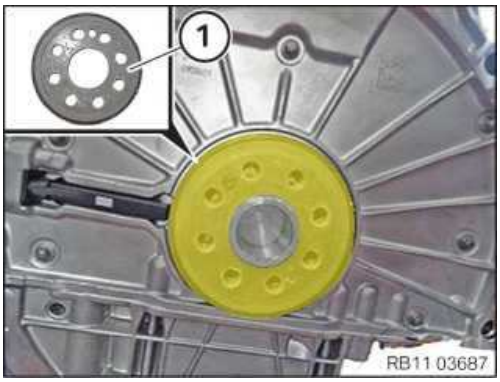
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Secure the flywheel with a transmission bolt (1) and with special tools **0 496 171 (11 9 811)** and **0 494 793 (11 9 265)**.
- Unscrew the flywheel bolts with the special tool **0 491 018 (11 4 180)**.
- Remove flywheel.



RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

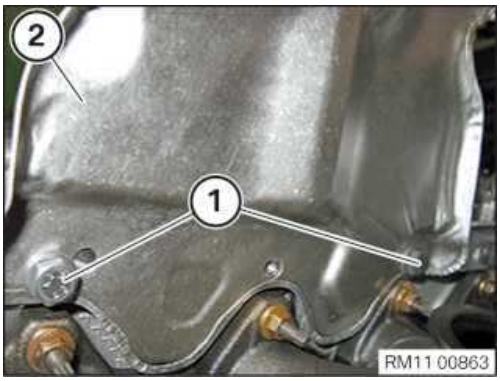
- Remove the increment wheel (1) from the crankshaft and lay it down correctly.

31 – Remove rear timing case cover

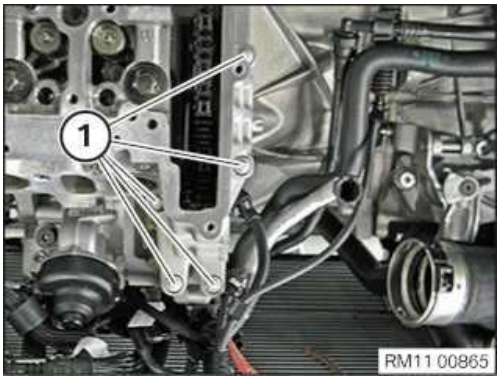
Prerequisite

Transmission is removed.

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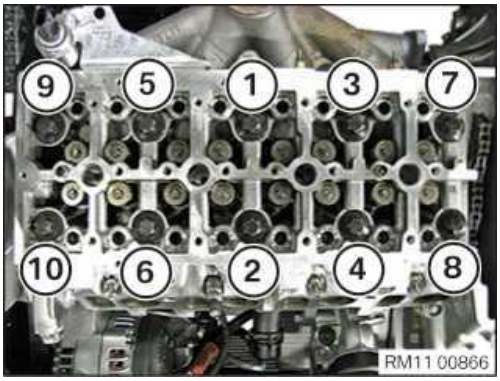
- Loosen screws (1).
- Feed out the heat shield (2) and place to one side.



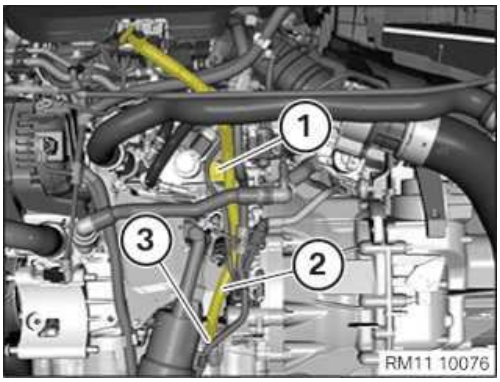
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

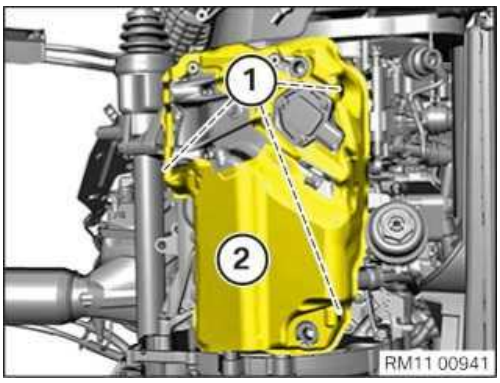
- Loosen screws (1).



- Loosen the cylinder head bolts in the sequence from (10) to (1).
- Remove cylinder head bolts (1) to (10) with washers.
- Remove cylinder head.

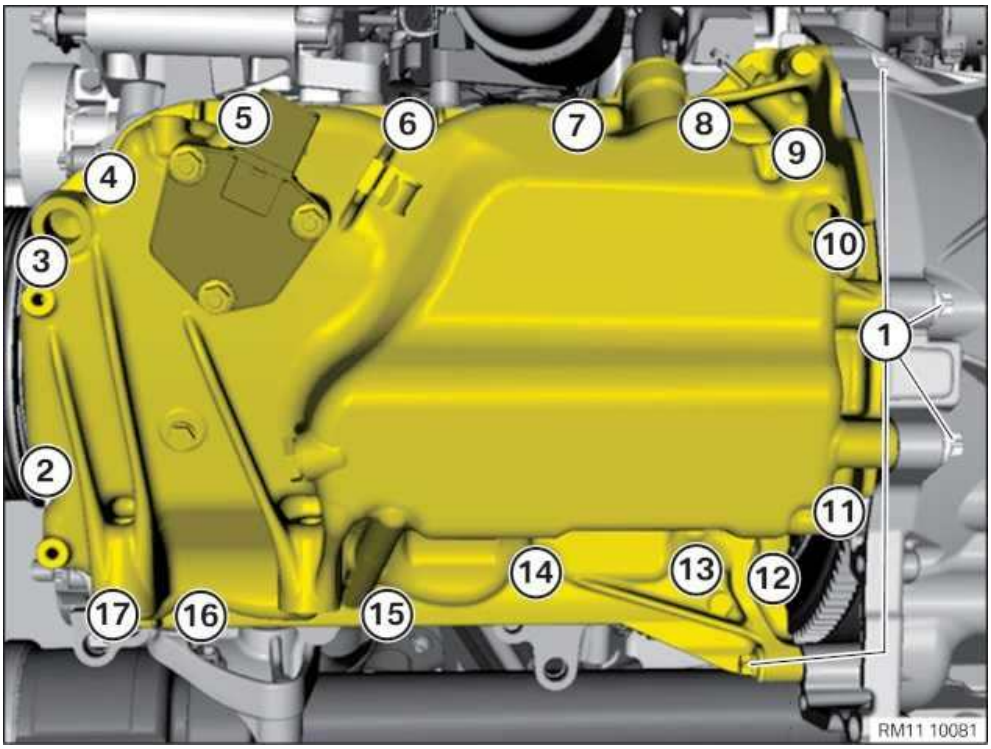


- Loosen screw (1).
- Disconnect the guide tube (2) for the oil dipstick toward the top from the oil sump and remove it.
- Remove sealing ring (3) from oil sump if necessary.

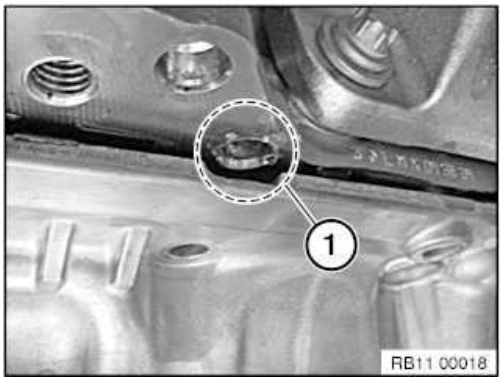


- Expanding rivets (1) on both sides of the acoustic cover (2).
- Feed out and remove the acoustic cover (2).

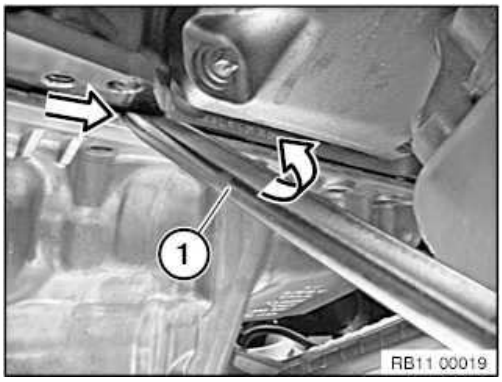
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- Loosen the transmission bolts (1) on the oil sump.
- Loosen screws (2) to (17).

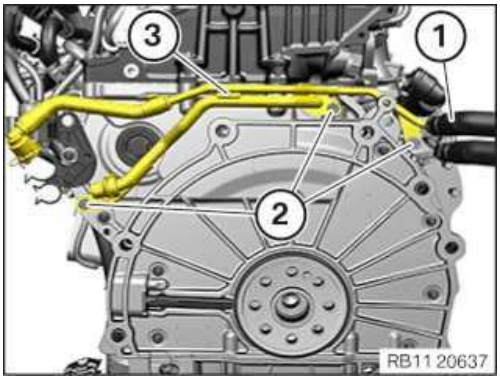


- Release oil sump only in area (1).



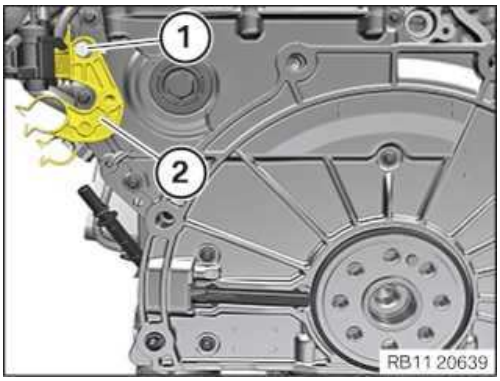
- Detach the oil sump with a suitable mounting lever (1) carefully at the point provided.
- Secure the oil sump against falling.

▶ **If installed: Remove coolant line of the SCR metering module**

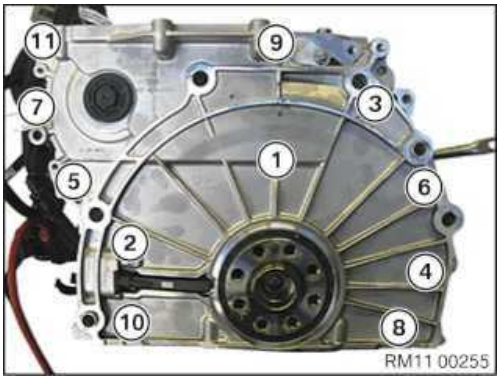


- Unlock and disconnect the coolant hose (1).
- Loosen screws (2).
- Remove the coolant line (3).

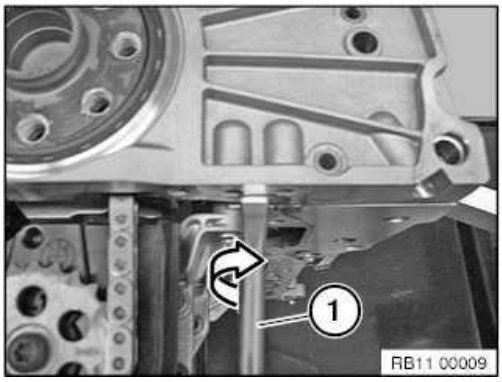
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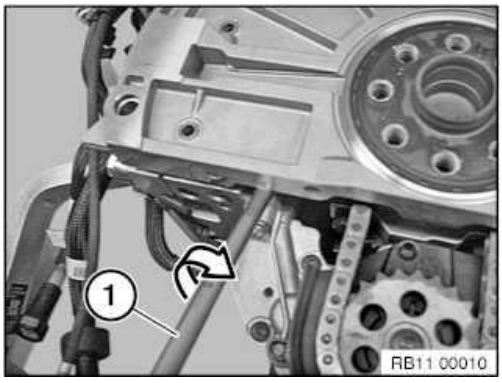
- Loosen screw (1).
- Guide out and remove holder (2).



- Loosen screws in the order (11) to (1).



- Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.



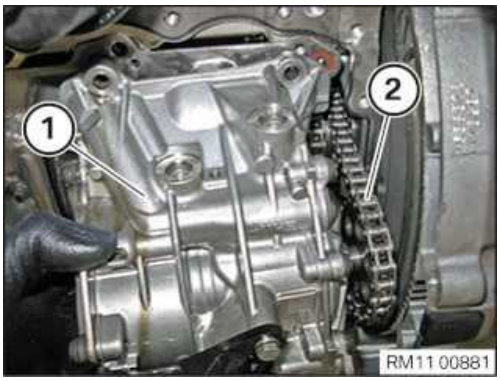
- Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.
- Remove the timing case cover.

32 – Remove the oil vacuum pump



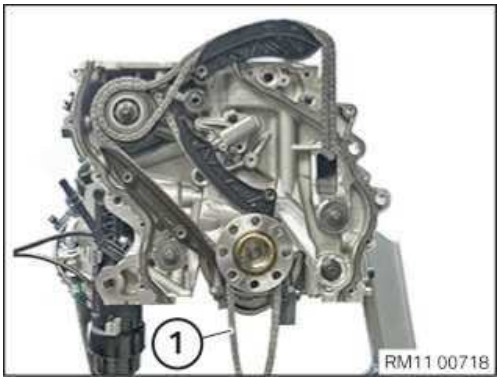
- Loosen screws (1) of the oil vacuum pump (2).

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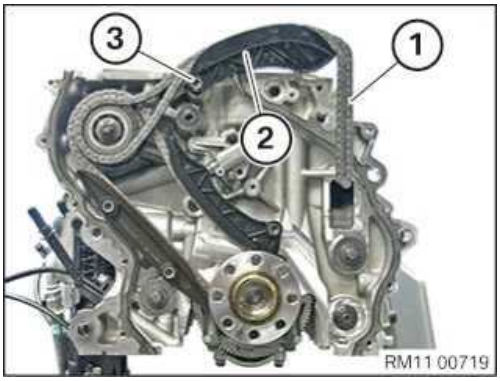


- Remove oil vacuum pump (1) and remove from the drive chain (2).

33 – Remove both timing chains

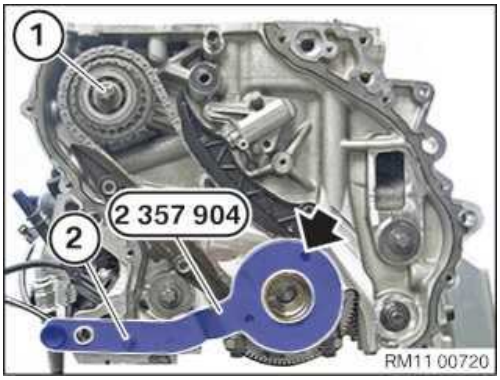


- Remove drive chain (1) for oil pump.

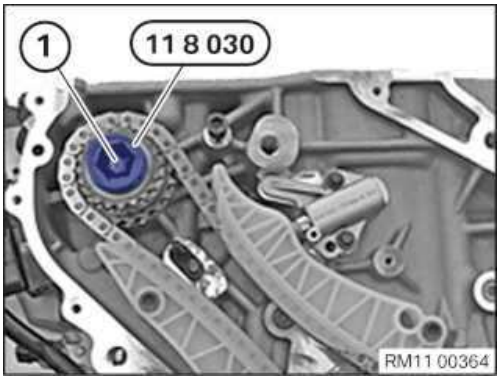


- Remove the timing chain (1) for the camshafts.
- Remove the tensioning rail (2) from the bearing journal (3).

  Bearing journal (3) does not have to be disassembled.

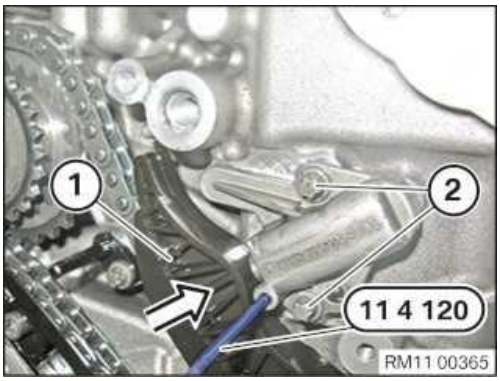


- Secure crankshaft to release central bolt (1) of high pressure pump.
- Position crankshaft with guide pin (arrow).
- Secure special tool **2 357 904** with bolt (2) on crankcase.
- Release central bolt (1) of high pressure pump; do not remove.

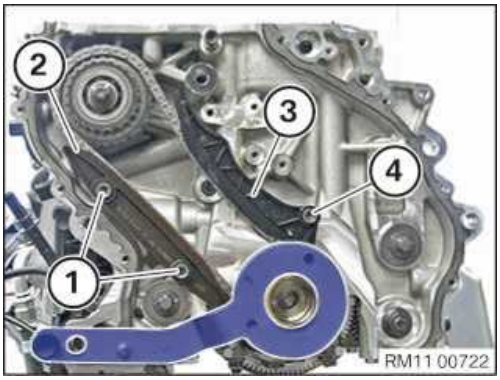


- Screw special tool **0 496 725 (11 8 030)** into sprocket of high pressure pump.
- Unscrew central bolt (1) of high pressure pump until central bolt can be supported on special tool **0 496 725 (11 8 030)**.
- Continue turning central bolt (1) until camshaft sprocket is released from high pressure pump shaft.

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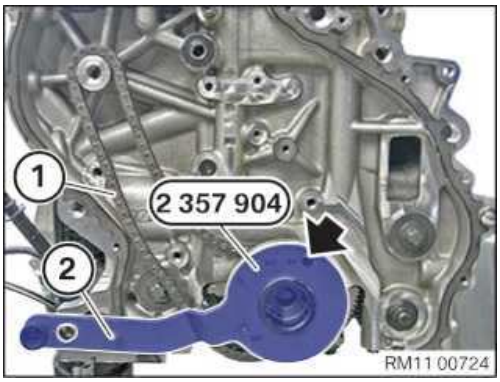
- Press chain tensioner in with tensioning rail (1) by hand in the direction of the arrow until the special tool **0 491 012 (11 4 120)** can be positioned.
- Loosen screws (2).
- Remove chain tensioner.



- Loosen both bearing journals (1).
- Remove the guide rail (2).
- Loosen the bearing journals (4).
- Remove the tensioning rail (3).



- Remove bolt and camshaft sprocket (1) of high pressure pump.



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Unscrew the bolt (2) and remove the special tool **2 357 904**.
- Remove the timing chain (1).

34 – Removing the oil deflector

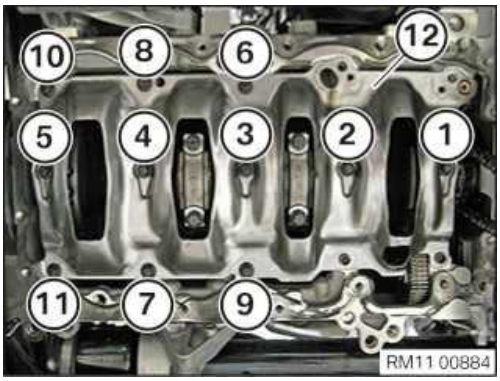
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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- Loosen screws in the order (11) to (1).
- Guide out and remove the oil deflector (12).

35 – Remove the connecting rod bearing cap

RISK OF DAMAGE

Engine damage caused by incorrectly installed bearing shells and bearing supports.

Engine damage may result from incorrectly installing bearing shells and bearing supports.

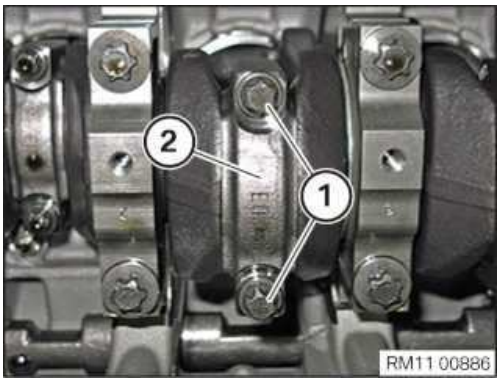
- Always install all bearing shells and bearing supports in the same position from which they were removed.

TECHNICAL INFORMATION

The connecting rods of the engine are balanced and are matched to each other.
A single connecting rod is not permitted to be replaced. Always replace all connecting rods.



- Turn the crankshaft until the connecting rod bearing journal (1) reaches a vertical position.



- Unscrew the connecting rod bolts (1).

TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.
Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

- Remove the connecting rod bearing cap (2) and put to one side in the correct order.

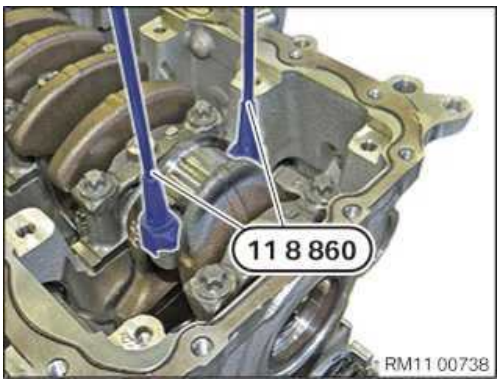
36 – Removing the piston with connecting rod

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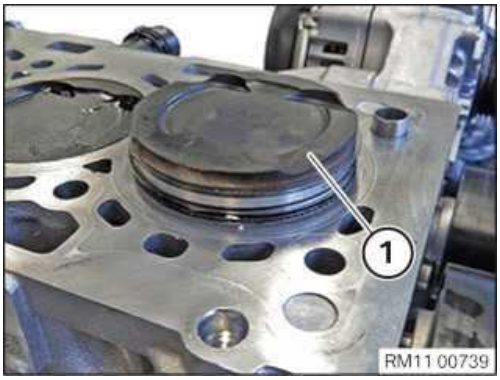
TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.



- Screw special tool **0 496 144 (11 8 860)** in at large connecting rod eye.



RISK OF DAMAGE

Damage on the cylinder wall and oil spray nozzles.

Major force can scratch the cylinder wall and bend the oil spray nozzles.

- Carefully move the piston and connecting rod in the engine block.

- Remove the piston (1) and connecting rod.

37 – Remove the connecting rod bearing shells

RISK OF DAMAGE

Engine damage caused by incorrectly installed bearing shells and bearing supports.

Engine damage may result from incorrectly installing bearing shells and bearing supports.

- Always install all bearing shells and bearing supports in the same position from which they were removed.

TECHNICAL INFORMATION

The connecting rods of the engine are balanced and are matched to each other.

A single connecting rod is not permitted to be replaced. Always replace all connecting rods.



TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

- Remove the connecting rod bearing (2) from the connecting rod (1) and store it properly.

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TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

- Remove the connecting rod bearing (2) from the connecting rod bearing cap (1) and store it properly.

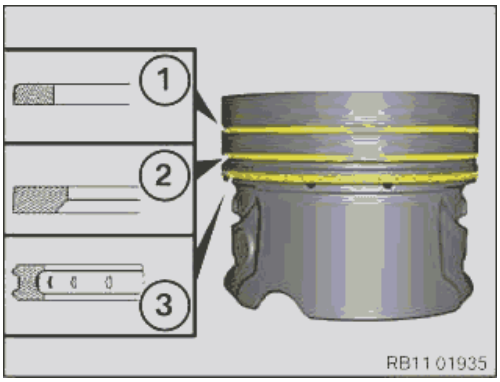
38 – Measure side clearance of piston rings

RISK OF DAMAGE

Damage to the piston rings.

Piston rings can bend or break due to large applications of force.

- Handle piston rings carefully.
- Only bend piston ring up lightly.



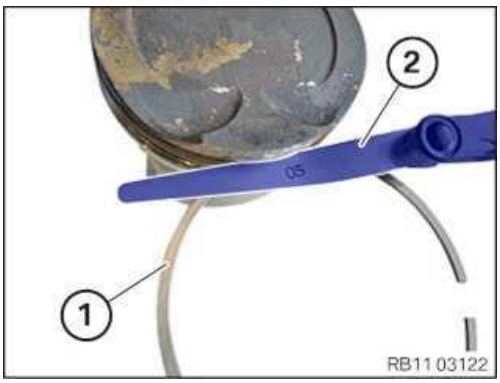
TECHNICAL INFORMATION

- Note the installation position of the component. The component may be installed in various installation positions.

- Mounting orientation of the piston rings

Position number	Description
1	1. Piston ring (plain rectangular compression ring)
2	2. Piston ring (taper faced piston ring)
3	3. Piston ring (oil scraper ring with spiral expander)

Check



- Install all piston rings (1) consecutively as shown in the piston ring groove. Measure the side clearance with a feeler gauge (2).

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desired state

- The side clearance of the piston rings is within the tolerance.

Side clearance of piston rings

Clean all components before measuring the side clearance.	
Side clearance of the plain rectangular compression ring	0,17 mm ... 0,27 mm
Side clearance of the taper faced piston ring	0,30 mm ... 0,50 mm
Side clearance of the oil scraper ring with spiral expander	0,2 mm ... 0,4 mm

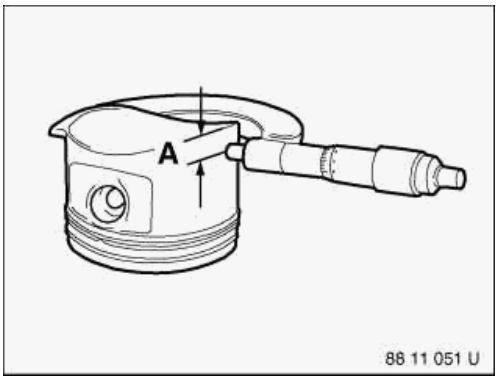
Result

» The side clearance of the piston rings is outside of the tolerance.

Measure

- Renew the piston ring.

39 – Measure the piston diameter



Check

- Position the measuring bolt in the area (A) and measure the piston installation clearance 90 ° transversely to the gudgeon pin.

Piston diameter

Measure the piston diameter at distance (A) from the lower end of the piston skirt.	
Distance (A) to the lower end of the piston skirt	17 mm
Nominal dimension of piston diameter	83,936 mm ... 83,954 mm

Result

» The piston does not correspond to the specifications.

Measure

- Renew the piston.

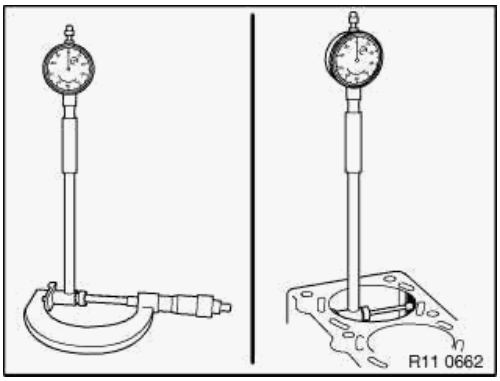
40 – Measure the cylinder bores

Prerequisite

Cylinder barrel is cleaned.

Check

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- Adjusting measuring screw to nominal dimension of cylinder bore.

Cylinder bore

Diameter of cylinder bore	84,00 mm ... 84,018 mm
Permitted irregularity of the cylinder bore	0,01 mm
Permitted conicity of the cylinder bore	0,01 mm

- Insert internal measuring device into measuring screw and set to zero.
- With the internal measuring device, measure the cylinder at the following points. Check the deviations from the nominal dimension.
  - Lower third of the cylinder bore in direction of travel,
  - Lower third of the cylinder bore transversely to direction of travel,
  - Middle third of the cylinder bore in direction of travel,
  - Middle third of the cylinder bore transversely to direction of travel,
  - Upper third of the cylinder bore in direction of travel,
  - Upper third of the cylinder bore transversely to direction of travel.

Cylinder bore

Diameter of cylinder bore	84,00 mm ... 84,018 mm
Permitted irregularity of the cylinder bore	0,01 mm
Permitted conicity of the cylinder bore	0,01 mm

Result

» Cylinder does not correspond to the specifications.

Measure

- Replace motor.

  Parts: Engine

MAIN WORK

41 – Remove crankshaft

RISK OF DAMAGE

Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

- Comply with the regulations for the installation and disassembly.
- Perform work with care.

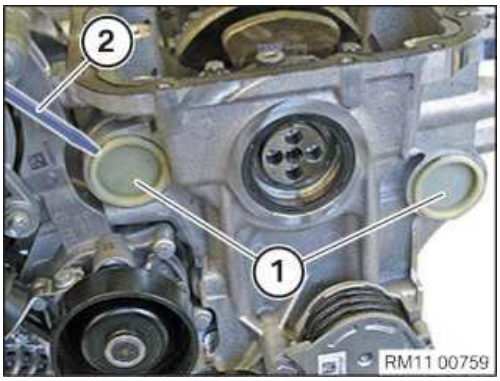
RISK OF DAMAGE

Contaminant or foreign body.

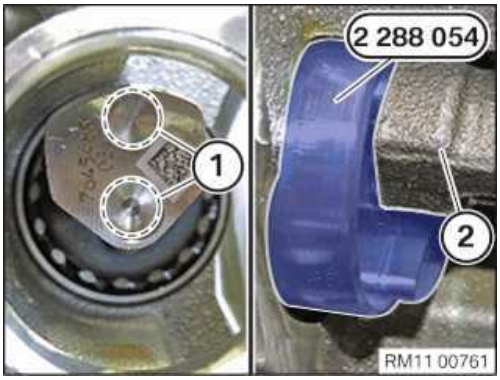
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

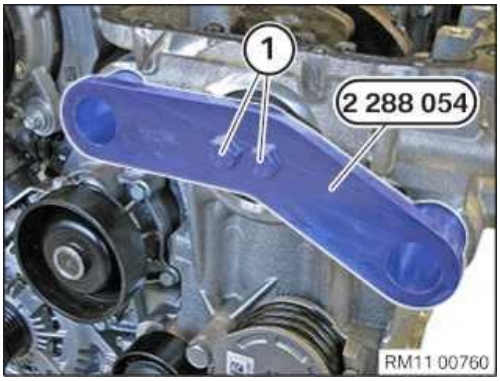
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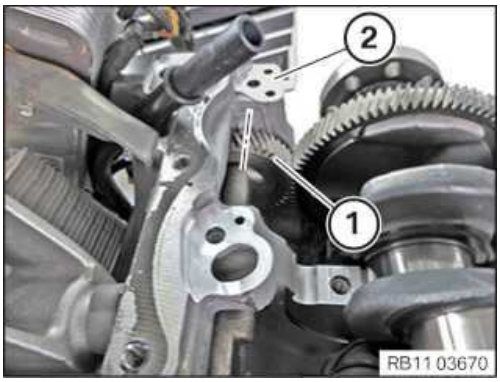
- Remove the sealing cap (1) with a suitable tool (2).



- Rotate the crankshaft to the **TDC of the first cylinder**.
- The special tool **2 288 054** must be positioned in the guides (1) of the counterbalance shafts (2).



- Secure special tool **2 288 054** with screws (1) to the crankshaft.
- Tighten the screws (1).

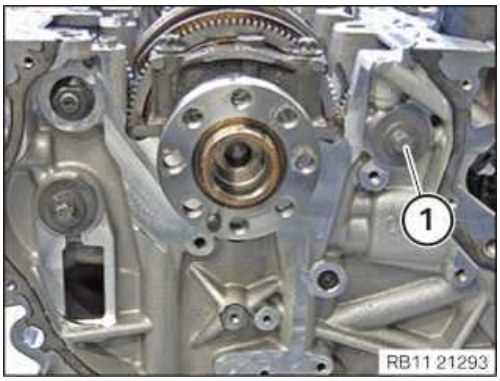


- The counterbalance shaft on the intake side (1) must be re-installed in the same position.
- Mark the position of the gearwheel of the counterbalance shaft on the intake side (1) in relation to the crankcase (2).

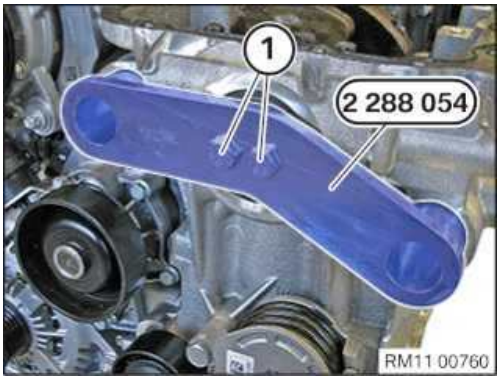


- The intermediate wheel of the exhaust side consists of a fixed wheel and a moving wheel and it must be pretensioned using special tool **0 495 131 (11 5 370)**.
- Pretension the intermediate wheel of the exhaust side using special tool **0 495 131 (11 5 370)** in the illustrated position.
- When reusing the intermediate wheel of the exhaust side, it must remain pretensioned in special tool **0 495 131 (11 5 370)** until its reinstallation.

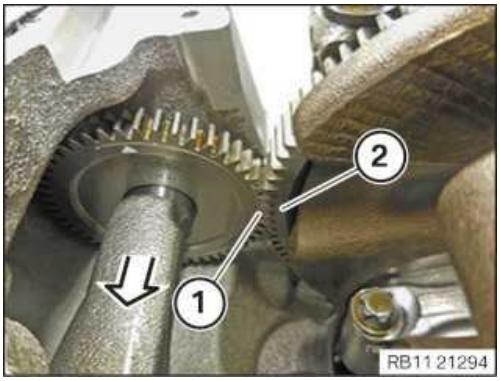
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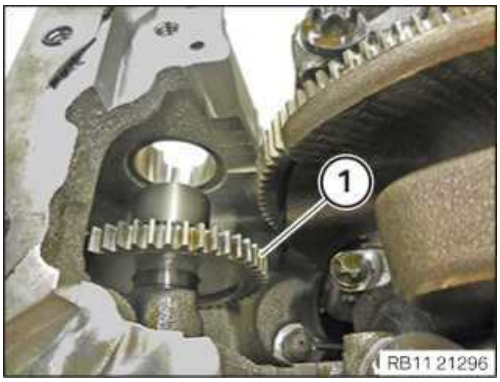
- Loosen screws (1) on the counterbalance shaft on the intake side.



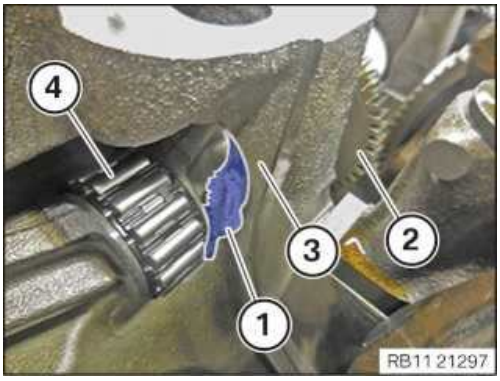
- Loosen screws (1).
- Guide the special tool **2 288 054** out and remove.



- Guide out counterbalance shaft (1) on the intake side from crankshaft (2) in the **direction of the arrow**.

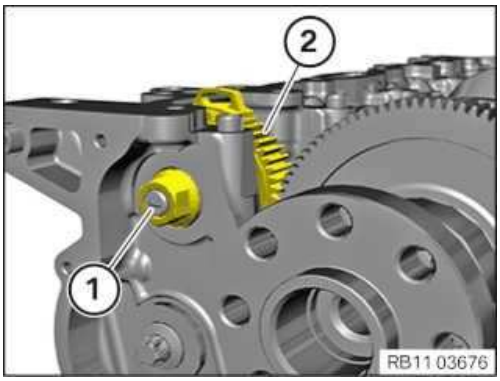


- **Carefully** place aside counterbalance shaft (1) on the intake side.

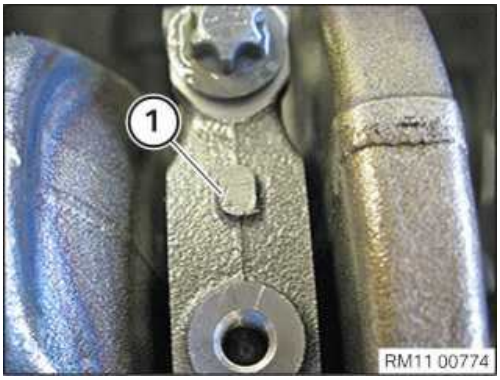


- Position a clean lint-free cleaning rag (1) between counterbalance shaft (2) on the intake side and crankcase (3).
- Ensure that needle bearing (4) is not **damaged**.

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- Unfasten nut (1).
- Remove the gear (2) using special tool **0 495 131 (11 5 370)**.



RISK OF DAMAGE

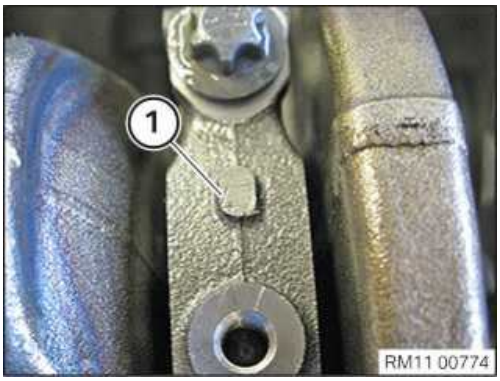
Engine damage caused by incorrectly installed bearing shells and bearing supports.

Engine damage may result from incorrectly installing bearing shells and bearing supports.

- Always install all bearing shells and bearing supports in the same position from which they were removed.

- Make sure that the mounting orientation is maintained.

  All main bearing caps (1) are marked: **Bearing positions 1 to 5.**



RISK OF DAMAGE

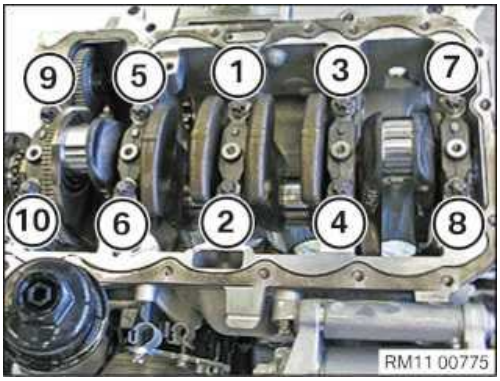
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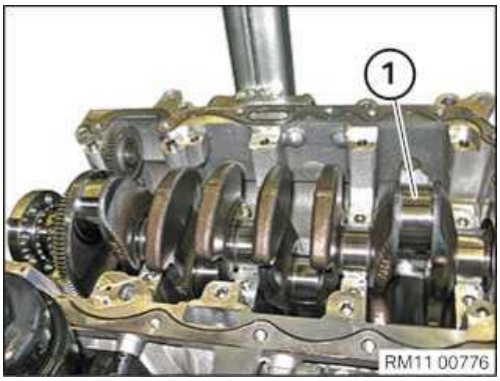
- Make sure that the mounting orientation is maintained.

  All main bearing caps (1) are marked: **Bearing positions 1 to 5.**



- Gradually detach the crankshaft bearings in the sequence (10) to (1).
- Remove the main bearing caps **1 to 5**.

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CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

TECHNICAL INFORMATION

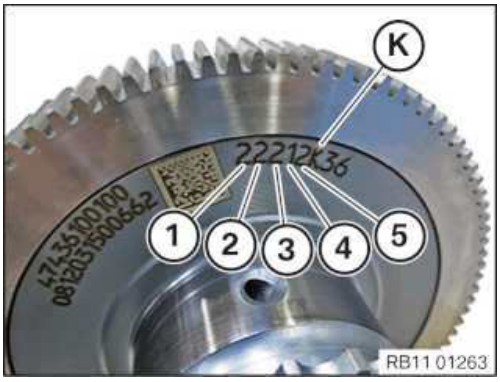
Conduct the following operation with the assistance of a second person.

- Remove the crankshaft (1) with a **second person** and carefully set it aside.

42 – Determine the classification of the main bearing shells and the guide bearing shells



- K = Clutch side
- Item numbers (5) to (1) describe the bearing seats 7 to 1 (key performance indicator on each of the crankshaft bearing caps).
- Enter the code letter on the crankcase in the table.



- K = Clutch side
- Item numbers (1) to (5) describe the bearing seats 1 to 5 (key performance indicator on each of the crankshaft bearing caps).
- Enter the identification numbers on the crankshaft in the table.

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- Enter the code letters and coefficients of the crankcase and the crankshaft.

	Code letter on the crankcase	**Key performance indicator** on the crankshaft
Bearing seat 1		
Bearing seat 2		
Bearing seat 3		
Bearing seat 4		
Bearing seat 5		
Bearing seat 6		
Bearing seat 7		

- The main bearing shells and guide bearing shells are indicated in **colour or with numbers**.
- Use the table below to determine the colours of the main bearing shells and the guide bearing shells in the **crankcase**:

	1	2	3
A	Blue = 1	Blue = 1	Blue = 1
B	Green = 2	Green = 2	Green = 2
C	Brown = 3	Brown = 3	Brown = 3

- Use the table below to determine the colours of the main bearing shells and the guide bearing shells in the **crankshaft bearing caps**:

	1	2	3
A	Blue = 1	Green = 2	Brown = 3
B	Blue = 1	Green = 2	Brown = 3
C	Blue = 1	Green = 2	Brown = 3

43 – Renewing main bearing shells and guide bearing shells

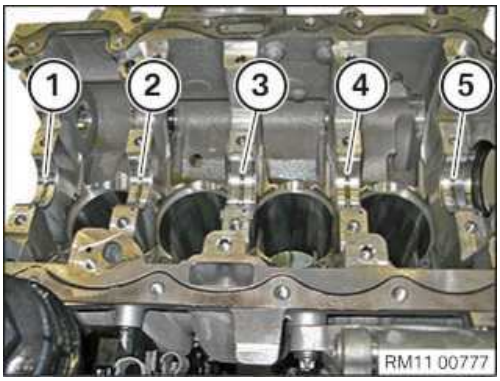
RISK OF DAMAGE

Engine damage caused by incorrectly installed bearing shells and bearing supports.

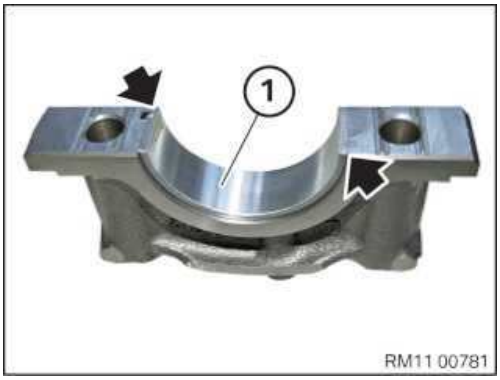
Engine damage may result from incorrectly installing bearing shells and bearing supports.

- Always install all bearing shells and bearing supports in the same position from which they were removed.

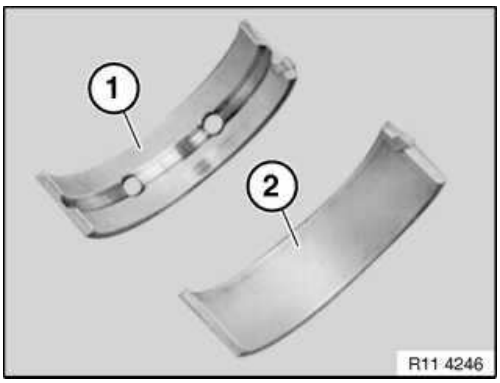
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- Feed out and remove the main bearing shell (1) and (2)- and (4) and (5) (with lubricating groove) from the crankcase.
- Feed out and remove the guide bearing shell (3) (with lubricating groove) from the crankcase.



- Feed out and remove the main bearing shells (1) from the crankshaft bearing caps (1) - and (2) and (4) and (5).
- Feed out and remove the guide bearing shell (1) from the crankshaft bearing cap (3).



- Replace main bearing shells with lubricating groove (1) and the main bearing shells (2).

  Parts: Main bearing shells



- Replace guide bearing shells with lubricating groove (1) and guide bearing shells (2).

  Parts: Guide bearing shells



- Make sure the guide bearing shells and main bearing shells with lubricating groove (1) are correctly positioned in the crankcase.

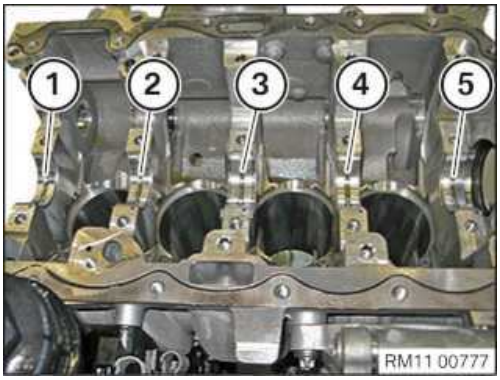
  All guide bearing shells and main bearing shell with lubricating groove (1) in the crankcase are protected against incorrect assembly (mark).

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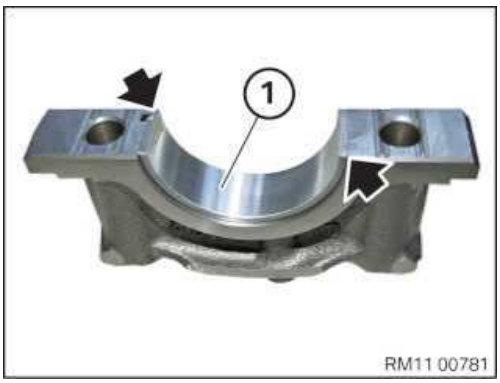


- Make sure the guide bearing shells and main bearing shells (1) are correctly positioned in the crankshaft bearing cap.

  All guide bearing shells and the main bearing shells (1) in the crankshaft bearing caps have protection against incorrect assembly (mark).

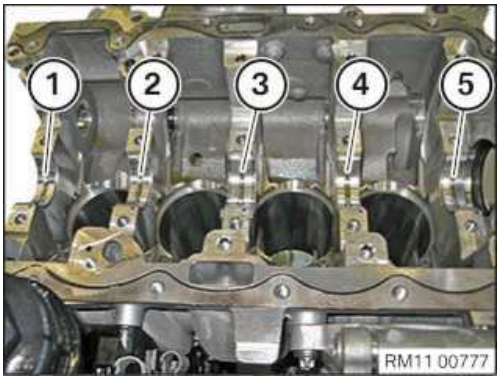


- Insert and install the main bearing shell with lubricating groove (1) and (2) and (4) and (5) in the crankcase.
- Oil main bearing shell with lubricating groove (1) and (2) and (4) and (5).
- Insert and install the guide bearing shell (3) (with lubricating groove) in the crankcase.
- Oil guide bearing shell with lubricating groove (3).



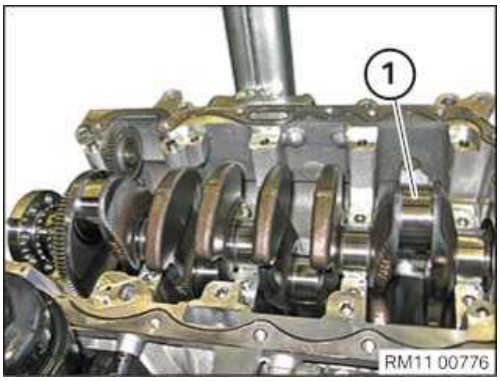
- Insert and install the main bearing shells (1) from the crankshaft bearing caps (1) - and (2) and (4) and (5).
- Oil main bearing shell (1) and (2) and (4) and (5).
- Insert and install the guide bearing shell (3) in the crankshaft bearing cap.
- Oil the guide bearing shell (3).

44 – Installing the crankshaft



- Ensure correct installation of the main bearing shells (1) to (5) with the guide lug.

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CAUTION

Heavy component.

Heavy components can lead to injury or damage.

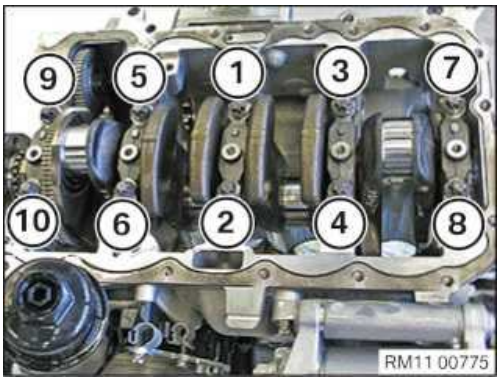
- Remove and install heavy components with the aid of another person/other persons.

TECHNICAL INFORMATION

Conduct the following operation with the assistance of a second person.

- Install the crankshaft (1).

  Parts: Crankshaft



- Observe the allocation and numbering 1 to 5 of the main bearing caps.

  Assign the main bearing caps according to the order of the cylinders.
- Do not install the main bearing cap in an incorrect position.
- Ensure that the main bearing cap is positioned mounted.

  The main bearing cap must not be mounted rotated by 180°!

  The main bearing caps are coded to prevent incorrect assembly.
- Align main bearing caps exactly.
- Replace main bearing bolts.

  Parts: Bolts
- Tighten the main bearing bolts in the sequence (1) to (10).

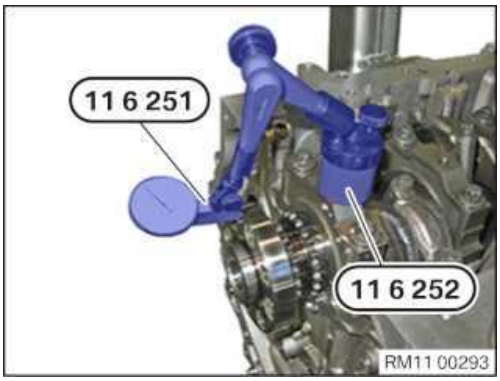
Main bearing cap to crankcase

M10x85	Replace screws.	1. tightening torque	25 Nm
		2. tightening torque	50 Nm
		3. Angle of rotation	60 °
		4. Angle of rotation	60 °

▸ **Check the crankshaft side clearance**

Check

- Set up the dial gauge **0 493 144 (11 6 251)** with the tripod **0 493 145 (11 6 252)** from the special tool **0 493 143 (11 6 250)** at the crankshaft.



Axial play of crankshaft

Equipment installation status	0,090 mm ... 0,273 mm
Operating condition	0,11 mm ... 0,314 mm

Result

» The side clearance has been exceeded.

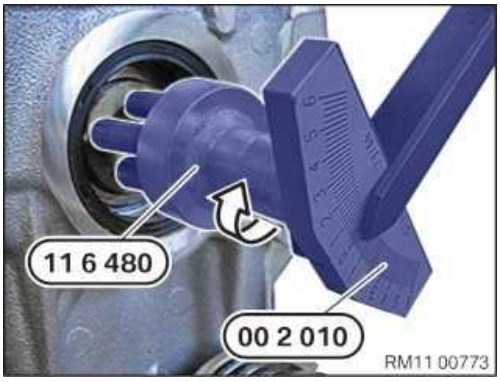
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Measure

- Renew worn components.

▸ **Check the coefficient of friction for the crankshaft**

Check



- Turn the crankshaft clockwise with the special tool **0 490 130 (00 2 010)** and compare the reading on the scale to the maximum permitted torque.

Maximum permitted torque of the crankshaft

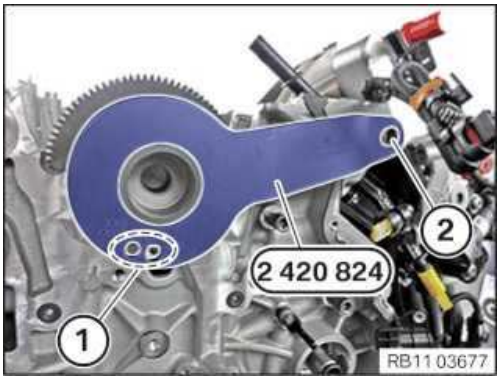
	max. 2 Nm

Result

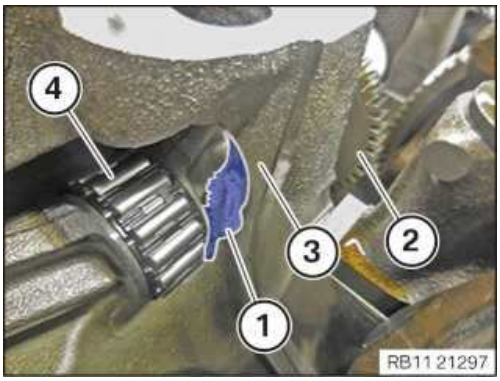
» The maximum permitted torque is exceeded.

Measure

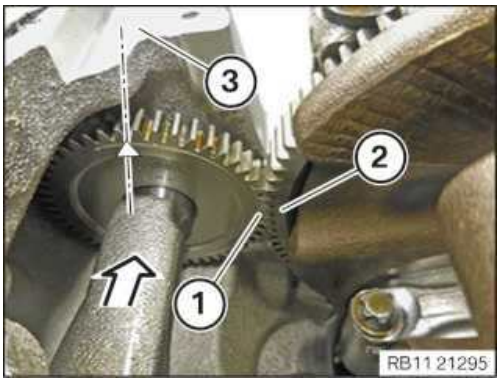
- Correct the radial clearance.



- Bring or adjust crankshaft (2) to the **TDC position** .
- The special tool **2 420 824** in the area (1) is labelled with the different engine versions.
- Install the special too **2 420 824** with the correct bore or on the crankshaft.
- Using the special tool **2 420 824** secure the crankshaft to the fitting sleeve (2) in the TDC position.

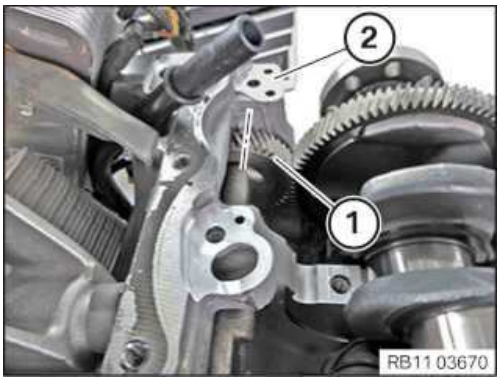


- Guide out lint-free cleaning rag (1) between counterbalance shaft (2) on the intake side and crankcase (3) and remove it.
- Ensure that needle bearing is (4) **not** damaged.



- Position counterbalance shaft (1) on the intake side in the **direction of the arrow** on crankshaft (2).
- Make sure that the mark on the gear (1) for the right counterbalance shaft points **up vertically** to the oil sump (3).

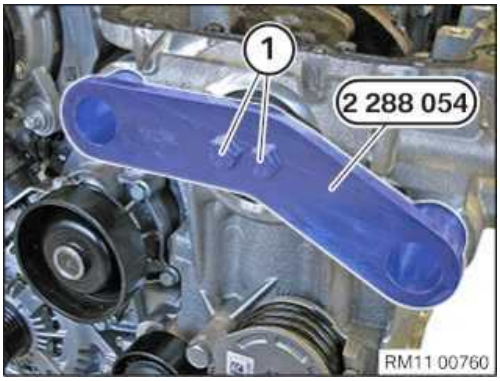
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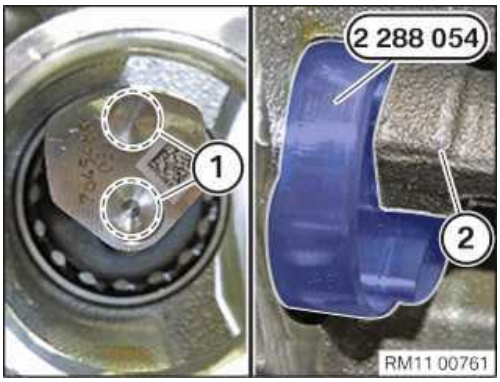
- Check the position of the gear of the counterbalance shaft on the intake side (1) to the crankcase (2) using the marking.



- Position the counterbalance shaft on the exhaust side so that the marking points perpendicular to the oil sump.



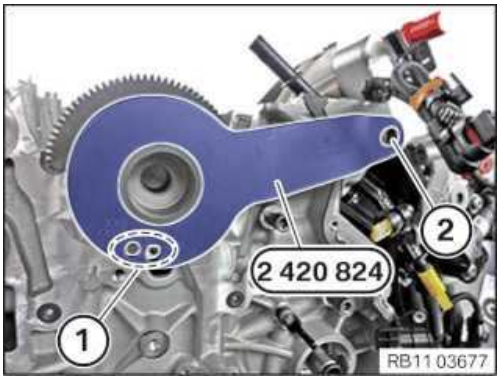
- Make sure that the balance weights on the counterbalance shafts face the oil sump.
- Mount the special tool **2 288 054** and abut the bolts (1).



- Make sure the special tool **2 288 054** is correctly fitted in the guides (1) of the counterbalance shaft (2).
- If necessary, slightly turn the counterbalance shafts.
- Tighten special tool **2 288 054**.

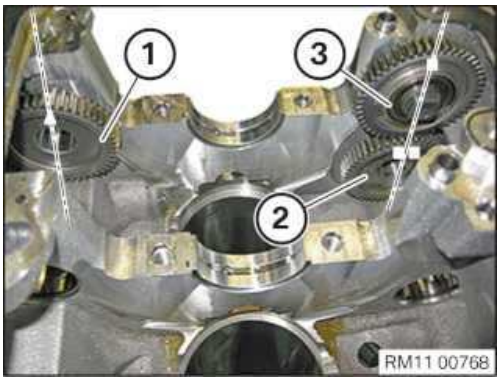
Special tool 2 288 054 to crankshaft

M10		Tightening torque	20 Nm



- Remove special tool **2 420 824**.

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NOTICE

To provide a better overview: Illustration of surrounding parts in removed state.

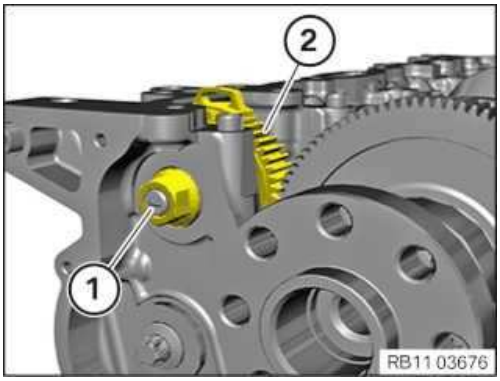
- Ensure that the identifications on the gears (1), (2) and (3) point up vertically to the oil sump sealing surface.



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

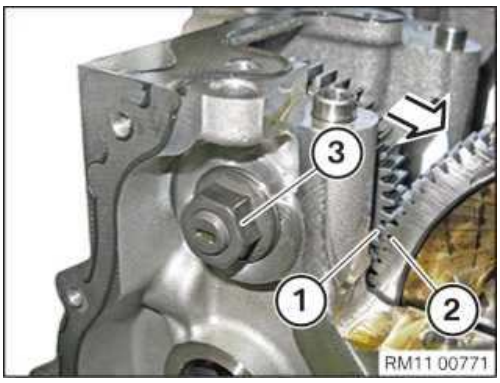
- When installing a new gear: Ensure the ring gear remains blocked until installation using the factory-mounted fixation (1).



- Insert the intermediate wheel (2)with the special tool **0 495 131 (11 5 370)** and install.
- Tighten the nut (1) hand-tight.



- Make sure that the teeth of the intermediate wheel engage with the teeth of the crankshaft and counterbalance shaft.
- Relieve tension on special tool **0 495 131 (11 5 370)** and remove.

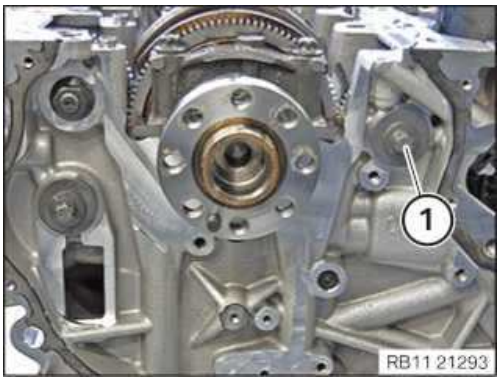


- Move the intermediate wheel (1)in the direction of the arrow into position on the crankshaft (2).
- Tighten nut (3).

Idler gear to crankcase

M12x1.5		Tightening torque	10 Nm
		Angle of rotation	45 °

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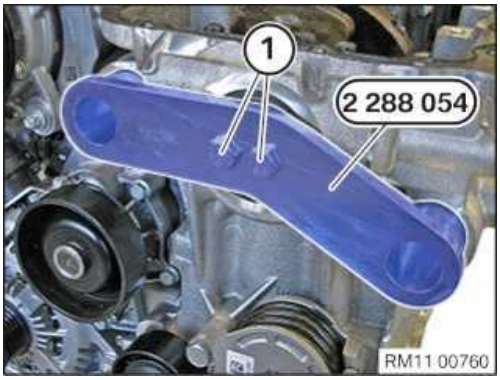
- Renew the screw (1).

  Parts: Screw

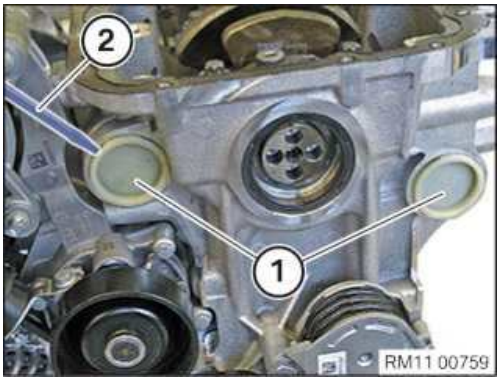
- Tighten screws (1)of the counterbalance shaft on the intake side.

Gear to counterbalance shaft

M10	Renew screws.	1. Jointing torque	20 Nm
		2. Angle of rotation	180 °



- Unscrew the bolts (1) and remove the special tool **2 288 054**.



- Renew the sealing cap (1).

  Parts: Sealing cap

- Make sure the O-rings of the sealing cap (1) are fitted correctly.
- Mount both sealing caps (1).

POSTPROCESSES

45 – If necessary: Renew the piston



CAUTION

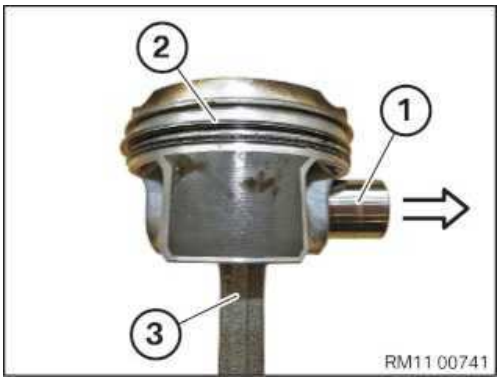
Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

- Use special tool to remove the gudgeon pin circlip.
- Insert the flat side (3) of special tool into the groove (4).
- Grab and remove the gudgeon pin circlip (1) with the arched side (2).

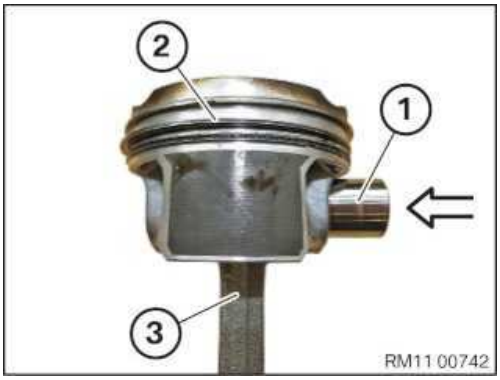
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TECHNICAL INFORMATION

Piston and gudgeon pin are matched to each other.
Always install piston and gudgeon pin together and do not switch by mistake.

- Remove the gudgeon pin (1) in the direction of arrow.
- Remove piston (2) from connecting rod (3).



- Renew piston with gudgeon pin.

  Parts: Pistons

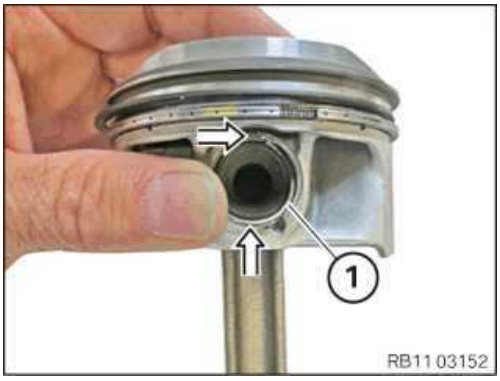
TECHNICAL INFORMATION

Piston and gudgeon pin are matched to each other.
Always install piston and gudgeon pin together and do not switch by mistake.

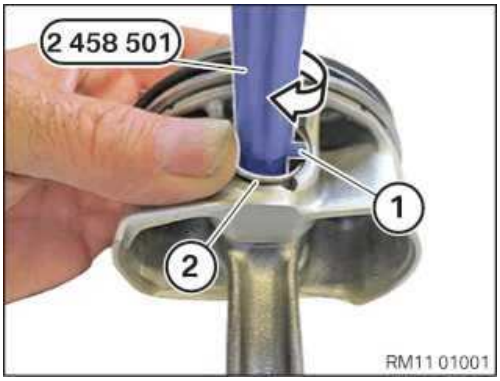
- Position piston (2) on the connecting rod (3).
- Install the gudgeon pin (1) in the direction of arrow.
- You must be able to install the gudgeon pin (1) without major effort.
- Gudgeon pin (1) must be free of play in piston and connecting rod.



- Prepare special tool on the fitting aid .

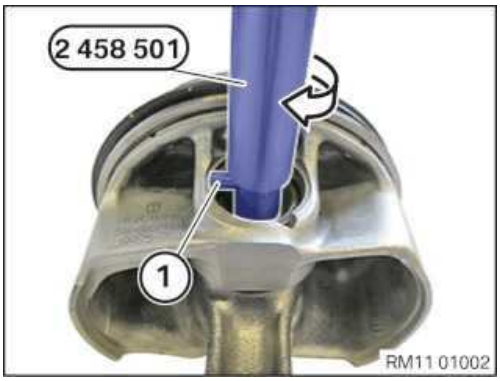


- Insert the gudgeon pin circlip (1) into the groove on the piston (see arrows).

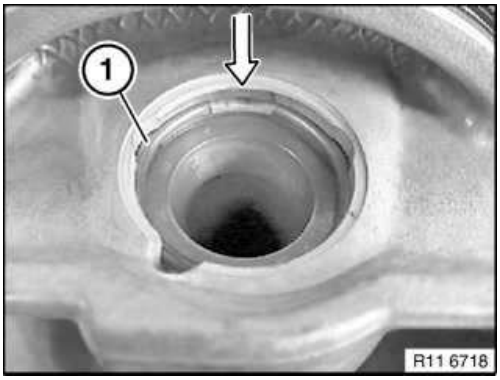


- Screw in the positioned gudgeon pin circlip (2)with and with the guide pin (1) in the direction of the arrow.

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- Screw the gudgeon pin circlip with guide pin (1) into the groove of the piston in the direction of the arrow.



- Gudgeon pin circlip (1) must be fitted correctly in the groove (arrow).

46 – Install the connecting rod bearing shell

RISK OF DAMAGE

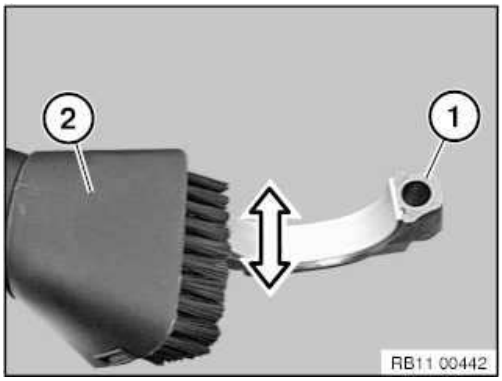
Engine damage caused by incorrectly installed bearing shells and bearing supports.

Engine damage may result from incorrectly installing bearing shells and bearing supports.

- Always install all bearing shells and bearing supports in the same position from which they were removed.

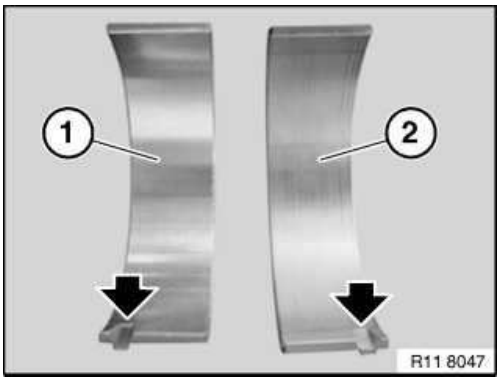
TECHNICAL INFORMATION

The connecting rods of the engine are balanced and are matched to each other.
A single connecting rod is not permitted to be replaced. Always replace all connecting rods.



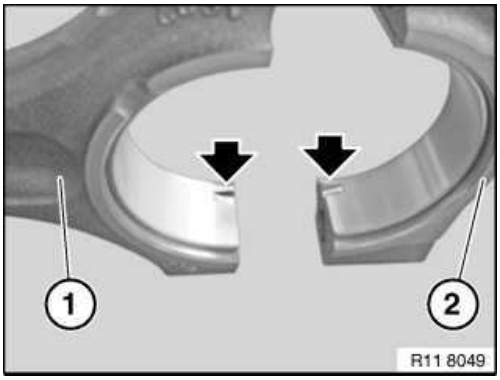
- Vacuum the crack surfaces (1) with a conventional vacuum cleaner (2).

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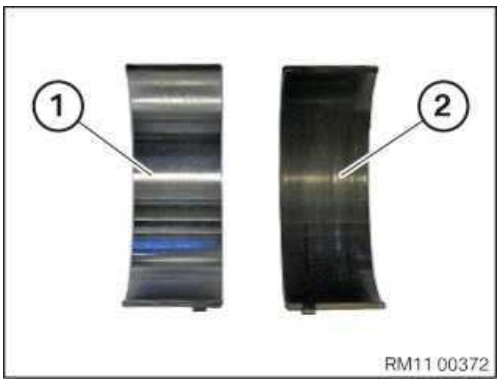
- To avoid incorrect assembly: Pay attention to marks (arrows).

  The connecting rod bearing (1) for the connecting rod bearing cap and the connecting rod bearing (2) for the connecting rod are each equipped with protection against incorrect assembly as shown in the marked area.



- To avoid incorrect assembly: Pay attention to marks (arrows).

  The connecting rod bearing cap (2) and the connecting rod (1) are each equipped with protection against incorrect assembly.



- Makes sure that a light connecting rod bearing shell (1) and a dark connecting rod bearing shell (2) are installed for each connecting rod.



TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

- Insert the dark connecting rod bearing shell (2) into the connecting rod (1).
- Oil the connecting rod bearing shell (2).



TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

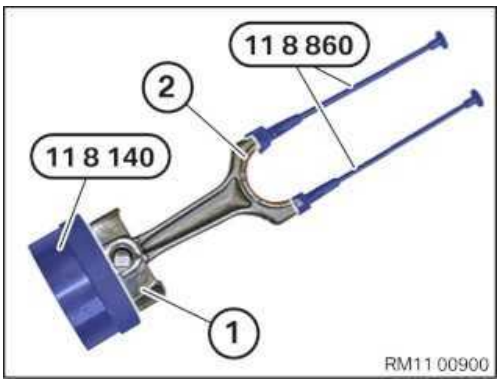
Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

- Insert the light connecting rod bearing shell (2) into the connecting rod bearing cap (1).
- Oil the connecting rod bearing shell (2).

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TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.
Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.



- Coat the pistons (1) and piston rings lightly with oil.
- Mount the special tool **0 493 582 (11 8 140)** on the piston (1).
- Screw the special tool **0 496 144 (11 8 860)** in on the large connecting rod eye (2).



- Insert the piston with the special tool **0 493 582 (11 8 140)** with the arrow pointing to cylinder 1.

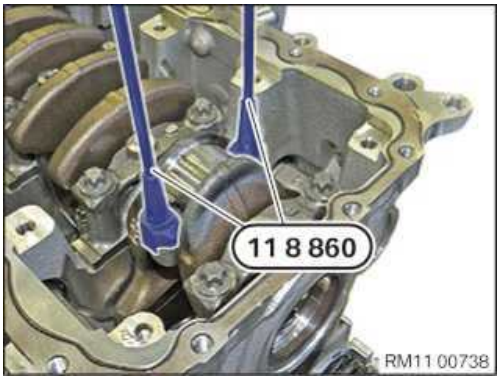
RISK OF DAMAGE

Damage on the cylinder wall and oil spray nozzles.

Major force can scratch the cylinder wall and bend the oil spray nozzles.

- Carefully move the piston and connecting rod in the engine block.

- Install the piston in the crankcase.



- Remove special tool **0 496 144 (11 8 860)** from large connecting rod eye.

48 – Install the connecting rod bearing cap

RISK OF DAMAGE

Engine damage caused by incorrectly installed bearing shells and bearing supports.

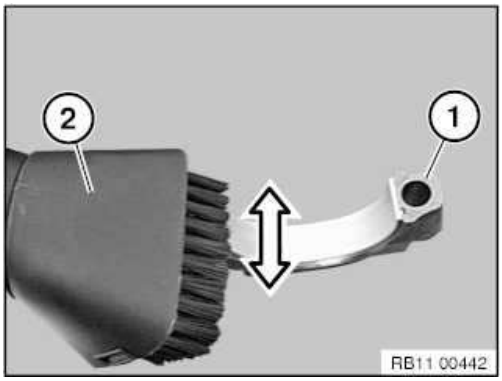
Engine damage may result from incorrectly installing bearing shells and bearing supports.

- Always install all bearing shells and bearing supports in the same position from which they were removed.

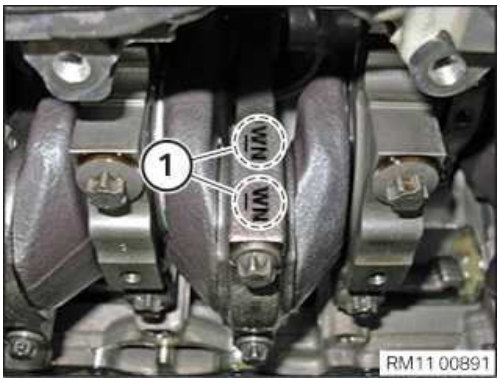
TECHNICAL INFORMATION

The connecting rods of the engine are balanced and are matched to each other.
A single connecting rod is not permitted to be replaced. Always replace all connecting rods.

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- Vacuum the crack surfaces (1) with a conventional vacuum cleaner (2).



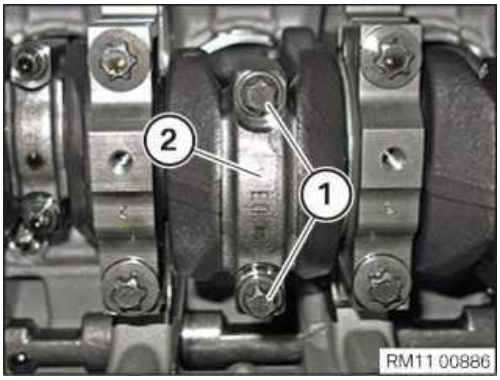
- Attach the connecting rod bearing caps to the connecting rod until the designations (1) match.

TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

- Make sure that the connecting rod bearing is attached to the same connecting rod that it was detached from.

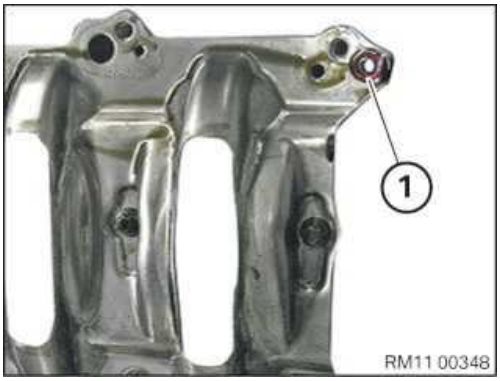


- Position the connecting rod bearing cap (2).
- Tighten the bolts (1) with the special tool **0 490 504 (00 9 120)**.

Connecting rod bearing cap to connecting rod

M9x47		Tightening torque	20 Nm
		Angle of rotation 1	70 °
		Angle of rotation 2	70 °

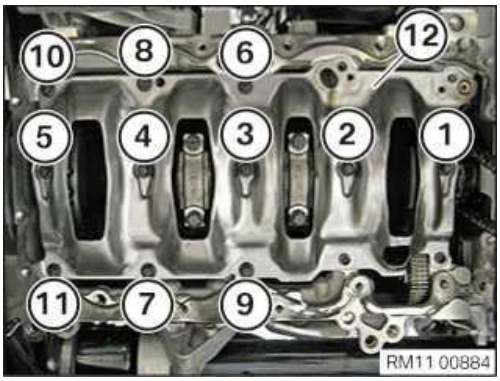
49 – Installing the oil deflector



- Check sealing ring (1) for damage and replace oil deflector if necessary.

  Parts: Oil deflector

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- Insert and install the oil deflector (12).
- Renew screws (1) to (11).

  Parts: Bolts
- Hand-tighten the bolts (1) to (5).
- Hand-tighten the bolts (6) to (11).
- Tighten the screws (1) to (5).

Oil deflector to crankshaft bearing cap

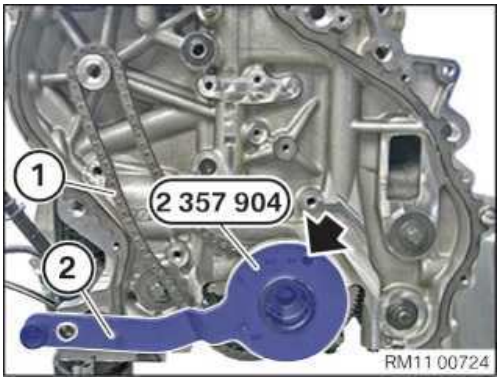
M8x14	Replace screws.	Tightening torque	35 Nm
		Release	180 °
		Tightening torque	15 Nm
		Angle of rotation	45 °

- Tighten the screws (6) to (11).

Oil deflector to crankcase

M8x14		Tightening torque	19 Nm

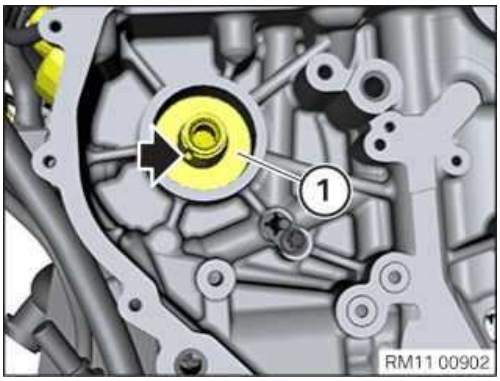
50 – Install both timing chains



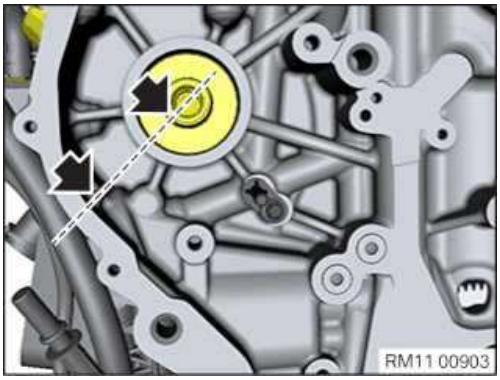
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Position the timing chain (1).
- Secure crankshaft with special tool **2 357 904**.
- Secure special tool **2 357 904** with bolt (2) on crankcase.

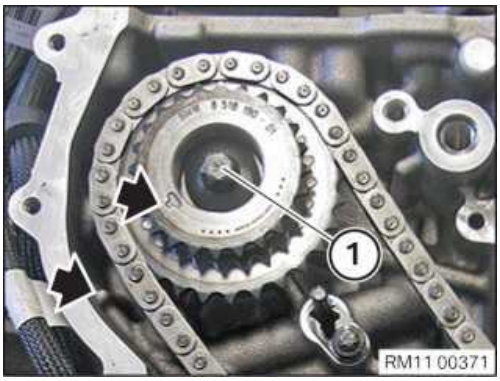


- Note spline groove on high pressure pump (1).

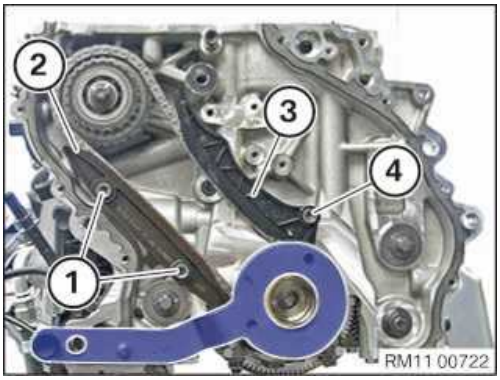


- Mark and groove (arrows) on high pressure pump and crankcase must align.

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- Position the impeller with timing chain on the high pressure pump.
- Screw in and fasten central bolt (1) of high pressure pump.
- Mark and cast lug (arrows) must align.



- Position tensioning rail (3).
- Replace bearing journal.

  Parts: Bearing journal
- Tighten the bearing journals (4).

Bearing journal of tensioning and guide rail

M8	*Replace bearing journal.*	Tightening torque	20 Nm

- Position the guide rail (2).
- Replace bearing journal.

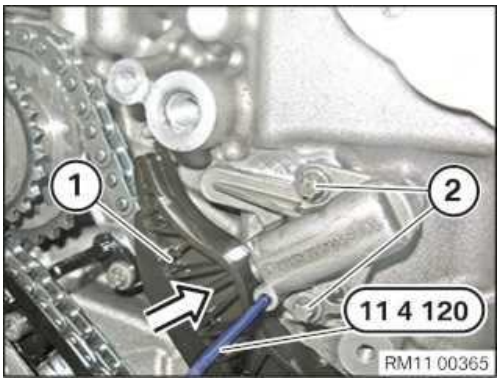
  Parts: Bearing journal
- Tighten both bearing journals (1).

Bearing journal of tensioning and guide rail

M8	*Replace bearing journal.*	Tightening torque	20 Nm



- Clean sealing surfaces (1) with compressed air.



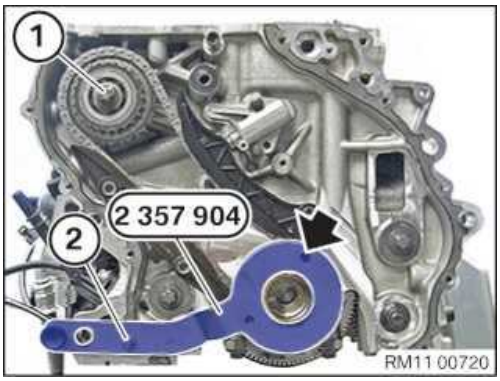
- Position hydraulic chain tensioner.
- Tighten down screws (2).

Chain tensioner to crankcase

M6x22		Tightening torque	10 Nm

- Press chain tensioner in by hand with tensioning rail (1) in direction of arrow until special tool **0 491 012 (11 4 120)** can be removed.

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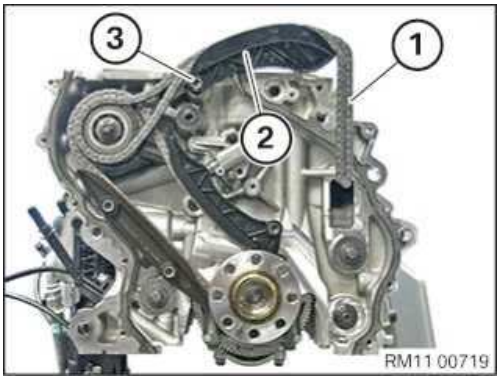


- To fasten central bolt (1) of high pressure pump, crankshaft must remain secured with special tool **2 357 904** and bolt (2).
- Renew central bolt (1).

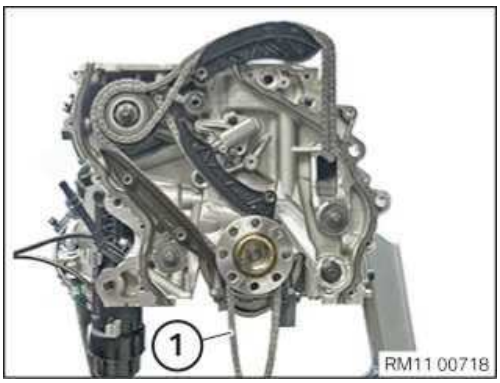
  Parts: Central bolt
- Tighten central bolt (1).

Camshaft sprocket on high pressure pump

M12		Tightening torque	65 Nm



- Position tensioning rail (2) on bearing journal (3).
- Position camshaft timing chain (1).



- Mount drive chain (1) for oil pump on crankshaft.

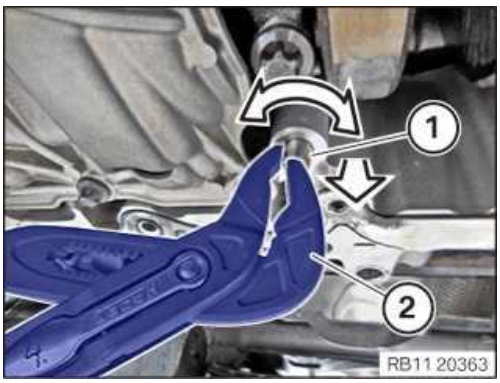
51 – Install the oil vacuum pump

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

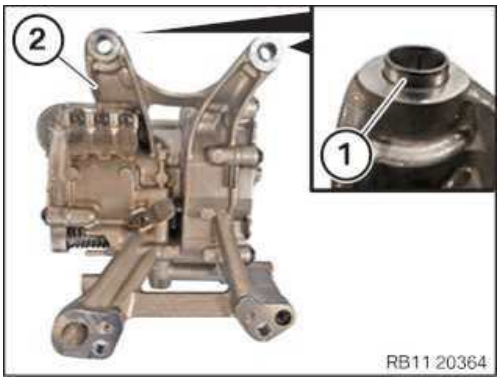
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Remove centering sleeves from the crankcase (1) using a standard tool (2).
- Renew the centring sleeves (1).

  Parts: Centring sleeves

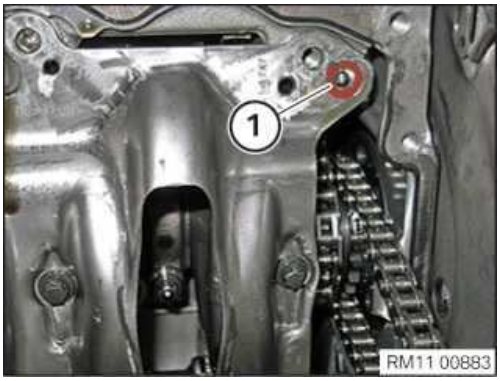
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- Install centering sleeves (1) in the oil vacuum pump (2).

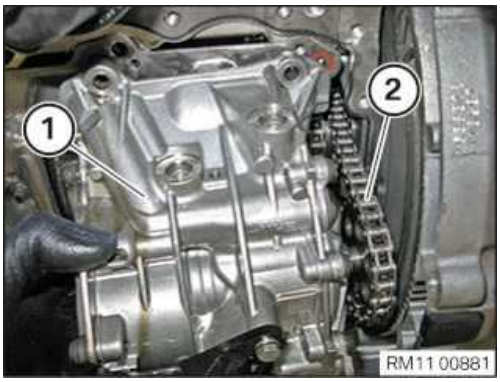


- Check the sealing ring (1) for damage and renew where required.
- Make sure the sealing ring (1) is installed correctly.



- Check sealing ring (1) for damage and replace oil deflector if necessary.

  Parts: Oil deflector



- Insert oil vacuum pump (1) into the drive chain (2).



- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1) of the oil vacuum pump (2).

Oil vacuum pump to crankcaseB47

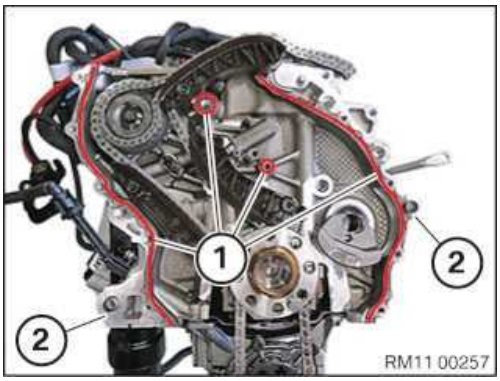
M8x35		Tightening torque	19 Nm

52 – Install the rear timing case cover

Prerequisite

Transmission is removed.

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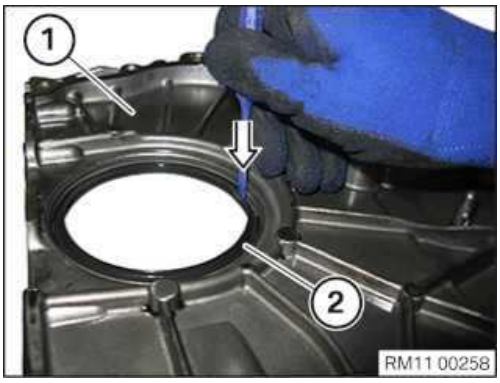
RISK OF DAMAGE

Damage to the surface.

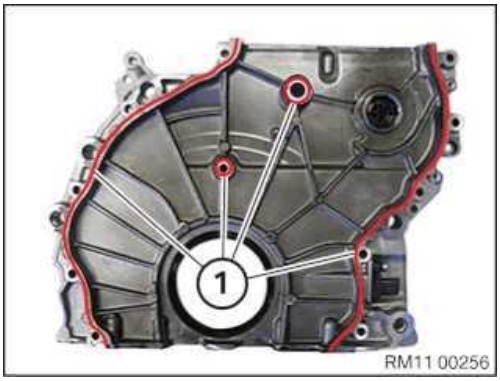
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

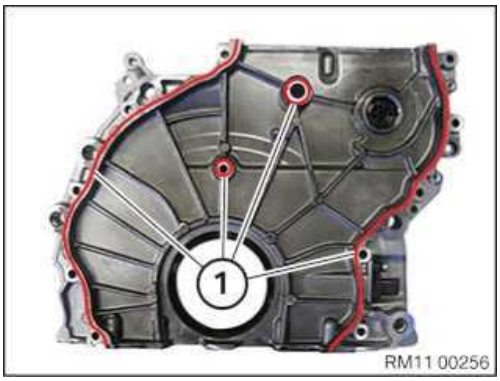
- Remove seal residue from the sealing surfaces (1) using special tool **0 495 102 (11 4 470)**.
- Check fitting sleeves (2) for damage and for tight fit; renew if necessary.



- Position the timing case cover (1) underneath.
- Position punch on inner side of crankshaft seal (2).
- Drive out crankshaft seal (2) outwards.



- Remove seal residue from the sealing surfaces (1) using special tool **0 495 102 (11 4 470)**.

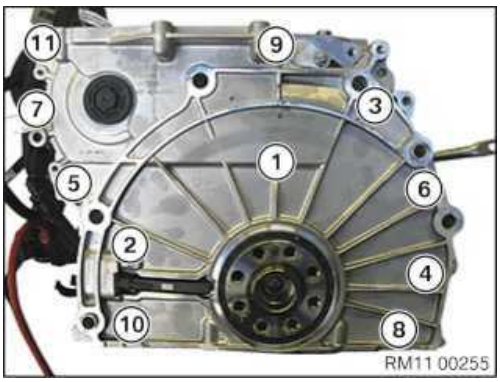


TECHNICAL INFORMATION

For more information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

- Apply sealing bead (1) with a height of approx. 1.5 mm to 2.0 mm on inner side of timing case cover in marked locations. Use liquid sealing compound for this.

  Application time of sealing bead (1) must not exceed 12 minutes.



- Mount the timing case cover without the crankshaft seal.
- Renew screws (1) to (11).

  Parts: Bolts
- Join the bolts in with the sequence (1) to (11).
- Tighten screws in the order (1) to (11).

Rear timing case cover to crankcase

M6	Renew screws.	Jointing torque	8 Nm
		Angle of rotation	90 °

▸ **Installing the rear crankshaft seal**

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RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) on the radial shaft seal with the sharp-edged connector gearing of the output shaft will result in destruction and/or leaks.

- When inserting the output shaft, make sure that the connector gearing of the output shaft does not touch the sealing lip (inner) of the radial shaft seal.

RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) and applying oil to the radial shaft seal will lead to its destruction.

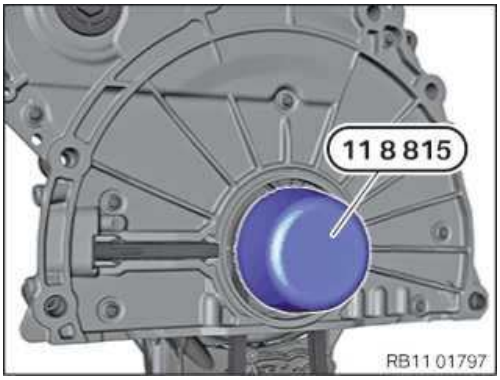
- Do not touch the sealing lip (inner) of the radial shaft seal.
- Do not apply oil to the radial shaft seal.
- Install the radial shaft seal dry.

RISK OF DAMAGE

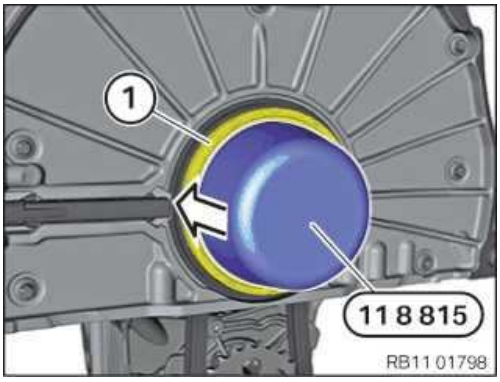
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Position special tool **0 496 137 (11 8 815)** on crankshaft. Make sure that the crankshaft sensor is not damaged.



- Fit the crankshaft seal (1) up to the timing case cover in the direction of the arrow using special tool **0 496 137 (11 8 815)** and position.
- Remove special tool **0 496 137 (11 8 815)**.

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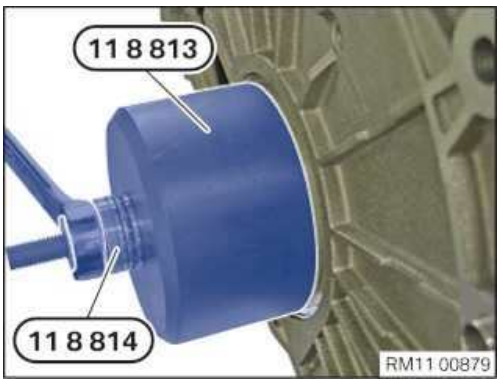


- Secure special tool **0 496 133 (11 8 811)** to the crankshaft using special tool **0 496 134 (11 8 812)**.

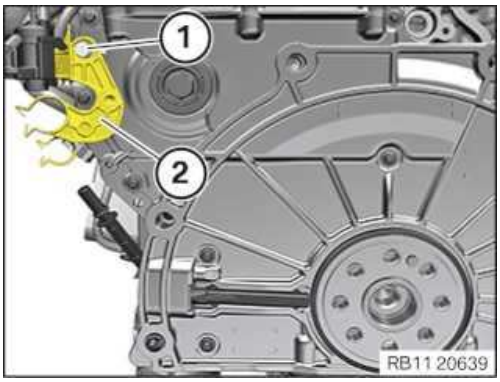


- Check the freedom of movement between the special tool **0 496 135 (11 8 813)** and the crankshaft sensor during installation.

  Otherwise there is a risk that the crankshaft sensor will be damaged.
- Slide on special tool **0 496 135 (11 8 813)**.
- Screw down special tool**0 496 136 (11 8 814)**.

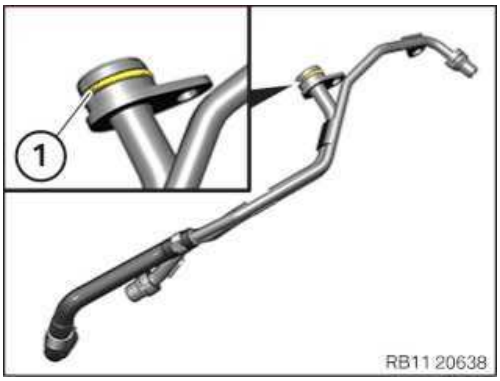


- Press in crankshaft seal with special tool **0 496 135 (11 8 813)**.
- Screw in special tool **0 496 135 (11 8 813)** up to timing case cover.



- Insert and install the holder (2).

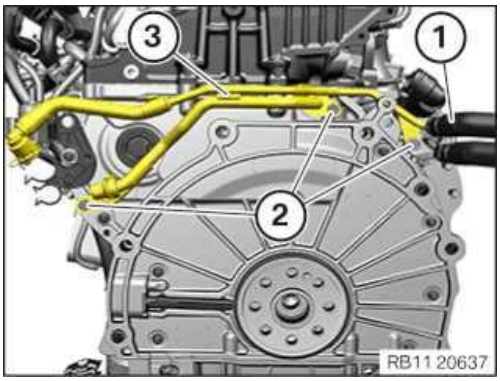
▶ **If installed: Installing the coolant line of the SCR metering module**



- Renew the O-ring 1.

  Parts: O-ring

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- Feed in and install coolant line (3).
- Tighten down screws (2).

SCR coolant lines to crankcase end cover

Hexagon screw M6x16		Tightening torque	8 Nm

- Connect and lock the coolant line (1).

  Coolant line (1) must audibly engage.

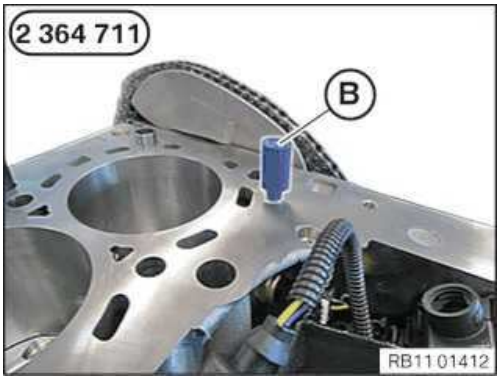
▸ **Cleaning the sealing surface**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Lock the front oil duct using special tool (B) from special tool **2 364 711**.



RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 103 (11 4 471)**.



RISK OF DAMAGE

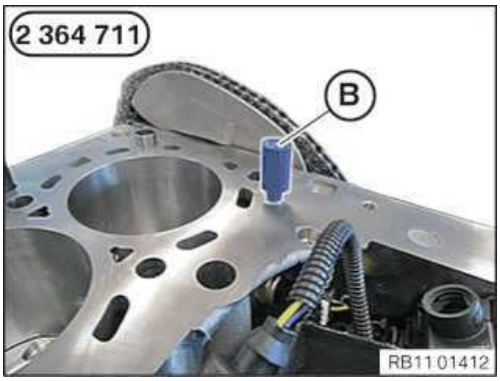
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

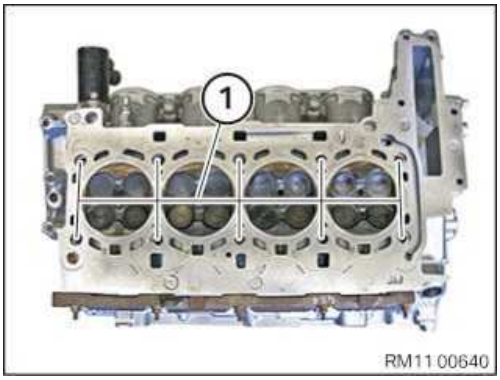
- Clean the sealing surface using special tool **0 495 104 (11 4 472)**.

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- Remove special tool (B).

▶ **Renewing the cylinder head gasket**



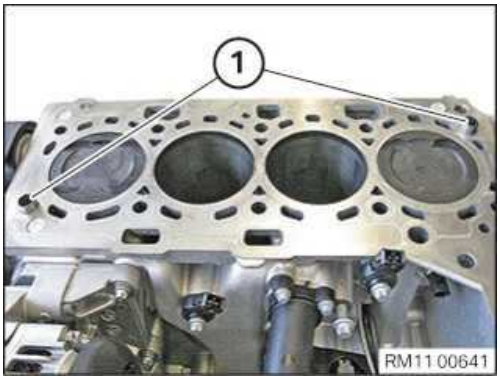
RISK OF DAMAGE

Damage to the surface.

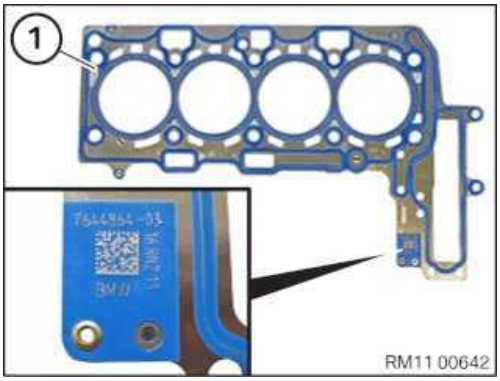
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Remove oil and dirt residue from the blind holes (1).

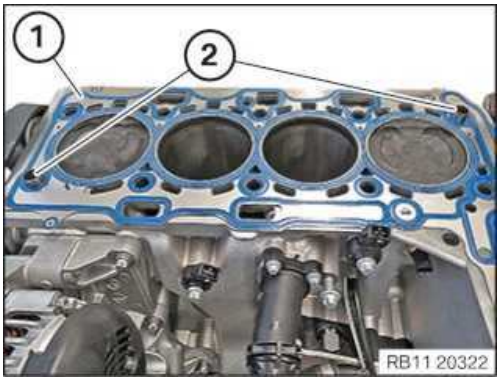


- Check the fitting sleeves (1) for secure fit and damage.



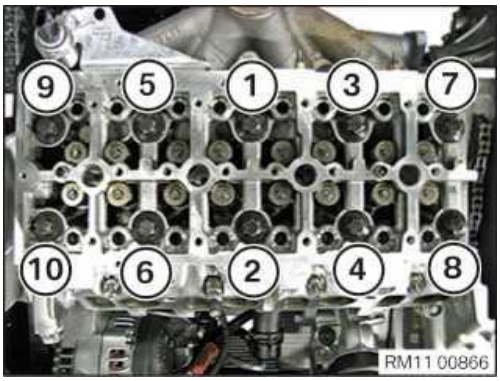
- Identify the cylinder head gasket (1) using the part number.

Note: If the cylinder head is reworked, an additional thicker gasket 0.3 mm is available for service personnel.



- Guide in the cylinder head gasket (1) and install.
- Ensure that the cylinder head gasket (1) is installed correctly in the fitting sleeves (2).

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CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Damage to threads.

Fluid in the threaded hole may damage the thread when screws are tightened in the threads.

- Dry threaded holes (e.g. using compressed air).

TECHNICAL INFORMATION

Do not remove bolt coating.

- Renew the cylinder head bolts (1).

  Parts: Cylinder head bolts
- Do **not** wash off coating of cylinder head bolts.
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

  No coolant, water or engine oil must be present in threaded holes of engine block.

TECHNICAL INFORMATION

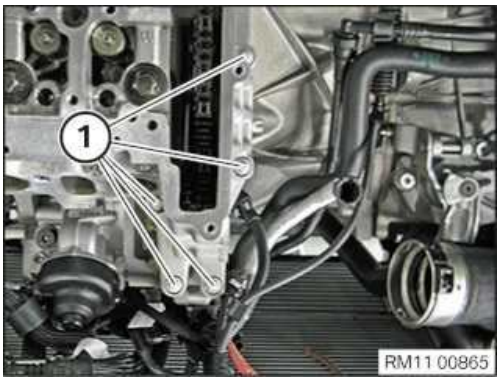
When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Feed in cylinder head bolts and install.
- Screw in cylinder head bolts in sequence (1) to (10).
- Tighten cylinder head bolts using special tools **0 490 504 (00 9 120)** and in sequence (1) to (10).

Cylinder head to crankcase

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

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- Tighten the cylinder head bolts (1).

Cylinder head bolt to timing case cover

M8x40		Tightening torque	19 Nm



TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

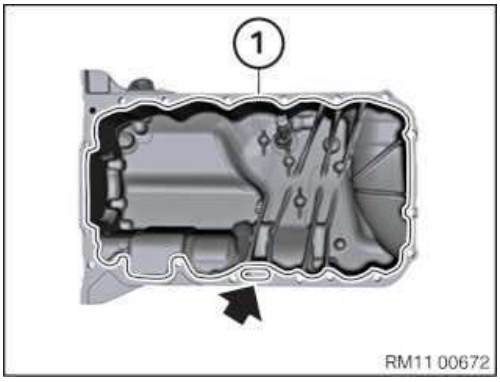
- Remove fine sealing remains on the sealing surface (1)and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.



TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove coarse sealing remains on the sealing surface (1)and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.



TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- Apply the sealing compound along the line (1) with a thickness of 2 mm to 2.5 mm.

  Apply the sealing compound along the inner edge.

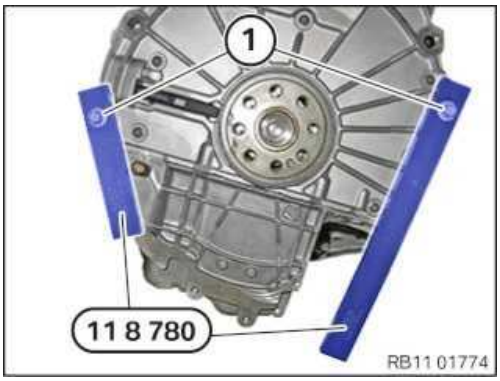
Sealing compound

Loctite 5970 liquid sealing compound	50 ml, Cartridge	83190404517

Overview of consumables (Electronic Parts Catalogue)

- Completely encircle the oil return orifice (arrow) with the sealing compound.

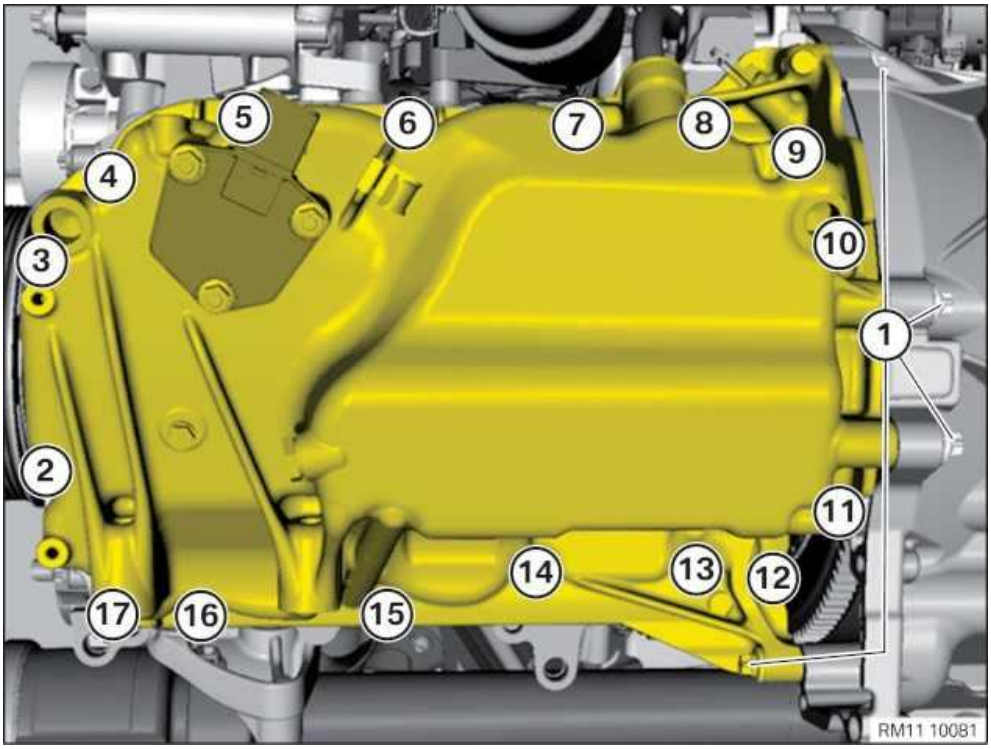
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TECHNICAL INFORMATION

The special tool 11 8 780 is only required when the transmission is removed.

- Position the special tool **0 496 120 (11 8 780)** with the transmission bolts (1) so that the oil sump is exactly flush with engine block.
- If necessary, renew fitting sleeves.



- Position and install oil sump.
- **Hand-tighten** oil sump screws (2) to (17) but do **not** tighten completely.
- Join transmission bolts (1) with 5 Nm.
- Tighten screws(2) to (17) of the oil sump.

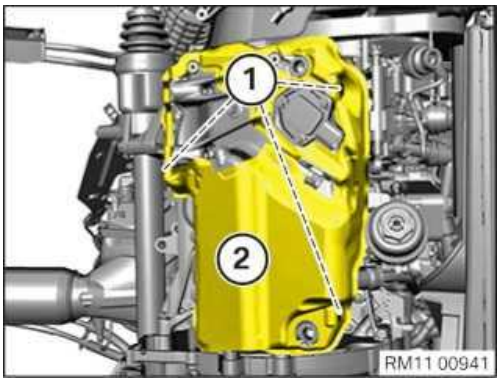
Oil sump to crankcase

M8x30		Tightening torque	2 Nr
M8x110		Tightening torque	2 Nr

- Tighten transmission bolts (1) on oil sump.

Transmission to oil sump

M8		Tightening torque	1 Nr



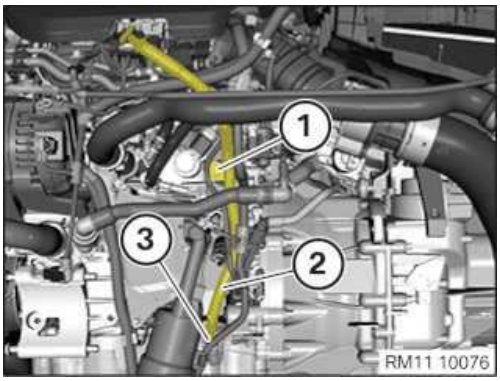
- Thread in and position the acoustic cover (2).
- Install the expanding rivet (1).



- Renew O-ring (1).

  Parts: O-ring

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- Guide in guide tube (2) for oil dipstick and insert it into oil sump.
- Make sure the sealing ring (3) is positioned correctly in the oil sump.
- Tighten down screw (1).

Guide tube for oil dipstick on engine

M8x16		Tightening torque	19 Nm

53 – Installing the flywheel

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

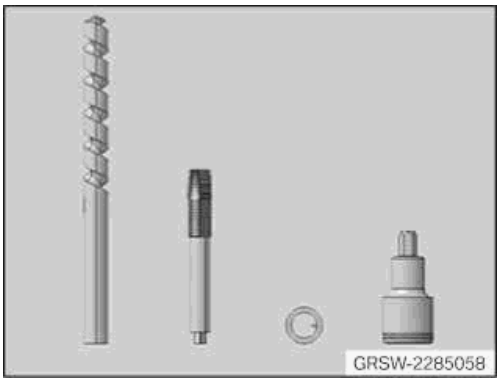
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



TECHNICAL INFORMATION

Clean all threads with a screw tap.

- Clean all screw threads (1).



- Use the set of special tools **2 285 058**.

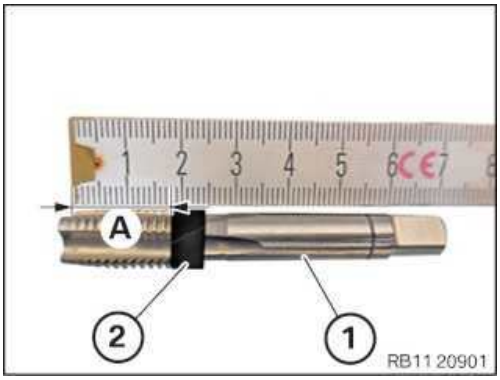
Description
Twist drill
Thread cutter M12x1.5
Depth
Insertion tool

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- Assemble tool set.

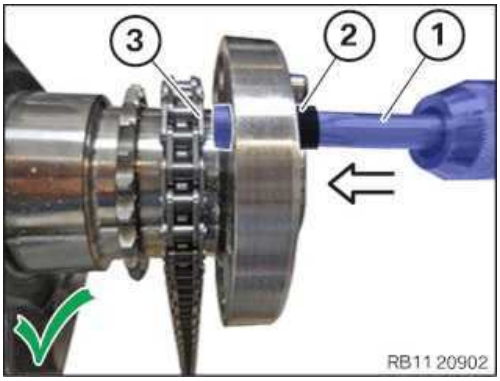
Number	Description
1	Tool holder
2	Thread cutter M12X1,5



- Mark the screw-in depth (A) on thread cutter (1) from the set of special tools **2 285 058** with a standard tool (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm



NOTICE

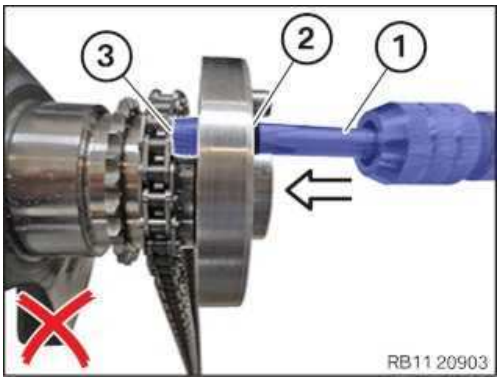
To provide a better overview: Shown with engine removed.

- Screw in the thread cutter (1) from the set of special tools **2 285 058** in direction of arrow up to the screw-in depth (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm

- Make sure that the thread cutter does (1) **not** rest on the timing chain (3).

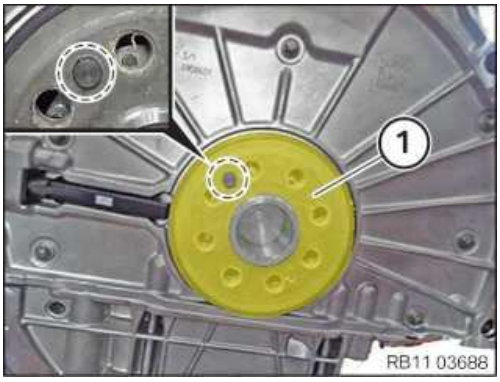


TECHNICAL INFORMATION

- **Carefully** handle the timing chain, to protect the timing chain and timing chain drive against damage.

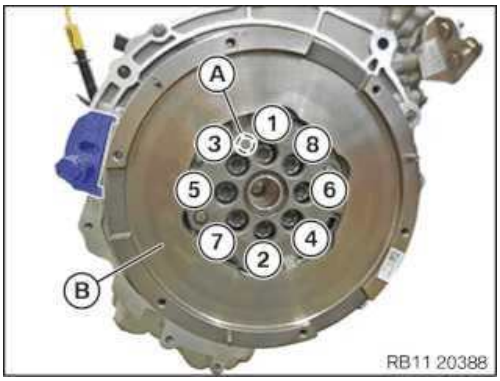
- Make sure that the screw-in depth (2) of the screw tap (1) is not exceeded.

  The thread cutter (1) may not rest on the timing chain (3).



- During the installation, note the mark shown without fail.
- Install special tool (1) on the crankshaft as shown.

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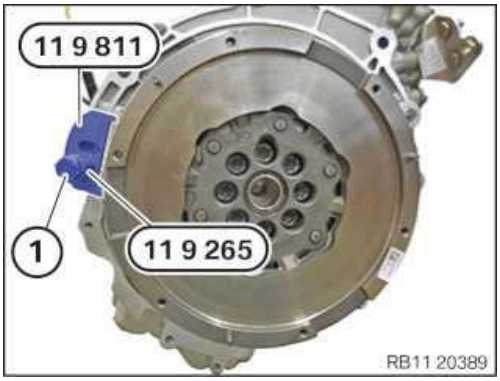


- Position flywheel (B) .
- Renew flywheel bolts (1) to (8).

  Parts: Flywheel bolts
- Tighten flywheel bolts hand-tight with special tool **0 491 018 (11 4 180)**.
- Observe tightening sequence. While doing so, begin with dowel pin (A).
- Tighten the flywheel bolts using the special tool **0 491 018 (11 4 180)** in sequence (1) to (8).

Flywheel to crankshaft

M12x1.5	Renew screws.	Tightening torque	120 Nm



- Loosen the transmission bolt (1).
- Feed out and remove special tools **0 494 793 (11 9 265)** and **0 496 171 (11 9 811)** with the **standard** (5 mm) washer.

54 – Install clutch

CAUTION

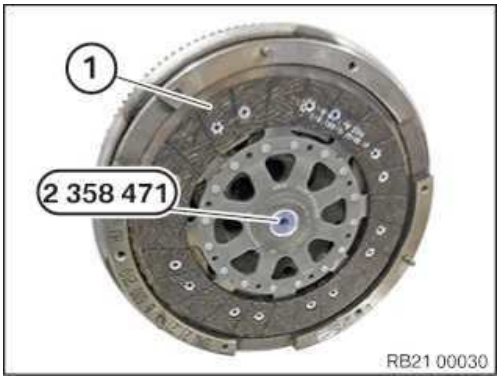
Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

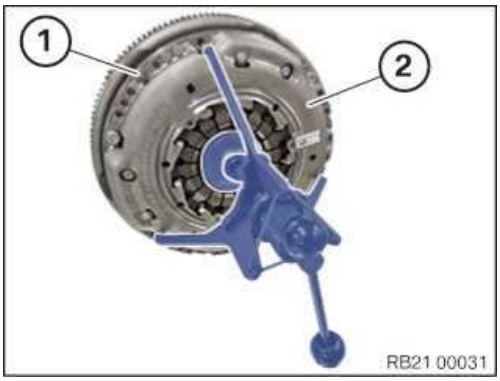
TECHNICAL INFORMATION

Handle the clutch disc carefully. Install the surfaces of the clutch disc in the correct mounting orientation.
Clean friction surfaces of the flywheel and the pressure plate with BMW-approved brake cleaner.
Note designation for ”engine side” / ”transmission side”.

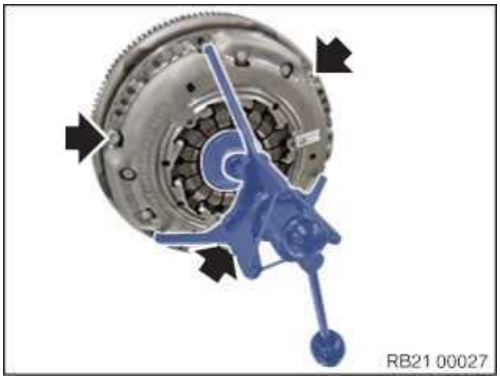


- Centre the clutch disc (1) using special tool .

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- Mount the clutch (2) together with the special tool to the flywheel.
- Observe the dowel pins (1).
- The clutch (2) must be secured via the dowel pins (1).

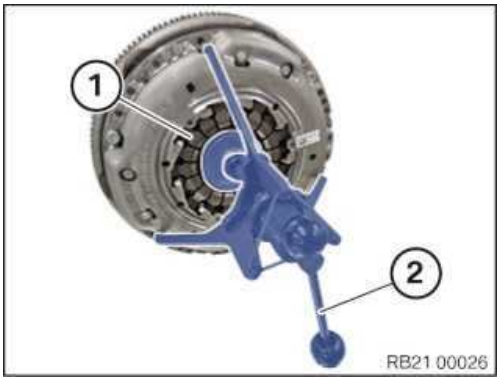


- Renew the bolts (arrows).

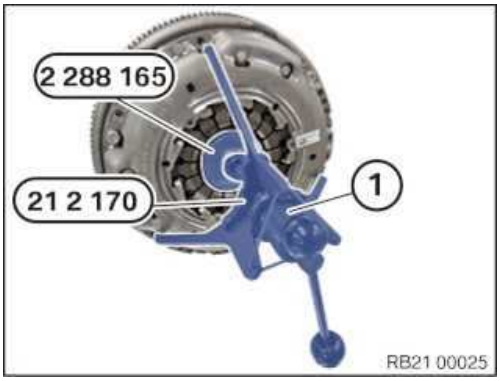
  Parts: Bolts
- Install and tighten screws (arrows).

Clutch to flywheel

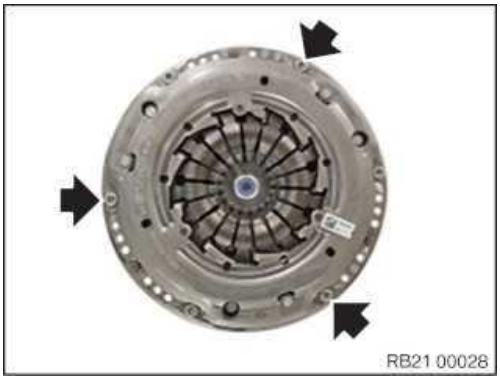
M8	Renew screws.	Jointing torque	15 Nm
		Angle of rotation	90 °



- Loosen the spindle (2) until the diaphragm spring (1) is fully relieved.



- Unscrew the knurled screw (1) and remove the special tool with **2 288 165** from the clutch.



- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Clutch to flywheel

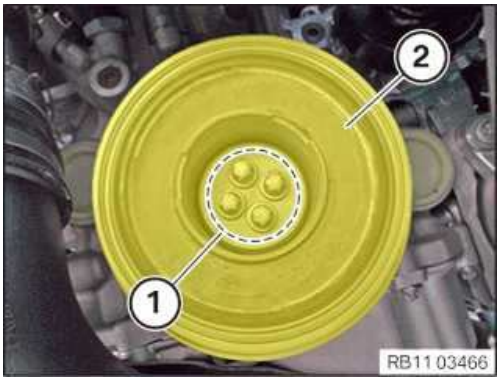
M8	Renew screws.	Jointing torque	15 Nm
		Angle of rotation	90 °

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- Withdraw special tool from clutch disc with aid of accompanying screw.

55 – Installing the vibration damper

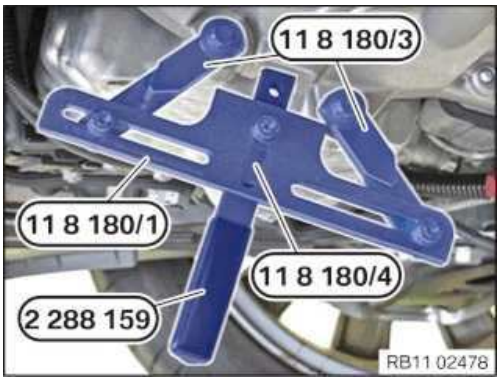


- Position vibration damper (2).
- Renew screws (1).

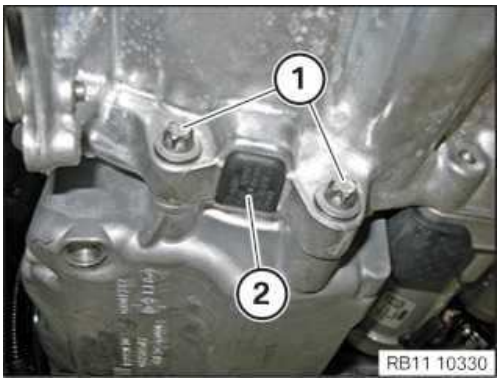
  Parts: Bolts
- Fasten the vibration damper (2) with the bolts (1).
- Tighten the screws (1).

Vibration damper with belt pulley to crankshaft

M10x65	Renew screws. Tighten screws crosswise.	1. Jointing torque	40 Nm
		2. Angle of rotation	60 °
		3. Angle of rotation	60 °



- Release the transmission bolts and remove the special tool **0 493 587 (11 8 180)**.



- Tighten transmission screws (1).

Transmission to engine

M8		Tightening torque	19 Nm

- Install protective cap (2).

56 – Installing the hydraulic valve clearance compensating element

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

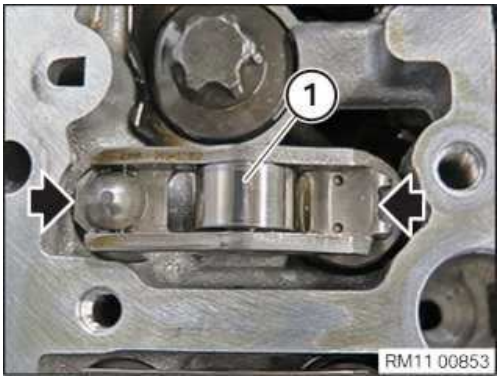


- Install the hydraulic valve clearance compensating element (1) in the direction of the arrow.
- Repeat the process on all hydraulic valve clearance compensating elements.

57 – Install the roller cam followers

TECHNICAL INFORMATION

- Note the installation position of the component. The component may be installed in various installation positions.

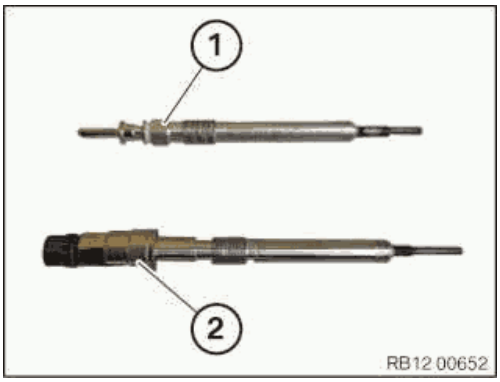


- Check all roller cam followers (1) for damage and replace if necessary.

  Parts: Roller cam followers
- Insert and install all roller cam followers (1).

  Roller cam followers (1) that have already been used must be installed in the same place.
- Note the mounting orientation of the roller cam followers (1).
- Oil all roller cam followers (1).

58 – Install glow elements



- Install glow elements (1) in cylinders 1, 2, 3 and 4.
- If fitted: Glow element (2) with the **combustion chamber pressure sensor** must be installed in cylinder **2**.

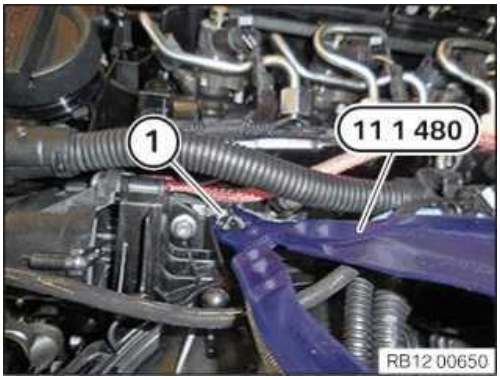
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- Tighten the glow element with the special tool or conventional tools.

Glow elements to cylinder head

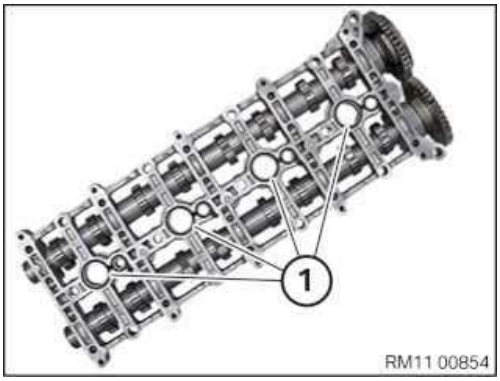
Glow element		Tightening torque	13 Nm



- Connect connectors (1) and lock.

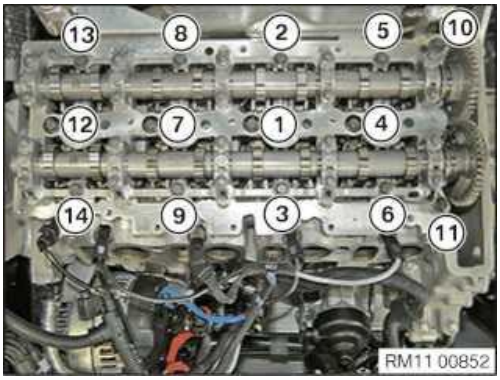
  The connector (1) must engage audibly.

59 – Installing the camshaft support



- Renew gaskets (1).

  Parts: gaskets



- Position the camshaft support including the camshafts.
- Tighten the screws in a sequence from (1) to (14) in several steps.

Camshaft carrier to cylinder head

M7x35		Tightening torque	13 Nm

60 – Adjusting the timing of the camshafts



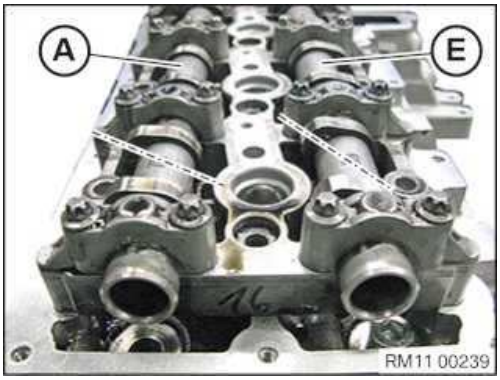
- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

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- Slide the special tool **2 288 380** completely into the bore hole of the oil sump.
- Use the special tool to block **2 288 380** the crankshaft in the TDC firing position at the first cylinder.



- The cam of the intake camshaft (E) at the first cylinder points up at an angle.
- The cam of the exhaust camshaft (A) at the first cylinder points outward at an angle.

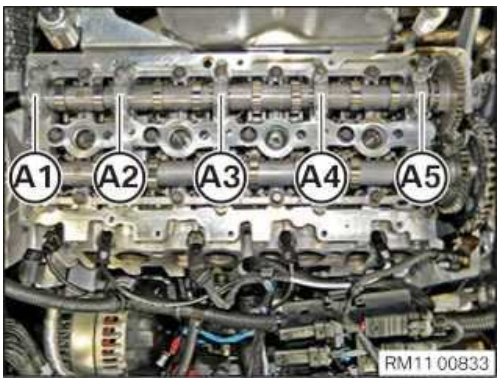
▸ **Remove exhaust camshaft.**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



TECHNICAL INFORMATION

The camshaft is tensioned by the valve springs. Tighten or loosen each screw on the camshaft bearing caps one at a time in the specified sequence and by half a turn only. Repeat procedure.

- Loosen all screws of the exhaust camshaft bearing caps (A1) to (A5) from the outside to the inside, step by step in 1/2 turns.
- Remove exhaust camshaft in upward direction.
- Place all components on special tool **0 495 105 (11 4 480)** in a tidy and orderly fashion.

▸ **Remove chain tensioner piston**

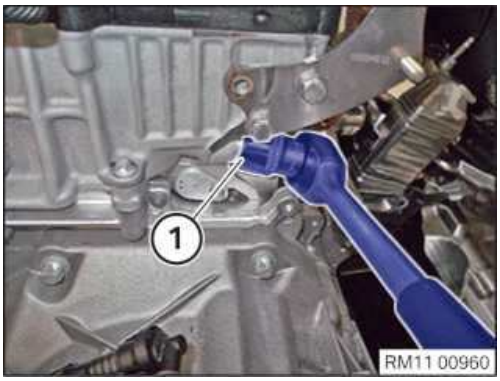
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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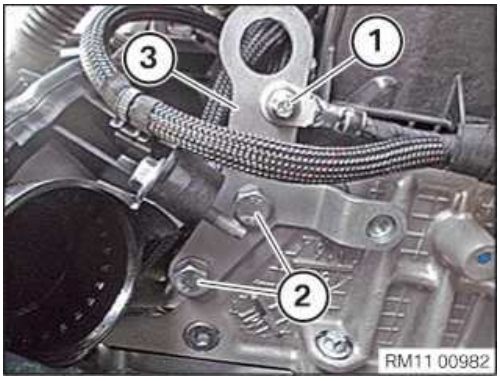


TECHNICAL INFORMATION

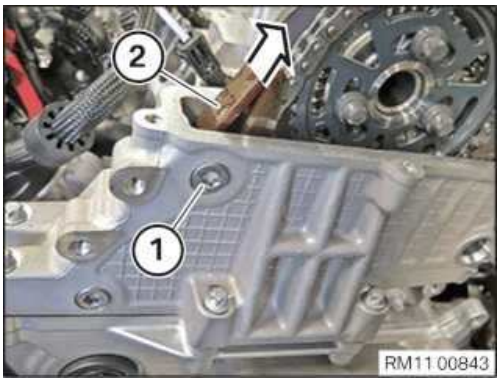
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

▸ **Remove the timing chain guide rail**

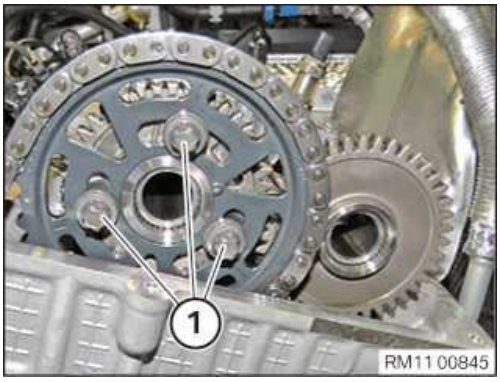


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

▸ **Removing the camshaft sprocket on the intake camshaft**



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

▸ **Install exhaust camshaft**

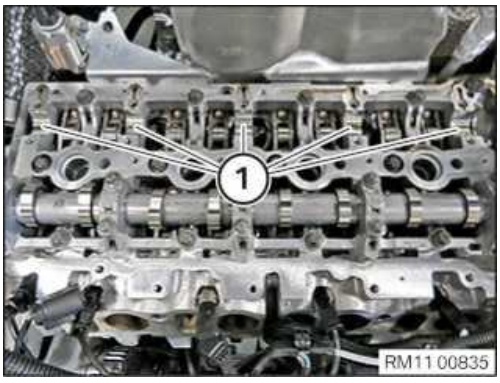
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RISK OF DAMAGE

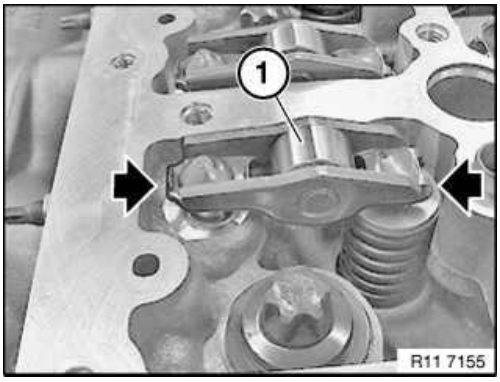
Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

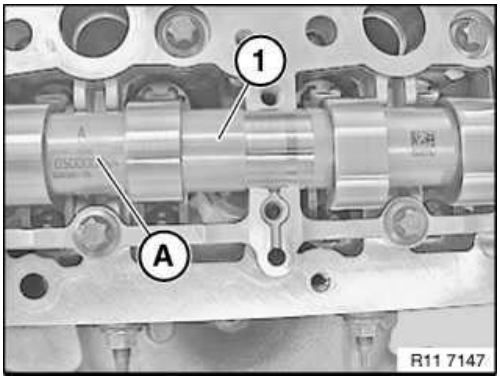
- Comply with the regulations for the installation and disassembly.
- Perform work with care.



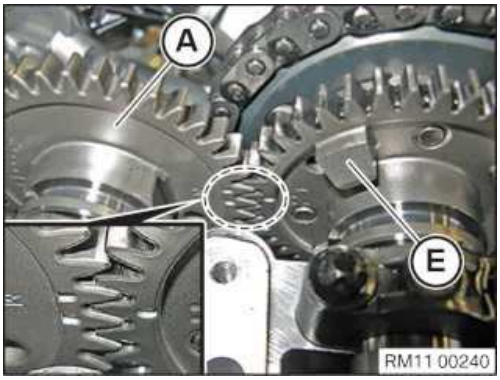
- Oil all bearing positions (1).



- Make sure the roller cam followers (1) have the correct mounting orientation.

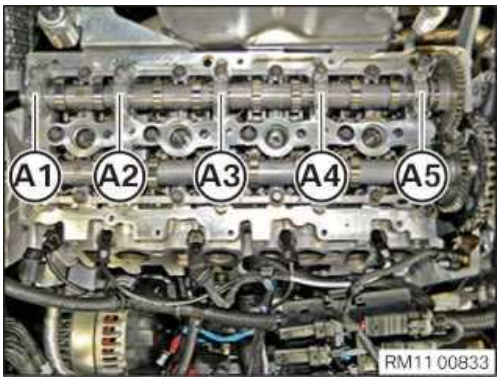


- Insert exhaust camshaft (1) so that the identification (A) points upwards.



- Insert the exhaust camshaft (A) so that the marks on the camshafts (A) and (E) correspond in the highlighted area.
- Position the camshafts (A) and (E) accordingly.

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- Tighten all exhaust camshaft bearing caps (A1) to (A5) from the inside to the outside by 1/2 a turn at a time.

Intake and exhaust camshaft in camshaft support

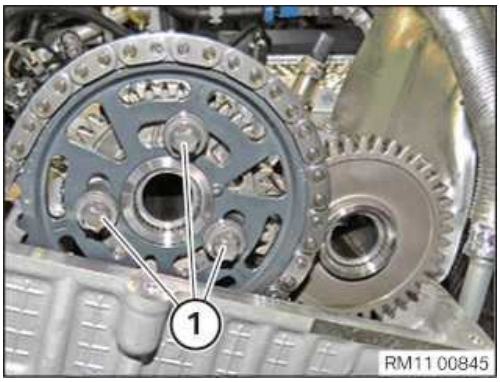
M6x31		Tightening torque	10 Nm



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

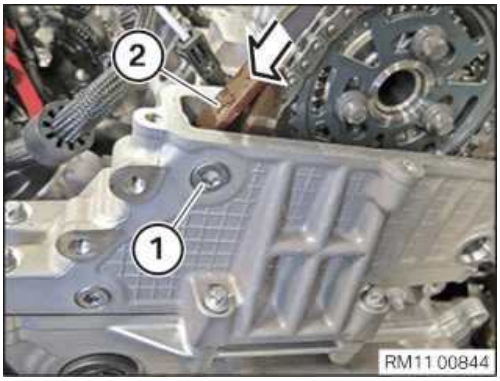
  Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

▶ **Installing the camshaft sprocket on the intake camshaft**



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

▶ **Install the timing chain guide rail**



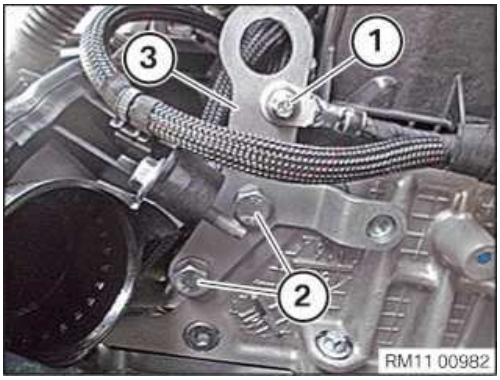
- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm



- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6			8 Nm

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▶ **Installing the chain tensioner piston**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Renew sealing ring (1).

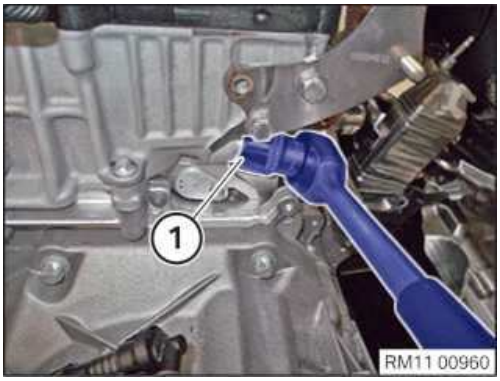
  Parts: Sealing ring



TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.

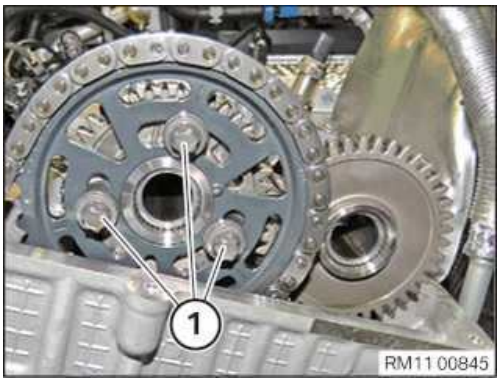


- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

▶ **Tightening the camshaft sprocket on the intake camshaft**



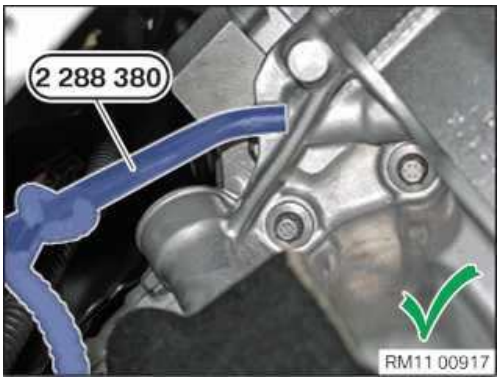
- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

61 – Removing the special tool to disconnect the crankshaft

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- Remove special tool **2 288 380**.

62 – Removing the special tool to secure the exhaust camshaft



- Remove the special tool **0 496 112 (11 8 760)** to fix the exhaust camshaft.

63 – Checking camshaft timing



- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

Damage to the engine.

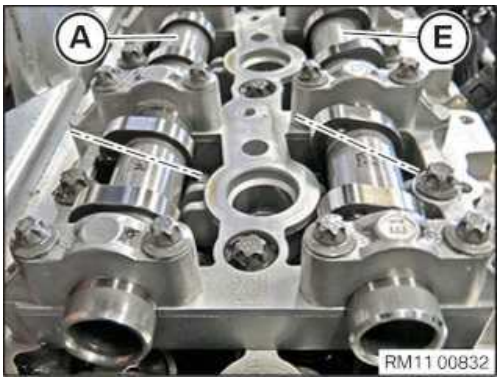
The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

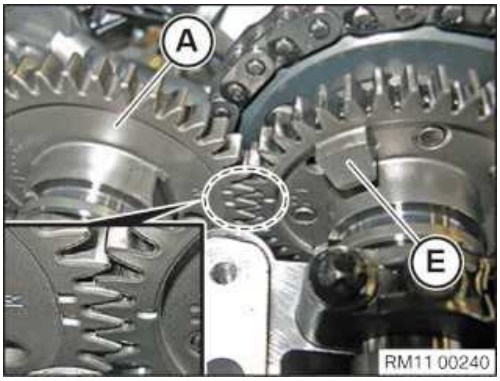
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- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

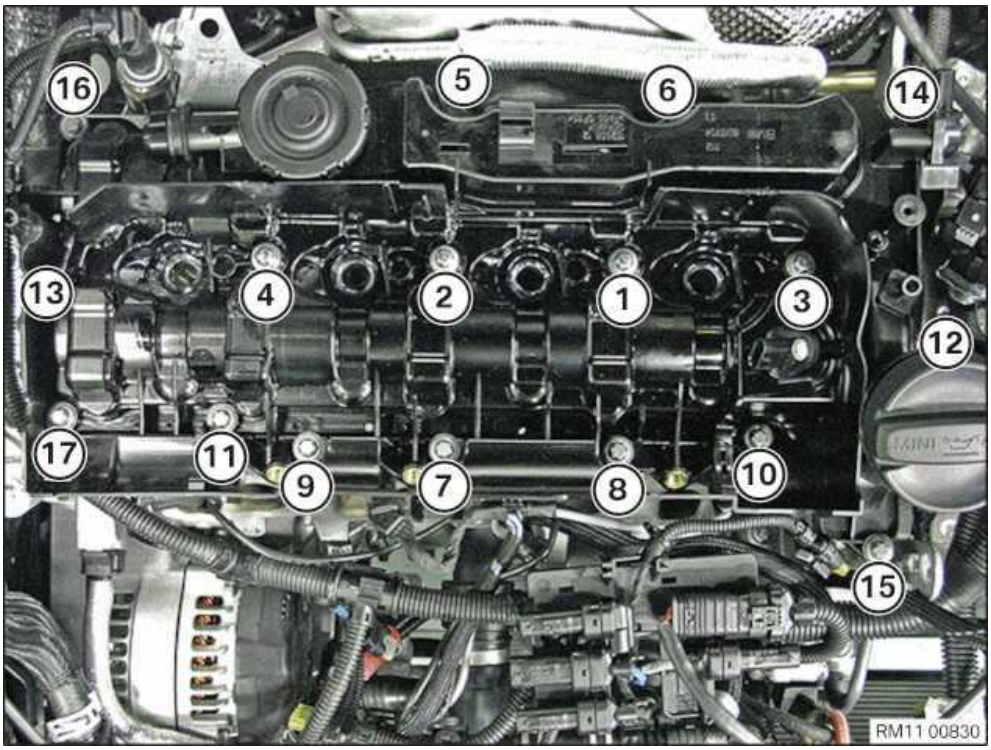


- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

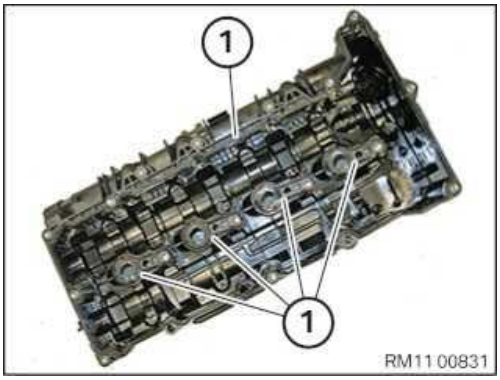
64 – Installing cylinder head cover

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Overview: Screw connection of the cylinder head cover

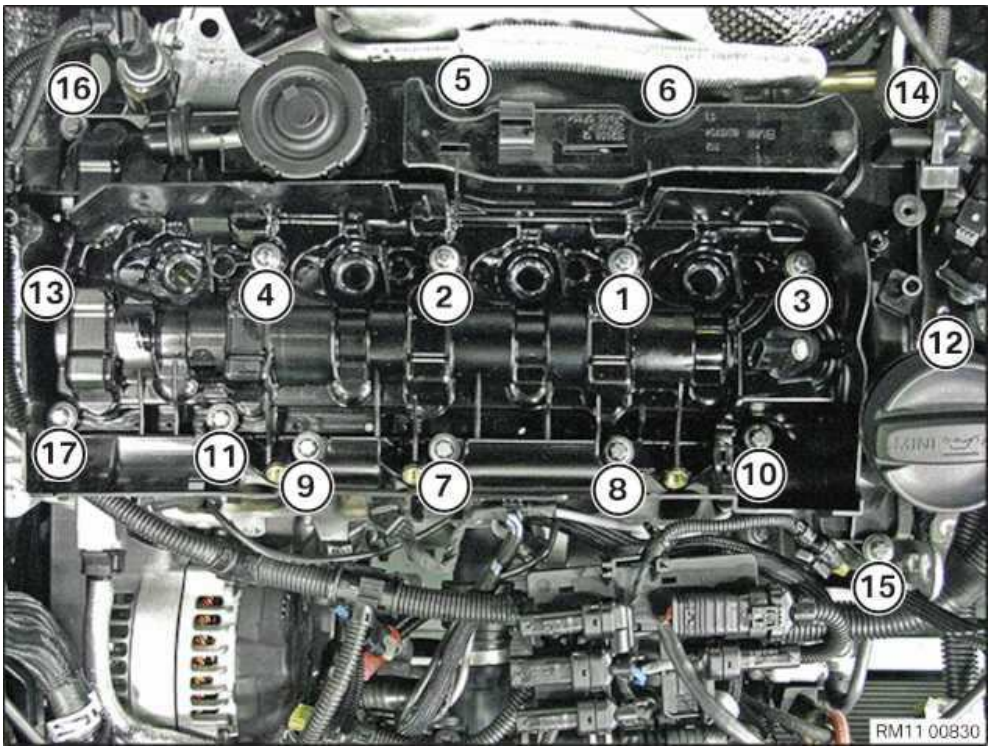


1 to 16 screws of the cylinder head cover.



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket



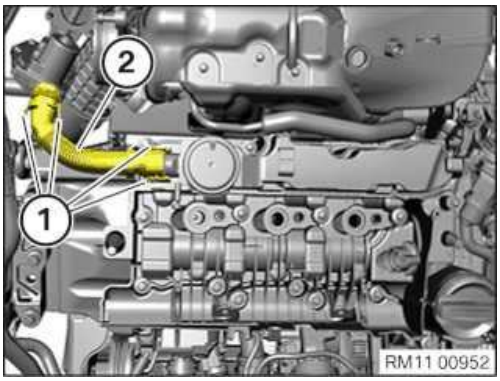
- Install cylinder head cover.
- Tighten screws in the order (1) to (17).

Cylinder head cover to cylinder head

M6		Tightening torque.	8, Nr

-

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- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

65 – Installing injectors of injection system

▸ **Cleaning the injector shafts**

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

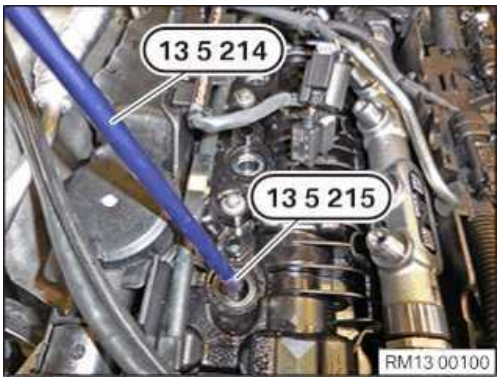
- Wear safety goggles.

RISK OF DAMAGE

Contaminant or foreign body.

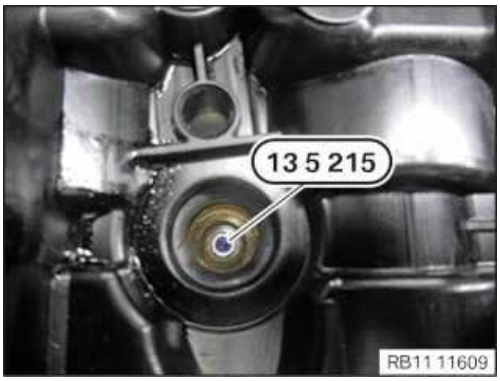
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.

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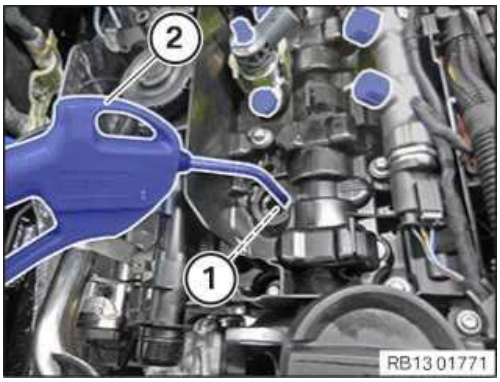
- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.



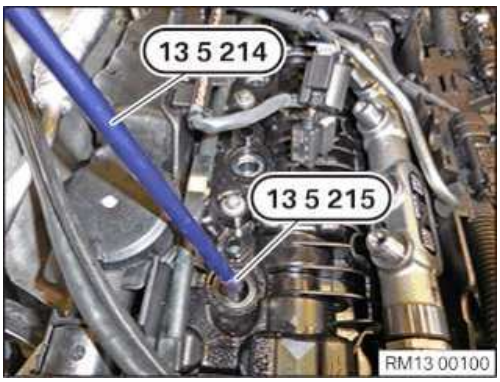
- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.



- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.



- Blow out injector shaft (1) with air gun (2).



- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

► **Check the placement of the clamping claw**

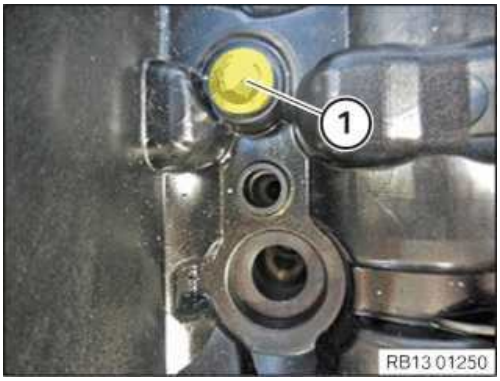
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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▸ **Prepare the injector for installation**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

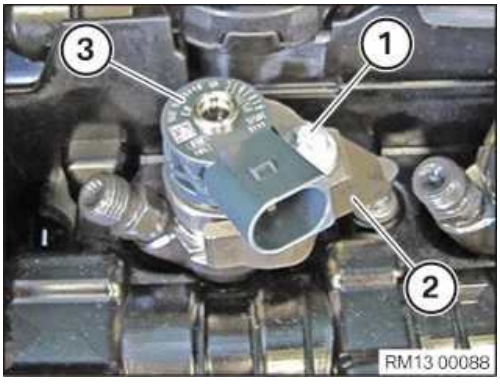


- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring
- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

Injector lubricating grease	50 g, Can	83230441070

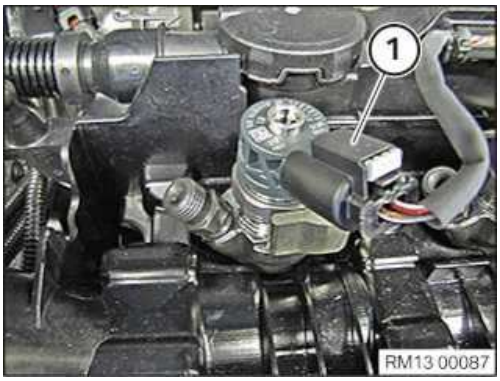


- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

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- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

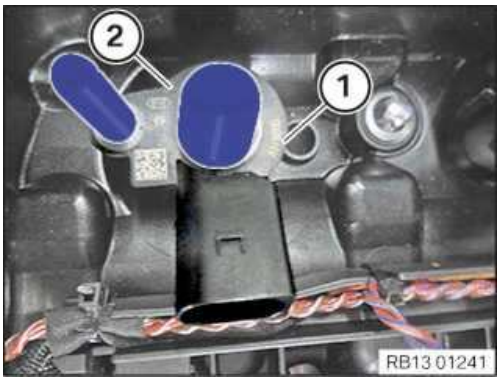
▶ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

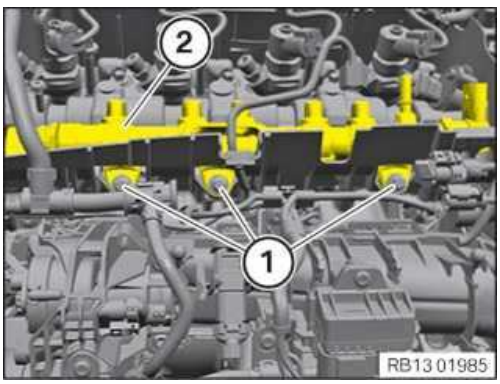


- Read off the adjustment value (1) on the new injector (2).



- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

66 – Installing the rail

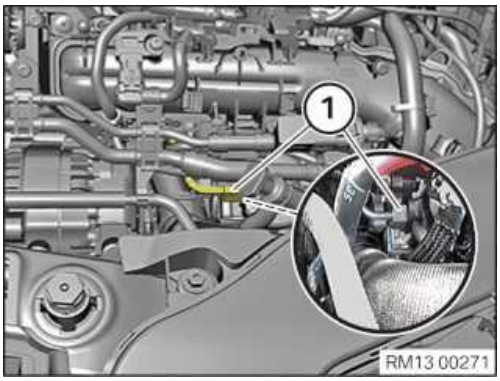


- Carefully insert and install the rail (2).
- Tighten the screws (1).

Rail on cylinder head cover

Torx screw M8x25		Tightening torque	19 Nm

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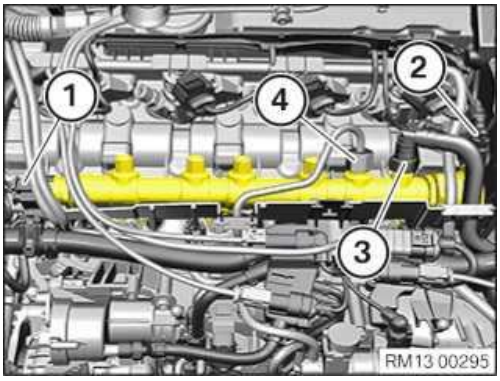
TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten union nut (1).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm



TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten union nut (4) with special tool .

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

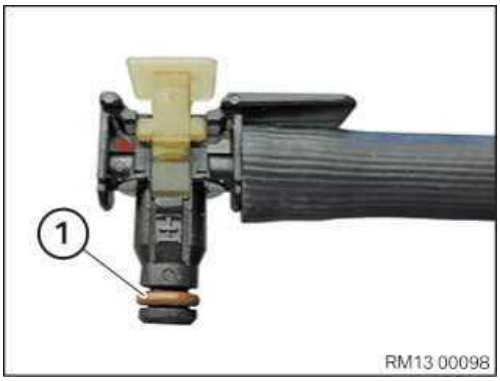
- Connect and lock the fuel line (3).

  Fuel line (3) must engage audibly.
- Connect connectors (2) and lock.

  The connector (2) must engage audibly.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

67 – Connect the leakage oil line on the injector



- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.

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- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

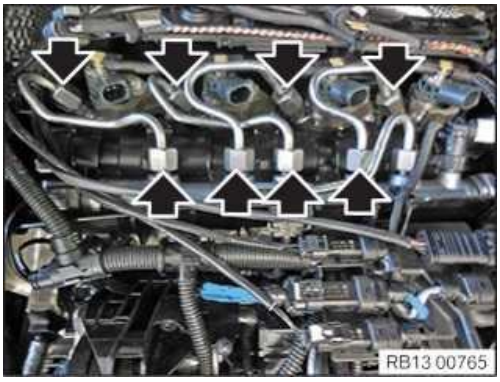
68 – Installing high pressure lines between rail and injectors

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Remove special tool .
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

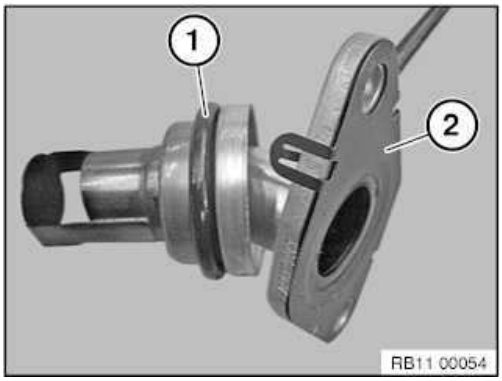
- Tighten the high pressure lines (arrows) with the special tool .

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

69 – Installing the intake plenum

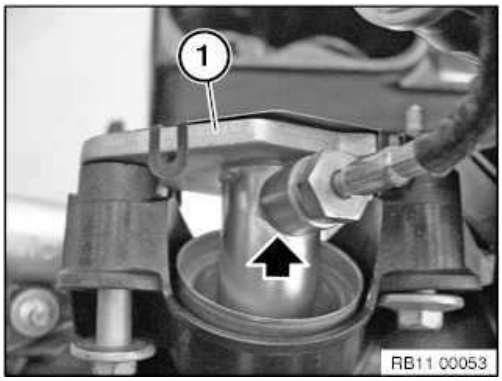


- Renew O-ring (1).

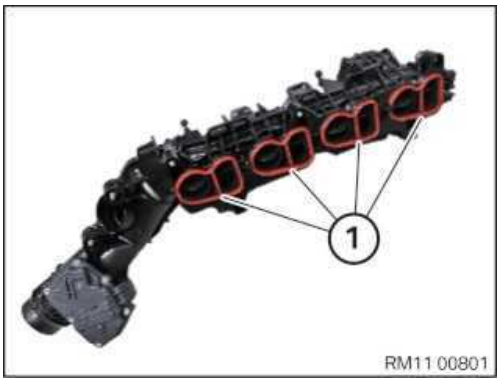
  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position the seal (2) and clip it in.

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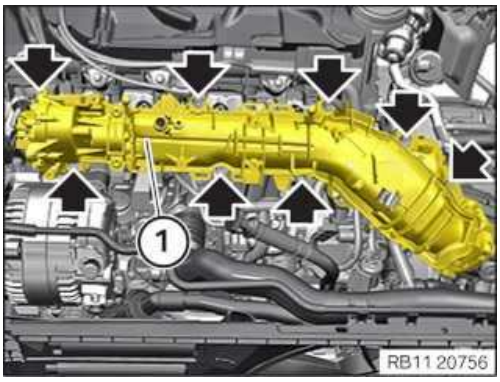


- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (1).

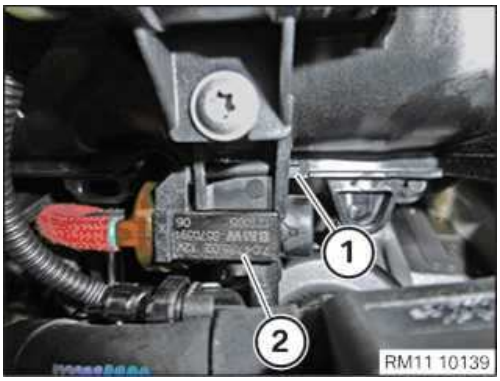
  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.



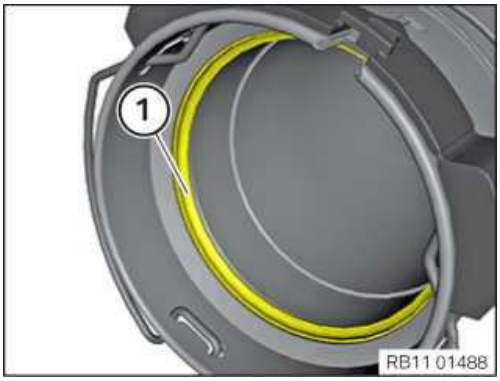
- Guide in and install intake (1) plenum.
- Tighten screws (arrows).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm



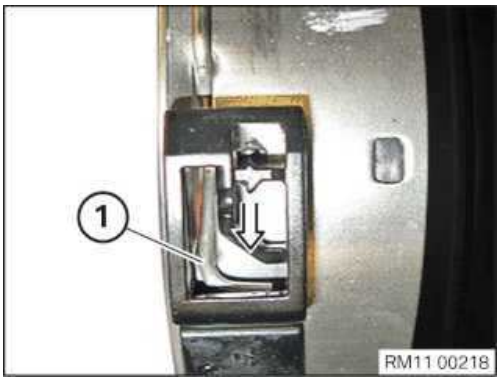
- Install the electric changeover valve (2) in the holder on the plenum from left to right.
- Lock (1) must engage audibly.



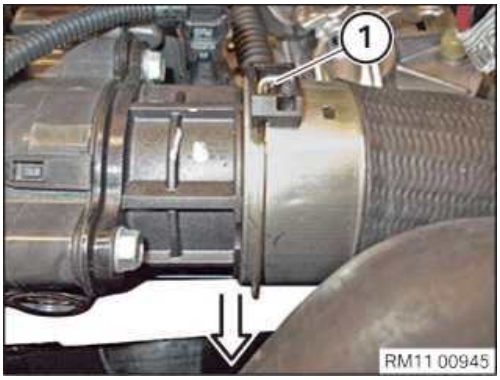
- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring

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- Engage the lock (1) on the bracket (arrow).



- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

70 – Remove the engine from the assembly stand

CAUTION

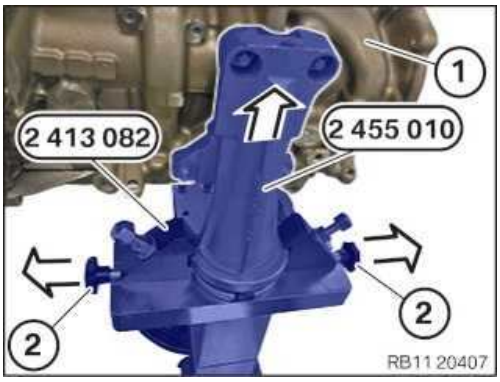
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Insert engine lifter with special tool and position engine (1).

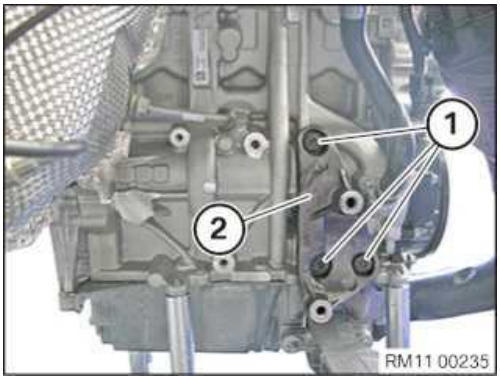


- Unscrew the nuts on special tool .
- Detach the holder (2) in the direction of the arrow.
- Detach the engine (1) with special tool **2 455 010** out of the special tool in the direction of arrow.

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- Remove conventional screws (arrows).
- Feed out the special tool **2 455 010** on the engine (1) and remove.



- Insert and install the holder (2).
- Tighten the screws (1).

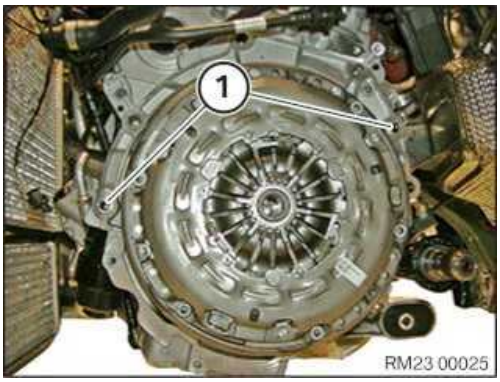
Holder to crankcase

M10		Tightening torque	38 Nm

71 – Mounting engine on manual gearbox

Prerequisite

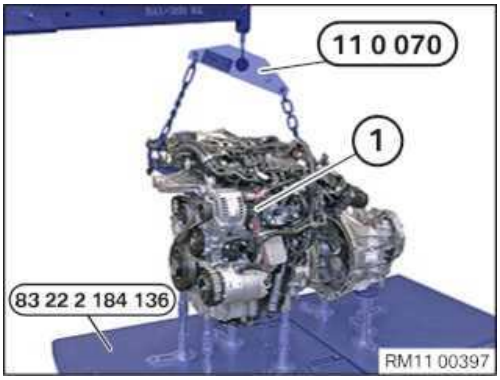
Engine has been removed.



- Check for correct fit of fitting sleeves(1).
- Replace damaged fitting sleeves.

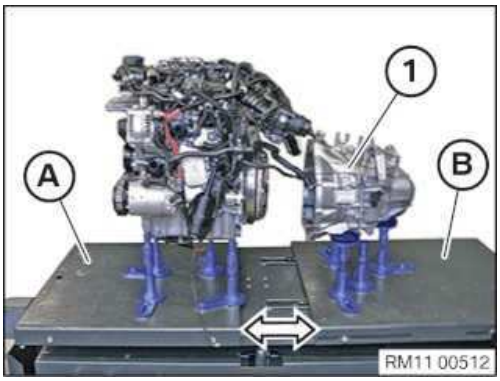


- Remove any grease from the transmission input shaft (arrow) and clean the shaft.
- Do not grease transmission input shaft.
- Check the clutch disc for frictional corrosion in the gearing and renew if necessary.

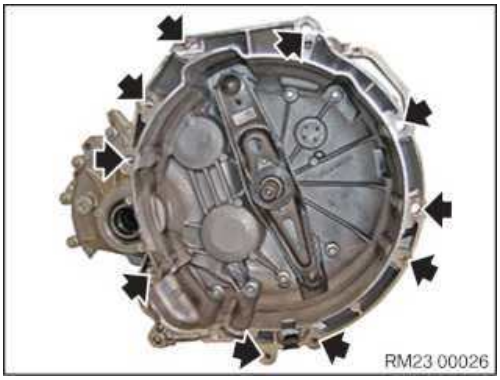


- Position the engine (1) on the lifting table **2 184 136** using the engine lifter and the special tool .
- Feed out engine lifter from engine (1) with special tool and push aside.

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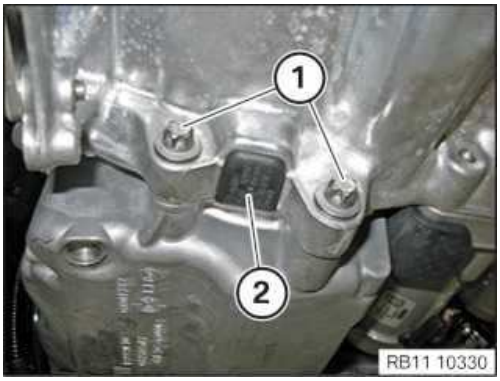
- Push table top (B) in direction of arrow and position manual gearbox (1) on engine.



- Tighten screws (arrows).

Transmission to engine

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm



- Tighten the screws (1).

Transmission to oil sump

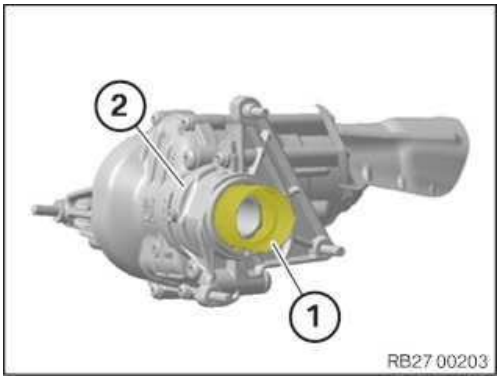
M8		Tightening torque	19 Nm

- Install the protective cap (2).



- Unscrew the bolts (1) of the special tool **2 459 012**.
- Feed out the special tool **2 459 012** at the cylinder head and remove.

72 – Install the transfer box (VTG)



- If intermediate shaft (1) gets caught on transfer box (VTG) (2), renew intermediate shaft (1) and the radial shaft seals in the automatic or manual transmission.

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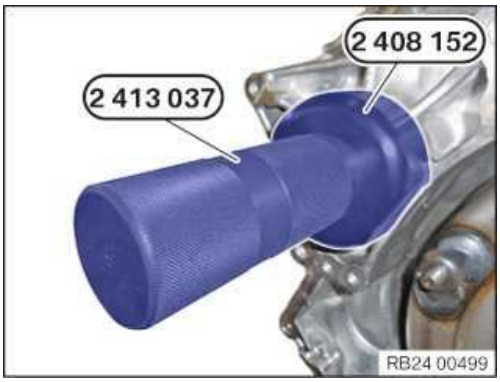
- Screw special tool **2 409 025** into the outer radial shaft seal.
- Turn the screw on the special tool **2 409 025** until the outer radial shaft seal has been pulled out.



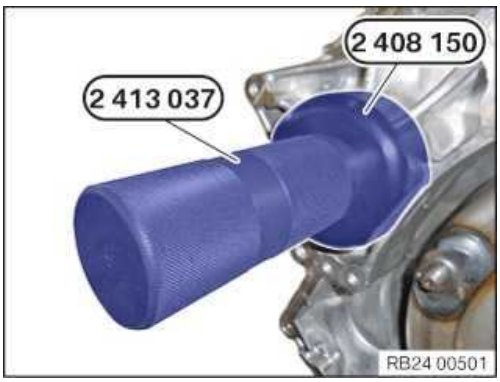
- Insert special tool **2 411 739** into the inner radial shaft seal.



- Screw special tool **2 411 739** into the inner radial shaft seal.
- Turn the screw on the special tool **2 411 739** until the inner radial shaft seal has been pulled out.

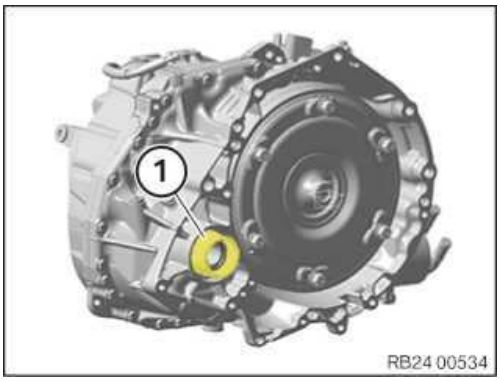


- Drive in the inner radial shaft seal using special tools **2 408 152** and **2 413 037** up to the limit position.



- Drive in the outer radial shaft seal using special tools **2 413 037** and **2 408 150** up to the limit position.

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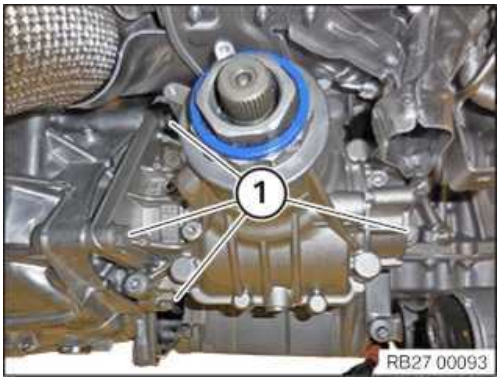
- If necessary, connect the new intermediate shaft (1) to the output flange of the automatic transmission or manual transmission.



- Coat the inside of the output flange (arrows) evenly with approx. 5 g of grease.

Expendable materials

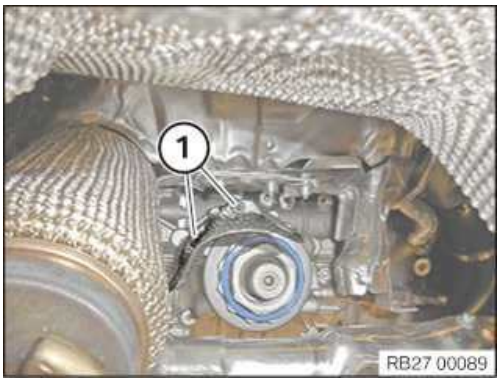
Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the transfer box (VTG).
- Tighten the screws (1).

Transfer box to transmission

M10		Tightening torque	56 Nm



- Install heat shield.
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Heat shield to transfer box

M6	Renew screws.	Tightening torque	6 Nm

▸ **Check the transfer box oil level**

RISK OF DAMAGE

Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.

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- Check transfer case oil level, correct:
- Open the oil filler plug (1).
- Check transfer box oil level.
- If necessary, top up transmission oil up to the lower edge of the oil filler plug opening (1).

Transmission oil

Technically suitable transfer box and electrical transmission oils	

Main group 27

- Tighten the oil filler plug (1).

Oil filler plug on transfer box (VTG)

M18x1.5		Tightening torque	35 Nm

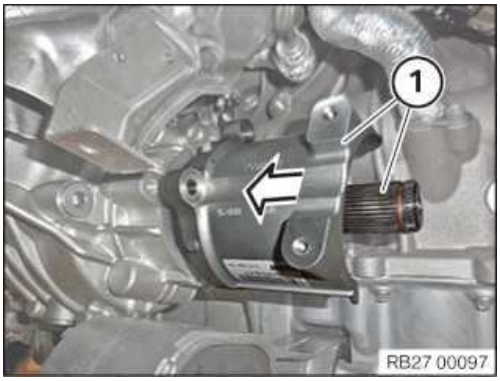
73 – Install the intermediate shaft with the support tube



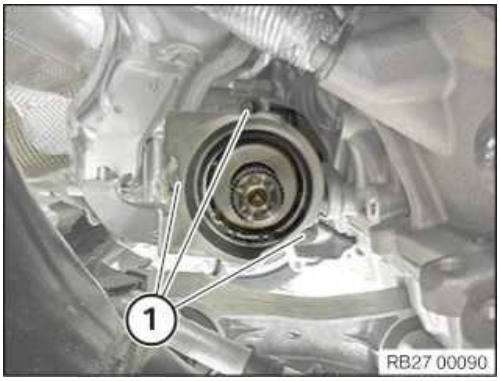
- Coat gearing of the intermediate shaft uniformly with 5 g of grease.

Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the intermediate shaft with support tube (1) in the transfer box.



- Position screws (1).

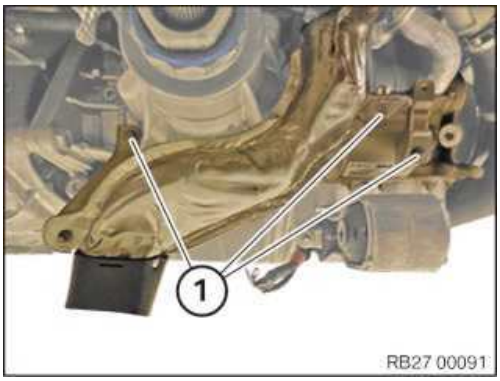
Note: Check for correct screw length! Bolt M8x35 8.8

- Tighten the screws (1).

Intermediate shaft to transfer box

M8x35		Tightening torque	19 Nm

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- If installed: Install air duct.
- Tighten the screws (1).

74 – Installing the high-pressure stage exhaust turbocharger

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

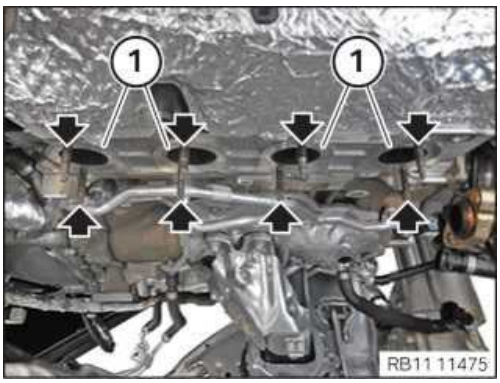
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

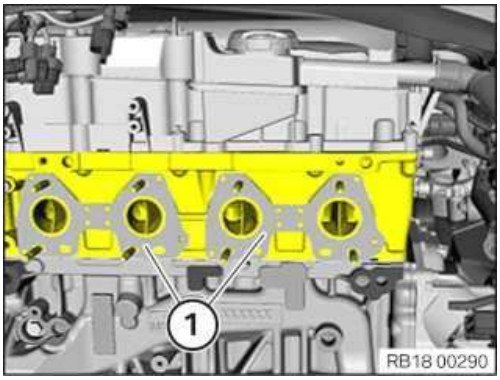


- Clean the sealing surfaces (1) on the cylinder head using special tool **0 495 102 (11 4 470)**.
- Check the stud bolts (arrows) on the cylinder head for correct fit.

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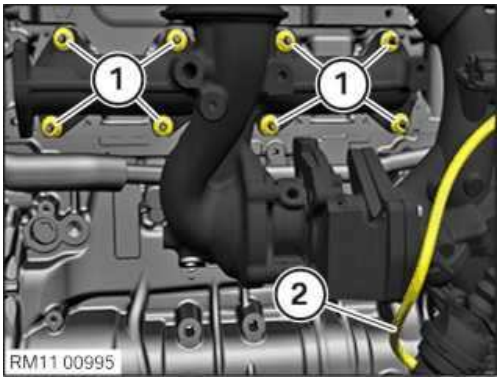
- Clean the sealing surfaces on the exhaust manifold using special tool **0 495 102 (11 4 470)**.



- Renew gasket (1).

  Parts: Gasket

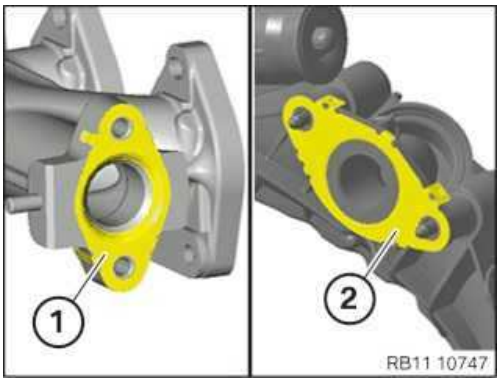
- Install new gasket (1).



- Feed in and install the exhaust manifold and the high-pressure stage exhaust turbocharger.
- Tighten nuts (1).

  Parts: Nuts

- Connect vacuum hose(2).

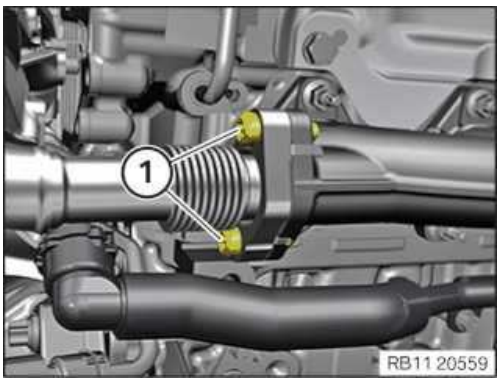


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket

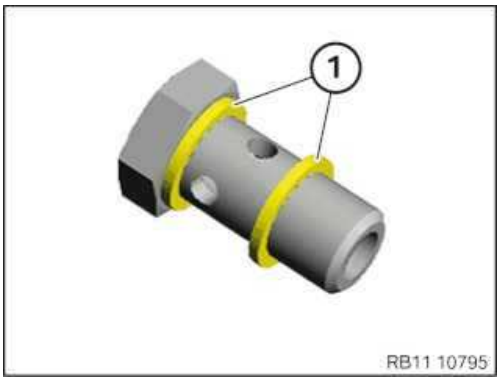


- Tighten the screws (1).

Exhaust-gas recirculation cooler to exhaust manifold

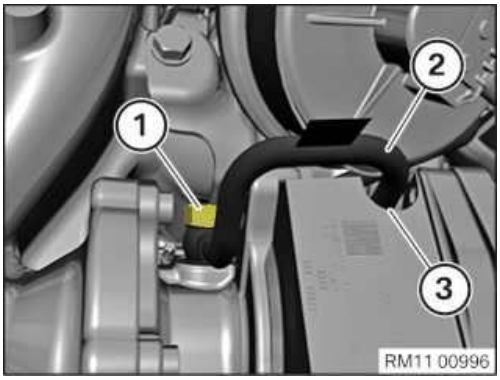
M8x28	Replace screws	Tightening torque	32 Nm

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- Renew sealing rings (1) of banjo bolt.

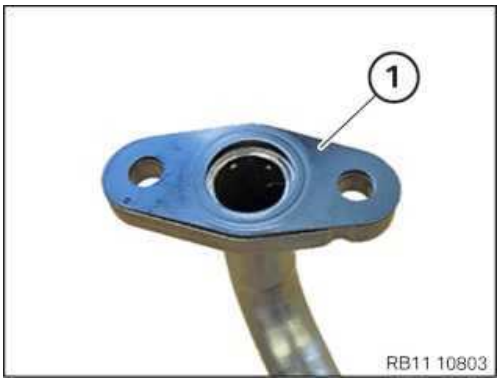
  Parts: Sealing ring



- Guide the oil feed line into the holder (3) and install it.
- Tighten down screw (1).

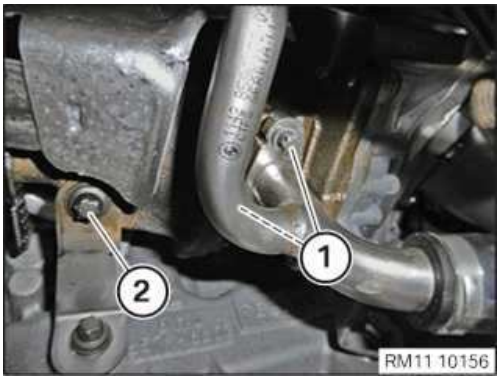


- Tighten bolt (1) from the right wheel arch.



- Renew seal (1) of oil return line.

  Parts: Gasket



- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

75 – Installing the low-pressure stage turbocharger

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RISK OF DAMAGE

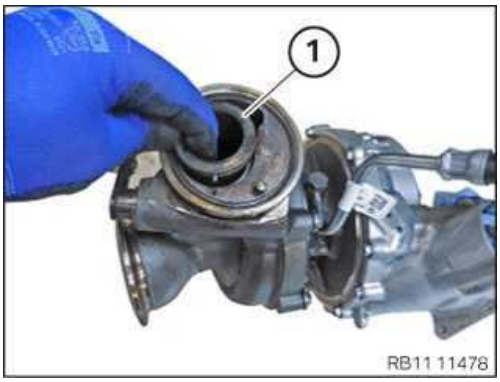
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

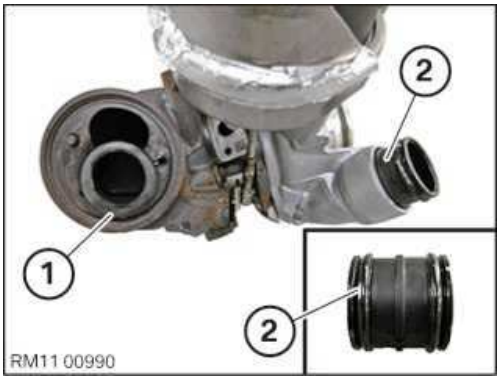
TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.



- Check the spacer plug (1) for damage, renew if necessary.

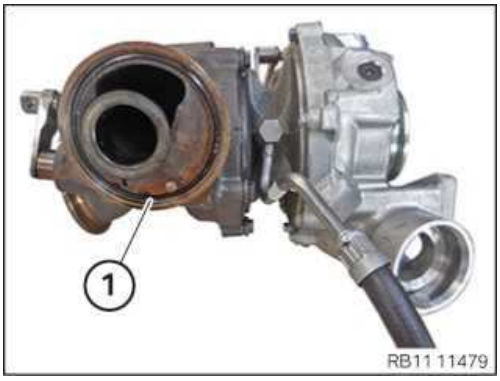
  Parts: Spacer ring
- Insert and install the spacer ring (1).
- Position spacer ring (1) correctly.



- Renew gasket (1).

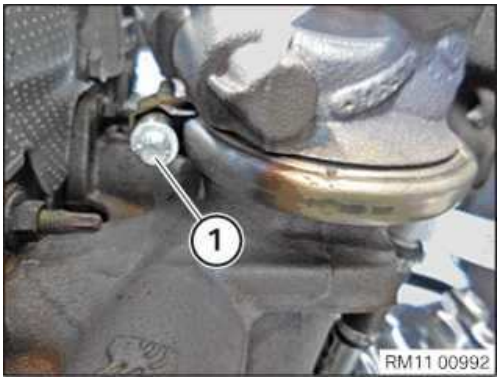
  Parts: Gasket
- Position the seal (1).
- Renew the sleeve(2).

  Parts: Holding sleeve



- Renew sealing ring (1).

  Parts: Sealing ring
- Affix the sealing rings on the exhaust turbocharger.



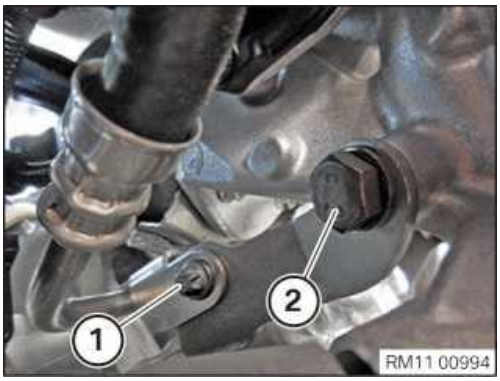
- Insert and install the low-pressure stage exhaust turbocharger on the exhaust manifold .
- Feed in and install V-band clamp .
- Tighten V-band clamp (2).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Screw in nut (1) with 2 **revolutions**.

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- Tighten down screw (1).

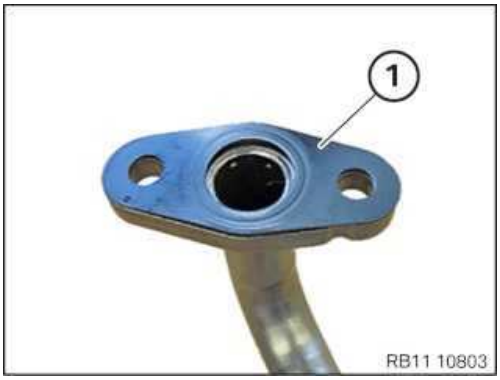
Oil feed line to bracket

Torx screw M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

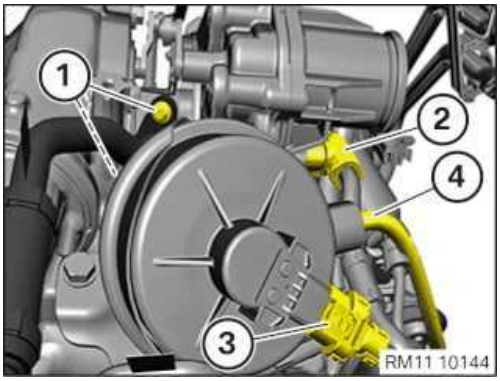
Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm



- Renew seal (1) on the oil return line.

  Parts: Gasket



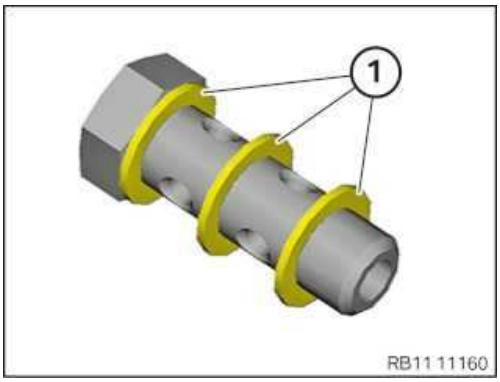
- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

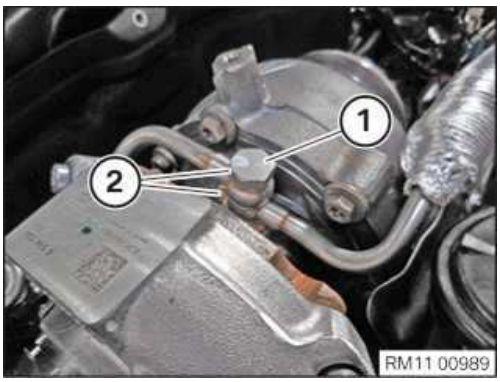
M6x12		Tightening torque	8 Nm

- Connect and lock connectors (2) and (3).

  The locks must engage audibly.
- Connect vacuum hose (4).

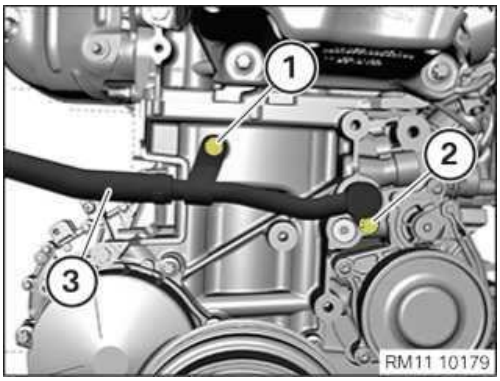


- Renew banjo bolt and sealing rings (1).
- **Parts:** Banjo bolt, sealing rings



- Install sealing rings (1).
- Tighten the banjo bolt (1).
- Ensure that the lines do not rest against the adjacent components.

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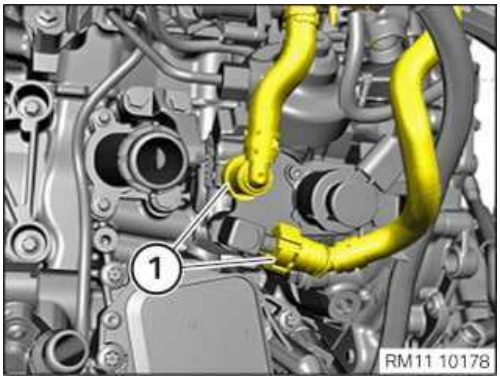


- Renew sealing ring of the coolant line (3).

  Parts: Sealing ring
- Coat the sealing ring and install the coolant line (3) .
- Tighten down screws (1) and (2).

Standard screw connection M6

M6		8 Nm



- Connect and lock fuel lines (1).

  The fuel lines (1) must audibly engage.

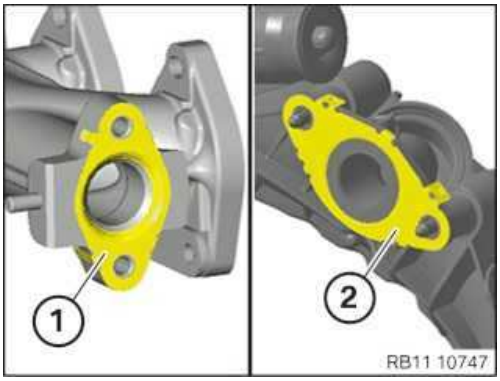
▶ **Installing the exhaust-gas recirculation cooler**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

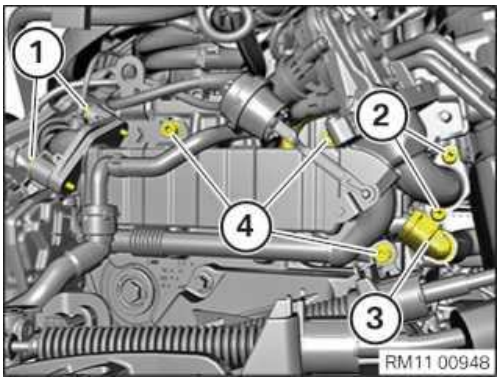


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket
- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket

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- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts
- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

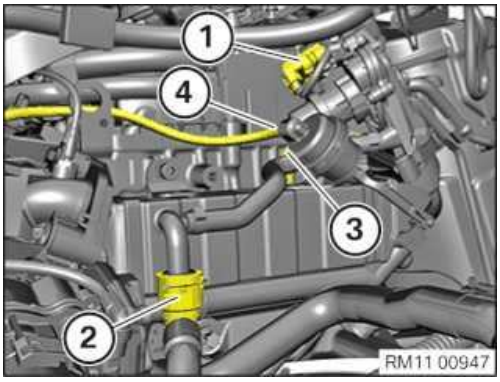
M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.
- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm



TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

▸ **Installing heat shield on exhaust turbocharger at bottom**

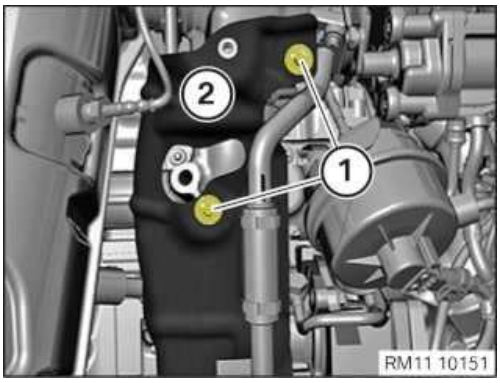
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WARNING

Hot surfaces.

Risk of burning!

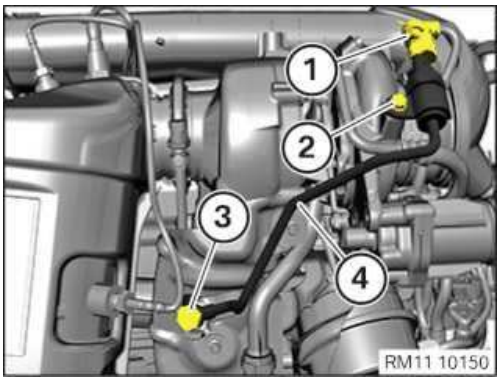
- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (2).
- Tighten the bolts (1) on the heat shield .

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm



- Position the exhaust gas pressure pipe (4).
- Hand-tighten the bolt (2).
- Renew sealing rings on the banjo bolt (3).

  Parts: Sealing ring
- Tighten the banjo bolt (3).

Banjo bolt for exhaust pressure pipe to exhaust manifold

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

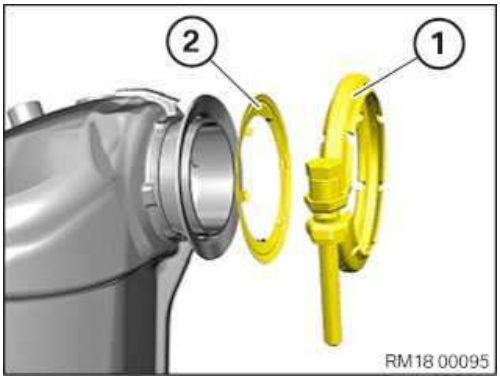
- Tighten down screw (2).

Standard screw connection M6

M6		8 Nm

- Connect connectors (1) and lock.

  Lock must audibly engage.



CAUTION

Heavy component.

Heavy components can lead to injury or damage.

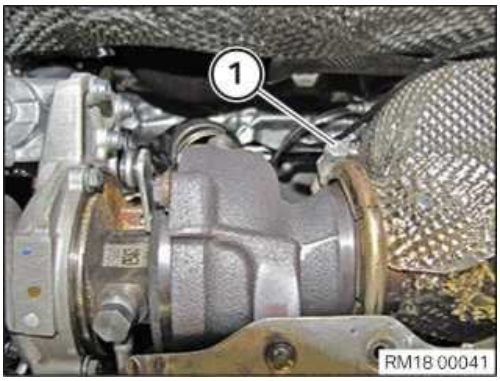
- Remove and install heavy components with the aid of another person/other persons.

- Renew the V-clip (1).

  Parts: V-band clamp
- Renew the gasket (2).

  Parts: Gasket

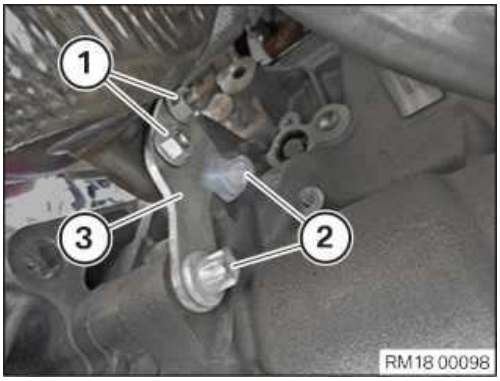
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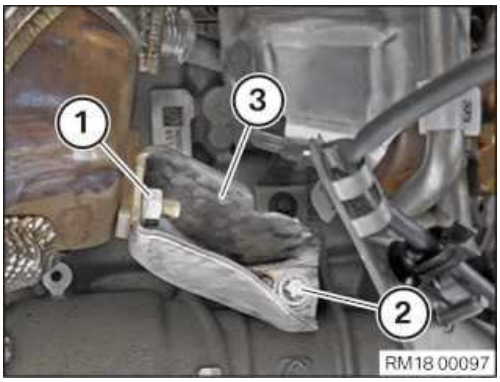
- Carefully insert and install the diesel particulate filter .
- Feed in and install V-band clamp (1).
- Make sure that the seal between the diesel particulate filter and the exhaust turbocharger is installed correctly.
- Align the diesel particulate filter on the exhaust turbocharger.
- Position V-clip (1).
- Hand-tighten the V-clip (1).



- Tighten nuts (1) by hand.



- Install holder (3).
- Hand-tighten the bolts (2).
- Tighten nuts (1) by hand.



- Install holder (3).
- Tighten the nut (1) hand-tight.
- Hand-tighten the bolt (2).



- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

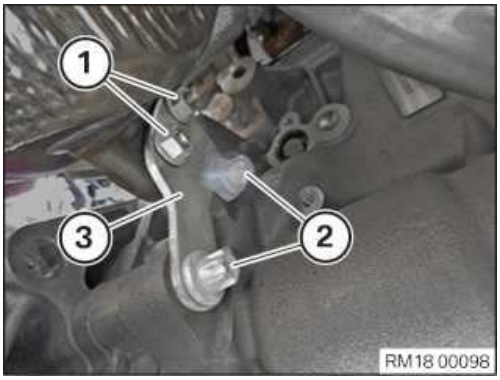
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- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screws (2).

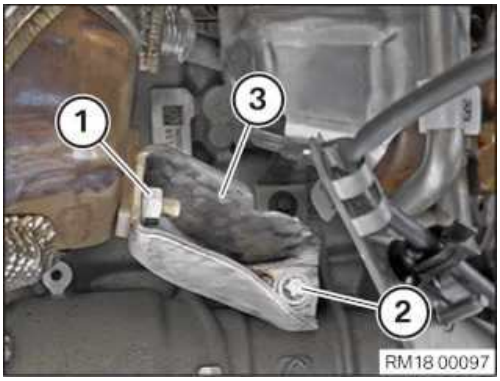
Diesel particulate filter holder to gearbox

M12x75		Tightening torque	66 Nm

- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screw (2).

Diesel particulate filter bracket to crankcase

M10x35		Tightening torque	38 Nm

- Tighten nut (1).

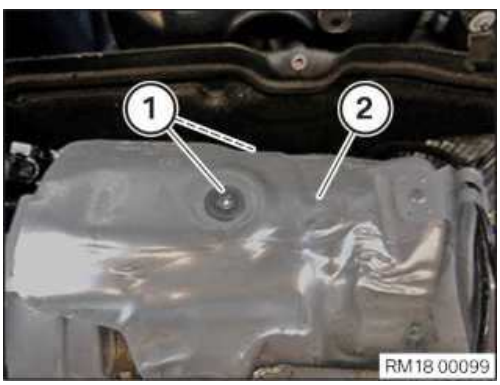
Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Remove fitting aid (1) for the flexible tube.

▶ **Install the heat shield on the exhaust turbocharger**



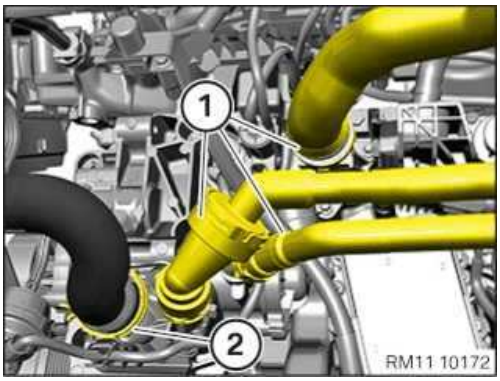
- Feed in and install the heat shield (2).
- Tighten the screws (1) at the top and bottom of the heat shield.

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

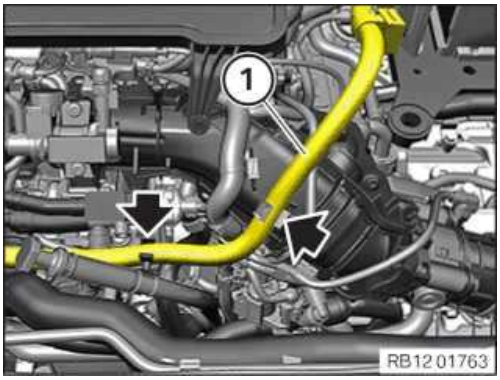
- Fasten the cable at the clips .

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- Install the coolant hose and secure with the clamp (2) .
- Connect and lock the coolant lines (1).

  The coolant lines (1) must engage audibly.



CAUTION

Improper routing of the positive battery cable.

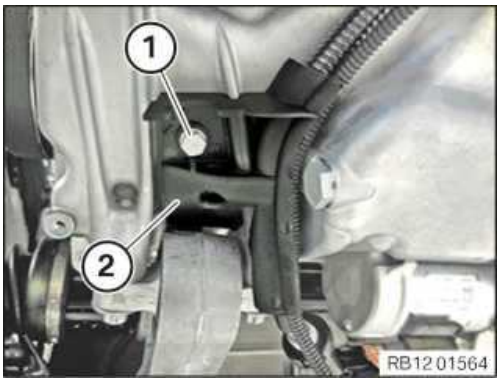
Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

- Insert the positive battery cable (1) into the clamps (arrows).



- Feed in and install positive battery cable at the clamps (1).



- Insert and install the holder (2).
- Tighten down screw (1).

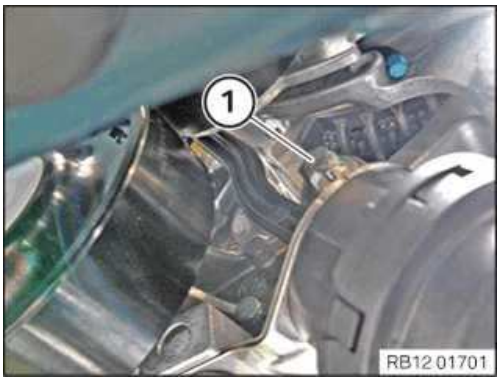
Bracket to oil sump

M6		Tightening torque	8 Nm



- Insert and install alternator (1) along with the screw (2) on the bottom of the alternator through the slot on the support.

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- Tighten the screw (1) below on the alternator.

Alternator to component carrier

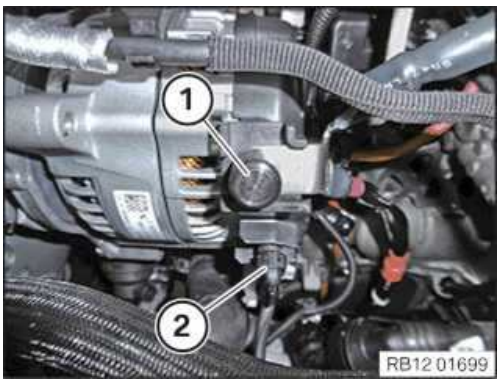
M10x75 / M10x125		Tightening torque	38 Nm



- Tighten the bolt (1) on top on the alternator.

Alternator to component carrier

M10x75 / M10x125		Tightening torque	38 Nm



- Mount positive battery cable to the alternator.
- Tighten nut.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

- Mount the cover (1).
- Connect the connector (2) to the alternator and lock audibly.



- Install air conditioning compressor (2) and position it correctly.
- Tighten the screws (1).

Air conditioning compressor in component carrier

M10		Tightening torque	38 Nm

▸ **Installing the drive belt for alternator**

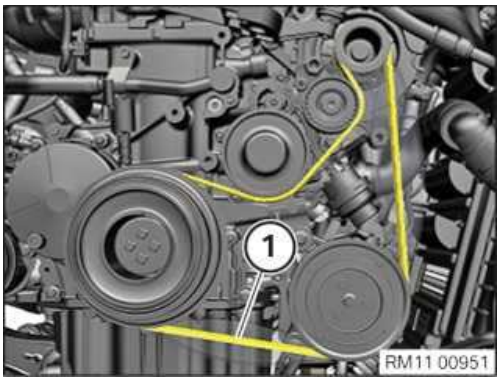
TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

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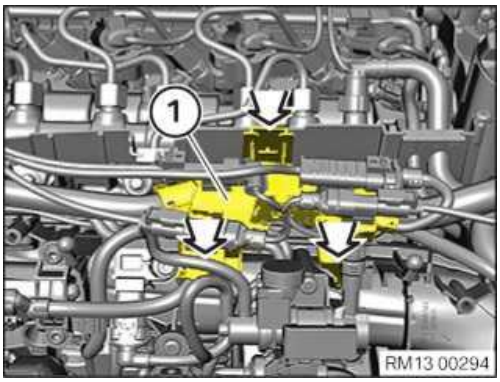


- Feed in the drive belt for the alternator (1) and install it.

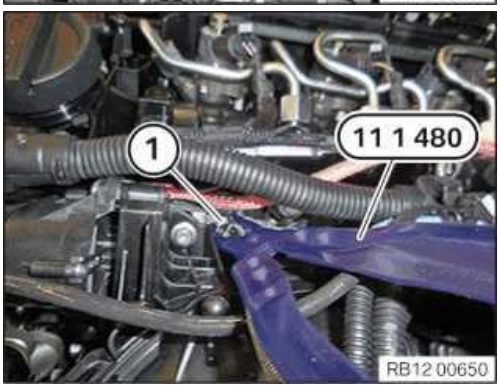


- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool **0 496 268 (11 0 390)** out of the belt tensioner and remove it.

▶ **Installing the cable clip for the intake plenum**

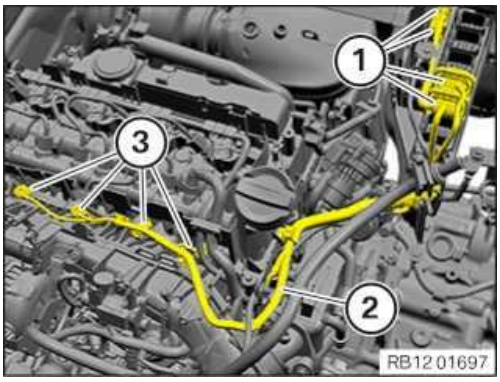


- Insert and install the cable clip (1) in the direction of the arrow.
- Make sure the cable clip (1) is fitted correctly.



- Connect and lock the connector (1) on the glow elements.

  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.

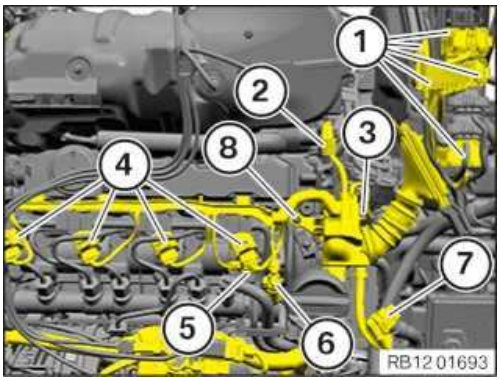


- Lay vehicle wiring harness and fasten with clamps.
- Route all connectors (1) to the integrated supply module (PDM) and to the DME control unit.
- Connect all connectors (3) to the glow elements and engage them audibly.
- Mount ground strap and tighten screw (2).

Ground cable to cylinder head

M6x12		Tightening torque	8 Nm

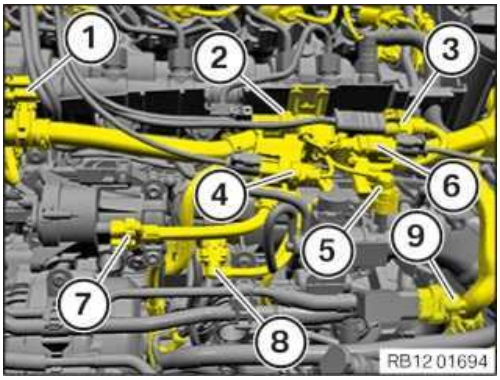
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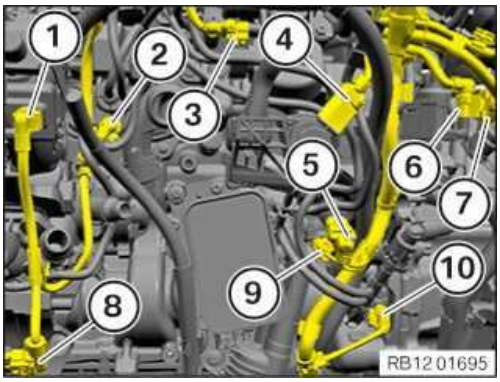
- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the integrated supply module (PDM) and to the DME control unit.
- Attach connector (2) to the differential pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust-gas recirculation valve and lock audibly.
- Attach connector (4) to the injectors and lock it audibly.
- Attach connector (5) to the camshaft sensor and lock it audibly.
- Attach connector (6) to the fuel pressure regulator and lock it audibly.
- Connect and audibly lock the connector (7) to the hot film air mass meter.
- Tighten down screw (8).

Wiring harness to cylinder head cover

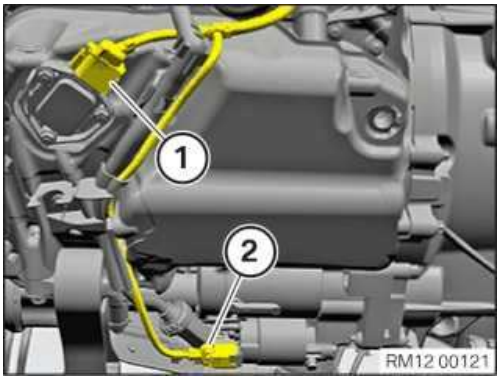
TS5x20		Tightening torque	3,5 Nm



- Connect the connector (1) to the rail pressure sensor and lock it audibly.
- Attach connector (2) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (3) to the front oxygen sensor and lock audibly.
- Attach connector (4) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Connect the connector (5) to the electric changeover valve and lock audibly.
- Attach connector (6) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (7) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (8) to the charging pressure sensor and lock it audibly.
- Attach connector (9) to the fuel pressure and temperature sensor and lock it audibly.

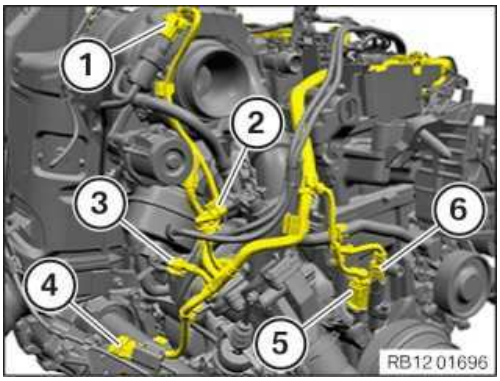


- Connect the connector (1) to the alternator and lock audibly.
- Connect the connector (2) to the electric changeover valve and lock audibly.
- Connect the connector (3) to the electric changeover valve and lock audibly.
- Connect the connector (4) to the high pressure pump and lock audibly.
- Connect the connector (5) to the oil pressure sensor and lock it audibly.
- Attach connector (6) to the throttle bodies and lock it audibly.
- Attach connector (7) to the intake air temperature sensor and lock it audibly.
- Connect the connector (8) to the air conditioning compressor and lock audibly.
- Connect the connector (9) to the solenoid valve and lock audibly.
- Connect the connector (10) to the crankshaft sensor and lock it audibly.

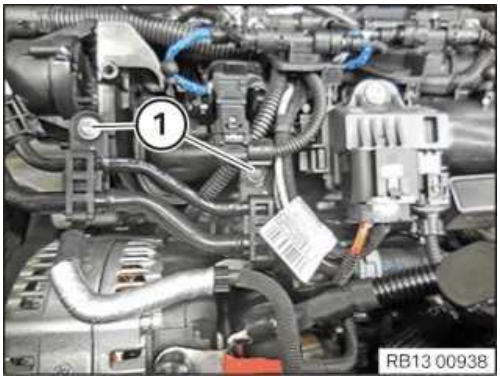


- Connect the connector (1) to the oil-level sensor and lock it audibly.
- Connect connector (2) to the starter motor and lock audibly.

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- Attach connector (1) to the exhaust turbocharger and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust gas pressure sensor and lock it audibly.
- Connect the connector (4) to the monitoring oxygen sensor and lock audibly.
- Attach connector (5) to the oil pressure switch and lock it audibly.
- Attach connector (6) to the switching valve and lock it audibly.

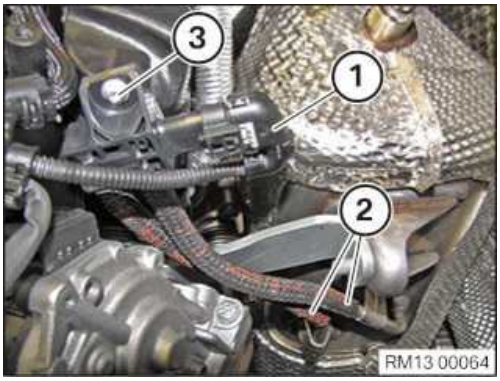


- Position the fuel line.
- Tighten the screws (1).

Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

77 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

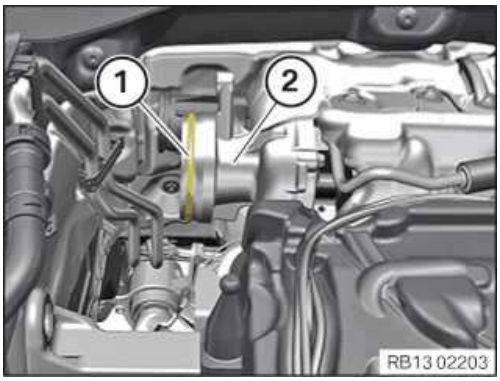
Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

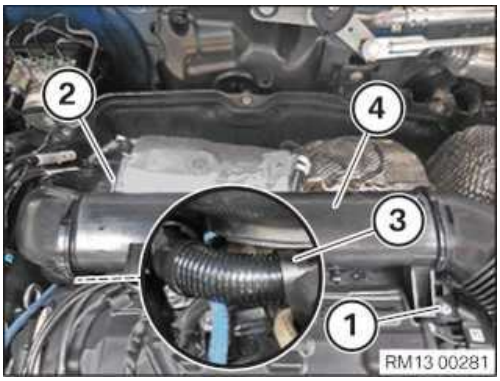
  The connector (1) must engage audibly.

78 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.

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- Feed in clean air pipe and install.
- Connect clean air pipe to the exhaust turbocharger and lock audibly in the clamps (2).
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Connect ventilation line (3) to the cylinder head cover and lock audibly.

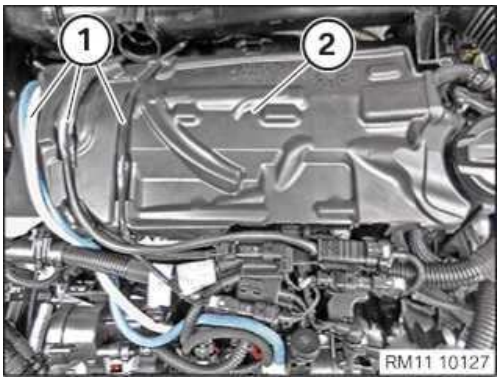


- Mount clean air pipe onto the intake filter housing.
- Tighten clamp (1) on the clean air pipe.

Clean air pipe to intake silencer housing

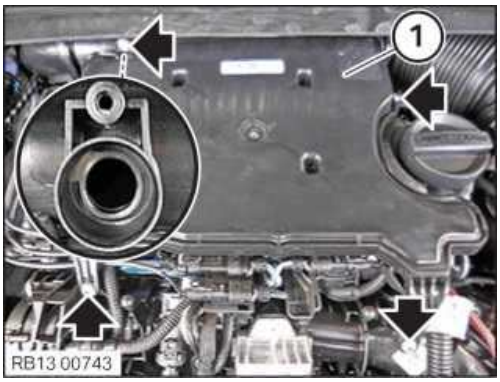
Clamp		Tightening torque	3 Nm

79 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the vehicle wiring harness (1) in the brackets.

80 – Install resonator



- Insert and install the resonator (1).
- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

81 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Check for correct installation of all rubber mounts in the acoustic cover (1).



- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

82 – Install engine



- See additional information.

Additional Information

Overview of Tightening Torques

Special tool to cylinder head Used in step 12

M8		Tightening torque	21,5 Nm

Special tool 2 455 010 to crankcase Used in step 13

M10x30		Tightening torque	38 Nm

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Special tool 11 8 930 to special tool 00 2 320

Used in step 13

M14x35		Tightening torque	160 Nm

Main bearing cap to crankcase

Used in step 44

M10x85	Replace screws.	1. tightening torque	25 Nm
		2. tightening torque	50 Nm
		3. Angle of rotation	60 °
		4. Angle of rotation	60 °

Special tool 2 288 054 to crankshaft

Used in step 44

M10		Tightening torque	20 Nm

Idler gear to crankcase

Used in step 44

M12x1.5		Tightening torque	10 Nm
		Angle of rotation	45 °

Gear to counterbalance shaft

Used in step 44

M10	Renew screws.	1. Jointing torque	20 Nm
		2. Angle of rotation	180 °

Connecting rod bearing cap to connecting rod

Used in step 48

M9x47		Tightening torque	20 Nm
		Angle of rotation 1	70 °
		Angle of rotation 2	70 °

Oil deflector to crankshaft bearing cap

Used in step 49

M8x14	Replace screws.	Tightening torque	35 Nm
		Release	180 °
		Tightening torque	15 Nm
		Angle of rotation	45 °

Oil deflector to crankcase

Used in step 49

M8x14		Tightening torque	19 Nm

Bearing journal of tensioning and guide rail

Used in step 50

M8	*Replace bearing journal.*	Tightening torque	20 Nm

Chain tensioner to crankcase

Used in step 50

M6x22		Tightening torque	10 Nm

Camshaft sprocket on high pressure pump

Used in step 50

M12		Tightening torque	65 Nm

Oil vacuum pump to crankcaseB47

Used in step 51

M8x35		Tightening torque	19 Nm

Rear timing case cover to crankcase

Used in step 52

M6	Renew screws.	Jointing torque	8 Nm
		Angle of rotation	90 °

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SCR coolant lines to crankcase end cover

Used in step 52

Hexagon screw M6x16		Tightening torque	8 Nm

Cylinder head to crankcase

Used in step 52

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

Cylinder head bolt to timing case cover

Used in step 52

M8x40		Tightening torque	19 Nm

Oil sump to crankcase

Used in step 52

M8x30		Tightening torque	24 Nm
M8x110		Tightening torque	24 Nm

Transmission to oil sump

Used in step 52 71

M8		Tightening torque	19 Nm

Guide tube for oil dipstick on engine

Used in step 52

M8x16		Tightening torque	19 Nm

Flywheel to crankshaft

Used in step 53

M12x1.5	Renew screws.	Tightening torque	120 Nm

Clutch to flywheel

Used in step 54

M8	Renew screws.	Jointing torque	15 Nm
		Angle of rotation	90 °

Vibration damper with belt pulley to crankshaft

Used in step 55

M10x65	Renew screws. Tighten screws crosswise.	1. Jointing torque	40 Nm
		2. Angle of rotation	60 °
		3. Angle of rotation	60 °

Transmission to engine

Used in step 55

M8		Tightening torque	19 Nm

Glow elements to cylinder head

Used in step 58

Glow element		Tightening torque	13 Nm

Camshaft carrier to cylinder head

Used in step 59

M7x35		Tightening torque	13 Nm

Intake and exhaust camshaft in camshaft support

Used in step 60

M6x31		Tightening torque	10 Nm

Bearing journal to cylinder head

Used in step 60

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8

Used in step 60

M8		Tightening torque	19 Nm

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Standard screw connection M6

Used in step 60 76

M6			8 Nm

Chain tensioner piston to cylinder head

Used in step 60

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft

Used in step 60

M7x17.			17 Nm

Cylinder head cover to cylinder head

Used in step 64

M6		Tightening torque.	8,5 Nm

Clamping claw facing to cylinder head cover

Used in step 65

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 65

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

Rail on cylinder head cover

Used in step 66

Torx screw M8x25		Tightening torque	19 Nm

High pressure line between high pressure pump and rail

Used in step 66

High-pressure pipe		Tightening torque	28 Nm

High pressure lines between injector and rail

Used in step 68

High pressure lines		Tightening torque	28 Nm

Intake plenum to cylinder head

Used in step 69

M6		Tightening torque	11 Nm

Holder to crankcase

Used in step 70

M10		Tightening torque	38 Nm

Transmission to engine

Used in step 71

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

Transfer box to transmission

Used in step 72

M10		Tightening torque	56 Nm

Heat shield to transfer box

Used in step 72

M6	Renew screws.	Tightening torque	6 Nm

Oil filler plug on transfer box (VTG)

Used in step 72

M18x1.5		Tightening torque	35 Nm

Intermediate shaft to transfer box

Used in step 73

M8x35		Tightening torque	19 Nm

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Exhaust-gas recirculation cooler to exhaust manifold — Used in step 74 76

M8x28	Replace screws	Tightening torque	32 Nm

Oil return line to turbocharger — Used in step 74 75

M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase — Used in step 74

M8x16		Tightening torque	22 Nm

Exhaust turbocharger to exhaust manifold — Used in step 75

V-band clamp		Tightening torque	19 Nm

Oil feed line to bracket — Used in step 75

Torx screw M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase — Used in step 75

M8x16		Tightening torque	22 Nm

Exhaust-gas recirculation cooler to cylinder head — Used in step 76

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler — Used in step 76

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to cylinder head — Used in step 76

M8x20		Tightening torque	19 Nm

Heat shield for exhaust turbocharger — Used in step 76

Torx screw BM 6x12		Tightening torque	10 Nm

Banjo bolt for exhaust pressure pipe to exhaust manifold — Used in step 76

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

Diesel particulate filter V-clip to exhaust turbocharger — Used in step 76

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Diesel particle filter to holder — Used in step 76

M8 hexagon nut		Tightening torque	19 Nm

Diesel particulate filter holder to gearbox — Used in step 76

M12x75		Tightening torque	66 Nm

Diesel particulate filter bracket to crankcase — Used in step 76

M10x35		Tightening torque	38 Nm

Heat shield for exhaust turbocharger — Used in step 76

Torx screw BM 6x12		Tightening torque	10 Nm

Bracket to oil sump — Used in step 76

M6		Tightening torque	8 Nm

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Alternator to component carrier — Used in step 76

M10x75 / M10x125		Tightening torque	38 Nm

Positive battery cable to alternator — Used in step 76

M8		Tightening torque	19 Nm

Air conditioning compressor in component carrier — Used in step 76

M10		Tightening torque	38 Nm

Ground cable to cylinder head — Used in step 76

M6x12		Tightening torque	8 Nm

Wiring harness to cylinder head cover — Used in step 76

TS5x20		Tightening torque	3,5 Nm

Fuel line to intake plenum — Used in step 76

TS6x20		Tightening torque	5 Nm

Differential pressure sensor to holder — Used in step 77

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor — Used in step 77

Clamp 15–19mm		Tightening torque	3 Nm

Clean air pipe to cylinder head cover — Used in step 78

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 78

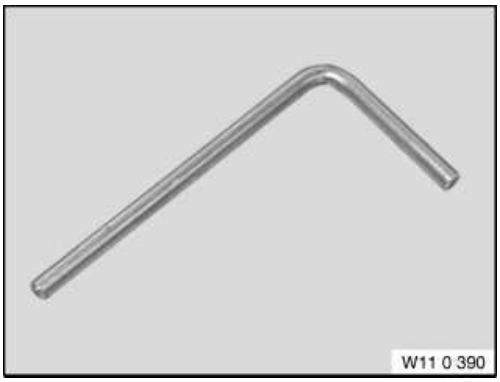
Clamp		Tightening torque	3 Nm

Resonator to manifold and clean air pipe — Used in step 80

Screw TS6	Renew screw.	Tightening torque	5 Nm

Overview of Special Tools

0 496 268 (11 0 390) Pin

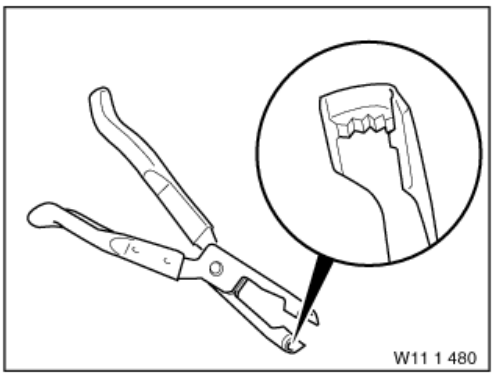


Common — Used in step 7 76

Usage	(roll pin) For securing new tensioning pulley (poly-V belt)
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 15 07 (390)

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0 490 796 (11 1 480) Pliers



Common Used in step 7 25

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

2 459 012 Holder



Common Used in step 12 71

Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

2 455 010 Engine support



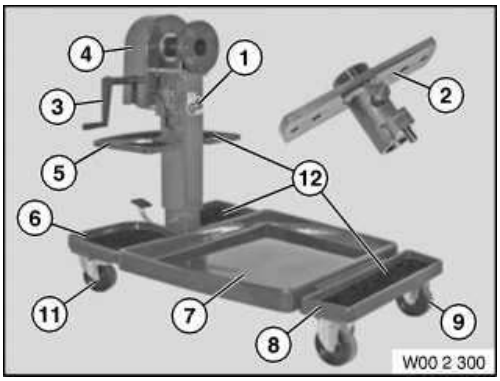
Common Used in step 13 70

Usage	For accommodating engine on assembly stand. Engine: B3x, B4x, N47.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

0 495 187 (00 2 300) Assembly stand

Used in step 13

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Common

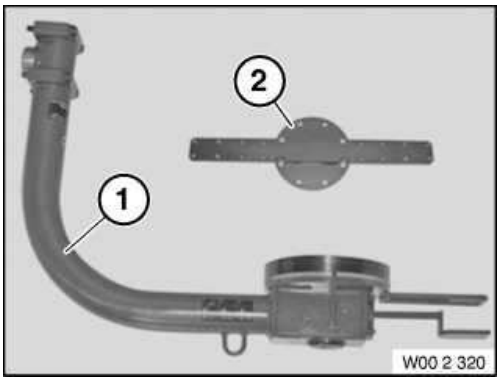
Usage	Assembly stand with universal flange for mounting engines from S85
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 188 (00 2 301)		**Assembly stand** available only as complete assembly stand 83 30 0 495 187.	
2	0 495 189 (00 2 302)	**2 299 563**	**Tool** (Universal flange). Do not use any more!!! Technically locked. Replaced with a new flange with material number 83 30 2 299 563. All flanges delivered until the end of 2011 will be replaced at no charge. From 2012, only the new flange will be supplied. Also applies to the complete engine mounting stand 00 2 300.	
3	0 495 200 (00 2 303)		**Crank**	
4	0 495 201 (00 2 304)		**Cover** (Protective hood)	
5	0 495 202 (00 2 305)		**oddments tray** (Oddments tray for small parts)	
6	0 495 203 (00 2 306)		**Shaped element** (Rear shaped pan)	
7	0 495 204 (00 2 307)		**Collection pan** (Oil collection pan)	
8	0 495 205 (00 2 308)		**Shaped element** (Front shaped pan)	
9	0 495 206 (00 2 309)		**Wheel** (Front wheel (without stop))	
10	0 495 207 (00 2 311)		**Wheel** (Rear wheel (with stop))	
11	0 495 208 (00 2 312)		**Mat** (Checker mat set)	
2	2 299 563		**Adapter** New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.	

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0 495 196 (00 2 320) Support arm



Common

Used in step 13

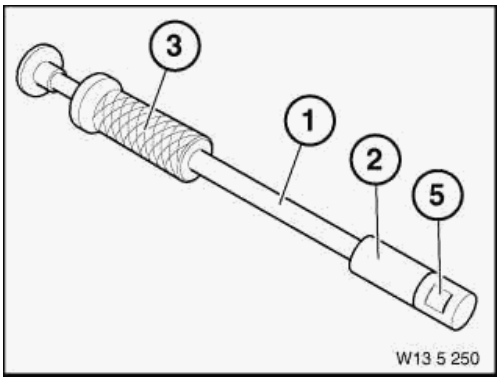
Usage	(Support arm with fixture) For mounting engines using the engine mounting bracket.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 197 (00 2 321)		**Support arm**	
2	0 495 198 (00 2 322)		**Panel** (take-up plate)	
3	0 495 380 (00 2 323)		**Panel** (fixture) Engine N73	
6	0 496 287 (00 2 326)		**Panel** (fixture) Engine: M73	
5	0 496 288 (00 2 327)	**0 496 373**	**Panel** (fixture) Engine: S62 Replaced by 11 5 420 (0 496 373)	
8	0 496 533 (00 2 328)		**Support** (Engine mount) Engine: N57, N57Top	
9	0 496 579 (00 2 329)	**0 496 680**	**Support** (Engine mount) Engine: N74 Replaced by 116160 (0 496 680)	
4	0 495 379 (00 2 324)		**Panel** (fixture) Engine M67TU	
5	0 495 381 (00 2 325)		**Panel** (fixture) Engine N62, N62TU	

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0 493 321 (13 5 250) Puller



Common

Used in step 17

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

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0 493 339 (13 5 252) Bush



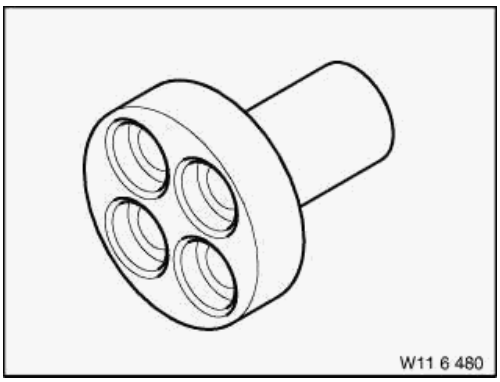
Common	Used in step 17
Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 340 (13 5 253) Weight



Common	Used in step 17
Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 380 (11 6 480) Connector



Common	Used in step 20 60 63
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

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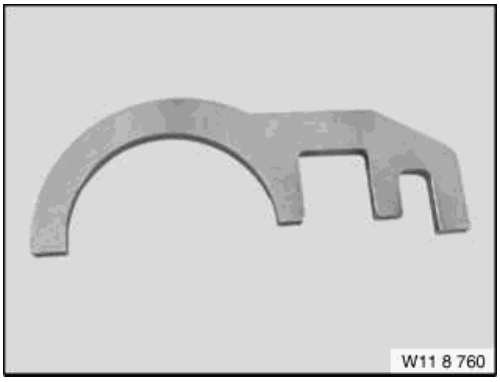
2 288 380 Locating stud



Common Used in step 20 60 61 63

Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 112 (11 8 760) Gauge



Common Used in step 20 60 62 63

Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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0 495 105 (11 4 480) oddments tray



Common

Used in step 26 27 60

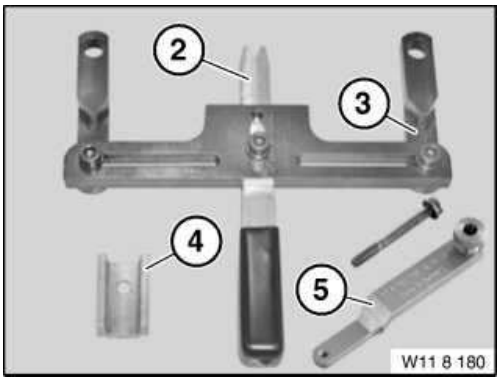
Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

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0 493 587 (11 8 180) Holder



Common

Used in step 28 55

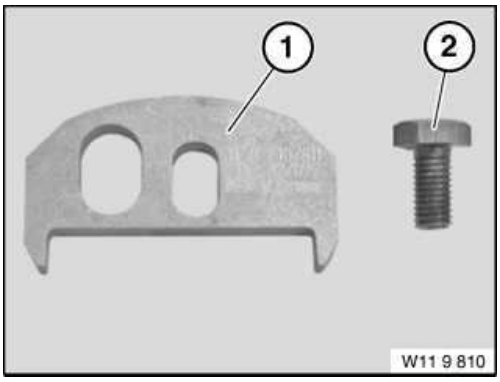
Usage	(Counter support) Blocking flywheel when releasing and tightening down central bolts on vibration absorber
Included in the tool or work	
Storage location	B45
Replaced by	
In connection with	
SI-Number	01 12 99 (452)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
2	0 494 433 (11 8 182)		**Shaped part** (shaped part)	
5	0 494 716 (11 8 185)		**Adapter** (Adapter with adjusting sleeve) E46 M47TU	
1	0 494 432 (11 8 181)	**0 494 434**	**Basic body** (Basic body) E65/M67, E38/M67 Discontinuation Replaced by 11 8 183 (0 494 434)	
3	0 494 434 (11 8 183)		**Basic body**	
4	0 494 435 (11 8 184)		**Adapter** E65 / M67	

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0 496 171 (11 9 811) Holder



Common	Used in step 29 30 53
Usage	Available only as a complete tool set 11 9 810 (83 30 0 496 170) - as of 13.01.12
Included in the tool or work	0 496 170
Storage location	C86
Replaced by	
In connection with	
SI-Number	01 07 07 (355)

0 494 793 (11 9 265) Bush



Common	Used in step 29 30 53
Usage	
Included in the tool or work	0 493 938
Storage location	A44
Replaced by	
In connection with	
SI-Number	

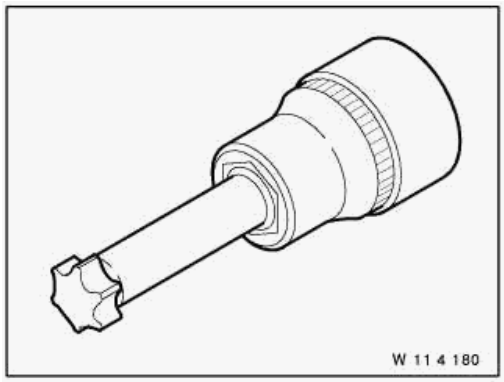
2 288 165 Synchronising key



Common	Used in step 29 54
Usage	Conversion kit for 21 2 170, for orders till 02.2014. Orders as of March 2014 do not require the conversion, as the new thrust piece has been accounted for.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 09 14 (088)

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0 491 018 (11 4 180) Socket WAF 46



Common Used in step 30 53

Usage	(screwdriver bit Torx T60) For releasing and tightening down dual-mass flywheel - model year: from Jan 94
Included in the tool or work	
Storage location	C9
Replaced by	
In connection with	
SI-Number	01 02 94 (777)

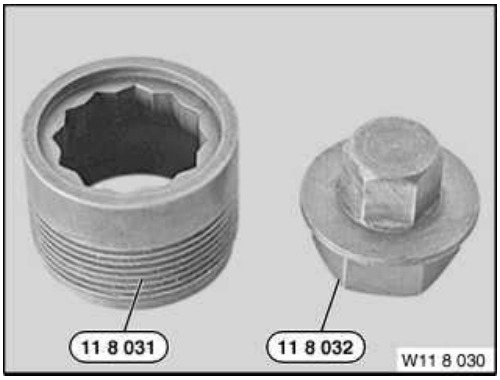
2 357 904 Gauge



Common Used in step 33 50

Usage	For positioning the high pressure pump to the crankshaft . Replaced by gauge 2420824
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 725 (11 8 030) Extractor



Common Used in step 33

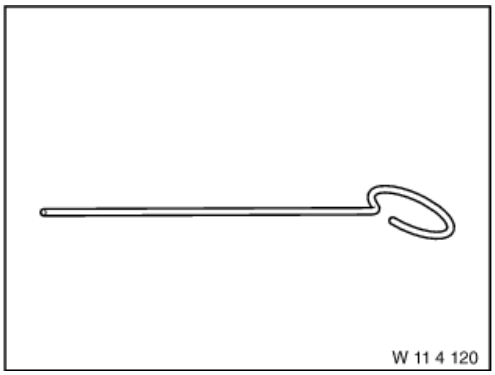
Usage	for the disassembly of the high pressure pump (replaces SWZ 11 8 740 as of 08/2009) 11 8 740 will be replaced by 83 30 2 448 914.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 757 (11 8 031)	**2 448 914**	**Holding sleeve** Replaces SWZ11 8 741 from 08/2009, 09/2011 no longer available individually. From 10/2016, can only be ordered as a new set of special tools 2 448 914.	
2	0 496 758 (11 8 032)	**2 448 914**	**Adapter** Replaces special tool 11 8 742 from 08/2009, 09/2011 remaining inventories will be sold off - no longer available individually. From 10/2016, can only be ordered as a new set of special tools 2 448 914.	

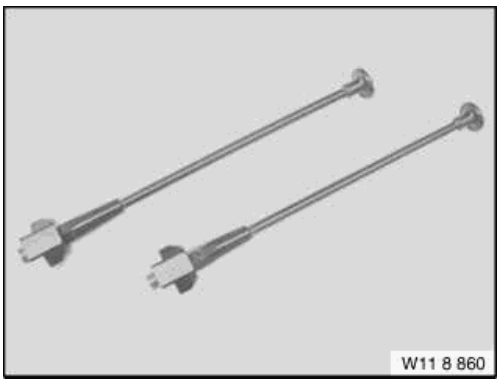
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0 491 012 (11 4 120) Pin



Common	Used in step 33 50
Usage	(lock pin) For chain tensioners, for locking the chain tensioner piston (e.g. during cylinder head removal and fitting)
Included in the tool or work	
Storage location	B1
Replaced by	
In connection with	
SI-Number	01 12 93 (701)

0 496 144 (11 8 860) Assembly tool



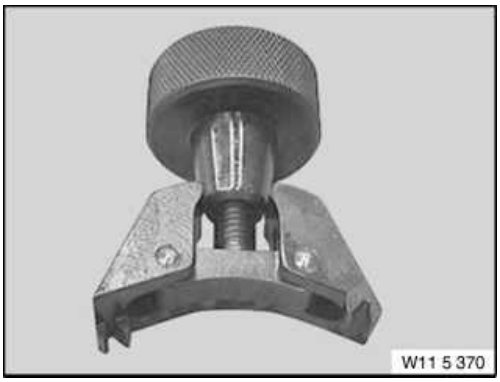
Common	Used in step 36 47
Usage	For installing piston with connecting rod in crankcase.
Included in the tool or work	
Storage location	A23
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

2 288 054 Gauge



Common	Used in step 41 44
Usage	For positioning the counterbalance shafts during installation.
Included in the tool or work	
Storage location	C56
Replaced by	
In connection with	
SI-Number	01 06 14 (076)

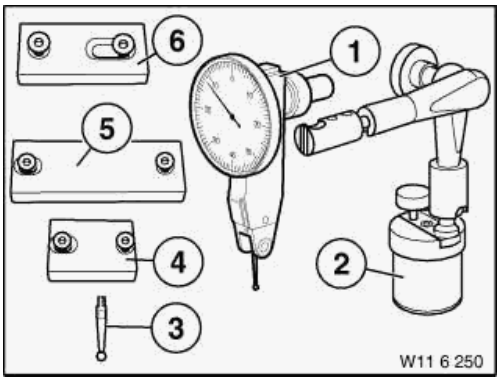
0 495 131 (11 5 370) Tool



Common	Used in step 41 44
Usage	(Locating tool) For VANOS exhaust camshaft gear setting.
Included in the tool or work	
Storage location	A71
Replaced by	
In connection with	
SI-Number	01 02 05 (173)

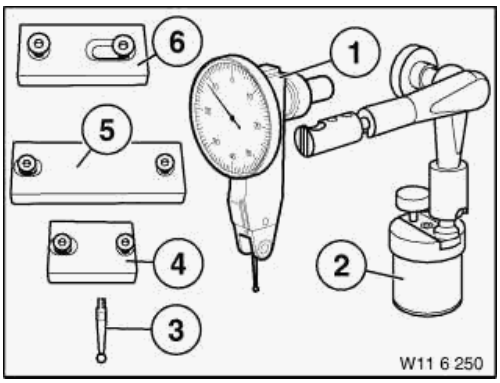
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0 493 144 (11 6 251) Dial gauge



Common	Used in step 44
Usage	(Dial gauge) With 0.8 mm measuring range in each direction
Included in the tool or work	0 493 143
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 145 (11 6 252) Tripod

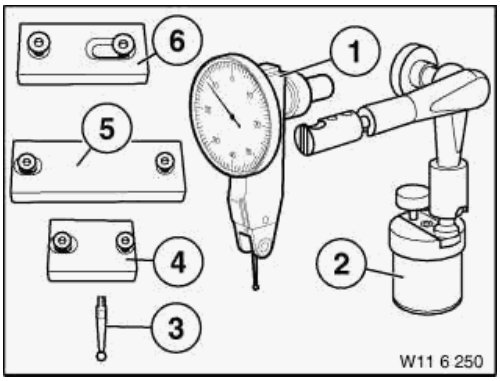


Common	Used in step 44
Usage	(Small hydraulic tripod with magnetic base)
Included in the tool or work	0 493 143
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 143 (11 6 250) Measuring device

Used in step 44

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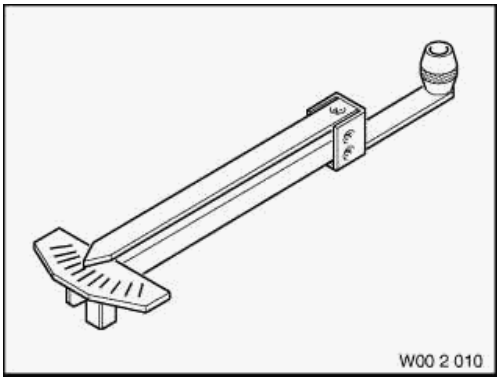
Common

Usage	(Measuring device) Sensing arm measuring device With small tripod for measuring tooth flank and side clearance on counterbalance shafts, camshafts and crankshafts.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 04 98 (304)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
4	0 495 214 (11 6 254)		**Panel** (Fixture) Engine: M47T2; M57T2; S85	
5	0 495 468 (11 6 255)		**Panel** (Fixture M7) Engine camshaft: M67TU	
3	0 493 146 (11 6 253)		**Sensor** (sensor) Sensor arm 11.5 mm	
1	0 493 144 (11 6 251)		**Dial gauge** (Dial gauge) With 0.8 mm measuring range in each direction	
2	0 493 145 (11 6 252)		**Tripod** (Small hydraulic tripod with magnetic base)	
6	0 495 470 (11 6 256)		**Panel** (Fixture M8) Engine crankshaft: M67TU	

0 490 130 (00 2 010) Measurement aid



Common Used in step 44

Usage	(Coefficient of friction meter) For adjusting the steering box (measurement possible in both directions) and for checking and adjusting the bevel pinion and crown wheel bearing in all final drives
Included in the tool or work	
Storage location	X9
Replaced by	
In connection with	
SI-Number	

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2 420 824 Gauge



Common

Used in step 44

Usage	For positioning the high pressure pump to the crankshaft . Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B56
Replaced by	
In connection with	
SI-Number	

0 493 582 (11 8 140) Bush



Common

Used in step 47

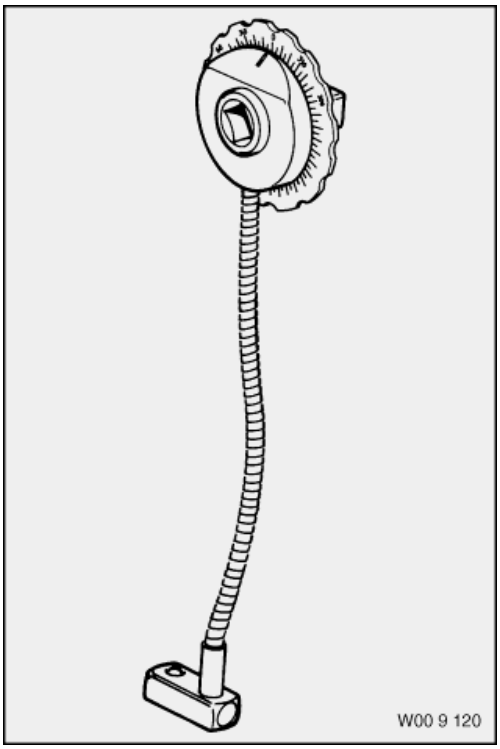
Usage	(Assembly bushes) For installing the pistons
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 12 99 (452)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 494 394 (11 8 141)		**Bush** Bush for piston installation 84.00 mm	
2	0 494 395 (11 8 142)		**Bush** Liquidation of existing inventory and then available only as a complete tool set 11 8140 (83 30 0 493 582) - as of 12.03.12.	
3	0 494 396 (11 8 143)		**Bush** Liquidation of existing inventory and then available only as a complete tool set 11 8140 (83 30 0 493 582) - as of 12.03.12.	

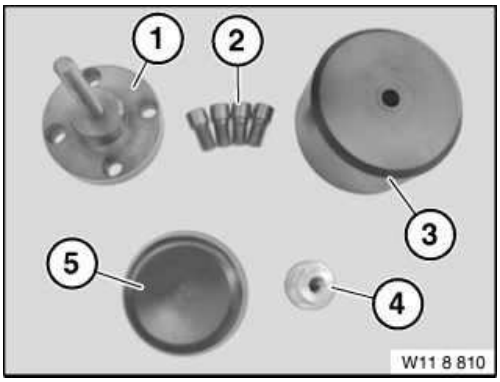
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0 490 504 (00 9 120) Torque angle measuring dial



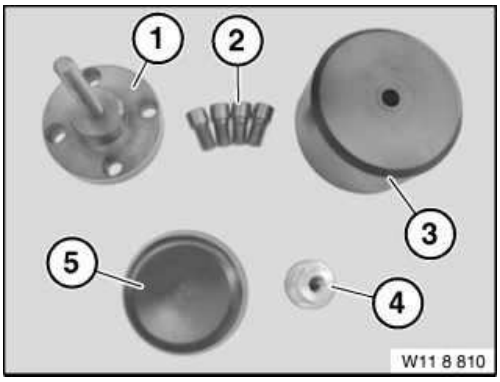
Common	Used in step 48 52
Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

0 496 137 (11 8 815) Holding sleeve



Common	Used in step 52
Usage	(Slip sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

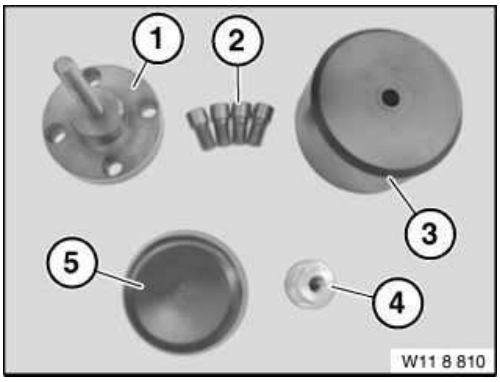
0 496 133 (11 8 811) Basic body



Common	Used in step 52
Usage	Liquidation of existing inventory and then available only as a complete tool set 11 8 810 = 83 30 0 496 132 - as of 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

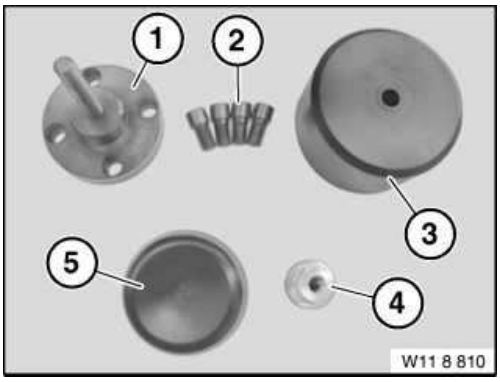
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0 496 134 (11 8 812) Screw



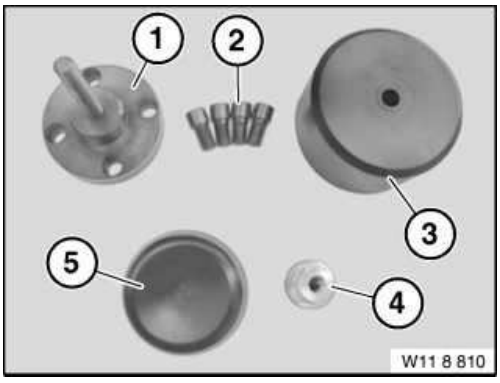
Common	Used in step 52
Usage	(Screw set) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 135 (11 8 813) Holding sleeve



Common	Used in step 52
Usage	(Thrust sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

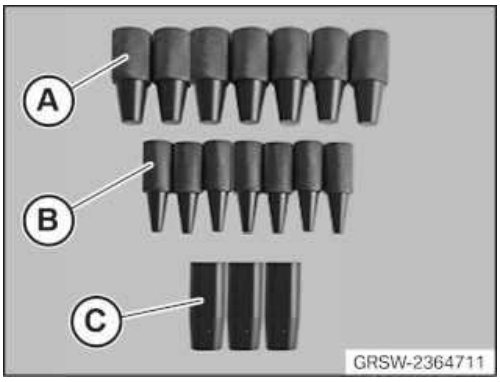
0 496 136 (11 8 814) Nut



Common	Used in step 52
Usage	(Nut with bearing) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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2 364 711 Plug



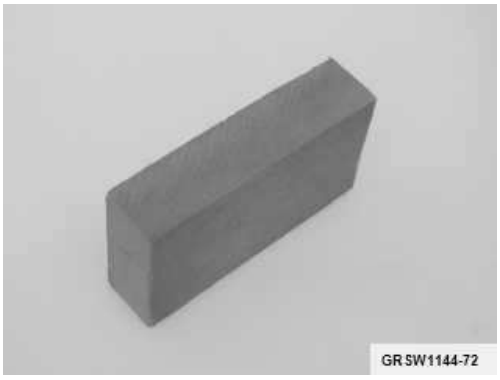
Common	Used in step 52
Usage	For closing the pressure oil holes for cleaning the cylinder head sealing surfaces.
Included in the tool or work	
Storage location	C20
Replaced by	
In connection with	
SI-Number	01 50 14 (203)

0 495 103 (11 4 471) Scraper



Common	Used in step 52
Usage	
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

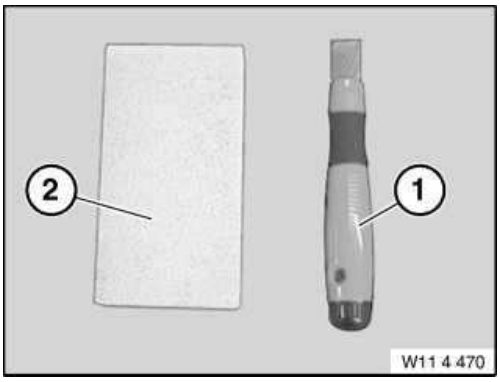
0 495 104 (11 4 472) Extractor



Common	Used in step 52
Usage	(grindstone)
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

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0 495 102 (11 4 470) Tool



Common

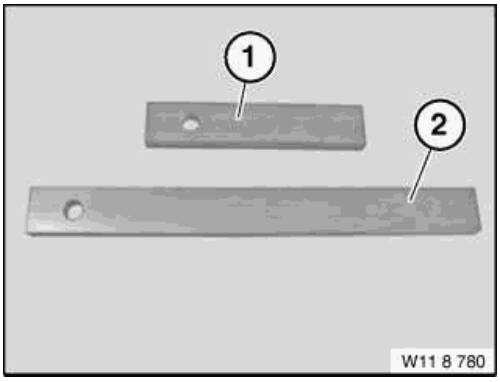
Used in step 52 74

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

0 496 120 (11 8 780) Plate



Common

Used in step 52

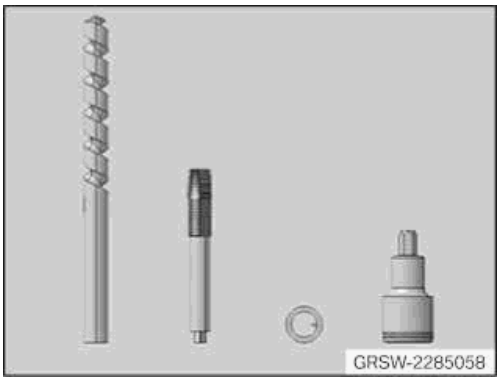
Usage	(Mounting plates) For securing transmission oil sump when gearbox is removed.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 121 (11 8 781)		**Plate** (Mounting plate, short)Discontinued; only available via set 11 8 780 = 0496120.	
2	0 496 122 (11 8 782)		**Plate** (Mounting plate, long) Discontinued; only available via set 11 8 780 = 0496120.	

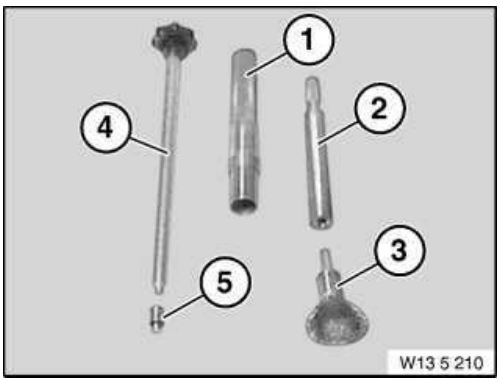
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2 285 058 Tool set



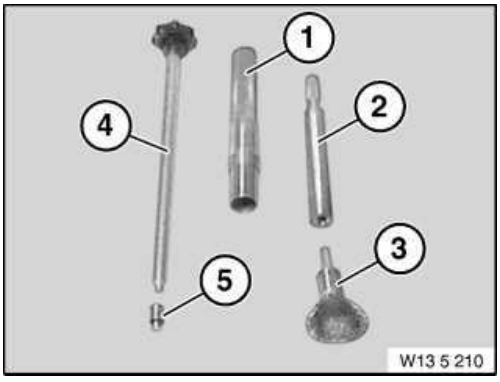
Common	Used in step 53
Usage	
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 02 14 (069)

0 493 763 (13 5 215) Plug



Common	Used in step 65
Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

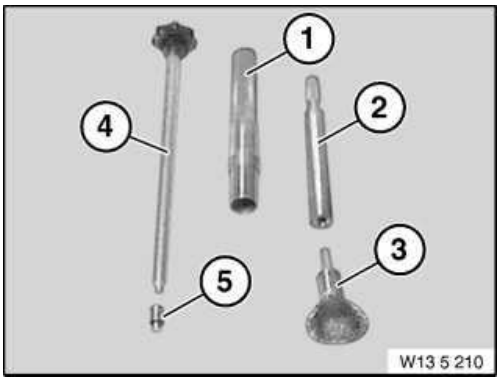
0 493 762 (13 5 214) Rod



Common	Used in step 65
Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 493 758 (13 5 210) Tool



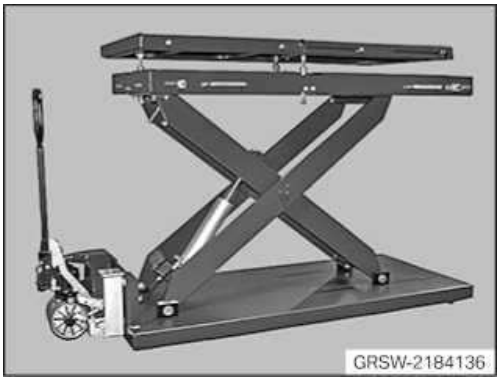
Common Used in step 65

Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

2 184 136 Mobile equipment table lift



Common Used in step 71

Usage	Table lift MHT 1200
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	06 01 10 (649)

2 409 025 Puller



Common Used in step 72

Usage	For disassembly of the outer radial shaft seal of the transmission output shaft, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A76
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

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2 411 739 Puller



Common	Used in step 72
Usage	For disassembly of the inner radial shaft seal of the output, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C78
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 408 152 Striking element



Common	Used in step 72
Usage	For installation of the right radial shaft seal transmission output shaft (inner). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

2 413 037 Handle



Common	Used in step 72
Usage	Universal drift handle. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C77
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

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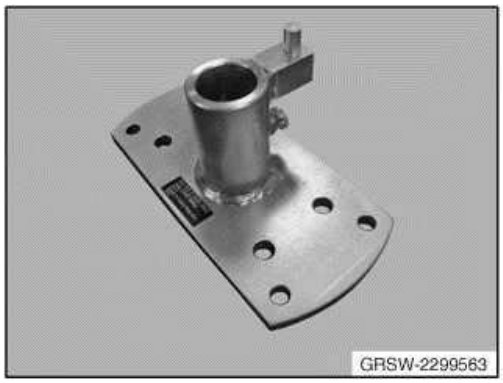
2 408 150 Striking element



Common	Used in step 72
Usage	For installing the right radial shaft seal transmission output shaft (outer). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

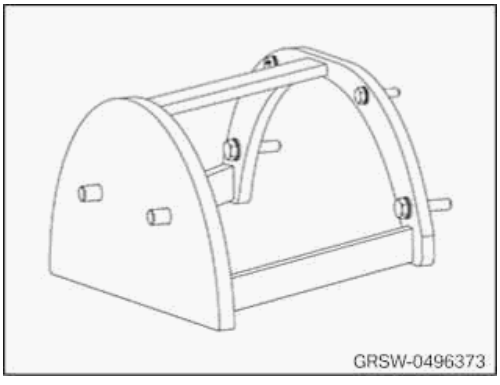
Replacement tools:

2 299 563 Adapter



Common	Used in step 13
Usage	New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.
Included in the tool or work	0 495 187
Storage location	
Replaced by	
In connection with	
SI-Number	

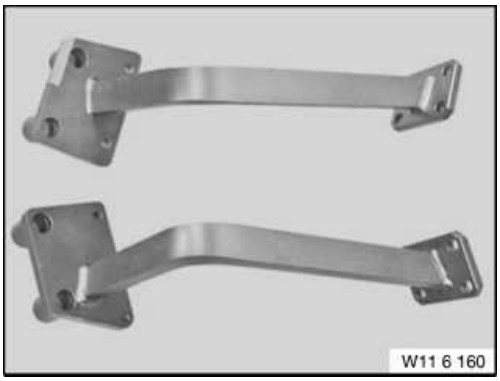
0 496 373 (11 5 420) Plate



Common	Used in step 13
Usage	(Fixture) Engine S62
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	

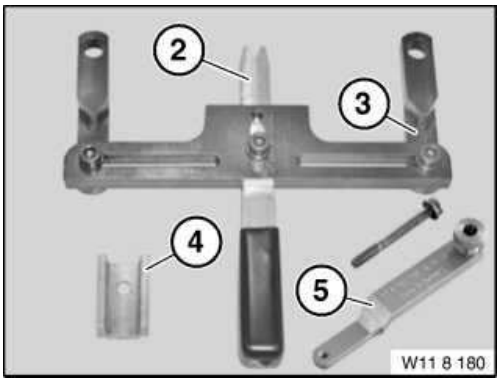
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0 496 680 (11 6 160) Support



Common	Used in step 13
Usage	For mounting N74 engine on the assembly stand. In combination with 00 2 300, 00 2 320
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	00 2 300; 00 2 320 = 0495196
SI-Number	01 31 09 (604)

0 494 434 (11 8 183) Basic body



Common	Used in step 28 55
Usage	
Included in the tool or work	0 493 587
Storage location	
Replaced by	
In connection with	
SI-Number	

2 448 914 Extractor



Common	Used in step 33
Usage	For removing and installing high pressure pump. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A49
Replaced by	
In connection with	
SI-Number	01 15 16 (411)

Overview Technical Data

Side clearance of piston rings	Used in step 38
Clean all components before measuring the side clearance.	
Side clearance of the plain rectangular compression ring	0,17 mm ... 0,27 mm
Side clearance of the taper faced piston ring	0,30 mm ... 0,50 mm
Side clearance of the oil scraper ring with spiral expander	0,2 mm ... 0,4 mm

Piston diameter	Used in step 39
Measure the piston diameter at distance (A) from the lower end of the piston skirt.	
Distance (A) to the lower end of the piston skirt	17 mm
Nominal dimension of piston diameter	83,936 mm ... 83,954 mm

Cylinder bore	Used in step 40

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Diameter of cylinder bore	84,00 mm ... 84,018 mm
Permitted irregularity of the cylinder bore	0,01 mm
Permitted conicity of the cylinder bore	0,01 mm

Axial play of crankshaft Used in step 44

Equipment installation status	0,090 mm ... 0,273 mm
Operating condition	0,11 mm ... 0,314 mm

Maximum permitted torque of the crankshaft Used in step 44

max. 2 Nm

Screw-in depth of thread cutter Used in step 53

Screw-in depth	18 mm

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	7 76
EGR controller	7 76

General repair instructions	Used in step
11 00 ... Overview of consumables (Electronic Parts Catalogue)	52

Repair instructions	Used in step
11 00 050 Removing and installing engine	1 82
11 00 050 Removing and installing engine	1 82
11 00 050 Removing and installing engine	1 82
11 00 050 Removing and installing engine	1 82
11 00 050 Removing and installing engine	1 82
11 00 050 Removing and installing engine	1 82
11 00 050 Removing and installing engine	1 82
11 00 050 Removing and installing engine	1 82
11 00 050 Removing and installing engine	1 82
31 10 001 Completely removing and installing front axle with engine and transmission	1 82
11 00 050 Removing and installing engine	1 82
11 00 050 Removing and installing engine	1 82
11 00 050 Removing and installing engine	1 82
11 00 050 Removing and installing engine	1 82
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11 00 050 Removing and installing engine	1 82

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11 00 050 Removing and installing engine 1 82
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11 00 050 Remove and install engine 1 82
11 00 050 Remove and install engine 1 82
11 00 050 Remove and install engine 1 82
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG) 1 82
11 00 050 Remove and install engine 1 82
11 00 050 Remove and install engine 1 82
11 00 050 Remove and install engine 1 82
11 00 050 Remove and install engine 1 82
11 00 050 Removing and installing the engine (manual gearbox) 1 82
11 00 050 Remove and install engine (Automatic) 1 82
11 00 050 Remove and install engine 1 82
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11 00 050 Remove and install engine 1 82
11 00 050 Removing and installing engine 1 82
11 00 050 Removing and installing engine \PREMIUM 1 82
11 00 050 Removing and installing/replacing engine (N63) 1 82
11 00 050 Removing and installing engine 1 82
11 00 050 Removing and installing engine 1 82
11 00 050 Removing and installing engine 1 82
11 00 050 Remove and install engine 1 82
11 00 050 Remove and install engine (Automatic) 1 82
11 00 050 Remove and install engine (Automatic) 1 82
11 00 050 Remove and install engine 1 82
11 00 050 Remove and install engine 1 82
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11 00 050 Remove and install engine (Automatic) 1 82
11 00 050 Remove and install engine 1 82
11 00 050 Remove and install engine 1 82
11 00 050 Remove and install engine 1 82
11 00 050 Remove and install engine 1 82
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG) 1 82
11 00 050 Remove and install engine 1 82
61 35 ... Notes on ESD protection (Electro Static Discharge) 6 17 25 52
61 35 ... Notes on ESD protection (Electro Static Discharge) 52

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Operating materials	Used in step

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	60
Exhaust-gas recirculation cooler seal on exhaust manifold	76
Exhaust-gas recirculation cooler seal on intake plenum	76

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11 21 001 Replacing crankshaft

PRELIMINARY WORK

1 – Removing engine



- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

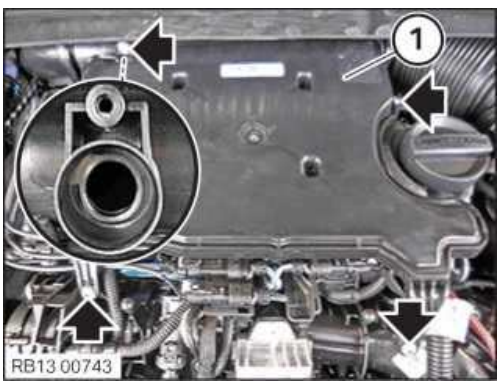
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

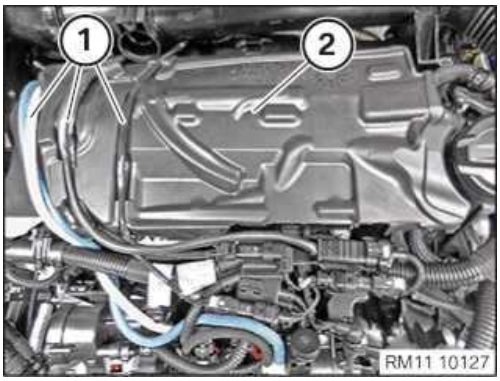
3 – Remove resonator



- Remove screws (arrows).
- Guide out and remove the resonator (1).

4 – Remove the acoustic cover for the injectors

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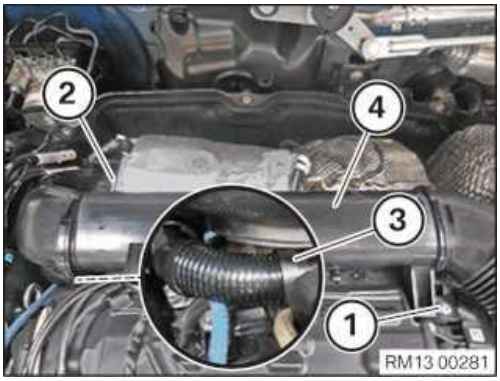


- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

5 – Removing clean air pipe



- Detach clamp (1) on the clean air pipe.
- Pull off the clean air pipe from the intake silencer housing.



- Loosen screw (1).
- Loosen clamp (2).
- Unlock the ventilation line (3) and pull it off the cylinder head cover.
- Feed out clean air pipe and remove.

6 – Remove differential pressure sensor

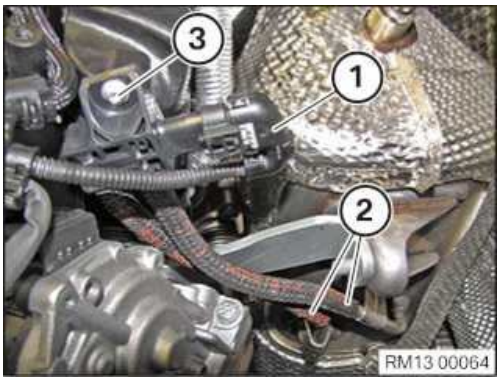
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

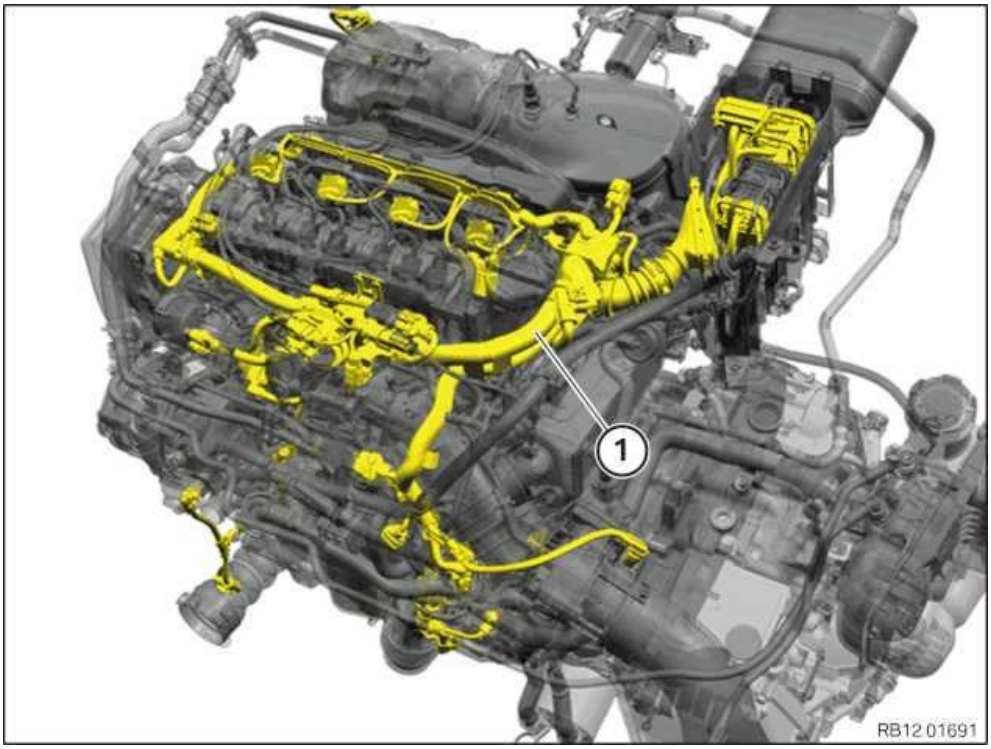
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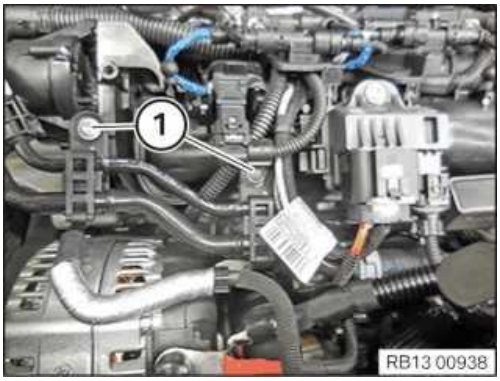
- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

7 – Removing assemblies (on lifting table)

Overview: Wiring harness section for the engine

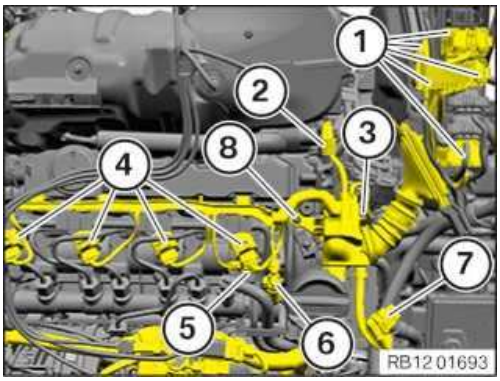


1 Wiring harness section for the engine

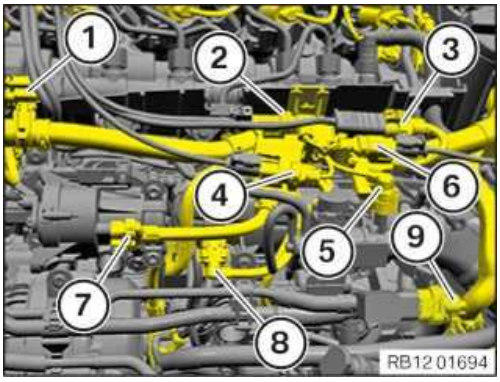


- Loosen screws (1).

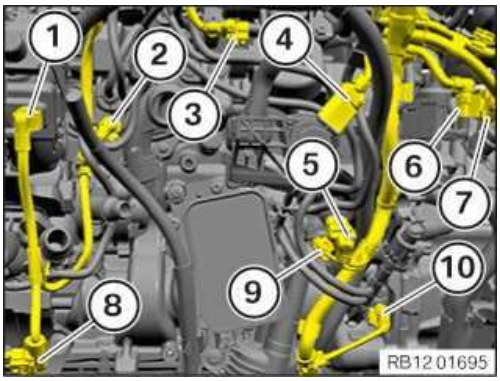
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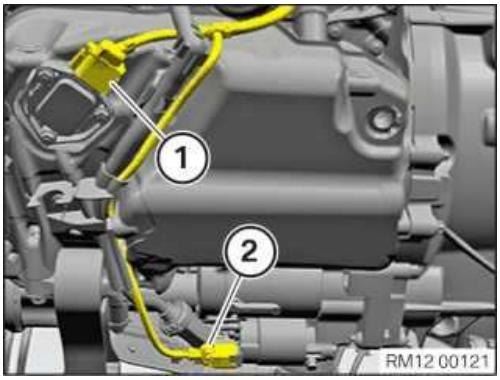
- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock the connector (2) and disconnect it from the differential pressure sensor.
- Unlock the connector (3) and disconnect it from the exhaust-gas recirculation valve.
- Unlock the connector (4) and pull off from the injectors.
- Unlock the connector (5) and disconnect it from the camshaft sensor.
- Unlock the connector (6) and disconnect it from the fuel pressure regulator.
- Unlock connector (7) and pull off from hot film air mass meter.
- Loosen screw (8).



- Unlock connector (1) and pull off from the rail pressure sensor.
- Unlock the connector (2) and disconnect it from the exhaust temperature sensor before the diesel particulate filter.
- Unlock connector (3) and pull it off from the front oxygen sensor.
- Unlock the connector (4) and disconnect it from the exhaust temperature sensor after the diesel particulate filter.
- Unlock and disconnect the connector (5) from the electric changeover valve.
- Unlock the connector (6) and disconnect it from the exhaust temperature sensor for the exhaust-gas recirculation cooler.
- Unlock the connector (7) and disconnect it from the servomotor for the swirl flaps.
- Unlock the connector (8) and pull it off the charging pressure sensor.
- Unlock the connector (9) and disconnect from the fuel pressure and temperature sensor.

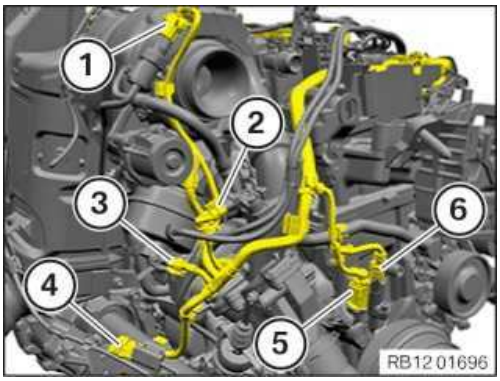


- Unlock and disconnect the connector (1) from the alternator.
- Unlock and disconnect the connector (2) from the electric changeover valve.
- Unlock and disconnect the connector (3) from the electric changeover valve.
- Unlock the connector (4) and pull it off the high pressure pump.
- Unlock the connector (5) and disconnect it from the oil pressure sensor.
- Unlock connector (6) and pull off from throttle body.
- Unlock the connector (7) and disconnect it from the intake air temperature sensor.
- Unlock the connector (8) and disconnect it from the air conditioning compressor.
- Unlock and disconnect the connector (9) from the solenoid valve.
- Unlock the connector (10) and pull it off the crankshaft sensor.



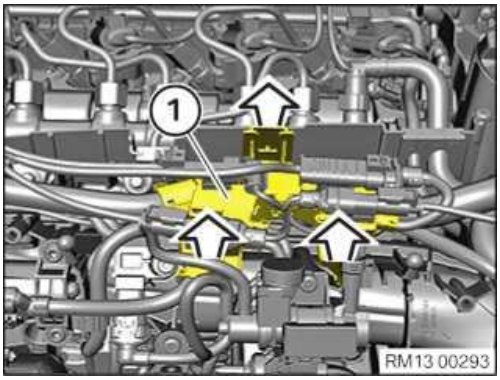
- Unlock the connector (1) and pull off of the oil-level sensor.
- Unlock connector (2) and remove from starter motor.

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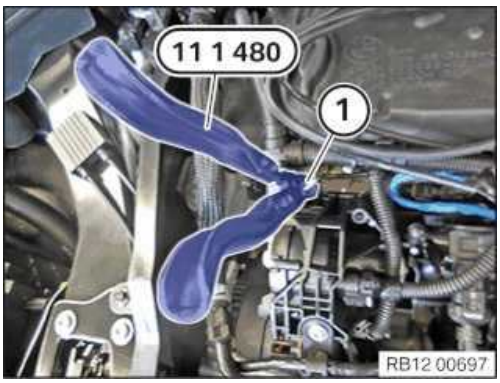


- Unlock the connector (1) and disconnect it from the exhaust gas pressure sensor.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock the connector (3) and pull it off the exhaust turbocharger.
- Unlock the connector (3) and disconnect it from the differential pressure sensor.
- Unlock connector (4) and pull it off from the monitoring oxygen sensor.
- Unlock the connector (5) and pull it off the oil pressure switch .
- Unlock connector (6) and disconnect from switching valve.
- Detach, feed out and remove the wiring harness from the clamps.

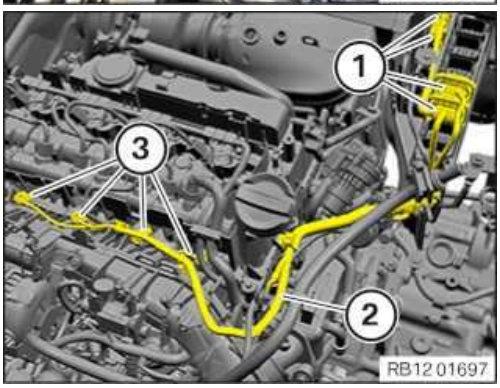
▶ **Removing the cable clips from the intake plenum**



- Detach the cable clip (1) in the direction of the arrow.
- Guide out the cable clip (1) in direction of arrow and set it aside.



- Unlock the connectors (1) of all glow elements with the special tool **0 490 796 (11 1 480)** and release them.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.



- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Pull off all connectors (3) from glow element using special tool **0 490 796 (11 1 480)**.
- Loosen screw (2) and remove the ground strap.
- Detach, feed out and remove the wiring harness from the clamps.

▶ **Removing the drive belt for alternator**

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

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CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

TECHNICAL INFORMATION

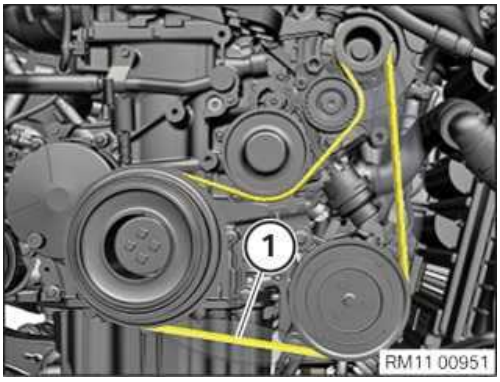
If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

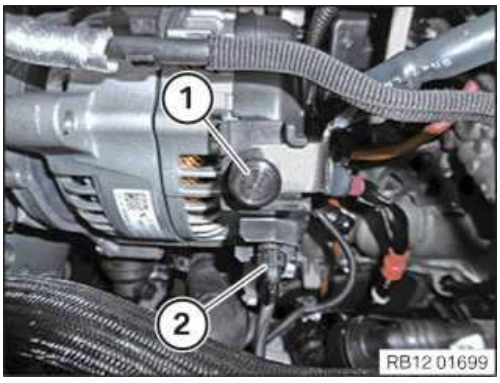
The drive belt must be replaced if contaminated with coolant- and oil residues.



- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool **0 496 268 (11 0 390)**.



- Guide out the drive belt for the alternator (1) and remove it.

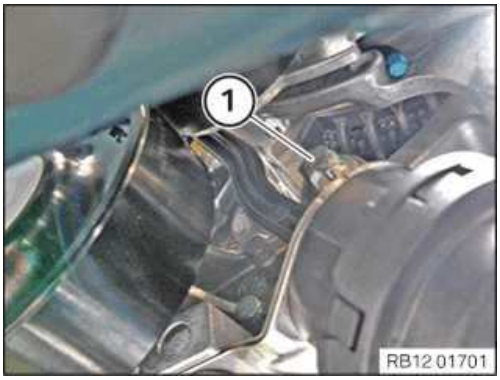


- Remove the cover (1) and loosen the nut below.
- Disconnect positive battery cable from alternator.
- Unlock and disconnect the connector (2) from the alternator.

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- Detach screw (1) on top on the alternator.



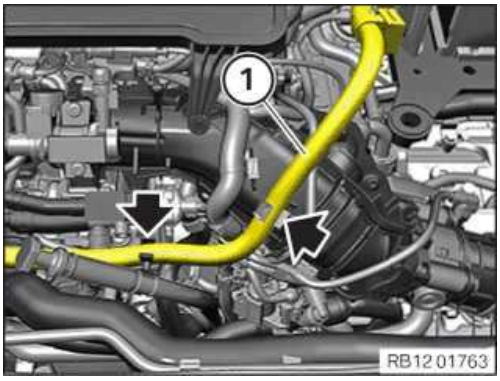
- Detach screw (1) below on the alternator.



- Feed out alternator (1) along with the screw (2) on the bottom of the alternator through the slot on the support and remove.

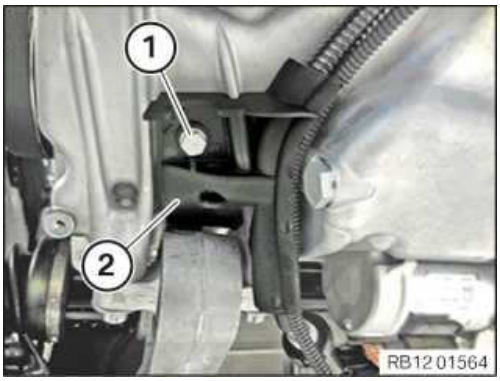


- Loosen screws (1).
- Feed out and remove the air conditioning compressor (2).



- Release the positive battery cable (1) from the clamps (arrows).

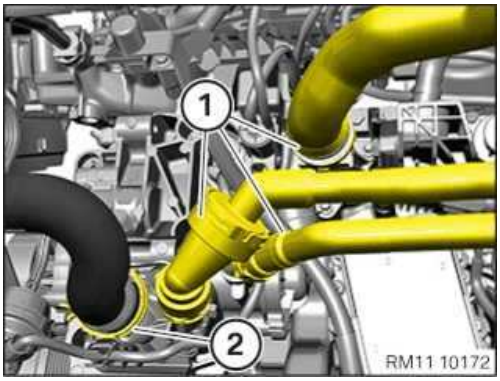
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- Loosen screw (1).
- Guide out and remove holder (2).



- Feed out positive battery cable from the clamps (1) and remove.



- Unlock and disconnect coolant lines (1).
- Guide out the coolant lines (1) and remove it.
- Detach the clamp (2).
- Guide the coolant hose out and remove.

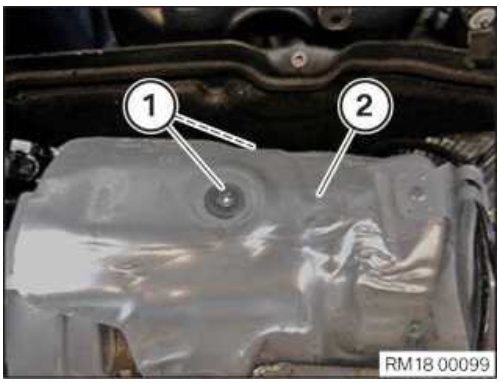
▶ **Removing heat shield from top exhaust turbocharger**

WARNING

Hot surfaces.

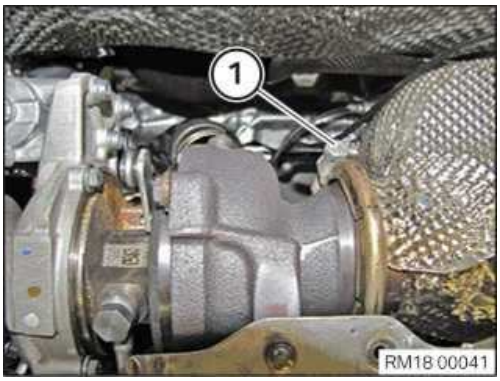
Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from holders.
- Release the screws (1) at the top and bottom of the heat shield.
- Feed out and remove the heat shield (2).

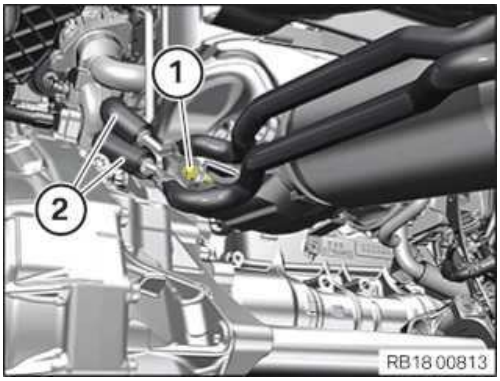
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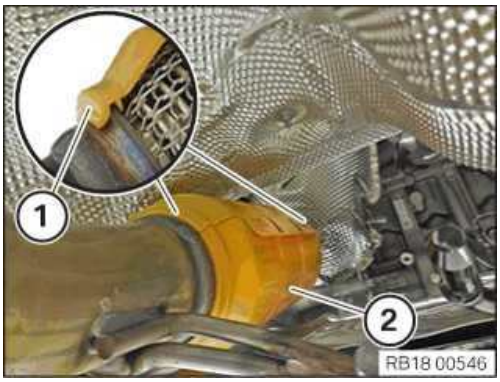
- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.



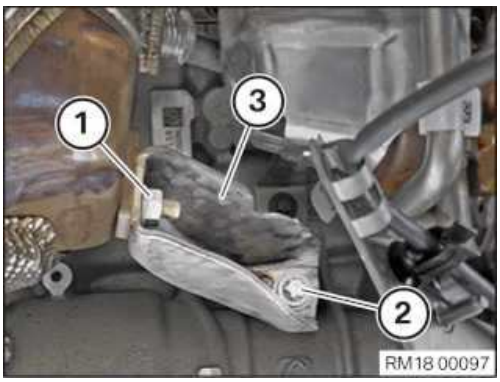
- Loosen nuts (1).



- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.

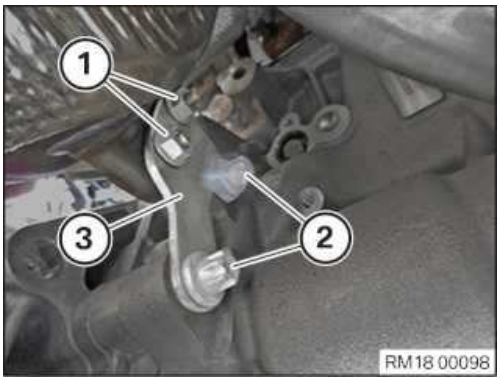


- Mount fitting aid (2).
- Make sure that the fitting aid is correctly position on the edges (1) of the flexible tube.



- Loosen nut (1).
- Loosen screw (2).
- Remove holder (3).

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- Loosen nuts (1).
- Loosen screws (2).
- Remove holder (3).
- Guide out and remove diesel particulate filter .

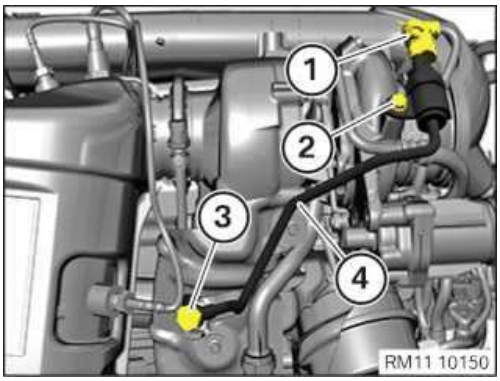
▶ **Remove the heat shield from the exhaust turbocharger at the bottom**

WARNING

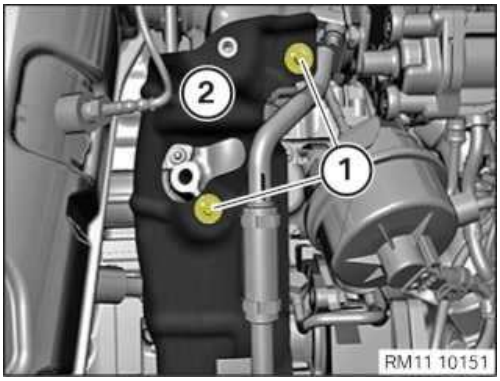
Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Unlock and disconnect connector (1).
- Unscrew the banjo bolt (3).
- The seals of the banjo bolt (3) must be renewed.
- Loosen screw (2).
- Remove the exhaust gas pressure pipe (4).



- Unscrew the bolts (1) on the heat shield .
- Feed out and remove the heat shield (2).

▶ **Removing the exhaust-gas recirculation cooler**

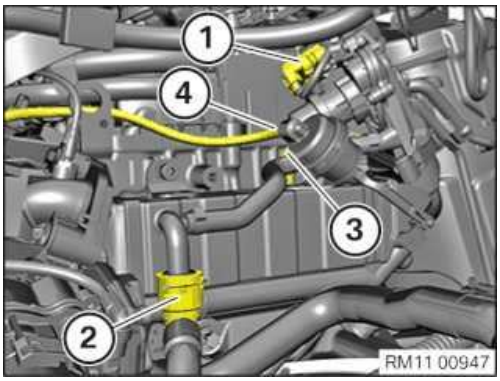
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

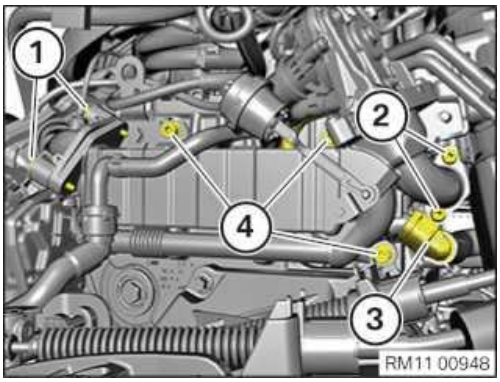
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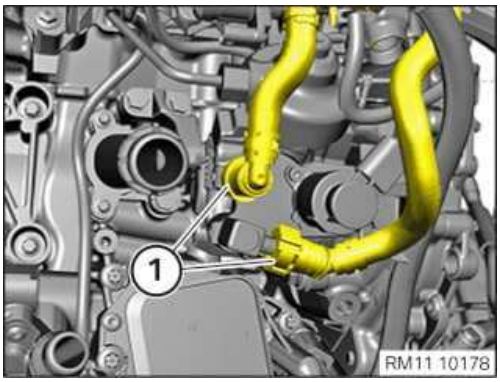
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

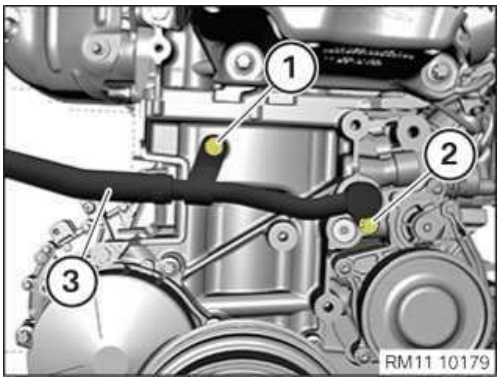
- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.



- Unlock the fuel lines (1) and disconnect from the high pressure pump.
- Remove the fuel lines.



- Loosen screws (1) and (2).
- Remove coolant line (3).

8 – Removing the low-pressure stage turbocharger

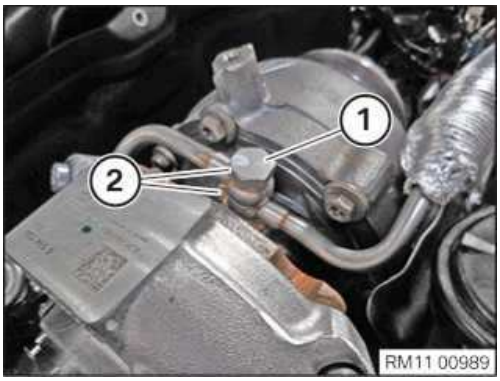
WARNING

Hot surfaces.

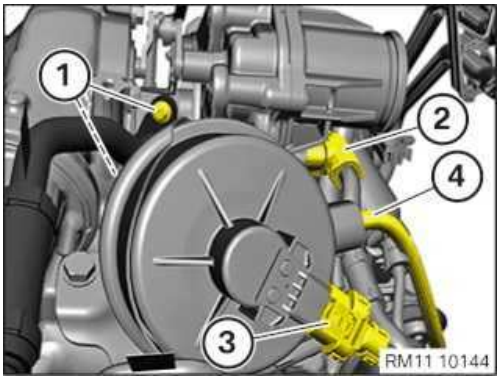
Risk of burning!

- Perform all work only on components that have cooled down.

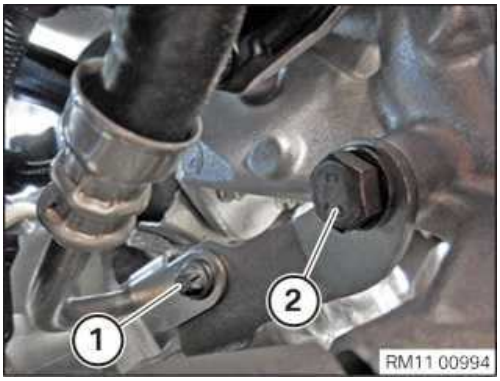
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- Release the banjo bolt (1) of the oil feed lines.
- Remove sealing rings (2).
- Place oil feed lines to one side.



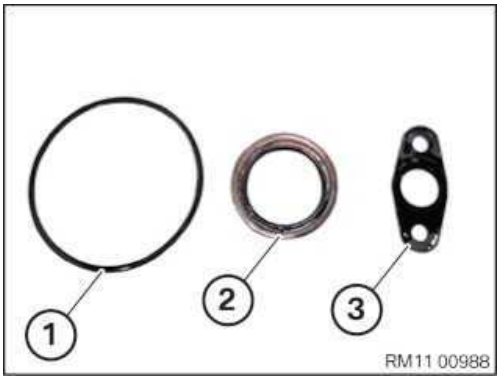
- Release the screws (1) of the oil return line.
- Unlock and disconnect the plug connections (2) and (3).
- Pull off the vacuum hose (4) carefully.



- Undo the bolt (1) of the oil feed line.
- Loosen screw (2).

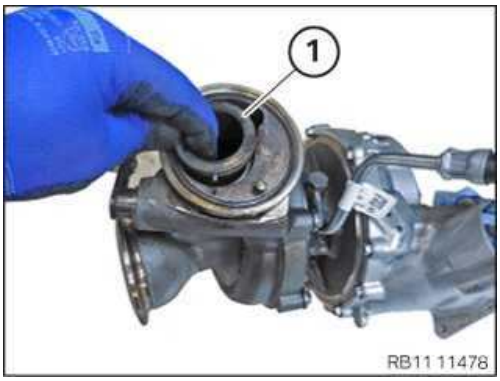


- Loosen screw (1).
- Remove the V hose clamp.
- Guide the low-pressure stage turbocharger out towards the top and remove.



- Remove seals (1), (2) and (3).

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- Remove the spacer ring (1).

9 – Removing the high-pressure stage exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

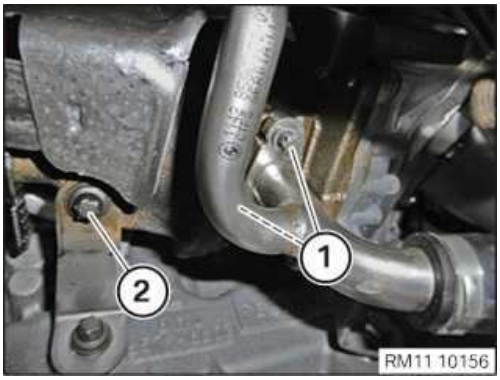
- Perform all work only on components that have cooled down.

CAUTION

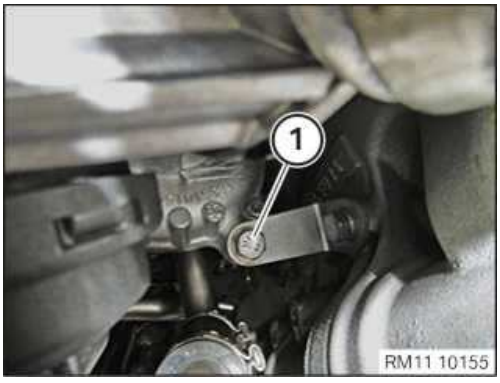
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

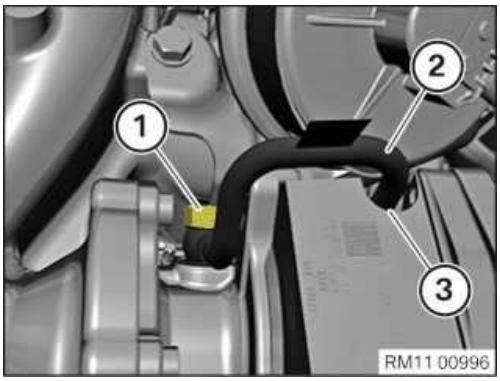


- Unscrew the bolts (1) on the oil return line .
- Loosen screw (2).

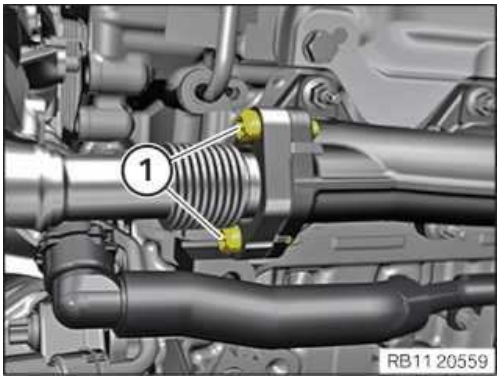


- Release screw (1) from the right wheel arch.

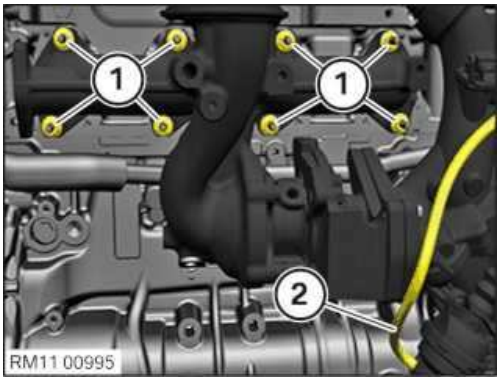
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- Unscrew the banjo bolt (1).
- Guide out oil feed line (2) from holder (3).

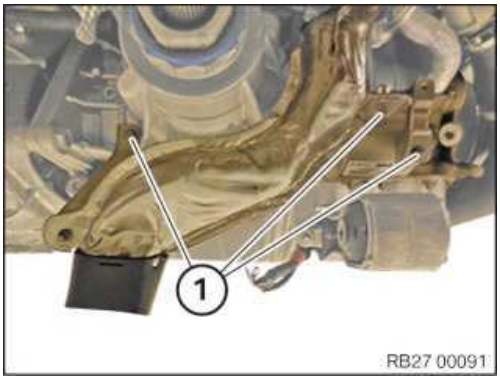


- Loosen screws (1).

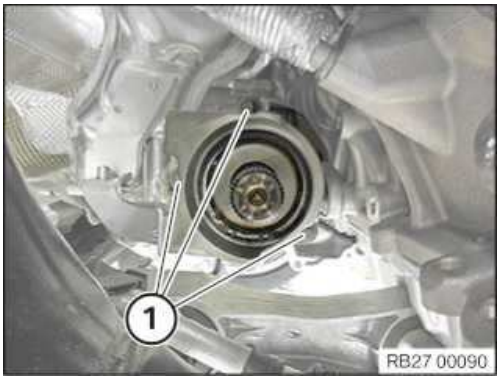


- Pull off the vacuum hose (2).
- Loosen nuts (1).
- Guide out the exhaust manifold and the high-pressure stage exhaust turbocharger to the top and remove them.

10 – Remove the intermediate shaft with the support tube

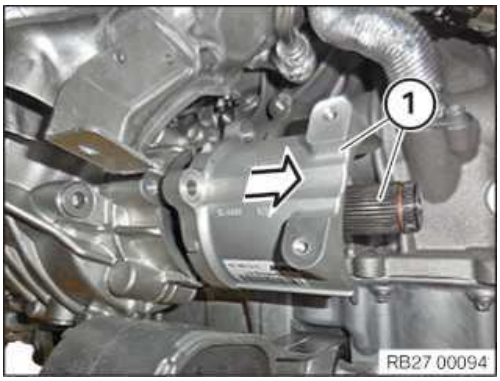


- With air duct installation: Loosen screws (1).
- Remove air duct



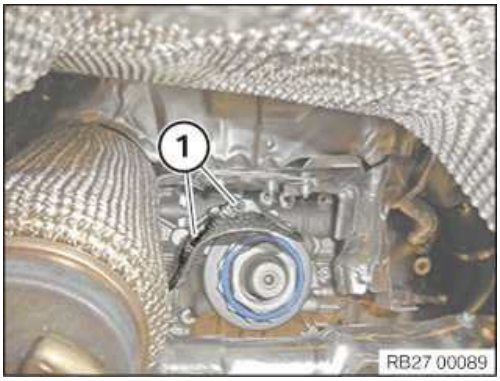
- Loosen screws (1).

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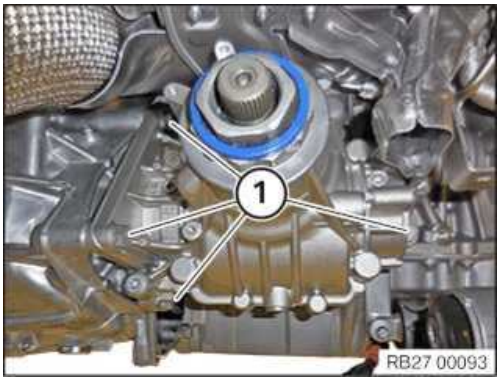


- Pull the intermediate shaft with the support tube (1) out of the transfer box.

11 – Remove transfer box (VTG)



- Loosen screws (1).
- Remove heat shield.



- Loosen screws (1).
- Remove the transfer box (VTG).

12 – Detach the engine from the automatic transmission

Prerequisite

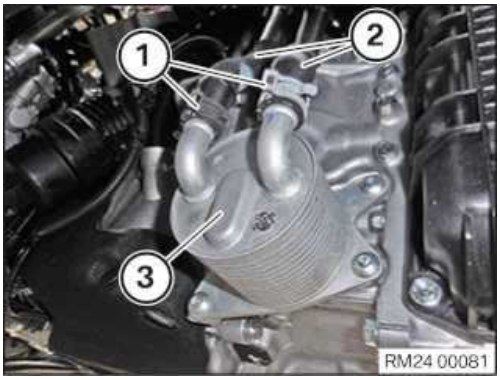
Engine has been removed.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Unfasten hose clamps (1).
- Disconnect coolant hoses (2) from transmission oil cooler (3).
- Catch the emerging coolant.

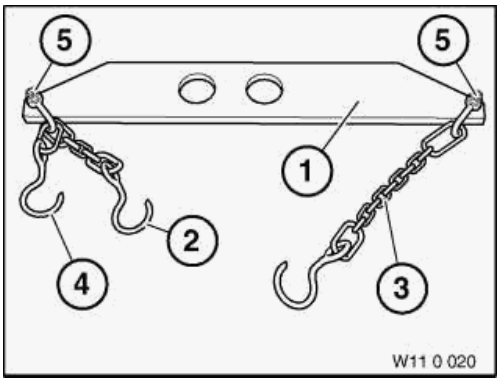
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- Crank engine with special tool **0 493 380 (11 6 480)** at vibration damper in direction of rotation.
- Unscrew the nut (1) of the torque converter.
- Crank engine further and release remaining 5 nuts.



- Stage the workshop crane **2 220 718**.



- Stage the lifting gear .



TECHNICAL INFORMATION

Conduct the following operation with the assistance of a second person.

- Secure the automatic transmission against dropping using a workshop crane **2 220 718** and lifting gear .
- Remove screws (arrows).
- Remove the automatic transmission with help from an auxiliary person and using the workshop crane **2 220 718** including lifting gear and put it to one side.

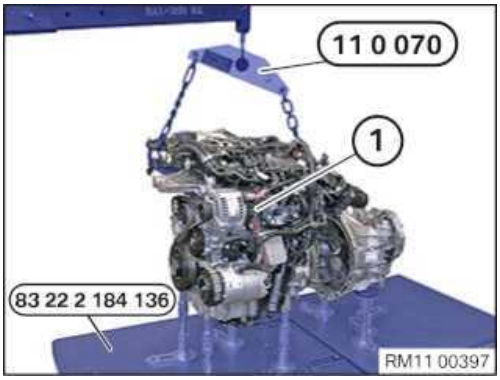
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- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

M8		Tightening torque	21,5 Nm



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Attach engine lifter to special tool and lift engine (1) off lifting table.

13 – Mount engine on assembly stand

CAUTION

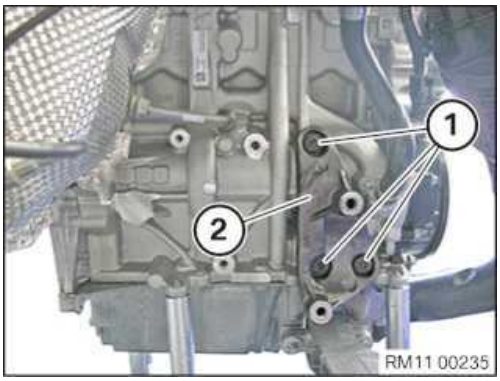
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Loosen screws (1).
- Guide out and remove holder (2).

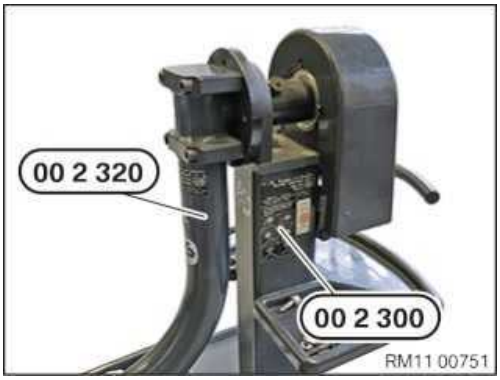
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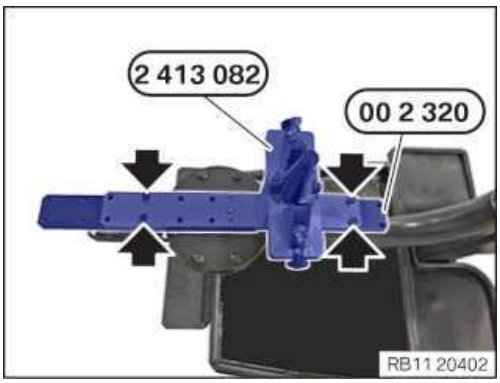
- Position the special tool **2 455 010** on the engine (1).
- Position the standard bolts **M10x30**.
- Tighten the standard bolts (arrows).
-

Special tool 2 455 010 to crankcase

M10x30		Tightening torque	38 Nm



- Prepare the assembly stand **0 495 187 (00 2 300)** with the special tool **0 495 196 (00 2 320)**.



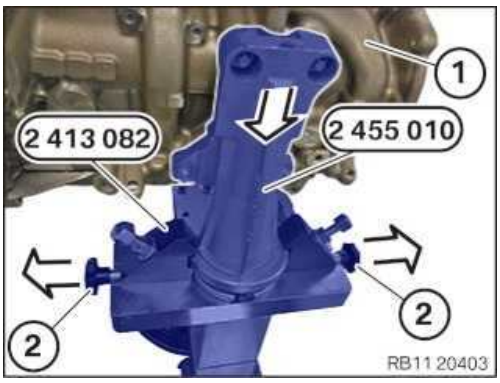
- Screw the special tool to the **0 495 196 (00 2 320)** special tool.
- Tighten screws (arrows).
-

Special tool 11 8 930 to special tool 00 2 320

M14x35		Tightening torque	160 Nm

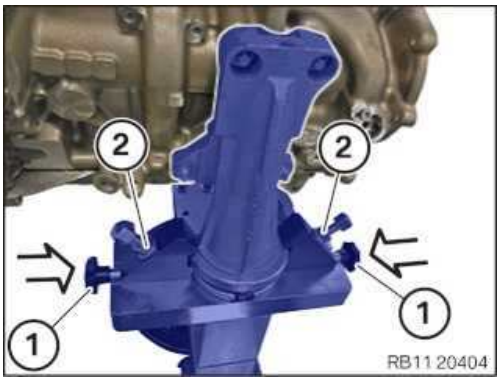


- Position the engine lifter with the special tool and the engine on the special tool **0 495 187 (00 2 300)**.



- Detach the holder (2) in the direction of the arrow.
- Position the engine (1) with the special tool **2 455 010** in the direction of the arrow on the special tool .

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- Lock the holder (1) in direction of arrow.
- Tighten nuts (2).

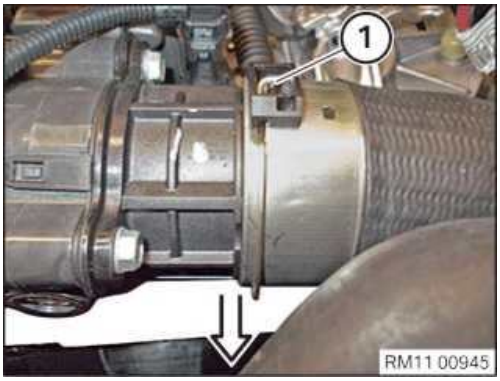
14 – Removing the intake plenum

TECHNICAL INFORMATION

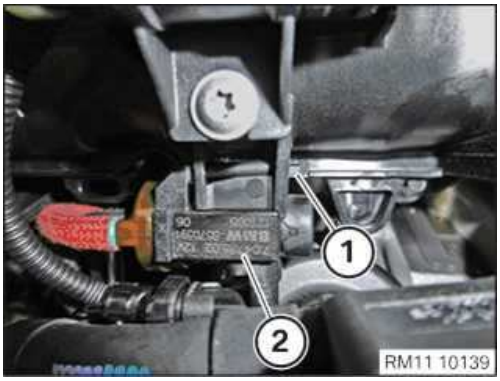
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Unlock the lock (1).

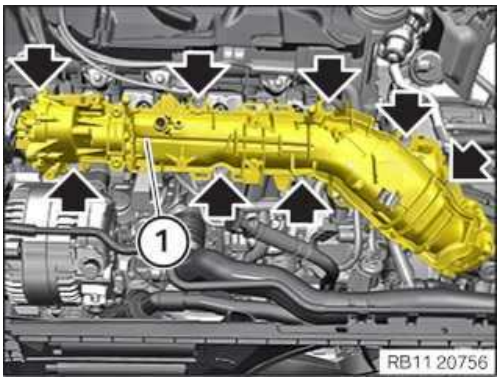


- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.

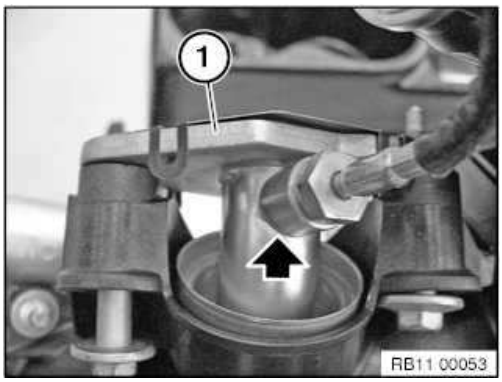


- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.

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- Release the screws (arrows) from the intake plenum (1).
- Guide the intake plenum (1) out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

15 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

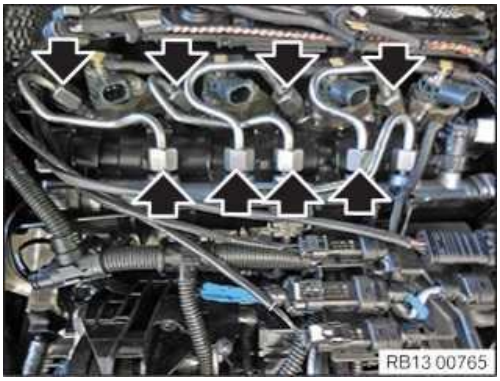
If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release the high pressure lines (arrows) with the special tool .
- Catch and dispose of escaping fuel.
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool .

16 – Detaching leakage oil line from injector

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

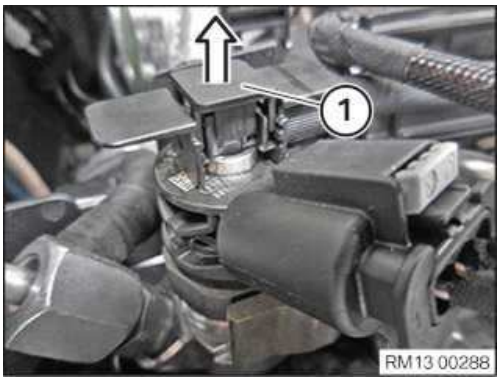
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

17 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

 **Electrostatic discharge.**

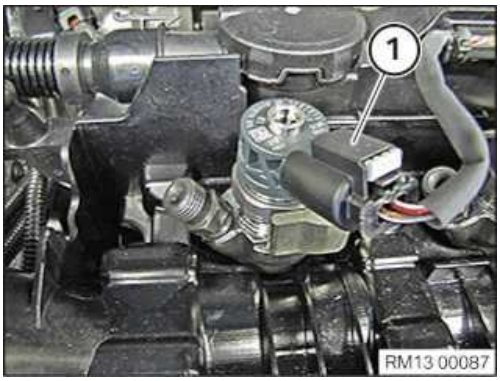
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

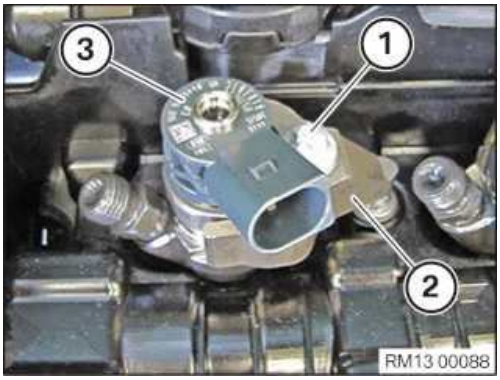
TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.

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- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

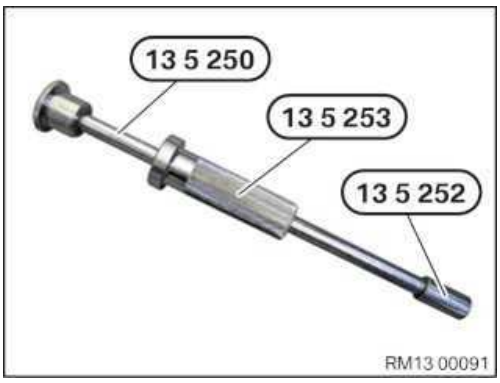
▶ **Loosen stuck injectors**

RISK OF DAMAGE

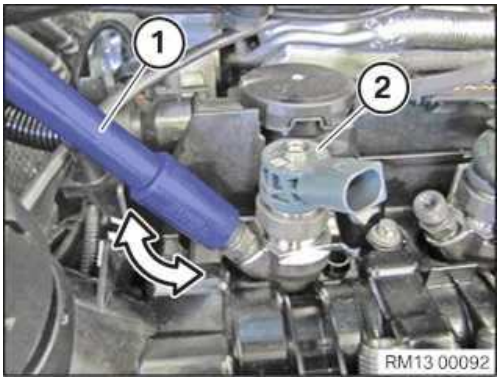
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)** back onto the special tool **0 493 321 (13 5 250)**.



- Screw the special tool (1) **0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1) **0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

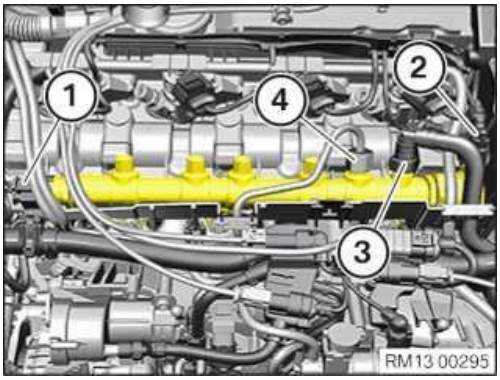
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

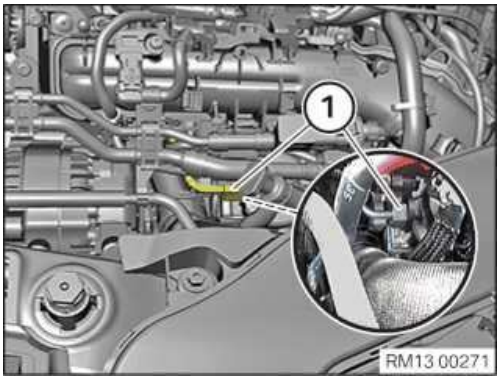
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

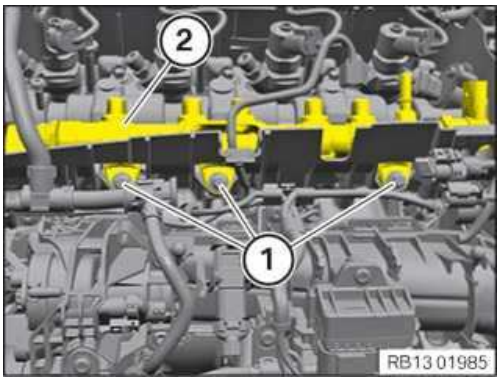


- Unlock and disconnect connector (1).
- Unlock and disconnect connector (2).
- Unlock and release fuel line (3).
- Loosen union nut (4) with special tool .
- Reset special tool early on to avoid bending pressure lines.



- Slacken the union nut (1) on the high pressure pump.

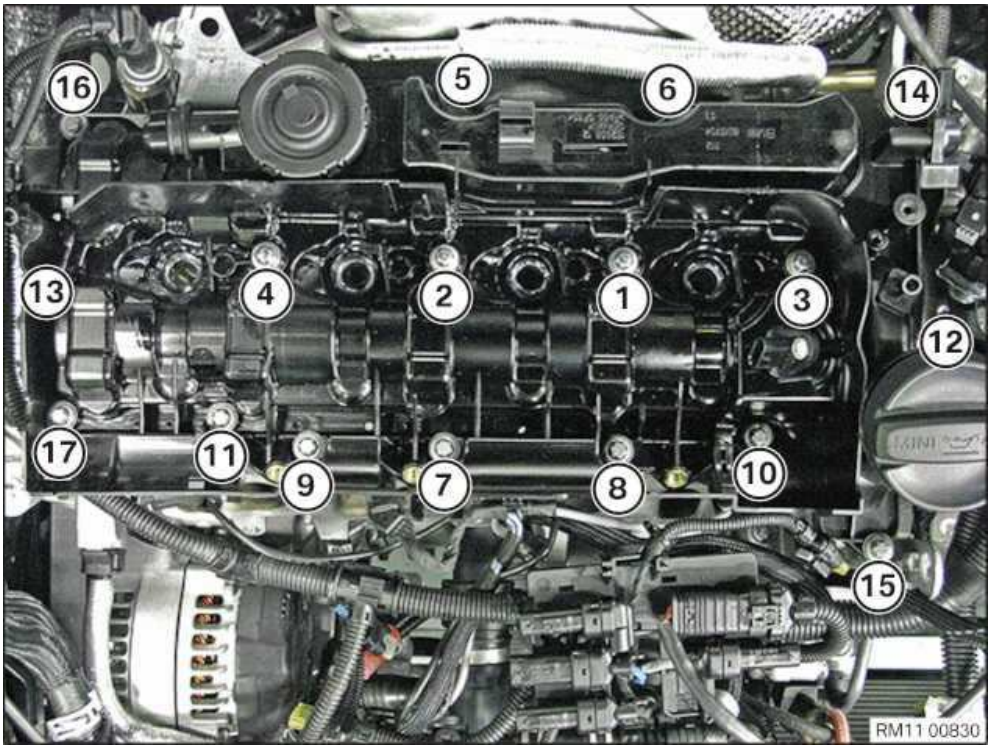
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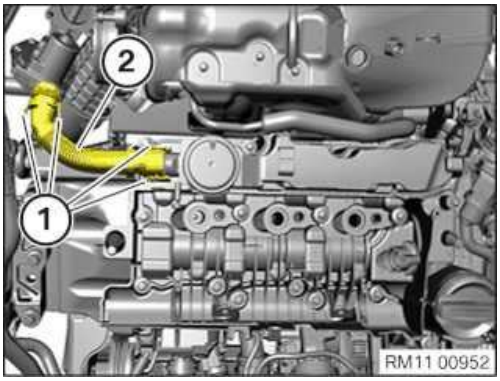
- Loosen screws (1).
- Carefully thread out and remove the rail (2).
- Make sure the pressure line of the high pressure pump is not bent.

19 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover

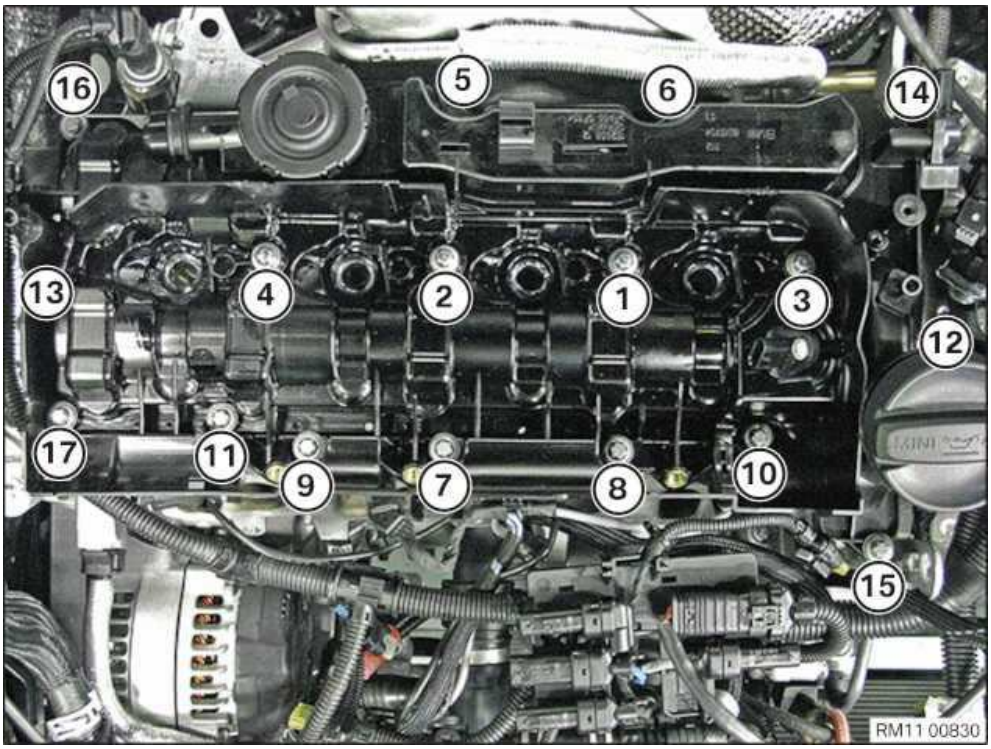


1 to 16 screws of the cylinder head cover.



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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- Loosen screws in the order (17) to (1).
- Remove cylinder head cover by lifting it out.

20 – Checking camshaft timing



- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

Damage to the engine.

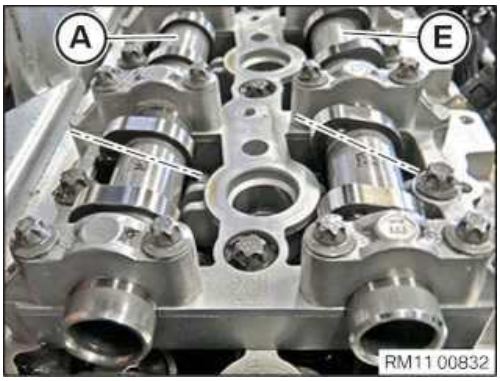
The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

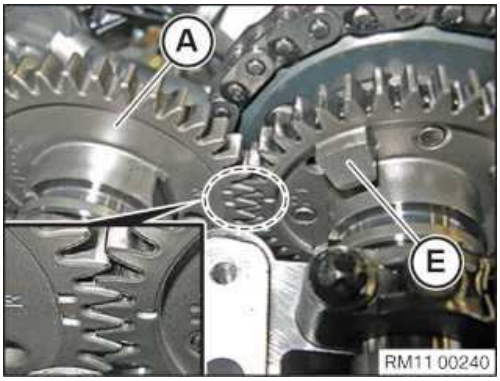
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- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.



- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

21 – Remove chain tensioner piston

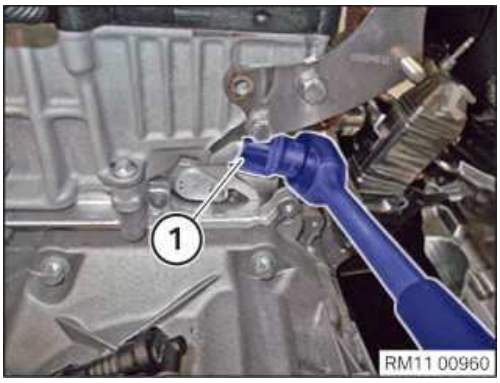
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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

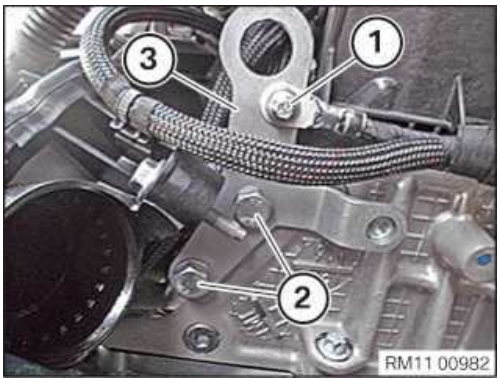


TECHNICAL INFORMATION

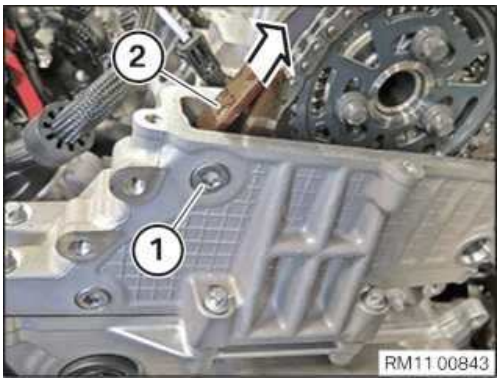
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

22 – Remove the timing chain guide rail

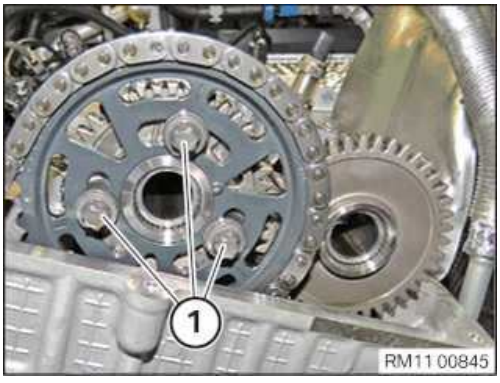


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

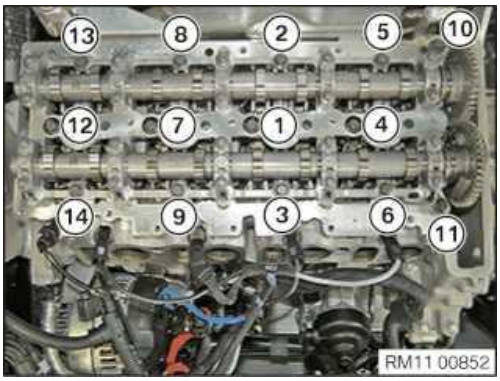
23 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

24 – Removing the camshaft support

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- Evenly loosen all screws in a sequence from (14) to (1).
- Loosen and remove all screws in a sequence from (14) to (1).
  Both camshafts can be removed with the camshaft carrier.
- Remove the camshaft support including camshafts towards the top.

25 – Removing glow elements

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Damage to the glow elements.

Excessive force may damage the glow elements and they may then have to be renewed.

- Handle glow elements with care and do not drop.
- Do not rest the cylinder head on glow elements. Glow elements protrude from the sealing surface of the cylinder head.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

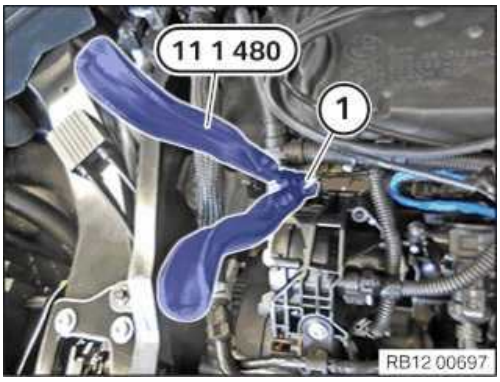
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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

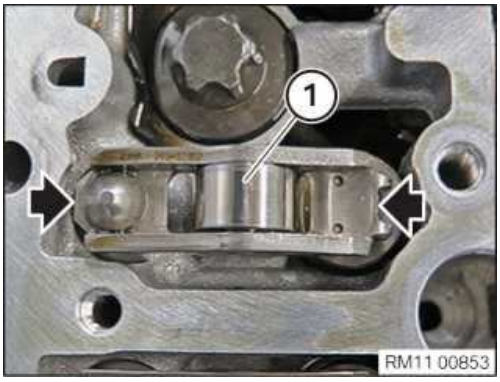


- Unlock and disconnect plug connection (1) using special tool **0 490 796 (11 1 480)**.



- Release the glow elements with the special tool or conventional tools.
- Feed out preheating elements and remove.

26 – Remove roller cam followers



- Guide out and remove all roller cam followers (1) (arrows).
- Place all roller cam followers (1) in order in special tool **0 495 105 (11 4 480)**.

  Roller cam followers that have already been used must be installed in same position again.

27 – Removing the hydraulic valve clearance compensating element

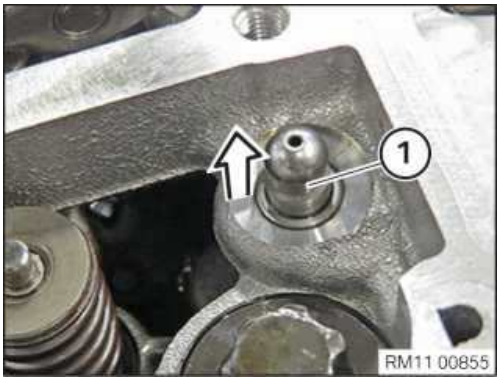
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RISK OF DAMAGE

Contaminant or foreign body.

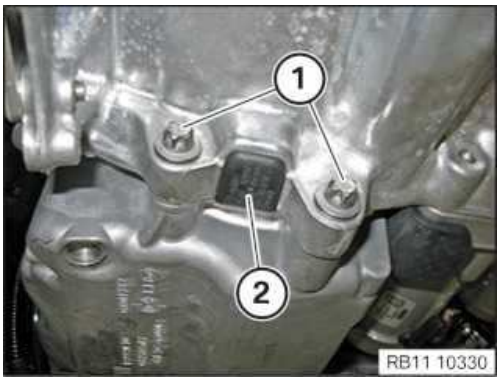
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

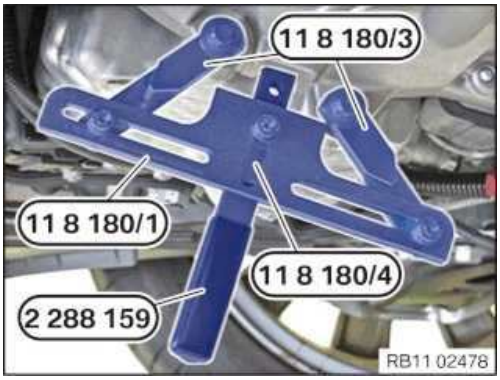


- Remove the hydraulic valve clearance compensating element (1) in the direction of the arrow and place on the special tool **0 495 105 (11 4 480)**.
- Repeat the process on all hydraulic valve clearance compensating elements.

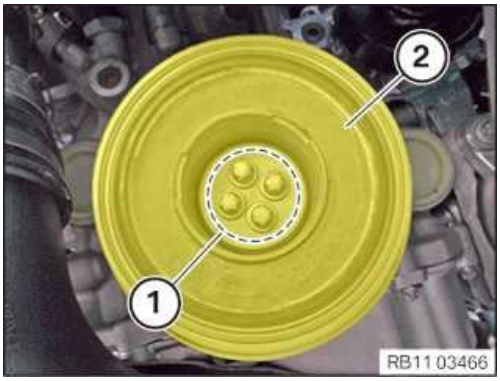
28 – Removing the vibration damper



- Release the transmission bolts (1).
- Remove the protective cap (2).



- Position special tool **0 493 587 (11 8 180)** as illustrated.
- Fasten the special tool **0 493 587 (11 8 180)** to the transmission with transmission bolts.



- Loosen screws in the area (1).
- Remove the vibration damper (2).

29 – Removing flywheel

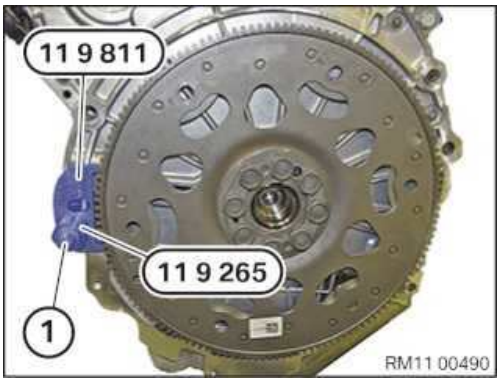
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CAUTION

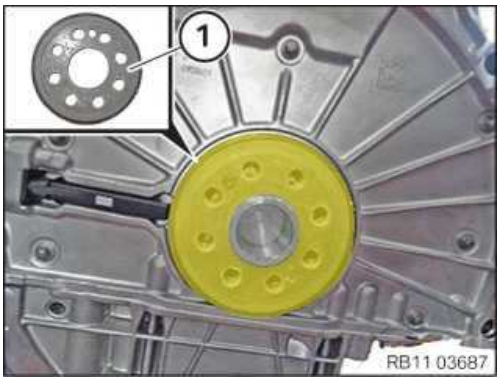
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Secure flywheel with a transmission bolt (1) and the special tools **0 496 171 (11 9 811)** and **0 494 793 (11 9 265)**.
- Unfasten flywheel bolts.
- Remove flywheel.



RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

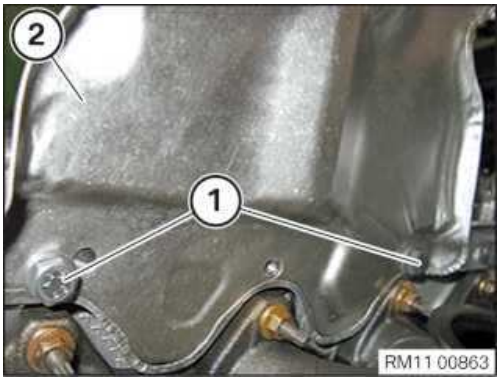
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Remove the increment wheel (1) from the crankshaft and set correctly.

30 – Remove rear timing case cover

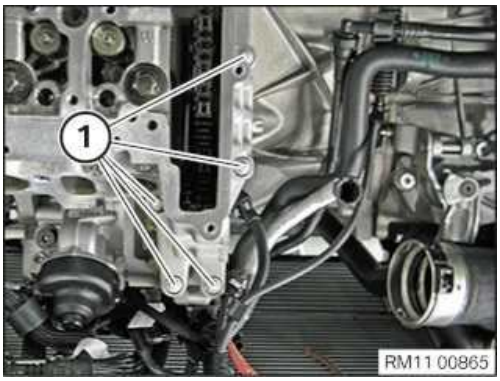
Prerequisite

Transmission is removed.



- Loosen screws (1).
- Feed out the heat shield (2) and place to one side.

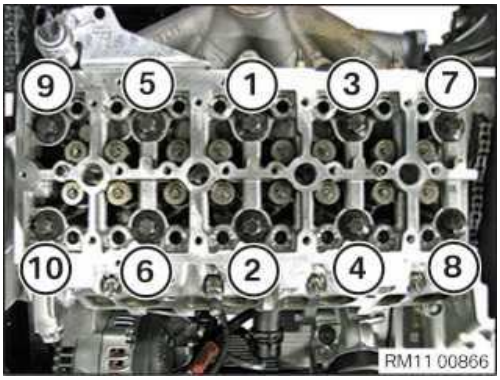
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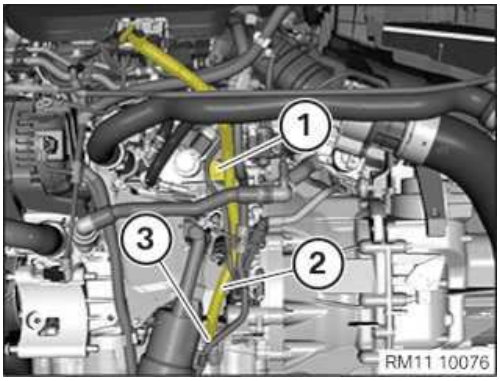
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

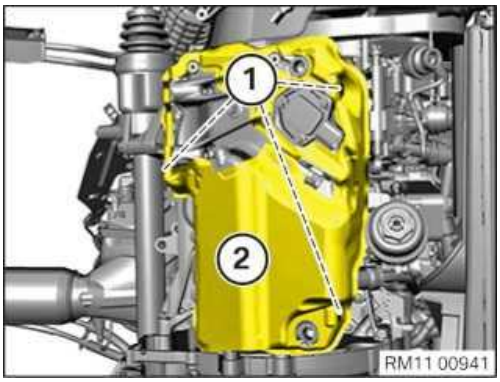
- Loosen screws (1).



- Loosen the cylinder head bolts in the sequence from (10) to (1).
- Remove cylinder head bolts (1) to (10) with washers.
- Remove cylinder head.

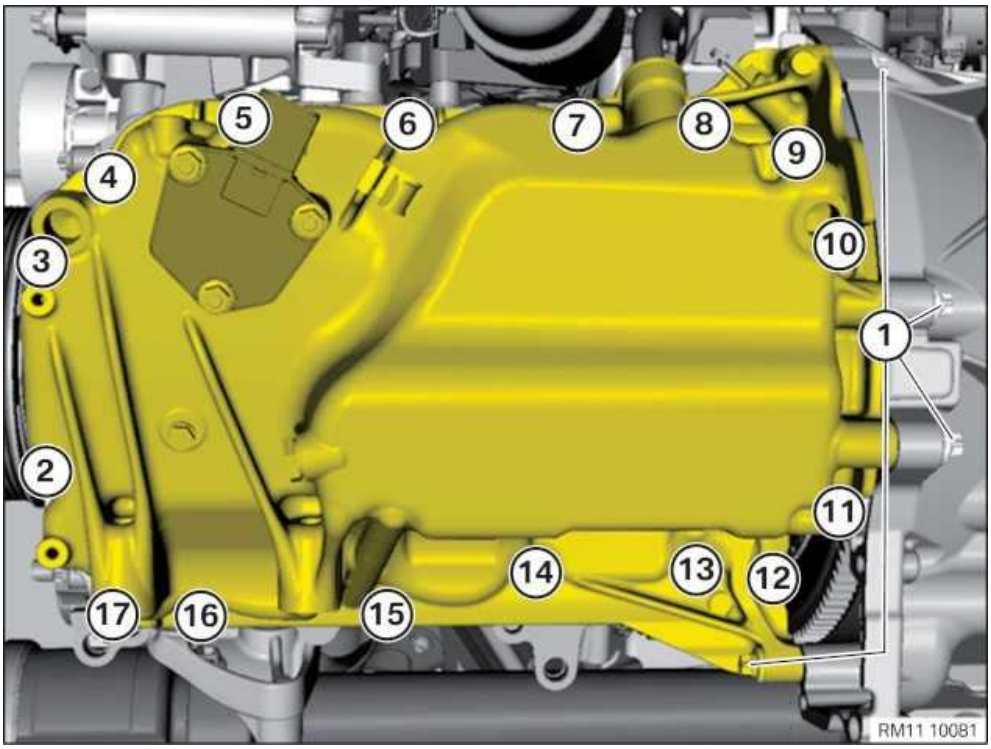


- Loosen screw (1).
- Disconnect the guide tube (2) for the oil dipstick toward the top from the oil sump and remove it.
- Remove sealing ring (3) from oil sump if necessary.

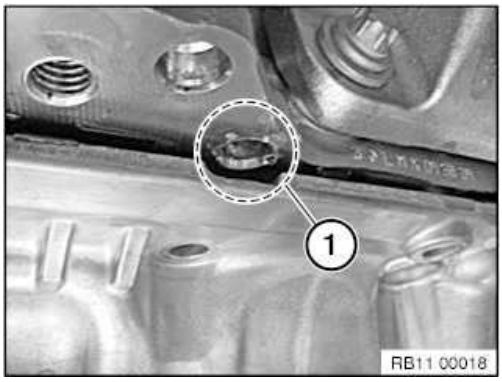


- Expanding rivets (1) on both sides of the acoustic cover (2).
- Feed out and remove the acoustic cover (2).

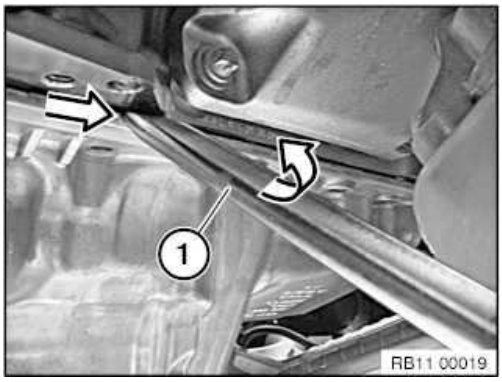
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- Loosen the transmission bolts (1) on the oil sump.
- Loosen screws (2) to (17).

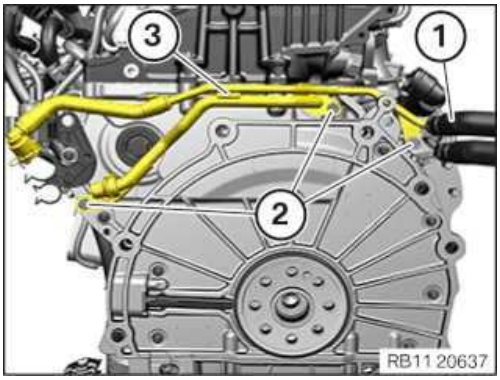


- Release oil sump only in area (1).



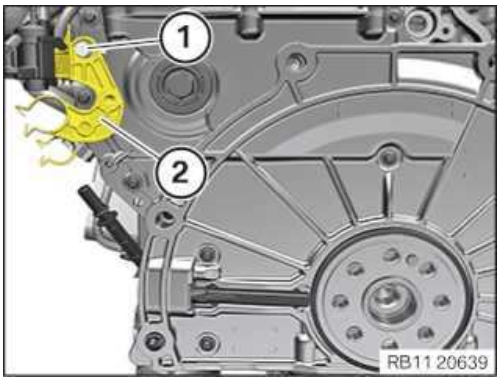
- Detach the oil sump with a suitable mounting lever (1) carefully at the point provided.
- Secure the oil sump against falling.

▶ **If installed: Remove coolant line of the SCR metering module**

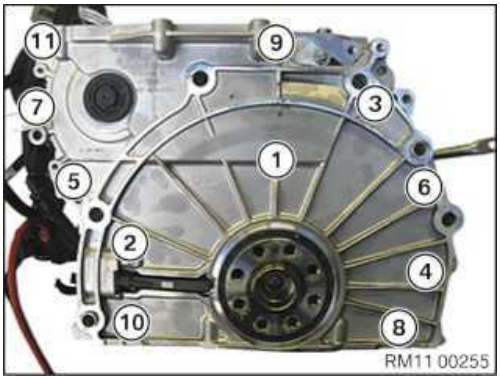


- Unlock and disconnect the coolant hose (1).
- Loosen screws (2).
- Remove the coolant line (3).

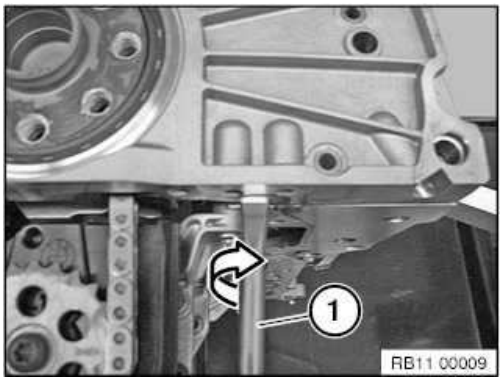
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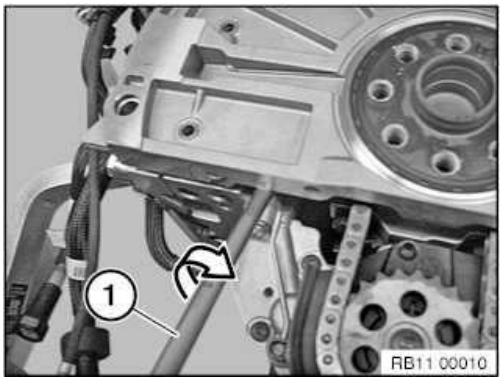
- Loosen screw (1).
- Guide out and remove holder (2).



- Loosen screws in the order (11) to (1).



- Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.



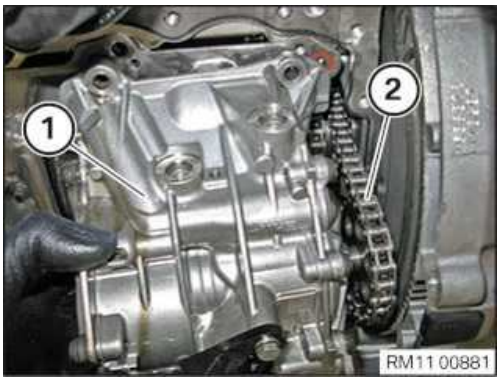
- Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.
- Remove the timing case cover.

31 – Remove the oil vacuum pump



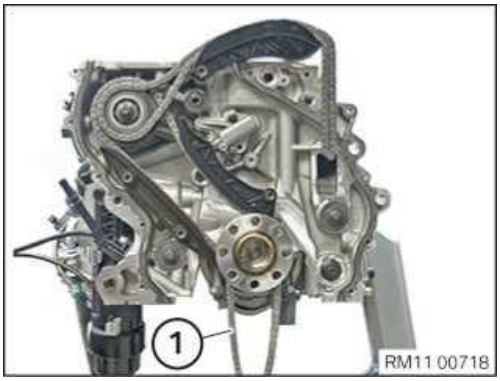
- Loosen screws (1) of the oil vacuum pump (2).

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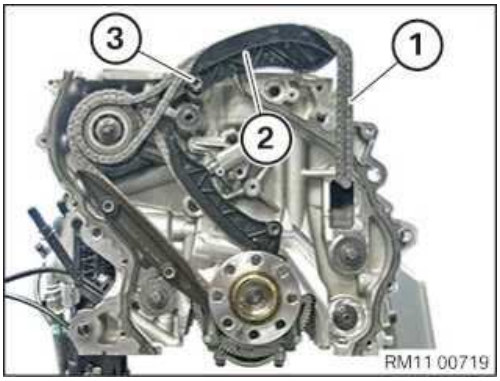


- Remove oil vacuum pump (1) and remove from the drive chain (2).

32 – Remove both timing chains

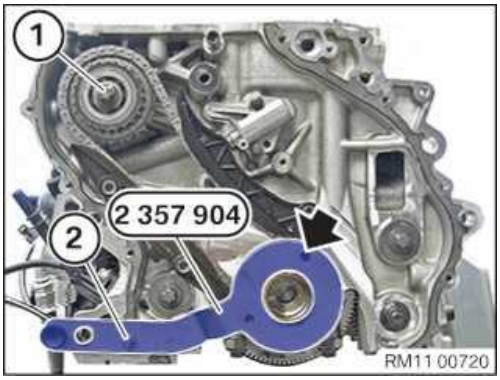


- Remove drive chain (1) for oil pump.

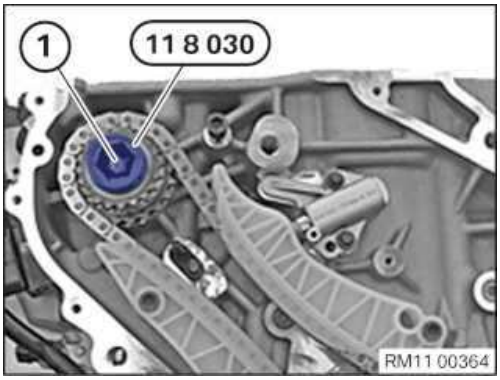


- Remove the timing chain (1) for the camshafts.
- Remove the tensioning rail (2) from the bearing journal (3).

  Bearing journal (3) does not have to be disassembled.

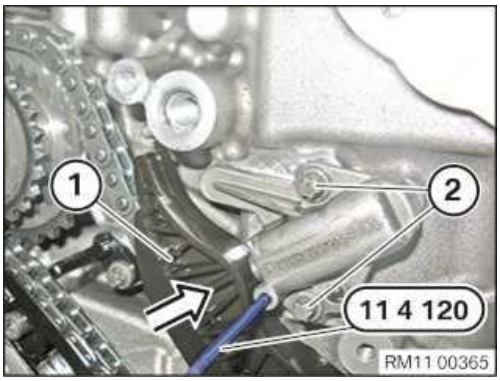


- Secure crankshaft to release central bolt (1) of high pressure pump.
- Position crankshaft with guide pin (arrow).
- Secure special tool **2 357 904** with bolt (2) on crankcase.
- Release central bolt (1) of high pressure pump; do not remove.

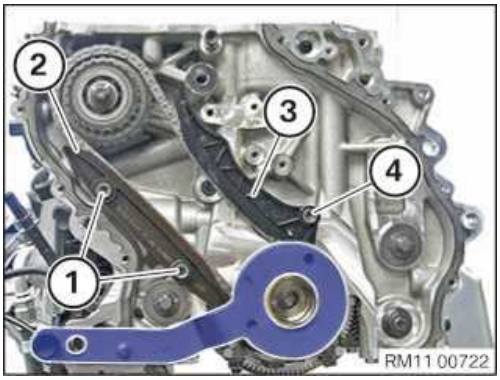


- Screw special tool **0 496 725 (11 8 030)** into sprocket of high pressure pump.
- Unscrew central bolt (1) of high pressure pump until central bolt can be supported on special tool **0 496 725 (11 8 030)**.
- Continue turning central bolt (1) until camshaft sprocket is released from high pressure pump shaft.

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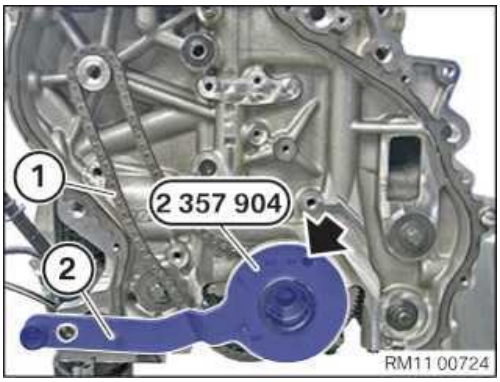
- Press chain tensioner in with tensioning rail (1) by hand in the direction of the arrow until the special tool **0 491 012 (11 4 120)** can be positioned.
- Loosen screws (2).
- Remove chain tensioner.



- Loosen both bearing journals (1).
- Remove the guide rail (2).
- Loosen the bearing journals (4).
- Remove the tensioning rail (3).



- Remove bolt and camshaft sprocket (1) of high pressure pump.



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Unscrew the bolt (2) and remove the special tool **2 357 904**.
- Remove the timing chain (1).

33 – Removing the oil deflector

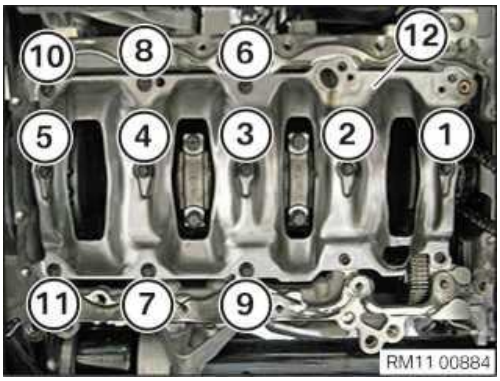
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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- Loosen screws in the order (11) to (1).
- Guide out and remove the oil deflector (12).

34 – Remove the connecting rod bearing cap

RISK OF DAMAGE

Engine damage caused by incorrectly installed bearing shells and bearing supports.

Engine damage may result from incorrectly installing bearing shells and bearing supports.

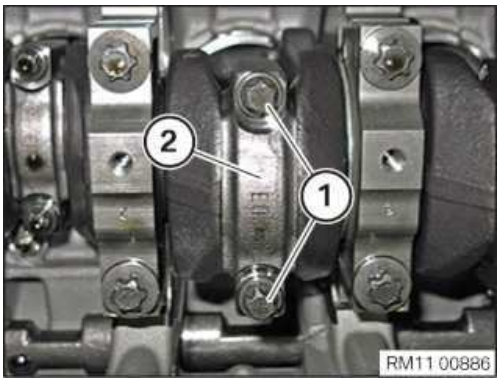
- Always install all bearing shells and bearing supports in the same position from which they were removed.

TECHNICAL INFORMATION

The connecting rods of the engine are balanced and are matched to each other.
A single connecting rod is not permitted to be replaced. Always replace all connecting rods.



- Turn the crankshaft until the connecting rod bearing journal (1) reaches a vertical position.



- Unscrew the connecting rod bolts (1).

TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.
Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

- Remove the connecting rod bearing cap (2) and put to one side in the correct order.

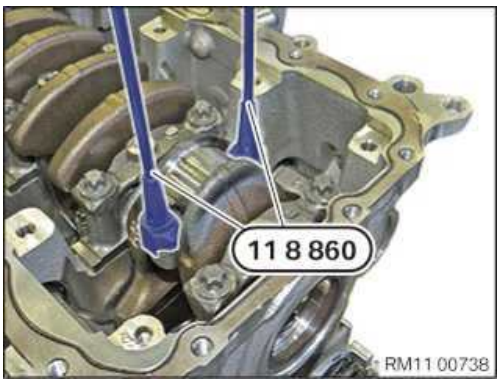
35 – Removing the piston with connecting rod

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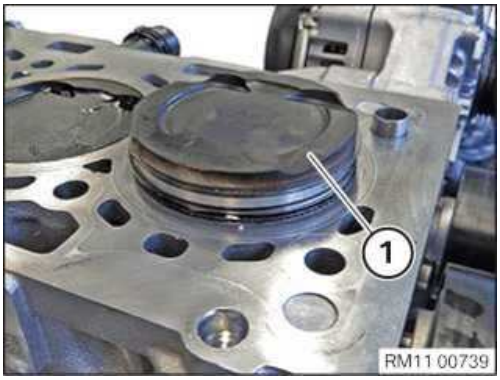
TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.



- Screw special tool **0 496 144 (11 8 860)** in at large connecting rod eye.



RISK OF DAMAGE

Damage on the cylinder wall and oil spray nozzles.

Major force can scratch the cylinder wall and bend the oil spray nozzles.

- Carefully move the piston and connecting rod in the engine block.

- Remove the piston (1) and connecting rod.

36 – Remove the connecting rod bearing shells

RISK OF DAMAGE

Engine damage caused by incorrectly installed bearing shells and bearing supports.

Engine damage may result from incorrectly installing bearing shells and bearing supports.

- Always install all bearing shells and bearing supports in the same position from which they were removed.

TECHNICAL INFORMATION

The connecting rods of the engine are balanced and are matched to each other.

A single connecting rod is not permitted to be replaced. Always replace all connecting rods.



TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

- Remove the connecting rod bearing (2) from the connecting rod (1) and store it properly.

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TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

- Remove the connecting rod bearing (2) from the connecting rod bearing cap (1) and store it properly.

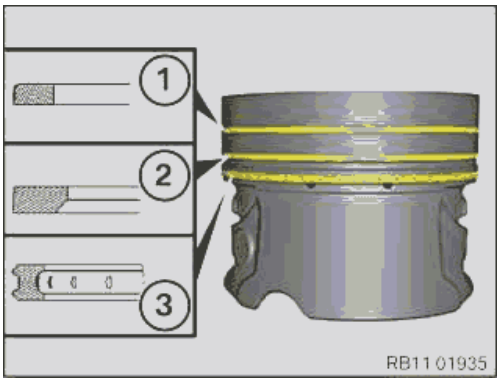
37 – Measure side clearance of piston rings

RISK OF DAMAGE

Damage to the piston rings.

Piston rings can bend or break due to large applications of force.

- Handle piston rings carefully.
- Only bend piston ring up lightly.



TECHNICAL INFORMATION

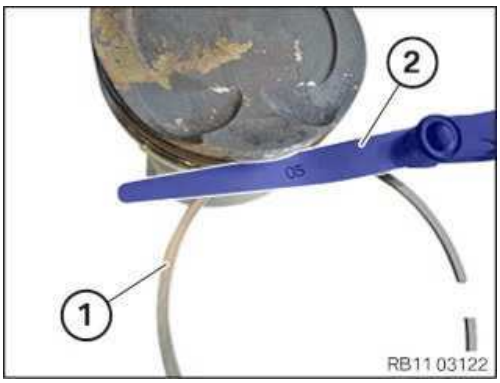
- Note the installation position of the component. The component may be installed in various installation positions.

- Mounting orientation of the piston rings

Position number	Description
1	1. Piston ring (plain rectangular compression ring)
2	2. Piston ring (taper faced piston ring)
3	3. Piston ring (oil scraper ring with spiral expander)

Check

- Install all piston rings (1) consecutively as shown in the piston ring groove. Measure the side clearance with a feeler gauge (2).



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desired state

- The side clearance of the piston rings is within the tolerance.

Side clearance of piston rings

Clean all components before measuring the side clearance.	
Side clearance of the plain rectangular compression ring	0,17 mm ... 0,27 mm
Side clearance of the taper faced piston ring	0,30 mm ... 0,50 mm
Side clearance of the oil scraper ring with spiral expander	0,2 mm ... 0,4 mm

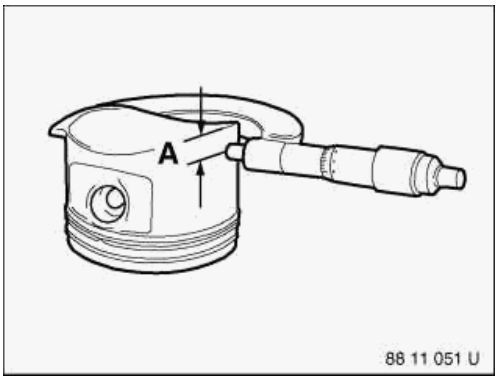
Result

» The side clearance of the piston rings is outside of the tolerance.

Measure

- Renew the piston ring.

38 – Measure the piston diameter



Check

- Position the measuring bolt in the area (A) and measure the piston installation clearance 90 ° transversely to the gudgeon pin.

Piston diameter

Measure the piston diameter at distance (A) from the lower end of the piston skirt.	
Distance (A) to the lower end of the piston skirt	17 mm
Nominal dimension of piston diameter	83,936 mm ... 83,954 mm

Result

» The piston does not correspond to the specifications.

Measure

- Renew the piston.

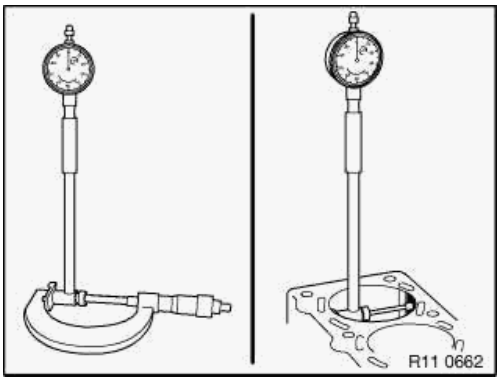
39 – Measure the cylinder bores

Prerequisite

Cylinder barrel is cleaned.

Check

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- Adjusting measuring screw to nominal dimension of cylinder bore.

Cylinder bore

Diameter of cylinder bore	84,00 mm ... 84,018 mm
Permitted irregularity of the cylinder bore	0,01 mm
Permitted conicity of the cylinder bore	0,01 mm

- Insert internal measuring device into measuring screw and set to zero.
- With the internal measuring device, measure the cylinder at the following points. Check the deviations from the nominal dimension.
  - Lower third of the cylinder bore in direction of travel,
  - Lower third of the cylinder bore transversely to direction of travel,
  - Middle third of the cylinder bore in direction of travel,
  - Middle third of the cylinder bore transversely to direction of travel,
  - Upper third of the cylinder bore in direction of travel,
  - Upper third of the cylinder bore transversely to direction of travel.

Cylinder bore

Diameter of cylinder bore	84,00 mm ... 84,018 mm
Permitted irregularity of the cylinder bore	0,01 mm
Permitted conicity of the cylinder bore	0,01 mm

Result

» Cylinder does not correspond to the specifications.

Measure

- Replace motor.

  Parts: Engine

MAIN WORK

40 – Remove crankshaft

RISK OF DAMAGE

Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

- Comply with the regulations for the installation and disassembly.
- Perform work with care.

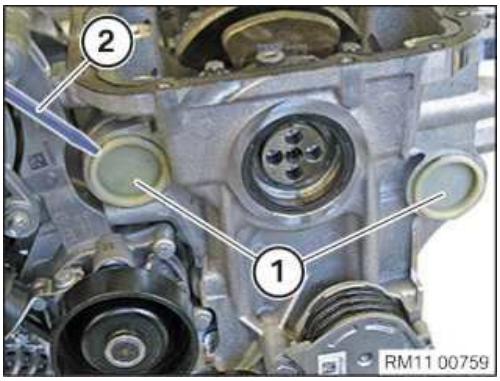
RISK OF DAMAGE

Contaminant or foreign body.

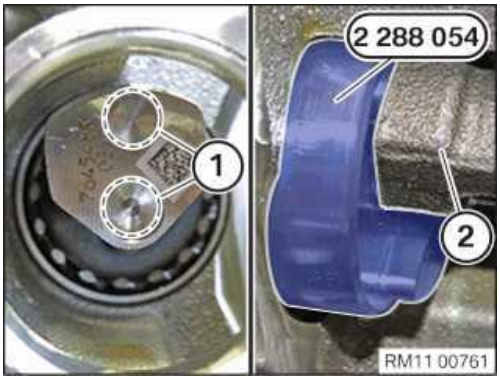
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

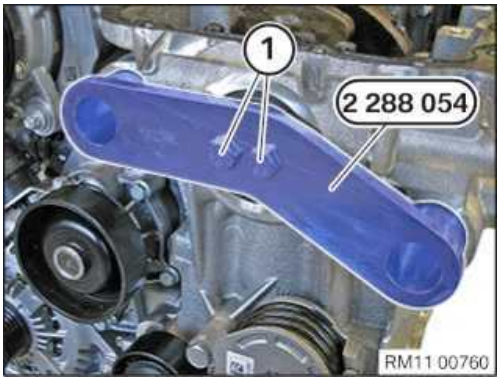
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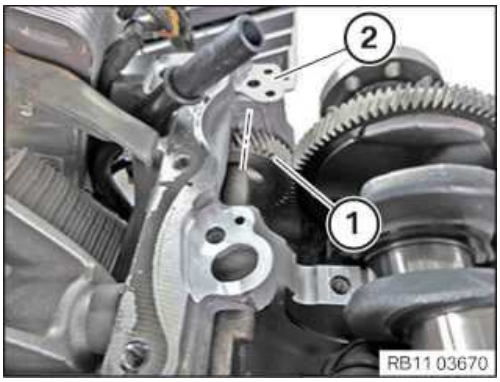
- Remove the sealing cap (1) with a suitable tool (2).



- Rotate the crankshaft to the **TDC of the first cylinder**.
- The special tool **2 288 054** must be positioned in the guides (1) of the counterbalance shafts (2).



- Secure special tool **2 288 054** with screws (1) to the crankshaft.
- Tighten the screws (1).

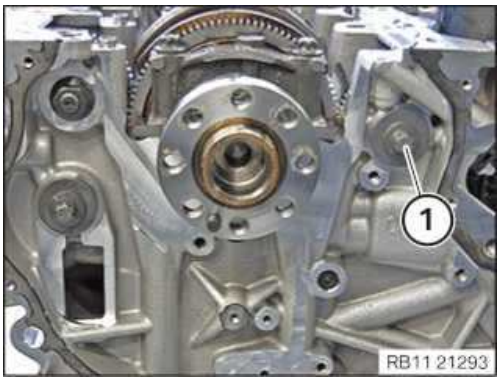


- The counterbalance shaft on the intake side (1) must be re-installed in the same position.
- Mark the position of the gearwheel of the counterbalance shaft on the intake side (1) in relation to the crankcase (2).

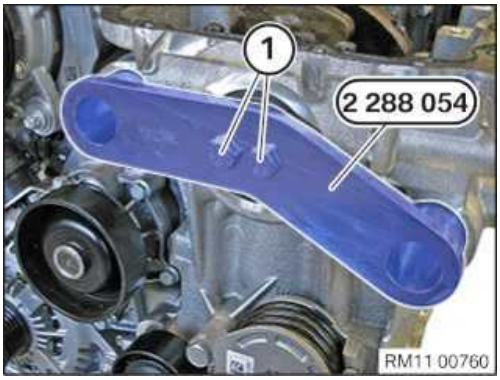


- The intermediate wheel of the exhaust side consists of a fixed wheel and a moving wheel and it must be pretensioned using special tool **0 495 131 (11 5 370)**.
- Pretension the intermediate wheel of the exhaust side using special tool **0 495 131 (11 5 370)** in the illustrated position.
- When reusing the intermediate wheel of the exhaust side, it must remain pretensioned in special tool **0 495 131 (11 5 370)** until its reinstallation.

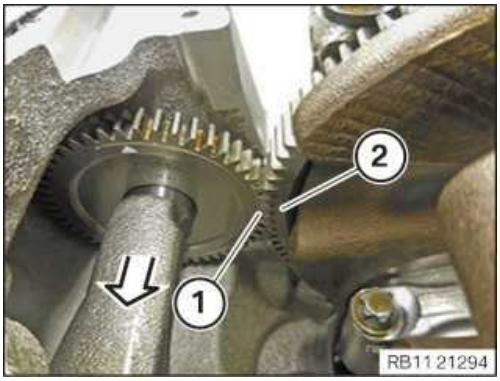
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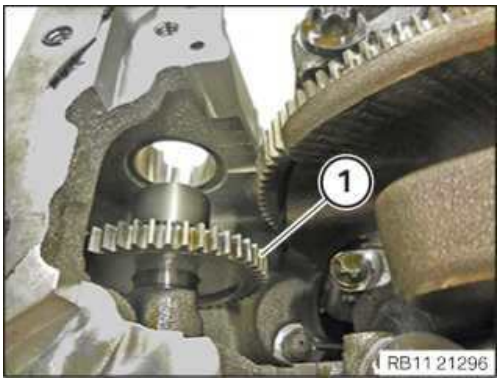
- Loosen screws (1) on the counterbalance shaft on the intake side.



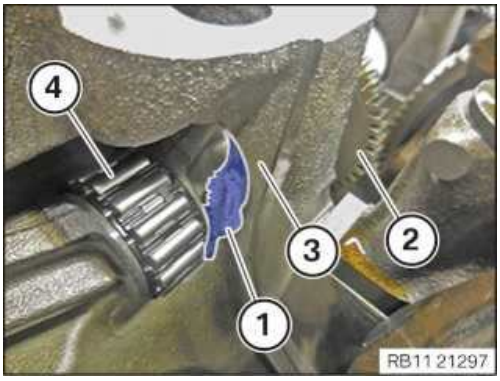
- Loosen screws (1).
- Guide the special tool **2 288 054** out and remove.



- Guide out counterbalance shaft (1) on the intake side from crankshaft (2) in the **direction of the arrow**.

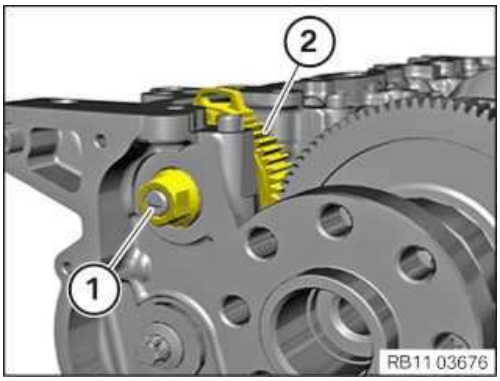


- **Carefully** place aside counterbalance shaft (1) on the intake side.

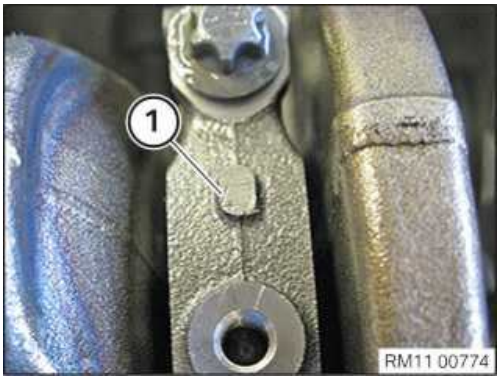


- Position a clean lint-free cleaning rag (1) between counterbalance shaft (2) on the intake side and crankcase (3).
- Ensure that needle bearing (4) is not **damaged**.

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- Unfasten nut (1).
- Remove the gear (2) using special tool **0 495 131 (11 5 370)**.



RISK OF DAMAGE

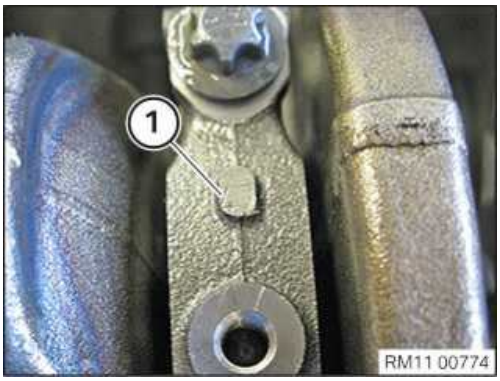
Engine damage caused by incorrectly installed bearing shells and bearing supports.

Engine damage may result from incorrectly installing bearing shells and bearing supports.

- Always install all bearing shells and bearing supports in the same position from which they were removed.

- Make sure that the mounting orientation is maintained.

  All main bearing caps (1) are marked: **Bearing positions 1 to 5.**



RISK OF DAMAGE

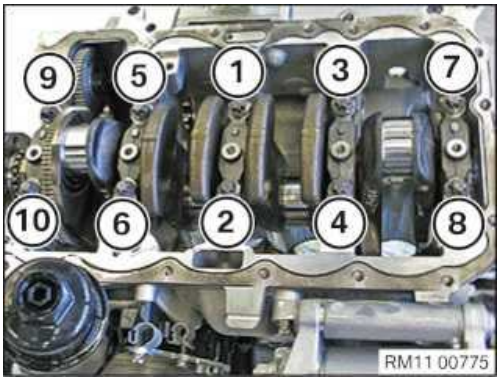
Engine damage caused by incorrectly installed bearing shells and bearing supports.

Engine damage may result from incorrectly installing bearing shells and bearing supports.

- Always install all bearing shells and bearing supports in the same position from which they were removed.

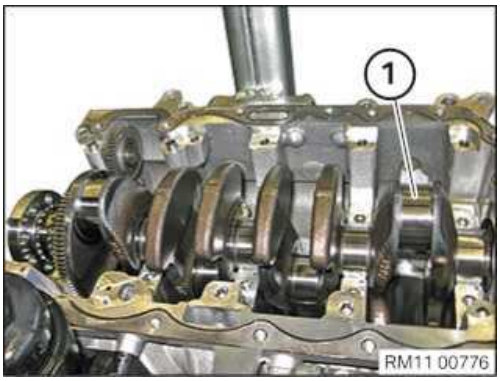
- Make sure that the mounting orientation is maintained.

  All main bearing caps (1) are marked: **Bearing positions 1 to 5.**



- Gradually detach the crankshaft bearings in the sequence (10) to (1).
- Remove the main bearing caps **1 to 5**.

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CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

TECHNICAL INFORMATION

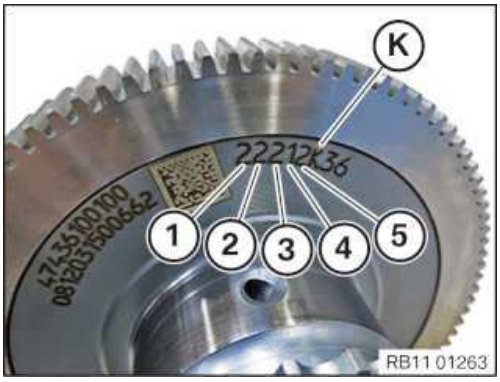
Conduct the following operation with the assistance of a second person.

- Remove the crankshaft (1) with a **second person** and carefully set it aside.

41 – Determine the classification of the main bearing shells and the guide bearing shells



- K = Clutch side
- Item numbers (5) to (1) describe the bearing seats 7 to 1 (key performance indicator on each of the crankshaft bearing caps).
- Enter the code letter on the crankcase in the table.



- K = Clutch side
- Item numbers (1) to (5) describe the bearing seats 1 to 5 (key performance indicator on each of the crankshaft bearing caps).
- Enter the identification numbers on the crankshaft in the table.

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- Enter the code letters and coefficients of the crankcase and the crankshaft.

	Code letter on the crankcase	**Key performance indicator** on the crankshaft
Bearing seat 1		
Bearing seat 2		
Bearing seat 3		
Bearing seat 4		
Bearing seat 5		
Bearing seat 6		
Bearing seat 7		

- The main bearing shells and guide bearing shells are indicated in **colour or with numbers**.
- Use the table below to determine the colours of the main bearing shells and the guide bearing shells in the **crankcase**:

	1	2	3
A	Blue = 1	Blue = 1	Blue = 1
B	Green = 2	Green = 2	Green = 2
C	Brown = 3	Brown = 3	Brown = 3

- Use the table below to determine the colours of the main bearing shells and the guide bearing shells in the **crankshaft bearing caps**:

	1	2	3
A	Blue = 1	Green = 2	Brown = 3
B	Blue = 1	Green = 2	Brown = 3
C	Blue = 1	Green = 2	Brown = 3

42 – Renewing main bearing shells and guide bearing shells

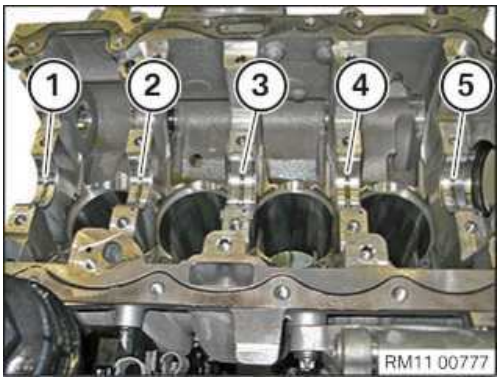
RISK OF DAMAGE

Engine damage caused by incorrectly installed bearing shells and bearing supports.

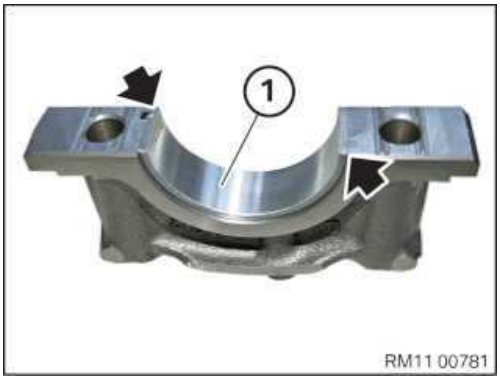
Engine damage may result from incorrectly installing bearing shells and bearing supports.

- Always install all bearing shells and bearing supports in the same position from which they were removed.

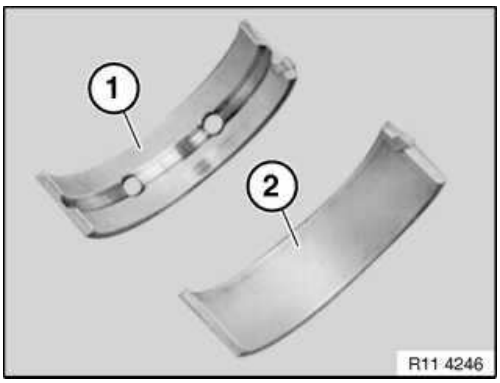
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- Feed out and remove the main bearing shell (1) and (2)- and (4) and (5) (with lubricating groove) from the crankcase.
- Feed out and remove the guide bearing shell (3) (with lubricating groove) from the crankcase.



- Feed out and remove the main bearing shells (1) from the crankshaft bearing caps (1) - and (2) and (4) and (5).
- Feed out and remove the guide bearing shell (1) from the crankshaft bearing cap (3).



- Replace main bearing shells with lubricating groove (1) and the main bearing shells (2).

  Parts: Main bearing shells



- Replace guide bearing shells with lubricating groove (1) and guide bearing shells (2).

  Parts: Guide bearing shells



- Make sure the guide bearing shells and main bearing shells with lubricating groove (1) are correctly positioned in the crankcase.

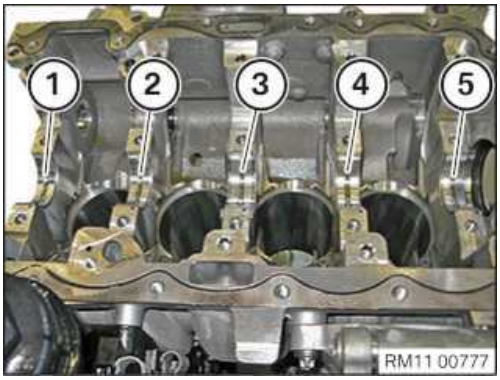
  All guide bearing shells and main bearing shell with lubricating groove (1) in the crankcase are protected against incorrect assembly (mark).

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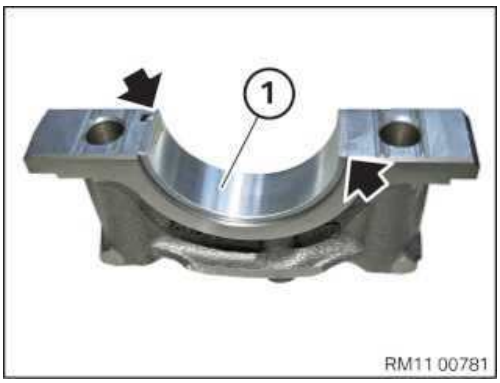


- Make sure the guide bearing shells and main bearing shells (1) are correctly positioned in the crankshaft bearing cap.

  All guide bearing shells and the main bearing shells (1) in the crankshaft bearing caps have protection against incorrect assembly (mark).

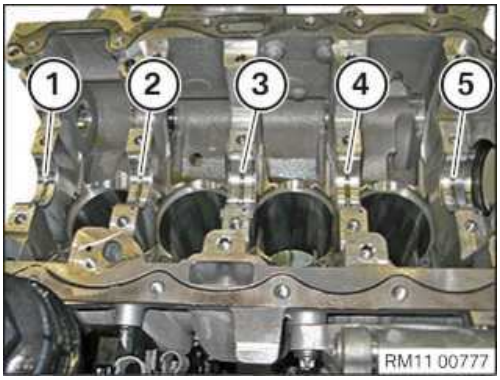


- Insert and install the main bearing shell with lubricating groove (1) and (2) and (4) and (5) in the crankcase.
- Oil main bearing shell with lubricating groove (1) and (2) and (4) and (5).
- Insert and install the guide bearing shell (3) (with lubricating groove) in the crankcase.
- Oil guide bearing shell with lubricating groove (3).



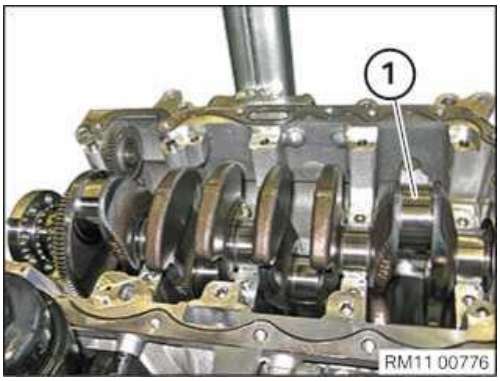
- Insert and install the main bearing shells (1) from the crankshaft bearing caps (1) - and (2) and (4) and (5).
- Oil main bearing shell (1) and (2) and (4) and (5).
- Insert and install the guide bearing shell (3) in the crankshaft bearing cap.
- Oil the guide bearing shell (3).

43 – Installing the crankshaft



- Ensure correct installation of the main bearing shells (1) to (5) with the guide lug.

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CAUTION

Heavy component.

Heavy components can lead to injury or damage.

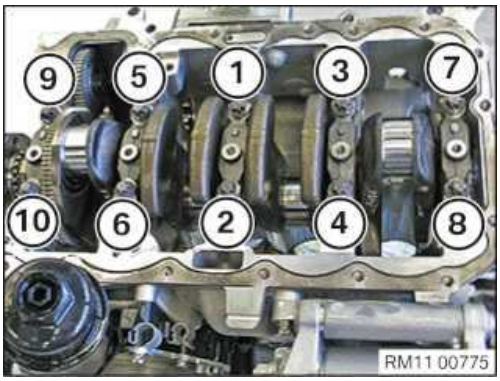
- Remove and install heavy components with the aid of another person/other persons.

TECHNICAL INFORMATION

Conduct the following operation with the assistance of a second person.

- Install the crankshaft (1).

  Parts: Crankshaft



- Observe the allocation and numbering 1 to 5 of the main bearing caps.

  Assign the main bearing caps according to the order of the cylinders.
- Do not install the main bearing cap in an incorrect position.
- Ensure that the main bearing cap is positioned mounted.

  The main bearing cap must not be mounted rotated by 180°!

  The main bearing caps are coded to prevent incorrect assembly.
- Align main bearing caps exactly.
- Replace main bearing bolts.

  Parts: Bolts
- Tighten the main bearing bolts in the sequence (1) to (10).

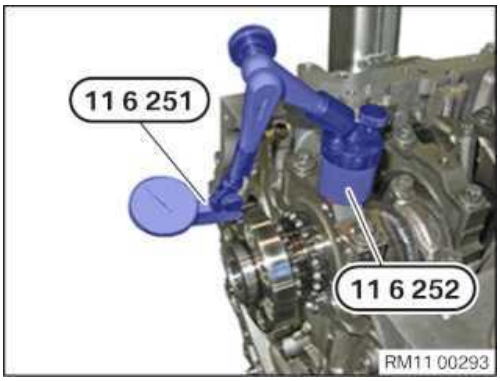
Main bearing cap to crankcase

M10x85	Replace screws.	1. tightening torque	25 Nm
		2. tightening torque	50 Nm
		3. Angle of rotation	60 °
		4. Angle of rotation	60 °

▸ **Check the crankshaft side clearance**

Check

- Set up the dial gauge **0 493 144 (11 6 251)** with the tripod **0 493 145 (11 6 252)** from the special tool **0 493 143 (11 6 250)** at the crankshaft.



Axial play of crankshaft

Equipment installation status	0,090 mm ... 0,273 mm
Operating condition	0,11 mm ... 0,314 mm

Result

» The side clearance has been exceeded.

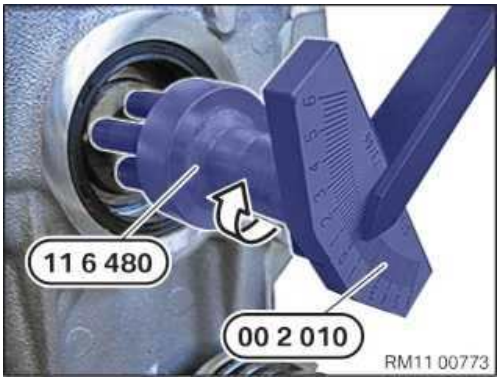
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Measure

- Renew worn components.

▸ **Check the coefficient of friction for the crankshaft**

Check



- Turn the crankshaft clockwise with the special tool **0 490 130 (00 2 010)** and compare the reading on the scale to the maximum permitted torque.

Maximum permitted torque of the crankshaft

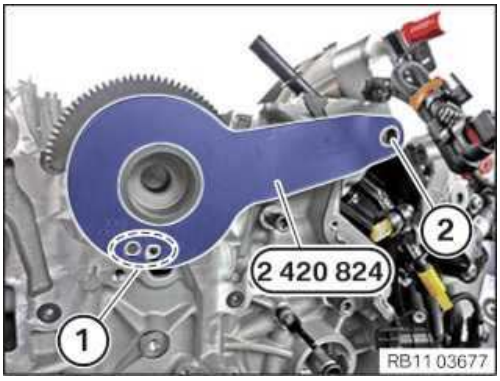
	max. 2 Nm

Result

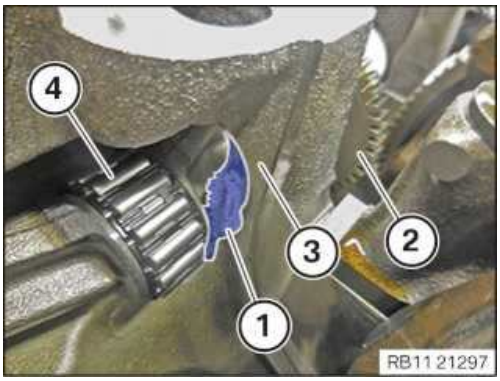
» The maximum permitted torque is exceeded.

Measure

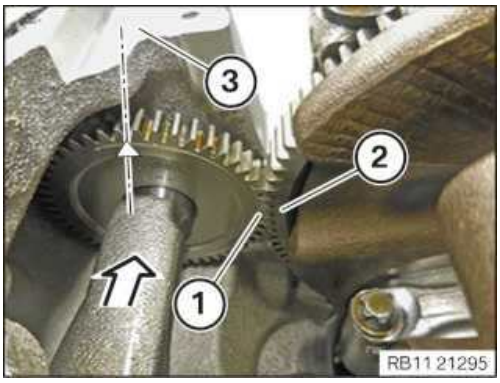
- Correct the radial clearance.



- Bring or adjust crankshaft (2) to the **TDC position** .
- The special tool **2 420 824** in the area (1) is labelled with the different engine versions.
- Install the special too **2 420 824** with the correct bore or on the crankshaft.
- Using the special tool **2 420 824** secure the crankshaft to the fitting sleeve (2) in the TDC position.

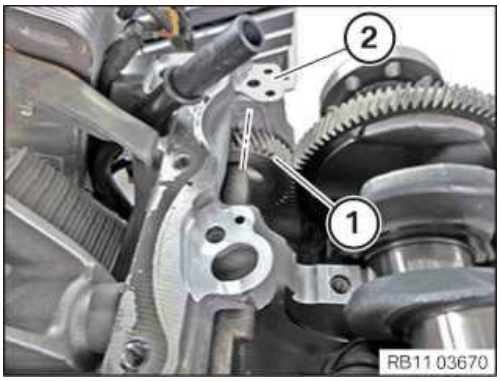


- Guide out lint-free cleaning rag (1) between counterbalance shaft (2) on the intake side and crankcase (3) and remove it.
- Ensure that needle bearing is (4) **not** damaged.



- Position counterbalance shaft (1) on the intake side in the **direction of the arrow** on crankshaft (2).
- Make sure that the mark on the gear (1) for the right counterbalance shaft points **up vertically** to the oil sump (3).

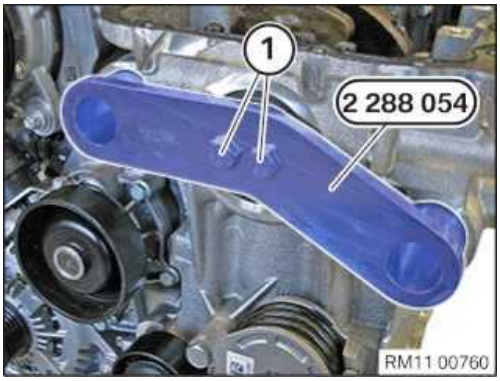
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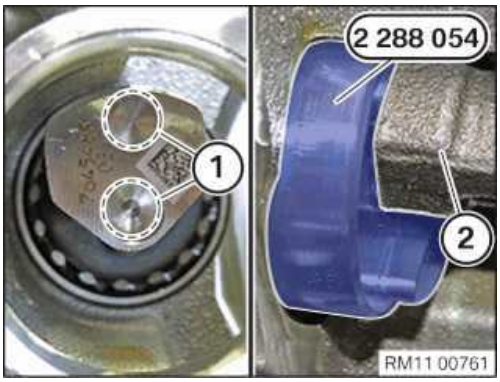
- Check the position of the gear of the counterbalance shaft on the intake side (1) to the crankcase (2) using the marking.



- Position the counterbalance shaft on the exhaust side so that the marking points perpendicular to the oil sump.



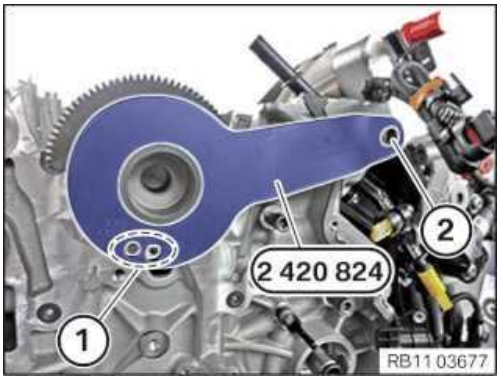
- Make sure that the balance weights on the counterbalance shafts face the oil sump.
- Mount the special tool **2 288 054** and abut the bolts (1).



- Make sure the special tool **2 288 054** is correctly fitted in the guides (1) of the counterbalance shaft (2).
- If necessary, slightly turn the counterbalance shafts.
- Tighten special tool **2 288 054**.

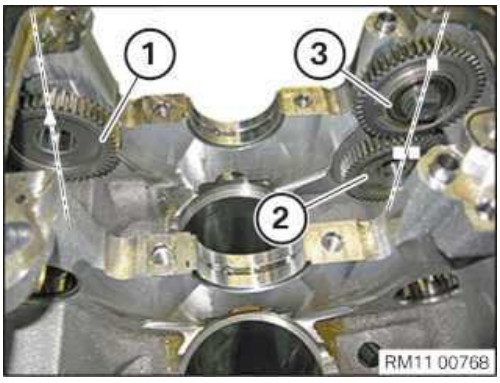
Special tool 2 288 054 to crankshaft

M10		Tightening torque	20 Nm



- Remove special tool **2 420 824**.

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NOTICE

To provide a better overview: Illustration of surrounding parts in removed state.

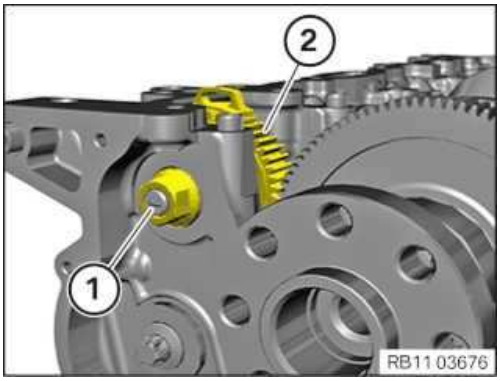
- Ensure that the identifications on the gears (1), (2) and (3) point up vertically to the oil sump sealing surface.



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

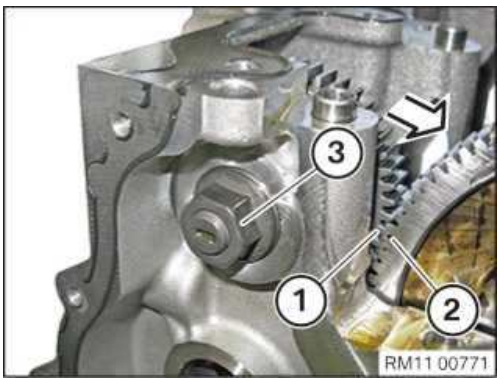
- When installing a new gear: Ensure the ring gear remains blocked until installation using the factory-mounted fixation (1).



- Insert the intermediate wheel (2)with the special tool **0 495 131 (11 5 370)** and install.
- Tighten the nut (1) hand-tight.



- Make sure that the teeth of the intermediate wheel engage with the teeth of the crankshaft and counterbalance shaft.
- Relieve tension on special tool **0 495 131 (11 5 370)** and remove.

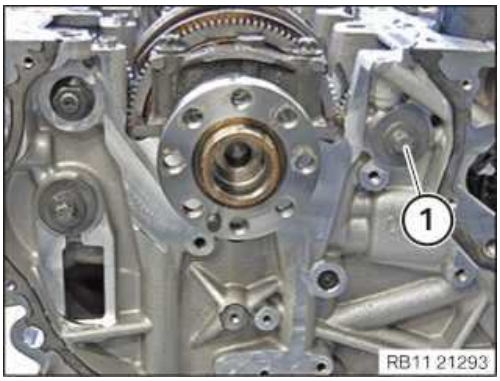


- Move the intermediate wheel (1)in the direction of the arrow into position on the crankshaft (2).
- Tighten nut (3).

Idler gear to crankcase

M12x1.5		Tightening torque	10 Nm
		Angle of rotation	45 °

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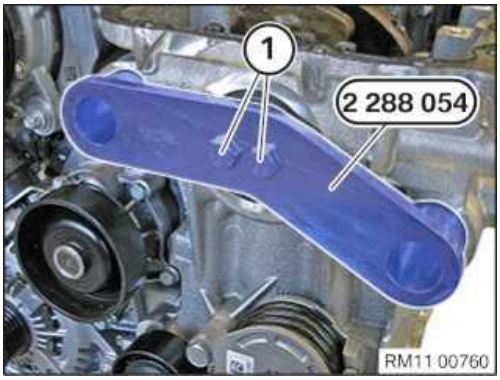
- Renew the screw (1).

  Parts: Screw

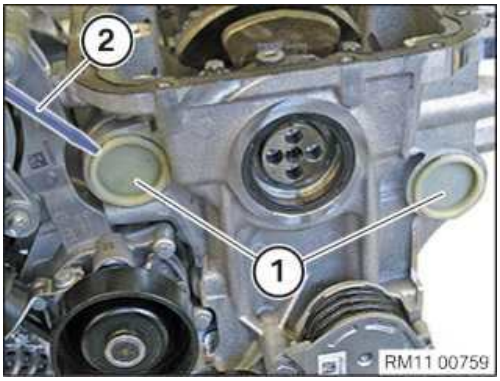
- Tighten screws (1)of the counterbalance shaft on the intake side.

Gear to counterbalance shaft

M10	Renew screws.	1. Jointing torque	20 Nm
		2. Angle of rotation	180 °



- Unscrew the bolts (1) and remove the special tool **2 288 054**.



- Renew the sealing cap (1).

  Parts: Sealing cap

- Make sure the O-rings of the sealing cap (1) are fitted correctly.
- Mount both sealing caps (1).

POSTPROCESSES

44 – If necessary: Renew the piston



CAUTION

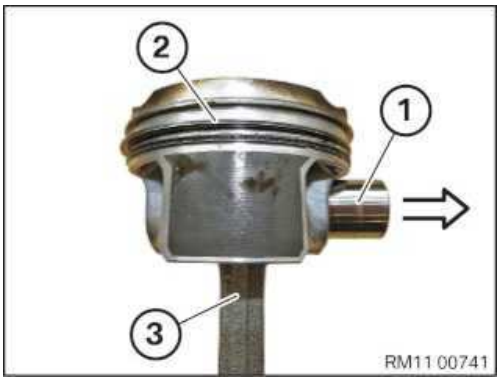
Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

- Use special tool to remove the gudgeon pin circlip.
- Insert the flat side (3) of special tool into the groove (4).
- Grab and remove the gudgeon pin circlip (1) with the arched side (2).

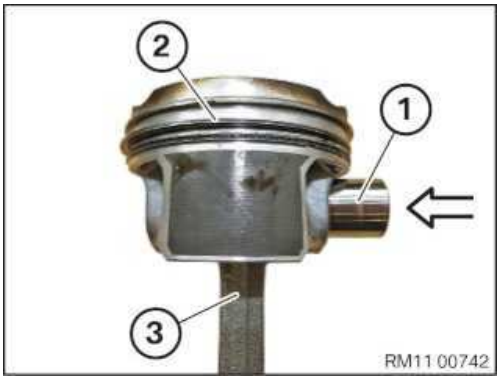
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TECHNICAL INFORMATION

Piston and gudgeon pin are matched to each other.
Always install piston and gudgeon pin together and do not switch by mistake.

- Remove the gudgeon pin (1) in the direction of arrow.
- Remove piston (2) from connecting rod (3).



- Renew piston with gudgeon pin.

  Parts: Pistons

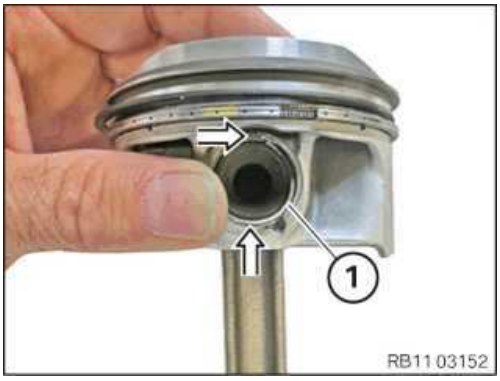
TECHNICAL INFORMATION

Piston and gudgeon pin are matched to each other.
Always install piston and gudgeon pin together and do not switch by mistake.

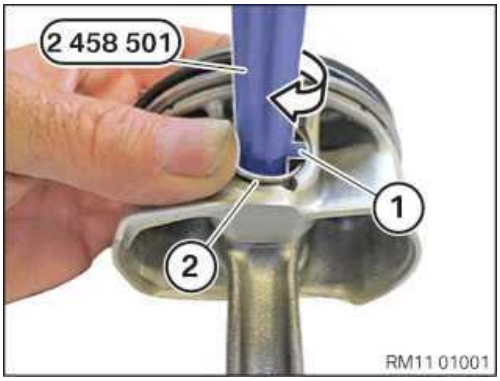
- Position piston (2) on the connecting rod (3).
- Install the gudgeon pin (1) in the direction of arrow.
- You must be able to install the gudgeon pin (1) without major effort.
- Gudgeon pin (1) must be free of play in piston and connecting rod.



- Prepare special tool on the fitting aid .

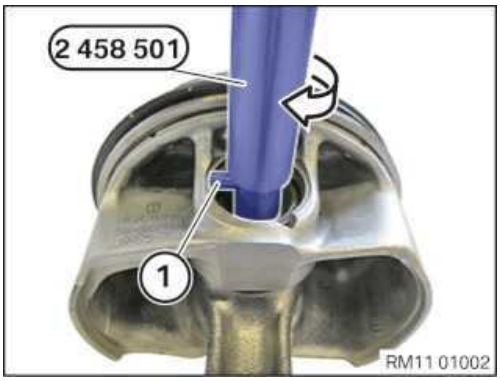


- Insert the gudgeon pin circlip (1) into the groove on the piston (see arrows).

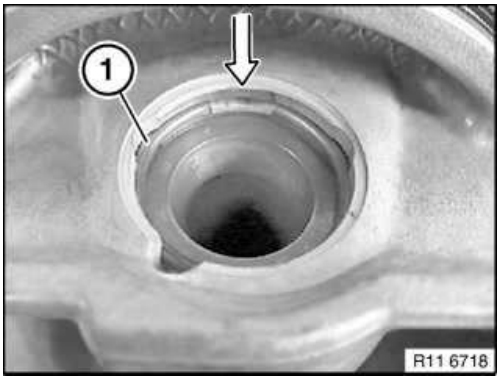


- Screw in the positioned gudgeon pin circlip (2)with and with the guide pin (1) in the direction of the arrow.

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- Screw the gudgeon pin circlip with guide pin (1) into the groove of the piston in the direction of the arrow.



- Gudgeon pin circlip (1) must be fitted correctly in the groove (arrow).

45 – Install the connecting rod bearing shell

RISK OF DAMAGE

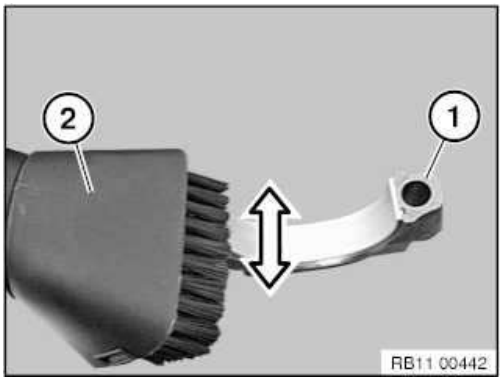
Engine damage caused by incorrectly installed bearing shells and bearing supports.

Engine damage may result from incorrectly installing bearing shells and bearing supports.

- Always install all bearing shells and bearing supports in the same position from which they were removed.

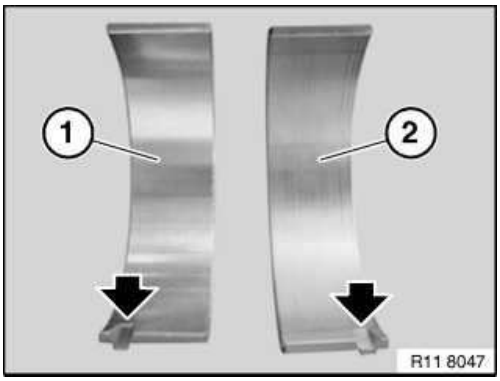
TECHNICAL INFORMATION

The connecting rods of the engine are balanced and are matched to each other.
A single connecting rod is not permitted to be replaced. Always replace all connecting rods.



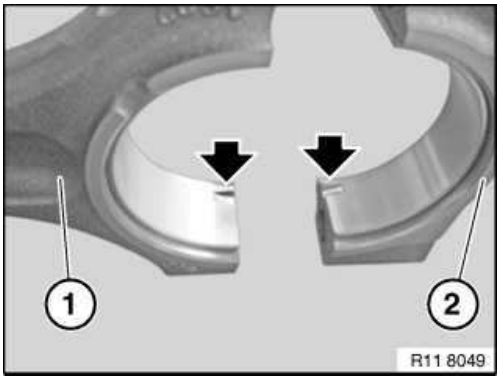
- Vacuum the crack surfaces (1) with a conventional vacuum cleaner (2).

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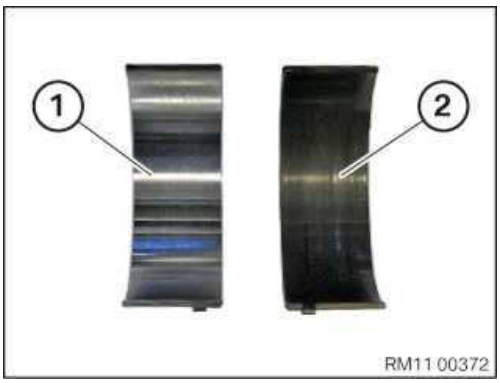
- To avoid incorrect assembly: Pay attention to marks (arrows).

  The connecting rod bearing (1) for the connecting rod bearing cap and the connecting rod bearing (2) for the connecting rod are each equipped with protection against incorrect assembly as shown in the marked area.



- To avoid incorrect assembly: Pay attention to marks (arrows).

  The connecting rod bearing cap (2) and the connecting rod (1) are each equipped with protection against incorrect assembly.



- Makes sure that a light connecting rod bearing shell (1) and a dark connecting rod bearing shell (2) are installed for each connecting rod.



TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

- Insert the dark connecting rod bearing shell (2) into the connecting rod (1).
- Oil the connecting rod bearing shell (2).



TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

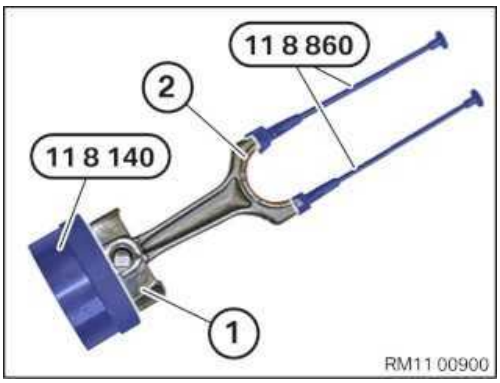
Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

- Insert the light connecting rod bearing shell (2) into the connecting rod bearing cap (1).
- Oil the connecting rod bearing shell (2).

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TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.
Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.



- Coat the pistons (1) and piston rings lightly with oil.
- Mount the special tool **0 493 582 (11 8 140)** on the piston (1).
- Screw the special tool **0 496 144 (11 8 860)** in on the large connecting rod eye (2).



- Insert the piston with the special tool **0 493 582 (11 8 140)** with the arrow pointing to cylinder 1.

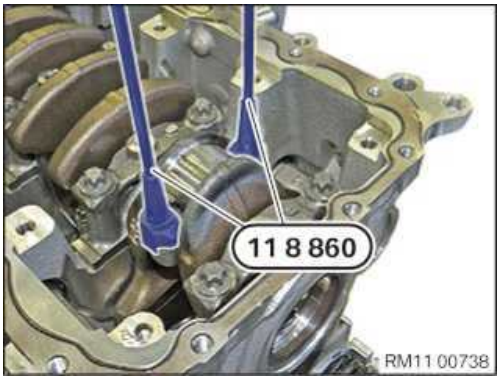
RISK OF DAMAGE

Damage on the cylinder wall and oil spray nozzles.

Major force can scratch the cylinder wall and bend the oil spray nozzles.

- Carefully move the piston and connecting rod in the engine block.

- Install the piston in the crankcase.



- Remove special tool **0 496 144 (11 8 860)** from large connecting rod eye.

47 – Install the connecting rod bearing cap

RISK OF DAMAGE

Engine damage caused by incorrectly installed bearing shells and bearing supports.

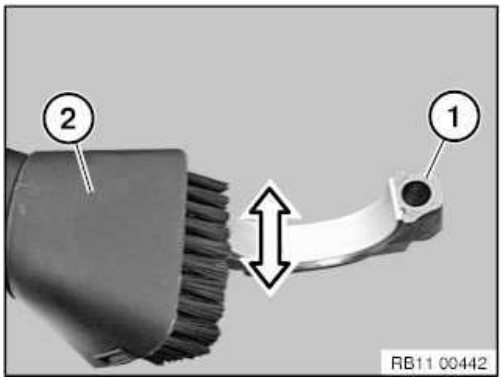
Engine damage may result from incorrectly installing bearing shells and bearing supports.

- Always install all bearing shells and bearing supports in the same position from which they were removed.

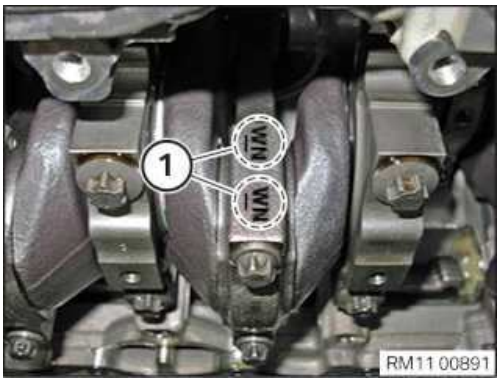
TECHNICAL INFORMATION

The connecting rods of the engine are balanced and are matched to each other.
A single connecting rod is not permitted to be replaced. Always replace all connecting rods.

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- Vacuum the crack surfaces (1) with a conventional vacuum cleaner (2).



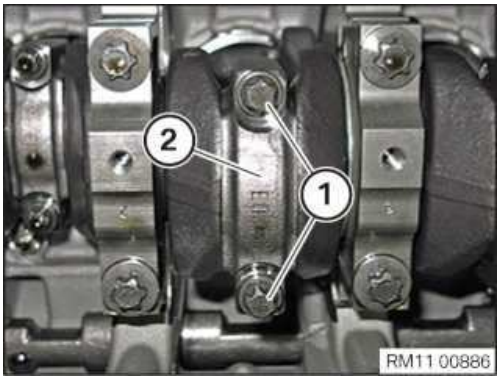
- Attach the connecting rod bearing caps to the connecting rod until the designations (1) match.

TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

- Make sure that the connecting rod bearing is attached to the same connecting rod that it was detached from.

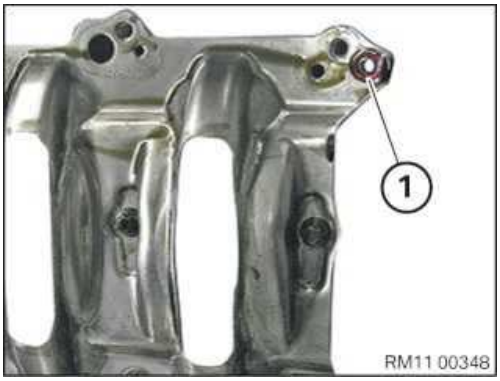


- Position the connecting rod bearing cap (2).
- Tighten the bolts (1) with the special tool **0 490 504 (00 9 120)**.

Connecting rod bearing cap to connecting rod

M9x47		Tightening torque	20 Nm
		Angle of rotation 1	70 °
		Angle of rotation 2	70 °

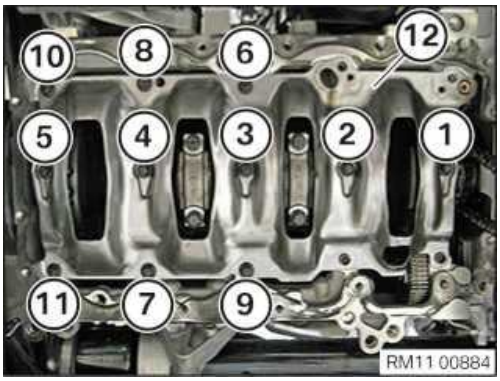
48 – Installing the oil deflector



- Check sealing ring (1) for damage and replace oil deflector if necessary.

  Parts: Oil deflector

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- Insert and install the oil deflector (12).
- Renew screws (1) to (11).

  Parts: Bolts
- Hand-tighten the bolts (1) to (5).
- Hand-tighten the bolts (6) to (11).
- Tighten the screws (1) to (5).

Oil deflector to crankshaft bearing cap

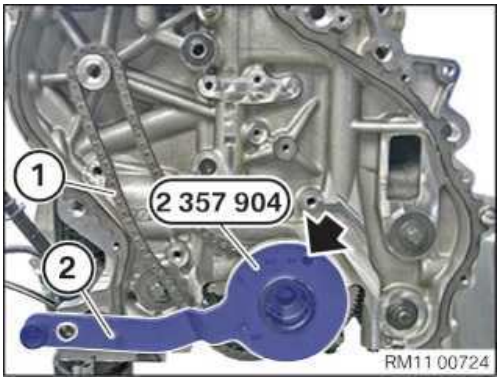
M8x14	Replace screws.	Tightening torque	35 Nm
		Release	180 °
		Tightening torque	15 Nm
		Angle of rotation	45 °

- Tighten the screws (6) to (11).

Oil deflector to crankcase

M8x14		Tightening torque	19 Nm

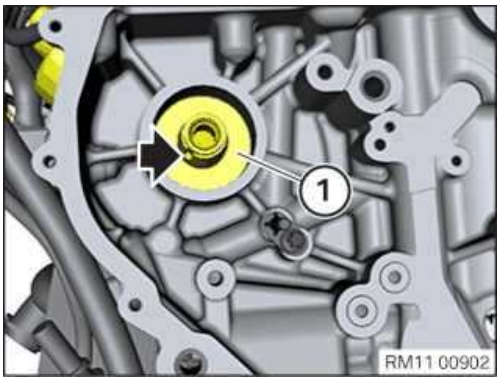
49 – Install both timing chains



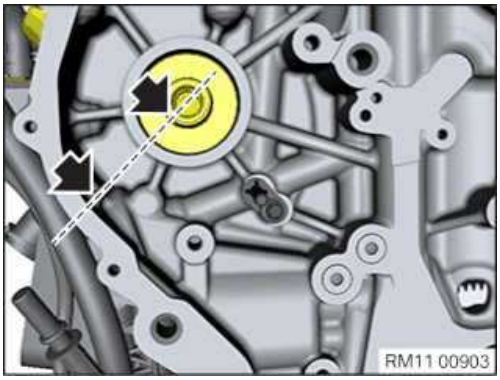
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Position the timing chain (1).
- Secure crankshaft with special tool **2 357 904**.
- Secure special tool **2 357 904** with bolt (2) on crankcase.

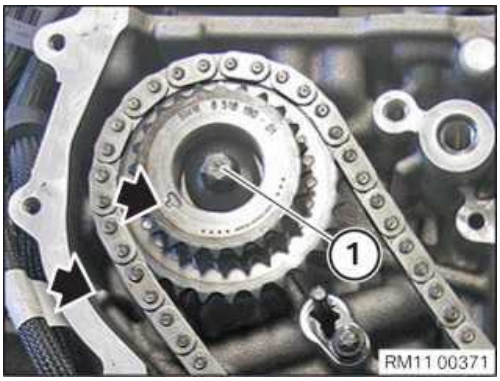


- Note spline groove on high pressure pump (1).

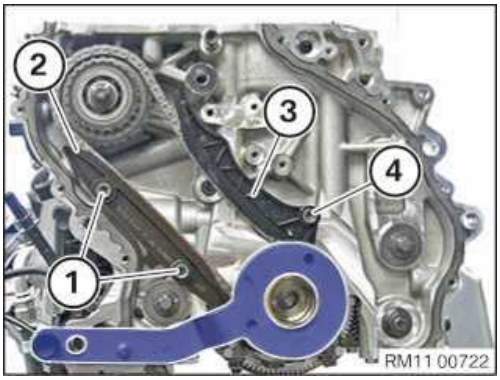


- Mark and groove (arrows) on high pressure pump and crankcase must align.

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- Position the impeller with timing chain on the high pressure pump.
- Screw in and fasten central bolt (1) of high pressure pump.
- Mark and cast lug (arrows) must align.



- Position tensioning rail (3).
- Replace bearing journal.

  Parts: Bearing journal
- Tighten the bearing journals (4).

Bearing journal of tensioning and guide rail

M8	*Replace bearing journal.*	Tightening torque	20 Nm

- Position the guide rail (2).
- Replace bearing journal.

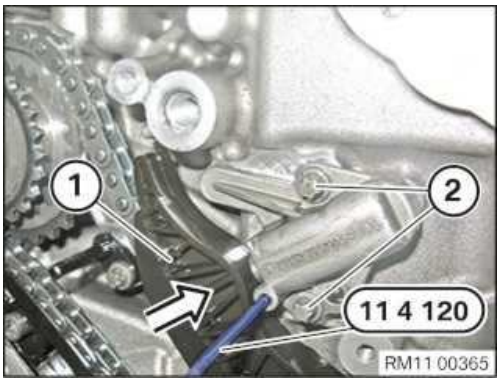
  Parts: Bearing journal
- Tighten both bearing journals (1).

Bearing journal of tensioning and guide rail

M8	*Replace bearing journal.*	Tightening torque	20 Nm



- Clean sealing surfaces (1) with compressed air.



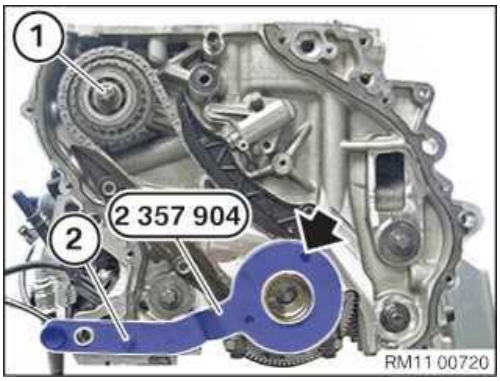
- Position hydraulic chain tensioner.
- Tighten down screws (2).

Chain tensioner to crankcase

M6x22		Tightening torque	10 Nm

- Press chain tensioner in by hand with tensioning rail (1) in direction of arrow until special tool **0 491 012 (11 4 120)** can be removed.

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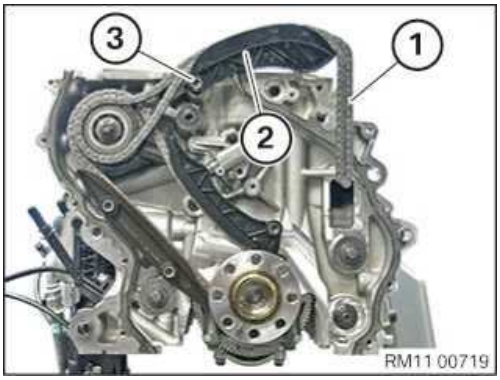


- To fasten central bolt (1) of high pressure pump, crankshaft must remain secured with special tool **2 357 904** and bolt (2).
- Renew central bolt (1).

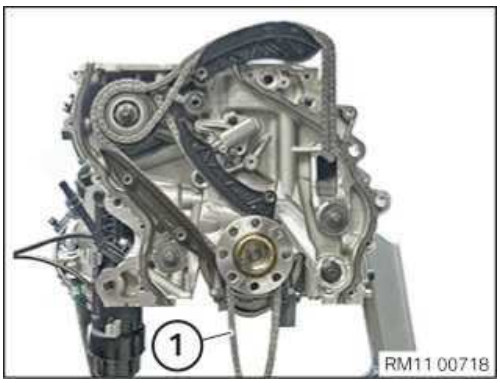
  Parts: Central bolt
- Tighten central bolt (1).

Camshaft sprocket on high pressure pump

M12		Tightening torque	65 Nm



- Position tensioning rail (2) on bearing journal (3).
- Position camshaft timing chain (1).



- Mount drive chain (1) for oil pump on crankshaft.

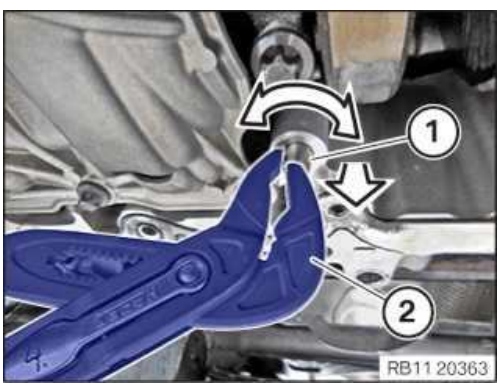
50 – Install the oil vacuum pump

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

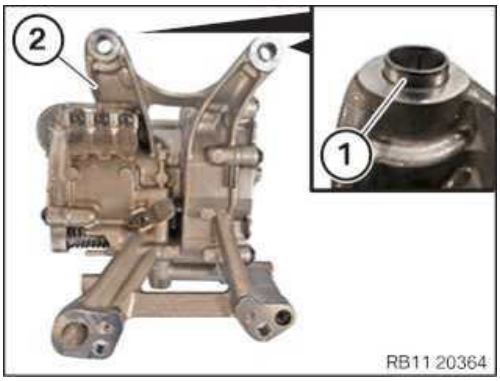
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Remove centering sleeves from the crankcase (1) using a standard tool (2).
- Renew the centring sleeves (1).

  Parts: Centring sleeves

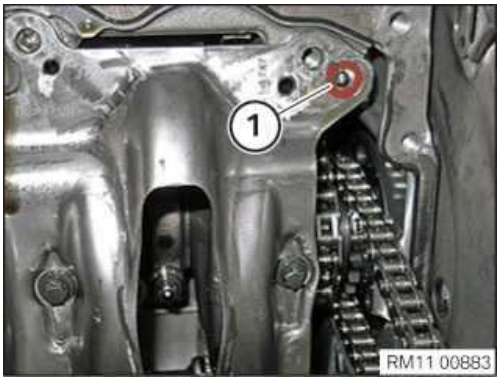
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- Install centering sleeves (1) in the oil vacuum pump (2).

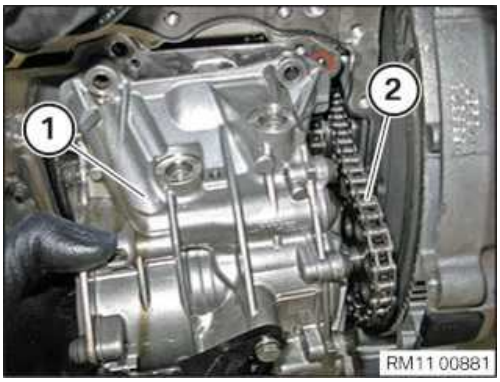


- Check the sealing ring (1) for damage and renew where required.
- Make sure the sealing ring (1) is installed correctly.



- Check sealing ring (1) for damage and replace oil deflector if necessary.

  Parts: Oil deflector



- Insert oil vacuum pump (1) into the drive chain (2).



- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1) of the oil vacuum pump (2).

Oil vacuum pump to crankcaseB47

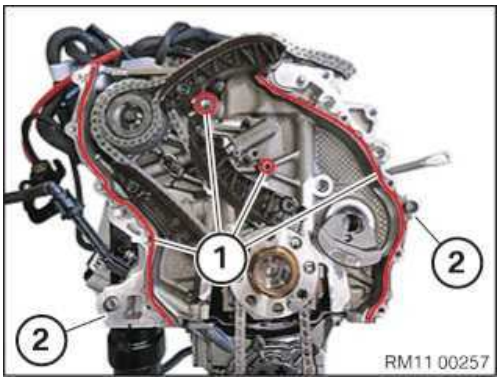
M8x35		Tightening torque	19 Nm

51 – Install the rear timing case cover

Prerequisite

Transmission is removed.

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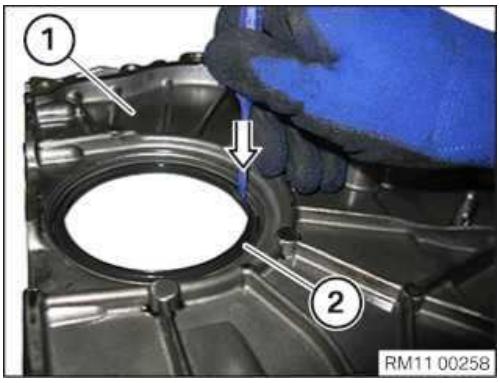
RISK OF DAMAGE

Damage to the surface.

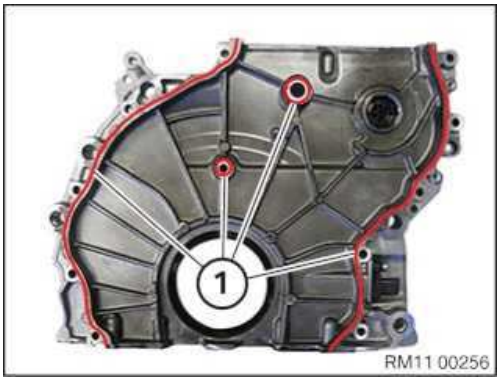
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

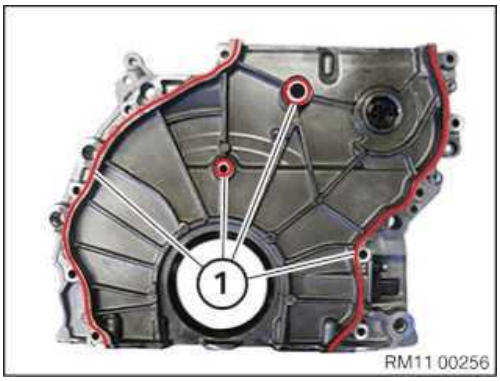
- Remove seal residue from the sealing surfaces (1) using special tool **0 495 102 (11 4 470)**.
- Check fitting sleeves (2) for damage and for tight fit; renew if necessary.



- Position the timing case cover (1) underneath.
- Position punch on inner side of crankshaft seal (2).
- Drive out crankshaft seal (2) outwards.



- Remove seal residue from the sealing surfaces (1) using special tool **0 495 102 (11 4 470)**.

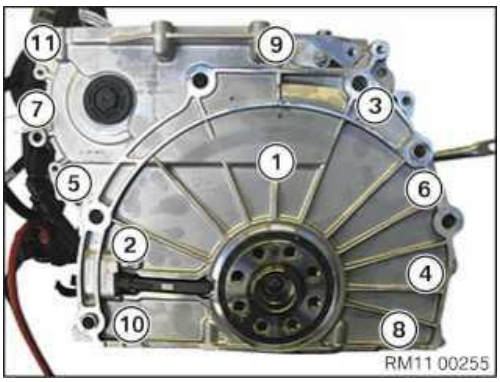


TECHNICAL INFORMATION

For more information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

- Apply sealing bead (1) with a height of approx. 1.5 mm to 2.0 mm on inner side of timing case cover in marked locations. Use liquid sealing compound for this.

  Application time of sealing bead (1) must not exceed 12 minutes.



- Mount the timing case cover without the crankshaft seal.
- Renew screws (1) to (11).

  Parts: Bolts
- Join the bolts in with the sequence (1) to (11).
- Tighten screws in the order (1) to (11).

Rear timing case cover to crankcase

M6	Renew screws.	Jointing torque	8 Nm
		Angle of rotation	90 °

▸ **Installing the rear crankshaft seal**

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RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) on the radial shaft seal with the sharp-edged connector gearing of the output shaft will result in destruction and/or leaks.

- When inserting the output shaft, make sure that the connector gearing of the output shaft does not touch the sealing lip (inner) of the radial shaft seal.

RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) and applying oil to the radial shaft seal will lead to its destruction.

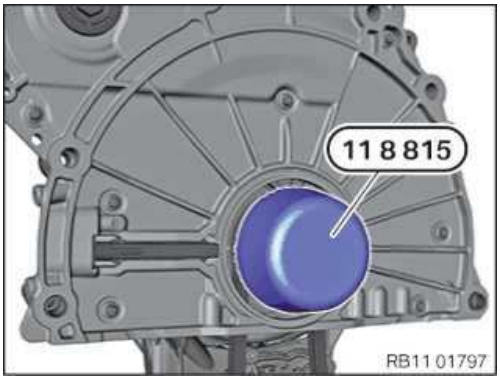
- Do not touch the sealing lip (inner) of the radial shaft seal.
- Do not apply oil to the radial shaft seal.
- Install the radial shaft seal dry.

RISK OF DAMAGE

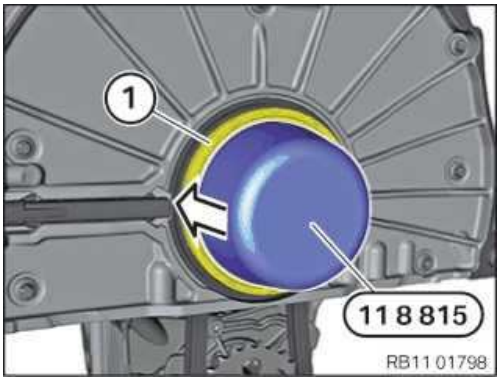
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Position special tool **0 496 137 (11 8 815)** on crankshaft. Make sure that the crankshaft sensor is not damaged.



- Fit the crankshaft seal (1) up to the timing case cover in the direction of the arrow using special tool **0 496 137 (11 8 815)** and position.
- Remove special tool **0 496 137 (11 8 815)**.

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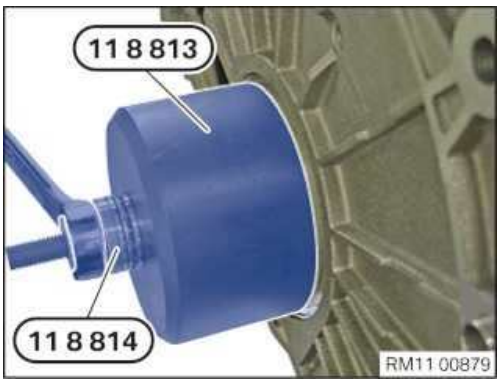


- Secure special tool **0 496 133 (11 8 811)** to the crankshaft using special tool **0 496 134 (11 8 812)**.

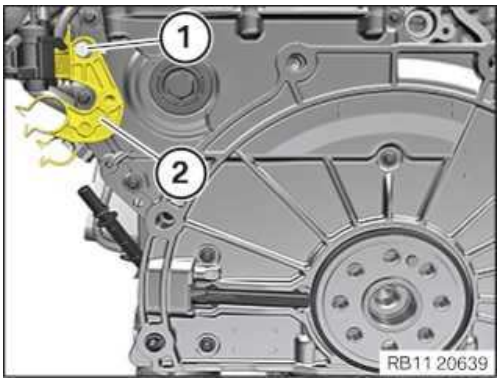


- Check the freedom of movement between the special tool **0 496 135 (11 8 813)** and the crankshaft sensor during installation.

  Otherwise there is a risk that the crankshaft sensor will be damaged.
- Slide on special tool **0 496 135 (11 8 813)**.
- Screw down special tool**0 496 136 (11 8 814)**.

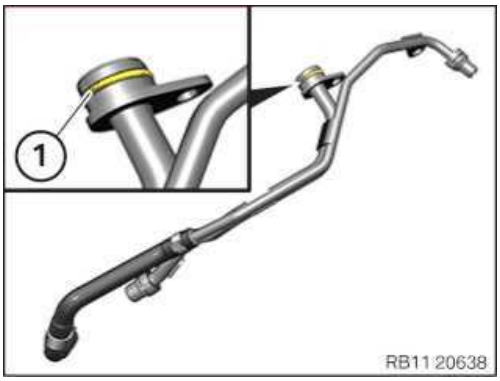


- Press in crankshaft seal with special tool **0 496 135 (11 8 813)**.
- Screw in special tool **0 496 135 (11 8 813)** up to timing case cover.



- Insert and install the holder (2).

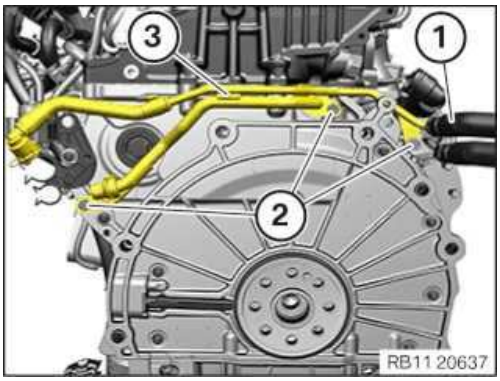
▶ **If installed: Installing the coolant line of the SCR metering module**



- Renew the O-ring 1.

  Parts: O-ring

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- Feed in and install coolant line (3).
- Tighten down screws (2).

SCR coolant lines to crankcase end cover

Hexagon screw M6x16		Tightening torque	8 Nm

- Connect and lock the coolant line (1).

  Coolant line (1) must audibly engage.

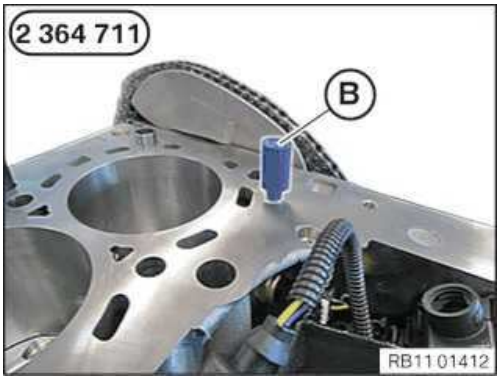
▸ **Cleaning the sealing surface**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Lock the front oil duct using special tool (B) from special tool **2 364 711**.



RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 103 (11 4 471)**.



RISK OF DAMAGE

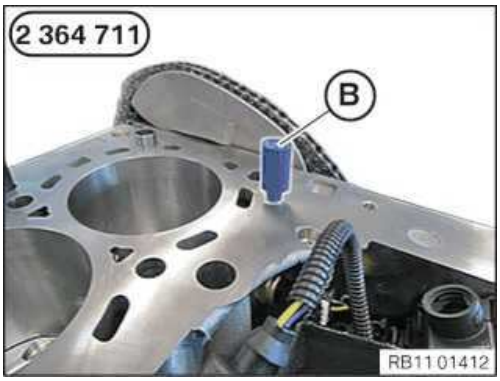
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

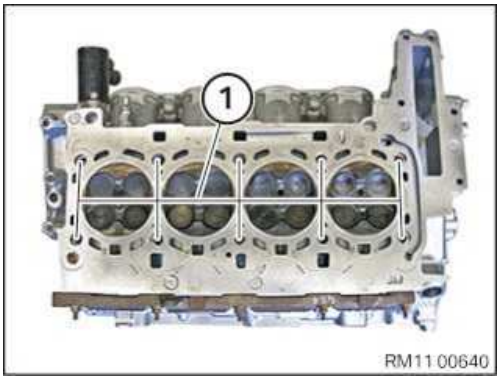
- Clean the sealing surface using special tool **0 495 104 (11 4 472)**.

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- Remove special tool (B).

▶ **Renewing the cylinder head gasket**



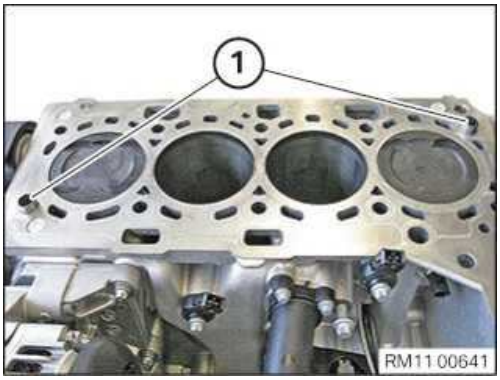
RISK OF DAMAGE

Damage to the surface.

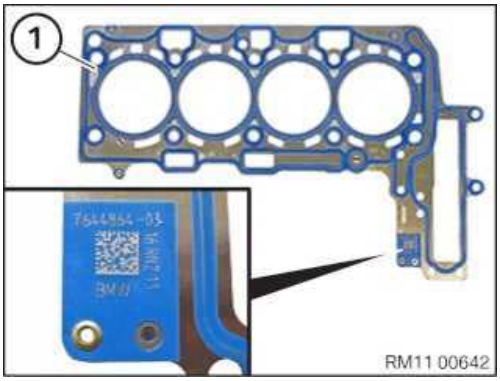
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Remove oil and dirt residue from the blind holes (1).

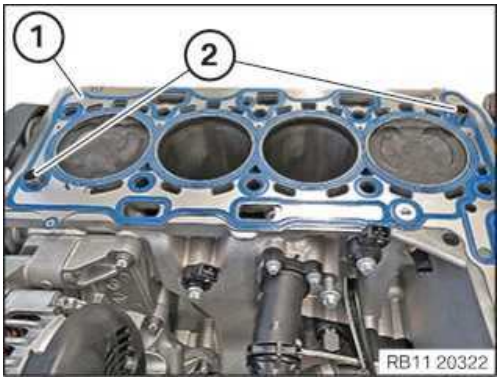


- Check the fitting sleeves (1) for secure fit and damage.



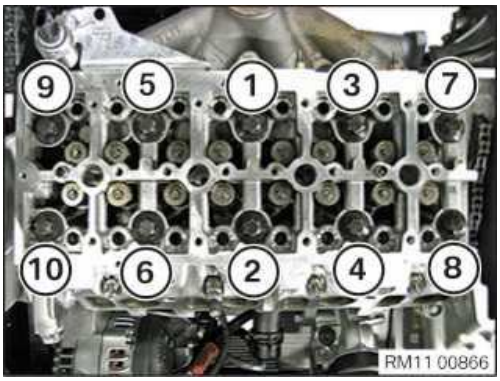
- Identify the cylinder head gasket (1) using the part number.

Note: If the cylinder head is reworked, an additional thicker gasket 0.3 mm is available for service personnel.



- Guide in the cylinder head gasket (1) and install.
- Ensure that the cylinder head gasket (1) is installed correctly in the fitting sleeves (2).

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CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Damage to threads.

Fluid in the threaded hole may damage the thread when screws are tightened in the threads.

- Dry threaded holes (e.g. using compressed air).

TECHNICAL INFORMATION

Do not remove bolt coating.

- Renew the cylinder head bolts (1).

  Parts: Cylinder head bolts
- Do **not** wash off coating of cylinder head bolts.
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

  No coolant, water or engine oil must be present in threaded holes of engine block.

TECHNICAL INFORMATION

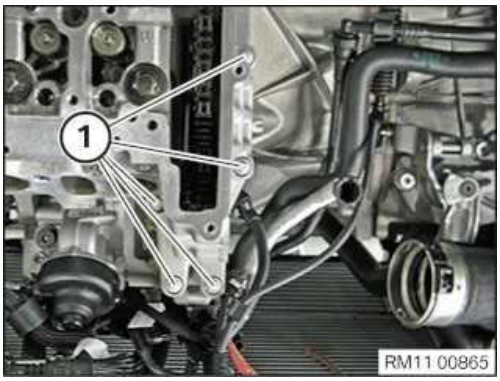
When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Feed in cylinder head bolts and install.
- Screw in cylinder head bolts in sequence (1) to (10).
- Tighten cylinder head bolts using special tools **0 490 504 (00 9 120)** and in sequence (1) to (10).

Cylinder head to crankcase

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

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- Tighten the cylinder head bolts (1).

Cylinder head bolt to timing case cover

M8x40		Tightening torque	19 Nm



TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

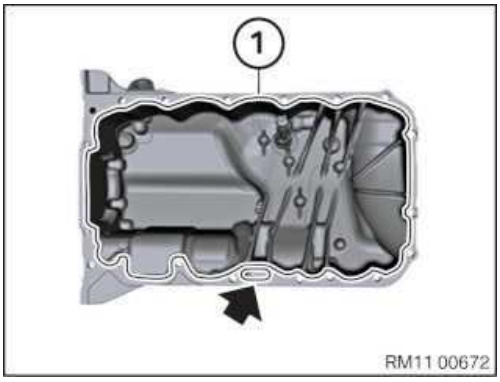
- Remove fine sealing remains on the sealing surface (1)and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.



TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove coarse sealing remains on the sealing surface (1)and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.



TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- Apply the sealing compound along the line (1) with a thickness of 2 mm to 2.5 mm.

  Apply the sealing compound along the inner edge.

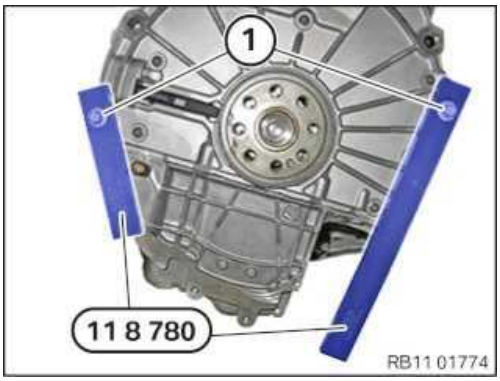
Sealing compound

Loctite 5970 liquid sealing compound	50 ml, Cartridge	83190404517

Overview of consumables (Electronic Parts Catalogue)

- Completely encircle the oil return orifice (arrow) with the sealing compound.

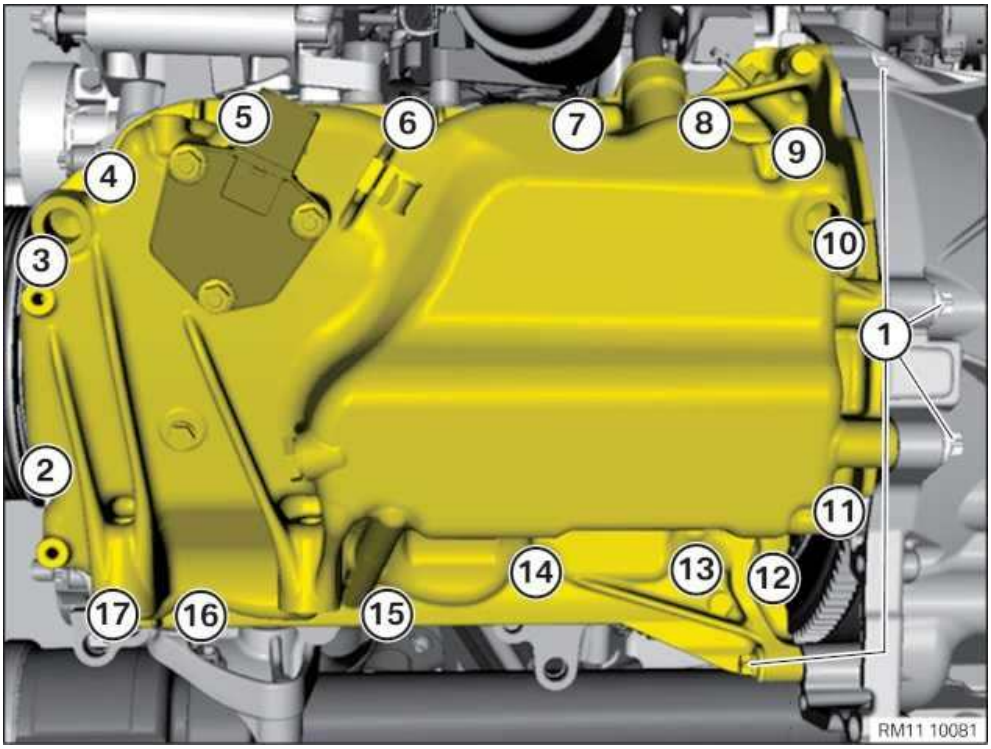
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TECHNICAL INFORMATION

The special tool 11 8 780 is only required when the transmission is removed.

- Position the special tool **0 496 120 (11 8 780)** with the transmission bolts (1) so that the oil sump is exactly flush with engine block.
- If necessary, renew fitting sleeves.



- Position and install oil sump.
- **Hand-tighten** oil sump screws (2) to (17) but do **not** tighten completely.
- Join transmission bolts (1) with 5 Nm.
- Tighten screws(2) to (17) of the oil sump.

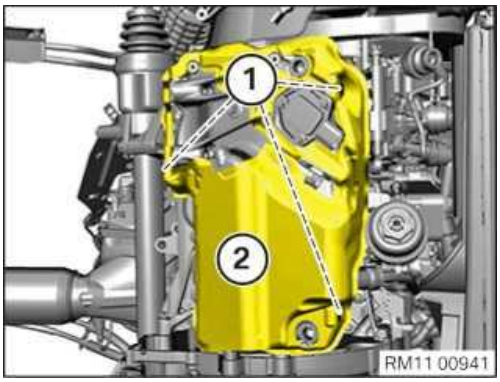
Oil sump to crankcase

M8x30		Tightening torque	2 Nr
M8x110		Tightening torque	2 Nr

- Tighten transmission bolts (1) on oil sump.

Transmission to oil sump

M8		Tightening torque	1 Nr



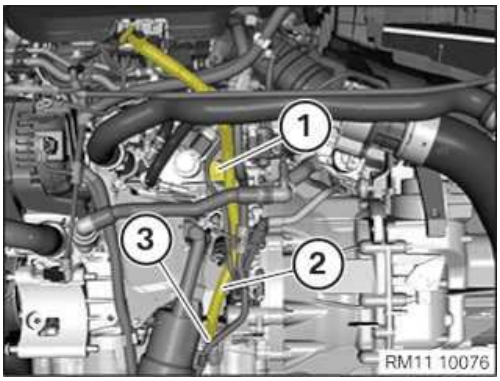
- Thread in and position the acoustic cover (2).
- Install the expanding rivet (1).



- Renew O-ring (1).

  Parts: O-ring

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- Guide in guide tube (2) for oil dipstick and insert it into oil sump.
- Make sure the sealing ring (3) is positioned correctly in the oil sump.
- Tighten down screw (1).

Guide tube for oil dipstick on engine

M8x16		Tightening torque	19 Nm

52 – Installing the flywheel

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Check fitting sleeve on the crankshaft for damage and replace if necessary.

TECHNICAL INFORMATION

Clean all threads with a screw tap.

- Clean all the screw threads (1).



- Use the set of special tools **2 285 058**.

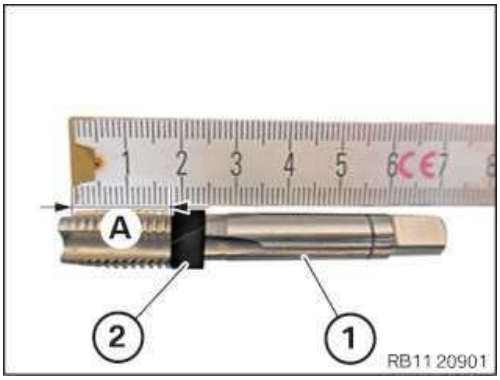
Description
Twist drill
Thread cutter M12x1.5
Depth
Insertion tool

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- Assemble tool set.

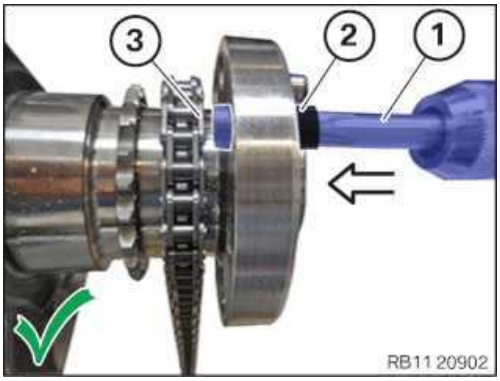
Number	Description
1	Tool holder
2	Thread cutter M12X1,5



- Mark the installation dimension (A) on thread cutter (1) from the set of special tools **2 285 058** using a commonly-available tool (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm



NOTICE

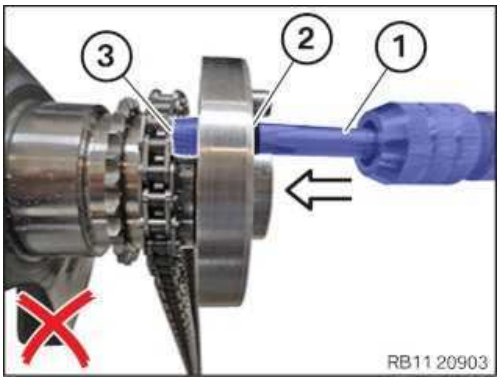
To provide a better overview: Shown with engine removed.

- Screw in the thread cutter (1) from the set of special tools **2 285 058** in direction of arrow up to the installation dimension (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm

- Make sure that the thread cutter does (1) **not** rest on the timing chain (3).

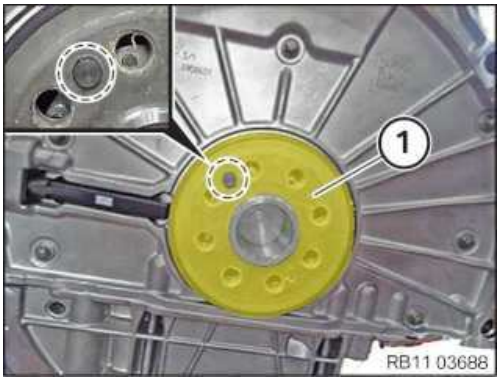


TECHNICAL INFORMATION

- **Carefully** handle the timing chain, to protect the timing chain and timing chain drive against damage.

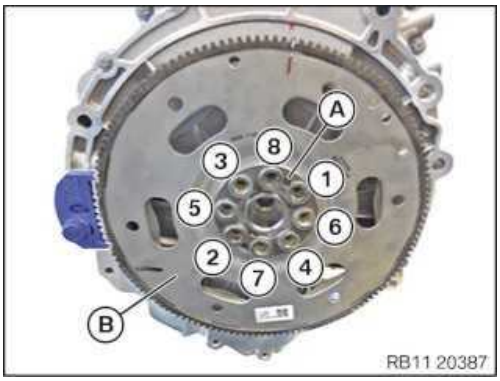
- Make sure the installation dimension (2) of the screw bore (1) is not exceeded.

  The thread cutter (1) may not rest on the timing chain (3).



- Important! Observe the marking shown during installation.
- Install special tool (1) on the crankshaft as shown.

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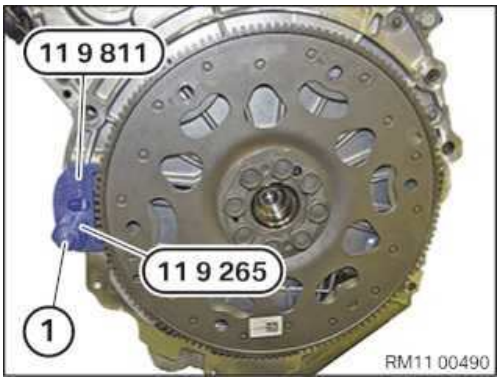


- Position flywheel (B) .
- Renew flywheel bolts (1) to (8).

  Parts: Flywheel bolts
- Screw in flywheel bolt (1) to (8) by hand.
- Observe tightening sequence. Begin at the dowel pin (A).
- Tighten flywheel bolts in sequence (1) to (8).

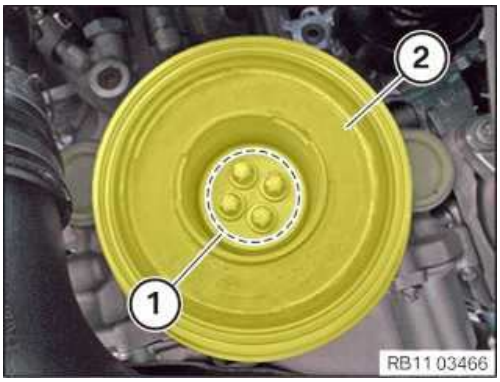
Flywheel to crankshaft

M12x1.5	Renew screws.	Tightening torque	120 Nm



- Loosen the transmission bolt (1).
- Guide out and remove the special tool **0 494 793 (11 9 265)** and **0 496 171 (11 9 811)** with the **standard** washer (5 mm).

53 – Installing the vibration damper

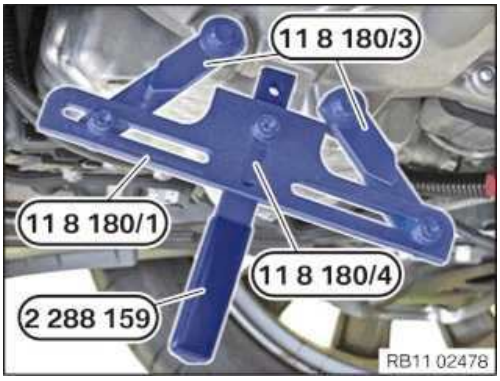


- Position vibration damper (2).
- Renew screws (1).

  Parts: Bolts
- Fasten the vibration damper (2) with the bolts (1).
- Tighten the screws (1).

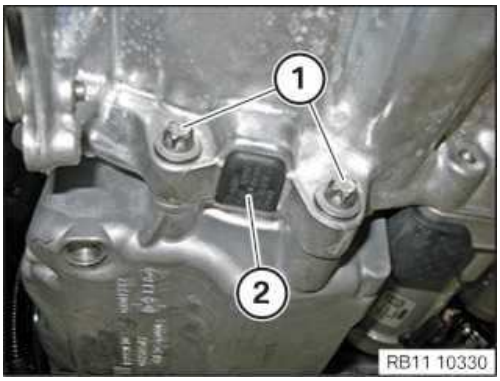
Vibration damper with belt pulley to crankshaft

M10x65	Renew screws. Tighten screws crosswise.	1. Jointing torque	40 Nm
		2. Angle of rotation	60 °
		3. Angle of rotation	60 °



- Release the transmission bolts and remove the special tool **0 493 587 (11 8 180)**.

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- Tighten transmission screws (1).

Transmission to engine

M8		Tightening torque	19 Nm

- Install protective cap (2).

54 – Installing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

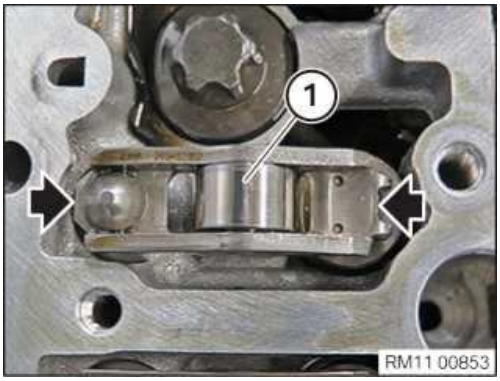


- Install the hydraulic valve clearance compensating element (1) in the direction of the arrow.
- Repeat the process on all hydraulic valve clearance compensating elements.

55 – Install the roller cam followers

TECHNICAL INFORMATION

- Note the installation position of the component. The component may be installed in various installation positions.



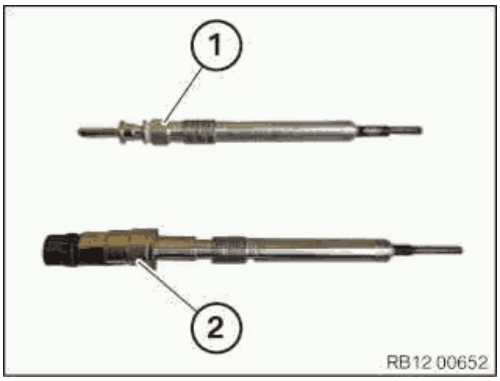
- Check all roller cam followers (1) for damage and replace if necessary.

  Parts: Roller cam followers
- Insert and install all roller cam followers (1).

  Roller cam followers (1) that have already been used must be installed in the same place.
- Note the mounting orientation of the roller cam followers (1).
- Oil all roller cam followers (1).

56 – Install glow elements

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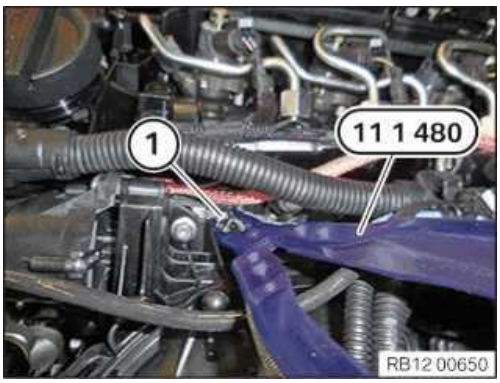
- Install glow elements (1) in cylinders 1, 2, 3 and 4.
- If fitted: Glow element (2) with the **combustion chamber pressure sensor** must be installed in cylinder **2**.



- Tighten the glow element with the special tool or conventional tools.

Glow elements to cylinder head

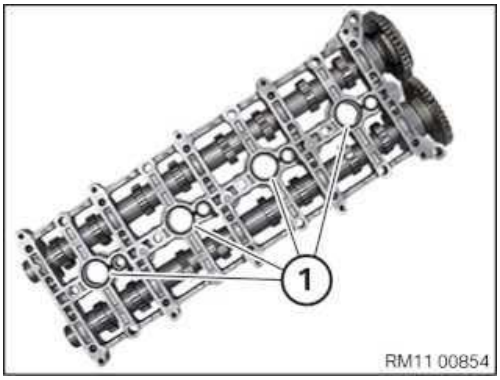
Glow element		Tightening torque	13 Nm



- Connect connectors (1) and lock.

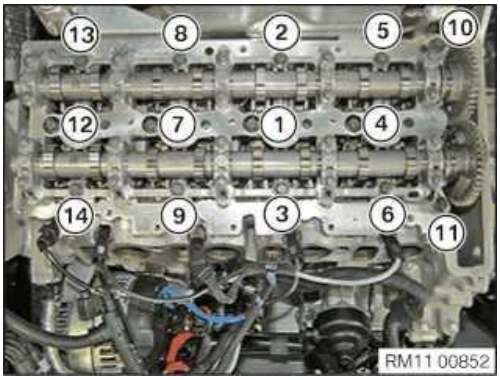
  The connector (1) must engage audibly.

57 – Installing the camshaft support



- Renew gaskets (1).

  Parts: gaskets



- Position the camshaft support including the camshafts.
- Tighten the screws in a sequence from (1) to (14) in several steps.

Camshaft carrier to cylinder head

M7x35		Tightening torque	13 Nm

58 – Adjusting the timing of the camshafts

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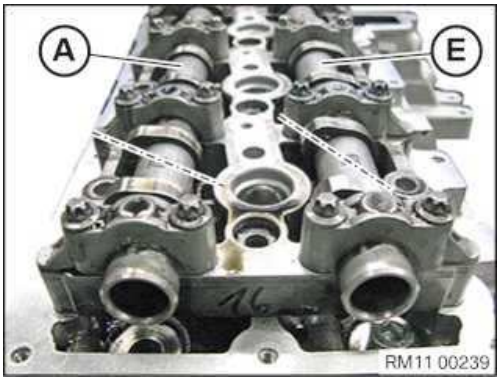


- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.



- Slide the special tool **2 288 380** completely into the bore hole of the oil sump.
- Use the special tool to block **2 288 380** the crankshaft in the TDC firing position at the first cylinder.



- The cam of the intake camshaft (E) at the first cylinder points up at an angle.
- The cam of the exhaust camshaft (A) at the first cylinder points outward at an angle.

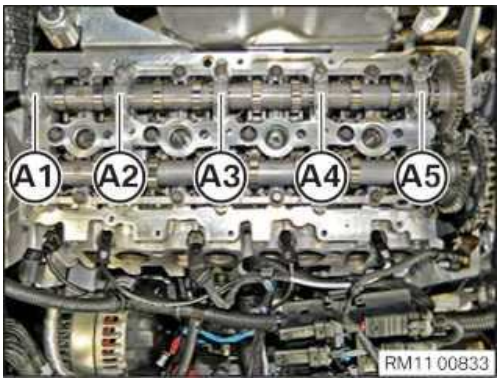
▸ **Remove exhaust camshaft.**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



TECHNICAL INFORMATION

The camshaft is tensioned by the valve springs. Tighten or loosen each screw on the camshaft bearing caps one at a time in the specified sequence and by half a turn only. Repeat procedure.

- Loosen all screws of the exhaust camshaft bearing caps (A1) to (A5) from the outside to the inside, step by step in 1/2 turns.
- Remove exhaust camshaft in upward direction.
- Place all components on special tool **0 495 105 (11 4 480)** in a tidy and orderly fashion.

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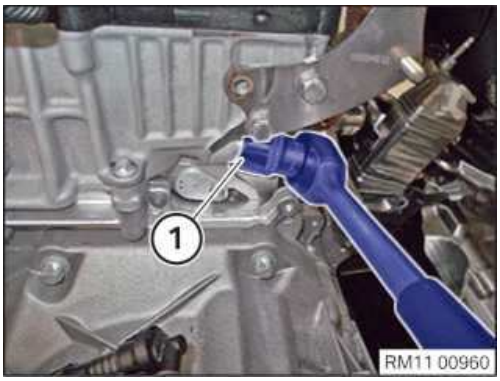
▶ **Remove chain tensioner piston**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

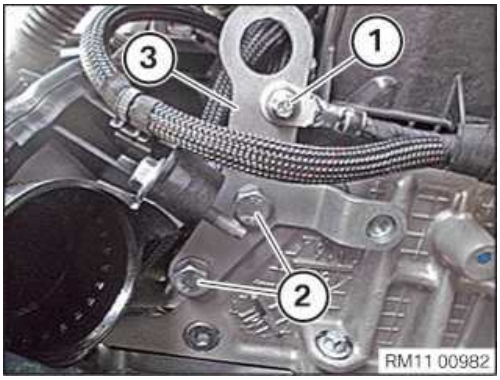


TECHNICAL INFORMATION

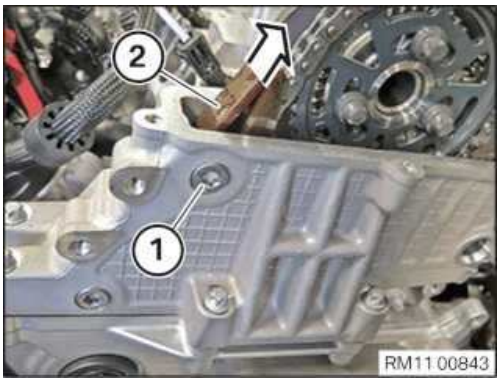
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

▶ **Remove the timing chain guide rail**

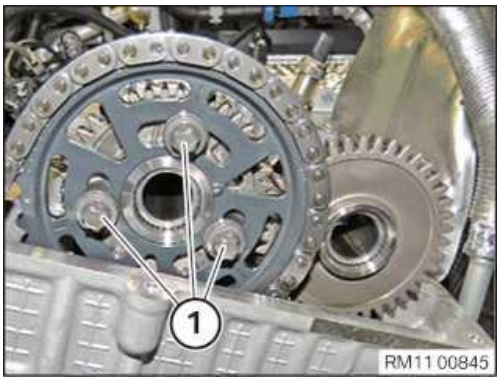


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

▶ **Removing the camshaft sprocket on the intake camshaft**



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

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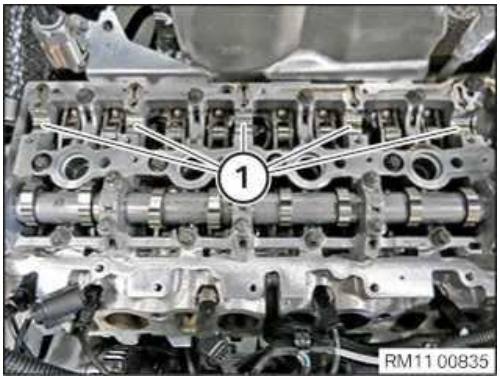
▶ **Install exhaust camshaft**

RISK OF DAMAGE

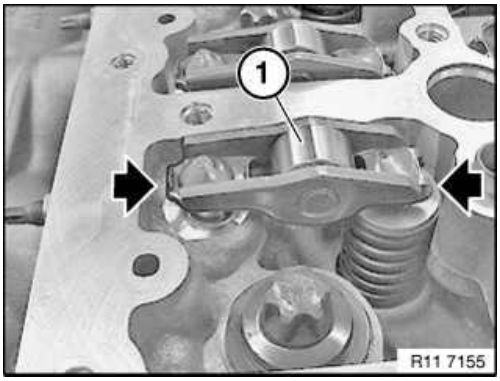
Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

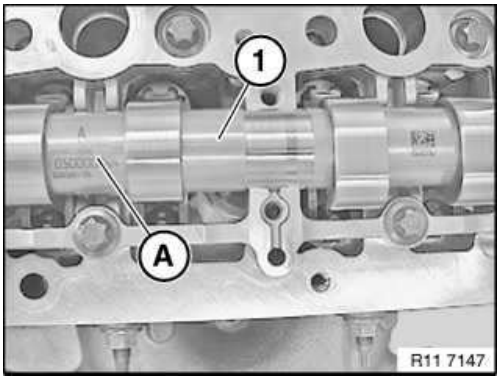
- Comply with the regulations for the installation and disassembly.
- Perform work with care.



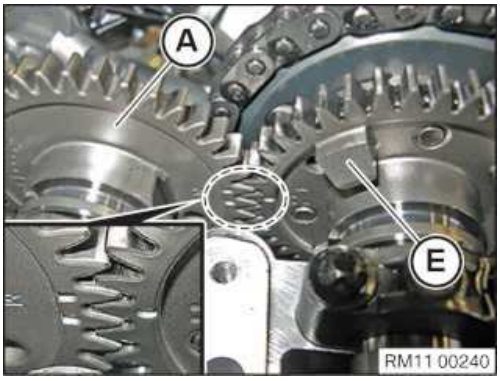
- Oil all bearing positions (1).



- Make sure the roller cam followers (1) have the correct mounting orientation.

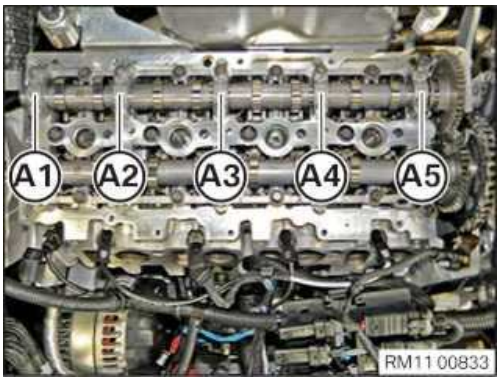


- Insert exhaust camshaft (1) so that the identification (A) points upwards.



- Insert the exhaust camshaft (A) so that the marks on the camshafts (A) and (E) correspond in the highlighted area.
- Position the camshafts (A) and (E) accordingly.

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- Tighten all exhaust camshaft bearing caps (A1) to (A5) from the inside to the outside by 1/2 a turn at a time.

Intake and exhaust camshaft in camshaft support

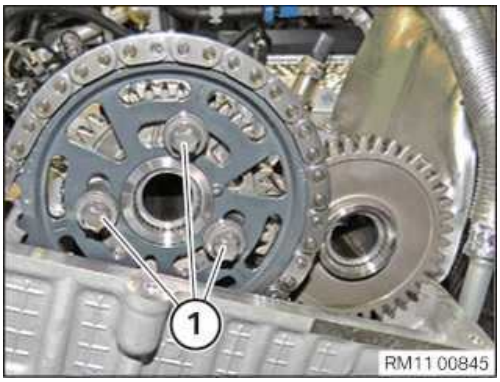
M6x31		Tightening torque	10 Nm



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

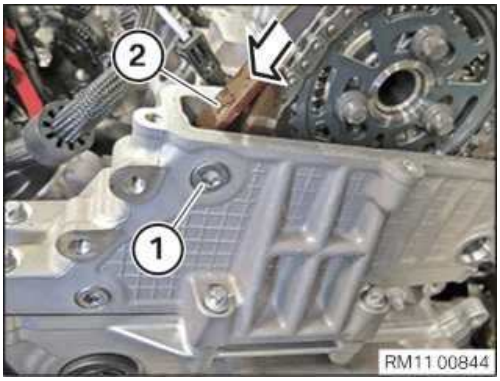
  Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

▶ **Installing the camshaft sprocket on the intake camshaft**



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

▶ **Install the timing chain guide rail**



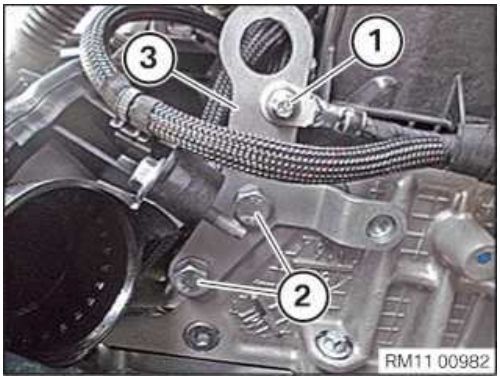
- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm



- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6			8 Nm

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▶ **Installing the chain tensioner piston**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Renew sealing ring (1).

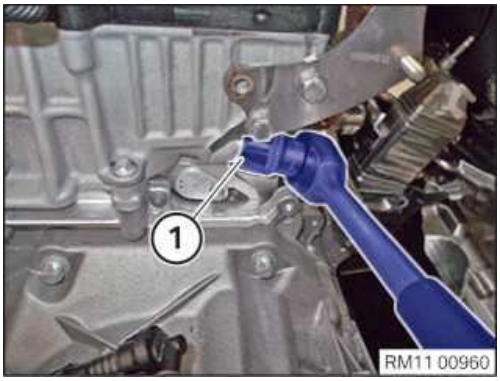
  Parts: Sealing ring



TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.

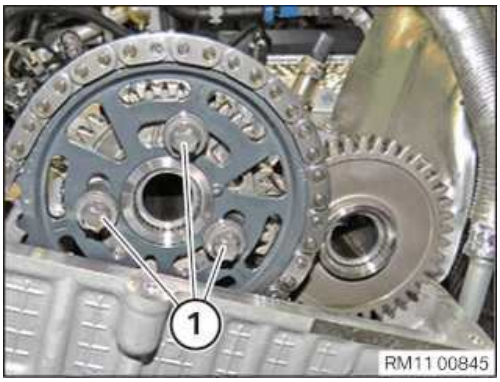


- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

▶ **Tightening the camshaft sprocket on the intake camshaft**



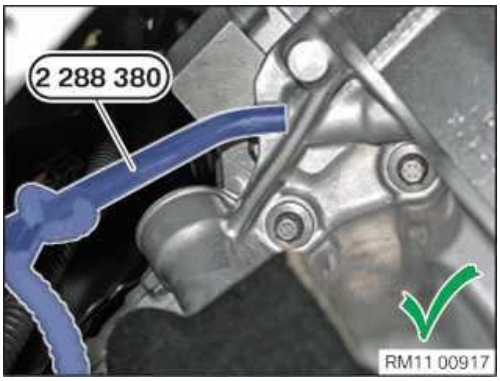
- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

59 – Removing the special tool to disconnect the crankshaft

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- Remove special tool **2 288 380**.

60 – Removing the special tool to secure the exhaust camshaft



- Remove the special tool **0 496 112 (11 8 760)** to fix the exhaust camshaft.

61 – Checking camshaft timing



- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

Damage to the engine.

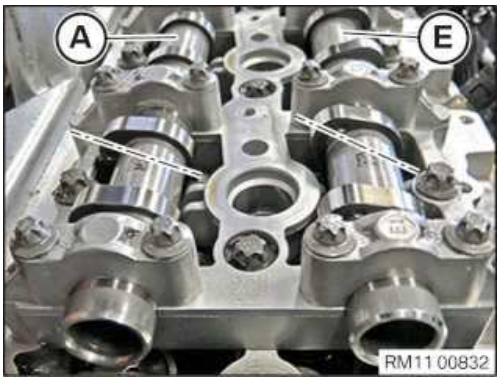
The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

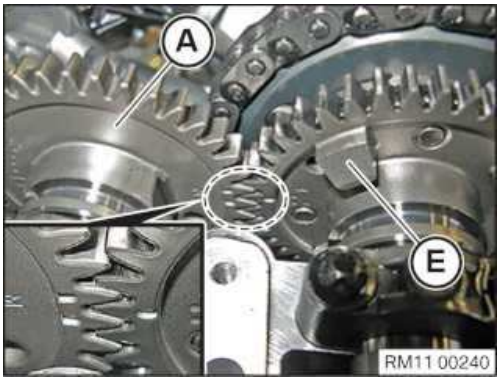
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- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

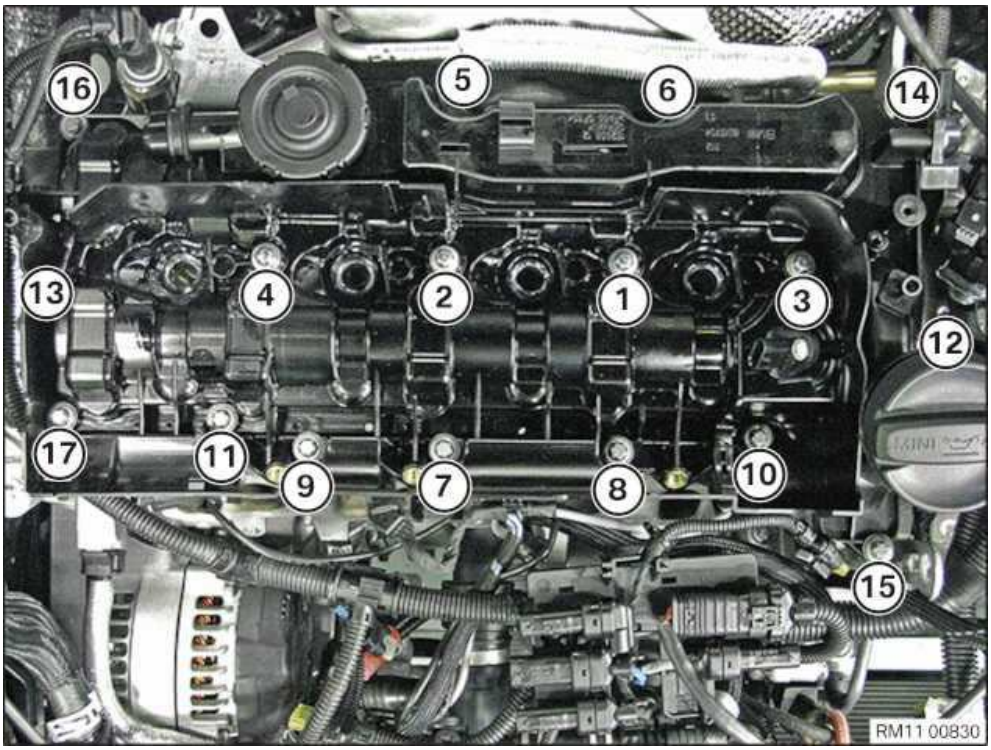
- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.



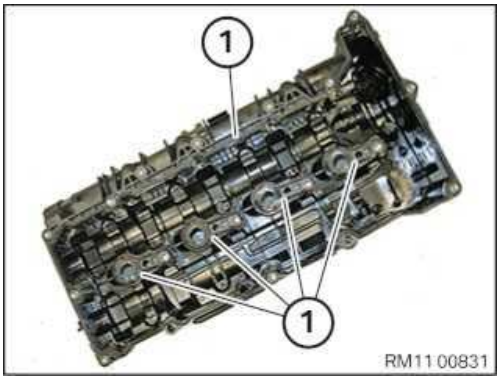
- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

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Overview: Screw connection of the cylinder head cover

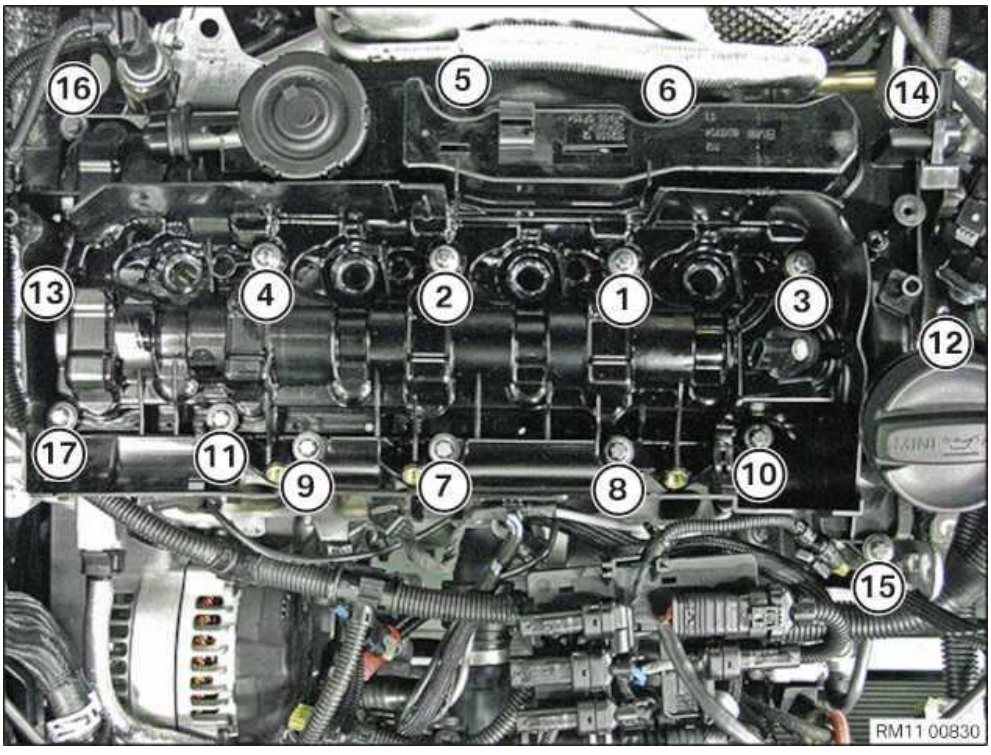


1 to 16 screws of the cylinder head cover.



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket



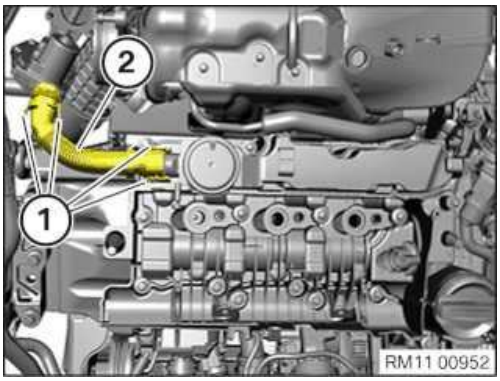
- Install cylinder head cover.
- Tighten screws in the order (1) to (17).

Cylinder head cover to cylinder head

M6		Tightening torque.	8, Nr

-

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- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

63 – Installing injectors of injection system

▶ **Cleaning the injector shafts**

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

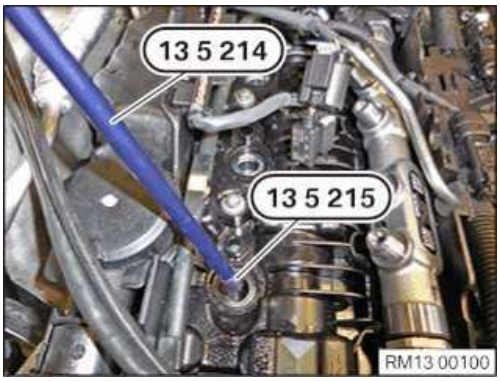
- Collect dirt particles, e.g. when blowing out, use cloth to do so.
- Wear safety goggles.

RISK OF DAMAGE

Contaminant or foreign body.

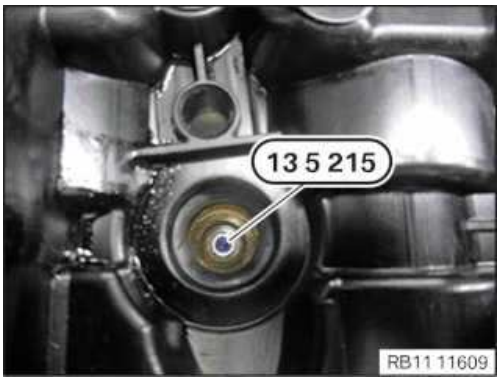
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.

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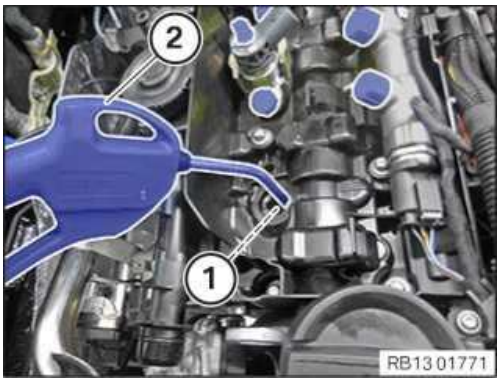
- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.



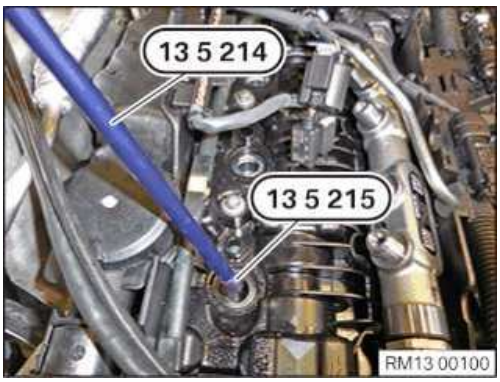
- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.



- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.



- Blow out injector shaft (1) with air gun (2).



- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

► **Check the placement of the clamping claw**

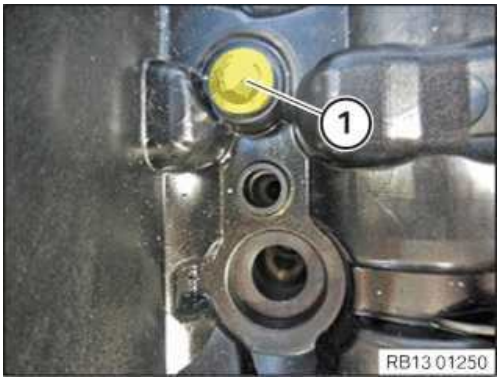
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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▸ **Prepare the injector for installation**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

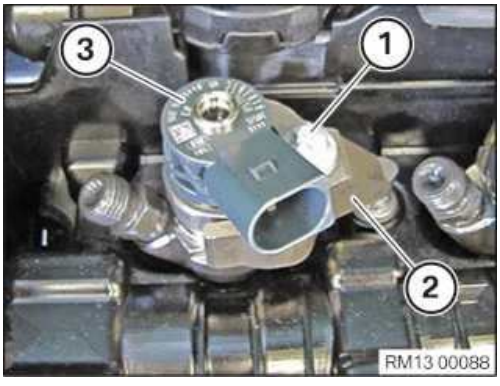


- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring
- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

Injector lubricating grease	50 g, Can	83230441070

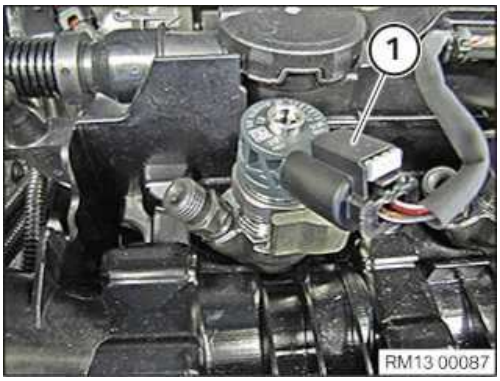


- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

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- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

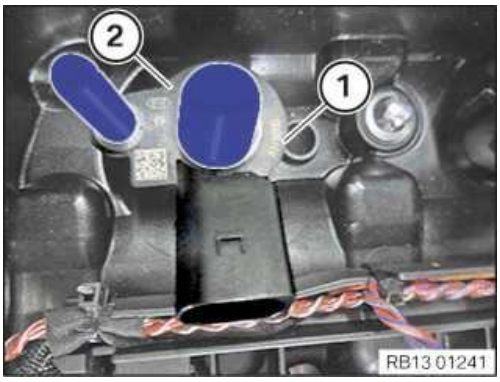
▶ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

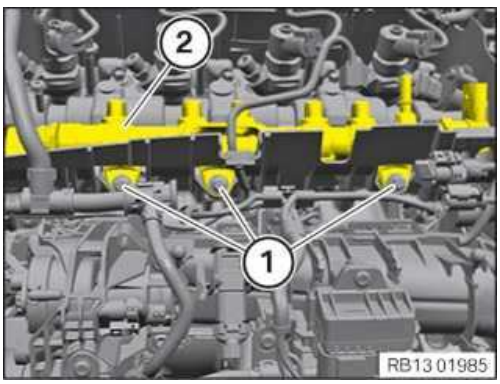


- Read off the adjustment value (1) on the new injector (2).



- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

64 – Installing the rail

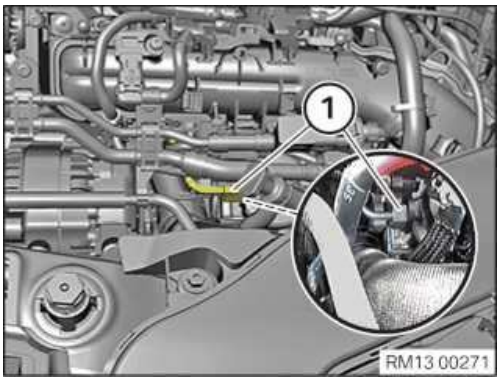


- Carefully insert and install the rail (2).
- Tighten the screws (1).

Rail on cylinder head cover

Torx screw M8x25		Tightening torque	19 Nm

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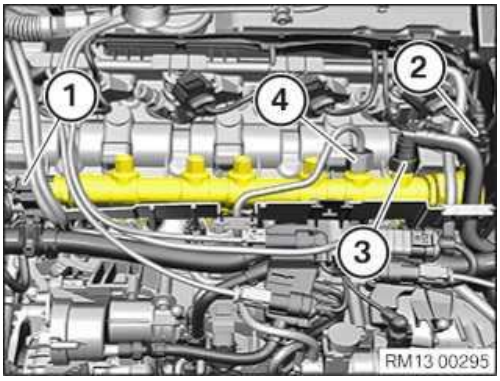
TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten union nut (1).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm



TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten union nut (4) with special tool .

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

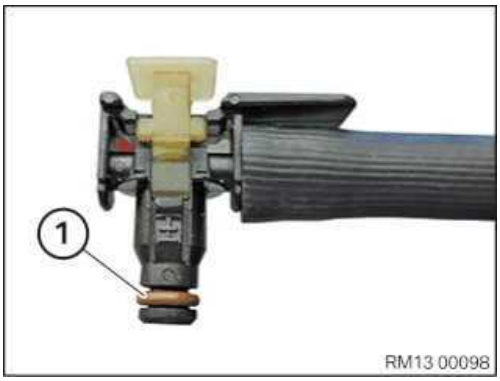
- Connect and lock the fuel line (3).

  Fuel line (3) must engage audibly.
- Connect connectors (2) and lock.

  The connector (2) must engage audibly.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

65 – Connect the leakage oil line on the injector



- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.

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- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

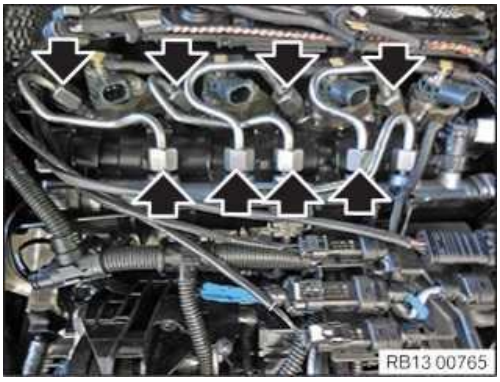
66 – Installing high pressure lines between rail and injectors

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Remove special tool .
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

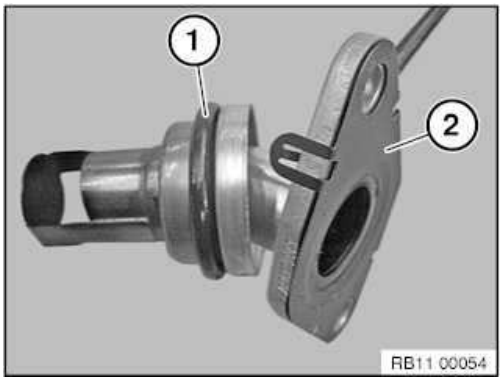
- Tighten the high pressure lines (arrows) with the special tool .

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

67 – Installing the intake plenum

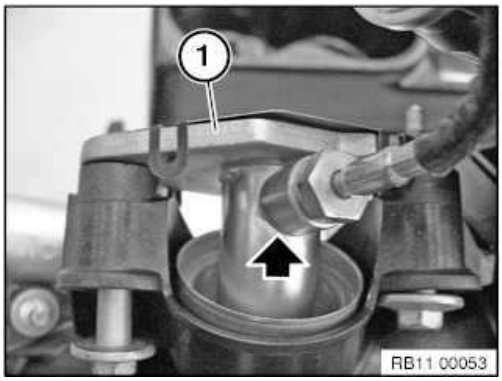


- Renew O-ring (1).

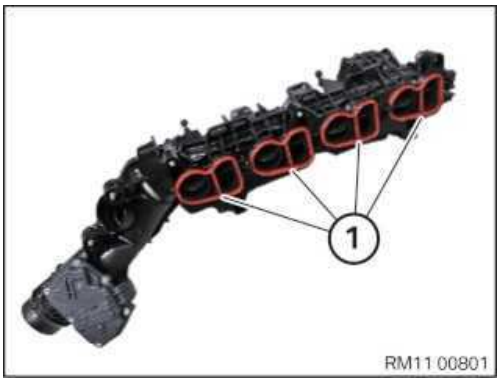
  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position the seal (2) and clip it in.

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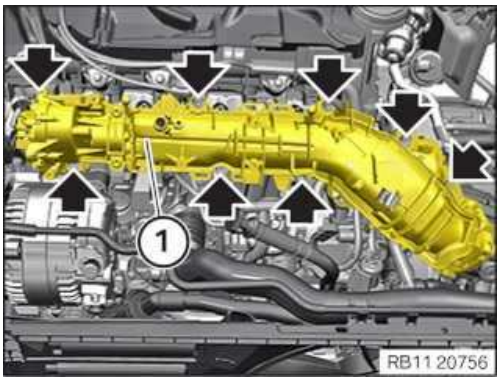


- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (1).

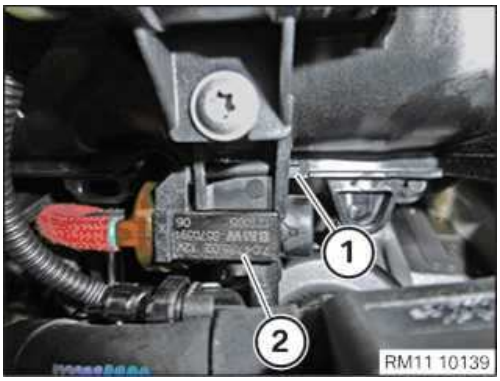
  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.



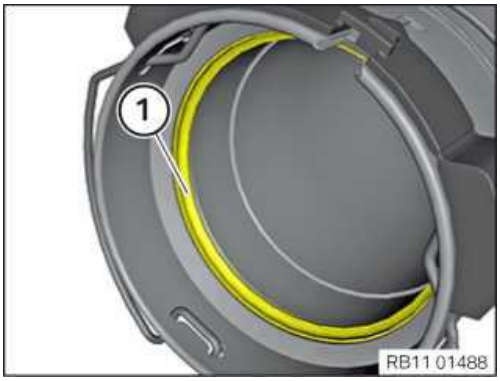
- Guide in and install intake (1) plenum.
- Tighten screws (arrows).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm



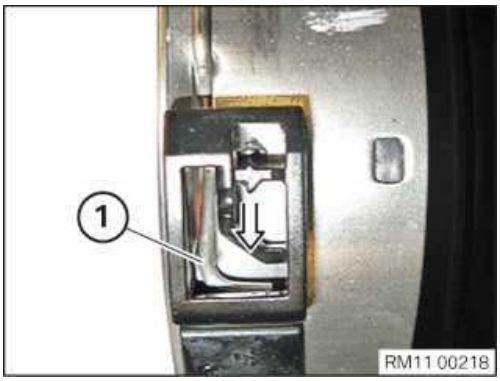
- Install the electric changeover valve (2) in the holder on the plenum from left to right.
- Lock (1) must engage audibly.



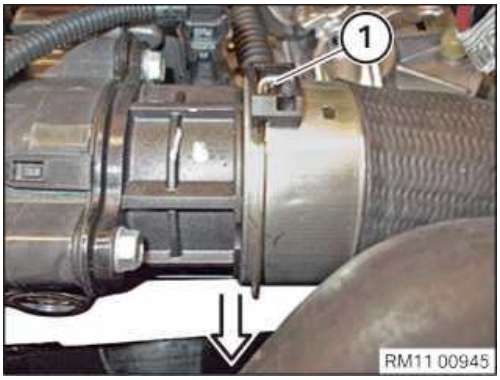
- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring

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- Engage the lock (1) on the bracket (arrow).



- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

68 – Remove the engine from the assembly stand

CAUTION

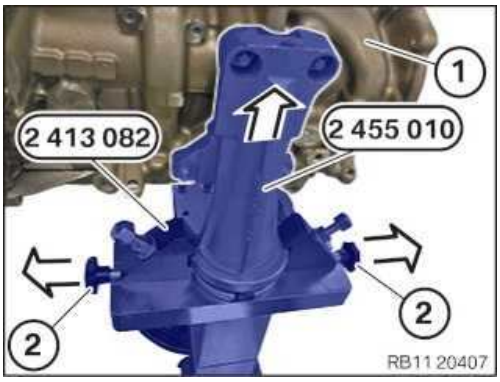
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Insert engine lifter with special tool and position engine (1).

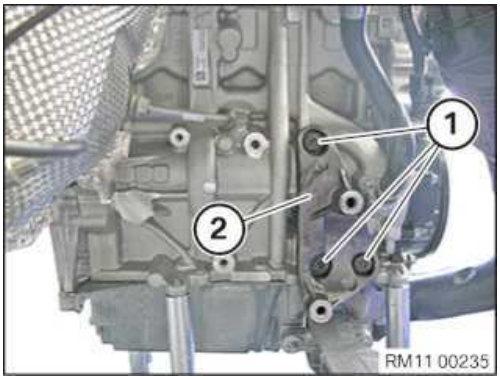


- Unscrew the nuts on special tool .
- Detach the holder (2) in the direction of the arrow.
- Detach the engine (1) with special tool **2 455 010** out of the special tool in the direction of arrow.

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- Remove conventional screws (arrows).
- Feed out the special tool **2 455 010** on the engine (1) and remove.



- Insert and install the holder (2).
- Tighten the screws (1).

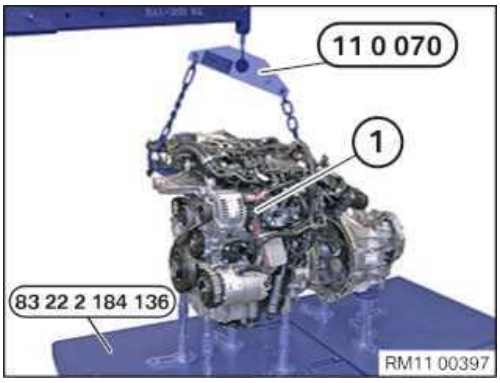
Holder to crankcase

M10		Tightening torque	38 Nm

69 – Mount engine on the automatic transmission

Prerequisite

Engine has been removed.



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Position the engine (1) on the lifting table **2 184 136** using the engine lifter and the special tool .
- Feed out engine lifter from engine (1) with special tool and push aside.

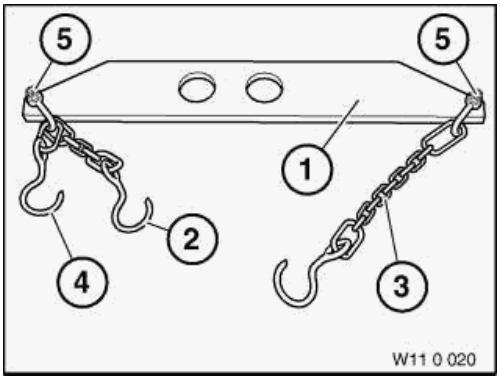


- Unscrew the bolts (1) of the special tool **2 459 012**.
- Feed out the special tool **2 459 012** at the cylinder head and remove.

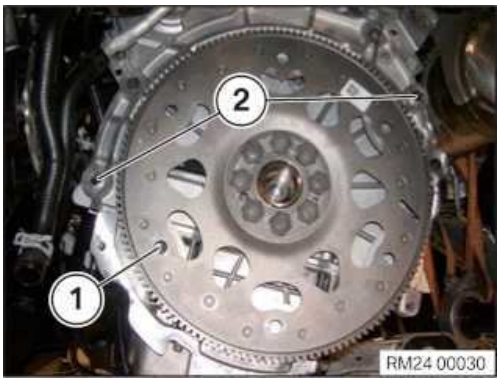
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- Stage the workshop crane **2 220 718**.



- Stage the lifting gear .



- The bore hole (1) of the flywheel must be accessible from the recess on the oil sump.
- Check for correct fit of fitting sleeves(2).

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TECHNICAL INFORMATION

Conduct the following operation with the assistance of a second person.

- Twist torque converter until bore hole in torque converter is flush with bore hole of flywheel.
- Flange-mount and screw automatic transmission on the engine with an auxiliary person and the workshop crane **2 220 718** with the lifting gear .
- Tighten screws (arrows).

Transmission to engine

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

- Feed out workshop crane **2 220 718** with the lifting gear from the automatic transmission and push it aside.

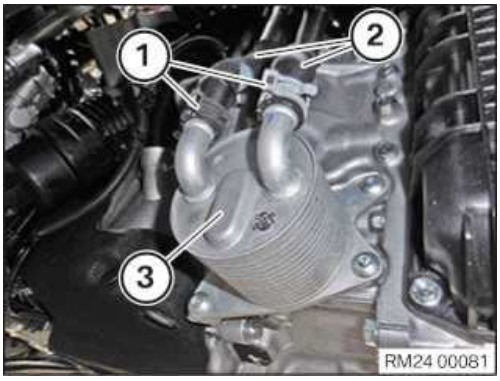


- Crank engine with special tool **0 493 380 (11 6 480)** at vibration damper in direction of rotation.
- Renew nuts (1).

  Parts: Nuts
- Tighten all 6 nuts (1) of the torque converter.

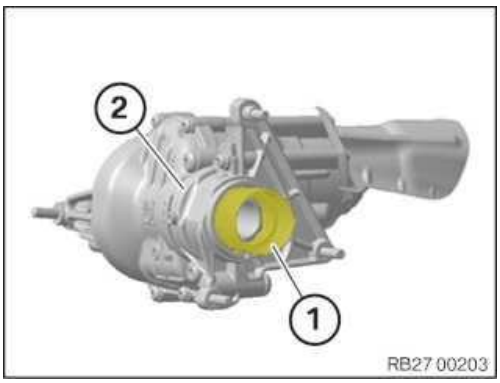
Torque converter to flywheel

M10	Replace nuts. Remove any adhesive residue from the threads.	Tightening torque	56 Nm



- Slide coolant hoses (1) onto transmission oil cooler (3).
- Secure hose clamps (1).

70 – Install the transfer box (VTG)



- If intermediate shaft (1) gets caught on transfer box (VTG) (2), renew intermediate shaft (1) and the radial shaft seals in the automatic or manual transmission.

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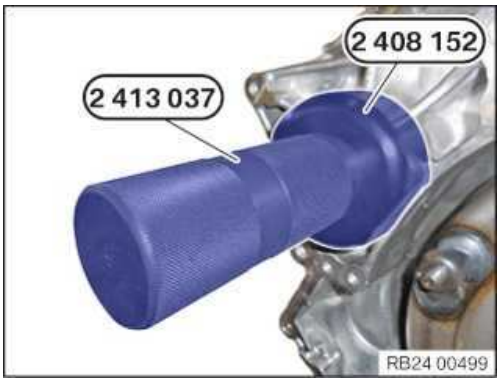
- Screw special tool **2 409 025** into the outer radial shaft seal.
- Turn the screw on the special tool **2 409 025** until the outer radial shaft seal has been pulled out.



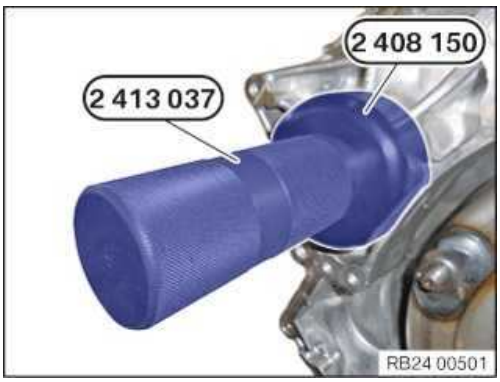
- Insert special tool **2 411 739** into the inner radial shaft seal.



- Screw special tool **2 411 739** into the inner radial shaft seal.
- Turn the screw on the special tool **2 411 739** until the inner radial shaft seal has been pulled out.

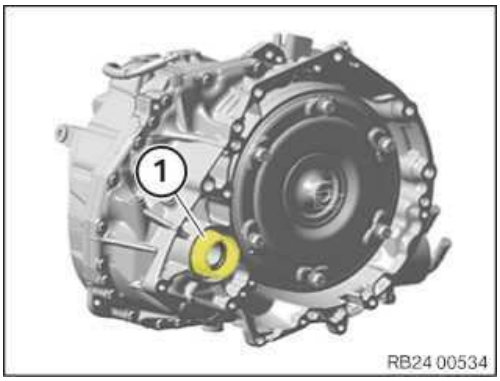


- Drive in the inner radial shaft seal using special tools **2 408 152** and **2 413 037** up to the limit position.



- Drive in the outer radial shaft seal using special tools **2 413 037** and **2 408 150** up to the limit position.

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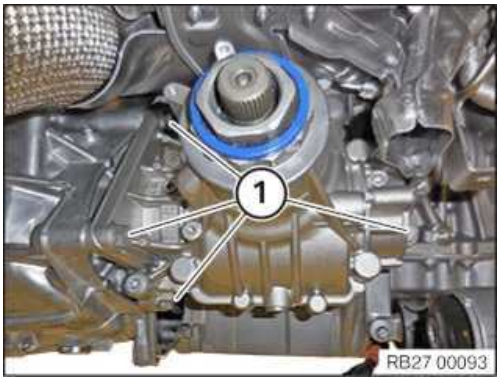
- If necessary, connect the new intermediate shaft (1) to the output flange of the automatic transmission or manual transmission.



- Coat the inside of the output flange (arrows) evenly with approx. 5 g of grease.

Expendable materials

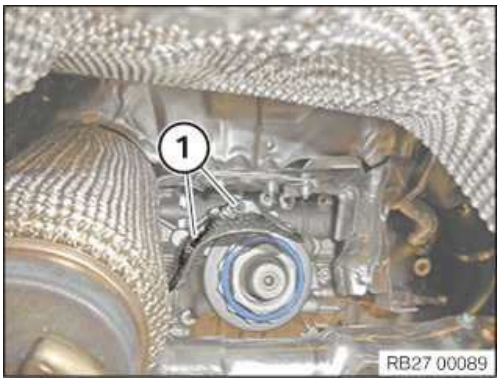
Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the transfer box (VTG).
- Tighten the screws (1).

Transfer box to transmission

M10		Tightening torque	56 Nm



- Install heat shield.
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Heat shield to transfer box

M6	Renew screws.	Tightening torque	6 Nm

▸ **Check the transfer box oil level**

RISK OF DAMAGE

Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.

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- Check transfer case oil level, correct:
- Open the oil filler plug (1).
- Check transfer box oil level.
- If necessary, top up transmission oil up to the lower edge of the oil filler plug opening (1).

Transmission oil

Technically suitable transfer box and electrical transmission oils	

Main group 27

- Tighten the oil filler plug (1).

Oil filler plug on transfer box (VTG)

M18x1.5		Tightening torque	35 Nm

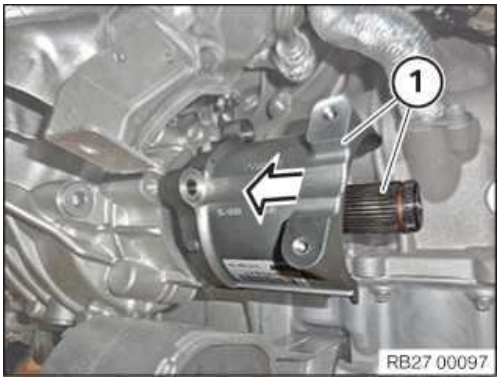
71 – Install the intermediate shaft with the support tube



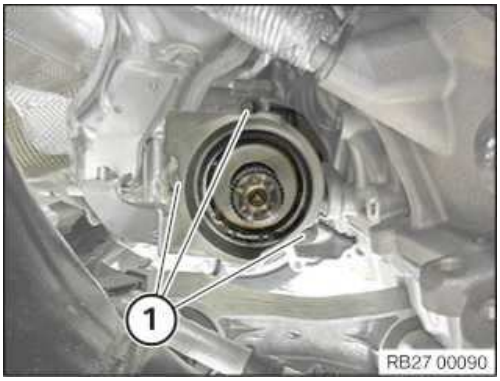
- Coat gearing of the intermediate shaft uniformly with 5 g of grease.

Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the intermediate shaft with support tube (1) in the transfer box.



- Position screws (1).

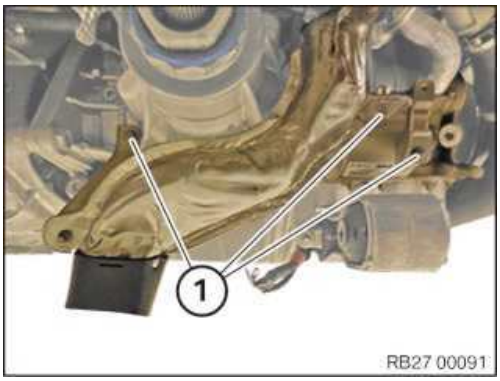
Note: Check for correct screw length! Bolt M8x35 8.8

- Tighten the screws (1).

Intermediate shaft to transfer box

M8x35		Tightening torque	19 Nm

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- If installed: Install air duct.
- Tighten the screws (1).

72 – Installing the high-pressure stage exhaust turbocharger

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

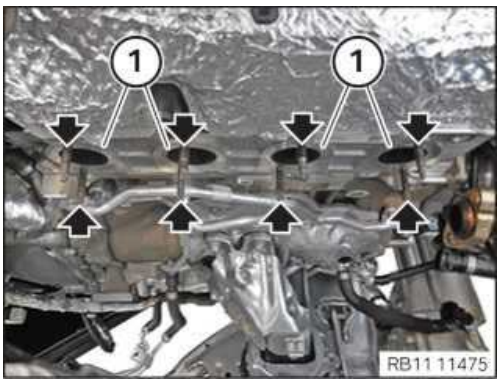
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

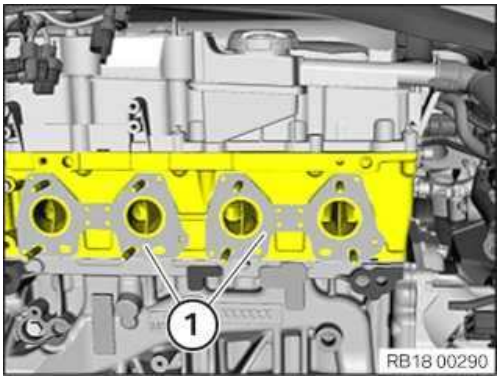


- Clean the sealing surfaces (1) on the cylinder head using special tool **0 495 102 (11 4 470)**.
- Check the stud bolts (arrows) on the cylinder head for correct fit.

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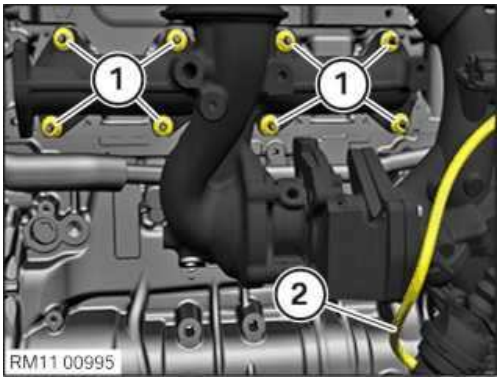
- Clean the sealing surfaces on the exhaust manifold using special tool **0 495 102 (11 4 470)**.



- Renew gasket (1).

  Parts: Gasket

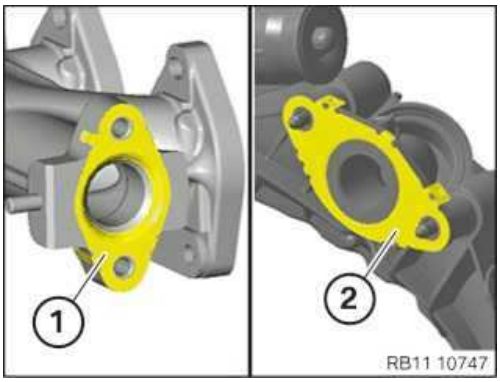
- Install new gasket (1).



- Feed in and install the exhaust manifold and the high-pressure stage exhaust turbocharger.
- Tighten nuts (1).

  Parts: Nuts

- Connect vacuum hose(2).

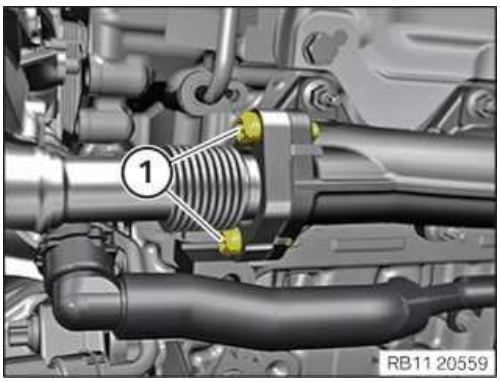


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket

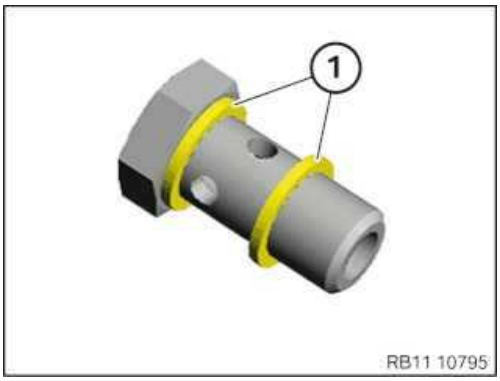


- Tighten the screws (1).

Exhaust-gas recirculation cooler to exhaust manifold

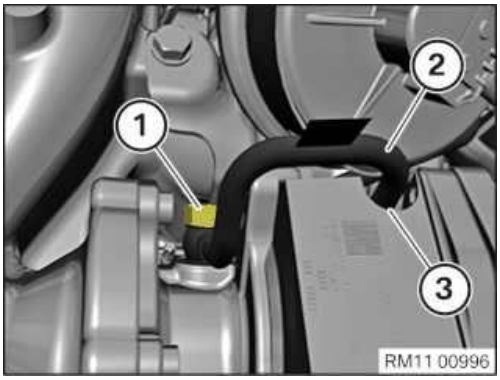
M8x28	Replace screws	Tightening torque	32 Nm

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- Renew sealing rings (1) of banjo bolt.

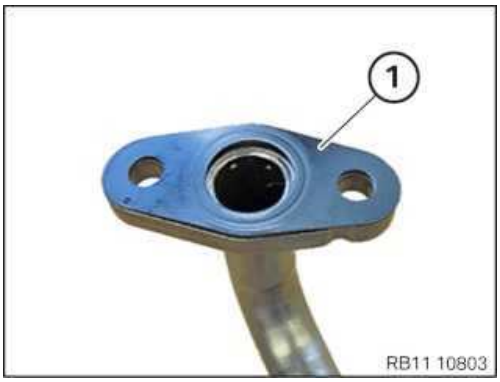
  Parts: Sealing ring



- Guide the oil feed line into the holder (3) and install it.
- Tighten down screw (1).

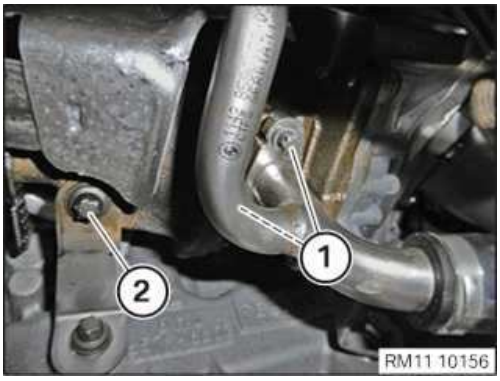


- Tighten bolt (1) from the right wheel arch.



- Renew seal (1) of oil return line.

  Parts: Gasket



- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

73 – Installing the low-pressure stage turbocharger

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RISK OF DAMAGE

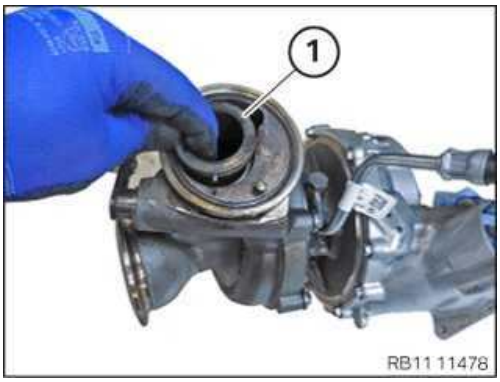
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

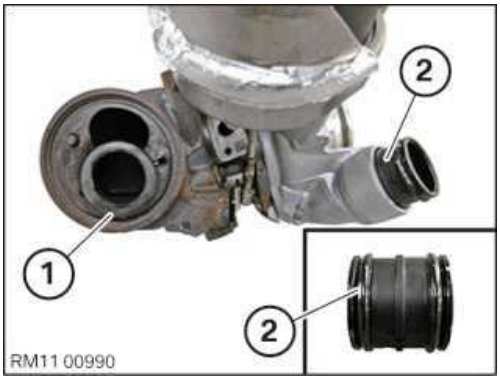
TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.



- Check the spacer plug (1) for damage, renew if necessary.

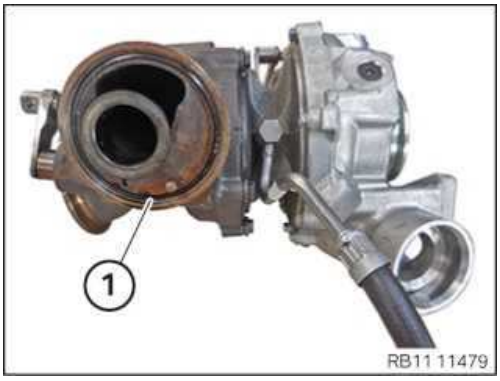
  Parts: Spacer ring
- Insert and install the spacer ring (1).
- Position spacer ring (1) correctly.



- Renew gasket (1).

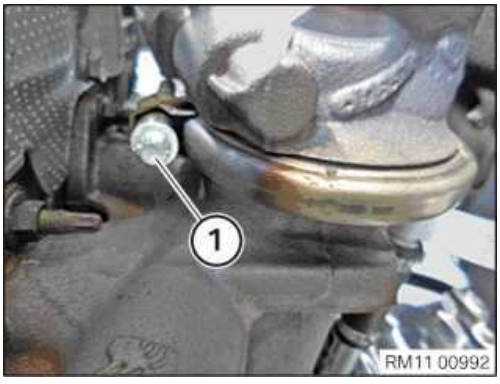
  Parts: Gasket
- Position the seal (1).
- Renew the sleeve(2).

  Parts: Holding sleeve



- Renew sealing ring (1).

  Parts: Sealing ring
- Affix the sealing rings on the exhaust turbocharger.



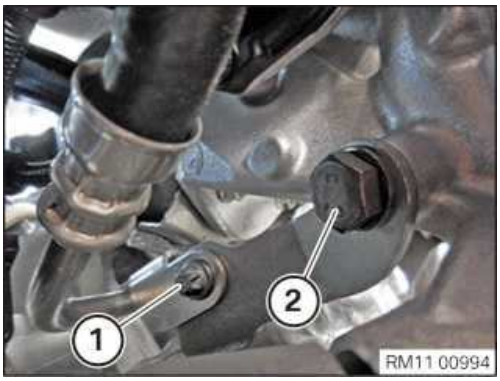
- Insert and install the low-pressure stage exhaust turbocharger on the exhaust manifold .
- Feed in and install V-band clamp .
- Tighten V-band clamp (2).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Screw in nut (1) with 2 **revolutions**.

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- Tighten down screw (1).

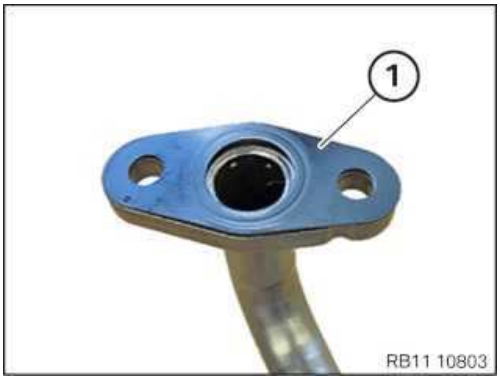
Oil feed line to bracket

Torx screw M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

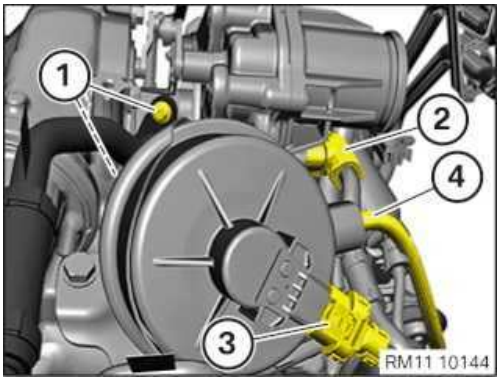
Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm



- Renew seal (1) on the oil return line.

  Parts: Gasket



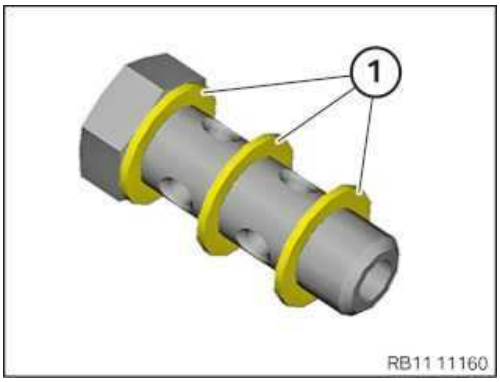
- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

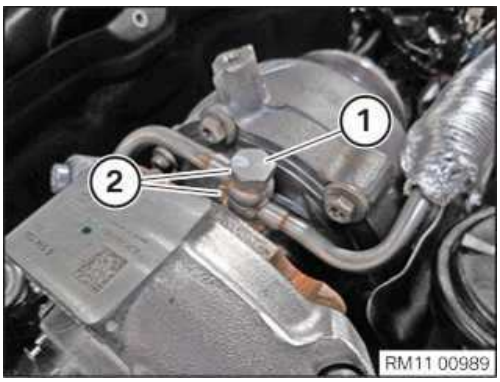
M6x12		Tightening torque	8 Nm

- Connect and lock connectors (2) and (3).

  The locks must engage audibly.
- Connect vacuum hose (4).

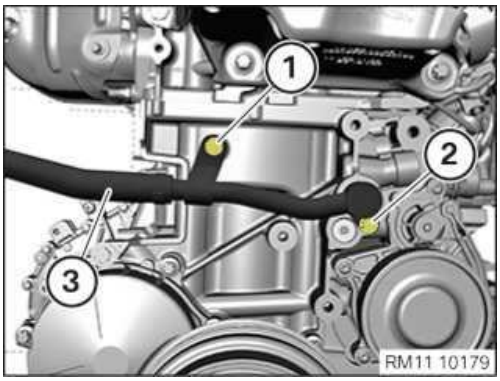


- Renew banjo bolt and sealing rings (1).
- **Parts:** Banjo bolt, sealing rings



- Install sealing rings (1).
- Tighten the banjo bolt (1).
- Ensure that the lines do not rest against the adjacent components.

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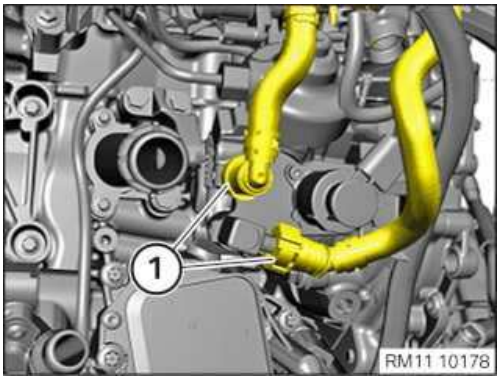


- Renew sealing ring of the coolant line (3).

  Parts: Sealing ring
- Coat the sealing ring and install the coolant line (3) .
- Tighten down screws (1) and (2).

Standard screw connection M6

M6		8 Nm



- Connect and lock fuel lines (1).

  The fuel lines (1) must audibly engage.

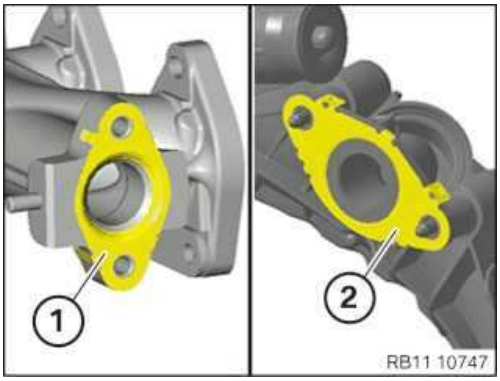
▶ **Installing the exhaust-gas recirculation cooler**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

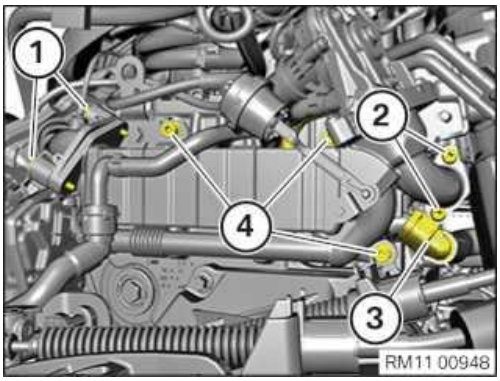


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket
- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket

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- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts
- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

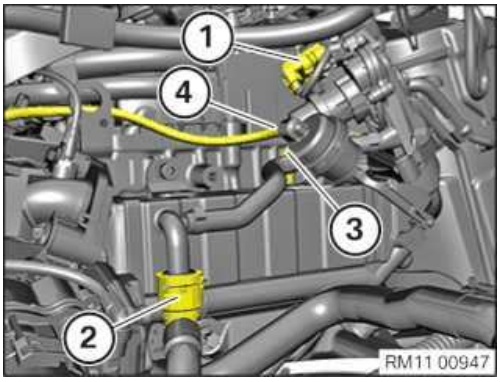
M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.
- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm



TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

▸ **Installing heat shield on exhaust turbocharger at bottom**

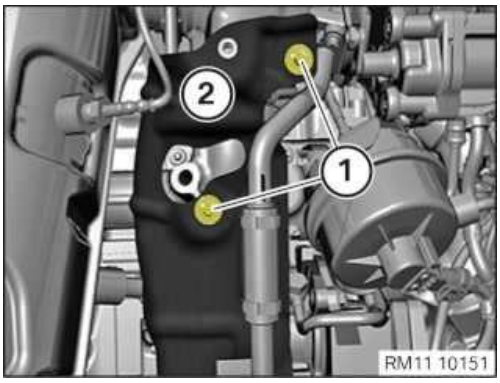
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WARNING

Hot surfaces.

Risk of burning!

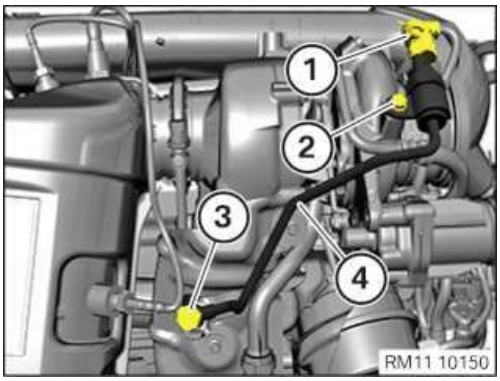
- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (2).
- Tighten the bolts (1) on the heat shield .

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm



- Position the exhaust gas pressure pipe (4).
- Hand-tighten the bolt (2).
- Renew sealing rings on the banjo bolt (3).

  Parts: Sealing ring
- Tighten the banjo bolt (3).

Banjo bolt for exhaust pressure pipe to exhaust manifold

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

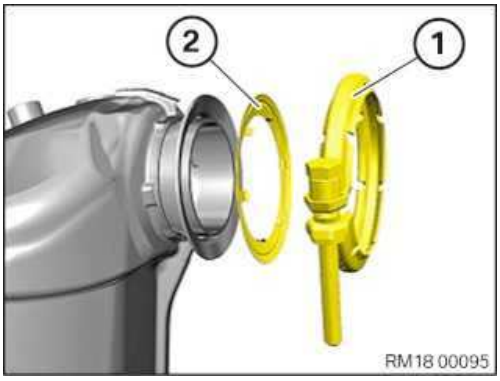
- Tighten down screw (2).

Standard screw connection M6

M6		8 Nm

- Connect connectors (1) and lock.

  Lock must audibly engage.



CAUTION

Heavy component.

Heavy components can lead to injury or damage.

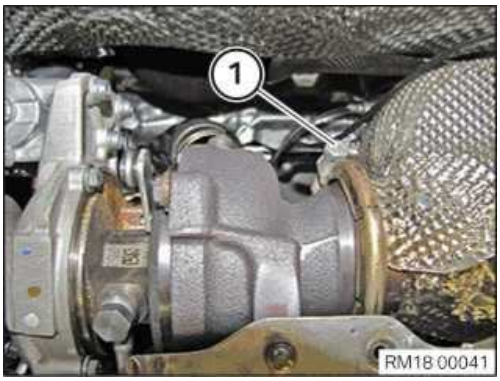
- Remove and install heavy components with the aid of another person/other persons.

- Renew the V-clip (1).

  Parts: V-band clamp
- Renew the gasket (2).

  Parts: Gasket

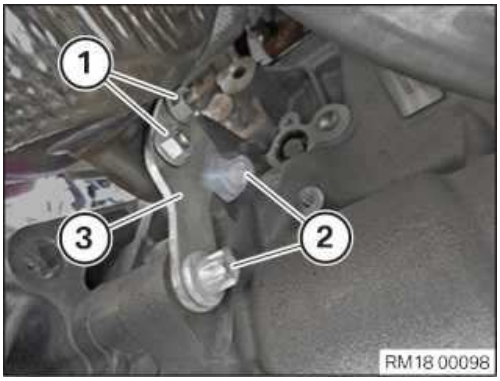
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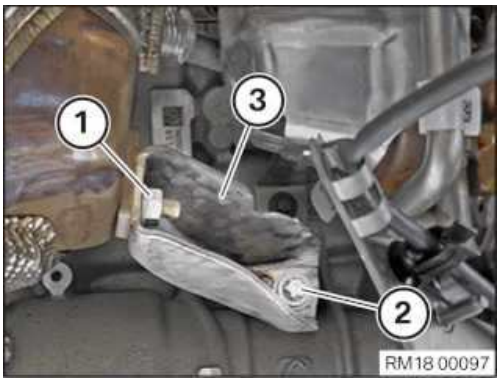
- Carefully insert and install the diesel particulate filter .
- Feed in and install V-band clamp (1).
- Make sure that the seal between the diesel particulate filter and the exhaust turbocharger is installed correctly.
- Align the diesel particulate filter on the exhaust turbocharger.
- Position V-clip (1).
- Hand-tighten the V-clip (1).



- Tighten nuts (1) by hand.



- Install holder (3).
- Hand-tighten the bolts (2).
- Tighten nuts (1) by hand.



- Install holder (3).
- Tighten the nut (1) hand-tight.
- Hand-tighten the bolt (2).



- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

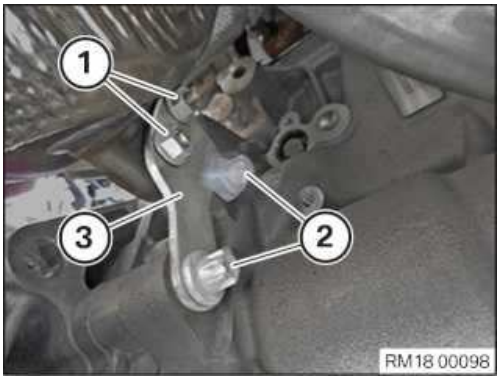
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- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screws (2).

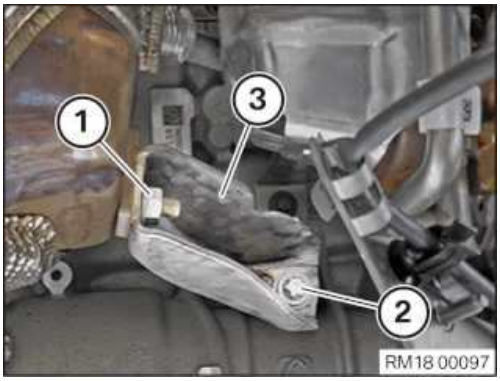
Diesel particulate filter holder to gearbox

M12x75		Tightening torque	66 Nm

- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screw (2).

Diesel particulate filter bracket to crankcase

M10x35		Tightening torque	38 Nm

- Tighten nut (1).

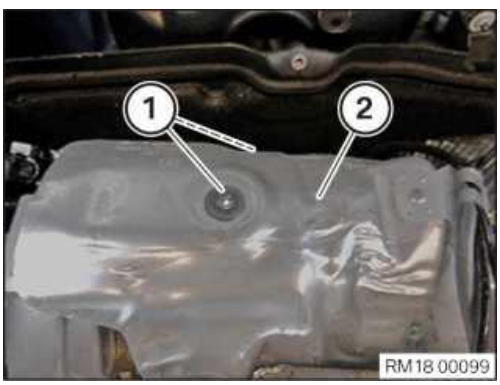
Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Remove fitting aid (1) for the flexible tube.

▶ **Install the heat shield on the exhaust turbocharger**



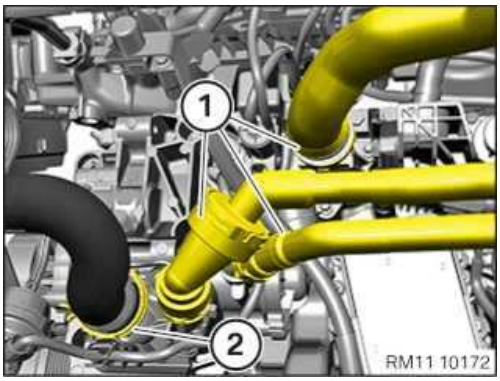
- Feed in and install the heat shield (2).
- Tighten the screws (1) at the top and bottom of the heat shield.

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

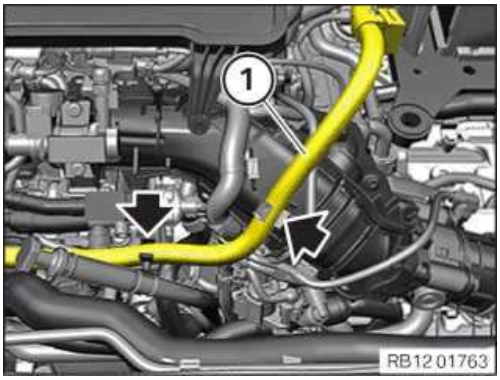
- Fasten the cable at the clips .

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- Install the coolant hose and secure with the clamp (2) .
- Connect and lock the coolant lines (1).

  The coolant lines (1) must engage audibly.



CAUTION

Improper routing of the positive battery cable.

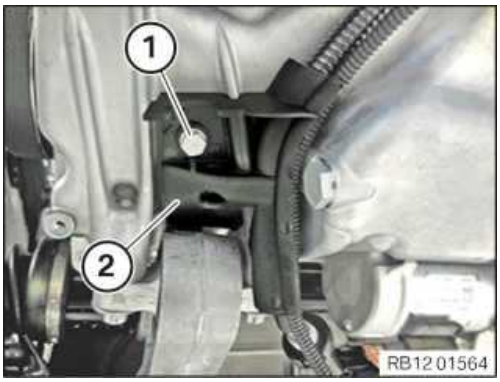
Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

- Insert the positive battery cable (1) into the clamps (arrows).



- Feed in and install positive battery cable at the clamps (1).



- Insert and install the holder (2).
- Tighten down screw (1).

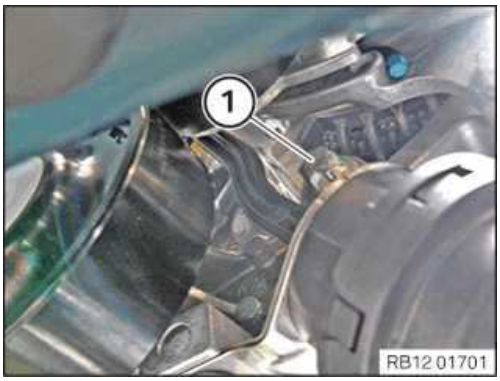
Bracket to oil sump

M6		Tightening torque	8 Nm



- Insert and install alternator (1) along with the screw (2) on the bottom of the alternator through the slot on the support.

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- Tighten the screw (1) below on the alternator.

Alternator to component carrier

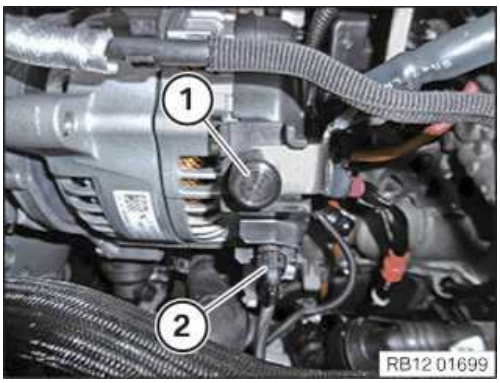
M10x75 / M10x125		Tightening torque	38 Nm



- Tighten the bolt (1) on top on the alternator.

Alternator to component carrier

M10x75 / M10x125		Tightening torque	38 Nm



- Mount positive battery cable to the alternator.
- Tighten nut.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

- Mount the cover (1).
- Connect the connector (2) to the alternator and lock audibly.



- Install air conditioning compressor (2) and position it correctly.
- Tighten the screws (1).

Air conditioning compressor in component carrier

M10		Tightening torque	38 Nm

▸ **Installing the drive belt for alternator**

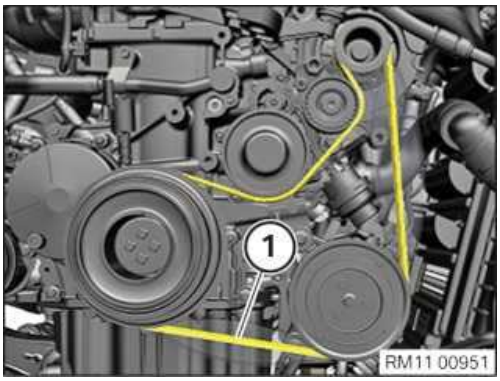
TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

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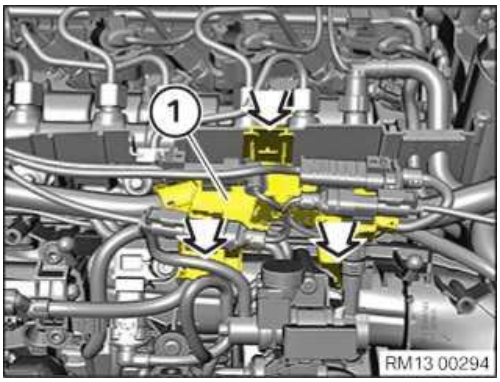


- Feed in the drive belt for the alternator (1) and install it.

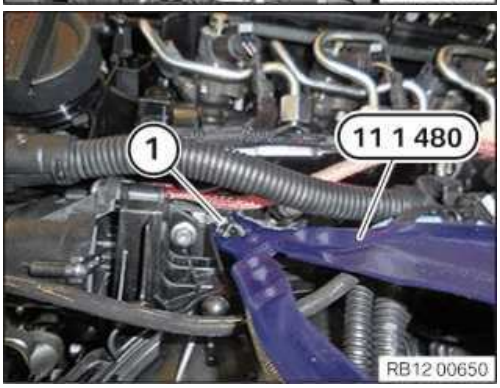


- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool **0 496 268 (11 0 390)** out of the belt tensioner and remove it.

▶ **Installing the cable clip for the intake plenum**

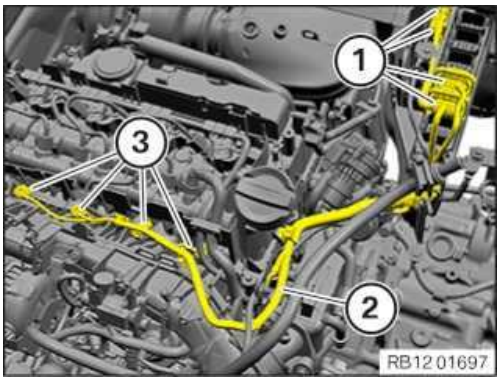


- Insert and install the cable clip (1) in the direction of the arrow.
- Make sure the cable clip (1) is fitted correctly.



- Connect and lock the connector (1) on the glow elements.

  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.

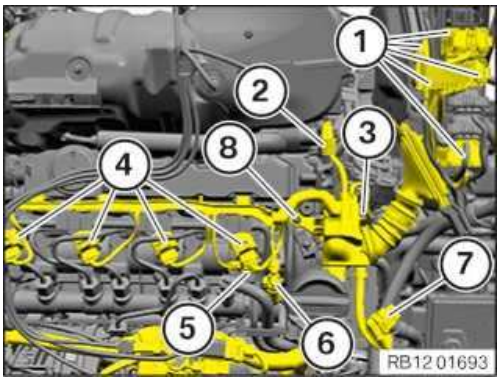


- Lay vehicle wiring harness and fasten with clamps.
- Route all connectors (1) to the integrated supply module (PDM) and to the DME control unit.
- Connect all connectors (3) to the glow elements and engage them audibly.
- Mount ground strap and tighten screw (2).

Ground cable to cylinder head

M6x12		Tightening torque	8 Nm

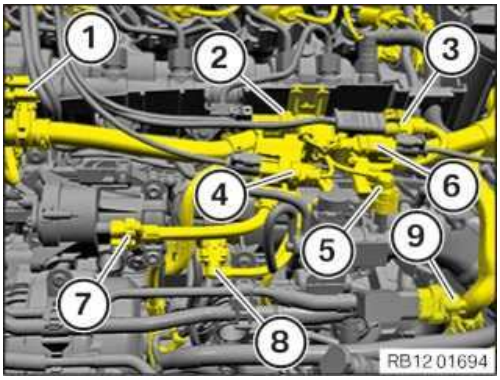
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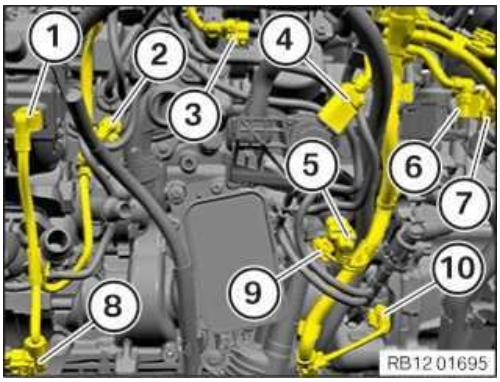
- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the integrated supply module (PDM) and to the DME control unit.
- Attach connector (2) to the differential pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust-gas recirculation valve and lock audibly.
- Attach connector (4) to the injectors and lock it audibly.
- Attach connector (5) to the camshaft sensor and lock it audibly.
- Attach connector (6) to the fuel pressure regulator and lock it audibly.
- Connect and audibly lock the connector (7) to the hot film air mass meter.
- Tighten down screw (8).

Wiring harness to cylinder head cover

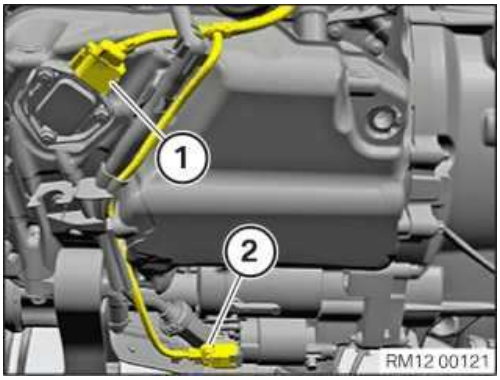
TS5x20		Tightening torque	3,5 Nm



- Connect the connector (1) to the rail pressure sensor and lock it audibly.
- Attach connector (2) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (3) to the front oxygen sensor and lock audibly.
- Attach connector (4) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Connect the connector (5) to the electric changeover valve and lock audibly.
- Attach connector (6) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (7) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (8) to the charging pressure sensor and lock it audibly.
- Attach connector (9) to the fuel pressure and temperature sensor and lock it audibly.

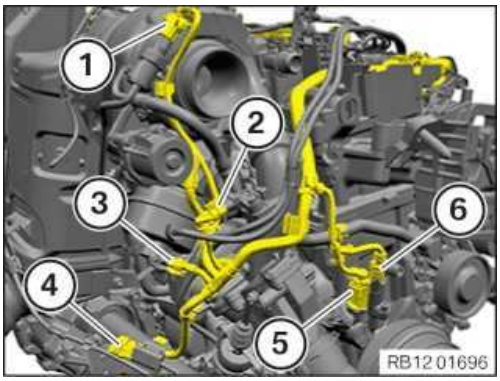


- Connect the connector (1) to the alternator and lock audibly.
- Connect the connector (2) to the electric changeover valve and lock audibly.
- Connect the connector (3) to the electric changeover valve and lock audibly.
- Connect the connector (4) to the high pressure pump and lock audibly.
- Connect the connector (5) to the oil pressure sensor and lock it audibly.
- Attach connector (6) to the throttle bodies and lock it audibly.
- Attach connector (7) to the intake air temperature sensor and lock it audibly.
- Connect the connector (8) to the air conditioning compressor and lock audibly.
- Connect the connector (9) to the solenoid valve and lock audibly.
- Connect the connector (10) to the crankshaft sensor and lock it audibly.

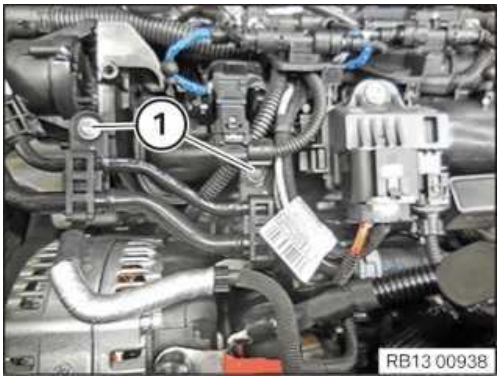


- Connect the connector (1) to the oil-level sensor and lock it audibly.
- Connect connector (2) to the starter motor and lock audibly.

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- Attach connector (1) to the exhaust turbocharger and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust gas pressure sensor and lock it audibly.
- Connect the connector (4) to the monitoring oxygen sensor and lock audibly.
- Attach connector (5) to the oil pressure switch and lock it audibly.
- Attach connector (6) to the switching valve and lock it audibly.

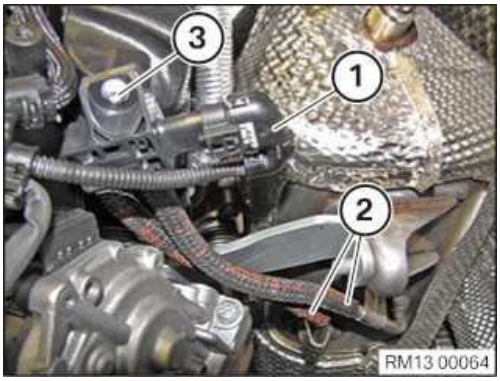


- Position the fuel line.
- Tighten the screws (1).

Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

75 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

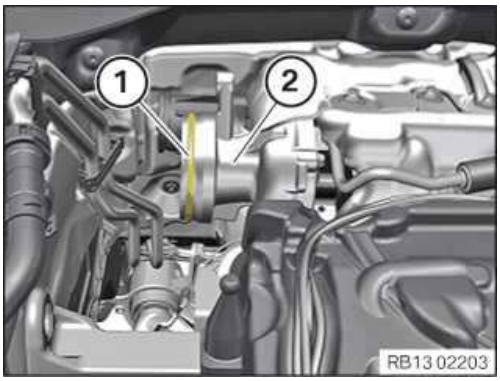
Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

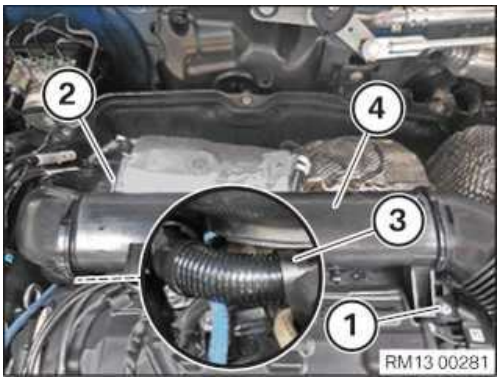
  The connector (1) must engage audibly.

76 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.

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- Feed in clean air pipe and install.
- Connect clean air pipe to the exhaust turbocharger and lock audibly in the clamps (2).
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Connect ventilation line (3) to the cylinder head cover and lock audibly.

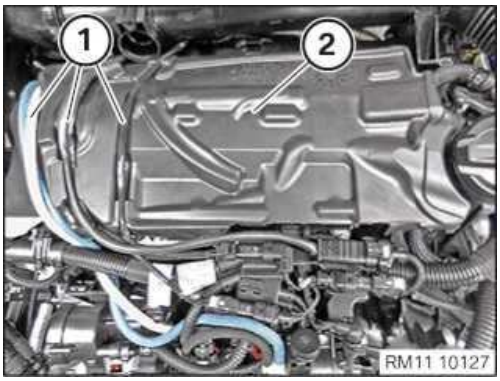


- Mount clean air pipe onto the intake filter housing.
- Tighten clamp (1) on the clean air pipe.

Clean air pipe to intake silencer housing

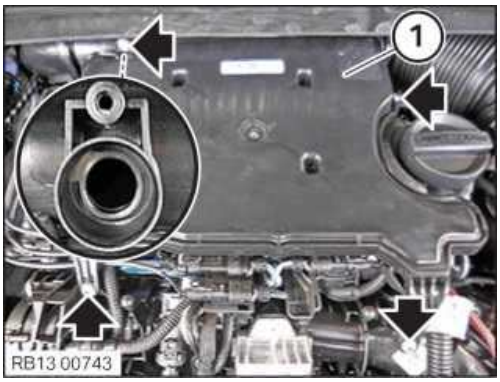
Clamp		Tightening torque	3 Nm

77 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the vehicle wiring harness (1) in the brackets.

78 – Install resonator



- Insert and install the resonator (1).
- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

79 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Check for correct installation of all rubber mounts in the acoustic cover (1).



- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

80 – Install engine



- See additional information.

Additional Information

Overview of Tightening Torques

Special tool to cylinder head Used in step 12

M8		Tightening torque	21,5 Nm

Special tool 2 455 010 to crankcase Used in step 13

M10x30		Tightening torque	38 Nm

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Special tool 11 8 930 to special tool 00 2 320

Used in step 13

M14x35		Tightening torque	160 Nm

Main bearing cap to crankcase

Used in step 43

M10x85	Replace screws.	1. tightening torque	25 Nm
		2. tightening torque	50 Nm
		3. Angle of rotation	60 °
		4. Angle of rotation	60 °

Special tool 2 288 054 to crankshaft

Used in step 43

M10		Tightening torque	20 Nm

Idler gear to crankcase

Used in step 43

M12x1.5		Tightening torque	10 Nm
		Angle of rotation	45 °

Gear to counterbalance shaft

Used in step 43

M10	Renew screws.	1. Jointing torque	20 Nm
		2. Angle of rotation	180 °

Connecting rod bearing cap to connecting rod

Used in step 47

M9x47		Tightening torque	20 Nm
		Angle of rotation 1	70 °
		Angle of rotation 2	70 °

Oil deflector to crankshaft bearing cap

Used in step 48

M8x14	Replace screws.	Tightening torque	35 Nm
		Release	180 °
		Tightening torque	15 Nm
		Angle of rotation	45 °

Oil deflector to crankcase

Used in step 48

M8x14		Tightening torque	19 Nm

Bearing journal of tensioning and guide rail

Used in step 49

M8	*Replace bearing journal.*	Tightening torque	20 Nm

Chain tensioner to crankcase

Used in step 49

M6x22		Tightening torque	10 Nm

Camshaft sprocket on high pressure pump

Used in step 49

M12		Tightening torque	65 Nm

Oil vacuum pump to crankcaseB47

Used in step 50

M8x35		Tightening torque	19 Nm

Rear timing case cover to crankcase

Used in step 51

M6	Renew screws.	Jointing torque	8 Nm
		Angle of rotation	90 °

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SCR coolant lines to crankcase end cover

Used in step 51

Hexagon screw M6x16		Tightening torque	8 Nm

Cylinder head to crankcase

Used in step 51

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

Cylinder head bolt to timing case cover

Used in step 51

M8x40		Tightening torque	19 Nm

Oil sump to crankcase

Used in step 51

M8x30		Tightening torque	24 Nm
M8x110		Tightening torque	24 Nm

Transmission to oil sump

Used in step 51

M8		Tightening torque	19 Nm

Guide tube for oil dipstick on engine

Used in step 51

M8x16		Tightening torque	19 Nm

Flywheel to crankshaft

Used in step 52

M12x1.5	Renew screws.	Tightening torque	120 Nm

Vibration damper with belt pulley to crankshaft

Used in step 53

M10x65	Renew screws. Tighten screws crosswise.	1. Jointing torque	40 Nm
		2. Angle of rotation	60 °
		3. Angle of rotation	60 °

Transmission to engine

Used in step 53

M8		Tightening torque	19 Nm

Glow elements to cylinder head

Used in step 56

Glow element		Tightening torque	13 Nm

Camshaft carrier to cylinder head

Used in step 57

M7x35		Tightening torque	13 Nm

Intake and exhaust camshaft in camshaft support

Used in step 58

M6x31		Tightening torque	10 Nm

Bearing journal to cylinder head

Used in step 58

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8

Used in step 58

M8		Tightening torque	19 Nm

Standard screw connection M6

Used in step 58 74

M6			8 Nm

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Chain tensioner piston to cylinder head

Used in step 58

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft

Used in step 58

M7x17.			17 Nm

Cylinder head cover to cylinder head

Used in step 62

M6		Tightening torque.	8,5 Nm

Clamping claw facing to cylinder head cover

Used in step 63

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 63

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

Rail on cylinder head cover

Used in step 64

Torx screw M8x25		Tightening torque	19 Nm

High pressure line between high pressure pump and rail

Used in step 64

High-pressure pipe		Tightening torque	28 Nm

High pressure lines between injector and rail

Used in step 66

High pressure lines		Tightening torque	28 Nm

Intake plenum to cylinder head

Used in step 67

M6		Tightening torque	11 Nm

Holder to crankcase

Used in step 68

M10		Tightening torque	38 Nm

Transmission to engine

Used in step 69

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

Torque converter to flywheel

Used in step 69

M10	Replace nuts. Remove any adhesive residue from the threads.	Tightening torque	56 Nm

Transfer box to transmission

Used in step 70

M10		Tightening torque	56 Nm

Heat shield to transfer box

Used in step 70

M6	Renew screws.	Tightening torque	6 Nm

Oil filler plug on transfer box (VTG)

Used in step 70

M18x1.5		Tightening torque	35 Nm

Intermediate shaft to transfer box

Used in step 71

M8x35		Tightening torque	19 Nm

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Exhaust-gas recirculation cooler to exhaust manifold

Used in step 72 74

M8x28	Replace screws	Tightening torque	32 Nm

Oil return line to turbocharger

Used in step 72 73

M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase

Used in step 72

M8x16		Tightening torque	22 Nm

Exhaust turbocharger to exhaust manifold

Used in step 73

V-band clamp		Tightening torque	19 Nm

Oil feed line to bracket

Used in step 73

Torx screw M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase

Used in step 73

M8x16		Tightening torque	22 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 74

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler

Used in step 74

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 74

M8x20		Tightening torque	19 Nm

Heat shield for exhaust turbocharger

Used in step 74

Torx screw BM 6x12		Tightening torque	10 Nm

Banjo bolt for exhaust pressure pipe to exhaust manifold

Used in step 74

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

Diesel particulate filter V-clip to exhaust turbocharger

Used in step 74

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Diesel particle filter to holder

Used in step 74

M8 hexagon nut		Tightening torque	19 Nm

Diesel particulate filter holder to gearbox

Used in step 74

M12x75		Tightening torque	66 Nm

Diesel particulate filter bracket to crankcase

Used in step 74

M10x35		Tightening torque	38 Nm

Heat shield for exhaust turbocharger

Used in step 74

Torx screw BM 6x12		Tightening torque	10 Nm

Bracket to oil sump

Used in step 74

M6		Tightening torque	8 Nm

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Alternator to component carrier — Used in step 74

M10x75 / M10x125		Tightening torque	38 Nm

Positive battery cable to alternator — Used in step 74

M8		Tightening torque	19 Nm

Air conditioning compressor in component carrier — Used in step 74

M10		Tightening torque	38 Nm

Ground cable to cylinder head — Used in step 74

M6x12		Tightening torque	8 Nm

Wiring harness to cylinder head cover — Used in step 74

TS5x20		Tightening torque	3,5 Nm

Fuel line to intake plenum — Used in step 74

TS6x20		Tightening torque	5 Nm

Differential pressure sensor to holder — Used in step 75

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor — Used in step 75

Clamp 15–19mm		Tightening torque	3 Nm

Clean air pipe to cylinder head cover — Used in step 76

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 76

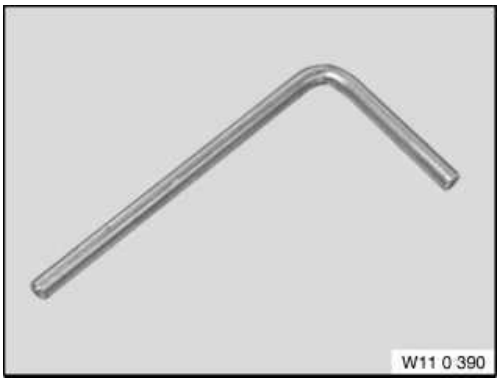
Clamp		Tightening torque	3 Nm

Resonator to manifold and clean air pipe — Used in step 78

Screw TS6	Renew screw.	Tightening torque	5 Nm

Overview of Special Tools

0 496 268 (11 0 390) Pin

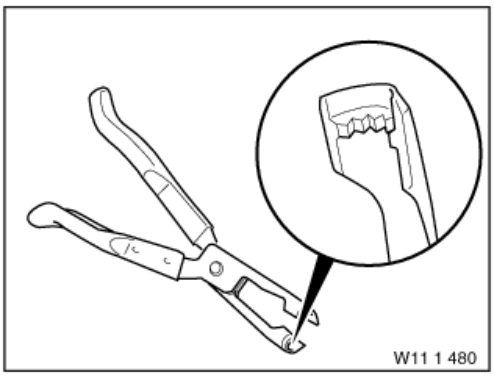


Common — Used in step 7 74

Usage	(roll pin) For securing new tensioning pulley (poly-V belt)
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 15 07 (390)

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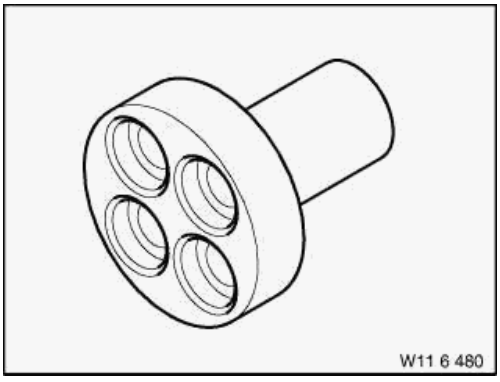
0 490 796 (11 1 480) Pliers



Common Used in step 7 25

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

0 493 380 (11 6 480) Connector



Common Used in step 12 20 58 61 69

Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

2 220 718 Workshop crane

Used in step 12 69

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Common	
Usage	WSK 1000
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	06 01 11 (701)

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2 459 012 Holder



Common	Used in step 12 69
Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

2 455 010 Engine support



Common

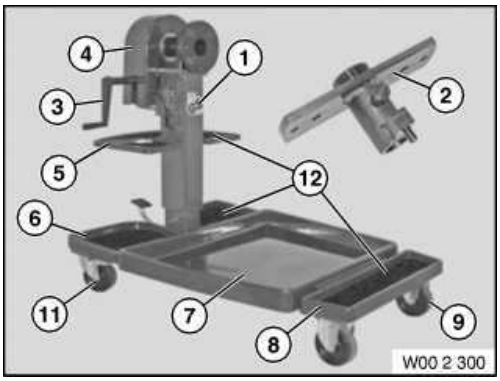
Used in step 13 68

Usage	For accommodating engine on assembly stand. Engine: B3x, B4x, N47.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

0 495 187 (00 2 300) Assembly stand

Used in step 13

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Common

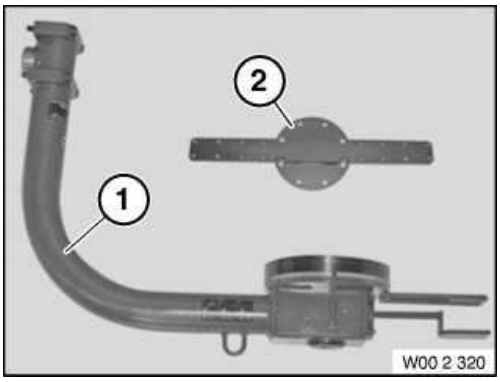
Usage	Assembly stand with universal flange for mounting engines from S85
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 188 (00 2 301)		**Assembly stand** available only as complete assembly stand 83 30 0 495 187.	
2	0 495 189 (00 2 302)	**2 299 563**	**Tool** (Universal flange). Do not use any more!!! Technically locked. Replaced with a new flange with material number 83 30 2 299 563. All flanges delivered until the end of 2011 will be replaced at no charge. From 2012, only the new flange will be supplied. Also applies to the complete engine mounting stand 00 2 300.	
3	0 495 200 (00 2 303)		**Crank**	
4	0 495 201 (00 2 304)		**Cover** (Protective hood)	
5	0 495 202 (00 2 305)		**oddments tray** (Oddments tray for small parts)	
6	0 495 203 (00 2 306)		**Shaped element** (Rear shaped pan)	
7	0 495 204 (00 2 307)		**Collection pan** (Oil collection pan)	
8	0 495 205 (00 2 308)		**Shaped element** (Front shaped pan)	
9	0 495 206 (00 2 309)		**Wheel** (Front wheel (without stop))	
10	0 495 207 (00 2 311)		**Wheel** (Rear wheel (with stop))	
11	0 495 208 (00 2 312)		**Mat** (Checker mat set)	
2	2 299 563		**Adapter** New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.	

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0 495 196 (00 2 320) Support arm



Common

Used in step 13

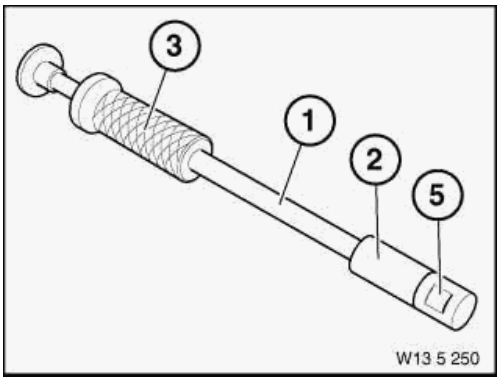
Usage	(Support arm with fixture) For mounting engines using the engine mounting bracket.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 197 (00 2 321)		**Support arm**	
2	0 495 198 (00 2 322)		**Panel** (take-up plate)	
3	0 495 380 (00 2 323)		**Panel** (fixture) Engine N73	
6	0 496 287 (00 2 326)		**Panel** (fixture) Engine: M73	
5	0 496 288 (00 2 327)	**0 496 373**	**Panel** (fixture) Engine: S62 Replaced by 11 5 420 (0 496 373)	
8	0 496 533 (00 2 328)		**Support** (Engine mount) Engine: N57, N57Top	
9	0 496 579 (00 2 329)	**0 496 680**	**Support** (Engine mount) Engine: N74 Replaced by 116160 (0 496 680)	
4	0 495 379 (00 2 324)		**Panel** (fixture) Engine M67TU	
5	0 495 381 (00 2 325)		**Panel** (fixture) Engine N62, N62TU	

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0 493 321 (13 5 250) Puller



Common

Used in step 17

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

0 493 339 (13 5 252) Bush



Common

Used in step 17

Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 340 (13 5 253) Weight



Common

Used in step 17

Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

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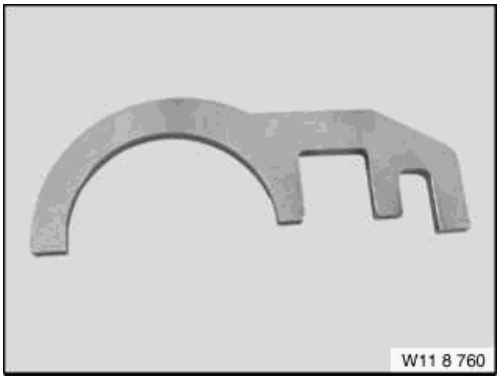
2 288 380 Locating stud



Common Used in step 20 58 59 61

Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 112 (11 8 760) Gauge



Common Used in step 20 58 60 61

Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 495 105 (11 4 480) oddments tray



Common Used in step 26 27 58

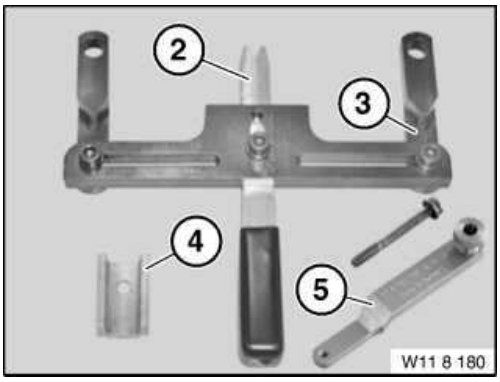
Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

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0 493 587 (11 8 180) Holder



Common

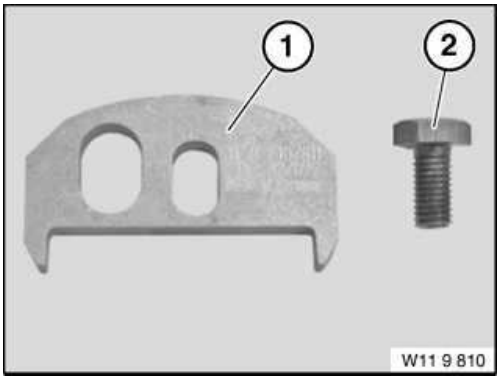
Used in step 28 53

Usage	(Counter support) Blocking flywheel when releasing and tightening down central bolts on vibration absorber
Included in the tool or work	
Storage location	B45
Replaced by	
In connection with	
SI-Number	01 12 99 (452)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
2	0 494 433 (11 8 182)		**Shaped part** (shaped part)	
5	0 494 716 (11 8 185)		**Adapter** (Adapter with adjusting sleeve) E46 M47TU	
1	0 494 432 (11 8 181)	**0 494 434**	**Basic body** (Basic body) E65/M67, E38/M67 Discontinuation Replaced by 11 8 183 (0 494 434)	
3	0 494 434 (11 8 183)		**Basic body**	
4	0 494 435 (11 8 184)		**Adapter** E65 / M67	

0 496 171 (11 9 811) Holder



Common

Used in step 29 52

Usage	Available only as a complete tool set 11 9 810 (83 30 0 496 170) - as of 13.01.12
Included in the tool or work	0 496 170
Storage location	C86
Replaced by	
In connection with	
SI-Number	01 07 07 (355)

0 494 793 (11 9 265) Bush



Common

Used in step 29 52

Usage	
Included in the tool or work	0 493 938
Storage location	A44
Replaced by	
In connection with	
SI-Number	

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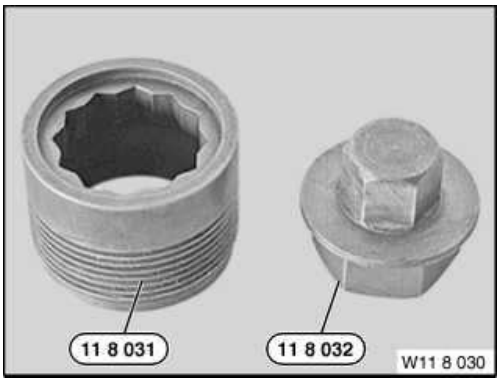
2 357 904 Gauge



Common Used in step 32 49

Usage	For positioning the high pressure pump to the crankshaft . Replaced by gauge 2420824
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 725 (11 8 030) Extractor



Common Used in step 32

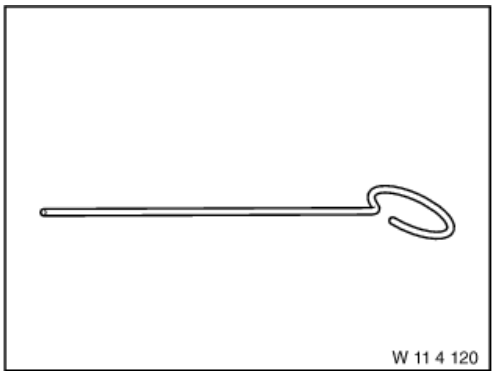
Usage	for the disassembly of the high pressure pump (replaces SWZ 11 8 740 as of 08/2009) 11 8 740 will be replaced by 83 30 2 448 914.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 757 (11 8 031)	2 448 914	**Holding sleeve** Replaces SWZ11 8 741 from 08/2009, 09/2011 no longer available individually. From 10/2016, can only be ordered as a new set of special tools 2 448 914.	
2	0 496 758 (11 8 032)	2 448 914	**Adapter** Replaces special tool 11 8 742 from 08/2009, 09/2011 remaining inventories will be sold off - no longer available individually. From 10/2016, can only be ordered as a new set of special tools 2 448 914.	

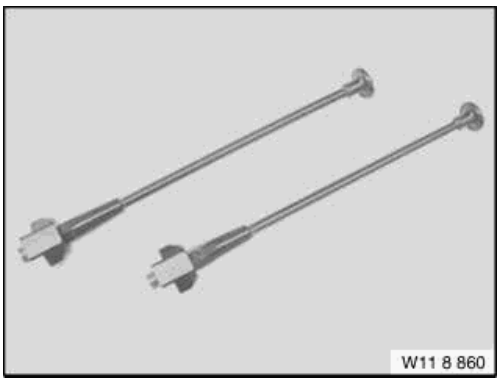
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0 491 012 (11 4 120) Pin



Common	Used in step 32 49
Usage	(lock pin) For chain tensioners, for locking the chain tensioner piston (e.g. during cylinder head removal and fitting)
Included in the tool or work	
Storage location	B1
Replaced by	
In connection with	
SI-Number	01 12 93 (701)

0 496 144 (11 8 860) Assembly tool



Common	Used in step 35 46
Usage	For installing piston with connecting rod in crankcase.
Included in the tool or work	
Storage location	A23
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

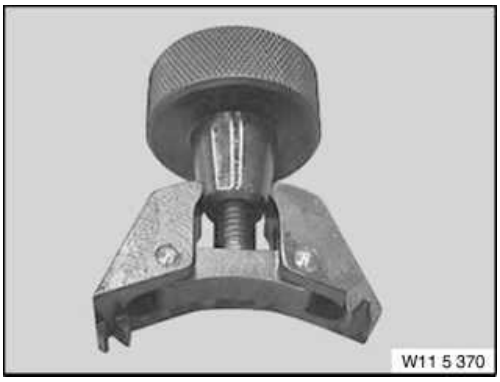
2 288 054 Gauge



Common	Used in step 40 43
Usage	For positioning the counterbalance shafts during installation.
Included in the tool or work	
Storage location	C56
Replaced by	
In connection with	
SI-Number	01 06 14 (076)

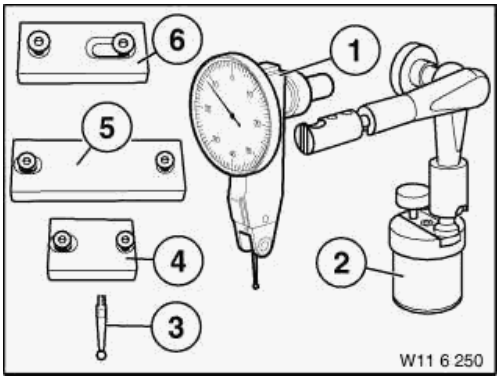
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0 495 131 (11 5 370) Tool



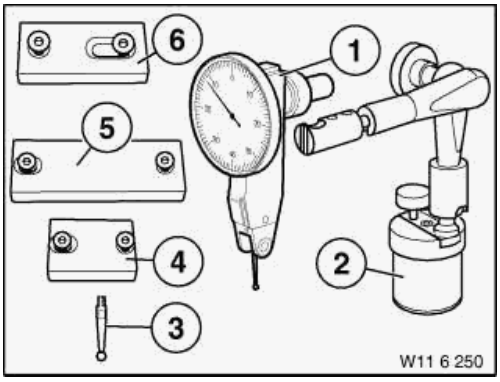
Common	Used in step 40 43
Usage	(Locating tool) For VANOS exhaust camshaft gear setting.
Included in the tool or work	
Storage location	A71
Replaced by	
In connection with	
SI-Number	01 02 05 (173)

0 493 144 (11 6 251) Dial gauge



Common	Used in step 43
Usage	(Dial gauge) With 0.8 mm measuring range in each direction
Included in the tool or work	0 493 143
Storage location	
Replaced by	
In connection with	
SI-Number	

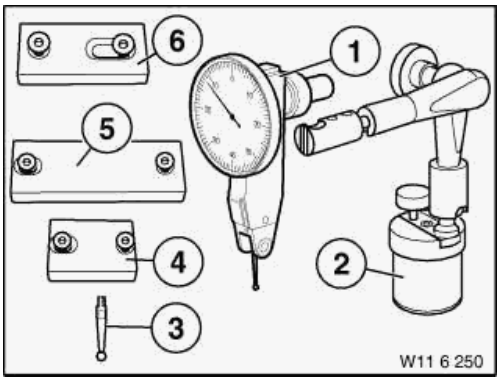
0 493 145 (11 6 252) Tripod



Common	Used in step 43
Usage	(Small hydraulic tripod with magnetic base)
Included in the tool or work	0 493 143
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 493 143 (11 6 250) Measuring device



Common

Used in step 43

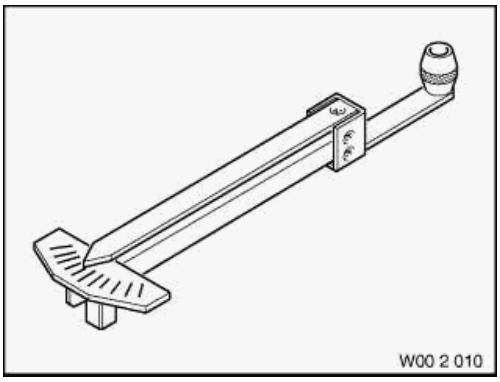
Usage	(Measuring device) Sensing arm measuring device With small tripod for measuring tooth flank and side clearance on counterbalance shafts, camshafts and crankshafts.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 04 98 (304)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
4	0 495 214 (11 6 254)		**Panel** (Fixture) Engine: M47T2; M57T2; S85	
5	0 495 468 (11 6 255)		**Panel** (Fixture M7) Engine camshaft: M67TU	
3	0 493 146 (11 6 253)		**Sensor** (sensor) Sensor arm 11.5 mm	
1	0 493 144 (11 6 251)		**Dial gauge** (Dial gauge) With 0.8 mm measuring range in each direction	
2	0 493 145 (11 6 252)		**Tripod** (Small hydraulic tripod with magnetic base)	
6	0 495 470 (11 6 256)		**Panel** (Fixture M8) Engine crankshaft: M67TU	

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0 490 130 (00 2 010) Measurement aid



Common	Used in step 43
Usage	(Coefficient of friction meter) For adjusting the steering box (measurement possible in both directions) and for checking and adjusting the bevel pinion and crown wheel bearing in all final drives
Included in the tool or work	
Storage location	X9
Replaced by	
In connection with	
SI-Number	

2 420 824 Gauge



Common	Used in step 43
Usage	For positioning the high pressure pump to the crankshaft . Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B56
Replaced by	
In connection with	
SI-Number	

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0 493 582 (11 8 140) Bush



Common

Used in step 46

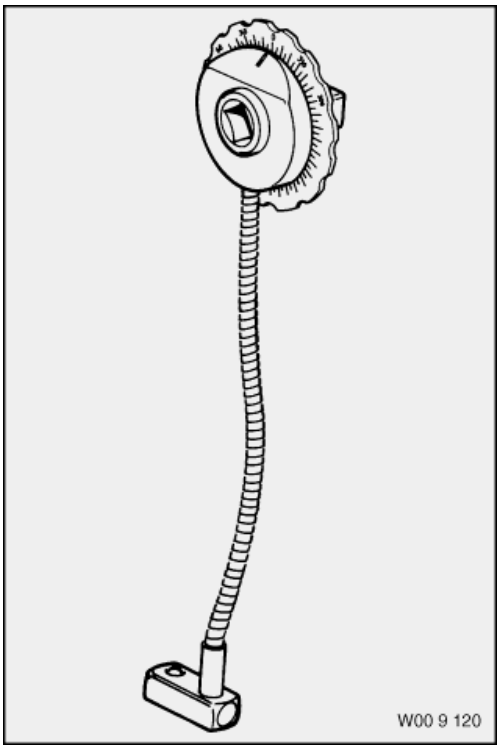
Usage	(Assembly bushes) For installing the pistons
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 12 99 (452)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 494 394 (11 8 141)		**Bush** Bush for piston installation 84.00 mm	
2	0 494 395 (11 8 142)		**Bush** Liquidation of existing inventory and then available only as a complete tool set 11 8140 (83 30 0 493 582) - as of 12.03.12.	
3	0 494 396 (11 8 143)		**Bush** Liquidation of existing inventory and then available only as a complete tool set 11 8140 (83 30 0 493 582) - as of 12.03.12.	

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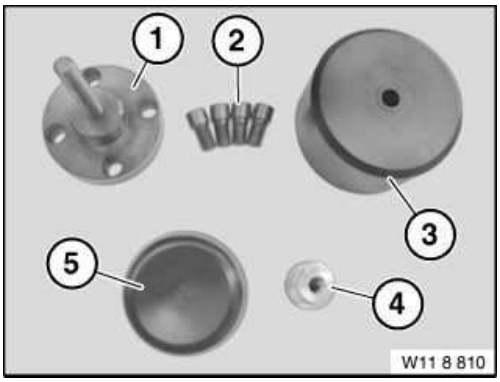
0 490 504 (00 9 120) Torque angle measuring dial



Common Used in step 47 51

Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

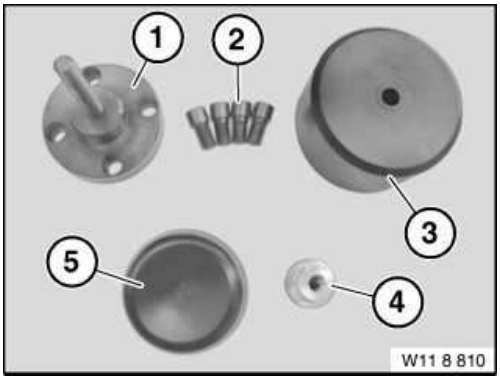
0 496 137 (11 8 815) Holding sleeve



Common Used in step 51

Usage	(Slip sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 133 (11 8 811) Basic body

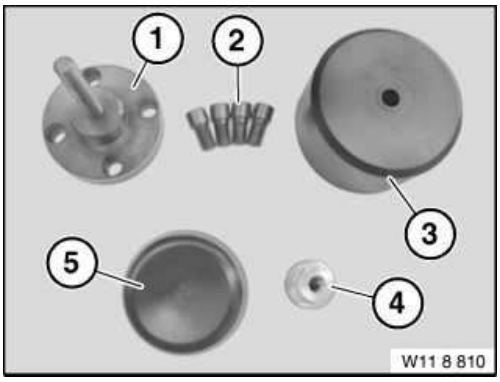


Common Used in step 51

Usage	Liquidation of existing inventory and then available only as a complete tool set 11 8 810 = 83 30 0 496 132 - as of 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

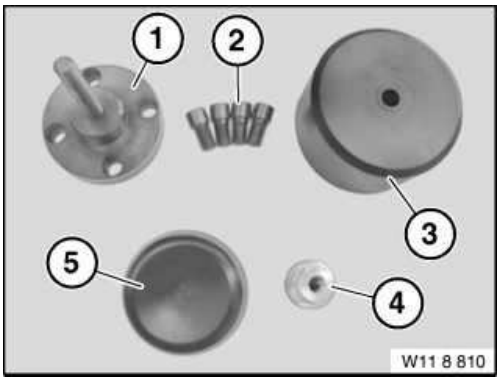
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0 496 134 (11 8 812) Screw



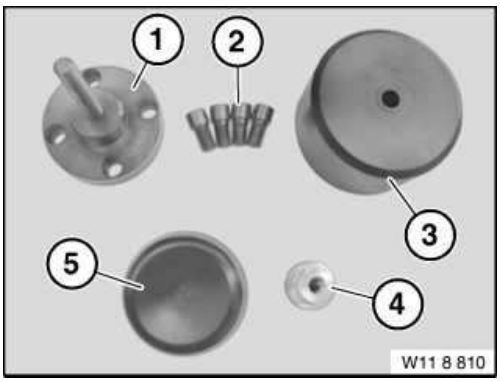
Common	Used in step 51
Usage	(Screw set) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 135 (11 8 813) Holding sleeve



Common	Used in step 51
Usage	(Thrust sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

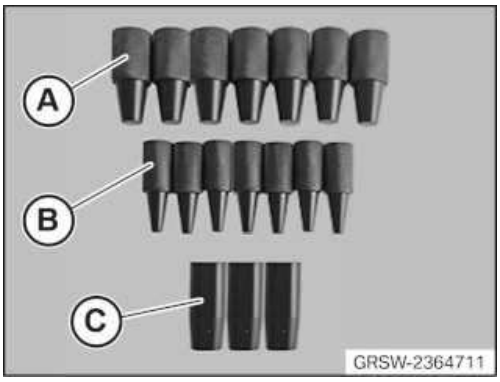
0 496 136 (11 8 814) Nut



Common	Used in step 51
Usage	(Nut with bearing) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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2 364 711 Plug



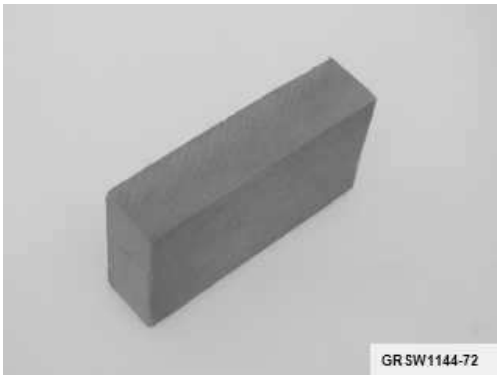
Common	Used in step 51
Usage	For closing the pressure oil holes for cleaning the cylinder head sealing surfaces.
Included in the tool or work	
Storage location	C20
Replaced by	
In connection with	
SI-Number	01 50 14 (203)

0 495 103 (11 4 471) Scraper



Common	Used in step 51
Usage	
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

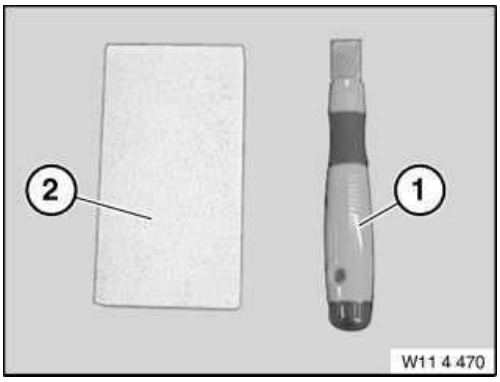
0 495 104 (11 4 472) Extractor



Common	Used in step 51
Usage	(grindstone)
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

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0 495 102 (11 4 470) Tool



Common

Used in step 51 72

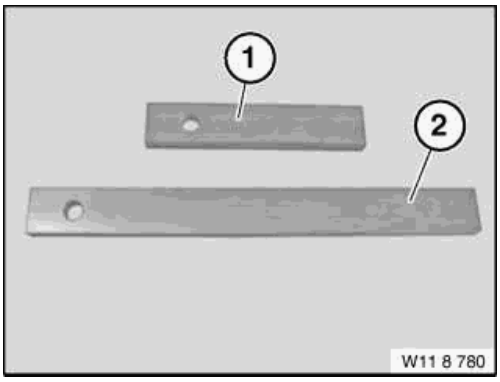
Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

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0 496 120 (11 8 780) Plate



Common

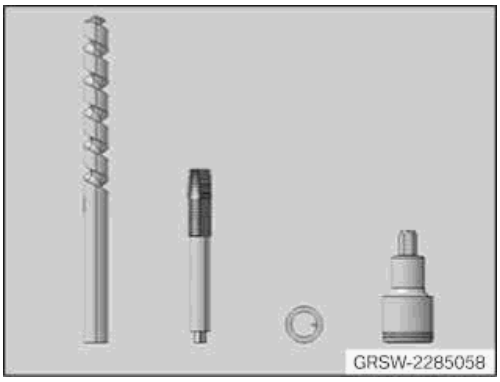
Used in step 51

Usage	(Mounting plates) For securing transmission oil sump when gearbox is removed.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 121 (11 8 781)		**Plate** (Mounting plate, short)Discontinued; only available via set 11 8 780 = 0496120.	
2	0 496 122 (11 8 782)		**Plate** (Mounting plate, long) Discontinued; only available via set 11 8 780 = 0496120.	

2 285 058 Tool set



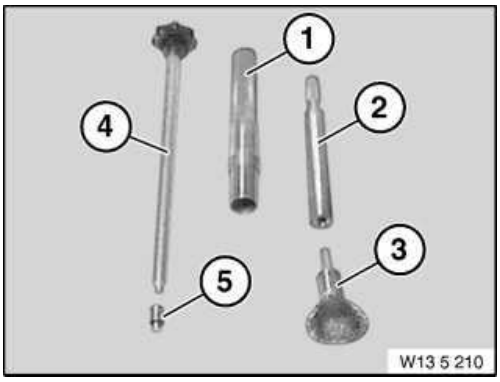
Common

Used in step 52

Usage	
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 02 14 (069)

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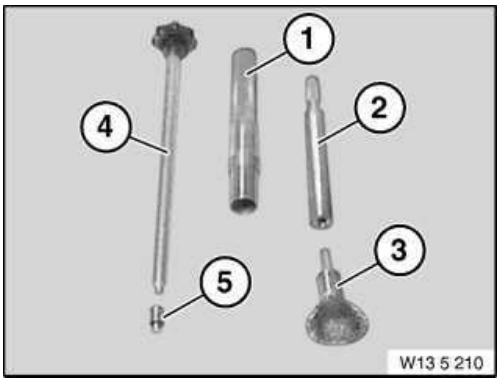
0 493 763 (13 5 215) Plug



Common Used in step 63

Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 762 (13 5 214) Rod

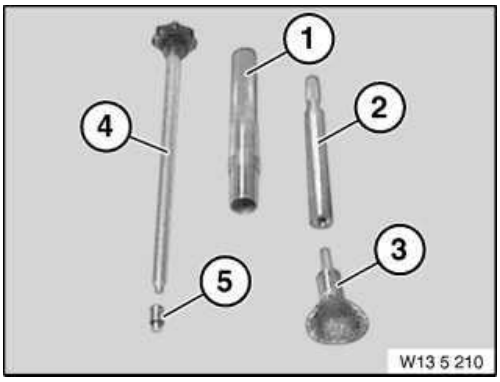


Common Used in step 63

Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 493 758 (13 5 210) Tool



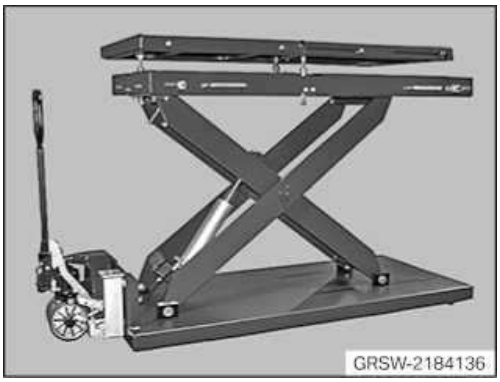
Common Used in step 63

Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

2 184 136 Mobile equipment table lift



Common Used in step 69

Usage	Table lift MHT 1200
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	06 01 10 (649)

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2 409 025 Puller



Common Used in step 70

Usage	For disassembly of the outer radial shaft seal of the transmission output shaft, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A76
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 411 739 Puller



Common Used in step 70

Usage	For disassembly of the inner radial shaft seal of the output, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C78
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 408 152 Striking element



Common Used in step 70

Usage	For installation of the right radial shaft seal transmission output shaft (inner). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

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2 413 037 Handle



Common Used in step 70

Usage	Universal drift handle. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C77
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 408 150 Striking element

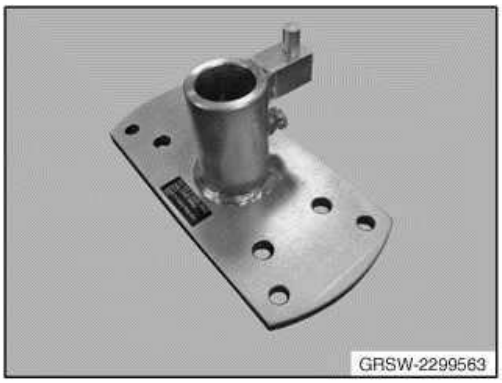


Common Used in step 70

Usage	For installing the right radial shaft seal transmission output shaft (outer). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

Replacement tools:

2 299 563 Adapter

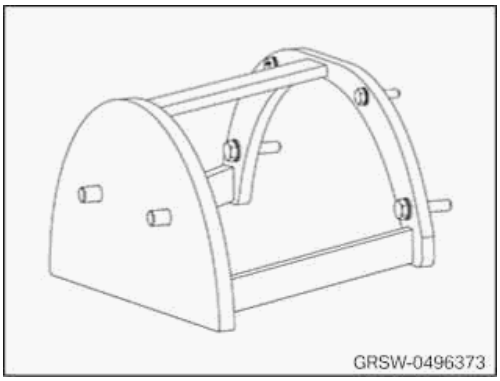


Common Used in step 13

Usage	New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.
Included in the tool or work	0 495 187
Storage location	
Replaced by	
In connection with	
SI-Number	

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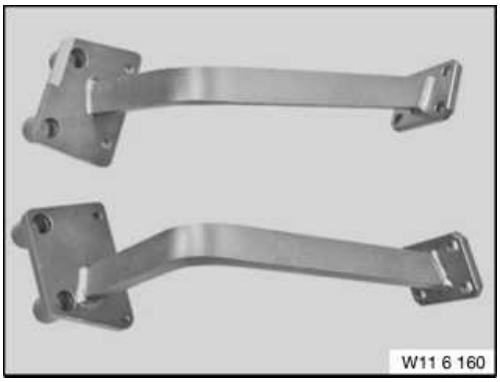
0 496 373 (11 5 420) Plate



Common Used in step 13

Usage	(Fixture) Engine S62
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	

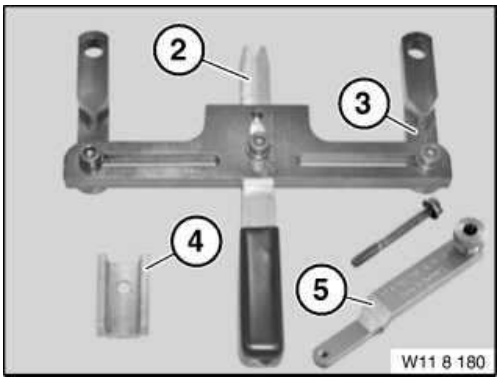
0 496 680 (11 6 160) Support



Common Used in step 13

Usage	For mounting N74 engine on the assembly stand. In combination with 00 2 300, 00 2 320
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	00 2 300; 00 2 320 = 0495196
SI-Number	01 31 09 (604)

0 494 434 (11 8 183) Basic body



Common Used in step 28 53

Usage	
Included in the tool or work	0 493 587
Storage location	
Replaced by	
In connection with	
SI-Number	

2 448 914 Extractor



Common Used in step 32

Usage	For removing and installing high pressure pump. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A49
Replaced by	
In connection with	
SI-Number	01 15 16 (411)

Overview Technical Data

Side clearance of piston rings Used in step 37

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Clean all components before measuring the side clearance.

Side clearance of the plain rectangular compression ring	0,17 mm ... 0,27 mm
Side clearance of the taper faced piston ring	0,30 mm ... 0,50 mm
Side clearance of the oil scraper ring with spiral expander	0,2 mm ... 0,4 mm

Piston diameter Used in step 38

Measure the piston diameter at distance (A) from the lower end of the piston skirt.

Distance (A) to the lower end of the piston skirt	17 mm
Nominal dimension of piston diameter	83,936 mm ... 83,954 mm

Cylinder bore Used in step 39

Diameter of cylinder bore	84,00 mm ... 84,018 mm
Permitted irregularity of the cylinder bore	0,01 mm
Permitted conicity of the cylinder bore	0,01 mm

Axial play of crankshaft Used in step 43

Equipment installation status	0,090 mm ... 0,273 mm
Operating condition	0,11 mm ... 0,314 mm

Maximum permitted torque of the crankshaft Used in step 43

max. 2 Nm

Screw-in depth of thread cutter Used in step 52

Screw-in depth	18 mm

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	7 74
EGR controller	7 74

General repair instructions	Used in step
11 00 ... Overview of consumables (Electronic Parts Catalogue)	51

Repair instructions	Used in step
11 00 050 Removing and installing engine	1 80
11 00 050 Removing and installing engine	1 80
11 00 050 Removing and installing engine	1 80
11 00 050 Removing and installing engine	1 80
11 00 050 Removing and installing engine	1 80
11 00 050 Removing and installing engine	1 80
11 00 050 Removing and installing engine	1 80
11 00 050 Removing and installing engine	1 80
11 00 050 Removing and installing engine	1 80
31 10 001 Completely removing and installing front axle with engine and transmission	1 80
11 00 050 Removing and installing engine	1 80
11 00 050 Removing and installing engine	1 80

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11 00 050 Removing and installing engine	1 80
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11 00 050 Remove and install engine	1 80
11 00 050 Remove and install engine	1 80
11 00 050 Remove and install engine	1 80
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG)	1 80
11 00 050 Remove and install engine	1 80
11 00 050 Remove and install engine	1 80
11 00 050 Remove and install engine	1 80
11 00 050 Remove and install engine	1 80
11 00 050 Removing and installing the engine (manual gearbox)	1 80
11 00 050 Remove and install engine (Automatic)	1 80
11 00 050 Remove and install engine	1 80
11 00 050 Remove and install engine	1 80
11 00 050 Remove and install engine	1 80
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11 00 050 Remove and install engine	1 80
11 00 050 Removing and installing engine	1 80
11 00 050 Removing and installing engine \PREMIUM	1 80
11 00 050 Removing and installing/replacing engine (N63)	1 80
11 00 050 Removing and installing engine	1 80
11 00 050 Removing and installing engine	1 80
11 00 050 Removing and installing engine	1 80
11 00 050 Remove and install engine	1 80
11 00 050 Remove and install engine (Automatic)	1 80
11 00 050 Remove and install engine (Automatic)	1 80
11 00 050 Remove and install engine	1 80

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11 00 050 Remove and install engine	1 80
11 00 050 Remove and install engine (Automatic)	1 80
11 00 050 Remove and install engine (Automatic)	1 80
11 00 050 Remove and install engine	1 80
11 00 050 Remove and install engine	1 80
11 00 050 Remove and install engine	1 80
11 00 050 Remove and install engine	1 80
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG)	1 80
11 00 050 Remove and install engine	1 80
61 35 ... Notes on ESD protection (Electro Static Discharge)	6 17 25 51
61 35 ... Notes on ESD protection (Electro Static Discharge)	51

Operating materials	Used in step

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	58
Exhaust-gas recirculation cooler seal on exhaust manifold	74
Exhaust-gas recirculation cooler seal on intake plenum	74

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11 21 500 Replacing crankshaft (B47AO0)

Special tools required:

- 2 288 054
- 00 2 010
- 11 6 480
- 2 420 824

Attention!

Replace main and connecting rod bolts.

There must be no oil in the blind holes **(risk of cracking)**.

Do not wash off bolt coating.

Incorrect assembly of the crankshaft bearing caps will result in damage to the crankcase.

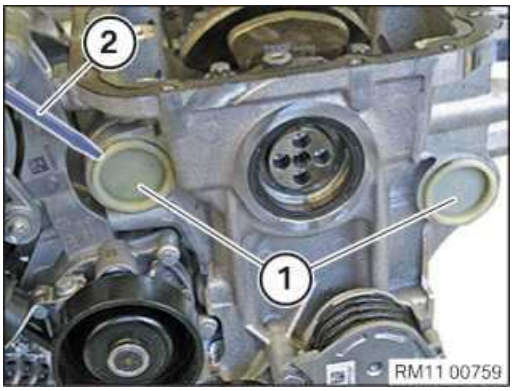
It is necessary to remove the counterbalance shafts in order to remove the crankshaft.

To properly adjust the counterbalance shafts, a new, coated intermediate gear must always be fitted.

Necessary preliminary work:

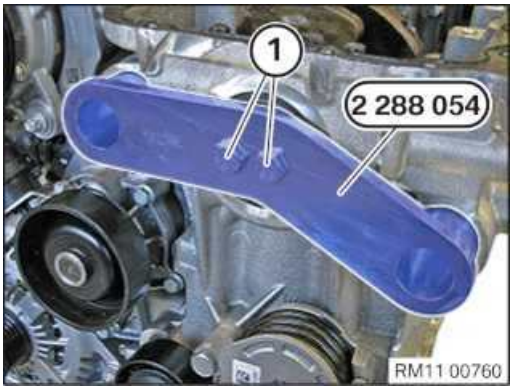
- Remove engine with gearbox
- Mount engine on assembly stand
- Remove rear timing case cover.
- Remove both timing chains
- Removing all pistons

Removal:



Remove sealing caps (1) with a suitable tool (2).

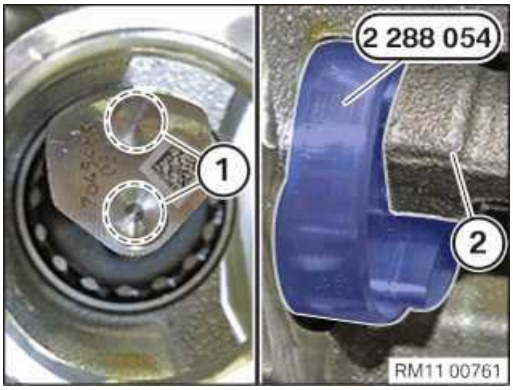
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Twist crankshaft to **top dead centre on first cylinder**.

Mount special tool 2 288 054 and abut screws (1).

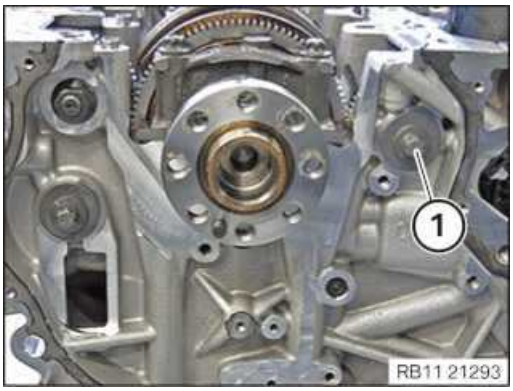
Observe installation note in next operation!



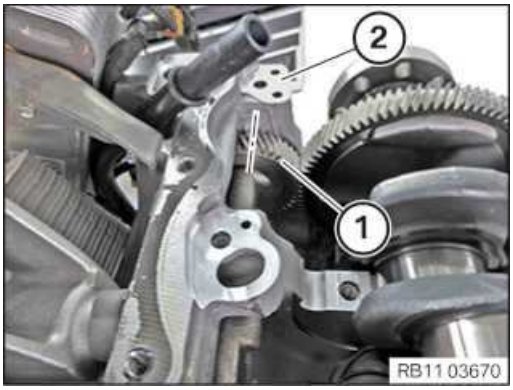
Note:
Make sure special tool 2 288 054 is properly seated in the guides (1) of the counterbalance shaft (2).

Slightly twist crankshaft if necessary.

Tighten special tool 2 288 054 to **20 Nm**.



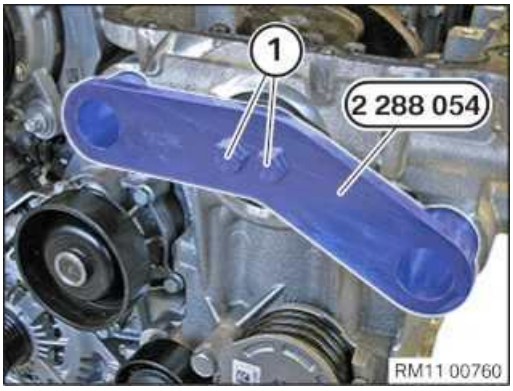
Release screw (1).



Counterbalance shaft (1) must be replaced in the same position.

Mark position of the counterbalance shaft (1) gear in relation to the crankcase (2).

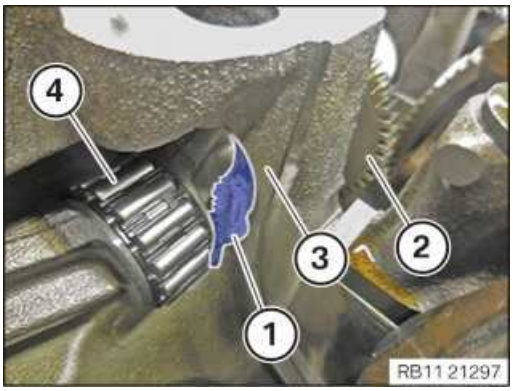
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Release screws (1) and remove special tool 2 288 054 .



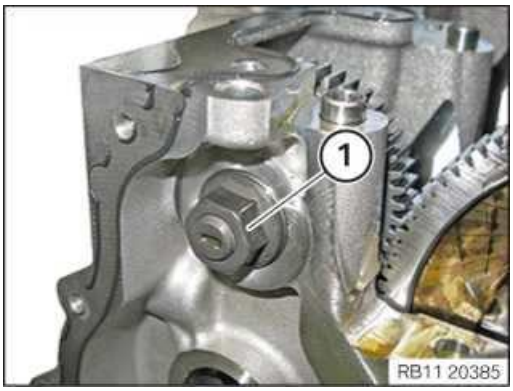
Detach the counterbalance shaft on the inlet side from the crankshaft by turning slightly in the direction of the arrow and push backwards.



Protect counterbalance shaft against damage on the intake side (2) by means of a suitable tool (1).

Lay counterbalance shaft, intake side, (2) in the crankcase (3).

Do not damage the needle bearing (4).

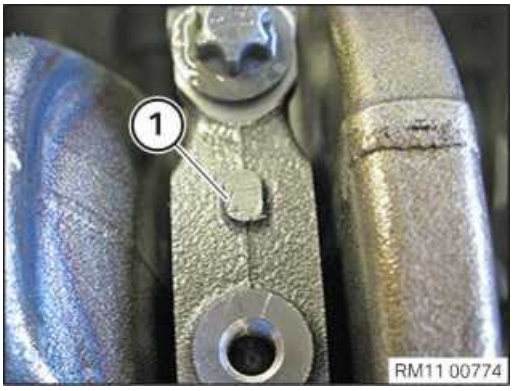


Slacken nut (1).

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Slide intermediate wheel out in the direction of the arrow and remove.

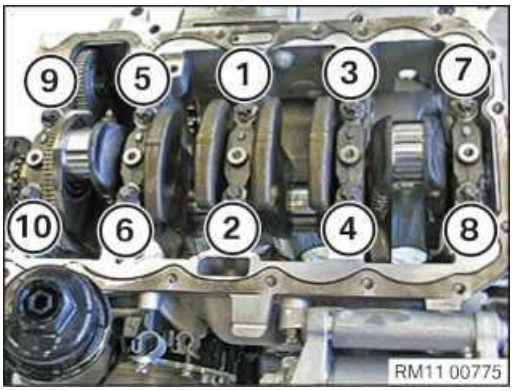


Note:

All crankshaft bearing caps (1) are labelled **(bearing position 1 to 5)**.

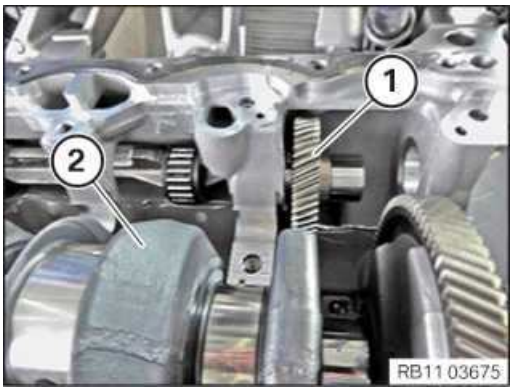
Installation position must be maintained.

Graphic at bearing seat number 4.



Release main bearing screw connection of main bearing cap in the sequence **10 - 1**.

Remove main bearing caps 1 - 5.



Attention!

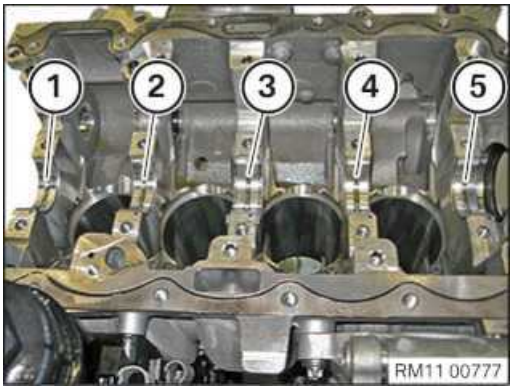
When removing the crankshaft (2), do not damage the counterbalance shaft (1).

With the assistance of a second person, remove crankshaft (2) and carefully place to one side.

Pay attention to the oil hole in the crankshaft bearing shells.

Installation:

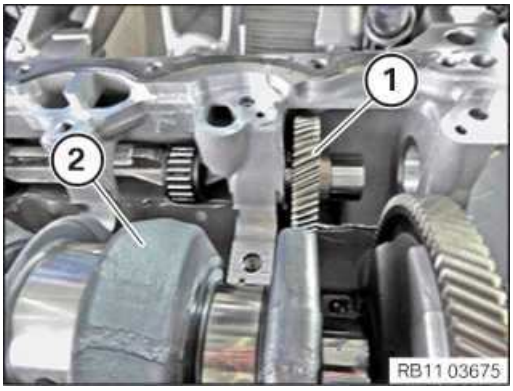
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For new crankshaft replace crankshaft main bearing shells.

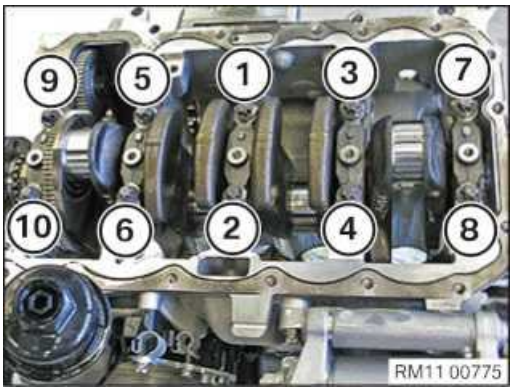
Oil the crankshaft bearing shells (1-5).

Both locating grooves of the crankshaft bearing shells in the crankcase and on the crankshaft bearing cap must be mounted on one side.



When installing the crankshaft (2), ensure that the counterbalance shaft (1) is not damaged.

With the help of a second person, insert the crankshaft (2).



Attention!

Do not fit crankshaft bearing cap in incorrect position.

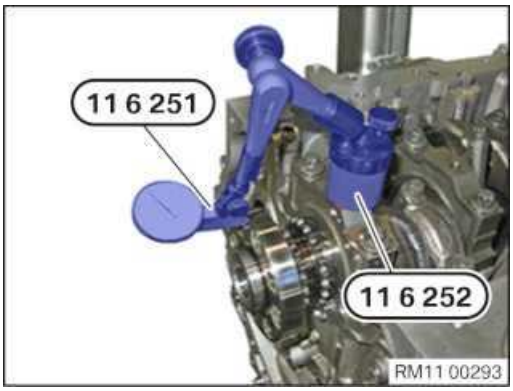
Risk of damage to crankcase moulding.

Align crankshaft bearing cap exactly.

Fit main bearing bolts.

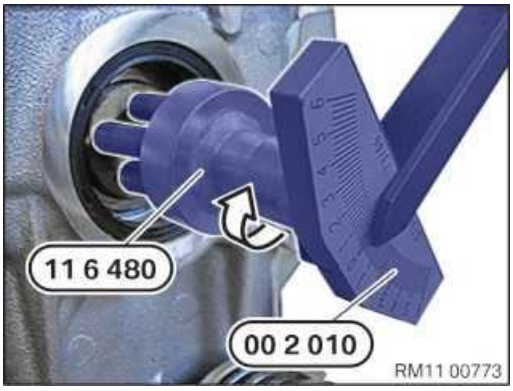
Tighten main bearing bolts in sequence **1 - 10** (comply with tightening specifications).

Tightening torque: 11 11 1AZ.



Check side clearance.

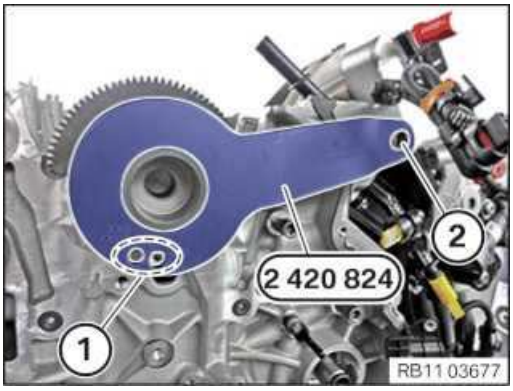
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Friction coefficient of crankshaft.

Screw in all screws of vibration damper by hand.

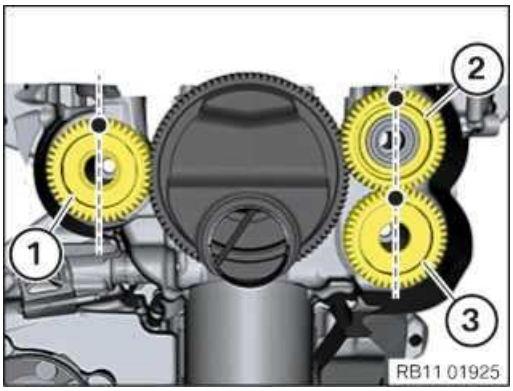
Turn crankshaft evenly with special tool 00 2 010 and special tool 11 6 480 .



Special tool 2 420 824 is labelled in area (1).

Install special tool 2 420 824 with the labelled bore hole **(B47)** on the crankshaft.

Fix crankshaft with special tool 2 420 824 on the fitting sleeve (2).



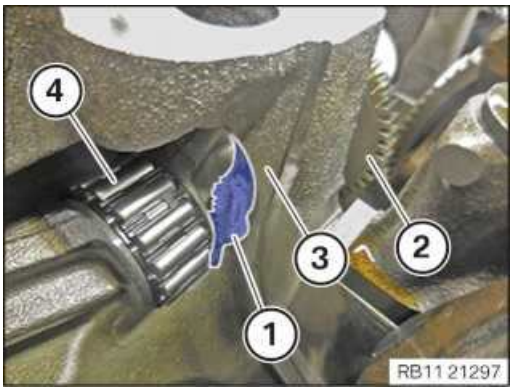
Schematic representation of drive and intermediate wheels.

Attention!

Install a new, coated intermediate wheel (2) to adjust the counterbalance shafts.

Parts: Intermediate wheel

All marks on the drive gears (1 and 3) and intermediate wheel (2) must point vertically to the oil sump sealing surface (upwards).

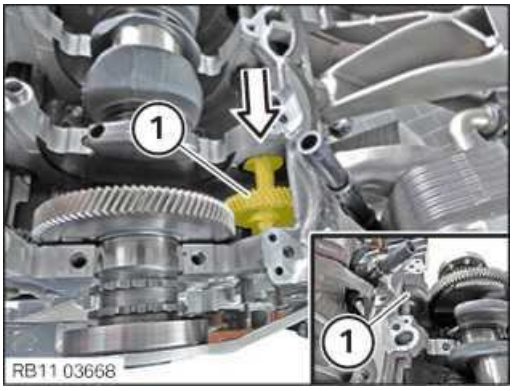


Raise counterbalance shaft (2) on the intake side.

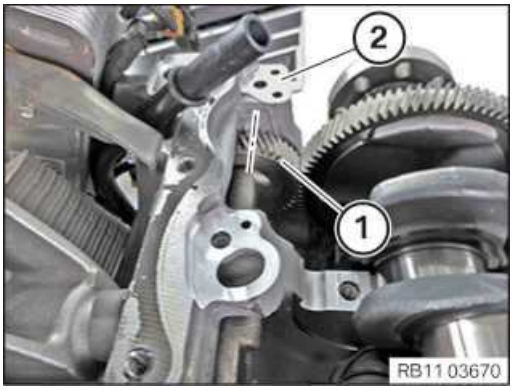
Remove (3) tools.

Carefully install the needle bearing (4) in the crankcase.

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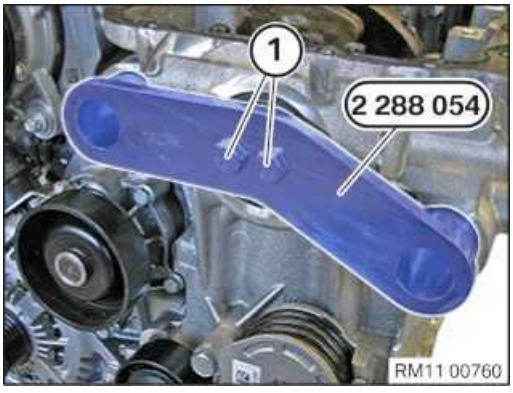
Insert counterbalance shaft (1) into the crankshaft gear by turning slightly and install.



Check position of the counterbalance shaft (1) gear in relation to the crankcase (2).



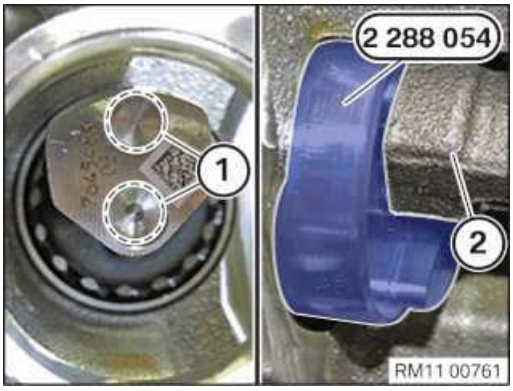
Position the counterbalance shaft on the exhaust side so that the marking points perpendicular to the oil sump.



Mount special tool 2 288 054 and abut screws (1).

Observe installation note in next operation!

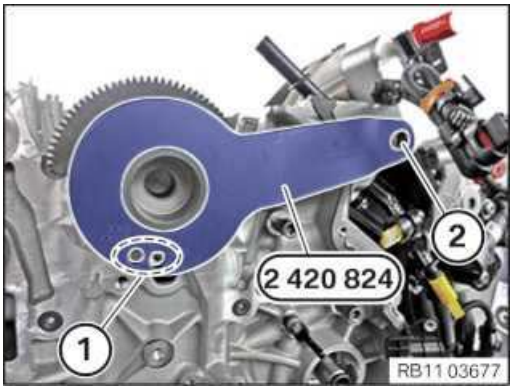
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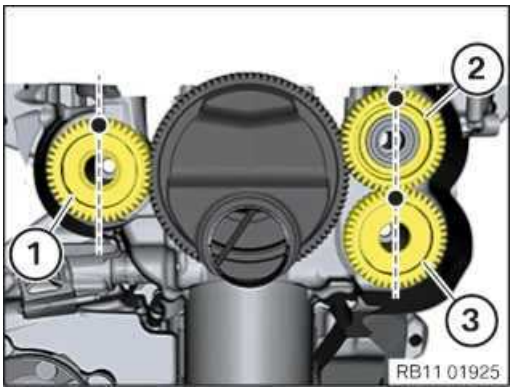
Note:
Make sure special tool 2 288 054 is properly seated in the guides (1) of the counterbalance shaft (2).

Slightly twist crankshaft and/or counterbalance shafts if necessary.

Tighten special tool 2 288 054 to 20 Nm.



Detach and remove special tool 2 420 824 .



Schematic representation of drive and intermediate gears.

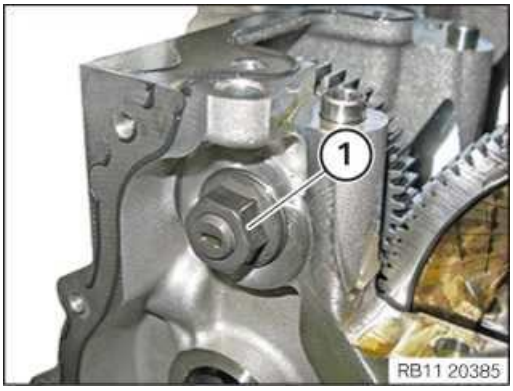
All marks on the drive gears (1 and 3) and intermediate wheel (2) must point vertically to the oil sump sealing surface (upwards).



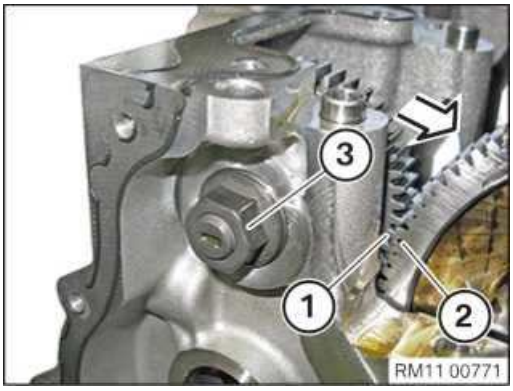
Install intermediate wheel on the crankshaft by turning slightly in the direction of the arrow.

Marking must point vertically upwards.

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Tighten nut (1) handtight.

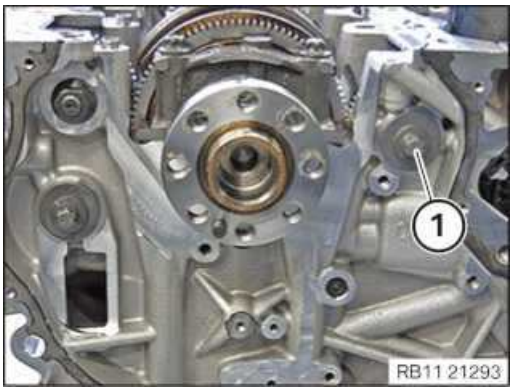


Press intermediate gear (1) hand-tight onto gear (2) of the crankshaft and the drive gear of counterbalance shaft, exhaust side;.

There must be zero play in both gearings.

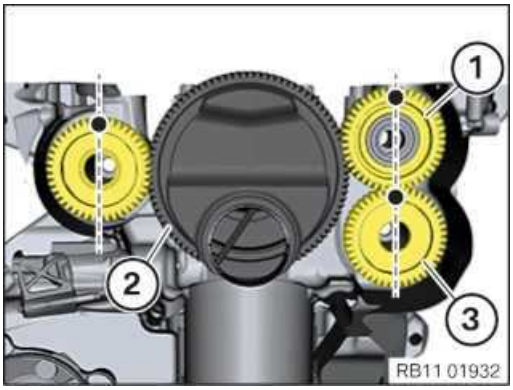
Tighten nut (3).

Tightening torque: 11 27 2AZ.



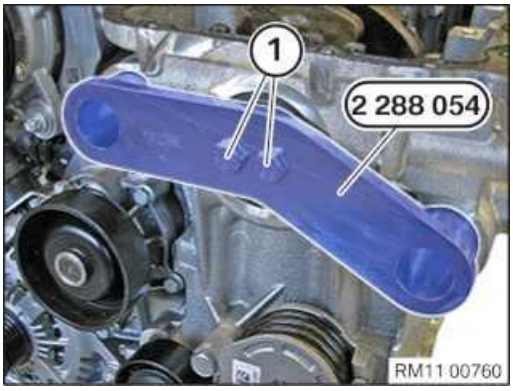
Tighten screw (1).

Tightening torque: 11 27 1AZ.

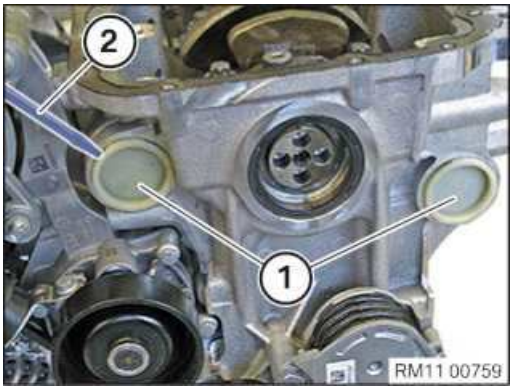


Check setting of gear wheels (1), (2) and (3).

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Release screws (1) and remove special tool 2 288 054 .



Parts: Replacing sealing cap (1).

Ensure proper fit of O-ring.

Install both sealing caps (1).

Required reworking:

- Install all pistons
- Install both timing chains
- Install the rear timing case cover
- Remove engine from assembly stand
- Install engine with gearbox

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11 22 000 Removing and installing/replacing flywheel (B47)

Special tools required:

- 11 9 811
- 11 9 265
- 11 4 180

Necessary preliminary work:

- Remove transmission.
- For manual gearbox:
  Remove clutch.

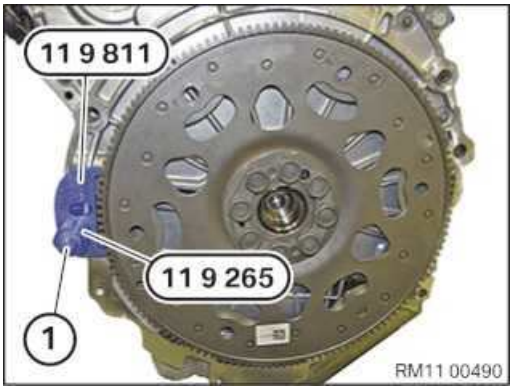
REMOVAL:



Manual gearbox.

Secure flywheel with Torx screw (1) and special tools 11 9 811 and 11 9 265 .

Release flywheel studs with special tool 11 4 180 /



Automatic transmission.

Secure flywheel with transmission bolt (1) and special tool 11 9 811 / 11 9 265 .

Unfasten flywheel bolts.

INSTALLATION:

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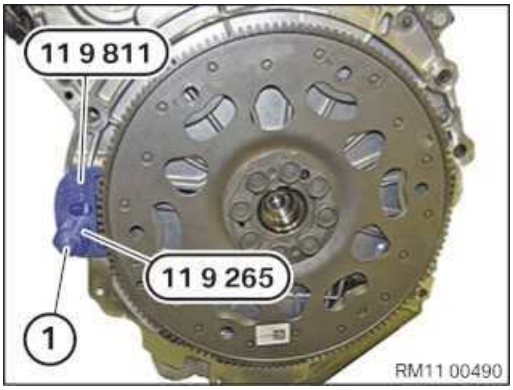
Manual gearbox.

Parts: Replace screws.

Secure flywheel with Torx screw (1) and special tools 11 9 811 and 11 9 265 .

Tighten flywheel bolts with special tool 11 4 180 .

Tightening torque: 11 22 1AZ.



Automatic transmission.

Parts: Replace screws.

Secure flywheel with transmission bolt (1) and special tool 11 9 811 / 11 9 265 .

Unfasten flywheel bolts.

Tightening torque: 11 22 1AZ.

Concluding tasks:

- Install clutch.
- Install transmission.

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11 22 000 Removing and installing/replacing the flywheel

WARNING

Motor vehicle may slip off the vehicle hoist where components are supported.

Danger! Life-threatening injuries!

- Secure the vehicle hoist against lowering and lifting.

WARNING

Motor vehicle may slip off the vehicle hoist if the weight is distributed unevenly.

Danger! Life-threatening injuries!

- Ensure there is a specific weight compensation on the motor vehicle.

WARNING

Vehicle may slip off the vehicle hoist if the vehicle hoist is handled incorrectly.

Danger! Life-threatening injuries!

- Observe safety information on raising the vehicle using a vehicle hoist.
- For additional information see: 00 ... Raising the vehicle using a vehicle hoist.

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

PRELIMINARY WORK

1 – Bring front compartment lid in the service position

Prerequisite

Engine compartment lid is open.

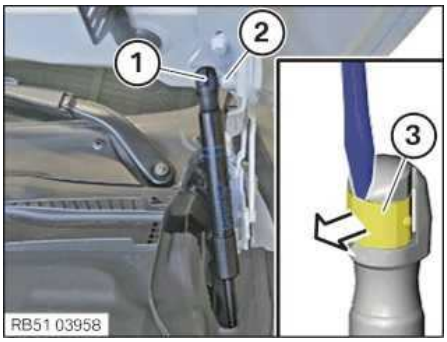
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CAUTION

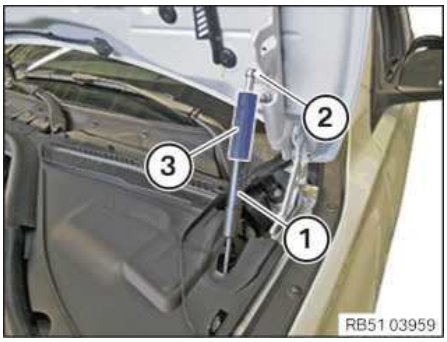
Shutting bonnet or tailgate.

Danger of injury!

- Support bonnet/tailgate in fully open position with the aid of a suitable device.



- Lift clamp (3) slightly using a screwdriver, in the direction of the arrow.
- Lift off ball socket (1) from ball pin (2).
- Repeat the operation on the other side of vehicle.



TECHNICAL INFORMATION

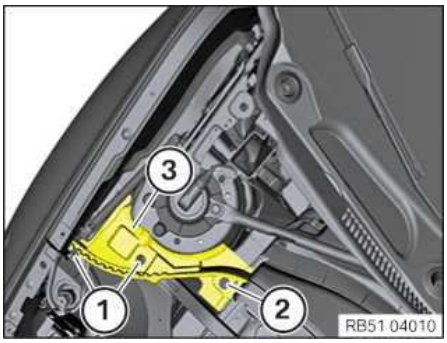
Conduct the following operation with the assistance of a second person.

- Remove the bonnet support and open the bonnet further.
- Push special tool (3) over gas pressure spring (1).
- Place special tool on the ball pin (2) and engage using force.
- Repeat the operation on the other side of vehicle.

2 – Remove suspension cross-brace

TECHNICAL INFORMATION

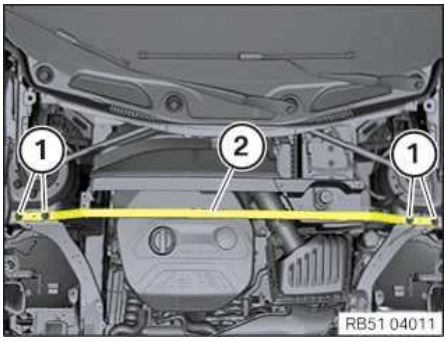
Driving without the strut brace/front end or tension strut is not permitted.



NOTICE

Description is for right component only. The procedure on the left side is identical.

- Loosen expanding rivet (1).
- Loosen screw (2).
- Remove the cover (3).



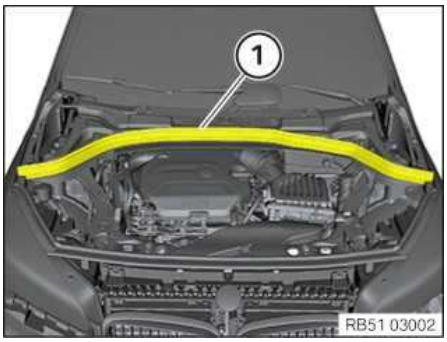
- Loosen screws (1).
- Remove strut brace (2).

3 – Remove the seal for the rear bonnet

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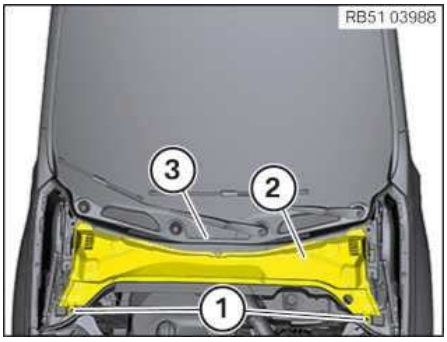
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



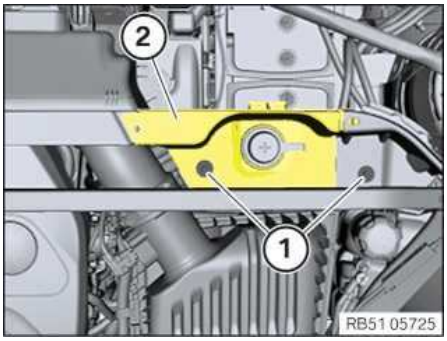
- Pull off rear bonnet seal (1) towards the top and remove.

4 – Removing front cowl panel cover

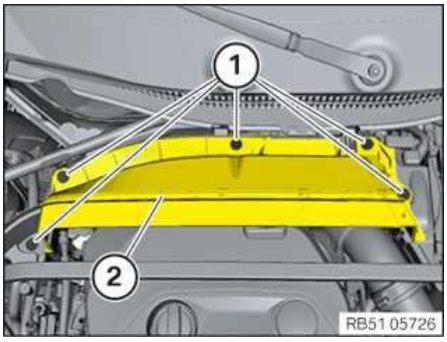


- Loosen the expanding rivet (1).
- Feed out and remove front cowl panel cover (2) from the rear cowl panel cover(3).

5 – Removing the upper bulkhead cover



- Loosen screws (1).
- Guide out and remove the cover (2).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

6 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

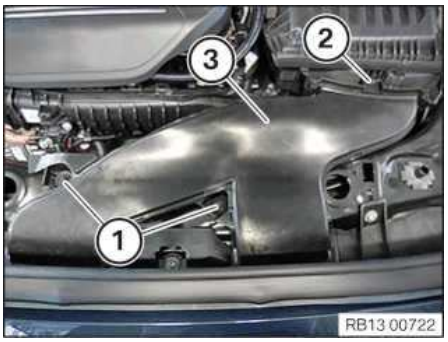
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

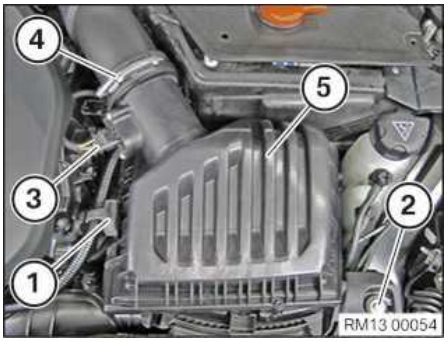
- Unclip the acoustic cover from the marked areas towards the top.

7 – Remove the intake neck for intake silencer housing



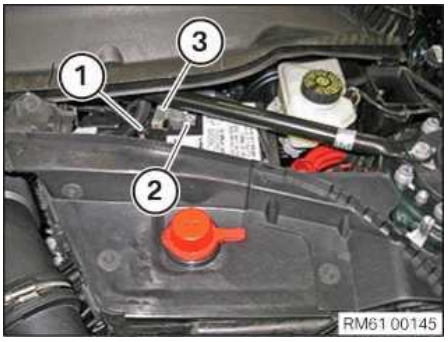
- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

8 – Removing intake silencer housing



- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

9 – Disconnecting the battery earth lead



- Unlock plug connection (1) and disconnect.
- Unfasten nut (2).
- Remove the battery earth lead (3) and secure to one side.

10 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

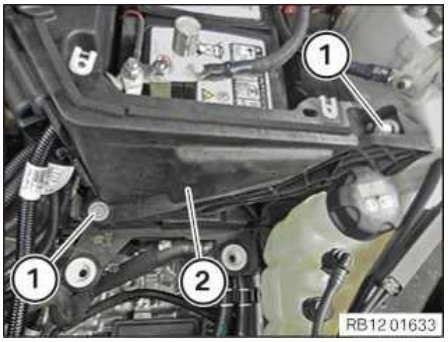
- Do not pull on the wires when disconnecting connectors and plug connections.

TECHNICAL INFORMATION

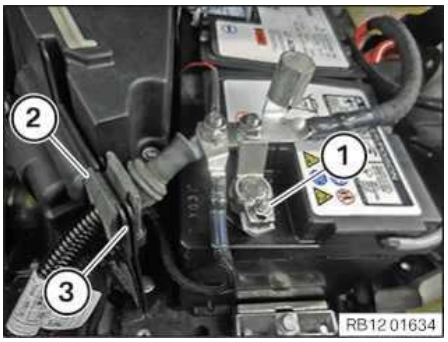
Follow instructions for removing and installing control units.
For additional information see: 12 00 ... Notes on removal and installation of control units

TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.

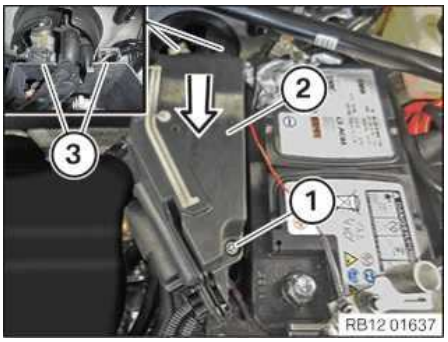


- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.

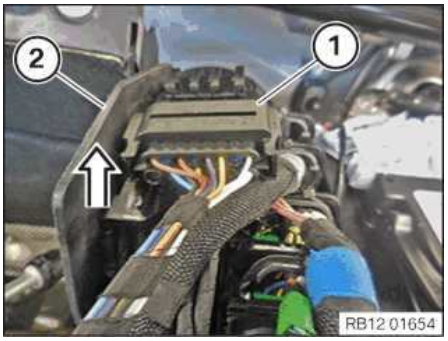


- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

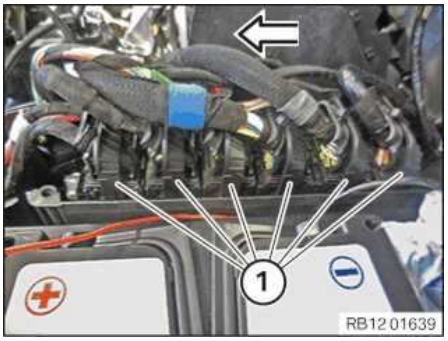
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- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



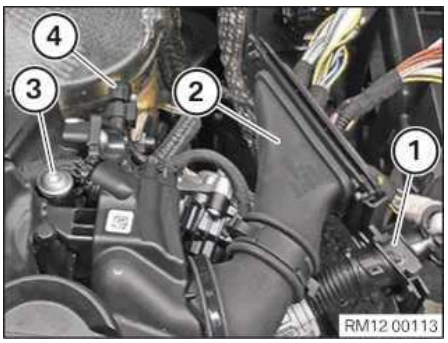
- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).



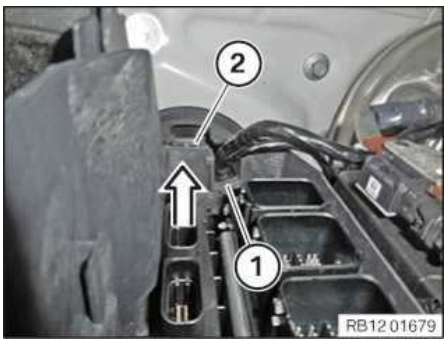
- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



- Unlock and loosen connector (1).

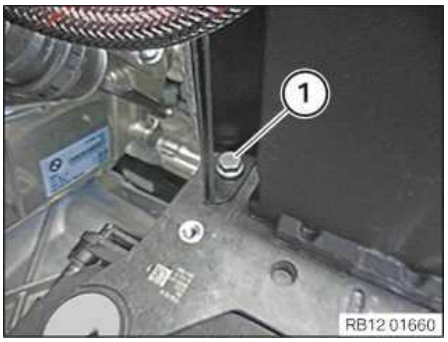


- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.

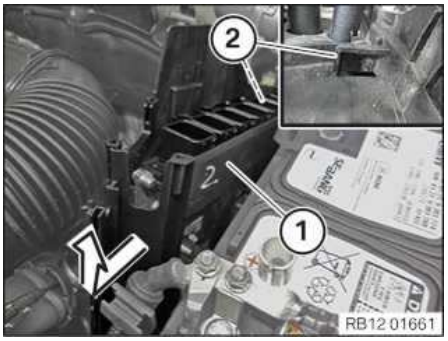


- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.

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- Loosen screw (1).



- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

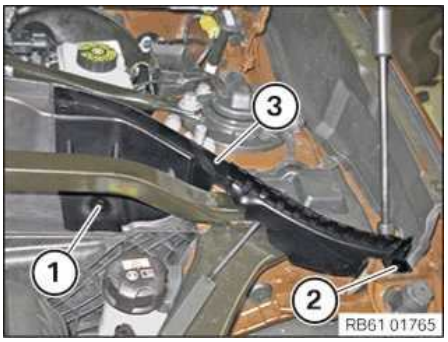
11 – Remove vehicle battery

WARNING

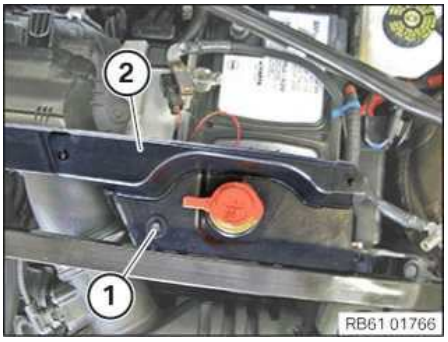
Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

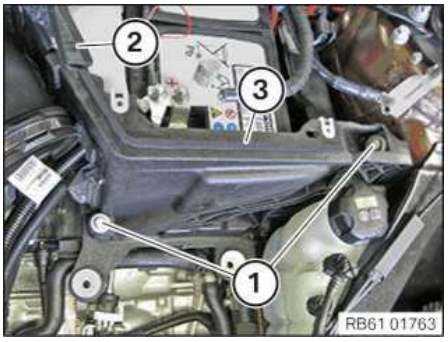
- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.



- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

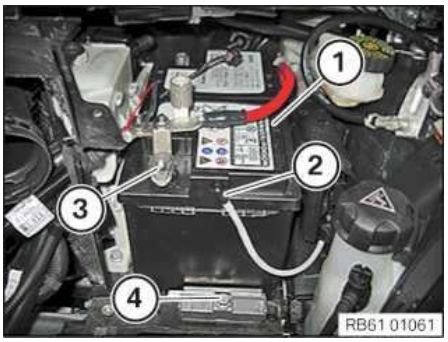


- Loosen screw (1).
- Remove the cover (2).



- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.

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- Pull off the vent hose (2).
- Slacken the nut (3) on the positive battery terminal and remove the positive battery terminal.

WARNING

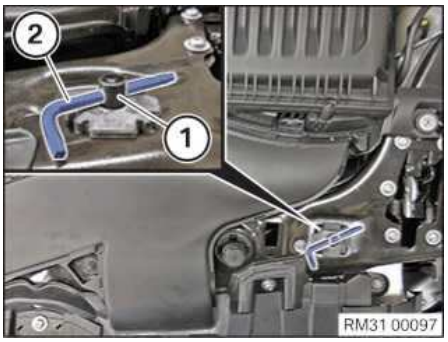
Unprotected battery terminals.

Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

12 – Securing radiator on left and right



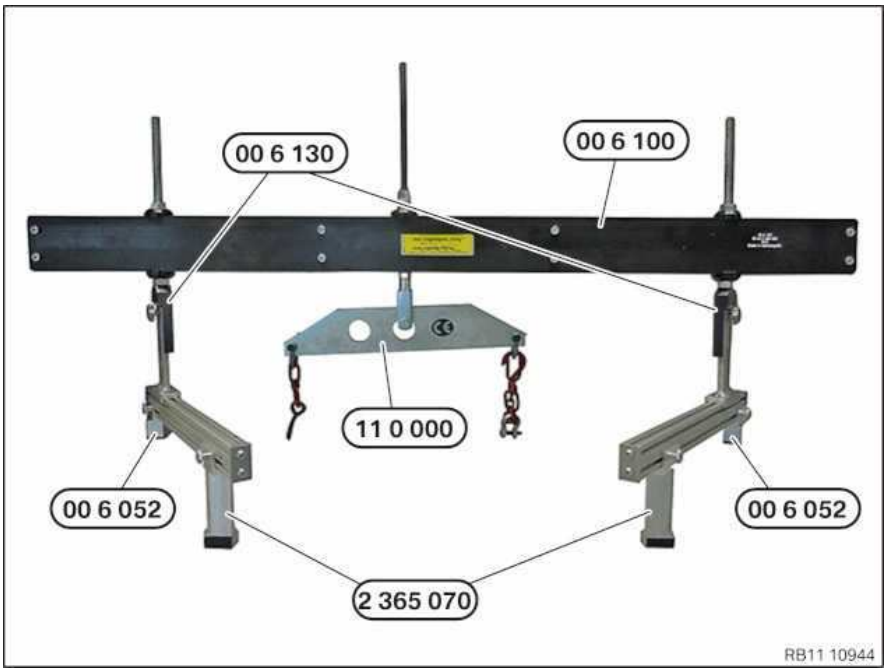
NOTICE

Perform the operations on the left and right side.

- Fasten radiator at centring pin (1) with suitable tool (2).

13 – Installing the engine bridge

Overview: Prepared engine bridge



Prerequisite

Front compartment lid is in service position.

CAUTION

Components connected to the engine joint or cross member.

Danger of injury!

- Check lifting eyes and engine mounting brackets for damage, e.g. cracks.
- Attach the component to correctly mounted engine joints or cross members only.
- Exclusively lift the component, do not move it forwards, backwards or in transverse direction.

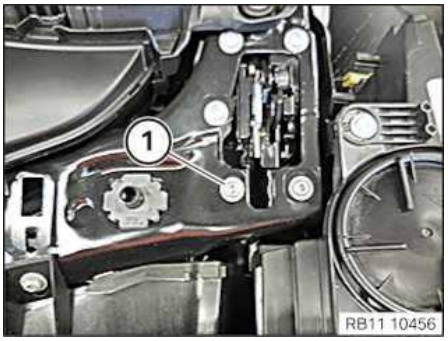
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- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

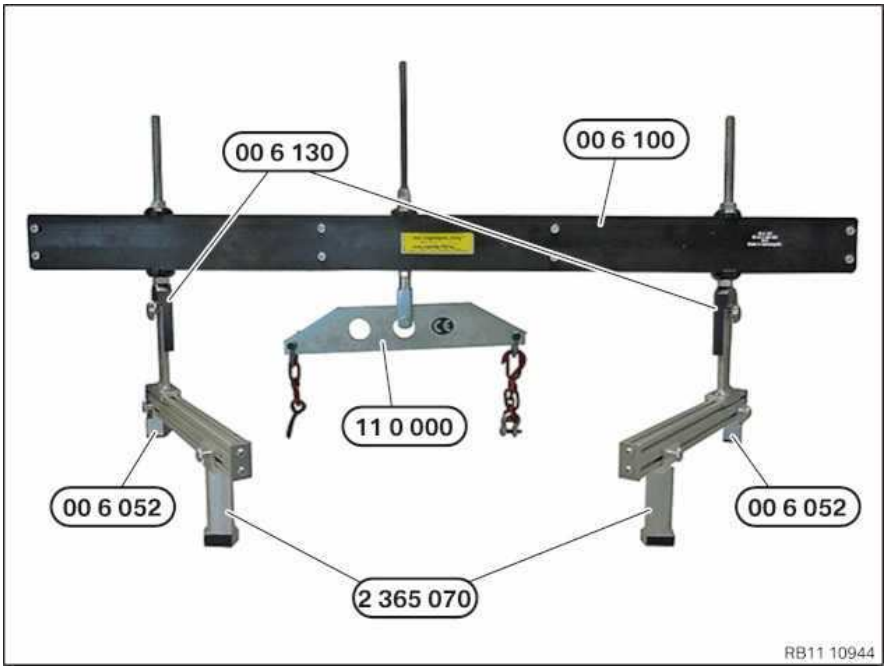
M8		Tightening torque	21,5 Nm



- Loosen screw (1) of the left bonnet catch.



- Loosen screw (1) of the right bonnet catch.



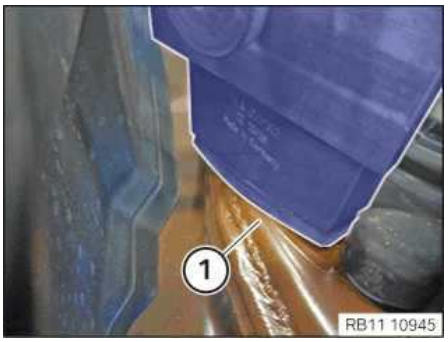
CAUTION

Heavy component.

Heavy components can lead to injury or damage.

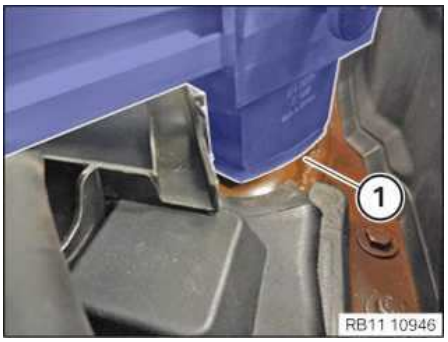
- Remove and install heavy components with the aid of another person/other persons.

- Set entire cross member **0 496 852 (00 6 100)** on the vehicle and position with the help of an auxiliary person.

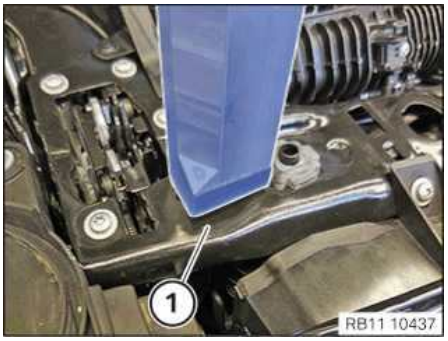


- Position the special tool at the rear mounting point (1) on the **right**.

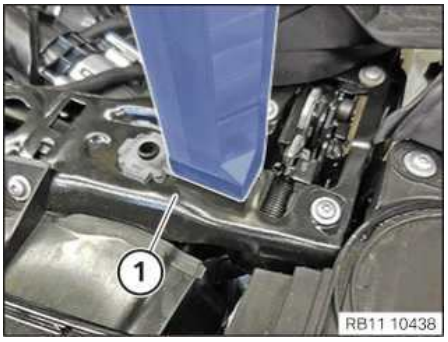
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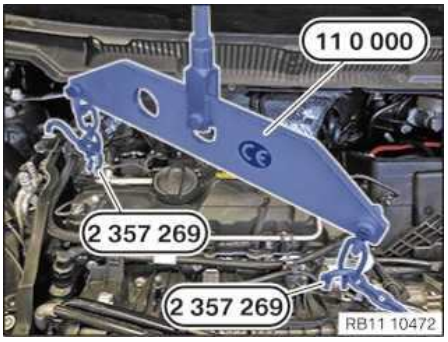
- Position the special tool at the rear mounting point (1) on the **left**.



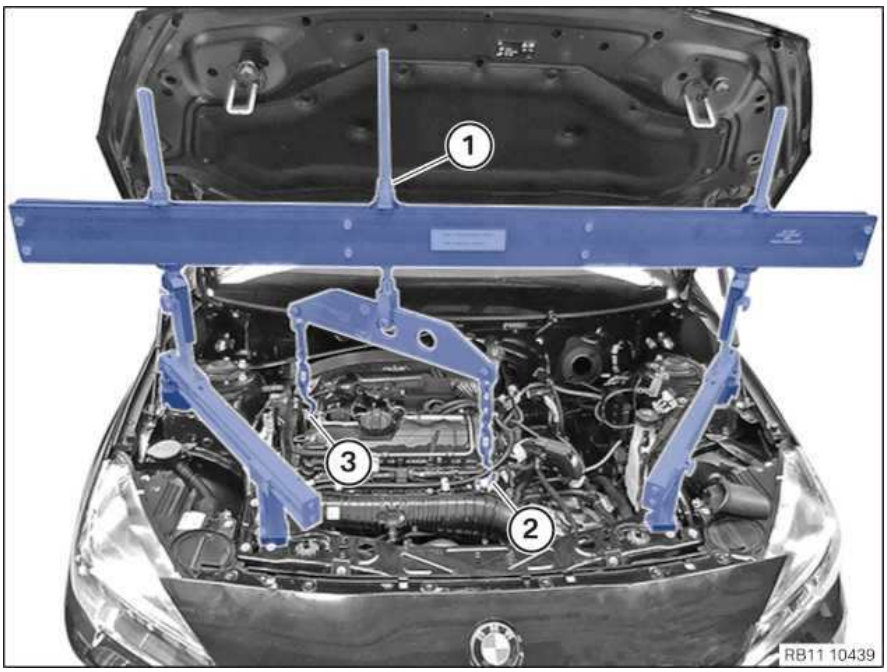
- Position the special tool at the front mounting point (1) on the **right**.



- Position the special tool at the front mounting point (1) on the **left**.



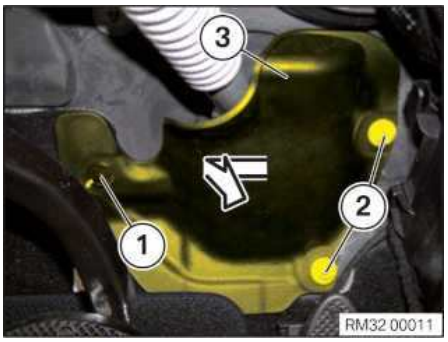
- Position special tool **0 490 561 (11 0 000)** above the engine.
- Attach special tools to the mounting lugs of the engine.



- Tighten side screws (2) and (3).
- Slightly pretension the spindle screw (1) of the engine support beams.
- Tighten down all adjusting screws, knurled screws and nuts on cross member **0 496 852 (00 6 100)** and on special tool .

14 – Releasing lower steering shaft from steering gear

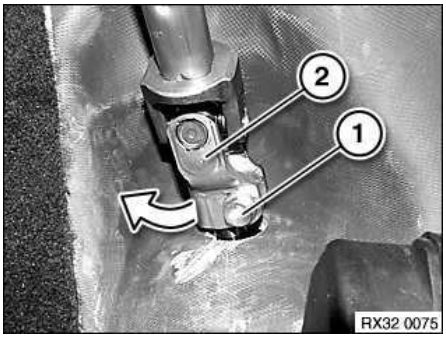
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- **If installed:**
- Unfasten nut (1).
- Unscrew the nuts (2) by 1 rotation.

  Do not remove the nuts (2) !
- Remove the cover (3) on the steering column in the direction of the arrow.

  The side footwell trim must not be disassembled!



- Loosen screw (1).
- Swivel out the universal joint (2) of the bottom steering shaft from the steering gear in the direction of the arrow.

15 – Removing both front wheels



▸ **Removing the wheel**

- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Unscrew the wheel bolts (arrows) and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

16 – Removing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

▸ **Remove the front wheel arch trim**

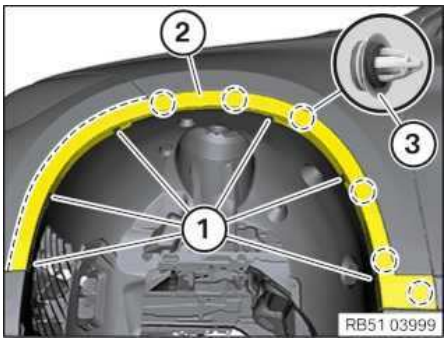
NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

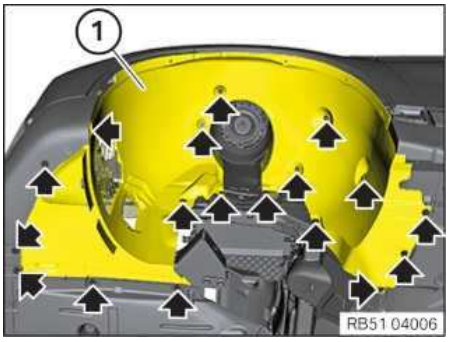
Description is for left component only. Procedure on the right side is identical.

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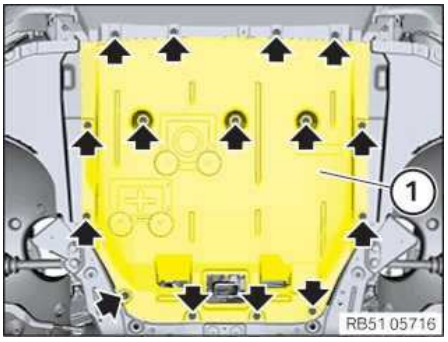
- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.

▸ **Remove front wheel arch cover**

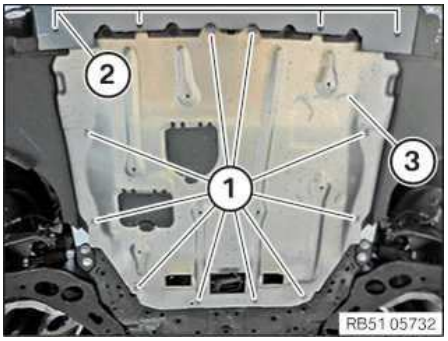


- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

17 – Removing the front underbody protection

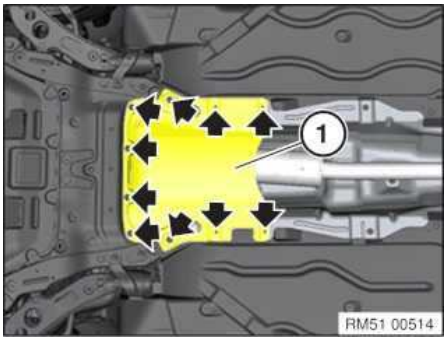


- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.



- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

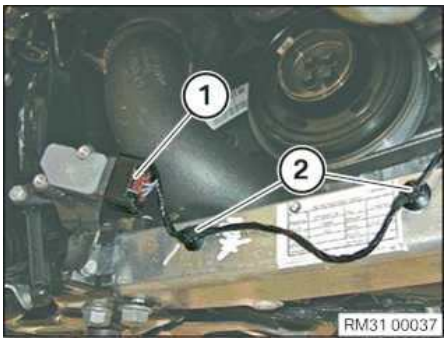
18 – If installed: Removing rear underbody protection



- Remove screws (arrows).
- Remove the rear underbody protection (1).

19 – With right installation: Detaching ride height sensor cable

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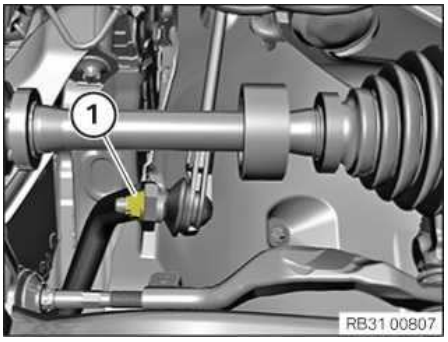
- Unlock plug connection (1) and disconnect.
- Release cable clip (2) from deformation element adapter.

20 – Releasing anti-roll bar on left and right from anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▶ **Detach the anti-roll bar from the anti-roll bar link**

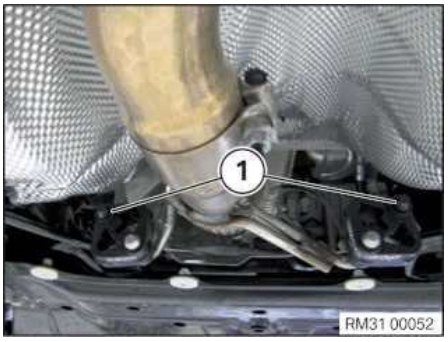


- Unfasten nut (1).

Note: Use the Torx socket for counter support.

- Loosen the anti-roll bar link from the anti-roll bar .

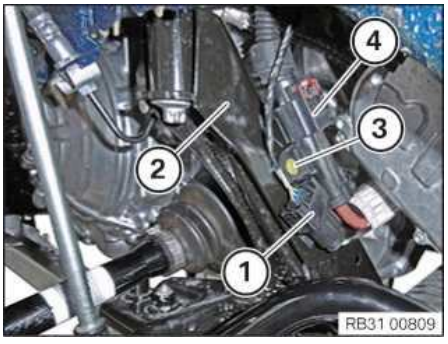
21 – Detaching rubber mount from front axle support



- Spray rubber mount (1) with lubricant and release from holder on front axle support.

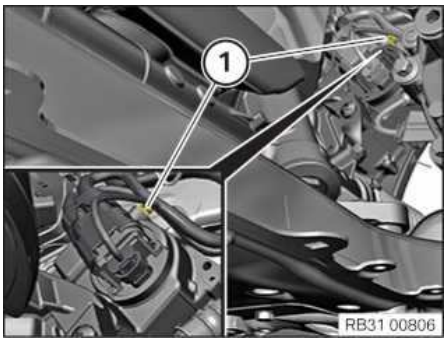
22 – Disconnecting plug connections from steering gear

▶ **If installed: Detach connectors from the front axle carrier**

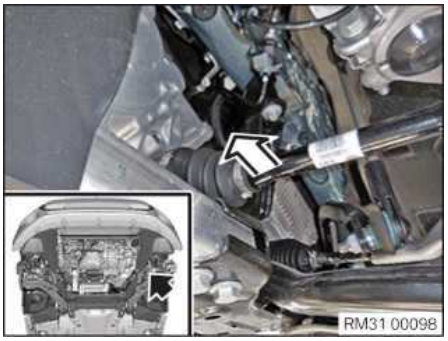


- Release the plug connection (1) from the front axle support (2).
- Loosen screw (3).
- Release the plug connection (4) from the front axle support (2).

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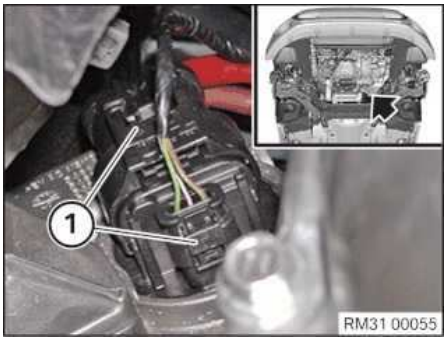


- Disconnect wiring harness (1) from steering gear.



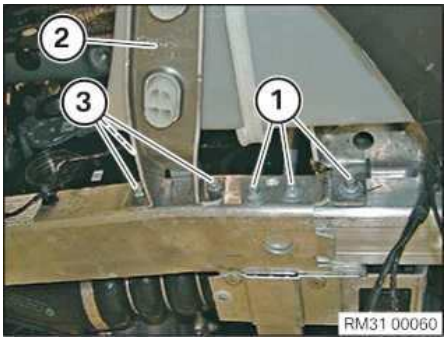
- To unlock the plug connections (see the following work step): unlock plug connections (arrow) with the right hand.

  The plug connections can be reached via the left-hand output shaft.



- Unlock plug connections (arrow) (1)and disconnect from the steering gear.
- Make sure when lowering the front axle that the cables are not damaged!

23 – Releasing the mounted part from the front axle support

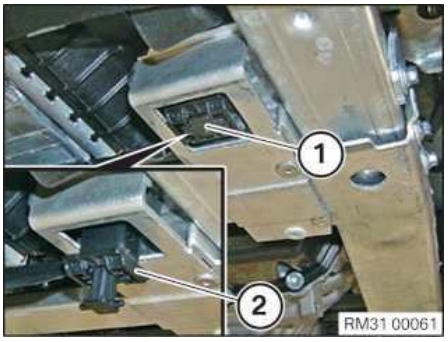


- **Only on right side:** Loosen screws (3) and remove holder for washer fluid reservoir (2).

NOTICE

Perform the operations on the left and right side.

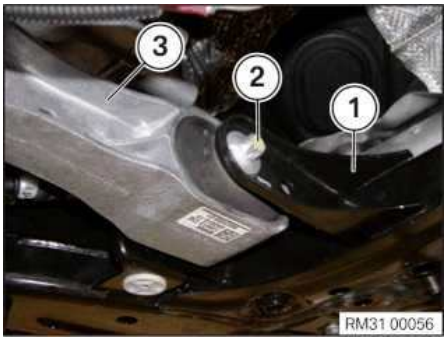
- Loosen screws (1).



NOTICE

Perform the operations on the left and right side.

- Unlock safety catch (1) of the lock (2) from the holder for the charge air cooler.
- Completely remove locks (2).



- Loosen screw (2) of the engine support (3) on the front axle (1).

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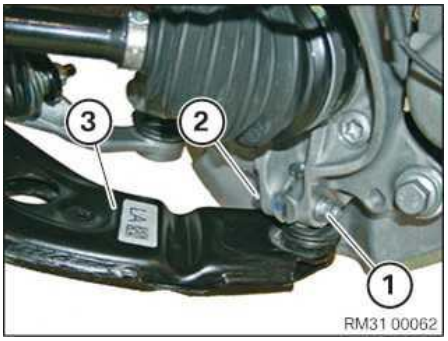


NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

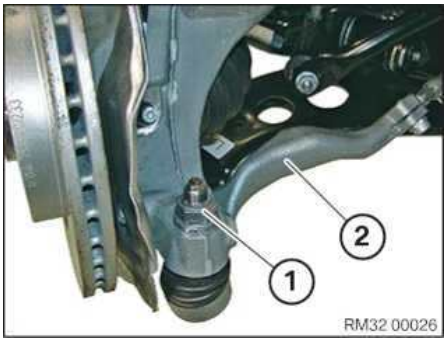
24 – Detaching and removing front axle completely



NOTICE

Perform the operations on the left and right side.

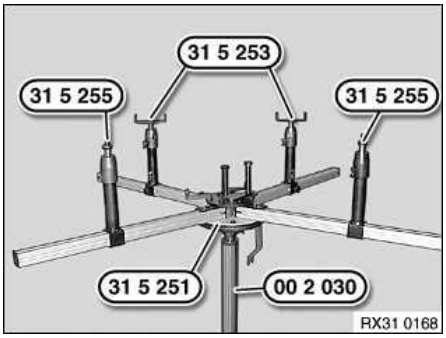
- Unfasten nut (1).
- (2)Pull out screw.
- Detach the wishbone (3) from the swivel bearing .



NOTICE

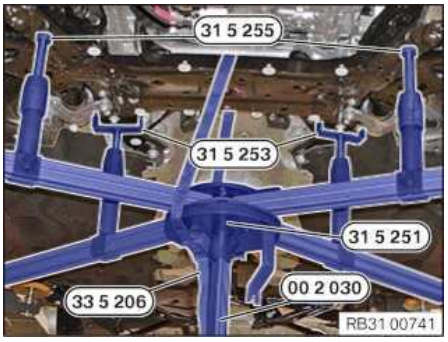
Perform the operations on the left and right side.

- Unfasten nut (1).
- Detach the track rod (2) from the swivel bearing.



- Fit the special tool completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools in telescopic supports of a profile rail pair.
- Insert special tools in telescopic supports of other profile rail pair.

Note: In a profile rail pair, two profile rails are connected to one another by gearing.

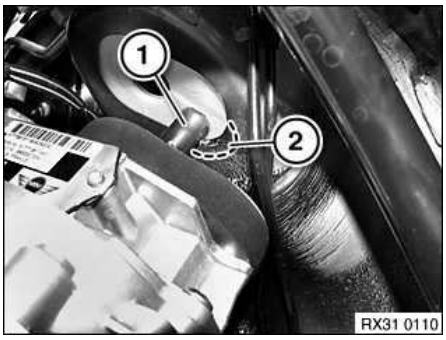


- Align special tools and to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool to special tool .

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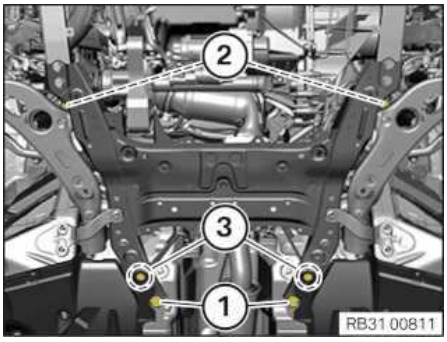


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and remove the front axle.

TECHNICAL INFORMATION

Note the information on thread repairs using Helicoil thread inserts.
For more information see: 41 00 ... Notes on repairing threads

- Check threads for damage; if necessary, repair with Helicoil thread inserts.

25 – Removing starter motor

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and loosen connector (1).
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).

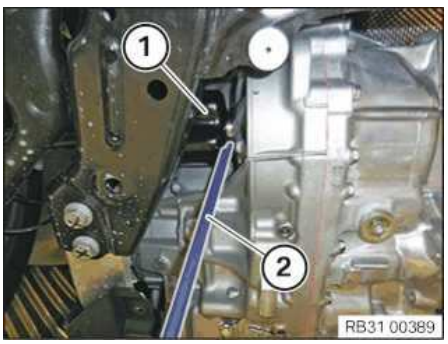


- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.



- Loosen screws (1).
- Feed out starter motor and remove.

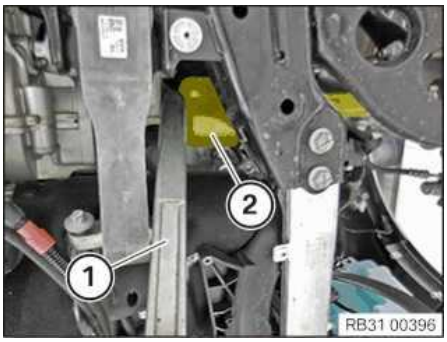
26 – Partially removing the left output shaft



- Protect the output shaft (1) from falling.
- Lever out the output shaft (1) with a mounting lever (2) from the transmission.
- Tie up output shaft (1).

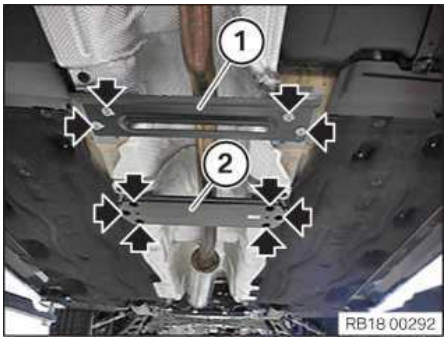
27 – Partially removing right output shaft

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- Lever out the output shaft (2) with a mounting lever (1).
- Tie up output shaft (1).

28 – Removing the connecting support from the tunnel in front and back

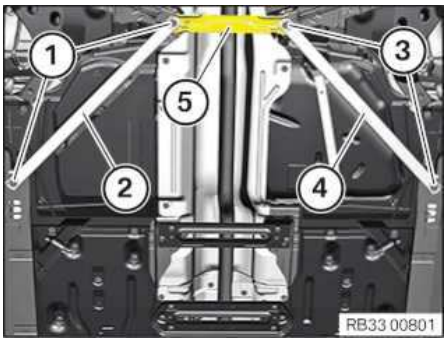


- Unscrew the bolts (arrows) from the connecting support (1).
- Feed out and remove the crossbeam (1).
- Unscrew the bolts (arrows) from the connecting support (2).
- Feed out and remove the crossbeam (2).

29 – Remove the cross strut with the torsion strut

TECHNICAL INFORMATION

Driving without a torsion strut is not permitted.



- Loosen screws (1).
- Thread out torsion strut (2) at left and remove.
- Loosen screws (3).
- Thread out torsion strut (4) at right and remove.
- Feed out and remove the cross-member (5).

30 – Remove exhaust system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

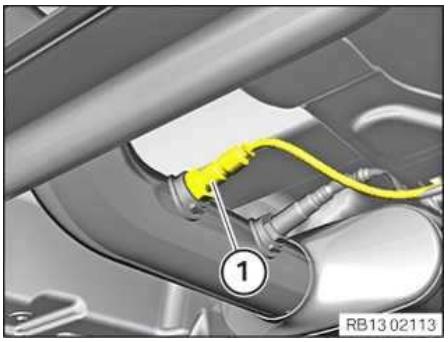
CAUTION

Heavy component.

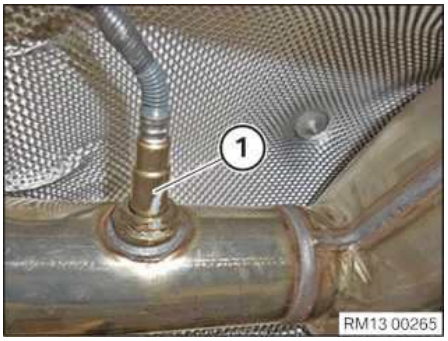
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

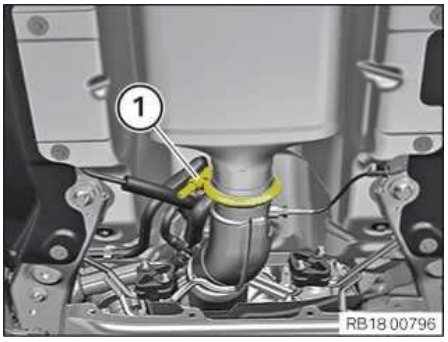
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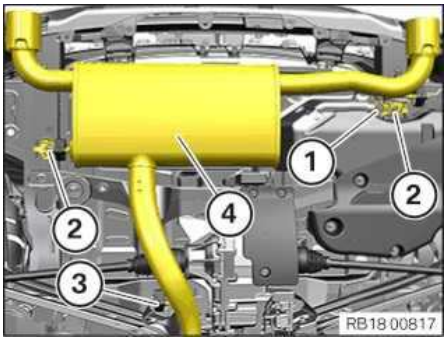
- Release the nitrogen oxide sensor (1) downstream of the SCR catalytic converter, guide it out and set it aside.



- Release the diesel particulate sensor (1), guide it out and set it aside.

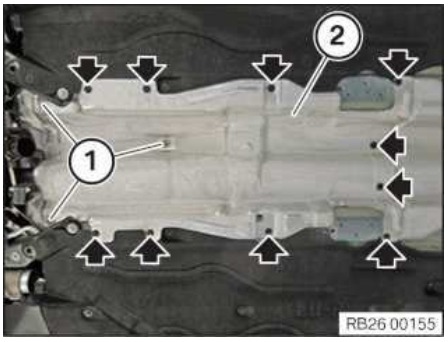


- Loosen V-band clamp (1).



- Loosen screw (1).
- Loosen nuts (2).
- Release the rubber mount (3) of the exhaust system (4).
- Lower and guide out the exhaust system (4) with assistance of a second person and remove it.

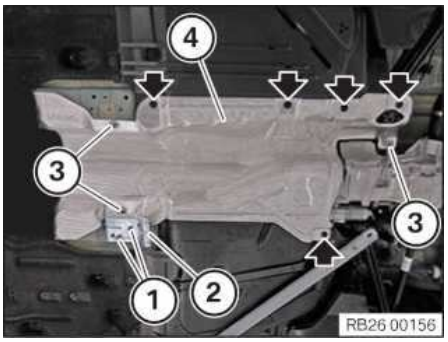
31 – Remove front heat shield



- Remove screws (arrows).
- Loosen nuts (1).
- Guide the heat shield (2) out and remove it.

32 – Remove heat shield at rear.

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- Loosen screws (1).
- Guide out and remove holder (2).
- Remove screws (arrows).
- Loosen nuts (3).
- Guide the heat shield (4) out and remove it.

33 – Remove propeller shaft

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

RISK OF DAMAGE

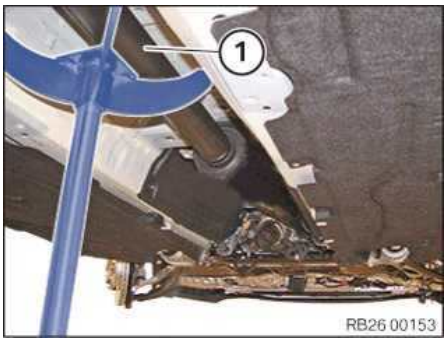
Damage to propeller shaft during removal.

Non-observance of the removal guidelines for the propeller shaft on the rear axle differential may cause severe damage.

- Do not disassemble the three-hole flange, flexible disc and propeller shaft. The three-hole flange to the rear axle differential is balanced with the flexible disc and propeller shaft.
- Loosen the recessed nut against the direction of travel in clockwise direction. The propeller shaft must be loosened on the recessed nut only and exclusively in the direction of rotation otherwise the anti-twist lock of the bi-hexagonal flange nut is damaged.
- In the event of a damaged anti-twist lock on the bi-hexagonal flange nut: Replace the rear axle differential.



- Install the special too l between the front and rear propeller shaft.
- Make sure that the arrows on the special tool point forward in the direction of travel.

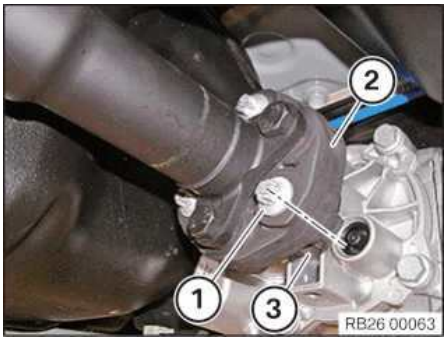


- Always support the propeller shaft (1) with a conventional jack.

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- Protect the propeller shaft (1) with the special tools **0 495 554 (33 5 070)** and from twisting.



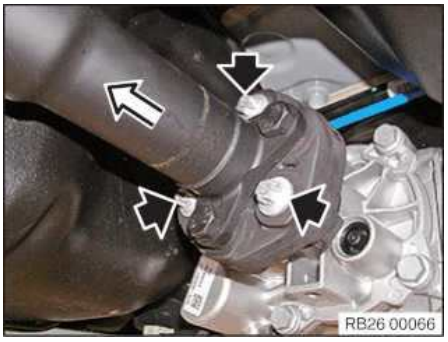
TECHNICAL INFORMATION

Compliance with the following instructions is required to avoid a humming noise from the propeller shaft after refitting the propeller shaft.

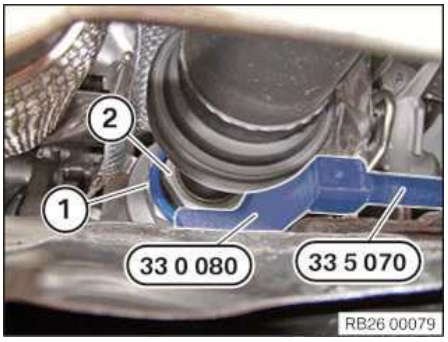
- Mark the installation position of the screw connection (1), the flexible disc (2) and the three-hole flange (3) on the same level.
- Loosen the screw connection (1).



- Loosen screws (1).



- Remove screws (arrows).
- Guide the propeller shaft out in the direction of the arrow and set it aside.



RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.

- Protect the recessed nut (2) on the transfer box from twisting with the special tools **0 495 554 (33 5 070)** and .

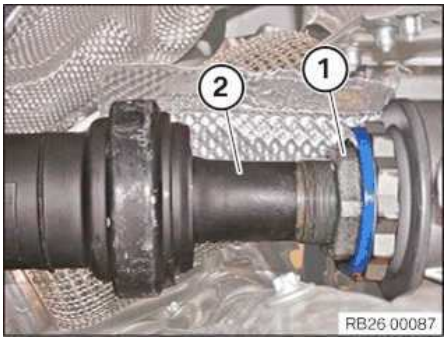
  The recessed nut (2) on the transfer box must **not** be used to detach the propeller shaft.

  The double hexagon flange nut (1) must **not** be used for counter support.

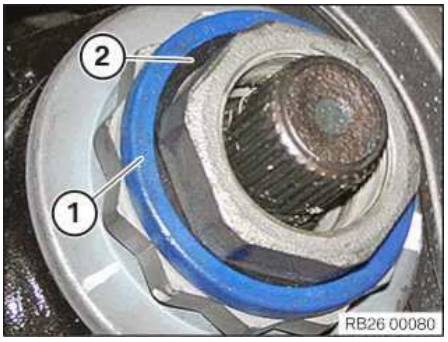
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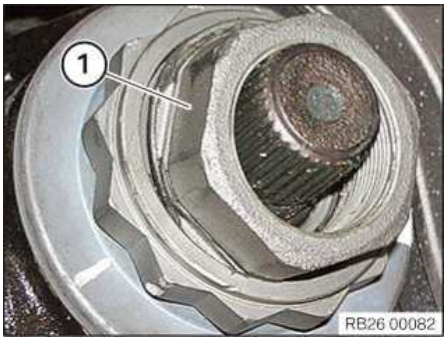
- Release the front propeller shaft with the special tools **0 495 554 (33 5 070)** and in the direction of the arrow.



- Thread the propeller shaft (2) out of the recessed nut (1) and remove.



- Thread the retaining clip (1) and the seal (2) out and remove.



- Thread out and remove the recessed nut (1).

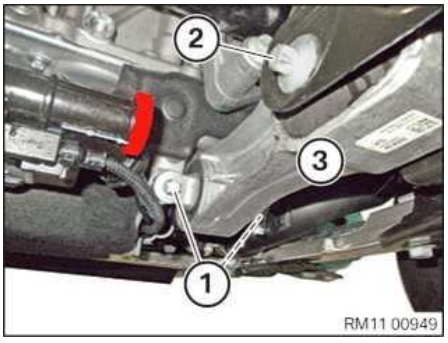
34 – Remove bracket with rubber mount

WARNING

Motor vehicle may slip off the vehicle hoist where components are supported.

Danger! Life-threatening injuries!

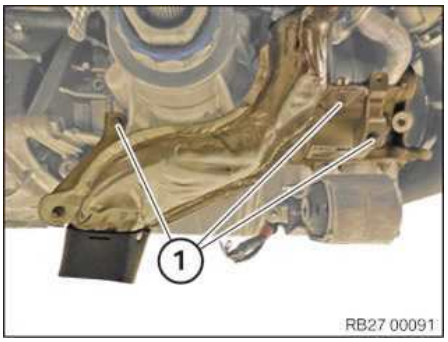
- Secure the vehicle hoist against lowering and lifting.



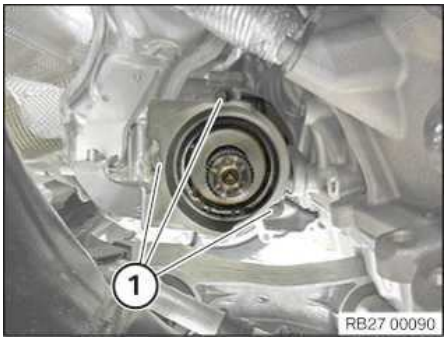
- Support the engine with the jack at a suitable point.
- Loosen screws (1) and (2).
- Guide out and remove holder (3).

35 – Remove the intermediate shaft with the support tube

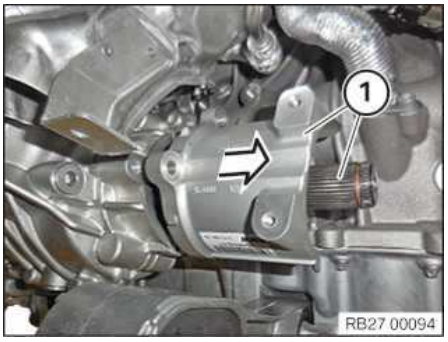
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- With air duct installation: Loosen screws (1).
- Remove air duct



- Loosen screws (1).



- Pull the intermediate shaft with the support tube (1) out of the transfer box.

36 – Drain oil level in the manual gearbox (GS6X60DA)

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.



- Draining transmission oil:
  - Unscrew oil drain plug (1) and allow oil to flow out completely.
  - Clean oil drain plug (1) and screw in.

Oil drain plug / oil filler plug

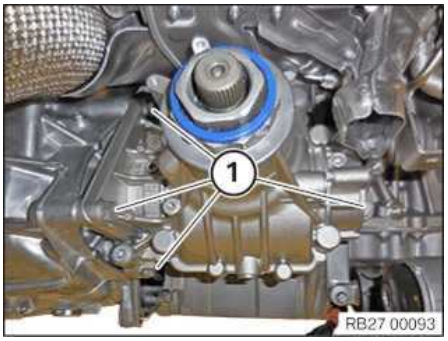
Hexagon socket		Tightening torque	43 Nm

37 – Remove transfer box (VTG)

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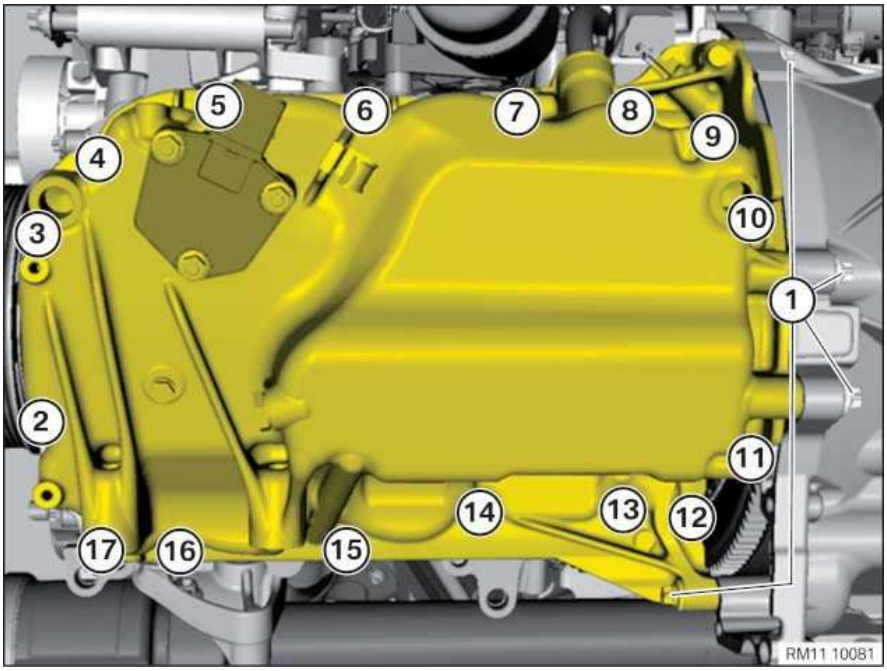


- Loosen screws (1).
- Remove heat shield.



- Loosen screws (1).
- Remove the transfer box (VTG).

38 – Release transmission-side bolting connection oil sump



- Unscrew the bolts (1) from the transmission.

39 – Removing the manual gearbox (GS6-59DG, GS6X60DA)

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

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RISK OF DAMAGE

Damage to the engine block.

Damaged and corroded bolts will lead to major damage in the engine block and the transmission.

- It is imperative that protruding threads of the transmission bolts are checked for corrosion and damage prior to removal.
- It is imperative that all rust is removed from corroded threads and that they are cleaned prior to removal.
- Renew rusted and damaged bolts.

▸ **Remove electronics box**

Prerequisite

Battery earth lead is disconnected.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

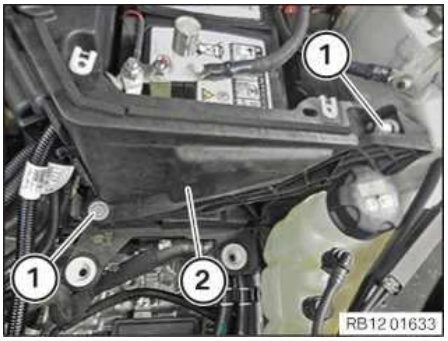
TECHNICAL INFORMATION

Follow instructions for removing and installing control units.

For additional information see: 12 00 ... Notes on removal and installation of control units

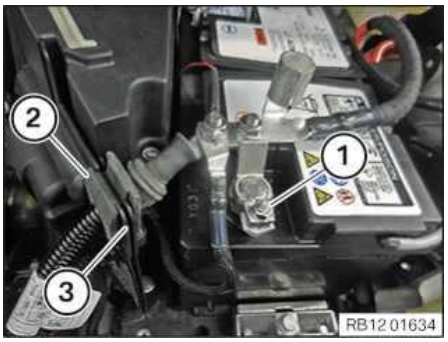
TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.

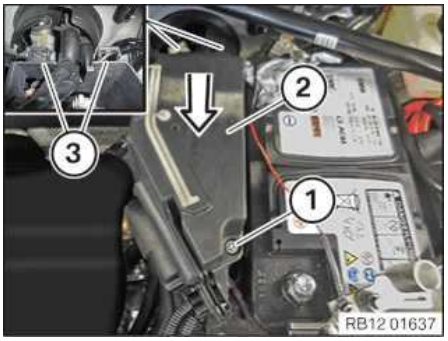


- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.

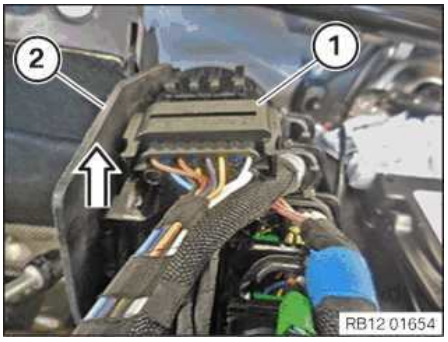
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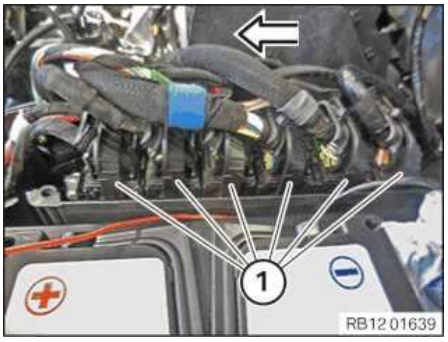
- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



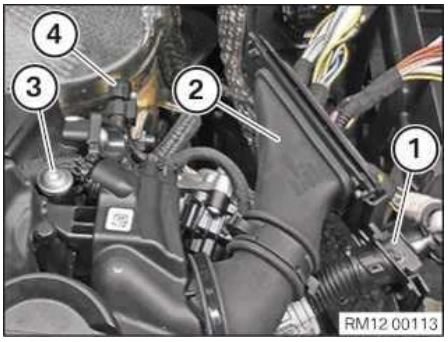
- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).



- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

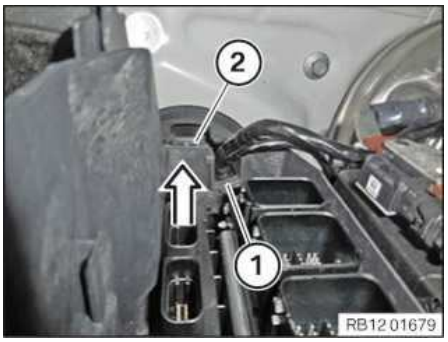


- Unlock and loosen connector (1).

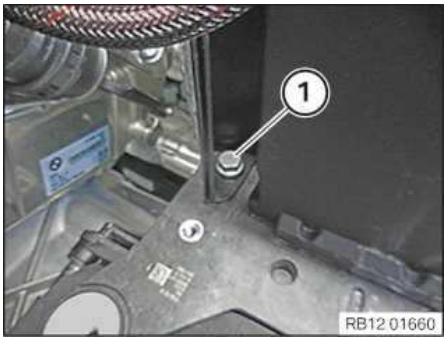


- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.

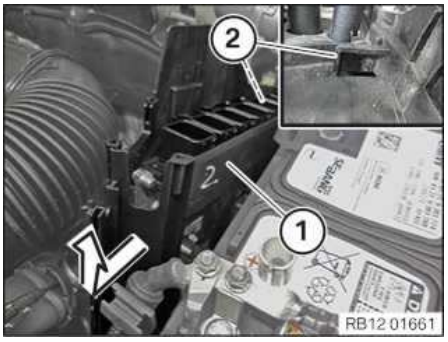
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- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.

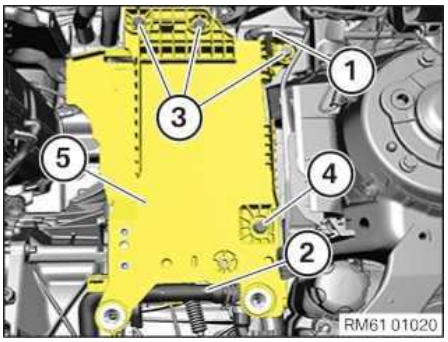


- Loosen screw (1).

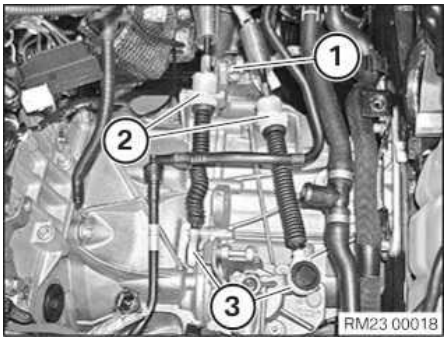


- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

▶ **Remove battery holder**

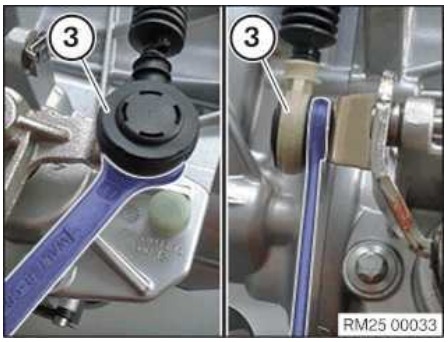


- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

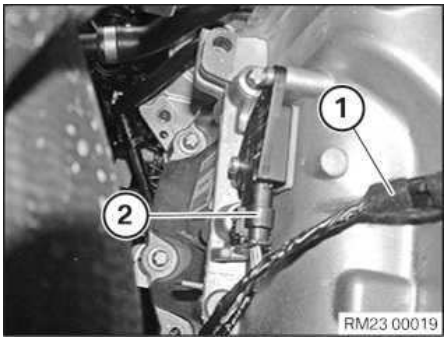


- Release the clip on the limit position/bracket (2) and bend the tabs slightly away from the limit position/bracket (2).
- Unscrew the bolt (1) and detach the ground strap from the transmission.

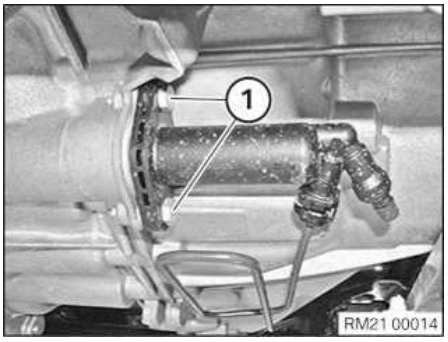
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- Lever the fixtures (3) of the selector lever cables away from the ball joints with an open-end spanner SW13.

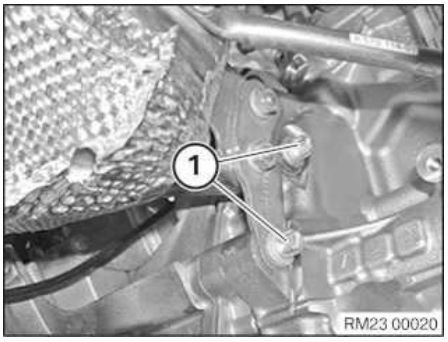


- Disconnect the plug connection (2) of the gear sensor.
- Detach the cable (1) with the holder from the transmission.

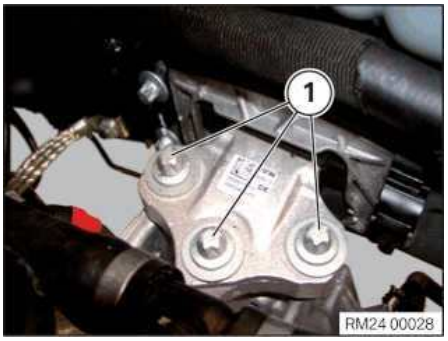


- Relieve tension on clutch slave cylinder slowly; otherwise air will be drawn in through sealing cup.

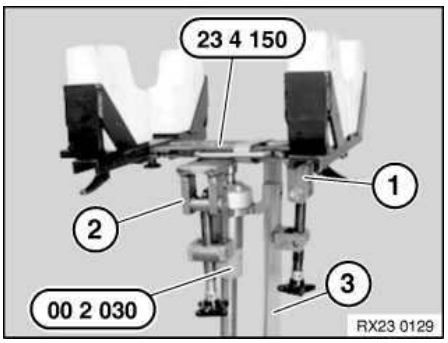
  Pressure line of clutch slave cylinder remains connected.
- Unscrew the bolts (1) and remove the clutch slave cylinder.



- Loosen screws (1).

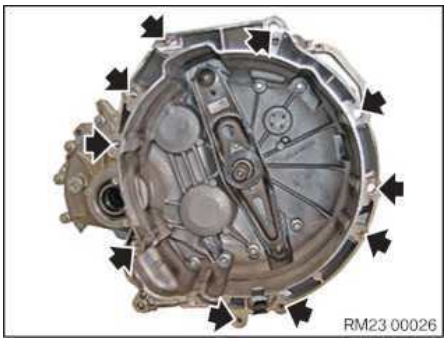


- Loosen screws (1).

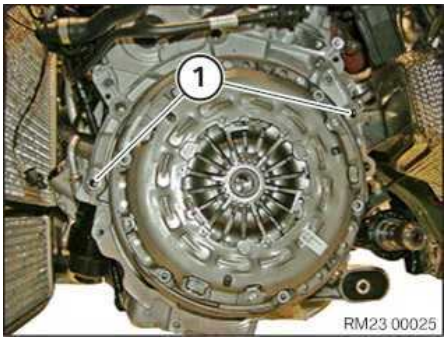


- Support the transmission with special tool **0 490 133 (00 2 030)**and .
- Secure the transmission with the tensioning strap (3).

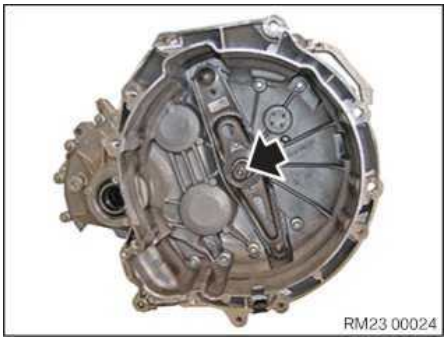
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- Remove screws (arrows).
- Pull transmission downwards and remove.



- Check for correct fit of fitting sleeves(1).
- Replace damaged fitting sleeves.



- Remove any grease from the transmission input shaft (arrow) and clean the shaft.
- Do not grease transmission input shaft.
- Check clutch disc for frictional corrosion in gearing and replace if necessary.

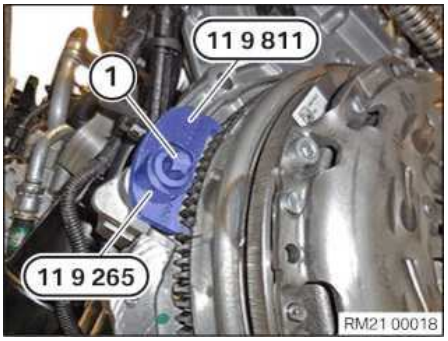
40 – Remove clutch

CAUTION

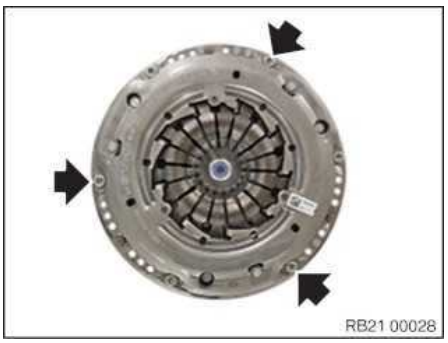
Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

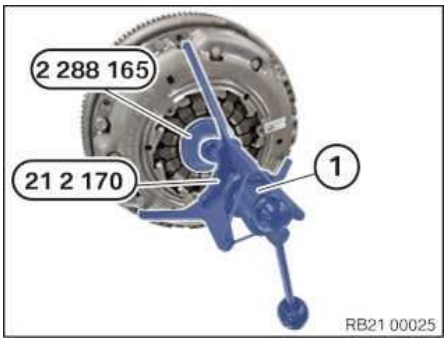


- Block flywheel with transmission bolt (1) and special tools **0 496 171 (11 9 811)** and **0 494 793 (11 9 265)**.

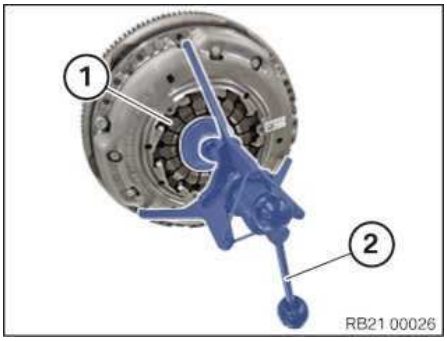


- Detach 3 screws to attach special tool and **2 288 165**.

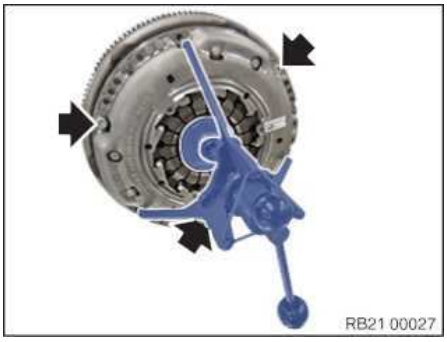
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- Position special tool and **2 288 165** and tighten on the knurled screw (1).



- Screw in the spindle (2) until the diaphragm spring (1) is preloaded and the clutch disc is free of tension.



- Loosen the remaining 3 screws and remove the clutch with clutch disc from the flywheel.

MAIN WORK

41 – Removing flywheel

CAUTION

Heavy component.

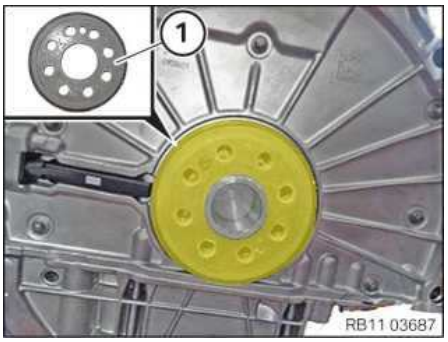
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Secure the flywheel with a transmission bolt (1) and with special tools **0 496 171 (11 9 811)** and **0 494 793 (11 9 265)**.
- Unscrew the flywheel bolts with the special tool **0 491 018 (11 4 180)**.
- Remove flywheel.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Remove the increment wheel (1) from the crankshaft and lay it down correctly.

42 – Installing the flywheel

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

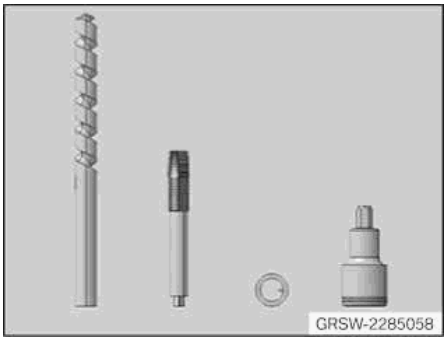
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



TECHNICAL INFORMATION

Clean all threads with a screw tap.

- Clean all screw threads (1).



- Use the set of special tools **2 285 058**.

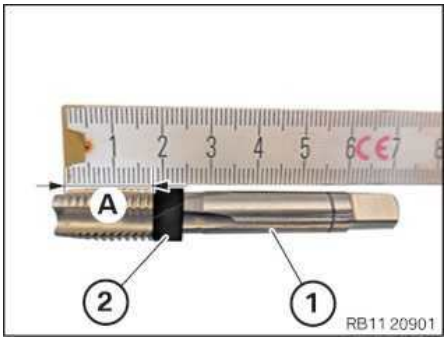
Description
Twist drill
Thread cutter M12x1.5
Depth
Insertion tool

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- Assemble tool set.

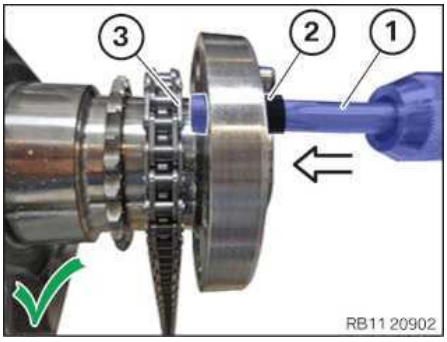
Number	Description
1	Tool holder
2	Thread cutter M12X1,5



- Mark the screw-in depth (A) on thread cutter (1) from the set of special tools **2 285 058** with a standard tool (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm



NOTICE

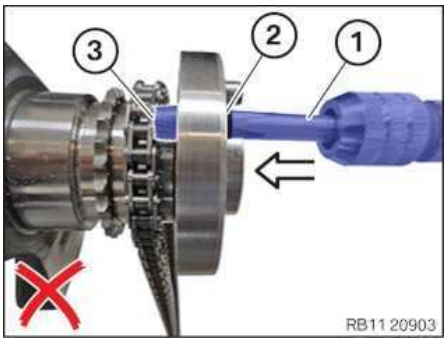
To provide a better overview: Shown with engine removed.

- Screw in the thread cutter (1) from the set of special tools **2 285 058** in direction of arrow up to the screw-in depth (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm

- Make sure that the thread cutter does (1) **not** rest on the timing chain (3).

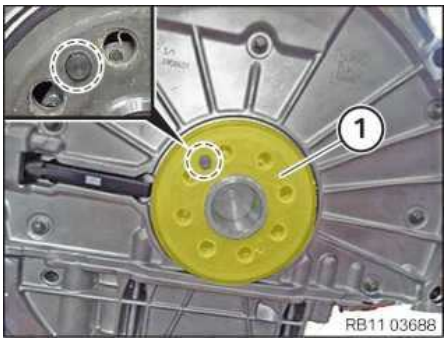


TECHNICAL INFORMATION

- **Carefully** handle the timing chain, to protect the timing chain and timing chain drive against damage.

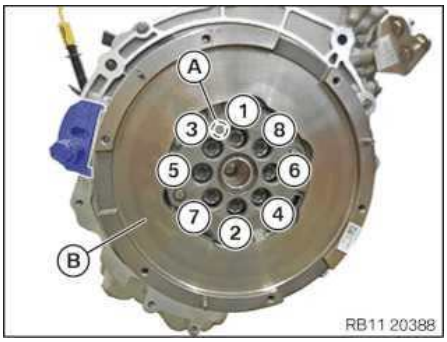
- Make sure that the screw-in depth (2) of the screw tap (1) is not exceeded.

  The thread cutter (1) may not rest on the timing chain (3).



- During the installation, note the mark shown without fail.
- Install special tool (1) on the crankshaft as shown.

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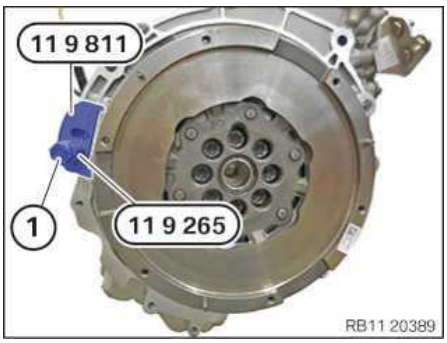


- Position flywheel (B) .
- Renew flywheel bolts (1) to (8).

  Parts: Flywheel bolts
- Tighten flywheel bolts hand-tight with special tool **0 491 018 (11 4 180)**.
- Observe tightening sequence. While doing so, begin with dowel pin (A).
- Tighten the flywheel bolts using the special tool **0 491 018 (11 4 180)** in sequence (1) to (8).

Flywheel to crankshaft

M12x1.5	Renew screws.	Tightening torque	120 Nm



- Loosen the transmission bolt (1).
- Feed out and remove special tools **0 494 793 (11 9 265)** and **0 496 171 (11 9 811)** with the **standard** (5 mm) washer.

POSTPROCESSES

43 – Install clutch

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

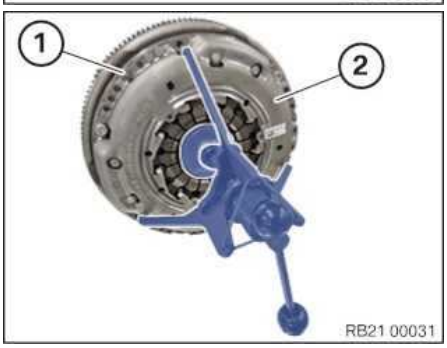
- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

TECHNICAL INFORMATION

Handle the clutch disc carefully. Install the surfaces of the clutch disc in the correct mounting orientation.
Clean friction surfaces of the flywheel and the pressure plate with BMW-approved brake cleaner.
Note designation for "engine side" / "transmission side".

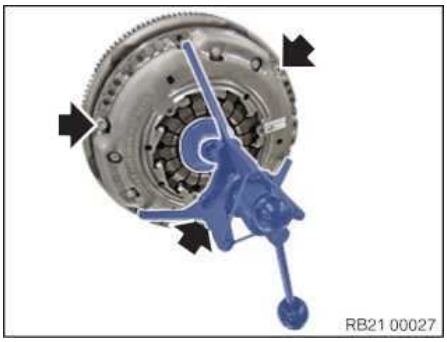


- Centre the clutch disc (1) using special tool .



- Mount the clutch (2) together with the special tool to the flywheel.
- Observe the dowel pins (1).
- The clutch (2) must be secured via the dowel pins (1).

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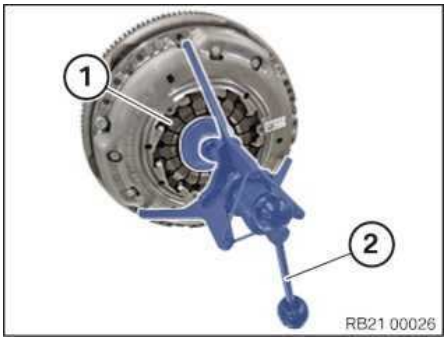


- Renew the bolts (arrows).

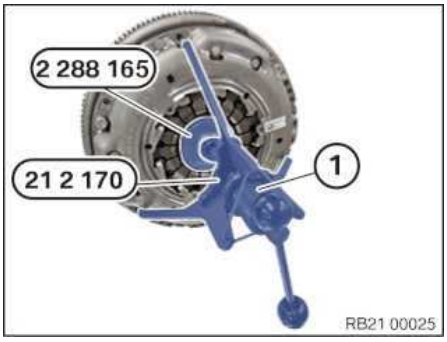
  Parts: Bolts
- Install and tighten screws (arrows).

Clutch to flywheel

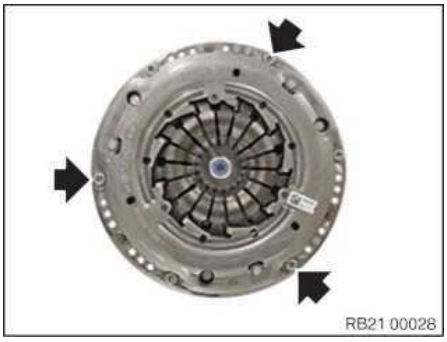
M8	Renew screws.	Jointing torque	15 Nm
		Angle of rotation	90 °



- Loosen the spindle (2) until the diaphragm spring (1) is fully relieved.



- Unscrew the knurled screw (1) and remove the special tool with **2 288 165** from the clutch.



- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Clutch to flywheel

M8	Renew screws.	Jointing torque	15 Nm
		Angle of rotation	90 °



- Withdraw special tool from clutch disc with aid of accompanying screw.

44 – Installing the manual gearbox (GS6-59DG, GS6X60DA)

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

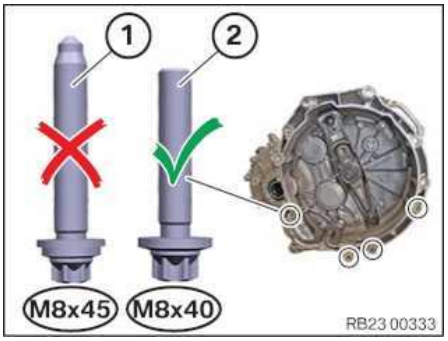
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RISK OF DAMAGE

Damage to the engine block.

Damaged and corroded bolts will lead to major damage in the engine block and the transmission.

- It is imperative that protruding threads of the transmission bolts are checked for corrosion and damage prior to removal.
- It is imperative that all rust is removed from corroded threads and that they are cleaned prior to removal.
- Renew rusted and damaged bolts.



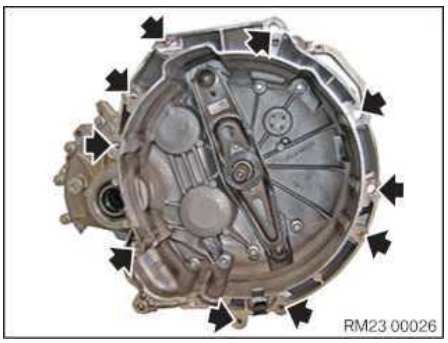
RISK OF DAMAGE

Component damage caused by incorrect screw length.

The use of screws with the incorrect screw length can damage the component.

- Check for correct screw length.
- Re-install screws that correspond to the original screw length.

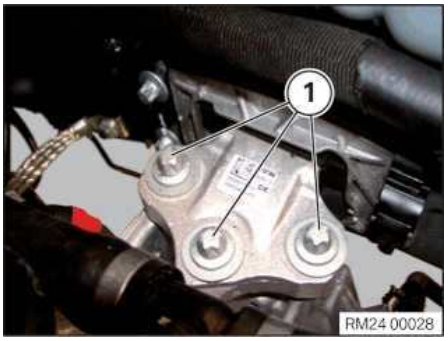
- **Wrong:** The screw (1) (starter motor screw connection) must **not** be used for the bottom screw connection of the transmission.
- **Correct:** It is imperative to use the bolt (2) (M8x40) for the lower screw connection of the transmission and flange-mount the transmission.



- Tighten screws (arrows).

Transmission to engine

M8x40		Tightening torque	19 Nm
M12x75		Tightening torque	66 Nm

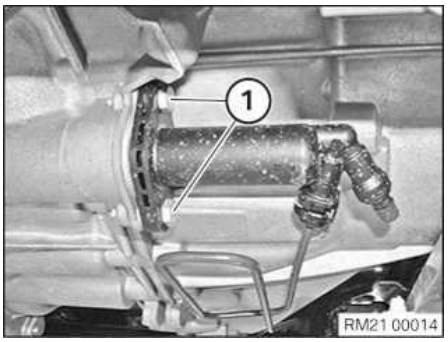


- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Transmission mounting

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

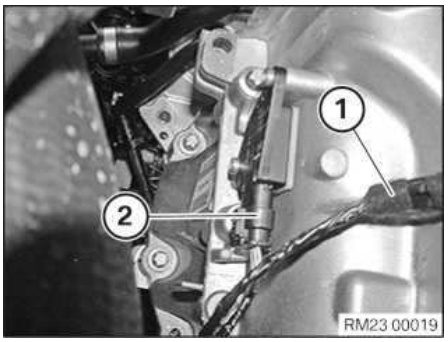


- Install clutch slave cylinder.
- Tighten the screws (1).

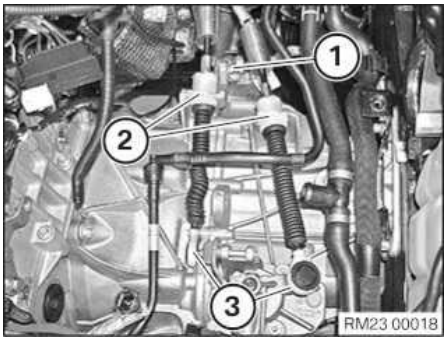
Clutch slave cylinder to transmission housing

M8		Tightening torque	19 Nm

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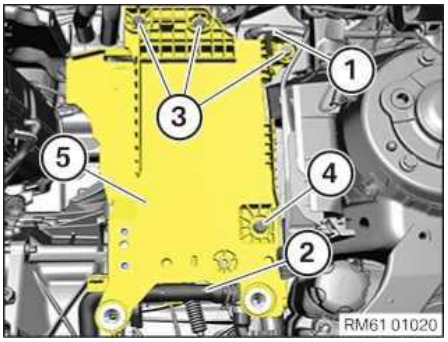


- Connect the plug connection (2) of the gear sensor.
- Clamp the cable (1) with the holder to the transmission.



- Tighten the ground strap on the transmission with the screw (1).
- Clip in the clip on the stop/holder (2).
- Attach the selector lever cables (3) on the ball joints.

▸ **Install the battery holder**



- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

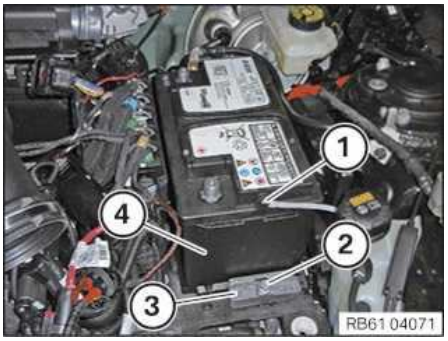
- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

▸ **Partially install vehicle battery**



- Install vehicle battery (4).
- Correctly position the holder (3).
- Tighten down screw (2).

Battery terminal rail to battery tray

M8		19 Nm

- Fit and clip the vent hose (1) in.

▹ **Check the vent holes of the battery**

WARNING

Gas emission.

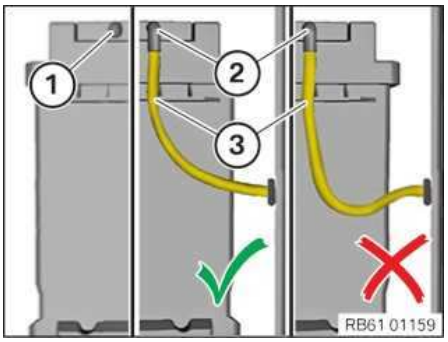
Danger of injury! Danger of explosion!

- Assign the vent holes correctly.
- Route the vent hose correctly.

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TECHNICAL INFORMATION

The battery has two vent holes, opposite:
One vent hole (1) must be closed correctly with a dummy plug.
The vent hose (3) must be correctly connected and routed at the other vent hole (2).



Check
- Check if the vent hole (1) is correctly closed with a dummy plug.

Result
» No dummy plug.

Measure
- Close the vent hole (1) correctly with a dummy plug.

Check
- Check if the vent hole (2) has a correctly connected vent hose (3).

Result
» The vent hose (3) is not correctly connected.

Measure
- At the vent hole (2), connect the vent hose (3) correctly.

Check
- Check if the vent hose (3) is routed to the outside with a downhill gradient (**no siphon formation!**).

Result
» The vent hose (3) is not correctly routed as shown in the image on the right.

Measure
- Route the vent hose (3) correctly as shown in the centre image.

◁

▶ **Install electronics box**

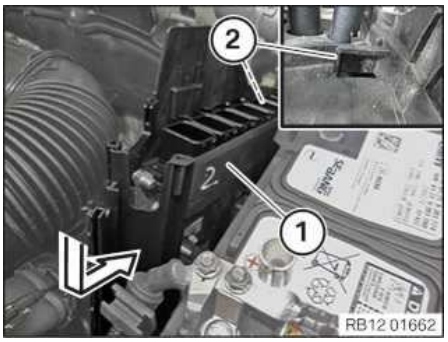
Prerequisite
Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.
- Route all cables without abrasions, do not trap and crush.

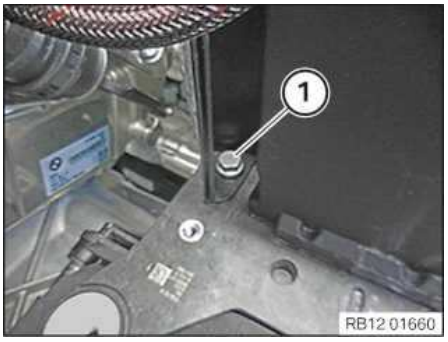
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- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.



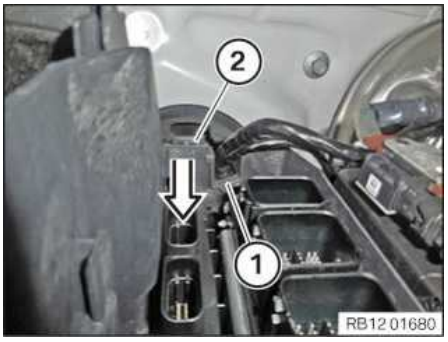
- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).



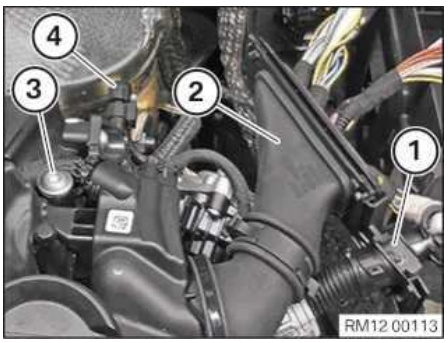
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.

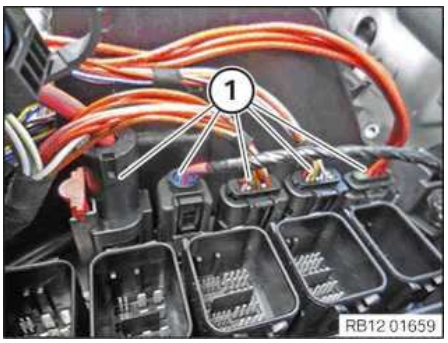


- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

Wiring harness to cylinder head cover

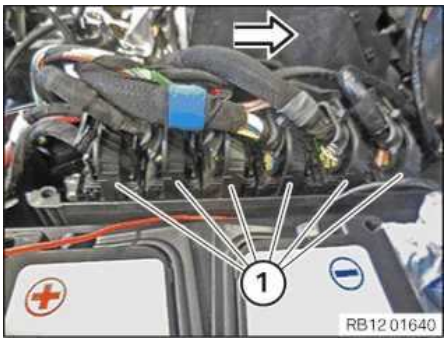
TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.

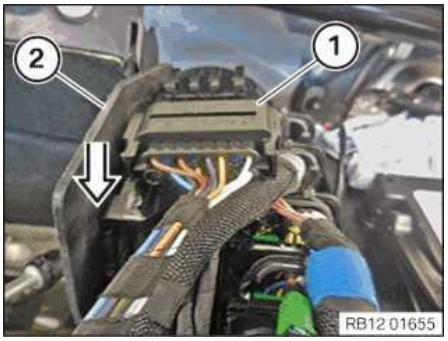


- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.

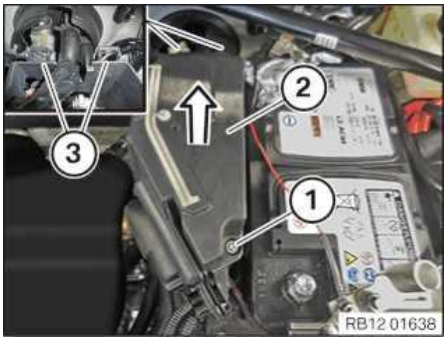
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- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



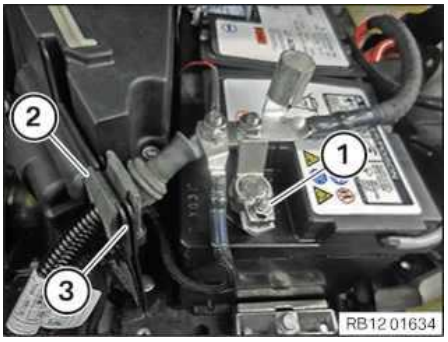
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

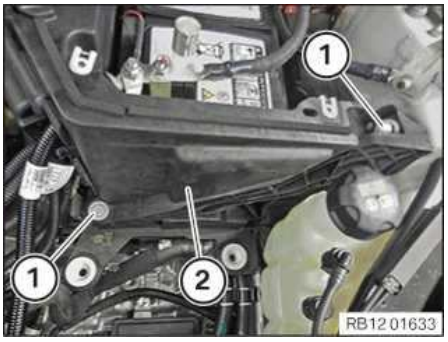
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

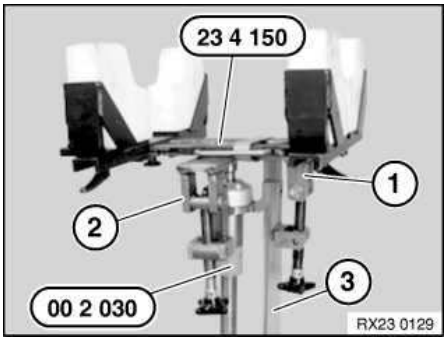
NutM6		Tightening torque	5 Nm



- Feed in and install tension strut (2).
- Tighten the screws (1).

Tension strut to spring strut dome/battery tray

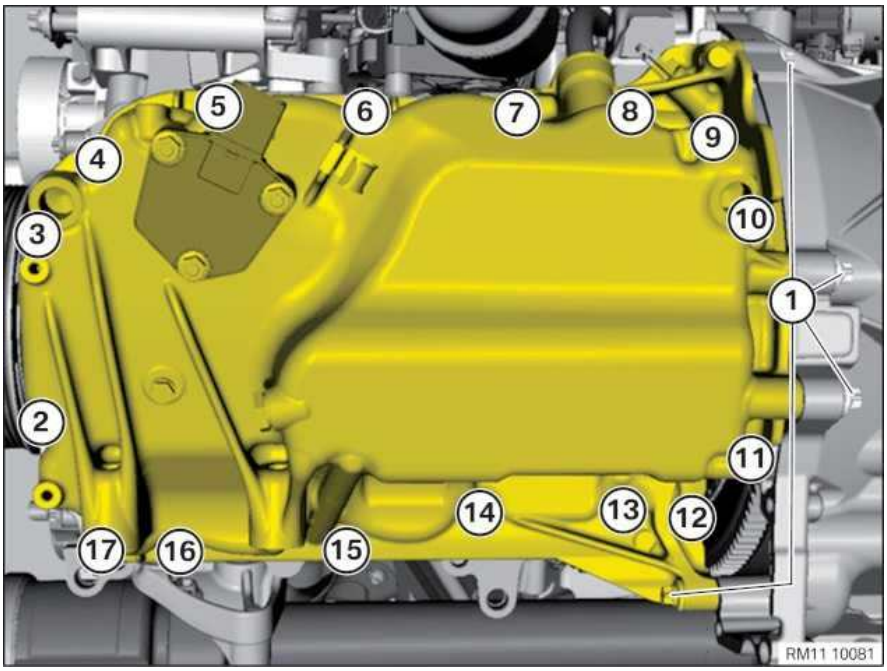
M8		Tightening torque	19 Nm



- Loosening the tensioning strap (3).
- Remove special tools **0 490 133 (00 2 030)** and .

45 – Tighten down transmission-side bolting connection oil sump

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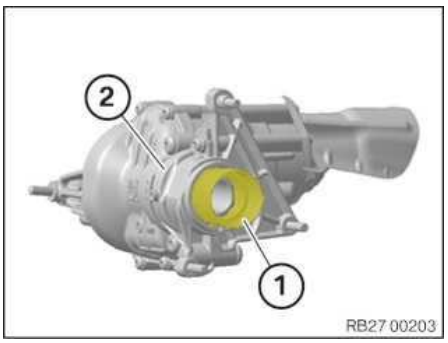


- Join transmission bolts (1) with 5 Nm.
- Tighten the transmission bolts (1) on the transmission.

Transmission to oil sump

M8			19 Nm

46 – Install the transfer box (VTG)



- If intermediate shaft (1) gets caught on transfer box (VTG) (2), renew intermediate shaft (1) and the radial shaft seals in the automatic or manual transmission.



- Screw special tool **2 409 025** into the outer radial shaft seal.
- Turn the screw on the special tool **2 409 025** until the outer radial shaft seal has been pulled out.

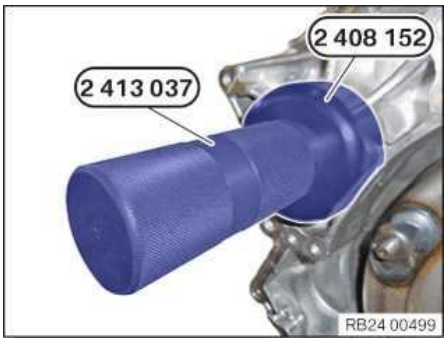


- Insert special tool **2 411 739** into the inner radial shaft seal.

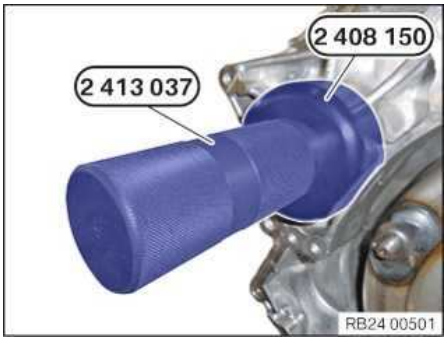


- Screw special tool **2 411 739** into the inner radial shaft seal.
- Turn the screw on the special tool **2 411 739** until the inner radial shaft seal has been pulled out.

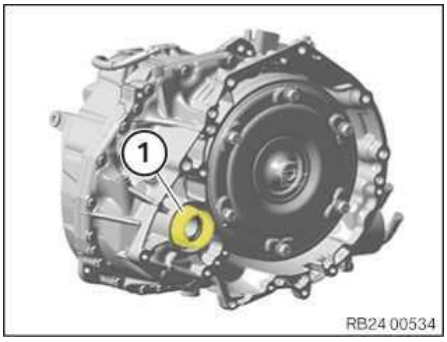
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- Drive in the inner radial shaft seal using special tools **2 408 152** and **2 413 037** up to the limit position.



- Drive in the outer radial shaft seal using special tools **2 413 037** and **2 408 150** up to the limit position.



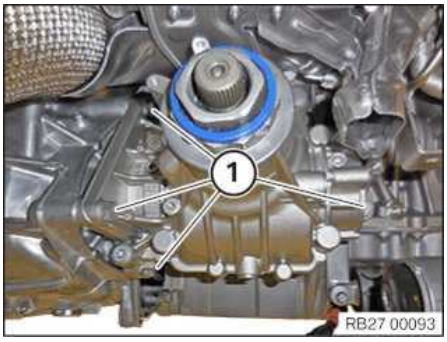
- If necessary, connect the new intermediate shaft (1) to the output flange of the automatic transmission or manual transmission.



- Coat the inside of the output flange (arrows) evenly with approx. 5 g of grease.

Expendable materials

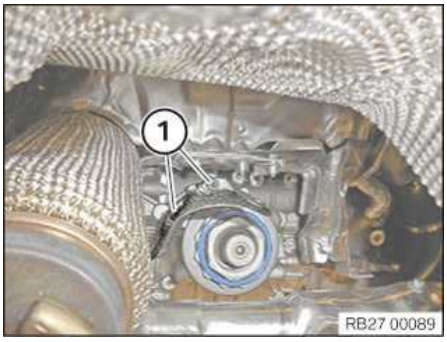
Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the transfer box (VTG).
- Tighten the screws (1).

Transfer box to transmission

M10		Tightening torque	56 Nm



- Install heat shield.
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Heat shield to transfer box

M6	Renew screws.	Tightening torque	6 Nm

▸ **Check the transfer box oil level**

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RISK OF DAMAGE

Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.



- Check transfer case oil level, correct:
- Open the oil filler plug (1).
- Check transfer box oil level.
- If necessary, top up transmission oil up to the lower edge of the oil filler plug opening (1).

Transmission oil

Technically suitable transfer box and electrical transmission oils	

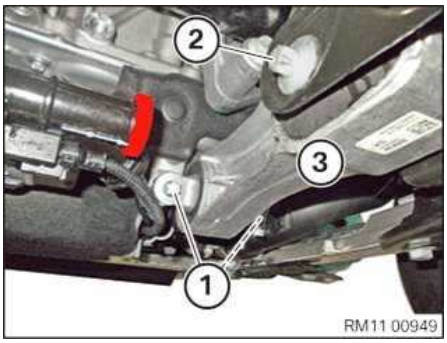
Main group 27

- Tighten the oil filler plug (1).

Oil filler plug on transfer box (VTG)

M18x1.5		Tightening torque	35 Nm

47 – Install the holder with the rubber mount



- Insert and install the holder (3).
- Tighten the screws (1) and (2) hand-tight.
- Release jack.
- Tighten down screw (2).

Holder to front axle support

M12		Tightening torque	100 Nm

- Tighten the screws (1).

Bracket to oil sump

M12		Tightening torque	100 Nm

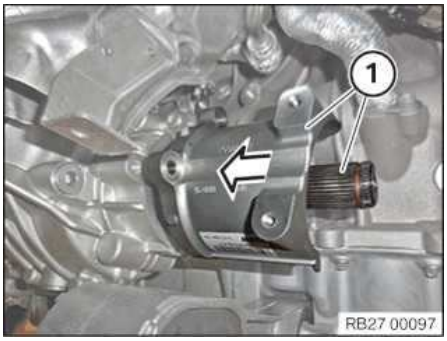
48 – Install the intermediate shaft with the support tube



- Coat gearing of the intermediate shaft uniformly with 5 g of grease.

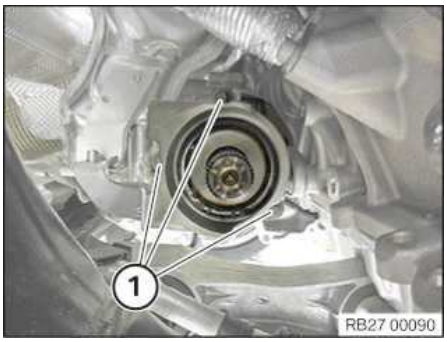
Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the intermediate shaft with support tube (1) in the transfer box.

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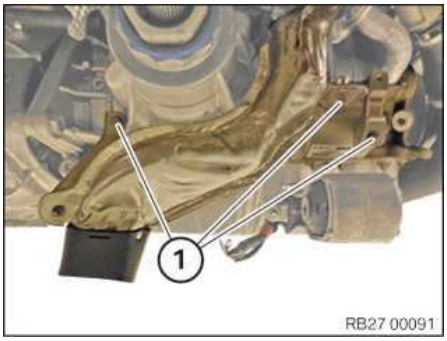
- Position screws (1).

Note: Check for correct screw length! Bolt M8x35 8.8

- Tighten the screws (1).

Intermediate shaft to transfer box

M8x35		Tightening torque	19 Nm



- If installed: Install air duct.
- Tighten the screws (1).

49 – Install propeller shaft.

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

RISK OF DAMAGE

Damage to the propeller shaft during installation.

Non-observance of the installation guidelines for the propeller shaft on the rear axle differential may cause severe damage.

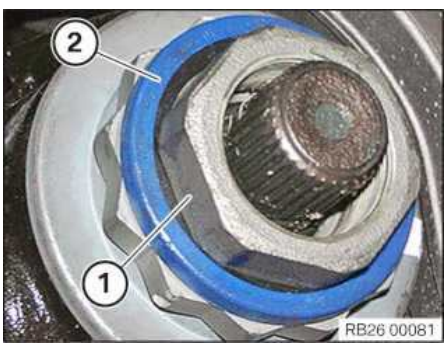
- Always renew the recessed nut on the rear axle differential. Screw locking must be available.
- Strictly observe a minimum hardening time of two hours after having screwed in the recessed nut. The hardening time may be longer at lower temperatures.

RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.



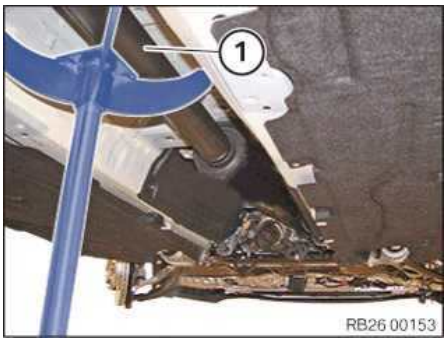
- Renew recessed nut (1).

  Parts: Insert nut
- Renew the retaining clip (2) and the seal.

  Parts: Retaining clip, seal
- Insert the seal with the recessed nut (1) and install.
- Insert the retaining clip (2) and install.
- Make sure that recessed nut (1) is screwed in within 5 min.
- Make sure that the hardening time of **minimum** 2 h for the recessed nut is observed.

  The hardening time must be extended at lower temperatures.

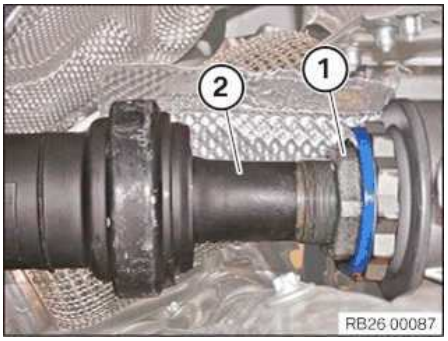
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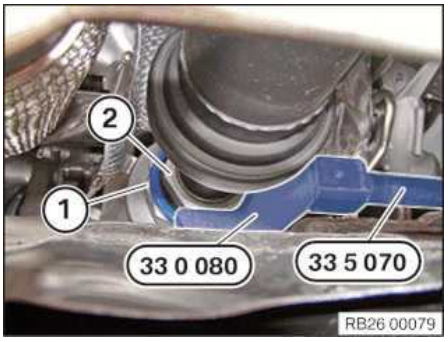
- Insert the propeller shaft (1) and install.
- Always support the propeller shaft (1) with a conventional jack.



- Hand-tighten the bolts (1).



- Push the propeller shaft (2) against the recessed nut (1) up to the limit position.
- Screw the propeller shaft (2) at least 2 thread starts onto the recessed nut (1) by hand.



RISK OF DAMAGE

Damage to the transfer box.

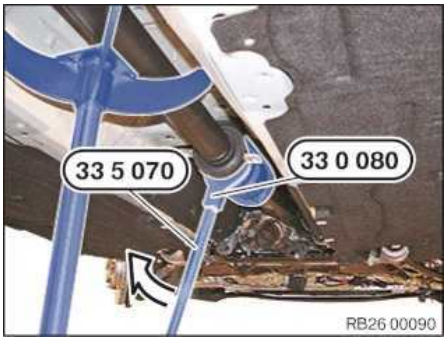
Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.

- Protect the recessed nut (2) on the transfer box from twisting with the special tools **0 495 554 (33 5 070)** and .

  The recessed nut (2) on the transfer box must **not** be used to tighten the propeller shaft.

  The double hexagon flange nut (1) must **not** be used for counter support.

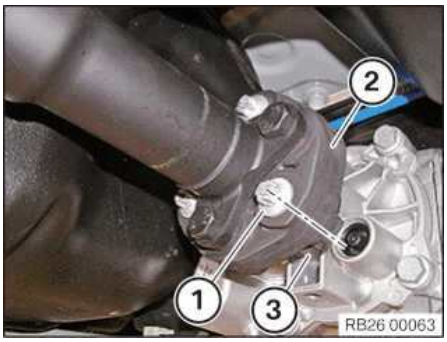


- Tighten the front propeller shaft with the special tools **0 495 554 (33 5 070)** and in the direction of the arrow.

Propeller shaft to transfer box

		Tightening torque	80 Nm

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TECHNICAL INFORMATION

Compliance with the following instructions is required to avoid a humming noise from the propeller shaft after refitting the propeller shaft.

- Assemble the screw connection (1) of the flexible disc (2) and the three-hole flange (3) according to the mark.
- Renew screws (1).

  Parts: Bolts
- Hand-tighten the bolts (1).



- Protect the propeller shaft (1) with the special tools **0 495 554 (33 5 070)** and from twisting.



- Tighten the bolts with the special tools **0 490 504 (00 9 120)** and .

Flexible disc to rear axle final drive

M12x1.5	Renew screws.	Tightening torque	55 Nm 90 °



- Tighten the screws (1).

Centre mount to body

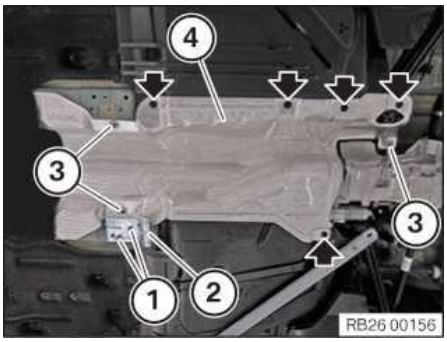
M8		Tightening torque	19 Nm



- Guide the special too l out between the front and rear propeller shaft and remove.

50 – Installing the rear heat shield

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- Insert and install the heat shield (4).
- Tighten screws (arrows).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

- Tighten nuts (3).

Heat shield to body

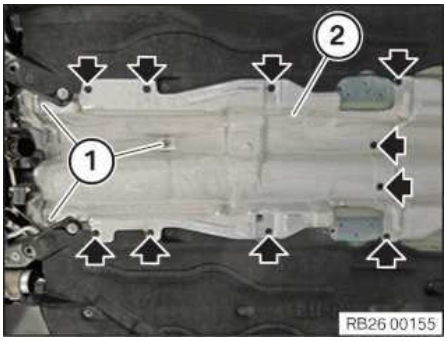
Bolts/nut		Tightening torque	3 Nm

- Insert and install the holder (2).
- Tighten the screws (1).

Bracket to body

M8		Tightening torque	21 Nm

51 – Install the front heat shield



- Insert and install the heat shield (2).
- Tighten screws (arrows).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

- Tighten nuts (1).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

52 – Install exhaust system

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

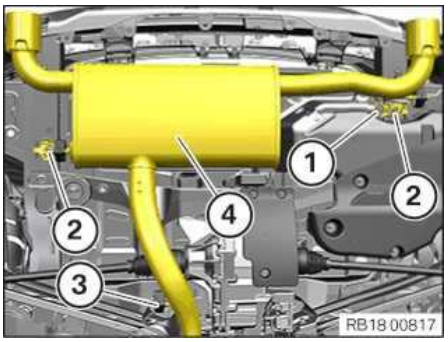
CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

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- Feed in and install the exhaust system (4) with a second person.
- Renew nuts (2).

  Parts: Nuts
- Tighten nuts (2).

Exhaust system to body

M8	Replace nuts.	Tightening torque	19 Nm

- Tighten down screw (1).

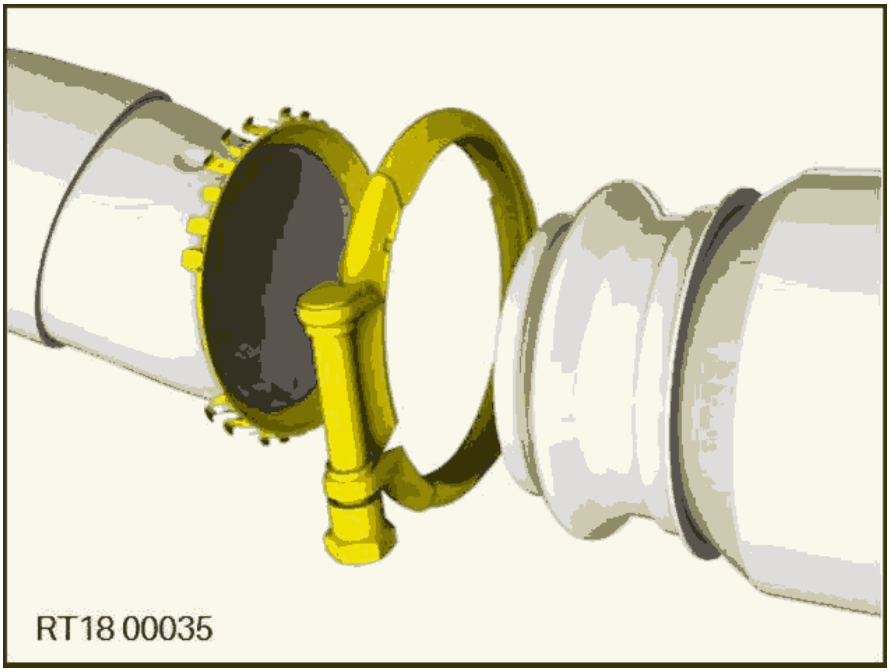
Exhaust bracket on body

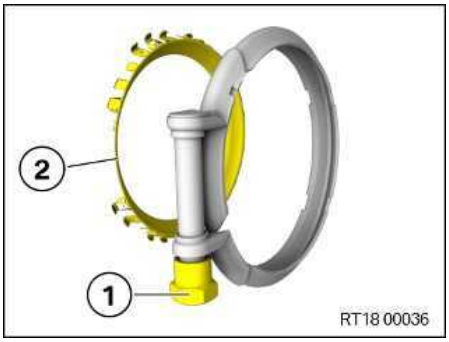
Hexagon screw M8x30		Tightening torque	19 Nm

- Check the rubber mount (3) for damage and renew as needed.
- Mount rubber mount (3) on the exhaust system (4).

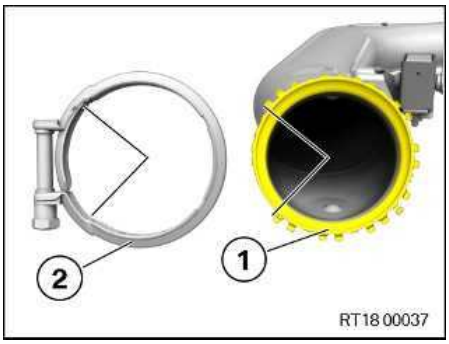
▸ **Install the V-clip**

V-band clamp





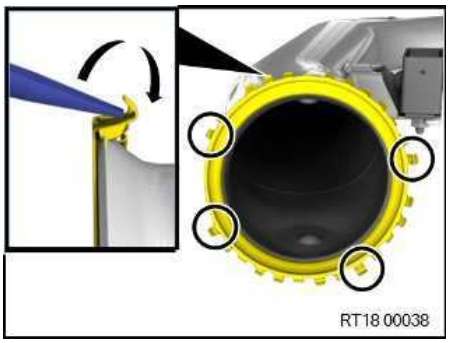
- Unscrew the nut (1) and remove the sealing ring (2).



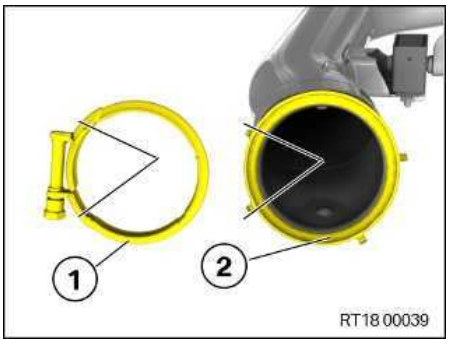
- Renew the V-clip (2).

  Parts: V-band clamp
- Mount the sealing ring (1) on the exhaust system.
- Ensure that the sealing ring (1) for the V-clip (2) is positioned correctly.

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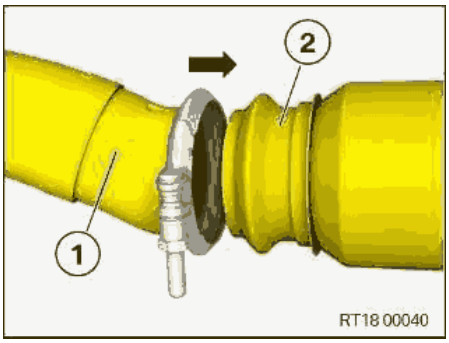
- Bend all sheet metal tabs over with a suitable tool, except those in the marked areas.



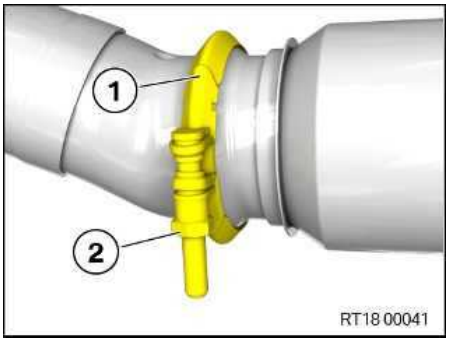
- Mount the V-clip (1) on the sealing ring (2).
- Make sure that the V-clip (1) is positioned correctly on the sealing ring (2).



- Make sure that the V-clip rests against the sheet metal tabs after mounting (marks).



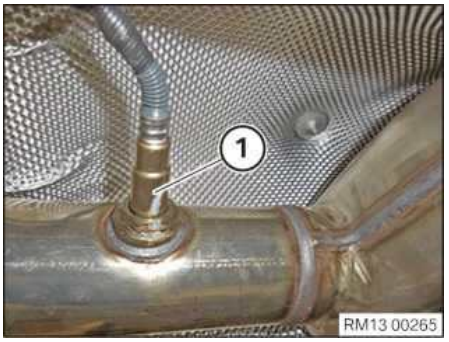
- Connect the exhaust system (1) with the catalytic converter (2) and position correctly.



- Make sure that V-clip (1) is fitted correctly.
- Tighten down screw (2).

V-clip to catalytic converter

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

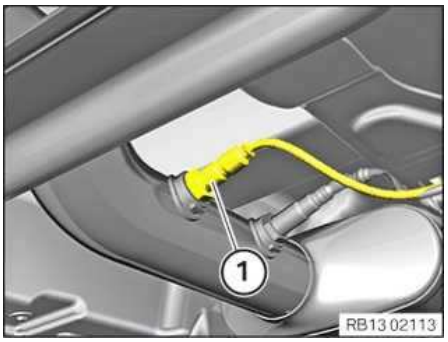


- Feed in, install and tighten diesel particulate sensor (1).

Diesel particulate sensor to exhaust system

Sensor		Tightening torque	50 Nm

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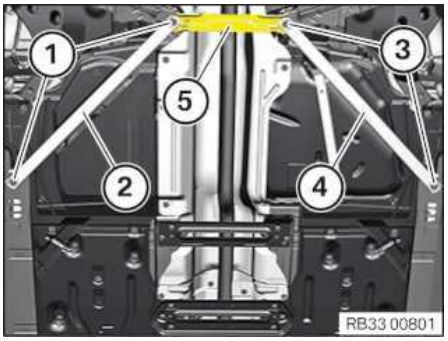


- Feed in, install and tighten nitrogen oxide sensor (1).

Nitrogen oxide sensor downstream of SCR catalytic converter

Sensor		Tightening torque	50 Nm

53 – Install the cross-member with torsion struts



- Insert and install the cross-member (5).
- Thread in torsion strut (4) at right and install.
- Renew screws (3).

  Parts: Bolts
- Tighten down screws (3).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

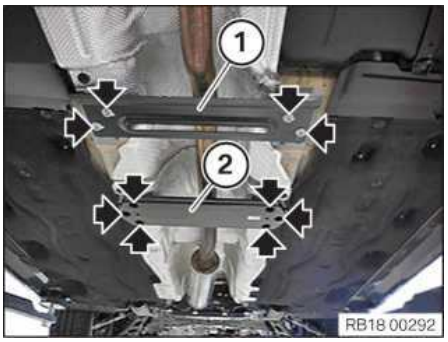
- Guide in and install the left torsion strut (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

54 – Install the connecting support on the tunnel in front and back



- Insert and install connecting supports (2).
- Tighten the screws (arrows) from the connecting support (2).

Front connection carrier to body

M10x18		Tightening torque	56 Nm

- Insert and install connecting supports (1).
- Tighten the screws (arrows) from the connecting support (1).

Rear connection carrier to body

M8x18		Tightening torque	28 Nm

55 – Installing right output shaft partially



- Renew the circlip (1).

  Parts: Circlip
- Slide output shaft into the transmission as far as the limit position.
- Check for secure seat by levering.

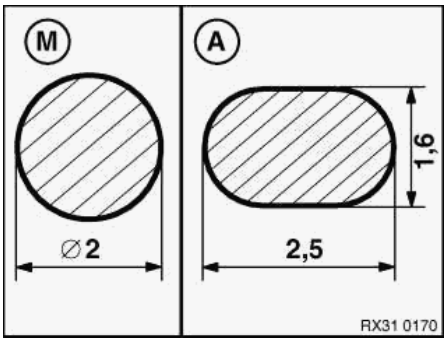
56 – Partially installing the left output shaft

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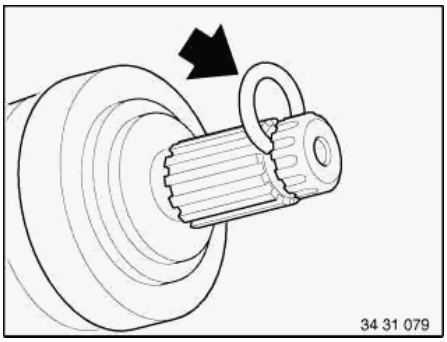
- **With automatic transmission only:**
- Lever out O-ring (1).
- Renew O-ring (1).

  Parts: O-ring
- Insert new O-ring (1).

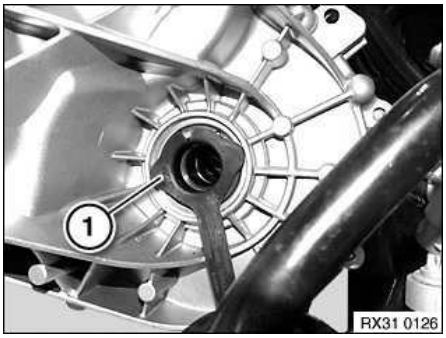


- Do not mix up circlips.

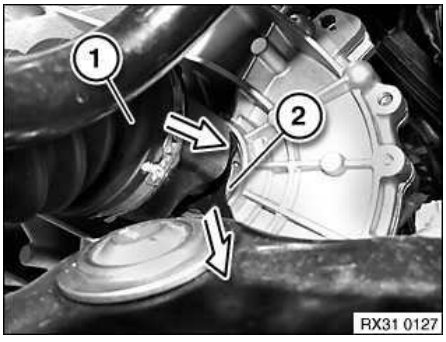
  Different types of output shafts fitted:
  - M: Manual transmission
  - A: Automatic transmission



- Renew circlip (arrow).



- Insert installation protection ring (1) into the radial shaft seal.
- Make sure the tool fits over the lip of the radial shaft seal so there is no damage to sealing ring when the output shaft is inserted.



- Insert output shaft (1) into transmission.
- **Manual gearbox only:** Pull on the handle to remove the installation protection ring (2) and dispose of it.
- Slide output shaft (1) into the transmission as far as the limit position.

  The output shaft (1) must engage audibly.
- Check for secure seat by levering.

57 – Installing starter motor

CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

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- Insert and install the starter motor .
- Tighten the screws (1).

Starter motor to transmission

M8x45		Tightening torque	19 Nm



- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

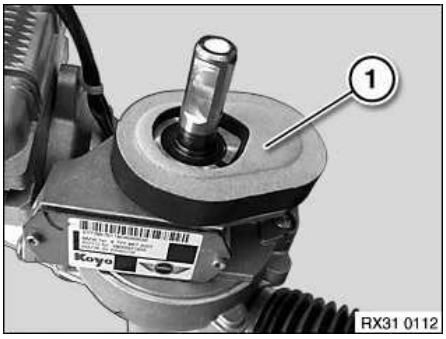
Battery positive lead to starter

M8		Tightening torque	13,5 Nm



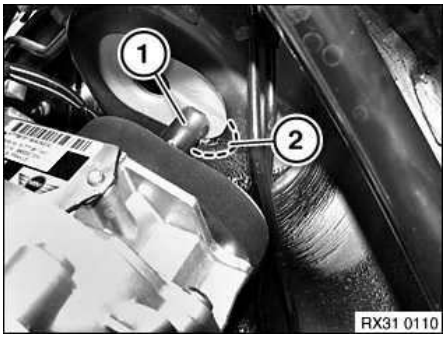
- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.

58 – Mount and secure the complete front axle



- Remove the seal (1).
- Clean surface on steering gear.
- Renew gasket (1).

  Parts: Gasket
- Position the seal (1) and glue it on.



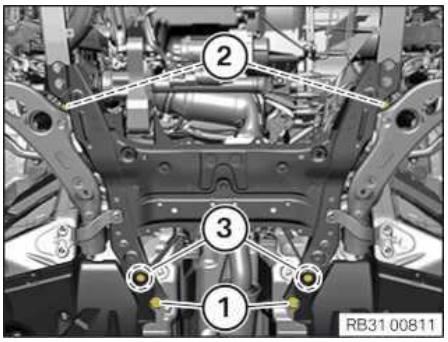
TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!

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- Position front axle support.
- Bend underbody panellings in the areas (3) to one side.
- Raise front axle support.
- When raising, insert charge air cooler into the rubber mount of the charge air cooler on cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

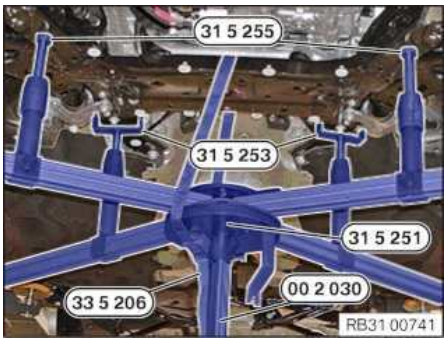
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

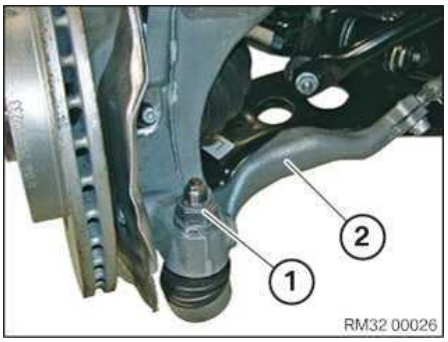
- If necessary, tighten the screws in the areas (3).

Underbody protection to body

Screw		Tightening torque	3 Nm



- Remove special tool from special tool .
- Lower universal jack **0 490 133 (00 2 030)** with the special tool and place it to the side.



NOTICE

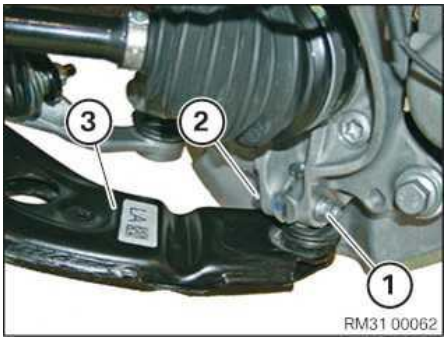
Perform the operations on the left and right side.

- Position the track rod (2) on the swivel bearing .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Track rod end to swivel bearing

M14	Renew nut.	Tightening torque	175 Nm



NOTICE

Perform the operations on the left and right side.

- Position the wishbone (3) on the swivel bearing .
- Renew the bolt (2) and the nut (1).

  Parts: Bolt, nut
- Insert screw (2).
- Tighten nut (1).

Wishbone to swivel bearing

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

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59 – Install the mounted parts on the front axle support



NOTICE

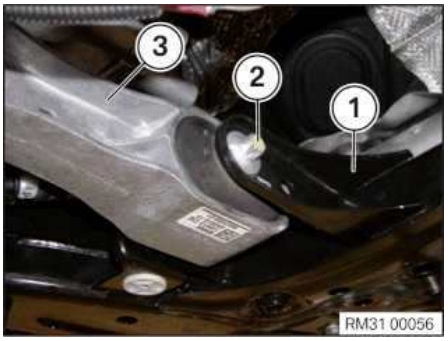
Perform the operations on the left and right side.

- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Holder, wishbone rubber mount, to body

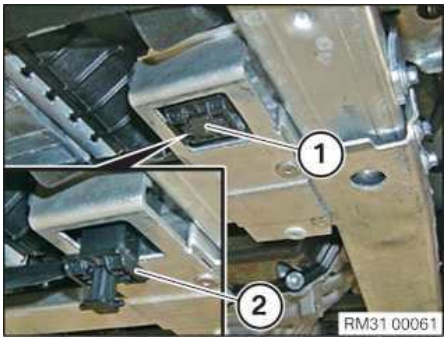
M10 screw	Renew screw.	Jointing torque	56 Nm
		Angle of rotation	90 °



- Position the engine support (3) on the front axle support (1).
- Tighten down screw (2).

Holder with rubber mount to front axle support

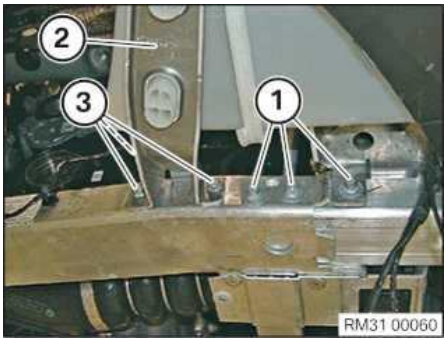
M12 screw		100 Nm



NOTICE

Perform the operations on the left and right side.

- Position the lock (2).
- Lock the bracket (1) of the lock (2) of the holder for the charge air cooler.



- **Only on right side:** Position the holder for the washer fluid reservoir (2).
- Tighten down screws (3).

Washer fluid reservoir holder to front axle support adapter plate

		Tightening torque	10 Nm

NOTICE

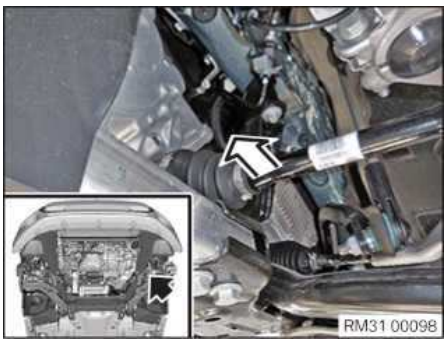
Perform the operations on the left and right side.

- Tighten the screws (1).

Deformation element, bottom, to adapter plate, front axle carrier

		Tightening torque	11,8 Nm

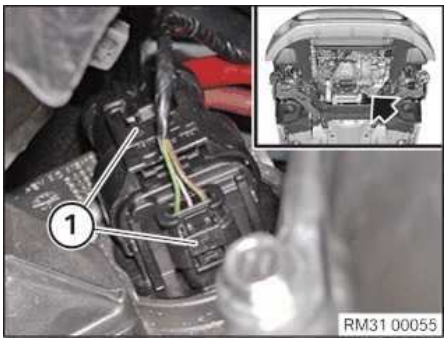
60 – Attaching connector at steering gear



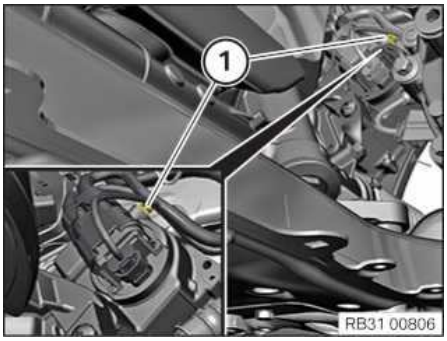
- To connect the connector (see the following step): Connect the connector with the right hand.

  The connectors can be accessed via the left output shaft.

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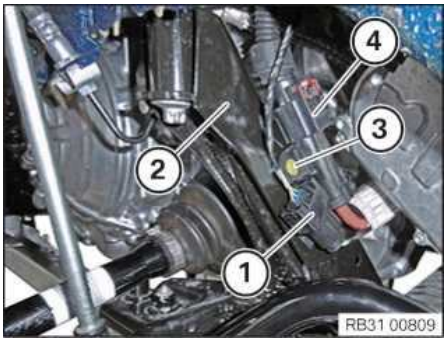


- Connect and lock connector (arrow) (1) with the steering gear.



- Fasten the wiring harness (1) on the steering gear.

▸ **If installed: Fasten the plug connections at the front axle support**



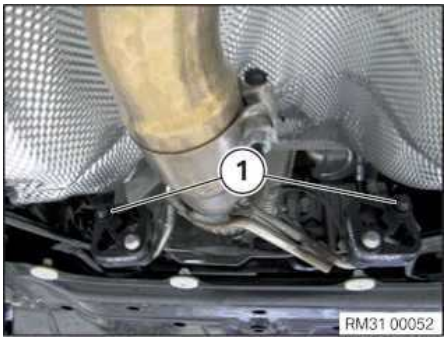
- Position the plug connection (4) at the front axle support (2).
- Tighten down screw (3).

Holder to front axle support

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

- Fasten the plug connection (1) at the front axle support (2).

61 – Securing rubber mount on front axle support



- Check rubber mount (1), replace if necessary.

  Parts: Rubber mount
- Spray rubber mount (1) with lubricant and slide onto holder on front axle support.

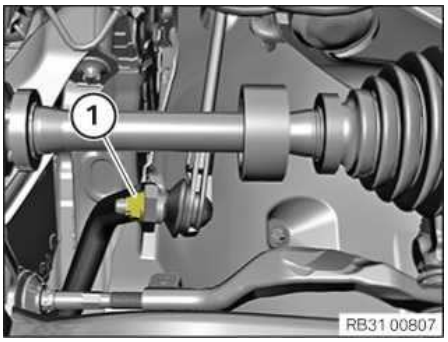
62 – Securing anti-roll bar on left and right on the anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▸ **Fastening anti-roll bar on the anti-roll bar link**

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- Position the anti-roll bar link on the anti-roll bar .
- Renew nut (1).

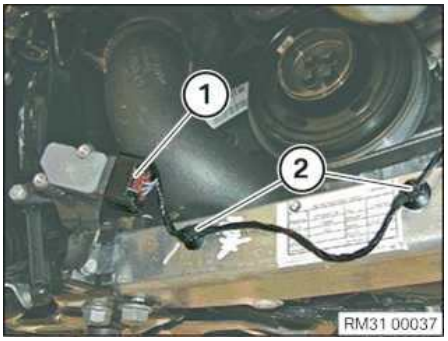
  Parts: Nut
- Tighten nut (1).

Note: Use the Torx socket for counter support.

Anti-roll bar link to anti-roll bar

M10	Renew nut.	Tightening torque	56 Nm

63 – With right installation: Securing the cable for the ride height sensor



- Secure the cable clip (2) on the adapter of the deformation element.
- Connect connectors (1) and lock.

64 – Topping up oil level in the manual gearbox (GS6X60DA)

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.



TECHNICAL INFORMATION

Make sure during removal of the filling/level control screw to note the installed filling/level control screw variant.

It is **mandatory** to use variant 1 in transmissions up to production date 08/2015.

It is **mandatory** to use variant 2 in transmissions from production date 08/2015.

Failure to observe will result in a leak on the transmission.

- Variant 1 **until** production date 08/2015.
- Variant 2 **from** production date 08/2015.



- Unscrew filling/level control screw (1) and fill the transmission until the oil overflows.

Transmission oil capacity

Transmission oil GS6-60DA, GS6X60DA/Owner's Handbook	2,2 l

Transmission oil: Technically suitable manual gearbox oil

- Allow surplus oil to drain off.
- Renew the filling/level control screw (1).

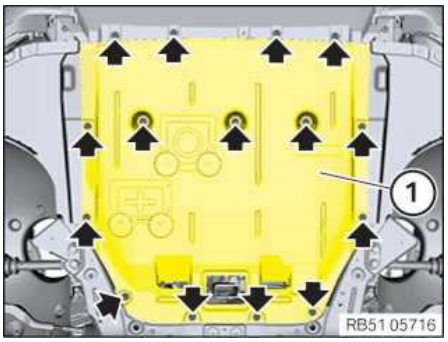
  Parts: Filling/level control screw
- Tighten filling/level control screw (1).

Oil drain plug / oil filler plug

Hexagon socket		Tightening torque	43 Nm

65 – Installing the front underbody protection

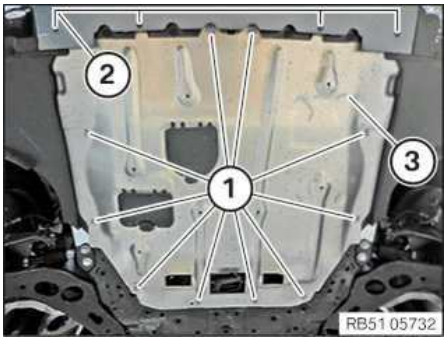
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- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

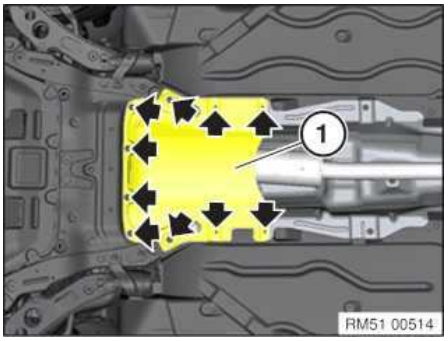


- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

66 – If installed: Installing underbody protection at rear



- Position rear underbody protection (1).
- Tighten screws (arrows).

Underbody protection to body

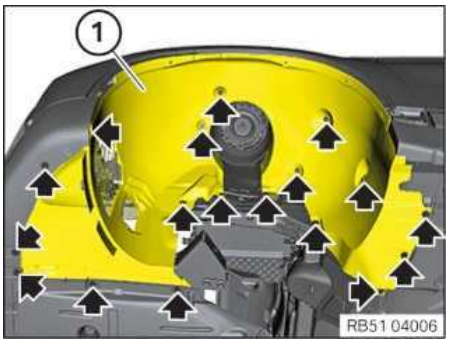
Screw		Tightening torque	3 Nm

67 – Installing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

▸ **Installing the front wheel arch cover**



- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Plastic nut		Tightening torque	2,6 Nm
Screw		Tightening torque	2,6 Nm

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

▸ **Installing front wheel arch trim**

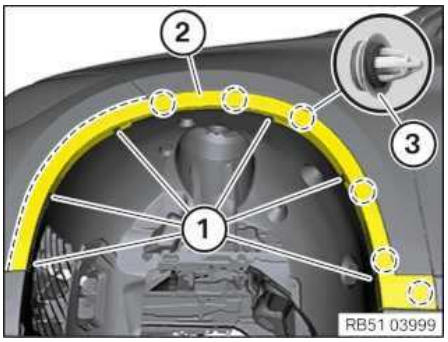
NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

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NOTICE

Description is for left component only. Procedure on the right side is identical.



- Check the clips (3) for damage and renew where required.

  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

68 – Installing both front wheels

▶ **Mounting the wheel**

▷ **Clean the contact surfaces between the brake disc and the wheel rim**



TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

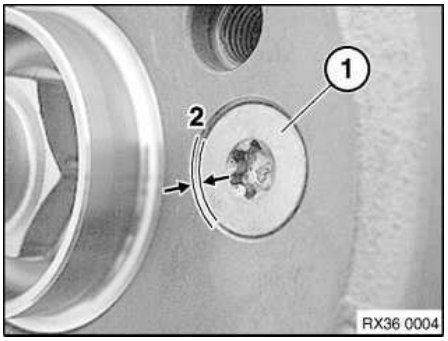
- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue in the area of the wheel bolt holes, remove and clean the brake disc.



- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).



- Renew mounting bolt (1).

  Parts: Mounting bolt
- Check that the mounting bolt (1) for the brake disc is securely seated.

  The mounting bolt (1) for the brake disc may not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

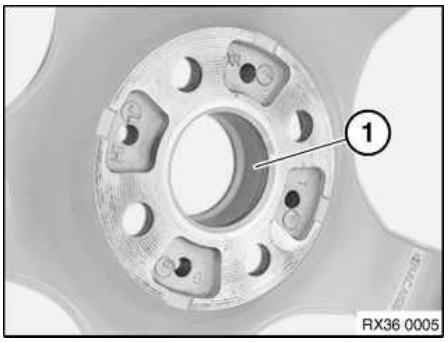
Brake disc to rear wheel hub

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub

M8	Renew screw.	Tightening torque	16 Nm

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- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring (1).

◁



TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

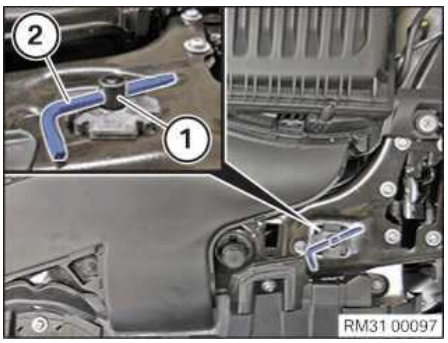
- Renew corroded wheel bolts.

  Parts: Wheel bolts
- Clean the wheel bolts.
- Check the wheel bolts and threads for damage, renew the wheel bolts if necessary.
- Join and tighten the wheel bolts (arrows).

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

69 – Removing fastener for left and right radiator



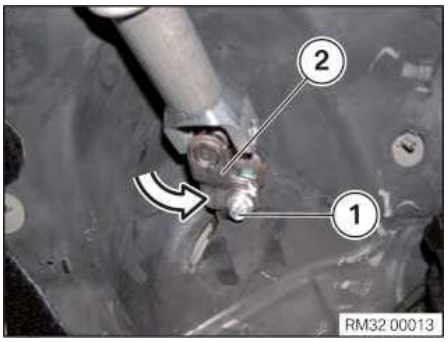
NOTICE

Perform the operations on the left and right side.

- Remove suitable tool (2) from the centering pin (1).

70 – Secure the steering shaft at the bottom on the steering gear

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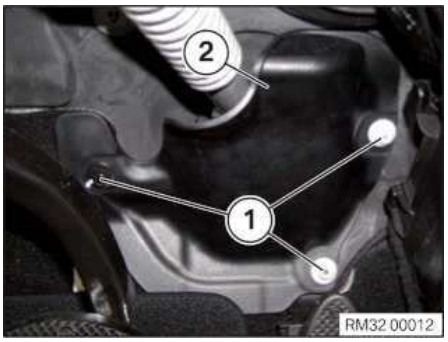


- Clean the screw lock residue from the screw thread in the universal joint (2).
- Pivot the universal joint (2) in the direction of the arrow to the steering gear.
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Lower steering shaft to steering gear

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm



- **If installed:**
- Position the cover on the steering column (2).
- Tighten nuts (1).

Steering column cover to bulkhead

Plastic nut		Tightening torque	3 Nm

71 – Remove the engine bridge

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

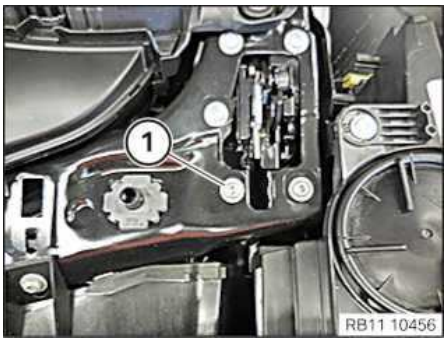


- Detach the spindle screw (1) from the engine bridge.
- Unscrew the leg screws (2) and (3).
- Guide the engine bridge out of the vehicle with the help of another person and remove.



- Unscrew the bolts (1) of the special tool **2 459 012**.
- Feed out the special tool **2 459 012** at the cylinder head and remove.

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- Tighten the screw (1) of the bonnet catch.

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm



- Tighten the screw (1) of the bonnet catch.

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

72 – Install electronics box

Prerequisite

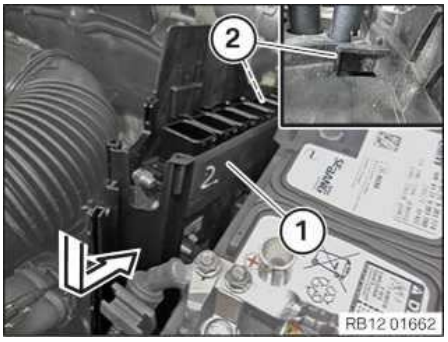
Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.

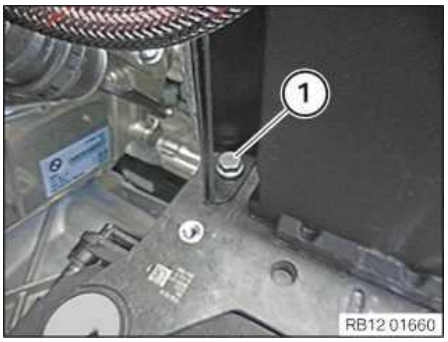


- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.



- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).

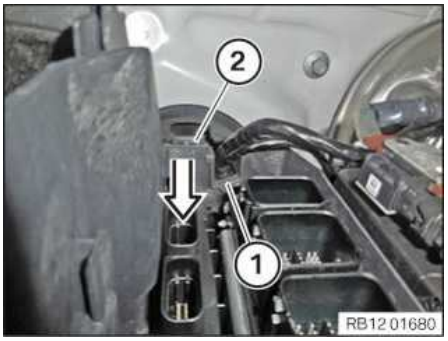
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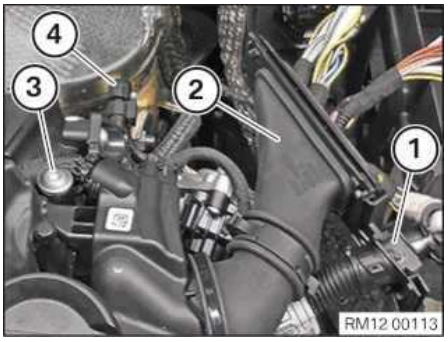
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.



- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

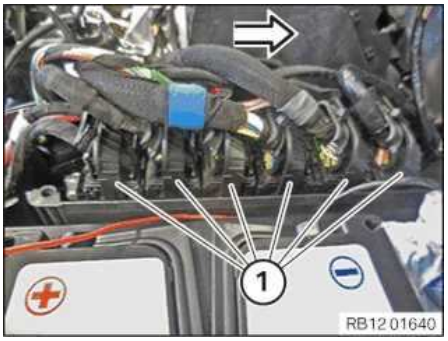
Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

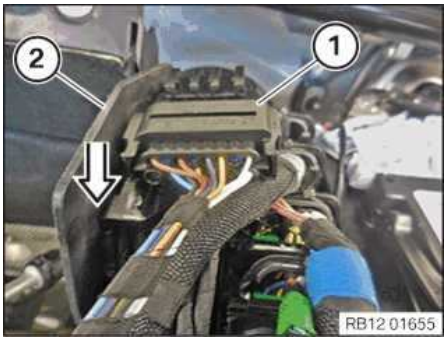
- Attach connector (4) to the differential pressure sensor and lock it audibly.



- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.

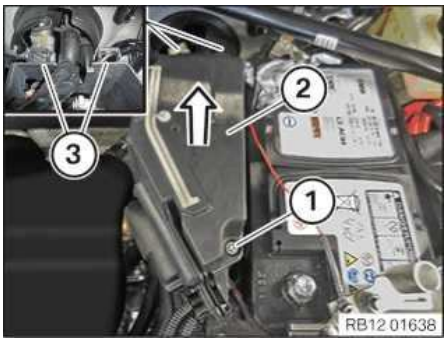


- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.

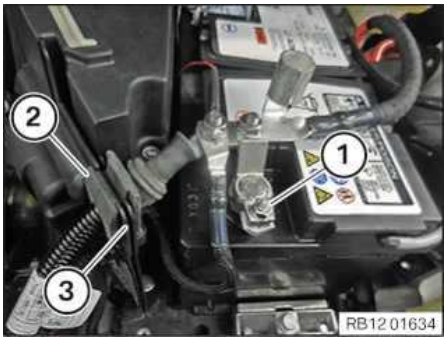
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- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

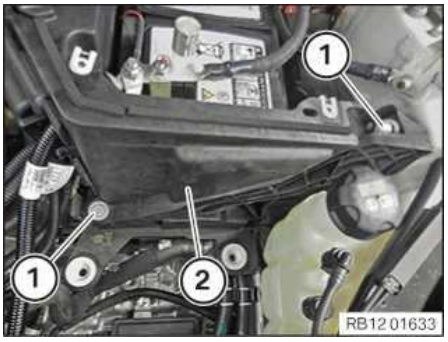
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

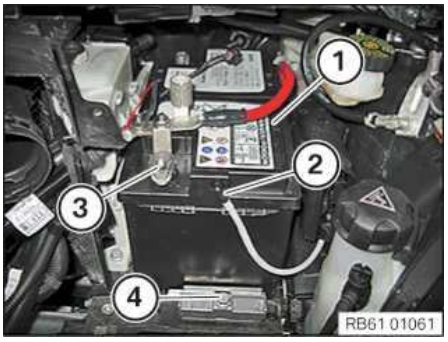


- Feed in and install tension strut (2).
- Tighten the screws (1).

Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

73 – Install vehicle battery



- Install vehicle battery (1).
- Position the bracket and tighten with the screw (4) .

Battery terminal rail to battery tray

M8		19 Nm

- Position the vent hose (2) and clip it in.
- Position the positive battery terminal and tighten with the nut (3) .

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

▸ **Check the vent holes of the battery**

WARNING

Gas emission.

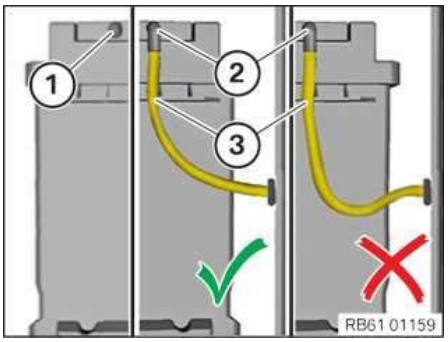
Danger of injury! Danger of explosion!

- Assign the vent holes correctly.
- Route the vent hose correctly.

TECHNICAL INFORMATION

The battery has two vent holes, opposite:
One vent hole (1) must be closed correctly with a dummy plug.
The vent hose (3) must be correctly connected and routed at the other vent hole (2).

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Check
- Check if the vent hole (1) is correctly closed with a dummy plug.

Result

» No dummy plug.

Measure
- Close the vent hole (1) correctly with a dummy plug.

Check
- Check if the vent hole (2) has a correctly connected vent hose (3).

Result

» The vent hose (3) is not correctly connected.

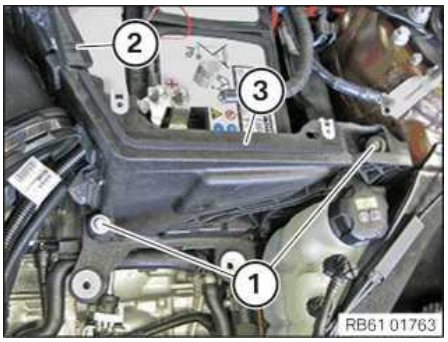
Measure
- At the vent hole (2), connect the vent hose (3) correctly.

Check
- Check if the vent hose (3) is routed to the outside with a downhill gradient (**no siphon formation!**).

Result

» The vent hose (3) is not correctly routed as shown in the image on the right.

Measure
- Route the vent hose (3) correctly as shown in the centre image.



- Insert tension strut (3) and tighten with screws (1).

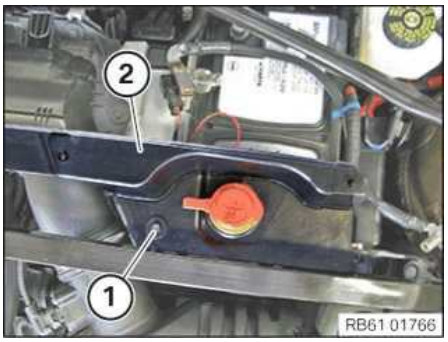
Trailing link

M8		Tightening torque	19 Nm

- Tighten down screw (2).

Battery cover

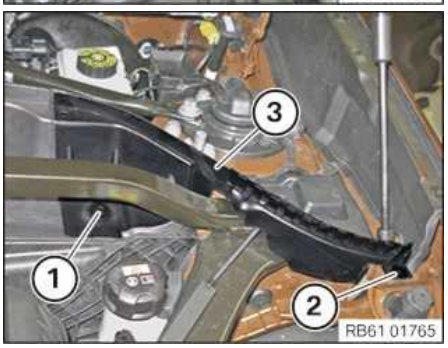
M8		2,8 Nm



- Position the cover (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

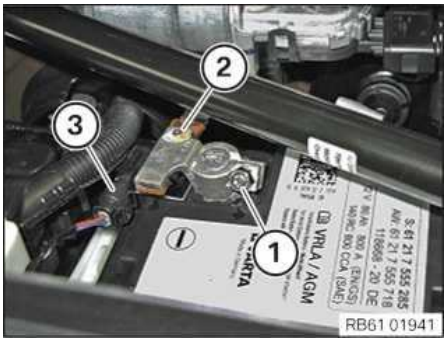
M8		2,8 Nm

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74 – Connecting the battery earth lead

TECHNICAL INFORMATION

For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)



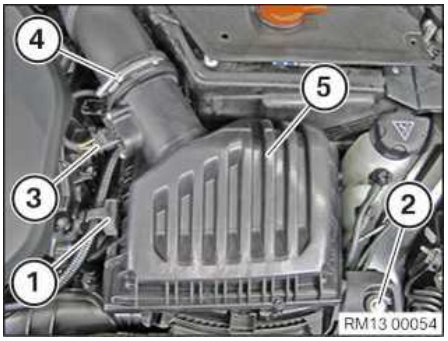
- Remove the protective cover of the positive battery terminal.
- Position the battery earth lead (2).
- Tighten nut (1).

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

- If required, connect the connector (3).

75 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

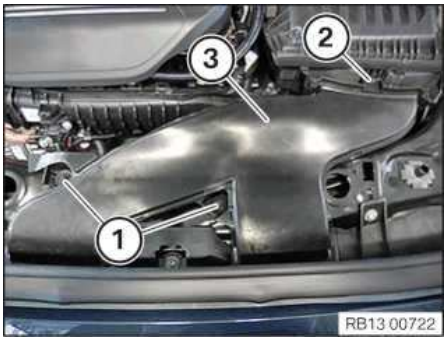
- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

76 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).
  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

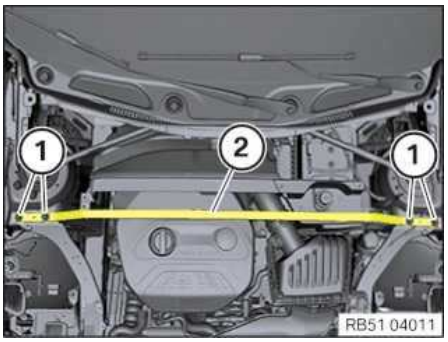
M6		Tightening torque	8 Nm

77 – Install strut brace

TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.

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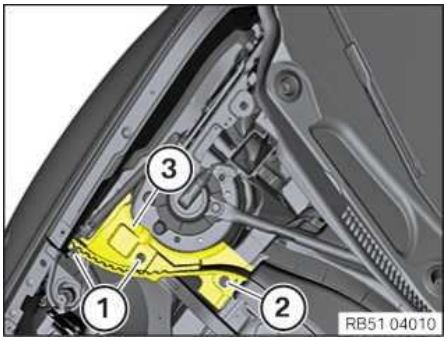


- Install the strut brace (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-brace to spring strut dome

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °



NOTICE

Description is for right component only. The procedure on the left side is identical.

- Install the cover (3).
- Tighten down screw (2).

Cover on body

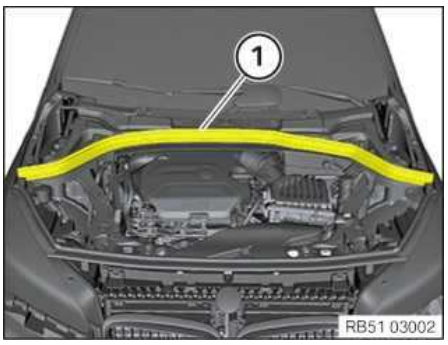
Hexagon screw		Tightening torque	3 Nm

- Install the expanding rivet (1).

78 – Install the seal for the bonnet

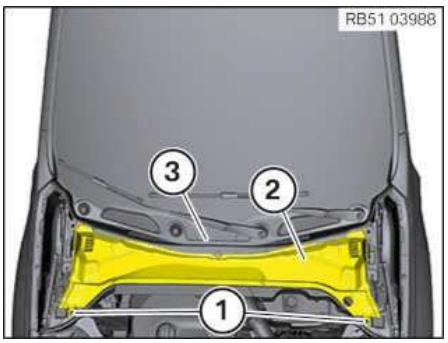
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

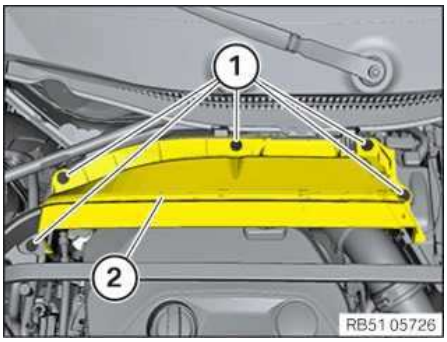
79 – Installing front cowl panel cover



- Insert and install cowl panel cover at front (2) into cowl panel cover at rear (3).
- Check cowl panel cover at front is correctly seated (2).
- Secure expanding rivet (1).

80 – Installing the upper bulkhead cover

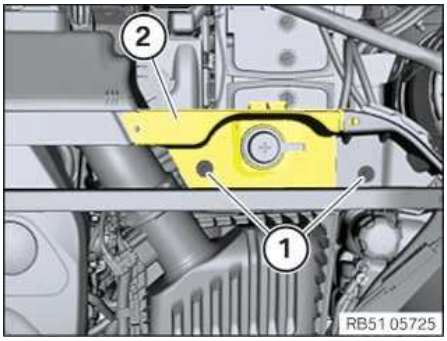
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- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Cover of top bulkhead

Screw		Tightening torque	2,6 Nm



- Guide in and install cover (2).
- Tighten down screw (1).

Cover of remote positive terminal

Screw		Tightening torque	2,6 Nm

81 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



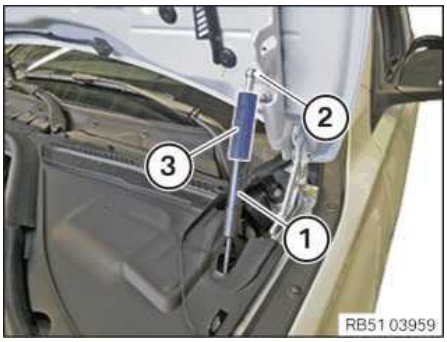
- Check for correct installation of all rubber mounts in the acoustic cover (1).



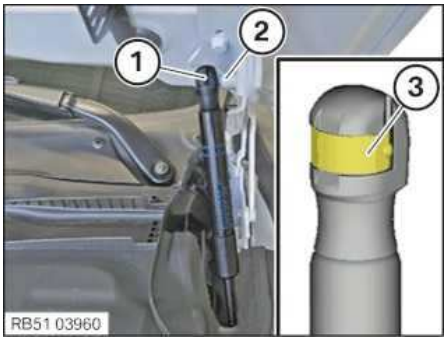
- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

82 – Take bonnet out of the service position

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- Support the bonnet by hand.
- Remove the special tool (3) from the ball pin (2).
- Pull off the special tool (3) from the gas pressure spring (1).
- Continue to support the bonnet and repeat the operation on the other side of vehicle.



CAUTION

Shutting bonnet or tailgate.

Danger of injury!

- Support bonnet/tailgate in fully open position with the aid of a suitable device.

- Check the clamp (3) is fitted correctly.
- Connect ball socket (1) to ball pin (2).
- Continue to support the bonnet and repeat the operation on the other side of vehicle.

Additional Information

Overview of Tightening Torques

Special tool to cylinder head			Used in step 13
M8		Tightening torque	21,5 Nm

Oil drain plug / oil filler plug			Used in step 36 64
Hexagon socket		Tightening torque	43 Nm

Flywheel to crankshaft			Used in step 42
M12x1.5	Renew screws.	Tightening torque	120 Nm

Clutch to flywheel			Used in step 43
M8	Renew screws.	Jointing torque	15 Nm
		Angle of rotation	90 °

Transmission to engine			Used in step 44
M8x40		Tightening torque	19 Nm
M12x75		Tightening torque	66 Nm

Transmission mounting			Used in step 44
M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

Clutch slave cylinder to transmission housing			Used in step 44
M8		Tightening torque	19 Nm

Battery holder to engine support			Used in step 44
Hexagon screw M8x30		Tightening torque	19 Nm

Battery terminal rail to battery tray			Used in step 44 73
M8			19 Nm

Electronics box to battery tray			Used in step 44 72
M8X16		Tightening torque	15 Nm

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Wiring harness to cylinder head cover — Used in step 44 72

TS5x20		Tightening torque	3,5 Nm

Cover to electronics box — Used in step 44 72

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery — Used in step 44 72

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray — Used in step 44 72

M8		Tightening torque	19 Nm

Transmission to oil sump — Used in step 45

M8			19 Nm

Transfer box to transmission — Used in step 46

M10		Tightening torque	56 Nm

Heat shield to transfer box — Used in step 46

M6	Renew screws.	Tightening torque	6 Nm

Oil filler plug on transfer box (VTG) — Used in step 46

M18x1.5		Tightening torque	35 Nm

Holder to front axle support — Used in step 47

M12		Tightening torque	100 Nm

Bracket to oil sump — Used in step 47

M12		Tightening torque	100 Nm

Intermediate shaft to transfer box — Used in step 48

M8x35		Tightening torque	19 Nm

Propeller shaft to transfer box — Used in step 49

		Tightening torque	80 Nm

Flexible disc to rear axle final drive — Used in step 49

M12x1.5	Renew screws.	Tightening torque	55 Nm 90 °

Centre mount to body — Used in step 49

M8		Tightening torque	19 Nm

Heat shield to body — Used in step 50 51

Bolts/nut		Tightening torque	3 Nm

Bracket to body — Used in step 50

M8		Tightening torque	21 Nm

Exhaust system to body — Used in step 52

M8	Replace nuts.	Tightening torque	19 Nm

Exhaust bracket on body — Used in step 52

Hexagon screw M8x30		Tightening torque	19 Nm

V-clip to catalytic converter — Used in step 52

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

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Diesel particulate sensor to exhaust system — Used in step 52

Sensor		Tightening torque	50 Nm

Nitrogen oxide sensor downstream of SCR catalytic converter — Used in step 52

Sensor		Tightening torque	50 Nm

Cross-member/torsion strut to axle support and mounting — Used in step 53

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

Front connection carrier to body — Used in step 54

M10x18		Tightening torque	56 Nm

Rear connection carrier to body — Used in step 54

M8x18		Tightening torque	28 Nm

Starter motor to transmission — Used in step 57

M8x45		Tightening torque	19 Nm

Battery positive lead to starter — Used in step 57

M8		Tightening torque	13,5 Nm

Rear end of front axle support to body — Used in step 58

M14 screw	Renew screw.	Tightening torque	175 Nm

Front axle support, front to body — Used in step 58

M12 screw	Renew screw.	Tightening torque	108 Nm

Underbody protection to body — Used in step 58 66

Screw		Tightening torque	3 Nm

Track rod end to swivel bearing — Used in step 58

M14	Renew nut.	Tightening torque	175 Nm

Wishbone to swivel bearing — Used in step 58

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

Holder, wishbone rubber mount, to body — Used in step 59

M10 screw	Renew screw.	Jointing torque	56 Nm
		Angle of rotation	90 °

Holder with rubber mount to front axle support — Used in step 59

M12 screw			100 Nm

Washer fluid reservoir holder to front axle support adapter plate — Used in step 59

		Tightening torque	10 Nm

Deformation element, bottom, to adapter plate, front axle carrier — Used in step 59

		Tightening torque	11,8 Nm

Holder to front axle support — Used in step 60

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

Anti-roll bar link to anti-roll bar — Used in step 62

M10	Renew nut.	Tightening torque	56 Nm

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Underbody protection front

Used in step 65

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Wheel arch cover to body

Used in step 67

Plastic nut		Tightening torque	2,6 Nm
Screw		Tightening torque	2,6 Nm

Wheel arch cover to body

Used in step 67

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Used in step 67

Plastic nut		Tightening torque	3 Nm

Brake disc to rear wheel hub

Used in step 68

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub

Used in step 68

M8	Renew screw.	Tightening torque	16 Nm

Wheel bolts

Used in step 68

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Lower steering shaft to steering gear

Used in step 70

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

Steering column cover to bulkhead

Used in step 70

Plastic nut		Tightening torque	3 Nm

Cross connection on support for cross connection

Used in step 71

M6x20		Tightening torque	12 Nm

Battery terminal with IBS positive battery terminal / negative battery terminal

Used in step 73 74

NutM6			5 Nm

Trailing link

Used in step 73

M8		Tightening torque	19 Nm

Battery cover

Used in step 73

M8			2,8 Nm

Intake silencer housing to lock bridge

Used in step 75

M6X30		Tightening torque	8 Nm

Clean air pipe to intake silencer housing

Used in step 75

Clamp		Tightening torque	3 Nm

Intake neck to cross connection

Used in step 76

M6		Tightening torque	8 Nm

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Cross-brace to spring strut dome Used in step 77

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

Cover on body Used in step 77

Hexagon screw		Tightening torque	3 Nm

Cover of top bulkhead Used in step 80

Screw		Tightening torque	2,6 Nm

Cover of remote positive terminal Used in step 80

Screw		Tightening torque	2,6 Nm

Overview of Special Tools

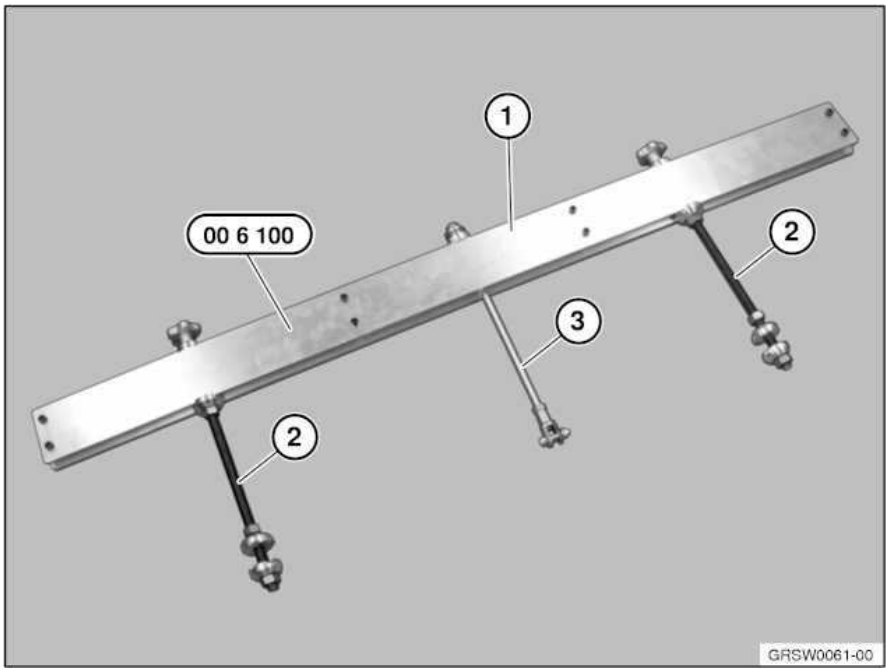
2 459 012 Holder



Common Used in step 13 71

Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

0 496 852 (00 6 100) Device



Common Used in step 13

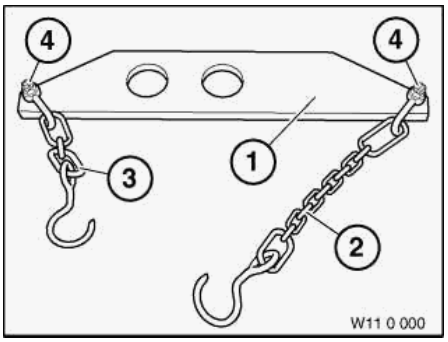
Usage	Engine bridge (device) 006000
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 10 (659)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
2	2 361 507 (00 6 102)		**Spindle** Set (2 pieces) in connection with 00 6 100.	
3	2 361 506 (00 6 103)		**Spindle** Spindle (central spindle) for Traverse 00 6 100.	

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0 490 561 (11 0 000) Lifting gear



Common

Used in step 13

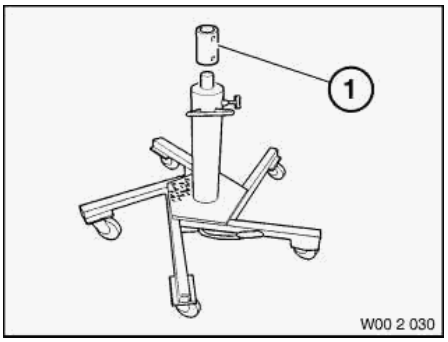
Usage	(Hoisting gear) For removing and installing engines. As of 08/2011 only available as a complete set. Delivered with TÜV inspection certificate and operating instructions. No delivery of separate parts.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 13 94 (888)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
4	0 490 565 (11 0 009)		**Shackle** (Shackle) 2 pieces. As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 562 (11 0 001)		**Lifting gear** (Cross member) As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
2	0 490 563 (11 0 002)		**Chain** (Chain) Version: long As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
3	0 490 564 (11 0 003)		**Chain** (Chain) Version: short As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	

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0 490 133 (00 2 030) Device



Common

Used in step 24 39 44 58

Usage	(universal hydraulic lifter base unit) Chassis and hydraulic lifter - For removing and installing rear axle supports and gearboxes. Also for soft top mounts. Is replaced by 81 22 2 219 012
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 90 (207)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 490 134 (00 2 031)		**Adapter** (adapter for gearbox holder) Model series: E30, E31, E32, E34, E36	

0 495 554 (33 5 070) Extension



Common

Used in step 33 49

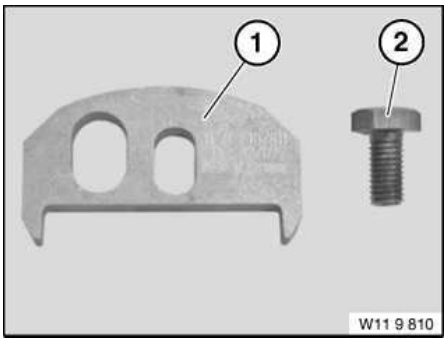
Usage	Pull-out extension for 33 5 040, 33 5 050, 33 5 060.
Included in the tool or work	
Storage location	A18
Replaced by	
In connection with	
SI-Number	01 21 06 (300)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 592 (33 5 071)		**Extension** (Extension (1 item)) discontinued, can only be ordered using complete tool	

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0 496 171 (11 9 811) Holder



Common	Used in step 40 41 42
Usage	Available only as a complete tool set 11 9 810 (83 30 0 496 170) - as of 13.01.12
Included in the tool or work	0 496 170
Storage location	C86
Replaced by	
In connection with	
SI-Number	01 07 07 (355)

0 494 793 (11 9 265) Bush



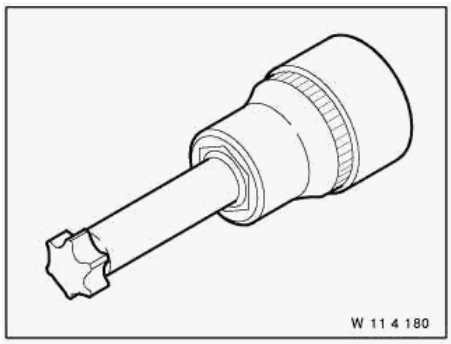
Common	Used in step 40 41 42
Usage	
Included in the tool or work	0 493 938
Storage location	A44
Replaced by	
In connection with	
SI-Number	

2 288 165 Synchronising key



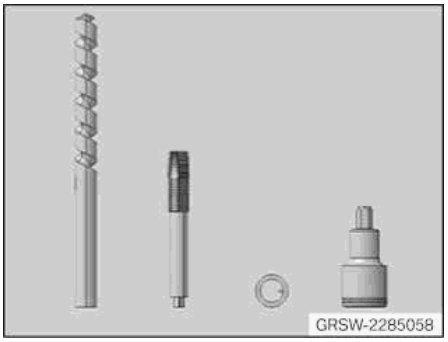
Common	Used in step 40 43
Usage	Conversion kit for 21 2 170, for orders till 02.2014. Orders as of March 2014 do not require the conversion, as the new thrust piece has been accounted for.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 09 14 (088)

0 491 018 (11 4 180) Socket WAF 46



Common	Used in step 41 42
Usage	(screwdriver bit Torx T60) For releasing and tightening down dual-mass flywheel - model year: from Jan 94
Included in the tool or work	
Storage location	C9
Replaced by	
In connection with	
SI-Number	01 02 94 (777)

2 285 058 Tool set



Common	Used in step 42
Usage	
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 02 14 (069)

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2 409 025 Puller



Common	Used in step 46
Usage	For disassembly of the outer radial shaft seal of the transmission output shaft, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A76
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 411 739 Puller



Common	Used in step 46
Usage	For disassembly of the inner radial shaft seal of the output, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C78
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 408 152 Striking element



Common	Used in step 46
Usage	For installation of the right radial shaft seal transmission output shaft (inner). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

2 413 037 Handle



Common	Used in step 46
Usage	Universal drift handle. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C77
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

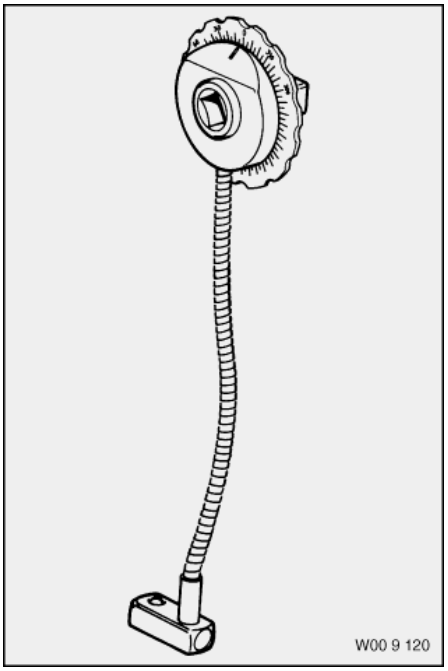
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2 408 150 Striking element



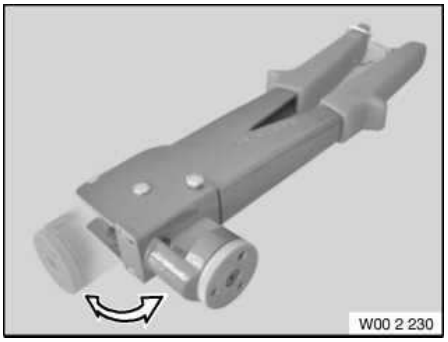
Common	Used in step 46
Usage	For installing the right radial shaft seal transmission output shaft (outer). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

0 490 504 (00 9 120) Torque angle measuring dial



Common	Used in step 49
Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

0 496 521 (00 2 230) Pliers



Common	Used in step 67
Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

2 344 011 Tool



Common	Used in step 68
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

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Replacement tools:

0 495 221 (36 1 323) Wheel stud



Common	Used in step 15
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud



Common	Used in step 15
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud



Common	Used in step 15
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud



Common	Used in step 15
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 227 (36 1 329) Wheel stud



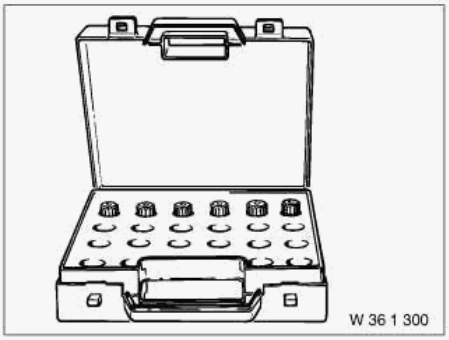
Common	Used in step 15
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud



Common	Used in step 15
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 229 (36 1 332) Wheel stud



Common	Used in step 15
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud



Common	Used in step 15
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Transmission oil capacity

Used in step 64

Transmission oil GS6-60DA, GS6X60DA/Owner's Handbook	2,2 l

Transmission oil: Technically suitable manual gearbox oil

Screw-in depth of thread cutter

Used in step 42

Screw-in depth	18 mm

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Links

General repair instructions	Used in step
61 20 ... Notes on AGM battery	74
61 12 ... Notes on intelligent battery sensor (IBS)	74
61 00 ... Notes for disconnecting and connecting battery	74

Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	10 39

Operating materials	Used in step
14.0 Automatic transmission fluid for ZF-transmission GA8HP45Z / GA8HP50Z / GA8HP70Z / GA8HP90Z / GA8P70H / GA8P75H / GA8HP75Z	36
2.0 Grease for wheel centring	68

Operating materials	Used in step

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11 22 000 Removing and installing/replacing the flywheel

WARNING

Motor vehicle may slip off the vehicle hoist where components are supported.

Danger! Life-threatening injuries!

- Secure the vehicle hoist against lowering and lifting.

WARNING

Motor vehicle may slip off the vehicle hoist if the weight is distributed unevenly.

Danger! Life-threatening injuries!

- Ensure there is a specific weight compensation on the motor vehicle.

WARNING

Vehicle may slip off the vehicle hoist if the vehicle hoist is handled incorrectly.

Danger! Life-threatening injuries!

- Observe safety information on raising the vehicle using a vehicle hoist.
- For additional information see: 00 ... Raising the vehicle using a vehicle hoist.

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

PRELIMINARY WORK

1 – Bring front compartment lid in the service position

Prerequisite

Engine compartment lid is open.

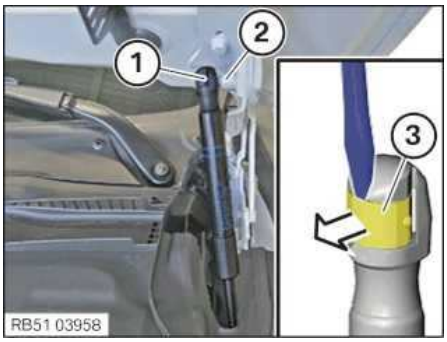
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CAUTION

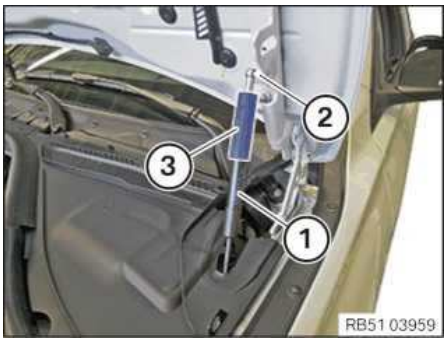
Shutting bonnet or tailgate.

Danger of injury!

- Support bonnet/tailgate in fully open position with the aid of a suitable device.



- Lift clamp (3) slightly using a screwdriver, in the direction of the arrow.
- Lift off ball socket (1) from ball pin (2).
- Repeat the operation on the other side of vehicle.



TECHNICAL INFORMATION

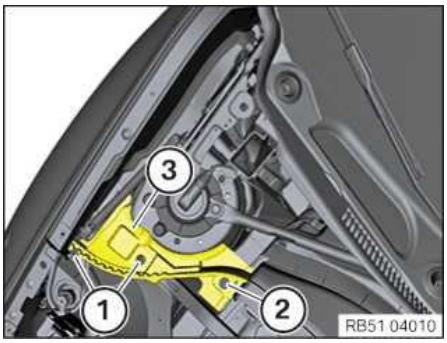
Conduct the following operation with the assistance of a second person.

- Remove the bonnet support and open the bonnet further.
- Push special tool (3) over gas pressure spring (1).
- Place special tool on the ball pin (2) and engage using force.
- Repeat the operation on the other side of vehicle.

2 – Remove suspension cross-brace

TECHNICAL INFORMATION

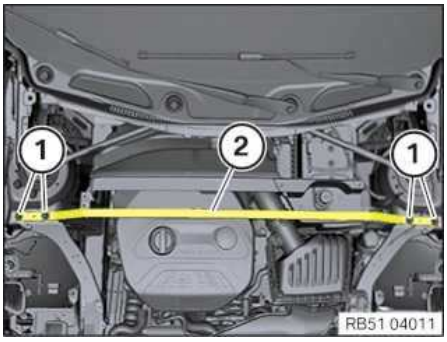
Driving without the strut brace/front end or tension strut is not permitted.



NOTICE

Description is for right component only. The procedure on the left side is identical.

- Loosen expanding rivet (1).
- Loosen screw (2).
- Remove the cover (3).



- Loosen screws (1).
- Remove strut brace (2).

3 – Removing the acoustic cover

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

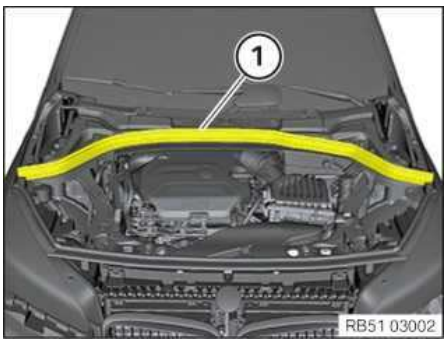
- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

4 – Remove the seal for the rear bonnet

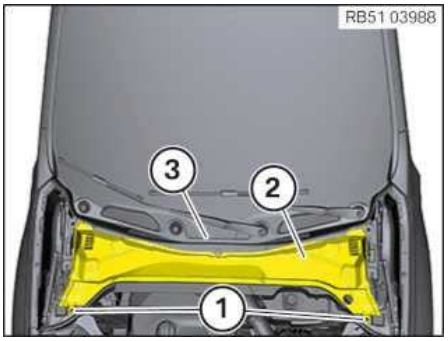
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Pull off rear bonnet seal (1) towards the top and remove.

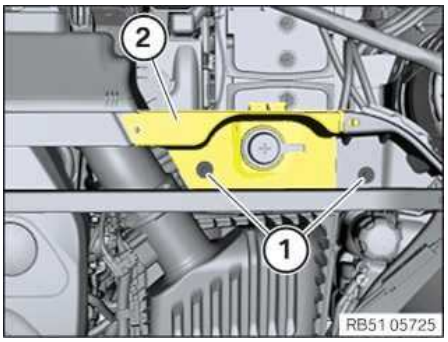
5 – Removing front cowl panel cover



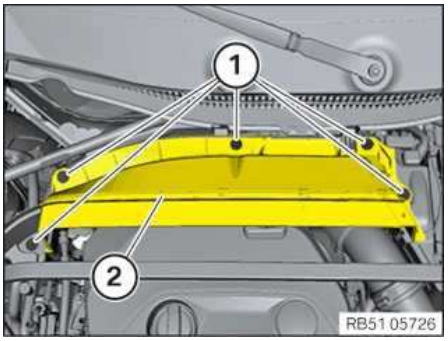
- Loosen the expanding rivet (1).
- Feed out and remove front cowl panel cover (2) from the rear cowl panel cover(3).

6 – Removing the upper bulkhead cover

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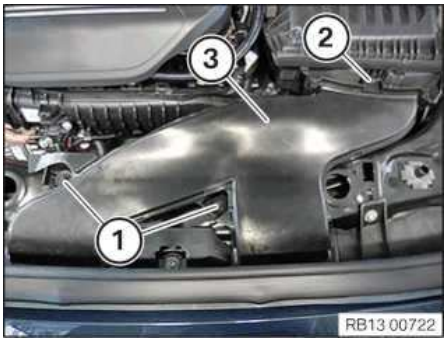


- Loosen screws (1).
- Guide out and remove the cover (2).



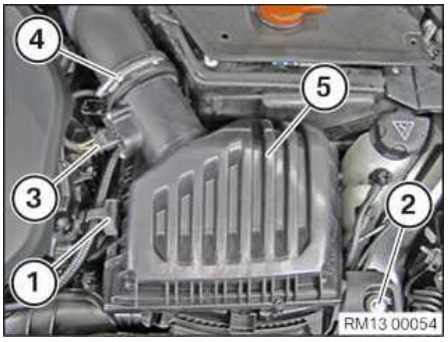
- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

7 – Remove the intake neck for intake silencer housing



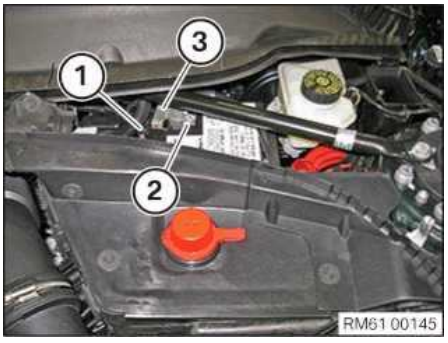
- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

8 – Removing intake silencer housing



- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

9 – Disconnecting the battery earth lead



- Unlock plug connection (1) and disconnect.
- Unfasten nut (2).
- Remove the battery earth lead (3) and secure to one side.

10 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

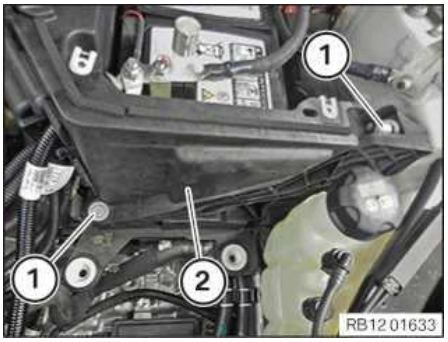
- Do not pull on the wires when disconnecting connectors and plug connections.

TECHNICAL INFORMATION

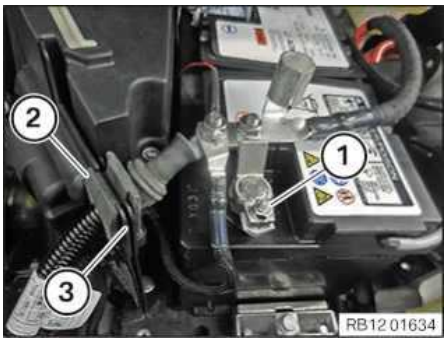
Follow instructions for removing and installing control units.
For additional information see: 12 00 ... Notes on removal and installation of control units

TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.

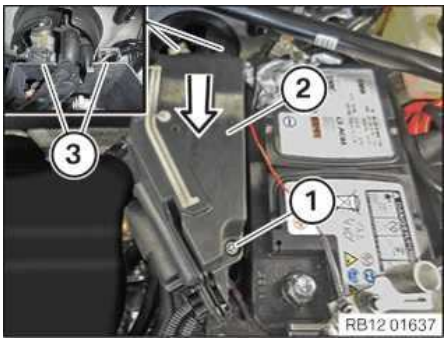


- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.

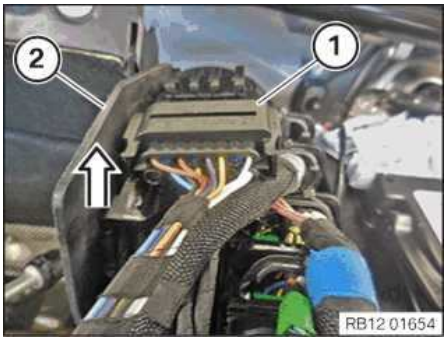


- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

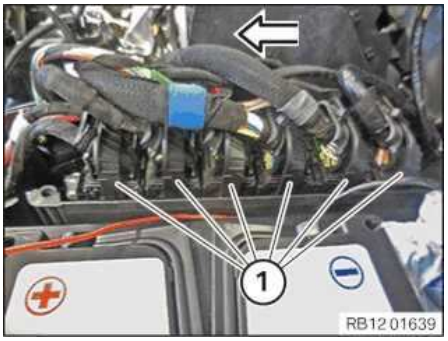
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- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



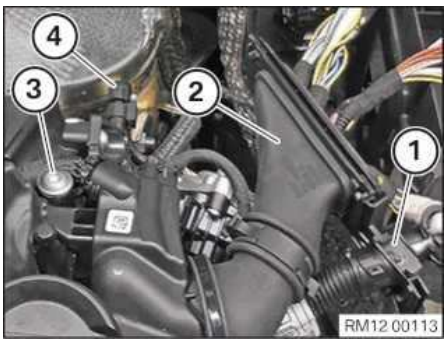
- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).



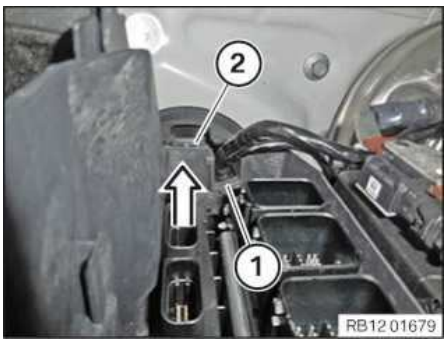
- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



- Unlock and loosen connector (1).

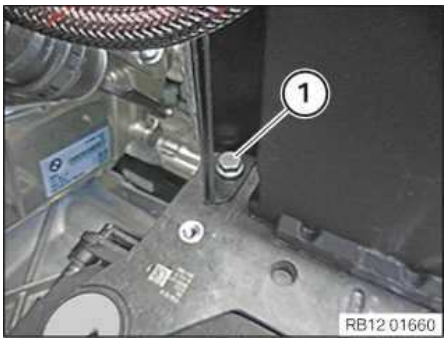


- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.

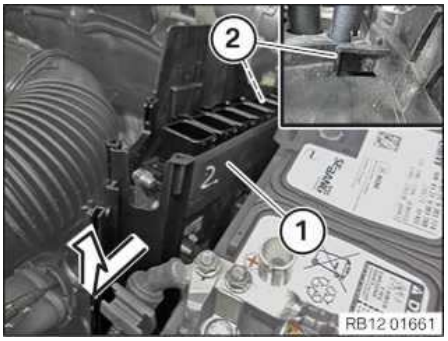


- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.

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- Loosen screw (1).



- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

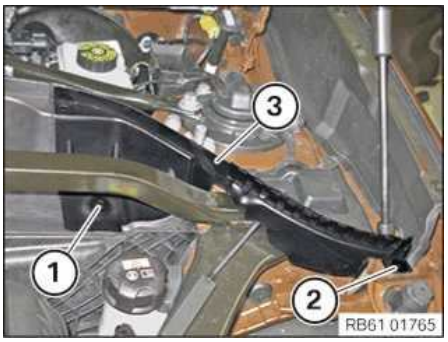
11 – Remove vehicle battery

WARNING

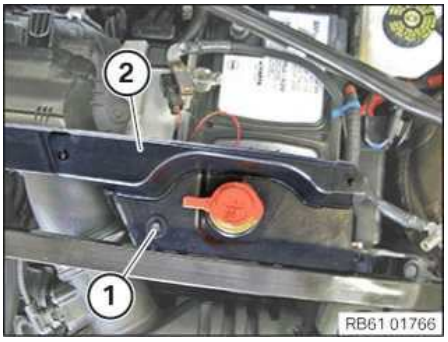
Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

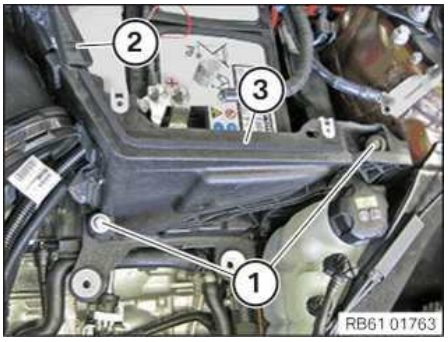
- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.



- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

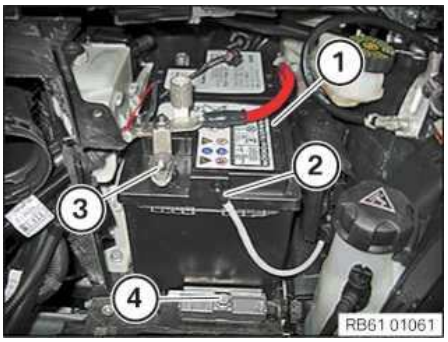


- Loosen screw (1).
- Remove the cover (2).



- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.

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- Pull off the vent hose (2).
- Slacken the nut (3) on the positive battery terminal and remove the positive battery terminal.

WARNING

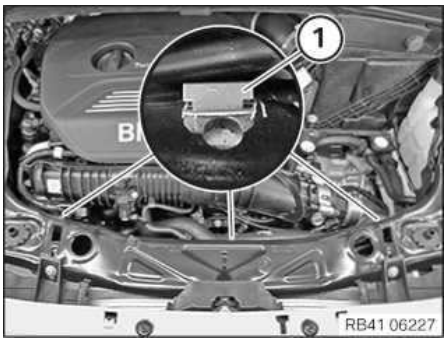
Unprotected battery terminals.

Risk of short circuits! Risk of fire!

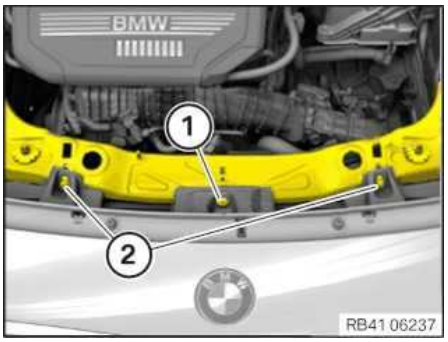
- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

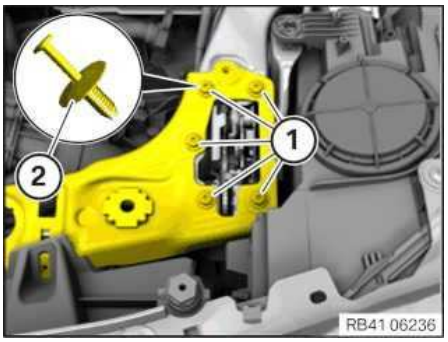
12 – Remove front cross connection



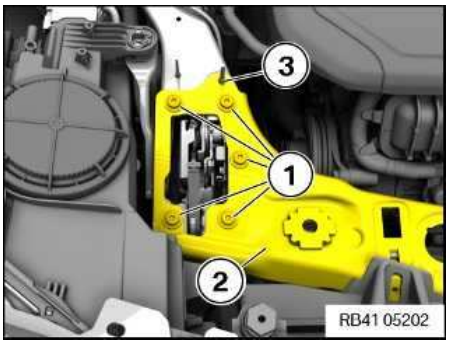
- Detach the clamps (1) for the Bowden cable of the bonnet locks from the cross connection.



- Loosen screw (1).
- Loosen screws (2).



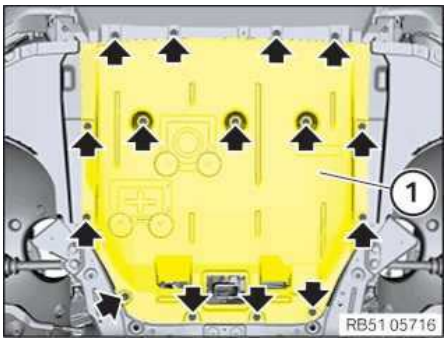
- Loosen screws (1).
- Lever out expanding rivet (2).



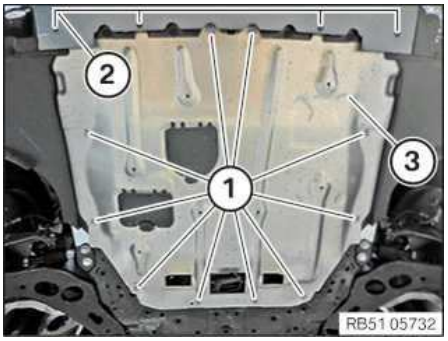
- Loosen screws (1).
- Unclip the front cross connection (2) from the rubber retainer (3) and remove it upward.

13 – Removing the front underbody protection

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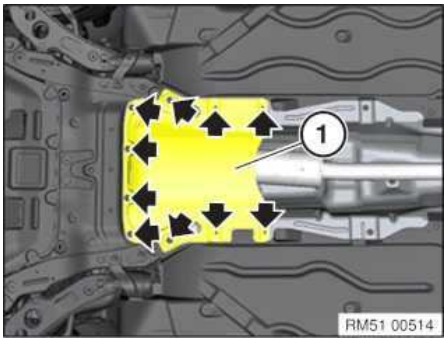


- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.



- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

14 – If installed: Removing rear underbody protection



- Remove screws (arrows).
- Remove the rear underbody protection (1).

15 – Draining coolant

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

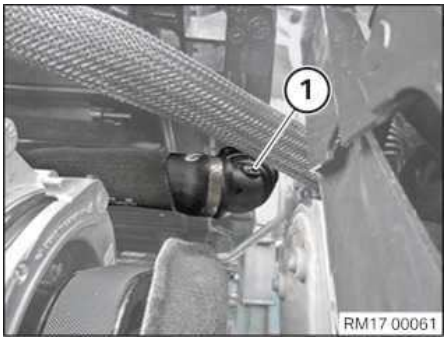
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

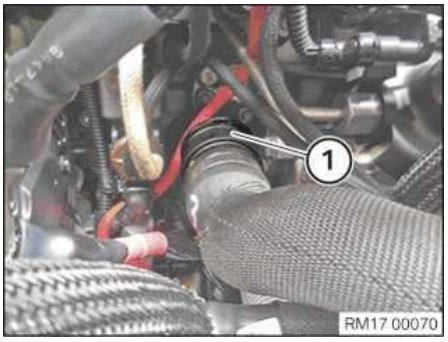
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- Loosen sealing cap (1).



- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.

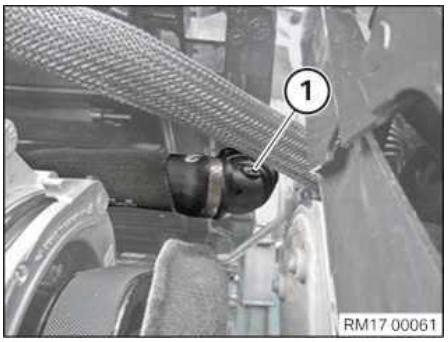


- Unlock the coolant line (1) and pull it off the connecting branch.
- Catch and dispose of escaping coolant.

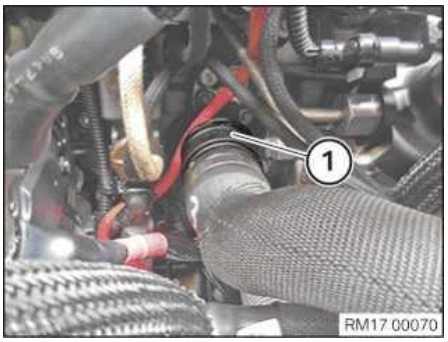
16 – Connect the coolant line

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



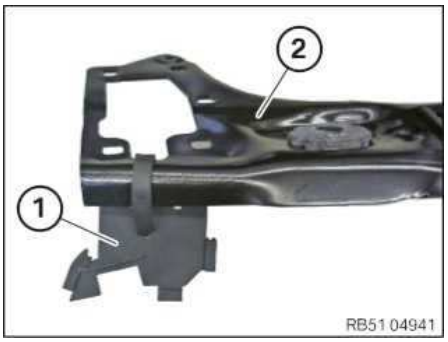
- Connect the right coolant line (1) to the radiator and lock audibly.



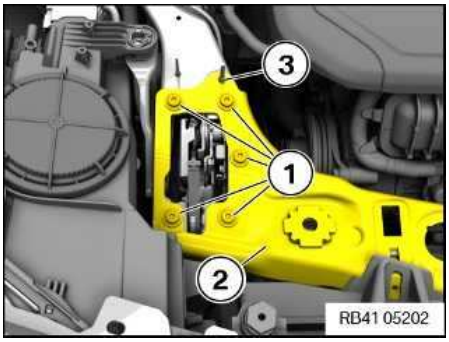
- Connect the coolant line (1) to the connecting branch and lock audibly.

17 – Install front cross connection

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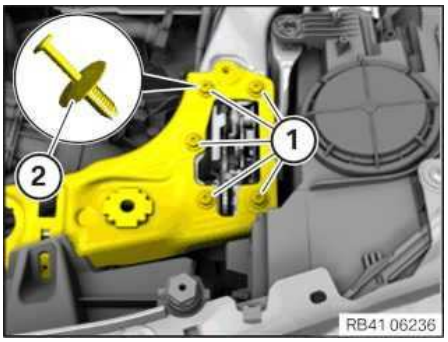
- Right side of vehicle only: Secure spray guard (1) on the cross connection (2) as pictured.



- Position front cross connection (2) and clip front cross connection (2) into the rubber retainer (3) at the same time.
- Tighten the screws (1).

Cross connection to carrier support

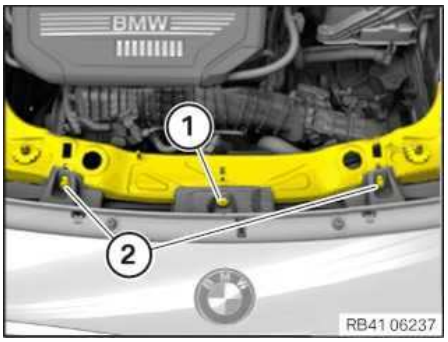
Screws M6x20		Tightening torque	11,8 Nm



- Tighten the screws (1).

Cross connection to carrier support

Screws M6x20		Tightening torque	11,8 Nm



- Position screws (3) on the rubber mounts for the radiator and tighten.

Screw connection for rubber mount of coolant radiator to coolant radiator

Bolt to rubber mount		Tightening torque	8 Nm

- Tighten down screws (2).

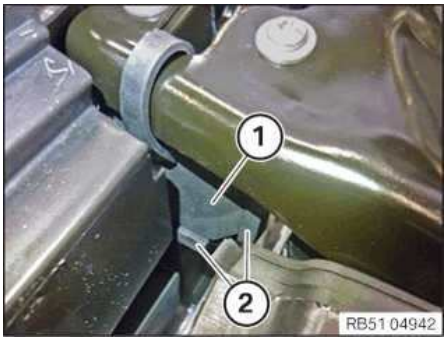
Air duct to upper connection

M6x20 screw		Tightening torque	11,8 Nm

- Tighten down screw (1).

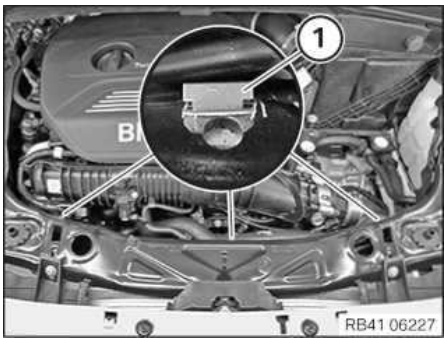
Bracing strut to upper connection

M8x20 screw		Tightening torque	28 Nm



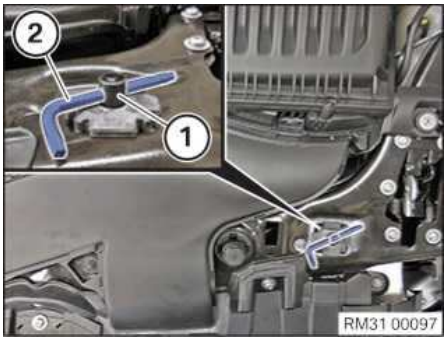
- Right side of vehicle only: Properly mount spray guard (1) to prevent corrosion.
- Secure spray guard (1) to the bridge with retaining tabs (2).

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- Fasten the clamps (1) from the Bowden cable of the bonnet lock on the cross connection.

18 – Securing radiator on left and right



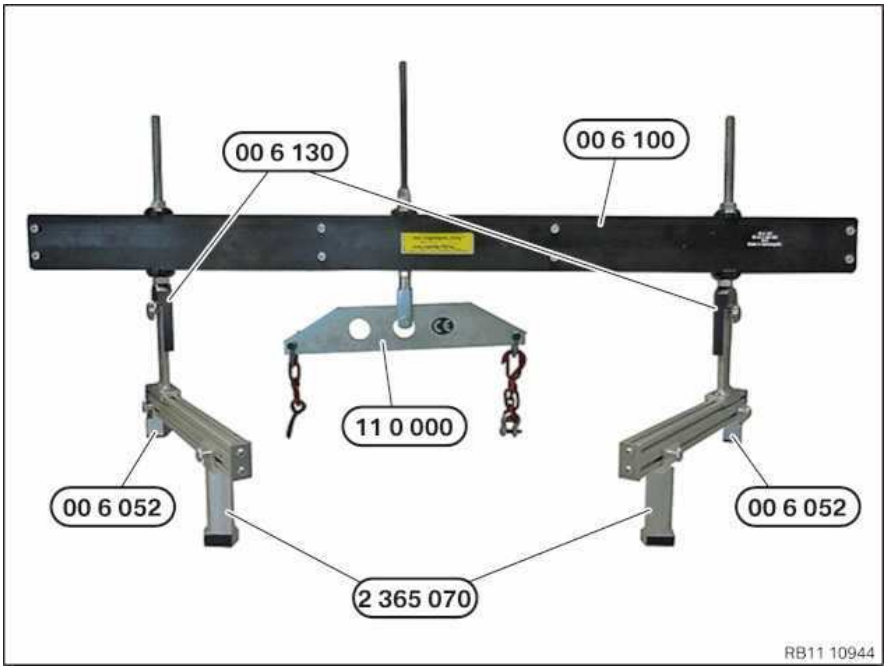
NOTICE

Perform the operations on the left and right side.

- Fasten radiator at centring pin (1) with suitable tool (2).

19 – Installing the engine bridge

Overview: Prepared engine bridge



Prerequisite

Front compartment lid is in service position.

CAUTION

Components connected to the engine joint or cross member.

Danger of injury!

- Check lifting eyes and engine mounting brackets for damage, e.g. cracks.
- Attach the component to correctly mounted engine joints or cross members only.
- Exclusively lift the component, do not move it forwards, backwards or in transverse direction.

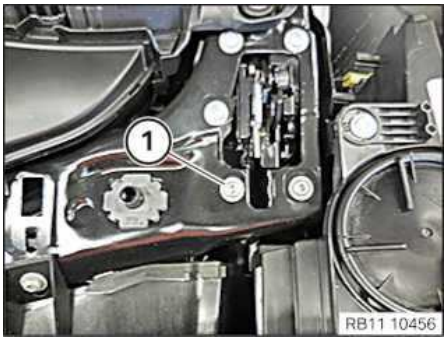
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- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

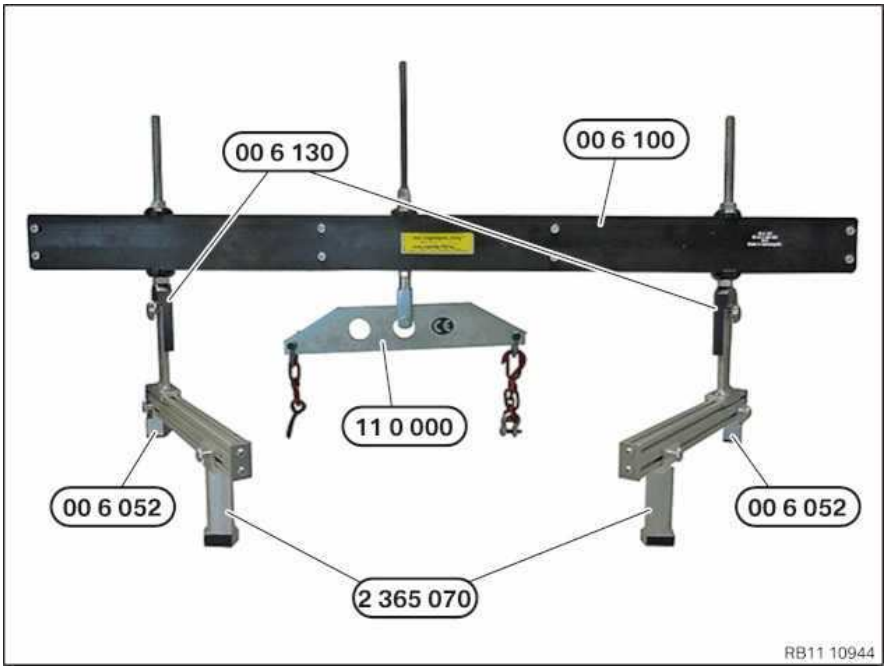
M8		Tightening torque	21,5 Nm



- Loosen screw (1) of the left bonnet catch.



- Loosen screw (1) of the right bonnet catch.



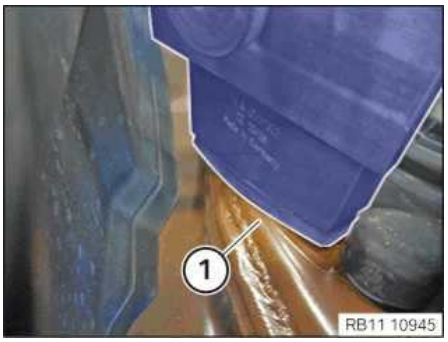
CAUTION

Heavy component.

Heavy components can lead to injury or damage.

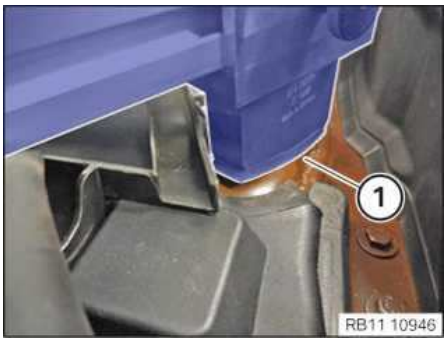
- Remove and install heavy components with the aid of another person/other persons.

- Set entire cross member **0 496 852 (00 6 100)** on the vehicle and position with the help of an auxiliary person.

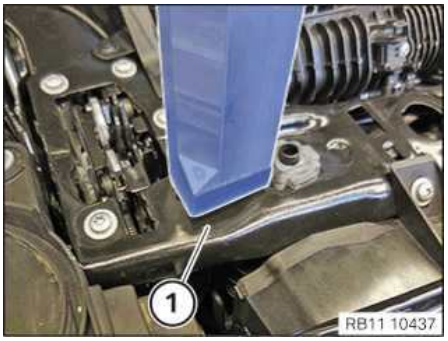


- Position the special tool at the rear mounting point (1) on the **right**.

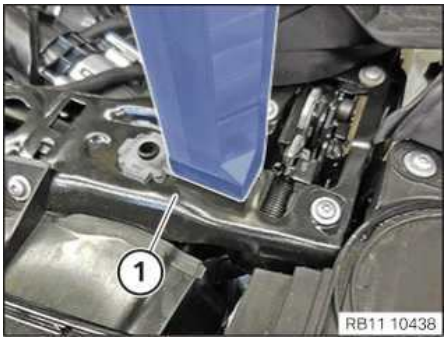
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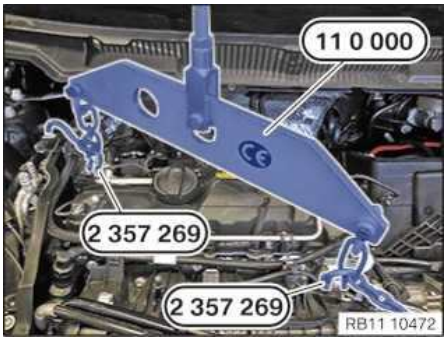
- Position the special tool at the rear mounting point (1) on the **left**.



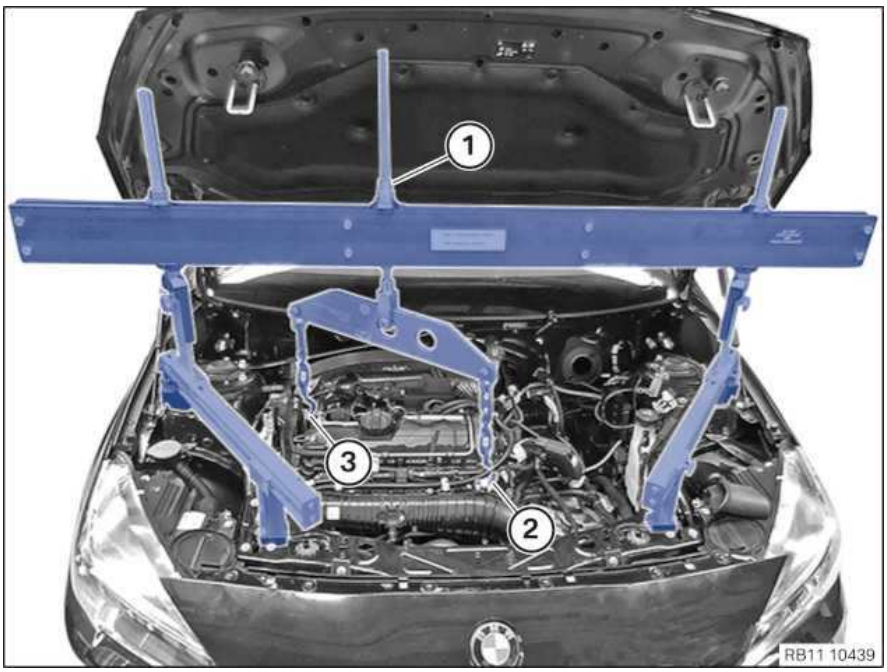
- Position the special tool at the front mounting point (1) on the **right**.



- Position the special tool at the front mounting point (1) on the **left**.



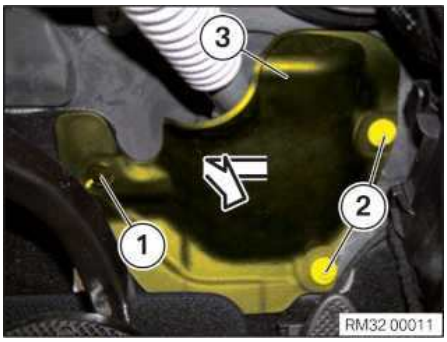
- Position special tool **0 490 561 (11 0 000)** above the engine.
- Attach special tools to the mounting lugs of the engine.



- Tighten side screws (2) and (3).
- Slightly pretension the spindle screw (1) of the engine support beams.
- Tighten down all adjusting screws, knurled screws and nuts on cross member **0 496 852 (00 6 100)** and on special tool .

20 – Releasing lower steering shaft from steering gear

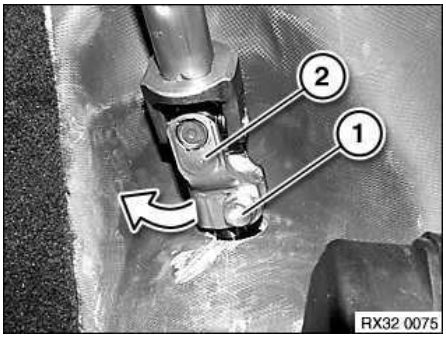
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- **If installed:**
- Unfasten nut (1).
- Unscrew the nuts (2) by 1 rotation.

  Do not remove the nuts (2) !
- Remove the cover (3) on the steering column in the direction of the arrow.

  The side footwell trim must not be disassembled!



- Loosen screw (1).
- Swivel out the universal joint (2) of the bottom steering shaft from the steering gear in the direction of the arrow.

21 – Removing both front wheels



▸ **Removing the wheel**

- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Unscrew the wheel bolts (arrows) and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

22 – Removing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

▸ **Remove the front wheel arch trim**

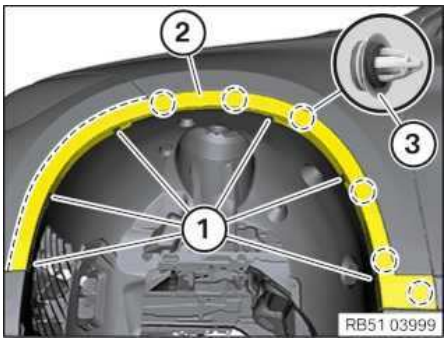
NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

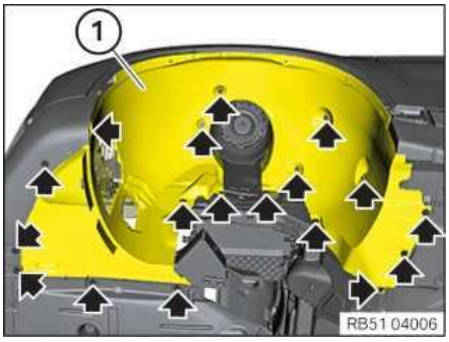
Description is for left component only. Procedure on the right side is identical.

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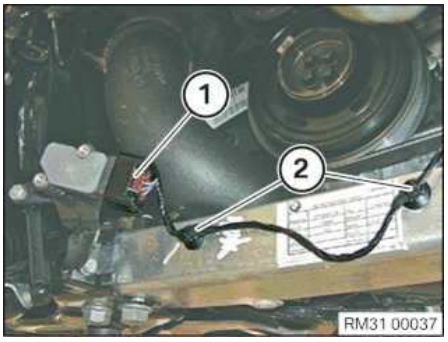
- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.

▸ **Remove front wheel arch cover**



- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

23 – With right installation: Detaching ride height sensor cable



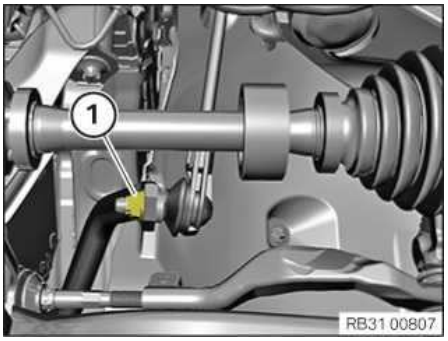
- Unlock plug connection (1) and disconnect.
- Release cable clip (2) from deformation element adapter.

24 – Releasing anti-roll bar on left and right from anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▸ **Detach the anti-roll bar from the anti-roll bar link**



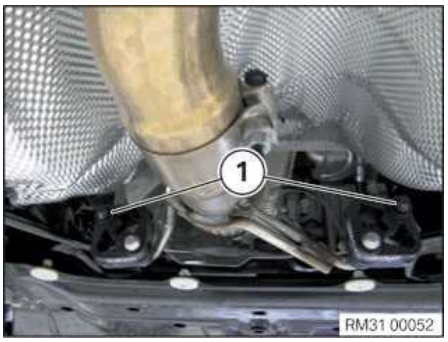
- Unfasten nut (1).

Note: Use the Torx socket for counter support.

- Loosen the anti-roll bar link from the anti-roll bar .

25 – Detaching rubber mount from front axle support

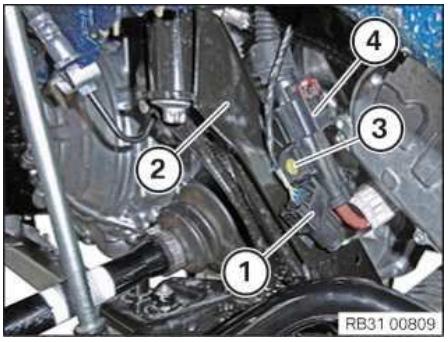
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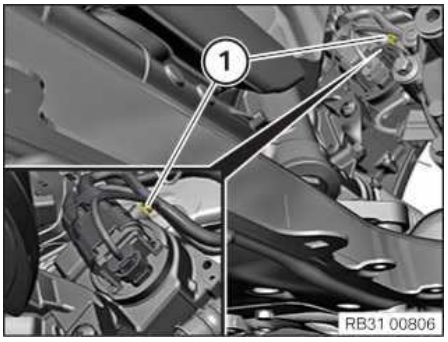
- Spray rubber mount (1) with lubricant and release from holder on front axle support.

26 – Disconnecting plug connections from steering gear

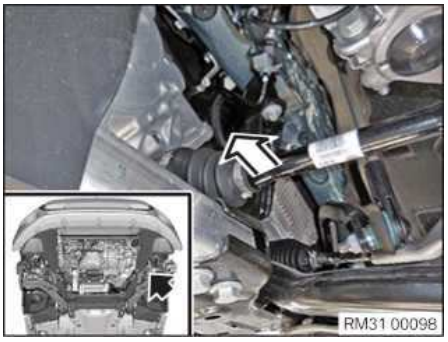
▶ **If installed: Detach connectors from the front axle carrier**



- Release the plug connection (1) from the front axle support (2).
- Loosen screw (3).
- Release the plug connection (4) from the front axle support (2).

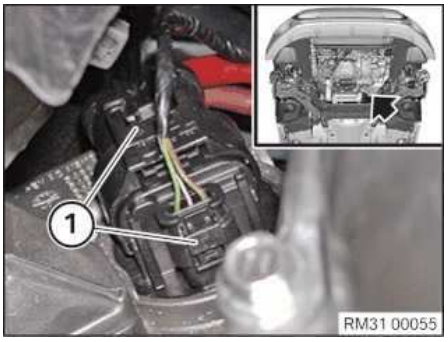


- Disconnect wiring harness (1) from steering gear.



- To unlock the plug connections (see the following work step): unlock plug connections (arrow) with the right hand.

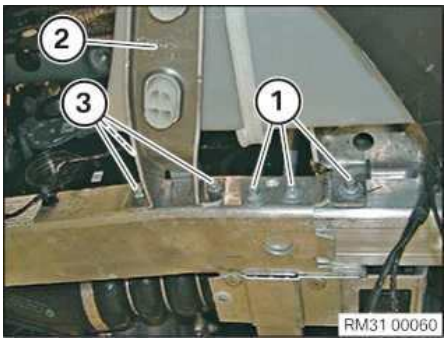
  The plug connections can be reached via the left-hand output shaft.



- Unlock plug connections (arrow) (1)and disconnect from the steering gear.
- Make sure when lowering the front axle that the cables are not damaged!

27 – Releasing the mounted part from the front axle support

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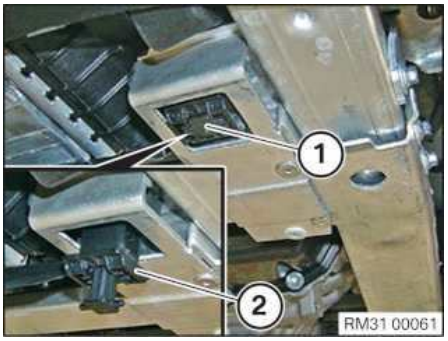


- **Only on right side:** Loosen screws (3) and remove holder for washer fluid reservoir (2).

NOTICE

Perform the operations on the left and right side.

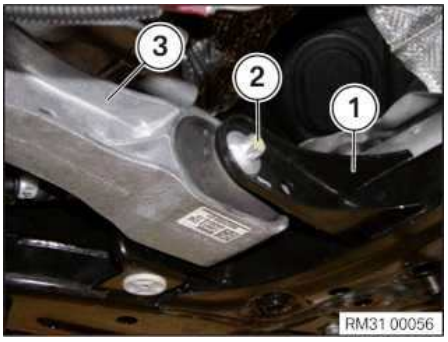
- Loosen screws (1).



NOTICE

Perform the operations on the left and right side.

- Unlock safety catch (1) of the lock (2) from the holder for the charge air cooler.
- Completely remove locks (2).



- Loosen screw (2) of the engine support (3) on the front axle (1).

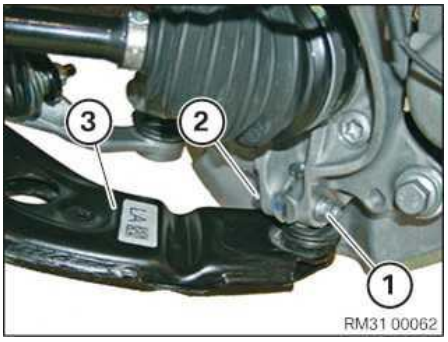


NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

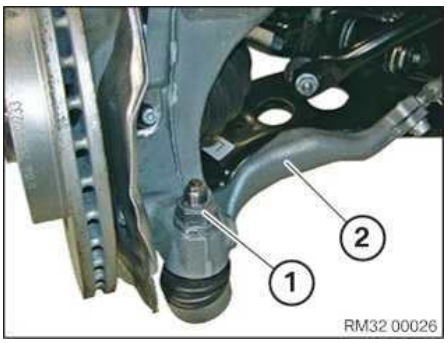
28 – Detaching and removing front axle completely



NOTICE

Perform the operations on the left and right side.

- Unfasten nut (1).
- (2)Pull out screw.
- Detach the wishbone (3) from the swivel bearing .

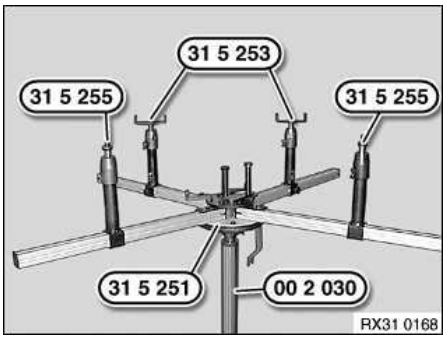


NOTICE

Perform the operations on the left and right side.

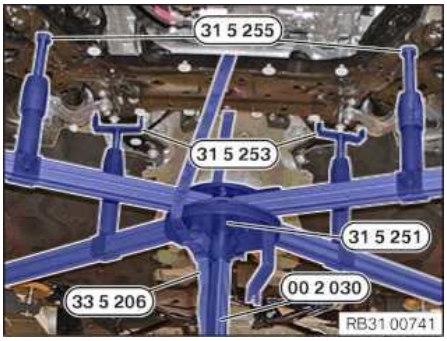
- Unfasten nut (1).
- Detach the track rod (2) from the swivel bearing.

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- Fit the special tool completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools in telescopic supports of a profile rail pair.
- Insert special tools in telescopic supports of other profile rail pair.

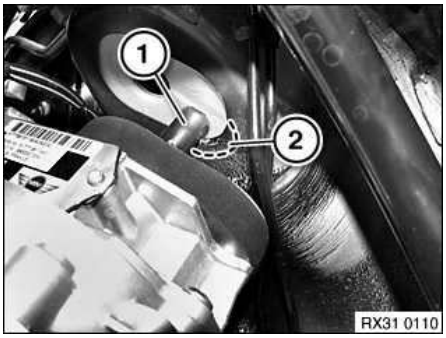
Note: In a profile rail pair, two profile rails are connected to one another by gearing.



- Align special tools and to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool to special tool .

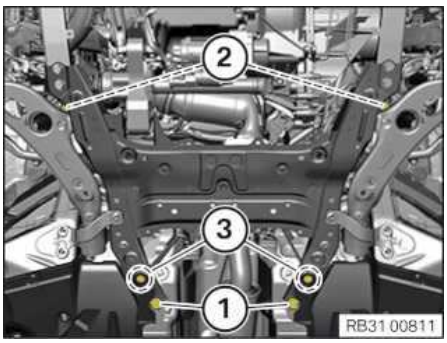


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and remove the front axle.

TECHNICAL INFORMATION

Note the information on thread repairs using Helicoil thread inserts.
For more information see: 41 00 ... Notes on repairing threads

- Check threads for damage; if necessary, repair with Helicoil thread inserts.

29 – Removing starter motor

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and loosen connector (1).
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).



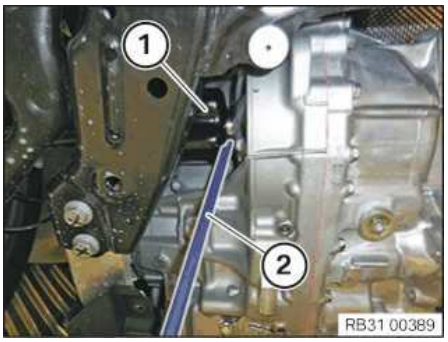
- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.



- Loosen screws (1).
- Feed out starter motor and remove.

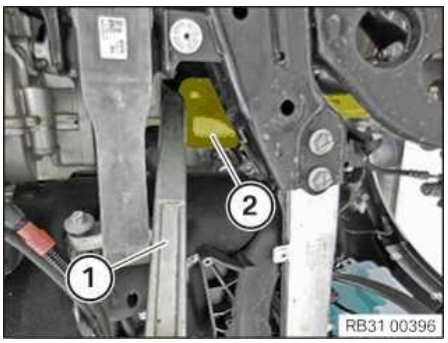
30 – Partially removing the left output shaft

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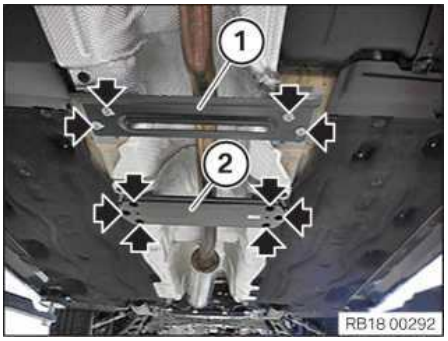
- Protect the output shaft (1) from falling.
- Lever out the output shaft (1) with a mounting lever (2) from the transmission.
- Tie up output shaft (1).

31 – Partially removing right output shaft



- Lever out the output shaft (2) with a mounting lever (1).
- Tie up output shaft (1).

32 – Removing the connecting support from the tunnel in front and back

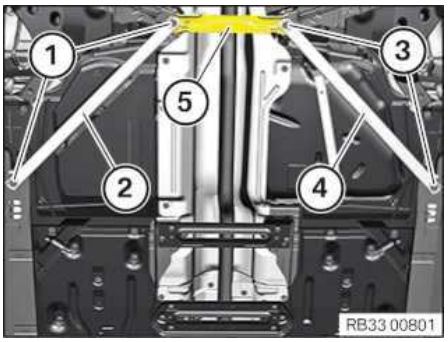


- Unscrew the bolts (arrows) from the connecting support (1).
- Feed out and remove the crossbeam (1).
- Unscrew the bolts (arrows) from the connecting support (2).
- Feed out and remove the crossbeam (2).

33 – Remove the cross strut with the torsion strut

TECHNICAL INFORMATION

Driving without a torsion strut is not permitted.



- Loosen screws (1).
- Thread out torsion strut (2) at left and remove.
- Loosen screws (3).
- Thread out torsion strut (4) at right and remove.
- Feed out and remove the cross-member (5).

34 – Remove exhaust system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

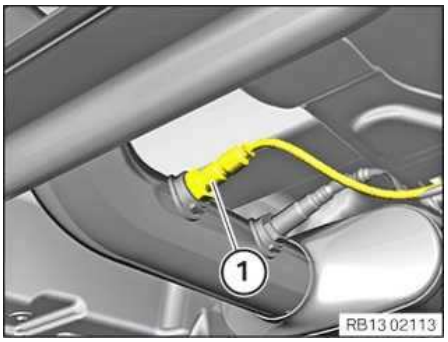
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CAUTION

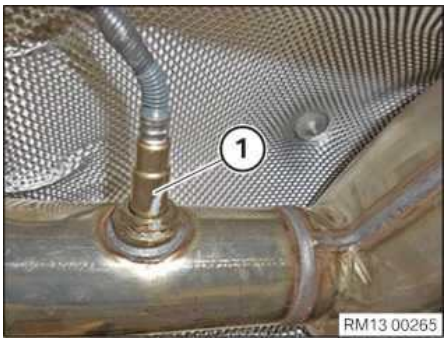
Heavy component.

Heavy components can lead to injury or damage.

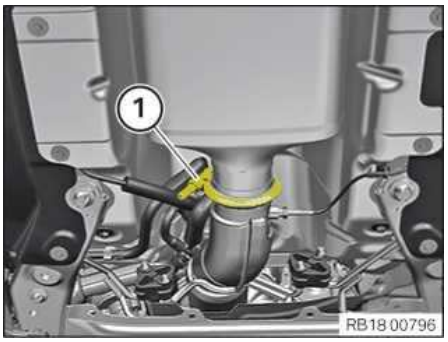
- Remove and install heavy components with the aid of another person/other persons.



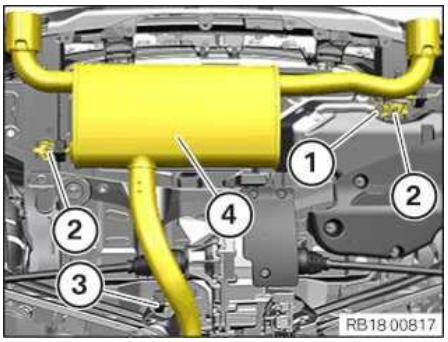
- Release the nitrogen oxide sensor (1) downstream of the SCR catalytic converter, guide it out and set it aside.



- Release the diesel particulate sensor (1), guide it out and set it aside.

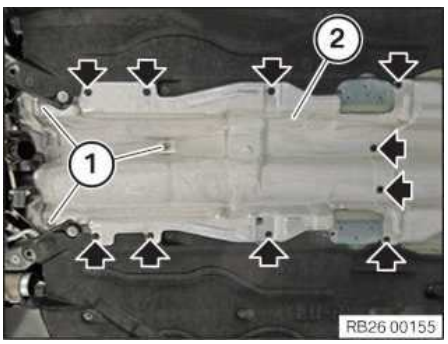


- Loosen V-band clamp (1).



- Loosen screw (1).
- Loosen nuts (2).
- Release the rubber mount (3) of the exhaust system (4).
- Lower and guide out the exhaust system (4) with assistance of a second person and remove it.

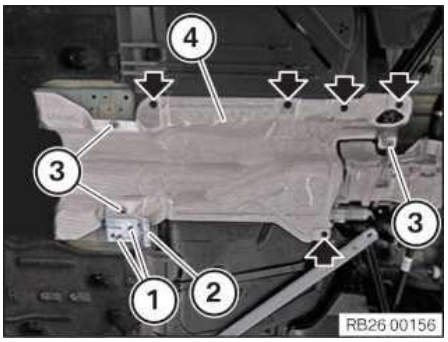
35 – Remove front heat shield



- Remove screws (arrows).
- Loosen nuts (1).
- Guide the heat shield (2) out and remove it.

36 – Remove heat shield at rear.

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- Loosen screws (1).
- Guide out and remove holder (2).
- Remove screws (arrows).
- Loosen nuts (3).
- Guide the heat shield (4) out and remove it.

37 – Remove propeller shaft

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

RISK OF DAMAGE

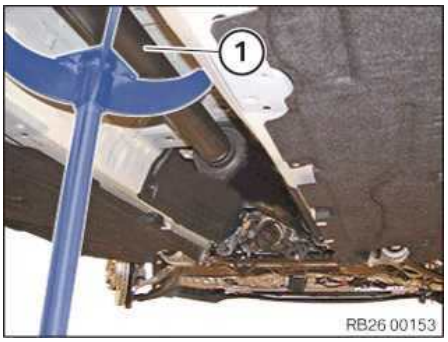
Damage to propeller shaft during removal.

Non-observance of the removal guidelines for the propeller shaft on the rear axle differential may cause severe damage.

- Do not disassemble the three-hole flange, flexible disc and propeller shaft. The three-hole flange to the rear axle differential is balanced with the flexible disc and propeller shaft.
- Loosen the recessed nut against the direction of travel in clockwise direction. The propeller shaft must be loosened on the recessed nut only and exclusively in the direction of rotation otherwise the anti-twist lock of the bi-hexagonal flange nut is damaged.
- In the event of a damaged anti-twist lock on the bi-hexagonal flange nut: Replace the rear axle differential.



- Install the special too l between the front and rear propeller shaft.
- Make sure that the arrows on the special tool point forward in the direction of travel.

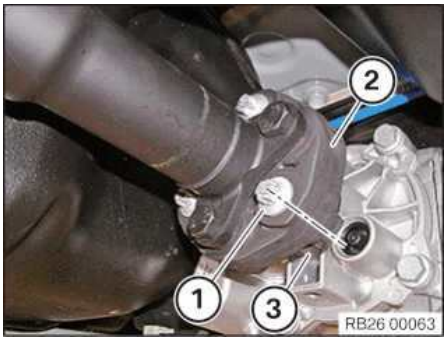


- Always support the propeller shaft (1) with a conventional jack.

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- Protect the propeller shaft (1) with the special tools **0 495 554 (33 5 070)** and from twisting.



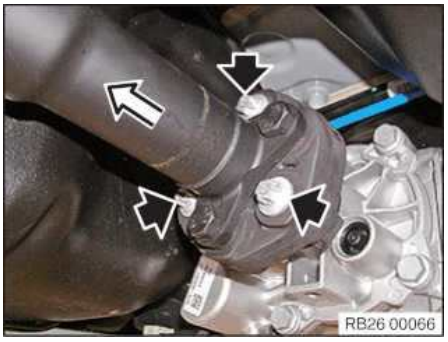
TECHNICAL INFORMATION

Compliance with the following instructions is required to avoid a humming noise from the propeller shaft after refitting the propeller shaft.

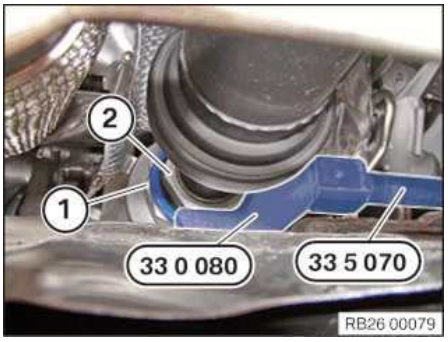
- Mark the installation position of the screw connection (1), the flexible disc (2) and the three-hole flange (3) on the same level.
- Loosen the screw connection (1).



- Loosen screws (1).



- Remove screws (arrows).
- Guide the propeller shaft out in the direction of the arrow and set it aside.



RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.

- Protect the recessed nut (2) on the transfer box from twisting with the special tools **0 495 554 (33 5 070)** and .

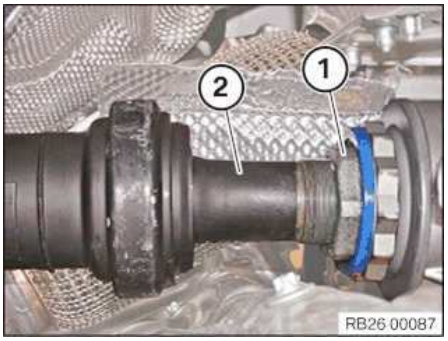
  The recessed nut (2) on the transfer box must **not** be used to detach the propeller shaft.

  The double hexagon flange nut (1) must **not** be used for counter support.

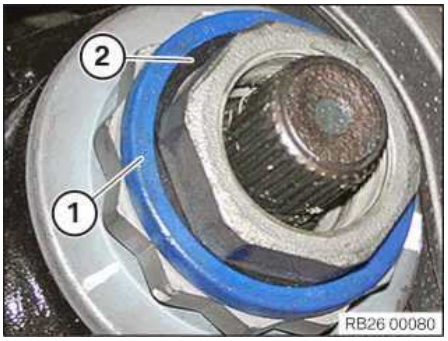
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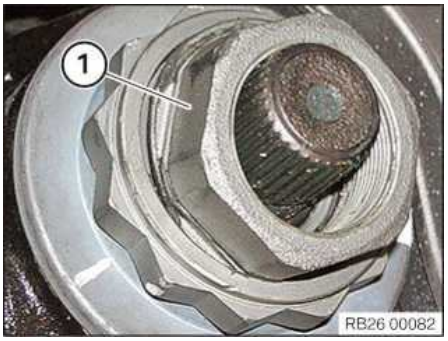
- Release the front propeller shaft with the special tools **0 495 554 (33 5 070)** and in the direction of the arrow.



- Thread the propeller shaft (2) out of the recessed nut (1) and remove.

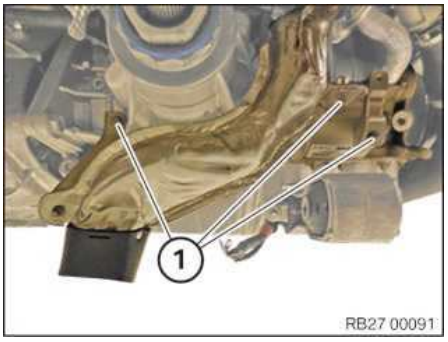


- Thread the retaining clip (1) and the seal (2) out and remove.

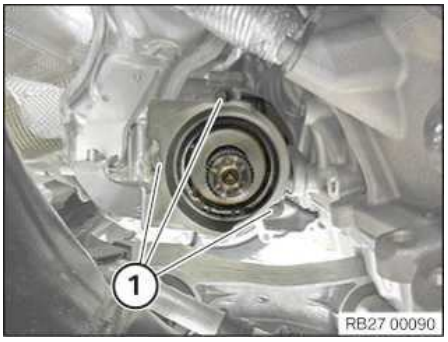


- Thread out and remove the recessed nut (1).

38 – Remove the intermediate shaft with the support tube

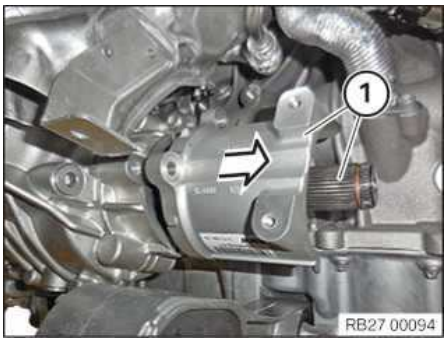


- With air duct installation: Loosen screws (1).
- Remove air duct



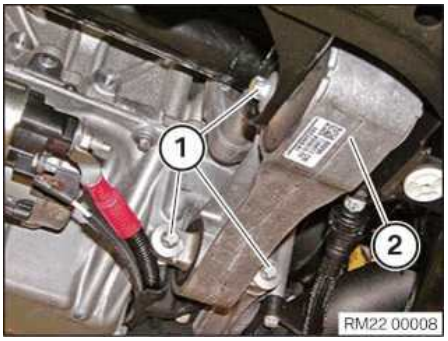
- Loosen screws (1).

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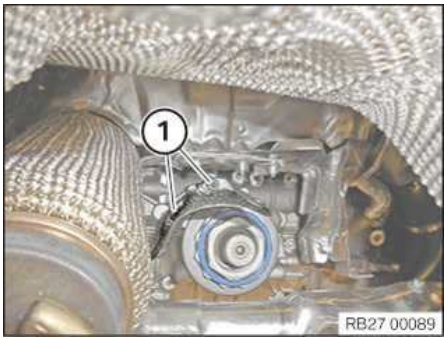
- Pull the intermediate shaft with the support tube (1) out of the transfer box.

39 – Remove bracket with rubber mount

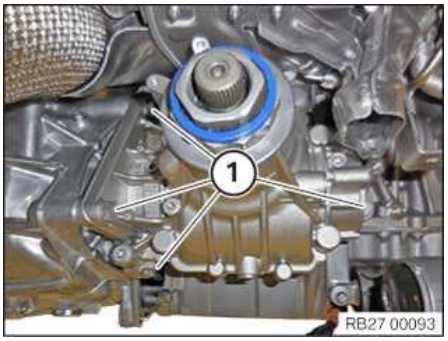


- Release screws (1) and remove holder (2) with rubber mount.

40 – Remove transfer box (VTG)



- Loosen screws (1).
- Remove heat shield.



- Loosen screws (1).
- Remove the transfer box (VTG).

41 – Remove the automatic transmission (AISIN GA8G45)

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

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RISK OF DAMAGE

Damage to the engine block.

Damaged and corroded bolts will lead to major damage in the engine block and the transmission.

- It is imperative that protruding threads of the transmission bolts are checked for corrosion and damage prior to removal.
- It is imperative that all rust is removed from corroded threads and that they are cleaned prior to removal.
- Renew rusted and damaged bolts.

▸ **Remove electronics box**

Prerequisite

Battery earth lead is disconnected.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

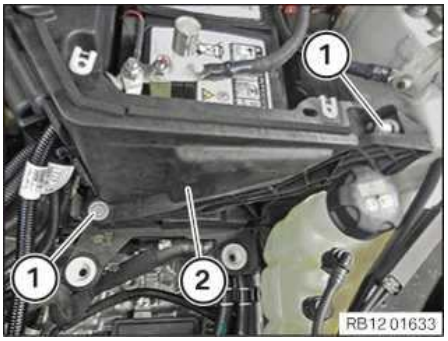
TECHNICAL INFORMATION

Follow instructions for removing and installing control units.

For additional information see: 12 00 ... Notes on removal and installation of control units

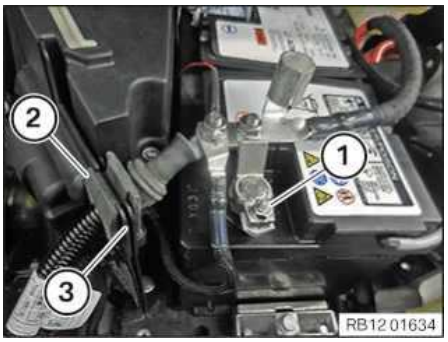
TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.

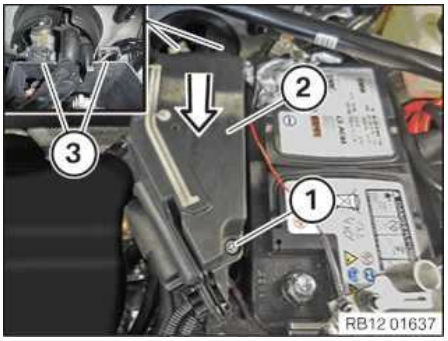


- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.

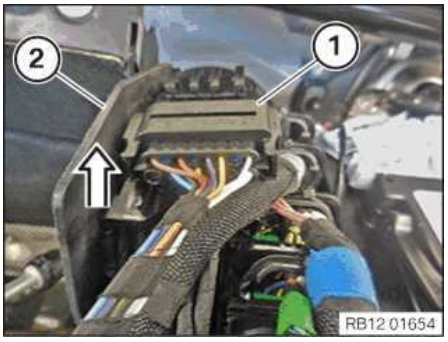
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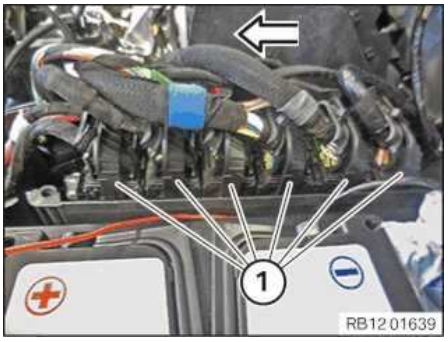
- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



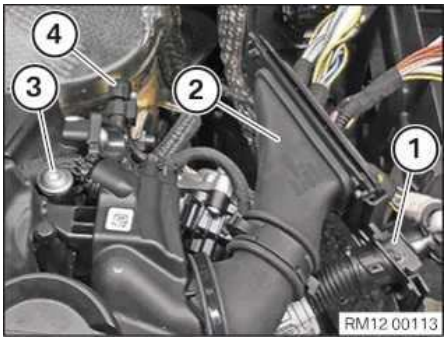
- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).



- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

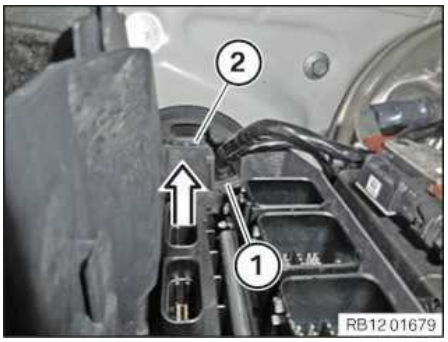


- Unlock and loosen connector (1).

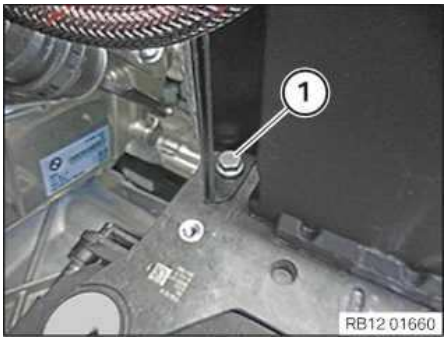


- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.

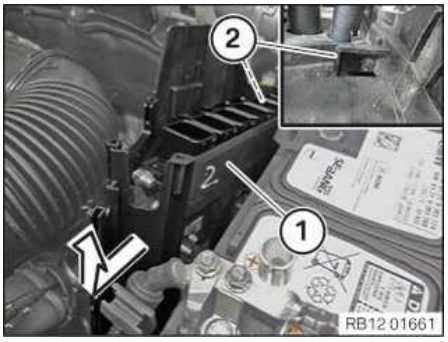
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- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.



- Loosen screw (1).



- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

▶ **Removing integrated supply module (PDM)**

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

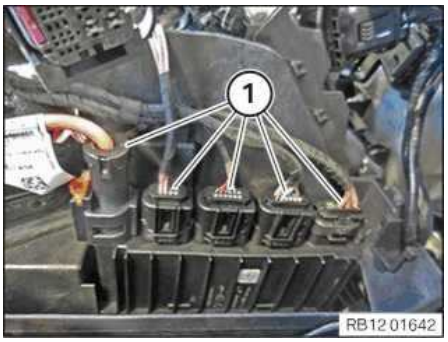
RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

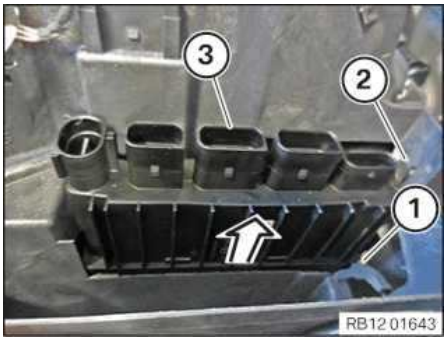
Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

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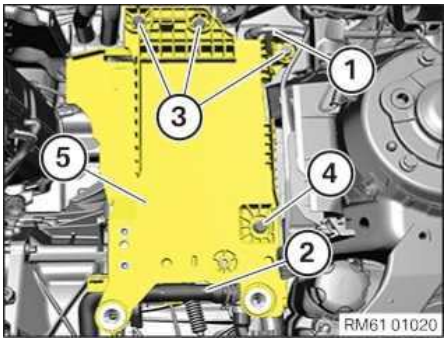


- Unlock and disconnect the plug connection (1).

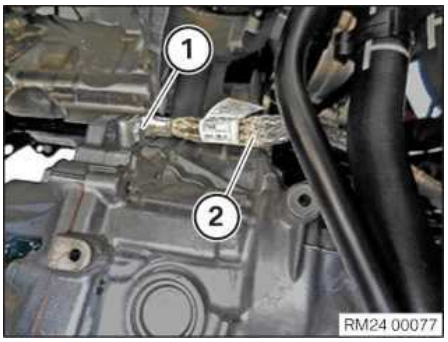


- Disengage locks (1) and (2).
- Guide out and remove the integrated supply module (3) in the direction of the arrow.

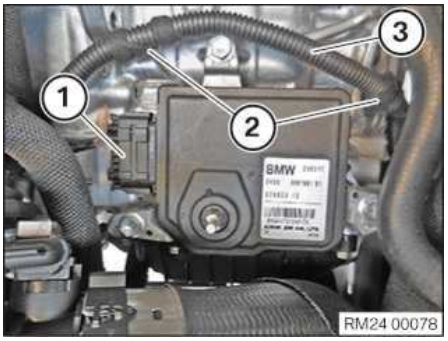
▶ **Remove battery holder**



- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

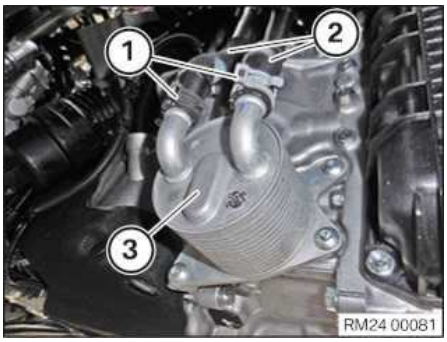


- Loosen screw (1).
- Detach the ground strap (2) from the transmission and set it aside.



- Unlock plug connection (1) and disconnect.
- Detach the clamps (2) with the wiring harness (3) from the transmission and set it aside.

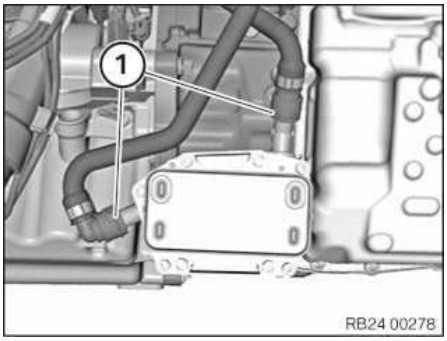
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TECHNICAL INFORMATION

The figure shows transmission oil cooler on vehicles with the B47 engine.

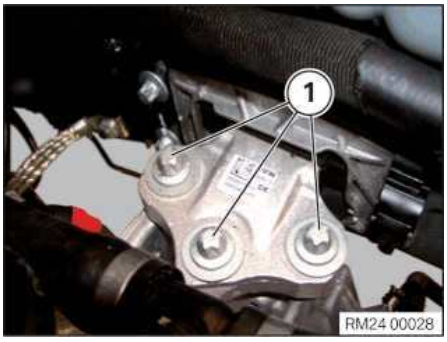
- Unfasten hose clamps (1).
- Disconnect coolant hoses (2) from transmission oil cooler (3).
- Catch and dispose of escaping coolant.



TECHNICAL INFORMATION

The figure shows transmission oil cooler on vehicles with the B48O engine.

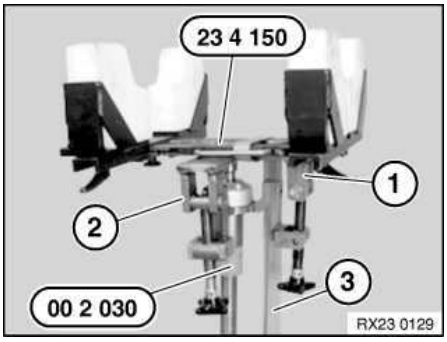
- Release locks (1).
- Disconnect coolant hoses from transmission oil cooler.
- Catch and dispose of escaping coolant.



- Loosen screws (1).



- Turn the engine using the special tool **0 493 380 (11 6 480)** on the vibration damper in the direction of rotation.
- Unscrew the nut (1) of the torque converter.
- Crank engine further and release remaining 5 nuts.



- Support the transmission using special tools **0 490 133 (00 2 030)** and .
- Secure the transmission with the tensioning strap (3).



- Unscrew the bolts (arrows) and remove the transmission.

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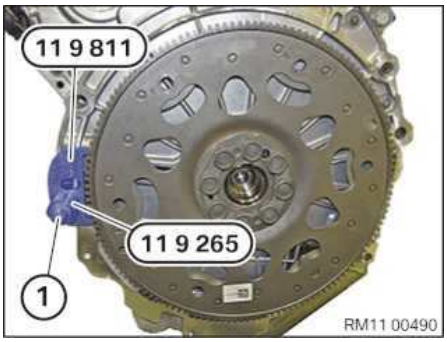
42 – Removing flywheel

CAUTION

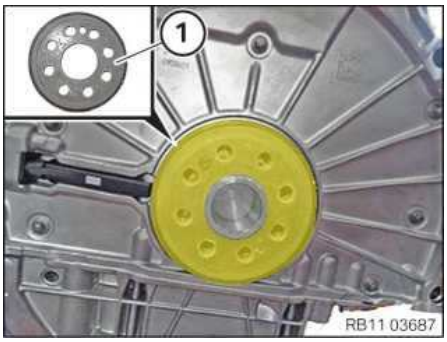
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Secure flywheel with a transmission bolt (1) and the special tools **0 496 171 (11 9 811)** and **0 494 793 (11 9 265)**.
- Unfasten flywheel bolts.
- Remove flywheel.



RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Remove the increment wheel (1) from the crankshaft and set correctly.

43 – Installing the flywheel

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

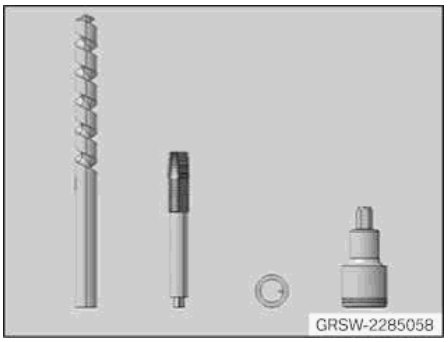


- Check fitting sleeve on the crankshaft for damage and replace if necessary.

TECHNICAL INFORMATION

Clean all threads with a screw tap.

- Clean all the screw threads (1).



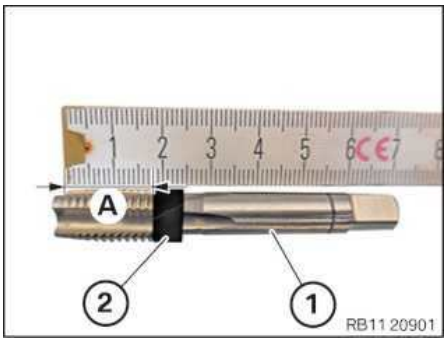
- Use the set of special tools **2 285 058**.

Description
Twist drill
Thread cutter M12x1.5
Depth
Insertion tool



- Assemble tool set.

Number	Description
1	Tool holder
2	Thread cutter M12X1,5

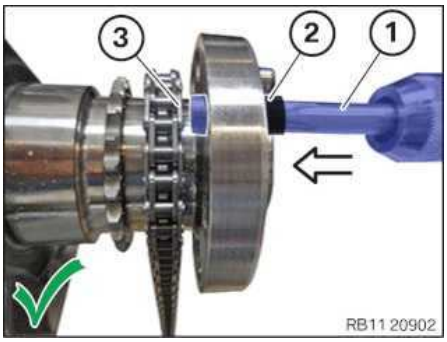


- Mark the installation dimension (A) on thread cutter (1) from the set of special tools **2 285 058** using a commonly-available tool (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm

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NOTICE

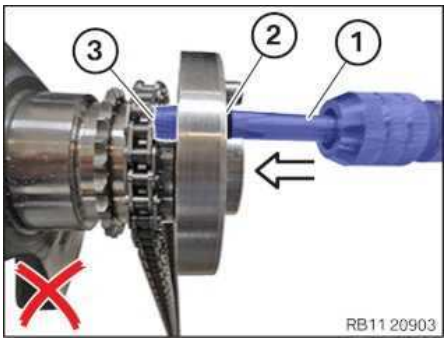
To provide a better overview: Shown with engine removed.

- Screw in the thread cutter (1) from the set of special tools **2 285 058** in direction of arrow up to the installation dimension (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm

- Make sure that the thread cutter does (1) **not** rest on the timing chain (3).

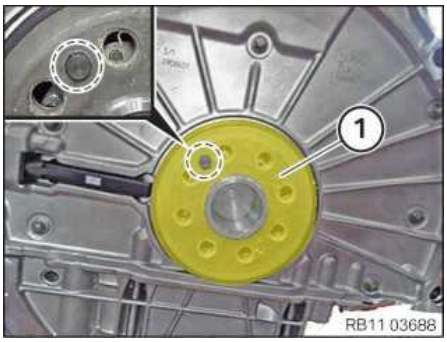


TECHNICAL INFORMATION

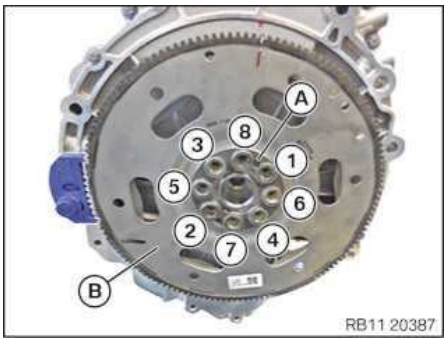
- **Carefully** handle the timing chain, to protect the timing chain and timing chain drive against damage.

- Make sure the installation dimension (2) of the screw bore (1) is not exceeded.

  The thread cutter (1) may not rest on the timing chain (3).



- Important! Observe the marking shown during installation.
- Install special tool (1) on the crankshaft as shown.

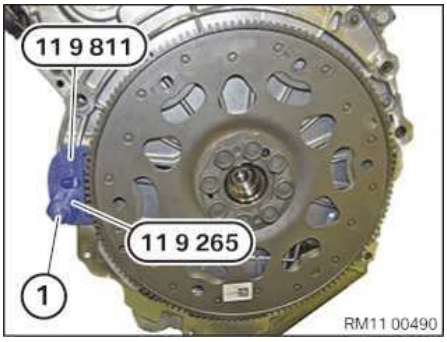


- Position flywheel (B) .
- Renew flywheel bolts (1) to (8).

  Parts: Flywheel bolts
- Screw in flywheel bolt (1) to (8) by hand.
- Observe tightening sequence. Begin at the dowel pin (A).
- Tighten flywheel bolts in sequence (1) to (8).

Flywheel to crankshaft

M12x1.5	Renew screws.	Tightening torque	120 Nm

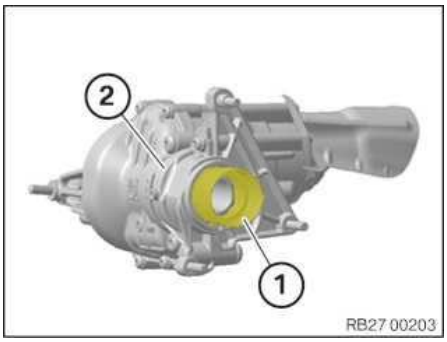


- Loosen the transmission bolt (1).
- Guide out and remove the special tool **0 494 793 (11 9 265)** and **0 496 171 (11 9 811)** with the **standard** washer (5 mm).

POSTPROCESSES

44 – Install the transfer box (VTG)

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- If intermediate shaft (1) gets caught on transfer box (VTG) (2), renew intermediate shaft (1) and the radial shaft seals in the automatic or manual transmission.



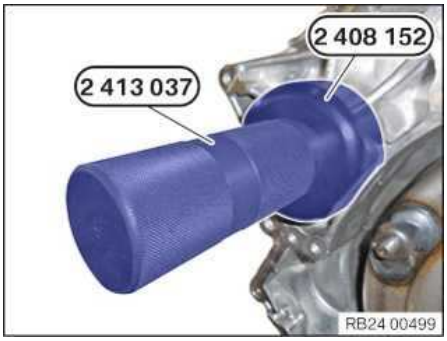
- Screw special tool **2 409 025** into the outer radial shaft seal.
- Turn the screw on the special tool **2 409 025** until the outer radial shaft seal has been pulled out.



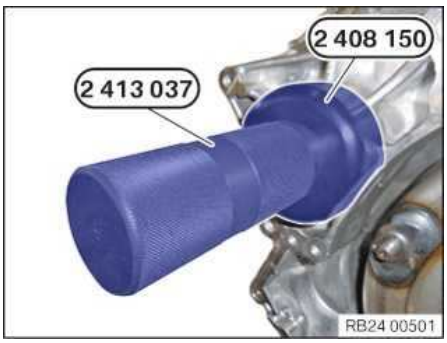
- Insert special tool **2 411 739** into the inner radial shaft seal.



- Screw special tool **2 411 739** into the inner radial shaft seal.
- Turn the screw on the special tool **2 411 739** until the inner radial shaft seal has been pulled out.

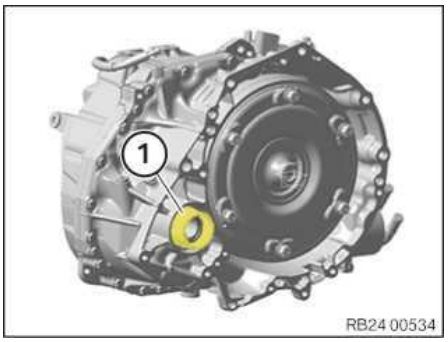


- Drive in the inner radial shaft seal using special tools **2 408 152** and **2 413 037** up to the limit position.



- Drive in the outer radial shaft seal using special tools **2 413 037** and **2 408 150** up to the limit position.

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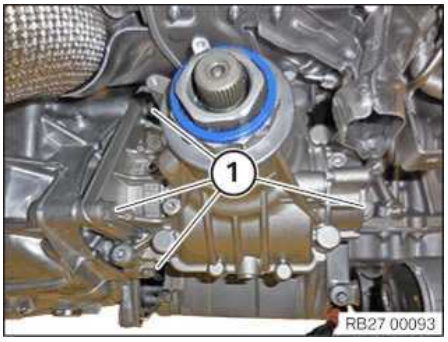
- If necessary, connect the new intermediate shaft (1) to the output flange of the automatic transmission or manual transmission.



- Coat the inside of the output flange (arrows) evenly with approx. 5 g of grease.

Expendable materials

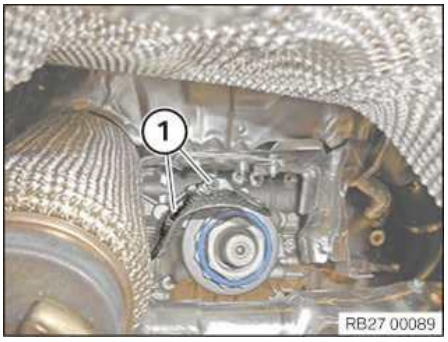
Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the transfer box (VTG).
- Tighten the screws (1).

Transfer box to transmission

M10		Tightening torque	56 Nm



- Install heat shield.
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Heat shield to transfer box

M6	Renew screws.	Tightening torque	6 Nm

▸ **Check the transfer box oil level**

RISK OF DAMAGE

Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.

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- Check transfer case oil level, correct:
- Open the oil filler plug (1).
- Check transfer box oil level.
- If necessary, top up transmission oil up to the lower edge of the oil filler plug opening (1).

Transmission oil

Technically suitable transfer box and electrical transmission oils	

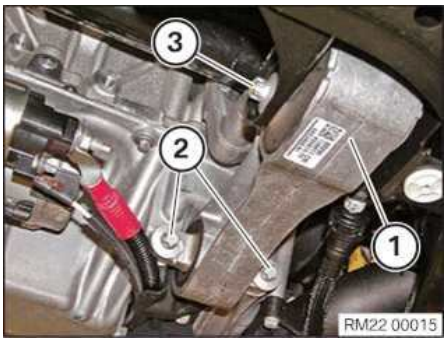
Main group 27

- Tighten the oil filler plug (1).

Oil filler plug on transfer box (VTG)

M18x1.5		Tightening torque	35 Nm

45 – Install the holder with rubber mount



- Install holder (1) with rubber mount.
- Tighten down screw (3).

Holder with rubber mount to front axle support

M12		Tightening torque	100 Nm

- Tighten down screws (2).

Holder with rubber mount to oil sump

M12		Tightening torque	100 Nm

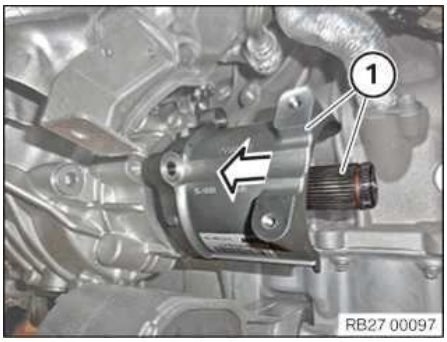
46 – Install the intermediate shaft with the support tube



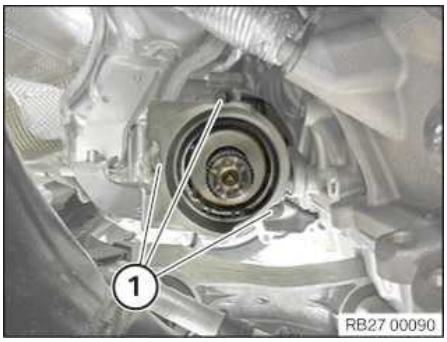
- Coat gearing of the intermediate shaft uniformly with 5 g of grease.

Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the intermediate shaft with support tube (1) in the transfer box.



- Position screws (1).

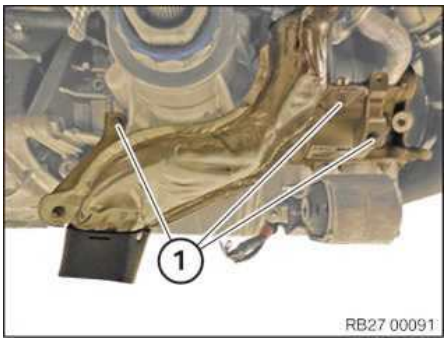
Note: Check for correct screw length! Bolt M8x35 8.8

- Tighten the screws (1).

Intermediate shaft to transfer box

M8x35		Tightening torque	19 Nm

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- If installed: Install air duct.
- Tighten the screws (1).

47 – Install propeller shaft.

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

RISK OF DAMAGE

Damage to the propeller shaft during installation.

Non-observance of the installation guidelines for the propeller shaft on the rear axle differential may cause severe damage.

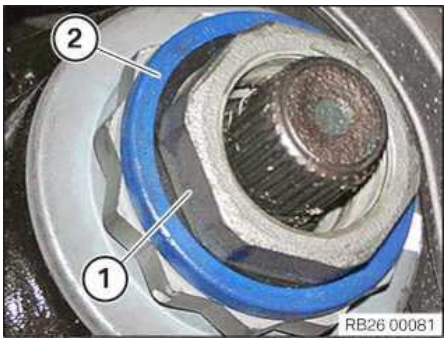
- Always renew the recessed nut on the rear axle differential. Screw locking must be available.
- Strictly observe a minimum hardening time of two hours after having screwed in the recessed nut. The hardening time may be longer at lower temperatures.

RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.

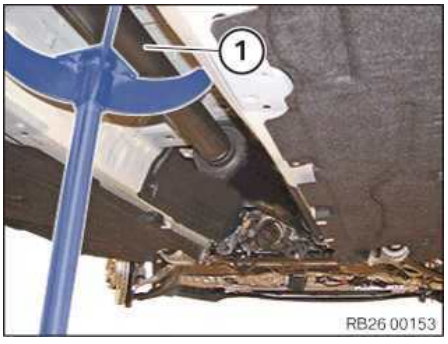


- Renew recessed nut (1).

  Parts: Insert nut
- Renew the retaining clip (2) and the seal.

  Parts: Retaining clip, seal
- Insert the seal with the recessed nut (1) and install.
- Insert the retaining clip (2) and install.
- Make sure that recessed nut (1) is screwed in within 5 min.
- Make sure that the hardening time of **minimum** 2 h for the recessed nut is observed.

  The hardening time must be extended at lower temperatures.

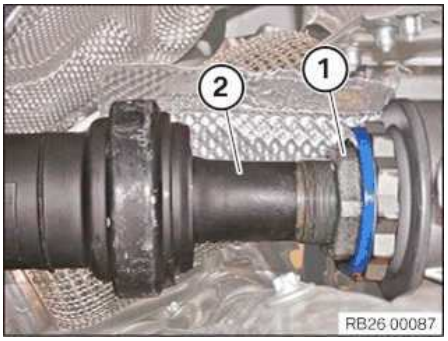


- Insert the propeller shaft (1) and install.
- Always support the propeller shaft (1) with a conventional jack.

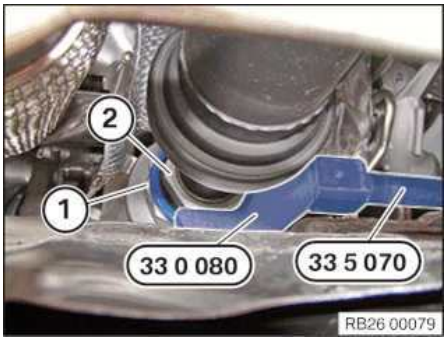
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- Hand-tighten the bolts (1).



- Push the propeller shaft (2) against the recessed nut (1) up to the limit position.
- Screw the propeller shaft (2) at least 2 thread starts onto the recessed nut (1) by hand.



RISK OF DAMAGE

Damage to the transfer box.

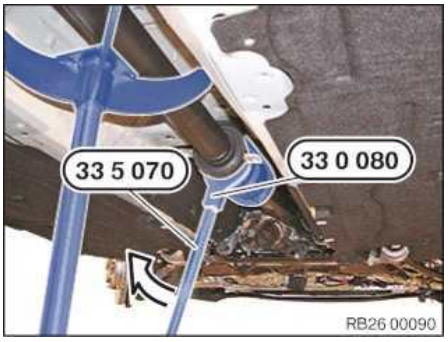
Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.

- Protect the recessed nut (2) on the transfer box from twisting with the special tools **0 495 554 (33 5 070)** and .

  The recessed nut (2) on the transfer box must **not** be used to tighten the propeller shaft.

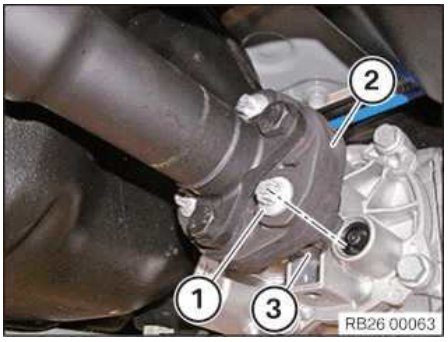
  The double hexagon flange nut (1) must **not** be used for counter support.



- Tighten the front propeller shaft with the special tools **0 495 554 (33 5 070)** and in the direction of the arrow.

Propeller shaft to transfer box

		Tightening torque	80 Nm



TECHNICAL INFORMATION

Compliance with the following instructions is required to avoid a humming noise from the propeller shaft after refitting the propeller shaft.

- Assemble the screw connection (1) of the flexible disc (2) and the three-hole flange (3) according to the mark.
- Renew screws (1).

  Parts: Bolts

- Hand-tighten the bolts (1).

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- Protect the propeller shaft (1) with the special tools **0 495 554 (33 5 070)** and from twisting.



- Tighten the bolts with the special tools **0 490 504 (00 9 120)** and .

Flexible disc to rear axle final drive

M12x1.5	Renew screws.	Tightening torque	55 Nm 90 °



- Tighten the screws (1).

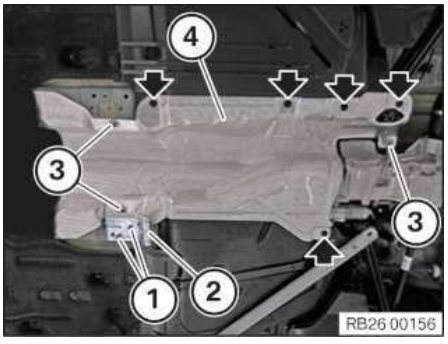
Centre mount to body

M8		Tightening torque	19 Nm



- Guide the special too l out between the front and rear propeller shaft and remove.

48 – Installing the rear heat shield



- Insert and install the heat shield (4).
- Tighten screws (arrows).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

- Tighten nuts (3).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

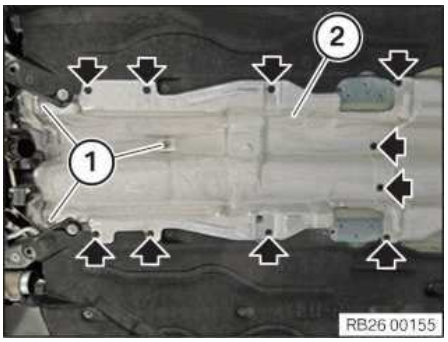
- Insert and install the holder (2).
- Tighten the screws (1).

Bracket to body

M8		Tightening torque	21 Nm

49 – Install the front heat shield

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- Insert and install the heat shield (2).
- Tighten screws (arrows).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

- Tighten nuts (1).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

50 – Install exhaust system

CAUTION

Component with heavy weight.

Danger of injury!

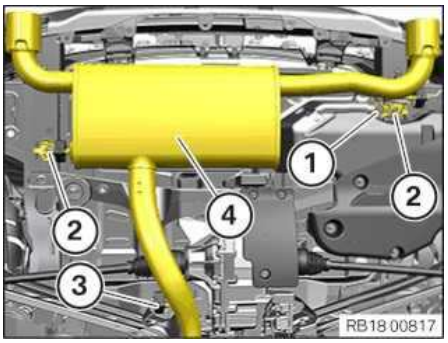
- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Feed in and install the exhaust system (4) with a second person.
- Renew nuts (2).

  Parts: Nuts
- Tighten nuts (2).

Exhaust system to body

M8	Replace nuts.	Tightening torque	19 Nm

- Tighten down screw (1).

Exhaust bracket on body

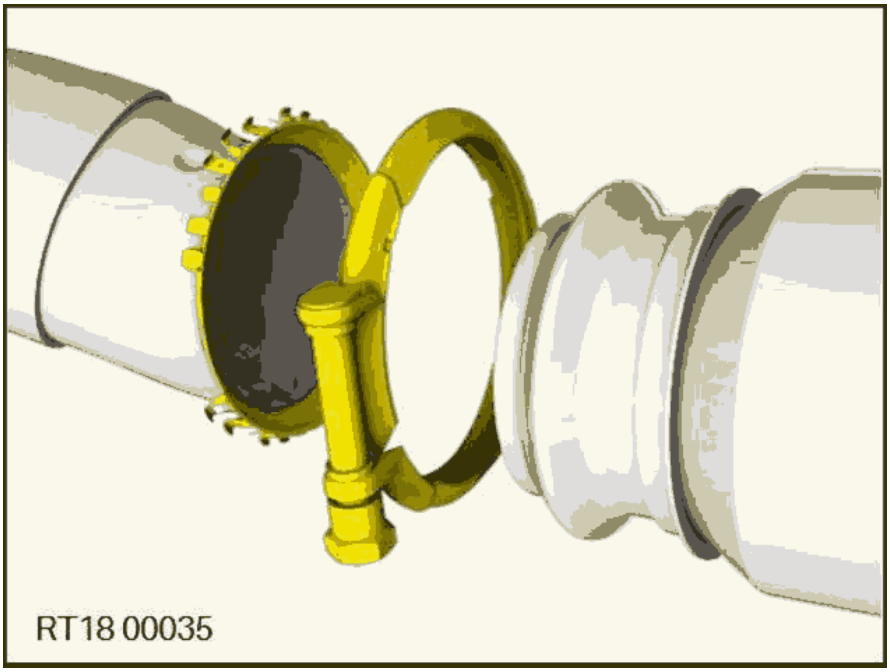
Hexagon screw M8x30		Tightening torque	19 Nm

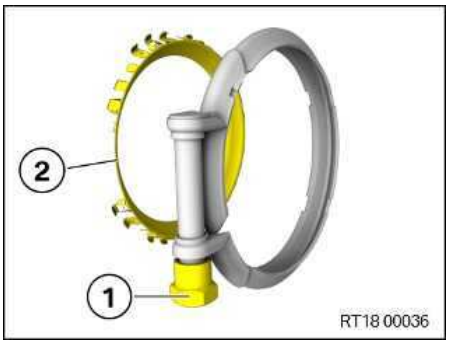
- Check the rubber mount (3) for damage and renew as needed.
- Mount rubber mount (3) on the exhaust system (4).

▸ **Install the V-clip**

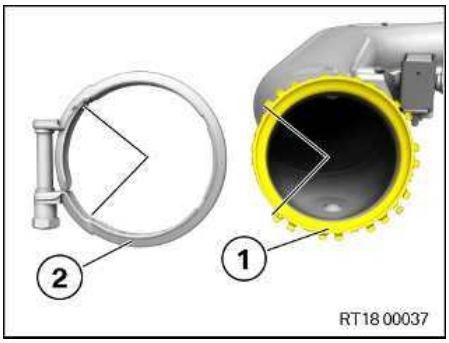
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V-band clamp



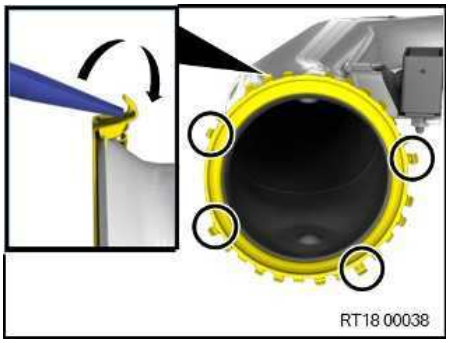


- Unscrew the nut (1) and remove the sealing ring (2).

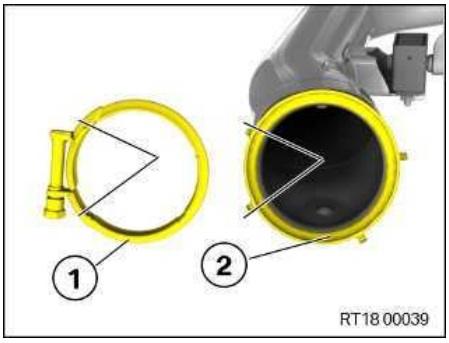


- Renew the V-clip (2).

  Parts: V-band clamp
- Mount the sealing ring (1) on the exhaust system.
- Ensure that the sealing ring (1) for the V-clip (2) is positioned correctly.



- Bend all sheet metal tabs over with a suitable tool, except those in the marked areas.

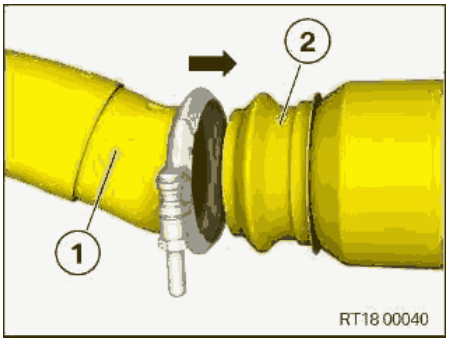


- Mount the V-clip (1) on the sealing ring (2).
- Make sure that the V-clip (1) is positioned correctly on the sealing ring (2).

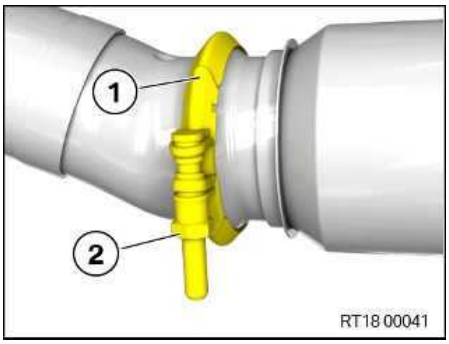
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- Make sure that the V-clip rests against the sheet metal tabs after mounting (marks).



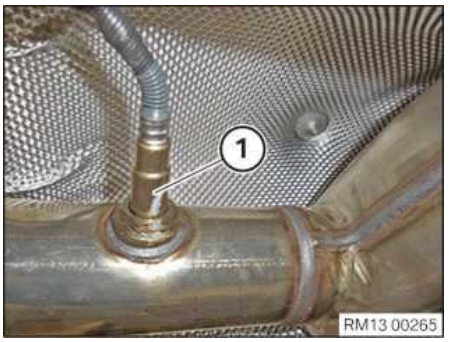
- Connect the exhaust system (1) with the catalytic converter (2) and position correctly.



- Make sure that V-clip (1) is fitted correctly.
- Tighten down screw (2).

V-clip to catalytic converter

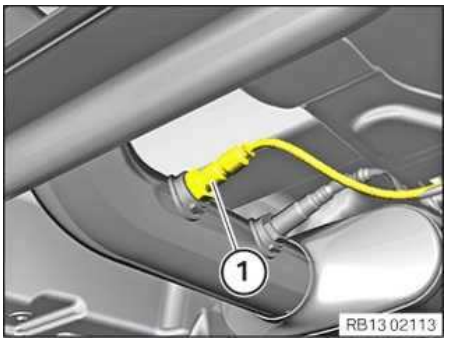
V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm



- Feed in, install and tighten diesel particulate sensor (1).

Diesel particulate sensor to exhaust system

Sensor		Tightening torque	50 Nm



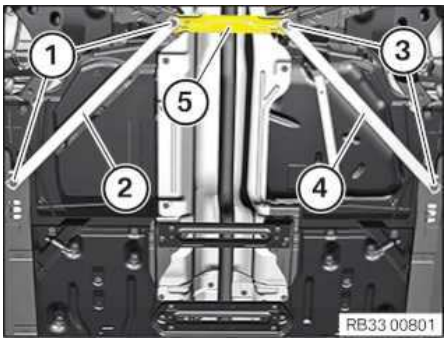
- Feed in, install and tighten nitrogen oxide sensor (1).

Nitrogen oxide sensor downstream of SCR catalytic converter

Sensor		Tightening torque	50 Nm

51 – Install the cross-member with torsion struts

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- Insert and install the cross-member (5).
- Thread in torsion strut (4) at right and install.
- Renew screws (3).

  Parts: Bolts
- Tighten down screws (3).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

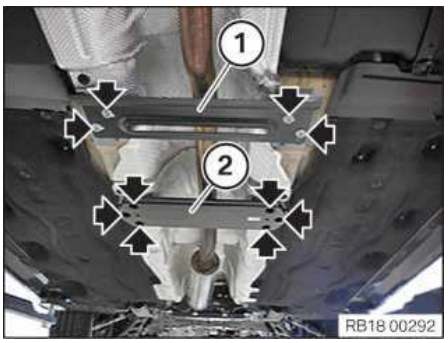
- Guide in and install the left torsion strut (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

52 – Install the connecting support on the tunnel in front and back



- Insert and install connecting supports (2).
- Tighten the screws (arrows) from the connecting support (2).

Front connection carrier to body

M10x18		Tightening torque	56 Nm

- Insert and install connecting supports (1).
- Tighten the screws (arrows) from the connecting support (1).

Rear connection carrier to body

M8x18		Tightening torque	28 Nm

53 – Installing right output shaft partially



- Renew the circlip (1).

  Parts: Circlip
- Slide output shaft into the transmission as far as the limit position.
- Check for secure seat by levering.

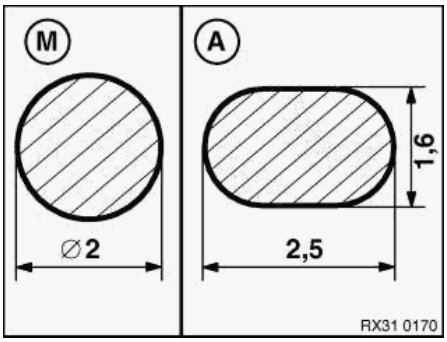
54 – Partially installing the left output shaft



- **With automatic transmission only:**
- Lever out O-ring (1).
- Renew O-ring (1).

  Parts: O-ring
- Insert new O-ring (1).

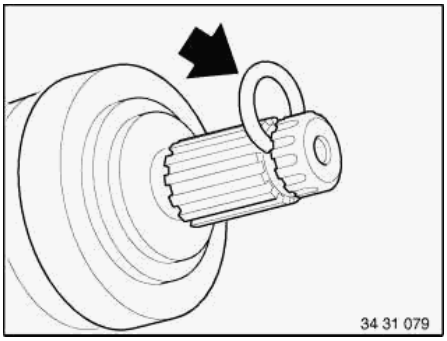
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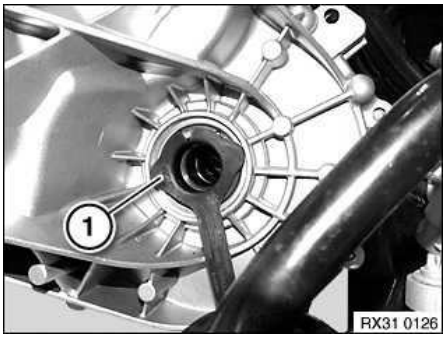
- Do not mix up circlips.

  Different types of output shafts fitted:

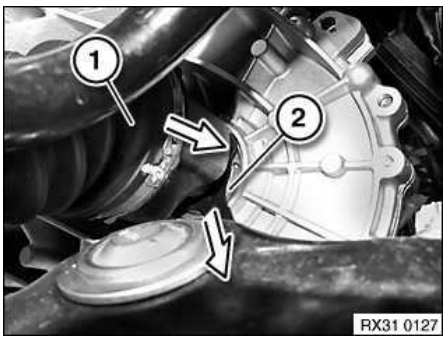
  - M: Manual transmission
  - A: Automatic transmission



- Renew circlip (arrow).



- Insert installation protection ring (1) into the radial shaft seal.
- Make sure the tool fits over the lip of the radial shaft seal so there is no damage to sealing ring when the output shaft is inserted.



- Insert output shaft (1) into transmission.
- **Manual gearbox only:** Pull on the handle to remove the installation protection ring (2) and dispose of it.
- Slide output shaft (1) into the transmission as far as the limit position.

  The output shaft (1) must engage audibly.
- Check for secure seat by levering.

55 – Installing starter motor

CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.



- Insert and install the starter motor .
- Tighten the screws (1).

Starter motor to transmission

M8x45		Tightening torque	19 Nm

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- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

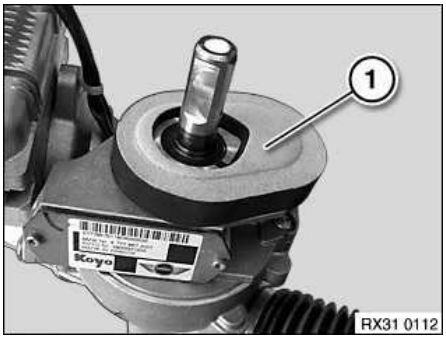
Battery positive lead to starter

M8		Tightening torque	13,5 Nm



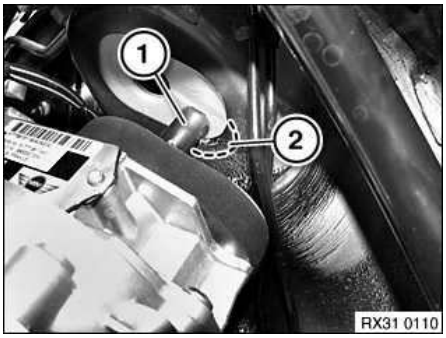
- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.

56 – Mount and secure the complete front axle



- Remove the seal (1).
- Clean surface on steering gear.
- Renew gasket (1).

  Parts: Gasket
- Position the seal (1) and glue it on.



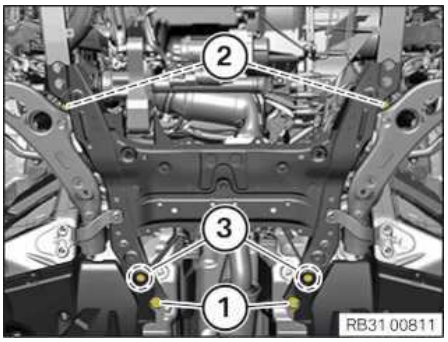
TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!

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- Position front axle support.
- Bend underbody panellings in the areas (3) to one side.
- Raise front axle support.
- When raising, insert charge air cooler into the rubber mount of the charge air cooler on cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

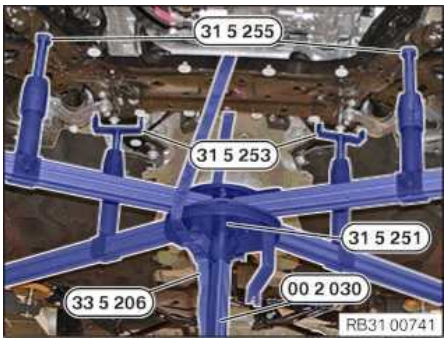
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

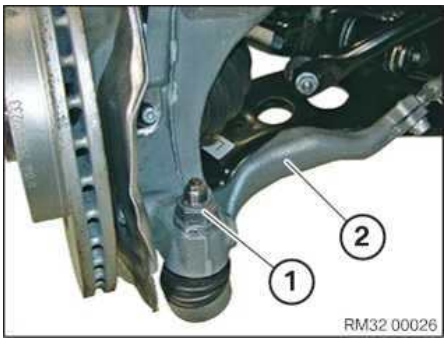
- If necessary, tighten the screws in the areas (3).

Underbody protection to body

Screw		Tightening torque	3 Nm



- Remove special tool from special tool .
- Lower universal jack **0 490 133 (00 2 030)** with the special tool and place it to the side.



NOTICE

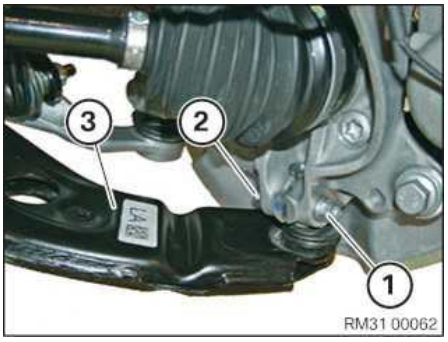
Perform the operations on the left and right side.

- Position the track rod (2) on the swivel bearing .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Track rod end to swivel bearing

M14	Renew nut.	Tightening torque	175 Nm



NOTICE

Perform the operations on the left and right side.

- Position the wishbone (3) on the swivel bearing .
- Renew the bolt (2) and the nut (1).

  Parts: Bolt, nut
- Insert screw (2).
- Tighten nut (1).

Wishbone to swivel bearing

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

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57 – Install the mounted parts on the front axle support



NOTICE

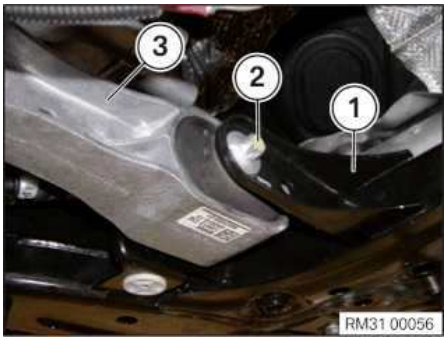
Perform the operations on the left and right side.

- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Holder, wishbone rubber mount, to body

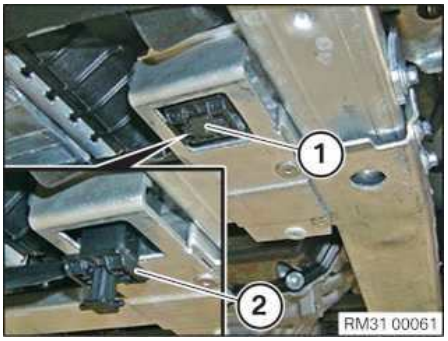
M10 screw	Renew screw.	Jointing torque	56 Nm
		Angle of rotation	90 °



- Position the engine support (3) on the front axle support (1).
- Tighten down screw (2).

Holder with rubber mount to front axle support

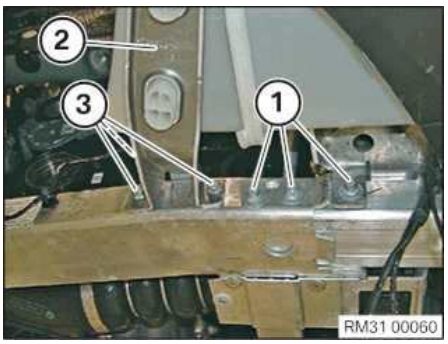
M12 screw		100 Nm



NOTICE

Perform the operations on the left and right side.

- Position the lock (2).
- Lock the bracket (1) of the lock (2) of the holder for the charge air cooler.



- **Only on right side:** Position the holder for the washer fluid reservoir (2).
- Tighten down screws (3).

Washer fluid reservoir holder to front axle support adapter plate

		Tightening torque	10 Nm

NOTICE

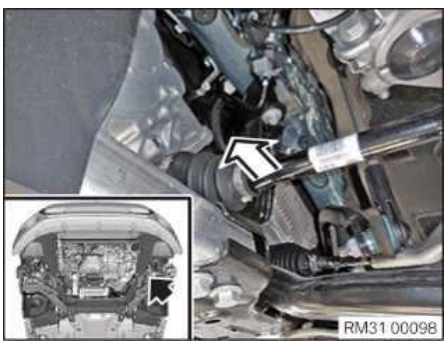
Perform the operations on the left and right side.

- Tighten the screws (1).

Deformation element, bottom, to adapter plate, front axle carrier

		Tightening torque	11,8 Nm

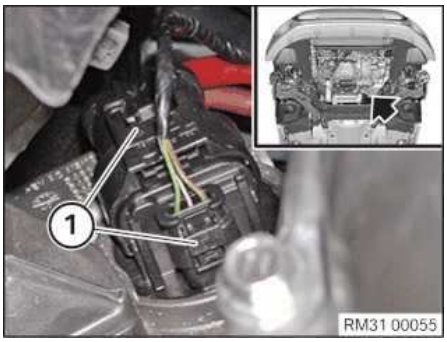
58 – Attaching connector at steering gear



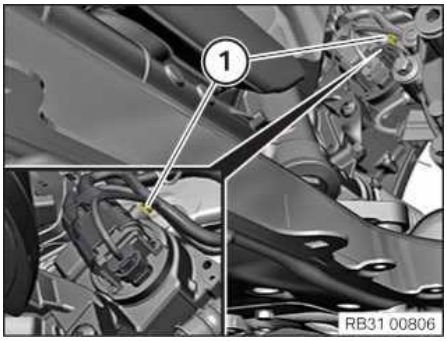
- To connect the connector (see the following step): Connect the connector with the right hand.

  The connectors can be accessed via the left output shaft.

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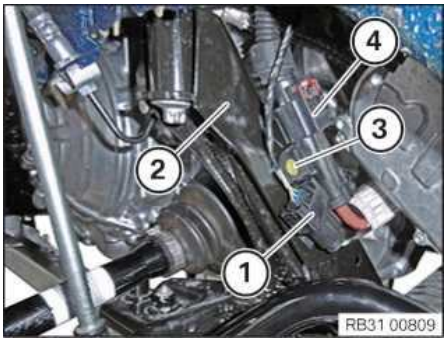


- Connect and lock connector (arrow) (1) with the steering gear.



- Fasten the wiring harness (1) on the steering gear.

▸ **If installed: Fasten the plug connections at the front axle support**



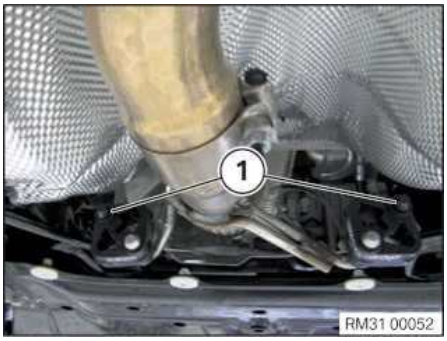
- Position the plug connection (4) at the front axle support (2).
- Tighten down screw (3).

Holder to front axle support

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

- Fasten the plug connection (1) at the front axle support (2).

59 – Securing rubber mount on front axle support



- Check rubber mount (1), replace if necessary.

  Parts: Rubber mount
- Spray rubber mount (1) with lubricant and slide onto holder on front axle support.

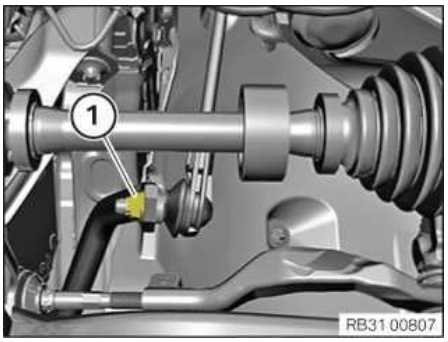
60 – Securing anti-roll bar on left and right on the anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▸ **Fastening anti-roll bar on the anti-roll bar link**

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- Position the anti-roll bar link on the anti-roll bar .
- Renew nut (1).

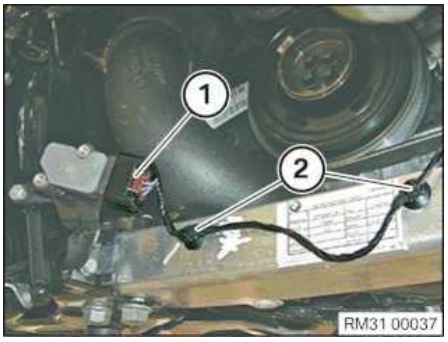
  Parts: Nut
- Tighten nut (1).

Note: Use the Torx socket for counter support.

Anti-roll bar link to anti-roll bar

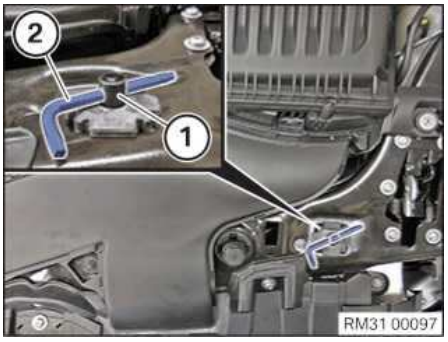
M10	Renew nut.	Tightening torque	56 Nm

61 – With right installation: Securing the cable for the ride height sensor



- Secure the cable clip (2) on the adapter of the deformation element.
- Connect connectors (1) and lock.

62 – Removing fastener for left and right radiator

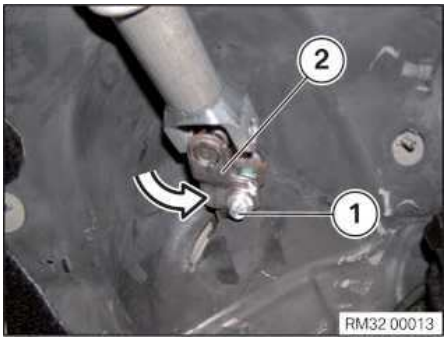


NOTICE

Perform the operations on the left and right side.

- Remove suitable tool (2) from the centering pin (1).

63 – Secure the steering shaft at the bottom on the steering gear

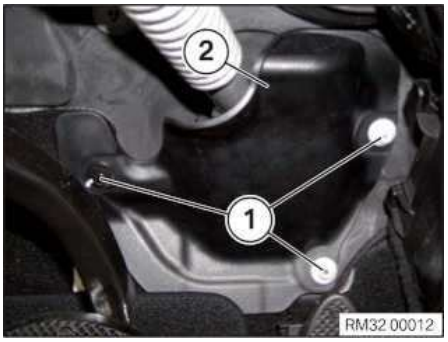


- Clean the screw lock residue from the screw thread in the universal joint (2).
- Pivot the universal joint (2) in the direction of the arrow to the steering gear.
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Lower steering shaft to steering gear

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm



- **If installed:**
- Position the cover on the steering column (2).
- Tighten nuts (1).

Steering column cover to bulkhead

Plastic nut		Tightening torque	3 Nm

64 – Remove the engine bridge

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CAUTION

Heavy component.

Heavy components can lead to injury or damage.

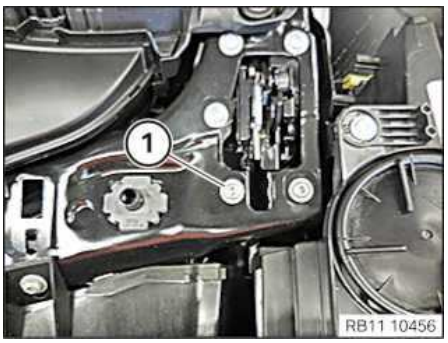
- Remove and install heavy components with the aid of another person/other persons.



- Detach the spindle screw (1) from the engine bridge.
- Unscrew the leg screws (2) and (3).
- Guide the engine bridge out of the vehicle with the help of another person and remove.



- Unscrew the bolts (1) of the special tool **2 459 012**.
- Feed out the special tool **2 459 012** at the cylinder head and remove.



- Tighten the screw (1) of the bonnet catch.

Cross connection on support for cross connection

M6x20		Tighten torque	12 Nm



- Tighten the screw (1) of the bonnet catch.

Cross connection on support for cross connection

M6x20		Tighten torque	12 Nm

65 – Install electronics box

Prerequisite

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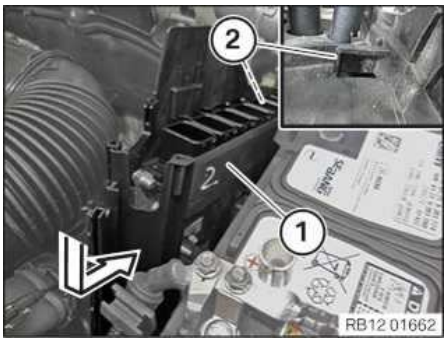
Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

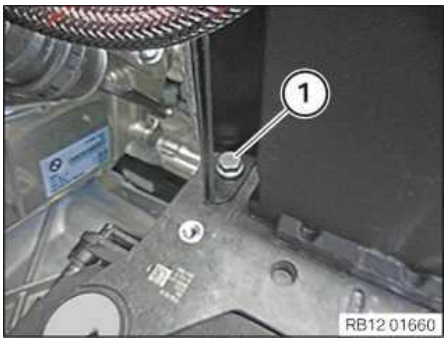
- Route all cables without abrasions, do not trap and crush.



- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.



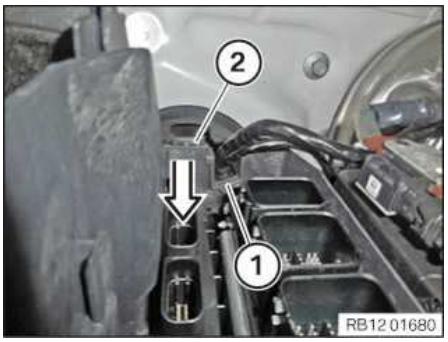
- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).



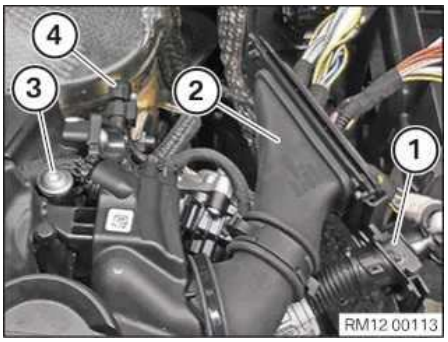
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.



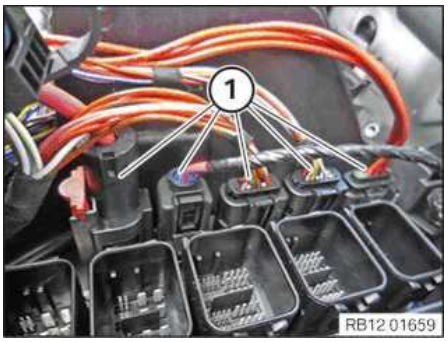
- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

Wiring harness to cylinder head cover

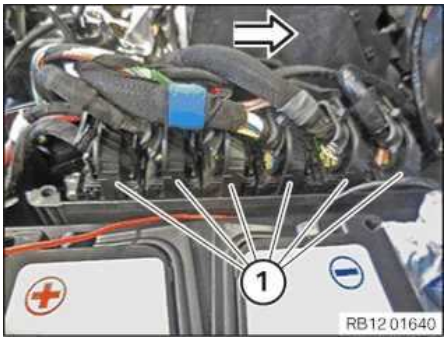
TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.

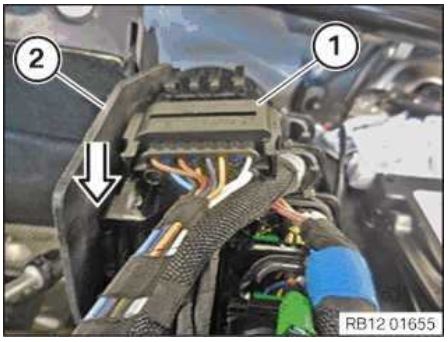
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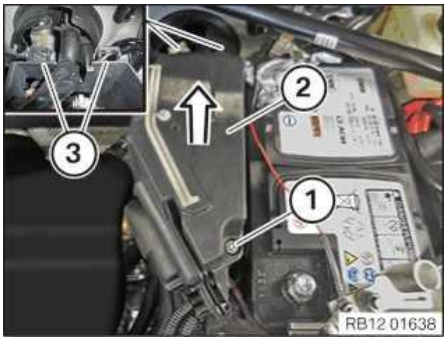
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



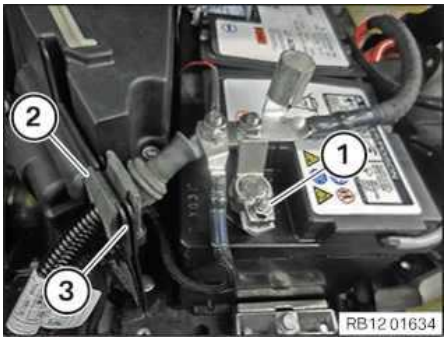
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

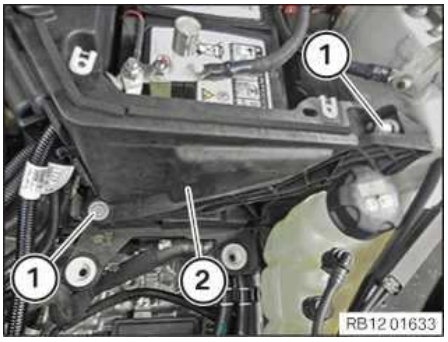
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

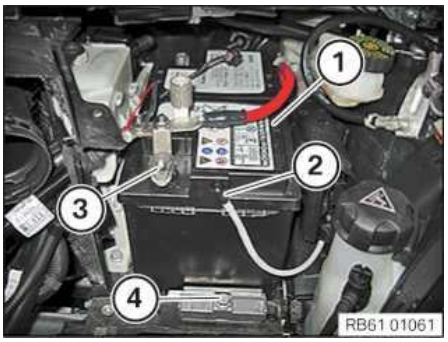


- Feed in and install tension strut (2).
- Tighten the screws (1).

Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

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- Install vehicle battery (1).
- Position the bracket and tighten with the screw (4) .

Battery terminal rail to battery tray

M8		19 Nm

- Position the vent hose (2) and clip it in.
- Position the positive battery terminal and tighten with the nut (3) .

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

▸ **Check the vent holes of the battery**

WARNING

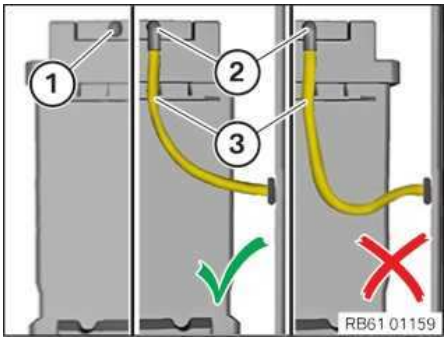
Gas emission.

Danger of injury! Danger of explosion!

- Assign the vent holes correctly.
- Route the vent hose correctly.

TECHNICAL INFORMATION

The battery has two vent holes, opposite:
One vent hole (1) must be closed correctly with a dummy plug.
The vent hose (3) must be correctly connected and routed at the other vent hole (2).



Check

- Check if the vent hole (1) is correctly closed with a dummy plug.

Result

» No dummy plug.

Measure

- Close the vent hole (1) correctly with a dummy plug.

Check

- Check if the vent hole (2) has a correctly connected vent hose (3).

Result

» The vent hose (3) is not correctly connected.

Measure

- At the vent hole (2), connect the vent hose (3) correctly.

Check

- Check if the vent hose (3) is routed to the outside with a downhill gradient (**no siphon formation!**).

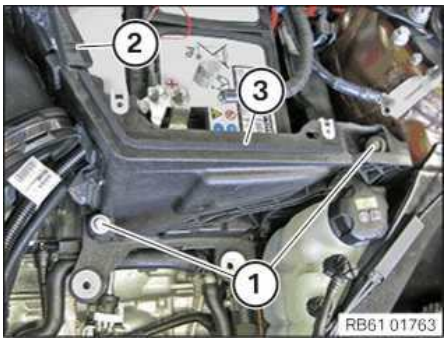
Result

» The vent hose (3) is not correctly routed as shown in the image on the right.

Measure

- Route the vent hose (3) correctly as shown in the centre image.

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- Insert tension strut (3) and tighten with screws (1).

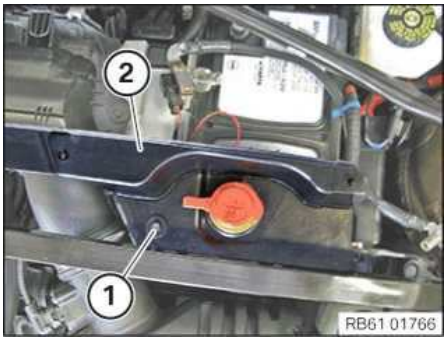
Trailing link

M8		Tightening torque	19 Nm

- Tighten down screw (2).

Battery cover

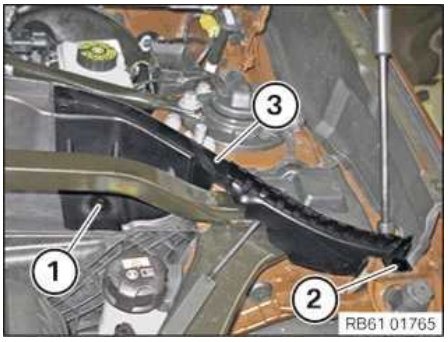
M8		2,8 Nm



- Position the cover (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

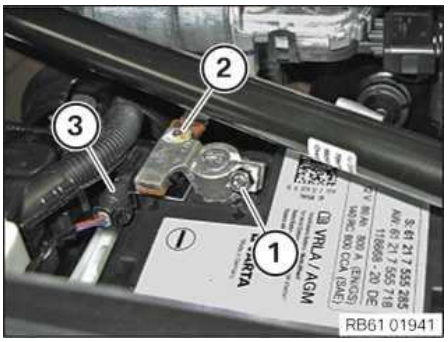
Battery cover

M8		2,8 Nm

67 – Connecting the battery earth lead

TECHNICAL INFORMATION

For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)



- Remove the protective cover of the positive battery terminal.
- Position the battery earth lead (2).
- Tighten nut (1).

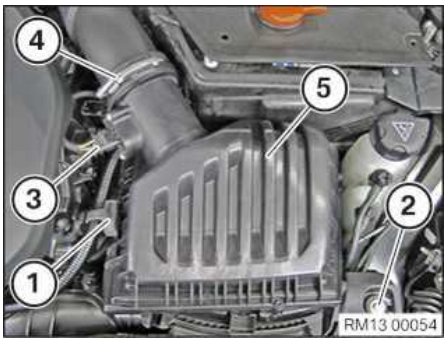
Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

- If required, connect the connector (3).

68 – Installing intake silencer housing

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- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

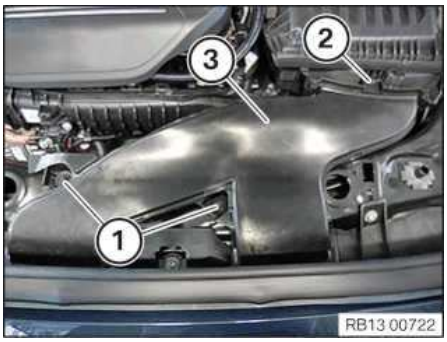
- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

69 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).
  The lock (2) must audibly engage.
- Tighten nuts (1).

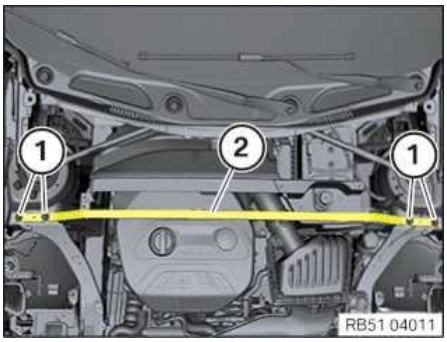
Intake neck to cross connection

M6		Tightening torque	8 Nm

70 – Install strut brace

TECHNICAL INFORMATION

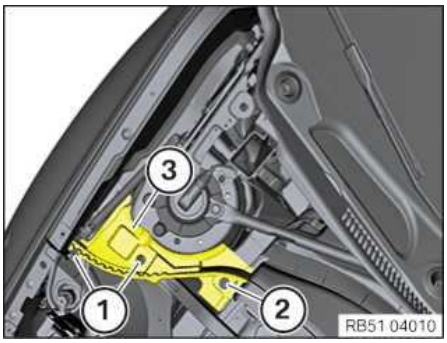
Driving without the strut brace/front end or tension strut is not permitted.



- Install the strut brace (2).
- Renew screws (1).
  Parts: Bolts
- Tighten the screws (1).

Cross-brace to spring strut dome

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °



NOTICE

Description is for right component only. The procedure on the left side is identical.

- Install the cover (3).
- Tighten down screw (2).

Cover on body

Hexagon screw		Tightening torque	3 Nm

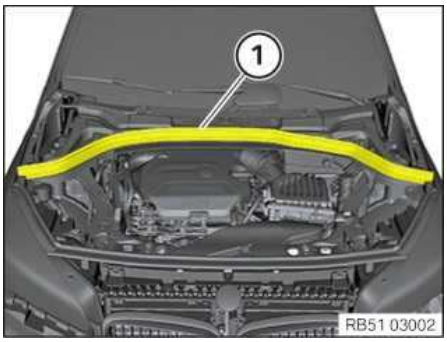
- Install the expanding rivet (1).

71 – Install the seal for the bonnet

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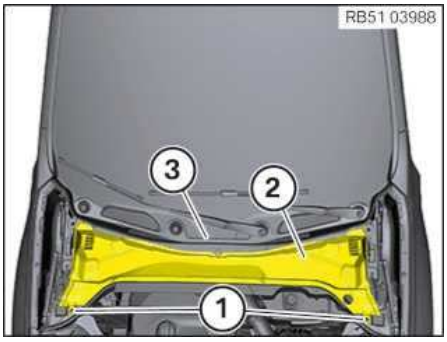
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



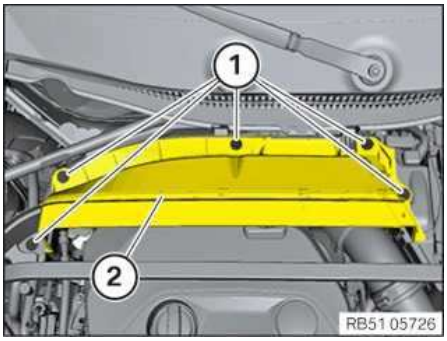
- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

72 – Installing front cowl panel cover



- Insert and install cowl panel cover at front (2) into cowl panel cover at rear (3).
- Check cowl panel cover at front is correctly seated (2).
- Secure expanding rivet (1).

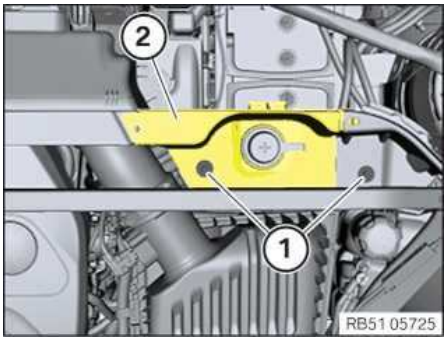
73 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Cover of top bulkhead

Screw		Tightening torque	2,6 Nm



- Guide in and install cover (2).
- Tighten down screw (1).

Cover of remote positive terminal

Screw		Tightening torque	2,6 Nm

74 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

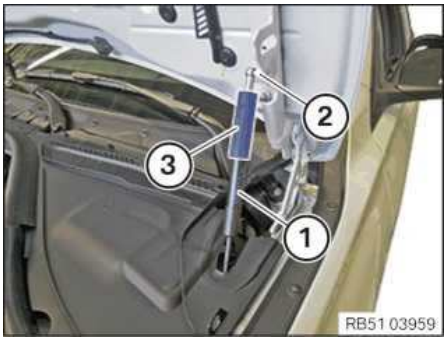


- Check for correct installation of all rubber mounts in the acoustic cover (1).

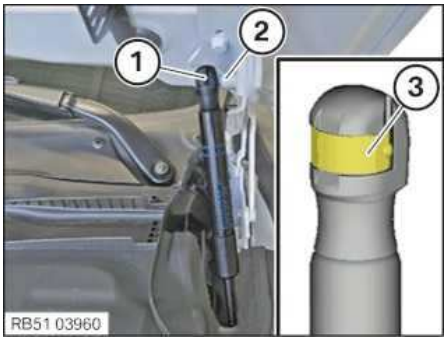


- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

75 – Take bonnet out of the service position



- Support the bonnet by hand.
- Remove the special tool (3) from the ball pin (2).
- Pull off the special tool (3) from the gas pressure spring (1).
- Continue to support the bonnet and repeat the operation on the other side of vehicle.



CAUTION

Shutting bonnet or tailgate.

Danger of injury!

- Support bonnet/tailgate in fully open position with the aid of a suitable device.

- Check the clamp (3) is fitted correctly.
- Connect ball socket (1) to ball pin (2).
- Continue to support the bonnet and repeat the operation on the other side of vehicle.

76 – Fill and bleed the coolant circuit

▸ **Filling and bleed the high-temperature coolant circuit**

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- See additional information.

77 – Checking/topping up oil level in automatic gearbox (AISIN GA8G45)

Prerequisite

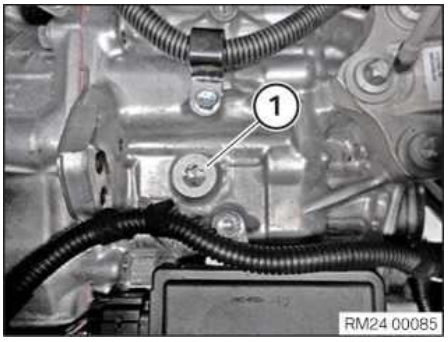
Vehicle in horizontal position.

CAUTION

Materials harmful to health.

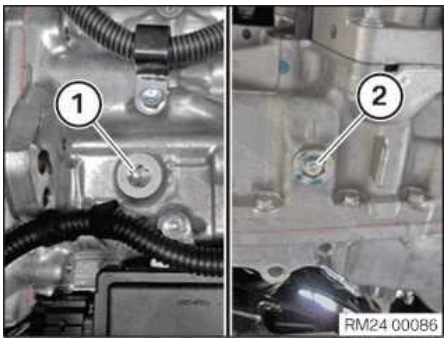
Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.



- Move the selector lever to the "P" position.
- Secure vehicle to prevent it rolling.
- Connect diagnosis system.
- Release the oil filler plug (1) using the Torx T55 .

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- **Topping up the automatic transmission fluid (the automatic transmission fluid was drained):**
- Release oil filler plug (1) from engine compartment.
- Loosen the overflow plug (2) below at the transmission.
- Top up automatic transmission fluid at oil filler plug (1) until oil emerges at overflow plug (2).
- Start engine and run at idle speed.
- Check whether the automatic transmission fluid is leaking at the overflow plug (2) .
- If there is no automatic transmission fluid leaking at the overflow plug (2) , fill in the automatic transmission fluid to the oil filler plug (1) .
- Press the footbrake and, when idle, shift through all the gears from "P" to "D" 2 times for more than 2 seconds .
- Move the selector lever to the "P" position.
- Check again whether the automatic transmission fluid is leaking at the overflow plug(2) .
- Read the temperature of the automatic transmission fluid with the diagnosis system.
- Increase temperature of automatic transmission fluid to 35 °C to 45 °C.
- Top up automatic transmission fluid until it flows over.
- Renew sealing rings.

  Parts: Sealing ring
- Screw in and fasten oil filler plug (1) and overflow plug (2).

Oil filler plug to transmission housing

M14	Renew the sealing ring.	Tightening torque	45 Nm

Overflow screw in oil drain plug

M6	Renew the sealing ring.		8 Nm

- **Check oil level (transmission oil temperature must be between** 35 °C **and** 45 °C **):**
- Open the oil filler plug (1).
- Slacken overflow plug (2).
- Start engine and run at idle speed.
- Unscrew and remove overflow plug (2).
- Check whether the automatic transmission fluid is leaking at the overflow plug (2) .
- If there is no automatic transmission fluid leaking at the overflow plug (2) , fill in the automatic transmission fluid to the oil filler plug (1) .
- Top up the automatic transmission fluid until it overflows at the overflow plug (2) .
- Press the footbrake and, when idle, shift through all the gears from "P" to "D" 2 times for more than 2 seconds .
- Move the selector lever to the "P" position.
- Check the oil level again.
- Renew sealing rings.

  Parts: Sealing ring
- If the oil escapes slightly from the overflow plug (2) , tighten the overflow plug (2) and the oil filler plug (1) .

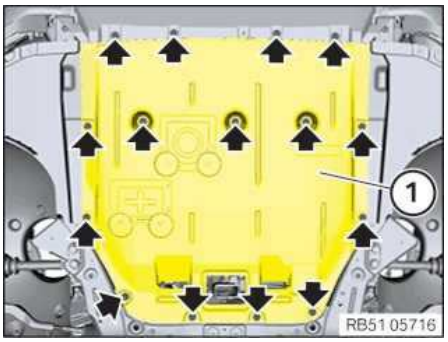
Overflow screw in oil drain plug

M6	Renew the sealing ring.		8 Nm

Oil filler plug to transmission housing

M14	Renew the sealing ring.	Tightening torque	45 Nm

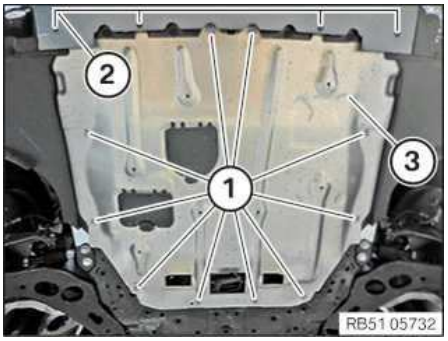
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- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

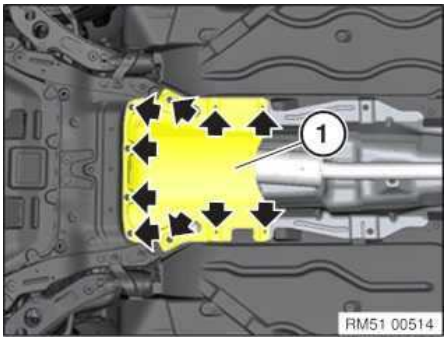


- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

79 – If installed: Installing underbody protection at rear



- Position rear underbody protection (1).
- Tighten screws (arrows).

Underbody protection to body

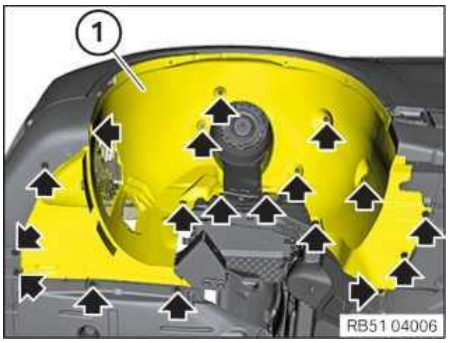
Screw		Tightening torque	3 Nm

80 – Installing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

▸ **Installing the front wheel arch cover**



- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Plastic nut		Tightening torque	2,6 Nm
Screw		Tightening torque	2,6 Nm

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

▸ **Installing front wheel arch trim**

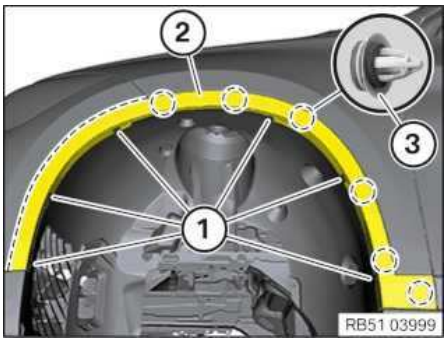
NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

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NOTICE

Description is for left component only. Procedure on the right side is identical.



- Check the clips (3) for damage and renew where required.

  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

81 – Installing both front wheels

▶ Mounting the wheel

▷ Clean the contact surfaces between the brake disc and the wheel rim



TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

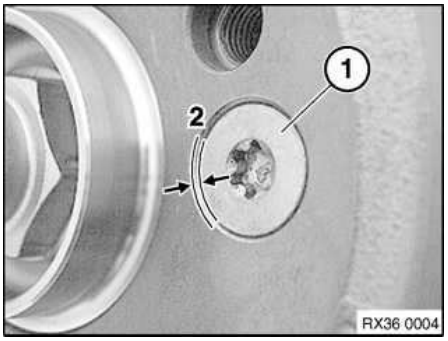
- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue in the area of the wheel bolt holes, remove and clean the brake disc.



- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).



- Renew mounting bolt (1).

  Parts: Mounting bolt
- Check that the mounting bolt (1) for the brake disc is securely seated.

  The mounting bolt (1) for the brake disc may not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

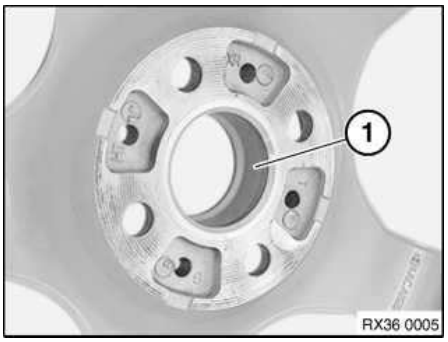
Brake disc to rear wheel hub

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub

M8	Renew screw.	Tightening torque	16 Nm

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- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring (1).

◁



TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

  Parts: Wheel bolts
- Clean the wheel bolts.
- Check the wheel bolts and threads for damage, renew the wheel bolts if necessary.
- Join and tighten the wheel bolts (arrows).

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

Additional Information

Overview of Tightening Torques

Cross connection to carrier support — Used in step 17

Screws M6x20		Tightening torque	11,8 Nm

Screw connection for rubber mount of coolant radiator to coolant radiator — Used in step 17

Bolt to rubber mount		Tightening torque	8 Nm

Air duct to upper connection — Used in step 17

M6x20 screw		Tightening torque	11,8 Nm

Bracing strut to upper connection — Used in step 17

M8x20 screw		Tightening torque	28 Nm

Special tool to cylinder head — Used in step 19

M8		Tightening torque	21,5 Nm

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Flywheel to crankshaft — Used in step 43

M12x1.5	Renew screws.	Tightening torque	120 Nm

Transfer box to transmission — Used in step 44

M10		Tightening torque	56 Nm

Heat shield to transfer box — Used in step 44

M6	Renew screws.	Tightening torque	6 Nm

Oil filler plug on transfer box (VTG) — Used in step 44

M18x1.5		Tightening torque	35 Nm

Holder with rubber mount to front axle support — Used in step 45

M12		Tightening torque	100 Nm

Holder with rubber mount to oil sump — Used in step 45

M12		Tightening torque	100 Nm

Intermediate shaft to transfer box — Used in step 46

M8x35		Tightening torque	19 Nm

Propeller shaft to transfer box — Used in step 47

		Tightening torque	80 Nm

Flexible disc to rear axle final drive — Used in step 47

M12x1.5	Renew screws.	Tightening torque	55 Nm 90 °

Centre mount to body — Used in step 47

M8		Tightening torque	19 Nm

Heat shield to body — Used in step 48 49

Bolts/nut		Tightening torque	3 Nm

Bracket to body — Used in step 48

M8		Tightening torque	21 Nm

Exhaust system to body — Used in step 50

M8	Replace nuts.	Tightening torque	19 Nm

Exhaust bracket on body — Used in step 50

Hexagon screw M8x30		Tightening torque	19 Nm

V-clip to catalytic converter — Used in step 50

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

Diesel particulate sensor to exhaust system — Used in step 50

Sensor		Tightening torque	50 Nm

Nitrogen oxide sensor downstream of SCR catalytic converter — Used in step 50

Sensor		Tightening torque	50 Nm

Cross-member/torsion strut to axle support and mounting — Used in step 51

M12x48	Renew screws.	Jointing torque Angle of rotation	100 Nm 90 °

Front connection carrier to body — Used in step 52

M10x18		Tightening torque	56 Nm

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Rear connection carrier to body — Used in step 52

M8x18		Tightening torque	28 Nm

Starter motor to transmission — Used in step 55

M8x45		Tightening torque	19 Nm

Battery positive lead to starter — Used in step 55

M8		Tightening torque	13,5 Nm

Rear end of front axle support to body — Used in step 56

M14 screw	Renew screw.	Tightening torque	175 Nm

Front axle support, front to body — Used in step 56

M12 screw	Renew screw.	Tightening torque	108 Nm

Underbody protection to body — Used in step 56 79

Screw		Tightening torque	3 Nm

Track rod end to swivel bearing — Used in step 56

M14	Renew nut.	Tightening torque	175 Nm

Wishbone to swivel bearing — Used in step 56

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

Holder, wishbone rubber mount, to body — Used in step 57

M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °

Holder with rubber mount to front axle support — Used in step 57

M12 screw			100 Nm

Washer fluid reservoir holder to front axle support adapter plate — Used in step 57

		Tightening torque	10 Nm

Deformation element, bottom, to adapter plate, front axle carrier — Used in step 57

		Tightening torque	11,8 Nm

Holder to front axle support — Used in step 58

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

Anti-roll bar link to anti-roll bar — Used in step 60

M10	Renew nut.	Tightening torque	56 Nm

Lower steering shaft to steering gear — Used in step 63

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

Steering column cover to bulkhead — Used in step 63

Plastic nut		Tightening torque	3 Nm

Cross connection on support for cross connection — Used in step 64

M6x20		Tightening torque	12 Nm

Electronics box to battery tray — Used in step 65

M8X16		Tightening torque	15 Nm

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Wiring harness to cylinder head cover — Used in step 65

TS5x20		Tightening torque	3,5 Nm

Cover to electronics box — Used in step 65

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery — Used in step 65

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray — Used in step 65

M8		Tightening torque	19 Nm

Battery terminal rail to battery tray — Used in step 66

M8			19 Nm

Battery terminal with IBS positive battery terminal / negative battery terminal — Used in step 66 67

NutM6			5 Nm

Trailing link — Used in step 66

M8		Tightening torque	19 Nm

Battery cover — Used in step 66

M8			2,8 Nm

Intake silencer housing to lock bridge — Used in step 68

M6X30		Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 68

Clamp		Tightening torque	3 Nm

Intake neck to cross connection — Used in step 69

M6		Tightening torque	8 Nm

Cross-brace to spring strut dome — Used in step 70

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

Cover on body — Used in step 70

Hexagon screw		Tightening torque	3 Nm

Cover of top bulkhead — Used in step 73

Screw		Tightening torque	2,6 Nm

Cover of remote positive terminal — Used in step 73

Screw		Tightening torque	2,6 Nm

Oil filler plug to transmission housing — Used in step 77

M14	Renew the sealing ring.	Tightening torque	45 Nm

Overflow screw in oil drain plug — Used in step 77

M6	Renew the sealing ring.		8 Nm

Underbody protection front — Used in step 78

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

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Wheel arch cover to body — Used in step 80

Plastic nut		Tightening torque	2,6 Nm
Screw		Tightening torque	2,6 Nm

Wheel arch cover to body — Used in step 80

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body — Used in step 80

Plastic nut		Tightening torque	3 Nm

Brake disc to rear wheel hub — Used in step 81

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub — Used in step 81

M8	Renew screw.	Tightening torque	16 Nm

Wheel bolts — Used in step 81

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Overview of Special Tools

2 459 012 Holder

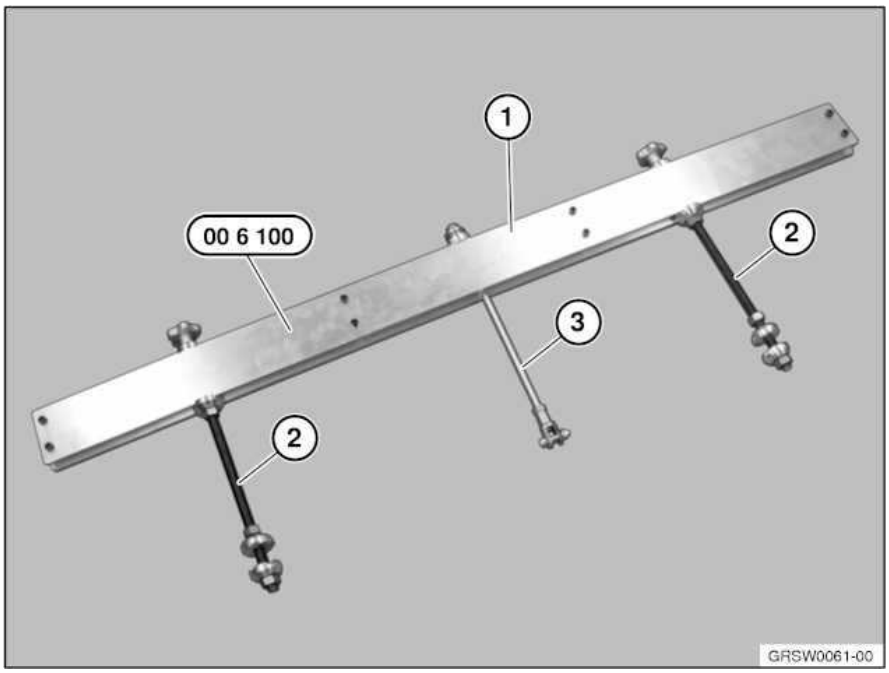


Common — Used in step 19 64

Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

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0 496 852 (00 6 100) Device



Common

Used in step 19

Usage	Engine bridge (device) 006000
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 10 (659)

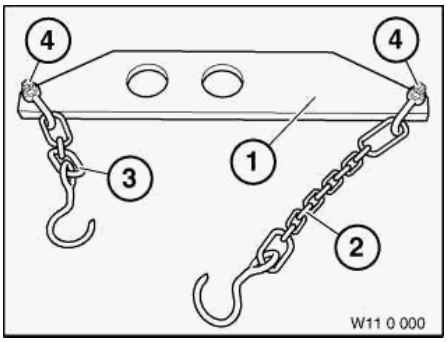
Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
2	2 361 507 (00 6 102)		**Spindle** Set (2 pieces) in connection with 00 6 100.	
3	2 361 506 (00 6 103)		**Spindle** Spindle (central spindle) for Traverse 00 6 100.	

0 490 561 (11 0 000) Lifting gear

Used in step 19

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Common

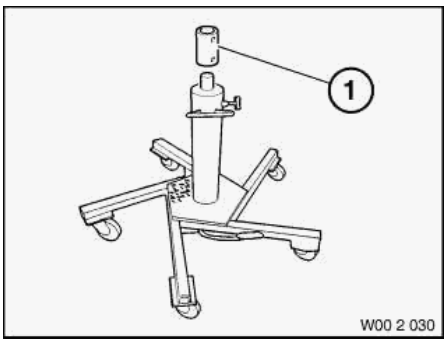
Usage	(Hoisting gear) For removing and installing engines. As of 08/2011 only available as a complete set. Delivered with TÜV inspection certificate and operating instructions. No delivery of separate parts.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 13 94 (888)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
4	0 490 565 (11 0 009)		**Shackle** (Shackle) 2 pieces. As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 562 (11 0 001)		**Lifting gear** (Cross member) As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
2	0 490 563 (11 0 002)		**Chain** (Chain) Version: long As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
3	0 490 564 (11 0 003)		**Chain** (Chain) Version: short As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	

Used in step 28 41 56

0 490 133 (00 2 030) Device



Common

Usage	(universal hydraulic lifter base unit) Chassis and hydraulic lifter - For removing and installing rear axle supports and gearboxes. Also for soft top mounts. Is replaced by 81 22 2 219 012
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 90 (207)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 490 134 (00 2 031)		**Adapter** (adapter for gearbox holder) Model series: E30, E31, E32, E34, E36	

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0 495 554 (33 5 070) Extension



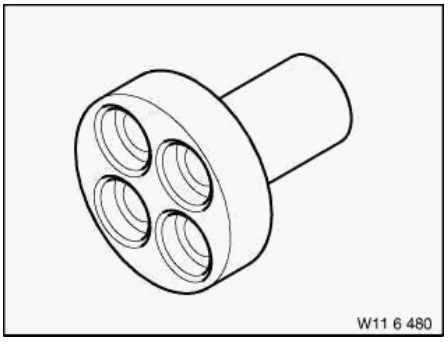
Common Used in step 37 47

Usage	Pull-out extension for 33 5 040, 33 5 050, 33 5 060.
Included in the tool or work	
Storage location	A18
Replaced by	
In connection with	
SI-Number	01 21 06 (300)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 592 (33 5 071)		**Extension** (Extension (1 item)) discontinued, can only be ordered using complete tool	

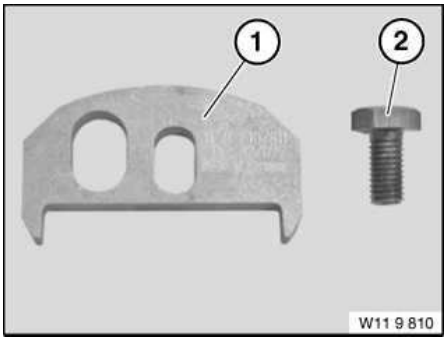
0 493 380 (11 6 480) Connector



Common Used in step 41

Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

0 496 171 (11 9 811) Holder



Common Used in step 42 43

Usage	Available only as a complete tool set 11 9 810 (83 30 0 496 170) - as of 13.01.12
Included in the tool or work	0 496 170
Storage location	C86
Replaced by	
In connection with	
SI-Number	01 07 07 (355)

0 494 793 (11 9 265) Bush



Common Used in step 42 43

Usage	
Included in the tool or work	0 493 938
Storage location	A44
Replaced by	
In connection with	
SI-Number	

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2 285 058 Tool set



Common	Used in step 43
Usage	
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 02 14 (069)

2 409 025 Puller



Common	Used in step 44
Usage	For disassembly of the outer radial shaft seal of the transmission output shaft, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A76
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 411 739 Puller



Common	Used in step 44
Usage	For disassembly of the inner radial shaft seal of the output, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C78
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 408 152 Striking element



Common	Used in step 44
Usage	For installation of the right radial shaft seal transmission output shaft (inner). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

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2 413 037 Handle



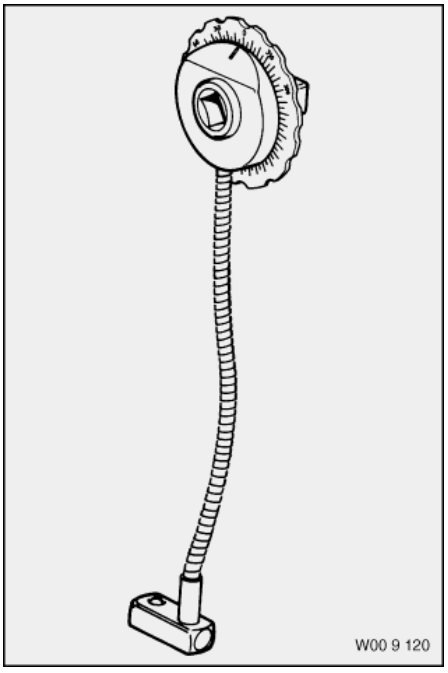
Common	Used in step 44
Usage	Universal drift handle. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C77
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 408 150 Striking element



Common	Used in step 44
Usage	For installing the right radial shaft seal transmission output shaft (outer). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

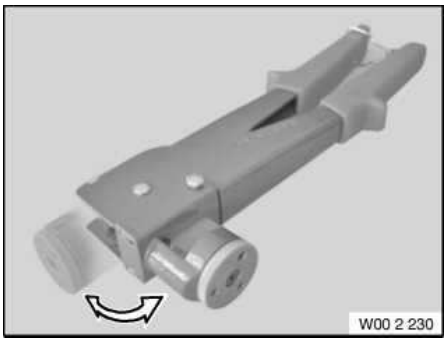
0 490 504 (00 9 120) Torque angle measuring dial



Common	Used in step 47
Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

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0 496 521 (00 2 230) Pliers



Common	Used in step 80
Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

2 344 011 Tool



Common	Used in step 81
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

0 495 221 (36 1 323) Wheel stud



Common	Used in step 21
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud



Common	Used in step 21
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud



Common	Used in step 21
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 226 (36 1 328) Wheel stud



Common	Used in step 21
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud



Common	Used in step 21
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud



Common	Used in step 21
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 229 (36 1 332) Wheel stud



Common	Used in step 21
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud



Common	Used in step 21
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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Overview Technical Data

Screw-in depth of thread cutter	Used in step 43
Screw-in depth	18 mm

Links

General repair instructions	Used in step
61 20 ... Notes on AGM battery	67
61 12 ... Notes on intelligent battery sensor (IBS)	67
61 00 ... Notes for disconnecting and connecting battery	67

Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	10 41
61 13 ... Unlocking and disconnecting different plug connections	41
17 00 008 Draining and topping up coolant for high-temperature circuit	76
17 00 008 Draining and topping up coolant for high-temperature circuit	76
17 00 008 Draining and topping up coolant for high-temperature circuit	76
17 00 039 Bleed the cooling system and check it for watertightness with the special tool

17 00 008 Draining and topping up the high-temperature coolant circuit 76

17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures) 76

17 00 039 Bleed the cooling system and check it for watertightness with the special tool 76

17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures) 76

17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures) 76

17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures) 76

Operating materials	Used in step
14.0 Automatic transmission fluid for ZF-transmission GA8HP45Z / GA8HP50Z / GA8HP70Z / GA8HP90Z / GA8P70H / GA8P75H / GA8HP75Z	77
2.0 Grease for wheel centring	81

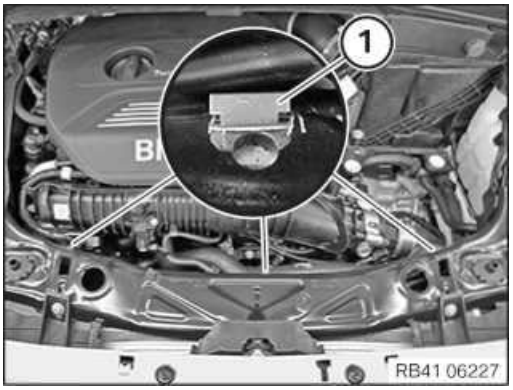
Operating materials	Used in step

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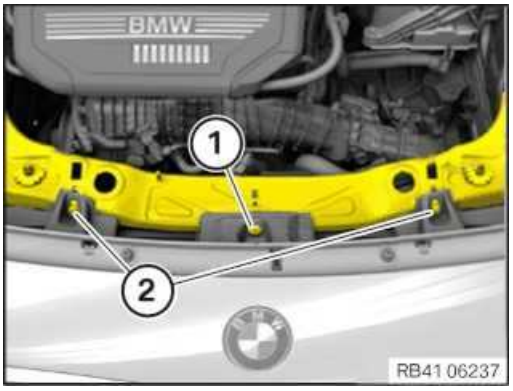
11 23 010 Removing and installing/replacing vibration damper

PRELIMINARY WORK

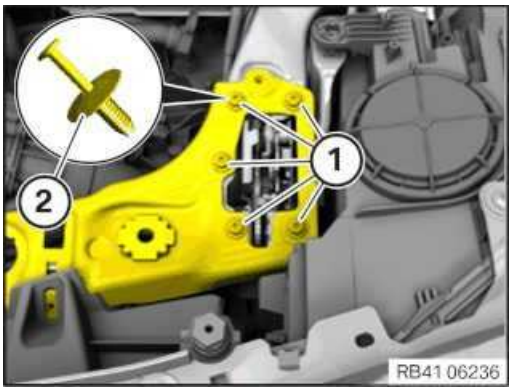
1 – Remove front cross connection



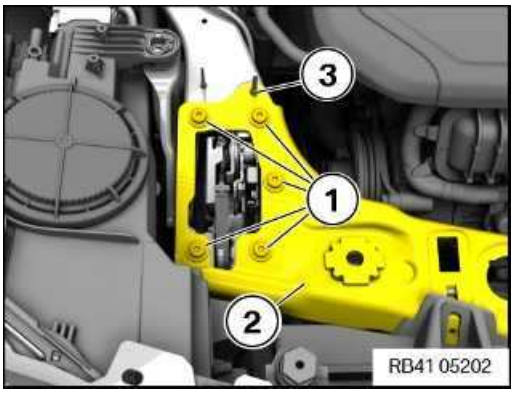
- Detach the clamps (1) for the Bowden cable of the bonnet locks from the cross connection.



- Loosen screw (1).
- Loosen screws (2).



- Loosen screws (1).
- Lever out expanding rivet (2).



- Loosen screws (1).
- Unclip the front cross connection (2) from the rubber retainer (3) and remove it upward.

2 – Remove front right wheel

TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

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TECHNICAL INFORMATION

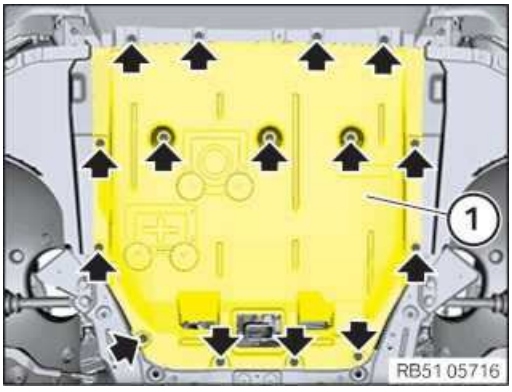
Strictly observe the specified procedure to prevent clamping errors and imbalance.



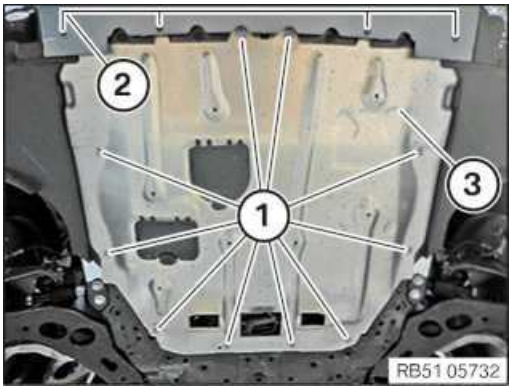
- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

3 – Removing the front underbody protection



- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.



- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

4 – Removing the front right wheel arch cover

▶ **Remove the front wheel arch trim**

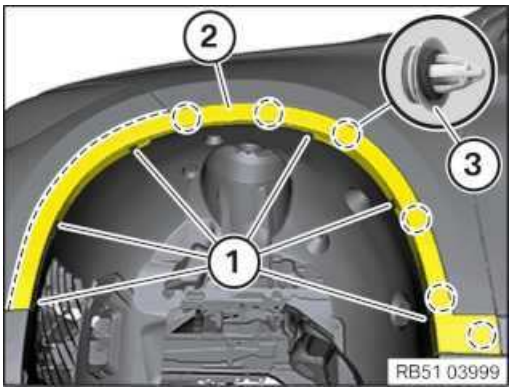
NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

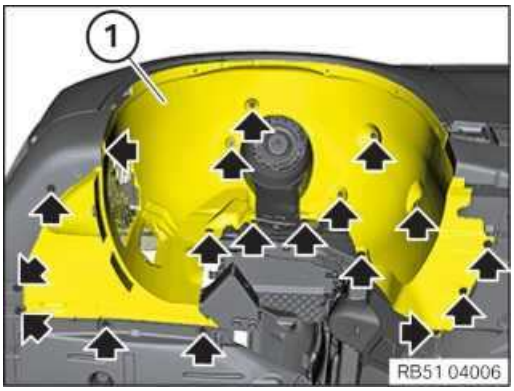
NOTICE

Description is for left component only. Procedure on the right side is identical.

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- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.



NOTICE

Description is for left component only. Procedure on the right side is identical.

- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

5 – Removing the drive belt for alternator

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

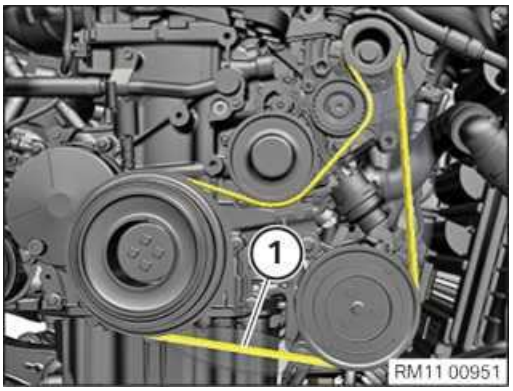
TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

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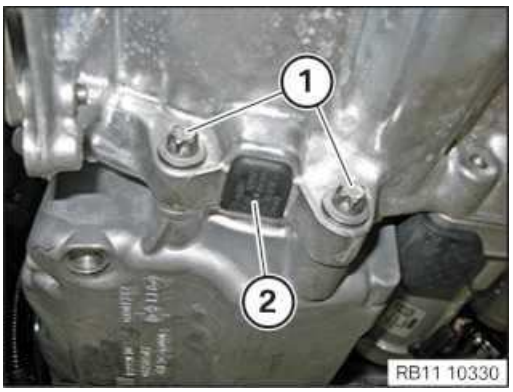
- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool **0 496 268 (11 0 390)**.



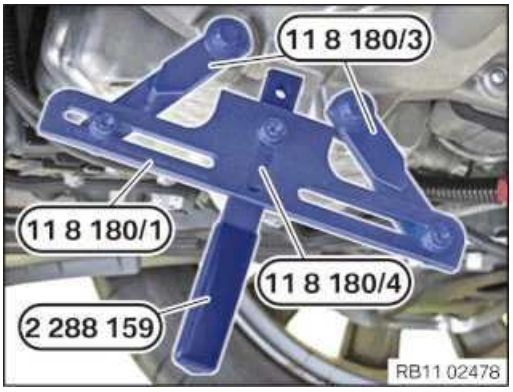
- Guide out the drive belt for the alternator (1) and remove it.

MAIN WORK

6 – Removing the vibration damper

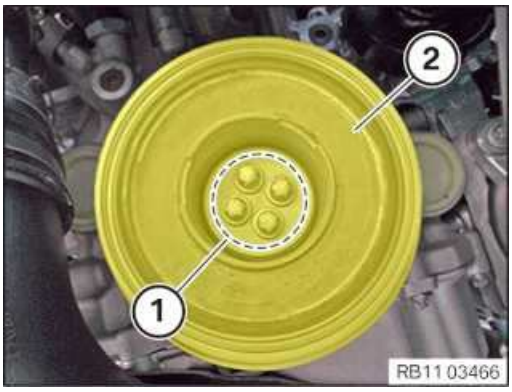


- Release the transmission bolts (1).
- Remove the protective cap (2).



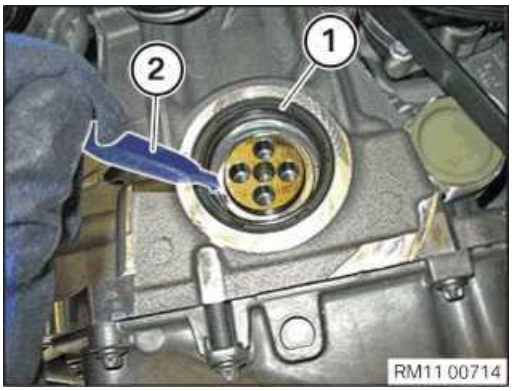
- Position special tool **0 493 587 (11 8 180)** as illustrated.
- Fasten the special tool **0 493 587 (11 8 180)** to the transmission with transmission bolts.

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- Loosen screws in the area (1).
- Remove the vibration damper (2).

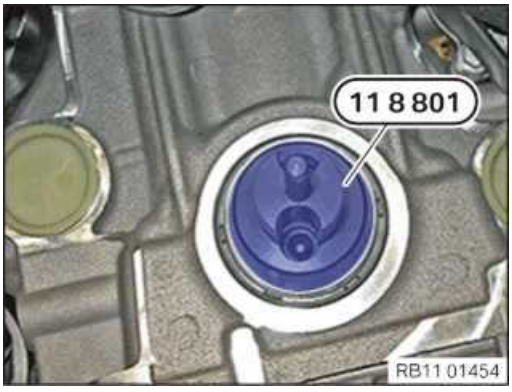
7 – Remove the crankshaft seal



- Lift the crankshaft sealing ring (1) with the special tool (2) **2 298 505**.

  Do not scratch the sealing surface on the engine block.

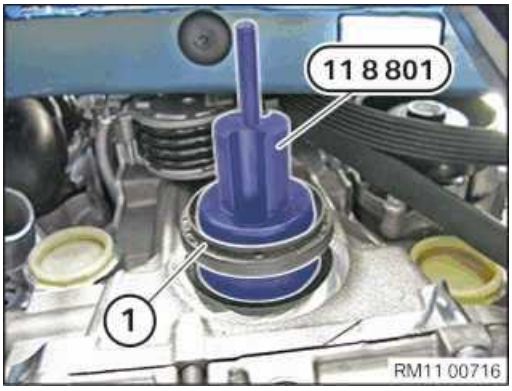
8 – Install the crankshaft seal



TECHNICAL INFORMATION

The radial shaft seal must be installed dry. Do not use engine oil or lubricant.

- Secure special tool **0 496 128 (11 8 801)** with special tool **0 496 129 (11 8 802)** to the crankshaft.



- Renew the crankshaft sealing ring (1).

  Parts: Crankshaft seal
- Position the crankshaft seal (1) on the special tool **0 496 128 (11 8 801)**.



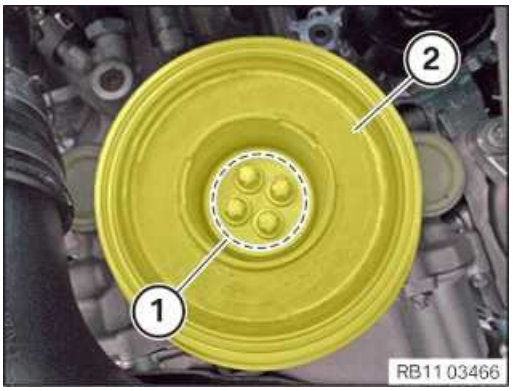
- Draw in the crankshaft sealing ring with the special tools **0 496 130 (11 8 803)** and **0 496 131 (11 8 804)**.
- Screw in special tool **0 496 130 (11 8 803)** until it is flush with the crankcase.
- Remove special tools **0 496 130 (11 8 803)** and **0 496 131 (11 8 804)**.

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- Remove special tool **0 496 128 (11 8 801)**.

9 – Installing the vibration damper

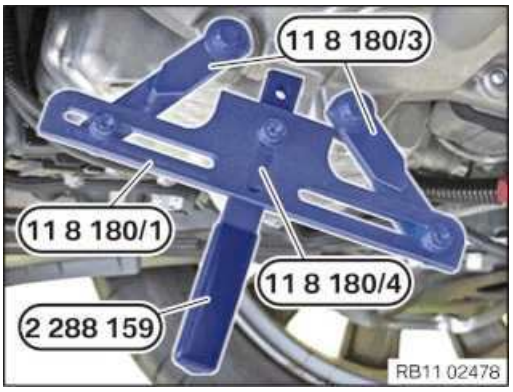


- Position vibration damper (2).
- Renew screws (1).

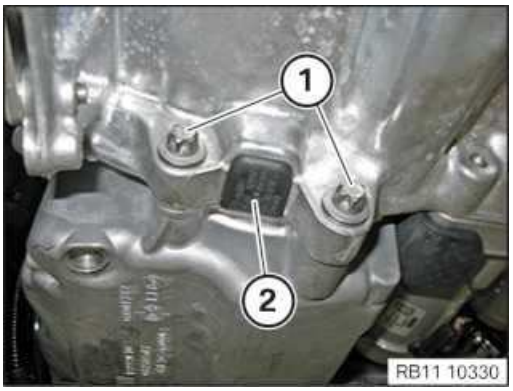
  Parts: Bolts
- Fasten the vibration damper (2) with the bolts (1).
- Tighten the screws (1).

Vibration damper with belt pulley to crankshaft

M10x65	Renew screws. Tighten screws crosswise.	1. Jointing torque 2. Angle of rotation	40 Nm 60 °
		3. Angle of rotation	60 °



- Release the transmission bolts and remove the special tool **0 493 587 (11 8 180)**.



- Tighten transmission screws (1).

Transmission to engine

M8		Tightening torque	19 Nm

- Install protective cap (2).

POSTPROCESSES

10 – Installing the drive belt for alternator

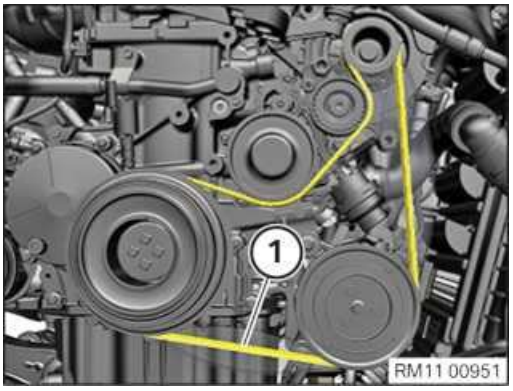
TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

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TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.



- Feed in the drive belt for the alternator (1) and install it.

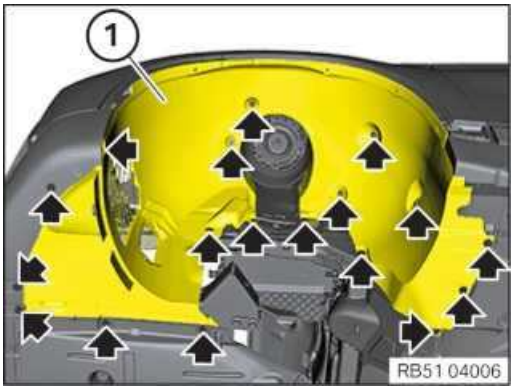


- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool **0 496 268 (11 0 390)** out of the belt tensioner and remove it.

11 – Installing the front right wheel arch cover

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

▸ **Installing front wheel arch trim**

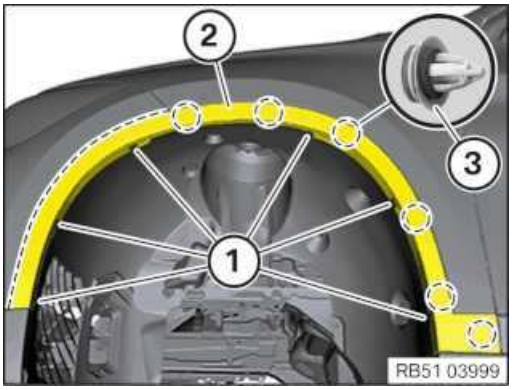
NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

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NOTICE

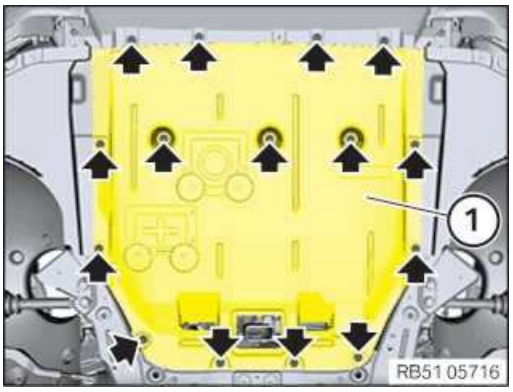
Description is for left component only. Procedure on the right side is identical.



- Check the clips (3) for damage and renew where required.

  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

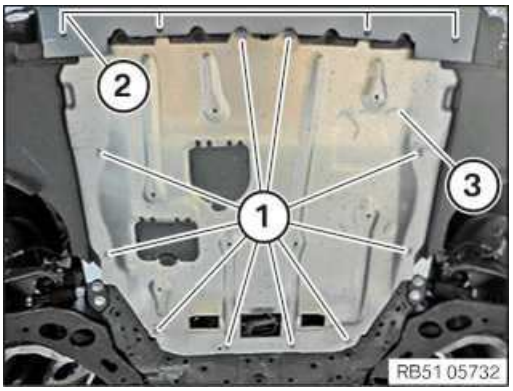
12 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm



- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

13 – Installing the front right wheel

▸ **Clean the contact surfaces between the brake disc and the wheel rim**

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TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

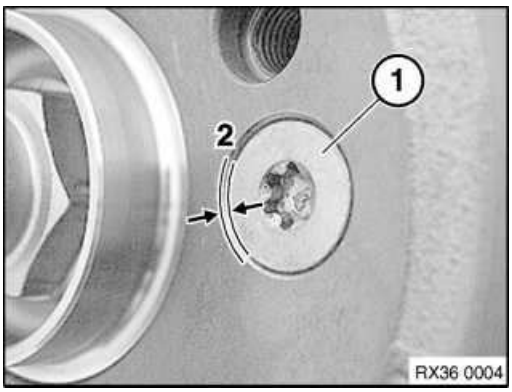
- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.



- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

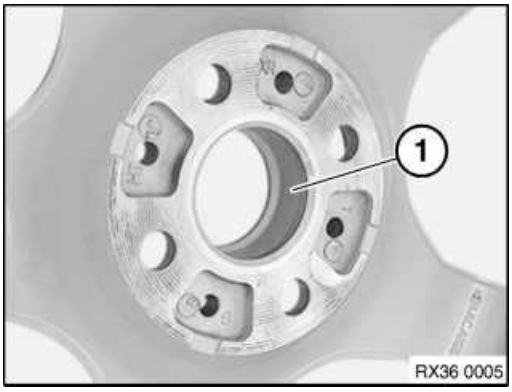


- Check the mounting bolt for the brake disc (1) for secure fit.

  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

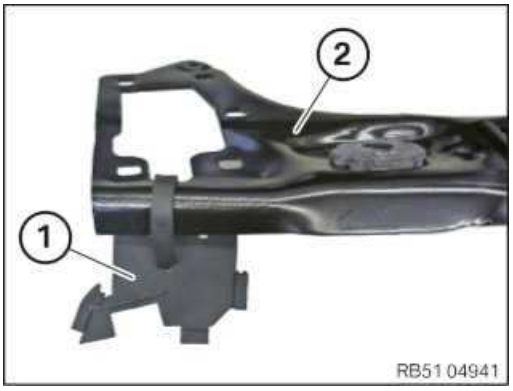
  Parts: Wheel bolts
- Clean the wheel bolts and check the threads for damage. Renew the wheel bolts as needed.
- Mount wheel bolts and tighten.

Wheel bolts

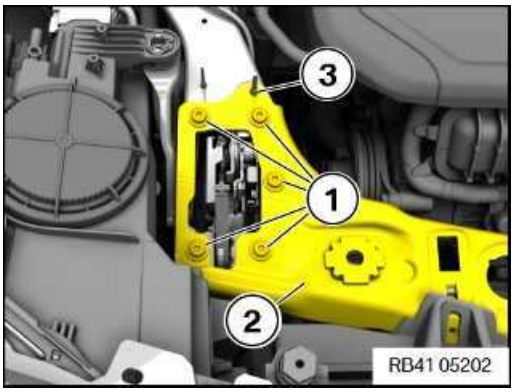
M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

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14 – Install front cross connection



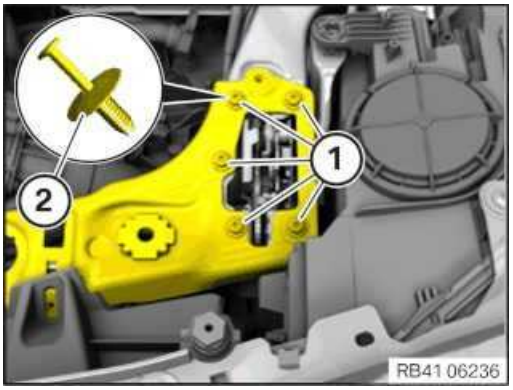
- Right side of vehicle only: Secure spray guard (1) on the cross connection (2) as pictured.



- Position front cross connection (2) and clip front cross connection (2) into the rubber retainer (3) at the same time.
- Tighten the screws (1).

Cross connection to carrier support

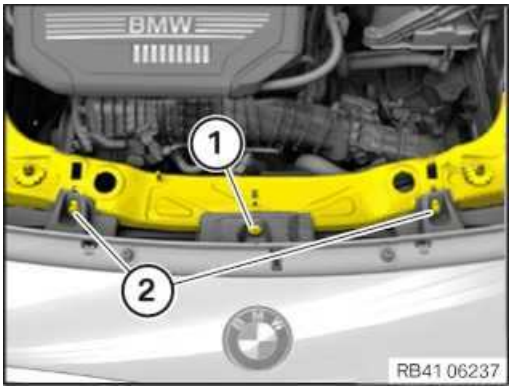
Screws M6x20		Tightening torque	11,8 Nm



- Tighten the screws (1).

Cross connection to carrier support

Screws M6x20		Tightening torque	11,8 Nm



- Position screws (3) on the rubber mounts for the radiator and tighten.

Screw connection for rubber mount of coolant radiator to coolant radiator

Bolt to rubber mount		Tightening torque	8 Nm

- Tighten down screws (2).

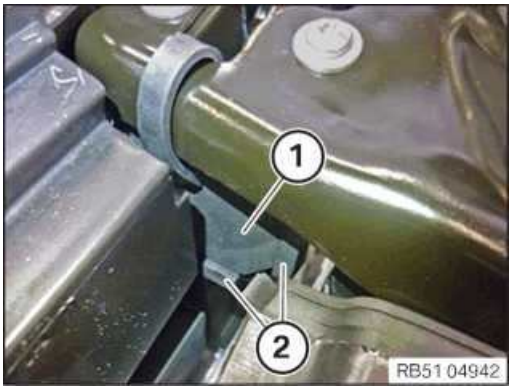
Air duct to upper connection

M6x20 screw		Tightening torque	11,8 Nm

- Tighten down screw (1).

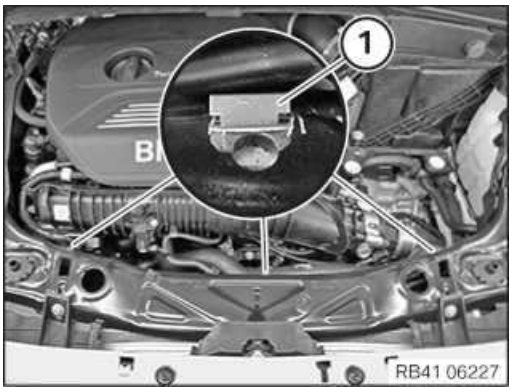
Bracing strut to upper connection

M8x20 screw		Tightening torque	28 Nm



- Right side of vehicle only: Properly mount spray guard (1) to prevent corrosion.
- Secure spray guard (1) to the bridge with retaining tabs (2).

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- Fasten the clamps (1) from the Bowden cable of the bonnet lock on the cross connection.

Additional Information

Overview of Tightening Torques

Vibration damper with belt pulley to crankshaft — Used in step 9

M10x65	Renew screws. Tighten screws crosswise.	1. Jointing torque 2. Angle of rotation 3. Angle of rotation	40 Nm 60 ° 60 °

Transmission to engine — Used in step 9

M8		Tightening torque	19 Nm

Wheel arch cover to body — Used in step 11

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body — Used in step 11

Plastic nut		Tightening torque	3 Nm

Underbody protection front — Used in step 12

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Brake disc to front wheel hub — Used in step 13

M8	Renew screw.		16 Nm

Wheel bolts — Used in step 13

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Cross connection to carrier support — Used in step 14

Screws M6x20		Tightening torque	11,8 Nm

Screw connection for rubber mount of coolant radiator to coolant radiator — Used in step 14

Bolt to rubber mount		Tightening torque	8 Nm

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Air duct to upper connection

Used in step 14

M6x20 screw		Tightening torque	11,8 Nm

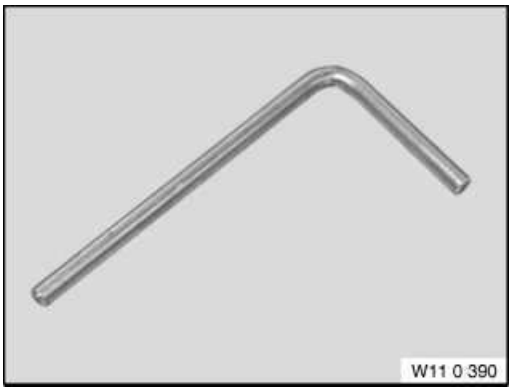
Bracing strut to upper connection

Used in step 14

M8x20 screw		Tightening torque	28 Nm

Overview of Special Tools

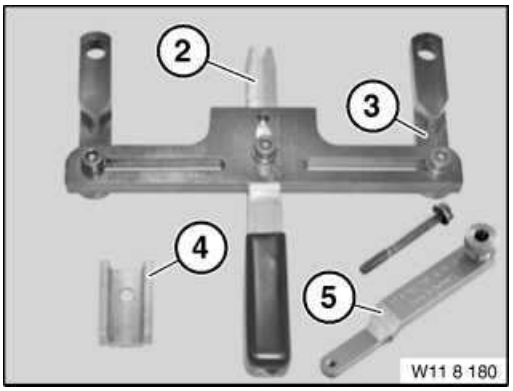
0 496 268 (11 0 390) Pin



Common Used in step 5 10

Usage	(roll pin) For securing new tensioning pulley (poly-V belt)
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 15 07 (390)

0 493 587 (11 8 180) Holder



Common Used in step 6 9

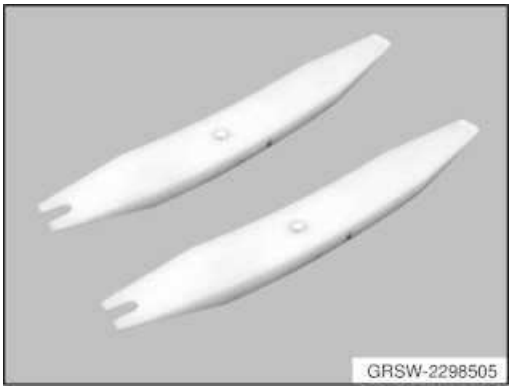
Usage	(Counter support) Blocking flywheel when releasing and tightening down central bolts on vibration absorber
Included in the tool or work	
Storage location	B45
Replaced by	
In connection with	
SI-Number	01 12 99 (452)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
2	0 494 433 (11 8 182)		**Shaped part** (shaped part)	
5	0 494 716 (11 8 185)		**Adapter** (Adapter with adjusting sleeve) E46 M47TU	
1	0 494 432 (11 8 181)	**0 494 434**	**Basic body** (Basic body) E65/M67, E38/M67 Discontinuation Replaced by 11 8 183 (0 494 434)	
3	0 494 434 (11 8 183)		**Basic body**	
4	0 494 435 (11 8 184)		**Adapter** E65 / M67	

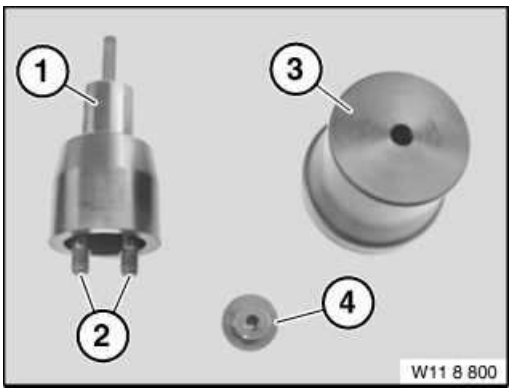
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2 298 505 Wedge



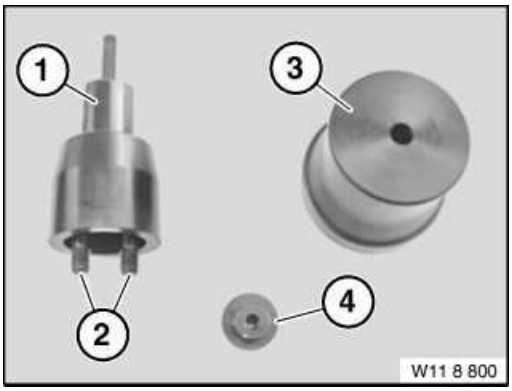
Common	Used in step 7
Usage	Set (delivery of 2 pieces)
Included in the tool or work	
Storage location	C34
Replaced by	
In connection with	
SI-Number	01 03 12 (792)

0 496 128 (11 8 801) Basic body



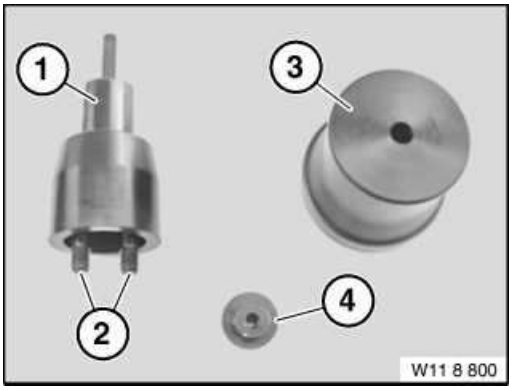
Common	Used in step 8
Usage	Available only as a complete tool set 11 8 800 = 83 30 0 496 127 - as of 30.11.2011
Included in the tool or work	0 496 127
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 129 (11 8 802) Screw



Common	Used in step 8
Usage	(Set of screws) Can only be ordered as part of complete tool 11 9 660 = 0495955
Included in the tool or work	0 496 127
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

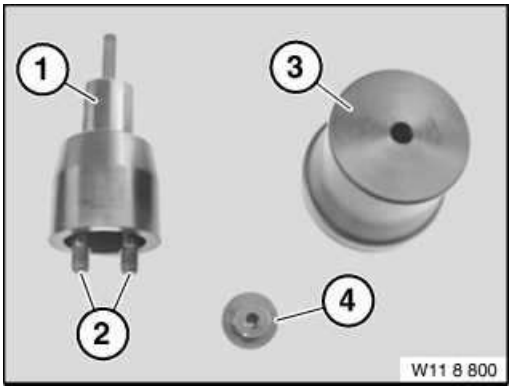
0 496 130 (11 8 803) Holding sleeve



Common	Used in step 8
Usage	(Thrust piece) sale of existing inventory and then available as part of complete tool set 11 8 800 = 83 30 0 496 127 only - as of 30.11.2011
Included in the tool or work	0 496 127
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

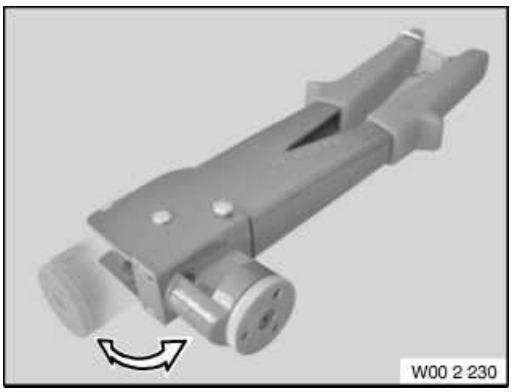
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0 496 131 (11 8 804) Nut



Common	Used in step 8
Usage	(Nut with collar) available as part of set of tools 11 8 800 = 83 30 0 496 127 only - as of 30.11.2011
Included in the tool or work	0 496 127
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 521 (00 2 230) Pliers



Common	Used in step 11
Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

2 344 011 Tool



Common	Used in step 13
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

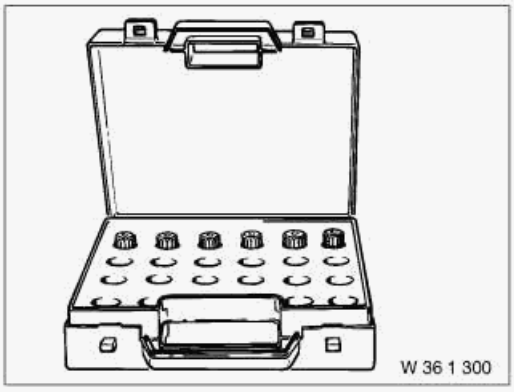
0 495 221 (36 1 323) Wheel stud



Common	Used in step 2
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 224 (36 1 326) Wheel stud



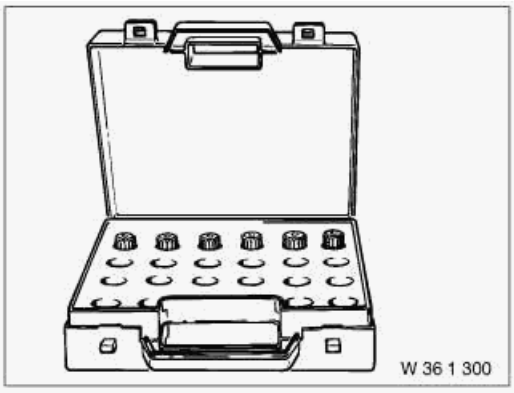
Common	Used in step 2
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud



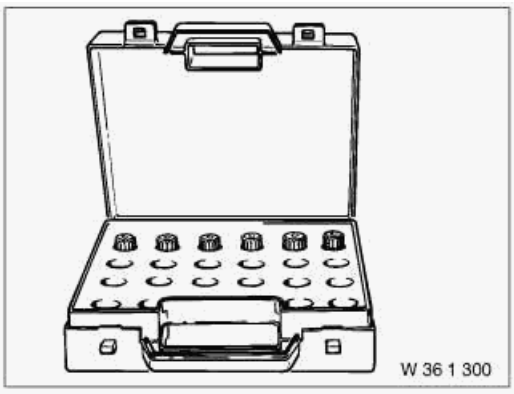
Common	Used in step 2
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud



Common	Used in step 2
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

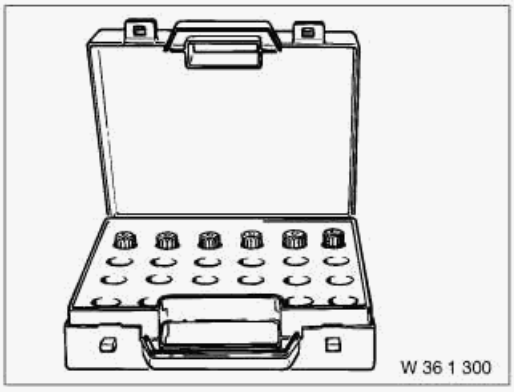
0 495 227 (36 1 329) Wheel stud



Common	Used in step 2
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 228 (36 1 331) Wheel stud



Common	Used in step 2
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 229 (36 1 332) Wheel stud



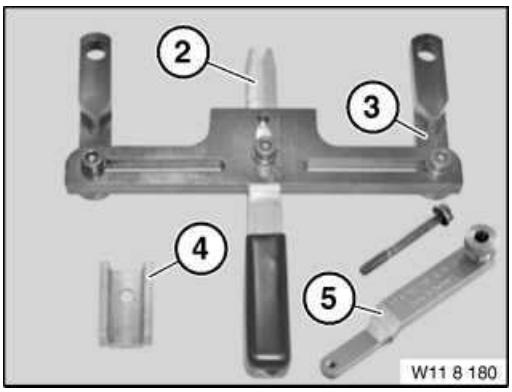
Common	Used in step 2
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud



Common	Used in step 2
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 434 (11 8 183) Basic body



Common	Used in step 6 9
Usage	
Included in the tool or work	0 493 587
Storage location	
Replaced by	
In connection with	
SI-Number	

Links

Operating materials	Used in step
2.0 Grease for wheel centring	13

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11 23 010 Removing and installing/replacing vibration damper (B48AO0)

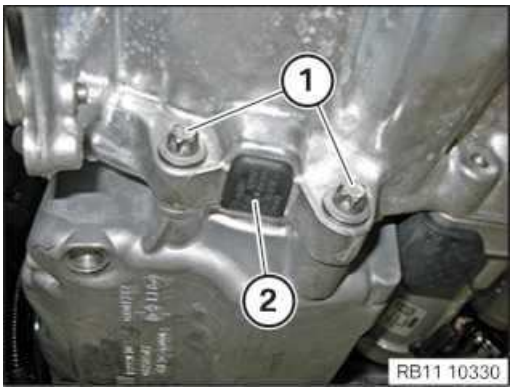
Special tools required:

- 11 8 180
- 2 288 159

Necessary preliminary tasks:

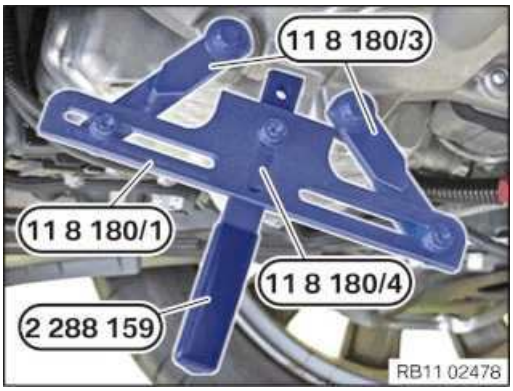
- Release drive belt for alternator

Removal:



Undo the transmission bolts (1).

Remove protective cap (2).



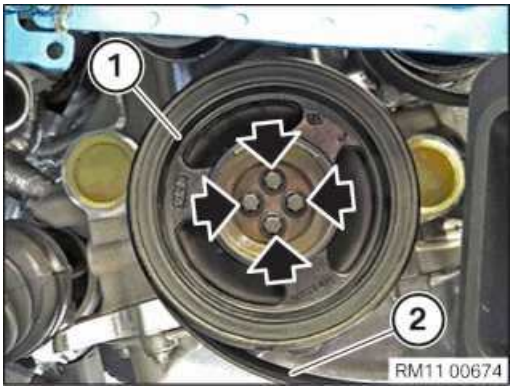
Prepare special tool 11 8 180 /1 with special tool 11 8 180 /3, 11 8 180 /4 and 2 288 159 .

Fix the special tool 11 8 180 with the housing screws.

Slide the special tool 2 288 159 in the gearbox housing and fix the flywheel.

Tighten down all screws.

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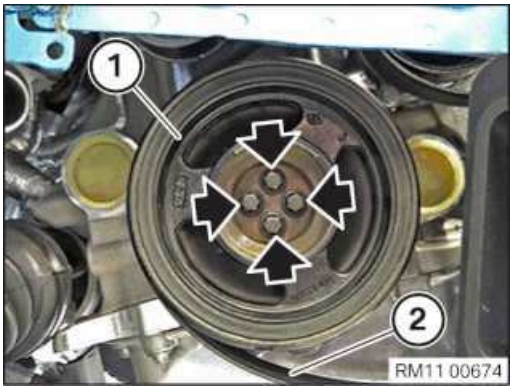


Slacken all screws on the vibration damper (1).
Feed out and remove vibration damper (1) from drive belt.

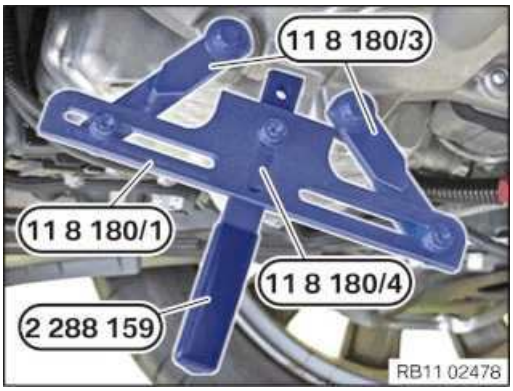
Replacement:

- Replacing front crankshaft seal

Installation:

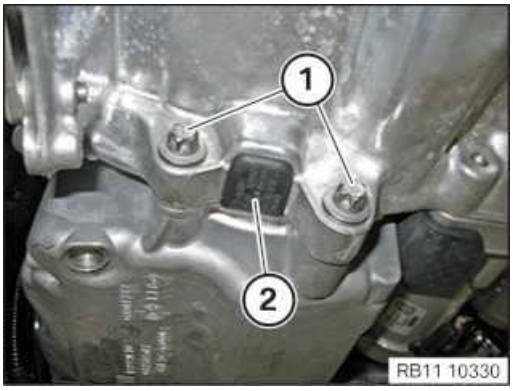


Position vibration damper (1).
Route drive belt (2) properly over the vibration damper.
Tighten down all screws.
Tightening torque 11 23 1AZ.



Undo the Torx screws.
Remove special tool 11 8 180 with 2 288 159 .

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Tighten down Torx screws (1).

Tightening torque 23 00 1AZ.

Mount protective cap (2).

Required reworking:

- Tension drive belt for alternator

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11 24 571 Replace all connecting rod bearings (B47)

Necessary preliminary tasks:

- Removing all pistons

Important!

The connecting rod bearing shells for the connecting rod and the connecting rod bearing cap are **different**.

Dark connecting rod bearing shell must be mounted in connecting rod.

Light connecting rod bearing shell must be mounted in connecting rod bearing cap.

Replace connecting rod bolts.

Removal:



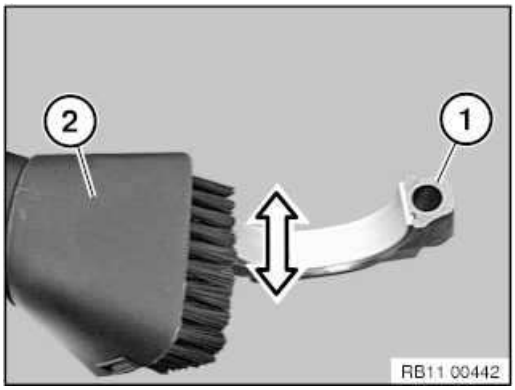
Remove connecting rod bearing (2) from connecting rod (1).



Remove connecting rod bearing (2) from connecting rod bearing cap (1).

Installation:

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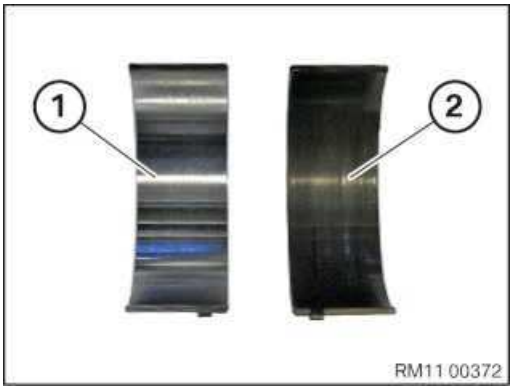


Important!

New connecting rods must be vacuum cleaned prior to installation.

Do not use compressed air to blow off cracked areas.

Use a commercially available vacuum cleaner (2) to vacuum clean cracked areas (1).



One light connecting rod bearing shell (1) and one dark connecting rod bearing shell (2) must be installed per connecting rod.



Clean connecting rod eye (1).

Insert dark connecting rod bearing shell (2) into connecting rod (1).

Oil connecting rod bearing shell (2).



Clean connecting rod bearing cap (1).

Insert light connecting rod bearing shell (2) into connecting rod bearing cap (1).

Oil connecting rod bearing shell (2).

Required follow-up work:

- Install all pistons

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11 25 000 Removing and installing or replacing all pistons (B47)



Special tools required:

- 11 8 860
- 2 318 460
- 11 4 492
- 11 8 140
- 00 2 530



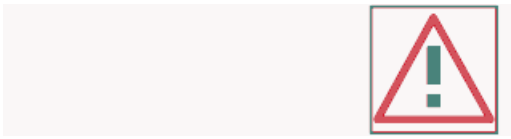
Warning!

Protective goggles must be worn when working on the piston pin circlip.



Necessary preliminary tasks:

- Remove engine with transmission.
- Remove transmission.
- Mount engine on assembly stand.
- Remove cylinder head.
- Remove oil pump with vacuum pump.



Important!

If pistons, connecting rods and connecting rod bearing shells are reused, they must be reinstalled in the same places.

Individual connecting rod replacement is not permitted; they are classified by weight class.

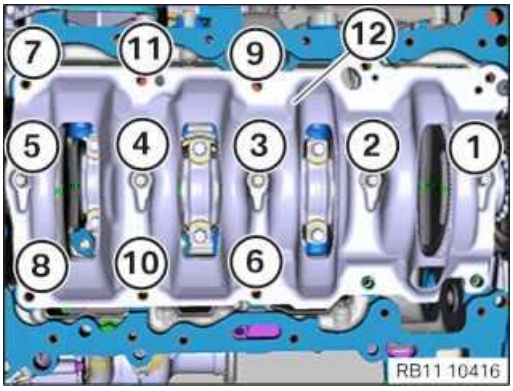
Connecting rods and connecting rod bearing caps are denoted with the same pairing letters. Mixing up the components will result in engine damage.

Piston and gudgeon pins are paired and must not be fitted individually or confused.



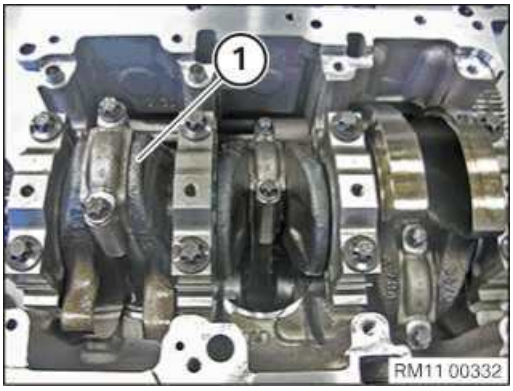
Removal:

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Remove screws in the sequence **11 - 1**.

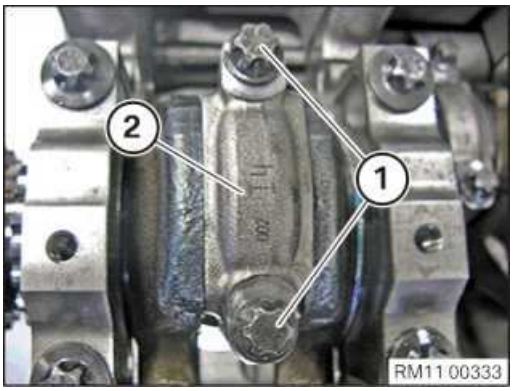
Remove reinforcement (12).



Important!

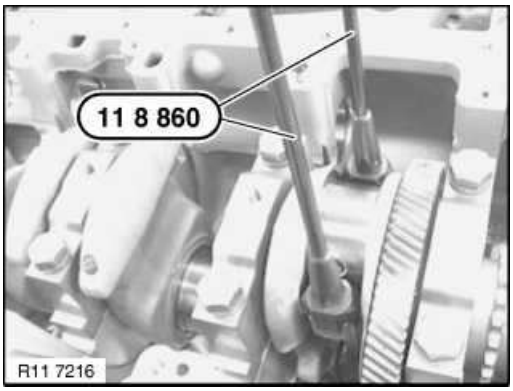
Position crankshaft (1) vertically.

Proceed with care at the cylinder wall and oil spray nozzles **Risk of damage**!



Undo the connecting rod bolt (1).

Remove connecting rod bearing caps (2) and set down in neat order.



Screw special tool 11 8 860 in at large connecting rod eye.

Remove piston and connecting rod.

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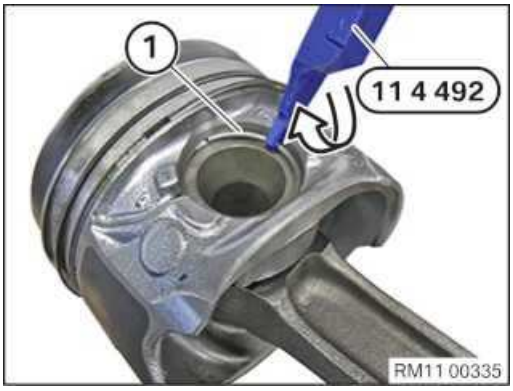


Position piston (1) with connecting rod on special tool 2 318 460 .



Warning!

Safety goggles must be worn for the next operation.



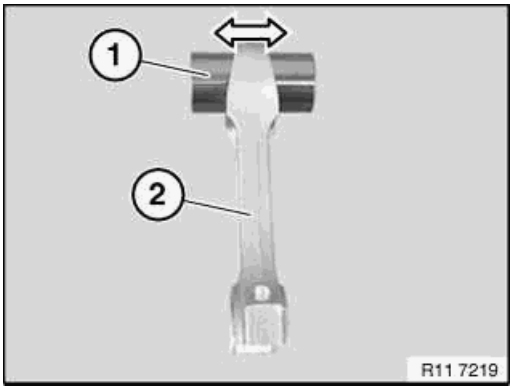
Warning!

Safety goggles must be worn.

Lever out piston circlip (1) with special tool 11 4 492 in direction of arrow.**Important!**

Piston and gudgeon pin are matched to each other.

They must not be mixed up.



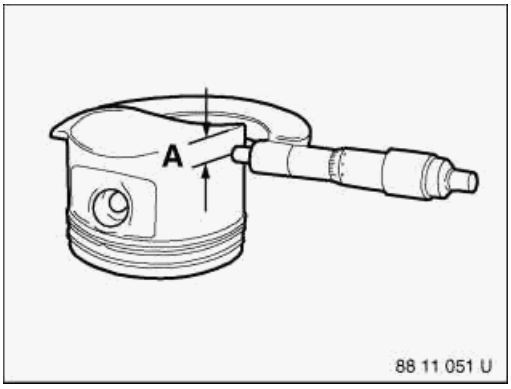
Note:
It must be possible to press gudgeon pin (1) through the bush (small connecting rod eye) with little force; it must not reveal any noticeable play.

Remove gudgeon pin (1) from piston (2) and connecting rod (3).*Note:*
Graphic B48



Installation:

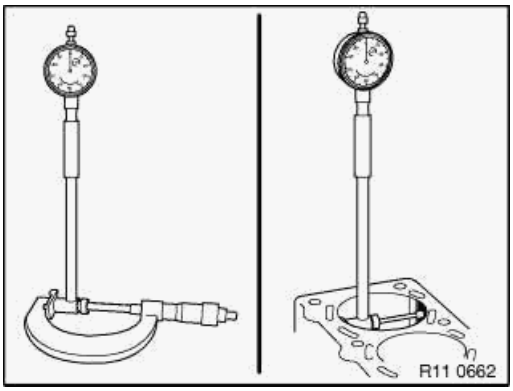
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Before installation, measure piston installation clearance. Measure piston diameter with micrometre screw at measuring point A from lower edge of piston and offset at 90° to the axis of the gudgeon pin.

Distance A,

Refer to Technical Data.



Adjust micrometre screw to cylinder bore of engine block. Set internal measuring device at micrometer screw to zero. Measure bottom, centre and top of cylinder bore in direction of travel and direction of rotation.

Diameter of the cylinder bore,

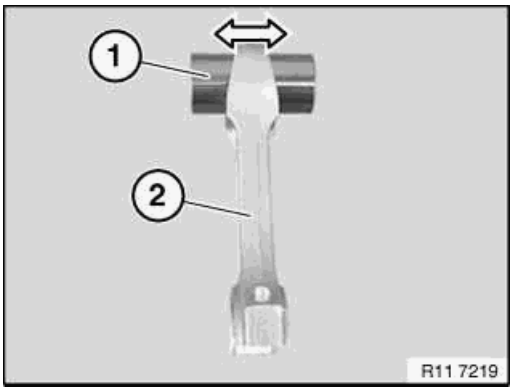
Technical Data.

Piston installation clearance,

Technical Data.

Permitted total wear clearance,

Technical Data.



Clean and oil connecting rod bearing.

If necessary, replace connecting rod bearing.

Note:
It must be possible to press gudgeon pin (1) through the bush (small connecting rod eye) and must not display any significant play.

Install gudgeon pin (1) in piston (2) and connecting rod (3).

Note:
Graphic B48



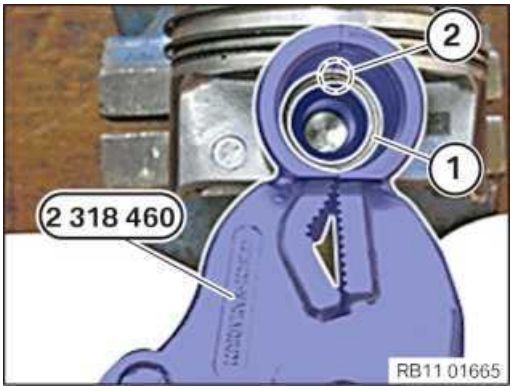
Warning!

Safety goggles must be worn for the next operation.



Pre-tension gudgeon pin circlip (1) in special tool 2 318 460 .

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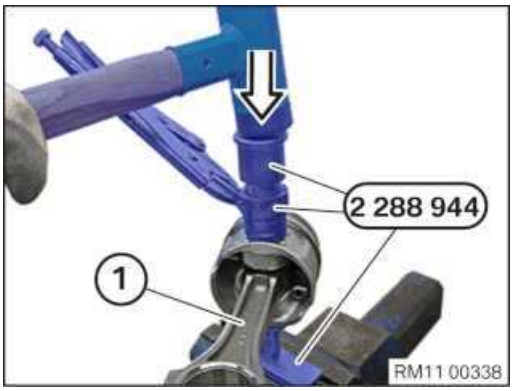


Important!

Insert the circlip (1) in a way that the opening (2) points towards the piston crown.



Note:
Make sure the tool is positioned correctly.



Important!

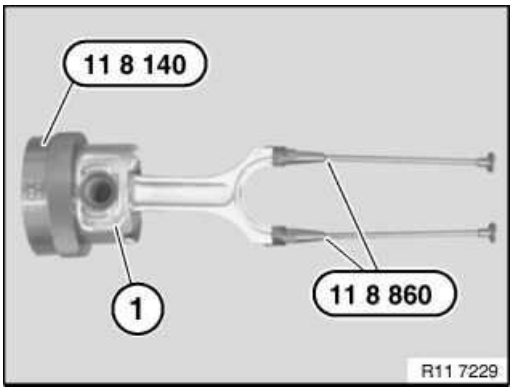
Piston and gudgeon pin are matched to each other.

They must not be mixed up.

Install circlip so that opening is opposite recess.

Insert connecting rod with gudgeon pin into piston.

Drive in gudgeon pin circlip in direction of arrow.



Align contact points of piston rings (offset at approx. 120°, but do not arrange over gudgeon pin boss).

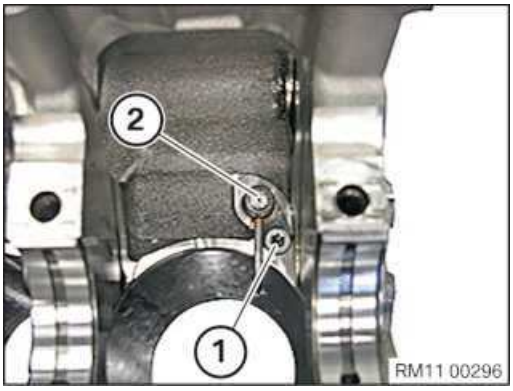
Lightly coat pistons and piston rings with oil.

Prepare piston with piston rings on special tool 11 8 140 .

Screw special tool 11 8 860 on at large connecting rod eye.

Pay attention to the protective edge for the cylinder wall.

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Important!

Oil spray nozzles (2) must not be maladjusted or bent.

A bent oil spray nozzle cannot be adjusted and must be replaced.

Release screw (1) and remove oil spray nozzle (2).



Insert piston (1) with connecting rod in cylinder.

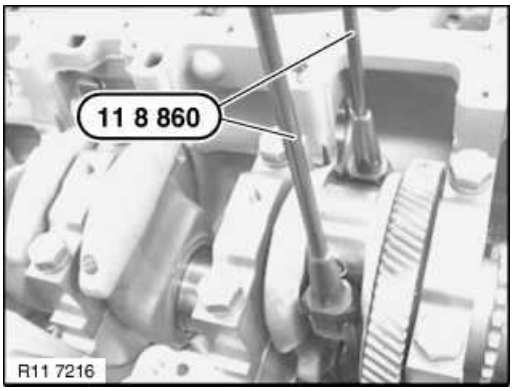
Important!

Risk of piston ring breakage.

Risk of damage to oil spray nozzle.

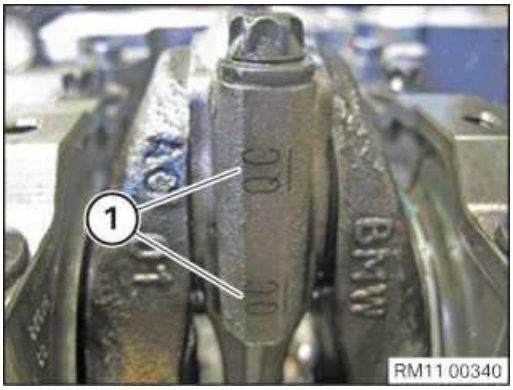
Only press pistons in with finger force - do **not** knock in!

Insert piston so that the arrow points in direction of cylinder 1.



Slide connecting rod eye onto crankshaft.

Remove special tool 11 8 860 from large connecting rod eye.



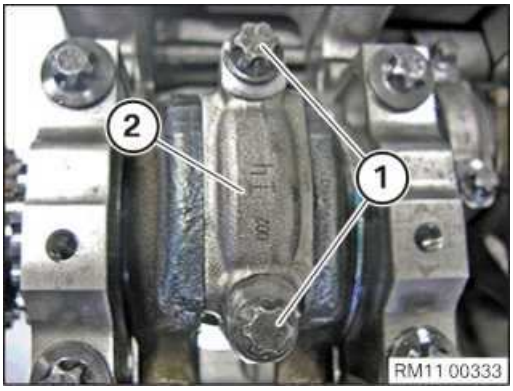
Clean and oil connecting rod bearing.

If necessary, replace connecting rod bearing.

Mount connecting rod bearing caps so that pairing letters (1) match.

Bolt piston (1) with connecting rod to crankshaft.

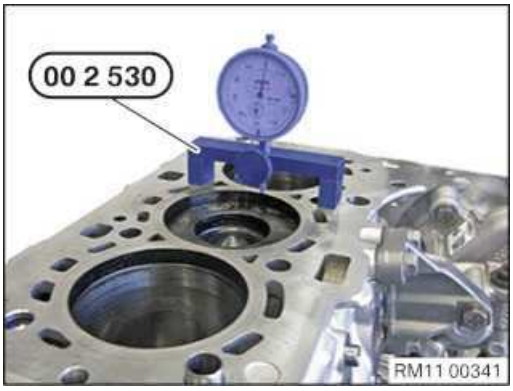
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Parts: Replace connecting rod bolt (1).

Tighten connecting rod bolts (1).

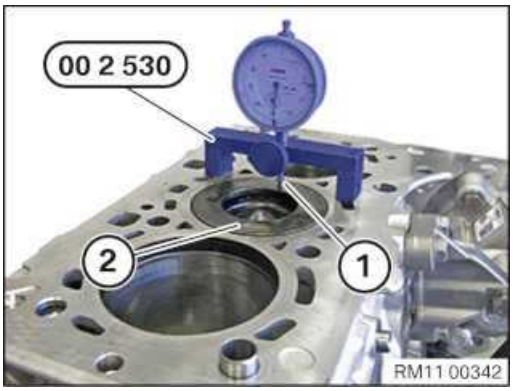
Tightening torque: 11 24 1AZ.



The gasket thickness must be recalculated when repair work is carried out on the crankshaft drive or pistons.

Measuring the **piston protrusion:**

Position dial gauge with measuring fixture special tool 00 2 530 on cleaned engine block sealing surface. Set dial gauge to zero under preload.



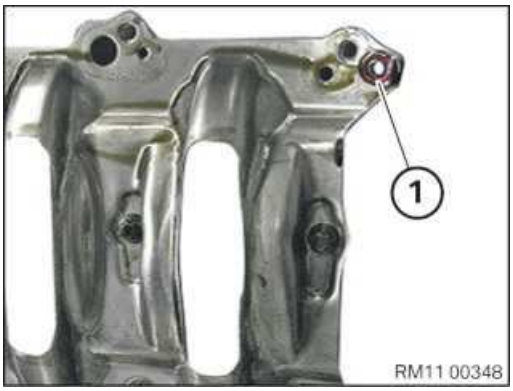
Position piston at TDC.

Clean piston at measuring points (1 and 2).

Position dial gauge at measuring point (1) on piston. Determine highest point by turning crankshaft.

Measure and note down piston protrusion at measuring points (1 and 2) on all pistons.

Determine thickness of cylinder head gasket.

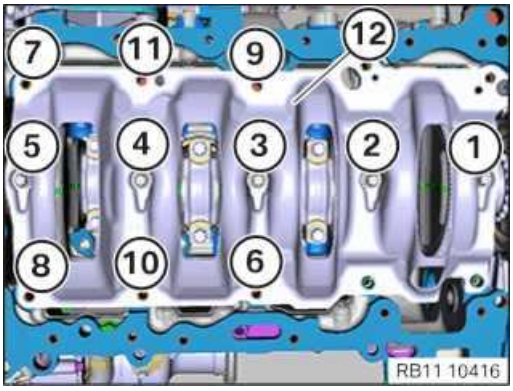


Important!

Sealing ring (1) must not be damaged or missing.

Check centring bushes for damage, replace if necessary.

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Parts:

- Replace reinforcement (12).
- Renew screws (1 - 5).

Install reinforcement (12).

Tighten screws in the sequence **1 - 5**.

Tightening torque: 11 41 3AZ.

Tighten screws in the sequence **6 - 11**.

Tightening torque: 11 41 4AZ.

Required follow-up work:

- Install oil pump with vacuum pump.
- Install cylinder head.
- Remove engine from assembly stand.
- Attach transmission.
- Install engine with transmission.
- Check engine function and leak tightness.

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This documentation refers to special tools that were not yet available when going to press.

11 25 000 Removing and installing/replacing all pistons

PRELIMINARY WORK

1 – Removing engine



- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

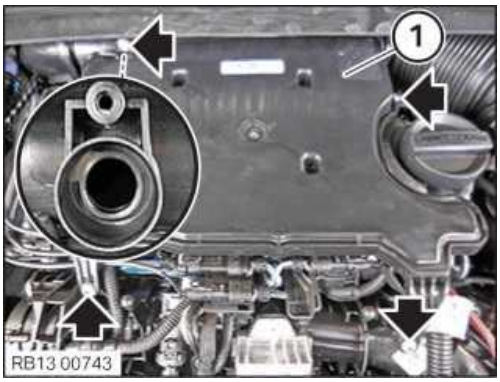
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

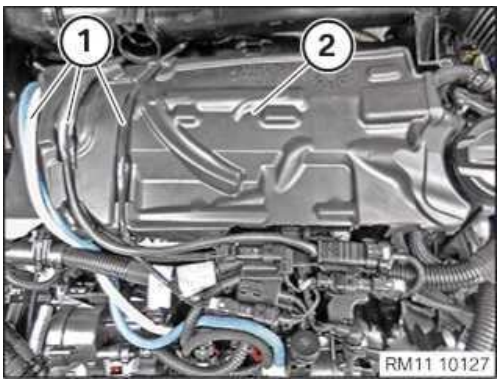
3 – Remove resonator



- Remove screws (arrows).
- Guide out and remove the resonator (1).

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4 – Remove the acoustic cover for the injectors

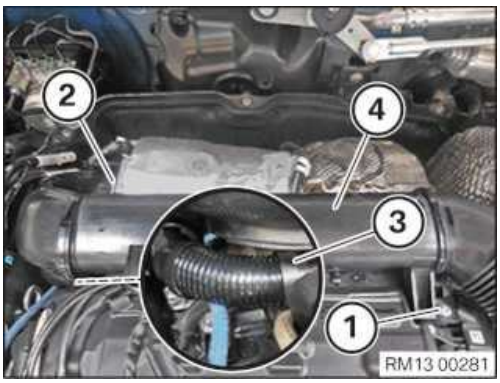


- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

5 – Removing clean air pipe



- Detach clamp (1) on the clean air pipe.
- Pull off the clean air pipe from the intake silencer housing.



- Loosen screw (1).
- Loosen clamp (2).
- Unlock the ventilation line (3) and pull it off the cylinder head cover.
- Feed out clean air pipe and remove.

6 – Remove differential pressure sensor

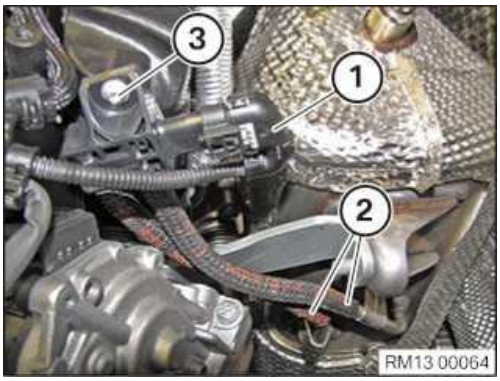
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

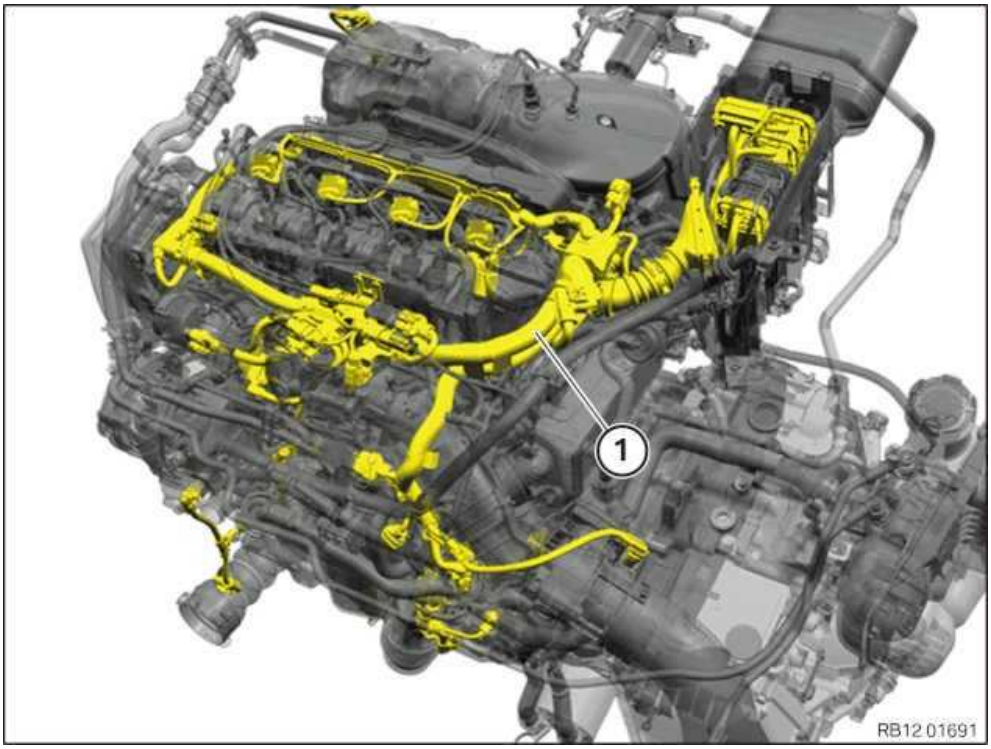
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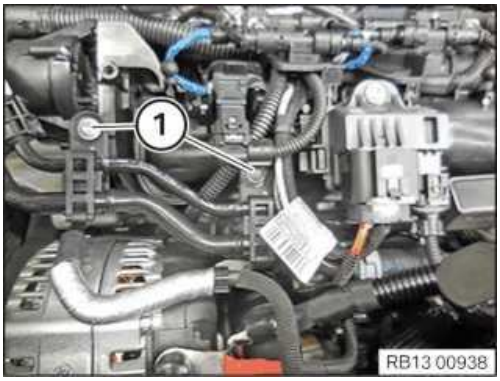
- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

7 – Removing assemblies (on lifting table)

Overview: Wiring harness section for the engine

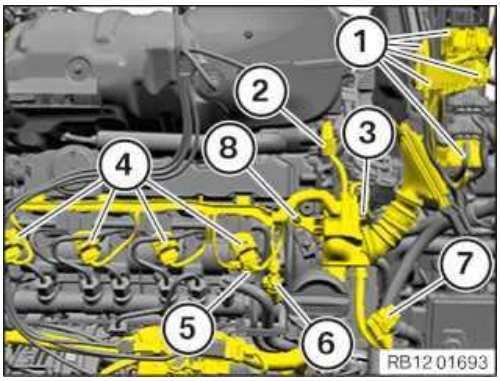


1 Wiring harness section for the engine

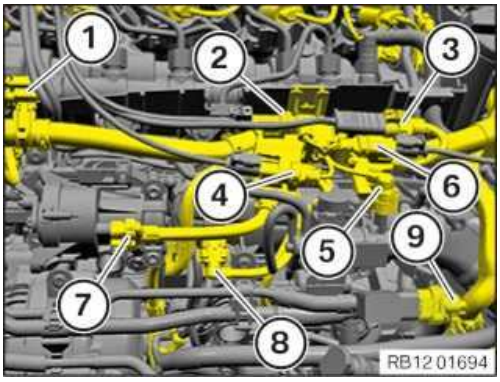


- Loosen screws (1).

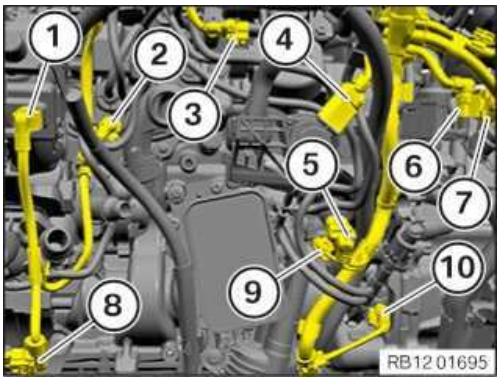
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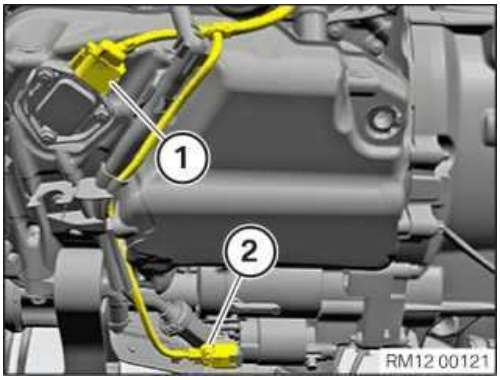
- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock the connector (2) and disconnect it from the differential pressure sensor.
- Unlock the connector (3) and disconnect it from the exhaust-gas recirculation valve.
- Unlock the connector (4) and pull off from the injectors.
- Unlock the connector (5) and disconnect it from the camshaft sensor.
- Unlock the connector (6) and disconnect it from the fuel pressure regulator.
- Unlock connector (7) and pull off from hot film air mass meter.
- Loosen screw (8).



- Unlock connector (1) and pull off from the rail pressure sensor.
- Unlock the connector (2) and disconnect it from the exhaust temperature sensor before the diesel particulate filter.
- Unlock connector (3) and pull it off from the front oxygen sensor.
- Unlock the connector (4) and disconnect it from the exhaust temperature sensor after the diesel particulate filter.
- Unlock and disconnect the connector (5) from the electric changeover valve.
- Unlock the connector (6) and disconnect it from the exhaust temperature sensor for the exhaust-gas recirculation cooler.
- Unlock the connector (7) and disconnect it from the servomotor for the swirl flaps.
- Unlock the connector (8) and pull it off the charging pressure sensor.
- Unlock the connector (9) and disconnect from the fuel pressure and temperature sensor.

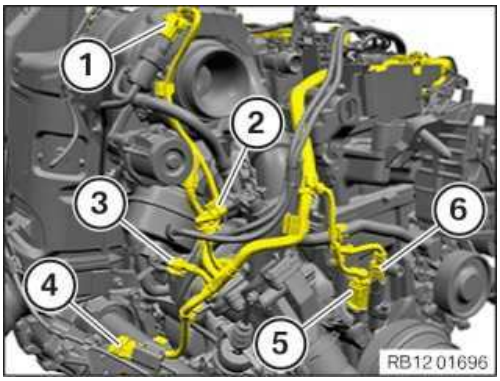


- Unlock and disconnect the connector (1) from the alternator.
- Unlock and disconnect the connector (2) from the electric changeover valve.
- Unlock and disconnect the connector (3) from the electric changeover valve.
- Unlock the connector (4) and pull it off the high pressure pump.
- Unlock the connector (5) and disconnect it from the oil pressure sensor.
- Unlock connector (6) and pull off from throttle body.
- Unlock the connector (7) and disconnect it from the intake air temperature sensor.
- Unlock the connector (8) and disconnect it from the air conditioning compressor.
- Unlock and disconnect the connector (9) from the solenoid valve.
- Unlock the connector (10) and pull it off the crankshaft sensor.



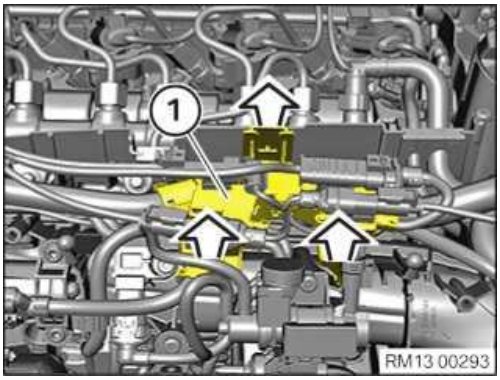
- Unlock the connector (1) and pull off of the oil-level sensor.
- Unlock connector (2) and remove from starter motor.

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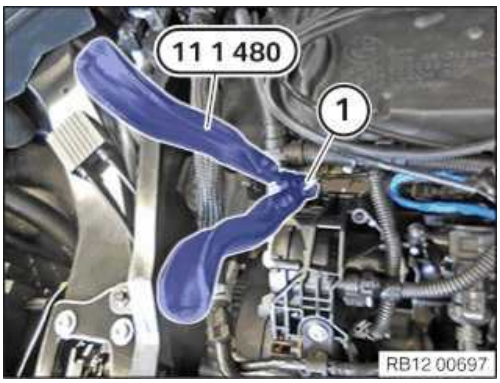


- Unlock the connector (1) and disconnect it from the exhaust gas pressure sensor.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock the connector (3) and pull it off the exhaust turbocharger.
- Unlock the connector (3) and disconnect it from the differential pressure sensor.
- Unlock connector (4) and pull it off from the monitoring oxygen sensor.
- Unlock the connector (5) and pull it off the oil pressure switch .
- Unlock connector (6) and disconnect from switching valve.
- Detach, feed out and remove the wiring harness from the clamps.

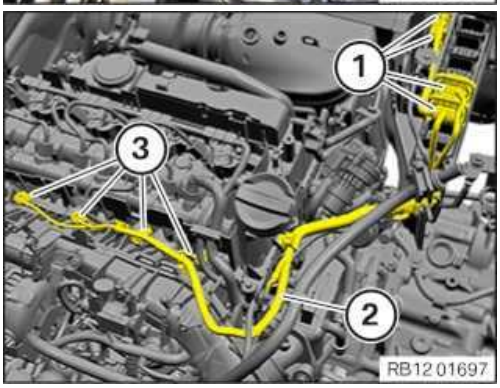
▶ **Removing the cable clips from the intake plenum**



- Detach the cable clip (1) in the direction of the arrow.
- Guide out the cable clip (1) in direction of arrow and set it aside.



- Unlock the connectors (1) of all glow elements with the special tool **0 490 796 (11 1 480)** and release them.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.



- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Pull off all connectors (3) from glow element using special tool **0 490 796 (11 1 480)**.
- Loosen screw (2) and remove the ground strap.
- Detach, feed out and remove the wiring harness from the clamps.

▶ **Removing the drive belt for alternator**

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

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CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

TECHNICAL INFORMATION

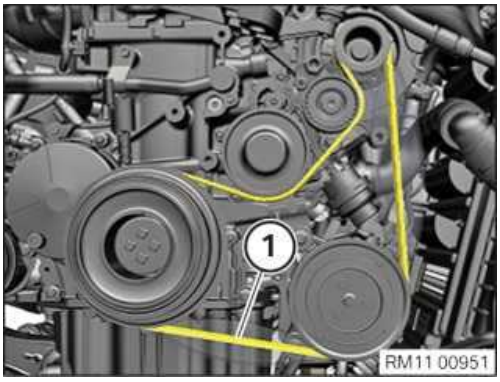
If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

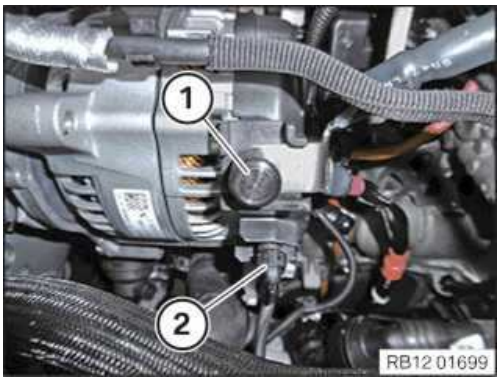
The drive belt must be replaced if contaminated with coolant- and oil residues.



- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool **0 496 268 (11 0 390)**.



- Guide out the drive belt for the alternator (1) and remove it.

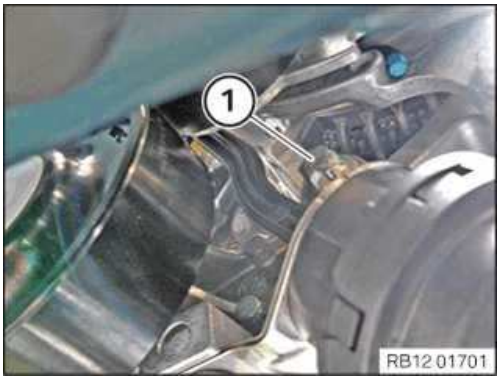


- Remove the cover (1) and loosen the nut below.
- Disconnect positive battery cable from alternator.
- Unlock and disconnect the connector (2) from the alternator.

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- Detach screw (1) on top on the alternator.



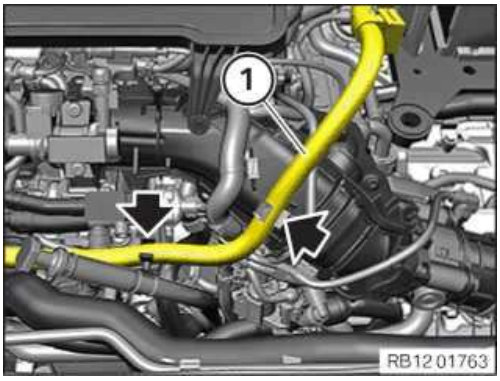
- Detach screw (1) below on the alternator.



- Feed out alternator (1) along with the screw (2) on the bottom of the alternator through the slot on the support and remove.

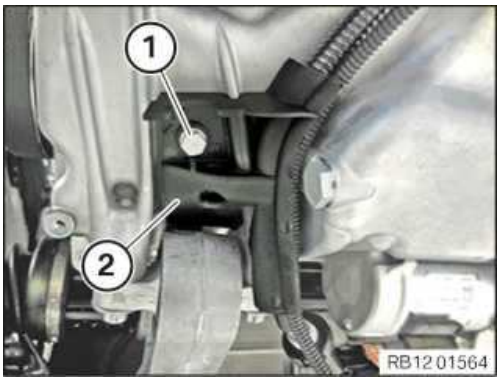


- Loosen screws (1).
- Feed out and remove the air conditioning compressor (2).



- Release the positive battery cable (1) from the clamps (arrows).

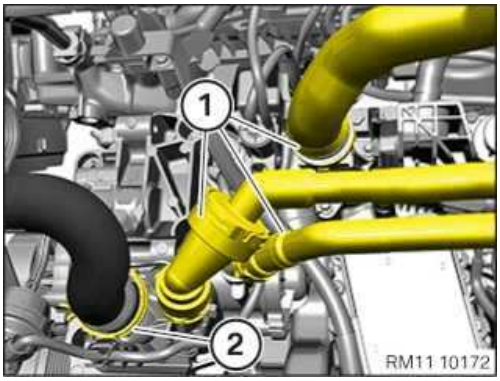
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- Loosen screw (1).
- Guide out and remove holder (2).



- Feed out positive battery cable from the clamps (1) and remove.



- Unlock and disconnect coolant lines (1).
- Guide out the coolant lines (1) and remove it.
- Detach the clamp (2).
- Guide the coolant hose out and remove.

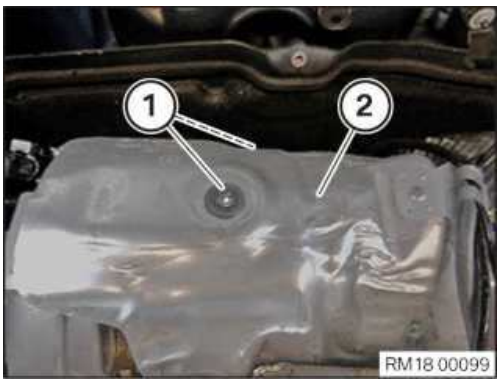
▶ **Removing heat shield from top exhaust turbocharger**

WARNING

Hot surfaces.

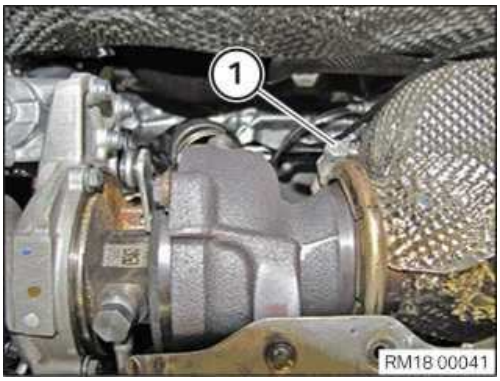
Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from holders.
- Release the screws (1) at the top and bottom of the heat shield.
- Feed out and remove the heat shield (2).

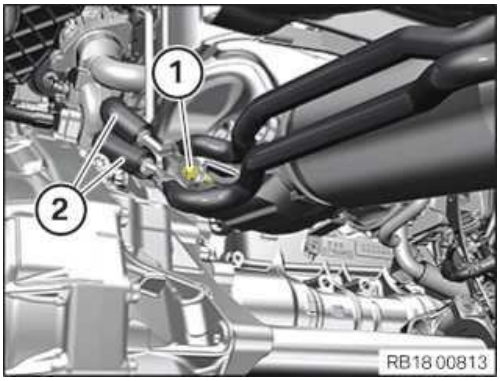
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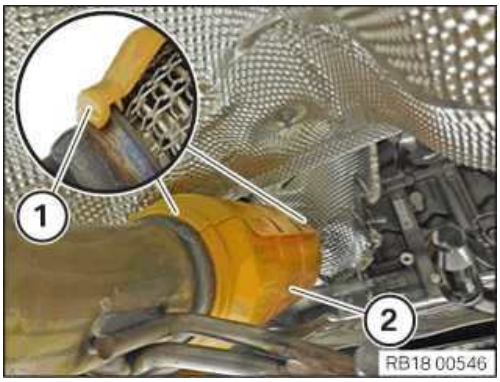
- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.



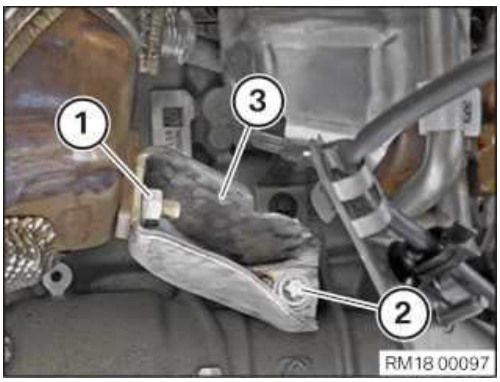
- Loosen nuts (1).



- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.

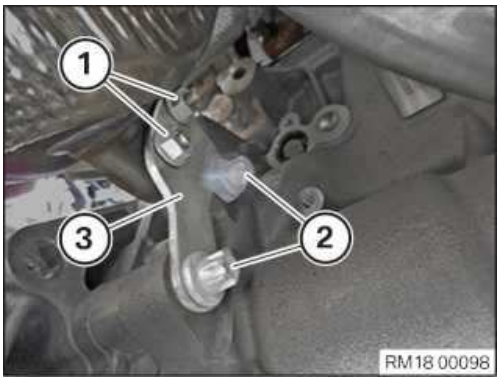


- Mount fitting aid (2).
- Make sure that the fitting aid is correctly position on the edges (1) of the flexible tube.



- Loosen nut (1).
- Loosen screw (2).
- Remove holder (3).

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- Loosen nuts (1).
- Loosen screws (2).
- Remove holder (3).
- Guide out and remove diesel particulate filter .

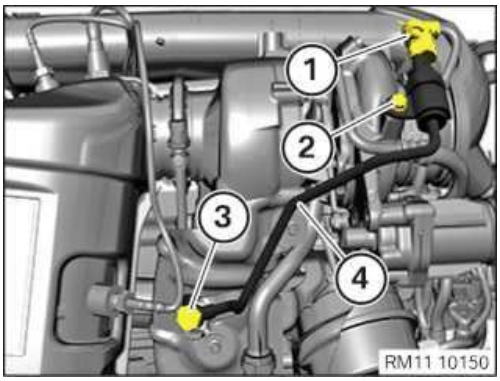
▶ **Remove the heat shield from the exhaust turbocharger at the bottom**

WARNING

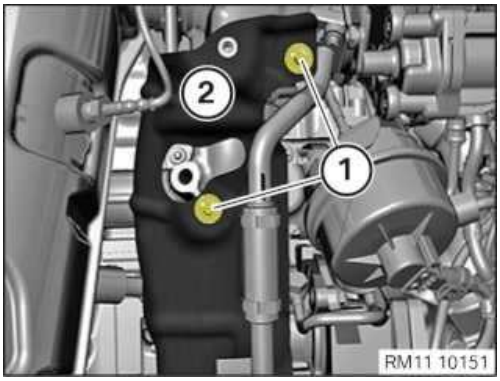
Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Unlock and disconnect connector (1).
- Unscrew the banjo bolt (3).
- The seals of the banjo bolt (3) must be renewed.
- Loosen screw (2).
- Remove the exhaust gas pressure pipe (4).



- Unscrew the bolts (1) on the heat shield .
- Feed out and remove the heat shield (2).

▶ **Removing the exhaust-gas recirculation cooler**

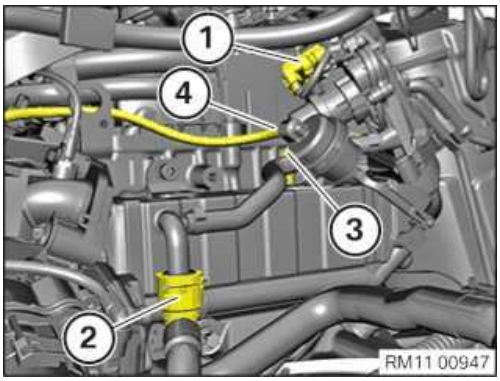
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

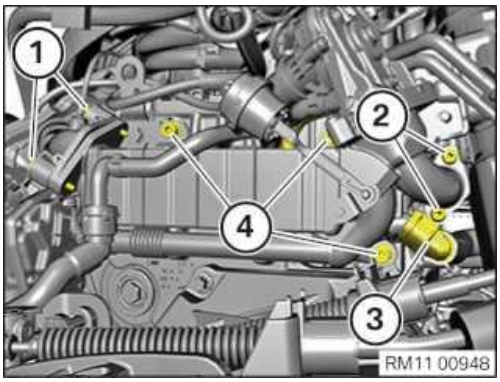
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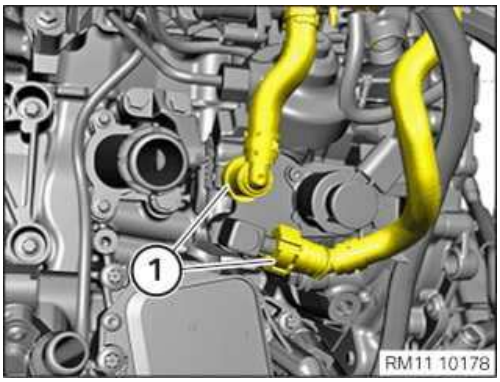
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

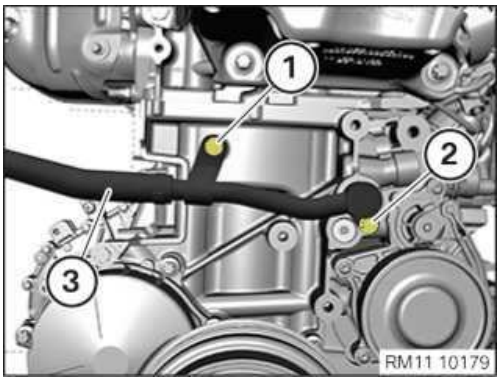
- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.



- Unlock the fuel lines (1) and disconnect from the high pressure pump.
- Remove the fuel lines.



- Loosen screws (1) and (2).
- Remove coolant line (3).

8 – Removing the low-pressure stage turbocharger

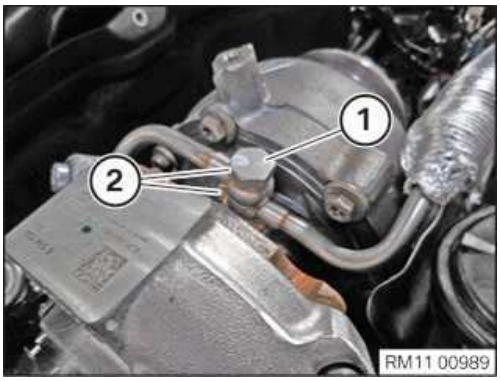
WARNING

Hot surfaces.

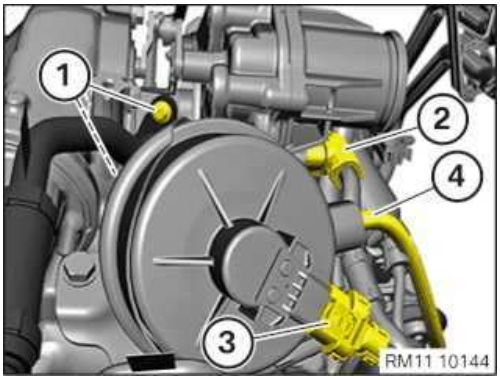
Risk of burning!

- Perform all work only on components that have cooled down.

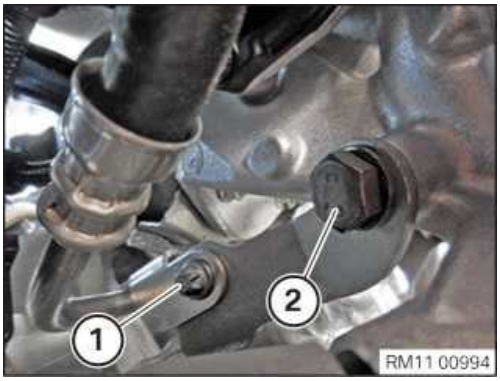
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- Release the banjo bolt (1) of the oil feed lines.
- Remove sealing rings (2).
- Place oil feed lines to one side.



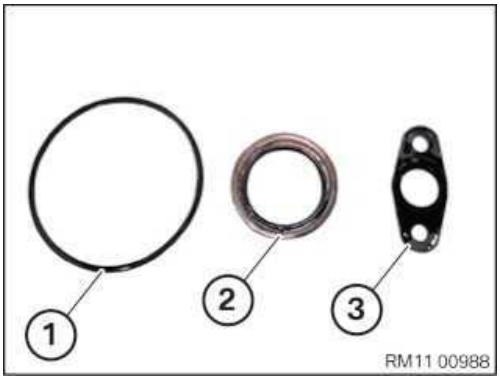
- Release the screws (1) of the oil return line.
- Unlock and disconnect the plug connections (2) and (3).
- Pull off the vacuum hose (4) carefully.



- Undo the bolt (1) of the oil feed line.
- Loosen screw (2).

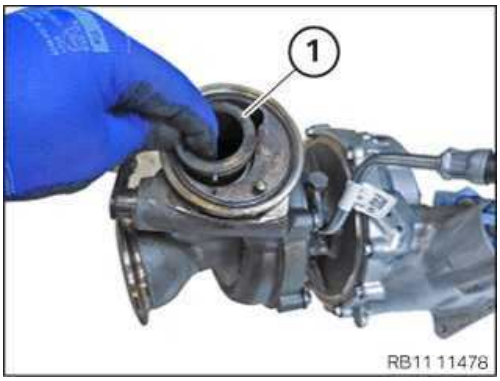


- Loosen screw (1).
- Remove the V hose clamp.
- Guide the low-pressure stage turbocharger out towards the top and remove.



- Remove seals (1), (2) and (3).

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- Remove the spacer ring (1).

9 – Removing the high-pressure stage exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

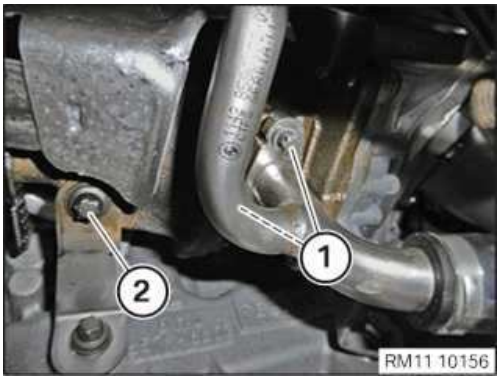
- Perform all work only on components that have cooled down.

CAUTION

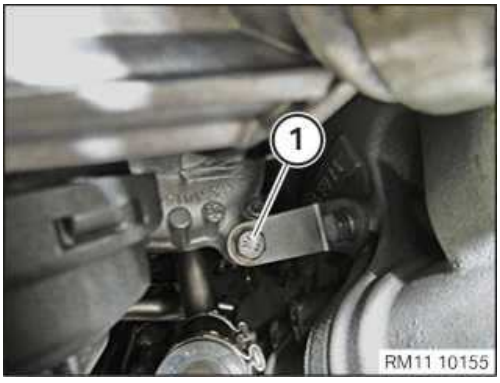
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

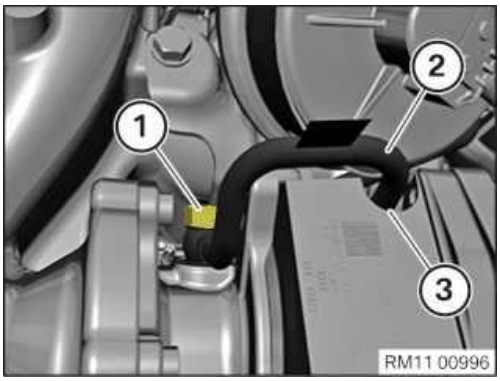


- Unscrew the bolts (1) on the oil return line .
- Loosen screw (2).

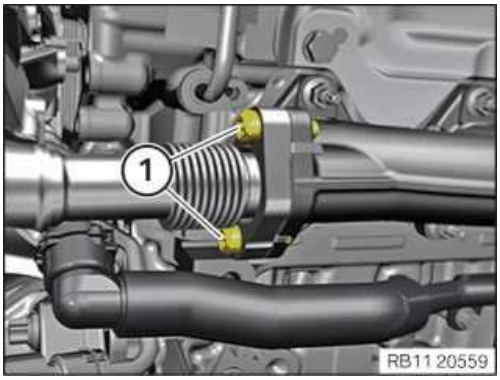


- Release screw (1) from the right wheel arch.

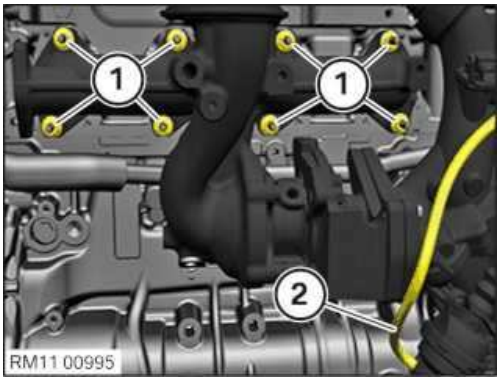
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- Unscrew the banjo bolt (1).
- Guide out oil feed line (2) from holder (3).

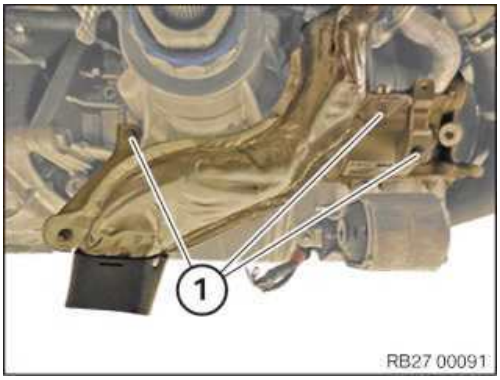


- Loosen screws (1).

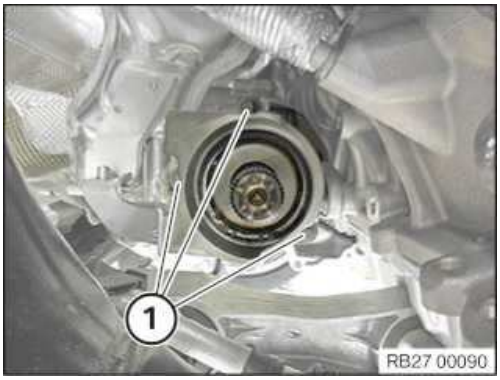


- Pull off the vacuum hose (2).
- Loosen nuts (1).
- Guide out the exhaust manifold and the high-pressure stage exhaust turbocharger to the top and remove them.

10 – Remove the intermediate shaft with the support tube

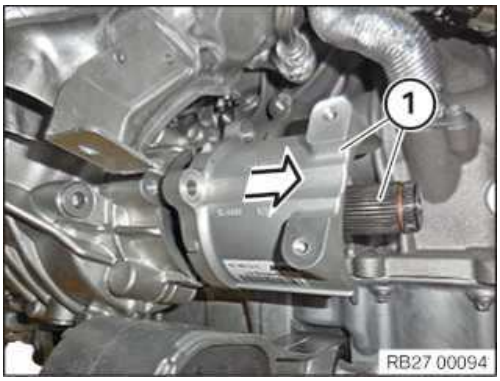


- With air duct installation: Loosen screws (1).
- Remove air duct



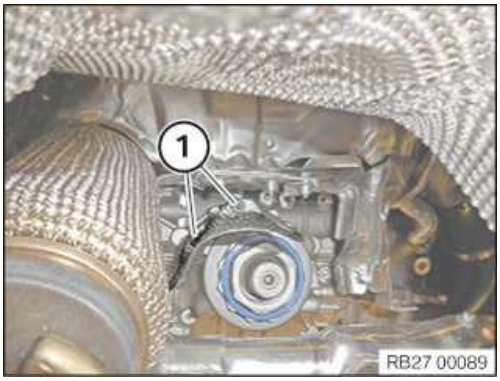
- Loosen screws (1).

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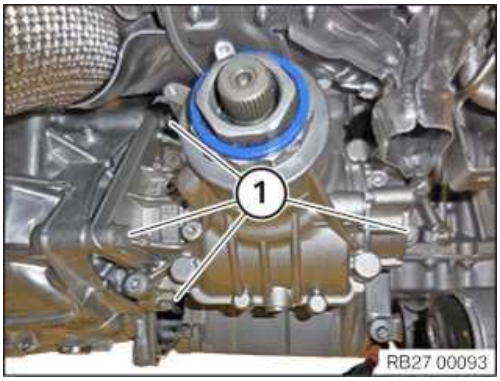


- Pull the intermediate shaft with the support tube (1) out of the transfer box.

11 – Remove transfer box (VTG)



- Loosen screws (1).
- Remove heat shield.



- Loosen screws (1).
- Remove the transfer box (VTG).

12 – Detach the engine from the manual gearbox

Prerequisite

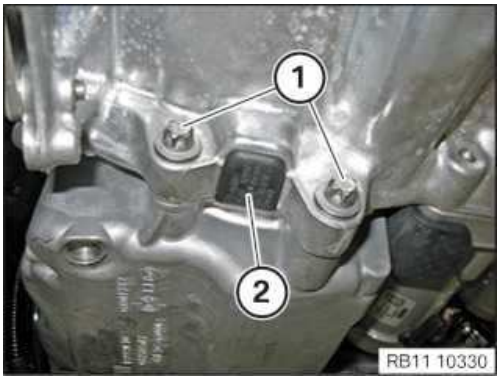
Engine has been removed.

CAUTION

Heavy component.

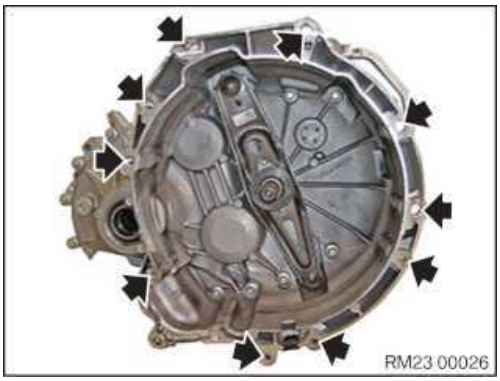
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

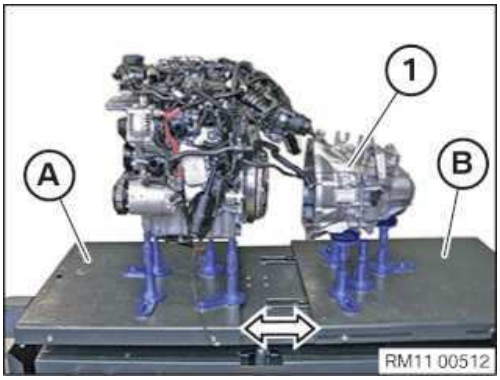


- Loosen screws (1).
- Remove protective cap (2).

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- Remove screws (arrows).



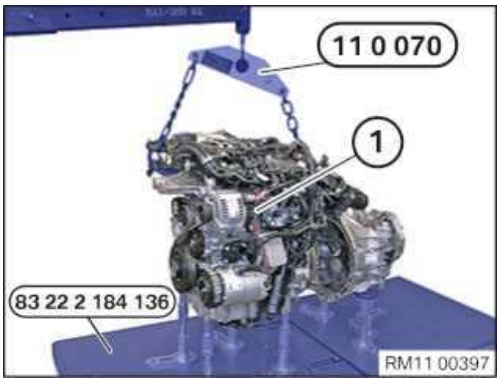
- Slide the table top (B) in the direction of the arrow and slide the manual gearbox (1) to the side.



- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

M8		Tightening torque	21,5 Nm



- Attach engine lifter to special tool and lift engine (1) off lifting table.

13 – Mount engine on assembly stand

CAUTION

Heavy component.

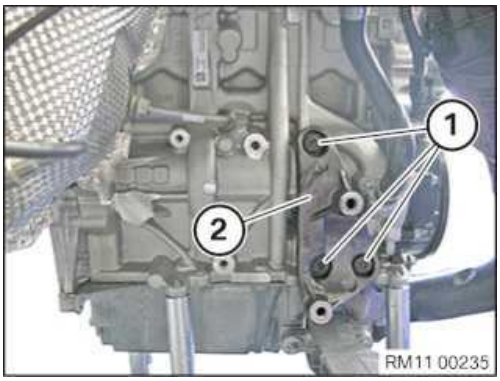
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

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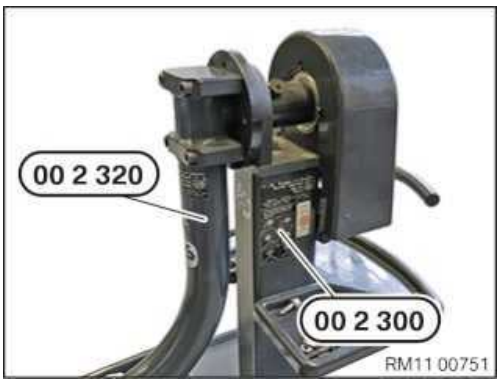
- Loosen screws (1).
- Guide out and remove holder (2).



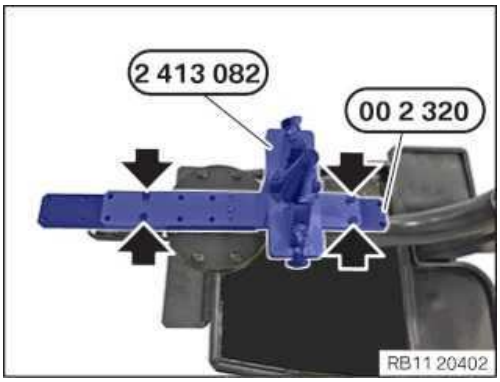
- Position the special tool **2 455 010** on the engine (1).
- Position the standard bolts **M10x30**.
- Tighten the standard bolts (arrows).
-

Special tool 2 455 010 to crankcase

M10x30		Tightening torque	38 Nm



- Prepare the assembly stand **0 495 187 (00 2 300)** with the special tool **0 495 196 (00 2 320)**.



- Screw the special tool to the **0 495 196 (00 2 320)** special tool.
- Tighten screws (arrows).
-

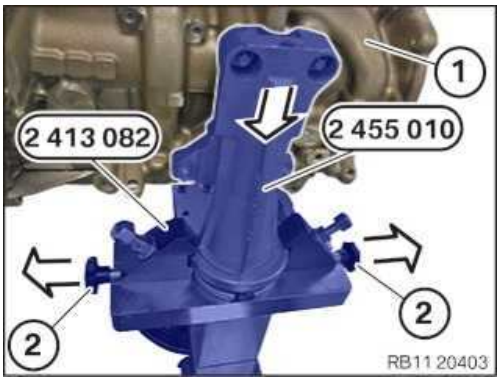
Special tool 11 8 930 to special tool 00 2 320

M14x35		Tightening torque	160 Nm

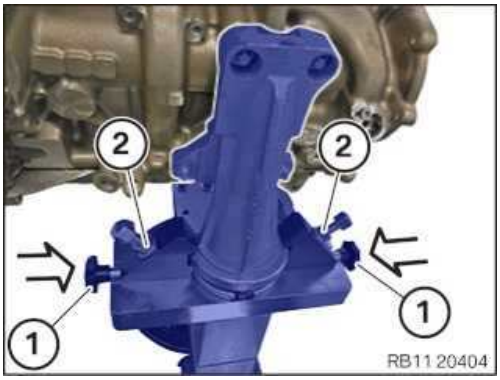


- Position the engine lifter with the special tool and the engine on the special tool **0 495 187 (00 2 300)**.

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- Detach the holder (2) in the direction of the arrow.
- Position the engine (1) with the special tool **2 455 010** in the direction of the arrow on the special tool .



- Lock the holder (1) in direction of arrow.
- Tighten nuts (2).

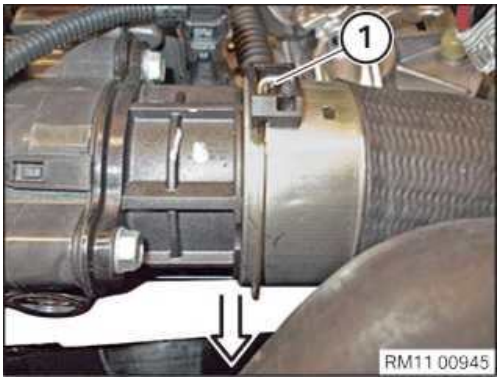
14 – Removing the intake plenum

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

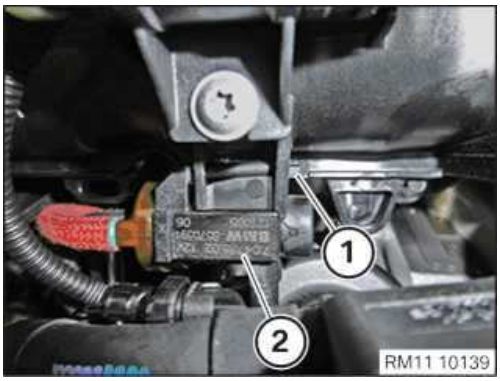


- Unlock the lock (1).

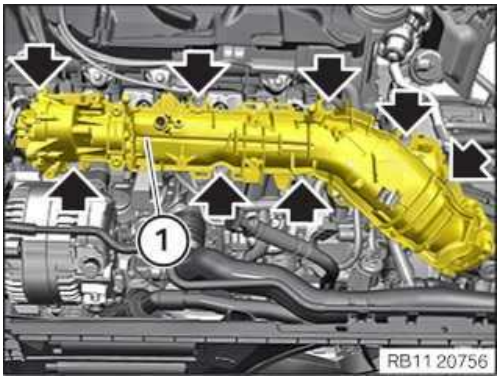


- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.

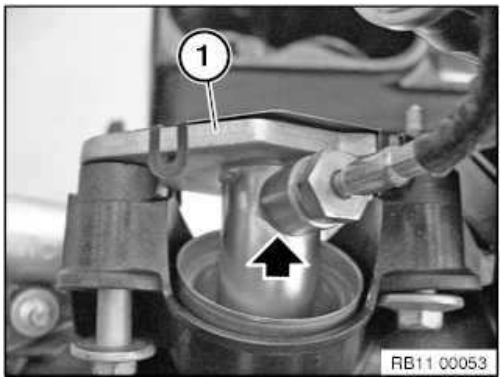
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- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



- Release the screws (arrows) from the intake plenum (1).
- Guide the intake plenum (1) out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

15 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

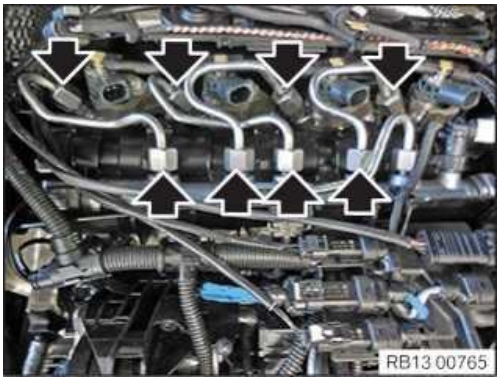
If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release the high pressure lines (arrows) with the special tool .
- Catch and dispose of escaping fuel.
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool .

16 – Detaching leakage oil line from injector

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

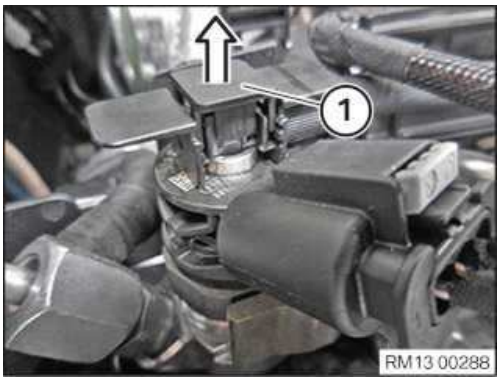
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

17 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

 **Electrostatic discharge.**

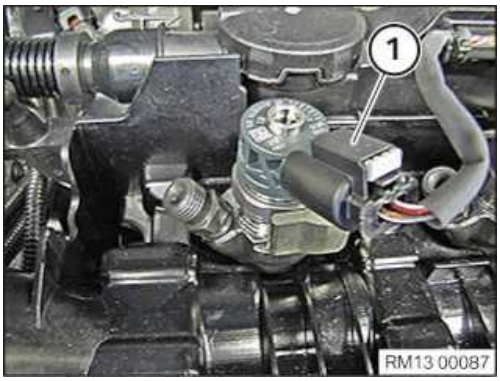
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

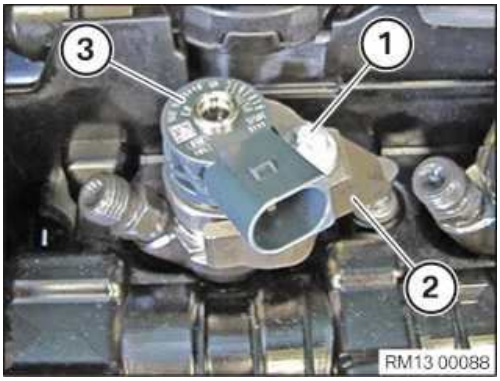
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TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.



- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

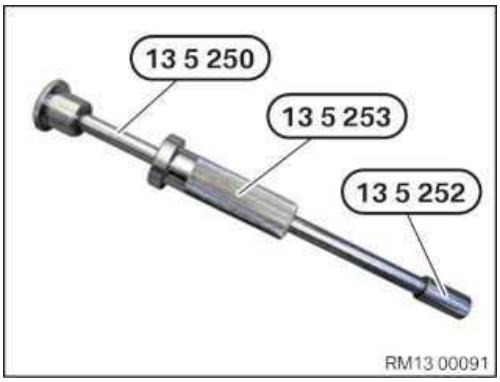
▶ **Loosen stuck injectors**

RISK OF DAMAGE

Contaminant or foreign body.

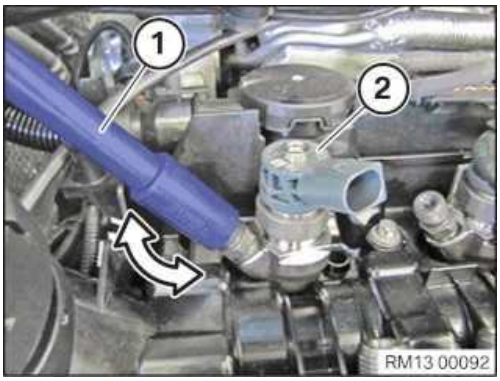
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)** back onto the special tool **0 493 321 (13 5 250)**.

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- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

18 – Remove high-pressure rail

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

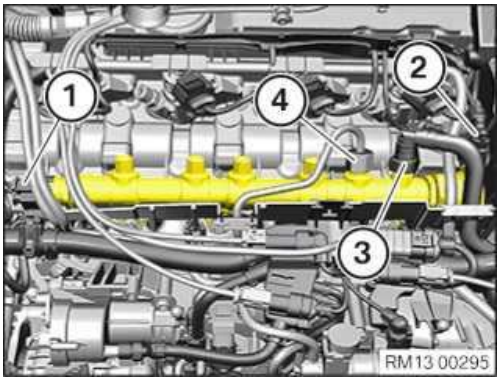
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

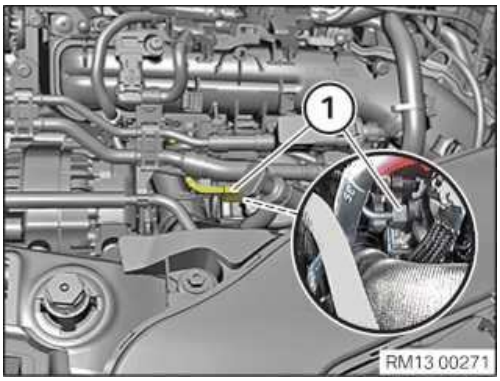
TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

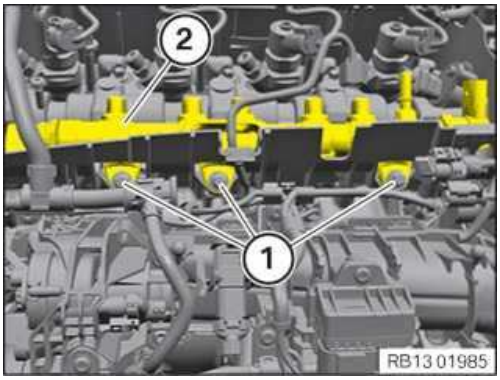


- Unlock and disconnect connector (1).
- Unlock and disconnect connector (2).
- Unlock and release fuel line (3).
- Loosen union nut (4) with special tool .
- Reset special tool early on to avoid bending pressure lines.

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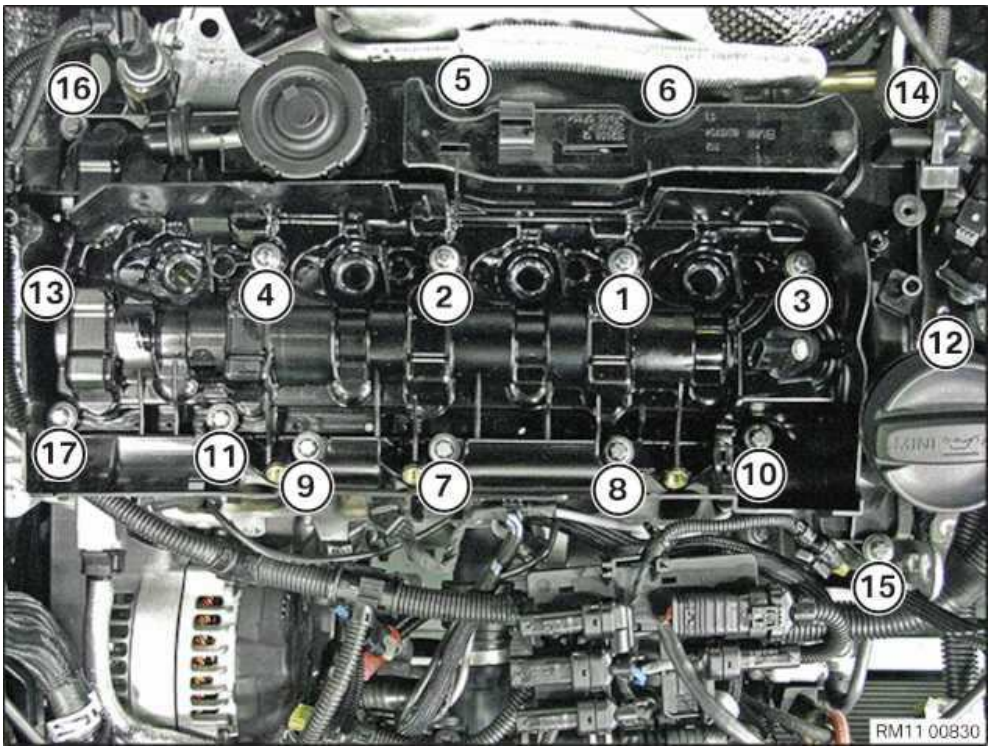
- Slacken the union nut (1) on the high pressure pump.



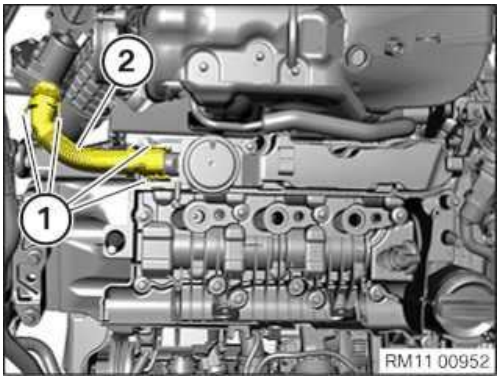
- Loosen screws (1).
- Carefully thread out and remove the rail (2).
- Make sure the pressure line of the high pressure pump is not bent.

19 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover

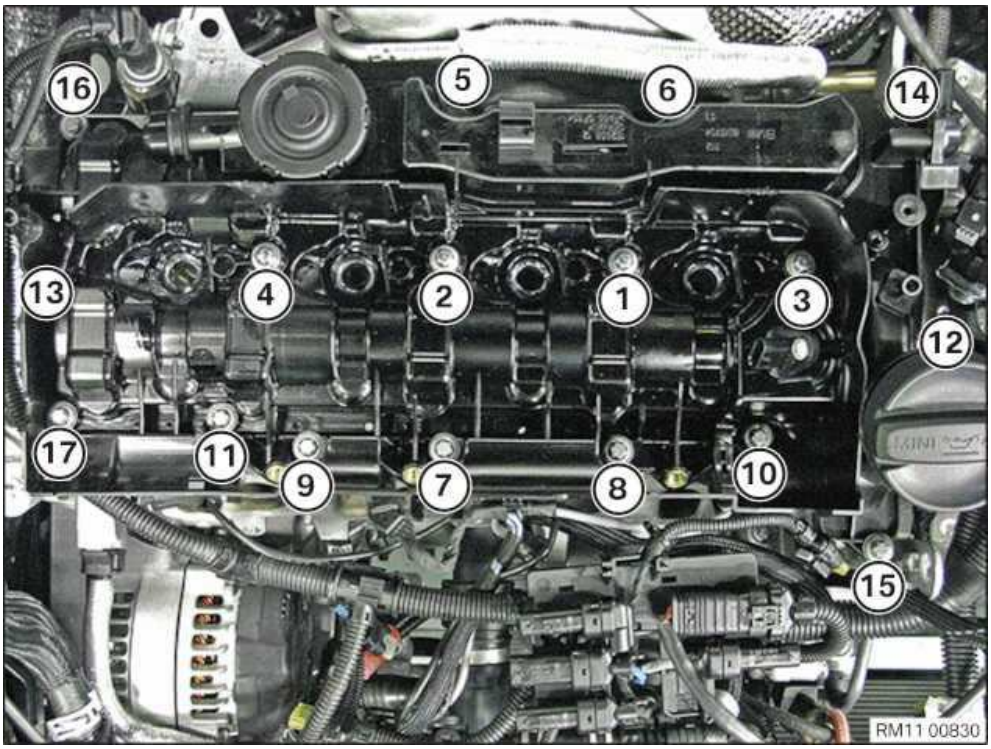


1 to 16 screws of the cylinder head cover.



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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- Loosen screws in the order (17) to (1).
- Remove cylinder head cover by lifting it out.

20 – Checking camshaft timing



- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

Damage to the engine.

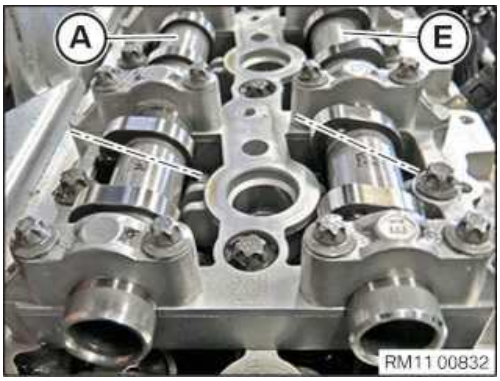
The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

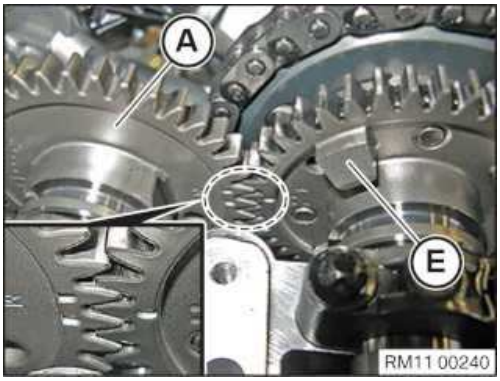
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- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.



- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

21 – Remove chain tensioner piston

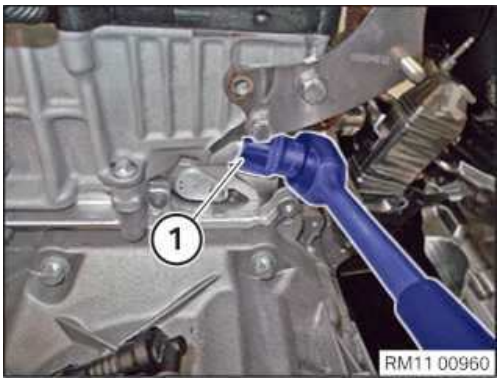
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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

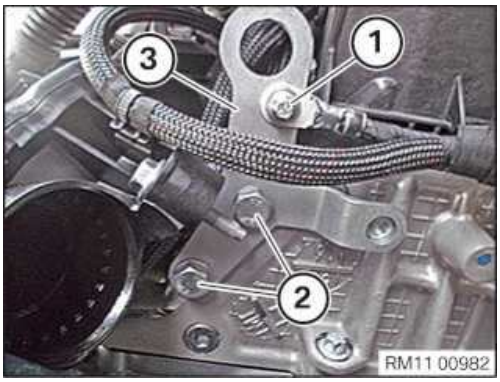


TECHNICAL INFORMATION

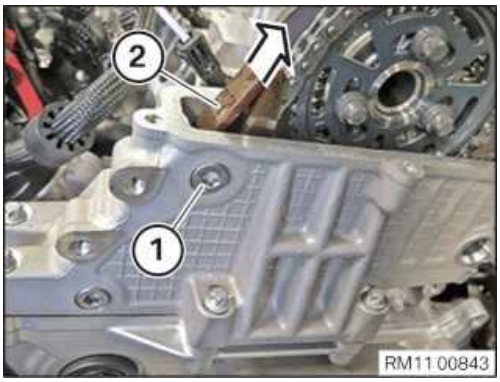
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

22 – Remove the timing chain guide rail

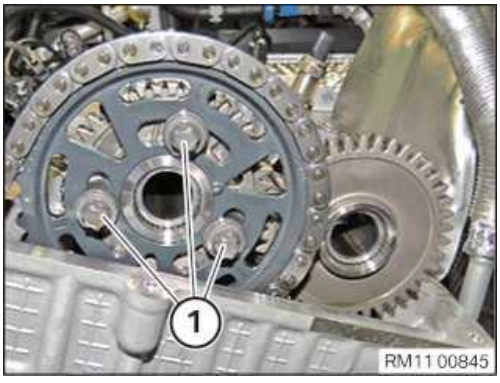


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

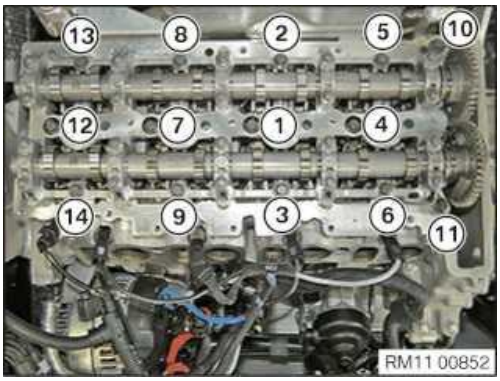
23 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

24 – Removing the camshaft support

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- Evenly loosen all screws in a sequence from (14) to (1).
- Loosen and remove all screws in a sequence from (14) to (1).
  Both camshafts can be removed with the camshaft carrier.
- Remove the camshaft support including camshafts towards the top.

25 – Removing glow elements

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Damage to the glow elements.

Excessive force may damage the glow elements and they may then have to be renewed.

- Handle glow elements with care and do not drop.
- Do not rest the cylinder head on glow elements. Glow elements protrude from the sealing surface of the cylinder head.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

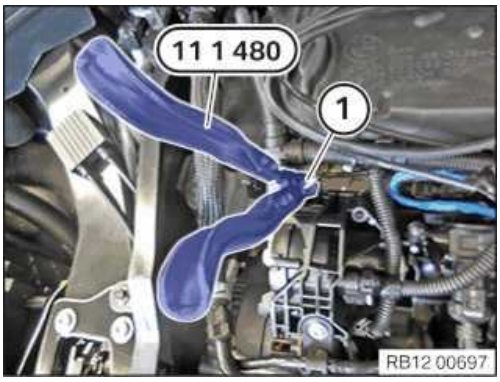
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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

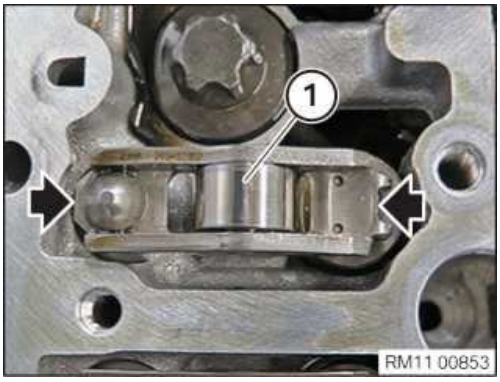


- Unlock and disconnect plug connection (1) using special tool **0 490 796 (11 1 480)**.



- Release the glow elements with the special tool or conventional tools.
- Feed out preheating elements and remove.

26 – Remove roller cam followers



- Guide out and remove all roller cam followers (1) (arrows).
- Place all roller cam followers (1) in order in special tool **0 495 105 (11 4 480)**.

  Roller cam followers that have already been used must be installed in same position again.

27 – Removing the hydraulic valve clearance compensating element

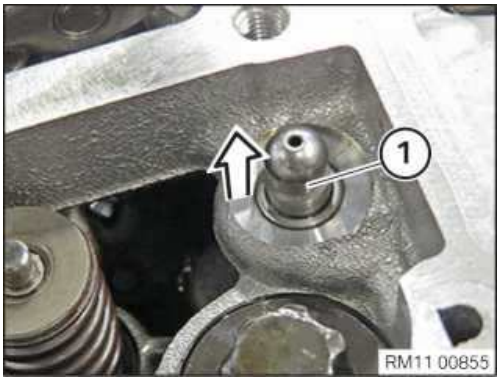
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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Remove the hydraulic valve clearance compensating element (1) in the direction of the arrow and place on the special tool **0 495 105 (11 4 480)**.
- Repeat the process on all hydraulic valve clearance compensating elements.

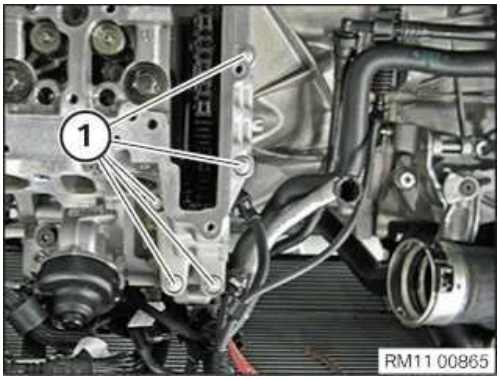
28 – Removing cylinder head

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

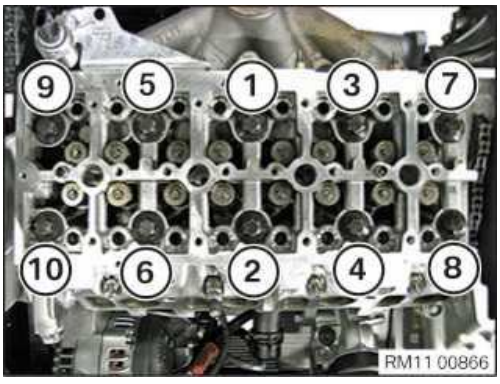
- Remove and install heavy components with the aid of another person/other persons.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screws (1).



- Loosen the cylinder head bolts in the sequence from (10) to (1).
- Remove cylinder head.

29 – Removing the acoustic cover of the oil sump

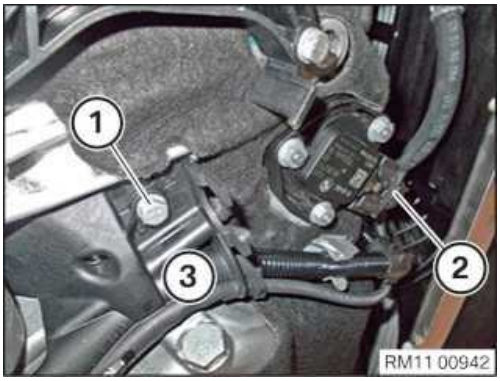
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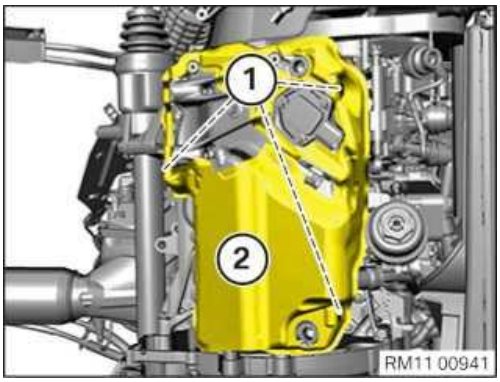
- Unlock connector (1) and pull off.
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).



- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.



- Unscrew the screw (1) on the wiring harness to the oil sump.
- Unlock and pull off connector (2) on the oil-level sensor.
- Place wiring harness (3) to one side.



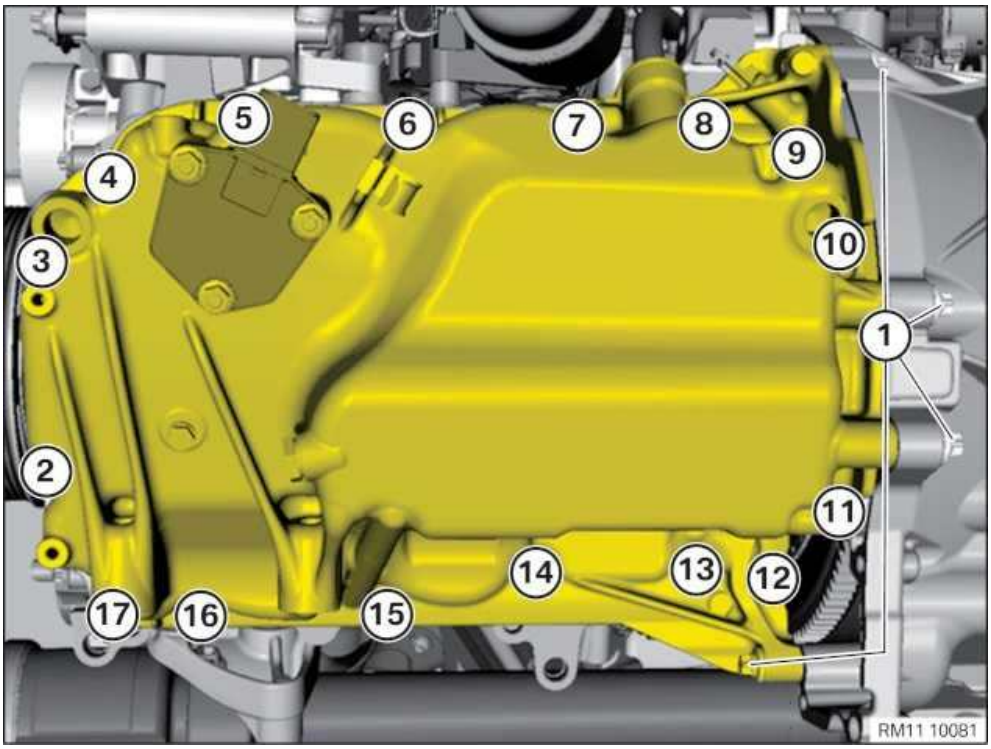
- Remove the expanding rivets (1) on both sides of the acoustic cover.
- Feed out and remove the acoustic cover (2).

30 – Remove oil sump

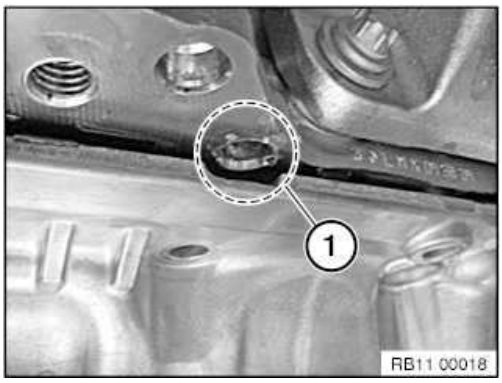


- Loosen screws (1).
- Feed out starter motor and remove.

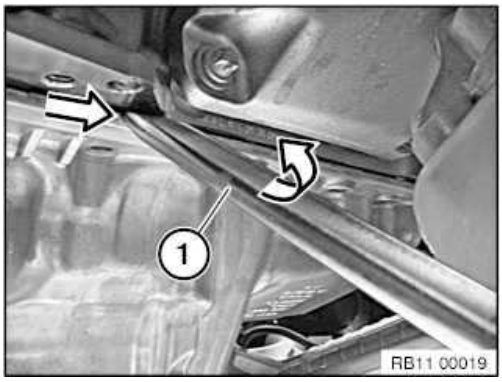
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- Release transmission bolts (1) on the oil sump.
- Loosen screws (2) to (17).



- Release the oil sump only in area (1).



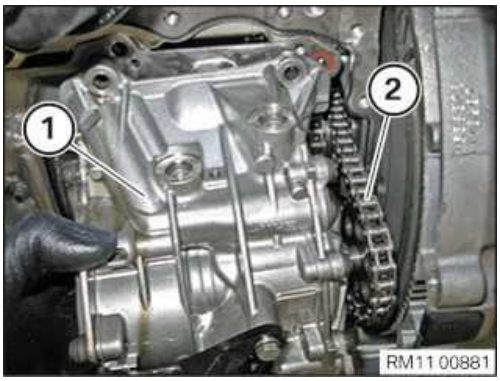
- Release the oil sump carefully using a suitable mounting lever (1) at the appropriate position in the direction of the arrow.
- Secure the oil sump to prevent it from falling.

31 – Remove the oil vacuum pump



- Loosen screws (1) of the oil vacuum pump (2).

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- Remove oil vacuum pump (1) and remove from the drive chain (2).

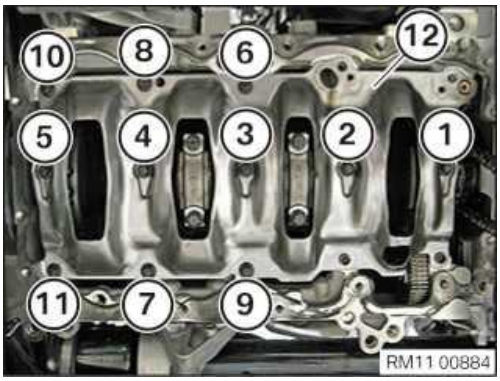
32 – Removing the oil deflector

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Loosen screws in the order (11) to (1).
- Guide out and remove the oil deflector (12).

33 – Remove the connecting rod bearing cap

RISK OF DAMAGE

Engine damage caused by incorrectly installed bearing shells and bearing supports.

Engine damage may result from incorrectly installing bearing shells and bearing supports.

- Always install all bearing shells and bearing supports in the same position from which they were removed.

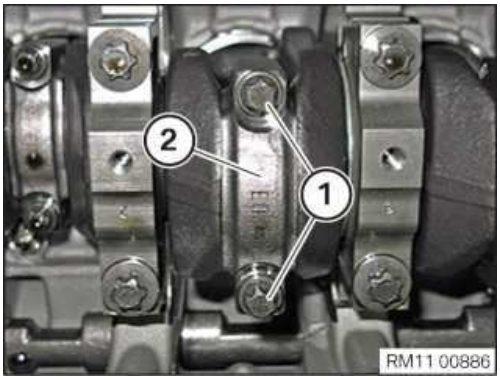
TECHNICAL INFORMATION

The connecting rods of the engine are balanced and are matched to each other.
A single connecting rod is not permitted to be replaced. Always replace all connecting rods.

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- Turn the crankshaft until the connecting rod bearing journal (1) reaches a vertical position.



- Unscrew the connecting rod bolts (1).

TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

- Remove the connecting rod bearing cap (2) and put to one side in the correct order.

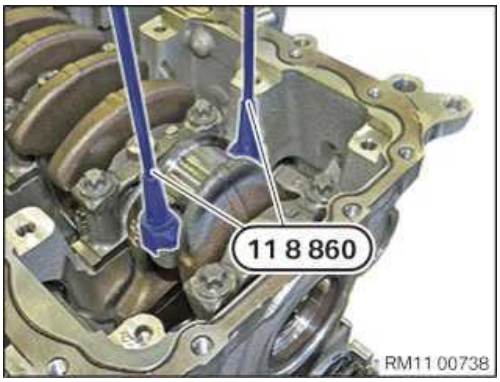
MAIN WORK

34 – Removing the piston with connecting rod

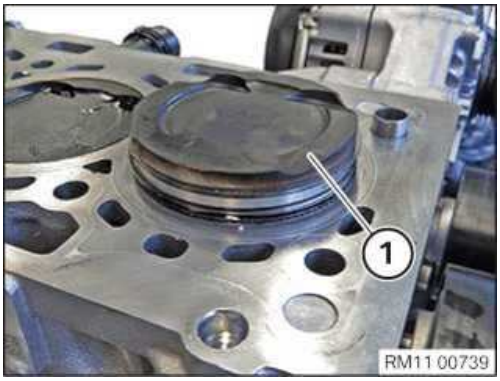
TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.



- Screw special tool **0 496 144 (11 8 860)** in at large connecting rod eye.



RISK OF DAMAGE

Damage on the cylinder wall and oil spray nozzles.

Major force can scratch the cylinder wall and bend the oil spray nozzles.

- Carefully move the piston and connecting rod in the engine block.
- Remove the piston (1) and connecting rod.

35 – Remove the connecting rod bearing shells

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RISK OF DAMAGE

Engine damage caused by incorrectly installed bearing shells and bearing supports.

Engine damage may result from incorrectly installing bearing shells and bearing supports.

- Always install all bearing shells and bearing supports in the same position from which they were removed.

TECHNICAL INFORMATION

The connecting rods of the engine are balanced and are matched to each other.

A single connecting rod is not permitted to be replaced. Always replace all connecting rods.



TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

- Remove the connecting rod bearing (2) from the connecting rod (1) and store it properly.



TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

- Remove the connecting rod bearing (2) from the connecting rod bearing cap (1) and store it properly.

36 – Measure side clearance of piston rings

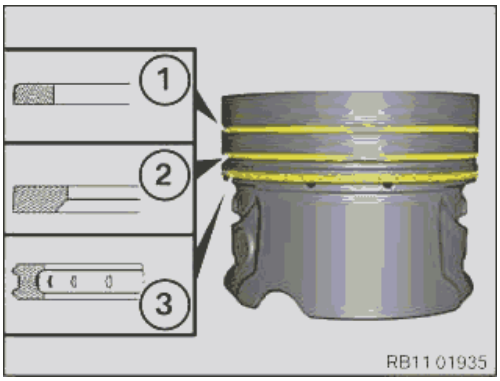
RISK OF DAMAGE

Damage to the piston rings.

Piston rings can bend or break due to large applications of force.

- Handle piston rings carefully.
- Only bend piston ring up lightly.

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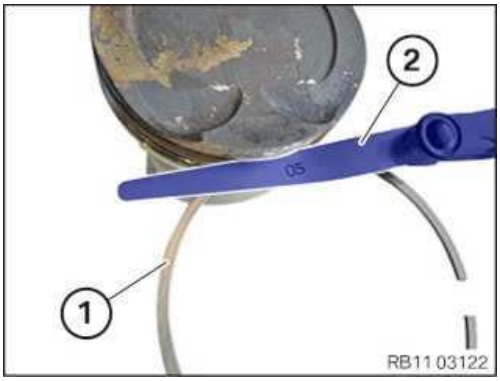


TECHNICAL INFORMATION

- Note the installation position of the component. The component may be installed in various installation positions.

- Mounting orientation of the piston rings

Position number	Description
1	1. Piston ring (plain rectangular compression ring)
2	2. Piston ring (taper faced piston ring)
3	3. Piston ring (oil scraper ring with spiral expander)



Check

- Install all piston rings (1) consecutively as shown in the piston ring groove. Measure the side clearance with a feeler gauge (2).

desired state

- The side clearance of the piston rings is within the tolerance.

Side clearance of piston rings

Clean all components before measuring the side clearance.	
Side clearance of the plain rectangular compression ring	0,17 mm ... 0,27 mm
Side clearance of the taper faced piston ring	0,30 mm ... 0,50 mm
Side clearance of the oil scraper ring with spiral expander	0,2 mm ... 0,4 mm

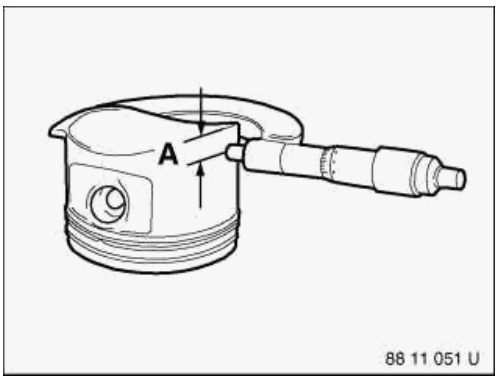
Result

» The side clearance of the piston rings is outside of the tolerance.

Measure

- Renew the piston ring.

37 – Measure the piston diameter



Check

- Position the measuring bolt in the area (A) and measure the piston installation clearance 90 ° transversely to the gudgeon pin.

Piston diameter

Measure the piston diameter at distance (A) from the lower end of the piston skirt.	
Distance (A) to the lower end of the piston skirt	17 mm
Nominal dimension of piston diameter	83,936 mm ... 83,954 mm

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Result

» The piston does not correspond to the specifications.

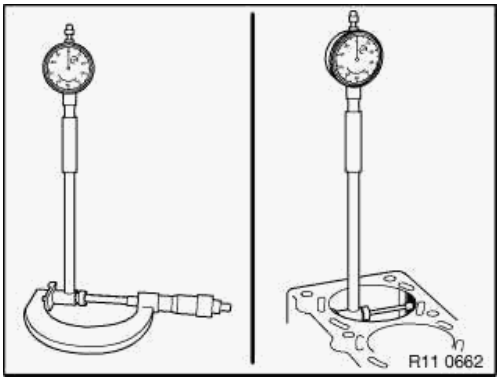
Measure

- Renew the piston.

38 – Measure the cylinder bores

Prerequisite

Cylinder barrel is cleaned.



Check

- Adjusting measuring screw to nominal dimension of cylinder bore.

Cylinder bore

Diameter of cylinder bore	84,00 mm ... 84,018 mm
Permitted irregularity of the cylinder bore	0,01 mm
Permitted conicity of the cylinder bore	0,01 mm

- Insert internal measuring device into measuring screw and set to zero.
- With the internal measuring device, measure the cylinder at the following points. Check the deviations from the nominal dimension.
  - Lower third of the cylinder bore in direction of travel,
  - Lower third of the cylinder bore transversely to direction of travel,
  - Middle third of the cylinder bore in direction of travel,
  - Middle third of the cylinder bore transversely to direction of travel,
  - Upper third of the cylinder bore in direction of travel,
  - Upper third of the cylinder bore transversely to direction of travel.

Cylinder bore

Diameter of cylinder bore	84,00 mm ... 84,018 mm
Permitted irregularity of the cylinder bore	0,01 mm
Permitted conicity of the cylinder bore	0,01 mm

Result

» Cylinder does not correspond to the specifications.

Measure

- Replace motor.

  Parts: Engine

39 – If necessary: Renew the piston

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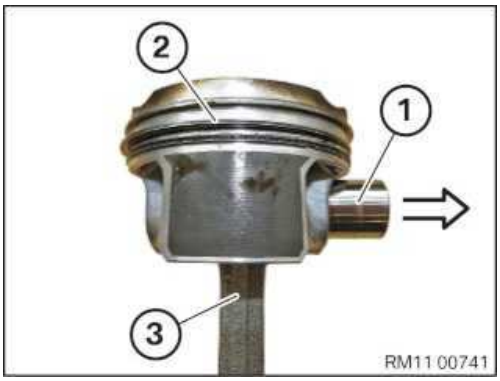
CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

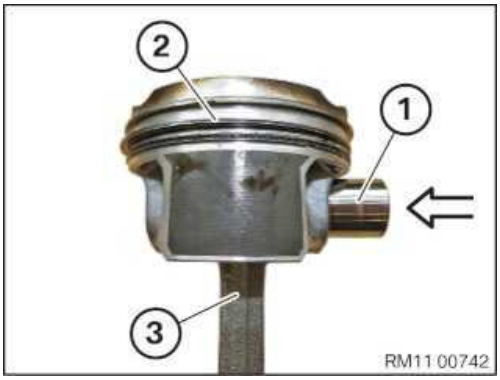
- Use special tool to remove the gudgeon pin circlip.
- Insert the flat side (3) of special tool into the groove (4).
- Grab and remove the gudgeon pin circlip (1) with the arched side (2).



TECHNICAL INFORMATION

Piston and gudgeon pin are matched to each other.
Always install piston and gudgeon pin together and do not switch by mistake.

- Remove the gudgeon pin (1) in the direction of arrow.
- Remove piston (2) from connecting rod (3).



- Renew piston with gudgeon pin.

  Parts: Pistons

TECHNICAL INFORMATION

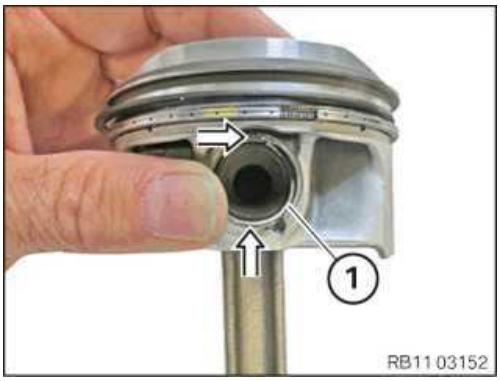
Piston and gudgeon pin are matched to each other.
Always install piston and gudgeon pin together and do not switch by mistake.

- Position piston (2) on the connecting rod (3).
- Install the gudgeon pin (1) in the direction of arrow.
- You must be able to install the gudgeon pin (1) without major effort.
- Gudgeon pin (1) must be free of play in piston and connecting rod.

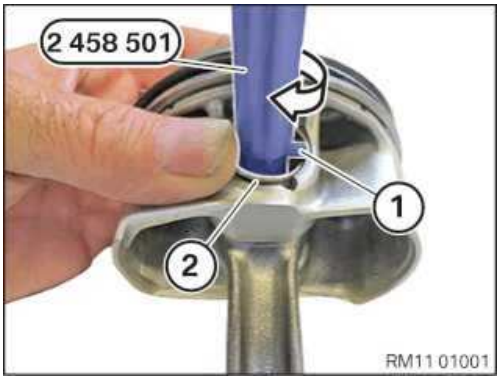


- Prepare special tool on the fitting aid .

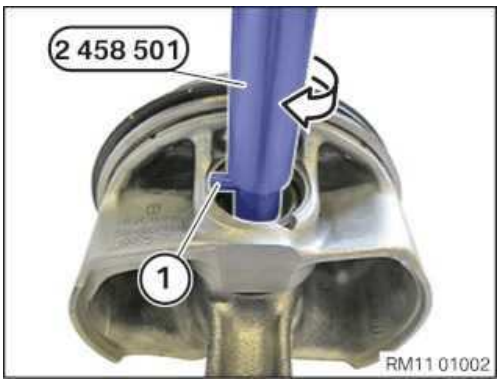
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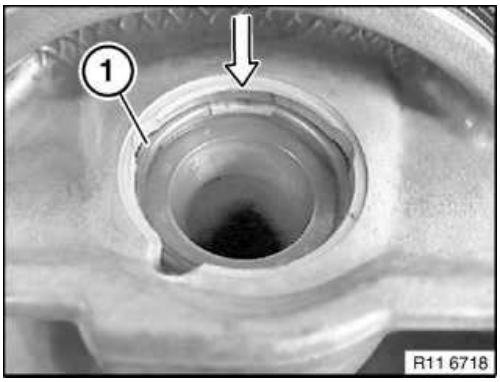
- Insert the gudgeon pin circlip (1) into the groove on the piston (see arrows).



- Screw in the positioned gudgeon pin circlip (2)with and with the guide pin (1) in the direction of the arrow.



- Screw the gudgeon pin circlip with guide pin (1) into the groove of the piston in the direction of the arrow.



- Gudgeon pin circlip (1) must be fitted correctly in the groove (arrow).

40 – Install the connecting rod bearing shell

RISK OF DAMAGE

Engine damage caused by incorrectly installed bearing shells and bearing supports.

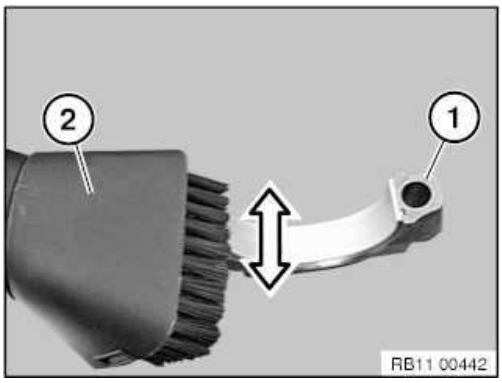
Engine damage may result from incorrectly installing bearing shells and bearing supports.

- Always install all bearing shells and bearing supports in the same position from which they were removed.

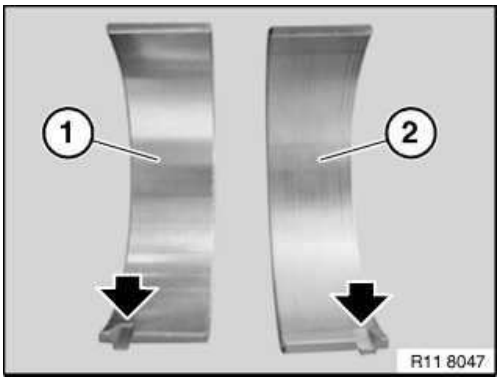
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TECHNICAL INFORMATION

The connecting rods of the engine are balanced and are matched to each other.
A single connecting rod is not permitted to be replaced. Always replace all connecting rods.

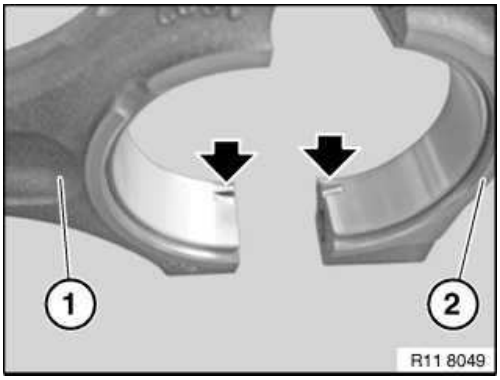


- Vacuum the crack surfaces (1) with a conventional vacuum cleaner (2).



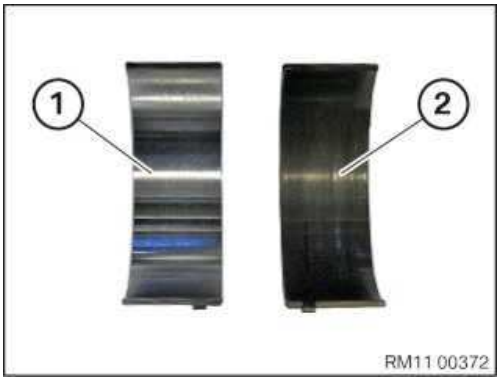
- To avoid incorrect assembly: Pay attention to marks (arrows).

  The connecting rod bearing (1) for the connecting rod bearing cap and the connecting rod bearing (2) for the connecting rod are each equipped with protection against incorrect assembly as shown in the marked area.



- To avoid incorrect assembly: Pay attention to marks (arrows).

  The connecting rod bearing cap (2) and the connecting rod (1) are each equipped with protection against incorrect assembly.



- Makes sure that a light connecting rod bearing shell (1) and a dark connecting rod bearing shell (2) are installed for each connecting rod.

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TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

- Insert the dark connecting rod bearing shell (2) into the connecting rod (1).
- Oil the connecting rod bearing shell (2).



TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

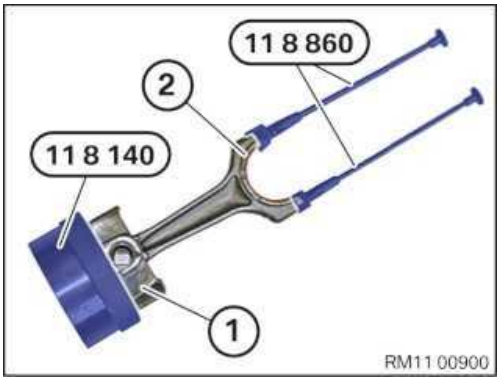
- Insert the light connecting rod bearing shell (2) into the connecting rod bearing cap (1).
- Oil the connecting rod bearing shell (2).

41 – Installing piston with connecting rod

TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.



- Coat the pistons (1) and piston rings lightly with oil.
- Mount the special tool **0 493 582 (11 8 140)** on the piston (1).
- Screw the special tool **0 496 144 (11 8 860)** in on the large connecting rod eye (2).



- Insert the piston with the special tool **0 493 582 (11 8 140)** with the arrow pointing to cylinder 1.

RISK OF DAMAGE

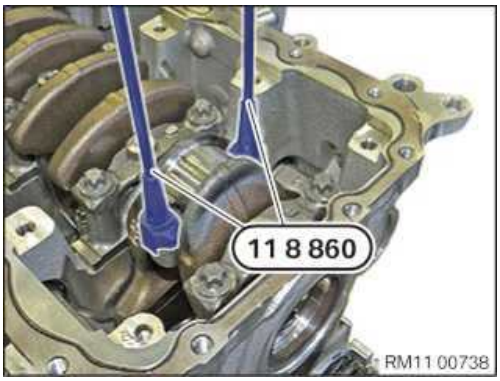
Damage on the cylinder wall and oil spray nozzles.

Major force can scratch the cylinder wall and bend the oil spray nozzles.

- Carefully move the piston and connecting rod in the engine block.

- Install the piston in the crankcase.

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- Remove special tool **0 496 144 (11 8 860)** from large connecting rod eye.

POSTPROCESSES

42 – Install the connecting rod bearing cap

RISK OF DAMAGE

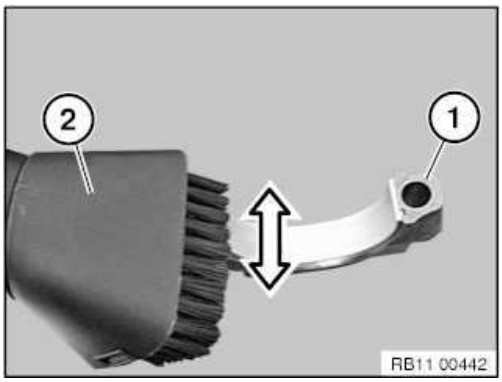
Engine damage caused by incorrectly installed bearing shells and bearing supports.

Engine damage may result from incorrectly installing bearing shells and bearing supports.

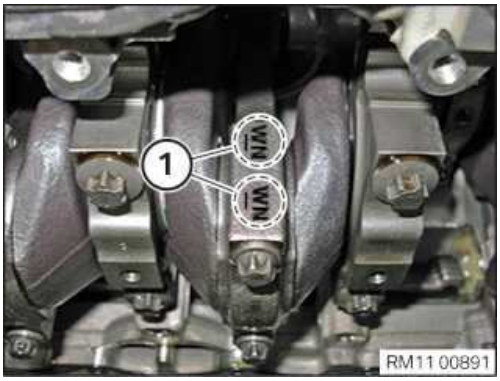
- Always install all bearing shells and bearing supports in the same position from which they were removed.

TECHNICAL INFORMATION

The connecting rods of the engine are balanced and are matched to each other.
A single connecting rod is not permitted to be replaced. Always replace all connecting rods.



- Vacuum the crack surfaces (1) with a conventional vacuum cleaner (2).



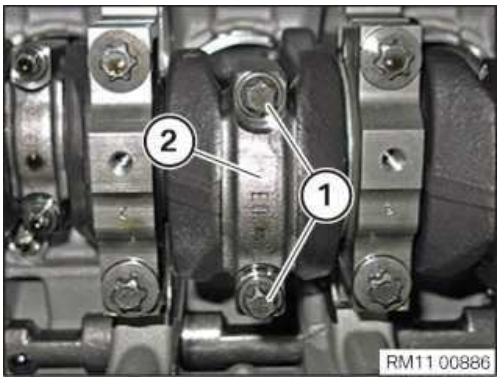
- Attach the connecting rod bearing caps to the connecting rod until the designations (1) match.

TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.
Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

- Make sure that the connecting rod bearing is attached to the same connecting rod that it was detached from.

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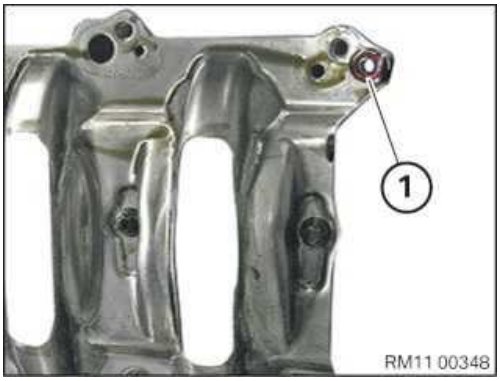


- Position the connecting rod bearing cap (2).
- Tighten the bolts (1) with the special tool **0 490 504 (00 9 120)**.

Connecting rod bearing cap to connecting rod

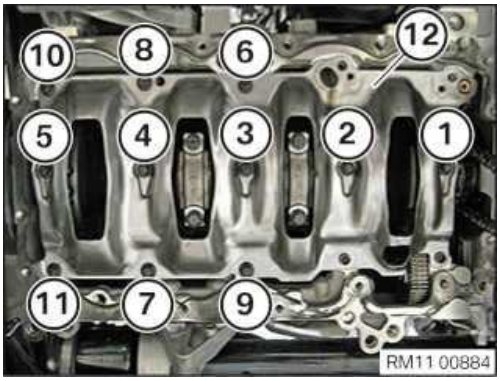
M9x47		Tightening torque	20 Nm
		Angle of rotation 1	70 °
		Angle of rotation 2	70 °

43 – Installing the oil deflector



- Check sealing ring (1) for damage and replace oil deflector if necessary.

  Parts: Oil deflector



- Insert and install the oil deflector (12).
- Renew screws (1) to (11).

  Parts: Bolts
- Hand-tighten the bolts (1) to (5).
- Hand-tighten the bolts (6) to (11).
- Tighten the screws (1) to (5).

Oil deflector to crankshaft bearing cap

M8x14	Replace screws.	Tightening torque	35 Nm
		Release	180 °
		Tightening torque	15 Nm
		Angle of rotation	45 °

- Tighten the screws (6) to (11).

Oil deflector to crankcase

M8x14		Tightening torque	19 Nm

44 – Install the oil vacuum pump

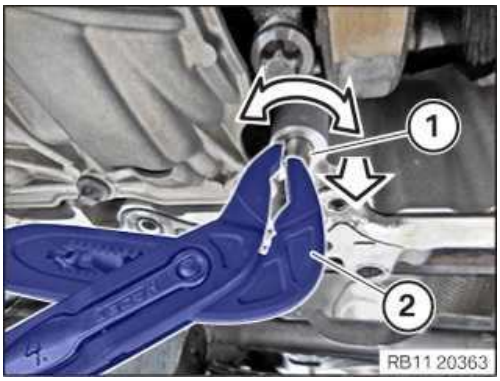
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

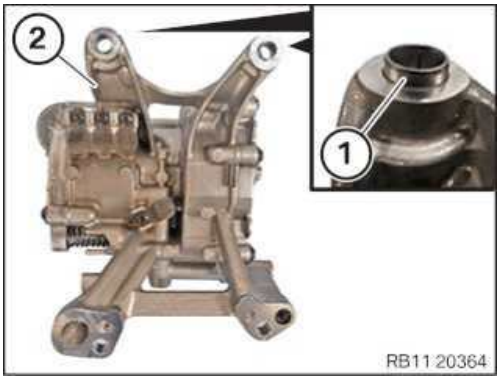
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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- Remove centering sleeves from the crankcase (1) using a standard tool (2).
- Renew the centring sleeves (1).

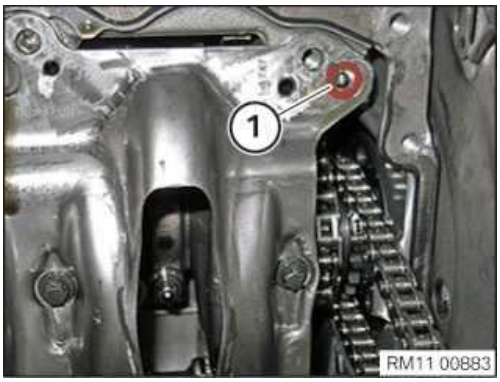
  Parts: Centring sleeves



- Install centering sleeves (1) in the oil vacuum pump (2).

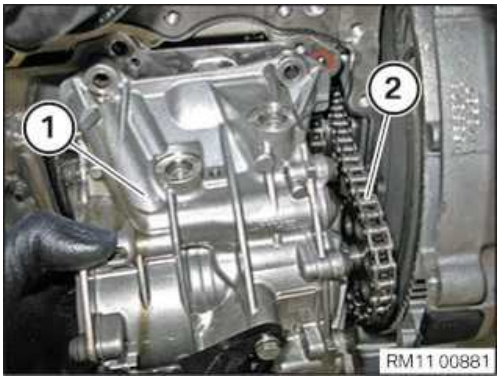


- Check the sealing ring (1) for damage and renew where required.
- Make sure the sealing ring (1) is installed correctly.



- Check sealing ring (1) for damage and replace oil deflector if necessary.

  Parts: Oil deflector



- Insert oil vacuum pump (1) into the drive chain (2).

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- Renew screws (1).

  Parts: Bolts

- Tighten the screws (1) of the oil vacuum pump (2).

Oil vacuum pump to crankcaseB47

M8x35		Tightening torque	19 Nm

45 – Refitting sump



TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove fine sealing remains on the sealing surface (1)and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.
- Clean sealing surface (1) with brake cleaner.

Expendable materials

Brake cleaner2.0	500 ml, Spray can	83192365214
	20 , Canister	83192365215



TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove coarse sealing remains on the sealing surface (1)and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.
- Clean sealing surface (1) with brake cleaner.

Expendable materials

Brake cleaner2.0	500 ml, Spray can	83192365214
	20 , Canister	83192365215



- Have the special tool ready.

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TECHNICAL INFORMATION

For more information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

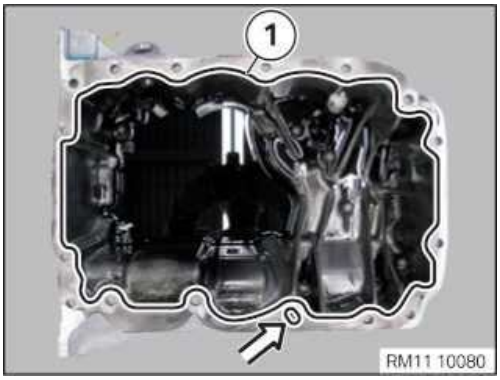
- Position the sealing compound (1) on special tool as shown.

  Parts: Sealing compound

Sealing compound

Loctite 5970 liquid sealing compound	50 ml, Cartridge	83190404517

Overview of consumables (Electronic Parts Catalogue)



TECHNICAL INFORMATION

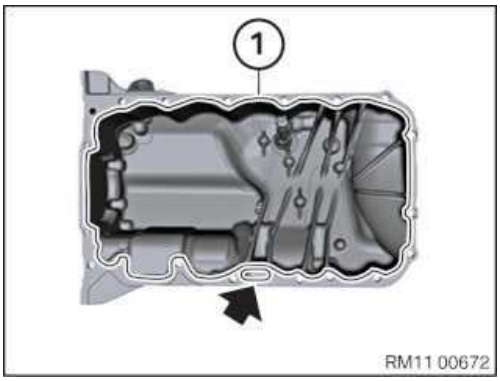
The sealing surfaces must be free from oils, grease and cleaning agents.

TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- The height of the sealing compound must be approx. between **2.0 mm** and **2.5 mm**.
- Apply the sealing bead along the inner edge (1) of the oil sump.
- Completely surround the oil return orifice (arrow) with the sealing compound.

  No sealing compound may enter the oil return orifice.
- Fix oil sump within the prescribed application time of the sealing compound.

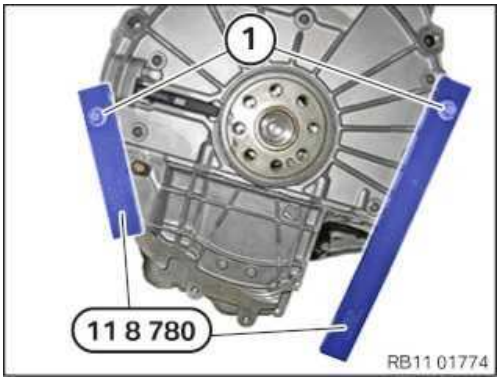


TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- Apply the sealing compound along the line (1) with a thickness of 2 mm to 2.5 mm.

  The sealing compound must be applied along the inner edge.
- Completely encircle the oil return orifice (arrow) with the sealing compound.

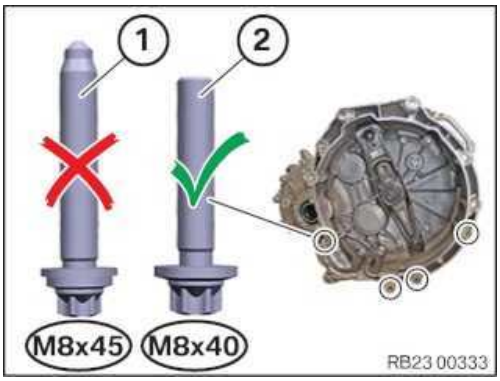


TECHNICAL INFORMATION

The special tool 11 8 780 is only required when the transmission is removed.

- Position the special tool **0 496 120 (11 8 780)** with the transmission bolts (1) so that the oil sump is exactly flush with engine block.
- Renew the fitting sleeves if required.

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RISK OF DAMAGE

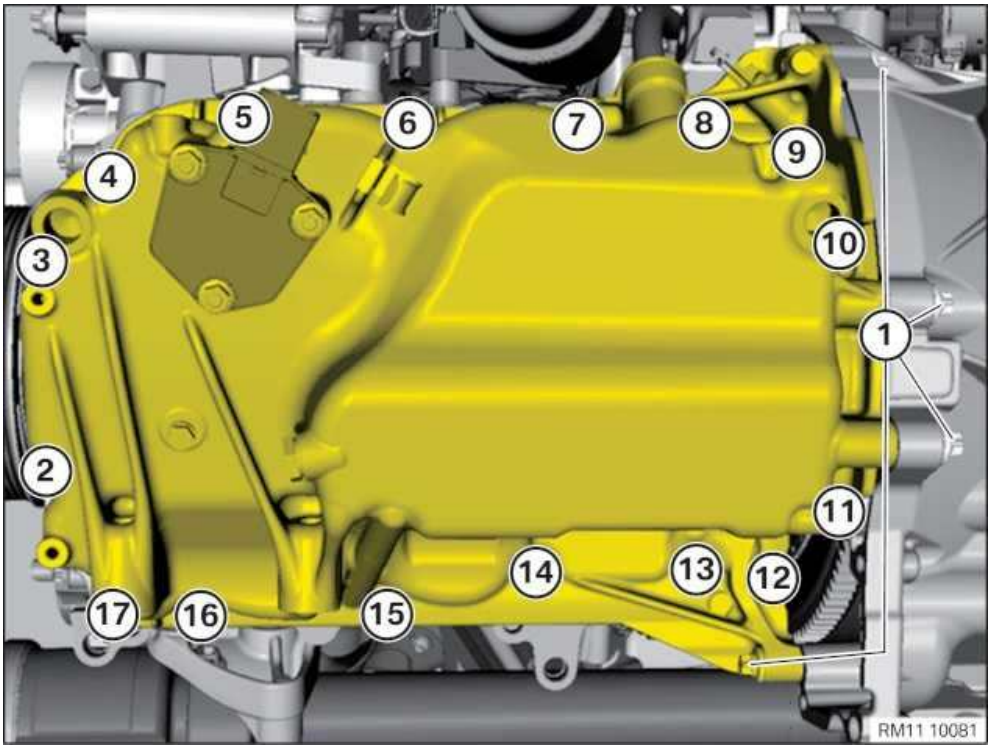
Component damage caused by incorrect screw length.

The use of screws with the incorrect screw length can damage the component.

- Check for correct screw length.
- Re-install screws that correspond to the original screw length.

- Ensure that the **correct** screw (2) (M8x40) is used for mounting the oil sump on the transmission.

  The screw (1) (mounting bolt of the starter motor) may **never** be used for mounting the oil sump.



- Position and install the oil sump.
- Tighten screws (2) to (17) **hand-tight**, do **not** tighten fully.
- Join transmission bolts (1) with 5 Nm.
- Tighten screws (2) to (17) on the oil sump.

Oil sump to crankcase

M8x30		Tightening torque	2 Nr
M8x110		Tightening torque	2 Nr

- Tighten the transmission bolts (1) on the oil sump.

Transmission to oil sump

M8		Tightening torque	1 Nr



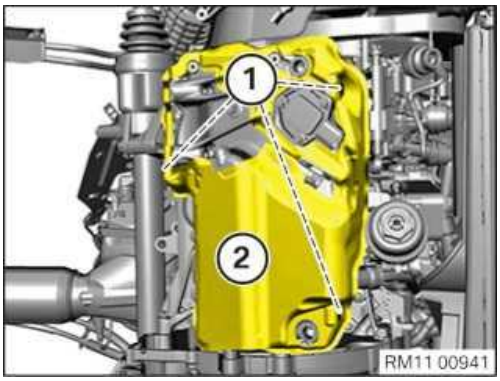
- Insert and install the starter motor .
- Tighten the screws (1).

Starter motor to transmission

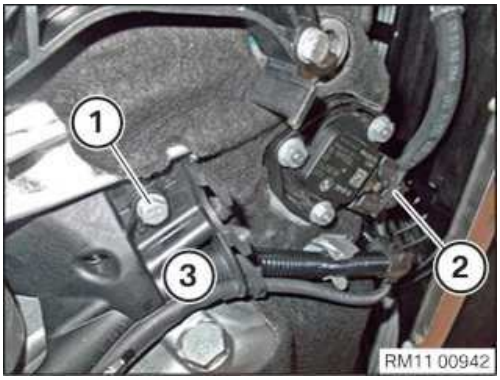
M8x45		Tightening torque	19 Nm

46 – Installing the acoustic cover for the oil sump

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- Thread in and position the acoustic cover (2).
- Install the expanding rivet (1).



- Position wiring harness (3).
- Tighten down screw (1).

Bracket to oil sump

M6		Tightening torque	8 Nm

- Connect and lock the connector (2) on the oil-level sensor.

  The connector must lock audibly.



CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

Battery positive lead to starter

M8		Tightening torque	13,5 Nm

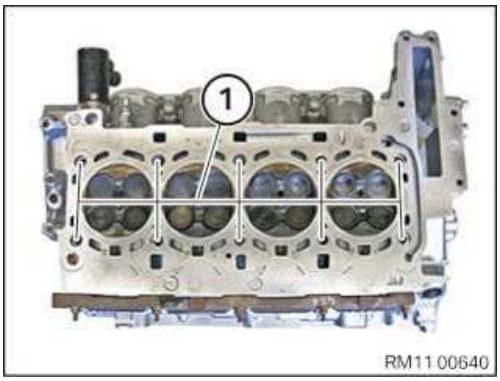


- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).

  The connector must engage audibly.

47 – Renewing the cylinder head gasket

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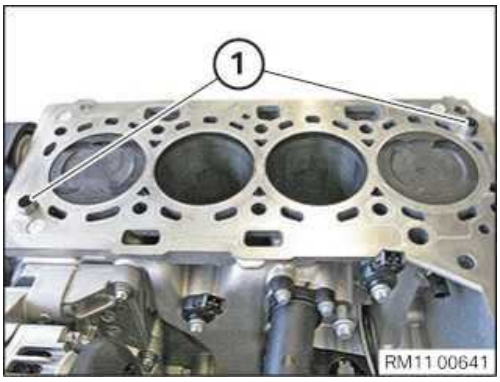
RISK OF DAMAGE

Damage to the surface.

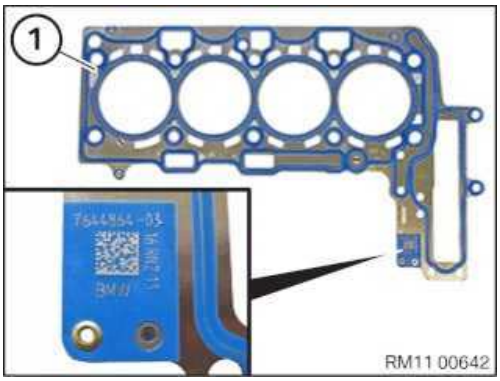
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Remove oil and dirt residue from the blind holes (1).

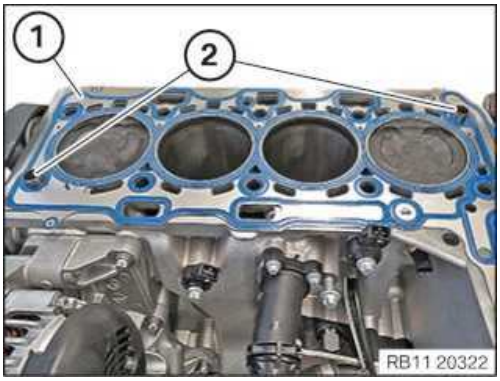


- Check the fitting sleeves (1) for secure fit and damage.



- Identify the cylinder head gasket (1) using the part number.

Note: If the cylinder head is reworked, an additional thicker gasket 0.3 mm is available for service personnel.



- Guide in the cylinder head gasket (1) and install.
- Ensure that the cylinder head gasket (1) is installed correctly in the fitting sleeves (2).

48 – Mounting the cylinder head

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

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RISK OF DAMAGE

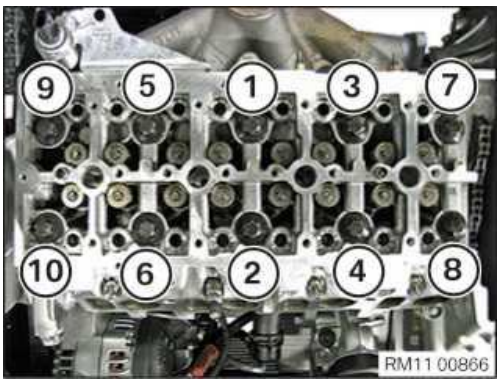
Damage to threads.

Fluid in the threaded hole may damage the thread when screws are tightened in the threads.

- Dry threaded holes (e.g. using compressed air).

TECHNICAL INFORMATION

Do not remove bolt coating.



- Position the cylinder head on the crankcase.
- Renew the cylinder head bolts (1).

  Parts: Cylinder head bolts
- Do **not** wash off coating of cylinder head bolts.
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

  No coolant, water or engine oil must be present in threaded holes of engine block.

TECHNICAL INFORMATION

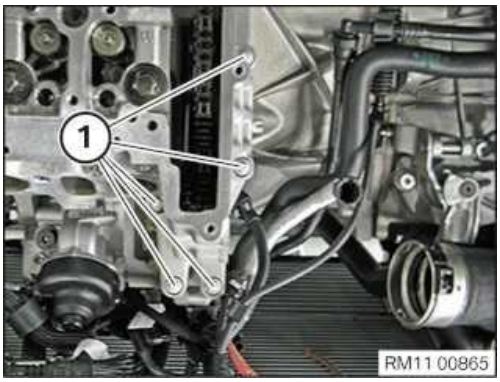
When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Feed in cylinder head bolts and install.
- Screw in cylinder head bolts in sequence (1) to (10).
- Tighten cylinder head bolts using special tools **0 490 504 (00 9 120)** and in sequence (1) to (10).

Cylinder head to crankcase

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °



- Tighten the cylinder head bolts (1).

Cylinder head bolt to timing case cover

M8x40		Tightening torque	19 Nm

49 – Installing the hydraulic valve clearance compensating element

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

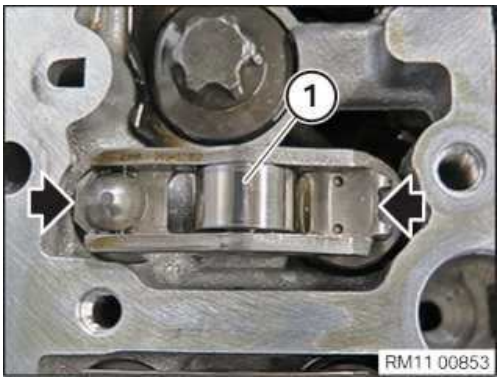


- Install the hydraulic valve clearance compensating element (1) in the direction of the arrow.
- Repeat the process on all hydraulic valve clearance compensating elements.

50 – Install the roller cam followers

TECHNICAL INFORMATION

- Note the installation position of the component. The component may be installed in various installation positions.

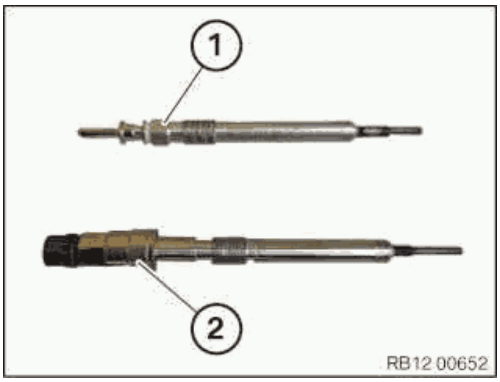


- Check all roller cam followers (1) for damage and replace if necessary.

  Parts: Roller cam followers
- Insert and install all roller cam followers (1).

  Roller cam followers (1) that have already been used must be installed in the same place.
- Note the mounting orientation of the roller cam followers (1).
- Oil all roller cam followers (1).

51 – Install glow elements



- Install glow elements (1) in cylinders 1, 2, 3 and 4.
- If fitted: Glow element (2) with the **combustion chamber pressure sensor** must be installed in cylinder **2**.

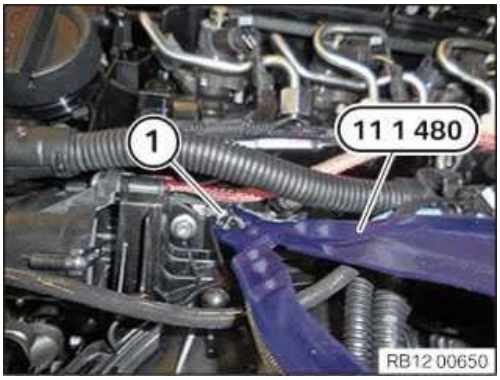
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- Tighten the glow element with the special tool or conventional tools.

Glow elements to cylinder head

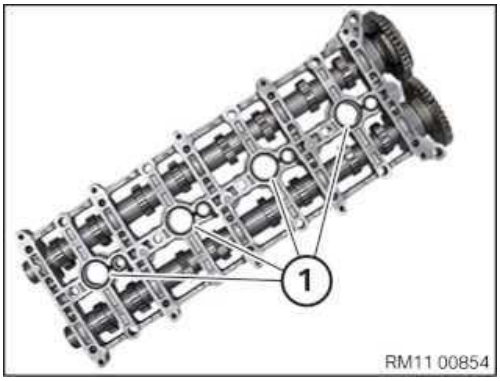
Glow element		Tightening torque	13 Nm



- Connect connectors (1) and lock.

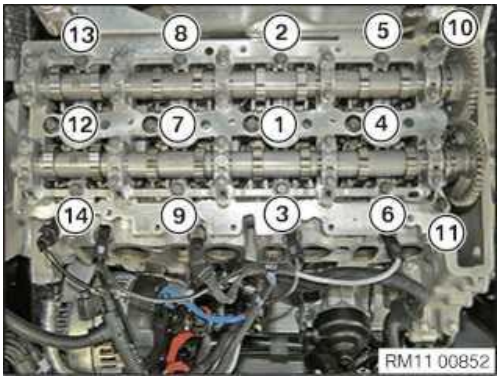
  The connector (1) must engage audibly.

52 – Installing the camshaft support



- Renew gaskets (1).

  Parts: gaskets



- Position the camshaft support including the camshafts.
- Tighten the screws in a sequence from (1) to (14) in several steps.

Camshaft carrier to cylinder head

M7x35		Tightening torque	13 Nm

53 – Adjusting the timing of the camshafts



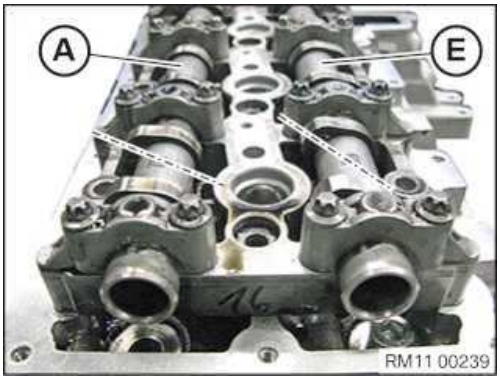
- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

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- Slide the special tool **2 288 380** completely into the bore hole of the oil sump.
- Use the special tool to block **2 288 380** the crankshaft in the TDC firing position at the first cylinder.



- The cam of the intake camshaft (E) at the first cylinder points up at an angle.
- The cam of the exhaust camshaft (A) at the first cylinder points outward at an angle.

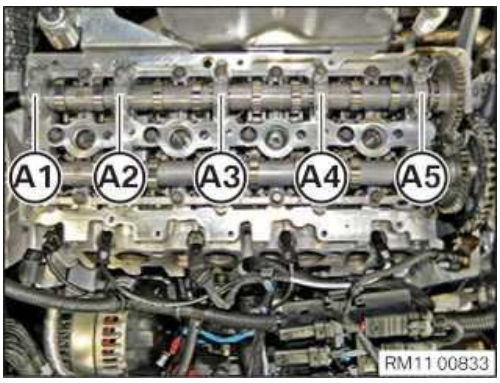
▸ **Remove exhaust camshaft.**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



TECHNICAL INFORMATION

The camshaft is tensioned by the valve springs. Tighten or loosen each screw on the camshaft bearing caps one at a time in the specified sequence and by half a turn only. Repeat procedure.

- Loosen all screws of the exhaust camshaft bearing caps (A1) to (A5) from the outside to the inside, step by step in 1/2 turns.
- Remove exhaust camshaft in upward direction.
- Place all components on special tool **0 495 105 (11 4 480)** in a tidy and orderly fashion.

▸ **Remove chain tensioner piston**

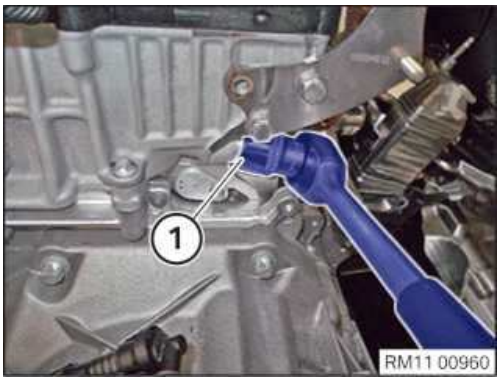
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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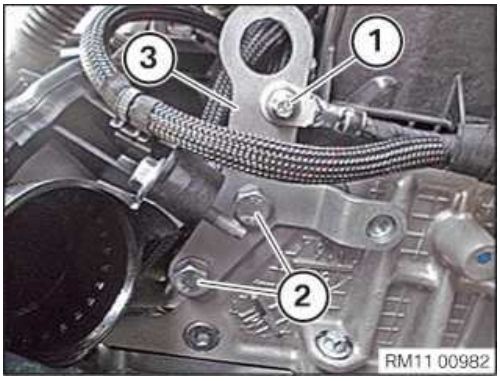


TECHNICAL INFORMATION

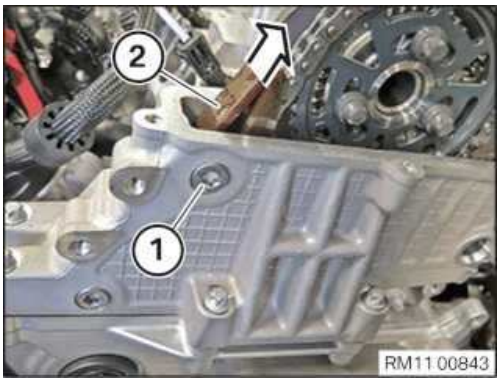
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

▸ **Remove the timing chain guide rail**

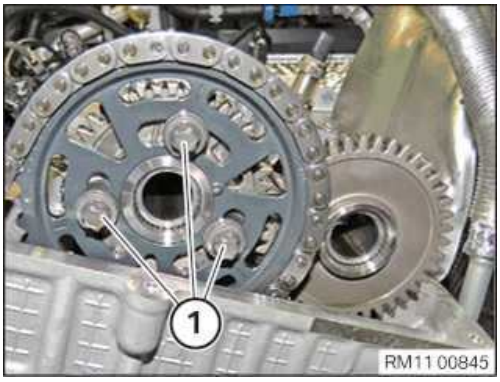


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

▸ **Removing the camshaft sprocket on the intake camshaft**



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

▸ **Install exhaust camshaft**

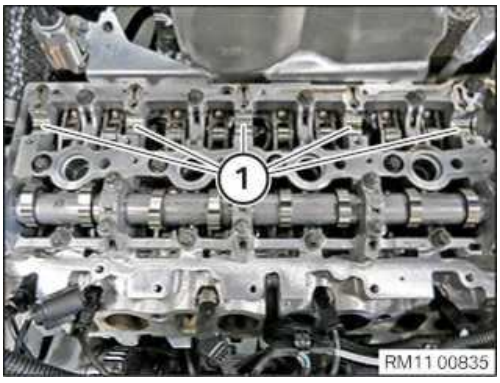
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RISK OF DAMAGE

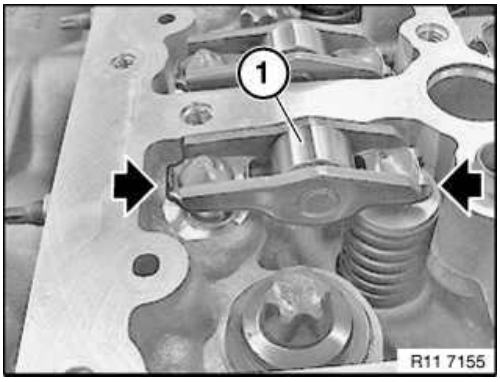
Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

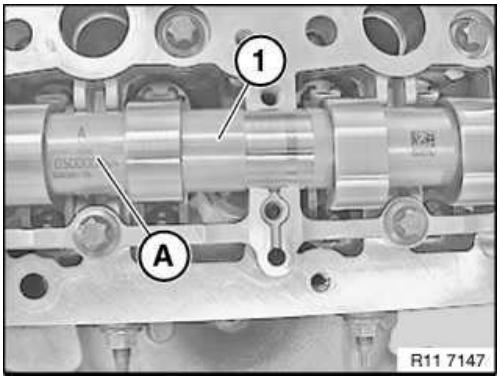
- Comply with the regulations for the installation and disassembly.
- Perform work with care.



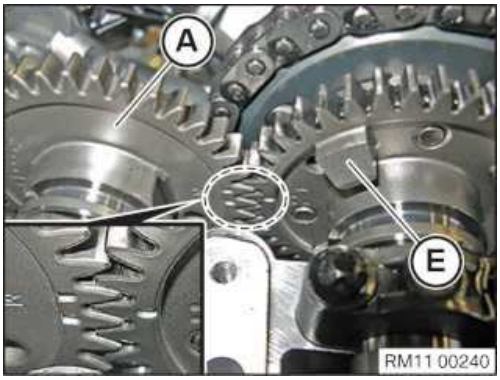
- Oil all bearing positions (1).



- Make sure the roller cam followers (1) have the correct mounting orientation.

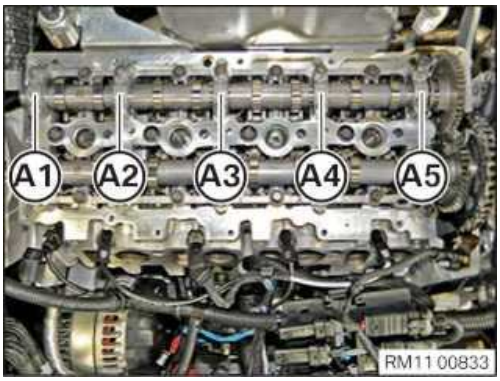


- Insert exhaust camshaft (1) so that the identification (A) points upwards.



- Insert the exhaust camshaft (A) so that the marks on the camshafts (A) and (E) correspond in the highlighted area.
- Position the camshafts (A) and (E) accordingly.

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- Tighten all exhaust camshaft bearing caps (A1) to (A5) from the inside to the outside by 1/2 a turn at a time.

Intake and exhaust camshaft in camshaft support

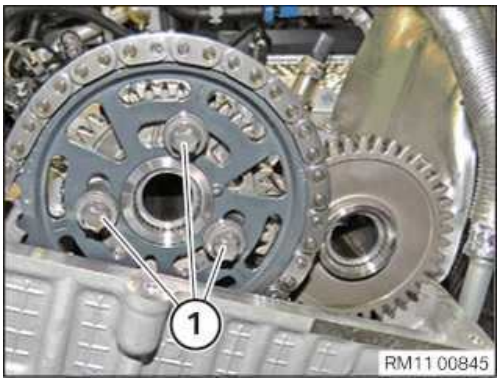
M6x31		Tightening torque	10 Nm



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

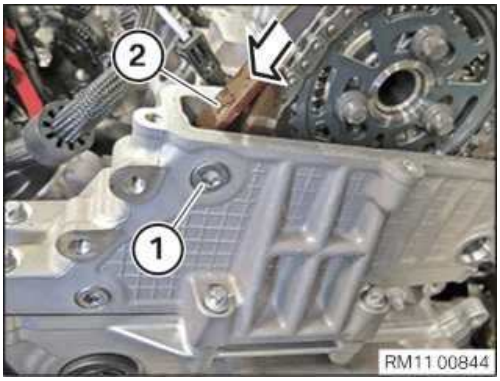
  Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

▶ **Installing the camshaft sprocket on the intake camshaft**



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

▶ **Install the timing chain guide rail**



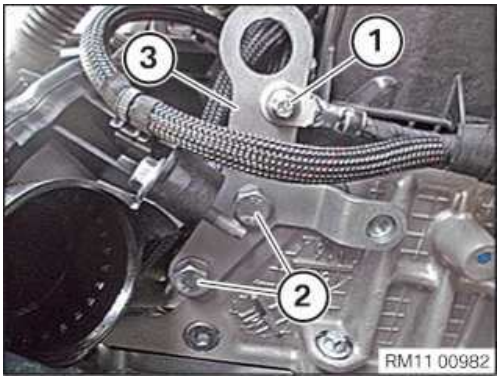
- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm



- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6			8 Nm

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▶ **Installing the chain tensioner piston**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Renew sealing ring (1).

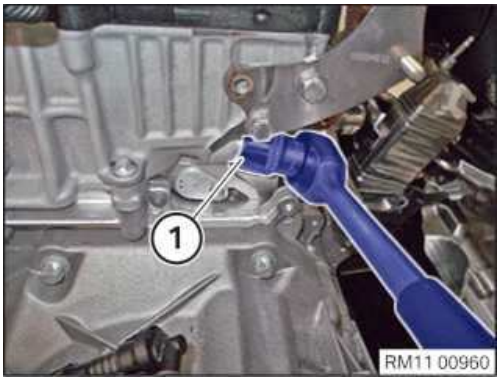
  Parts: Sealing ring



TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.

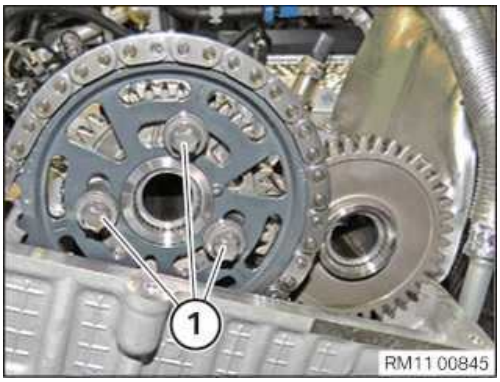


- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

▶ **Tightening the camshaft sprocket on the intake camshaft**

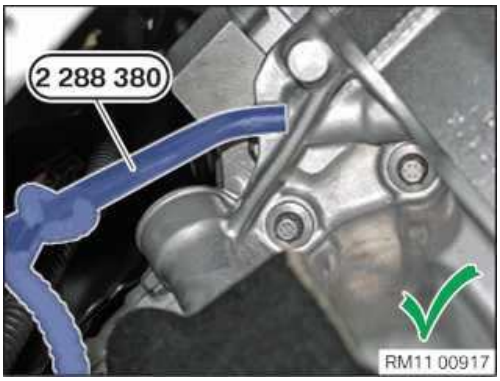


- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

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- Remove special tool **2 288 380**.

55 – Removing the special tool to secure the exhaust camshaft



- Remove the special tool **0 496 112 (11 8 760)** to fix the exhaust camshaft.

56 – Checking camshaft timing



- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

Damage to the engine.

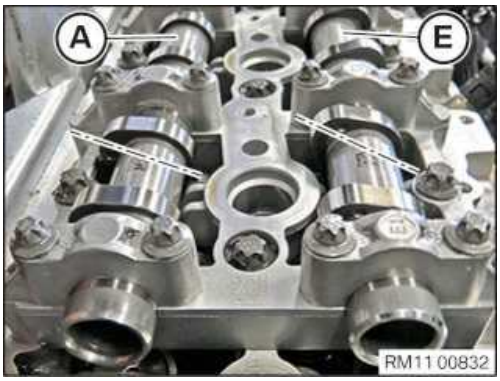
The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

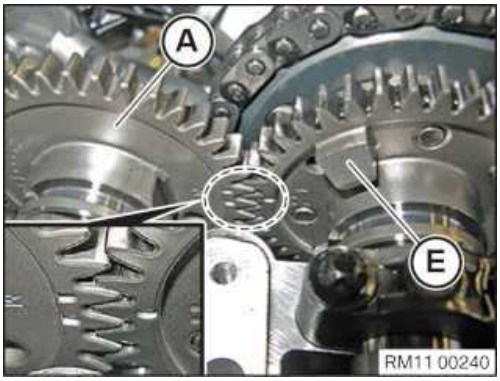
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- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

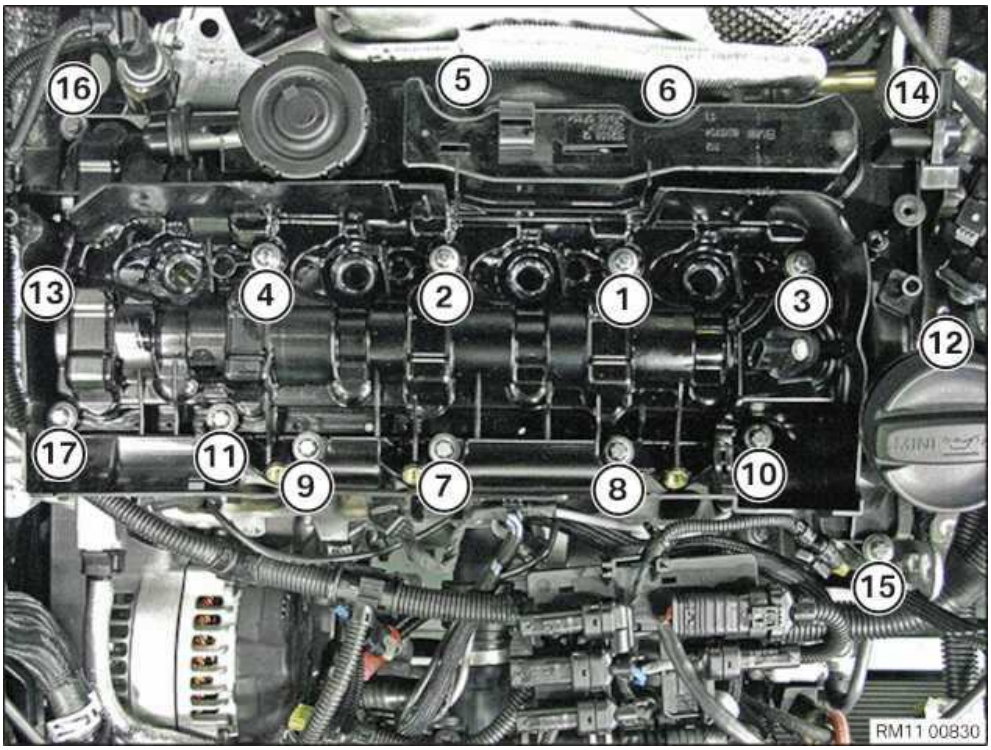


- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

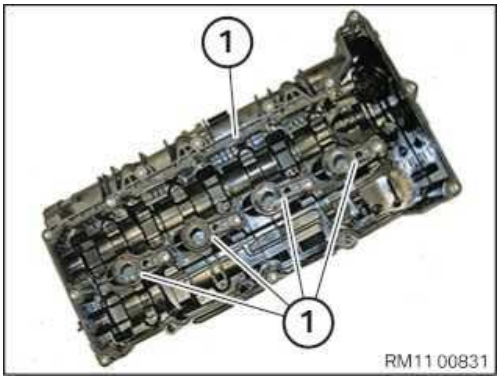
57 – Installing cylinder head cover

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Overview: Screw connection of the cylinder head cover

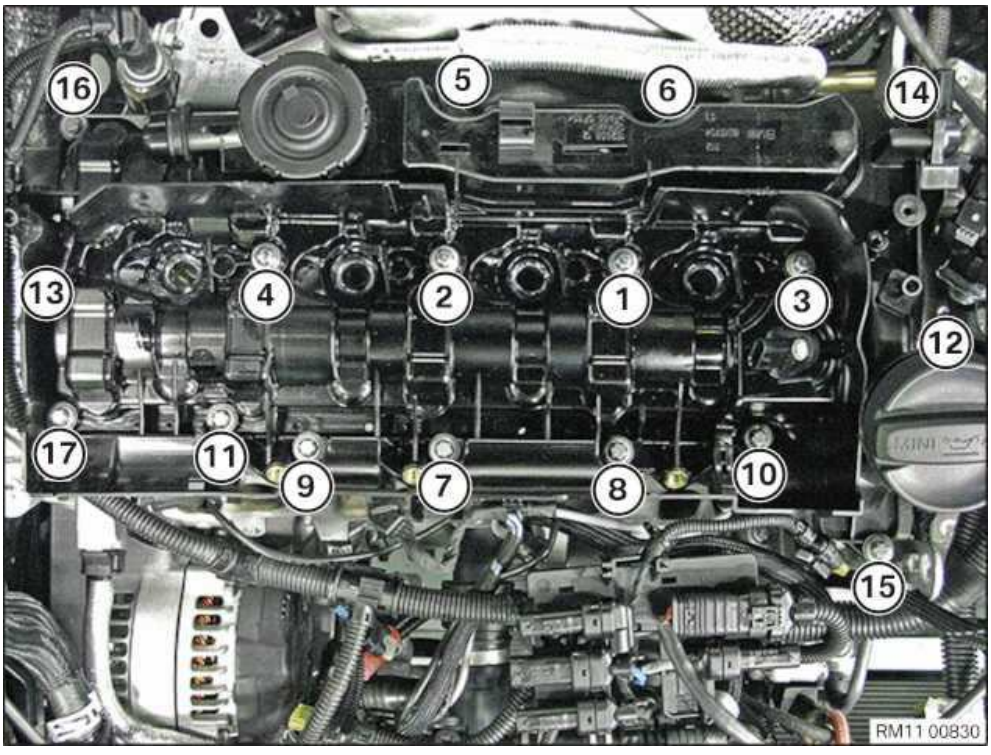


1 to 16 screws of the cylinder head cover.



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket



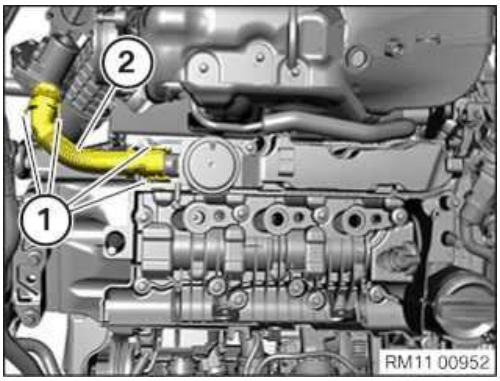
- Install cylinder head cover.
- Tighten screws in the order (1) to (17).

Cylinder head cover to cylinder head

M6		Tightening torque.	8, Nr

-

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- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

58 – Installing injectors of injection system

▶ **Cleaning the injector shafts**

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

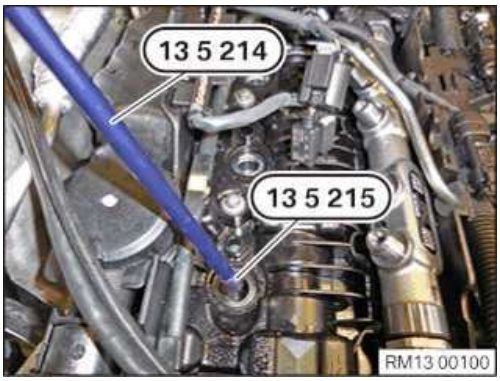
- Wear safety goggles.

RISK OF DAMAGE

Contaminant or foreign body.

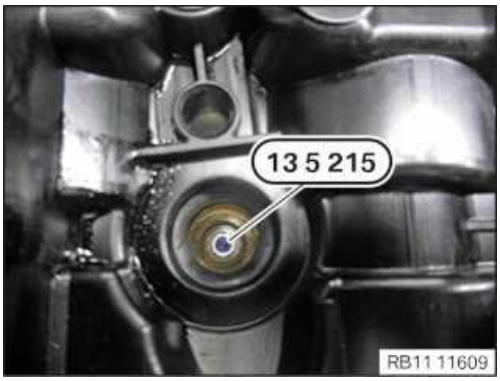
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.

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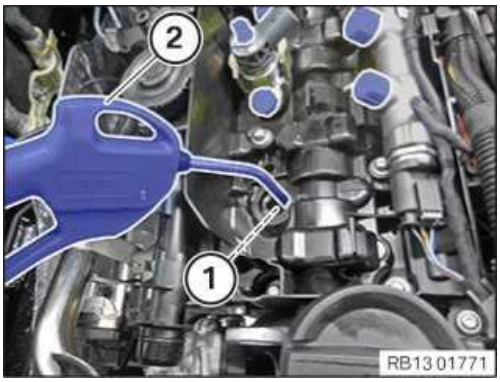
- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.



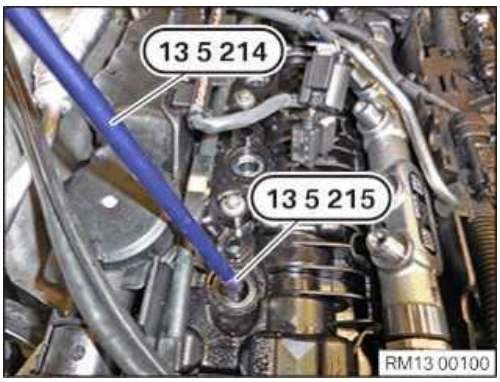
- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.



- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.



- Blow out injector shaft (1) with air gun (2).



- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

► **Check the placement of the clamping claw**

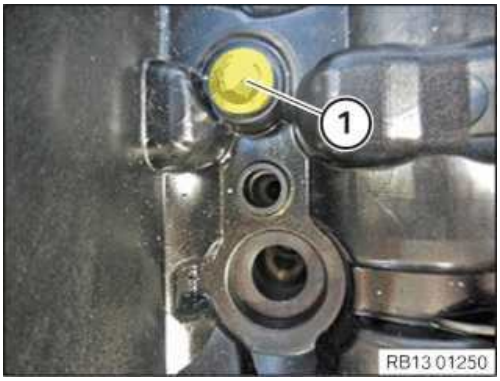
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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▸ **Prepare the injector for installation**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

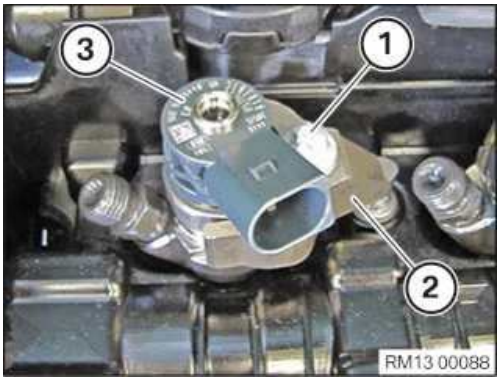


- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring
- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

Injector lubricating grease	50 g, Can	83230441070

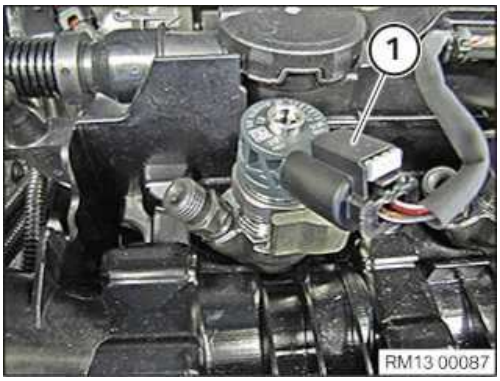


- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

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- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

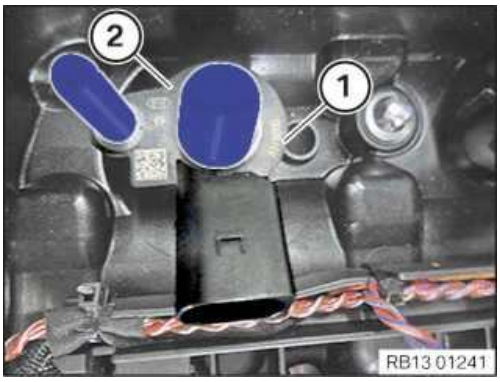
▶ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

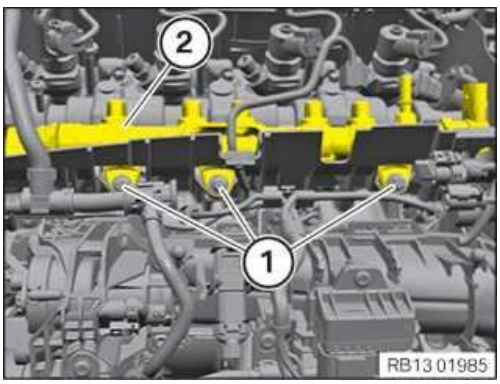


- Read off the adjustment value (1) on the new injector (2).



- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

59 – Installing the rail

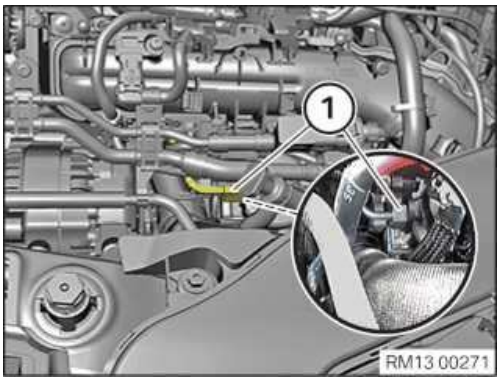


- Carefully insert and install the rail (2).
- Tighten the screws (1).

Rail on cylinder head cover

Torx screw M8x25		Tightening torque	19 Nm

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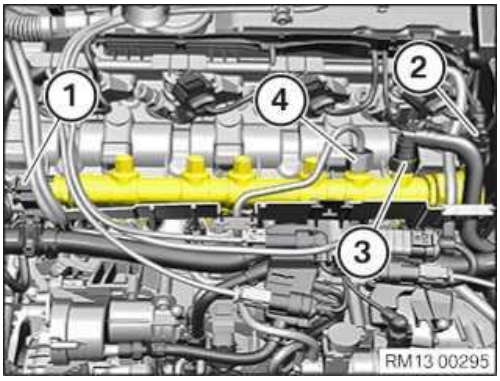
TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten union nut (1).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm



TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten union nut (4) with special tool .

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

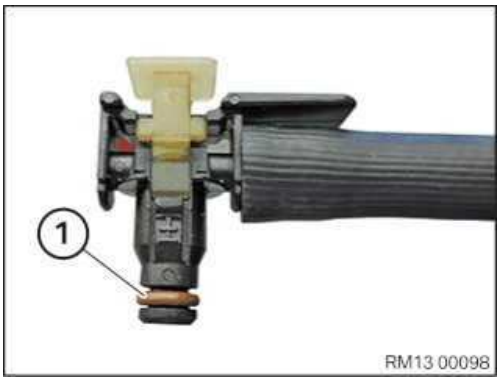
- Connect and lock the fuel line (3).

  Fuel line (3) must engage audibly.
- Connect connectors (2) and lock.

  The connector (2) must engage audibly.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

60 – Connect the leakage oil line on the injector



- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.

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- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

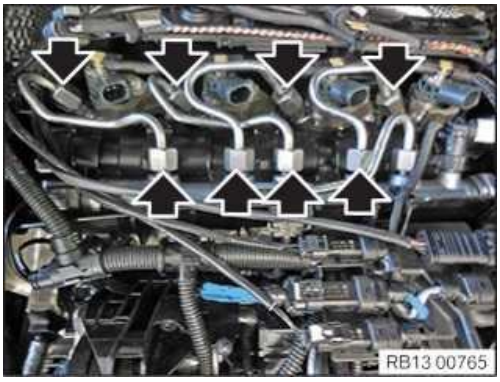
61 – Installing high pressure lines between rail and injectors

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Remove special tool .
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

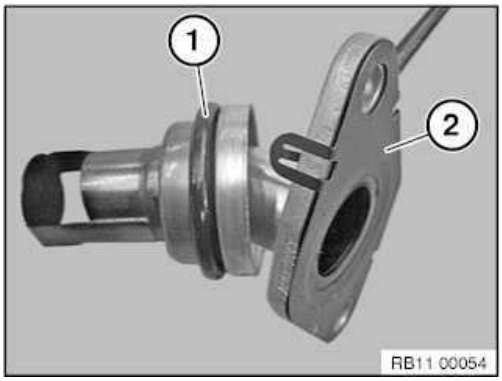
- Tighten the high pressure lines (arrows) with the special tool .

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

62 – Installing the intake plenum

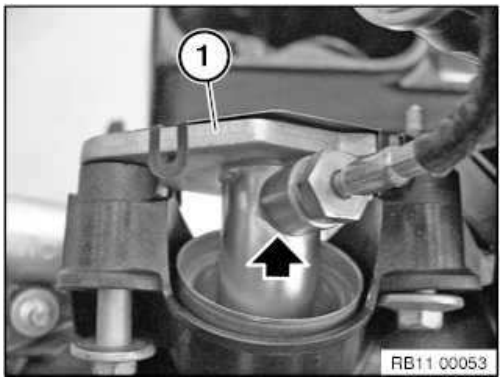


- Renew O-ring (1).

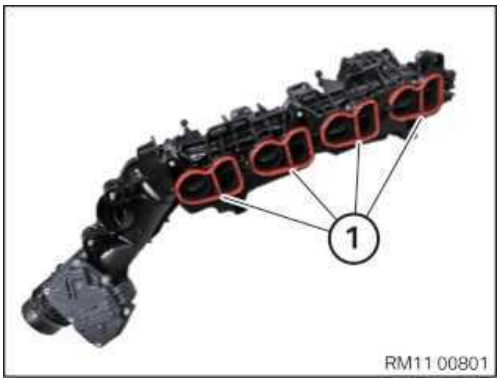
  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position the seal (2) and clip it in.

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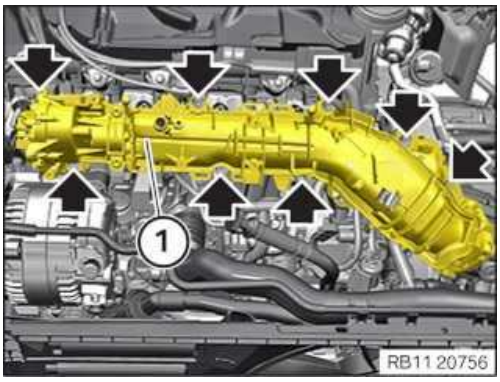


- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (1).

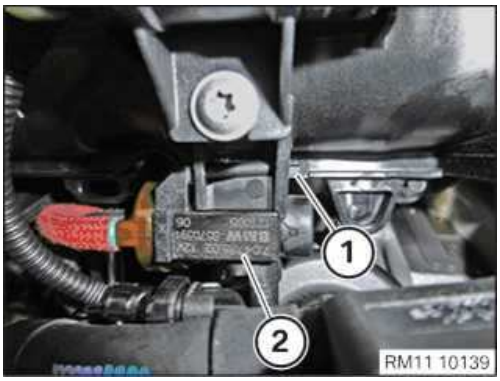
  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.



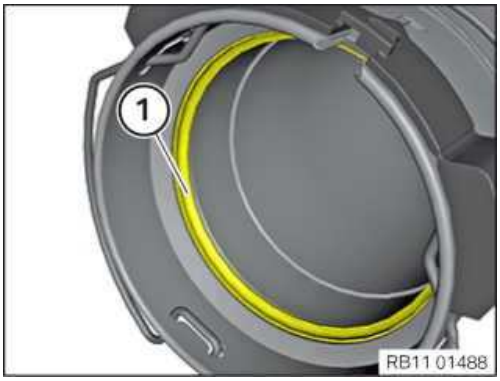
- Guide in and install intake (1) plenum.
- Tighten screws (arrows).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm



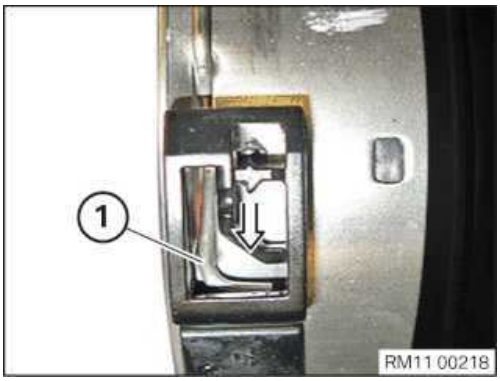
- Install the electric changeover valve (2) in the holder on the plenum from left to right.
- Lock (1) must engage audibly.



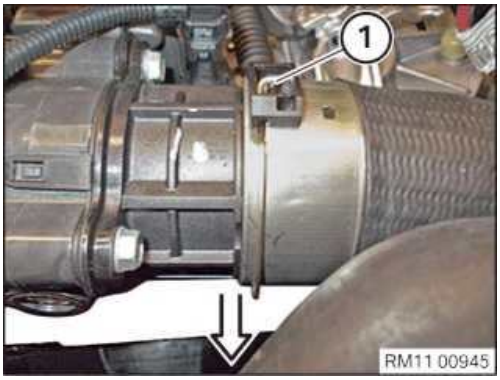
- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring

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- Engage the lock (1) on the bracket (arrow).



- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

63 – Remove the engine from the assembly stand

CAUTION

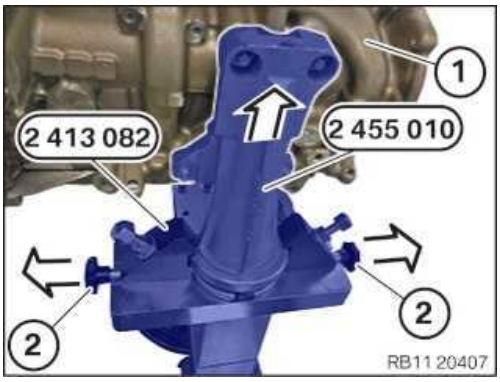
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Insert engine lifter with special tool and position engine (1).

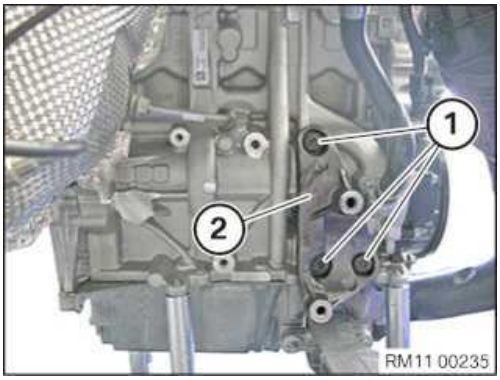


- Unscrew the nuts on special tool .
- Detach the holder (2) in the direction of the arrow.
- Detach the engine (1) with special tool **2 455 010** out of the special tool in the direction of arrow.

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- Remove conventional screws (arrows).
- Feed out the special tool **2 455 010** on the engine (1) and remove.



- Insert and install the holder (2).
- Tighten the screws (1).

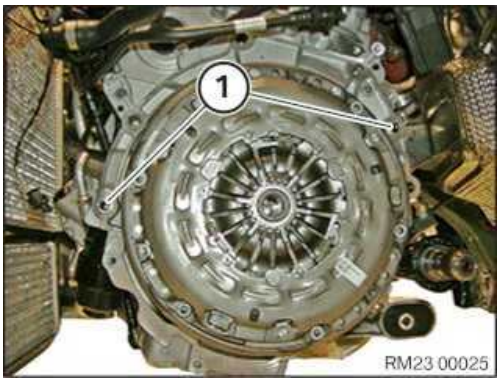
Holder to crankcase

M10		Tightening torque	38 Nm

64 – Mounting engine on manual gearbox

Prerequisite

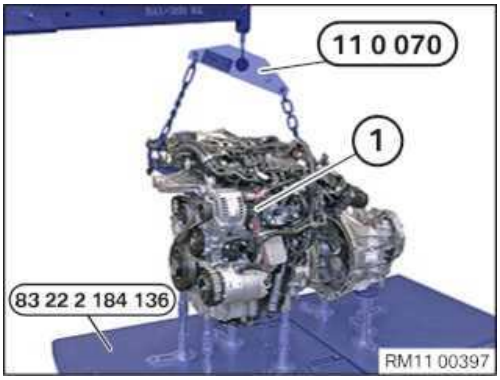
Engine has been removed.



- Check for correct fit of fitting sleeves(1).
- Replace damaged fitting sleeves.

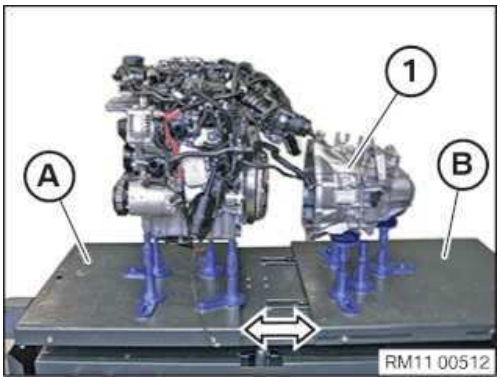


- Remove any grease from the transmission input shaft (arrow) and clean the shaft.
- Do not grease transmission input shaft.
- Check the clutch disc for frictional corrosion in the gearing and renew if necessary.

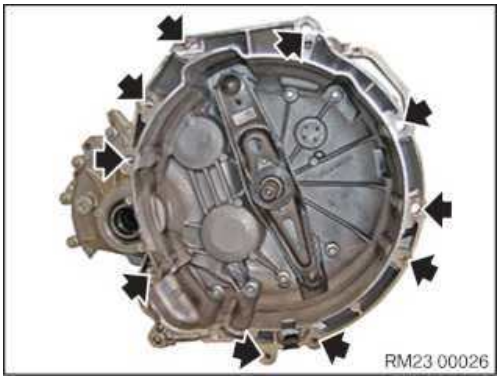


- Position the engine (1) on the lifting table **2 184 136** using the engine lifter and the special tool .
- Feed out engine lifter from engine (1) with special tool and push aside.

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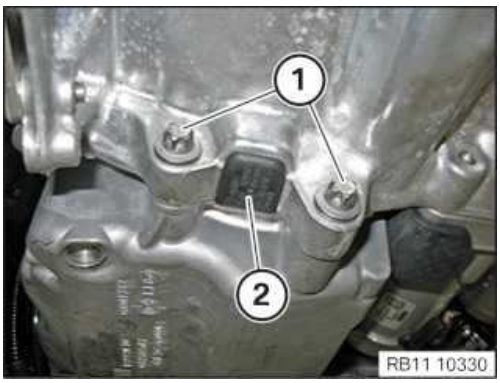
- Push table top (B) in direction of arrow and position manual gearbox (1) on engine.



- Tighten screws (arrows).

Transmission to engine

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm



- Tighten the screws (1).

Transmission to oil sump

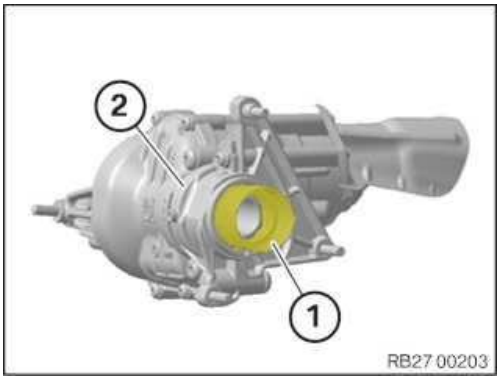
M8		Tightening torque	19 Nm

- Install the protective cap (2).



- Unscrew the bolts (1) of the special tool **2 459 012**.
- Feed out the special tool **2 459 012** at the cylinder head and remove.

65 – Install the transfer box (VTG)



- If intermediate shaft (1) gets caught on transfer box (VTG) (2), renew intermediate shaft (1) and the radial shaft seals in the automatic or manual transmission.

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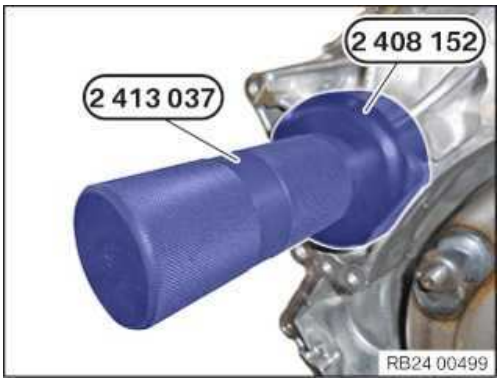
- Screw special tool **2 409 025** into the outer radial shaft seal.
- Turn the screw on the special tool **2 409 025** until the outer radial shaft seal has been pulled out.



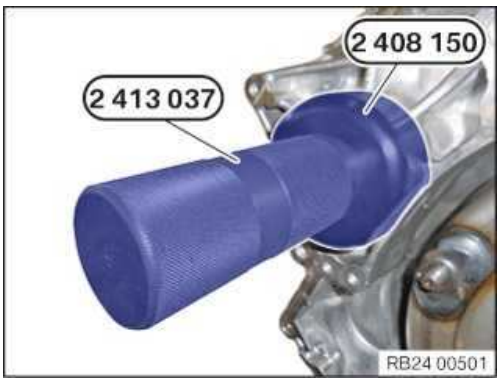
- Insert special tool **2 411 739** into the inner radial shaft seal.



- Screw special tool **2 411 739** into the inner radial shaft seal.
- Turn the screw on the special tool **2 411 739** until the inner radial shaft seal has been pulled out.

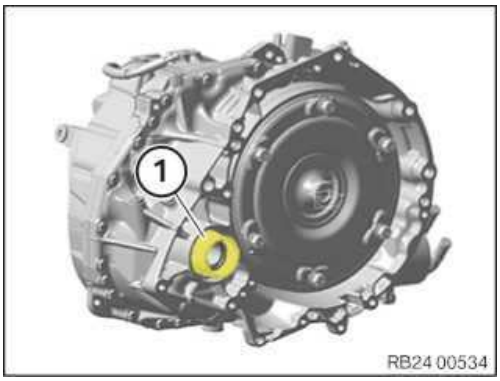


- Drive in the inner radial shaft seal using special tools **2 408 152** and **2 413 037** up to the limit position.



- Drive in the outer radial shaft seal using special tools **2 413 037** and **2 408 150** up to the limit position.

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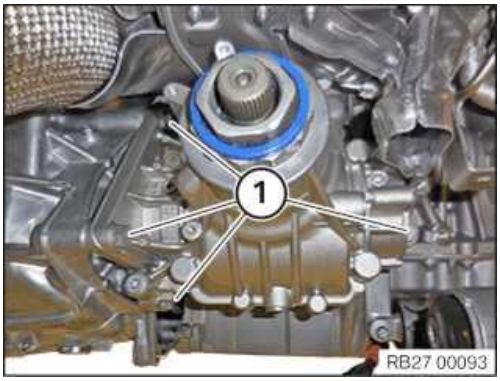
- If necessary, connect the new intermediate shaft (1) to the output flange of the automatic transmission or manual transmission.



- Coat the inside of the output flange (arrows) evenly with approx. 5 g of grease.

Expendable materials

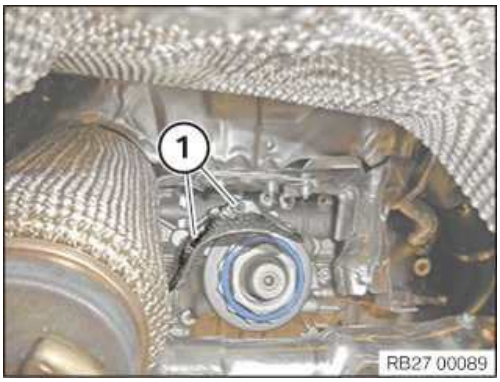
Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the transfer box (VTG).
- Tighten the screws (1).

Transfer box to transmission

M10		Tightening torque	56 Nm



- Install heat shield.
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Heat shield to transfer box

M6	Renew screws.	Tightening torque	6 Nm

▸ **Check the transfer box oil level**

RISK OF DAMAGE

Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.

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- Check transfer case oil level, correct:
- Open the oil filler plug (1).
- Check transfer box oil level.
- If necessary, top up transmission oil up to the lower edge of the oil filler plug opening (1).

Transmission oil

Technically suitable transfer box and electrical transmission oils	

Main group 27

- Tighten the oil filler plug (1).

Oil filler plug on transfer box (VTG)

M18x1.5		Tightening torque	35 Nm

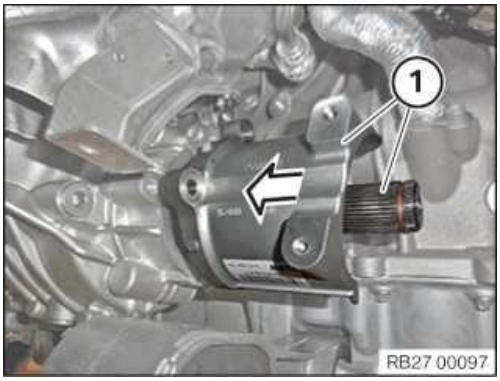
66 – Install the intermediate shaft with the support tube



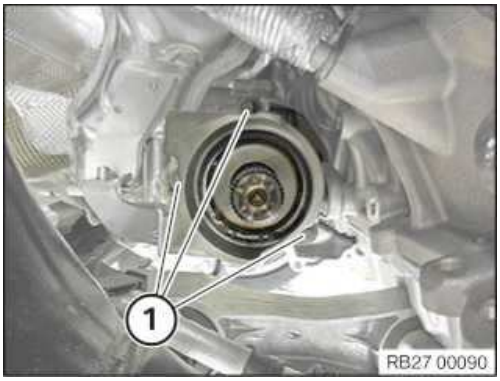
- Coat gearing of the intermediate shaft uniformly with 5 g of grease.

Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the intermediate shaft with support tube (1) in the transfer box.



- Position screws (1).

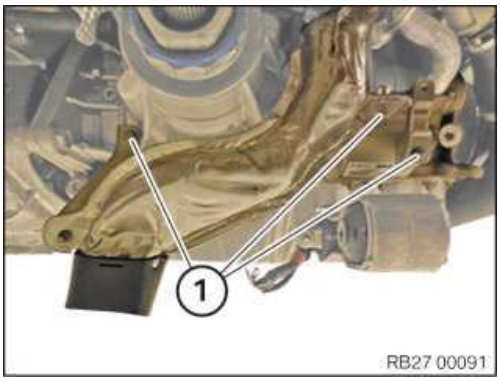
Note: Check for correct screw length! Bolt M8x35 8.8

- Tighten the screws (1).

Intermediate shaft to transfer box

M8x35		Tightening torque	19 Nm

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- If installed: Install air duct.
- Tighten the screws (1).

67 – Installing the high-pressure stage exhaust turbocharger

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

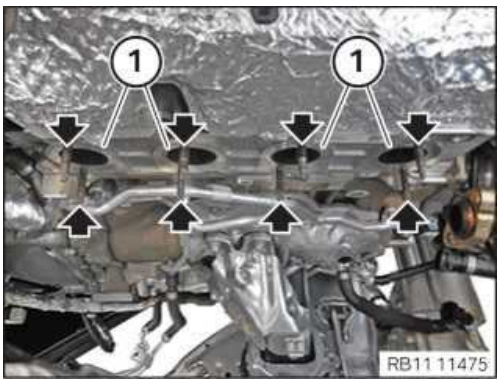
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

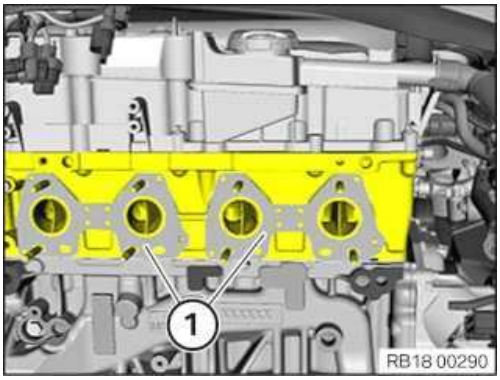


- Clean the sealing surfaces (1) on the cylinder head using special tool **0 495 102 (11 4 470)**.
- Check the stud bolts (arrows) on the cylinder head for correct fit.

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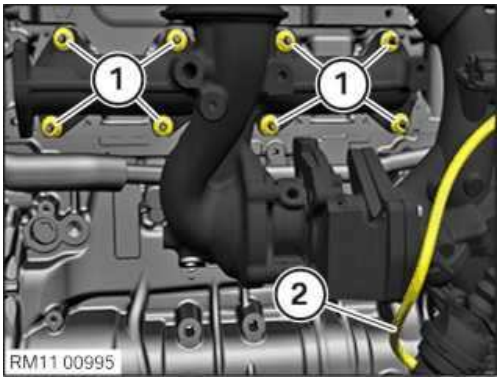
- Clean the sealing surfaces on the exhaust manifold using special tool **0 495 102 (11 4 470)**.



- Renew gasket (1).

  Parts: Gasket

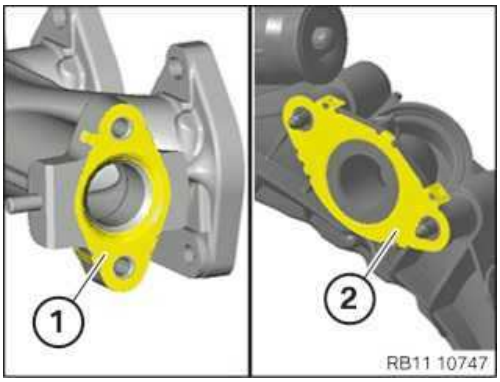
- Install new gasket (1).



- Feed in and install the exhaust manifold and the high-pressure stage exhaust turbocharger.
- Tighten nuts (1).

  Parts: Nuts

- Connect vacuum hose(2).

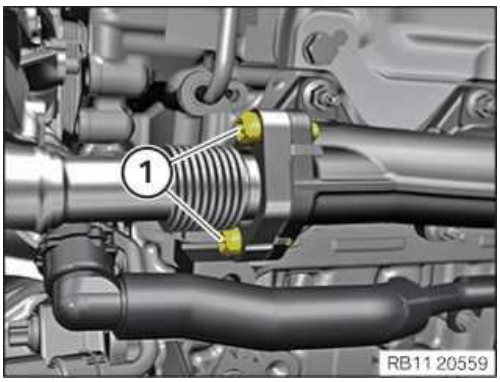


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket

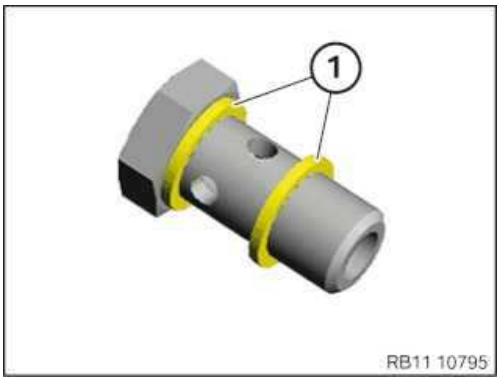


- Tighten the screws (1).

Exhaust-gas recirculation cooler to exhaust manifold

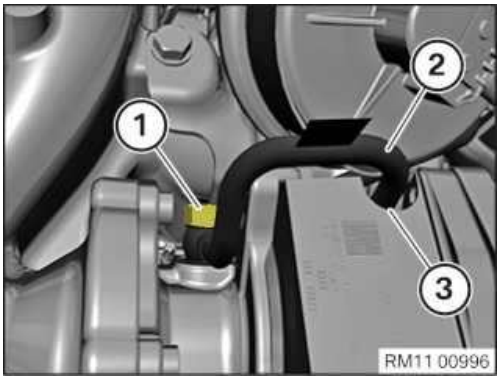
M8x28	Replace screws	Tightening torque	32 Nm

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- Renew sealing rings (1) of banjo bolt.

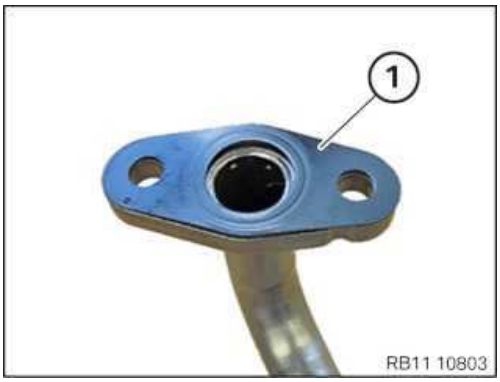
  Parts: Sealing ring



- Guide the oil feed line into the holder (3) and install it.
- Tighten down screw (1).

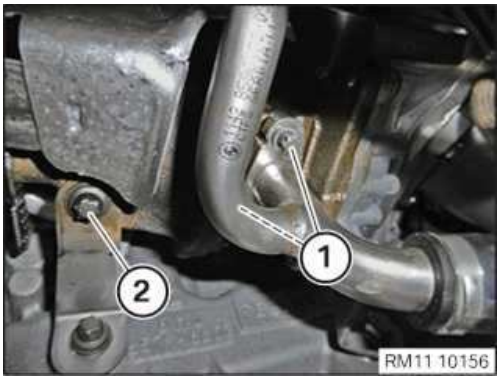


- Tighten bolt (1) from the right wheel arch.



- Renew seal (1) of oil return line.

  Parts: Gasket



- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

68 – Installing the low-pressure stage turbocharger

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RISK OF DAMAGE

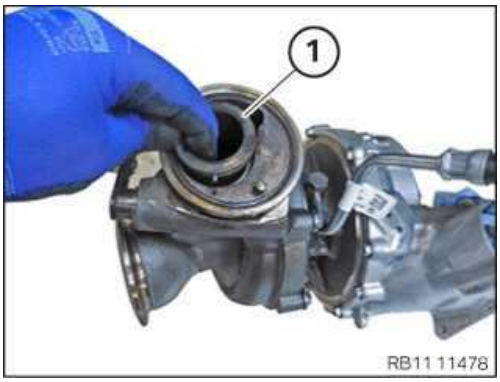
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

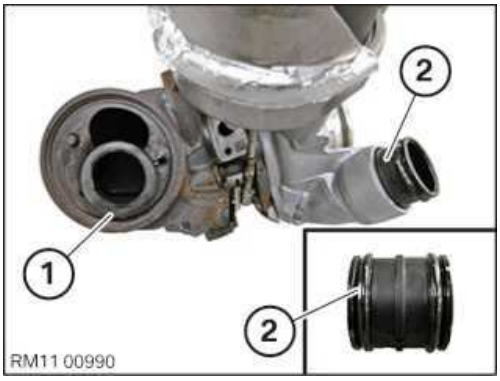
TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.



- Check the spacer plug (1) for damage, renew if necessary.

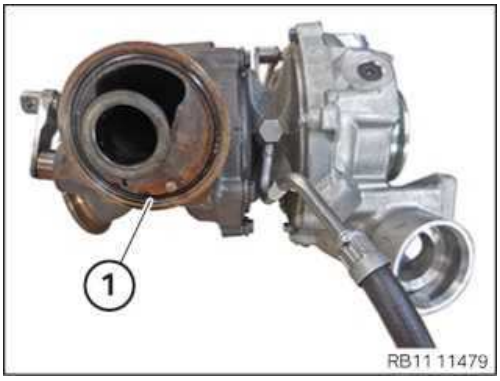
  Parts: Spacer ring
- Insert and install the spacer ring (1).
- Position spacer ring (1) correctly.



- Renew gasket (1).

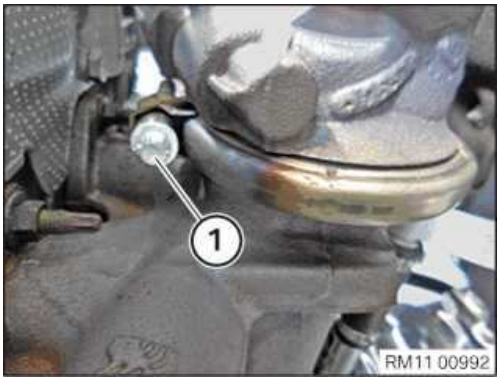
  Parts: Gasket
- Position the seal (1).
- Renew the sleeve(2).

  Parts: Holding sleeve



- Renew sealing ring (1).

  Parts: Sealing ring
- Affix the sealing rings on the exhaust turbocharger.



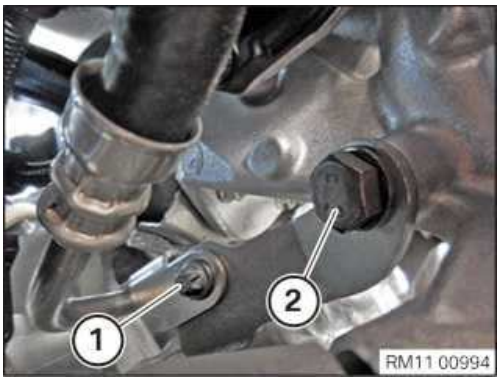
- Insert and install the low-pressure stage exhaust turbocharger on the exhaust manifold .
- Feed in and install V-band clamp .
- Tighten V-band clamp (2).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Screw in nut (1) with 2 **revolutions**.

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- Tighten down screw (1).

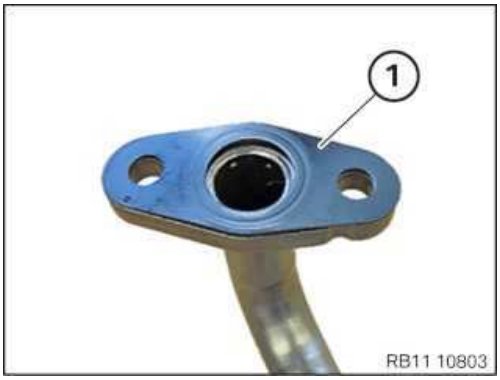
Oil feed line to bracket

Torx screw M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

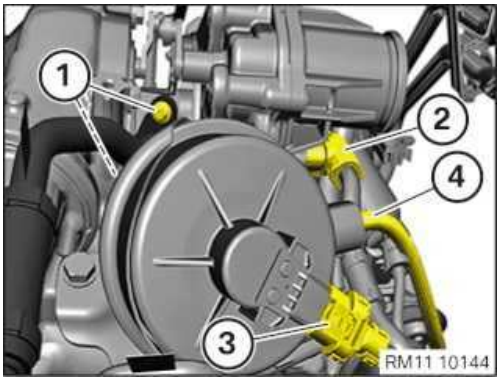
Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm



- Renew seal (1) on the oil return line.

  Parts: Gasket



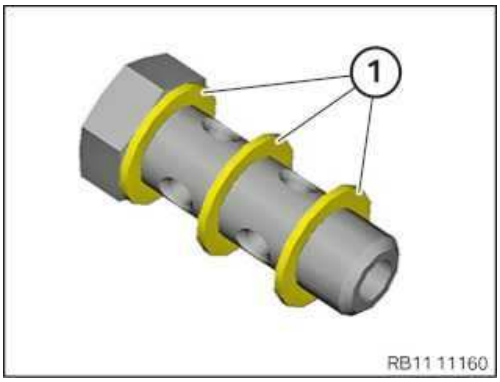
- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

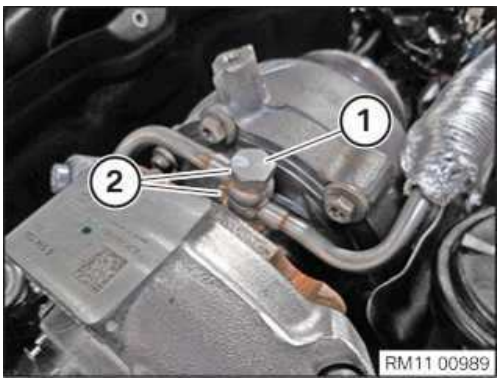
M6x12		Tightening torque	8 Nm

- Connect and lock connectors (2) and (3).

  The locks must engage audibly.
- Connect vacuum hose (4).

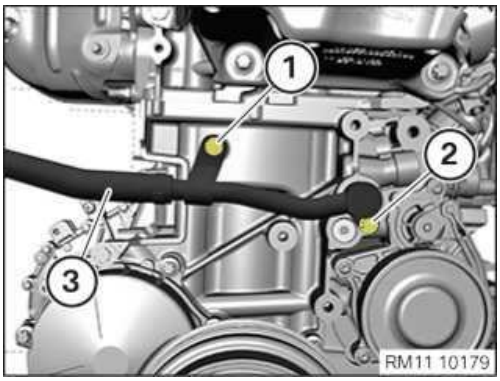


- Renew banjo bolt and sealing rings (1).
- **Parts:** Banjo bolt, sealing rings



- Install sealing rings (1).
- Tighten the banjo bolt (1).
- Ensure that the lines do not rest against the adjacent components.

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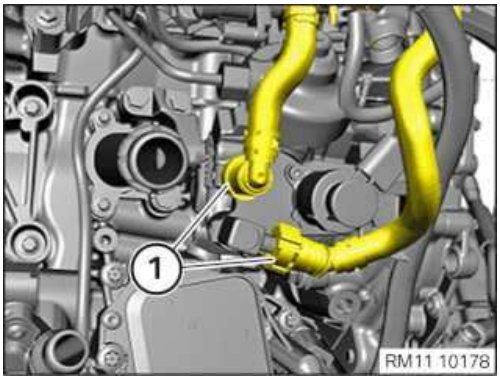


- Renew sealing ring of the coolant line (3).

  Parts: Sealing ring
- Coat the sealing ring and install the coolant line (3) .
- Tighten down screws (1) and (2).

Standard screw connection M6

M6		8 Nm



- Connect and lock fuel lines (1).

  The fuel lines (1) must audibly engage.

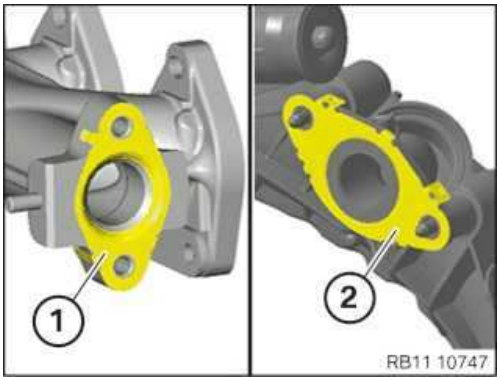
▶ **Installing the exhaust-gas recirculation cooler**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

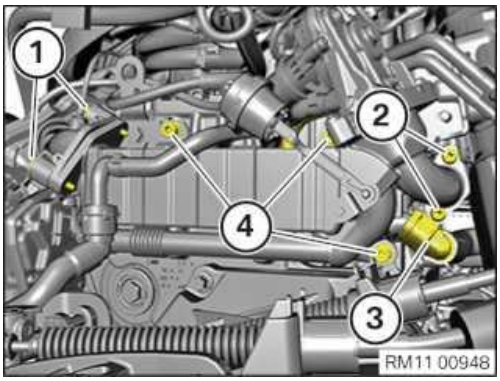


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket
- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket

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- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts
- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

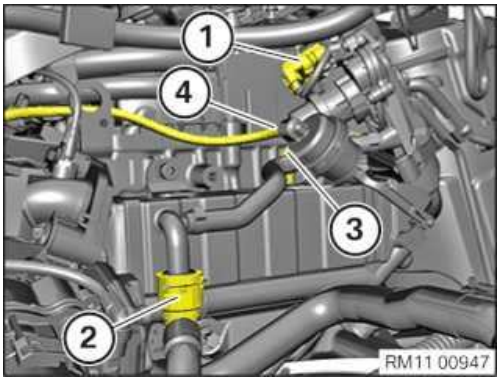
M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.
- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm



TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

▸ **Installing heat shield on exhaust turbocharger at bottom**

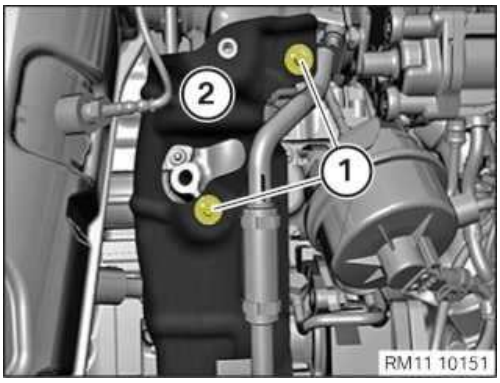
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WARNING

Hot surfaces.

Risk of burning!

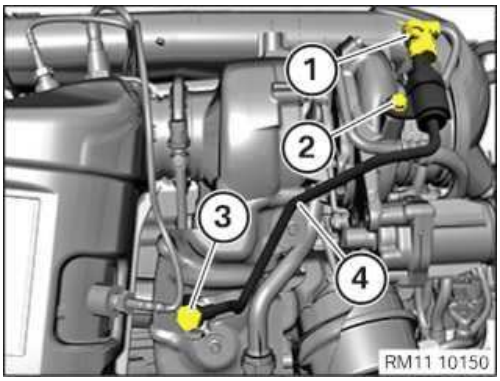
- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (2).
- Tighten the bolts (1) on the heat shield .

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm



- Position the exhaust gas pressure pipe (4).
- Hand-tighten the bolt (2).
- Renew sealing rings on the banjo bolt (3).

  Parts: Sealing ring
- Tighten the banjo bolt (3).

Banjo bolt for exhaust pressure pipe to exhaust manifold

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

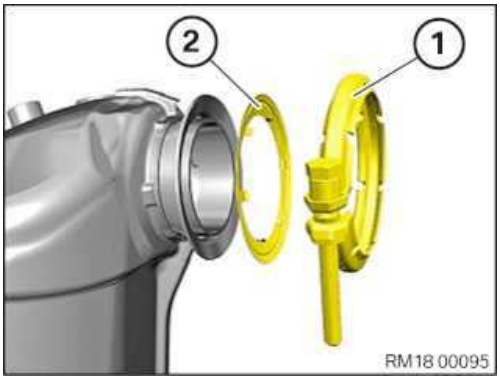
- Tighten down screw (2).

Standard screw connection M6

M6		8 Nm

- Connect connectors (1) and lock.

  Lock must audibly engage.



CAUTION

Heavy component.

Heavy components can lead to injury or damage.

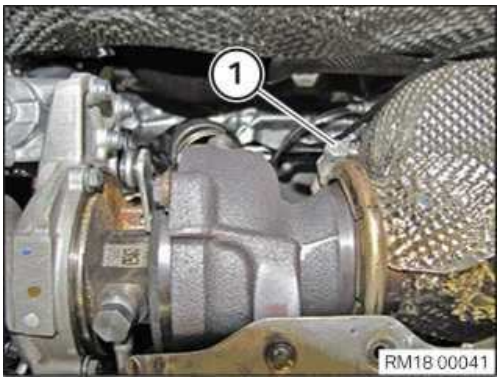
- Remove and install heavy components with the aid of another person/other persons.

- Renew the V-clip (1).

  Parts: V-band clamp
- Renew the gasket (2).

  Parts: Gasket

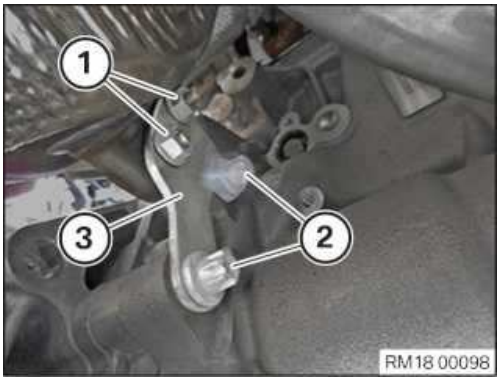
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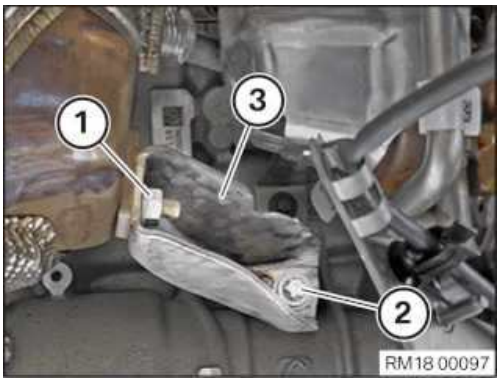
- Carefully insert and install the diesel particulate filter .
- Feed in and install V-band clamp (1).
- Make sure that the seal between the diesel particulate filter and the exhaust turbocharger is installed correctly.
- Align the diesel particulate filter on the exhaust turbocharger.
- Position V-clip (1).
- Hand-tighten the V-clip (1).



- Tighten nuts (1) by hand.



- Install holder (3).
- Hand-tighten the bolts (2).
- Tighten nuts (1) by hand.



- Install holder (3).
- Tighten the nut (1) hand-tight.
- Hand-tighten the bolt (2).



- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

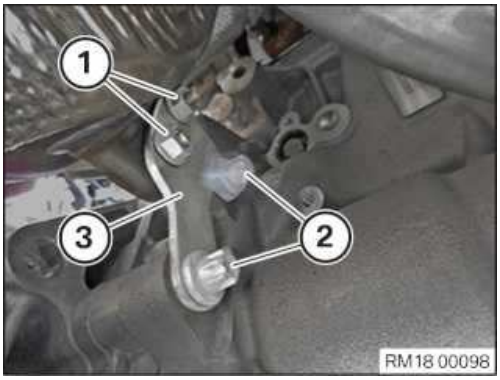
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- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screws (2).

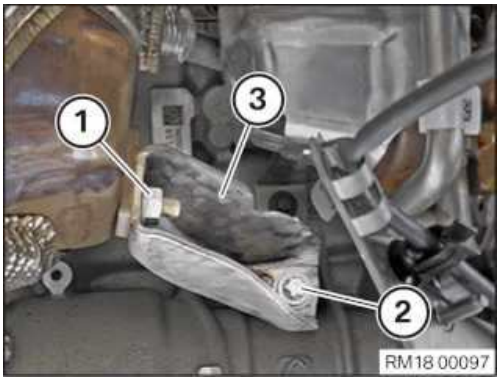
Diesel particulate filter holder to gearbox

M12x75		Tightening torque	66 Nm

- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screw (2).

Diesel particulate filter bracket to crankcase

M10x35		Tightening torque	38 Nm

- Tighten nut (1).

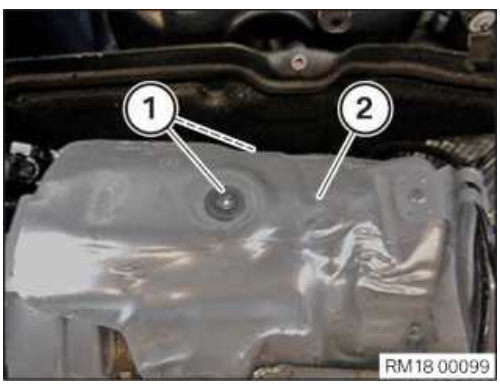
Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Remove fitting aid (1) for the flexible tube.

▶ **Install the heat shield on the exhaust turbocharger**



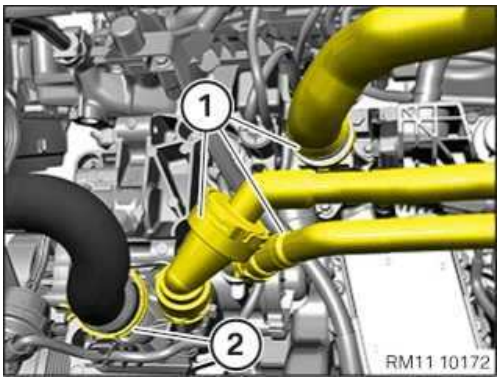
- Feed in and install the heat shield (2).
- Tighten the screws (1) at the top and bottom of the heat shield.

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

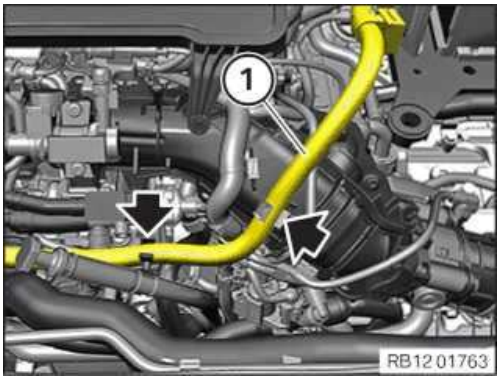
- Fasten the cable at the clips .

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- Install the coolant hose and secure with the clamp (2) .
- Connect and lock the coolant lines (1).

  The coolant lines (1) must engage audibly.



CAUTION

Improper routing of the positive battery cable.

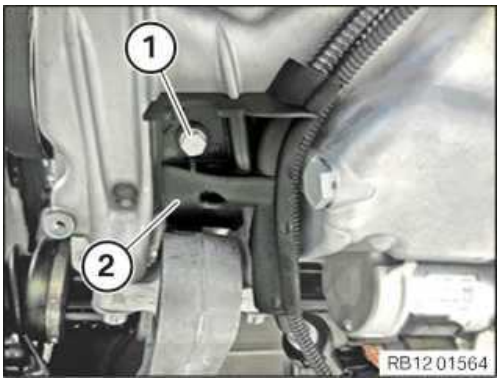
Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

- Insert the positive battery cable (1) into the clamps (arrows).



- Feed in and install positive battery cable at the clamps (1).



- Insert and install the holder (2).
- Tighten down screw (1).

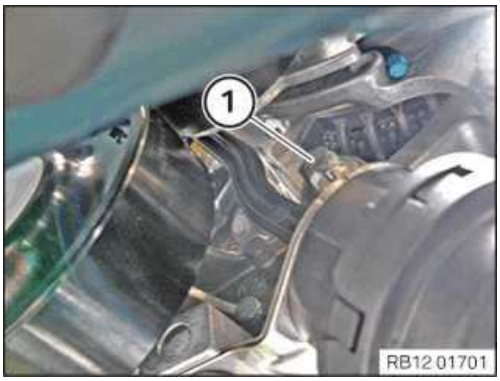
Bracket to oil sump

M6		Tightening torque	8 Nm



- Insert and install alternator (1) along with the screw (2) on the bottom of the alternator through the slot on the support.

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- Tighten the screw (1) below on the alternator.

Alternator to component carrier

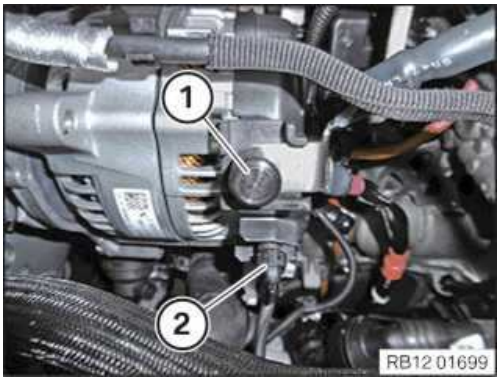
M10x75 / M10x125		Tightening torque	38 Nm



- Tighten the bolt (1) on top on the alternator.

Alternator to component carrier

M10x75 / M10x125		Tightening torque	38 Nm



- Mount positive battery cable to the alternator.
- Tighten nut.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

- Mount the cover (1).
- Connect the connector (2) to the alternator and lock audibly.



- Install air conditioning compressor (2) and position it correctly.
- Tighten the screws (1).

Air conditioning compressor in component carrier

M10		Tightening torque	38 Nm

▸ **Installing the drive belt for alternator**

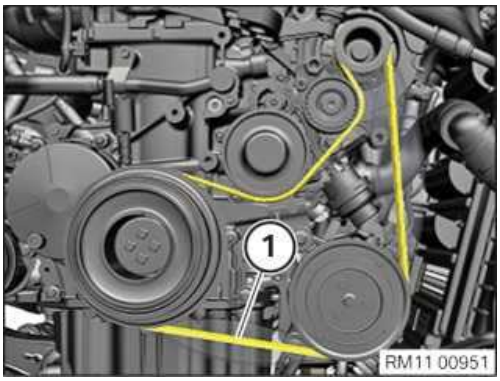
TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

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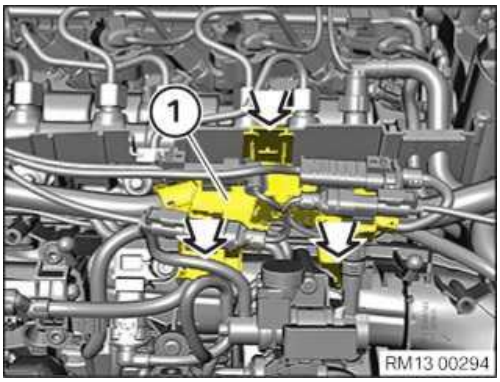


- Feed in the drive belt for the alternator (1) and install it.

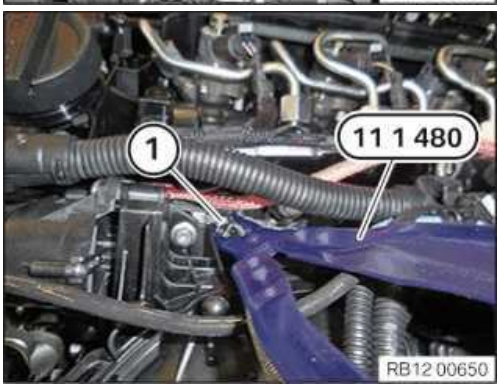


- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool **0 496 268 (11 0 390)** out of the belt tensioner and remove it.

▶ **Installing the cable clip for the intake plenum**

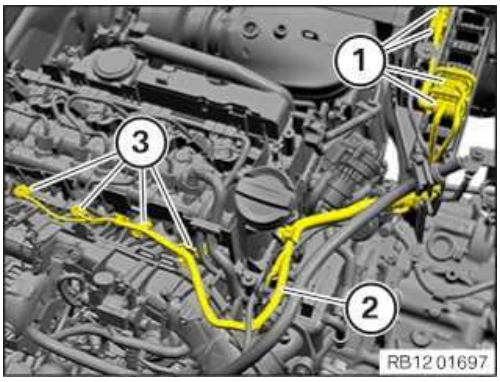


- Insert and install the cable clip (1) in the direction of the arrow.
- Make sure the cable clip (1) is fitted correctly.



- Connect and lock the connector (1) on the glow elements.

  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.

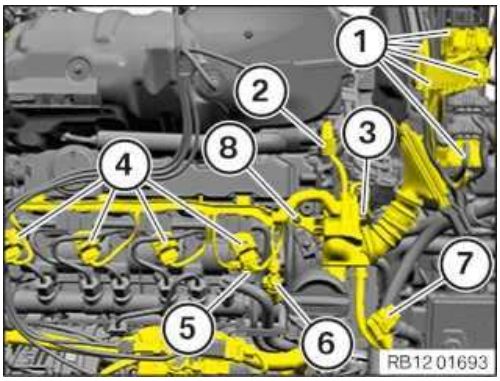


- Lay vehicle wiring harness and fasten with clamps.
- Route all connectors (1) to the integrated supply module (PDM) and to the DME control unit.
- Connect all connectors (3) to the glow elements and engage them audibly.
- Mount ground strap and tighten screw (2).

Ground cable to cylinder head

M6x12		Tightening torque	8 Nm

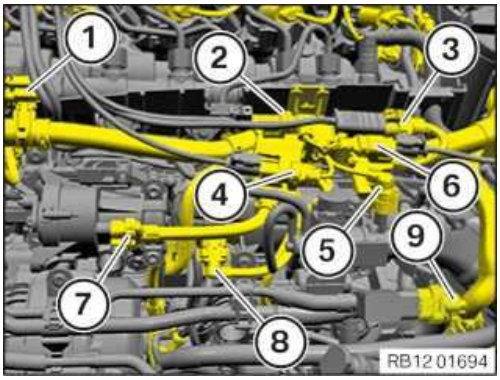
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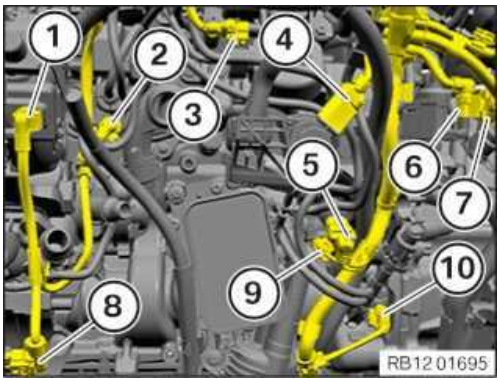
- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the integrated supply module (PDM) and to the DME control unit.
- Attach connector (2) to the differential pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust-gas recirculation valve and lock audibly.
- Attach connector (4) to the injectors and lock it audibly.
- Attach connector (5) to the camshaft sensor and lock it audibly.
- Attach connector (6) to the fuel pressure regulator and lock it audibly.
- Connect and audibly lock the connector (7) to the hot film air mass meter.
- Tighten down screw (8).

Wiring harness to cylinder head cover

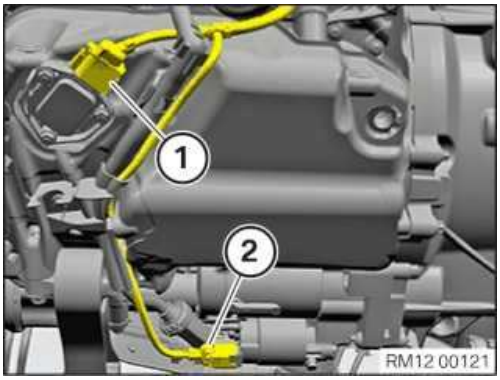
TS5x20		Tightening torque	3,5 Nm



- Connect the connector (1) to the rail pressure sensor and lock it audibly.
- Attach connector (2) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (3) to the front oxygen sensor and lock audibly.
- Attach connector (4) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Connect the connector (5) to the electric changeover valve and lock audibly.
- Attach connector (6) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (7) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (8) to the charging pressure sensor and lock it audibly.
- Attach connector (9) to the fuel pressure and temperature sensor and lock it audibly.

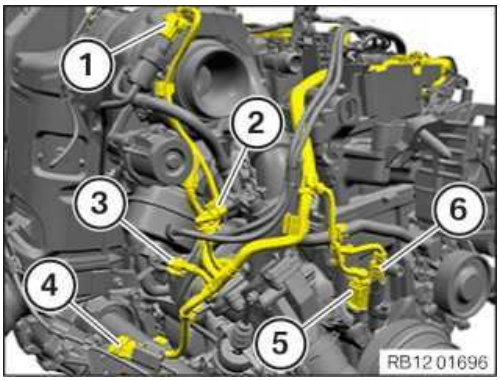


- Connect the connector (1) to the alternator and lock audibly.
- Connect the connector (2) to the electric changeover valve and lock audibly.
- Connect the connector (3) to the electric changeover valve and lock audibly.
- Connect the connector (4) to the high pressure pump and lock audibly.
- Connect the connector (5) to the oil pressure sensor and lock it audibly.
- Attach connector (6) to the throttle bodies and lock it audibly.
- Attach connector (7) to the intake air temperature sensor and lock it audibly.
- Connect the connector (8) to the air conditioning compressor and lock audibly.
- Connect the connector (9) to the solenoid valve and lock audibly.
- Connect the connector (10) to the crankshaft sensor and lock it audibly.

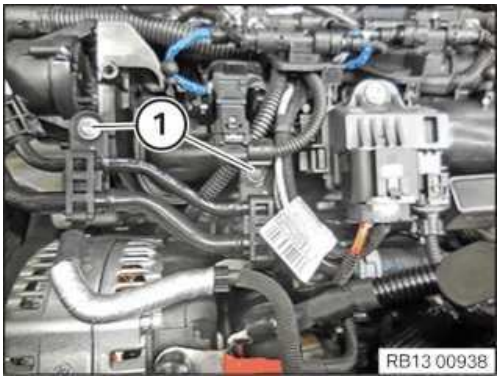


- Connect the connector (1) to the oil-level sensor and lock it audibly.
- Connect connector (2) to the starter motor and lock audibly.

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- Attach connector (1) to the exhaust turbocharger and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust gas pressure sensor and lock it audibly.
- Connect the connector (4) to the monitoring oxygen sensor and lock audibly.
- Attach connector (5) to the oil pressure switch and lock it audibly.
- Attach connector (6) to the switching valve and lock it audibly.

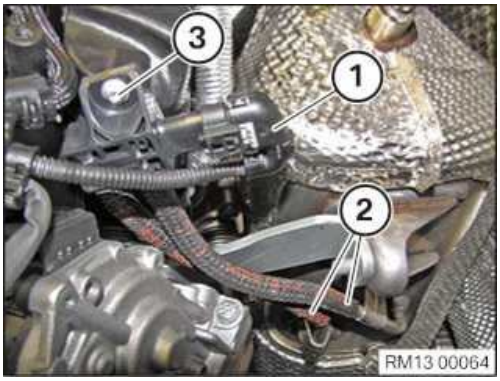


- Position the fuel line.
- Tighten the screws (1).

Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

70 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

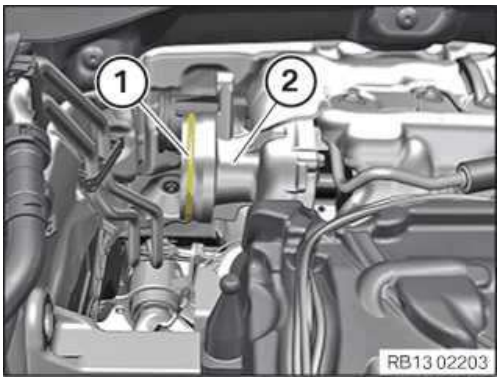
Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

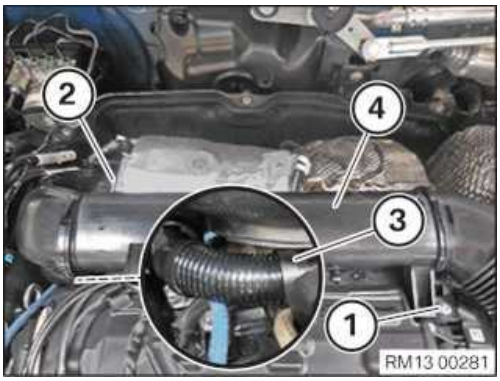
  The connector (1) must engage audibly.

71 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.

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- Feed in clean air pipe and install.
- Connect clean air pipe to the exhaust turbocharger and lock audibly in the clamps (2).
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Connect ventilation line (3) to the cylinder head cover and lock audibly.

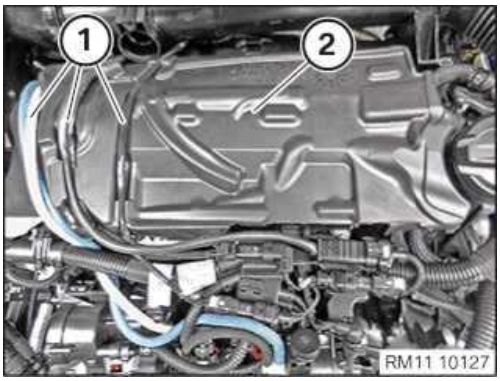


- Mount clean air pipe onto the intake filter housing.
- Tighten clamp (1) on the clean air pipe.

Clean air pipe to intake silencer housing

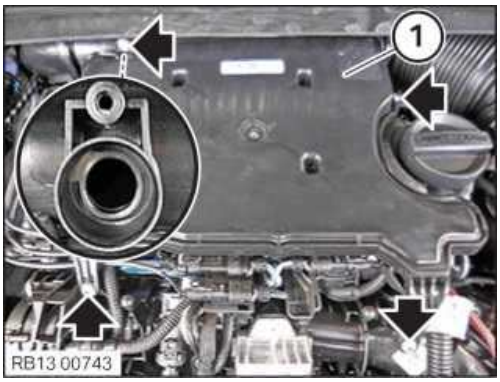
Clamp		Tightening torque	3 Nm

72 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the vehicle wiring harness (1) in the brackets.

73 – Install resonator



- Insert and install the resonator (1).
- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

74 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Check for correct installation of all rubber mounts in the acoustic cover (1).



- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

75 – Install engine



- See additional information.

Additional Information

Overview of Tightening Torques

Special tool to cylinder head Used in step 12

M8		Tightening torque	21,5 Nm

Special tool 2 455 010 to crankcase Used in step 13

M10x30		Tightening torque	38 Nm

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Special tool 11 8 930 to special tool 00 2 320

Used in step 13

M14x35		Tightening torque	160 Nm

Connecting rod bearing cap to connecting rod

Used in step 42

M9x47		Tightening torque	20 Nm
		Angle of rotation 1	70 °
		Angle of rotation 2	70 °

Oil deflector to crankshaft bearing cap

Used in step 43

M8x14	Replace screws.	Tightening torque	35 Nm
		Release	180 °
		Tightening torque	15 Nm
		Angle of rotation	45 °

Oil deflector to crankcase

Used in step 43

M8x14		Tightening torque	19 Nm

Oil vacuum pump to crankcaseB47

Used in step 44

M8x35		Tightening torque	19 Nm

Oil sump to crankcase

Used in step 45

M8x30		Tightening torque	24 Nm
M8x110		Tightening torque	24 Nm

Transmission to oil sump

Used in step 45 64

M8		Tightening torque	19 Nm

Starter motor to transmission

Used in step 45

M8x45		Tightening torque	19 Nm

Bracket to oil sump

Used in step 46 69

M6		Tightening torque	8 Nm

Battery positive lead to starter

Used in step 46

M8		Tightening torque	13,5 Nm

Cylinder head to crankcase

Used in step 48

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

Cylinder head bolt to timing case cover

Used in step 48

M8x40		Tightening torque	19 Nm

Glow elements to cylinder head

Used in step 51

Glow element		Tightening torque	13 Nm

Camshaft carrier to cylinder head

Used in step 52

M7x35		Tightening torque	13 Nm

Intake and exhaust camshaft in camshaft support

Used in step 53

M6x31		Tightening torque	10 Nm

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Bearing journal to cylinder head

Used in step 53

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8

Used in step 53

M8		Tightening torque	19 Nm

Standard screw connection M6

Used in step 53 69

M6			8 Nm

Chain tensioner piston to cylinder head

Used in step 53

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft

Used in step 53

M7x17.			17 Nm

Cylinder head cover to cylinder head

Used in step 57

M6		Tightening torque.	8,5 Nm

Clamping claw facing to cylinder head cover

Used in step 58

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 58

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

Rail on cylinder head cover

Used in step 59

Torx screw M8x25		Tightening torque	19 Nm

High pressure line between high pressure pump and rail

Used in step 59

High-pressure pipe		Tightening torque	28 Nm

High pressure lines between injector and rail

Used in step 61

High pressure lines		Tightening torque	28 Nm

Intake plenum to cylinder head

Used in step 62

M6		Tightening torque	11 Nm

Holder to crankcase

Used in step 63

M10		Tightening torque	38 Nm

Transmission to engine

Used in step 64

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

Transfer box to transmission

Used in step 65

M10		Tightening torque	56 Nm

Heat shield to transfer box

Used in step 65

M6	Renew screws.	Tightening torque	6 Nm

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Oil filler plug on transfer box (VTG)

Used in step 65

M18x1.5		Tightening torque	35 Nm

Intermediate shaft to transfer box

Used in step 66

M8x35		Tightening torque	19 Nm

Exhaust-gas recirculation cooler to exhaust manifold

Used in step 67 69

M8x28	Replace screws	Tightening torque	32 Nm

Oil return line to turbocharger

Used in step 67 68

M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase

Used in step 67

M8x16		Tightening torque	22 Nm

Exhaust turbocharger to exhaust manifold

Used in step 68

V-band clamp		Tightening torque	19 Nm

Oil feed line to bracket

Used in step 68

Torx screw M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase

Used in step 68

M8x16		Tightening torque	22 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 69

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler

Used in step 69

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 69

M8x20		Tightening torque	19 Nm

Heat shield for exhaust turbocharger

Used in step 69

Torx screw BM 6x12		Tightening torque	10 Nm

Banjo bolt for exhaust pressure pipe to exhaust manifold

Used in step 69

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

Diesel particulate filter V-clip to exhaust turbocharger

Used in step 69

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Diesel particle filter to holder

Used in step 69

M8 hexagon nut		Tightening torque	19 Nm

Diesel particulate filter holder to gearbox

Used in step 69

M12x75		Tightening torque	66 Nm

Diesel particulate filter bracket to crankcase

Used in step 69

M10x35		Tightening torque	38 Nm

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Heat shield for exhaust turbocharger — Used in step 69

Torx screw BM 6x12		Tightening torque	10 Nm

Alternator to component carrier — Used in step 69

M10x75 / M10x125		Tightening torque	38 Nm

Positive battery cable to alternator — Used in step 69

M8		Tightening torque	19 Nm

Air conditioning compressor in component carrier — Used in step 69

M10		Tightening torque	38 Nm

Ground cable to cylinder head — Used in step 69

M6x12		Tightening torque	8 Nm

Wiring harness to cylinder head cover — Used in step 69

TS5x20		Tightening torque	3,5 Nm

Fuel line to intake plenum — Used in step 69

TS6x20		Tightening torque	5 Nm

Differential pressure sensor to holder — Used in step 70

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor — Used in step 70

Clamp 15–19mm		Tightening torque	3 Nm

Clean air pipe to cylinder head cover — Used in step 71

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 71

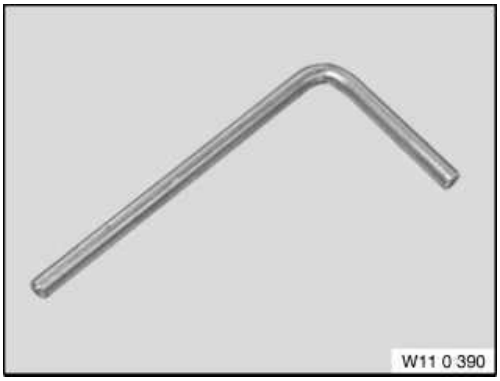
Clamp		Tightening torque	3 Nm

Resonator to manifold and clean air pipe — Used in step 73

Screw TS6	Renew screw.	Tightening torque	5 Nm

Overview of Special Tools

0 496 268 (11 0 390) Pin

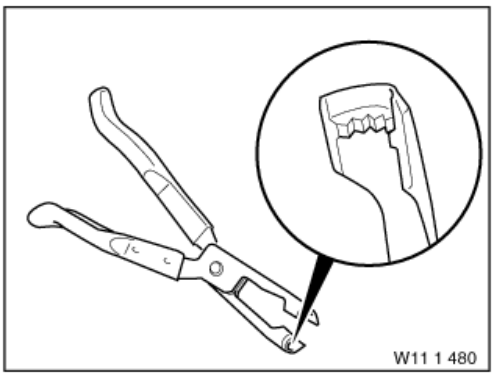


Common — Used in step 7 69

Usage	(roll pin) For securing new tensioning pulley (poly-V belt)
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 15 07 (390)

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0 490 796 (11 1 480) Pliers



Common Used in step 7 25

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

2 459 012 Holder



Common Used in step 12 64

Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

2 455 010 Engine support



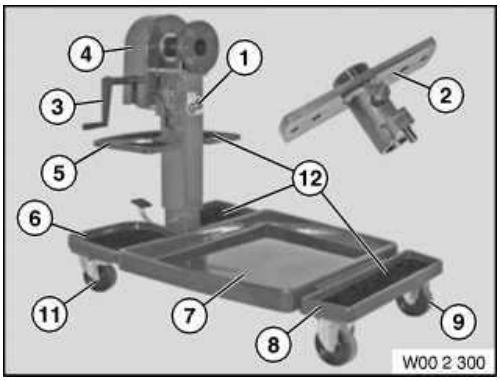
Common Used in step 13 63

Usage	For accommodating engine on assembly stand. Engine: B3x, B4x, N47.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

0 495 187 (00 2 300) Assembly stand

Used in step 13

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Common

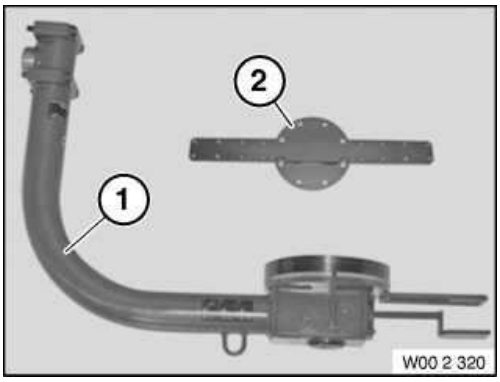
Usage	Assembly stand with universal flange for mounting engines from S85
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 188 (00 2 301)		**Assembly stand** available only as complete assembly stand 83 30 0 495 187.	
2	0 495 189 (00 2 302)	**2 299 563**	**Tool** (Universal flange). Do not use any more!!! Technically locked. Replaced with a new flange with material number 83 30 2 299 563. All flanges delivered until the end of 2011 will be replaced at no charge. From 2012, only the new flange will be supplied. Also applies to the complete engine mounting stand 00 2 300.	
3	0 495 200 (00 2 303)		**Crank**	
4	0 495 201 (00 2 304)		**Cover** (Protective hood)	
5	0 495 202 (00 2 305)		**oddments tray** (Oddments tray for small parts)	
6	0 495 203 (00 2 306)		**Shaped element** (Rear shaped pan)	
7	0 495 204 (00 2 307)		**Collection pan** (Oil collection pan)	
8	0 495 205 (00 2 308)		**Shaped element** (Front shaped pan)	
9	0 495 206 (00 2 309)		**Wheel** (Front wheel (without stop))	
10	0 495 207 (00 2 311)		**Wheel** (Rear wheel (with stop))	
11	0 495 208 (00 2 312)		**Mat** (Checker mat set)	
2	2 299 563		**Adapter** New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.	

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0 495 196 (00 2 320) Support arm



Common

Used in step 13

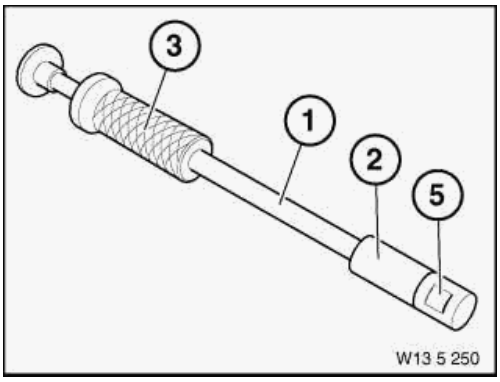
Usage	(Support arm with fixture) For mounting engines using the engine mounting bracket.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 197 (00 2 321)		**Support arm**	
2	0 495 198 (00 2 322)		**Panel** (take-up plate)	
3	0 495 380 (00 2 323)		**Panel** (fixture) Engine N73	
6	0 496 287 (00 2 326)		**Panel** (fixture) Engine: M73	
5	0 496 288 (00 2 327)	**0 496 373**	**Panel** (fixture) Engine: S62 Replaced by 11 5 420 (0 496 373)	
8	0 496 533 (00 2 328)		**Support** (Engine mount) Engine: N57, N57Top	
9	0 496 579 (00 2 329)	**0 496 680**	**Support** (Engine mount) Engine: N74 Replaced by 116160 (0 496 680)	
4	0 495 379 (00 2 324)		**Panel** (fixture) Engine M67TU	
5	0 495 381 (00 2 325)		**Panel** (fixture) Engine N62, N62TU	

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0 493 321 (13 5 250) Puller



Common Used in step 17

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

0 493 339 (13 5 252) Bush



Common Used in step 17

Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 340 (13 5 253) Weight

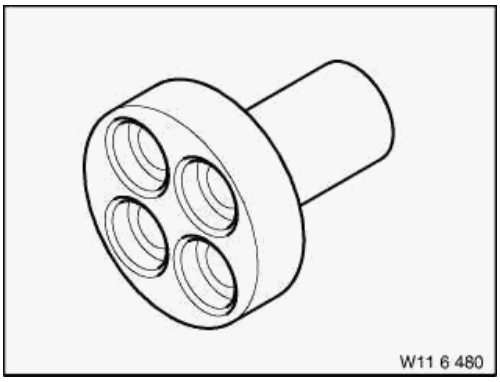


Common Used in step 17

Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 493 380 (11 6 480) Connector



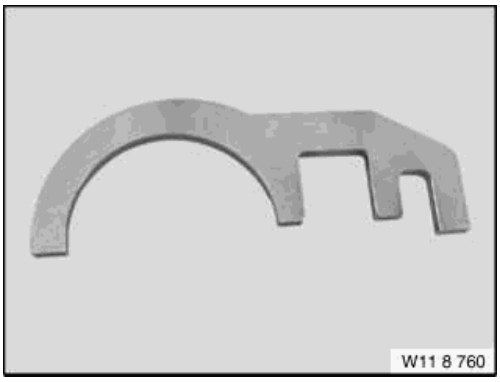
Common	Used in step 20 53 56
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

2 288 380 Locating stud



Common	Used in step 20 53 54 56
Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 112 (11 8 760) Gauge



Common	Used in step 20 53 55 56
Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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0 495 105 (11 4 480) oddments tray



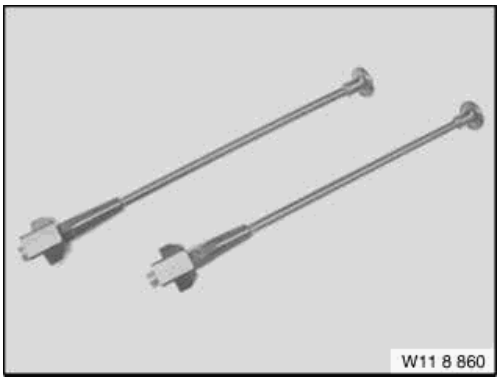
Common Used in step 26 27 53

Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

0 496 144 (11 8 860) Assembly tool



Common Used in step 34 41

Usage	For installing piston with connecting rod in crankcase.
Included in the tool or work	
Storage location	A23
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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0 493 582 (11 8 140) Bush



Common

Used in step 41

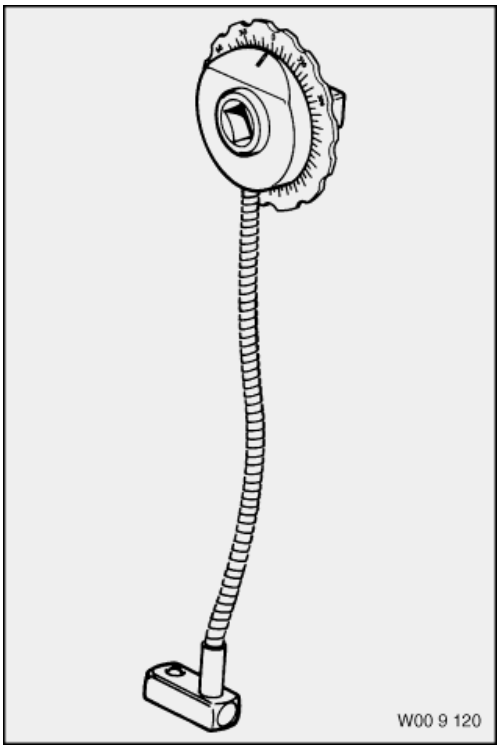
Usage	(Assembly bushes) For installing the pistons
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 12 99 (452)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 494 394 (11 8 141)		**Bush** Bush for piston installation 84.00 mm	
2	0 494 395 (11 8 142)		**Bush** Liquidation of existing inventory and then available only as a complete tool set 11 8140 (83 30 0 493 582) - as of 12.03.12.	
3	0 494 396 (11 8 143)		**Bush** Liquidation of existing inventory and then available only as a complete tool set 11 8140 (83 30 0 493 582) - as of 12.03.12.	

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0 490 504 (00 9 120) Torque angle measuring dial



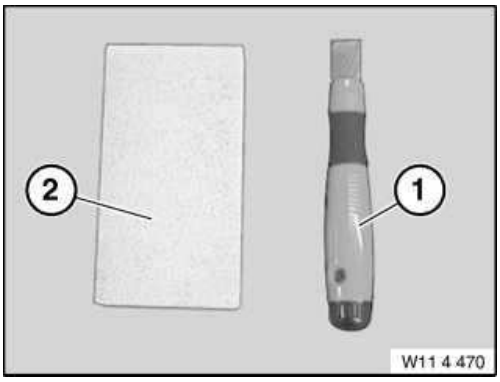
Common

Used in step 42 48

Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

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0 495 102 (11 4 470) Tool



Common

Used in step 45 67

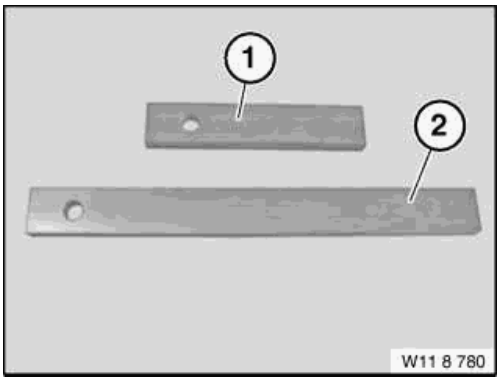
Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

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0 496 120 (11 8 780) Plate



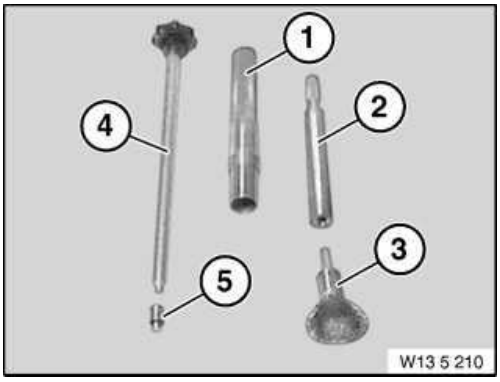
Common Used in step 45

Usage	(Mounting plates) For securing transmission oil sump when gearbox is removed.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 121 (11 8 781)		**Plate** (Mounting plate, short)Discontinued; only available via set 11 8 780 = 0496120.	
2	0 496 122 (11 8 782)		**Plate** (Mounting plate, long) Discontinued; only available via set 11 8 780 = 0496120.	

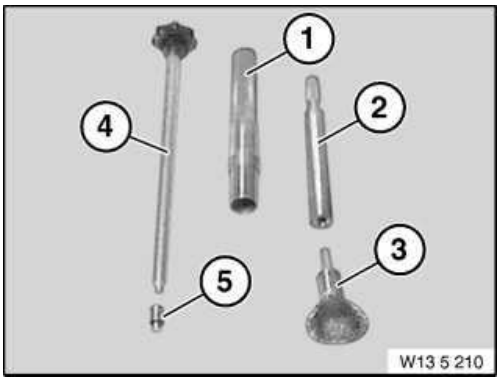
0 493 763 (13 5 215) Plug



Common Used in step 58

Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 762 (13 5 214) Rod

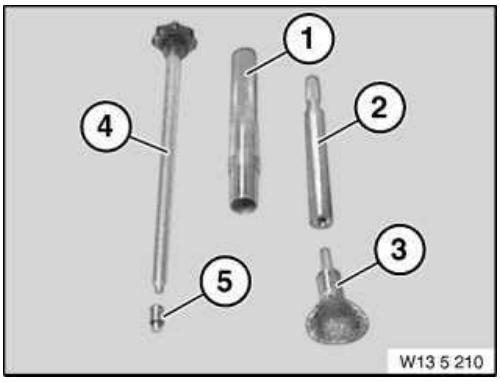


Common Used in step 58

Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 493 758 (13 5 210) Tool



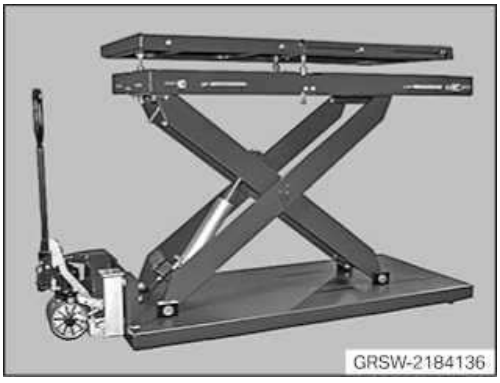
Common Used in step 58

Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

2 184 136 Mobile equipment table lift



Common Used in step 64

Usage	Table lift MHT 1200
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	06 01 10 (649)

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2 409 025 Puller



Common	Used in step 65
Usage	For disassembly of the outer radial shaft seal of the transmission output shaft, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A76
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

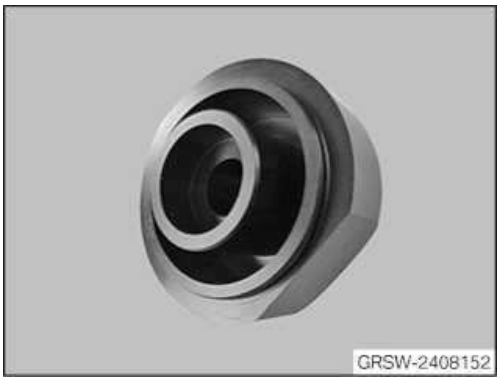
2 411 739 Puller



Common	Used in step 65
Usage	For disassembly of the inner radial shaft seal of the output, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C78
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

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2 408 152 Striking element



Common Used in step 65

Usage	For installation of the right radial shaft seal transmission output shaft (inner). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

2 413 037 Handle



Common Used in step 65

Usage	Universal drift handle. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C77
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 408 150 Striking element



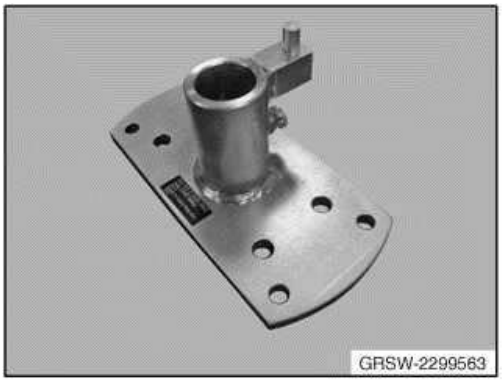
Common Used in step 65

Usage	For installing the right radial shaft seal transmission output shaft (outer). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

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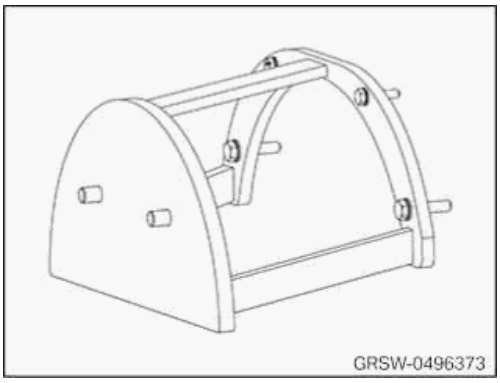
Replacement tools:

2 299 563 Adapter



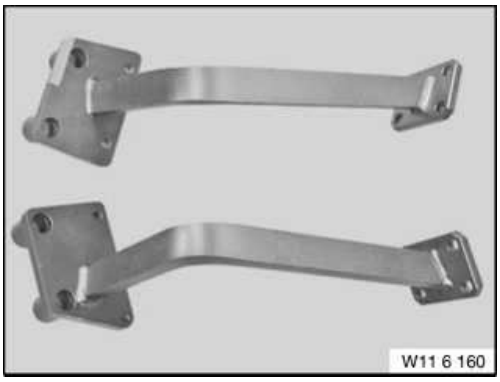
Common	Used in step 13
Usage	New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.
Included in the tool or work	0 495 187
Storage location	
Replaced by	
In connection with	
SI-Number	

0 496 373 (11 5 420) Plate



Common	Used in step 13
Usage	(Fixture) Engine S62
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	

0 496 680 (11 6 160) Support



Common	Used in step 13
Usage	For mounting N74 engine on the assembly stand. In combination with 00 2 300, 00 2 320
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	00 2 300; 00 2 320 = 0495196
SI-Number	01 31 09 (604)

Overview Technical Data

Side clearance of piston rings

Used in step 36

Clean all components before measuring the side clearance.

Side clearance of the plain rectangular compression ring	0,17 mm ... 0,27 mm
Side clearance of the taper faced piston ring	0,30 mm ... 0,50 mm
Side clearance of the oil scraper ring with spiral expander	0,2 mm ... 0,4 mm

Piston diameter

Used in step 37

Measure the piston diameter at distance (A) from the lower end of the piston skirt.

Distance (A) to the lower end of the piston skirt	17 mm
Nominal dimension of piston diameter	83,936 mm ... 83,954 mm

Cylinder bore

Used in step 38

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Diameter of cylinder bore	84,00 mm ... 84,018 mm
Permitted irregularity of the cylinder bore	0,01 mm
Permitted conicity of the cylinder bore	0,01 mm

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	7 69
EGR controller	7 69

General repair instructions	Used in step
11 00 ... Overview of consumables (Electronic Parts Catalogue)	45

Repair instructions	Used in step
11 00 050 Removing and installing engine	1 75
11 00 050 Removing and installing engine	1 75
11 00 050 Removing and installing engine	1 75
11 00 050 Removing and installing engine	1 75
11 00 050 Removing and installing engine	1 75
11 00 050 Removing and installing engine	1 75
11 00 050 Removing and installing engine	1 75
11 00 050 Removing and installing engine	1 75
11 00 050 Removing and installing engine	1 75
31 10 001 Completely removing and installing front axle with engine and transmission	1 75
11 00 050 Removing and installing engine	1 75
11 00 050 Removing and installing engine	1 75
11 00 050 Removing and installing engine	1 75
11 00 050 Removing and installing engine	1 75
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11 00 050 Removing and installing engine	1 75
11 00 050 Remove and install engine	1 75
11 00 050 Remove and install engine	1 75
11 00 050 Remove and install engine	1 75
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG)	1 75
11 00 050 Remove and install engine	1 75

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11 00 050 Remove and install engine	1 75
11 00 050 Remove and install engine	1 75
11 00 050 Remove and install engine	1 75
11 00 050 Removing and installing the engine (manual gearbox)	1 75
11 00 050 Remove and install engine (Automatic)	1 75
11 00 050 Remove and install engine	1 75
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11 00 050 Remove and install engine	1 75
11 00 050 Removing and installing engine	1 75
11 00 050 Removing and installing engine \PREMIUM	1 75
11 00 050 Removing and installing/replacing engine (N63)	1 75
11 00 050 Removing and installing engine	1 75
11 00 050 Removing and installing engine	1 75
11 00 050 Removing and installing engine	1 75
11 00 050 Remove and install engine	1 75
11 00 050 Remove and install engine (Automatic)	1 75
11 00 050 Remove and install engine (Automatic)	1 75
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11 00 050 Remove and install engine	1 75
11 00 050 Remove and install engine (Automatic)	1 75
11 00 050 Remove and install engine (Automatic)	1 75
11 00 050 Remove and install engine	1 75
11 00 050 Remove and install engine	1 75
11 00 050 Remove and install engine	1 75
11 00 050 Remove and install engine	1 75
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG)	1 75
11 00 050 Remove and install engine	1 75
61 35 ... Notes on ESD protection (Electro Static Discharge)	6 17 25

Operating materials	Used in step

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	53
Exhaust-gas recirculation cooler seal on exhaust manifold	69
Exhaust-gas recirculation cooler seal on intake plenum	69

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This documentation refers to special tools that were not yet available when going to press.

11 25 000 Removing and installing/replacing all pistons

PRELIMINARY WORK

1 – Removing engine



- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

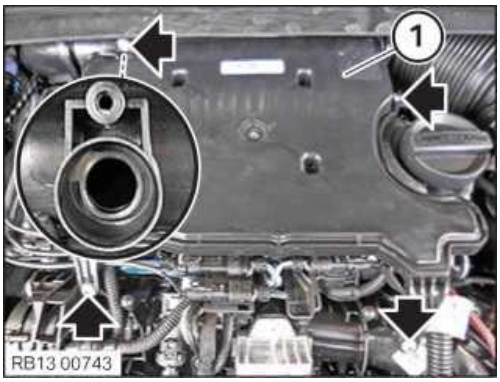
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

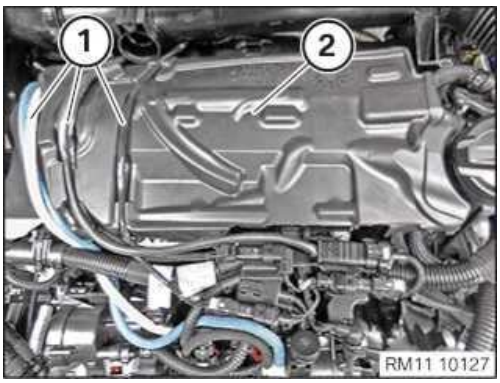
3 – Remove resonator



- Remove screws (arrows).
- Guide out and remove the resonator (1).

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4 – Remove the acoustic cover for the injectors

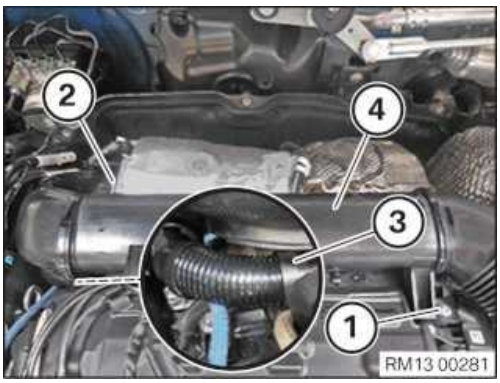


- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

5 – Removing clean air pipe



- Detach clamp (1) on the clean air pipe.
- Pull off the clean air pipe from the intake silencer housing.



- Loosen screw (1).
- Loosen clamp (2).
- Unlock the ventilation line (3) and pull it off the cylinder head cover.
- Feed out clean air pipe and remove.

6 – Remove differential pressure sensor

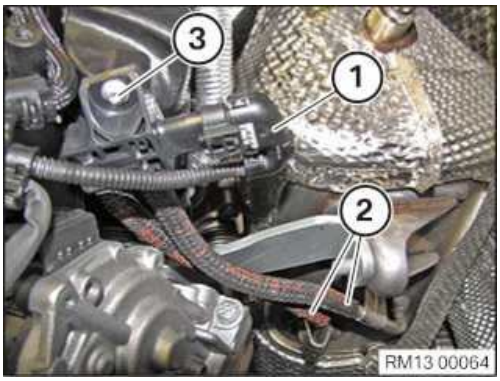
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

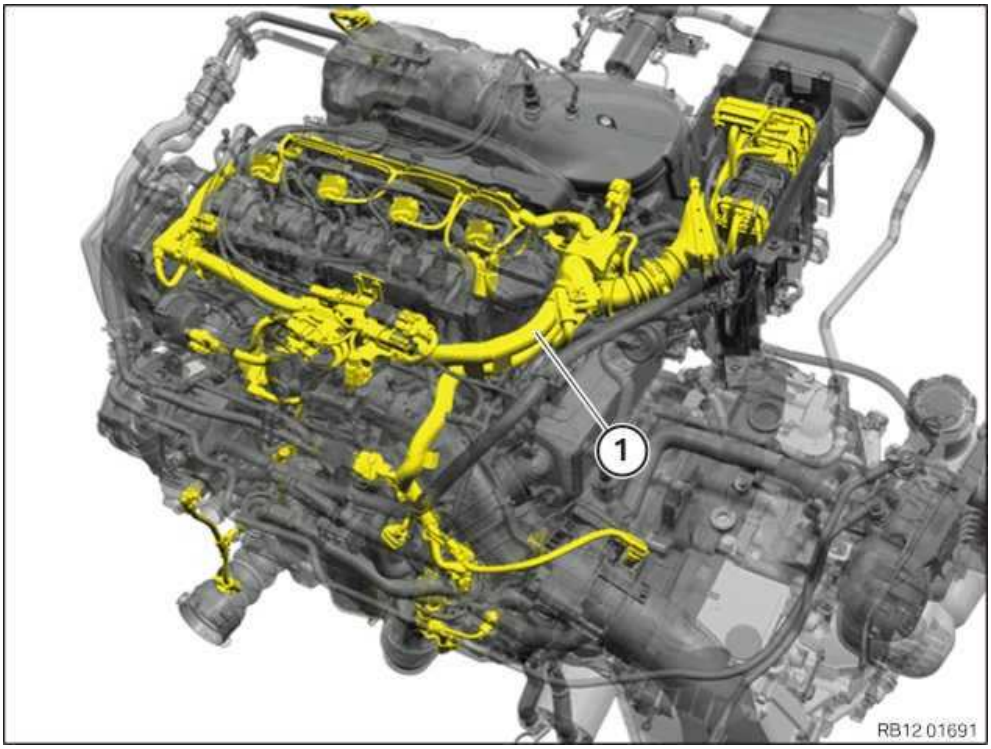
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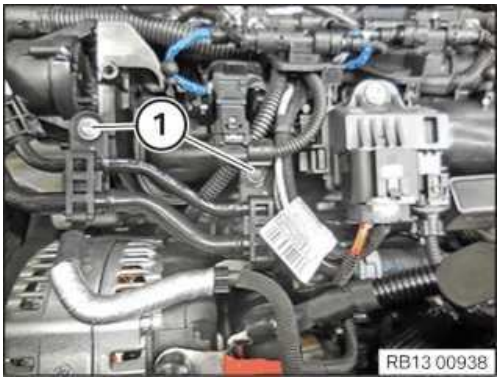
- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

7 – Removing assemblies (on lifting table)

Overview: Wiring harness section for the engine

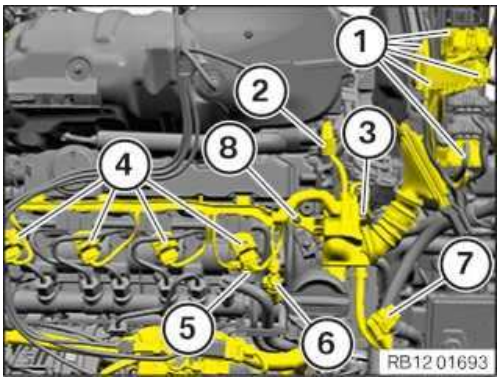


1 Wiring harness section for the engine

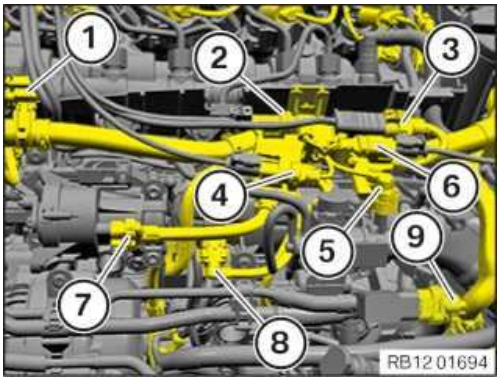


- Loosen screws (1).

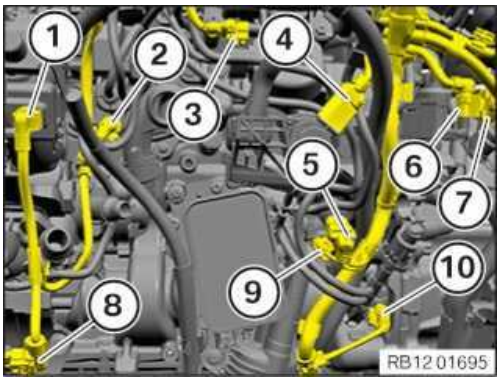
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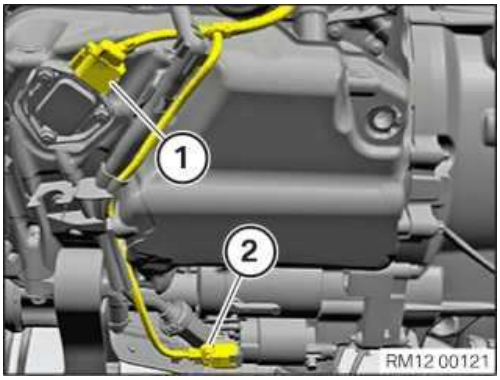
- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock the connector (2) and disconnect it from the differential pressure sensor.
- Unlock the connector (3) and disconnect it from the exhaust-gas recirculation valve.
- Unlock the connector (4) and pull off from the injectors.
- Unlock the connector (5) and disconnect it from the camshaft sensor.
- Unlock the connector (6) and disconnect it from the fuel pressure regulator.
- Unlock connector (7) and pull off from hot film air mass meter.
- Loosen screw (8).



- Unlock connector (1) and pull off from the rail pressure sensor.
- Unlock the connector (2) and disconnect it from the exhaust temperature sensor before the diesel particulate filter.
- Unlock connector (3) and pull it off from the front oxygen sensor.
- Unlock the connector (4) and disconnect it from the exhaust temperature sensor after the diesel particulate filter.
- Unlock and disconnect the connector (5) from the electric changeover valve.
- Unlock the connector (6) and disconnect it from the exhaust temperature sensor for the exhaust-gas recirculation cooler.
- Unlock the connector (7) and disconnect it from the servomotor for the swirl flaps.
- Unlock the connector (8) and pull it off the charging pressure sensor.
- Unlock the connector (9) and disconnect from the fuel pressure and temperature sensor.

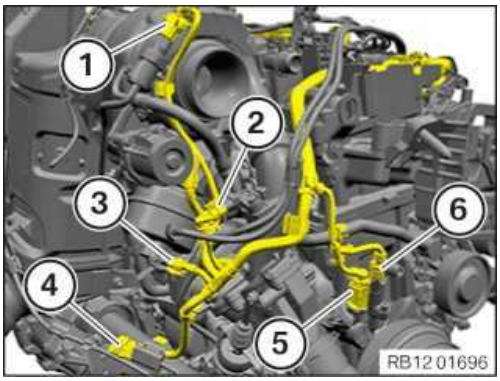


- Unlock and disconnect the connector (1) from the alternator.
- Unlock and disconnect the connector (2) from the electric changeover valve.
- Unlock and disconnect the connector (3) from the electric changeover valve.
- Unlock the connector (4) and pull it off the high pressure pump.
- Unlock the connector (5) and disconnect it from the oil pressure sensor.
- Unlock connector (6) and pull off from throttle body.
- Unlock the connector (7) and disconnect it from the intake air temperature sensor.
- Unlock the connector (8) and disconnect it from the air conditioning compressor.
- Unlock and disconnect the connector (9) from the solenoid valve.
- Unlock the connector (10) and pull it off the crankshaft sensor.



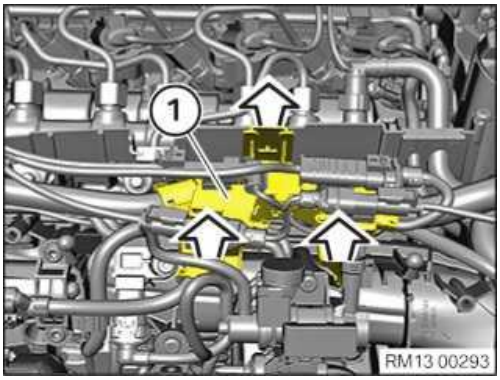
- Unlock the connector (1) and pull off of the oil-level sensor.
- Unlock connector (2) and remove from starter motor.

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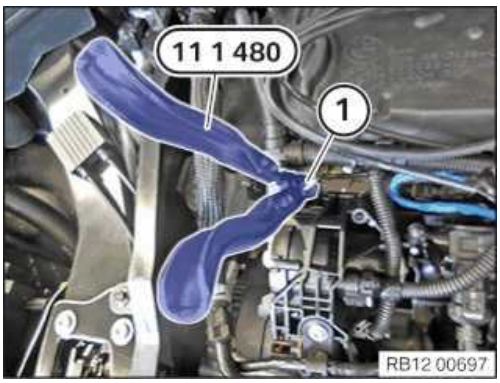


- Unlock the connector (1) and disconnect it from the exhaust gas pressure sensor.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock the connector (3) and pull it off the exhaust turbocharger.
- Unlock the connector (3) and disconnect it from the differential pressure sensor.
- Unlock connector (4) and pull it off from the monitoring oxygen sensor.
- Unlock the connector (5) and pull it off the oil pressure switch .
- Unlock connector (6) and disconnect from switching valve.
- Detach, feed out and remove the wiring harness from the clamps.

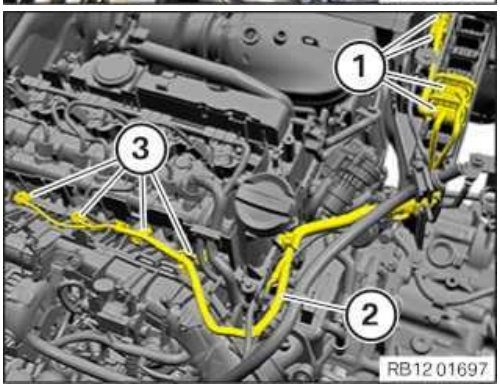
▶ **Removing the cable clips from the intake plenum**



- Detach the cable clip (1) in the direction of the arrow.
- Guide out the cable clip (1) in direction of arrow and set it aside.



- Unlock the connectors (1) of all glow elements with the special tool **0 490 796 (11 1 480)** and release them.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.



- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Pull off all connectors (3) from glow element using special tool **0 490 796 (11 1 480)**.
- Loosen screw (2) and remove the ground strap.
- Detach, feed out and remove the wiring harness from the clamps.

▶ **Removing the drive belt for alternator**

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

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CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

TECHNICAL INFORMATION

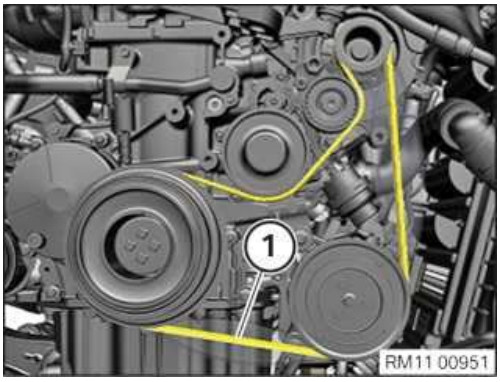
If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

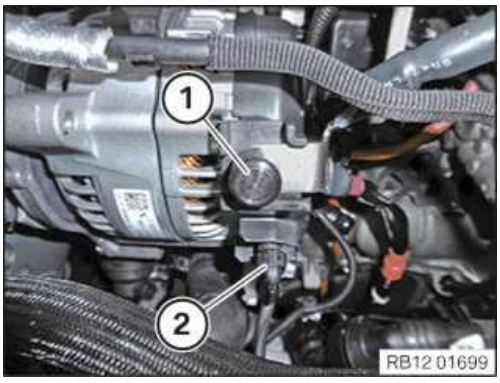
The drive belt must be replaced if contaminated with coolant- and oil residues.



- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool **0 496 268 (11 0 390)**.



- Guide out the drive belt for the alternator (1) and remove it.

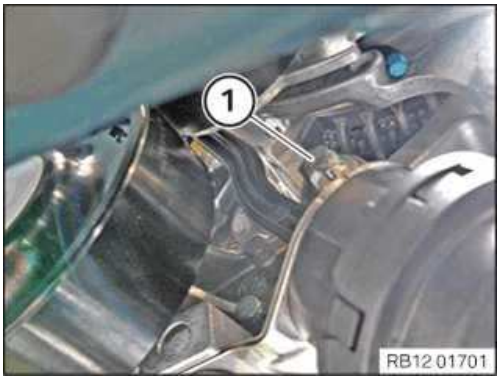


- Remove the cover (1) and loosen the nut below.
- Disconnect positive battery cable from alternator.
- Unlock and disconnect the connector (2) from the alternator.

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- Detach screw (1) on top on the alternator.



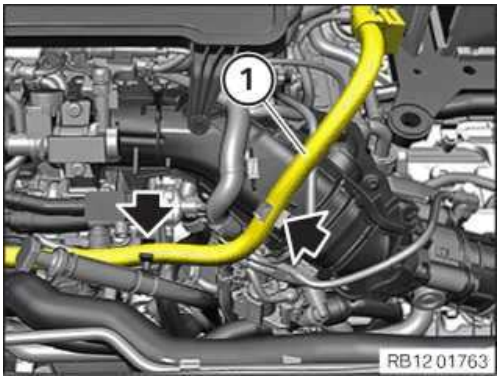
- Detach screw (1) below on the alternator.



- Feed out alternator (1) along with the screw (2) on the bottom of the alternator through the slot on the support and remove.

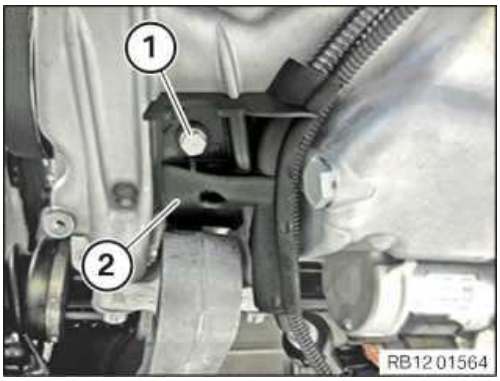


- Loosen screws (1).
- Feed out and remove the air conditioning compressor (2).



- Release the positive battery cable (1) from the clamps (arrows).

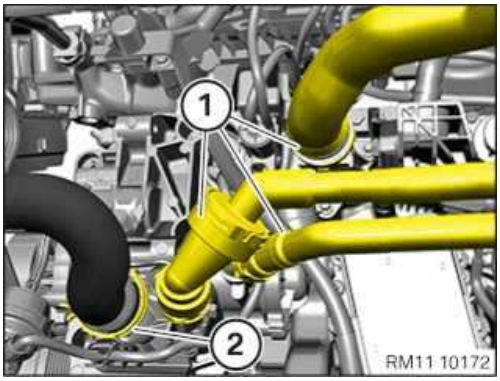
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- Loosen screw (1).
- Guide out and remove holder (2).



- Feed out positive battery cable from the clamps (1) and remove.



- Unlock and disconnect coolant lines (1).
- Guide out the coolant lines (1) and remove it.
- Detach the clamp (2).
- Guide the coolant hose out and remove.

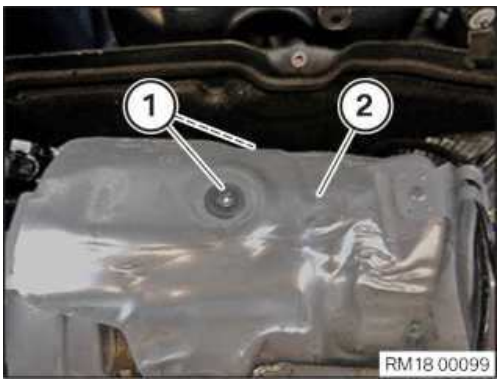
▶ **Removing heat shield from top exhaust turbocharger**

WARNING

Hot surfaces.

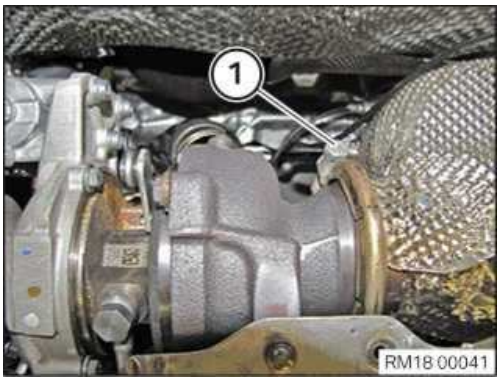
Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from holders.
- Release the screws (1) at the top and bottom of the heat shield.
- Feed out and remove the heat shield (2).

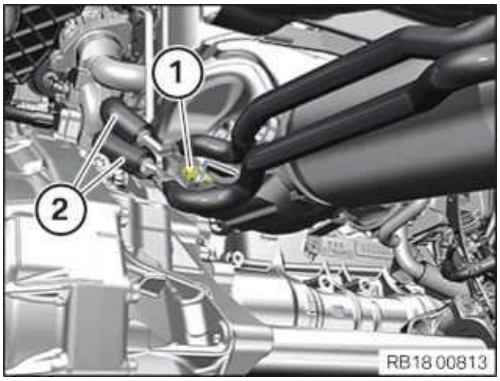
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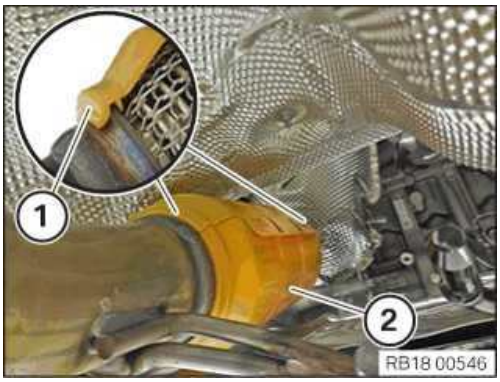
- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.



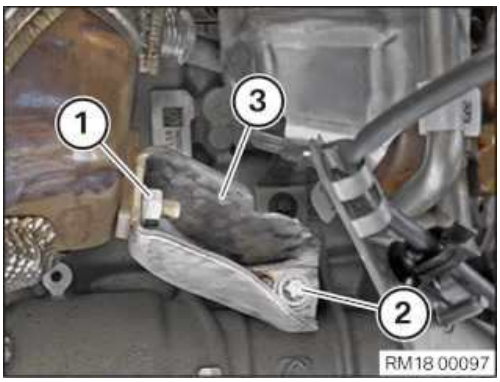
- Loosen nuts (1).



- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.

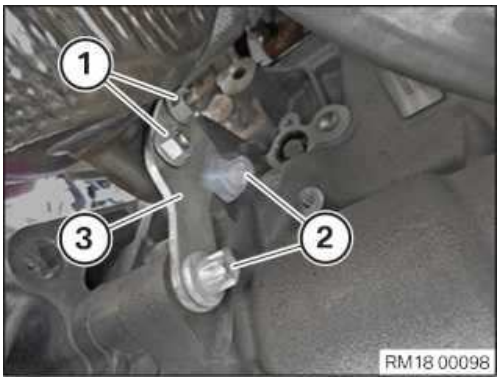


- Mount fitting aid (2).
- Make sure that the fitting aid is correctly position on the edges (1) of the flexible tube.



- Loosen nut (1).
- Loosen screw (2).
- Remove holder (3).

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- Loosen nuts (1).
- Loosen screws (2).
- Remove holder (3).
- Guide out and remove diesel particulate filter .

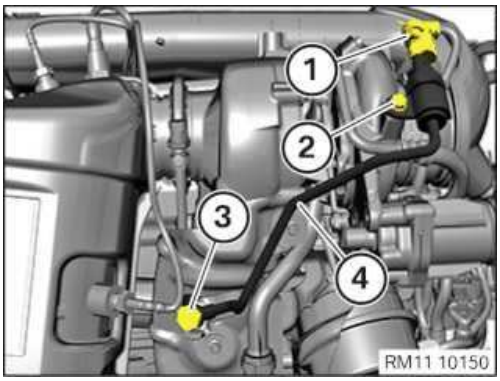
▶ **Remove the heat shield from the exhaust turbocharger at the bottom**

WARNING

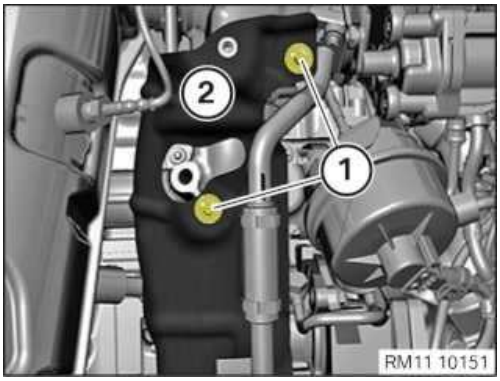
Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Unlock and disconnect connector (1).
- Unscrew the banjo bolt (3).
- The seals of the banjo bolt (3) must be renewed.
- Loosen screw (2).
- Remove the exhaust gas pressure pipe (4).



- Unscrew the bolts (1) on the heat shield .
- Feed out and remove the heat shield (2).

▶ **Removing the exhaust-gas recirculation cooler**

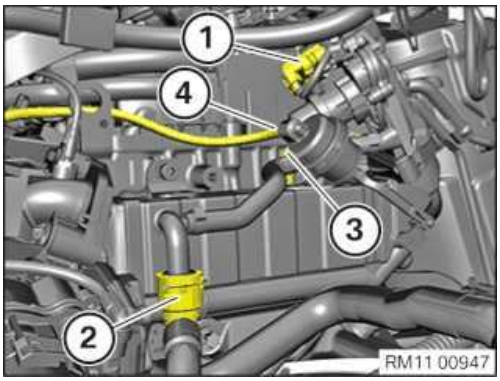
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

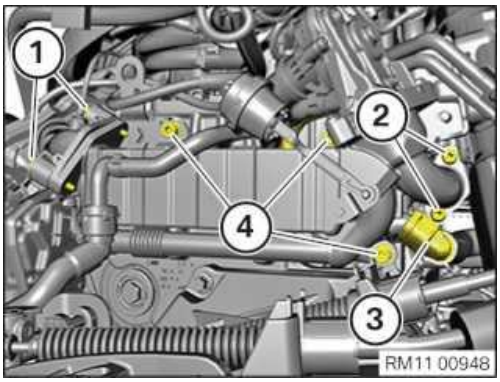
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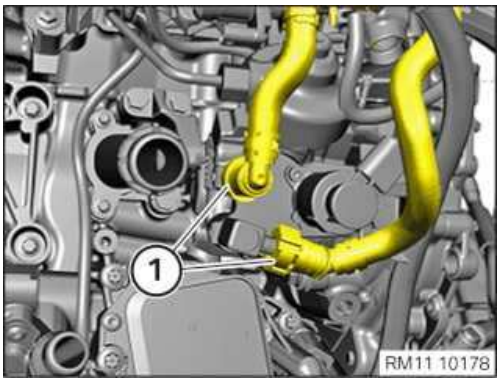
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

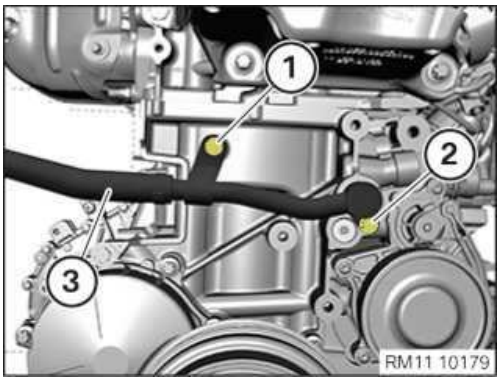
- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.



- Unlock the fuel lines (1) and disconnect from the high pressure pump.
- Remove the fuel lines.



- Loosen screws (1) and (2).
- Remove coolant line (3).

8 – Removing the low-pressure stage turbocharger

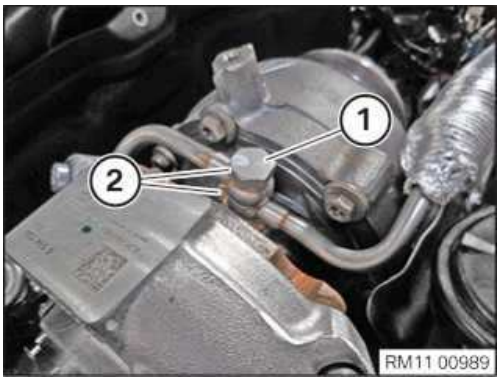
WARNING

Hot surfaces.

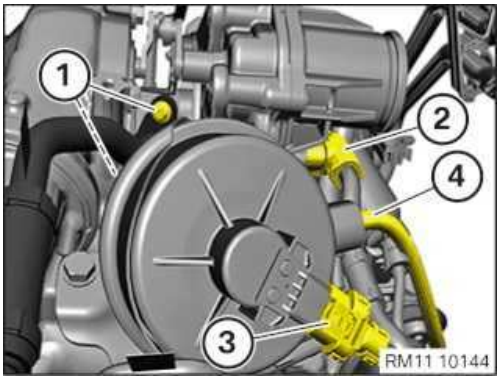
Risk of burning!

- Perform all work only on components that have cooled down.

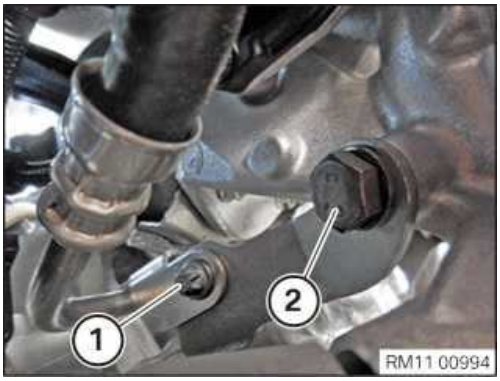
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- Release the banjo bolt (1) of the oil feed lines.
- Remove sealing rings (2).
- Place oil feed lines to one side.



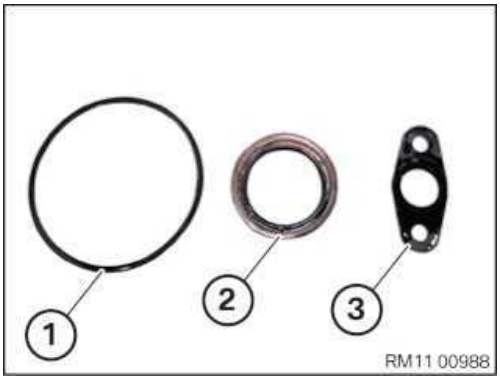
- Release the screws (1) of the oil return line.
- Unlock and disconnect the plug connections (2) and (3).
- Pull off the vacuum hose (4) carefully.



- Undo the bolt (1) of the oil feed line.
- Loosen screw (2).

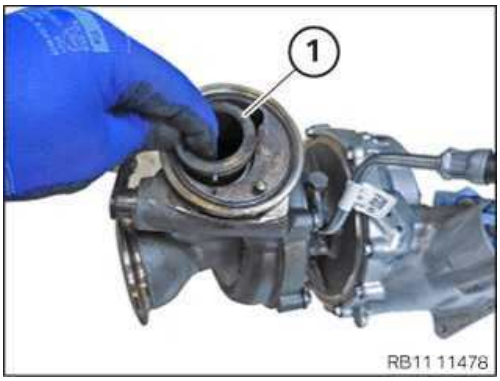


- Loosen screw (1).
- Remove the V hose clamp.
- Guide the low-pressure stage turbocharger out towards the top and remove.



- Remove seals (1), (2) and (3).

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- Remove the spacer ring (1).

9 – Removing the high-pressure stage exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

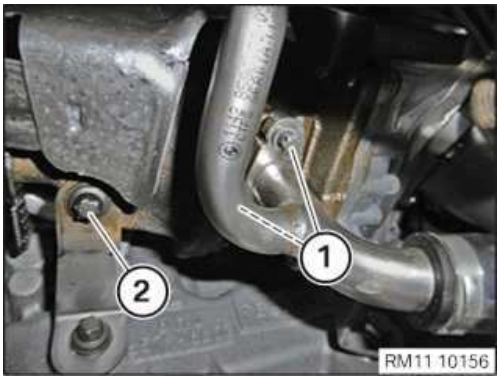
- Perform all work only on components that have cooled down.

CAUTION

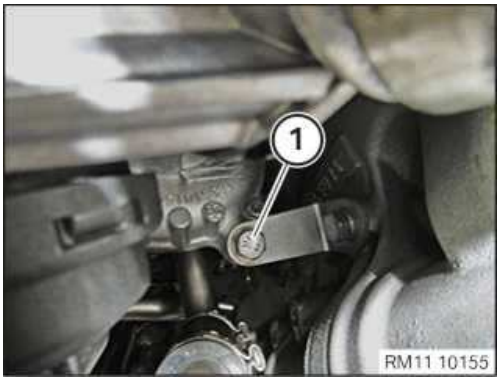
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

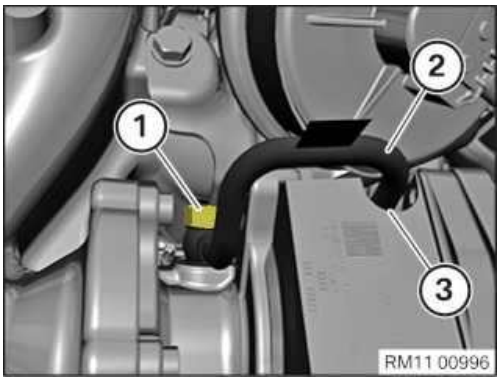


- Unscrew the bolts (1) on the oil return line .
- Loosen screw (2).

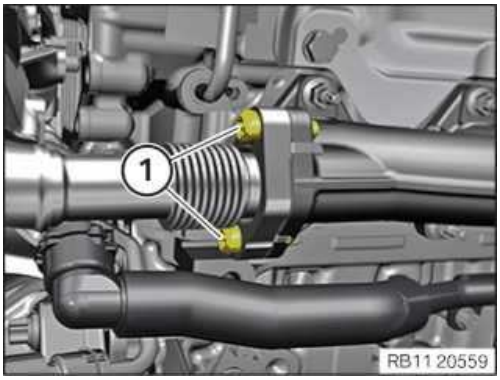


- Release screw (1) from the right wheel arch.

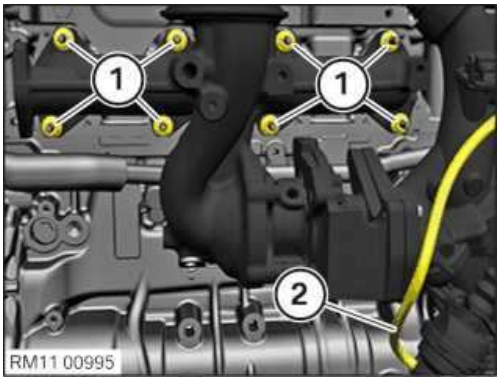
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- Unscrew the banjo bolt (1).
- Guide out oil feed line (2) from holder (3).

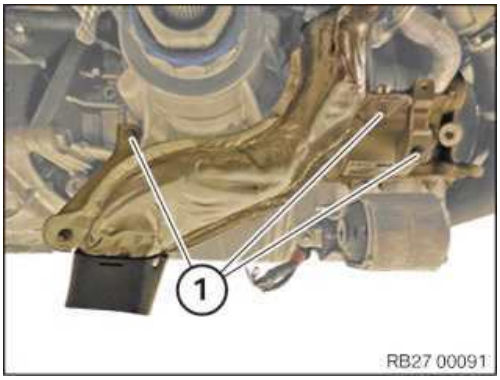


- Loosen screws (1).

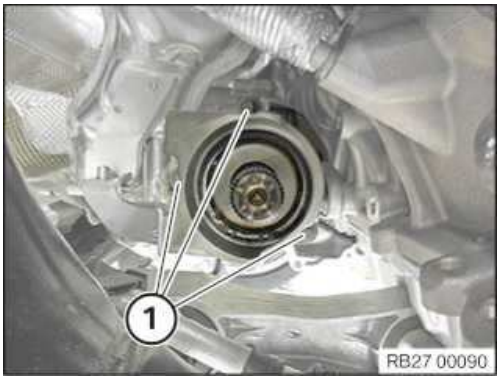


- Pull off the vacuum hose (2).
- Loosen nuts (1).
- Guide out the exhaust manifold and the high-pressure stage exhaust turbocharger to the top and remove them.

10 – Remove the intermediate shaft with the support tube

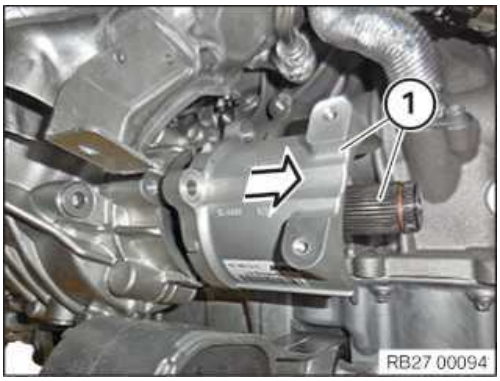


- With air duct installation: Loosen screws (1).
- Remove air duct



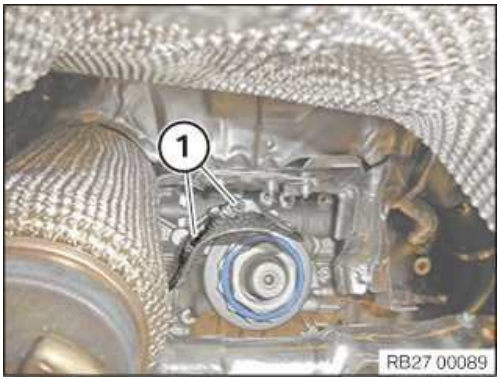
- Loosen screws (1).

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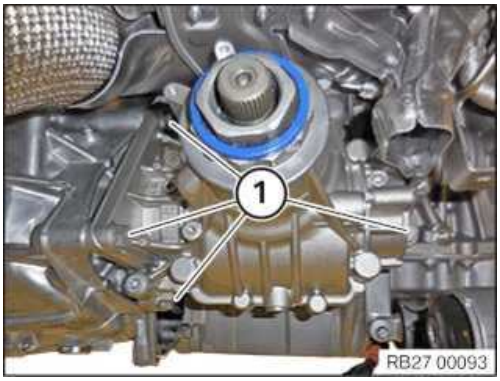


- Pull the intermediate shaft with the support tube (1) out of the transfer box.

11 – Remove transfer box (VTG)



- Loosen screws (1).
- Remove heat shield.



- Loosen screws (1).
- Remove the transfer box (VTG).

12 – Detach the engine from the automatic transmission

Prerequisite

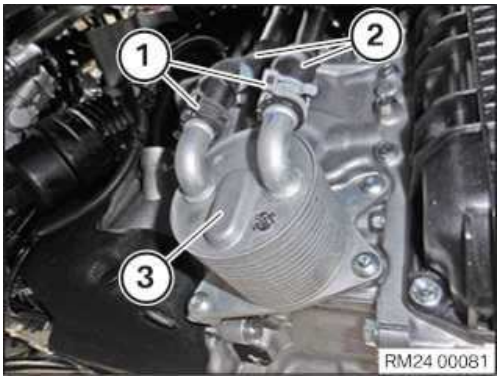
Engine has been removed.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Unfasten hose clamps (1).
- Disconnect coolant hoses (2) from transmission oil cooler (3).
- Catch the emerging coolant.

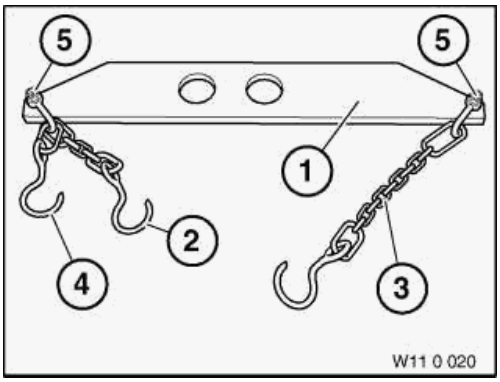
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- Crank engine with special tool **0 493 380 (11 6 480)** at vibration damper in direction of rotation.
- Unscrew the nut (1) of the torque converter.
- Crank engine further and release remaining 5 nuts.



- Stage the workshop crane **2 220 718**.



- Stage the lifting gear .



TECHNICAL INFORMATION

Conduct the following operation with the assistance of a second person.

- Secure the automatic transmission against dropping using a workshop crane **2 220 718** and lifting gear .
- Remove screws (arrows).
- Remove the automatic transmission with help from an auxiliary person and using the workshop crane **2 220 718** including lifting gear and put it to one side.

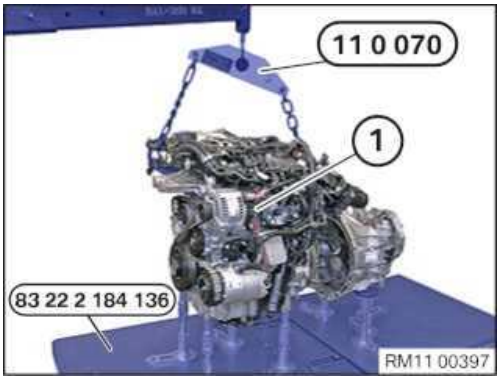
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- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

M8		Tightening torque	21,5 Nm



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Attach engine lifter to special tool and lift engine (1) off lifting table.

13 – Mount engine on assembly stand

CAUTION

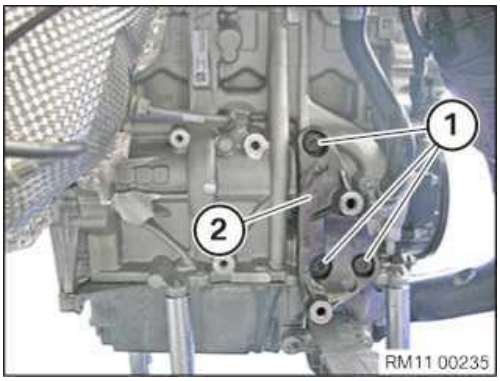
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Loosen screws (1).
- Guide out and remove holder (2).

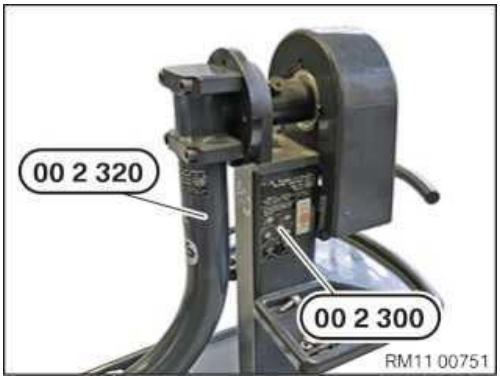
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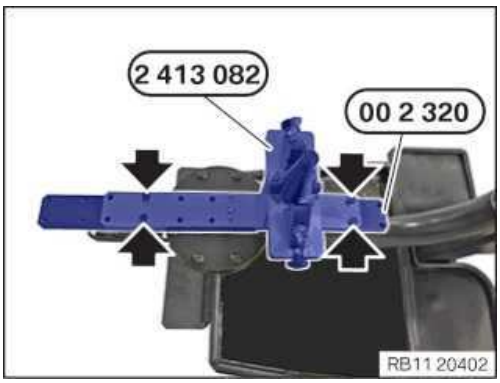
- Position the special tool **2 455 010** on the engine (1).
- Position the standard bolts **M10x30**.
- Tighten the standard bolts (arrows).
-

Special tool 2 455 010 to crankcase

M10x30		Tightening torque	38 Nm



- Prepare the assembly stand **0 495 187 (00 2 300)** with the special tool **0 495 196 (00 2 320)**.



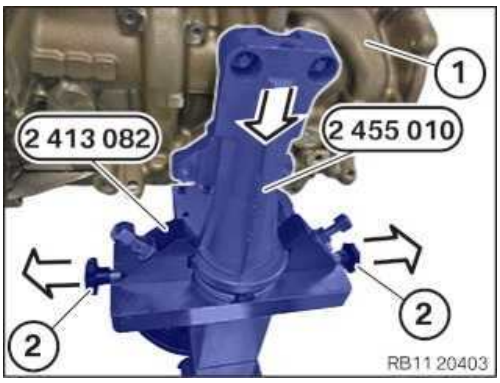
- Screw the special tool to the **0 495 196 (00 2 320)** special tool.
- Tighten screws (arrows).
-

Special tool 11 8 930 to special tool 00 2 320

M14x35		Tightening torque	160 Nm

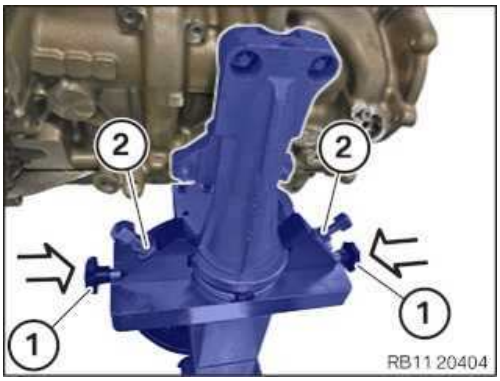


- Position the engine lifter with the special tool and the engine on the special tool **0 495 187 (00 2 300)**.



- Detach the holder (2) in the direction of the arrow.
- Position the engine (1) with the special tool **2 455 010** in the direction of the arrow on the special tool .

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- Lock the holder (1) in direction of arrow.
- Tighten nuts (2).

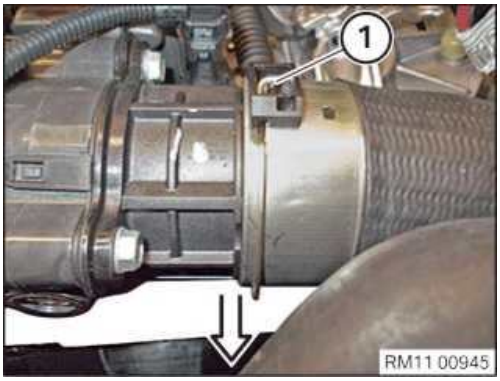
14 – Removing the intake plenum

TECHNICAL INFORMATION

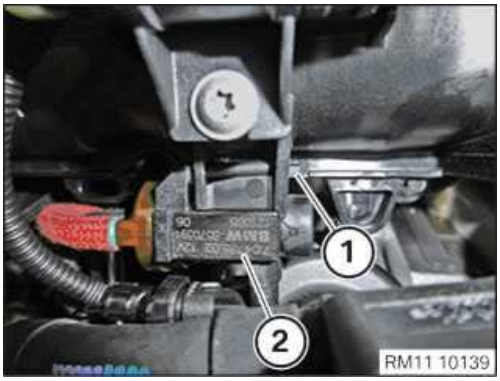
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Unlock the lock (1).

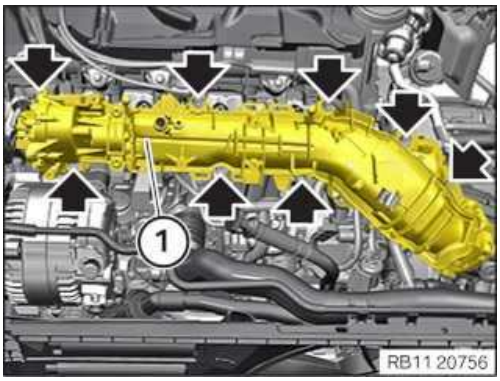


- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.

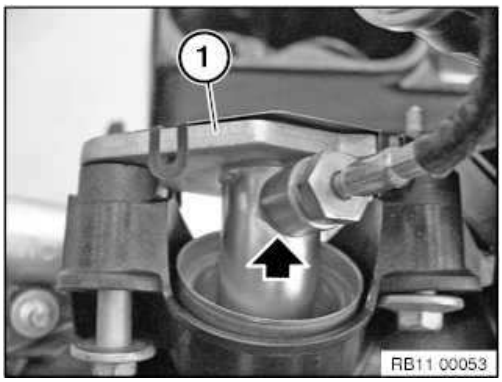


- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.

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- Release the screws (arrows) from the intake plenum (1).
- Guide the intake plenum (1) out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

15 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

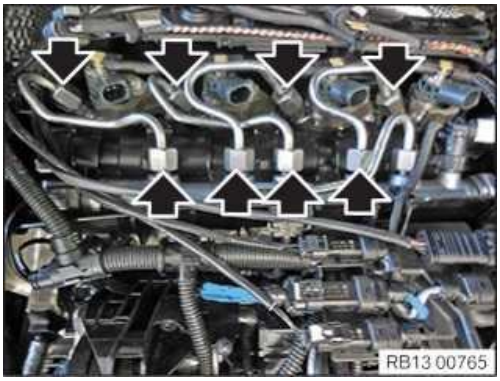
If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release the high pressure lines (arrows) with the special tool .
- Catch and dispose of escaping fuel.
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool .

16 – Detaching leakage oil line from injector

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

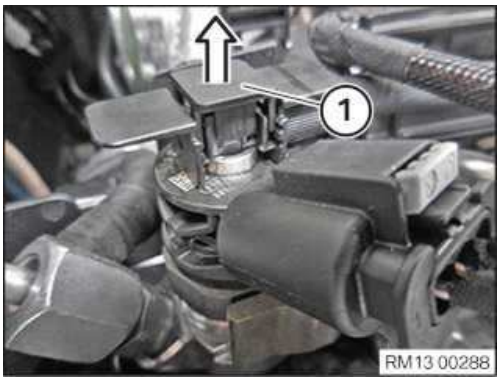
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

17 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

 **Electrostatic discharge.**

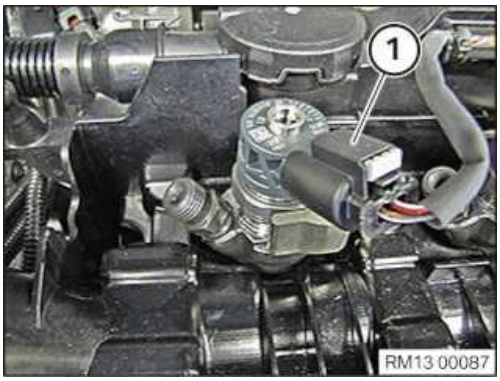
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

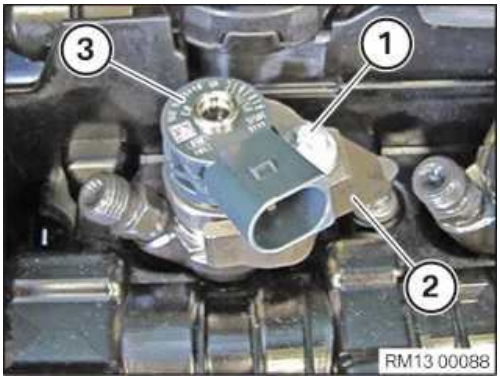
TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.

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- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

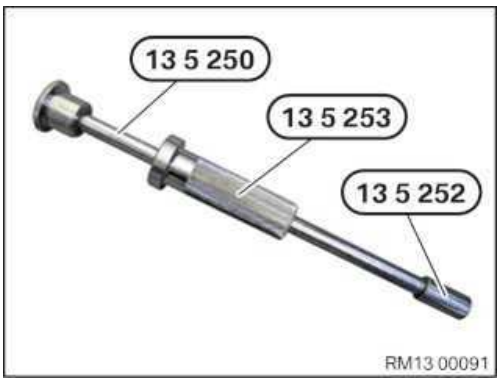
▶ **Loosen stuck injectors**

RISK OF DAMAGE

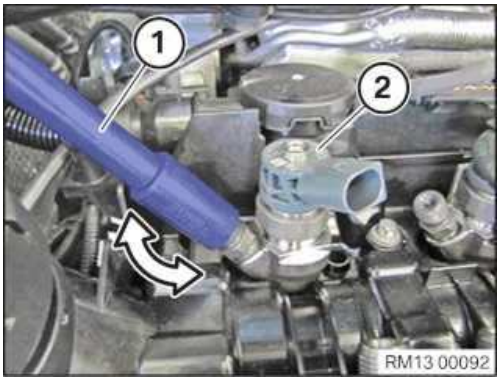
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)** back onto the special tool **0 493 321 (13 5 250)**.



- Screw the special tool (1) **0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1) **0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

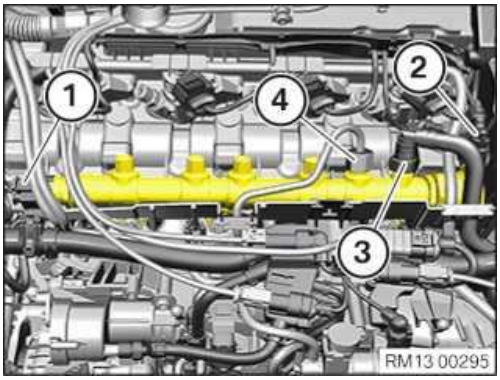
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

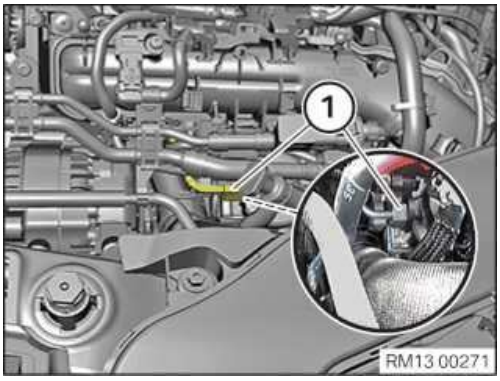
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

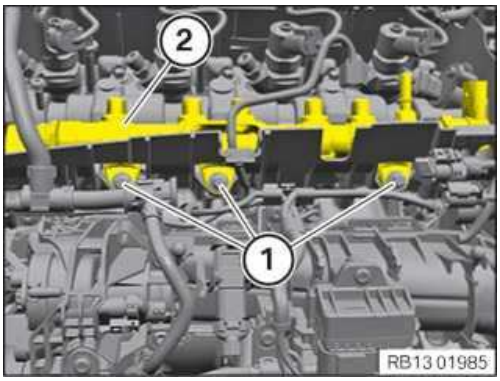


- Unlock and disconnect connector (1).
- Unlock and disconnect connector (2).
- Unlock and release fuel line (3).
- Loosen union nut (4) with special tool .
- Reset special tool early on to avoid bending pressure lines.



- Slacken the union nut (1) on the high pressure pump.

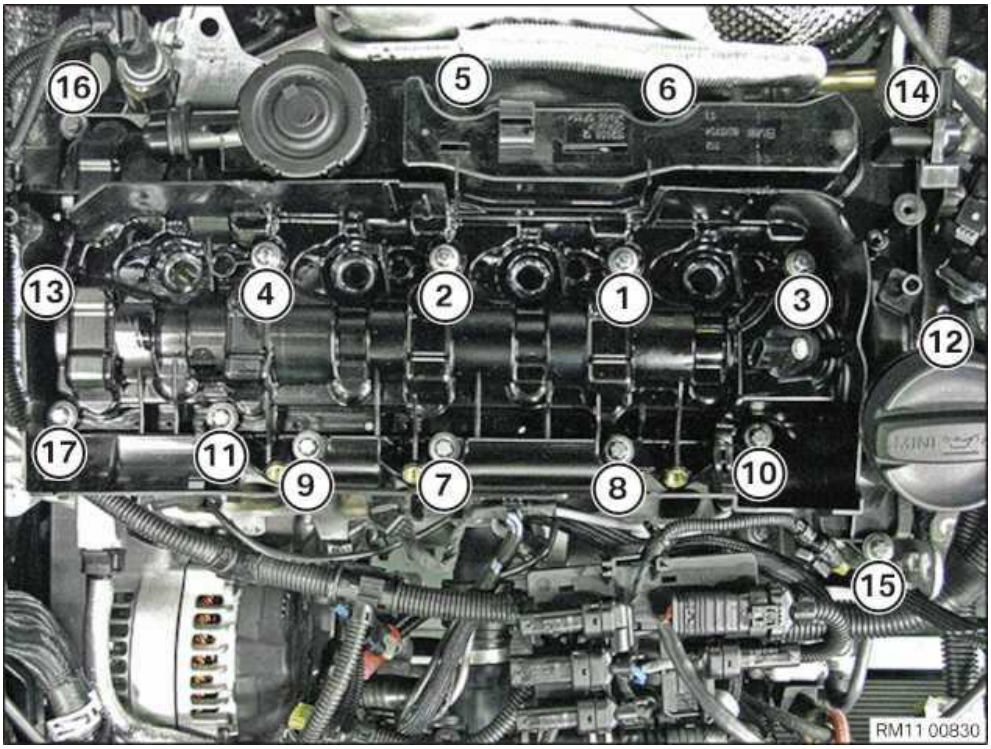
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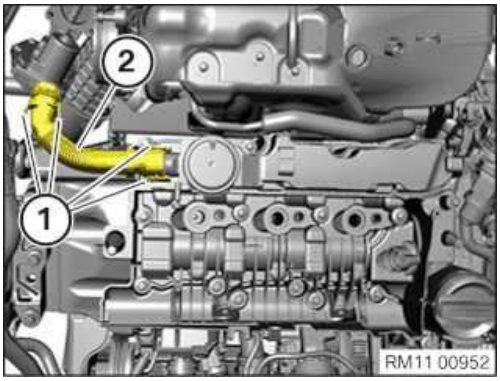
- Loosen screws (1).
- Carefully thread out and remove the rail (2).
- Make sure the pressure line of the high pressure pump is not bent.

19 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover

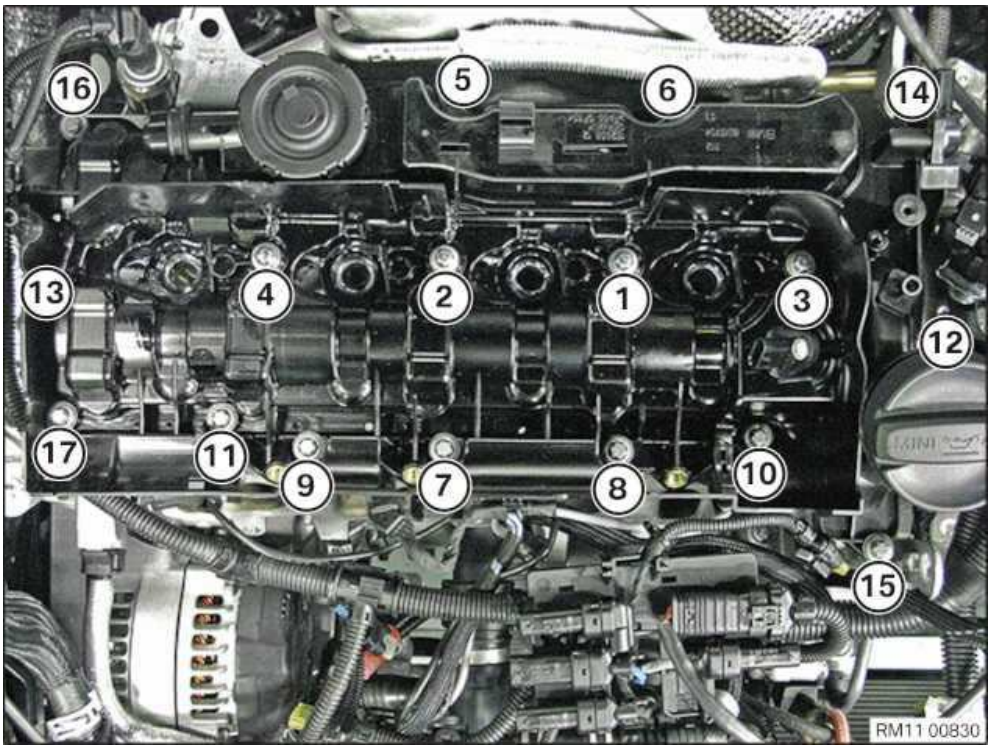


1 to 16 screws of the cylinder head cover.



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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- Loosen screws in the order (17) to (1).
- Remove cylinder head cover by lifting it out.

20 – Checking camshaft timing



- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

Damage to the engine.

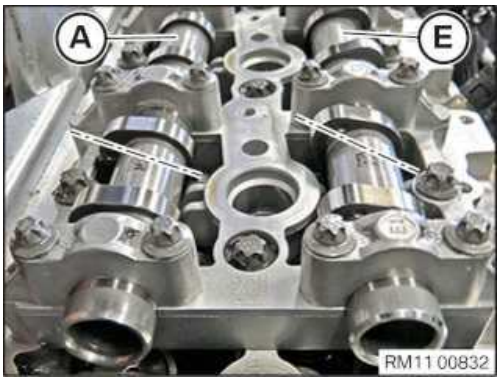
The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

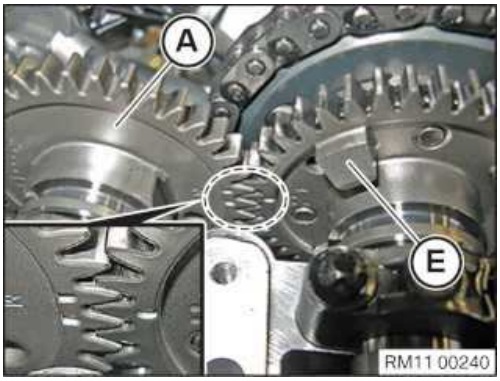
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- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.



- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

21 – Remove chain tensioner piston

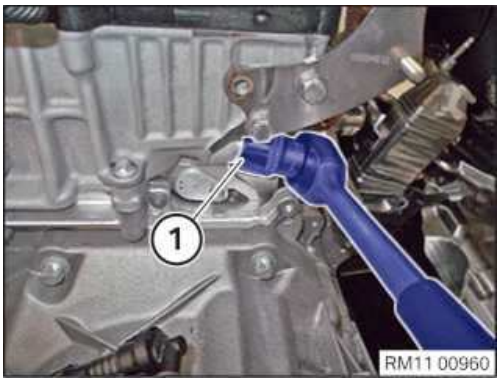
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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

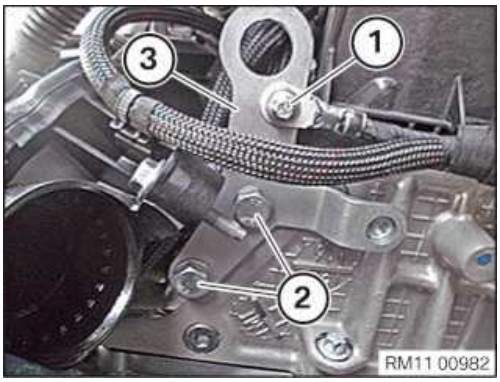


TECHNICAL INFORMATION

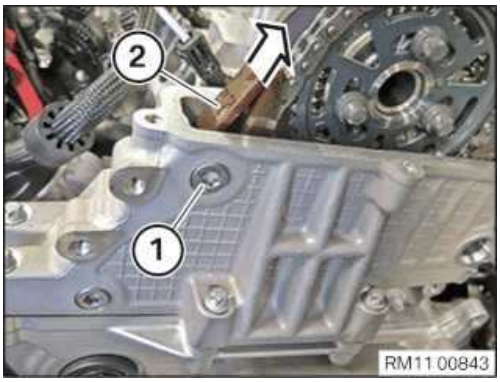
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

22 – Remove the timing chain guide rail

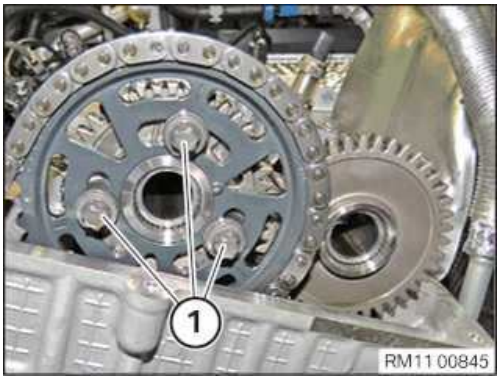


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

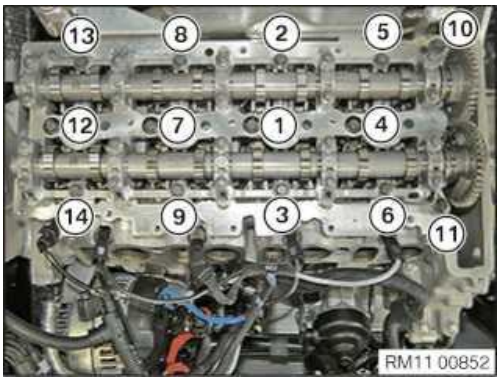
23 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

24 – Removing the camshaft support

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- Evenly loosen all screws in a sequence from (14) to (1).
- Loosen and remove all screws in a sequence from (14) to (1).
  Both camshafts can be removed with the camshaft carrier.
- Remove the camshaft support including camshafts towards the top.

25 – Removing glow elements

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Damage to the glow elements.

Excessive force may damage the glow elements and they may then have to be renewed.

- Handle glow elements with care and do not drop.
- Do not rest the cylinder head on glow elements. Glow elements protrude from the sealing surface of the cylinder head.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

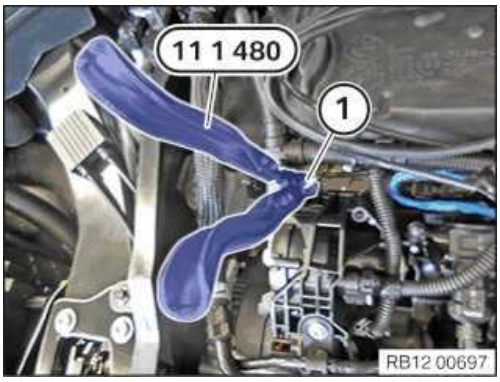
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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

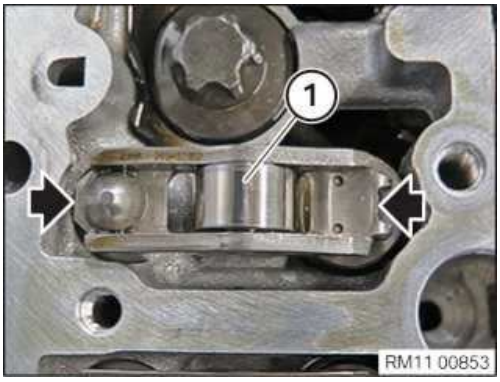


- Unlock and disconnect plug connection (1) using special tool **0 490 796 (11 1 480)**.



- Release the glow elements with the special tool or conventional tools.
- Feed out preheating elements and remove.

26 – Remove roller cam followers



- Guide out and remove all roller cam followers (1) (arrows).
- Place all roller cam followers (1) in order in special tool **0 495 105 (11 4 480)**.

  Roller cam followers that have already been used must be installed in same position again.

27 – Removing the hydraulic valve clearance compensating element

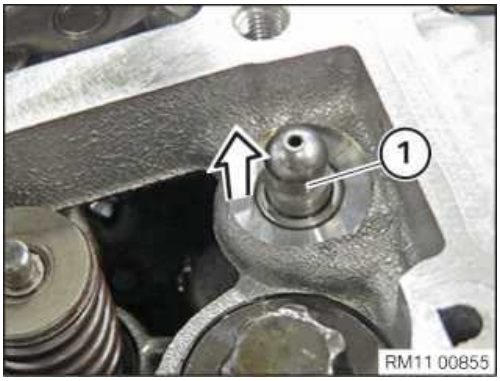
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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Remove the hydraulic valve clearance compensating element (1) in the direction of the arrow and place on the special tool **0 495 105 (11 4 480)**.
- Repeat the process on all hydraulic valve clearance compensating elements.

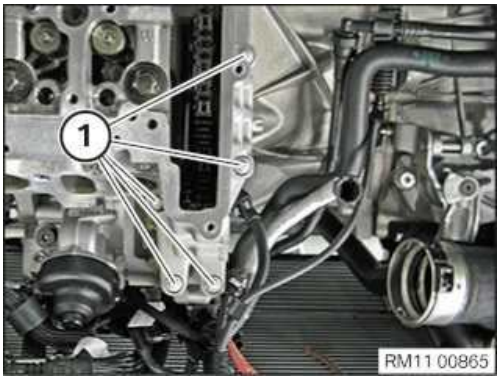
28 – Removing cylinder head

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

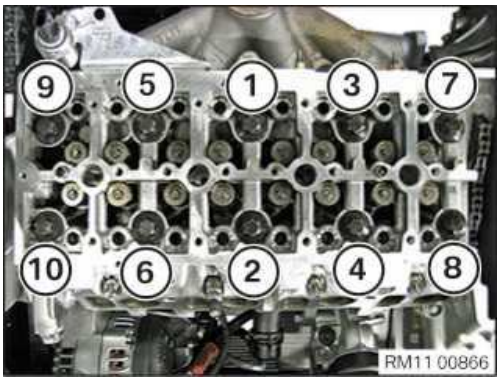
- Remove and install heavy components with the aid of another person/other persons.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screws (1).



- Loosen the cylinder head bolts in the sequence from (10) to (1).
- Remove cylinder head.

29 – Removing the acoustic cover of the oil sump

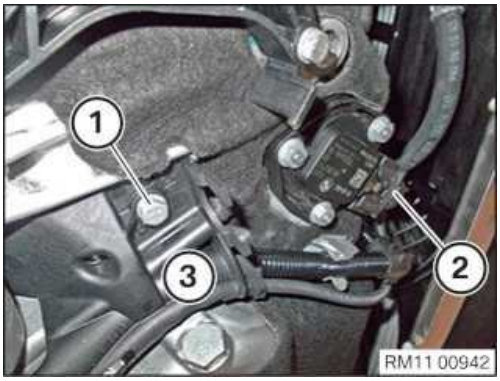
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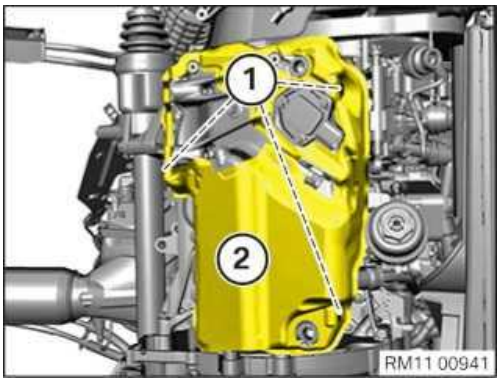
- Unlock connector (1) and pull off.
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).



- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.



- Unscrew the screw (1) on the wiring harness to the oil sump.
- Unlock and pull off connector (2) on the oil-level sensor.
- Place wiring harness (3) to one side.



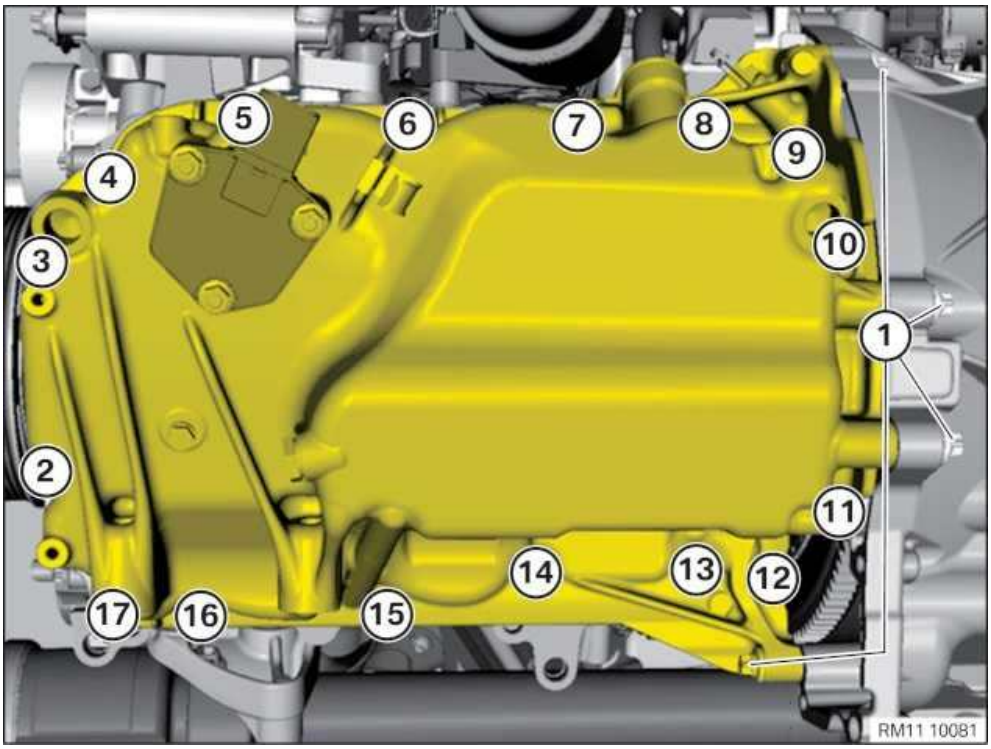
- Remove the expanding rivets (1) on both sides of the acoustic cover.
- Feed out and remove the acoustic cover (2).

30 – Remove oil sump

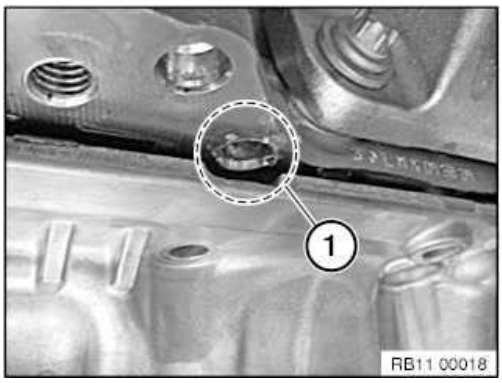


- Loosen screws (1).
- Feed out starter motor and remove.

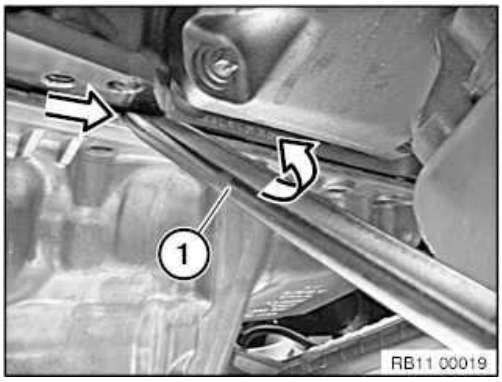
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- Release transmission bolts (1) on the oil sump.
- Loosen screws (2) to (17).



- Release the oil sump only in area (1).



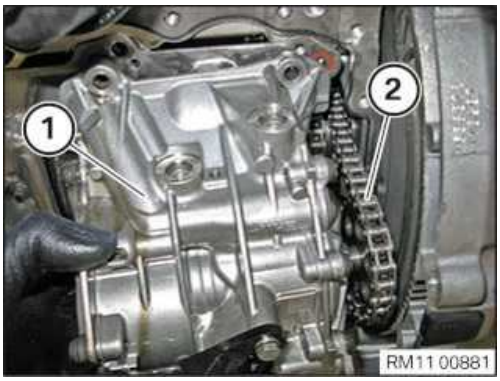
- Release the oil sump carefully using a suitable mounting lever (1) at the appropriate position in the direction of the arrow.
- Secure the oil sump to prevent it from falling.

31 – Remove the oil vacuum pump



- Loosen screws (1) of the oil vacuum pump (2).

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- Remove oil vacuum pump (1) and remove from the drive chain (2).

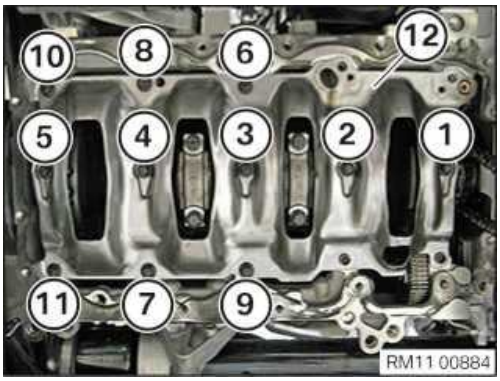
32 – Removing the oil deflector

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Loosen screws in the order (11) to (1).
- Guide out and remove the oil deflector (12).

33 – Remove the connecting rod bearing cap

RISK OF DAMAGE

Engine damage caused by incorrectly installed bearing shells and bearing supports.

Engine damage may result from incorrectly installing bearing shells and bearing supports.

- Always install all bearing shells and bearing supports in the same position from which they were removed.

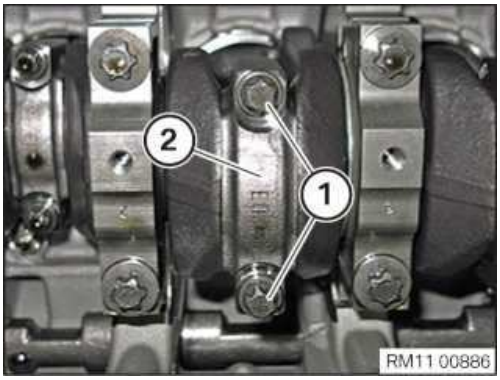
TECHNICAL INFORMATION

The connecting rods of the engine are balanced and are matched to each other.
A single connecting rod is not permitted to be replaced. Always replace all connecting rods.

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- Turn the crankshaft until the connecting rod bearing journal (1) reaches a vertical position.



- Unscrew the connecting rod bolts (1).

TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

- Remove the connecting rod bearing cap (2) and put to one side in the correct order.

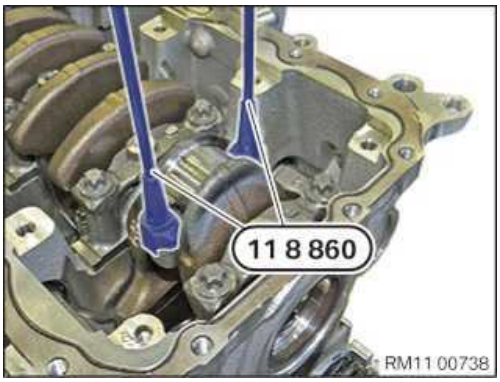
MAIN WORK

34 – Removing the piston with connecting rod

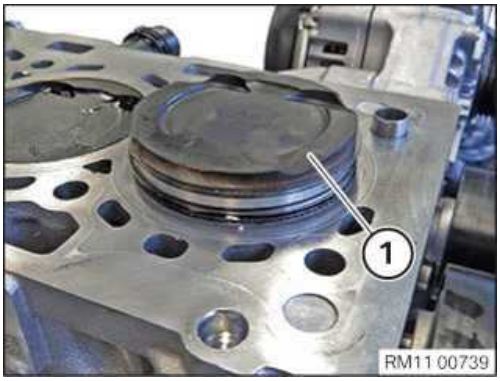
TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.



- Screw special tool **0 496 144 (11 8 860)** in at large connecting rod eye.



RISK OF DAMAGE

Damage on the cylinder wall and oil spray nozzles.

Major force can scratch the cylinder wall and bend the oil spray nozzles.

- Carefully move the piston and connecting rod in the engine block.
- Remove the piston (1) and connecting rod.

35 – Remove the connecting rod bearing shells

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RISK OF DAMAGE

Engine damage caused by incorrectly installed bearing shells and bearing supports.

Engine damage may result from incorrectly installing bearing shells and bearing supports.

- Always install all bearing shells and bearing supports in the same position from which they were removed.

TECHNICAL INFORMATION

The connecting rods of the engine are balanced and are matched to each other.

A single connecting rod is not permitted to be replaced. Always replace all connecting rods.



TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

- Remove the connecting rod bearing (2) from the connecting rod (1) and store it properly.



TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

- Remove the connecting rod bearing (2) from the connecting rod bearing cap (1) and store it properly.

36 – Measure side clearance of piston rings

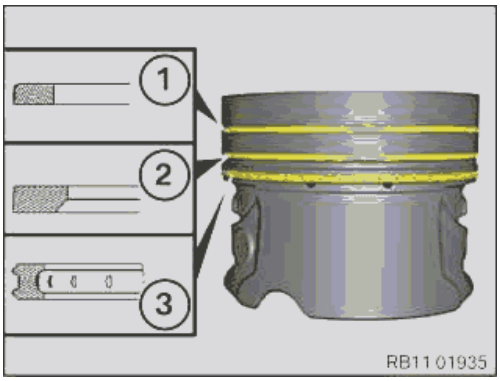
RISK OF DAMAGE

Damage to the piston rings.

Piston rings can bend or break due to large applications of force.

- Handle piston rings carefully.
- Only bend piston ring up lightly.

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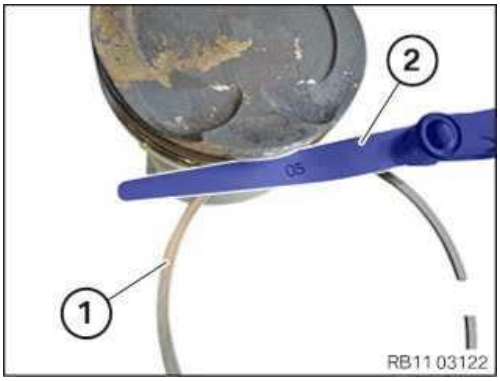


TECHNICAL INFORMATION

- Note the installation position of the component. The component may be installed in various installation positions.

- Mounting orientation of the piston rings

Position number	Description
1	1. Piston ring (plain rectangular compression ring)
2	2. Piston ring (taper faced piston ring)
3	3. Piston ring (oil scraper ring with spiral expander)



Check

- Install all piston rings (1) consecutively as shown in the piston ring groove. Measure the side clearance with a feeler gauge (2).

desired state

- The side clearance of the piston rings is within the tolerance.

Side clearance of piston rings

Clean all components before measuring the side clearance.	
Side clearance of the plain rectangular compression ring	0,17 mm ... 0,27 mm
Side clearance of the taper faced piston ring	0,30 mm ... 0,50 mm
Side clearance of the oil scraper ring with spiral expander	0,2 mm ... 0,4 mm

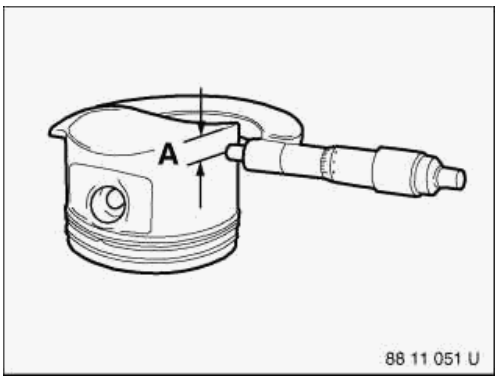
Result

» The side clearance of the piston rings is outside of the tolerance.

Measure

- Renew the piston ring.

37 – Measure the piston diameter



Check

- Position the measuring bolt in the area (A) and measure the piston installation clearance 90 ° transversely to the gudgeon pin.

Piston diameter

Measure the piston diameter at distance (A) from the lower end of the piston skirt.	
Distance (A) to the lower end of the piston skirt	17 mm
Nominal dimension of piston diameter	83,936 mm ... 83,954 mm

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Result

» The piston does not correspond to the specifications.

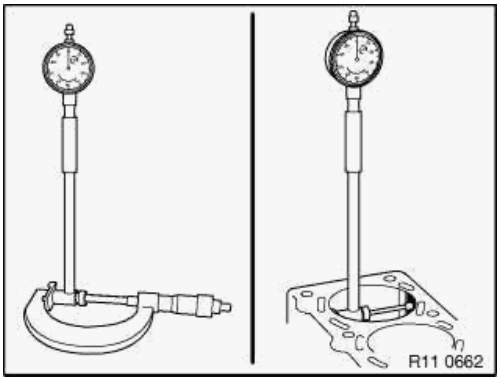
Measure

- Renew the piston.

38 – Measure the cylinder bores

Prerequisite

Cylinder barrel is cleaned.



Check

- Adjusting measuring screw to nominal dimension of cylinder bore.

Cylinder bore

Diameter of cylinder bore	84,00 mm ... 84,018 mm
Permitted irregularity of the cylinder bore	0,01 mm
Permitted conicity of the cylinder bore	0,01 mm

- Insert internal measuring device into measuring screw and set to zero.
- With the internal measuring device, measure the cylinder at the following points. Check the deviations from the nominal dimension.
  - Lower third of the cylinder bore in direction of travel,
  - Lower third of the cylinder bore transversely to direction of travel,
  - Middle third of the cylinder bore in direction of travel,
  - Middle third of the cylinder bore transversely to direction of travel,
  - Upper third of the cylinder bore in direction of travel,
  - Upper third of the cylinder bore transversely to direction of travel.

Cylinder bore

Diameter of cylinder bore	84,00 mm ... 84,018 mm
Permitted irregularity of the cylinder bore	0,01 mm
Permitted conicity of the cylinder bore	0,01 mm

Result

» Cylinder does not correspond to the specifications.

Measure

- Replace motor.

  Parts: Engine

39 – If necessary: Renew the piston

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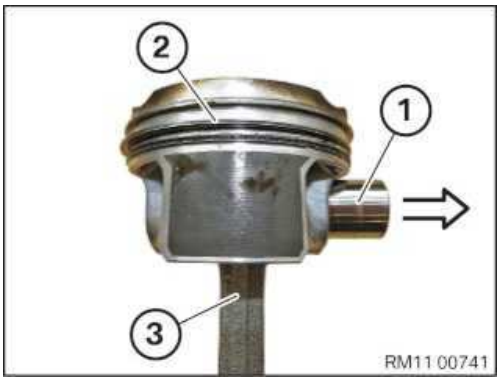
CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

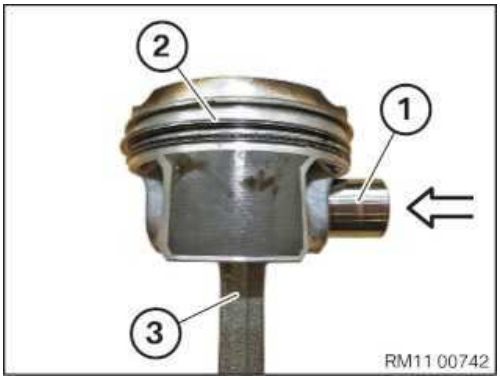
- Use special tool to remove the gudgeon pin circlip.
- Insert the flat side (3) of special tool into the groove (4).
- Grab and remove the gudgeon pin circlip (1) with the arched side (2).



TECHNICAL INFORMATION

Piston and gudgeon pin are matched to each other.
Always install piston and gudgeon pin together and do not switch by mistake.

- Remove the gudgeon pin (1) in the direction of arrow.
- Remove piston (2) from connecting rod (3).



- Renew piston with gudgeon pin.

  Parts: Pistons

TECHNICAL INFORMATION

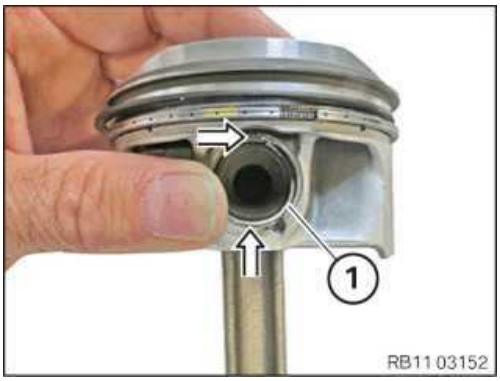
Piston and gudgeon pin are matched to each other.
Always install piston and gudgeon pin together and do not switch by mistake.

- Position piston (2) on the connecting rod (3).
- Install the gudgeon pin (1) in the direction of arrow.
- You must be able to install the gudgeon pin (1) without major effort.
- Gudgeon pin (1) must be free of play in piston and connecting rod.

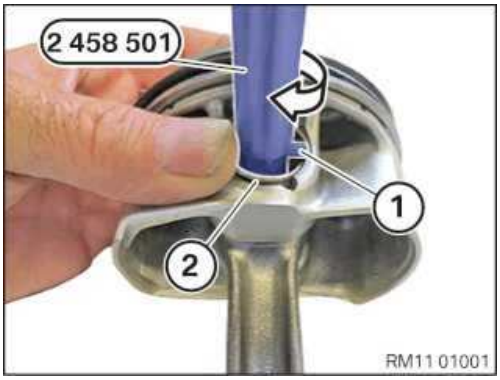


- Prepare special tool on the fitting aid .

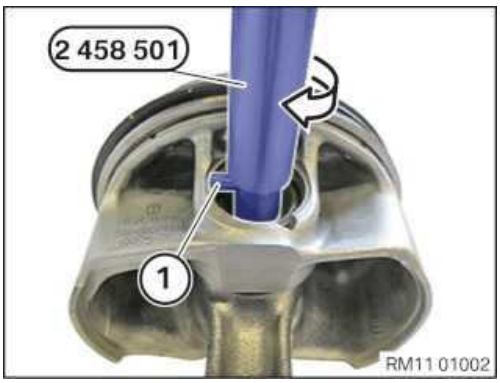
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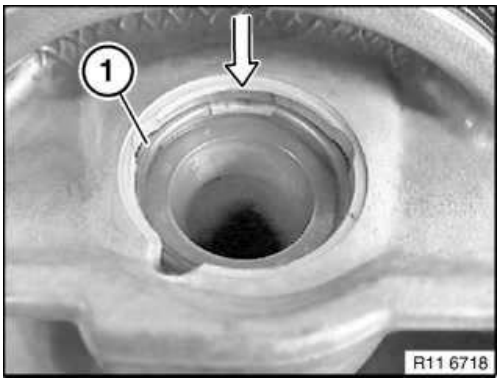
- Insert the gudgeon pin circlip (1) into the groove on the piston (see arrows).



- Screw in the positioned gudgeon pin circlip (2)with and with the guide pin (1) in the direction of the arrow.



- Screw the gudgeon pin circlip with guide pin (1) into the groove of the piston in the direction of the arrow.



- Gudgeon pin circlip (1) must be fitted correctly in the groove (arrow).

40 – Install the connecting rod bearing shell

RISK OF DAMAGE

Engine damage caused by incorrectly installed bearing shells and bearing supports.

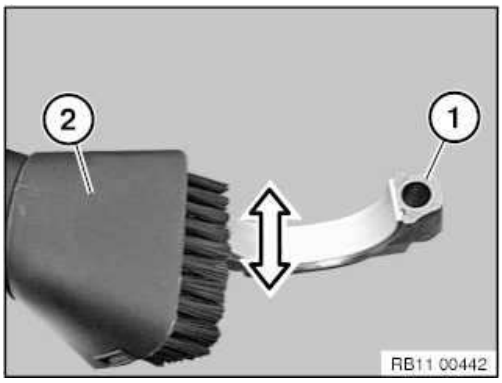
Engine damage may result from incorrectly installing bearing shells and bearing supports.

- Always install all bearing shells and bearing supports in the same position from which they were removed.

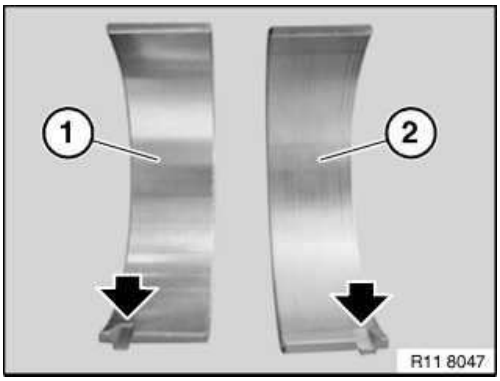
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TECHNICAL INFORMATION

The connecting rods of the engine are balanced and are matched to each other.
A single connecting rod is not permitted to be replaced. Always replace all connecting rods.

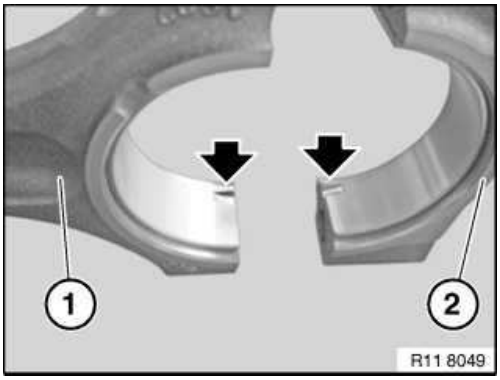


- Vacuum the crack surfaces (1) with a conventional vacuum cleaner (2).



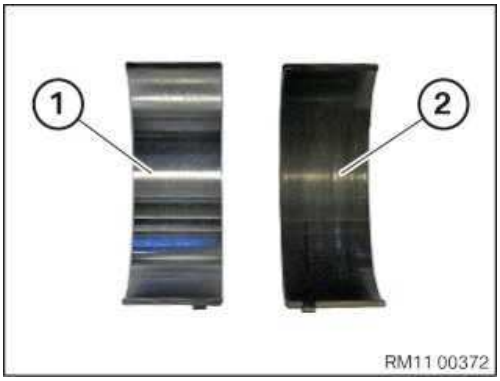
- To avoid incorrect assembly: Pay attention to marks (arrows).

  The connecting rod bearing (1) for the connecting rod bearing cap and the connecting rod bearing (2) for the connecting rod are each equipped with protection against incorrect assembly as shown in the marked area.



- To avoid incorrect assembly: Pay attention to marks (arrows).

  The connecting rod bearing cap (2) and the connecting rod (1) are each equipped with protection against incorrect assembly.



- Makes sure that a light connecting rod bearing shell (1) and a dark connecting rod bearing shell (2) are installed for each connecting rod.

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TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

- Insert the dark connecting rod bearing shell (2) into the connecting rod (1).
- Oil the connecting rod bearing shell (2).



TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

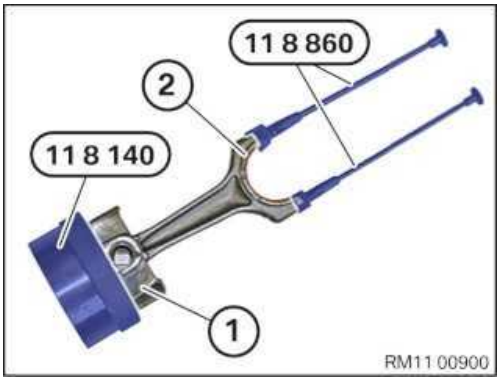
- Insert the light connecting rod bearing shell (2) into the connecting rod bearing cap (1).
- Oil the connecting rod bearing shell (2).

41 – Installing piston with connecting rod

TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.



- Coat the pistons (1) and piston rings lightly with oil.
- Mount the special tool **0 493 582 (11 8 140)** on the piston (1).
- Screw the special tool **0 496 144 (11 8 860)** in on the large connecting rod eye (2).



- Insert the piston with the special tool **0 493 582 (11 8 140)** with the arrow pointing to cylinder 1.

RISK OF DAMAGE

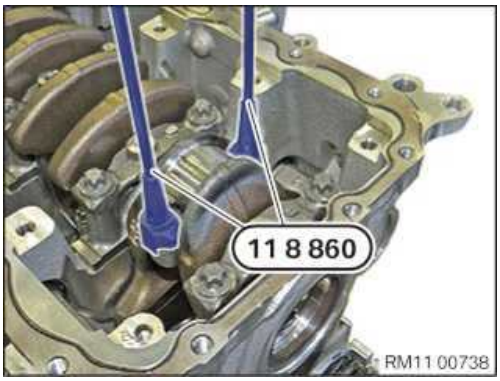
Damage on the cylinder wall and oil spray nozzles.

Major force can scratch the cylinder wall and bend the oil spray nozzles.

- Carefully move the piston and connecting rod in the engine block.

- Install the piston in the crankcase.

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- Remove special tool **0 496 144 (11 8 860)** from large connecting rod eye.

POSTPROCESSES

42 – Install the connecting rod bearing cap

RISK OF DAMAGE

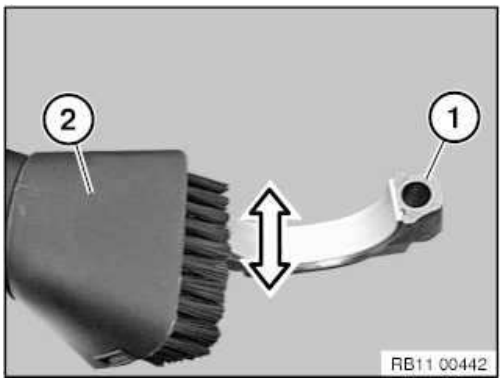
Engine damage caused by incorrectly installed bearing shells and bearing supports.

Engine damage may result from incorrectly installing bearing shells and bearing supports.

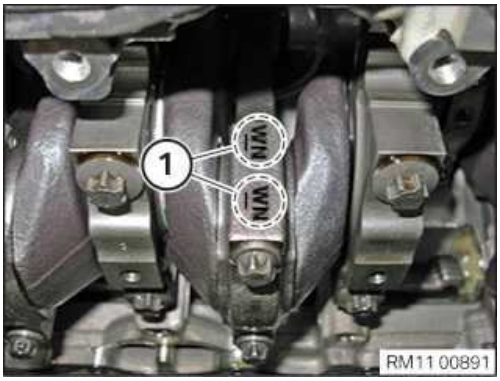
- Always install all bearing shells and bearing supports in the same position from which they were removed.

TECHNICAL INFORMATION

The connecting rods of the engine are balanced and are matched to each other.
A single connecting rod is not permitted to be replaced. Always replace all connecting rods.



- Vacuum the crack surfaces (1) with a conventional vacuum cleaner (2).



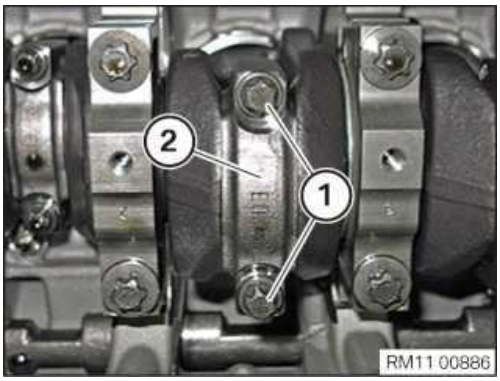
- Attach the connecting rod bearing caps to the connecting rod until the designations (1) match.

TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.
Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

- Make sure that the connecting rod bearing is attached to the same connecting rod that it was detached from.

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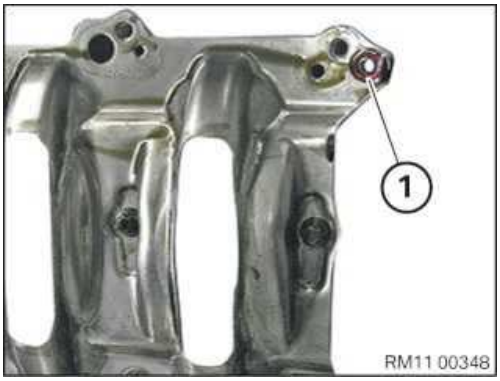


- Position the connecting rod bearing cap (2).
- Tighten the bolts (1) with the special tool **0 490 504 (00 9 120)**.

Connecting rod bearing cap to connecting rod

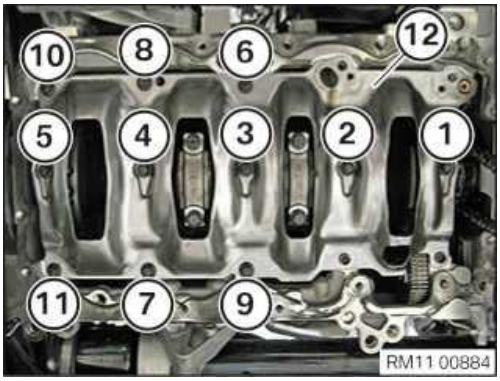
M9x47		Tightening torque	20 Nm
		Angle of rotation 1	70 °
		Angle of rotation 2	70 °

43 – Installing the oil deflector



- Check sealing ring (1) for damage and replace oil deflector if necessary.

  Parts: Oil deflector



- Insert and install the oil deflector (12).
- Renew screws (1) to (11).

  Parts: Bolts
- Hand-tighten the bolts (1) to (5).
- Hand-tighten the bolts (6) to (11).
- Tighten the screws (1) to (5).

Oil deflector to crankshaft bearing cap

M8x14	Replace screws.	Tightening torque	35 Nm
		Release	180 °
		Tightening torque	15 Nm
		Angle of rotation	45 °

- Tighten the screws (6) to (11).

Oil deflector to crankcase

M8x14		Tightening torque	19 Nm

44 – Install the oil vacuum pump

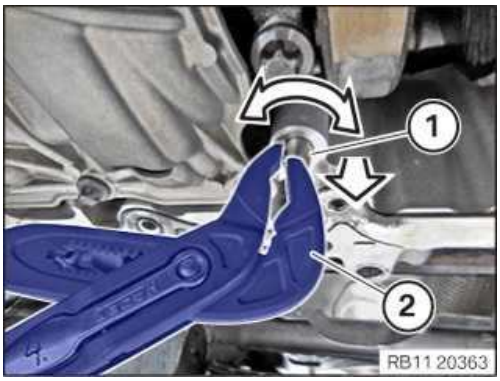
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

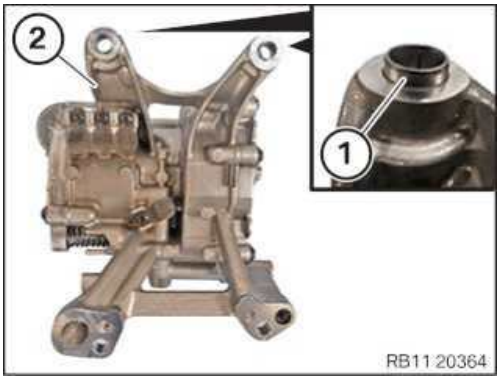
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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- Remove centering sleeves from the crankcase (1) using a standard tool (2).
- Renew the centring sleeves (1).

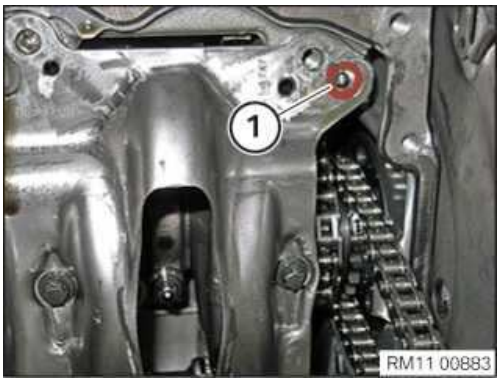
  Parts: Centring sleeves



- Install centering sleeves (1) in the oil vacuum pump (2).

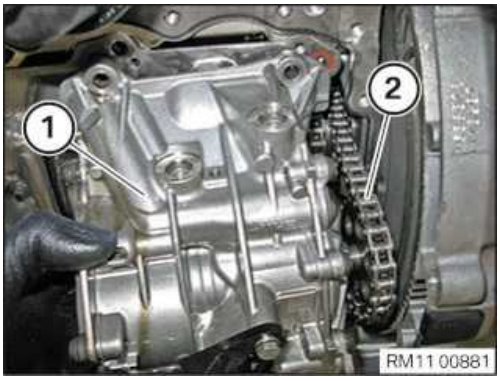


- Check the sealing ring (1) for damage and renew where required.
- Make sure the sealing ring (1) is installed correctly.



- Check sealing ring (1) for damage and replace oil deflector if necessary.

  Parts: Oil deflector



- Insert oil vacuum pump (1) into the drive chain (2).

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- Renew screws (1).

  Parts: Bolts

- Tighten the screws (1) of the oil vacuum pump (2).

Oil vacuum pump to crankcaseB47

M8x35		Tightening torque	19 Nm

45 – Refitting sump



TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove fine sealing remains on the sealing surface (1)and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.
- Clean sealing surface (1) with brake cleaner.

Expendable materials

Brake cleaner2.0	500 ml, Spray can	83192365214
	20 , Canister	83192365215



TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove coarse sealing remains on the sealing surface (1)and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.
- Clean sealing surface (1) with brake cleaner.

Expendable materials

Brake cleaner2.0	500 ml, Spray can	83192365214
	20 , Canister	83192365215



- Have the special tool ready.

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TECHNICAL INFORMATION

For more information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

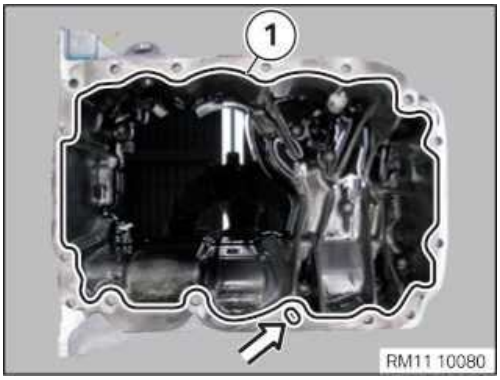
- Position the sealing compound (1) on special tool as shown.

  Parts: Sealing compound

Sealing compound

Loctite 5970 liquid sealing compound	50 ml, Cartridge	83190404517

Overview of consumables (Electronic Parts Catalogue)



TECHNICAL INFORMATION

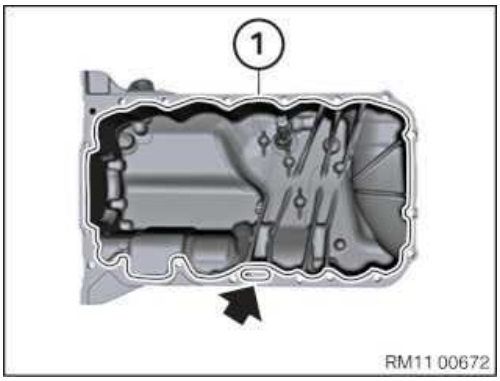
The sealing surfaces must be free from oils, grease and cleaning agents.

TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- The height of the sealing compound must be approx. between **2.0 mm** and **2.5 mm**.
- Apply the sealing bead along the inner edge (1) of the oil sump.
- Completely surround the oil return orifice (arrow) with the sealing compound.

  No sealing compound may enter the oil return orifice.
- Fix oil sump within the prescribed application time of the sealing compound.

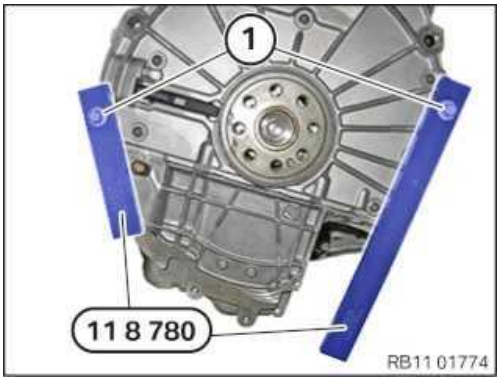


TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- Apply the sealing compound along the line (1) with a thickness of 2 mm to 2.5 mm.

  The sealing compound must be applied along the inner edge.
- Completely encircle the oil return orifice (arrow) with the sealing compound.

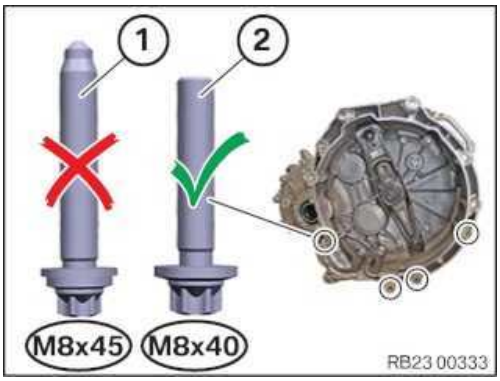


TECHNICAL INFORMATION

The special tool 11 8 780 is only required when the transmission is removed.

- Position the special tool **0 496 120 (11 8 780)** with the transmission bolts (1) so that the oil sump is exactly flush with engine block.
- Renew the fitting sleeves if required.

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RISK OF DAMAGE

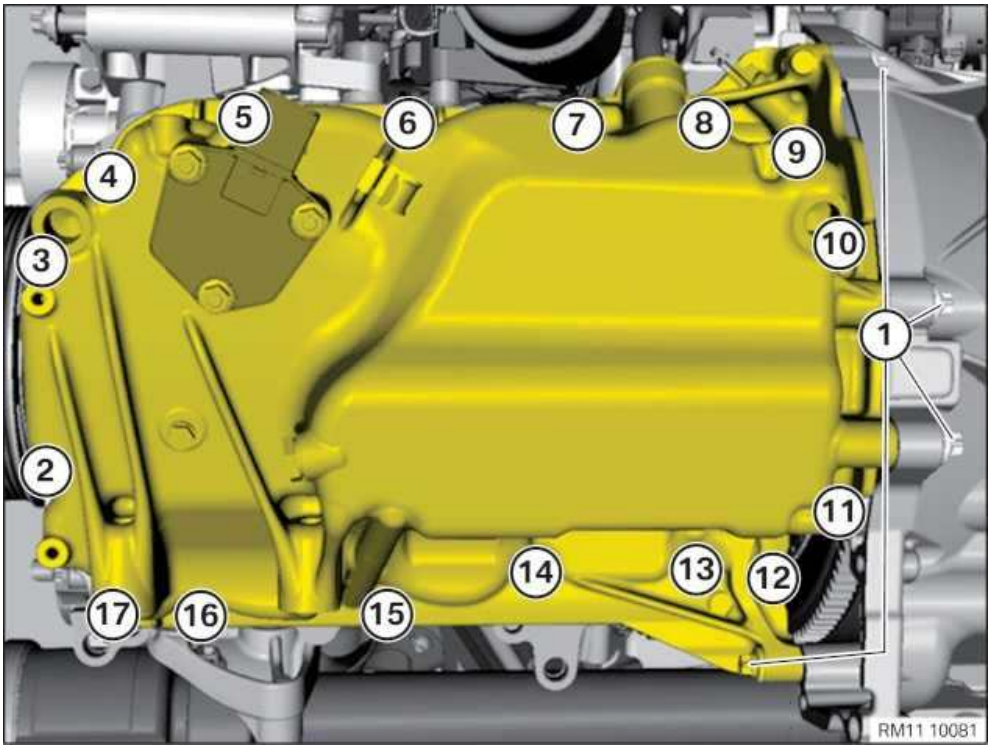
Component damage caused by incorrect screw length.

The use of screws with the incorrect screw length can damage the component.

- Check for correct screw length.
- Re-install screws that correspond to the original screw length.

- Ensure that the **correct** screw (2) (M8x40) is used for mounting the oil sump on the transmission.

  The screw (1) (mounting bolt of the starter motor) may **never** be used for mounting the oil sump.



- Position and install the oil sump.
- Tighten screws (2) to (17) **hand-tight**, do **not** tighten fully.
- Join transmission bolts (1) with 5 Nm.
- Tighten screws (2) to (17) on the oil sump.

Oil sump to crankcase

M8x30		Tightening torque	2 Nr
M8x110		Tightening torque	2 Nr

- Tighten the transmission bolts (1) on the oil sump.

Transmission to oil sump

M8		Tightening torque	1 Nr



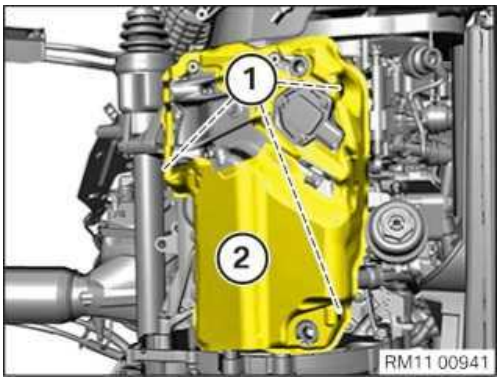
- Insert and install the starter motor .
- Tighten the screws (1).

Starter motor to transmission

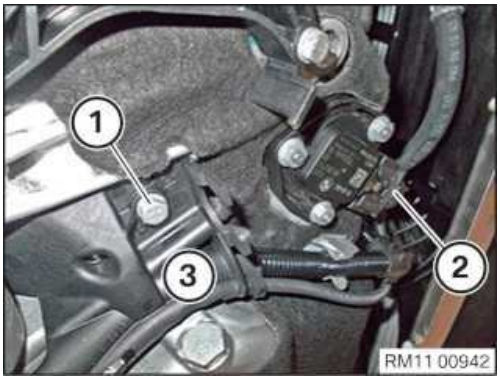
M8x45		Tightening torque	19 Nm

46 – Installing the acoustic cover for the oil sump

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- Thread in and position the acoustic cover (2).
- Install the expanding rivet (1).



- Position wiring harness (3).
- Tighten down screw (1).

Bracket to oil sump

M6		Tightening torque	8 Nm

- Connect and lock the connector (2) on the oil-level sensor.

  The connector must lock audibly.



CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

Battery positive lead to starter

M8		Tightening torque	13,5 Nm

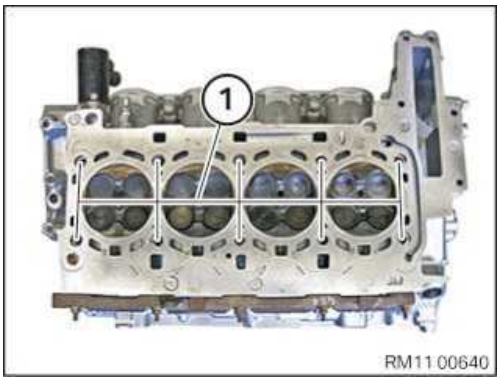


- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).

  The connector must engage audibly.

47 – Renewing the cylinder head gasket

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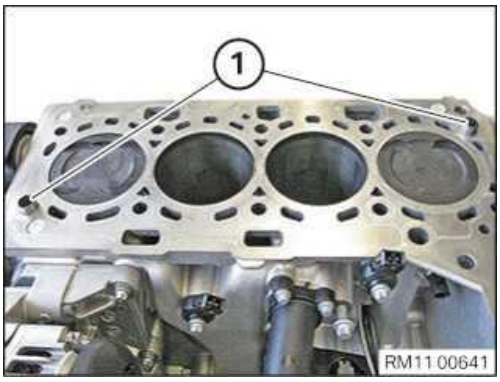
RISK OF DAMAGE

Damage to the surface.

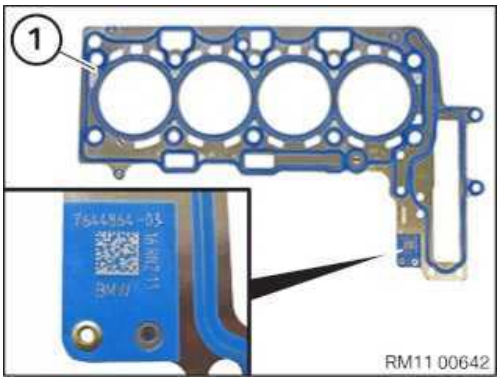
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Remove oil and dirt residue from the blind holes (1).

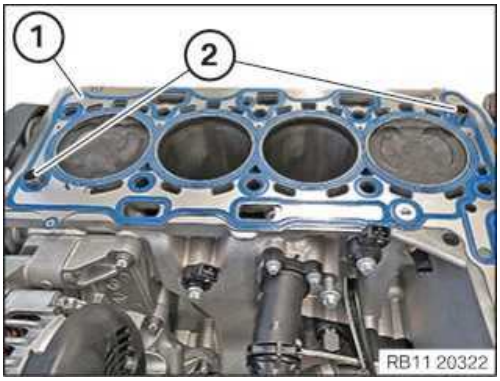


- Check the fitting sleeves (1) for secure fit and damage.



- Identify the cylinder head gasket (1) using the part number.

Note: If the cylinder head is reworked, an additional thicker gasket 0.3 mm is available for service personnel.



- Guide in the cylinder head gasket (1) and install.
- Ensure that the cylinder head gasket (1) is installed correctly in the fitting sleeves (2).

48 – Mounting the cylinder head

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

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RISK OF DAMAGE

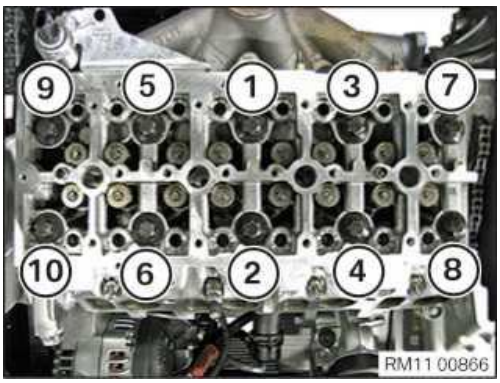
Damage to threads.

Fluid in the threaded hole may damage the thread when screws are tightened in the threads.

- Dry threaded holes (e.g. using compressed air).

TECHNICAL INFORMATION

Do not remove bolt coating.



- Position the cylinder head on the crankcase.
- Renew the cylinder head bolts (1).

  Parts: Cylinder head bolts
- Do **not** wash off coating of cylinder head bolts.
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

  No coolant, water or engine oil must be present in threaded holes of engine block.

TECHNICAL INFORMATION

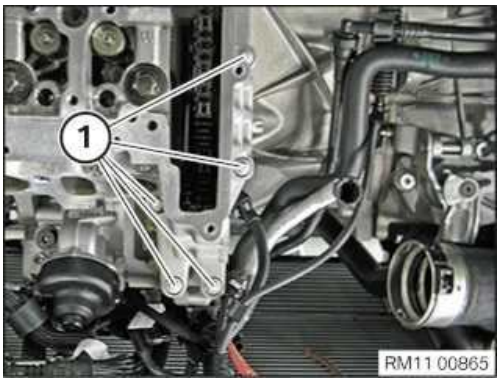
When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Feed in cylinder head bolts and install.
- Screw in cylinder head bolts in sequence (1) to (10).
- Tighten cylinder head bolts using special tools **0 490 504 (00 9 120)** and in sequence (1) to (10).

Cylinder head to crankcase

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °



- Tighten the cylinder head bolts (1).

Cylinder head bolt to timing case cover

M8x40		Tightening torque	19 Nm

49 – Installing the hydraulic valve clearance compensating element

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

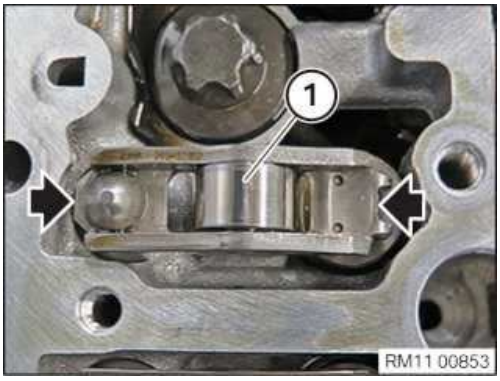


- Install the hydraulic valve clearance compensating element (1) in the direction of the arrow.
- Repeat the process on all hydraulic valve clearance compensating elements.

50 – Install the roller cam followers

TECHNICAL INFORMATION

- Note the installation position of the component. The component may be installed in various installation positions.

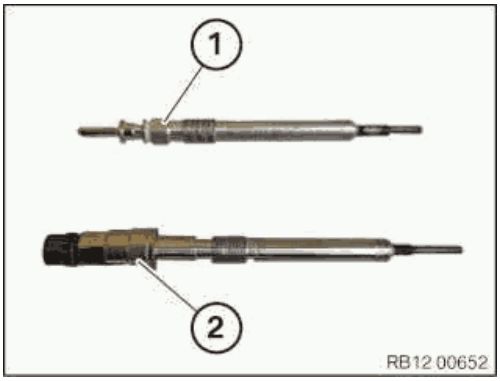


- Check all roller cam followers (1) for damage and replace if necessary.

  Parts: Roller cam followers
- Insert and install all roller cam followers (1).

  Roller cam followers (1) that have already been used must be installed in the same place.
- Note the mounting orientation of the roller cam followers (1).
- Oil all roller cam followers (1).

51 – Install glow elements



- Install glow elements (1) in cylinders 1, 2, 3 and 4.
- If fitted: Glow element (2) with the **combustion chamber pressure sensor** must be installed in cylinder **2**.

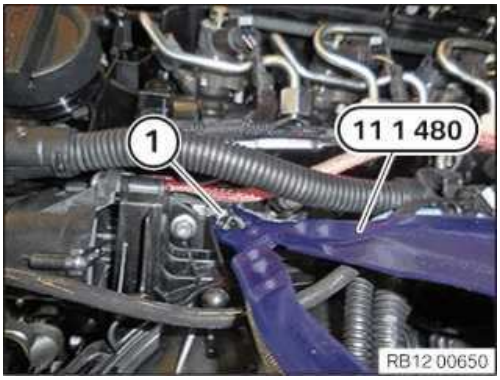
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- Tighten the glow element with the special tool or conventional tools.

Glow elements to cylinder head

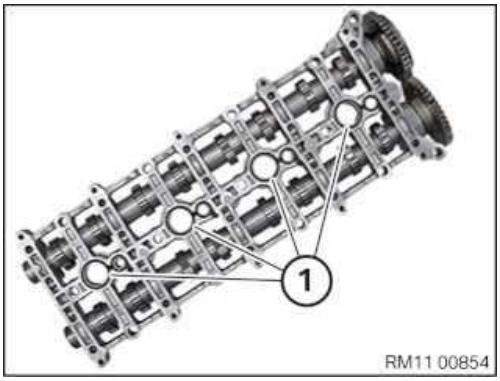
Glow element		Tightening torque	13 Nm



- Connect connectors (1) and lock.

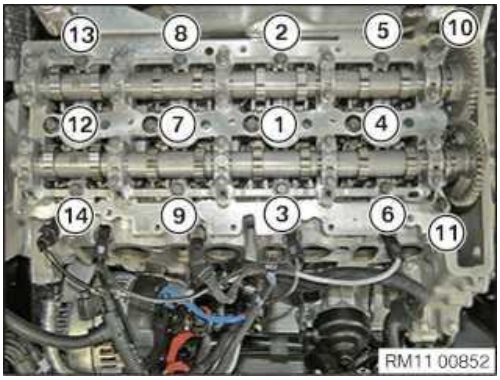
  The connector (1) must engage audibly.

52 – Installing the camshaft support



- Renew gaskets (1).

  Parts: gaskets



- Position the camshaft support including the camshafts.
- Tighten the screws in a sequence from (1) to (14) in several steps.

Camshaft carrier to cylinder head

M7x35		Tightening torque	13 Nm

53 – Adjusting the timing of the camshafts



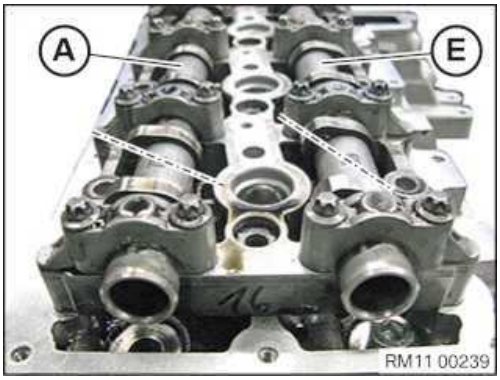
- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

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- Slide the special tool **2 288 380** completely into the bore hole of the oil sump.
- Use the special tool to block **2 288 380** the crankshaft in the TDC firing position at the first cylinder.



- The cam of the intake camshaft (E) at the first cylinder points up at an angle.
- The cam of the exhaust camshaft (A) at the first cylinder points outward at an angle.

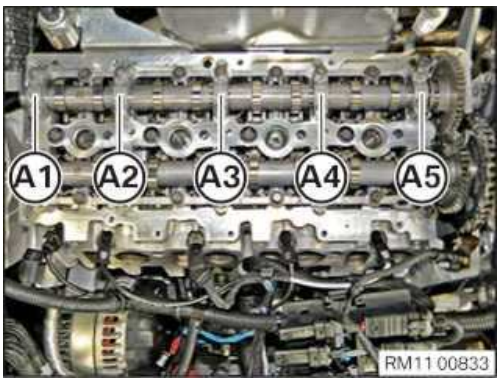
▸ **Remove exhaust camshaft.**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



TECHNICAL INFORMATION

The camshaft is tensioned by the valve springs. Tighten or loosen each screw on the camshaft bearing caps one at a time in the specified sequence and by half a turn only. Repeat procedure.

- Loosen all screws of the exhaust camshaft bearing caps (A1) to (A5) from the outside to the inside, step by step in 1/2 turns.
- Remove exhaust camshaft in upward direction.
- Place all components on special tool **0 495 105 (11 4 480)** in a tidy and orderly fashion.

▸ **Remove chain tensioner piston**

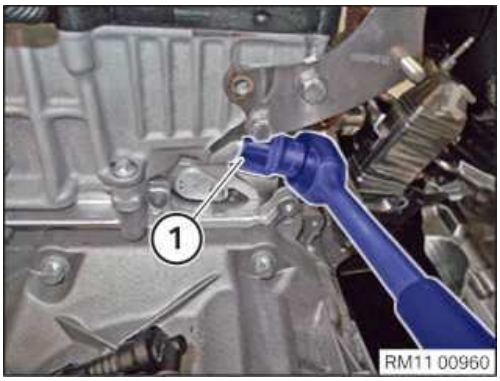
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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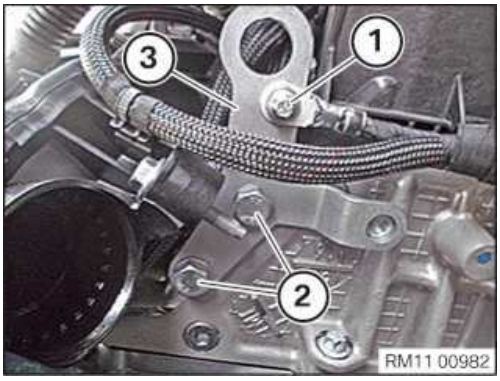


TECHNICAL INFORMATION

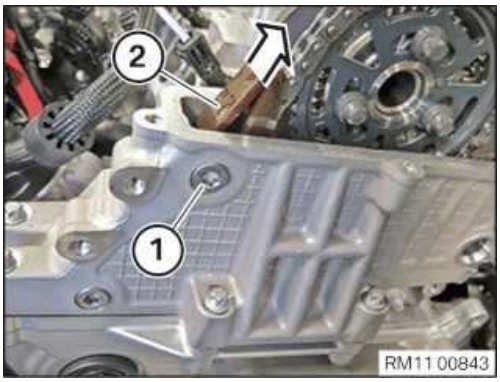
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

▶ **Remove the timing chain guide rail**

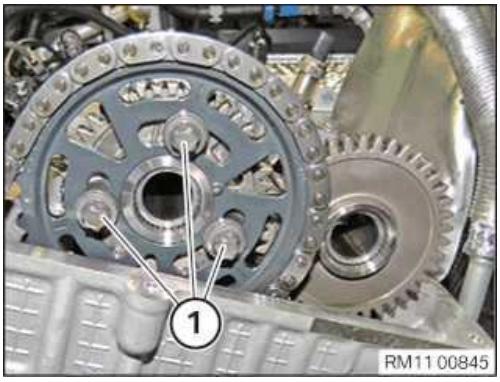


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

▶ **Removing the camshaft sprocket on the intake camshaft**



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

▶ **Install exhaust camshaft**

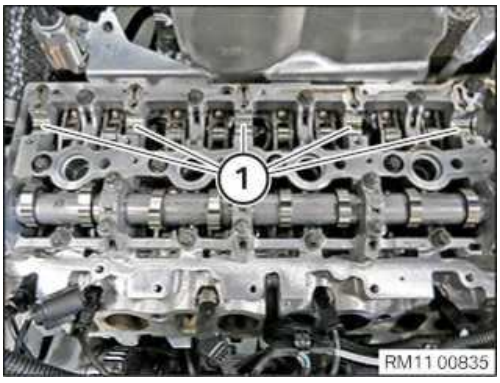
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RISK OF DAMAGE

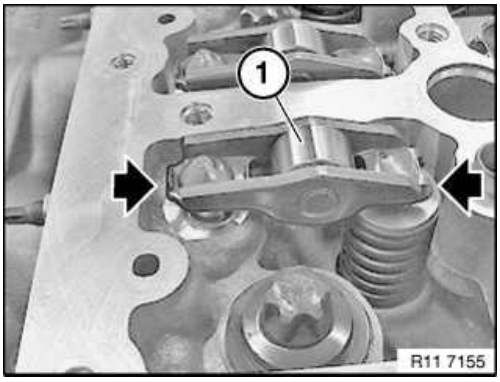
Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

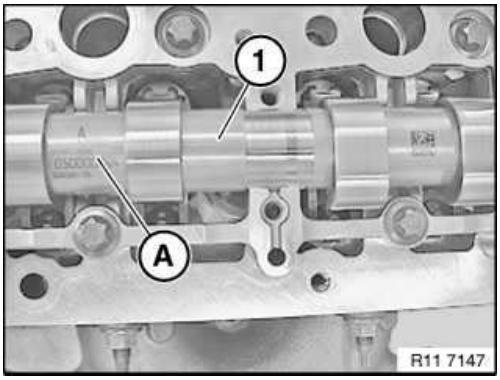
- Comply with the regulations for the installation and disassembly.
- Perform work with care.



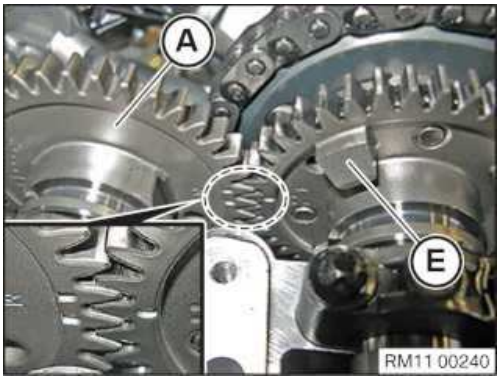
- Oil all bearing positions (1).



- Make sure the roller cam followers (1) have the correct mounting orientation.

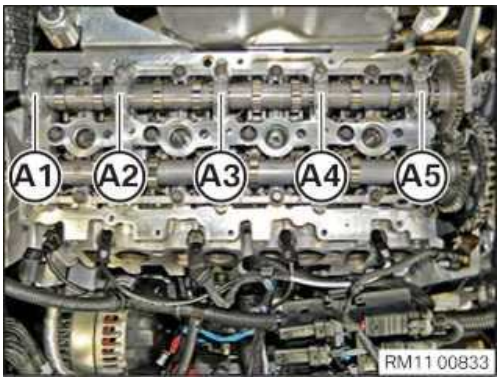


- Insert exhaust camshaft (1) so that the identification (A) points upwards.



- Insert the exhaust camshaft (A) so that the marks on the camshafts (A) and (E) correspond in the highlighted area.
- Position the camshafts (A) and (E) accordingly.

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- Tighten all exhaust camshaft bearing caps (A1) to (A5) from the inside to the outside by 1/2 a turn at a time.

Intake and exhaust camshaft in camshaft support

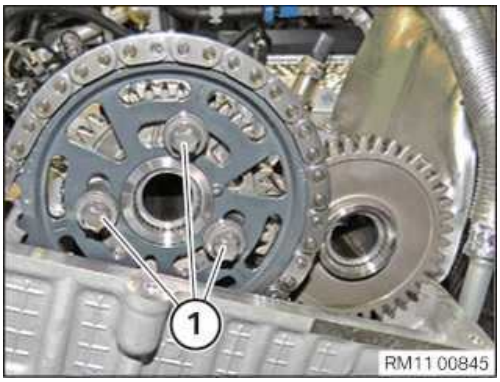
M6x31		Tightening torque	10 Nm



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

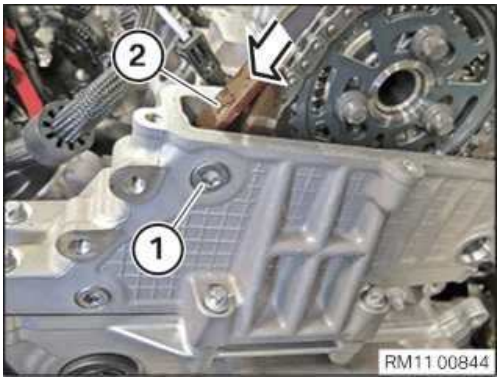
  Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

▶ **Installing the camshaft sprocket on the intake camshaft**



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

▶ **Install the timing chain guide rail**



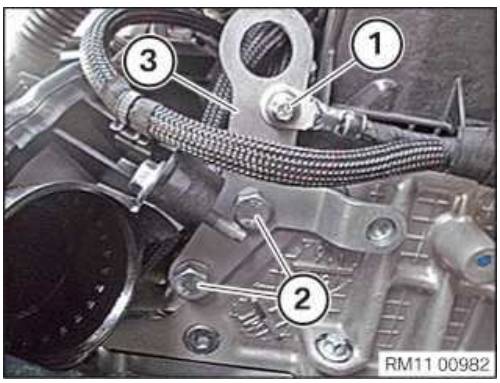
- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm



- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6			8 Nm

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▶ **Installing the chain tensioner piston**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Renew sealing ring (1).

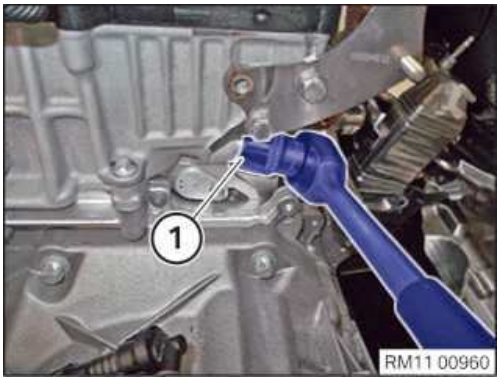
  Parts: Sealing ring



TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.

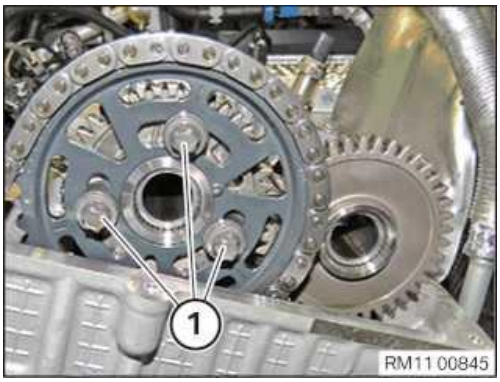


- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

▶ **Tightening the camshaft sprocket on the intake camshaft**

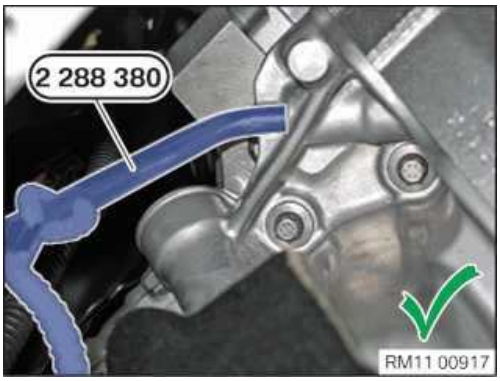


- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

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- Remove special tool **2 288 380**.

55 – Removing the special tool to secure the exhaust camshaft



- Remove the special tool **0 496 112 (11 8 760)** to fix the exhaust camshaft.

56 – Checking camshaft timing



- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

Damage to the engine.

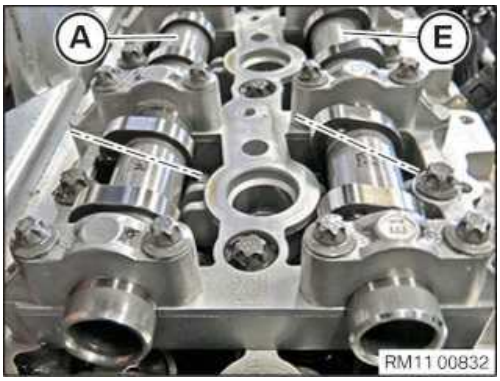
The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

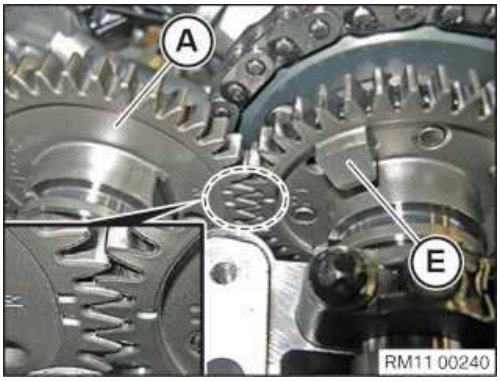
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- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

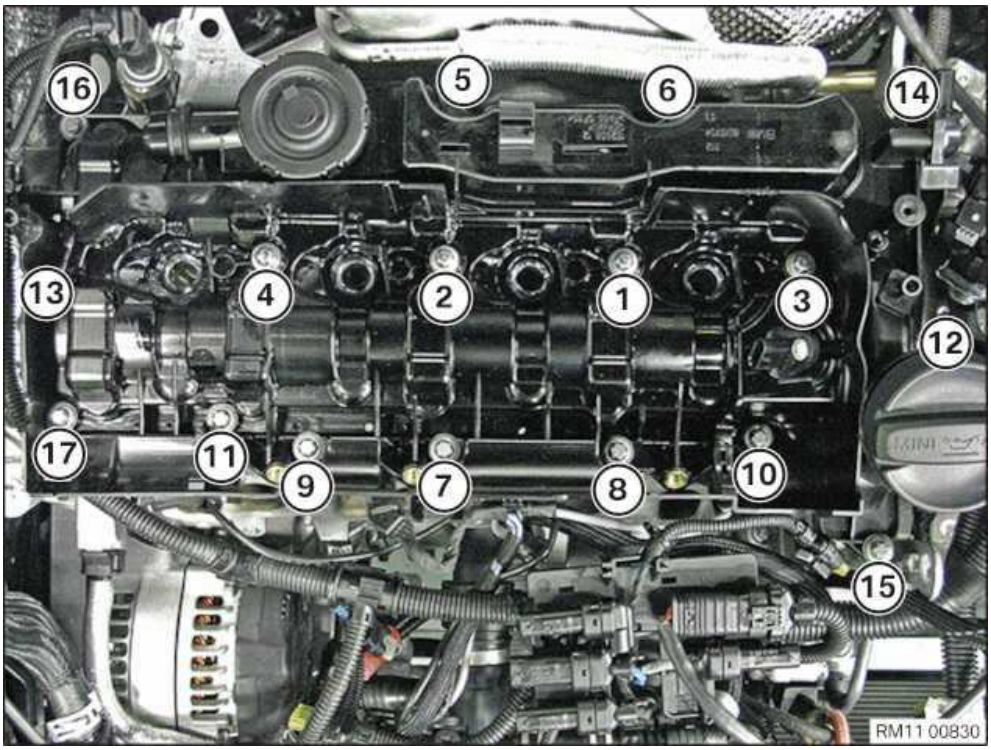


- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

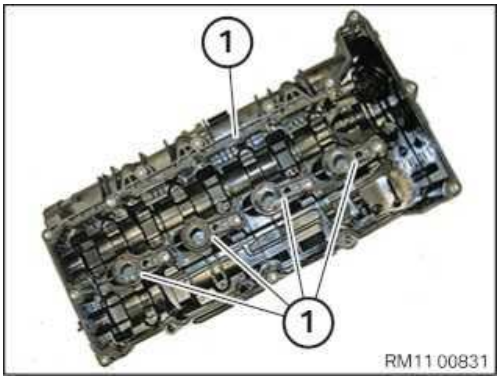
57 – Installing cylinder head cover

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Overview: Screw connection of the cylinder head cover

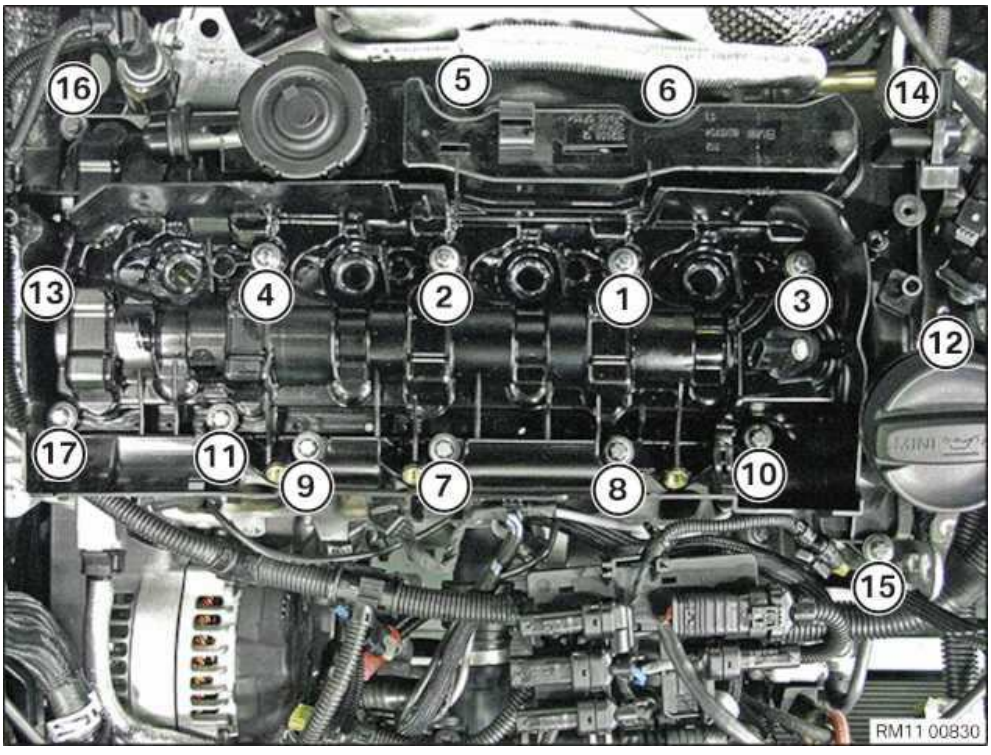


1 to 16 screws of the cylinder head cover.



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket



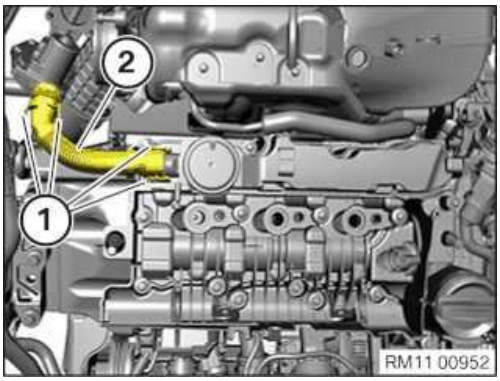
- Install cylinder head cover.
- Tighten screws in the order (1) to (17).

Cylinder head cover to cylinder head

M6		Tightening torque.	8, Nr

-

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- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

58 – Installing injectors of injection system

▶ **Cleaning the injector shafts**

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

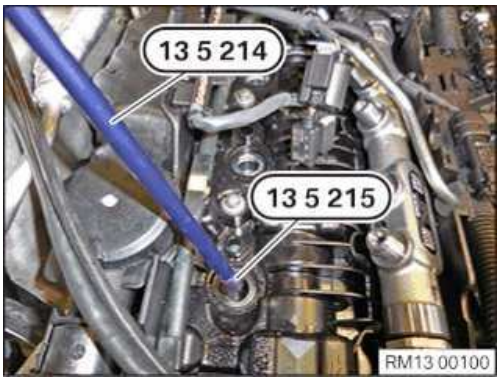
- Collect dirt particles, e.g. when blowing out, use cloth to do so.
- Wear safety goggles.

RISK OF DAMAGE

Contaminant or foreign body.

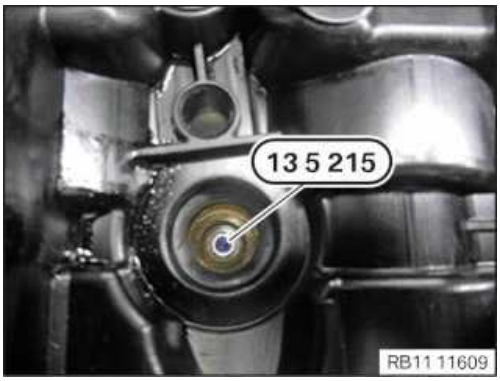
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.

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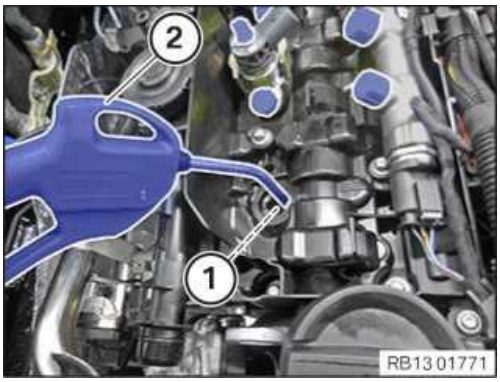
- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.



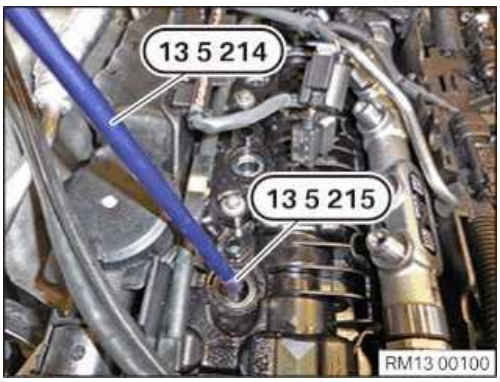
- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.



- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.



- Blow out injector shaft (1) with air gun (2).



- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

► **Check the placement of the clamping claw**

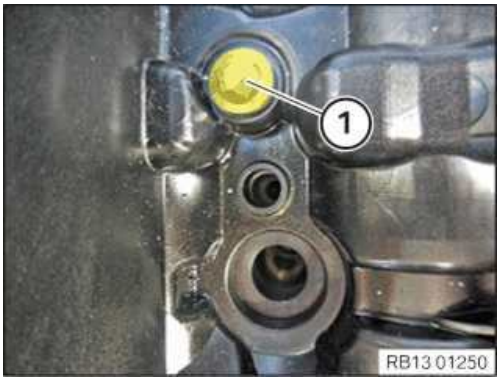
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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▸ **Prepare the injector for installation**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

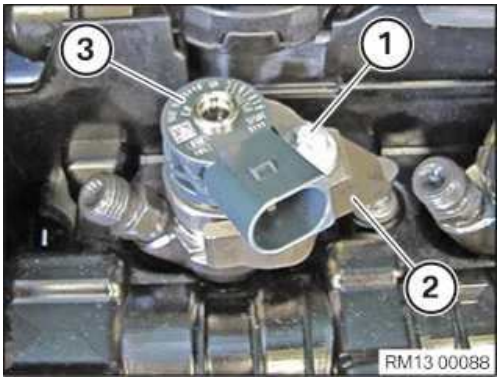


- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring
- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

Injector lubricating grease	50 g, Can	83230441070

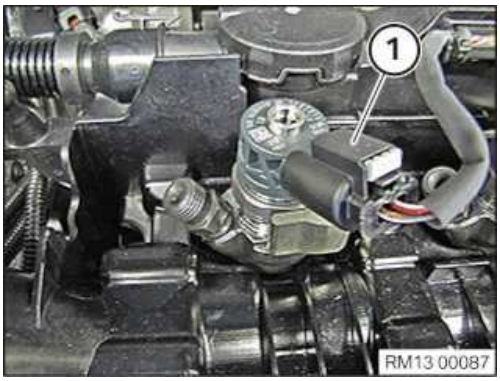


- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

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- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

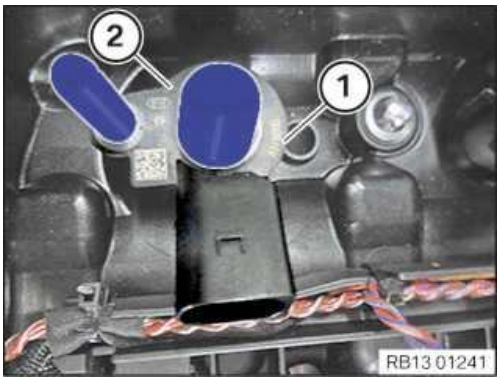
▶ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

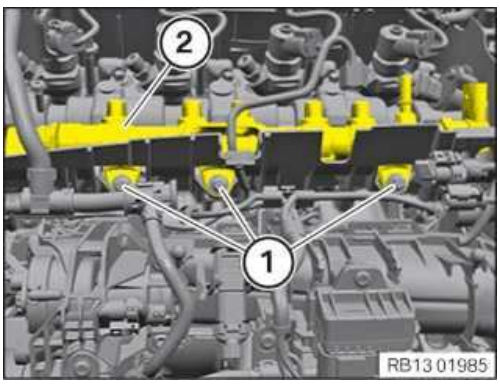
Schematic diagram is for example purposes. Some parts may differ in certain details.



- Read off the adjustment value (1) on the new injector (2).

- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

59 – Installing the rail

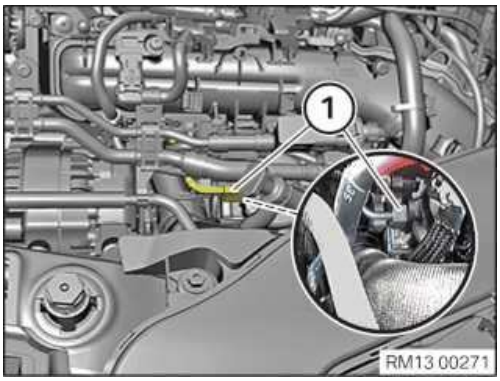


- Carefully insert and install the rail (2).
- Tighten the screws (1).

Rail on cylinder head cover

Torx screw M8x25		Tightening torque	19 Nm

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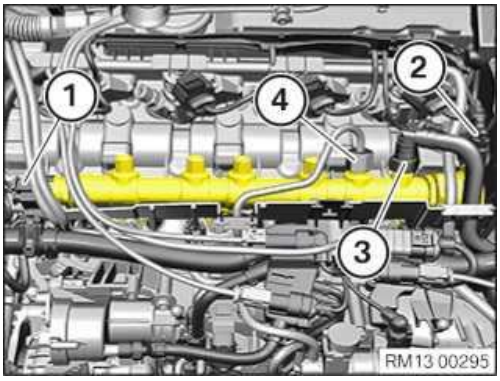
TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten union nut (1).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm



TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten union nut (4) with special tool .

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

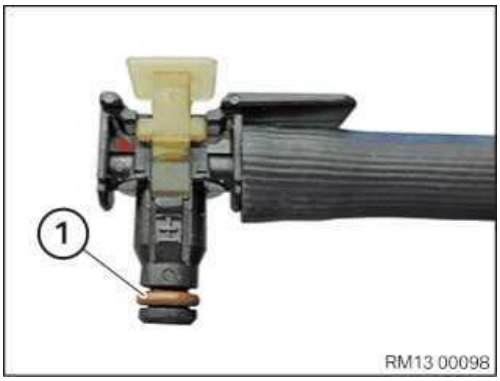
- Connect and lock the fuel line (3).

  Fuel line (3) must engage audibly.
- Connect connectors (2) and lock.

  The connector (2) must engage audibly.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

60 – Connect the leakage oil line on the injector



- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.

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- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

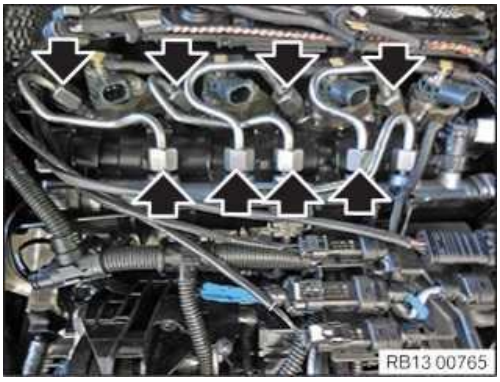
61 – Installing high pressure lines between rail and injectors

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Remove special tool .
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

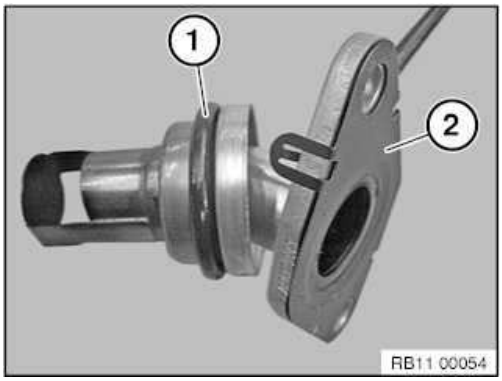
- Tighten the high pressure lines (arrows) with the special tool .

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

62 – Installing the intake plenum

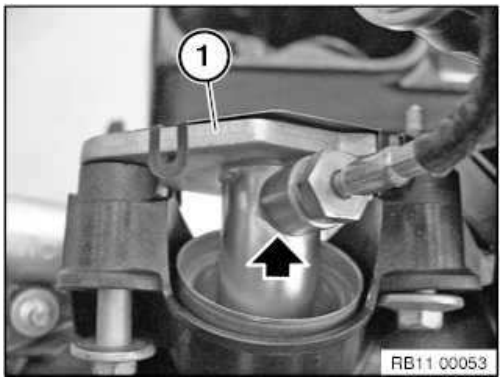


- Renew O-ring (1).

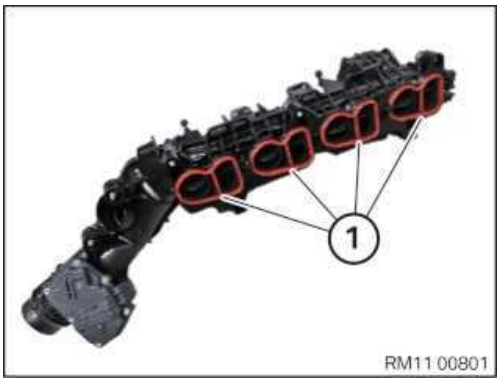
  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position the seal (2) and clip it in.

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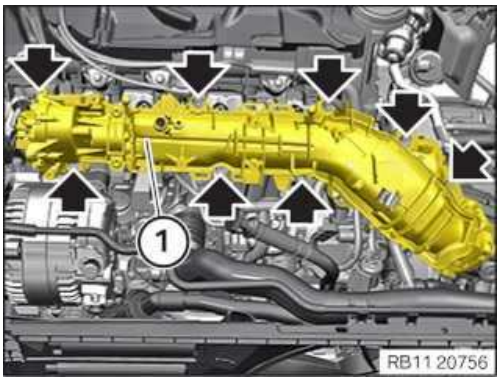


- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (1).

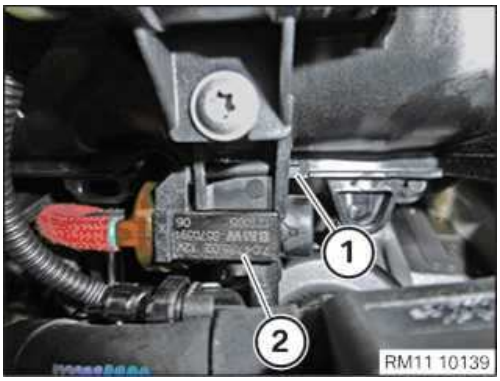
  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.



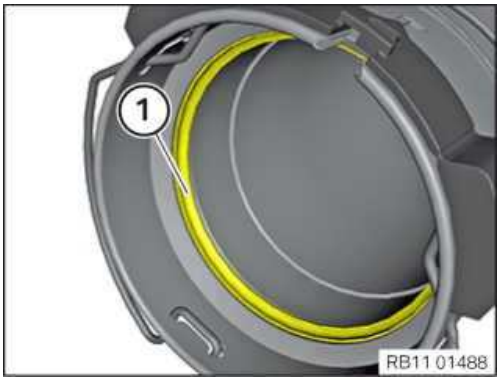
- Guide in and install intake (1) plenum.
- Tighten screws (arrows).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm



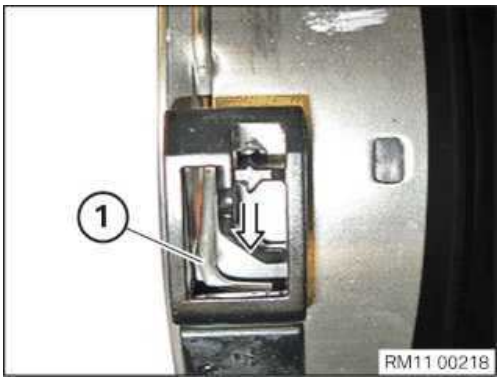
- Install the electric changeover valve (2) in the holder on the plenum from left to right.
- Lock (1) must engage audibly.



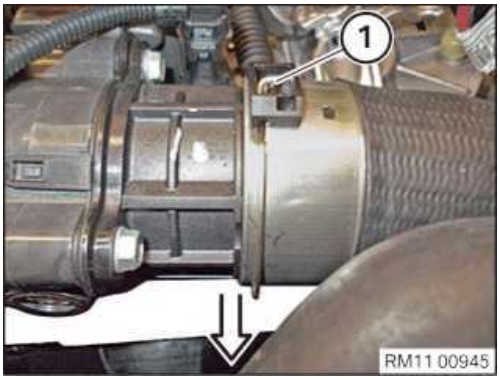
- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring

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- Engage the lock (1) on the bracket (arrow).



- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

63 – Remove the engine from the assembly stand

CAUTION

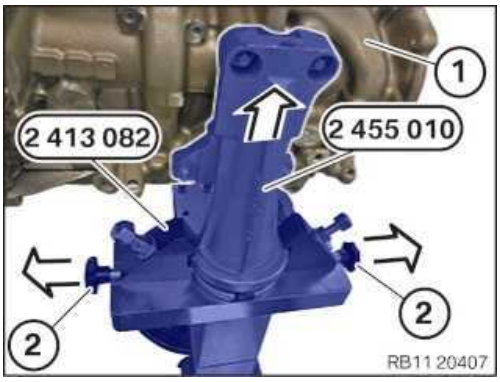
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Insert engine lifter with special tool and position engine (1).

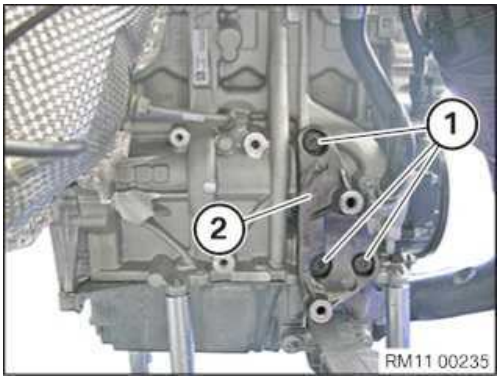


- Unscrew the nuts on special tool .
- Detach the holder (2) in the direction of the arrow.
- Detach the engine (1) with special tool **2 455 010** out of the special tool in the direction of arrow.

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- Remove conventional screws (arrows).
- Feed out the special tool **2 455 010** on the engine (1) and remove.



- Insert and install the holder (2).
- Tighten the screws (1).

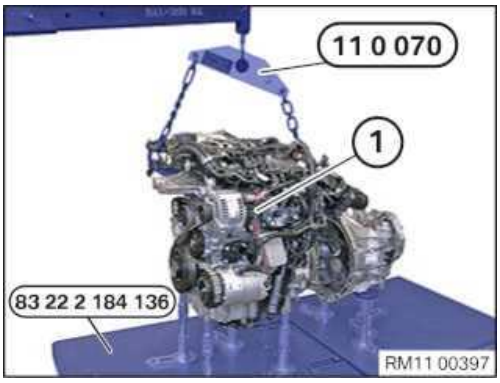
Holder to crankcase

M10		Tightening torque	38 Nm

64 – Mount engine on the automatic transmission

Prerequisite

Engine has been removed.



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Position the engine (1) on the lifting table **2 184 136** using the engine lifter and the special tool .
- Feed out engine lifter from engine (1) with special tool and push aside.

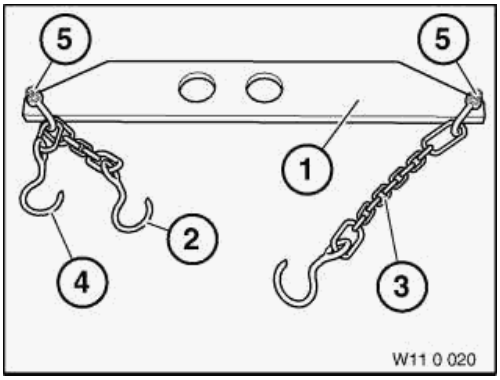


- Unscrew the bolts (1) of the special tool **2 459 012**.
- Feed out the special tool **2 459 012** at the cylinder head and remove.

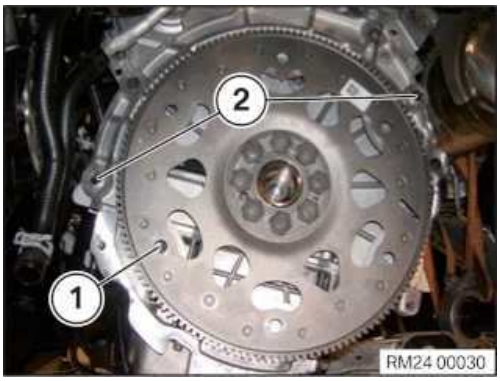
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- Stage the workshop crane **2 220 718**.



- Stage the lifting gear .



- The bore hole (1) of the flywheel must be accessible from the recess on the oil sump.
- Check for correct fit of fitting sleeves(2).

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TECHNICAL INFORMATION

Conduct the following operation with the assistance of a second person.

- Twist torque converter until bore hole in torque converter is flush with bore hole of flywheel.
- Flange-mount and screw automatic transmission on the engine with an auxiliary person and the workshop crane **2 220 718** with the lifting gear .
- Tighten screws (arrows).

Transmission to engine

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

- Feed out workshop crane **2 220 718** with the lifting gear from the automatic transmission and push it aside.

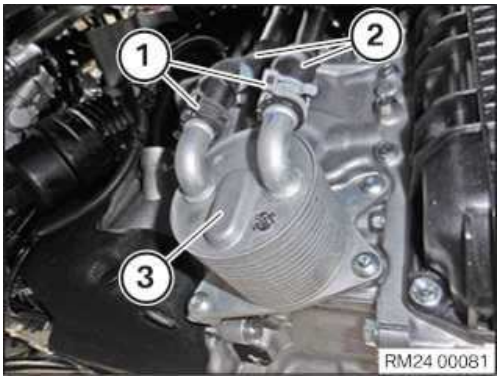


- Crank engine with special tool **0 493 380 (11 6 480)** at vibration damper in direction of rotation.
- Renew nuts (1).

  Parts: Nuts
- Tighten all 6 nuts (1) of the torque converter.

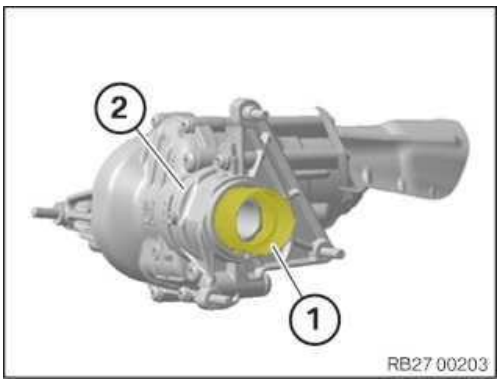
Torque converter to flywheel

M10	Replace nuts. Remove any adhesive residue from the threads.	Tightening torque	56 Nm



- Slide coolant hoses (1) onto transmission oil cooler (3).
- Secure hose clamps (1).

65 – Install the transfer box (VTG)



- If intermediate shaft (1) gets caught on transfer box (VTG) (2), renew intermediate shaft (1) and the radial shaft seals in the automatic or manual transmission.

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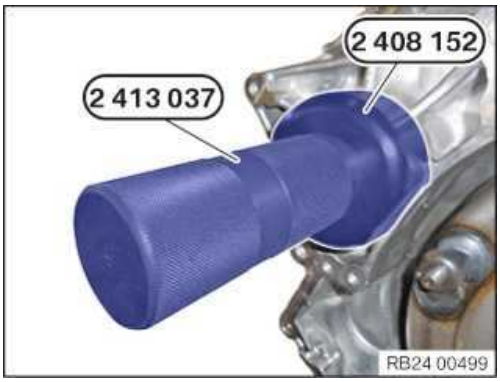
- Screw special tool **2 409 025** into the outer radial shaft seal.
- Turn the screw on the special tool **2 409 025** until the outer radial shaft seal has been pulled out.



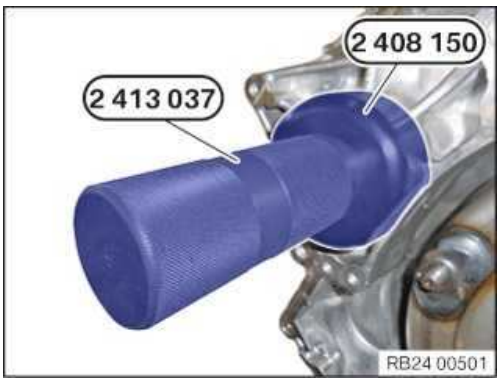
- Insert special tool **2 411 739** into the inner radial shaft seal.



- Screw special tool **2 411 739** into the inner radial shaft seal.
- Turn the screw on the special tool **2 411 739** until the inner radial shaft seal has been pulled out.

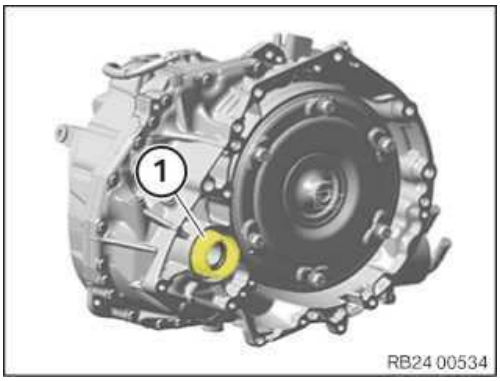


- Drive in the inner radial shaft seal using special tools **2 408 152** and **2 413 037** up to the limit position.



- Drive in the outer radial shaft seal using special tools **2 413 037** and **2 408 150** up to the limit position.

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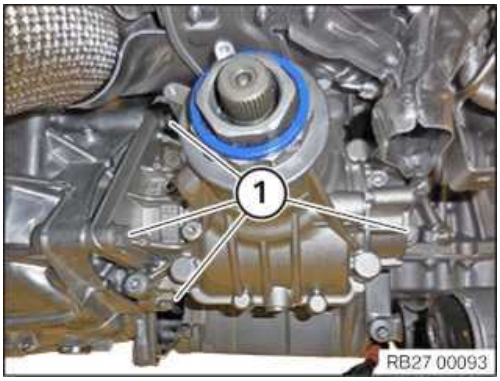
- If necessary, connect the new intermediate shaft (1) to the output flange of the automatic transmission or manual transmission.



- Coat the inside of the output flange (arrows) evenly with approx. 5 g of grease.

Expendable materials

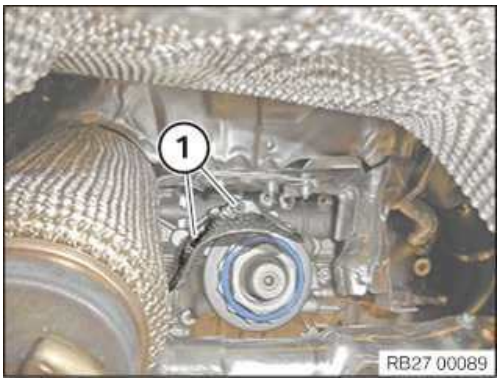
Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the transfer box (VTG).
- Tighten the screws (1).

Transfer box to transmission

M10		Tightening torque	56 Nm



- Install heat shield.
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Heat shield to transfer box

M6	Renew screws.	Tightening torque	6 Nm

▸ **Check the transfer box oil level**

RISK OF DAMAGE

Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.

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- Check transfer case oil level, correct:
- Open the oil filler plug (1).
- Check transfer box oil level.
- If necessary, top up transmission oil up to the lower edge of the oil filler plug opening (1).

Transmission oil

Technically suitable transfer box and electrical transmission oils	

Main group 27

- Tighten the oil filler plug (1).

Oil filler plug on transfer box (VTG)

M18x1.5		Tightening torque	35 Nm

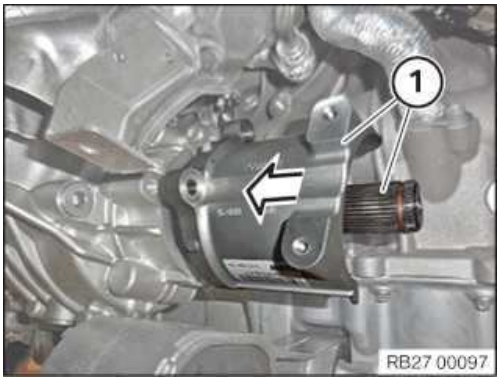
66 – Install the intermediate shaft with the support tube



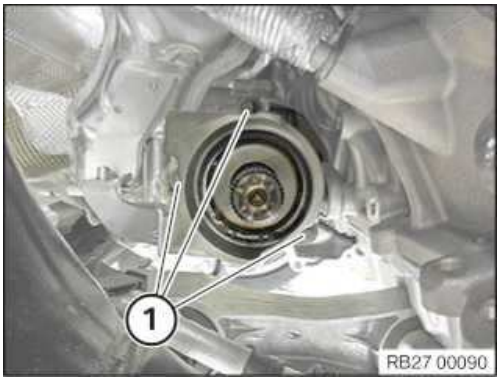
- Coat gearing of the intermediate shaft uniformly with 5 g of grease.

Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the intermediate shaft with support tube (1) in the transfer box.



- Position screws (1).

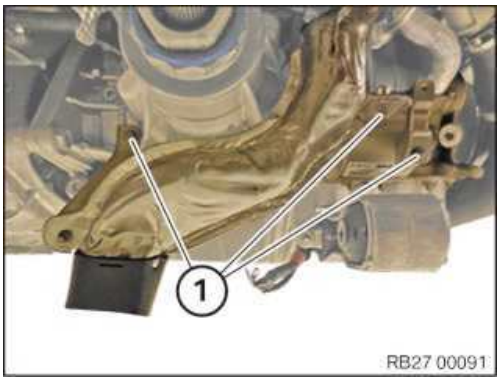
Note: Check for correct screw length! Bolt M8x35 8.8

- Tighten the screws (1).

Intermediate shaft to transfer box

M8x35		Tightening torque	19 Nm

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- If installed: Install air duct.
- Tighten the screws (1).

67 – Installing the high-pressure stage exhaust turbocharger

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

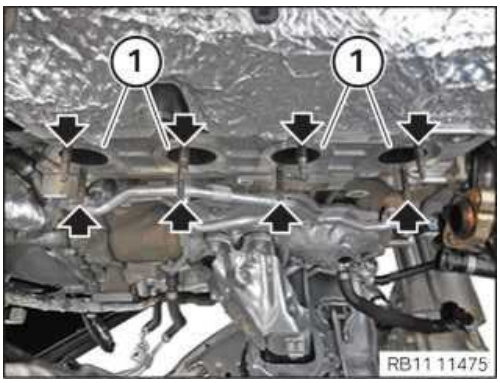
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

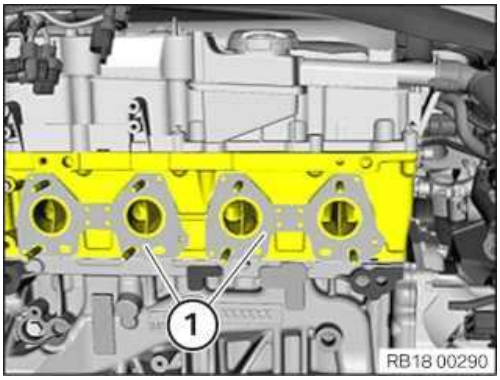


- Clean the sealing surfaces (1) on the cylinder head using special tool **0 495 102 (11 4 470)**.
- Check the stud bolts (arrows) on the cylinder head for correct fit.

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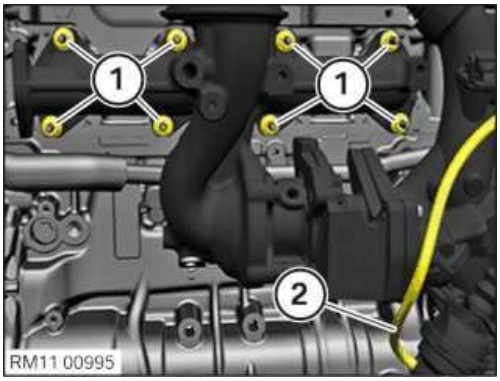
- Clean the sealing surfaces on the exhaust manifold using special tool **0 495 102 (11 4 470)**.



- Renew gasket (1).

  Parts: Gasket

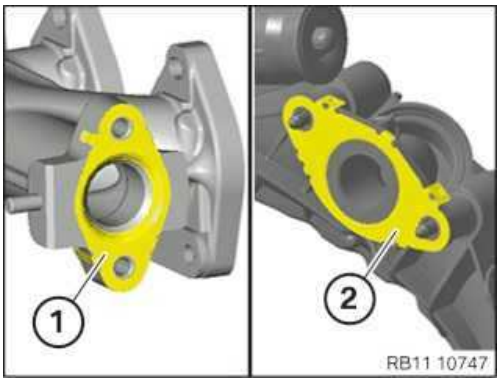
- Install new gasket (1).



- Feed in and install the exhaust manifold and the high-pressure stage exhaust turbocharger.
- Tighten nuts (1).

  Parts: Nuts

- Connect vacuum hose(2).

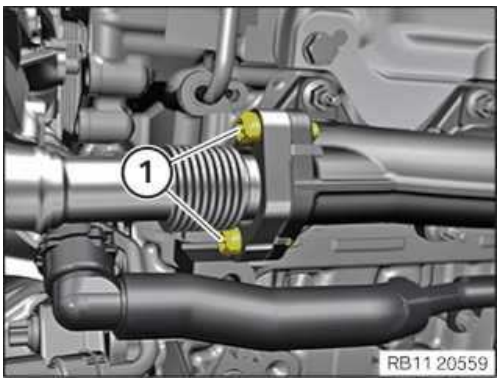


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket

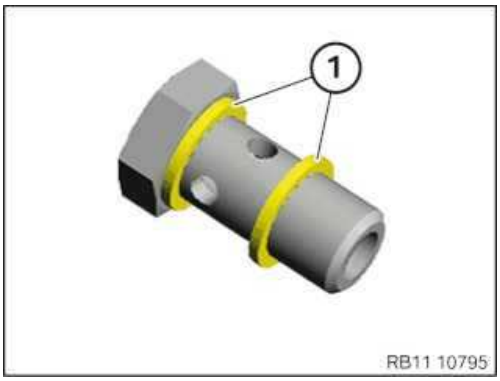


- Tighten the screws (1).

Exhaust-gas recirculation cooler to exhaust manifold

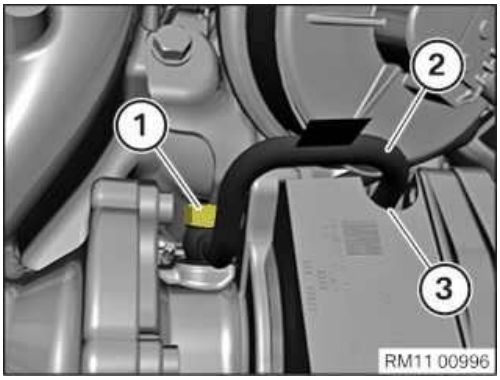
M8x28	Replace screws	Tightening torque	32 Nm

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- Renew sealing rings (1) of banjo bolt.

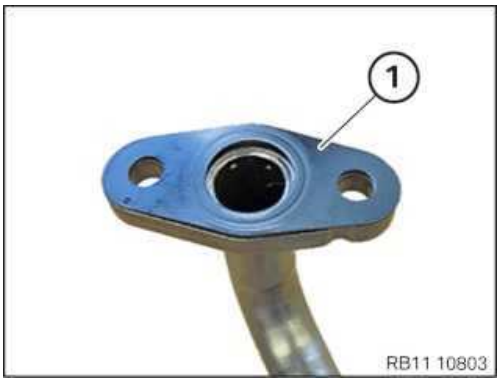
  Parts: Sealing ring



- Guide the oil feed line into the holder (3) and install it.
- Tighten down screw (1).

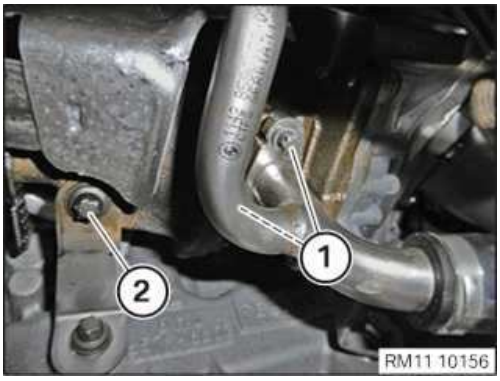


- Tighten bolt (1) from the right wheel arch.



- Renew seal (1) of oil return line.

  Parts: Gasket



- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

68 – Installing the low-pressure stage turbocharger

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RISK OF DAMAGE

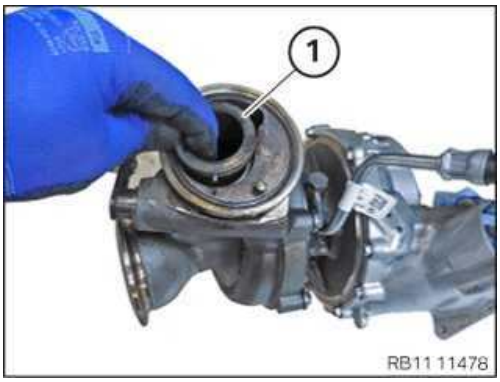
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

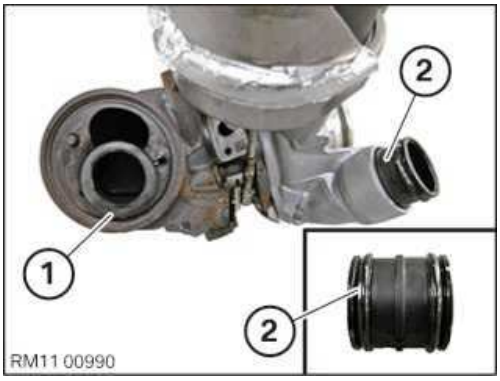
TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.



- Check the spacer plug (1) for damage, renew if necessary.

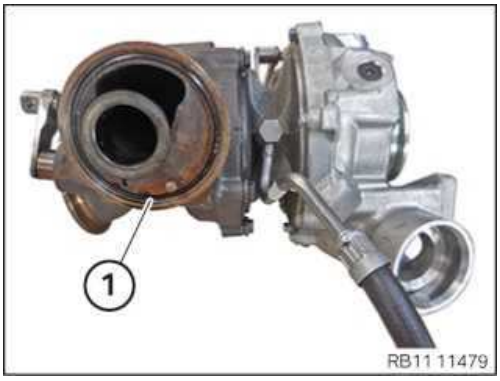
  Parts: Spacer ring
- Insert and install the spacer ring (1).
- Position spacer ring (1) correctly.



- Renew gasket (1).

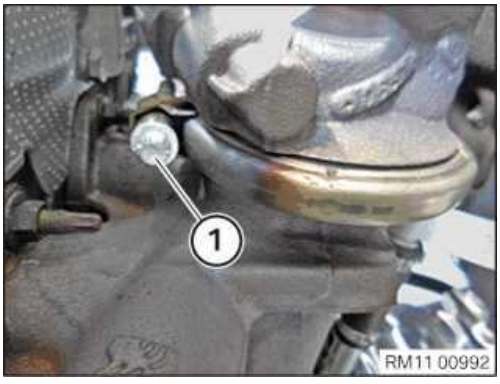
  Parts: Gasket
- Position the seal (1).
- Renew the sleeve(2).

  Parts: Holding sleeve



- Renew sealing ring (1).

  Parts: Sealing ring
- Affix the sealing rings on the exhaust turbocharger.



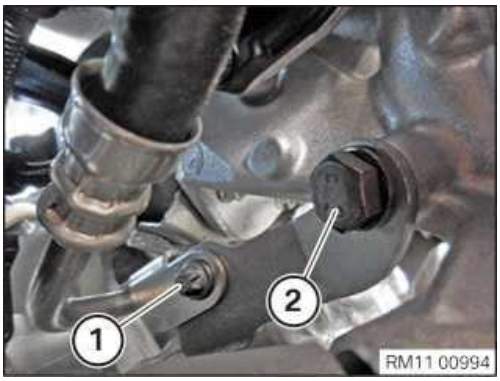
- Insert and install the low-pressure stage exhaust turbocharger on the exhaust manifold .
- Feed in and install V-band clamp .
- Tighten V-band clamp (2).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Screw in nut (1) with 2 **revolutions**.

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- Tighten down screw (1).

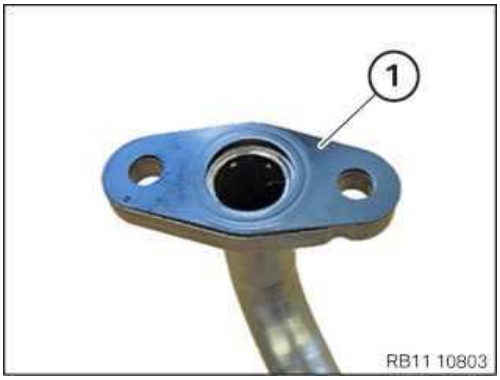
Oil feed line to bracket

Torx screw M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

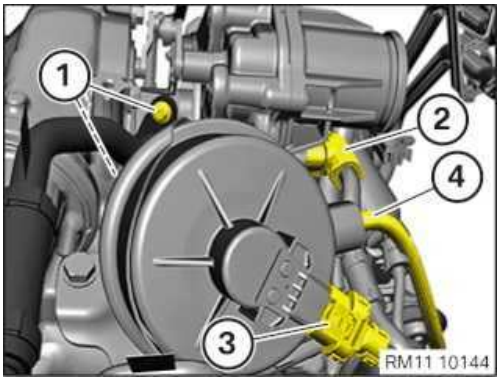
Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm



- Renew seal (1) on the oil return line.

  Parts: Gasket



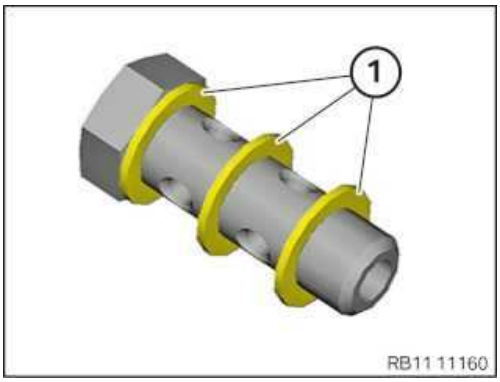
- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

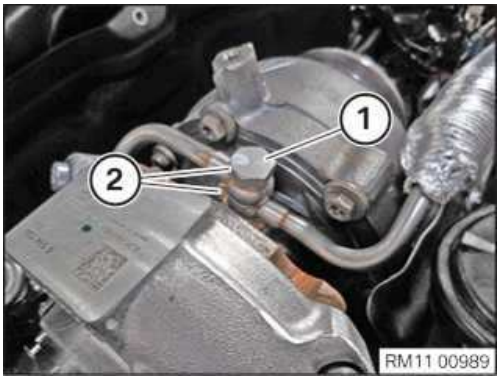
M6x12		Tightening torque	8 Nm

- Connect and lock connectors (2) and (3).

  The locks must engage audibly.
- Connect vacuum hose (4).

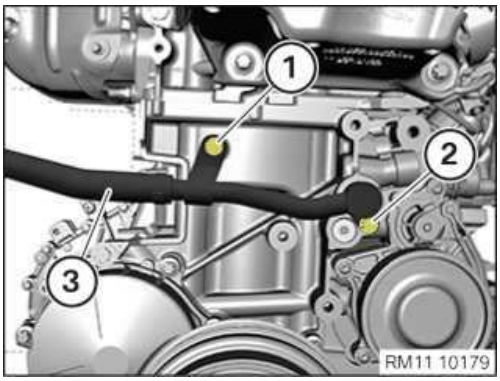


- Renew banjo bolt and sealing rings (1).
- **Parts:** Banjo bolt, sealing rings



- Install sealing rings (1).
- Tighten the banjo bolt (1).
- Ensure that the lines do not rest against the adjacent components.

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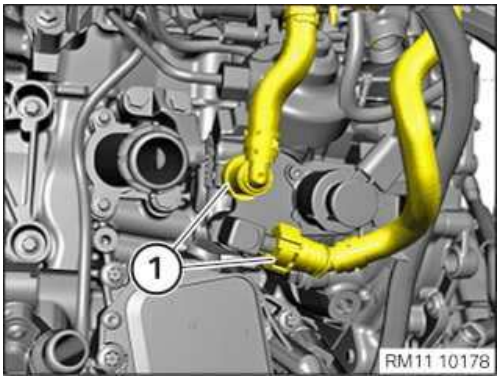


- Renew sealing ring of the coolant line (3).

  Parts: Sealing ring
- Coat the sealing ring and install the coolant line (3) .
- Tighten down screws (1) and (2).

Standard screw connection M6

M6		8 Nm



- Connect and lock fuel lines (1).

  The fuel lines (1) must audibly engage.

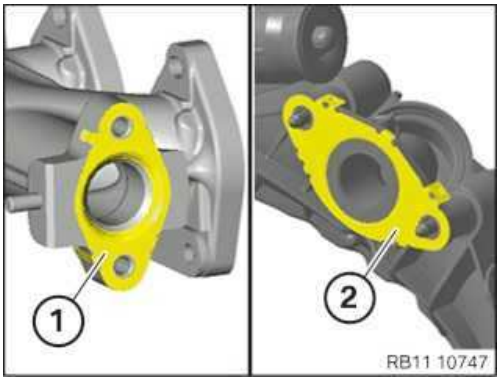
▶ **Installing the exhaust-gas recirculation cooler**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

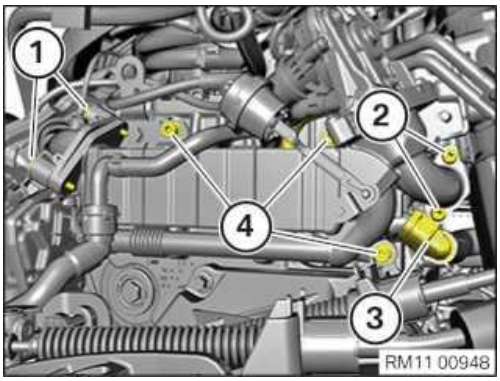


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket
- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket

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- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts
- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

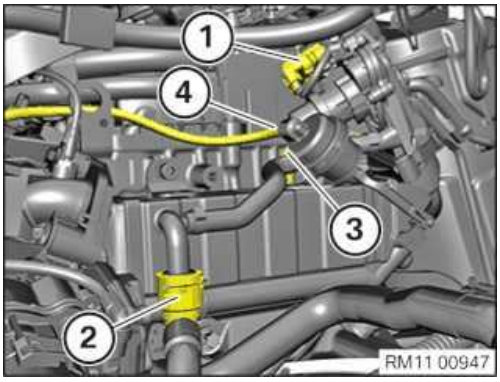
M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.
- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm



TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

▸ **Installing heat shield on exhaust turbocharger at bottom**

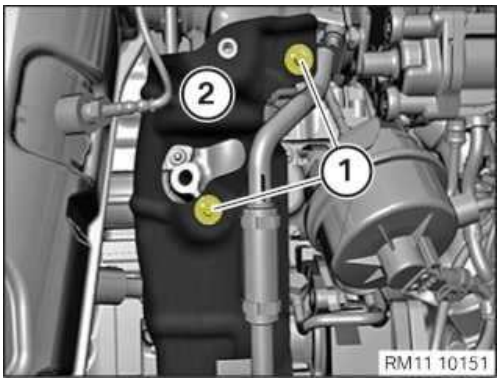
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WARNING

Hot surfaces.

Risk of burning!

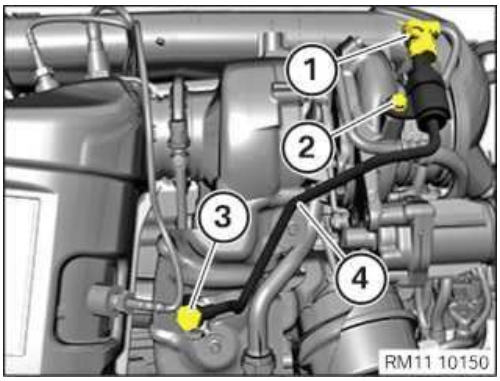
- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (2).
- Tighten the bolts (1) on the heat shield .

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm



- Position the exhaust gas pressure pipe (4).
- Hand-tighten the bolt (2).
- Renew sealing rings on the banjo bolt (3).

  Parts: Sealing ring
- Tighten the banjo bolt (3).

Banjo bolt for exhaust pressure pipe to exhaust manifold

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

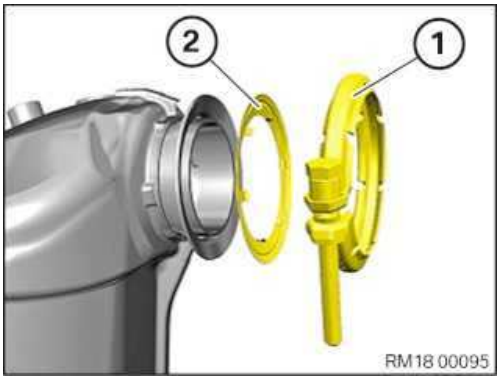
- Tighten down screw (2).

Standard screw connection M6

M6		8 Nm

- Connect connectors (1) and lock.

  Lock must audibly engage.



CAUTION

Heavy component.

Heavy components can lead to injury or damage.

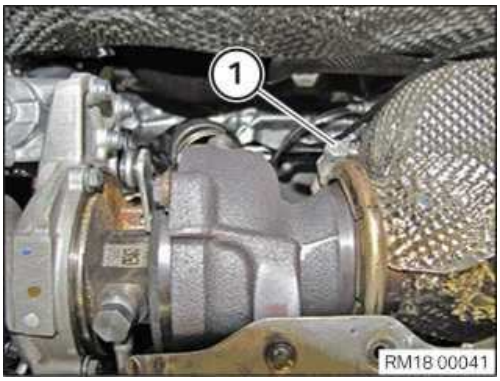
- Remove and install heavy components with the aid of another person/other persons.

- Renew the V-clip (1).

  Parts: V-band clamp
- Renew the gasket (2).

  Parts: Gasket

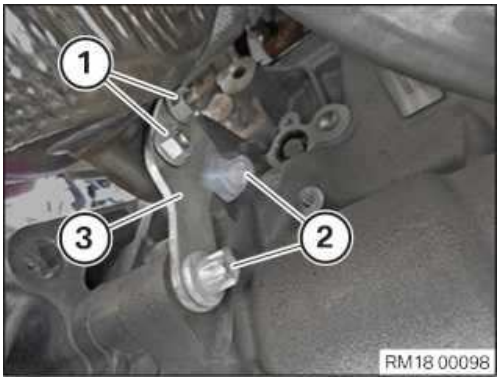
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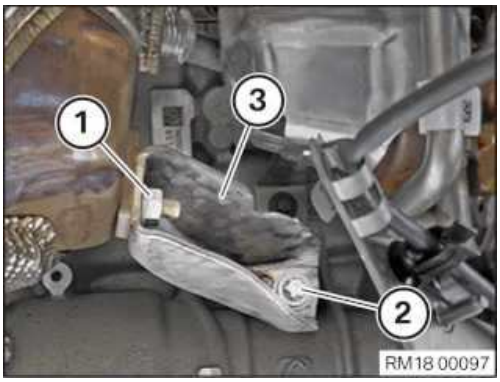
- Carefully insert and install the diesel particulate filter .
- Feed in and install V-band clamp (1).
- Make sure that the seal between the diesel particulate filter and the exhaust turbocharger is installed correctly.
- Align the diesel particulate filter on the exhaust turbocharger.
- Position V-clip (1).
- Hand-tighten the V-clip (1).



- Tighten nuts (1) by hand.



- Install holder (3).
- Hand-tighten the bolts (2).
- Tighten nuts (1) by hand.



- Install holder (3).
- Tighten the nut (1) hand-tight.
- Hand-tighten the bolt (2).



- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

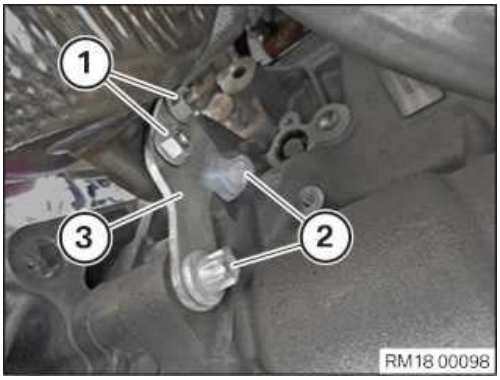
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- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screws (2).

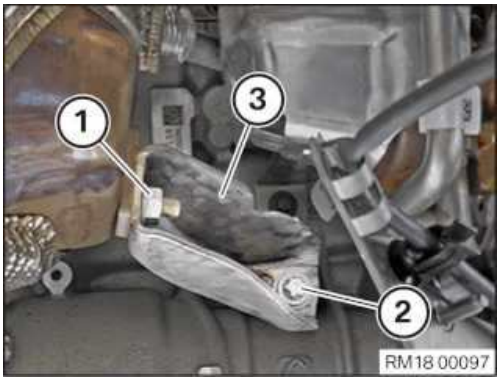
Diesel particulate filter holder to gearbox

M12x75		Tightening torque	66 Nm

- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screw (2).

Diesel particulate filter bracket to crankcase

M10x35		Tightening torque	38 Nm

- Tighten nut (1).

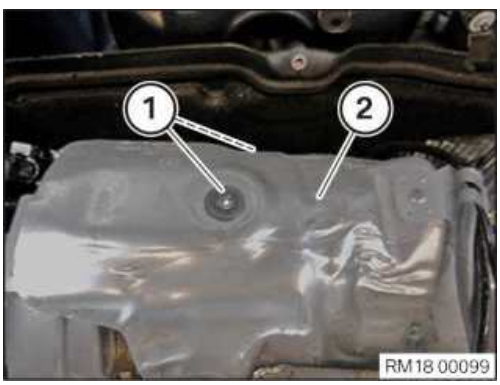
Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Remove fitting aid (1) for the flexible tube.

▶ **Install the heat shield on the exhaust turbocharger**



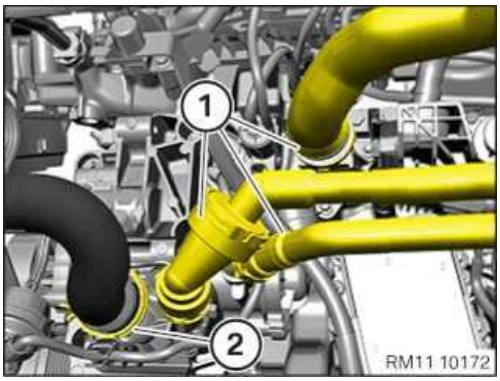
- Feed in and install the heat shield (2).
- Tighten the screws (1) at the top and bottom of the heat shield.

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

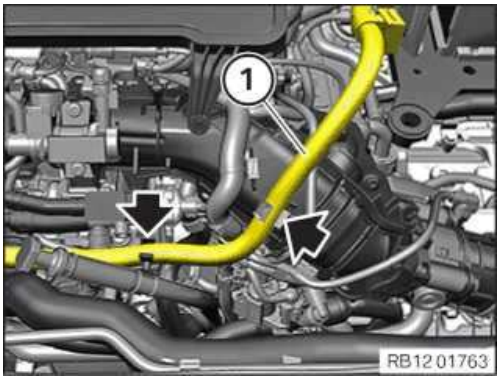
- Fasten the cable at the clips .

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- Install the coolant hose and secure with the clamp (2) .
- Connect and lock the coolant lines (1).

  The coolant lines (1) must engage audibly.



CAUTION

Improper routing of the positive battery cable.

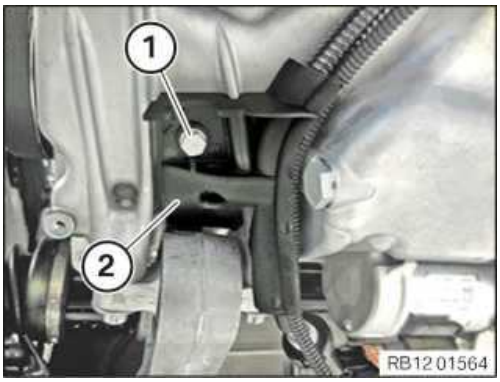
Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

- Insert the positive battery cable (1) into the clamps (arrows).



- Feed in and install positive battery cable at the clamps (1).



- Insert and install the holder (2).
- Tighten down screw (1).

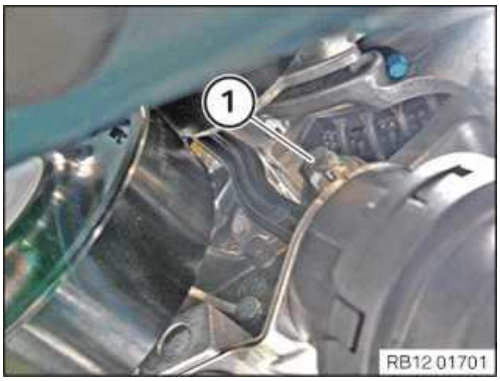
Bracket to oil sump

M6		Tightening torque	8 Nm



- Insert and install alternator (1) along with the screw (2) on the bottom of the alternator through the slot on the support.

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- Tighten the screw (1) below on the alternator.

Alternator to component carrier

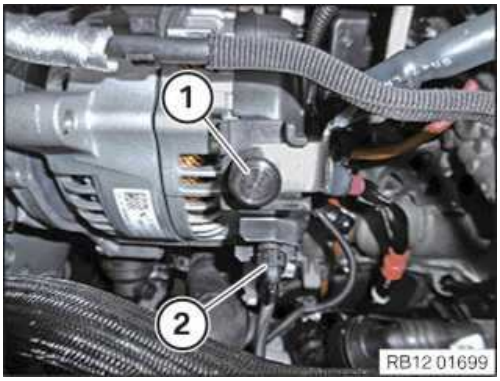
M10x75 / M10x125		Tightening torque	38 Nm



- Tighten the bolt (1) on top on the alternator.

Alternator to component carrier

M10x75 / M10x125		Tightening torque	38 Nm



- Mount positive battery cable to the alternator.
- Tighten nut.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

- Mount the cover (1).
- Connect the connector (2) to the alternator and lock audibly.



- Install air conditioning compressor (2) and position it correctly.
- Tighten the screws (1).

Air conditioning compressor in component carrier

M10		Tightening torque	38 Nm

▸ **Installing the drive belt for alternator**

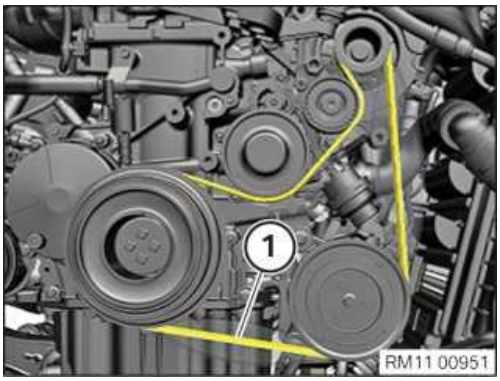
TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

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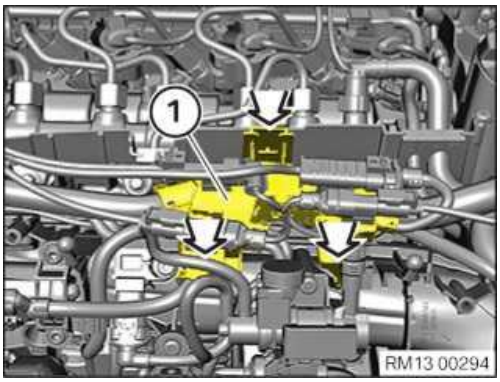


- Feed in the drive belt for the alternator (1) and install it.

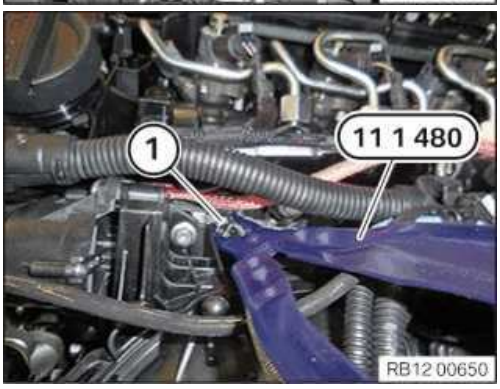


- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool **0 496 268 (11 0 390)** out of the belt tensioner and remove it.

▶ **Installing the cable clip for the intake plenum**

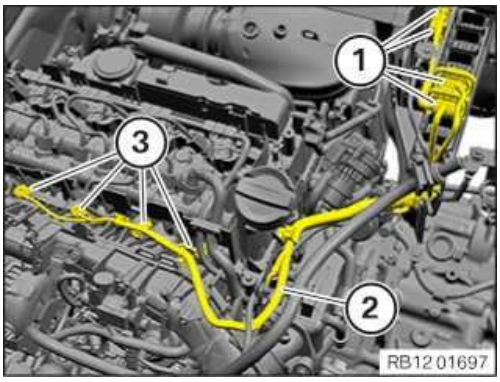


- Insert and install the cable clip (1) in the direction of the arrow.
- Make sure the cable clip (1) is fitted correctly.



- Connect and lock the connector (1) on the glow elements.

  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.

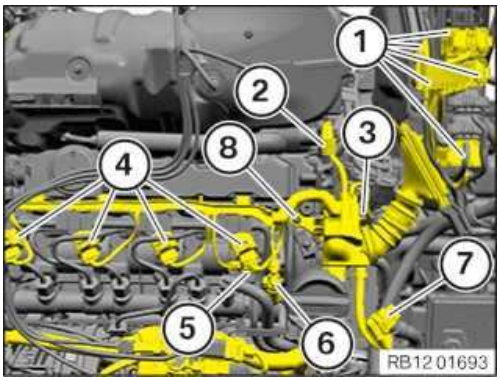


- Lay vehicle wiring harness and fasten with clamps.
- Route all connectors (1) to the integrated supply module (PDM) and to the DME control unit.
- Connect all connectors (3) to the glow elements and engage them audibly.
- Mount ground strap and tighten screw (2).

Ground cable to cylinder head

M6x12		Tightening torque	8 Nm

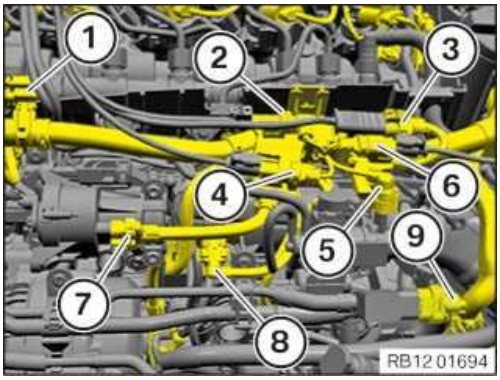
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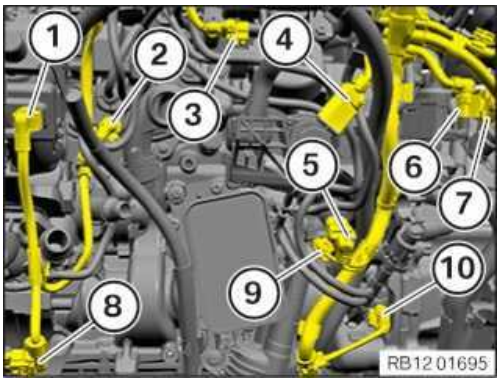
- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the integrated supply module (PDM) and to the DME control unit.
- Attach connector (2) to the differential pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust-gas recirculation valve and lock audibly.
- Attach connector (4) to the injectors and lock it audibly.
- Attach connector (5) to the camshaft sensor and lock it audibly.
- Attach connector (6) to the fuel pressure regulator and lock it audibly.
- Connect and audibly lock the connector (7) to the hot film air mass meter.
- Tighten down screw (8).

Wiring harness to cylinder head cover

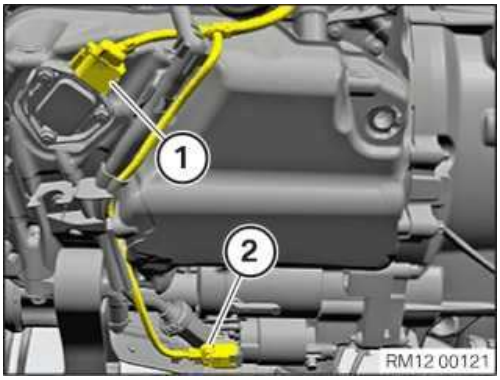
TS5x20		Tightening torque	3,5 Nm



- Connect the connector (1) to the rail pressure sensor and lock it audibly.
- Attach connector (2) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (3) to the front oxygen sensor and lock audibly.
- Attach connector (4) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Connect the connector (5) to the electric changeover valve and lock audibly.
- Attach connector (6) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (7) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (8) to the charging pressure sensor and lock it audibly.
- Attach connector (9) to the fuel pressure and temperature sensor and lock it audibly.

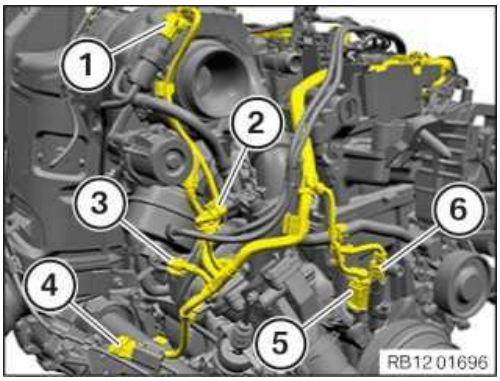


- Connect the connector (1) to the alternator and lock audibly.
- Connect the connector (2) to the electric changeover valve and lock audibly.
- Connect the connector (3) to the electric changeover valve and lock audibly.
- Connect the connector (4) to the high pressure pump and lock audibly.
- Connect the connector (5) to the oil pressure sensor and lock it audibly.
- Attach connector (6) to the throttle bodies and lock it audibly.
- Attach connector (7) to the intake air temperature sensor and lock it audibly.
- Connect the connector (8) to the air conditioning compressor and lock audibly.
- Connect the connector (9) to the solenoid valve and lock audibly.
- Connect the connector (10) to the crankshaft sensor and lock it audibly.

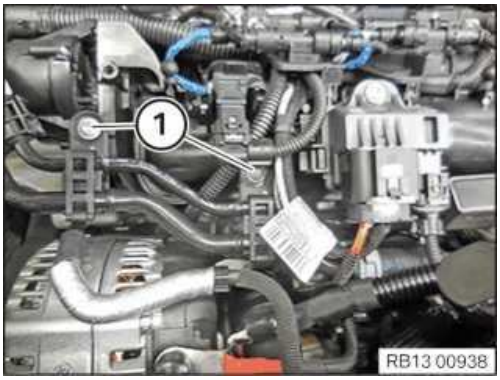


- Connect the connector (1) to the oil-level sensor and lock it audibly.
- Connect connector (2) to the starter motor and lock audibly.

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- Attach connector (1) to the exhaust turbocharger and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust gas pressure sensor and lock it audibly.
- Connect the connector (4) to the monitoring oxygen sensor and lock audibly.
- Attach connector (5) to the oil pressure switch and lock it audibly.
- Attach connector (6) to the switching valve and lock it audibly.

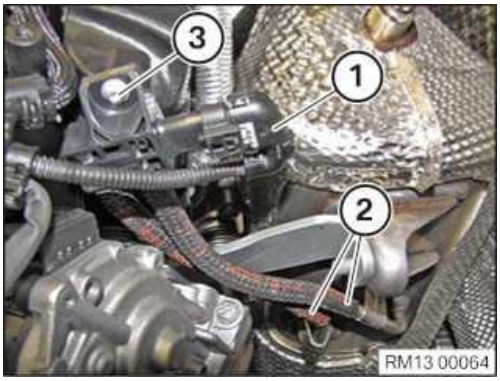


- Position the fuel line.
- Tighten the screws (1).

Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

70 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

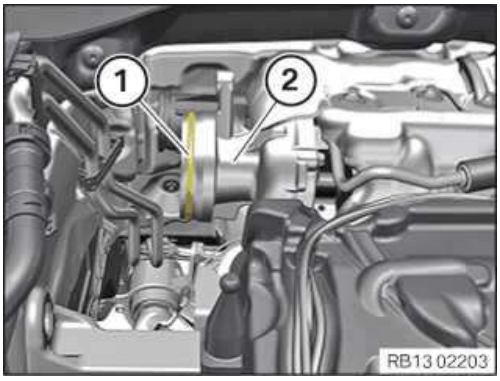
Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

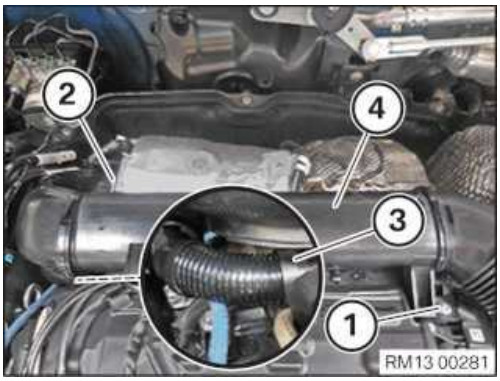
  The connector (1) must engage audibly.

71 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.

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- Feed in clean air pipe and install.
- Connect clean air pipe to the exhaust turbocharger and lock audibly in the clamps (2).
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Connect ventilation line (3) to the cylinder head cover and lock audibly.

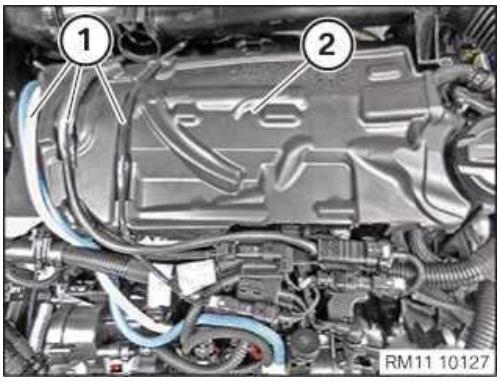


- Mount clean air pipe onto the intake filter housing.
- Tighten clamp (1) on the clean air pipe.

Clean air pipe to intake silencer housing

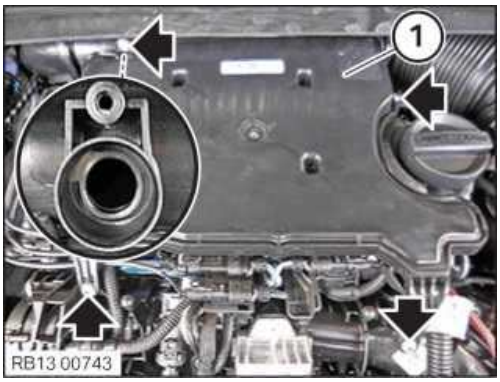
Clamp		Tightening torque	3 Nm

72 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the vehicle wiring harness (1) in the brackets.

73 – Install resonator



- Insert and install the resonator (1).
- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

74 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Check for correct installation of all rubber mounts in the acoustic cover (1).



- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

75 – Install engine



- See additional information.

Additional Information

Overview of Tightening Torques

Special tool to cylinder head Used in step 12

M8		Tightening torque	21,5 Nm

Special tool 2 455 010 to crankcase Used in step 13

M10x30		Tightening torque	38 Nm

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Special tool 11 8 930 to special tool 00 2 320

Used in step 13

M14x35		Tightening torque	160 Nm

Connecting rod bearing cap to connecting rod

Used in step 42

M9x47		Tightening torque	20 Nm
		Angle of rotation 1	70 °
		Angle of rotation 2	70 °

Oil deflector to crankshaft bearing cap

Used in step 43

M8x14	Replace screws.	Tightening torque	35 Nm
		Release	180 °
		Tightening torque	15 Nm
		Angle of rotation	45 °

Oil deflector to crankcase

Used in step 43

M8x14		Tightening torque	19 Nm

Oil vacuum pump to crankcaseB47

Used in step 44

M8x35		Tightening torque	19 Nm

Oil sump to crankcase

Used in step 45

M8x30		Tightening torque	24 Nm
M8x110		Tightening torque	24 Nm

Transmission to oil sump

Used in step 45

M8		Tightening torque	19 Nm

Starter motor to transmission

Used in step 45

M8x45		Tightening torque	19 Nm

Bracket to oil sump

Used in step 46 69

M6		Tightening torque	8 Nm

Battery positive lead to starter

Used in step 46

M8		Tightening torque	13,5 Nm

Cylinder head to crankcase

Used in step 48

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

Cylinder head bolt to timing case cover

Used in step 48

M8x40		Tightening torque	19 Nm

Glow elements to cylinder head

Used in step 51

Glow element		Tightening torque	13 Nm

Camshaft carrier to cylinder head

Used in step 52

M7x35		Tightening torque	13 Nm

Intake and exhaust camshaft in camshaft support

Used in step 53

M6x31		Tightening torque	10 Nm

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Bearing journal to cylinder head

Used in step 53

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8

Used in step 53

M8		Tightening torque	19 Nm

Standard screw connection M6

Used in step 53 69

M6			8 Nm

Chain tensioner piston to cylinder head

Used in step 53

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft

Used in step 53

M7x17.			17 Nm

Cylinder head cover to cylinder head

Used in step 57

M6		Tightening torque.	8,5 Nm

Clamping claw facing to cylinder head cover

Used in step 58

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 58

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

Rail on cylinder head cover

Used in step 59

Torx screw M8x25		Tightening torque	19 Nm

High pressure line between high pressure pump and rail

Used in step 59

High-pressure pipe		Tightening torque	28 Nm

High pressure lines between injector and rail

Used in step 61

High pressure lines		Tightening torque	28 Nm

Intake plenum to cylinder head

Used in step 62

M6		Tightening torque	11 Nm

Holder to crankcase

Used in step 63

M10		Tightening torque	38 Nm

Transmission to engine

Used in step 64

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

Torque converter to flywheel

Used in step 64

M10	Replace nuts. Remove any adhesive residue from the threads.	Tightening torque	56 Nm

Transfer box to transmission

Used in step 65

M10		Tightening torque	56 Nm

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Heat shield to transfer box

Used in step 65

M6	Renew screws.	Tightening torque	6 Nm

Oil filler plug on transfer box (VTG)

Used in step 65

M18x1.5		Tightening torque	35 Nm

Intermediate shaft to transfer box

Used in step 66

M8x35		Tightening torque	19 Nm

Exhaust-gas recirculation cooler to exhaust manifold

Used in step 67 69

M8x28	Replace screws	Tightening torque	32 Nm

Oil return line to turbocharger

Used in step 67 68

M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase

Used in step 67

M8x16		Tightening torque	22 Nm

Exhaust turbocharger to exhaust manifold

Used in step 68

V-band clamp		Tightening torque	19 Nm

Oil feed line to bracket

Used in step 68

Torx screw M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase

Used in step 68

M8x16		Tightening torque	22 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 69

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler

Used in step 69

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 69

M8x20		Tightening torque	19 Nm

Heat shield for exhaust turbocharger

Used in step 69

Torx screw BM 6x12		Tightening torque	10 Nm

Banjo bolt for exhaust pressure pipe to exhaust manifold

Used in step 69

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

Diesel particulate filter V-clip to exhaust turbocharger

Used in step 69

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Diesel particle filter to holder

Used in step 69

M8 hexagon nut		Tightening torque	19 Nm

Diesel particulate filter holder to gearbox

Used in step 69

M12x75		Tightening torque	66 Nm

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Diesel particulate filter bracket to crankcase — Used in step 69

M10x35		Tightening torque	38 Nm

Heat shield for exhaust turbocharger — Used in step 69

Torx screw BM 6x12		Tightening torque	10 Nm

Alternator to component carrier — Used in step 69

M10x75 / M10x125		Tightening torque	38 Nm

Positive battery cable to alternator — Used in step 69

M8		Tightening torque	19 Nm

Air conditioning compressor in component carrier — Used in step 69

M10		Tightening torque	38 Nm

Ground cable to cylinder head — Used in step 69

M6x12		Tightening torque	8 Nm

Wiring harness to cylinder head cover — Used in step 69

TS5x20		Tightening torque	3,5 Nm

Fuel line to intake plenum — Used in step 69

TS6x20		Tightening torque	5 Nm

Differential pressure sensor to holder — Used in step 70

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor — Used in step 70

Clamp 15–19mm		Tightening torque	3 Nm

Clean air pipe to cylinder head cover — Used in step 71

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 71

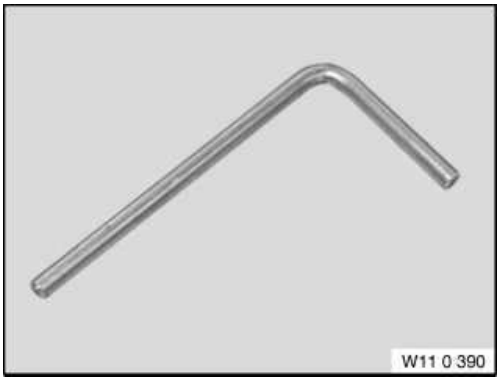
Clamp		Tightening torque	3 Nm

Resonator to manifold and clean air pipe — Used in step 73

Screw TS6	Renew screw.	Tightening torque	5 Nm

Overview of Special Tools

0 496 268 (11 0 390) Pin

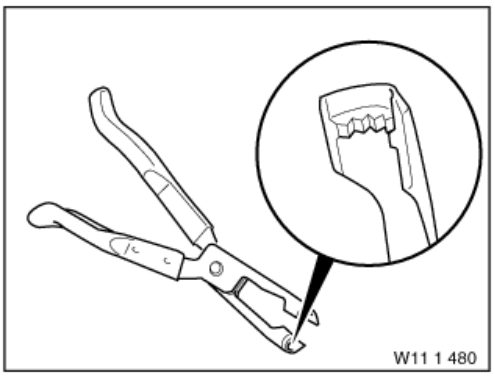


Common — Used in step 7 69

Usage	(roll pin) For securing new tensioning pulley (poly-V belt)
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 15 07 (390)

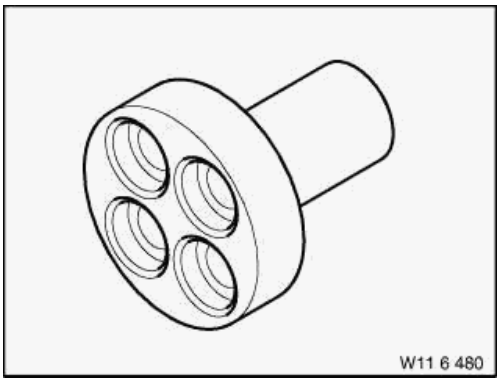
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0 490 796 (11 1 480) Pliers



Common	Used in step 7 25
Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

0 493 380 (11 6 480) Connector



Common	Used in step 12 20 53 56 64
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

2 220 718 Workshop crane



Common	Used in step 12 64
Usage	WSK 1000
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	06 01 11 (701)

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2 459 012 Holder



Common Used in step 12 64

Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

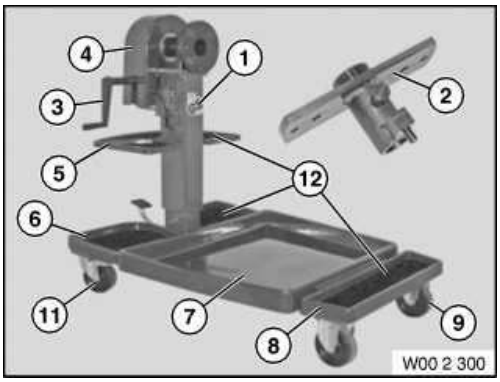
2 455 010 Engine support



Common Used in step 13 63

Usage	For accommodating engine on assembly stand. Engine: B3x, B4x, N47.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

0 495 187 (00 2 300) Assembly stand



Common Used in step 13

Usage	Assembly stand with universal flange for mounting engines from S85
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 25 04 (155)

Consisting of

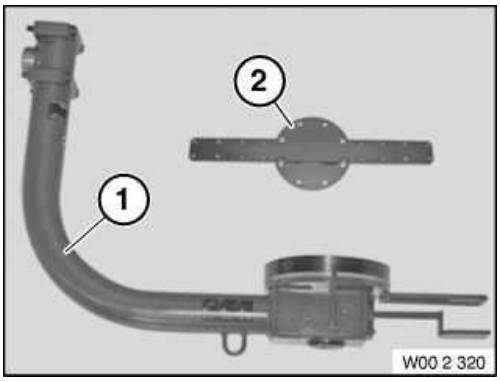
Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 188 (00 2 301)		**Assembly stand** available only as complete assembly stand 83 30 0 495 187.	

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2	0 495 189 (00 2 302)	**2 299 563**	**Tool** (Universal flange). Do not use any more!!! Technically locked. Replaced with a new flange with material number 83 30 2 299 563. All flanges delivered until the end of 2011 will be replaced at no charge. From 2012, only the new flange will be supplied. Also applies to the complete engine mounting stand 00 2 300.	
3	0 495 200 (00 2 303)		**Crank**	
4	0 495 201 (00 2 304)		**Cover** (Protective hood)	
5	0 495 202 (00 2 305)		**oddments tray** (Oddments tray for small parts)	
6	0 495 203 (00 2 306)		**Shaped element** (Rear shaped pan)	
7	0 495 204 (00 2 307)		**Collection pan** (Oil collection pan)	
8	0 495 205 (00 2 308)		**Shaped element** (Front shaped pan)	
9	0 495 206 (00 2 309)		**Wheel** (Front wheel (without stop))	
10	0 495 207 (00 2 311)		**Wheel** (Rear wheel (with stop))	
11	0 495 208 (00 2 312)		**Mat** (Checker mat set)	
2	2 299 563		**Adapter** New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.	

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0 495 196 (00 2 320) Support arm



Common

Used in step 13

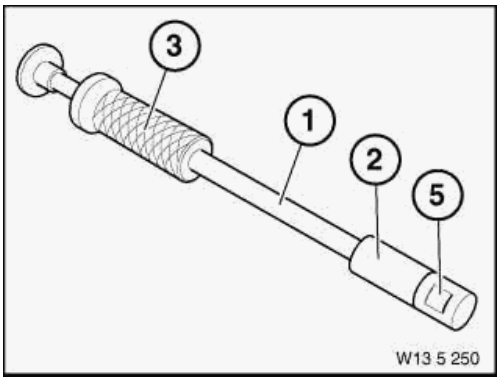
Usage	(Support arm with fixture) For mounting engines using the engine mounting bracket.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 197 (00 2 321)		**Support arm**	
2	0 495 198 (00 2 322)		**Panel** (take-up plate)	
3	0 495 380 (00 2 323)		**Panel** (fixture) Engine N73	
6	0 496 287 (00 2 326)		**Panel** (fixture) Engine: M73	
5	0 496 288 (00 2 327)	**0 496 373**	**Panel** (fixture) Engine: S62 Replaced by 11 5 420 (0 496 373)	
8	0 496 533 (00 2 328)		**Support** (Engine mount) Engine: N57, N57Top	
9	0 496 579 (00 2 329)	**0 496 680**	**Support** (Engine mount) Engine: N74 Replaced by 116160 (0 496 680)	
4	0 495 379 (00 2 324)		**Panel** (fixture) Engine M67TU	
5	0 495 381 (00 2 325)		**Panel** (fixture) Engine N62, N62TU	

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0 493 321 (13 5 250) Puller



Common

Used in step 17

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

0 493 339 (13 5 252) Bush



Common

Used in step 17

Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 493 340 (13 5 253) Weight



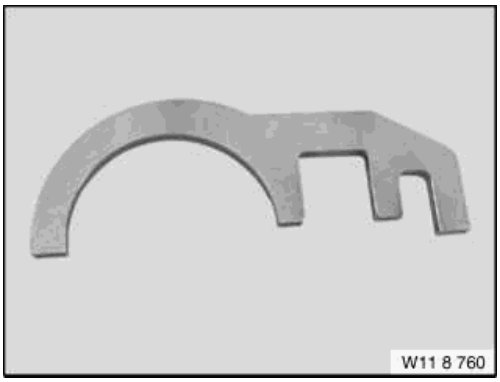
Common	Used in step 17
Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

2 288 380 Locating stud



Common	Used in step 20 53 54 56
Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 112 (11 8 760) Gauge



Common	Used in step 20 53 55 56
Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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0 495 105 (11 4 480) oddments tray



Common

Used in step 26 27 53

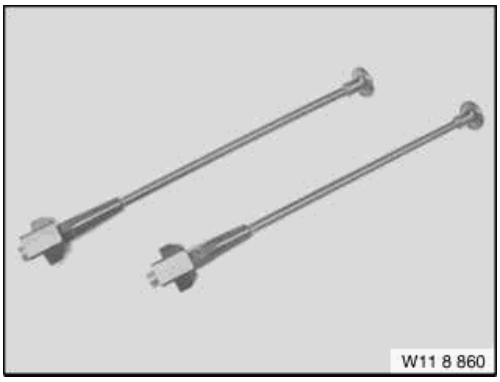
Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

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0 496 144 (11 8 860) Assembly tool



Common

Used in step 34 41

Usage	For installing piston with connecting rod in crankcase.
Included in the tool or work	
Storage location	A23
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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0 493 582 (11 8 140) Bush



Common

Used in step 41

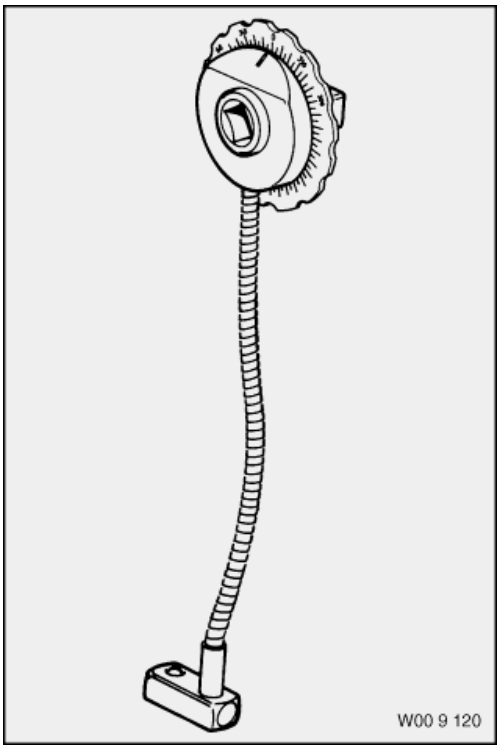
Usage	(Assembly bushes) For installing the pistons
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 12 99 (452)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 494 394 (11 8 141)		**Bush** Bush for piston installation 84.00 mm	
2	0 494 395 (11 8 142)		**Bush** Liquidation of existing inventory and then available only as a complete tool set 11 8140 (83 30 0 493 582) - as of 12.03.12.	
3	0 494 396 (11 8 143)		**Bush** Liquidation of existing inventory and then available only as a complete tool set 11 8140 (83 30 0 493 582) - as of 12.03.12.	

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0 490 504 (00 9 120) Torque angle measuring dial



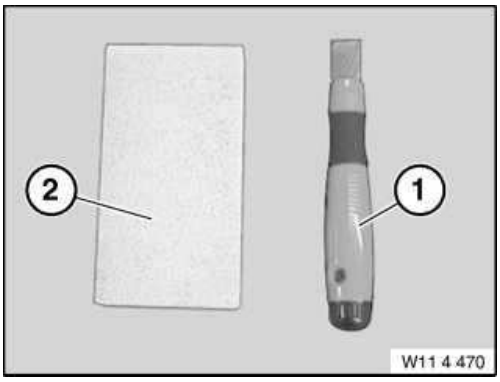
Common

Used in step 42 48

Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

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0 495 102 (11 4 470) Tool



Common

Used in step 45 67

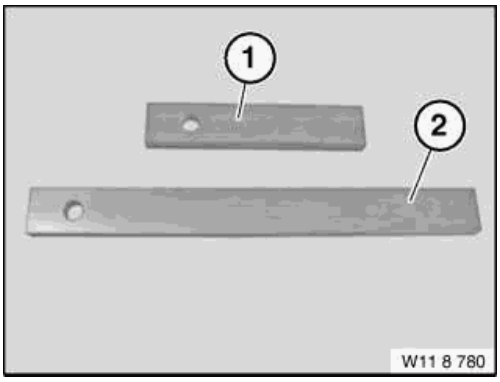
Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

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0 496 120 (11 8 780) Plate



Common

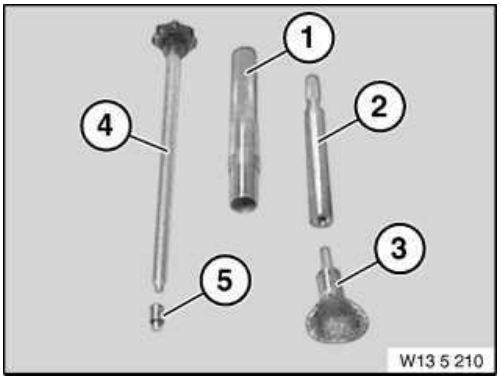
Used in step 45

Usage	(Mounting plates) For securing transmission oil sump when gearbox is removed.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 121 (11 8 781)		**Plate** (Mounting plate, short)Discontinued; only available via set 11 8 780 = 0496120.	
2	0 496 122 (11 8 782)		**Plate** (Mounting plate, long) Discontinued; only available via set 11 8 780 = 0496120.	

0 493 763 (13 5 215) Plug



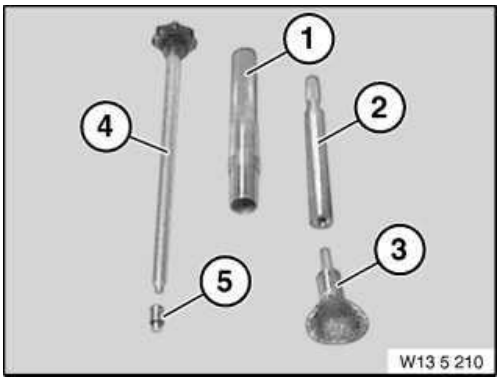
Common

Used in step 58

Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 493 762 (13 5 214) Rod



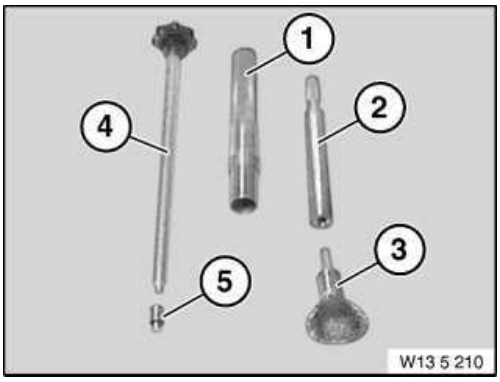
Common

Used in step 58

Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 493 758 (13 5 210) Tool



Common

Used in step 58

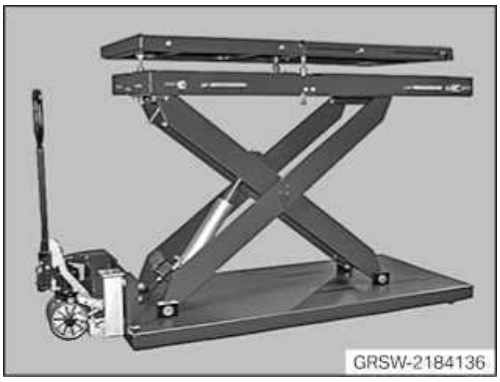
Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

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2 184 136 Mobile equipment table lift



Common	Used in step 64
Usage	Table lift MHT 1200
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	06 01 10 (649)

2 409 025 Puller



Common	Used in step 65
Usage	For disassembly of the outer radial shaft seal of the transmission output shaft, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A76
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

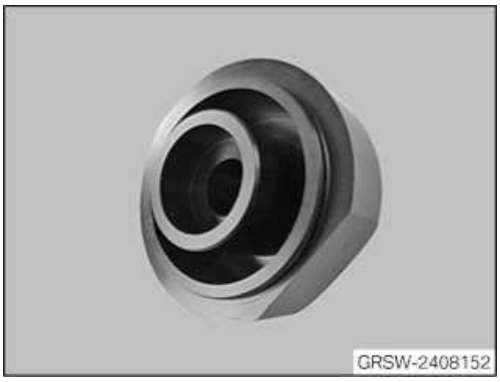
2 411 739 Puller



Common	Used in step 65
Usage	For disassembly of the inner radial shaft seal of the output, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C78
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

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2 408 152 Striking element



Common Used in step 65

Usage	For installation of the right radial shaft seal transmission output shaft (inner). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

2 413 037 Handle



Common Used in step 65

Usage	Universal drift handle. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C77
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 408 150 Striking element



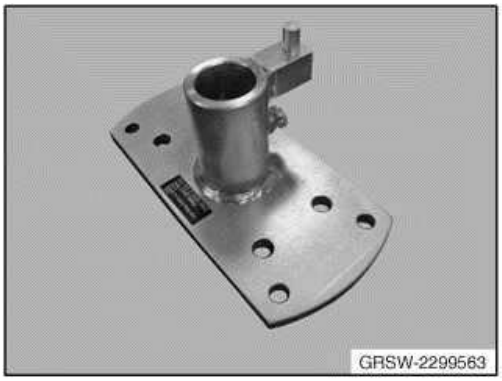
Common Used in step 65

Usage	For installing the right radial shaft seal transmission output shaft (outer). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

Replacement tools:

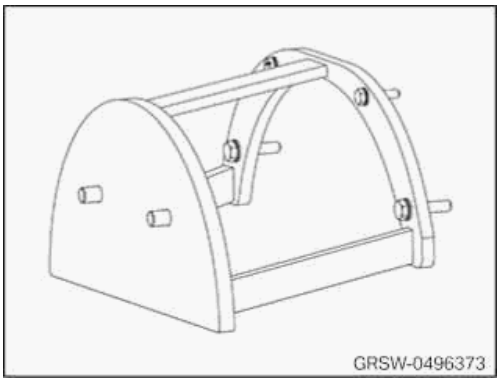
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2 299 563 Adapter



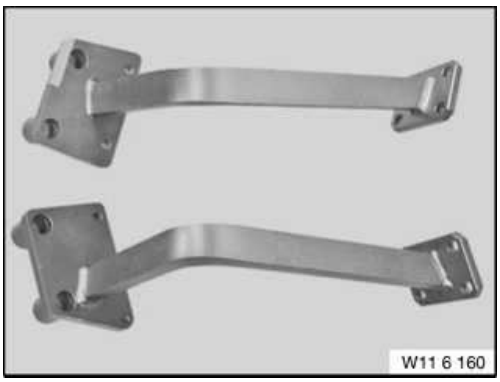
Common	Used in step 13
Usage	New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.
Included in the tool or work	0 495 187
Storage location	
Replaced by	
In connection with	
SI-Number	

0 496 373 (11 5 420) Plate



Common	Used in step 13
Usage	(Fixture) Engine S62
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	

0 496 680 (11 6 160) Support



Common	Used in step 13
Usage	For mounting N74 engine on the assembly stand. In combination with 00 2 300, 00 2 320
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	00 2 300; 00 2 320 = 0495196
SI-Number	01 31 09 (604)

Overview Technical Data

Side clearance of piston rings

Used in step 36

Clean all components before measuring the side clearance.

Side clearance of the plain rectangular compression ring	0,17 mm ... 0,27 mm
Side clearance of the taper faced piston ring	0,30 mm ... 0,50 mm
Side clearance of the oil scraper ring with spiral expander	0,2 mm ... 0,4 mm

Piston diameter

Used in step 37

Measure the piston diameter at distance (A) from the lower end of the piston skirt.

Distance (A) to the lower end of the piston skirt	17 mm
Nominal dimension of piston diameter	83,936 mm ... 83,954 mm

Cylinder bore

Used in step 38

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Diameter of cylinder bore	84,00 mm ... 84,018 mm
Permitted irregularity of the cylinder bore	0,01 mm
Permitted conicity of the cylinder bore	0,01 mm

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	7 69
EGR controller	7 69

General repair instructions	Used in step
11 00 ... Overview of consumables (Electronic Parts Catalogue)	45

Repair instructions	Used in step
11 00 050 Removing and installing engine	1 75
11 00 050 Removing and installing engine	1 75
11 00 050 Removing and installing engine	1 75
11 00 050 Removing and installing engine	1 75
11 00 050 Removing and installing engine	1 75
11 00 050 Removing and installing engine	1 75
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11 00 050 Removing and installing engine	1 75
11 00 050 Removing and installing engine	1 75
31 10 001 Completely removing and installing front axle with engine and transmission	1 75
11 00 050 Removing and installing engine	1 75
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11 00 050 Remove and install engine	1 75
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG)	1 75
11 00 050 Remove and install engine	1 75
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11 00 050 Remove and install engine	1 75
11 00 050 Removing and installing the engine (manual gearbox)	1 75
11 00 050 Remove and install engine (Automatic)	1 75
11 00 050 Remove and install engine	1 75
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11 00 050 Removing and installing engine \PREMIUM	1 75
11 00 050 Removing and installing/replacing engine (N63)	1 75
11 00 050 Removing and installing engine	1 75
11 00 050 Removing and installing engine	1 75
11 00 050 Removing and installing engine	1 75
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11 00 050 Remove and install engine (Automatic)	1 75
11 00 050 Remove and install engine (Automatic)	1 75
11 00 050 Remove and install engine	1 75
11 00 050 Remove and install engine	1 75
11 00 050 Remove and install engine (Automatic)	1 75
11 00 050 Remove and install engine (Automatic)	1 75
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11 00 050 Remove and install engine	1 75
11 00 050 Remove and install engine	1 75
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG)	1 75
11 00 050 Remove and install engine	1 75
61 35 ... Notes on ESD protection (Electro Static Discharge)	6 17 25

Operating materials	Used in step

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	53
Exhaust-gas recirculation cooler seal on exhaust manifold	69
Exhaust-gas recirculation cooler seal on intake plenum	69

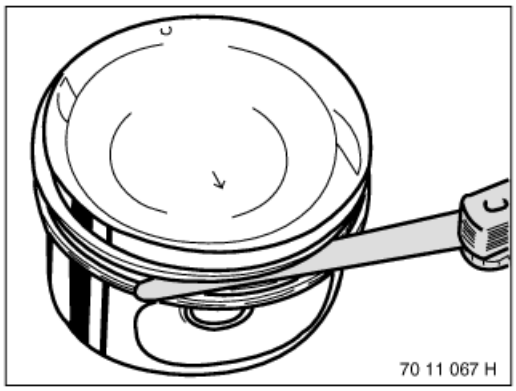
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11 25 671 Replacing piston rings on all pistons (B47)

Necessary preliminary tasks:

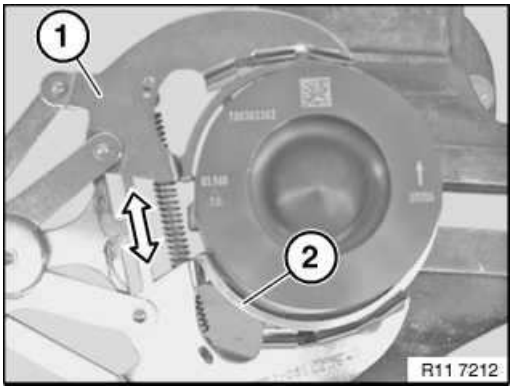
- Removing piston

Removal:



If necessary, measure side clearance.

Refer to Technical Data.

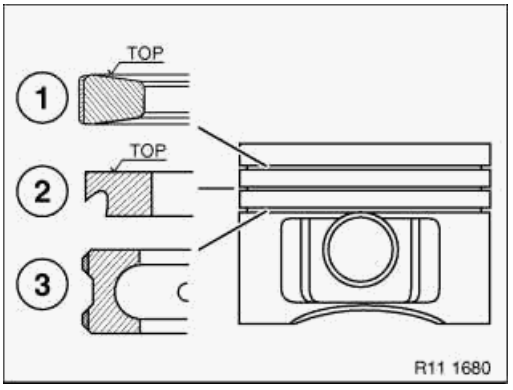


Note:

It might not be possible to find the identification on used piston rings.

Put aside piston rings in correct sequence and installation position.

Remove all piston rings (2) with piston ring pliers (1).



Note:

1. Plain rectangular compression ring
2. Piston ring
3. Oil scraper ring with spiral expander.

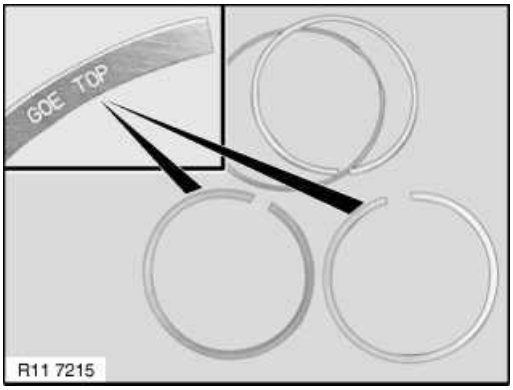
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If necessary, measure end clearance.

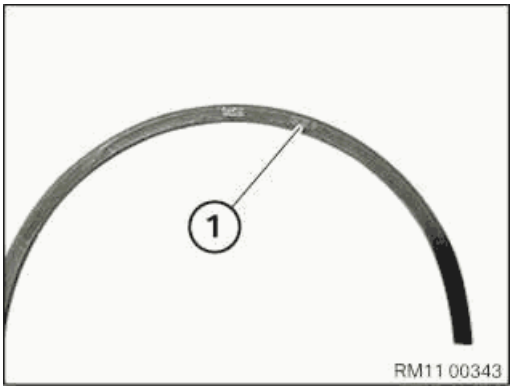
Refer to Technical Data.

Installation:



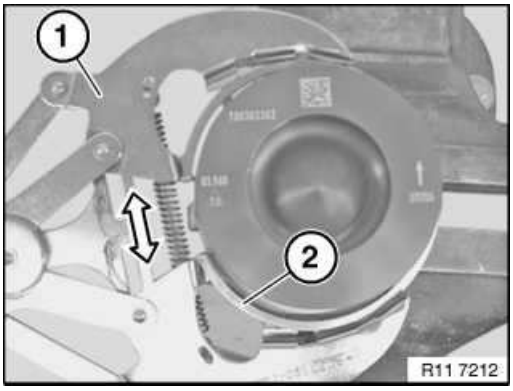
Installation note:
Marking “TOP” must point towards piston crown.

The oil scraper ring has no identification marking and can be installed in any position.



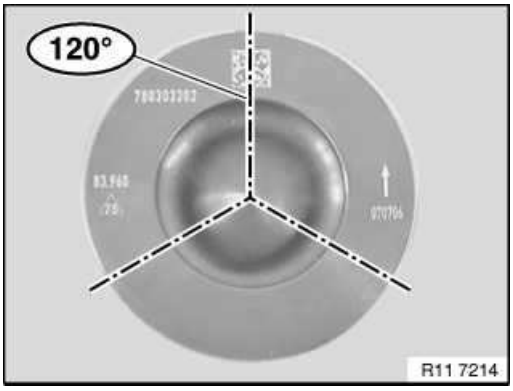
Installation note:
If there is no “TOP” marking, the “GOE” marking (1) must point to the piston crown.

The oil scraper ring has no identification marking and can be installed in any position.



Using piston ring pliers (1), install all piston rings (2) in the correct installation position.

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Note:
Piston rings must be arranged with a 120° offset.

Align contact points on piston rings (offset at approx. 120°, but do not arrange over gudgeon pin boss).

Lightly coat pistons and piston rings with oil.

Required follow-up work:

- Install piston

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11 27 030 Remove and install/replace counterbalance shafts

PRELIMINARY WORK

1 – Removing engine



- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

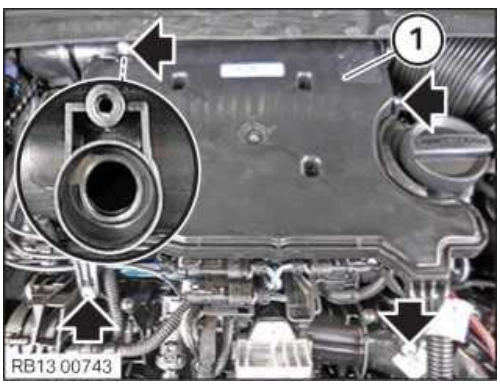
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

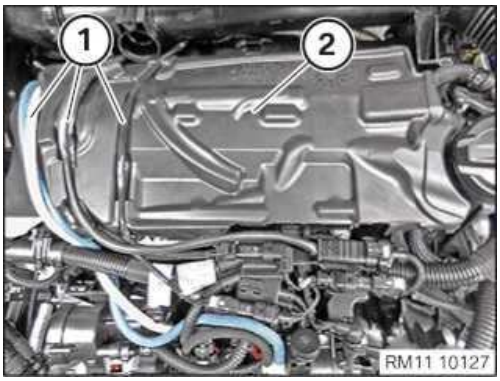
3 – Remove resonator



- Remove screws (arrows).
- Guide out and remove the resonator (1).

4 – Remove the acoustic cover for the injectors

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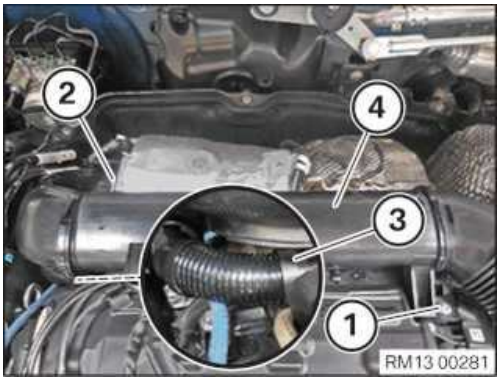


- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

5 – Removing clean air pipe



- Detach clamp (1) on the clean air pipe.
- Pull off the clean air pipe from the intake silencer housing.



- Loosen screw (1).
- Loosen clamp (2).
- Unlock the ventilation line (3) and pull it off the cylinder head cover.
- Feed out clean air pipe and remove.

6 – Remove differential pressure sensor

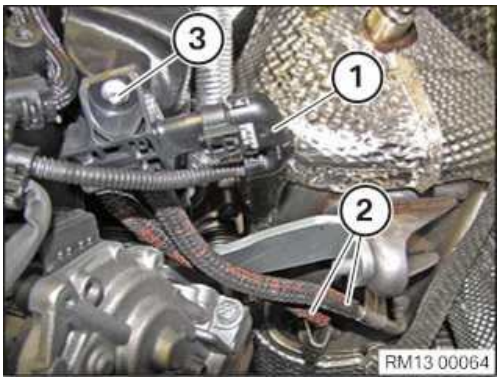
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

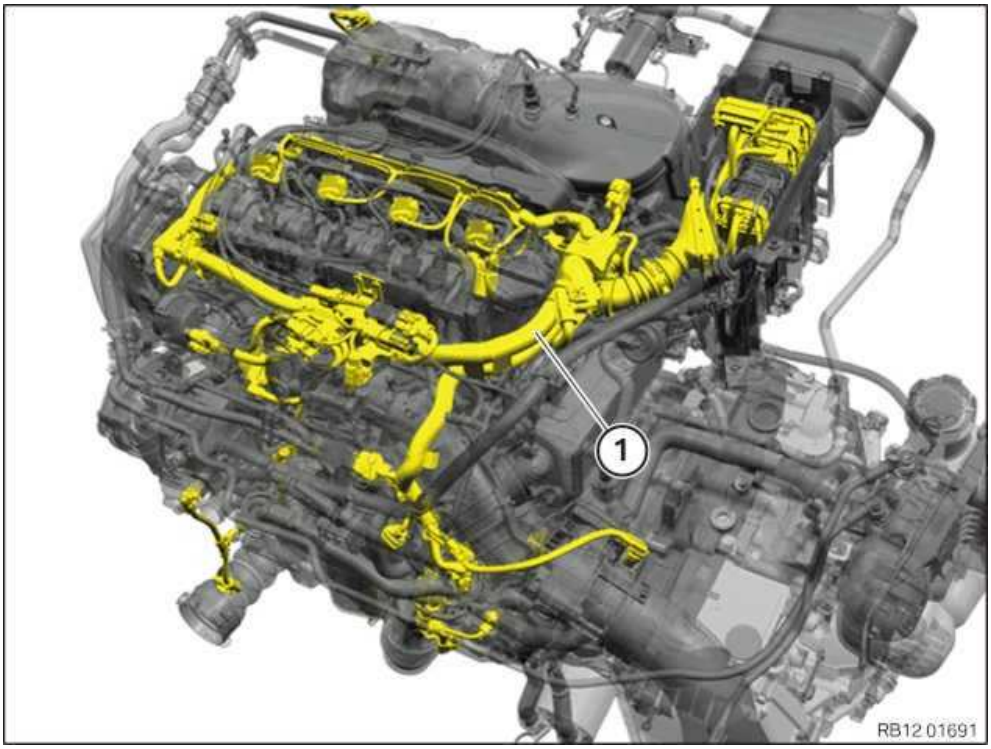
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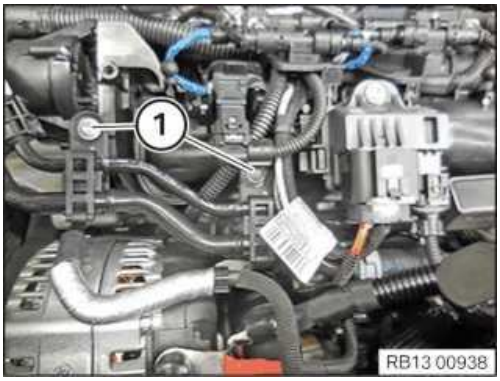
- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

7 – Removing assemblies (on lifting table)

Overview: Wiring harness section for the engine

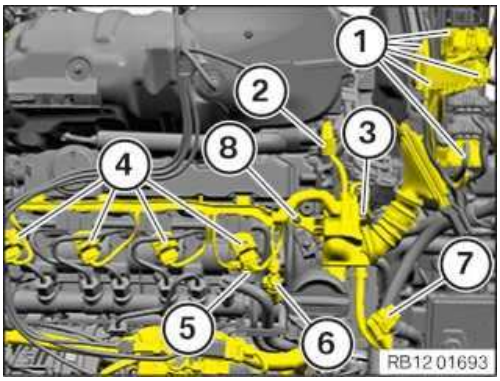


1 Wiring harness section for the engine

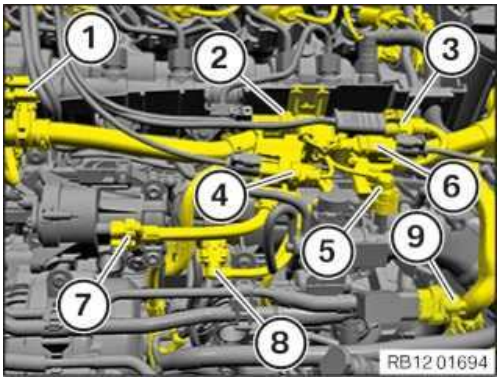


- Loosen screws (1).

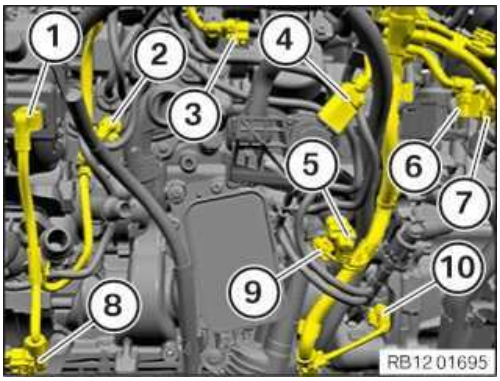
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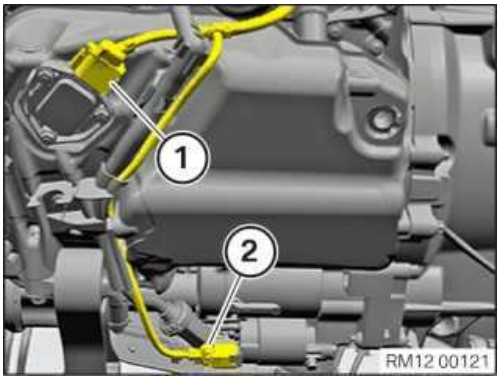
- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock the connector (2) and disconnect it from the differential pressure sensor.
- Unlock the connector (3) and disconnect it from the exhaust-gas recirculation valve.
- Unlock the connector (4) and pull off from the injectors.
- Unlock the connector (5) and disconnect it from the camshaft sensor.
- Unlock the connector (6) and disconnect it from the fuel pressure regulator.
- Unlock connector (7) and pull off from hot film air mass meter.
- Loosen screw (8).



- Unlock connector (1) and pull off from the rail pressure sensor.
- Unlock the connector (2) and disconnect it from the exhaust temperature sensor before the diesel particulate filter.
- Unlock connector (3) and pull it off from the front oxygen sensor.
- Unlock the connector (4) and disconnect it from the exhaust temperature sensor after the diesel particulate filter.
- Unlock and disconnect the connector (5) from the electric changeover valve.
- Unlock the connector (6) and disconnect it from the exhaust temperature sensor for the exhaust-gas recirculation cooler.
- Unlock the connector (7) and disconnect it from the servomotor for the swirl flaps.
- Unlock the connector (8) and pull it off the charging pressure sensor.
- Unlock the connector (9) and disconnect from the fuel pressure and temperature sensor.

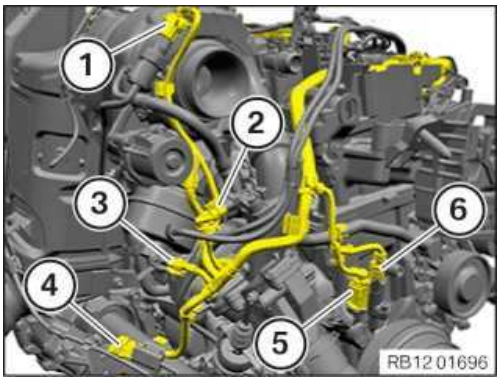


- Unlock and disconnect the connector (1) from the alternator.
- Unlock and disconnect the connector (2) from the electric changeover valve.
- Unlock and disconnect the connector (3) from the electric changeover valve.
- Unlock the connector (4) and pull it off the high pressure pump.
- Unlock the connector (5) and disconnect it from the oil pressure sensor.
- Unlock connector (6) and pull off from throttle body.
- Unlock the connector (7) and disconnect it from the intake air temperature sensor.
- Unlock the connector (8) and disconnect it from the air conditioning compressor.
- Unlock and disconnect the connector (9) from the solenoid valve.
- Unlock the connector (10) and pull it off the crankshaft sensor.



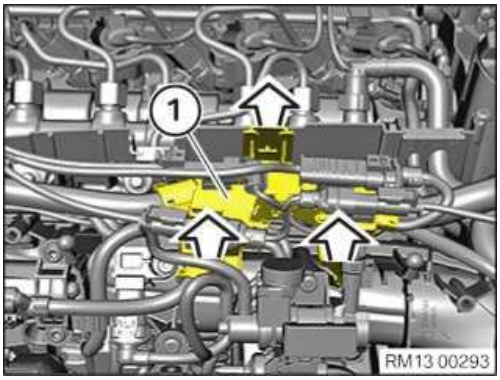
- Unlock the connector (1) and pull off of the oil-level sensor.
- Unlock connector (2) and remove from starter motor.

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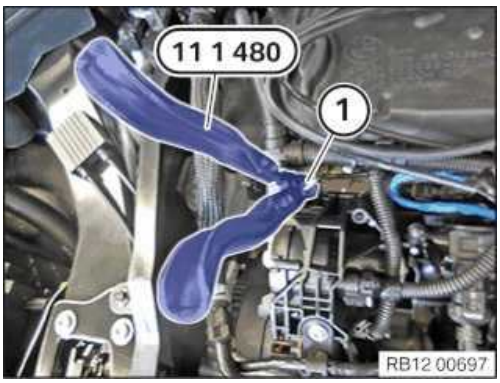


- Unlock the connector (1) and disconnect it from the exhaust gas pressure sensor.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock the connector (3) and pull it off the exhaust turbocharger.
- Unlock the connector (3) and disconnect it from the differential pressure sensor.
- Unlock connector (4) and pull it off from the monitoring oxygen sensor.
- Unlock the connector (5) and pull it off the oil pressure switch .
- Unlock connector (6) and disconnect from switching valve.
- Detach, feed out and remove the wiring harness from the clamps.

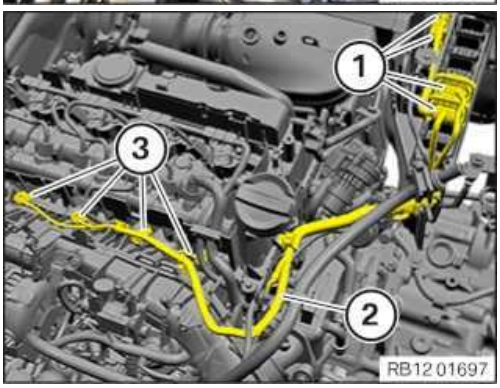
▶ **Removing the cable clips from the intake plenum**



- Detach the cable clip (1) in the direction of the arrow.
- Guide out the cable clip (1) in direction of arrow and set it aside.



- Unlock the connectors (1) of all glow elements with the special tool **0 490 796 (11 1 480)** and release them.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.



- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Pull off all connectors (3) from glow element using special tool **0 490 796 (11 1 480)**.
- Loosen screw (2) and remove the ground strap.
- Detach, feed out and remove the wiring harness from the clamps.

▶ **Removing the drive belt for alternator**

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

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CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

TECHNICAL INFORMATION

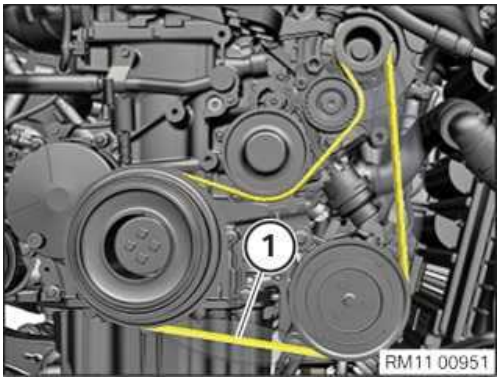
If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

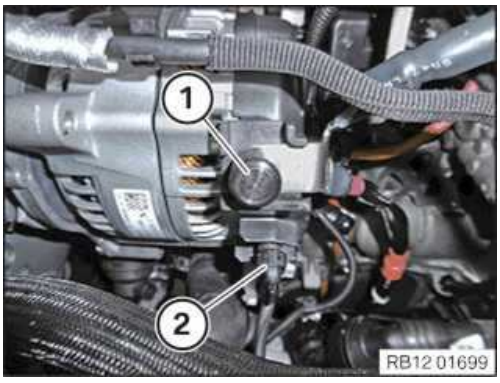
The drive belt must be replaced if contaminated with coolant- and oil residues.



- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool **0 496 268 (11 0 390)**.



- Guide out the drive belt for the alternator (1) and remove it.

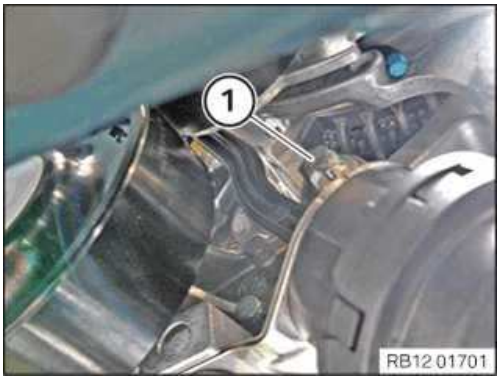


- Remove the cover (1) and loosen the nut below.
- Disconnect positive battery cable from alternator.
- Unlock and disconnect the connector (2) from the alternator.

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- Detach screw (1) on top on the alternator.



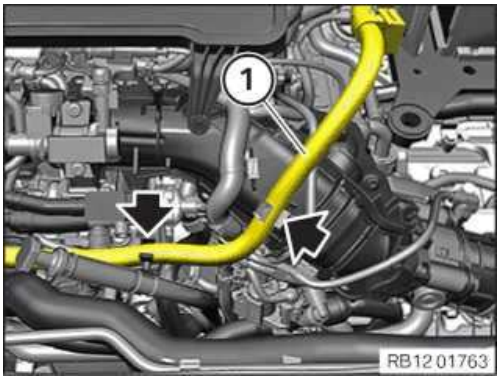
- Detach screw (1) below on the alternator.



- Feed out alternator (1) along with the screw (2) on the bottom of the alternator through the slot on the support and remove.

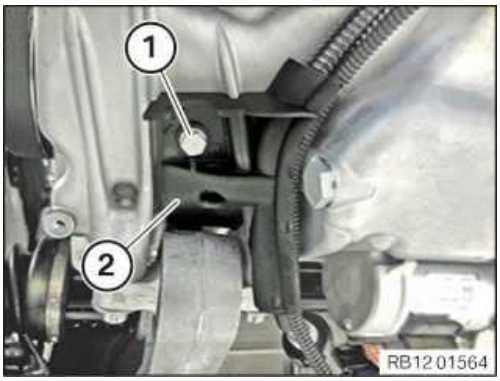


- Loosen screws (1).
- Feed out and remove the air conditioning compressor (2).



- Release the positive battery cable (1) from the clamps (arrows).

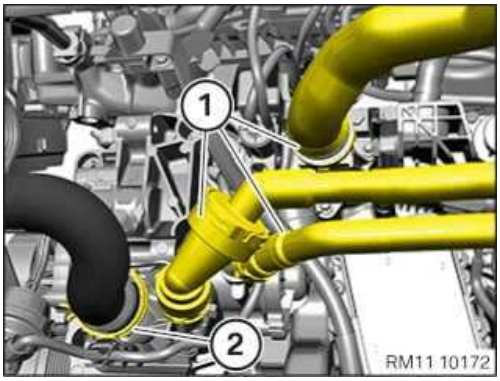
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- Loosen screw (1).
- Guide out and remove holder (2).



- Feed out positive battery cable from the clamps (1) and remove.



- Unlock and disconnect coolant lines (1).
- Guide out the coolant lines (1) and remove it.
- Detach the clamp (2).
- Guide the coolant hose out and remove.

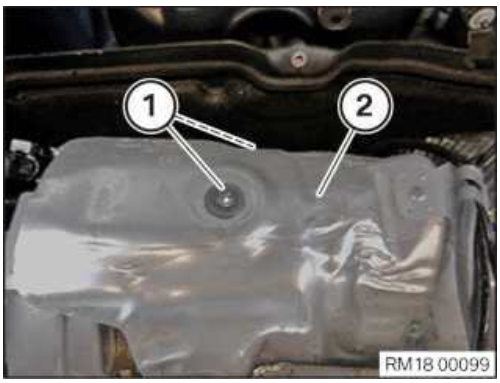
▶ **Removing heat shield from top exhaust turbocharger**

WARNING

Hot surfaces.

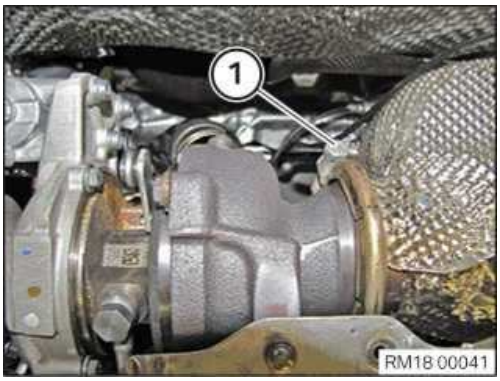
Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from holders.
- Release the screws (1) at the top and bottom of the heat shield.
- Feed out and remove the heat shield (2).

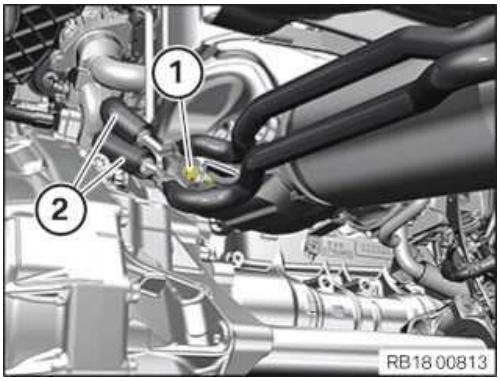
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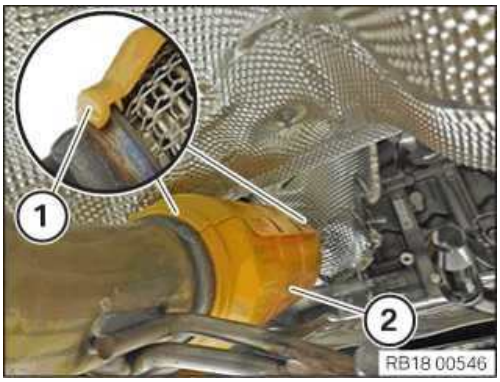
- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.



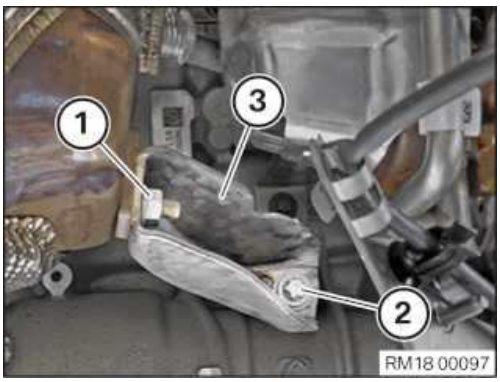
- Loosen nuts (1).



- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.

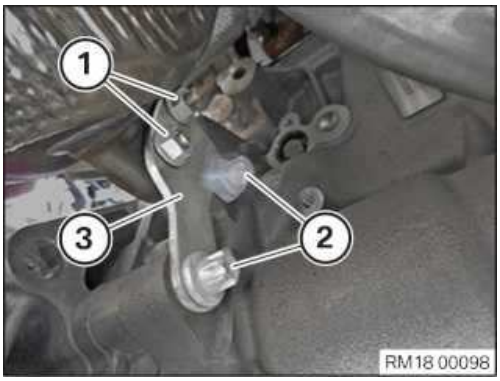


- Mount fitting aid (2).
- Make sure that the fitting aid is correctly position on the edges (1) of the flexible tube.



- Loosen nut (1).
- Loosen screw (2).
- Remove holder (3).

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- Loosen nuts (1).
- Loosen screws (2).
- Remove holder (3).
- Guide out and remove diesel particulate filter .

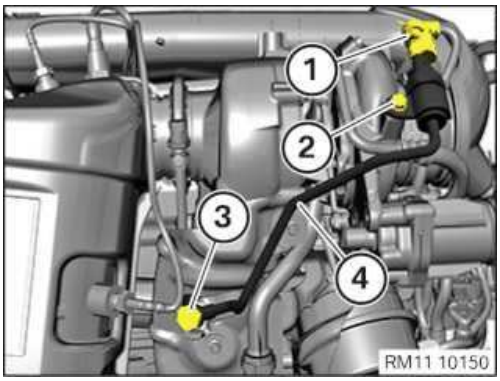
▶ **Remove the heat shield from the exhaust turbocharger at the bottom**

WARNING

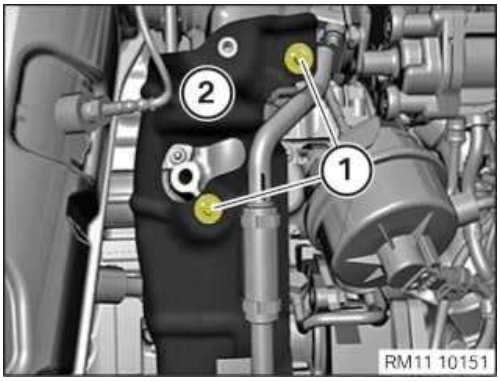
Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Unlock and disconnect connector (1).
- Unscrew the banjo bolt (3).
- The seals of the banjo bolt (3) must be renewed.
- Loosen screw (2).
- Remove the exhaust gas pressure pipe (4).



- Unscrew the bolts (1) on the heat shield .
- Feed out and remove the heat shield (2).

▶ **Removing the exhaust-gas recirculation cooler**

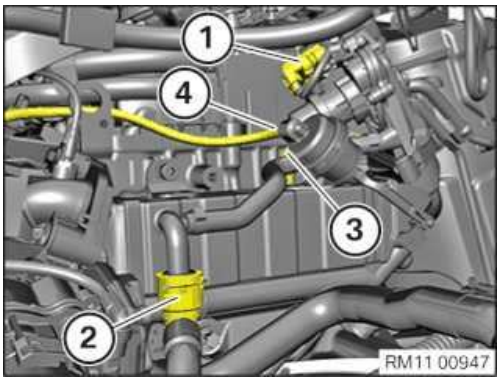
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

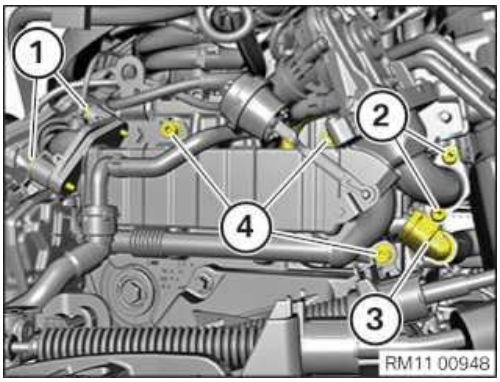
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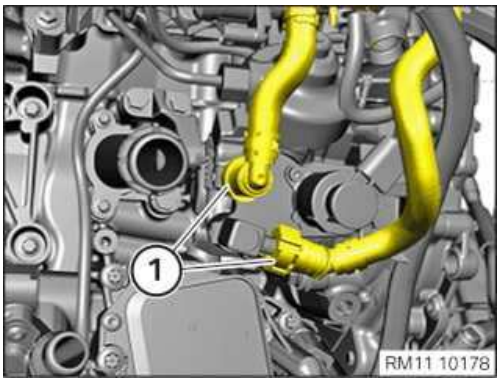
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

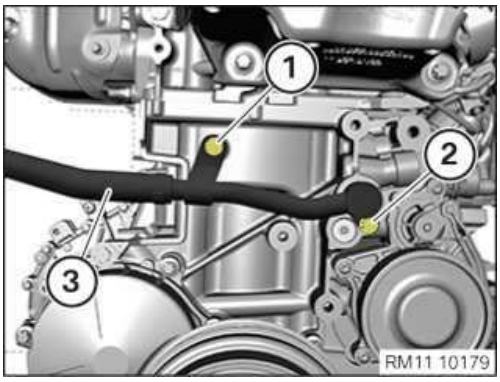
- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.



- Unlock the fuel lines (1) and disconnect from the high pressure pump.
- Remove the fuel lines.



- Loosen screws (1) and (2).
- Remove coolant line (3).

8 – Removing the low-pressure stage turbocharger

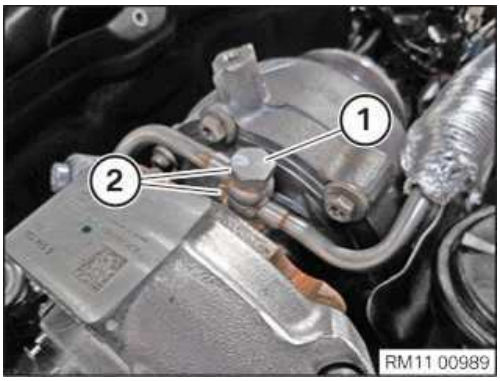
WARNING

Hot surfaces.

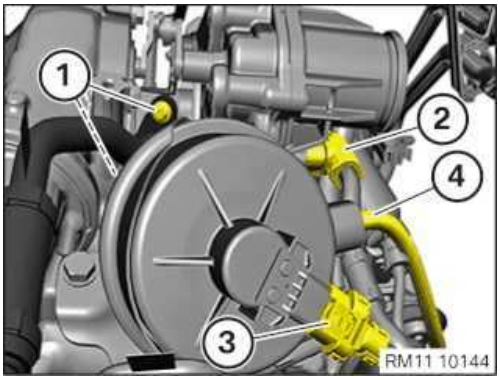
Risk of burning!

- Perform all work only on components that have cooled down.

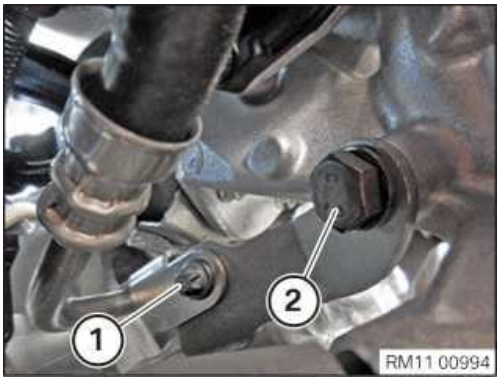
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- Release the banjo bolt (1) of the oil feed lines.
- Remove sealing rings (2).
- Place oil feed lines to one side.



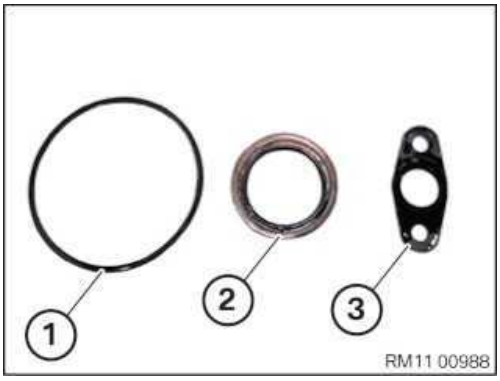
- Release the screws (1) of the oil return line.
- Unlock and disconnect the plug connections (2) and (3).
- Pull off the vacuum hose (4) carefully.



- Undo the bolt (1) of the oil feed line.
- Loosen screw (2).

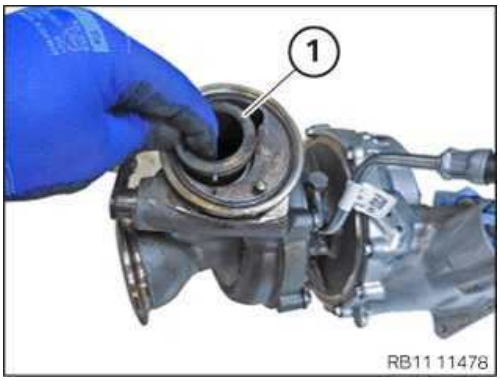


- Loosen screw (1).
- Remove the V hose clamp.
- Guide the low-pressure stage turbocharger out towards the top and remove.



- Remove seals (1), (2) and (3).

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- Remove the spacer ring (1).

9 – Removing the high-pressure stage exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

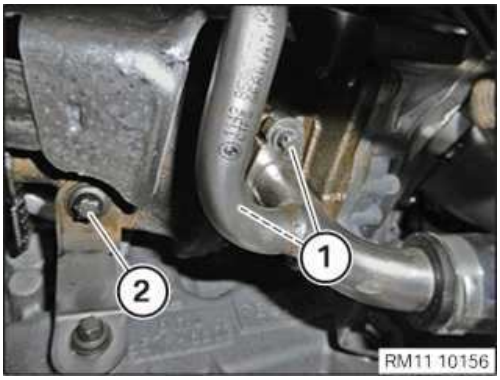
- Perform all work only on components that have cooled down.

CAUTION

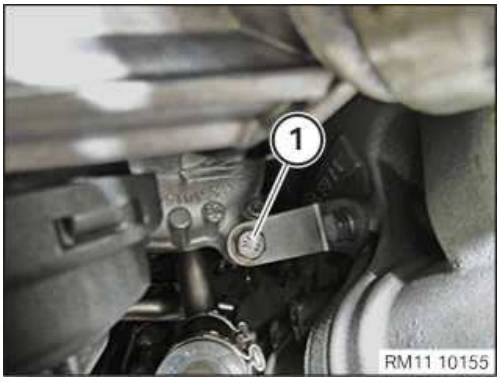
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

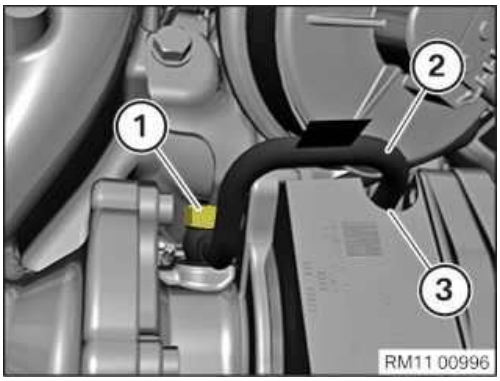


- Unscrew the bolts (1) on the oil return line .
- Loosen screw (2).

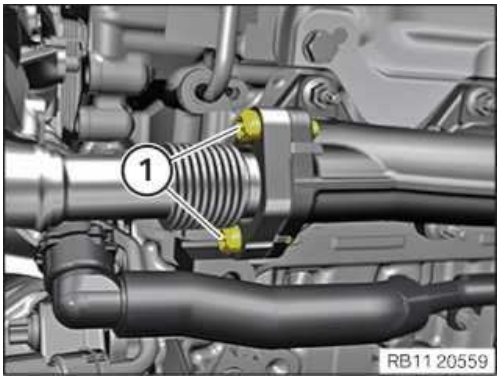


- Release screw (1) from the right wheel arch.

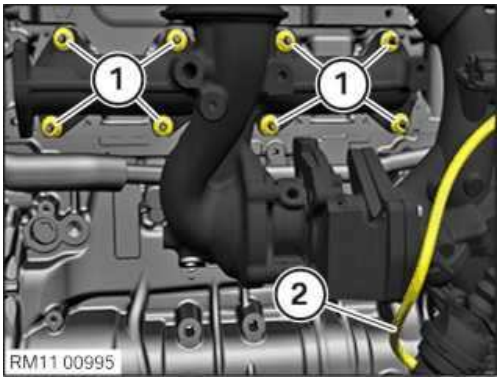
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- Unscrew the banjo bolt (1).
- Guide out oil feed line (2) from holder (3).

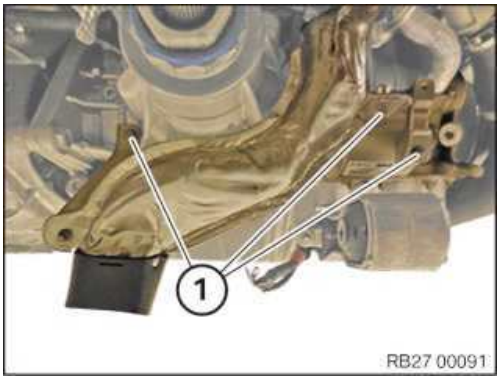


- Loosen screws (1).

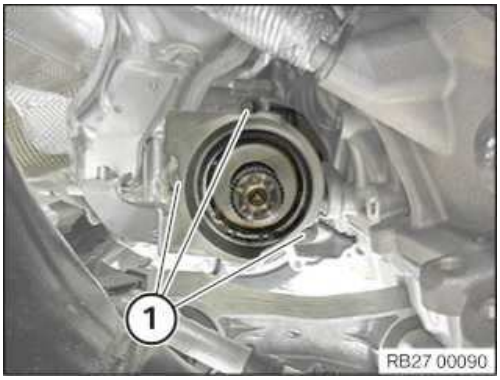


- Pull off the vacuum hose (2).
- Loosen nuts (1).
- Guide out the exhaust manifold and the high-pressure stage exhaust turbocharger to the top and remove them.

10 – Remove the intermediate shaft with the support tube

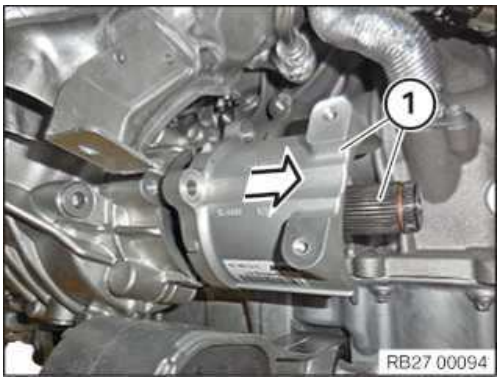


- With air duct installation: Loosen screws (1).
- Remove air duct



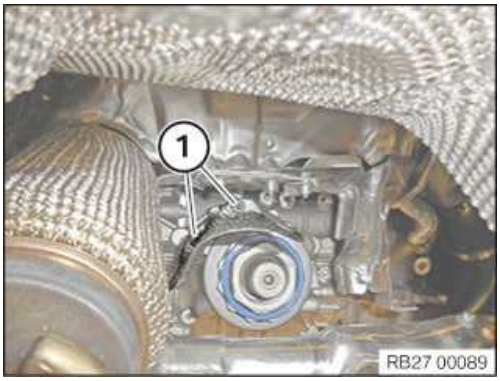
- Loosen screws (1).

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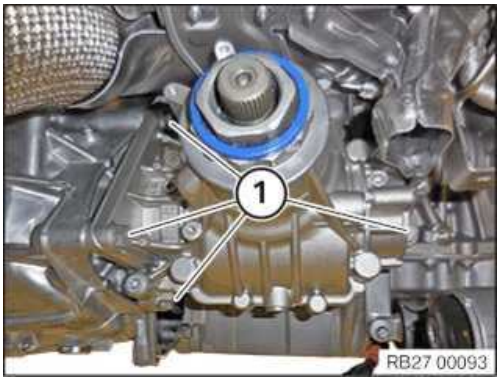


- Pull the intermediate shaft with the support tube (1) out of the transfer box.

11 – Remove transfer box (VTG)



- Loosen screws (1).
- Remove heat shield.



- Loosen screws (1).
- Remove the transfer box (VTG).

12 – Detach the engine from the manual gearbox

Prerequisite

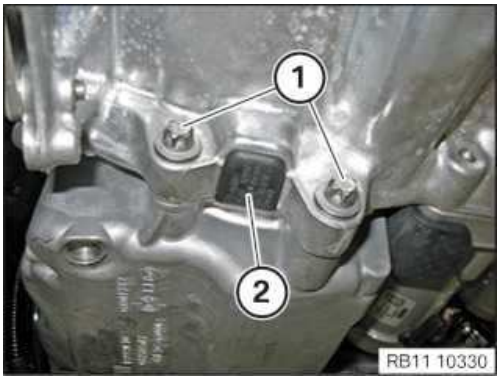
Engine has been removed.

CAUTION

Heavy component.

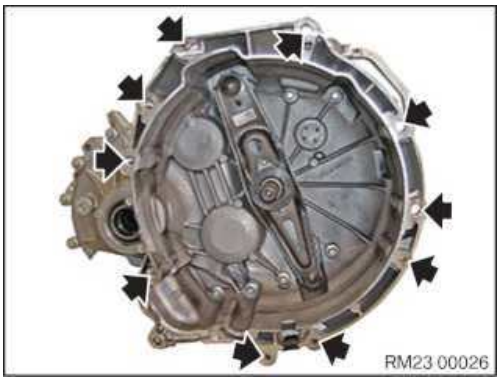
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

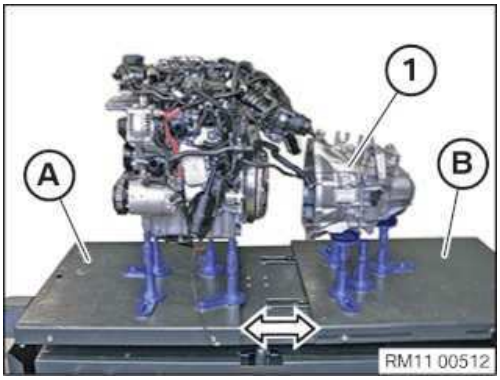


- Loosen screws (1).
- Remove protective cap (2).

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- Remove screws (arrows).



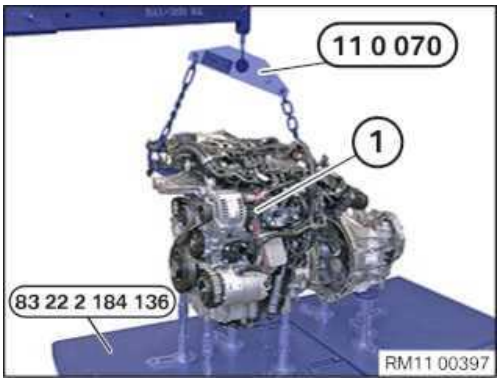
- Slide the table top (B) in the direction of the arrow and slide the manual gearbox (1) to the side.



- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

M8		Tightening torque	21,5 Nm



- Attach engine lifter to special tool and lift engine (1) off lifting table.

13 – Mount engine on assembly stand

CAUTION

Heavy component.

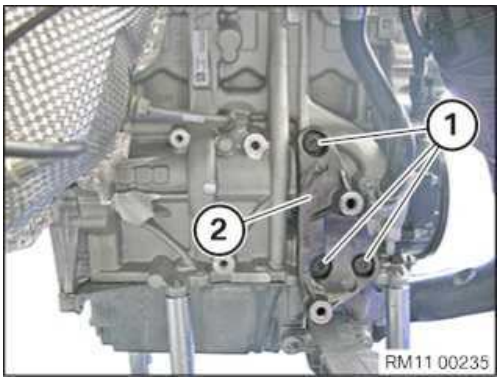
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

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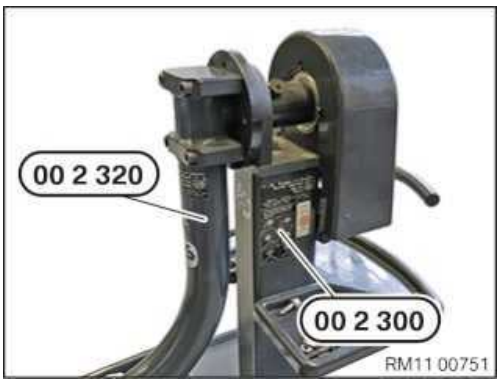
- Loosen screws (1).
- Guide out and remove holder (2).



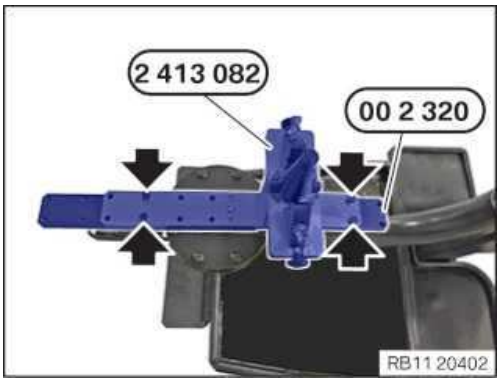
- Position the special tool **2 455 010** on the engine (1).
- Position the standard bolts **M10x30**.
- Tighten the standard bolts (arrows).
-

Special tool 2 455 010 to crankcase

M10x30		Tightening torque	38 Nm



- Prepare the assembly stand **0 495 187 (00 2 300)** with the special tool **0 495 196 (00 2 320)**.



- Screw the special tool to the **0 495 196 (00 2 320)** special tool.
- Tighten screws (arrows).
-

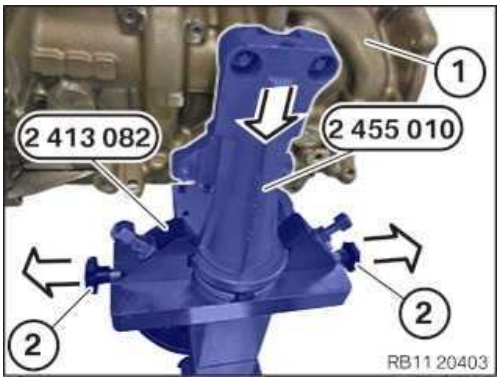
Special tool 11 8 930 to special tool 00 2 320

M14x35		Tightening torque	160 Nm

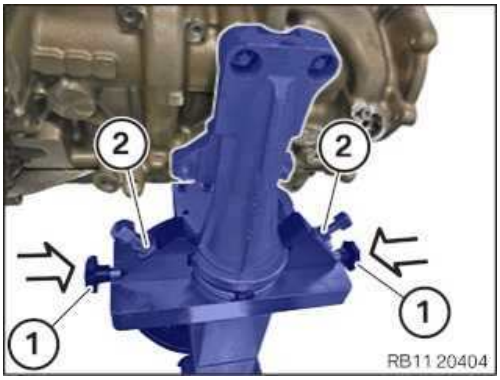


- Position the engine lifter with the special tool and the engine on the special tool **0 495 187 (00 2 300)**.

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- Detach the holder (2) in the direction of the arrow.
- Position the engine (1) with the special tool **2 455 010** in the direction of the arrow on the special tool .



- Lock the holder (1) in direction of arrow.
- Tighten nuts (2).

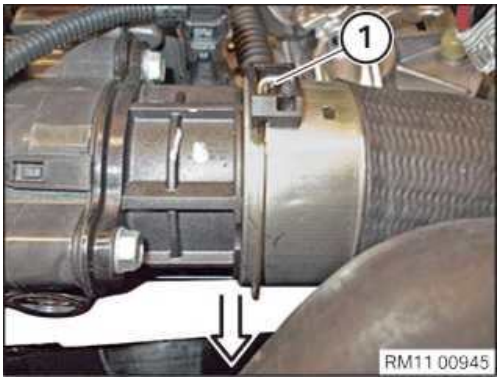
14 – Removing the intake plenum

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

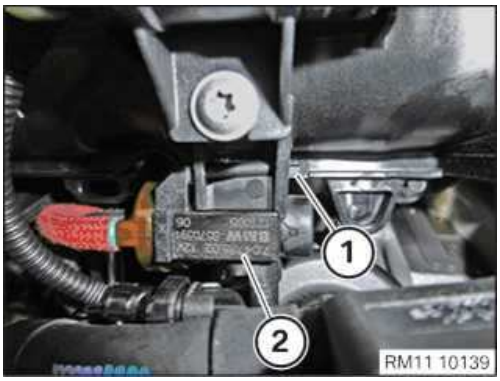


- Unlock the lock (1).

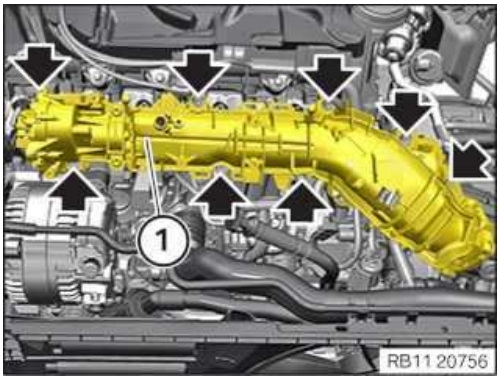


- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.

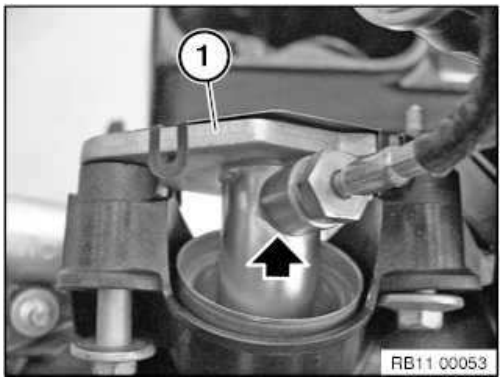
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- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



- Release the screws (arrows) from the intake plenum (1).
- Guide the intake plenum (1) out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

15 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

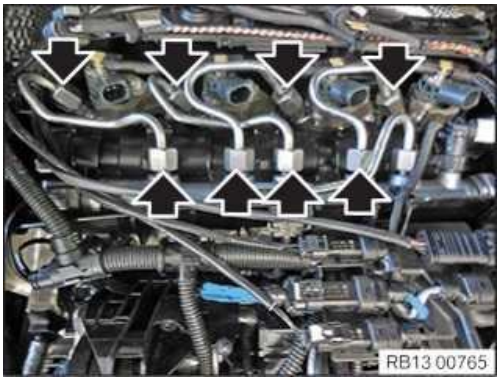
If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release the high pressure lines (arrows) with the special tool .
- Catch and dispose of escaping fuel.
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool .

16 – Detaching leakage oil line from injector

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

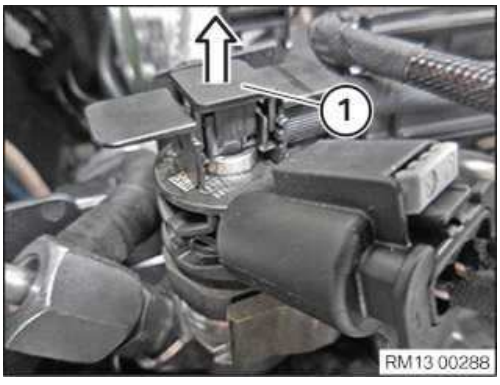
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

17 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

 **Electrostatic discharge.**

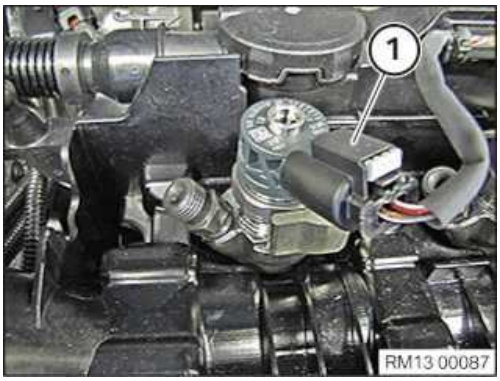
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

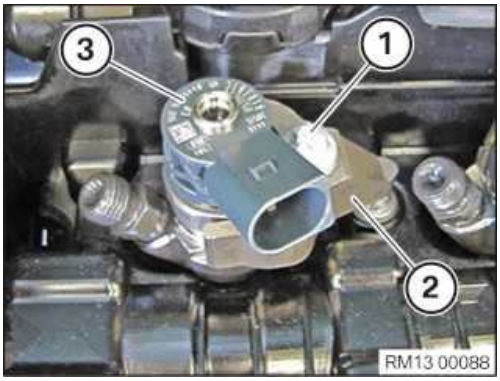
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TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.



- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

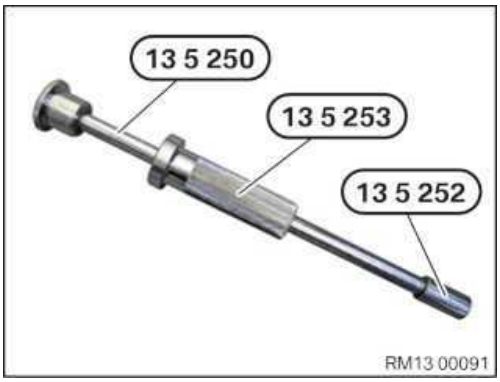
▶ **Loosen stuck injectors**

RISK OF DAMAGE

Contaminant or foreign body.

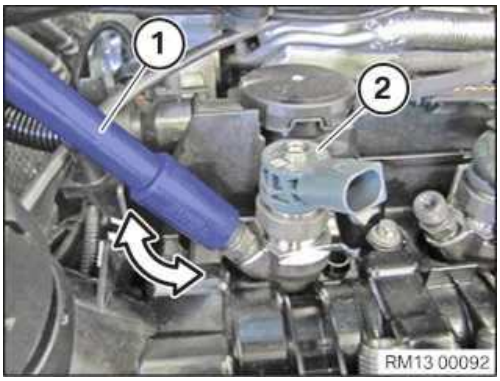
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)** back onto the special tool **0 493 321 (13 5 250)**.

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- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

18 – Remove high-pressure rail

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

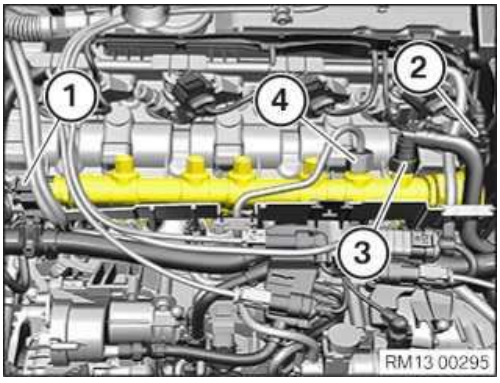
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

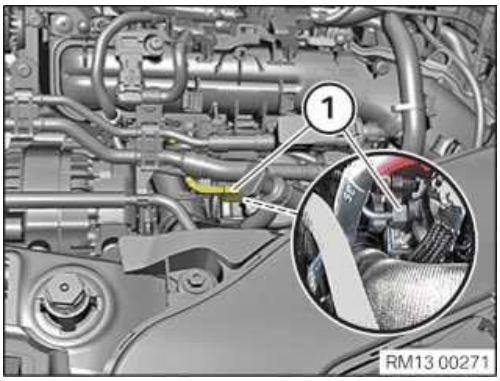
TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

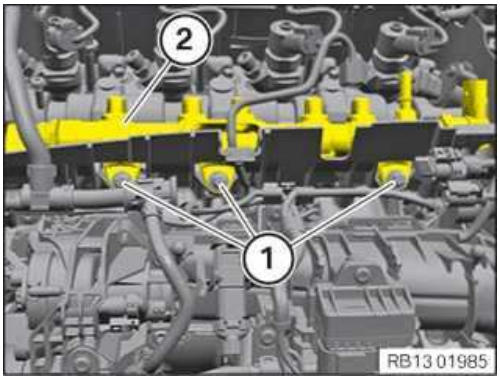


- Unlock and disconnect connector (1).
- Unlock and disconnect connector (2).
- Unlock and release fuel line (3).
- Loosen union nut (4) with special tool .
- Reset special tool early on to avoid bending pressure lines.

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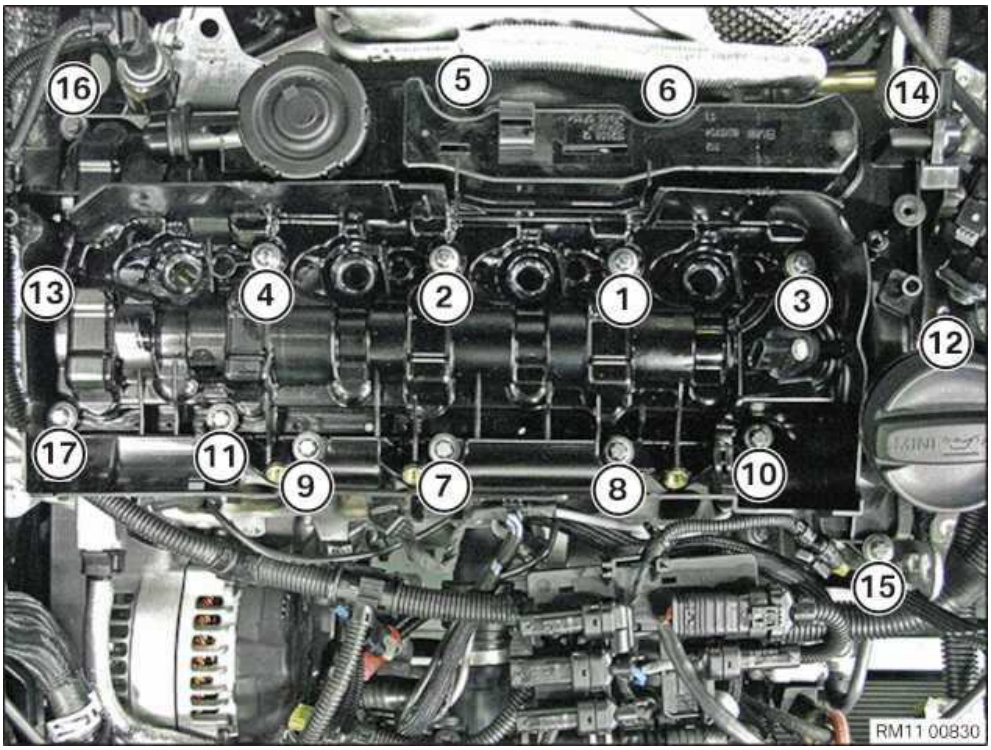
- Slacken the union nut (1) on the high pressure pump.



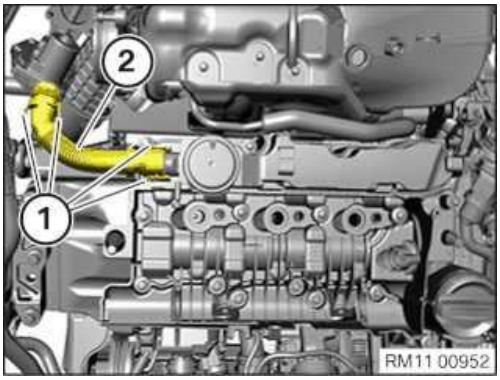
- Loosen screws (1).
- Carefully thread out and remove the rail (2).
- Make sure the pressure line of the high pressure pump is not bent.

19 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover

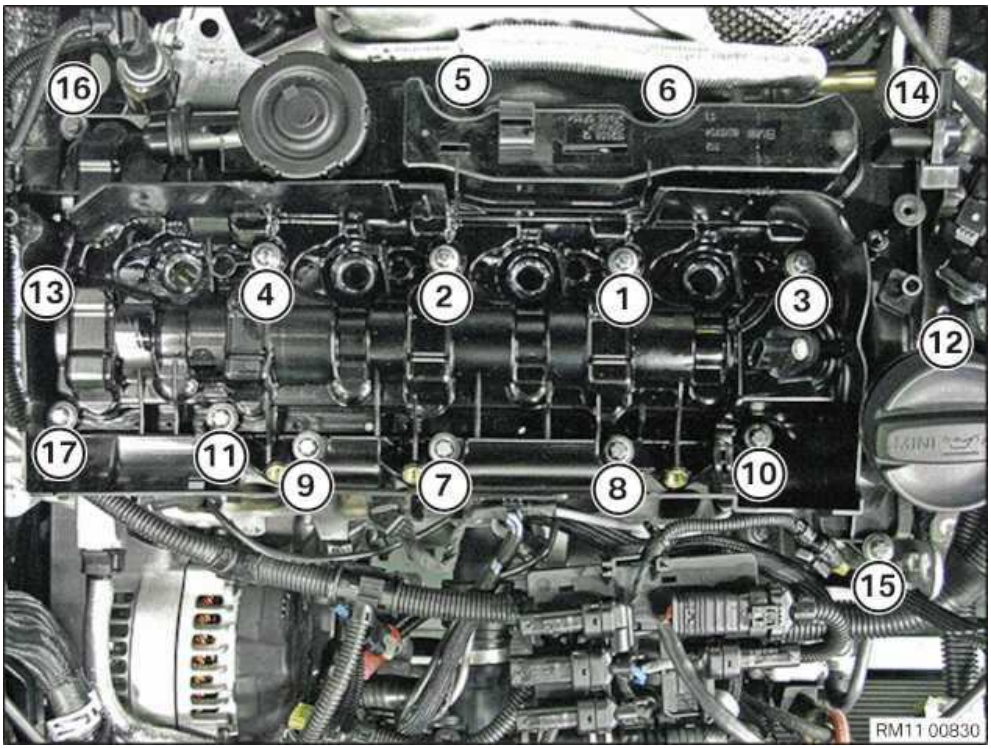


1 to 16 screws of the cylinder head cover.



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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- Loosen screws in the order (17) to (1).
- Remove cylinder head cover by lifting it out.

20 – Checking camshaft timing



- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

Damage to the engine.

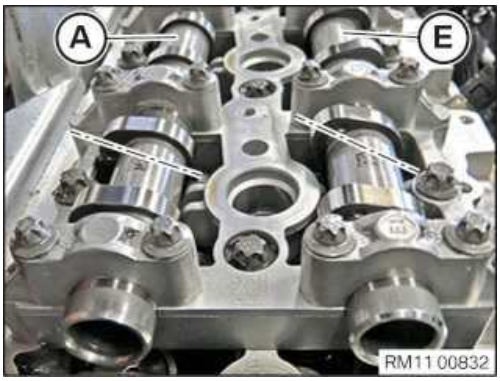
The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

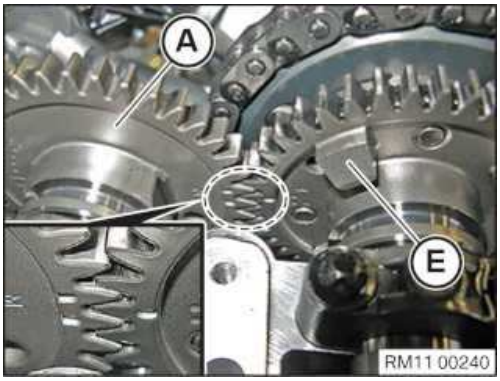
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- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.



- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

21 – Remove chain tensioner piston

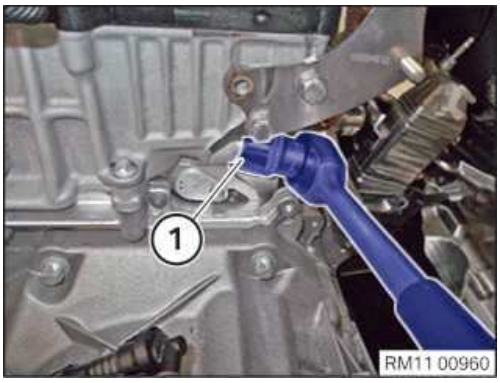
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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

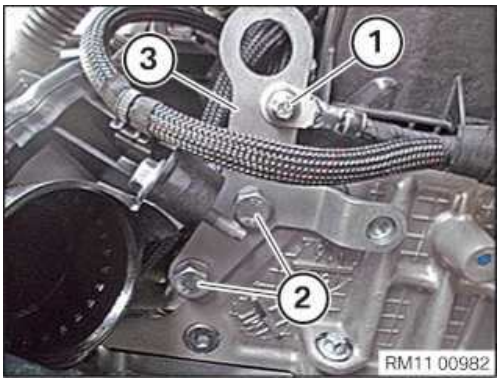


TECHNICAL INFORMATION

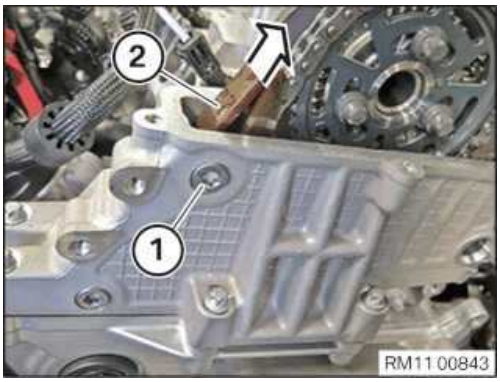
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

22 – Remove the timing chain guide rail

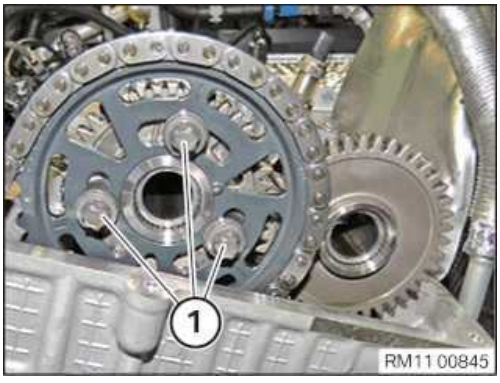


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

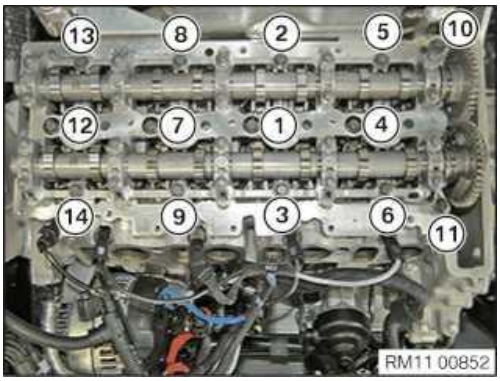
23 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

24 – Removing the camshaft support

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- Evenly loosen all screws in a sequence from (14) to (1).
- Loosen and remove all screws in a sequence from (14) to (1).
  Both camshafts can be removed with the camshaft carrier.
- Remove the camshaft support including camshafts towards the top.

25 – Removing glow elements

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Damage to the glow elements.

Excessive force may damage the glow elements and they may then have to be renewed.

- Handle glow elements with care and do not drop.
- Do not rest the cylinder head on glow elements. Glow elements protrude from the sealing surface of the cylinder head.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

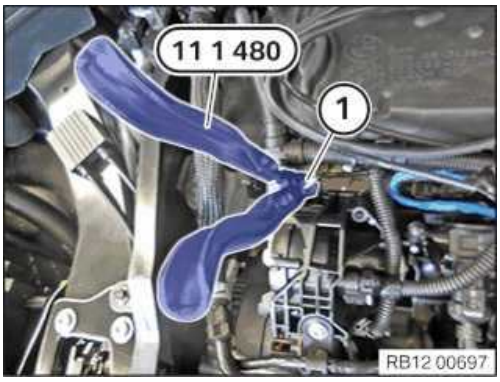
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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

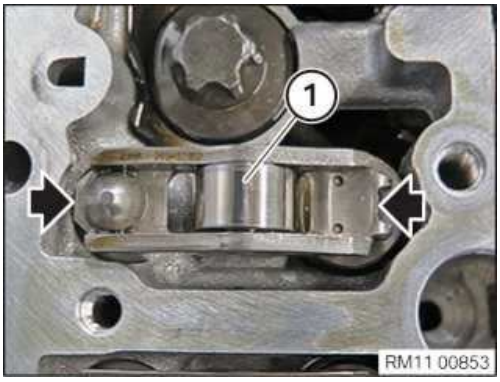


- Unlock and disconnect plug connection (1) using special tool **0 490 796 (11 1 480)**.



- Release the glow elements with the special tool or conventional tools.
- Feed out preheating elements and remove.

26 – Remove roller cam followers



- Guide out and remove all roller cam followers (1) (arrows).
- Place all roller cam followers (1) in order in special tool **0 495 105 (11 4 480)**.

  Roller cam followers that have already been used must be installed in same position again.

27 – Removing the hydraulic valve clearance compensating element

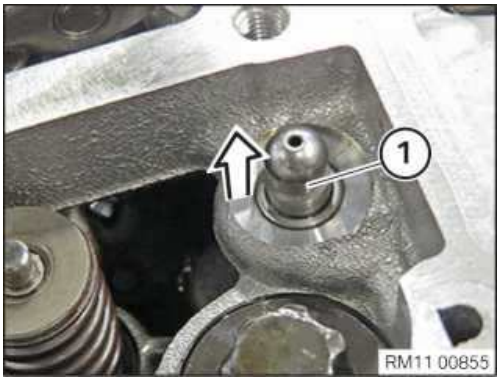
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RISK OF DAMAGE

Contaminant or foreign body.

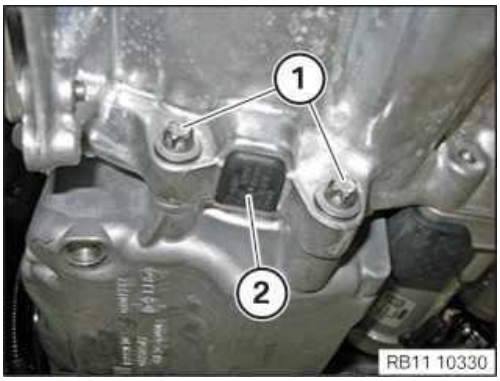
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

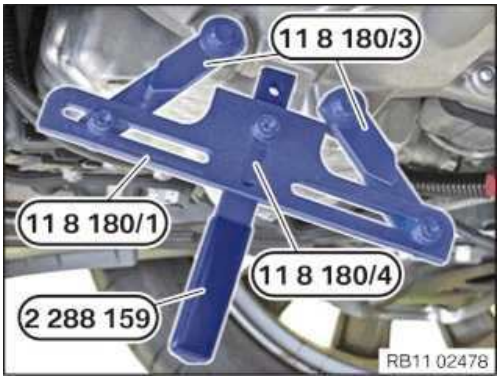


- Remove the hydraulic valve clearance compensating element (1) in the direction of the arrow and place on the special tool **0 495 105 (11 4 480)**.
- Repeat the process on all hydraulic valve clearance compensating elements.

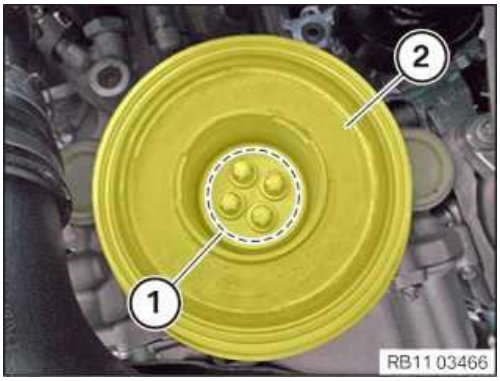
28 – Removing the vibration damper



- Release the transmission bolts (1).
- Remove the protective cap (2).



- Position special tool **0 493 587 (11 8 180)** as illustrated.
- Fasten the special tool **0 493 587 (11 8 180)** to the transmission with transmission bolts.



- Loosen screws in the area (1).
- Remove the vibration damper (2).

29 – Remove clutch

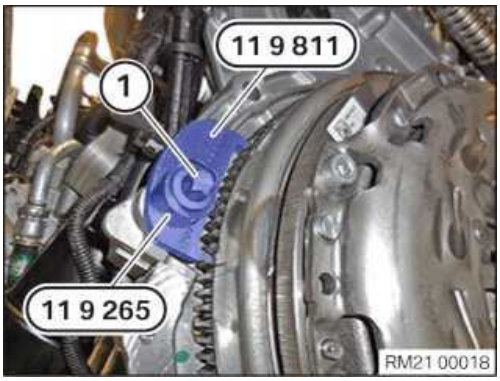
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CAUTION

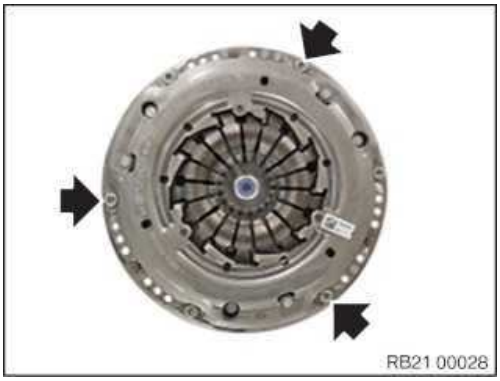
Materials harmful to health.

Contact with fluids harmful to health!

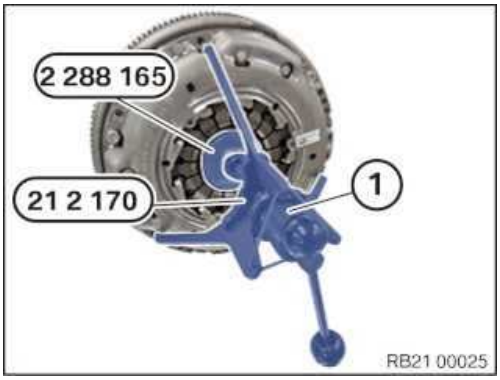
- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.



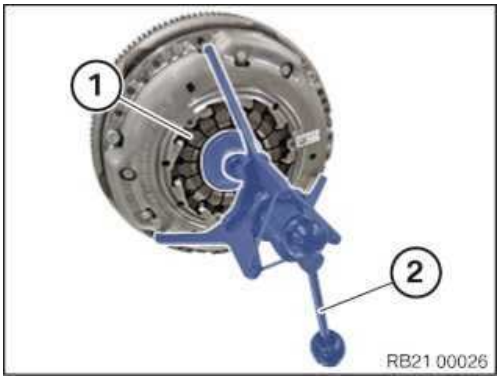
- Block flywheel with transmission bolt (1) and special tools **0 496 171 (11 9 811)** and **0 494 793 (11 9 265)**.



- Detach 3 screws to attach special tool and **2 288 165**.

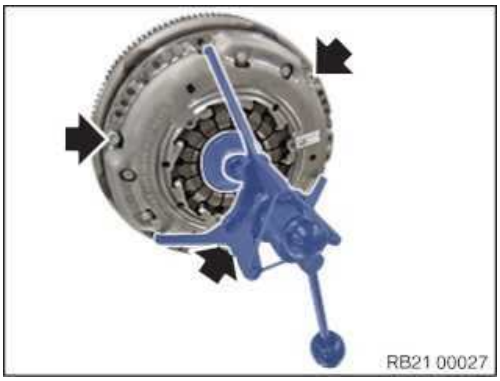


- Position special tool and **2 288 165** and tighten on the knurled screw (1).



- Screw in the spindle (2) until the diaphragm spring (1) is preloaded and the clutch disc is free of tension.

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- Loosen the remaining 3 screws and remove the clutch with clutch disc from the flywheel.

30 – Removing flywheel

CAUTION

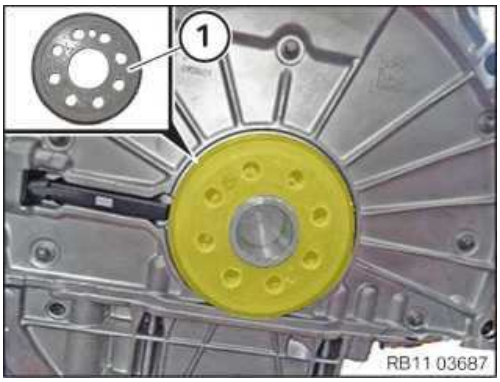
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Secure the flywheel with a transmission bolt (1) and with special tools **0 496 171 (11 9 811)** and **0 494 793 (11 9 265)**.
- Unscrew the flywheel bolts with the special tool **0 491 018 (11 4 180)**.
- Remove flywheel.



RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

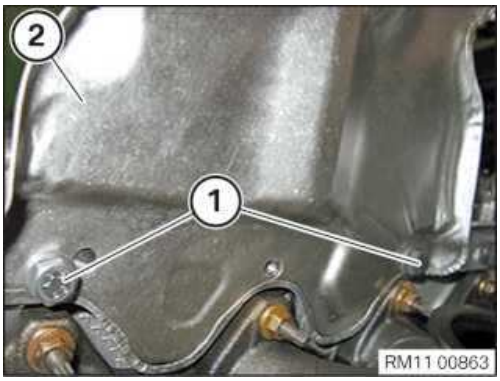
- Remove the increment wheel (1) from the crankshaft and lay it down correctly.

31 – Remove rear timing case cover

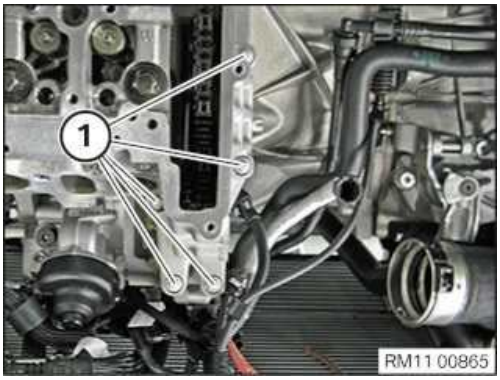
Prerequisite

Transmission is removed.

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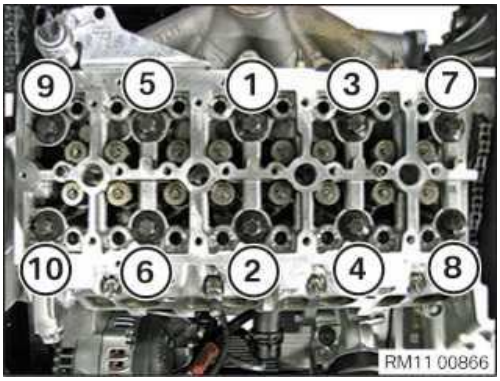
- Loosen screws (1).
- Feed out the heat shield (2) and place to one side.



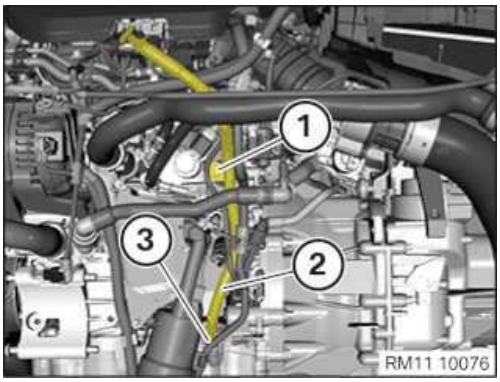
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

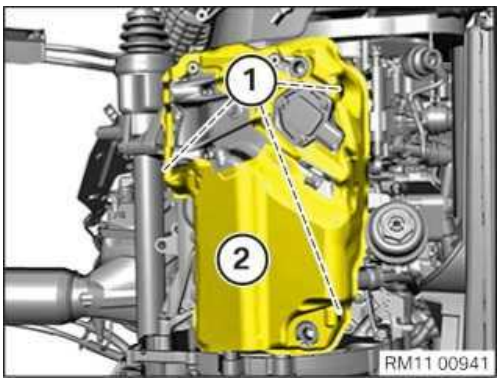
- Loosen screws (1).



- Loosen the cylinder head bolts in the sequence from (10) to (1).
- Remove cylinder head bolts (1) to (10) with washers.
- Remove cylinder head.

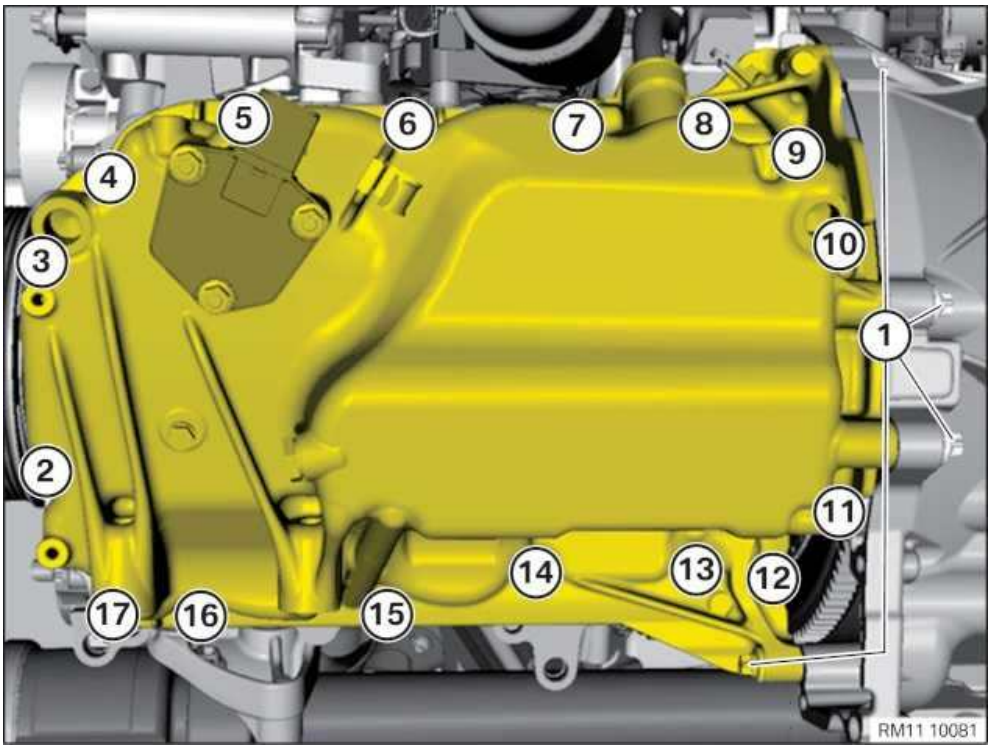


- Loosen screw (1).
- Disconnect the guide tube (2) for the oil dipstick toward the top from the oil sump and remove it.
- Remove sealing ring (3) from oil sump if necessary.

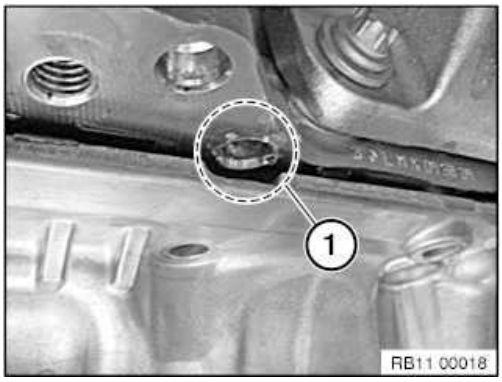


- Expanding rivets (1) on both sides of the acoustic cover (2).
- Feed out and remove the acoustic cover (2).

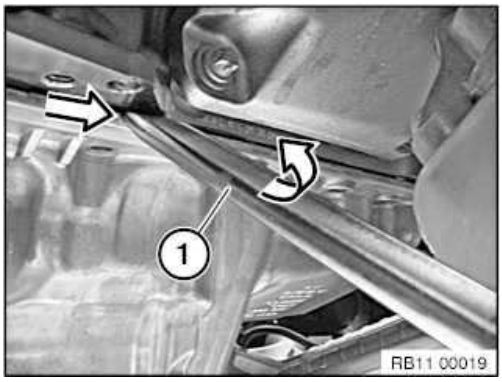
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- Loosen the transmission bolts (1) on the oil sump.
- Loosen screws (2) to (17).

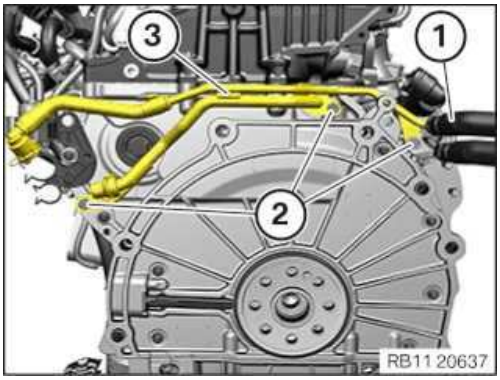


- Release oil sump only in area (1).



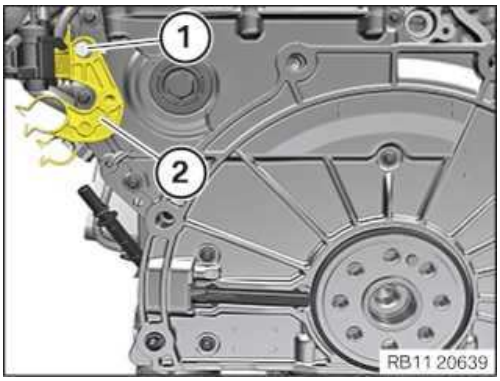
- Detach the oil sump with a suitable mounting lever (1) carefully at the point provided.
- Secure the oil sump against falling.

▶ **If installed: Remove coolant line of the SCR metering module**

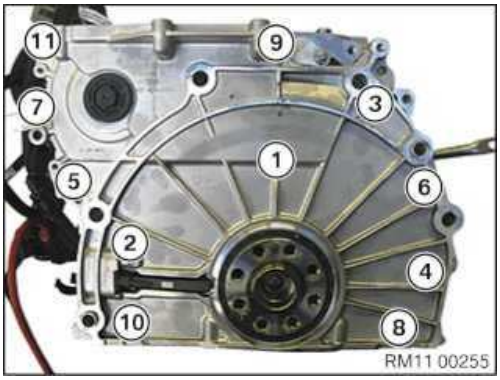


- Unlock and disconnect the coolant hose (1).
- Loosen screws (2).
- Remove the coolant line (3).

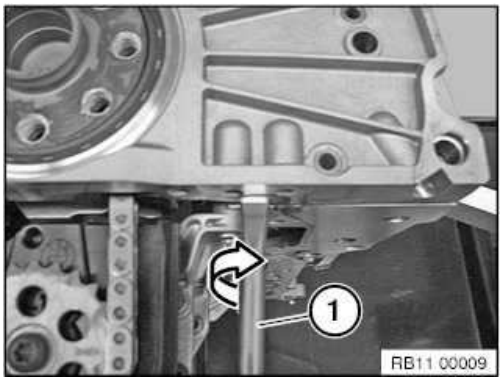
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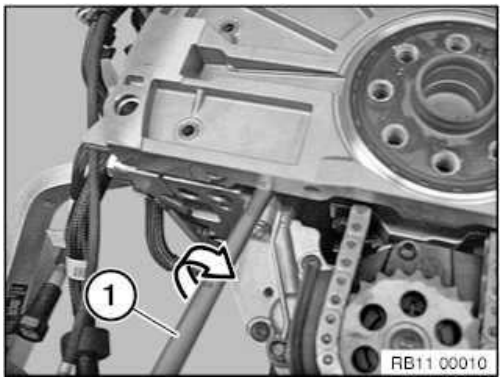
- Loosen screw (1).
- Guide out and remove holder (2).



- Loosen screws in the order (11) to (1).



- Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.



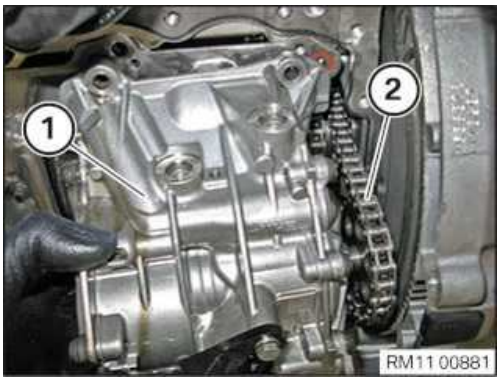
- Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.
- Remove the timing case cover.

32 – Remove the oil vacuum pump



- Loosen screws (1) of the oil vacuum pump (2).

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- Remove oil vacuum pump (1) and remove from the drive chain (2).

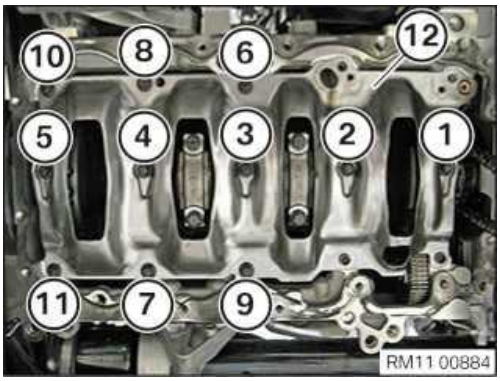
33 – Removing the oil deflector

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Loosen screws in the order (11) to (1).
- Guide out and remove the oil deflector (12).

MAIN WORK

34 – Remove counterbalance shafts

RISK OF DAMAGE

Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

- Comply with the regulations for the installation and disassembly.
- Perform work with care.

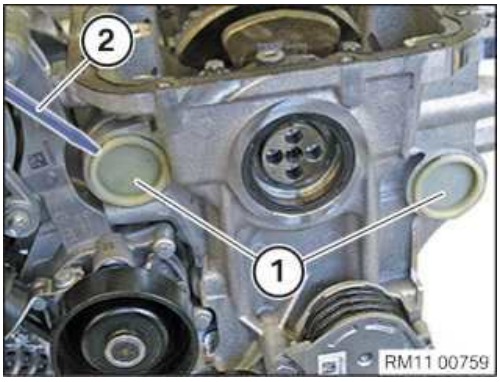
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RISK OF DAMAGE

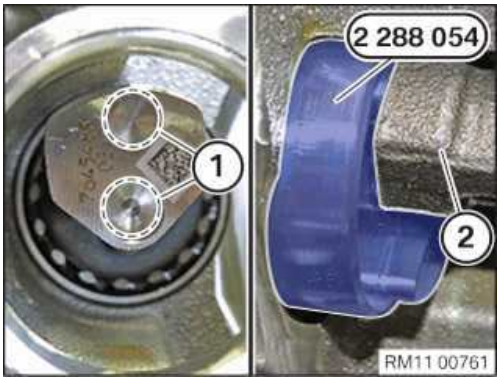
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

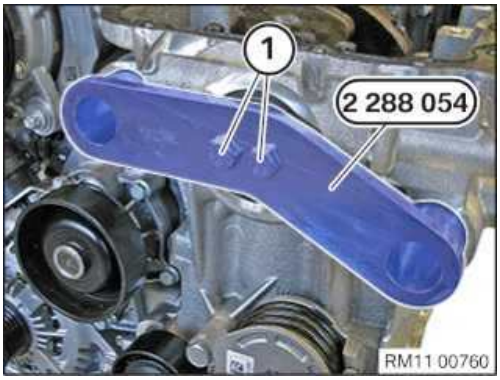
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Remove the sealing cap (1) with a suitable tool (2).



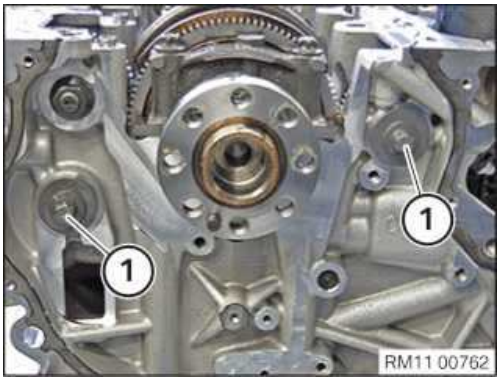
- Rotate the crankshaft to the **TDC of the first cylinder**.
- The special tool **2 288 054** must be positioned in the guides (1) of the counterbalance shafts (2).



- Secure special tool **2 288 054** with screws (1) to the crankshaft.
- Tighten the screws (1).

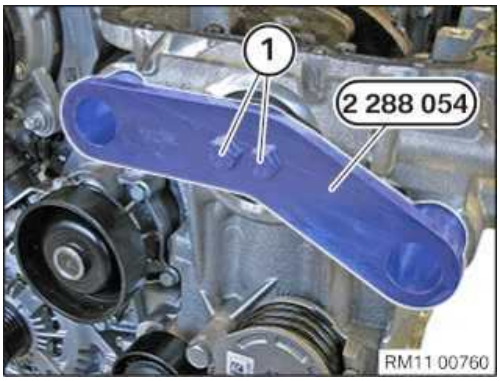
Special tool 2 288 054 to crankshaft

M10		Tightening torque	20 Nm

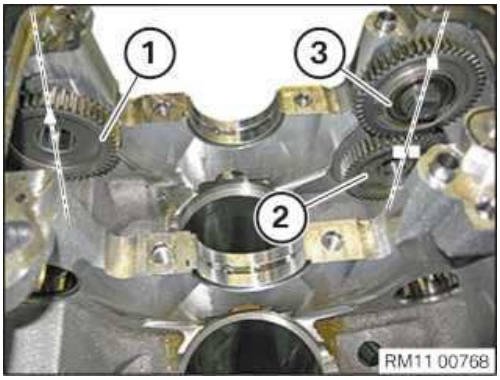


- Loosen screws (1).

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- Loosen screws (1).
- Guide the special tool **2 288 054** out and remove.



NOTICE

To provide a better overview: Illustration of surrounding parts in removed state.

- The identifications on the gears (1) , (2) and (3) must point vertically to the top towards the oil sump sealing surface.

Gear	Identification
1 intake side	Triangle and E
2 exhaust side	Two squares and A
3 exhaust side of intermediate wheel	One square

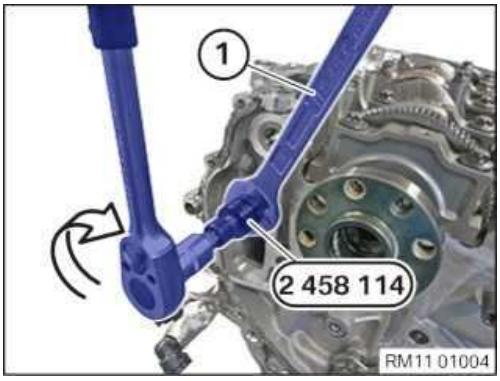


- The intermediate wheel of the exhaust side consists of a fixed wheel and a moving wheel and it must be pretensioned using special tool **0 495 131 (11 5 370)**.
- Pretension the intermediate wheel of the exhaust side using special tool **0 495 131 (11 5 370)** in the illustrated position.
- When reusing the intermediate wheel of the exhaust side, it must remain pretensioned in special tool **0 495 131 (11 5 370)** until its reinstallation.



- Screw in special tool **2 458 114** into the gear of the counterbalance shaft.

Note: The gears have been pressed onto the counterbalance shaft with a taper and they can exclusively be released using the special tool.

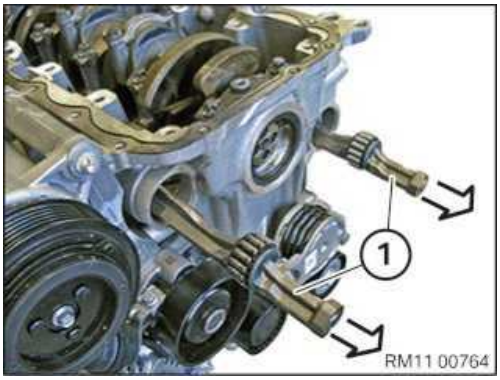


- Counter support special tool **2 458 114** with an open-end spanner (1).
- Screw the bolt of the special tool **2 458 114** in to detach the counterbalance shaft from the gear.

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- Release the counterbalance shaft of the intake side from the gear using special tool **2 458 114**.



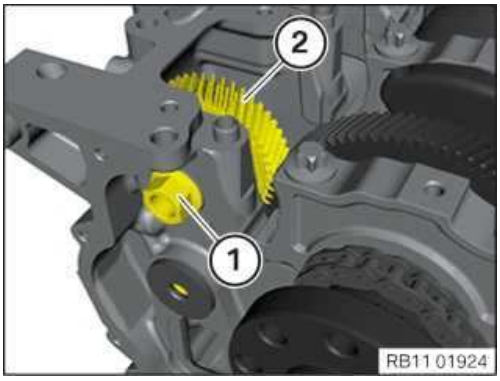
- Feed out the counterbalance shaft (1) in the direction of arrow out of the crankcase and remove.



- Remove the gear (1) of the intake side.



- Remove the gear (1) of the exhaust side.



- Unfasten nut (1).
- Remove the gear (2) using special tool **0 495 131 (11 5 370)**.

35 – Install counterbalance shafts

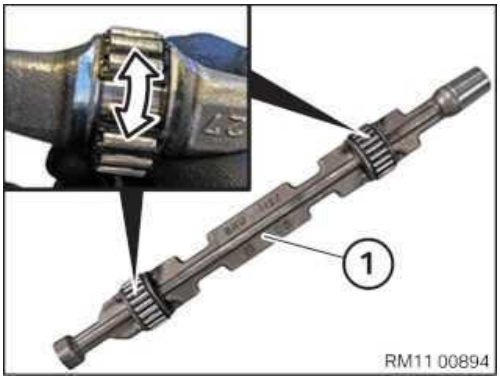
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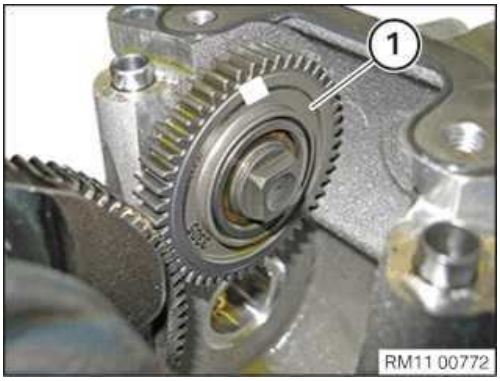
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

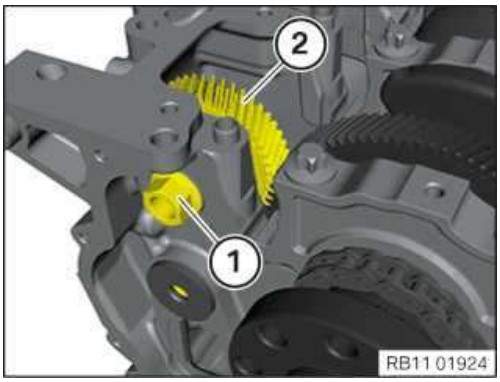
- If a new gear is installed, the ring gear must remain blocked until installation using the factory-mounted fixation (1) .



- Check both needle bearings (1) of counterbalance shaft for damage.
- Pull off damaged needle bearing (1) from the counterbalance shaft and renew it.

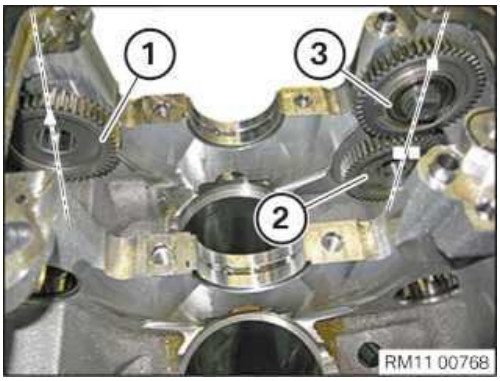


- Rotate the crankshaft to the **TDC of the first cylinder**.
- Replace the gear (1).
- **Parts:** Gear
- Position the intermediate wheel (1) such that the mark points vertically to the top.



- Tighten the nut (1) on the intermediate wheel (2) hand-tight.

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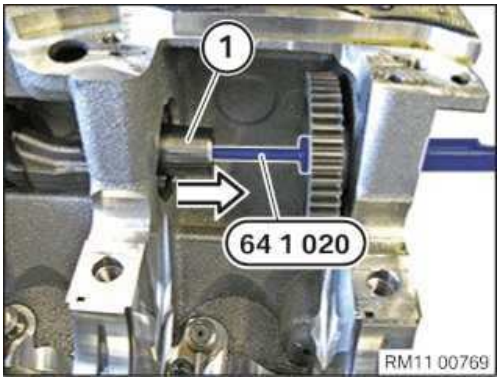
NOTICE

To provide a better overview: Illustration of surrounding parts in removed state.

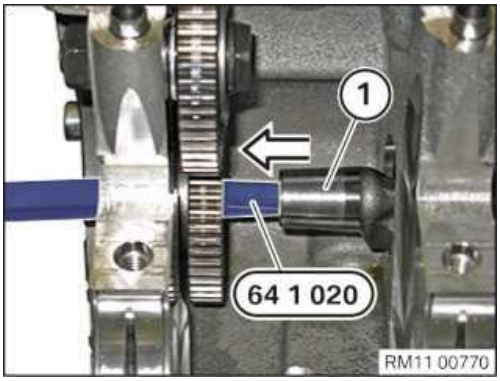
- The identifications on the gears (1) , (2) and (3) must point vertically to the top towards the oil sump sealing surface.

Gear	Marking	Identification
1 intake side	Triangle	E
2 exhaust side	Two rectangles	A
3 exhaust side of intermediate wheel	One square	

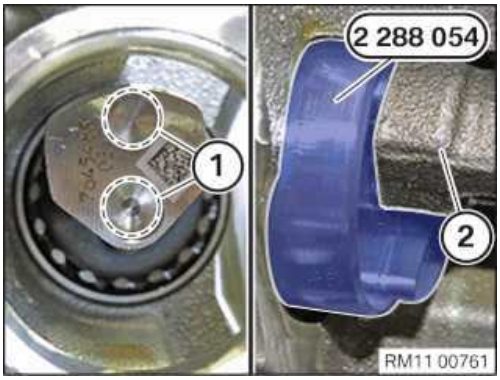
- Install the gear (1) identification **E** such that the marks point vertically to the top.
- Install the gear (2) identification **A** such that the marks point vertically to the top.



- Slide the special tool **0 493 681 (64 1 020)** or another suitable tool through the gear into the counterbalance shaft.
- Carefully insert the counterbalance shaft (1) into the gear on the intake side.

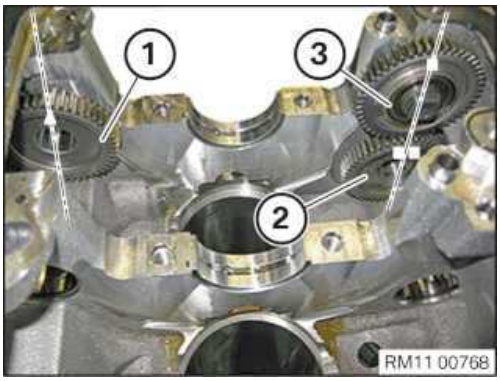


- Slide the special tool **0 493 681 (64 1 020)** or another suitable tool through the gear into the counterbalance shaft.
- Carefully insert the counterbalance shaft (1) into the gear on the exhaust side.



- The crankshaft must be at the **top dead centre of the first cylinder**.
- The special tool **2 288 054** must be positioned in the guides (1) of the counterbalance shafts (2).

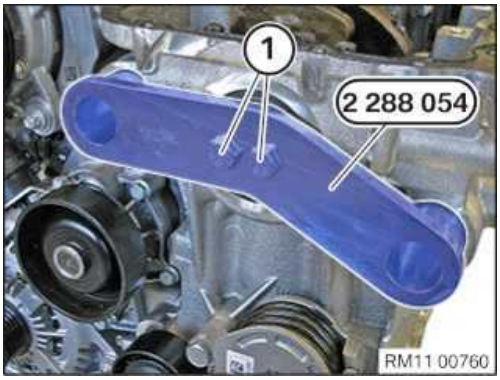
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NOTICE

To provide a better overview: Illustration of surrounding parts in removed state.

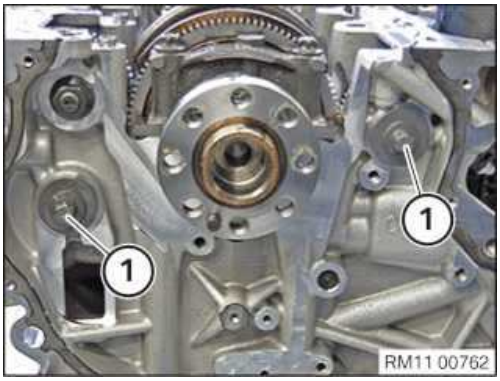
- The identifications on the gears (1) , (2) and (3) must point vertically to the top towards the oil sump sealing surface.



- Secure special tool **2 288 054** with screws (1) to the crankshaft.
- Tighten the screws (1).

Special tool 2 288 054 to crankshaft

M10		Tightening torque	20 Nm



- Renew screws (1).

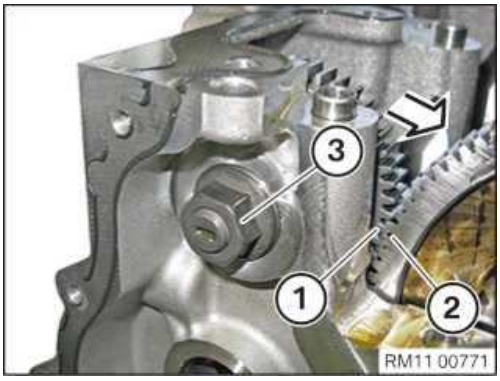
  Parts: Bolts
- Tighten the screws (1).

Gear to counterbalance shaft

M10	Renew screws.	1. Jointing torque	20 Nm
		2. Angle of rotation	180 °



- The gearing of the intermediate wheel engages in the gearing of the crankshaft and the counterbalance shaft.
- Relieve tension on special tool **0 495 131 (11 5 370)** and remove.

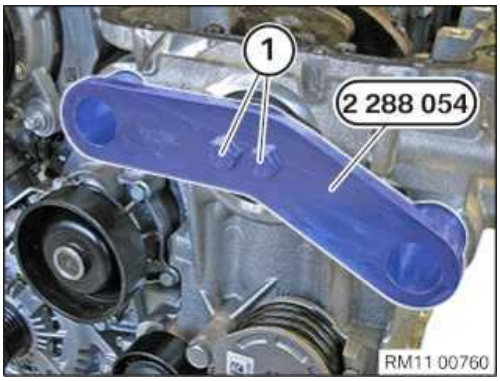


- Move the intermediate wheel (1) in the direction of arrow on the crankshaft (2) to the equipment.
- Tighten nut (3).

Idler gear to crankcase

M12x1.5		Tightening torque	10 Nm
		Angle of rotation	45 °

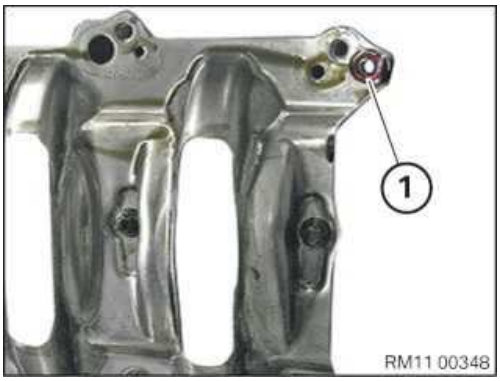
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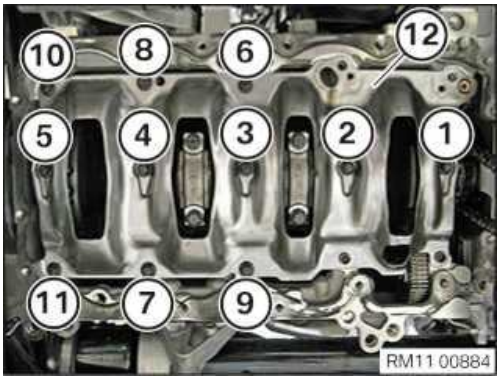
- Unscrew the bolts (1) and remove the special tool **2 288 054**.
-

POSTPROCESSES

36 – Installing the oil deflector



- Check sealing ring (1) for damage and replace oil deflector if necessary.
  Parts: Oil deflector



- Insert and install the oil deflector (12).
- Renew screws (1) to (11).
  Parts: Bolts
- Hand-tighten the bolts (1) to (5).
- Hand-tighten the bolts (6) to (11).
- Tighten the screws (1) to (5).

Oil deflector to crankshaft bearing cap

M8x14	Replace screws.	Tightening torque	35 Nm
		Release	180 °
		Tightening torque	15 Nm
		Angle of rotation	45 °

- Tighten the screws (6) to (11).

Oil deflector to crankcase

M8x14		Tightening torque	19 Nm

37 – Install the oil vacuum pump

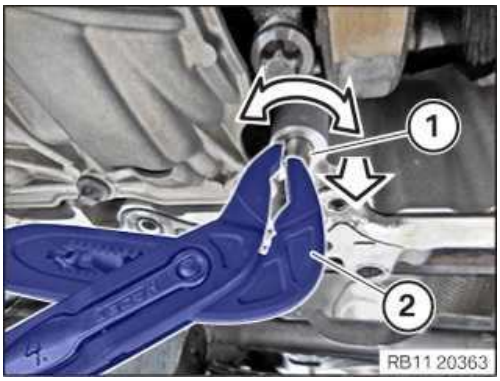
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

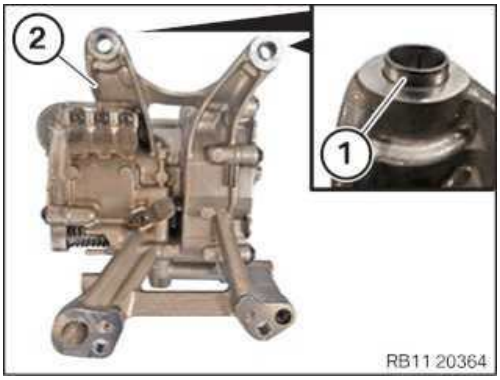
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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- Remove centering sleeves from the crankcase (1) using a standard tool (2).
- Renew the centring sleeves (1).

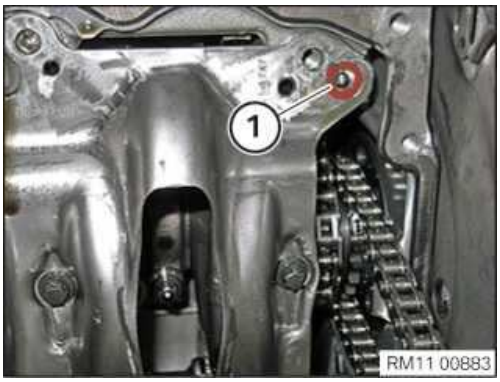
  Parts: Centring sleeves



- Install centering sleeves (1) in the oil vacuum pump (2).

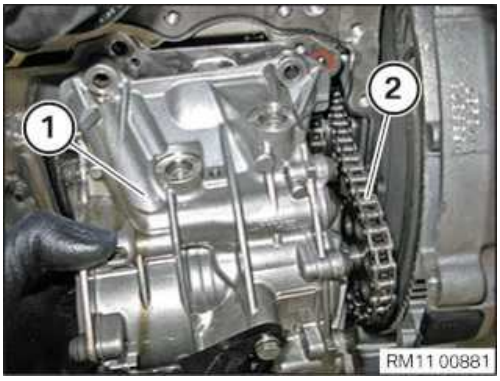


- Check the sealing ring (1) for damage and renew where required.
- Make sure the sealing ring (1) is installed correctly.



- Check sealing ring (1) for damage and replace oil deflector if necessary.

  Parts: Oil deflector



- Insert oil vacuum pump (1) into the drive chain (2).

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- Renew screws (1).

  Parts: Bolts

- Tighten the screws (1) of the oil vacuum pump (2).

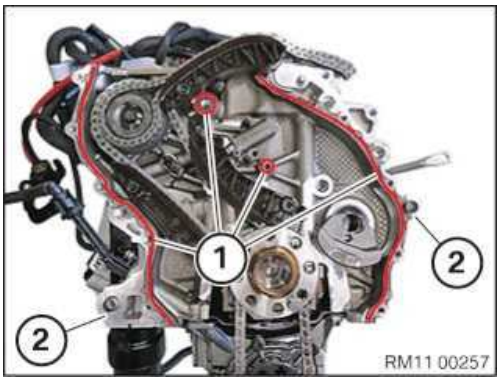
Oil vacuum pump to crankcaseB47

M8x35		Tightening torque	19 Nm

38 – Install the rear timing case cover

Prerequisite

Transmission is removed.



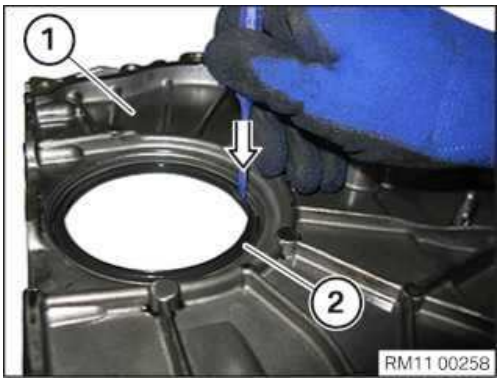
RISK OF DAMAGE

Damage to the surface.

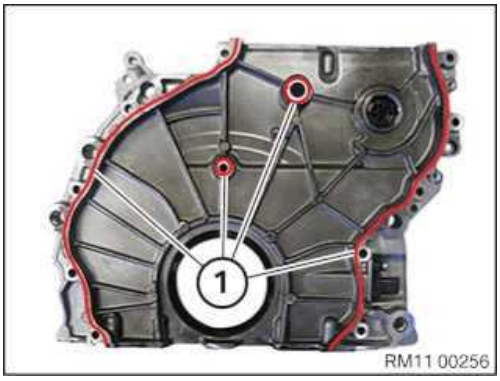
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Remove seal residue from the sealing surfaces (1) using special tool **0 495 102 (11 4 470)**.
- Check fitting sleeves (2) for damage and for tight fit; renew if necessary.

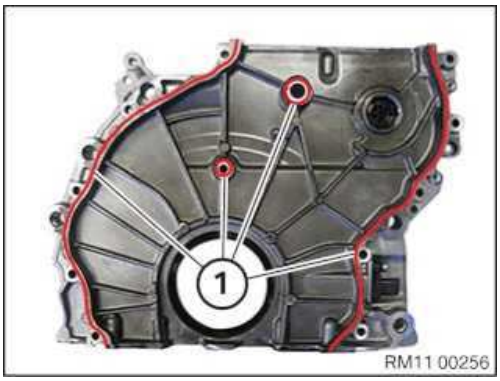


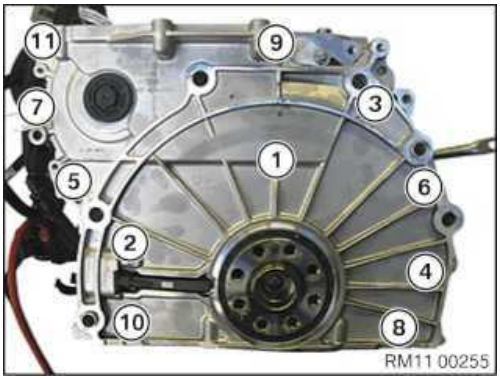
- Position the timing case cover (1) underneath.
- Position punch on inner side of crankshaft seal (2).
- Drive out crankshaft seal (2) outwards.



- Remove seal residue from the sealing surfaces (1) using special tool **0 495 102 (11 4 470)**.

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TECHNICAL INFORMATION

For more information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

- Apply sealing bead (1) with a height of approx. 1.5 mm to 2.0 mm on inner side of timing case cover in marked locations. Use liquid sealing compound for this.

  Application time of sealing bead (1) must not exceed 12 minutes.

- Mount the timing case cover without the crankshaft seal.
- Renew screws (1) to (11).

  Parts: Bolts
- Join the bolts in with the sequence (1) to (11).
- Tighten screws in the order (1) to (11).

Rear timing case cover to crankcase

M6	Renew screws.	Jointing torque	8 Nm
		Angle of rotation	90 °

▸ **Installing the rear crankshaft seal**

RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) on the radial shaft seal with the sharp-edged connector gearing of the output shaft will result in destruction and/or leaks.

- When inserting the output shaft, make sure that the connector gearing of the output shaft does not touch the sealing lip (inner) of the radial shaft seal.

RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) and applying oil to the radial shaft seal will lead to its destruction.

- Do not touch the sealing lip (inner) of the radial shaft seal.
- Do not apply oil to the radial shaft seal.
- Install the radial shaft seal dry.

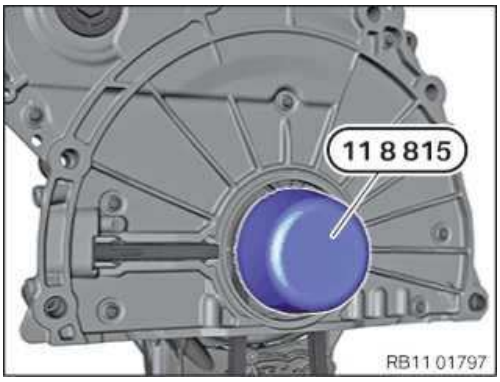
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RISK OF DAMAGE

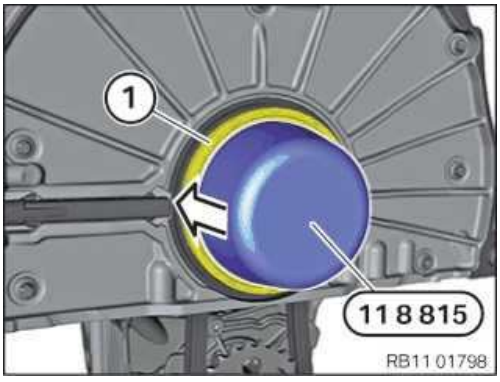
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Position special tool **0 496 137 (11 8 815)** on crankshaft. Make sure that the crankshaft sensor is not damaged.



- Fit the crankshaft seal (1) up to the timing case cover in the direction of the arrow using special tool **0 496 137 (11 8 815)** and position.
- Remove special tool **0 496 137 (11 8 815)**.



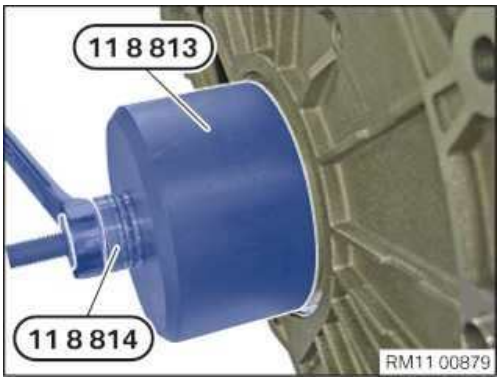
- Secure special tool **0 496 133 (11 8 811)** to the crankshaft using special tool **0 496 134 (11 8 812)**.



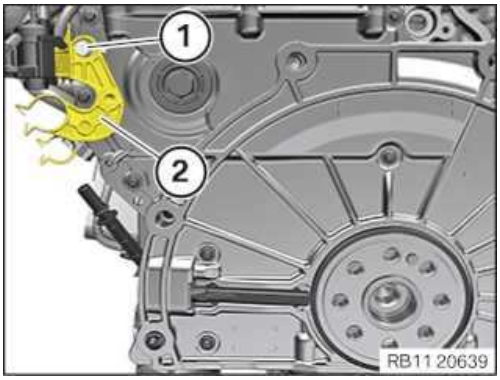
- Check the freedom of movement between the special tool **0 496 135 (11 8 813)** and the crankshaft sensor during installation.

  Otherwise there is a risk that the crankshaft sensor will be damaged.
- Slide on special tool **0 496 135 (11 8 813)**.
- Screw down special tool **0 496 136 (11 8 814)**.

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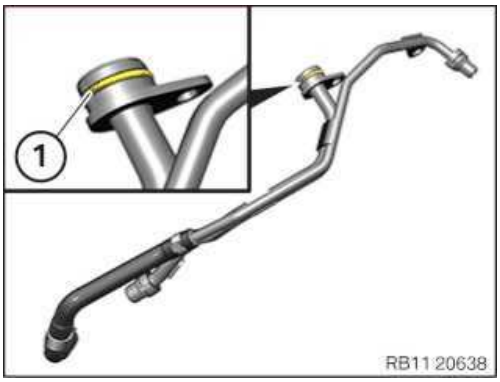


- Press in crankshaft seal with special tool **0 496 135 (11 8 813)**.
- Screw in special tool **0 496 135 (11 8 813)** up to timing case cover.



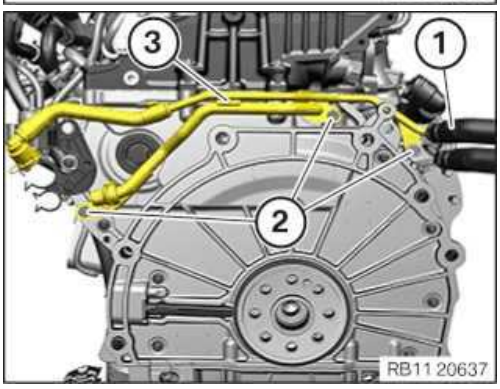
- Insert and install the holder (2).

▶ **If installed: Installing the coolant line of the SCR metering module**



- Renew the O-ring 1.

  Parts: O-ring



- Feed in and install coolant line (3).
- Tighten down screws (2).

SCR coolant lines to crankcase end cover

Hexagon screw M6x16		Tightening torque	8 Nm

- Connect and lock the coolant line (1).

  Coolant line (1) must audibly engage.

▶ **Cleaning the sealing surface**

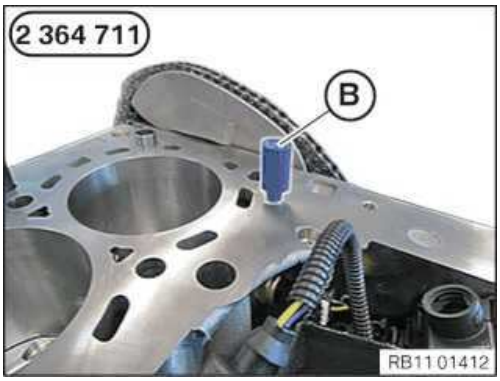
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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- Lock the front oil duct using special tool (B) from special tool **2 364 711**.



RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 103 (11 4 471)**.



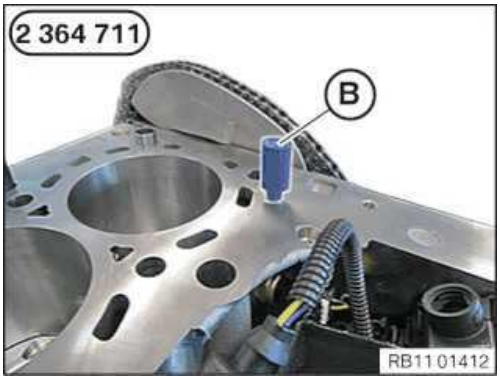
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

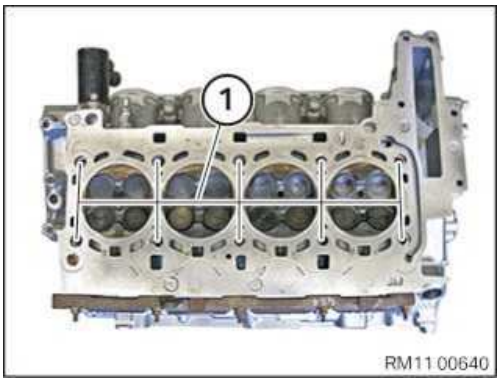
- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 104 (11 4 472)**.



- Remove special tool (B).

▸ **Renewing the cylinder head gasket**



RISK OF DAMAGE

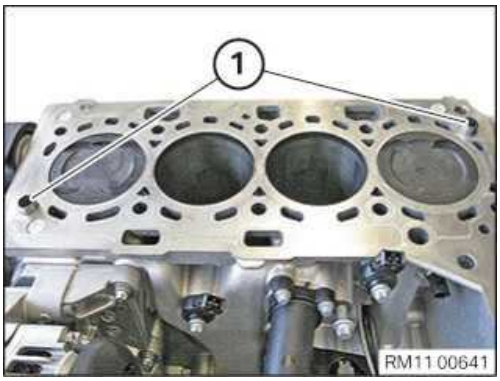
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

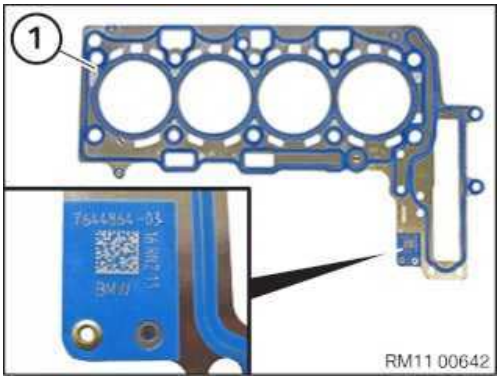
- Do not use any metal-cutting tools.

- Remove oil and dirt residue from the blind holes (1).

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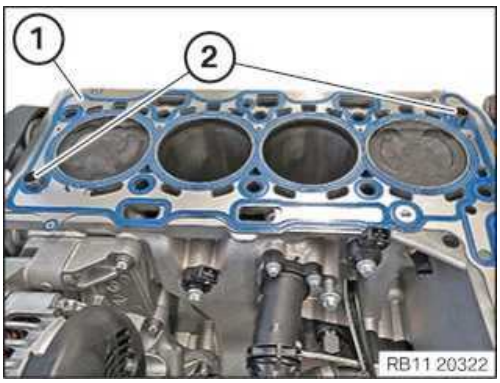


- Check the fitting sleeves (1) for secure fit and damage.



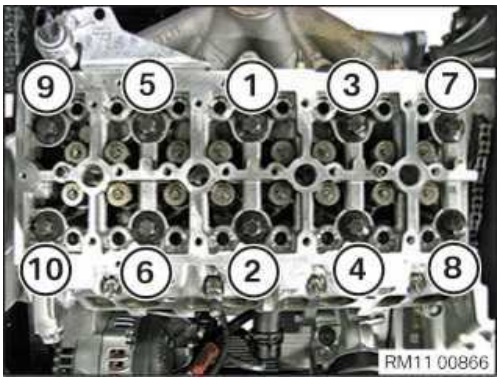
- Identify the cylinder head gasket (1) using the part number.

Note: If the cylinder head is reworked, an additional thicker gasket 0.3 mm is available for service personnel.



- Guide in the cylinder head gasket (1) and install.
- Ensure that the cylinder head gasket (1) is installed correctly in the fitting sleeves (2).

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CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Damage to threads.

Fluid in the threaded hole may damage the thread when screws are tightened in the threads.

- Dry threaded holes (e.g. using compressed air).

TECHNICAL INFORMATION

Do not remove bolt coating.

- Renew the cylinder head bolts (1).

  Parts: Cylinder head bolts
- Do **not** wash off coating of cylinder head bolts.
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

  No coolant, water or engine oil must be present in threaded holes of engine block.

TECHNICAL INFORMATION

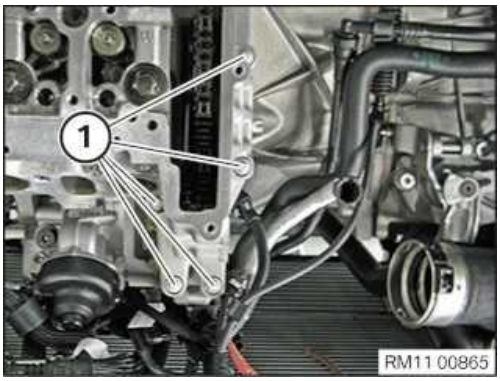
When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Feed in cylinder head bolts and install.
- Screw in cylinder head bolts in sequence (1) to (10).
- Tighten cylinder head bolts using special tools **0 490 504 (00 9 120)** and in sequence (1) to (10).

Cylinder head to crankcase

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

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- Tighten the cylinder head bolts (1).

Cylinder head bolt to timing case cover

M8x40		Tightening torque	19 Nm

-



TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

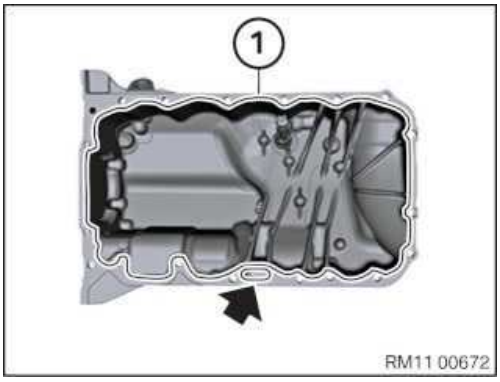
- Remove fine sealing remains on the sealing surface (1)and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.



TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove coarse sealing remains on the sealing surface (1)and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.



TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- Apply the sealing compound along the line (1) with a thickness of 2 mm to 2.5 mm.

  Apply the sealing compound along the inner edge.

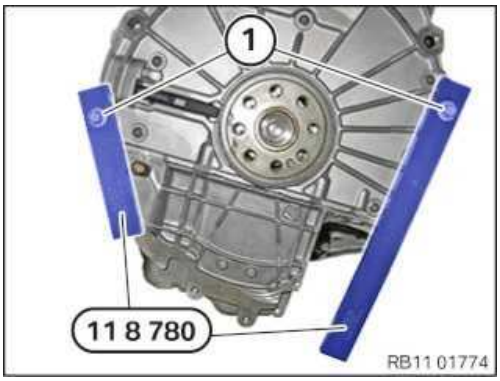
Sealing compound

Loctite 5970 liquid sealing compound	50 ml, Cartridge	83190404517

Overview of consumables (Electronic Parts Catalogue)

- Completely encircle the oil return orifice (arrow) with the sealing compound.

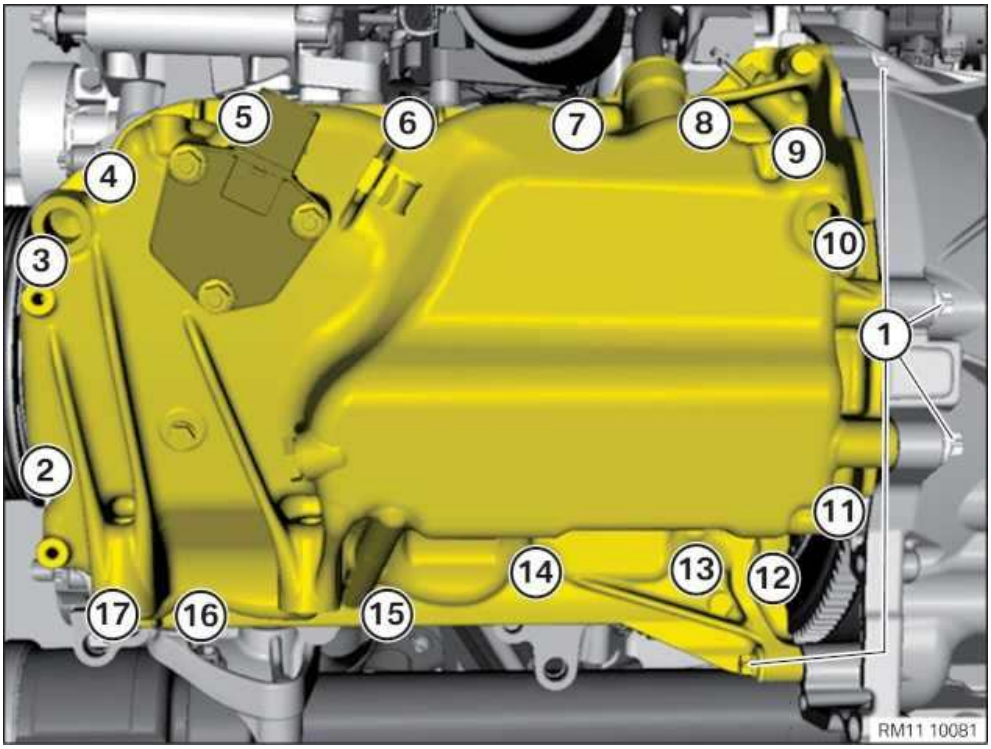
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TECHNICAL INFORMATION

The special tool 11 8 780 is only required when the transmission is removed.

- Position the special tool **0 496 120 (11 8 780)** with the transmission bolts (1) so that the oil sump is exactly flush with engine block.
- If necessary, renew fitting sleeves.



- Position and install oil sump.
- **Hand-tighten** oil sump screws (2) to (17) but do **not** tighten completely.
- Join transmission bolts (1) with 5 Nm.
- Tighten screws(2) to (17) of the oil sump.

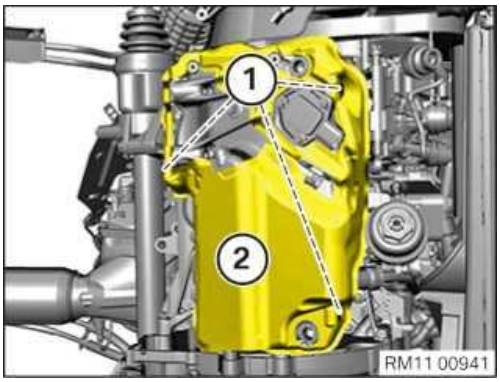
Oil sump to crankcase

M8x30		Tightening torque	2 Nr
M8x110		Tightening torque	2 Nr

- Tighten transmission bolts (1) on oil sump.

Transmission to oil sump

M8		Tightening torque	1 Nr



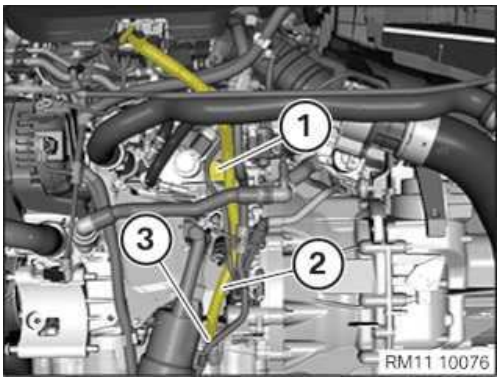
- Thread in and position the acoustic cover (2).
- Install the expanding rivet (1).



- Renew O-ring (1).

  Parts: O-ring

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- Guide in guide tube (2) for oil dipstick and insert it into oil sump.
- Make sure the sealing ring (3) is positioned correctly in the oil sump.
- Tighten down screw (1).

Guide tube for oil dipstick on engine

M8x16		Tightening torque	19 Nm

39 – Installing the flywheel

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

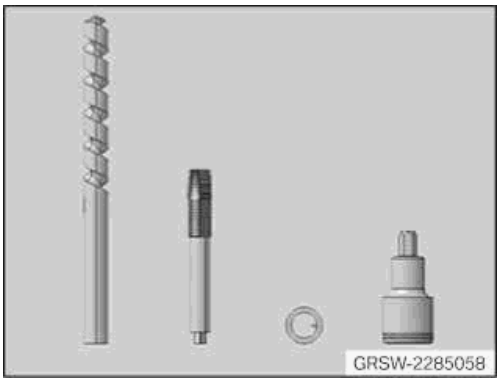
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



TECHNICAL INFORMATION

Clean all threads with a screw tap.

- Clean all screw threads (1).



- Use the set of special tools **2 285 058**.

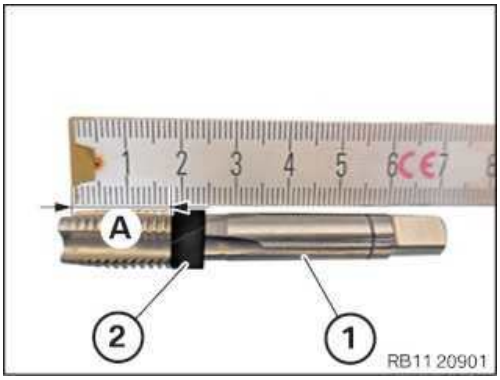
Description
Twist drill
Thread cutter M12x1.5
Depth
Insertion tool

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- Assemble tool set.

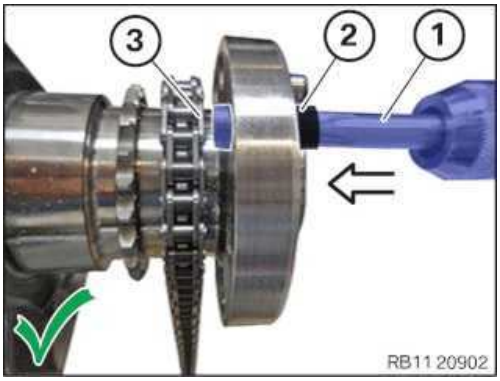
Number	Description
1	Tool holder
2	Thread cutter M12X1,5



- Mark the screw-in depth (A) on thread cutter (1) from the set of special tools **2 285 058** with a standard tool (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm



NOTICE

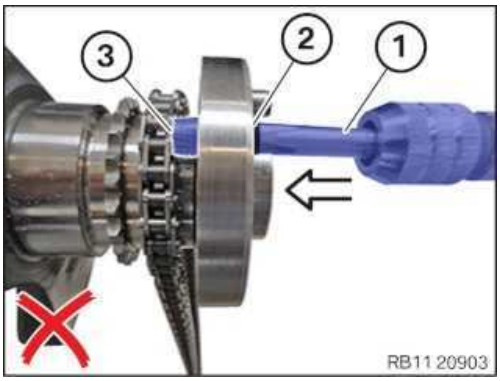
To provide a better overview: Shown with engine removed.

- Screw in the thread cutter (1) from the set of special tools **2 285 058** in direction of arrow up to the screw-in depth (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm

- Make sure that the thread cutter does (1) **not** rest on the timing chain (3).

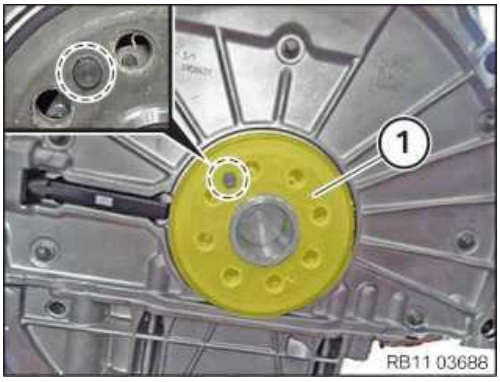


TECHNICAL INFORMATION

- **Carefully** handle the timing chain, to protect the timing chain and timing chain drive against damage.

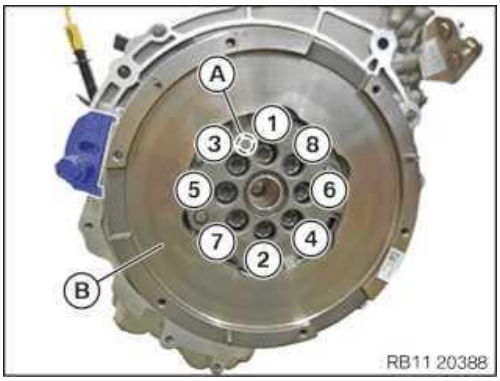
- Make sure that the screw-in depth (2) of the screw tap (1) is not exceeded.

  The thread cutter (1) may not rest on the timing chain (3).



- During the installation, note the mark shown without fail.
- Install special tool (1) on the crankshaft as shown.

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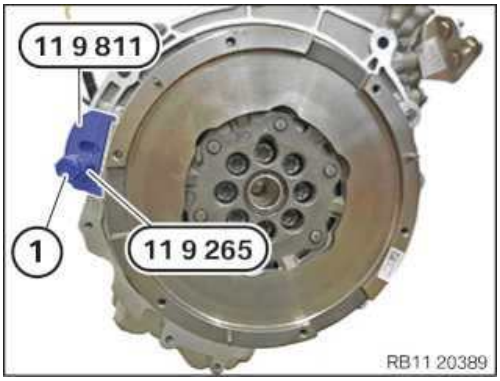


- Position flywheel (B) .
- Renew flywheel bolts (1) to (8).

  Parts: Flywheel bolts
- Tighten flywheel bolts hand-tight with special tool **0 491 018 (11 4 180)**.
- Observe tightening sequence. While doing so, begin with dowel pin (A).
- Tighten the flywheel bolts using the special tool **0 491 018 (11 4 180)** in sequence (1) to (8).

Flywheel to crankshaft

M12x1.5	Renew screws.	Tightening torque	120 Nm



- Loosen the transmission bolt (1).
- Feed out and remove special tools **0 494 793 (11 9 265)** and **0 496 171 (11 9 811)** with the **standard** (5 mm) washer.

40 – Install clutch

CAUTION

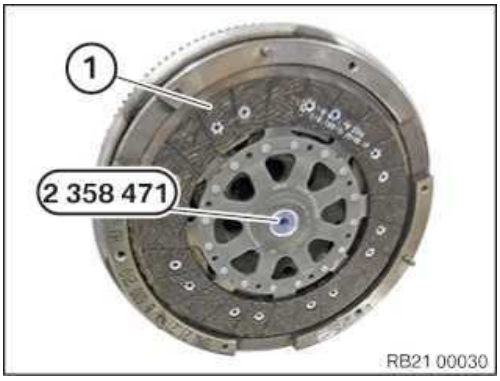
Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

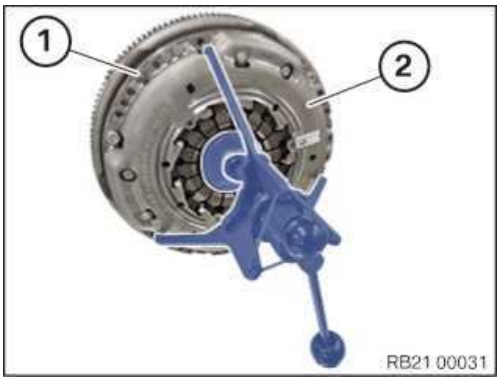
TECHNICAL INFORMATION

Handle the clutch disc carefully. Install the surfaces of the clutch disc in the correct mounting orientation.
Clean friction surfaces of the flywheel and the pressure plate with BMW-approved brake cleaner.
Note designation for ”engine side” / ”transmission side”.

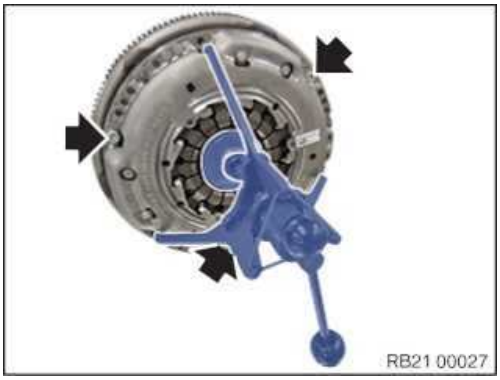


- Centre the clutch disc (1) using special tool .

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- Mount the clutch (2) together with the special tool to the flywheel.
- Observe the dowel pins (1).
- The clutch (2) must be secured via the dowel pins (1).

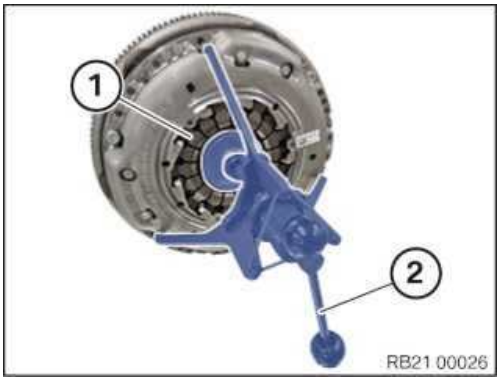


- Renew the bolts (arrows).

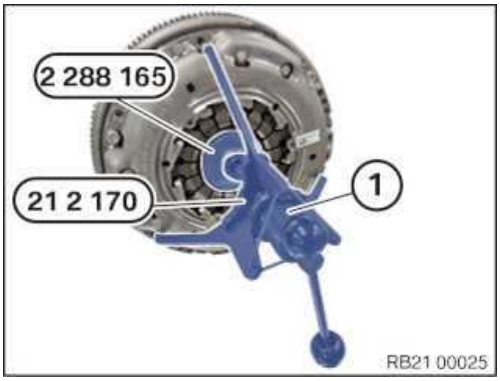
  Parts: Bolts
- Install and tighten screws (arrows).

Clutch to flywheel

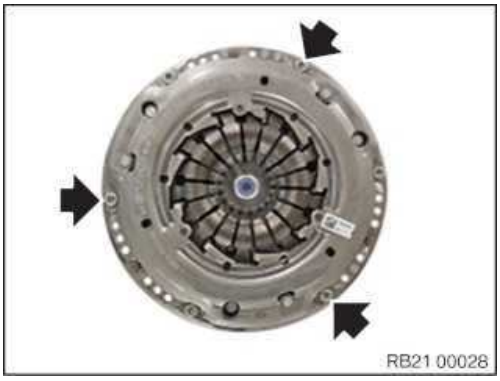
M8	Renew screws.	Jointing torque	15 Nm
		Angle of rotation	90 °



- Loosen the spindle (2) until the diaphragm spring (1) is fully relieved.



- Unscrew the knurled screw (1) and remove the special tool with **2 288 165** from the clutch.



- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Clutch to flywheel

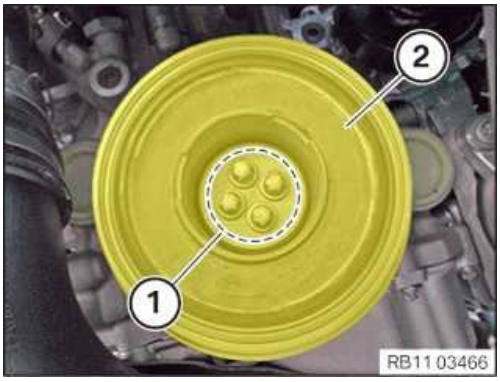
M8	Renew screws.	Jointing torque	15 Nm
		Angle of rotation	90 °

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- Withdraw special tool from clutch disc with aid of accompanying screw.

41 – Installing the vibration damper

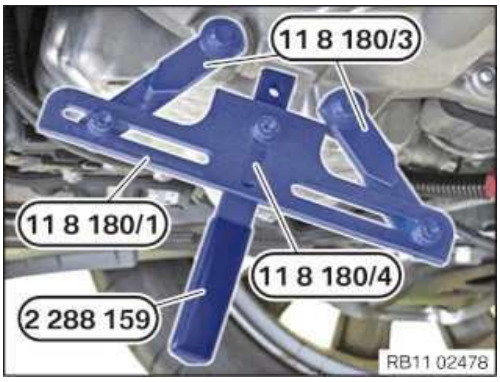


- Position vibration damper (2).
- Renew screws (1).

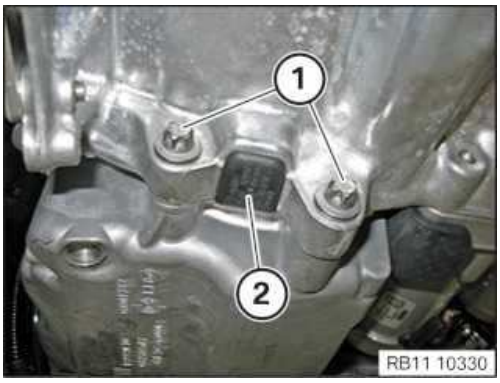
  Parts: Bolts
- Fasten the vibration damper (2) with the bolts (1).
- Tighten the screws (1).

Vibration damper with belt pulley to crankshaft

M10x65	Renew screws. Tighten screws crosswise.	1. Jointing torque	40 Nm
		2. Angle of rotation	60 °
		3. Angle of rotation	60 °



- Release the transmission bolts and remove the special tool **0 493 587 (11 8 180)**.



- Tighten transmission screws (1).

Transmission to engine

M8		Tightening torque	19 Nm

- Install protective cap (2).

42 – Installing the hydraulic valve clearance compensating element

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

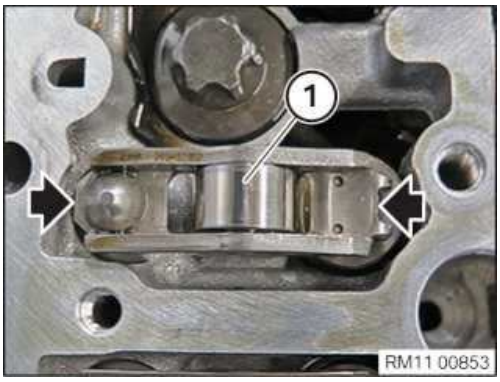


- Install the hydraulic valve clearance compensating element (1) in the direction of the arrow.
- Repeat the process on all hydraulic valve clearance compensating elements.

43 – Install the roller cam followers

TECHNICAL INFORMATION

- Note the installation position of the component. The component may be installed in various installation positions.

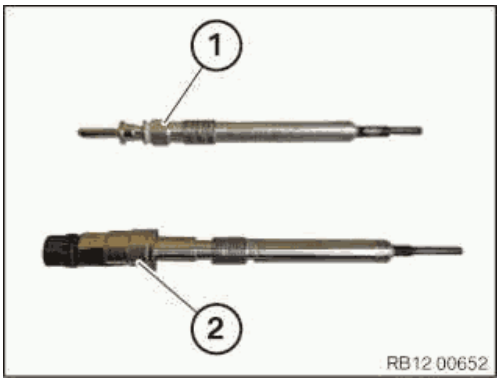


- Check all roller cam followers (1) for damage and replace if necessary.

  Parts: Roller cam followers
- Insert and install all roller cam followers (1).

  Roller cam followers (1) that have already been used must be installed in the same place.
- Note the mounting orientation of the roller cam followers (1).
- Oil all roller cam followers (1).

44 – Install glow elements



- Install glow elements (1) in cylinders 1, 2, 3 and 4.
- If fitted: Glow element (2) with the **combustion chamber pressure sensor** must be installed in cylinder **2**.

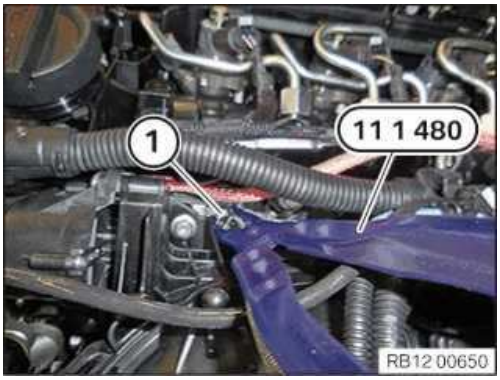
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- Tighten the glow element with the special tool or conventional tools.

Glow elements to cylinder head

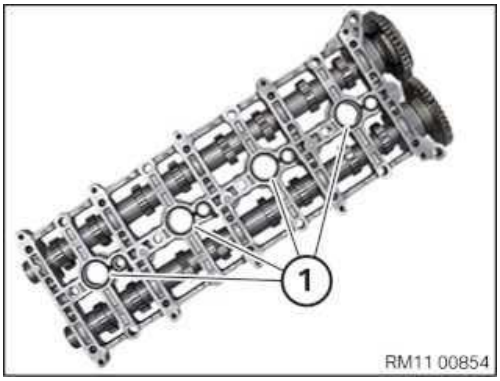
Glow element		Tightening torque	13 Nm



- Connect connectors (1) and lock.

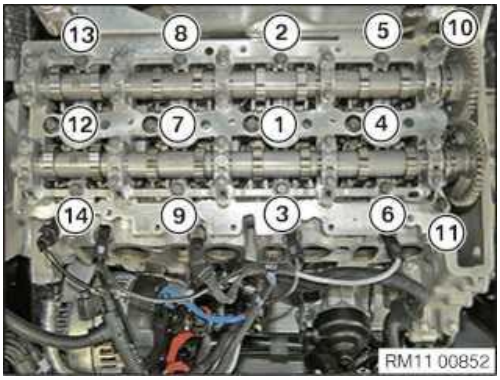
  The connector (1) must engage audibly.

45 – Installing the camshaft support



- Renew gaskets (1).

  Parts: gaskets



- Position the camshaft support including the camshafts.
- Tighten the screws in a sequence from (1) to (14) in several steps.

Camshaft carrier to cylinder head

M7x35		Tightening torque	13 Nm

46 – Adjusting the timing of the camshafts



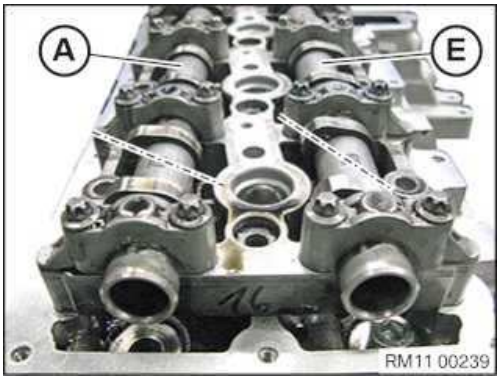
- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

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- Slide the special tool **2 288 380** completely into the bore hole of the oil sump.
- Use the special tool to block **2 288 380** the crankshaft in the TDC firing position at the first cylinder.



- The cam of the intake camshaft (E) at the first cylinder points up at an angle.
- The cam of the exhaust camshaft (A) at the first cylinder points outward at an angle.

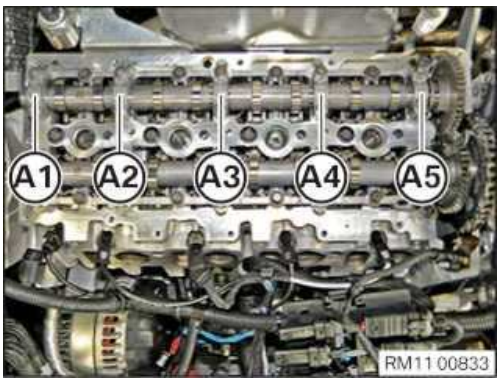
▸ **Remove exhaust camshaft.**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



TECHNICAL INFORMATION

The camshaft is tensioned by the valve springs. Tighten or loosen each screw on the camshaft bearing caps one at a time in the specified sequence and by half a turn only. Repeat procedure.

- Loosen all screws of the exhaust camshaft bearing caps (A1) to (A5) from the outside to the inside, step by step in 1/2 turns.
- Remove exhaust camshaft in upward direction.
- Place all components on special tool **0 495 105 (11 4 480)** in a tidy and orderly fashion.

▸ **Remove chain tensioner piston**

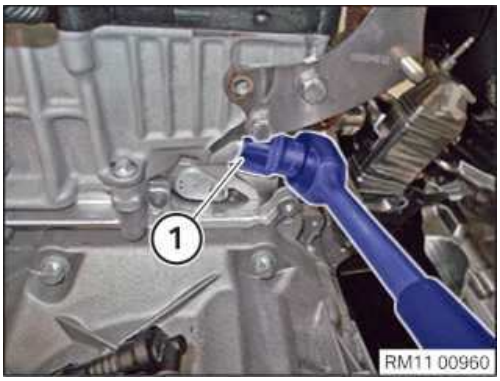
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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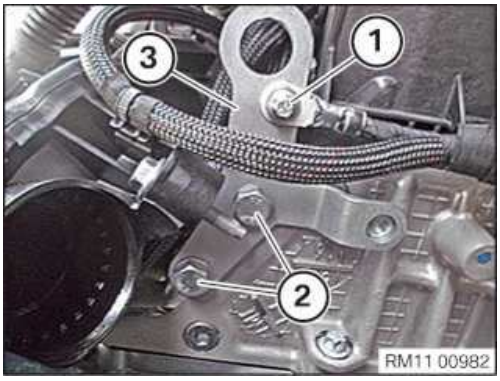


TECHNICAL INFORMATION

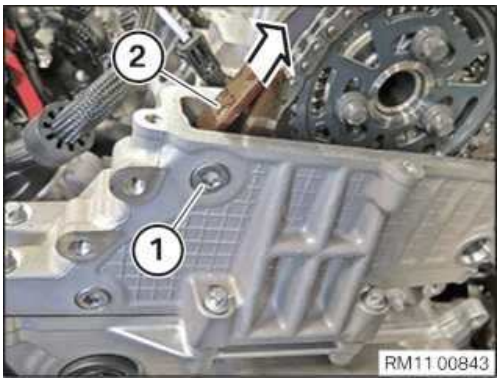
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

▶ **Remove the timing chain guide rail**

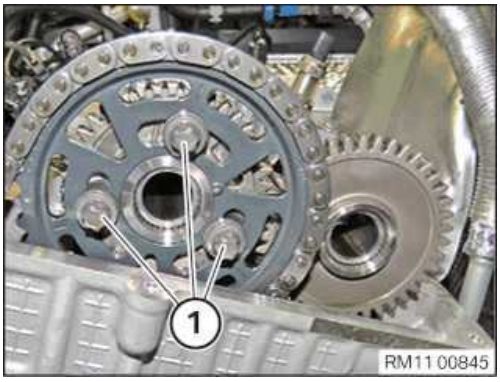


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

▶ **Removing the camshaft sprocket on the intake camshaft**



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

▶ **Install exhaust camshaft**

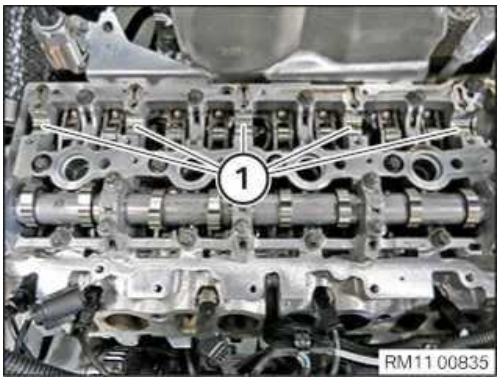
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RISK OF DAMAGE

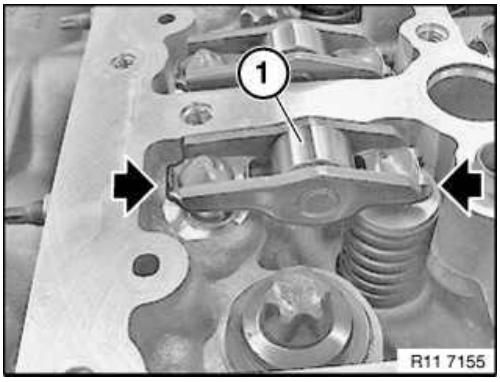
Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

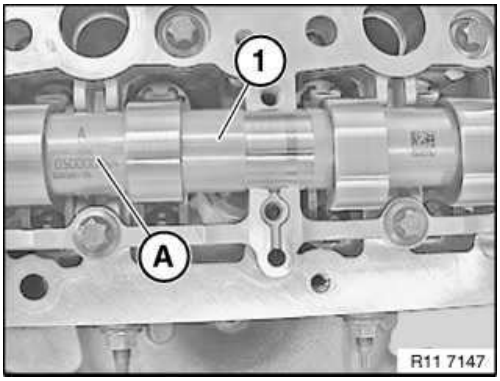
- Comply with the regulations for the installation and disassembly.
- Perform work with care.



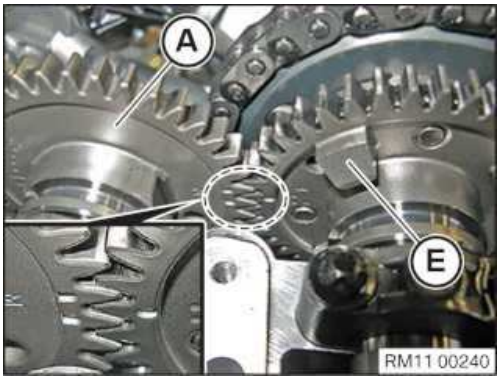
- Oil all bearing positions (1).



- Make sure the roller cam followers (1) have the correct mounting orientation.

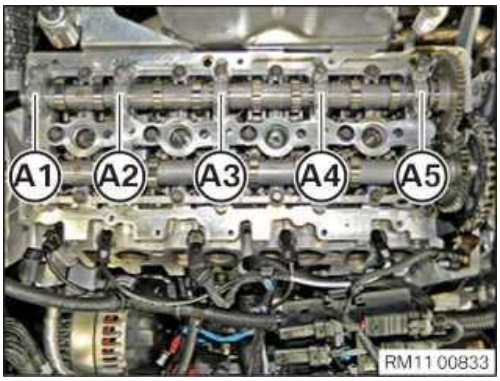


- Insert exhaust camshaft (1) so that the identification (A) points upwards.



- Insert the exhaust camshaft (A) so that the marks on the camshafts (A) and (E) correspond in the highlighted area.
- Position the camshafts (A) and (E) accordingly.

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- Tighten all exhaust camshaft bearing caps (A1) to (A5) from the inside to the outside by 1/2 a turn at a time.

Intake and exhaust camshaft in camshaft support

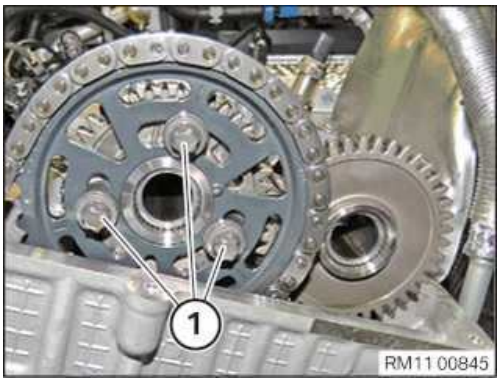
M6x31		Tightening torque	10 Nm



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

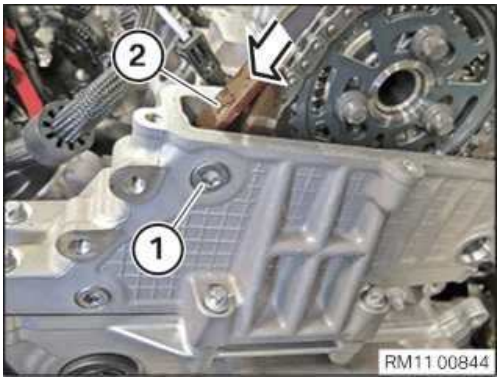
  Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

▶ **Installing the camshaft sprocket on the intake camshaft**



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

▶ **Install the timing chain guide rail**



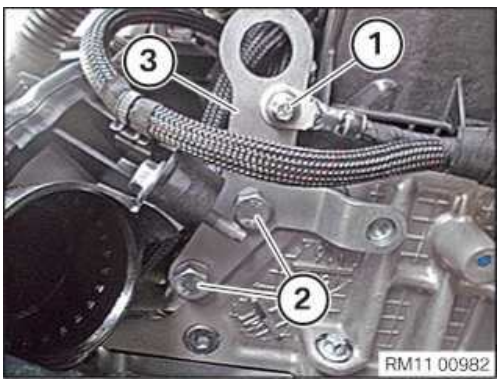
- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm



- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6			8 Nm

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▶ **Installing the chain tensioner piston**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Renew sealing ring (1).

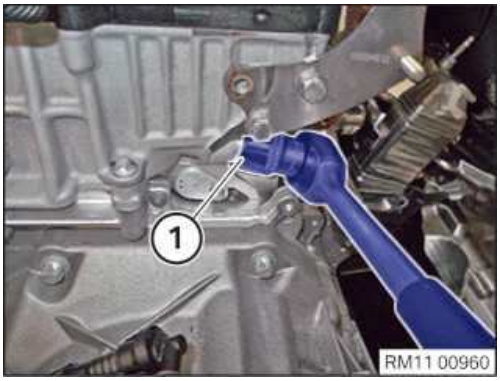
  Parts: Sealing ring



TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.

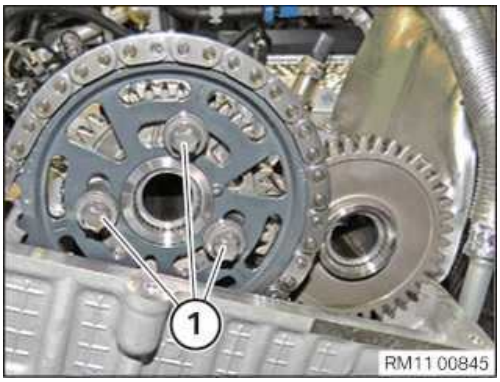


- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

▶ **Tightening the camshaft sprocket on the intake camshaft**



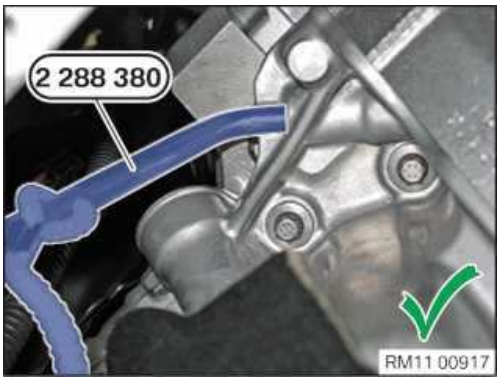
- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

47 – Removing the special tool to disconnect the crankshaft

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- Remove special tool **2 288 380**.

48 – Removing the special tool to secure the exhaust camshaft



- Remove the special tool **0 496 112 (11 8 760)** to fix the exhaust camshaft.

49 – Checking camshaft timing



- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

Damage to the engine.

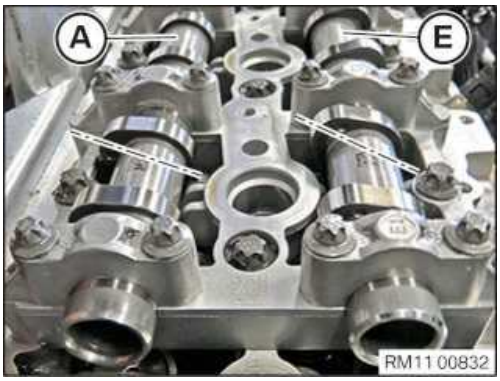
The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

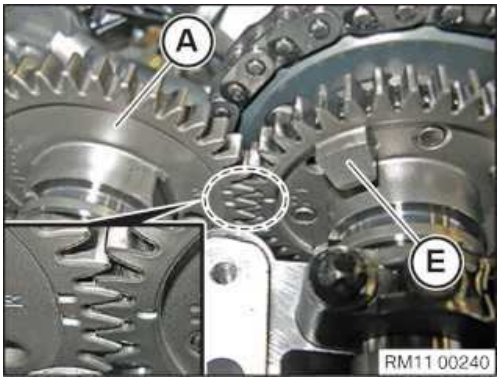
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- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

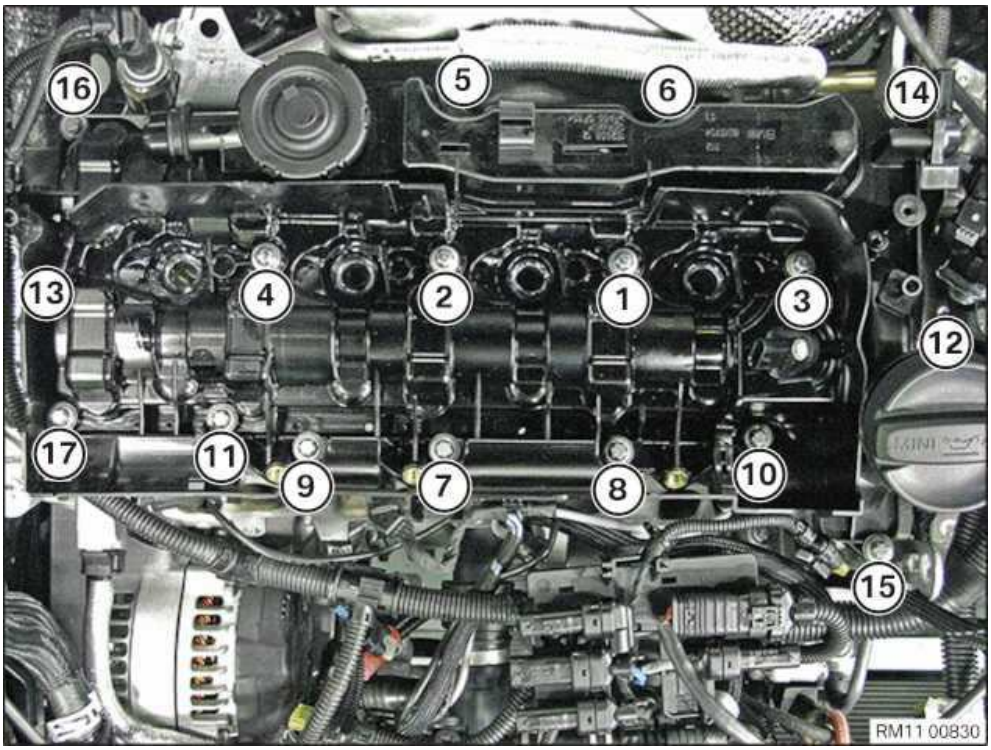
- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.



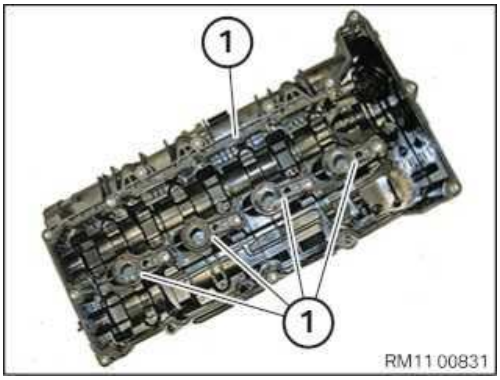
- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

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Overview: Screw connection of the cylinder head cover

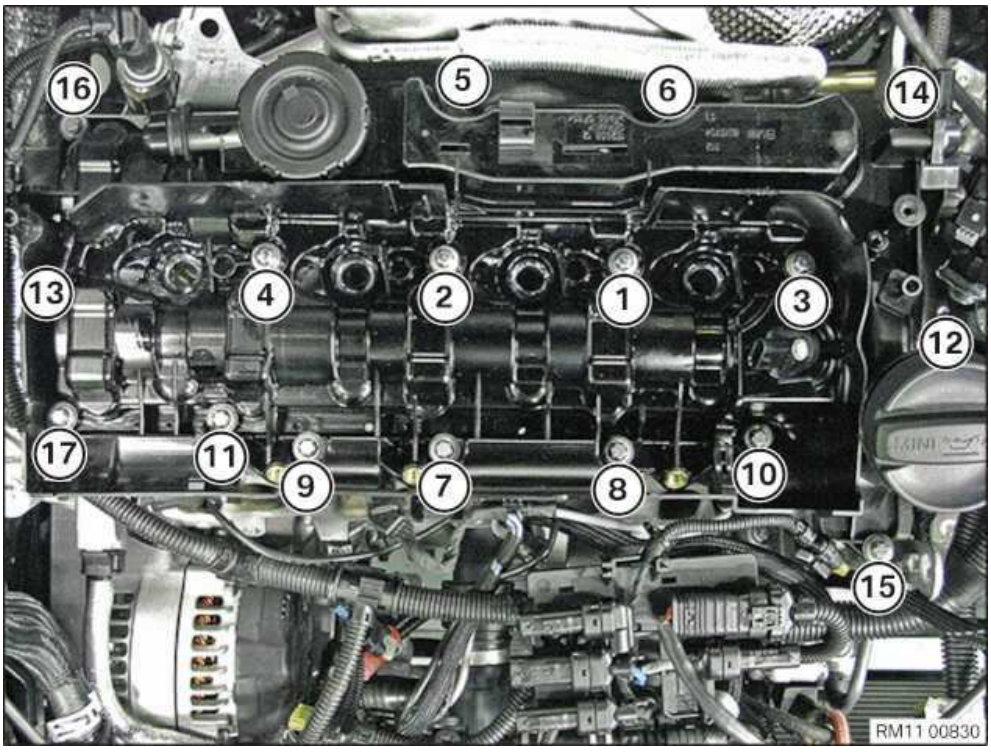


1 to 16 screws of the cylinder head cover.



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket



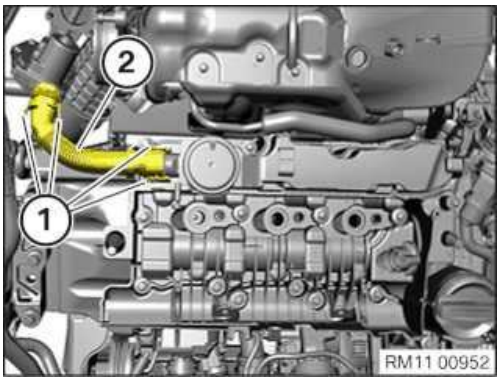
- Install cylinder head cover.
- Tighten screws in the order (1) to (17).

Cylinder head cover to cylinder head

M6		Tightening torque.	8, Nr

-

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- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

51 – Installing injectors of injection system

▸ **Cleaning the injector shafts**

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

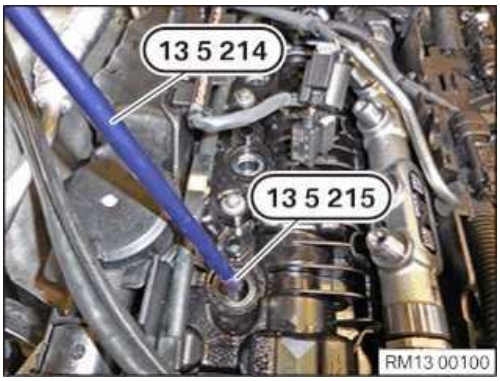
- Wear safety goggles.

RISK OF DAMAGE

Contaminant or foreign body.

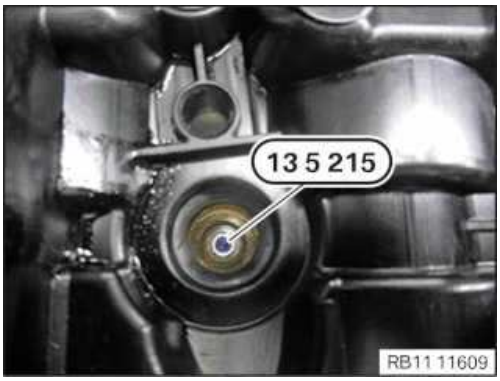
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.

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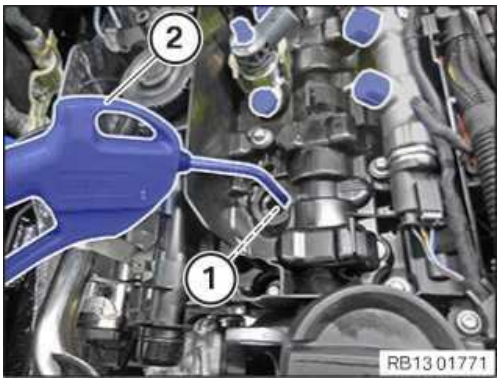
- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.



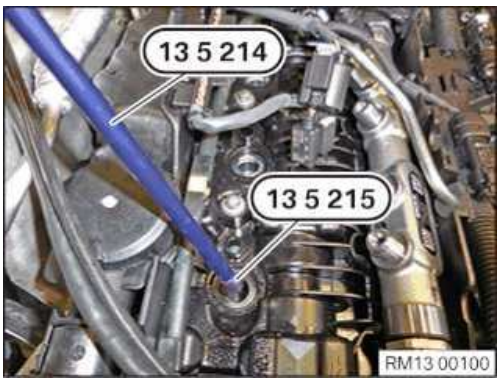
- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.



- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.



- Blow out injector shaft (1) with air gun (2).



- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

► **Check the placement of the clamping claw**

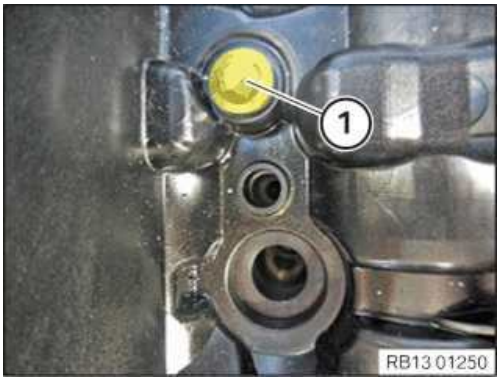
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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▸ **Prepare the injector for installation**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

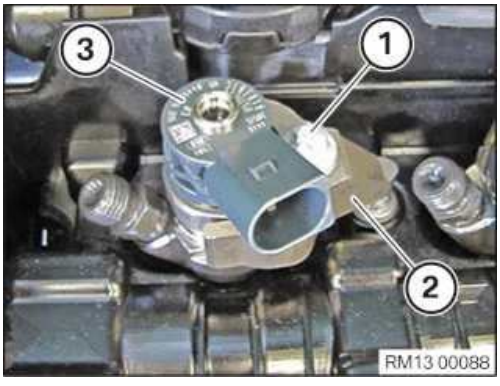


- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring
- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

Injector lubricating grease	50 g, Can	83230441070

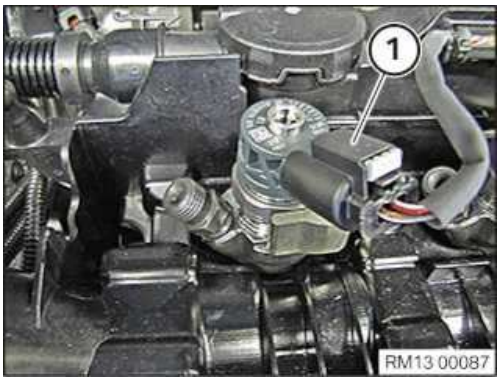


- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

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- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

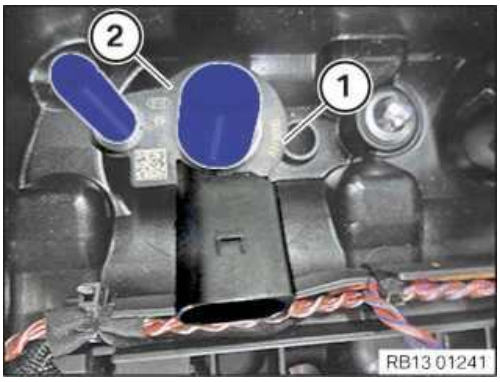
▶ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

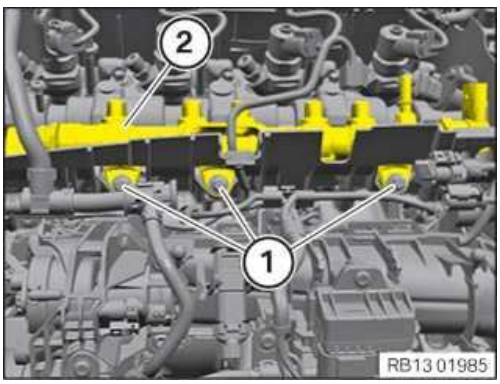


- Read off the adjustment value (1) on the new injector (2).



- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

52 – Installing the rail

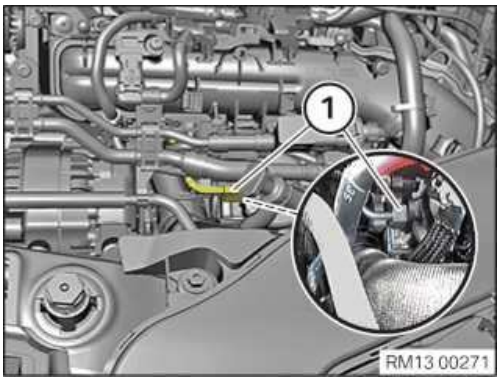


- Carefully insert and install the rail (2).
- Tighten the screws (1).

Rail on cylinder head cover

Torx screw M8x25		Tightening torque	19 Nm

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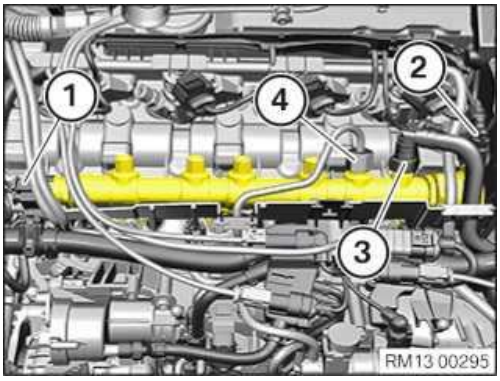
TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten union nut (1).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm



TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten union nut (4) with special tool .

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

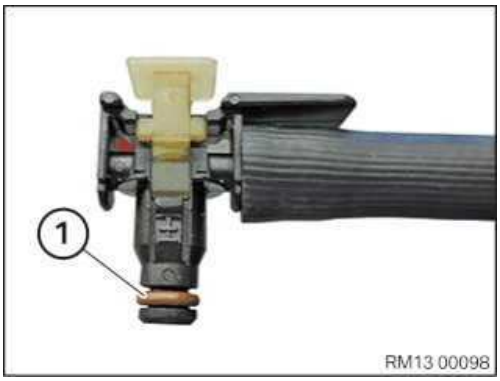
- Connect and lock the fuel line (3).

  Fuel line (3) must engage audibly.
- Connect connectors (2) and lock.

  The connector (2) must engage audibly.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

53 – Connect the leakage oil line on the injector



- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.

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- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

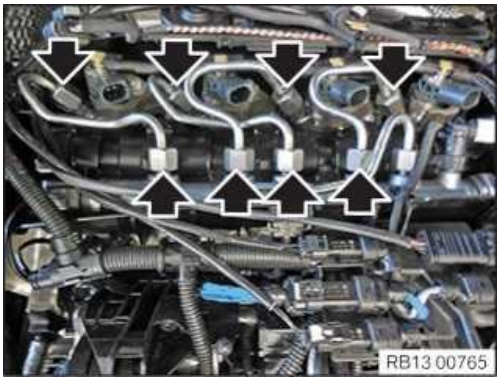
54 – Installing high pressure lines between rail and injectors

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Remove special tool .
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

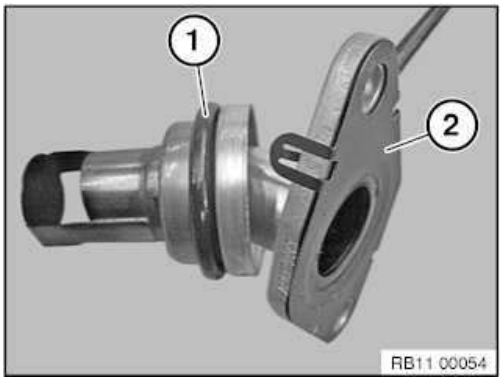
- Tighten the high pressure lines (arrows) with the special tool .

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

55 – Installing the intake plenum

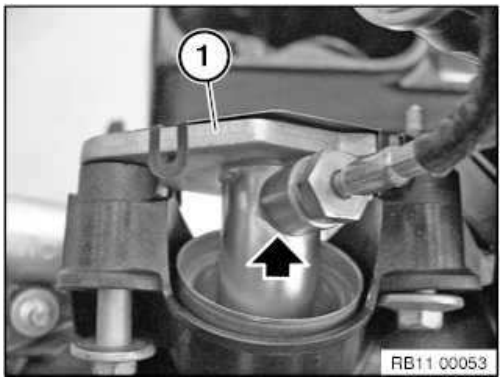


- Renew O-ring (1).

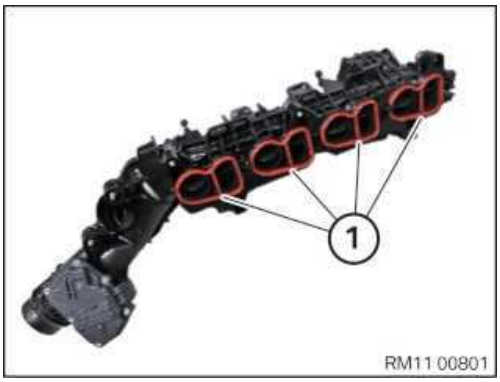
  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position the seal (2) and clip it in.

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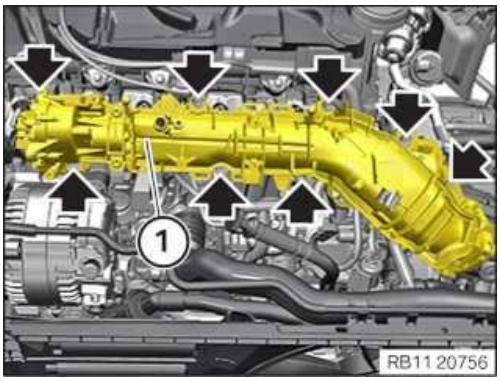


- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (1).

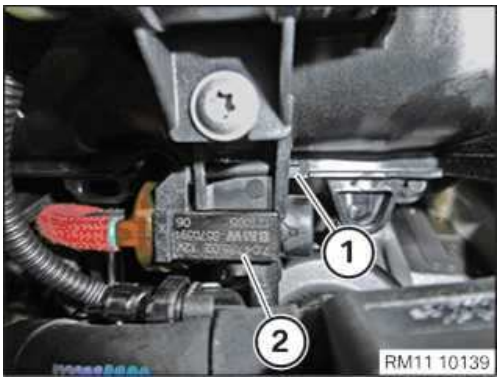
  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.



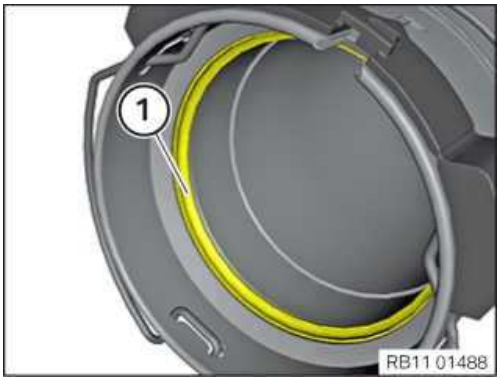
- Guide in and install intake (1) plenum.
- Tighten screws (arrows).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm



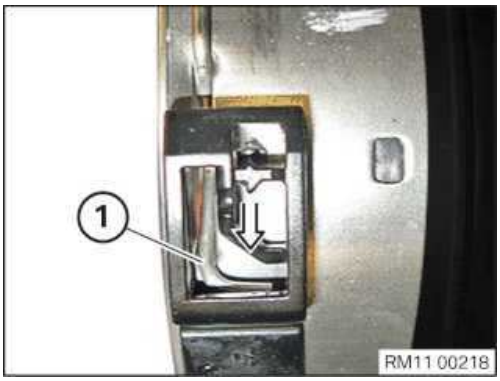
- Install the electric changeover valve (2) in the holder on the plenum from left to right.
- Lock (1) must engage audibly.



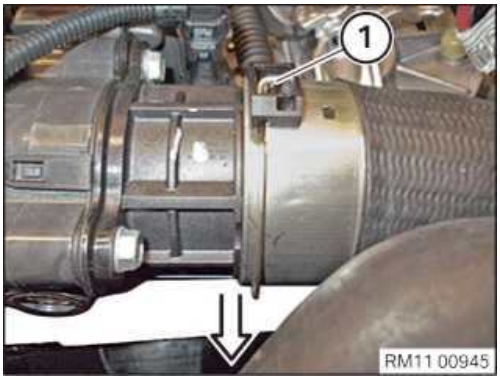
- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring

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- Engage the lock (1) on the bracket (arrow).



- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

56 – Remove the engine from the assembly stand

CAUTION

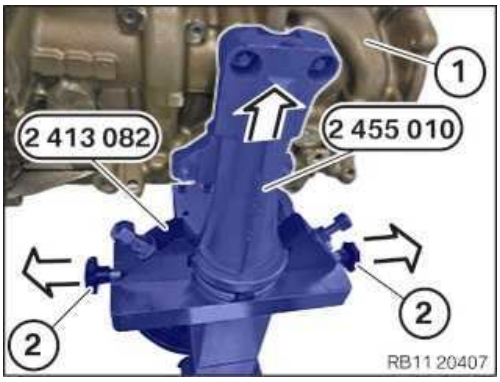
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Insert engine lifter with special tool and position engine (1).

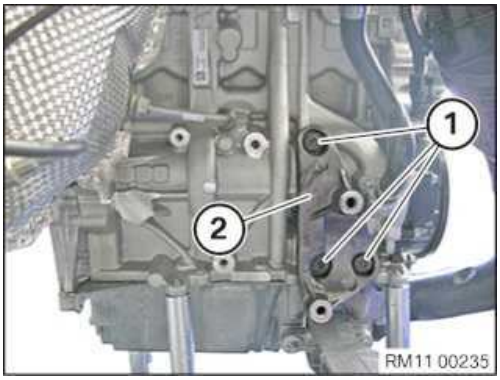


- Unscrew the nuts on special tool .
- Detach the holder (2) in the direction of the arrow.
- Detach the engine (1) with special tool **2 455 010** out of the special tool in the direction of arrow.

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- Remove conventional screws (arrows).
- Feed out the special tool **2 455 010** on the engine (1) and remove.



- Insert and install the holder (2).
- Tighten the screws (1).

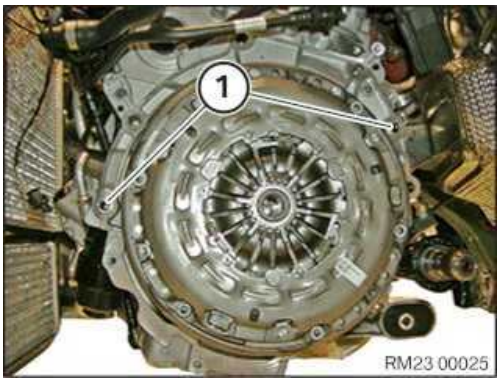
Holder to crankcase

M10		Tightening torque	38 Nm

57 – Mounting engine on manual gearbox

Prerequisite

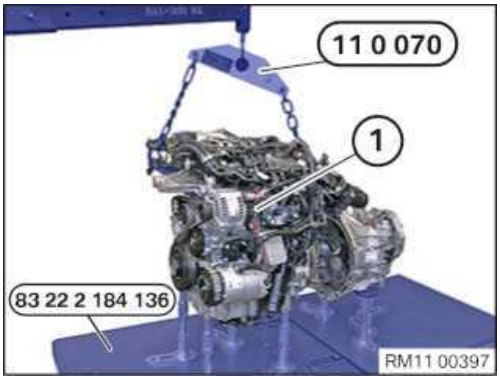
Engine has been removed.



- Check for correct fit of fitting sleeves(1).
- Replace damaged fitting sleeves.

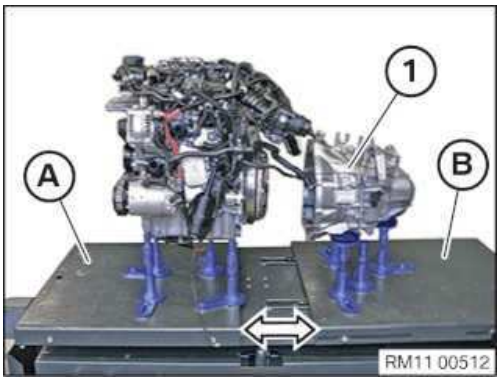


- Remove any grease from the transmission input shaft (arrow) and clean the shaft.
- Do not grease transmission input shaft.
- Check the clutch disc for frictional corrosion in the gearing and renew if necessary.

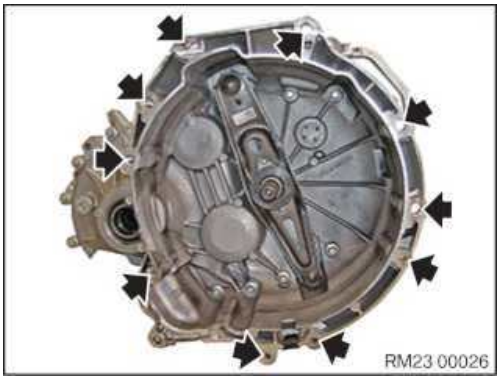


- Position the engine (1) on the lifting table **2 184 136** using the engine lifter and the special tool .
- Feed out engine lifter from engine (1) with special tool and push aside.

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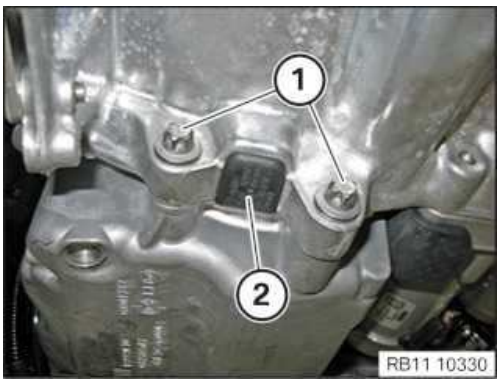
- Push table top (B) in direction of arrow and position manual gearbox (1) on engine.



- Tighten screws (arrows).

Transmission to engine

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm



- Tighten the screws (1).

Transmission to oil sump

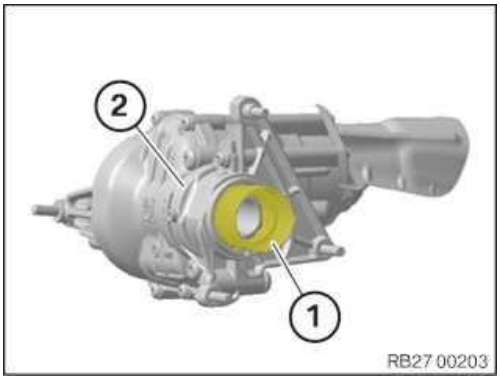
M8		Tightening torque	19 Nm

- Install the protective cap (2).



- Unscrew the bolts (1) of the special tool **2 459 012**.
- Feed out the special tool **2 459 012** at the cylinder head and remove.

58 – Install the transfer box (VTG)



- If intermediate shaft (1) gets caught on transfer box (VTG) (2), renew intermediate shaft (1) and the radial shaft seals in the automatic or manual transmission.

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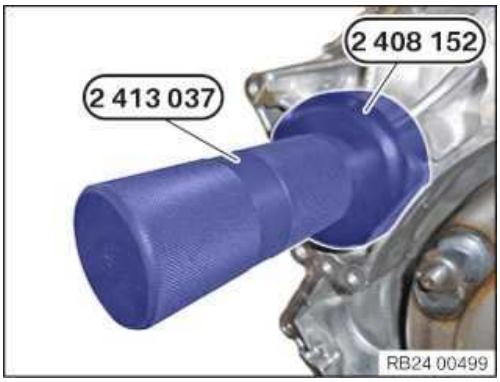
- Screw special tool **2 409 025** into the outer radial shaft seal.
- Turn the screw on the special tool **2 409 025** until the outer radial shaft seal has been pulled out.



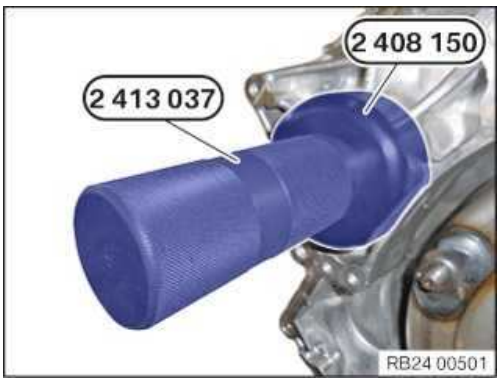
- Insert special tool **2 411 739** into the inner radial shaft seal.



- Screw special tool **2 411 739** into the inner radial shaft seal.
- Turn the screw on the special tool **2 411 739** until the inner radial shaft seal has been pulled out.

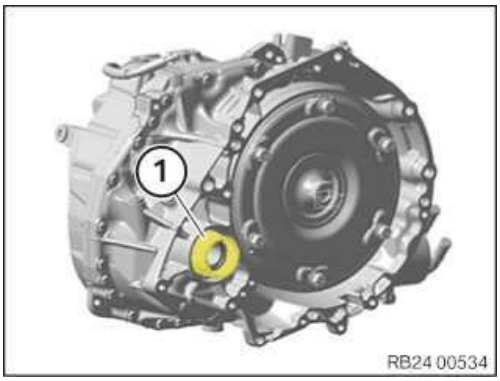


- Drive in the inner radial shaft seal using special tools **2 408 152** and **2 413 037** up to the limit position.



- Drive in the outer radial shaft seal using special tools **2 413 037** and **2 408 150** up to the limit position.

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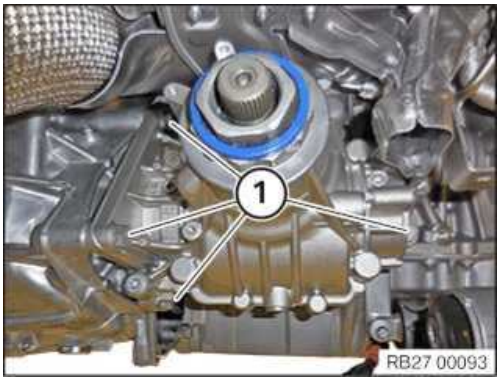
- If necessary, connect the new intermediate shaft (1) to the output flange of the automatic transmission or manual transmission.



- Coat the inside of the output flange (arrows) evenly with approx. 5 g of grease.

Expendable materials

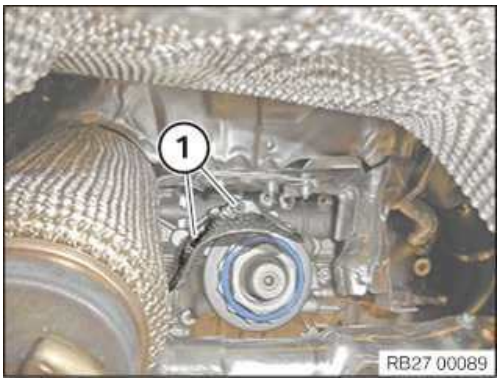
Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the transfer box (VTG).
- Tighten the screws (1).

Transfer box to transmission

M10		Tightening torque	56 Nm



- Install heat shield.
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Heat shield to transfer box

M6	Renew screws.	Tightening torque	6 Nm

▸ **Check the transfer box oil level**

RISK OF DAMAGE

Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.

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- Check transfer case oil level, correct:
- Open the oil filler plug (1).
- Check transfer box oil level.
- If necessary, top up transmission oil up to the lower edge of the oil filler plug opening (1).

Transmission oil

Technically suitable transfer box and electrical transmission oils	

Main group 27

- Tighten the oil filler plug (1).

Oil filler plug on transfer box (VTG)

M18x1.5		Tightening torque	35 Nm

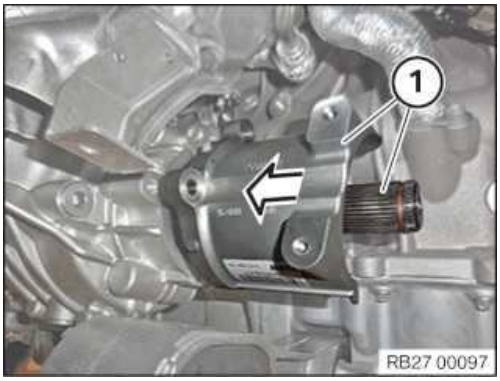
59 – Install the intermediate shaft with the support tube



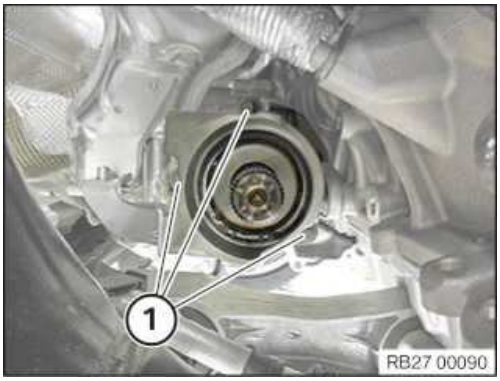
- Coat gearing of the intermediate shaft uniformly with 5 g of grease.

Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the intermediate shaft with support tube (1) in the transfer box.



- Position screws (1).

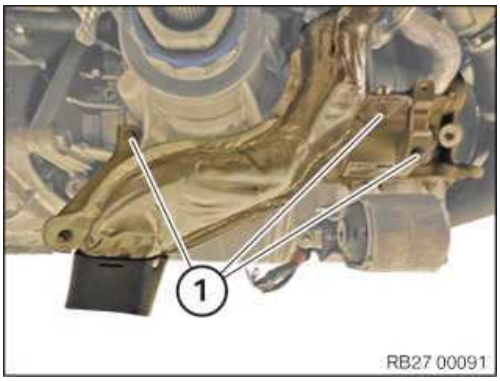
Note: Check for correct screw length! Bolt M8x35 8.8

- Tighten the screws (1).

Intermediate shaft to transfer box

M8x35		Tightening torque	19 Nm

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- If installed: Install air duct.
- Tighten the screws (1).

60 – Installing the high-pressure stage exhaust turbocharger

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

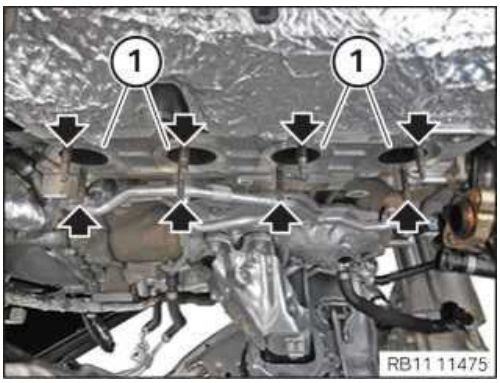
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

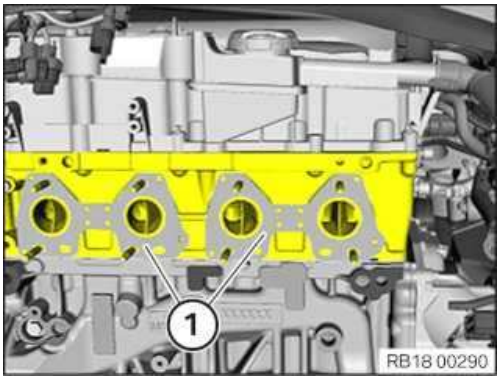


- Clean the sealing surfaces (1) on the cylinder head using special tool **0 495 102 (11 4 470)**.
- Check the stud bolts (arrows) on the cylinder head for correct fit.

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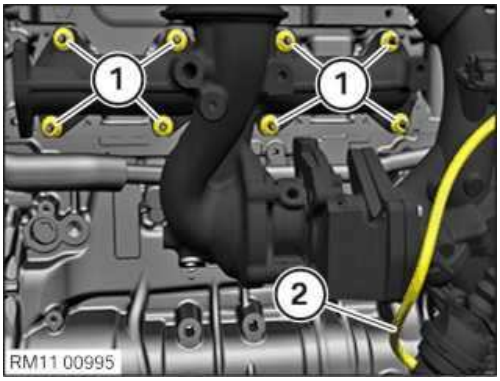
- Clean the sealing surfaces on the exhaust manifold using special tool **0 495 102 (11 4 470)**.



- Renew gasket (1).

  Parts: Gasket

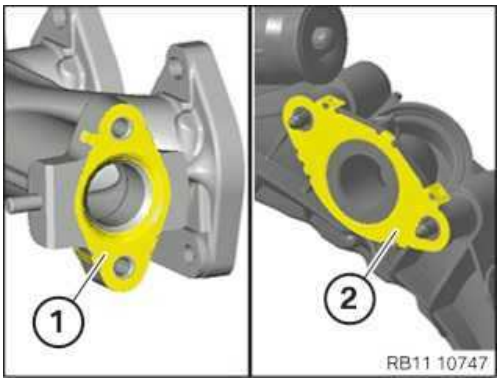
- Install new gasket (1).



- Feed in and install the exhaust manifold and the high-pressure stage exhaust turbocharger.
- Tighten nuts (1).

  Parts: Nuts

- Connect vacuum hose(2).

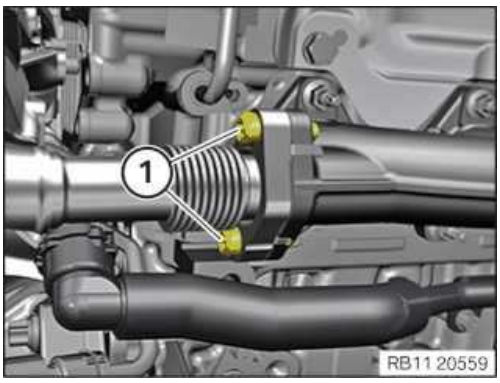


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket

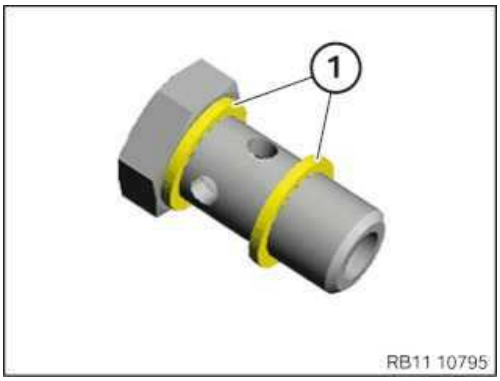


- Tighten the screws (1).

Exhaust-gas recirculation cooler to exhaust manifold

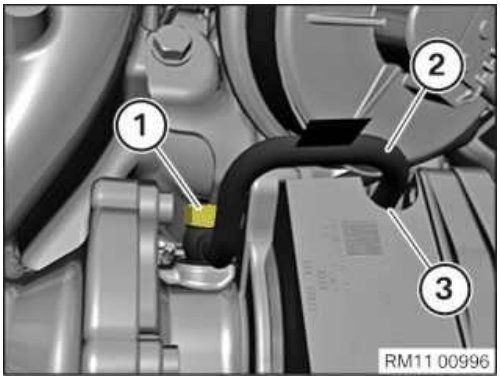
M8x28	Replace screws	Tightening torque	32 Nm

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- Renew sealing rings (1) of banjo bolt.

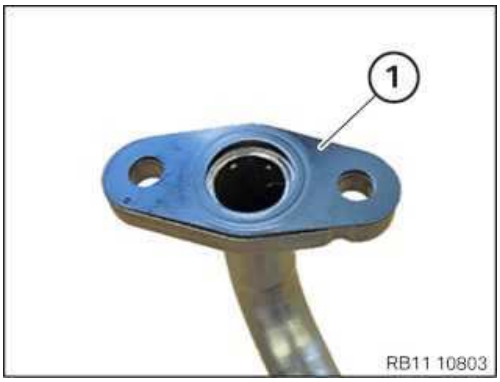
  Parts: Sealing ring



- Guide the oil feed line into the holder (3) and install it.
- Tighten down screw (1).

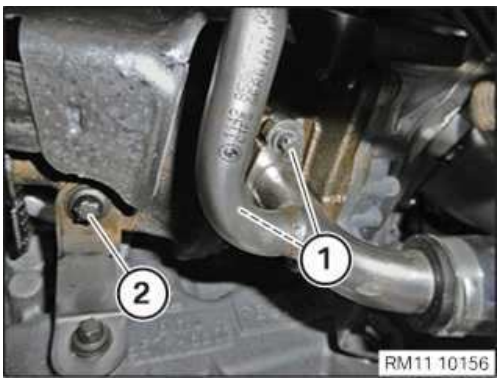


- Tighten bolt (1) from the right wheel arch.



- Renew seal (1) of oil return line.

  Parts: Gasket



- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

61 – Installing the low-pressure stage turbocharger

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RISK OF DAMAGE

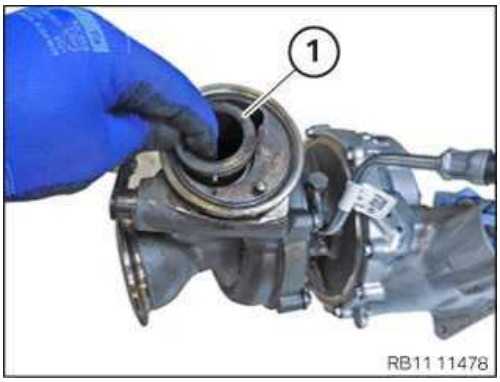
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

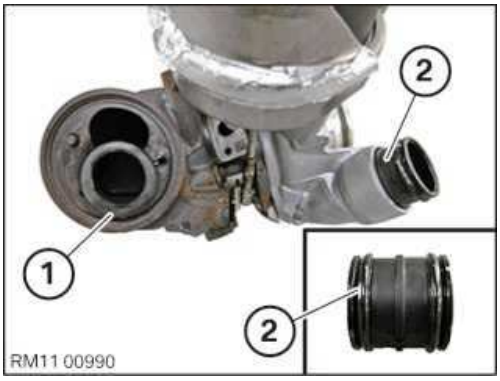
TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.



- Check the spacer plug (1) for damage, renew if necessary.

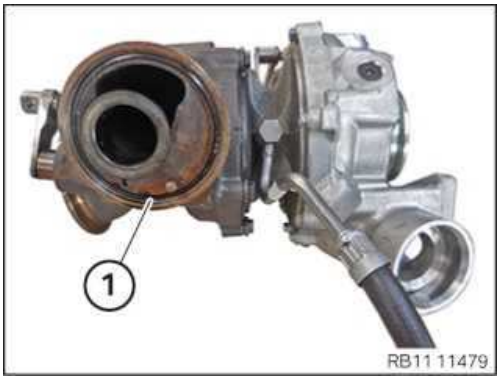
  Parts: Spacer ring
- Insert and install the spacer ring (1).
- Position spacer ring (1) correctly.



- Renew gasket (1).

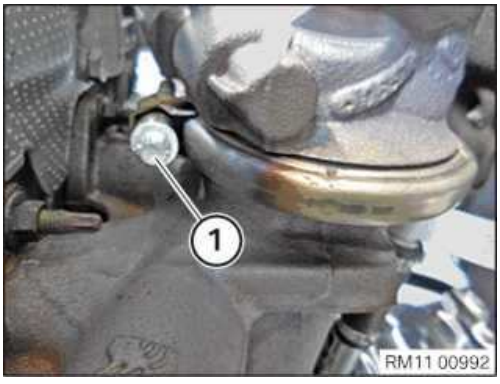
  Parts: Gasket
- Position the seal (1).
- Renew the sleeve(2).

  Parts: Holding sleeve



- Renew sealing ring (1).

  Parts: Sealing ring
- Affix the sealing rings on the exhaust turbocharger.



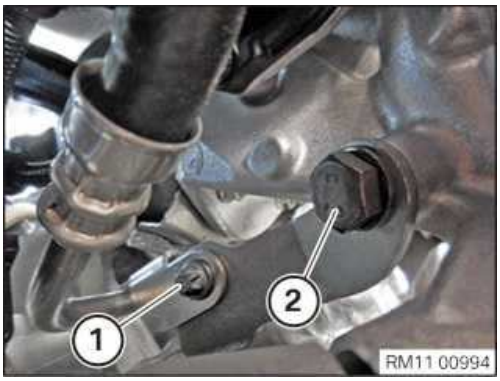
- Insert and install the low-pressure stage exhaust turbocharger on the exhaust manifold .
- Feed in and install V-band clamp .
- Tighten V-band clamp (2).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Screw in nut (1) with 2 **revolutions**.

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- Tighten down screw (1).

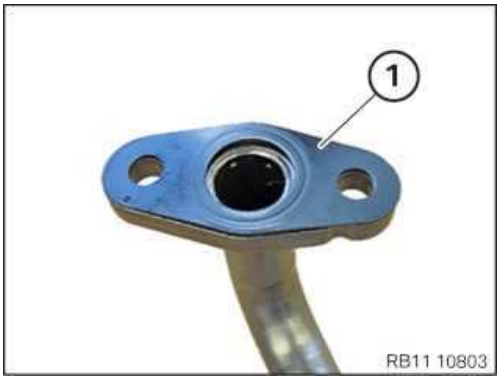
Oil feed line to bracket

Torx screw M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

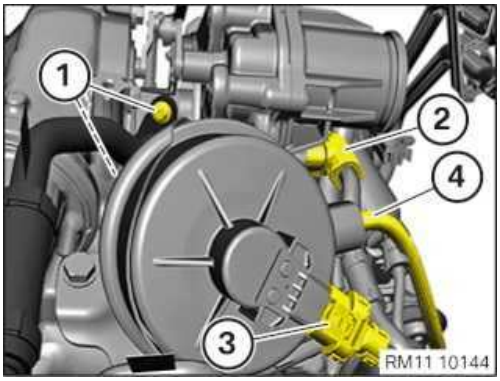
Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm



- Renew seal (1) on the oil return line.

  Parts: Gasket



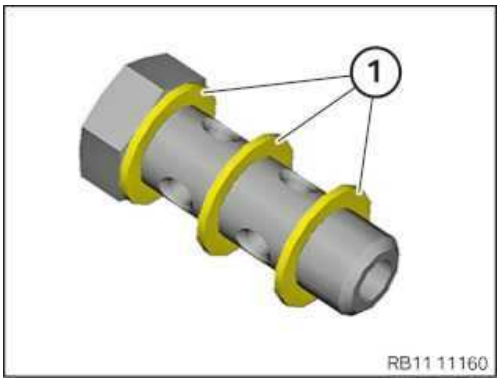
- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

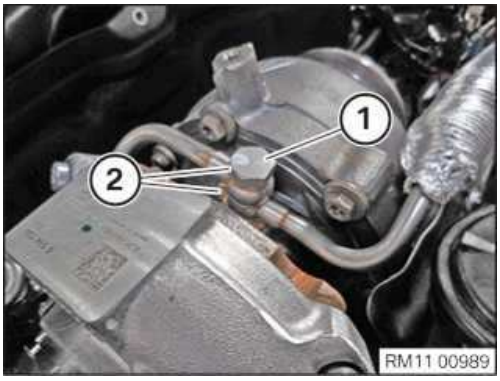
M6x12		Tightening torque	8 Nm

- Connect and lock connectors (2) and (3).

  The locks must engage audibly.
- Connect vacuum hose (4).

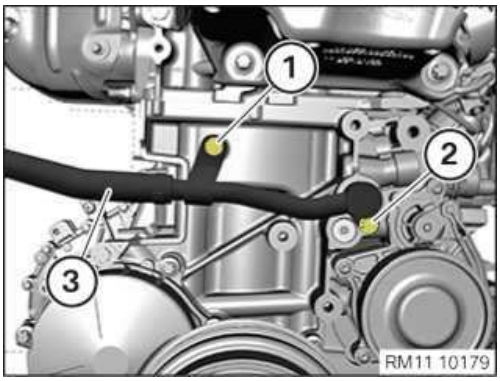


- Renew banjo bolt and sealing rings (1).
- **Parts:** Banjo bolt, sealing rings



- Install sealing rings (1).
- Tighten the banjo bolt (1).
- Ensure that the lines do not rest against the adjacent components.

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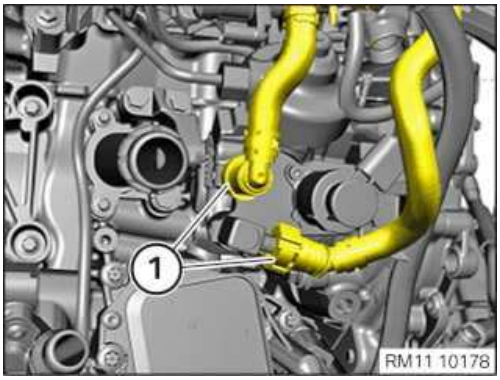


- Renew sealing ring of the coolant line (3).

  Parts: Sealing ring
- Coat the sealing ring and install the coolant line (3) .
- Tighten down screws (1) and (2).

Standard screw connection M6

M6		8 Nm



- Connect and lock fuel lines (1).

  The fuel lines (1) must audibly engage.

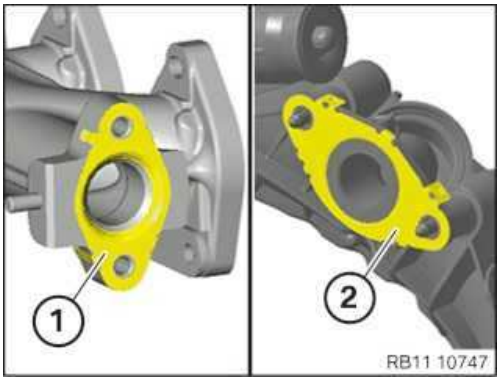
▶ **Installing the exhaust-gas recirculation cooler**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

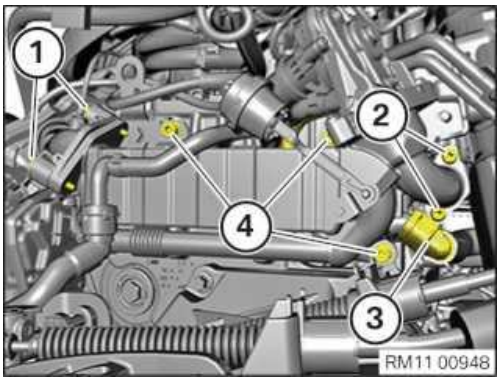


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket
- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket

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- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts
- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

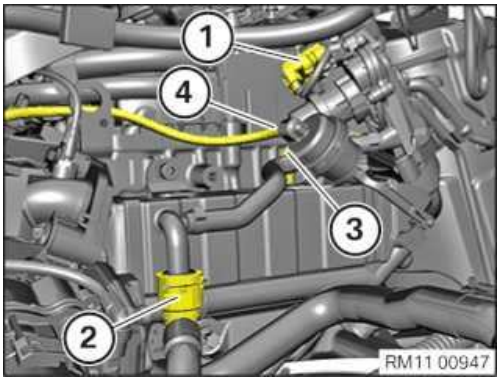
M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.
- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm



TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

▸ **Installing heat shield on exhaust turbocharger at bottom**

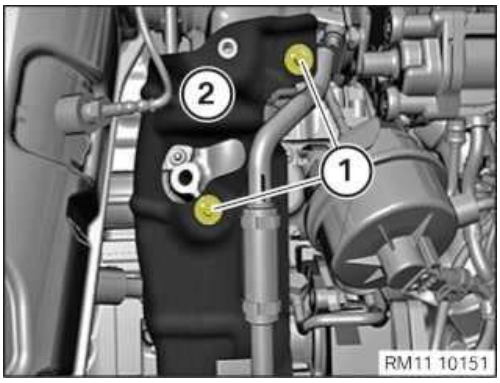
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WARNING

Hot surfaces.

Risk of burning!

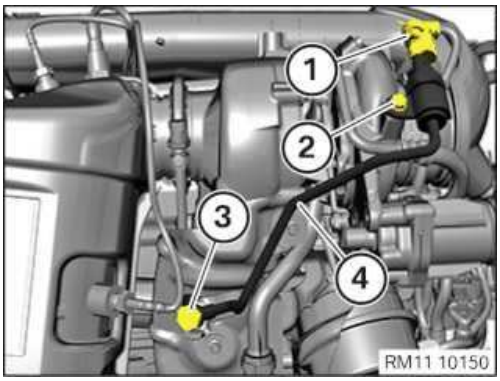
- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (2).
- Tighten the bolts (1) on the heat shield .

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm



- Position the exhaust gas pressure pipe (4).
- Hand-tighten the bolt (2).
- Renew sealing rings on the banjo bolt (3).

  Parts: Sealing ring
- Tighten the banjo bolt (3).

Banjo bolt for exhaust pressure pipe to exhaust manifold

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

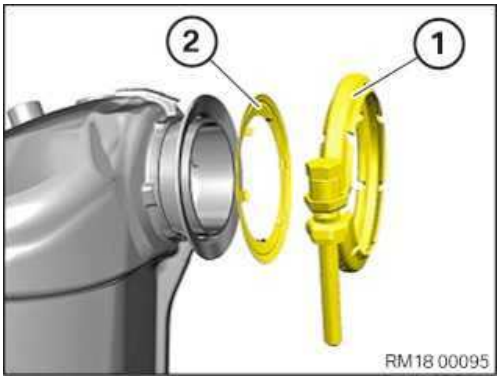
- Tighten down screw (2).

Standard screw connection M6

M6		8 Nm

- Connect connectors (1) and lock.

  Lock must audibly engage.



CAUTION

Heavy component.

Heavy components can lead to injury or damage.

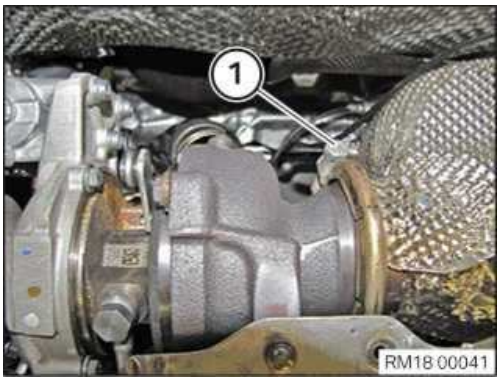
- Remove and install heavy components with the aid of another person/other persons.

- Renew the V-clip (1).

  Parts: V-band clamp
- Renew the gasket (2).

  Parts: Gasket

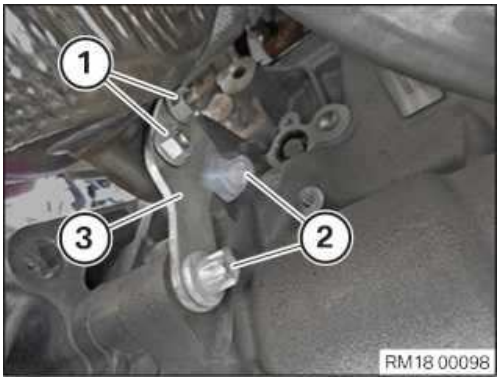
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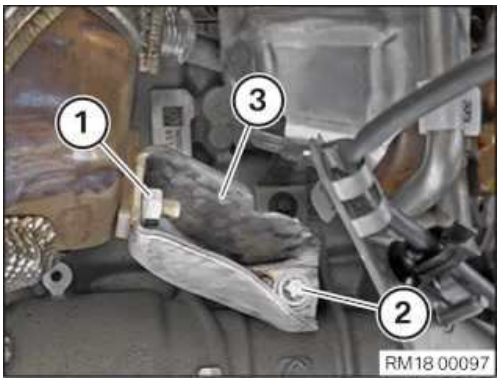
- Carefully insert and install the diesel particulate filter .
- Feed in and install V-band clamp (1).
- Make sure that the seal between the diesel particulate filter and the exhaust turbocharger is installed correctly.
- Align the diesel particulate filter on the exhaust turbocharger.
- Position V-clip (1).
- Hand-tighten the V-clip (1).



- Tighten nuts (1) by hand.



- Install holder (3).
- Hand-tighten the bolts (2).
- Tighten nuts (1) by hand.



- Install holder (3).
- Tighten the nut (1) hand-tight.
- Hand-tighten the bolt (2).



- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

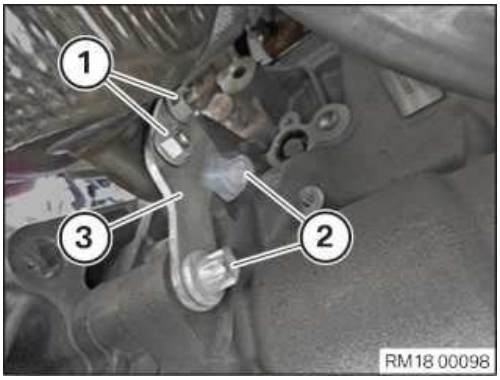
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- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screws (2).

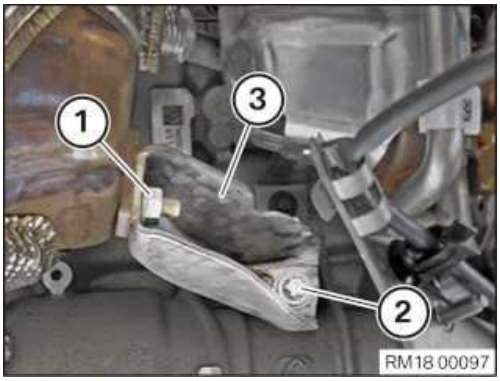
Diesel particulate filter holder to gearbox

M12x75		Tightening torque	66 Nm

- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screw (2).

Diesel particulate filter bracket to crankcase

M10x35		Tightening torque	38 Nm

- Tighten nut (1).

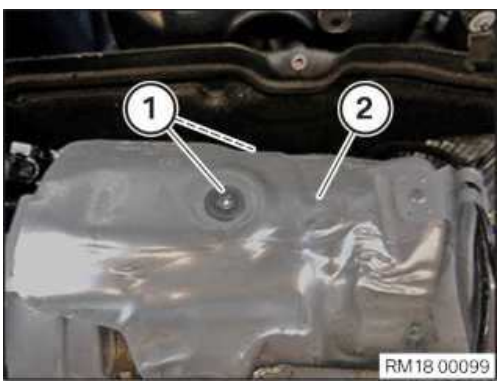
Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Remove fitting aid (1) for the flexible tube.

▶ **Install the heat shield on the exhaust turbocharger**



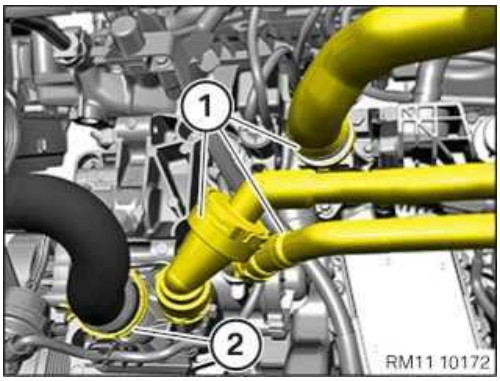
- Feed in and install the heat shield (2).
- Tighten the screws (1) at the top and bottom of the heat shield.

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

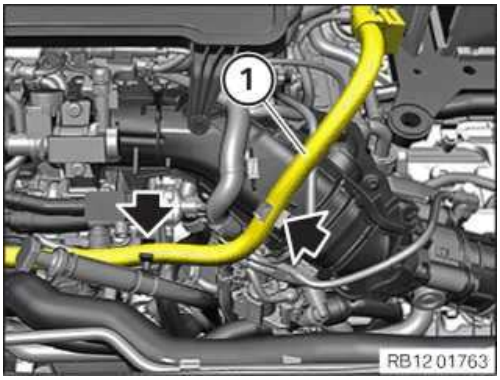
- Fasten the cable at the clips .

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- Install the coolant hose and secure with the clamp (2) .
- Connect and lock the coolant lines (1).

  The coolant lines (1) must engage audibly.



CAUTION

Improper routing of the positive battery cable.

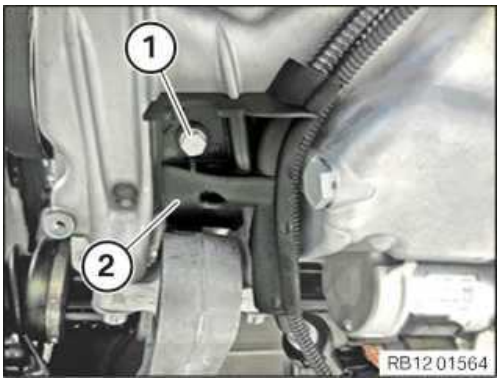
Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

- Insert the positive battery cable (1) into the clamps (arrows).



- Feed in and install positive battery cable at the clamps (1).



- Insert and install the holder (2).
- Tighten down screw (1).

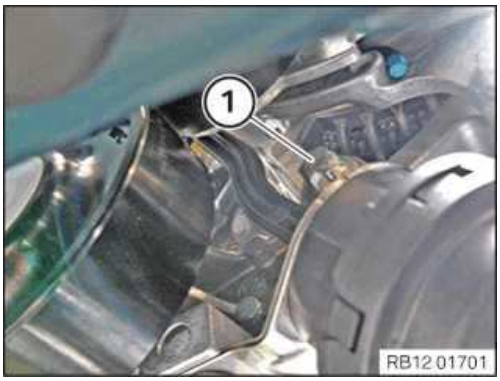
Bracket to oil sump

M6		Tightening torque	8 Nm



- Insert and install alternator (1) along with the screw (2) on the bottom of the alternator through the slot on the support.

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- Tighten the screw (1) below on the alternator.

Alternator to component carrier

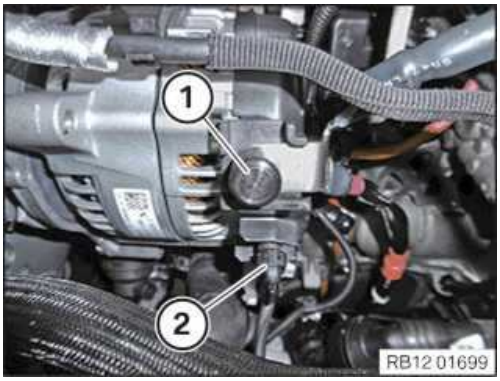
M10x75 / M10x125		Tightening torque	38 Nm



- Tighten the bolt (1) on top on the alternator.

Alternator to component carrier

M10x75 / M10x125		Tightening torque	38 Nm



- Mount positive battery cable to the alternator.
- Tighten nut.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

- Mount the cover (1).
- Connect the connector (2) to the alternator and lock audibly.



- Install air conditioning compressor (2) and position it correctly.
- Tighten the screws (1).

Air conditioning compressor in component carrier

M10		Tightening torque	38 Nm

▸ **Installing the drive belt for alternator**

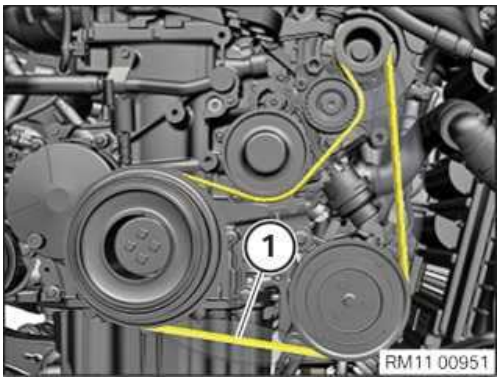
TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

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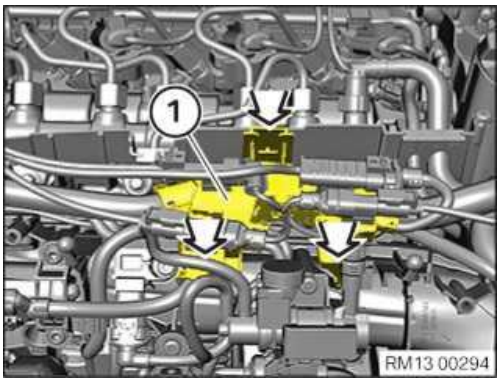


- Feed in the drive belt for the alternator (1) and install it.

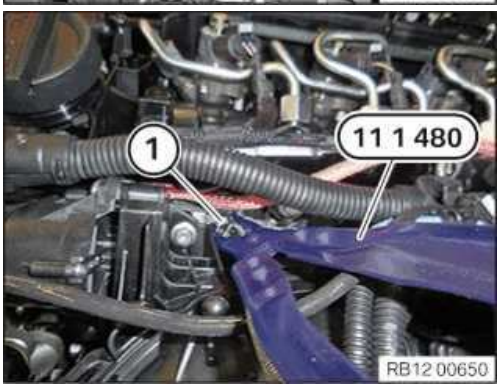


- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool **0 496 268 (11 0 390)** out of the belt tensioner and remove it.

▶ **Installing the cable clip for the intake plenum**

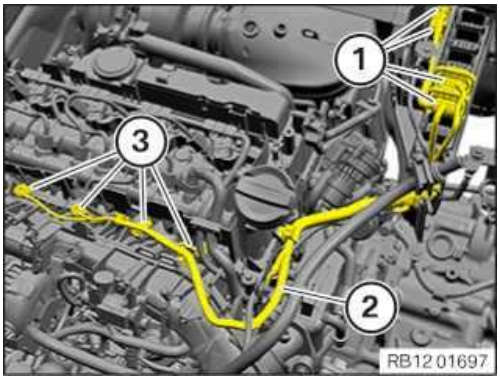


- Insert and install the cable clip (1) in the direction of the arrow.
- Make sure the cable clip (1) is fitted correctly.



- Connect and lock the connector (1) on the glow elements.

  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.

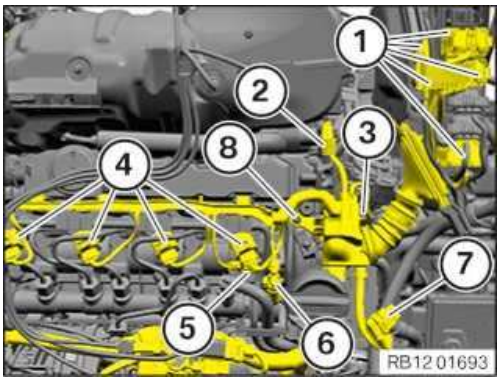


- Lay vehicle wiring harness and fasten with clamps.
- Route all connectors (1) to the integrated supply module (PDM) and to the DME control unit.
- Connect all connectors (3) to the glow elements and engage them audibly.
- Mount ground strap and tighten screw (2).

Ground cable to cylinder head

M6x12		Tightening torque	8 Nm

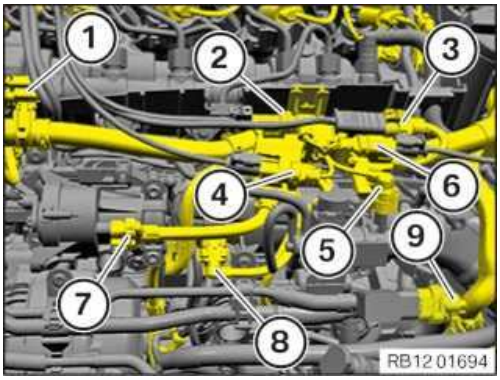
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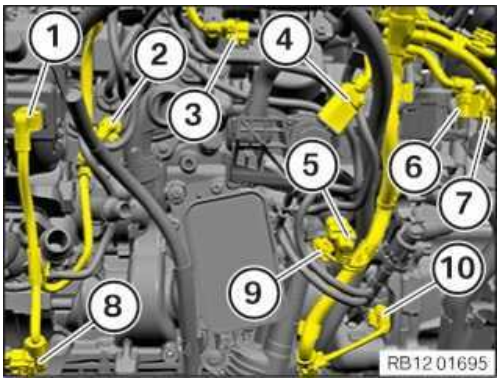
- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the integrated supply module (PDM) and to the DME control unit.
- Attach connector (2) to the differential pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust-gas recirculation valve and lock audibly.
- Attach connector (4) to the injectors and lock it audibly.
- Attach connector (5) to the camshaft sensor and lock it audibly.
- Attach connector (6) to the fuel pressure regulator and lock it audibly.
- Connect and audibly lock the connector (7) to the hot film air mass meter.
- Tighten down screw (8).

Wiring harness to cylinder head cover

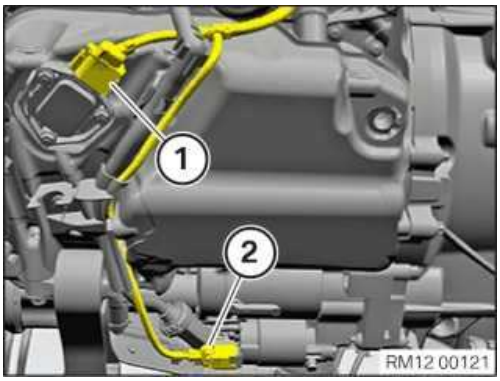
TS5x20		Tightening torque	3,5 Nm



- Connect the connector (1) to the rail pressure sensor and lock it audibly.
- Attach connector (2) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (3) to the front oxygen sensor and lock audibly.
- Attach connector (4) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Connect the connector (5) to the electric changeover valve and lock audibly.
- Attach connector (6) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (7) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (8) to the charging pressure sensor and lock it audibly.
- Attach connector (9) to the fuel pressure and temperature sensor and lock it audibly.

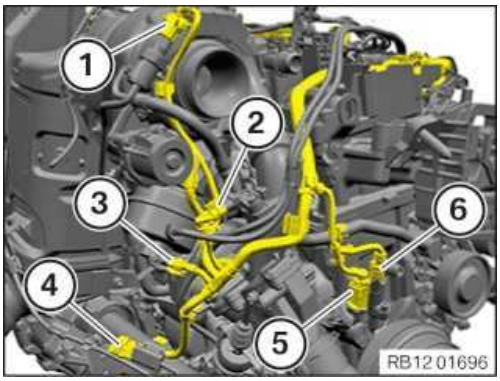


- Connect the connector (1) to the alternator and lock audibly.
- Connect the connector (2) to the electric changeover valve and lock audibly.
- Connect the connector (3) to the electric changeover valve and lock audibly.
- Connect the connector (4) to the high pressure pump and lock audibly.
- Connect the connector (5) to the oil pressure sensor and lock it audibly.
- Attach connector (6) to the throttle bodies and lock it audibly.
- Attach connector (7) to the intake air temperature sensor and lock it audibly.
- Connect the connector (8) to the air conditioning compressor and lock audibly.
- Connect the connector (9) to the solenoid valve and lock audibly.
- Connect the connector (10) to the crankshaft sensor and lock it audibly.

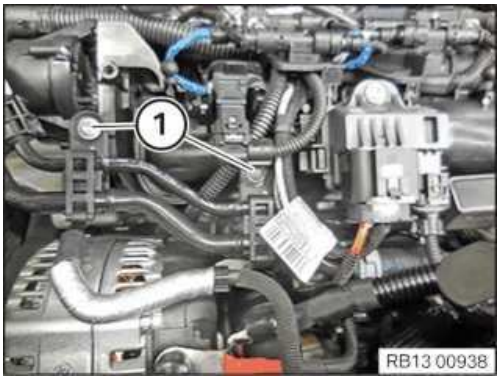


- Connect the connector (1) to the oil-level sensor and lock it audibly.
- Connect connector (2) to the starter motor and lock audibly.

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- Attach connector (1) to the exhaust turbocharger and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust gas pressure sensor and lock it audibly.
- Connect the connector (4) to the monitoring oxygen sensor and lock audibly.
- Attach connector (5) to the oil pressure switch and lock it audibly.
- Attach connector (6) to the switching valve and lock it audibly.

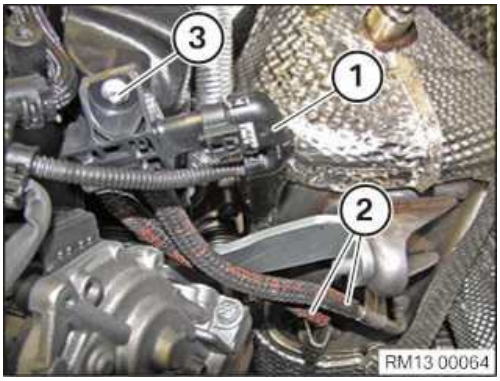


- Position the fuel line.
- Tighten the screws (1).

Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

63 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

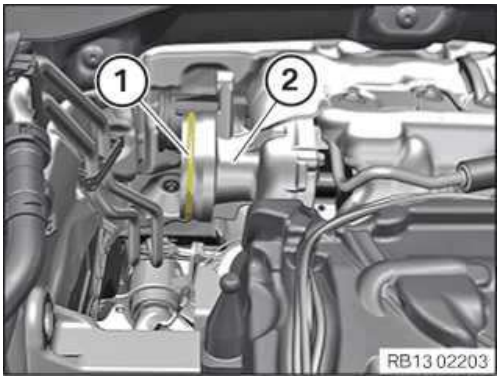
Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

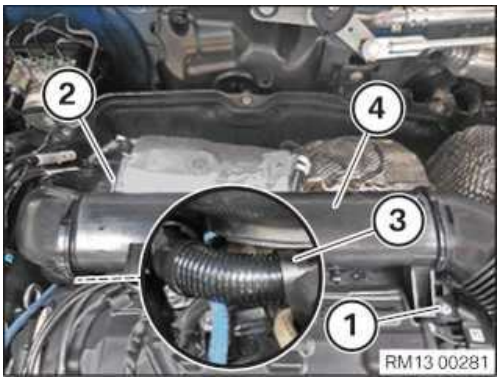
  The connector (1) must engage audibly.

64 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.

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- Feed in clean air pipe and install.
- Connect clean air pipe to the exhaust turbocharger and lock audibly in the clamps (2).
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Connect ventilation line (3) to the cylinder head cover and lock audibly.

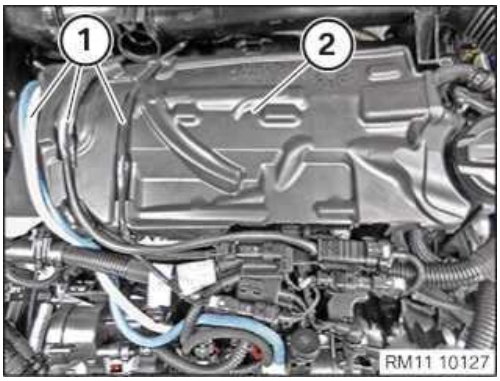


- Mount clean air pipe onto the intake filter housing.
- Tighten clamp (1) on the clean air pipe.

Clean air pipe to intake silencer housing

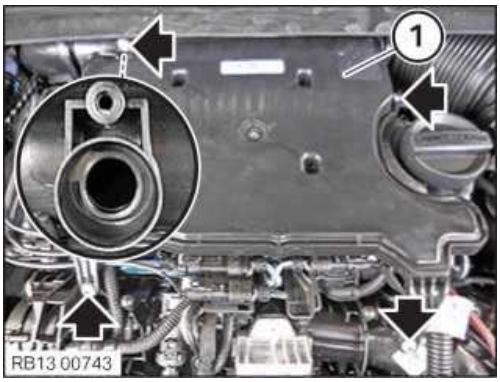
Clamp		Tightening torque	3 Nm

65 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the vehicle wiring harness (1) in the brackets.

66 – Install resonator



- Insert and install the resonator (1).
- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

67 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Check for correct installation of all rubber mounts in the acoustic cover (1).



- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

68 – Install engine



- See additional information.

Additional Information

Overview of Tightening Torques

Special tool to cylinder head Used in step 12

M8		Tightening torque	21,5 Nm

Special tool 2 455 010 to crankcase Used in step 13

M10x30		Tightening torque	38 Nm

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Special tool 11 8 930 to special tool 00 2 320

Used in step 13

M14x35		Tightening torque	160 Nm

Special tool 2 288 054 to crankshaft

Used in step 34 35

M10		Tightening torque	20 Nm

Gear to counterbalance shaft

Used in step 35

M10	Renew screws.	1. Jointing torque	20 Nm
		2. Angle of rotation	180 °

Idler gear to crankcase

Used in step 35

M12x1.5		Tightening torque	10 Nm
		Angle of rotation	45 °

Oil deflector to crankshaft bearing cap

Used in step 36

M8x14	Replace screws.	Tightening torque	35 Nm
		Release	180 °
		Tightening torque	15 Nm
		Angle of rotation	45 °

Oil deflector to crankcase

Used in step 36

M8x14		Tightening torque	19 Nm

Oil vacuum pump to crankcaseB47

Used in step 37

M8x35		Tightening torque	19 Nm

Rear timing case cover to crankcase

Used in step 38

M6	Renew screws.	Jointing torque	8 Nm
		Angle of rotation	90 °

SCR coolant lines to crankcase end cover

Used in step 38

Hexagon screw M6x16		Tightening torque	8 Nm

Cylinder head to crankcase

Used in step 38

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

Cylinder head bolt to timing case cover

Used in step 38

M8x40		Tightening torque	19 Nm

Oil sump to crankcase

Used in step 38

M8x30		Tightening torque	24 Nm
M8x110		Tightening torque	24 Nm

Transmission to oil sump

Used in step 38 57

M8		Tightening torque	19 Nm

Guide tube for oil dipstick on engine

Used in step 38

M8x16		Tightening torque	19 Nm

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Flywheel to crankshaft

Used in step 39

M12x1.5	Renew screws.	Tightening torque	120 Nm

Clutch to flywheel

Used in step 40

M8	Renew screws.	Jointing torque	15 Nm
		Angle of rotation	90 °

Vibration damper with belt pulley to crankshaft

Used in step 41

M10x65	Renew screws. Tighten screws crosswise.	1. Jointing torque	40 Nm
		2. Angle of rotation	60 °
		3. Angle of rotation	60 °

Transmission to engine

Used in step 41

M8		Tightening torque	19 Nm

Glow elements to cylinder head

Used in step 44

Glow element		Tightening torque	13 Nm

Camshaft carrier to cylinder head

Used in step 45

M7x35		Tightening torque	13 Nm

Intake and exhaust camshaft in camshaft support

Used in step 46

M6x31		Tightening torque	10 Nm

Bearing journal to cylinder head

Used in step 46

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8

Used in step 46

M8		Tightening torque	19 Nm

Standard screw connection M6

Used in step 46 62

M6			8 Nm

Chain tensioner piston to cylinder head

Used in step 46

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft

Used in step 46

M7x17.			17 Nm

Cylinder head cover to cylinder head

Used in step 50

M6		Tightening torque.	8,5 Nm

Clamping claw facing to cylinder head cover

Used in step 51

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 51

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

Rail on cylinder head cover

Used in step 52

Torx screw M8x25		Tightening torque	19 Nm

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High pressure line between high pressure pump and rail

Used in step 52

High-pressure pipe		Tightening torque	28 Nm

High pressure lines between injector and rail

Used in step 54

High pressure lines		Tightening torque	28 Nm

Intake plenum to cylinder head

Used in step 55

M6		Tightening torque	11 Nm

Holder to crankcase

Used in step 56

M10		Tightening torque	38 Nm

Transmission to engine

Used in step 57

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

Transfer box to transmission

Used in step 58

M10		Tightening torque	56 Nm

Heat shield to transfer box

Used in step 58

M6	Renew screws.	Tightening torque	6 Nm

Oil filler plug on transfer box (VTG)

Used in step 58

M18x1.5		Tightening torque	35 Nm

Intermediate shaft to transfer box

Used in step 59

M8x35		Tightening torque	19 Nm

Exhaust-gas recirculation cooler to exhaust manifold

Used in step 60 62

M8x28	Replace screws	Tightening torque	32 Nm

Oil return line to turbocharger

Used in step 60 61

M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase

Used in step 60

M8x16		Tightening torque	22 Nm

Exhaust turbocharger to exhaust manifold

Used in step 61

V-band clamp		Tightening torque	19 Nm

Oil feed line to bracket

Used in step 61

Torx screw M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase

Used in step 61

M8x16		Tightening torque	22 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 62

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler

Used in step 62

M6		Tightening torque	11 Nm

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Exhaust-gas recirculation cooler to cylinder head — Used in step 62

M8x20		Tightening torque	19 Nm

Heat shield for exhaust turbocharger — Used in step 62

Torx screw BM 6x12		Tightening torque	10 Nm

Banjo bolt for exhaust pressure pipe to exhaust manifold — Used in step 62

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

Diesel particulate filter V-clip to exhaust turbocharger — Used in step 62

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Diesel particle filter to holder — Used in step 62

M8 hexagon nut		Tightening torque	19 Nm

Diesel particulate filter holder to gearbox — Used in step 62

M12x75		Tightening torque	66 Nm

Diesel particulate filter bracket to crankcase — Used in step 62

M10x35		Tightening torque	38 Nm

Heat shield for exhaust turbocharger — Used in step 62

Torx screw BM 6x12		Tightening torque	10 Nm

Bracket to oil sump — Used in step 62

M6		Tightening torque	8 Nm

Alternator to component carrier — Used in step 62

M10x75 / M10x125		Tightening torque	38 Nm

Positive battery cable to alternator — Used in step 62

M8		Tightening torque	19 Nm

Air conditioning compressor in component carrier — Used in step 62

M10		Tightening torque	38 Nm

Ground cable to cylinder head — Used in step 62

M6x12		Tightening torque	8 Nm

Wiring harness to cylinder head cover — Used in step 62

TS5x20		Tightening torque	3,5 Nm

Fuel line to intake plenum — Used in step 62

TS6x20		Tightening torque	5 Nm

Differential pressure sensor to holder — Used in step 63

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor — Used in step 63

Clamp 15–19mm		Tightening torque	3 Nm

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Clean air pipe to cylinder head cover Used in step 64

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing Used in step 64

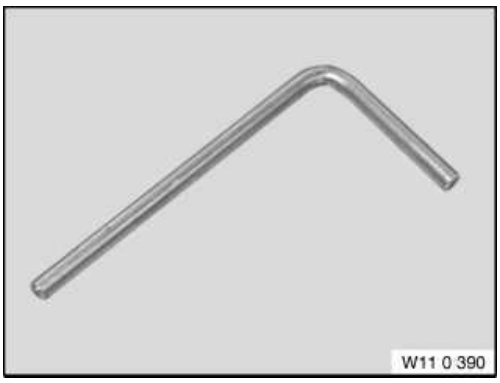
Clamp		Tightening torque	3 Nm

Resonator to manifold and clean air pipe Used in step 66

Screw TS6	Renew screw.	Tightening torque	5 Nm

Overview of Special Tools

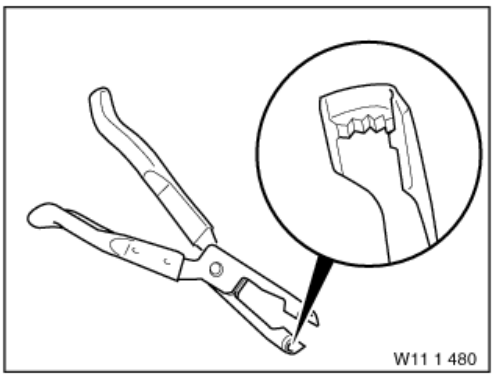
0 496 268 (11 0 390) Pin



Common Used in step 7 62

Usage	(roll pin) For securing new tensioning pulley (poly-V belt)
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 15 07 (390)

0 490 796 (11 1 480) Pliers



Common Used in step 7 25

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

2 459 012 Holder



Common Used in step 12 57

Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

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2 455 010 Engine support



Common

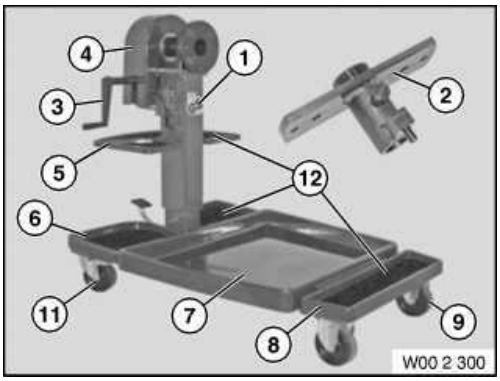
Used in step 13 56

Usage	For accommodating engine on assembly stand. Engine: B3x, B4x, N47.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

0 495 187 (00 2 300) Assembly stand

Used in step 13

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Common

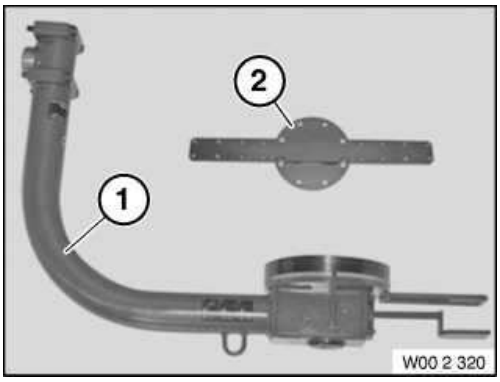
Usage	Assembly stand with universal flange for mounting engines from S85
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 188 (00 2 301)		**Assembly stand** available only as complete assembly stand 83 30 0 495 187.	
2	0 495 189 (00 2 302)	**2 299 563**	**Tool** (Universal flange). Do not use any more!!! Technically locked. Replaced with a new flange with material number 83 30 2 299 563. All flanges delivered until the end of 2011 will be replaced at no charge. From 2012, only the new flange will be supplied. Also applies to the complete engine mounting stand 00 2 300.	
3	0 495 200 (00 2 303)		**Crank**	
4	0 495 201 (00 2 304)		**Cover** (Protective hood)	
5	0 495 202 (00 2 305)		**oddments tray** (Oddments tray for small parts)	
6	0 495 203 (00 2 306)		**Shaped element** (Rear shaped pan)	
7	0 495 204 (00 2 307)		**Collection pan** (Oil collection pan)	
8	0 495 205 (00 2 308)		**Shaped element** (Front shaped pan)	
9	0 495 206 (00 2 309)		**Wheel** (Front wheel (without stop))	
10	0 495 207 (00 2 311)		**Wheel** (Rear wheel (with stop))	
11	0 495 208 (00 2 312)		**Mat** (Checker mat set)	
2	2 299 563		**Adapter** New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.	

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0 495 196 (00 2 320) Support arm



Common

Used in step 13

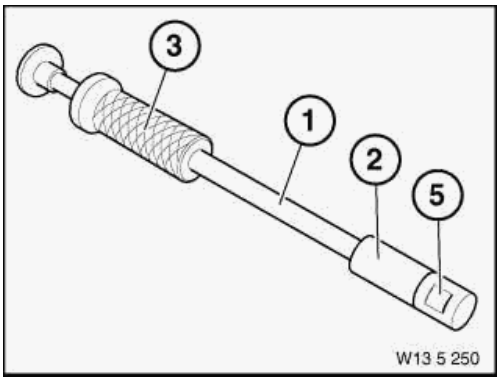
Usage	(Support arm with fixture) For mounting engines using the engine mounting bracket.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 197 (00 2 321)		**Support arm**	
2	0 495 198 (00 2 322)		**Panel** (take-up plate)	
3	0 495 380 (00 2 323)		**Panel** (fixture) Engine N73	
6	0 496 287 (00 2 326)		**Panel** (fixture) Engine: M73	
5	0 496 288 (00 2 327)	**0 496 373**	**Panel** (fixture) Engine: S62 Replaced by 11 5 420 (0 496 373)	
8	0 496 533 (00 2 328)		**Support** (Engine mount) Engine: N57, N57Top	
9	0 496 579 (00 2 329)	**0 496 680**	**Support** (Engine mount) Engine: N74 Replaced by 116160 (0 496 680)	
4	0 495 379 (00 2 324)		**Panel** (fixture) Engine M67TU	
5	0 495 381 (00 2 325)		**Panel** (fixture) Engine N62, N62TU	

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0 493 321 (13 5 250) Puller



Common

Used in step 17

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

0 493 339 (13 5 252) Bush



Common

Used in step 17

Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

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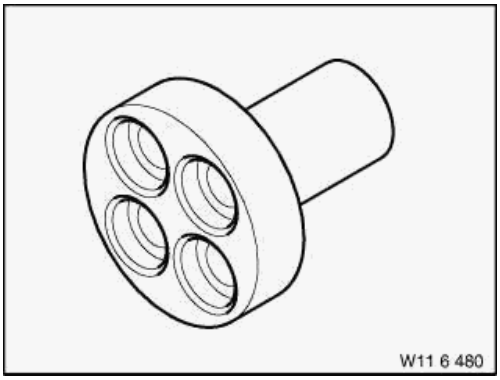
0 493 340 (13 5 253) Weight



Common Used in step 17

Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 380 (11 6 480) Connector



Common Used in step 20 46 49

Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

2 288 380 Locating stud

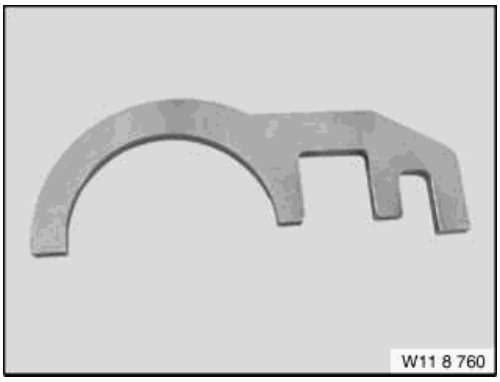


Common Used in step 20 46 47 49

Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

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0 496 112 (11 8 760) Gauge



Common Used in step 20 46 48 49

Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 495 105 (11 4 480) oddments tray



Common Used in step 26 27 46

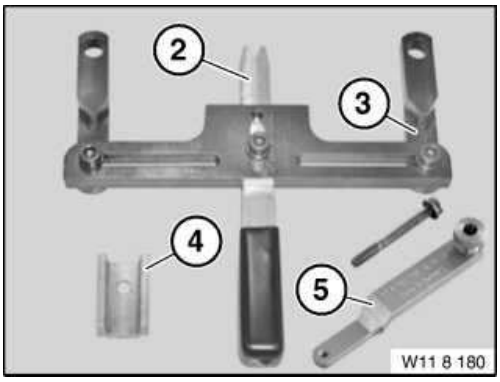
Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

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0 493 587 (11 8 180) Holder



Common

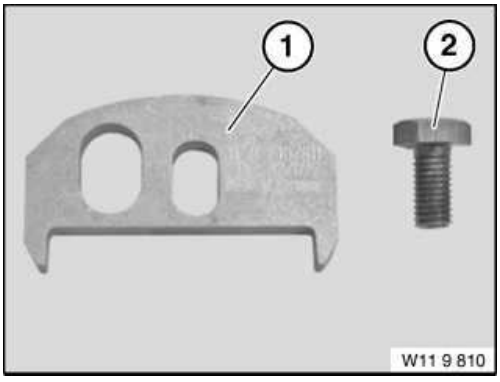
Used in step 28 41

Usage	(Counter support) Blocking flywheel when releasing and tightening down central bolts on vibration absorber
Included in the tool or work	
Storage location	B45
Replaced by	
In connection with	
SI-Number	01 12 99 (452)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
2	0 494 433 (11 8 182)		**Shaped part** (shaped part)	
5	0 494 716 (11 8 185)		**Adapter** (Adapter with adjusting sleeve) E46 M47TU	
1	0 494 432 (11 8 181)	**0 494 434**	**Basic body** (Basic body) E65/M67, E38/M67 Discontinuation Replaced by 11 8 183 (0 494 434)	
3	0 494 434 (11 8 183)		**Basic body**	
4	0 494 435 (11 8 184)		**Adapter** E65 / M67	

0 496 171 (11 9 811) Holder



Common

Used in step 29 30 39

Usage	Available only as a complete tool set 11 9 810 (83 30 0 496 170) - as of 13.01.12
Included in the tool or work	0 496 170
Storage location	C86
Replaced by	
In connection with	
SI-Number	01 07 07 (355)

0 494 793 (11 9 265) Bush



Common

Used in step 29 30 39

Usage	
Included in the tool or work	0 493 938
Storage location	A44
Replaced by	
In connection with	
SI-Number	

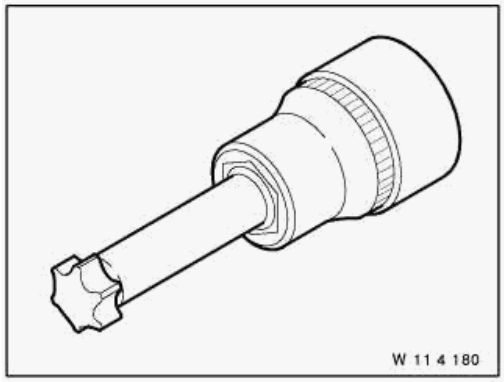
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2 288 165 Synchronising key



Common	Used in step 29 40
Usage	Conversion kit for 21 2 170, for orders till 02.2014. Orders as of March 2014 do not require the conversion, as the new thrust piece has been accounted for.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 09 14 (088)

0 491 018 (11 4 180) Socket WAF 46



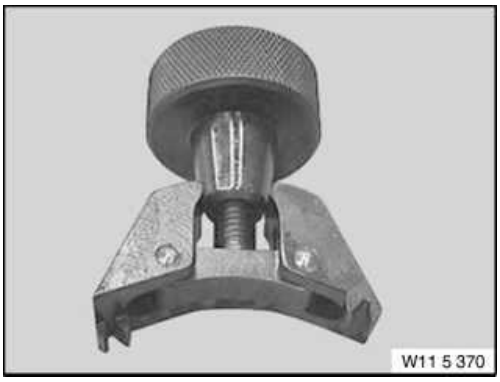
Common	Used in step 30 39
Usage	(screwdriver bit Torx T60) For releasing and tightening down dual-mass flywheel - model year: from Jan 94
Included in the tool or work	
Storage location	C9
Replaced by	
In connection with	
SI-Number	01 02 94 (777)

2 288 054 Gauge



Common	Used in step 34 35
Usage	For positioning the counterbalance shafts during installation.
Included in the tool or work	
Storage location	C56
Replaced by	
In connection with	
SI-Number	01 06 14 (076)

0 495 131 (11 5 370) Tool



Common	Used in step 34 35
Usage	(Locating tool) For VANOS exhaust camshaft gear setting.
Included in the tool or work	
Storage location	A71
Replaced by	
In connection with	
SI-Number	01 02 05 (173)

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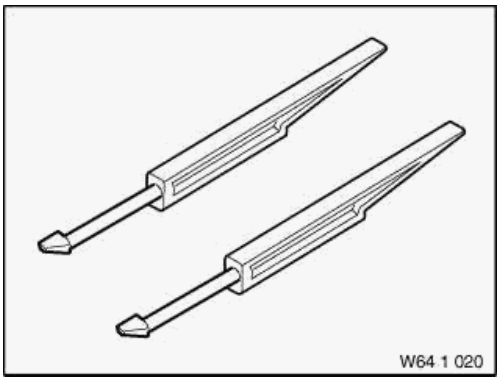
2 458 114 Extractor



Common Used in step 34

Usage	For the disassembly of the counterbalance shaft gears. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 21 17 (514)

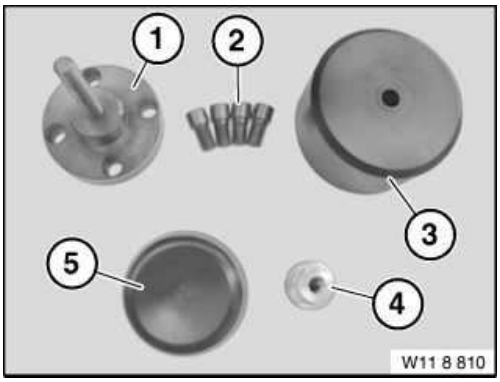
0 493 681 (64 1 020) Hook



Common Used in step 35

Usage	(release hook) For releasing and removing fresh air grille. For removing various covers.
Included in the tool or work	
Storage location	C2
Replaced by	
In connection with	
SI-Number	01 15 99 (483)

0 496 137 (11 8 815) Holding sleeve

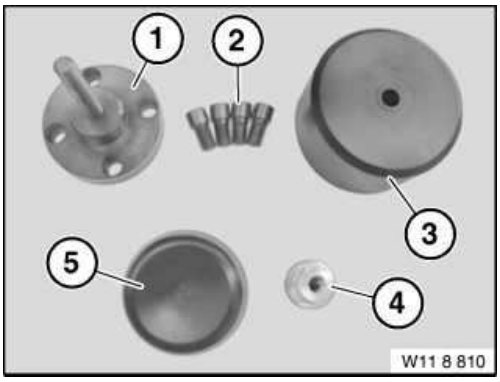


Common Used in step 38

Usage	(Slip sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

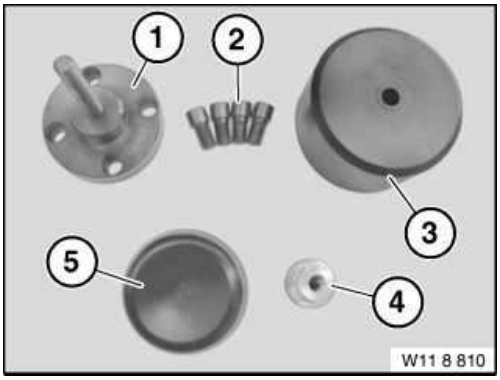
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0 496 133 (11 8 811) Basic body



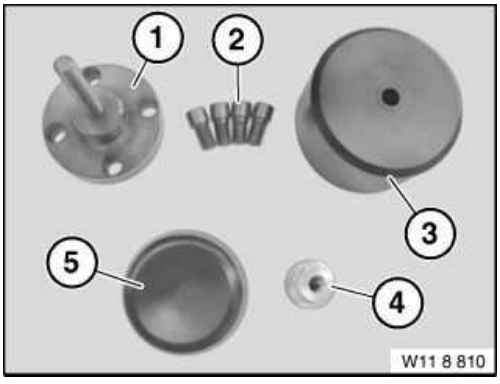
Common	Used in step 38
Usage	Liquidation of existing inventory and then available only as a complete tool set 11 8 810 = 83 30 0 496 132 - as of 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 134 (11 8 812) Screw



Common	Used in step 38
Usage	(Screw set) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

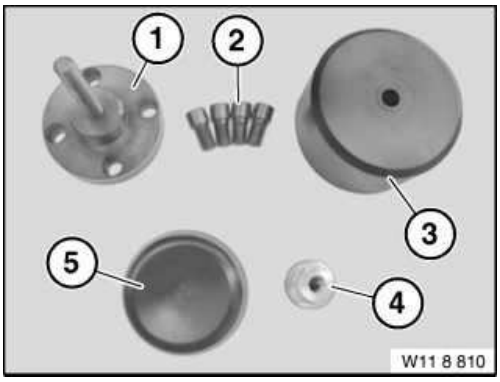
0 496 135 (11 8 813) Holding sleeve



Common	Used in step 38
Usage	(Thrust sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

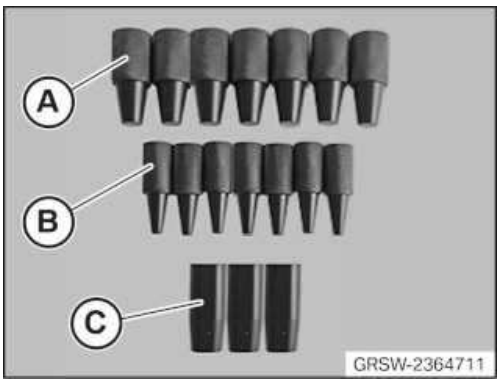
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0 496 136 (11 8 814) Nut



Common	Used in step 38
Usage	(Nut with bearing) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

2 364 711 Plug



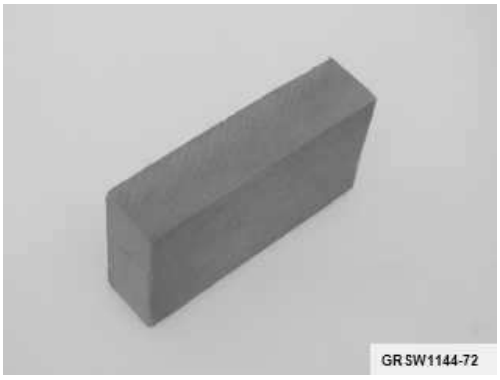
Common	Used in step 38
Usage	For closing the pressure oil holes for cleaning the cylinder head sealing surfaces.
Included in the tool or work	
Storage location	C20
Replaced by	
In connection with	
SI-Number	01 50 14 (203)

0 495 103 (11 4 471) Scraper



Common	Used in step 38
Usage	
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

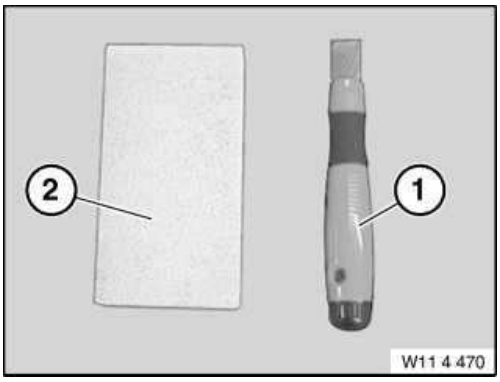
0 495 104 (11 4 472) Extractor



Common	Used in step 38
Usage	(grindstone)
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

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0 495 102 (11 4 470) Tool



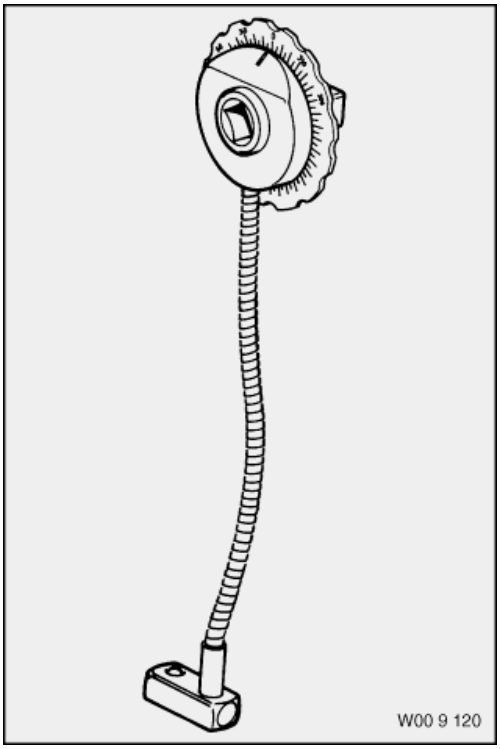
Common Used in step 38 60

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

0 490 504 (00 9 120) Torque angle measuring dial

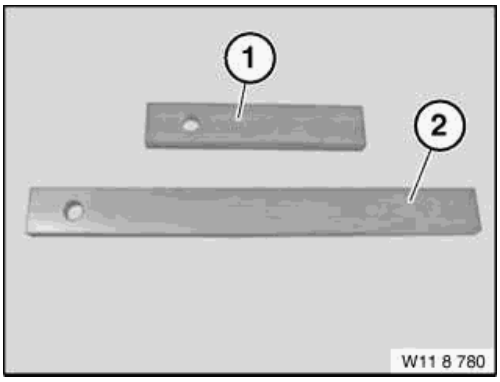


Common Used in step 38

Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

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0 496 120 (11 8 780) Plate



Common

Used in step 38

Usage	(Mounting plates) For securing transmission oil sump when gearbox is removed.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 121 (11 8 781)		**Plate** (Mounting plate, short)Discontinued; only available via set 11 8 780 = 0496120.	
2	0 496 122 (11 8 782)		**Plate** (Mounting plate, long) Discontinued; only available via set 11 8 780 = 0496120.	

2 285 058 Tool set



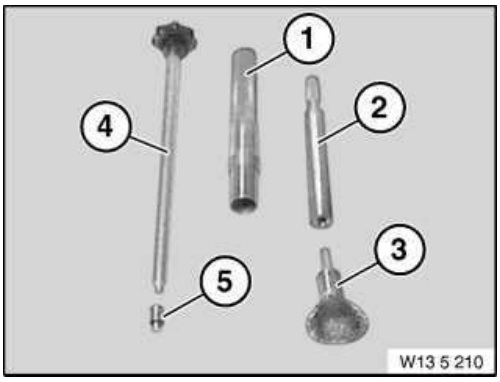
Common

Used in step 39

Usage	
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 02 14 (069)

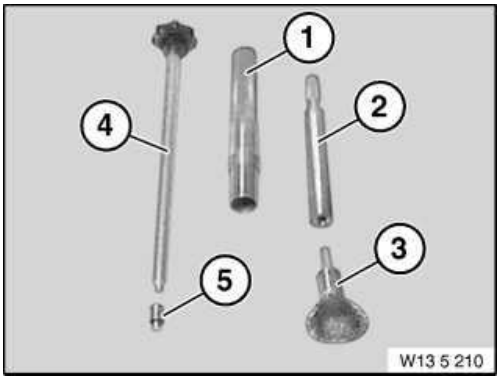
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0 493 763 (13 5 215) Plug



Common	Used in step 51
Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

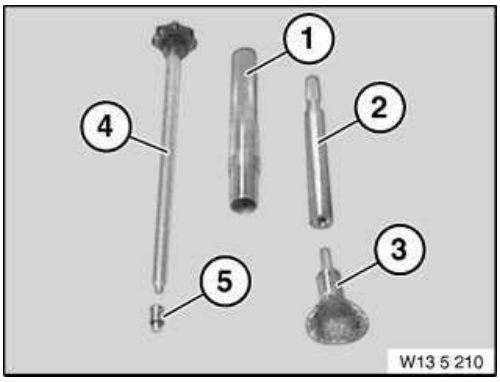
0 493 762 (13 5 214) Rod



Common	Used in step 51
Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 493 758 (13 5 210) Tool



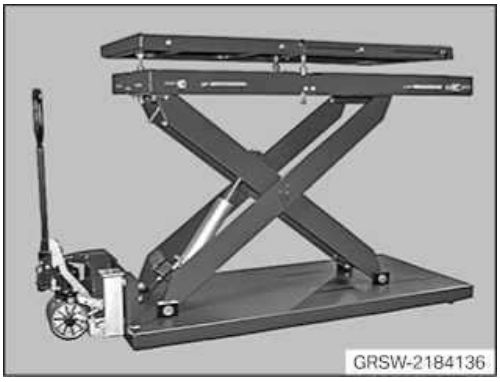
Common Used in step 51

Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

2 184 136 Mobile equipment table lift



Common Used in step 57

Usage	Table lift MHT 1200
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	06 01 10 (649)

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2 409 025 Puller



Common	Used in step 58
Usage	For disassembly of the outer radial shaft seal of the transmission output shaft, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A76
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 411 739 Puller



Common	Used in step 58
Usage	For disassembly of the inner radial shaft seal of the output, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C78
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 408 152 Striking element



Common	Used in step 58
Usage	For installation of the right radial shaft seal transmission output shaft (inner). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

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2 413 037 Handle



Common	Used in step 58
Usage	Universal drift handle. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C77
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

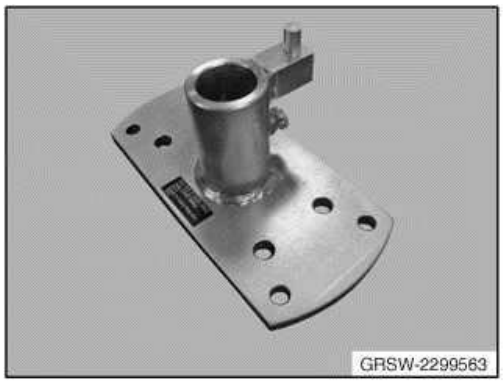
2 408 150 Striking element



Common	Used in step 58
Usage	For installing the right radial shaft seal transmission output shaft (outer). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

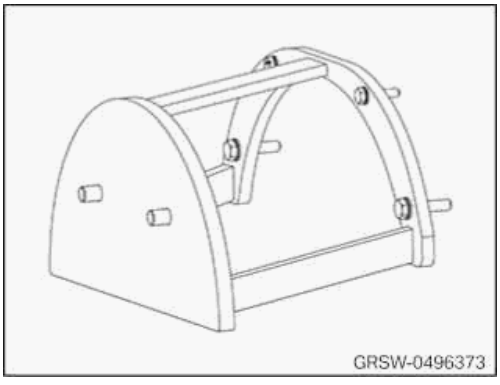
Replacement tools:

2 299 563 Adapter



Common	Used in step 13
Usage	New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.
Included in the tool or work	0 495 187
Storage location	
Replaced by	
In connection with	
SI-Number	

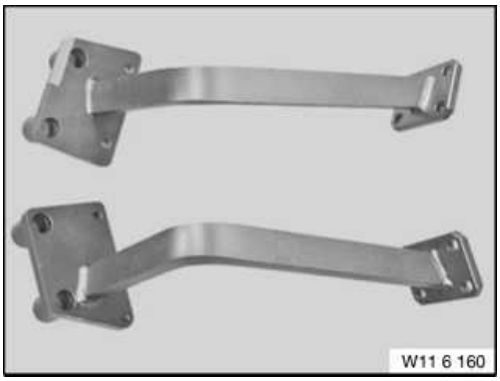
0 496 373 (11 5 420) Plate



Common	Used in step 13
Usage	(Fixture) Engine S62
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	

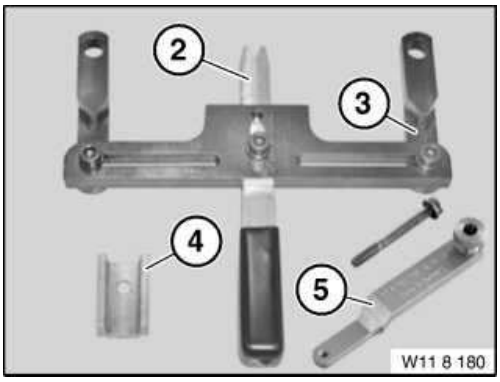
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0 496 680 (11 6 160) Support



Common	Used in step 13
Usage	For mounting N74 engine on the assembly stand. In combination with 00 2 300, 00 2 320
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	00 2 300; 00 2 320 = 0495196
SI-Number	01 31 09 (604)

0 494 434 (11 8 183) Basic body



Common	Used in step 28 41
Usage	
Included in the tool or work	0 493 587
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Screw-in depth of thread cutter	Used in step 39
Screw-in depth	18 mm

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	7 62
EGR controller	7 62

General repair instructions	Used in step
11 00 ... Overview of consumables (Electronic Parts Catalogue)	38

Repair instructions	Used in step
11 00 050 Removing and installing engine	1 68
11 00 050 Removing and installing engine	1 68
11 00 050 Removing and installing engine	1 68
11 00 050 Removing and installing engine	1 68
11 00 050 Removing and installing engine	1 68
11 00 050 Removing and installing engine	1 68
11 00 050 Removing and installing engine	1 68
11 00 050 Removing and installing engine	1 68
11 00 050 Removing and installing engine	1 68
31 10 001 Completely removing and installing front axle with engine and transmission	1 68
11 00 050 Removing and installing engine	1 68

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11 00 050 Removing and installing engine	1	68
11 00 050 Removing and installing engine	1	68
11 00 050 Removing and installing engine	1	68
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11 00 050 Removing and installing engine	1	68
11 00 050 Remove and install engine	1	68
11 00 050 Remove and install engine	1	68
11 00 050 Remove and install engine	1	68
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG)	1	68
11 00 050 Remove and install engine	1	68
11 00 050 Remove and install engine	1	68
11 00 050 Remove and install engine	1	68
11 00 050 Remove and install engine	1	68
11 00 050 Removing and installing the engine (manual gearbox)	1	68
11 00 050 Remove and install engine (Automatic)	1	68
11 00 050 Remove and install engine	1	68
11 00 050 Remove and install engine	1	68
11 00 050 Remove and install engine	1	68
11 00 050 Remove and install engine	1	68
11 00 050 Remove and install engine	1	68
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11 00 050 Removing and installing engine	1	68
11 00 050 Remove and install engine	1	68
11 00 050 Removing and installing engine	1	68
11 00 050 Removing and installing engine \PREMIUM	1	68
11 00 050 Removing and installing/replacing engine (N63)	1	68
11 00 050 Removing and installing engine	1	68
11 00 050 Removing and installing engine	1	68
11 00 050 Removing and installing engine	1	68
11 00 050 Remove and install engine	1	68
11 00 050 Remove and install engine (Automatic)	1	68
11 00 050 Remove and install engine (Automatic)	1	68

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11 00 050 Remove and install engine	1 68
11 00 050 Remove and install engine	1 68
11 00 050 Remove and install engine (Automatic)	1 68
11 00 050 Remove and install engine (Automatic)	1 68
11 00 050 Remove and install engine	1 68
11 00 050 Remove and install engine	1 68
11 00 050 Remove and install engine	1 68
11 00 050 Remove and install engine	1 68
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG)	1 68
11 00 050 Remove and install engine	1 68
61 35 ... Notes on ESD protection (Electro Static Discharge)	6 17 25 38
61 35 ... Notes on ESD protection (Electro Static Discharge)	38

Operating materials	Used in step

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	46
Exhaust-gas recirculation cooler seal on exhaust manifold	62
Exhaust-gas recirculation cooler seal on intake plenum	62

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11 27 030 Remove and install/replace counterbalance shafts

PRELIMINARY WORK

1 – Removing engine



- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

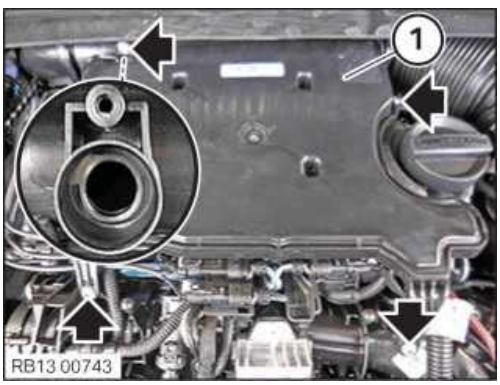
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

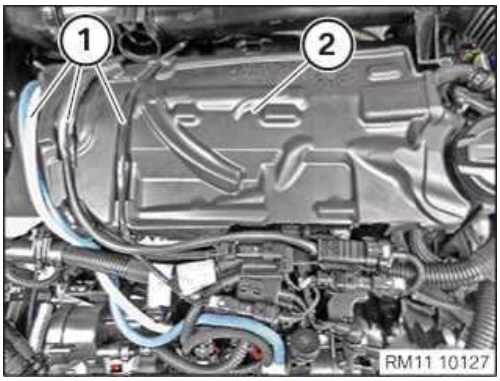
3 – Remove resonator



- Remove screws (arrows).
- Guide out and remove the resonator (1).

4 – Remove the acoustic cover for the injectors

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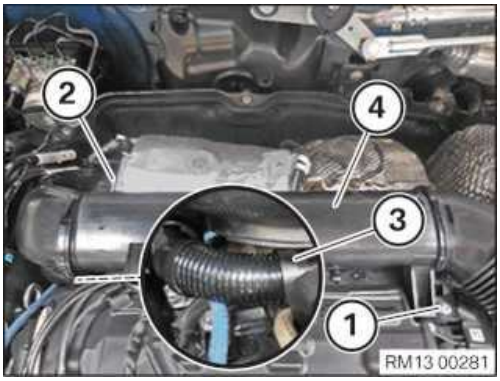


- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

5 – Removing clean air pipe



- Detach clamp (1) on the clean air pipe.
- Pull off the clean air pipe from the intake silencer housing.



- Loosen screw (1).
- Loosen clamp (2).
- Unlock the ventilation line (3) and pull it off the cylinder head cover.
- Feed out clean air pipe and remove.

6 – Remove differential pressure sensor

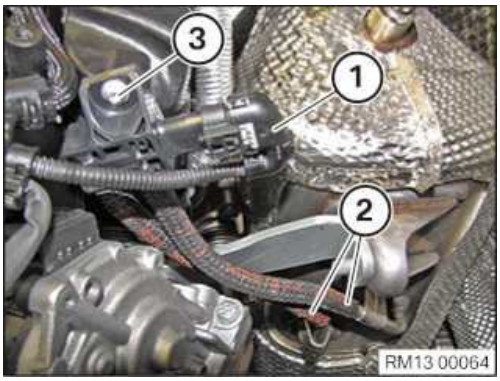
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

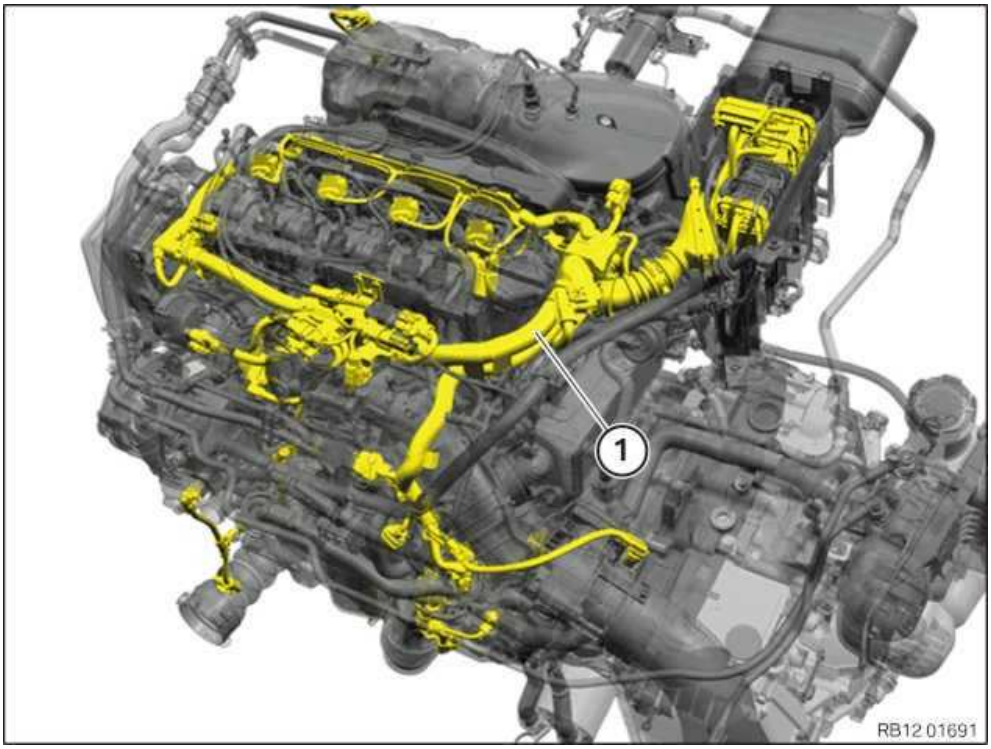
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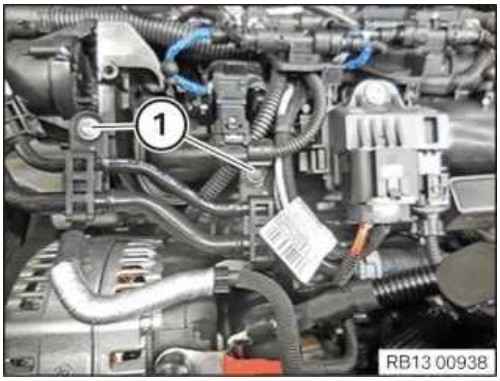
- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

7 – Removing assemblies (on lifting table)

Overview: Wiring harness section for the engine

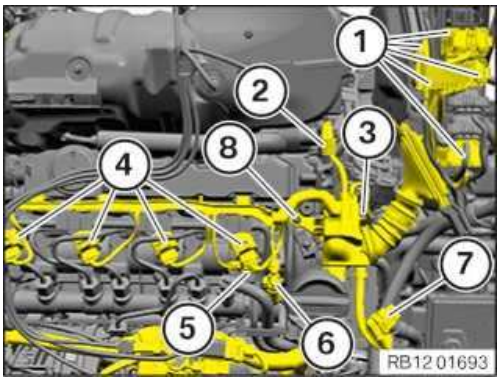


1 Wiring harness section for the engine

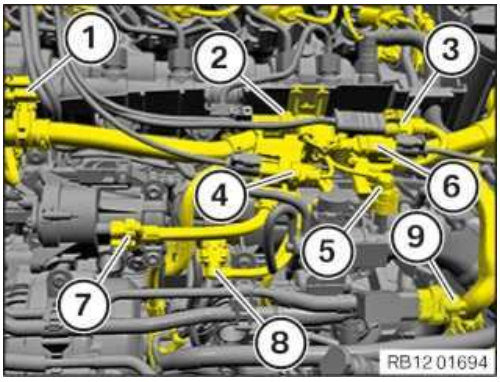


- Loosen screws (1).

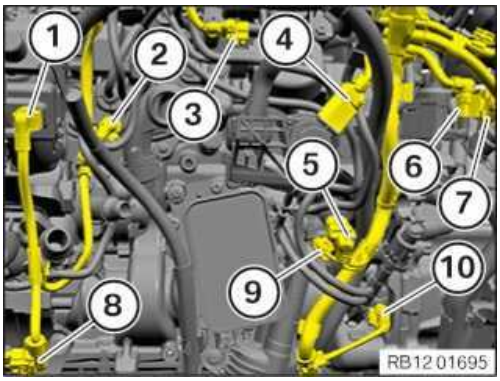
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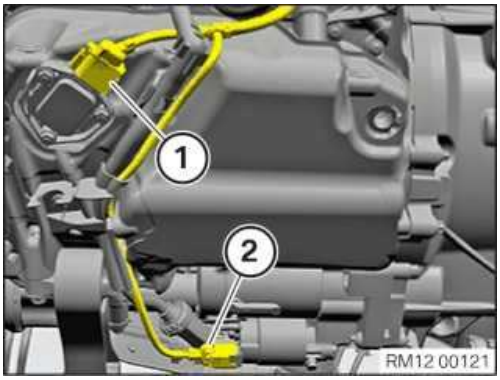
- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock the connector (2) and disconnect it from the differential pressure sensor.
- Unlock the connector (3) and disconnect it from the exhaust-gas recirculation valve.
- Unlock the connector (4) and pull off from the injectors.
- Unlock the connector (5) and disconnect it from the camshaft sensor.
- Unlock the connector (6) and disconnect it from the fuel pressure regulator.
- Unlock connector (7) and pull off from hot film air mass meter.
- Loosen screw (8).



- Unlock connector (1) and pull off from the rail pressure sensor.
- Unlock the connector (2) and disconnect it from the exhaust temperature sensor before the diesel particulate filter.
- Unlock connector (3) and pull it off from the front oxygen sensor.
- Unlock the connector (4) and disconnect it from the exhaust temperature sensor after the diesel particulate filter.
- Unlock and disconnect the connector (5) from the electric changeover valve.
- Unlock the connector (6) and disconnect it from the exhaust temperature sensor for the exhaust-gas recirculation cooler.
- Unlock the connector (7) and disconnect it from the servomotor for the swirl flaps.
- Unlock the connector (8) and pull it off the charging pressure sensor.
- Unlock the connector (9) and disconnect from the fuel pressure and temperature sensor.

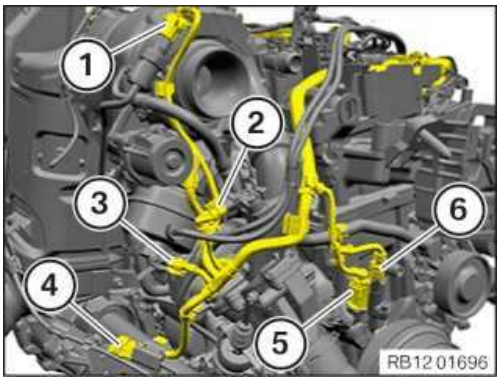


- Unlock and disconnect the connector (1) from the alternator.
- Unlock and disconnect the connector (2) from the electric changeover valve.
- Unlock and disconnect the connector (3) from the electric changeover valve.
- Unlock the connector (4) and pull it off the high pressure pump.
- Unlock the connector (5) and disconnect it from the oil pressure sensor.
- Unlock connector (6) and pull off from throttle body.
- Unlock the connector (7) and disconnect it from the intake air temperature sensor.
- Unlock the connector (8) and disconnect it from the air conditioning compressor.
- Unlock and disconnect the connector (9) from the solenoid valve.
- Unlock the connector (10) and pull it off the crankshaft sensor.



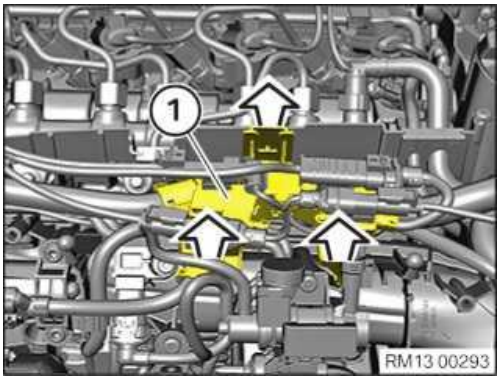
- Unlock the connector (1) and pull off of the oil-level sensor.
- Unlock connector (2) and remove from starter motor.

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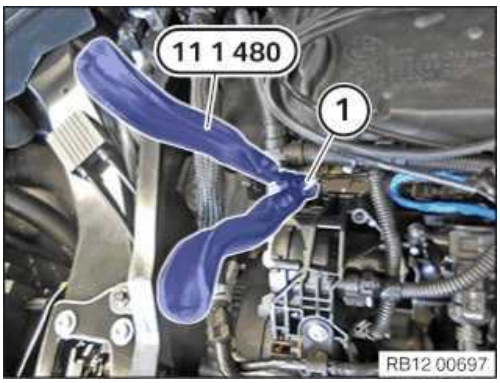


- Unlock the connector (1) and disconnect it from the exhaust gas pressure sensor.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock the connector (3) and pull it off the exhaust turbocharger.
- Unlock the connector (3) and disconnect it from the differential pressure sensor.
- Unlock connector (4) and pull it off from the monitoring oxygen sensor.
- Unlock the connector (5) and pull it off the oil pressure switch .
- Unlock connector (6) and disconnect from switching valve.
- Detach, feed out and remove the wiring harness from the clamps.

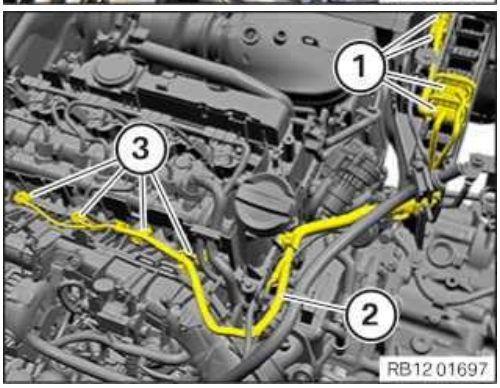
▶ **Removing the cable clips from the intake plenum**



- Detach the cable clip (1) in the direction of the arrow.
- Guide out the cable clip (1) in direction of arrow and set it aside.



- Unlock the connectors (1) of all glow elements with the special tool **0 490 796 (11 1 480)** and release them.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.



- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Pull off all connectors (3) from glow element using special tool **0 490 796 (11 1 480)**.
- Loosen screw (2) and remove the ground strap.
- Detach, feed out and remove the wiring harness from the clamps.

▶ **Removing the drive belt for alternator**

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

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CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

TECHNICAL INFORMATION

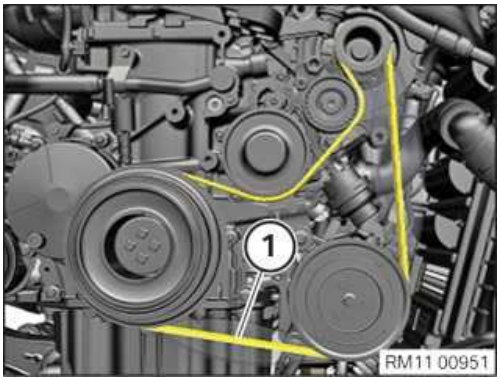
If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

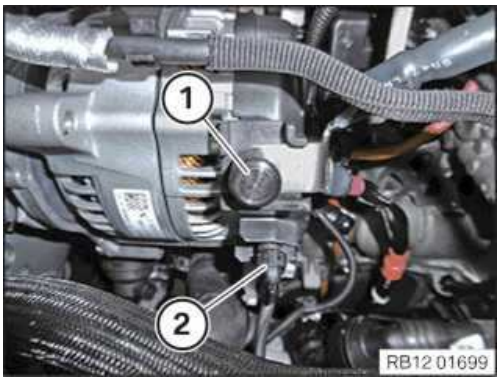
The drive belt must be replaced if contaminated with coolant- and oil residues.



- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool **0 496 268 (11 0 390)**.



- Guide out the drive belt for the alternator (1) and remove it.

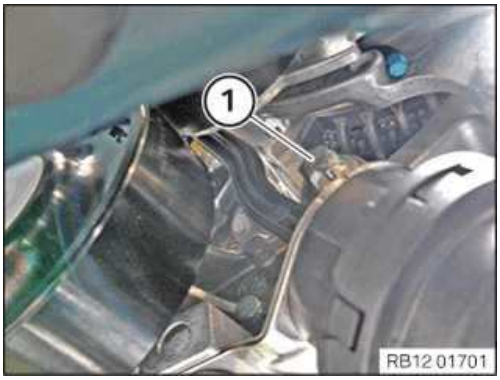


- Remove the cover (1) and loosen the nut below.
- Disconnect positive battery cable from alternator.
- Unlock and disconnect the connector (2) from the alternator.

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- Detach screw (1) on top on the alternator.



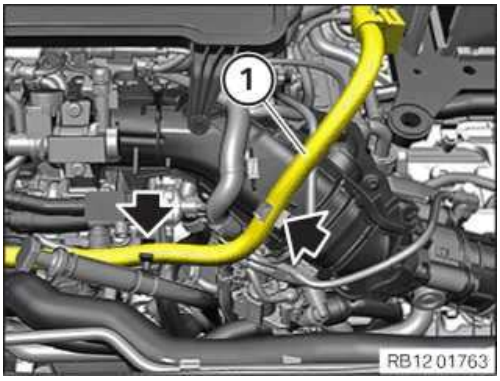
- Detach screw (1) below on the alternator.



- Feed out alternator (1) along with the screw (2) on the bottom of the alternator through the slot on the support and remove.

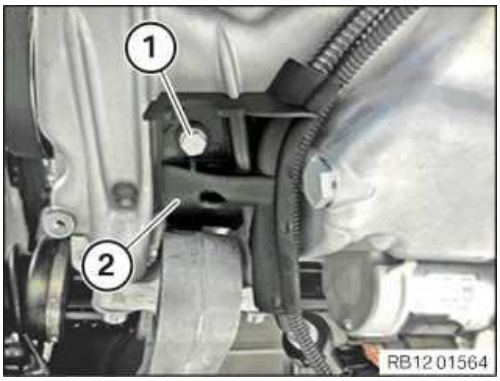


- Loosen screws (1).
- Feed out and remove the air conditioning compressor (2).



- Release the positive battery cable (1) from the clamps (arrows).

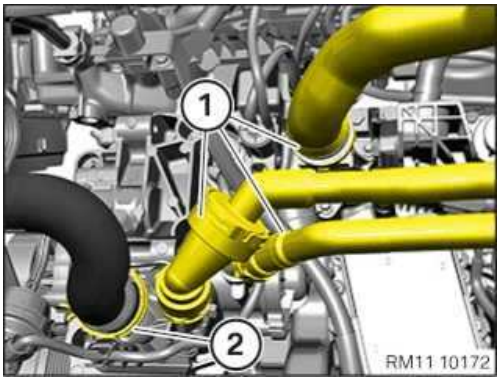
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- Loosen screw (1).
- Guide out and remove holder (2).



- Feed out positive battery cable from the clamps (1) and remove.



- Unlock and disconnect coolant lines (1).
- Guide out the coolant lines (1) and remove it.
- Detach the clamp (2).
- Guide the coolant hose out and remove.

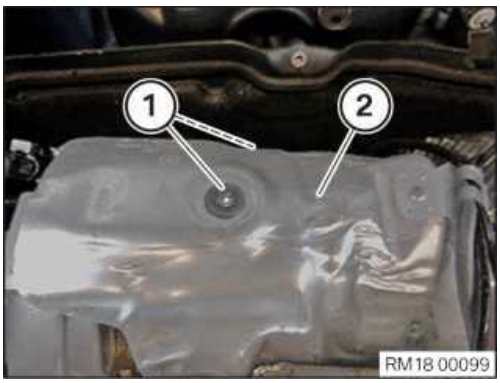
▶ **Removing heat shield from top exhaust turbocharger**

WARNING

Hot surfaces.

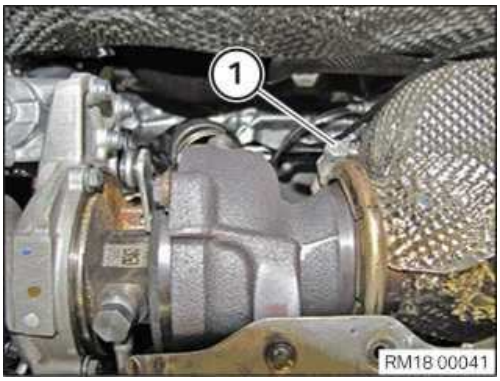
Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from holders.
- Release the screws (1) at the top and bottom of the heat shield.
- Feed out and remove the heat shield (2).

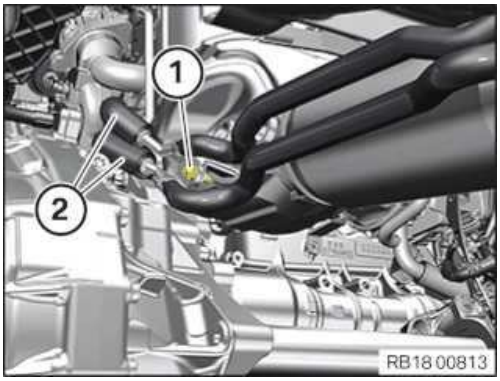
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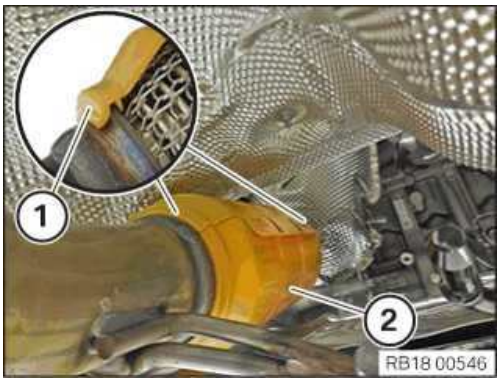
- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.



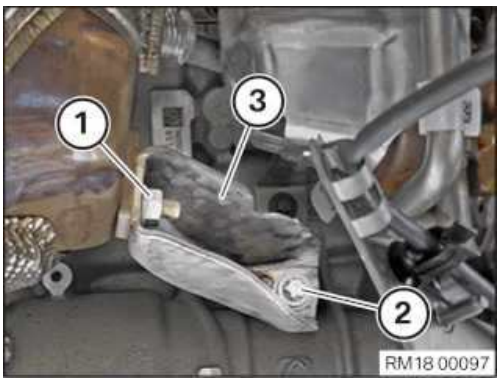
- Loosen nuts (1).



- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.

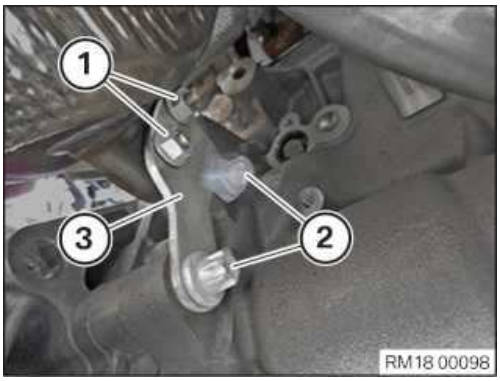


- Mount fitting aid (2).
- Make sure that the fitting aid is correctly position on the edges (1) of the flexible tube.



- Loosen nut (1).
- Loosen screw (2).
- Remove holder (3).

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- Loosen nuts (1).
- Loosen screws (2).
- Remove holder (3).
- Guide out and remove diesel particulate filter .

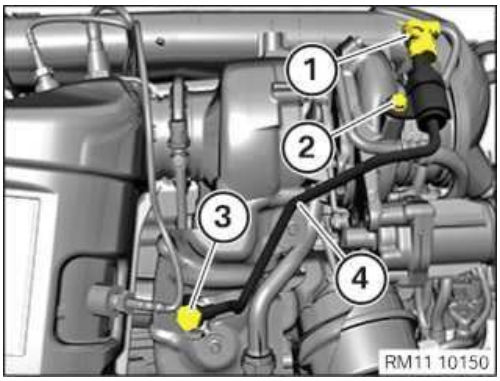
▶ **Remove the heat shield from the exhaust turbocharger at the bottom**

WARNING

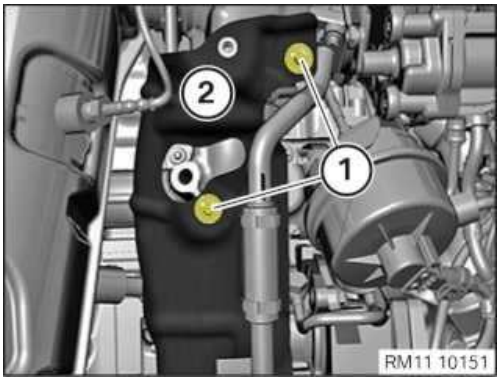
Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Unlock and disconnect connector (1).
- Unscrew the banjo bolt (3).
- The seals of the banjo bolt (3) must be renewed.
- Loosen screw (2).
- Remove the exhaust gas pressure pipe (4).



- Unscrew the bolts (1) on the heat shield .
- Feed out and remove the heat shield (2).

▶ **Removing the exhaust-gas recirculation cooler**

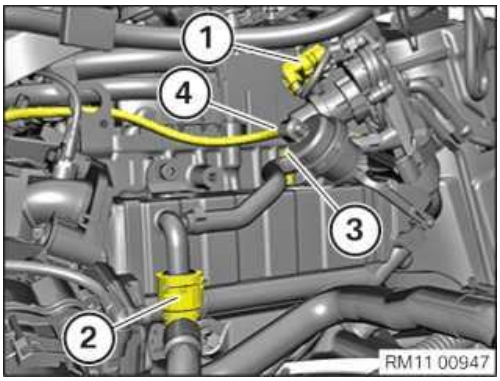
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

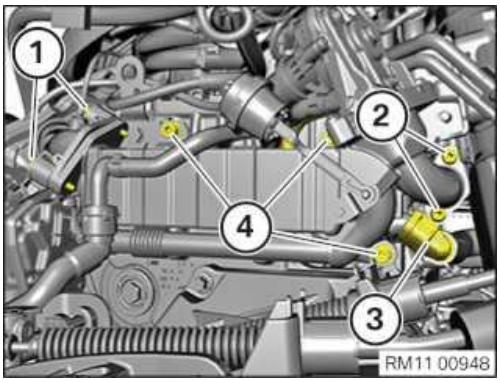
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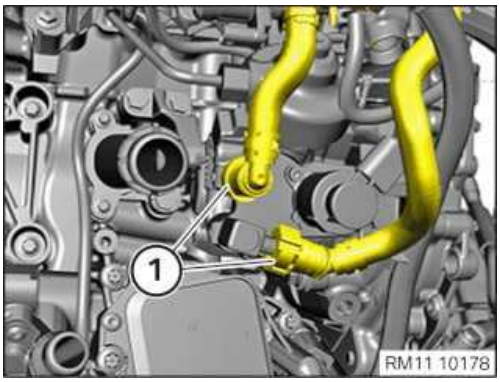
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

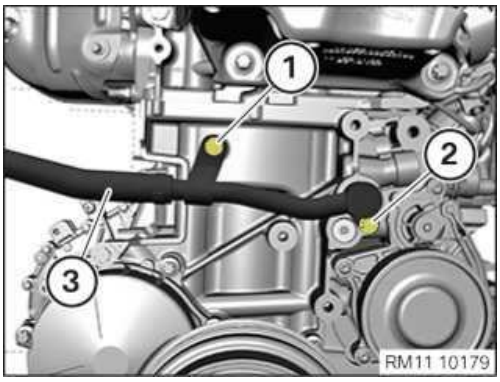
- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.



- Unlock the fuel lines (1) and disconnect from the high pressure pump.
- Remove the fuel lines.



- Loosen screws (1) and (2).
- Remove coolant line (3).

8 – Removing the low-pressure stage turbocharger

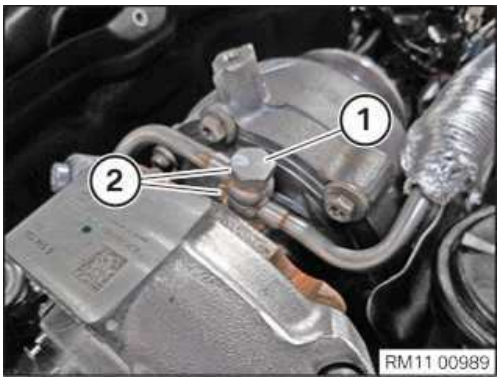
WARNING

Hot surfaces.

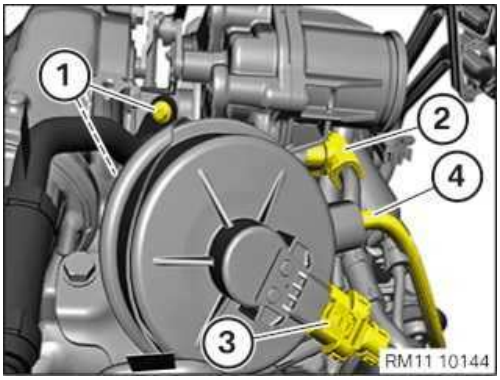
Risk of burning!

- Perform all work only on components that have cooled down.

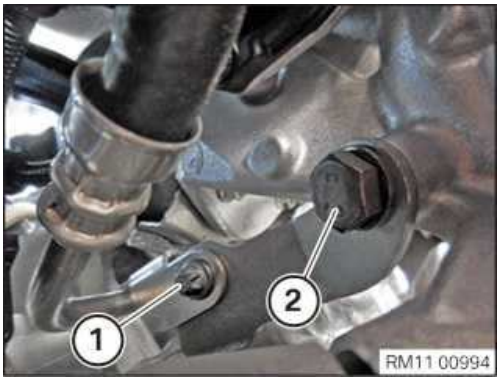
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- Release the banjo bolt (1) of the oil feed lines.
- Remove sealing rings (2).
- Place oil feed lines to one side.



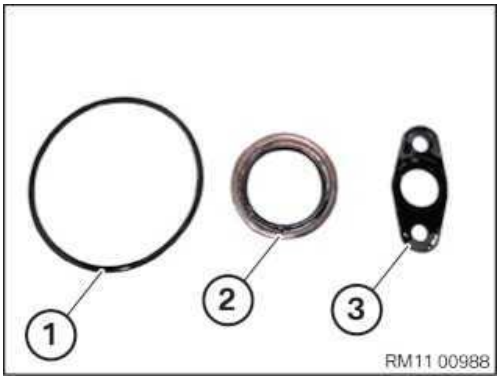
- Release the screws (1) of the oil return line.
- Unlock and disconnect the plug connections (2) and (3).
- Pull off the vacuum hose (4) carefully.



- Undo the bolt (1) of the oil feed line.
- Loosen screw (2).

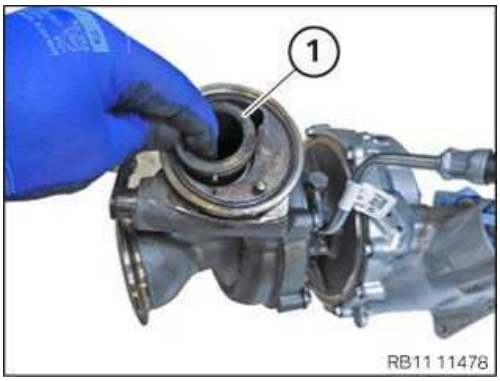


- Loosen screw (1).
- Remove the V hose clamp.
- Guide the low-pressure stage turbocharger out towards the top and remove.



- Remove seals (1), (2) and (3).

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- Remove the spacer ring (1).

9 – Removing the high-pressure stage exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

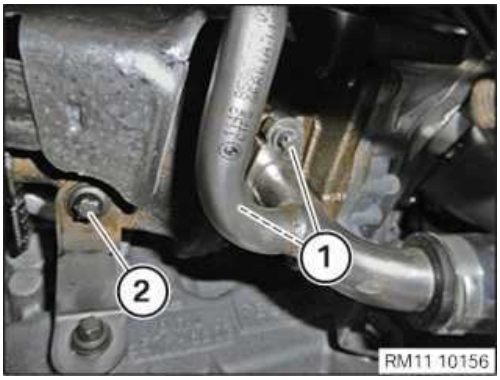
- Perform all work only on components that have cooled down.

CAUTION

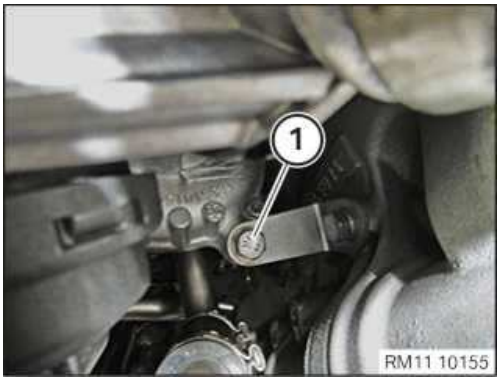
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

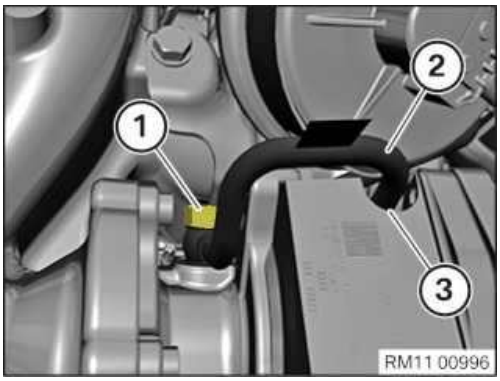


- Unscrew the bolts (1) on the oil return line .
- Loosen screw (2).

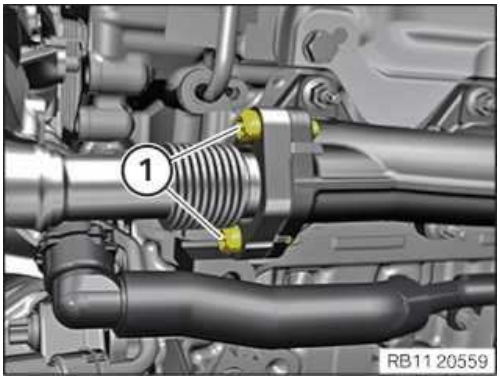


- Release screw (1) from the right wheel arch.

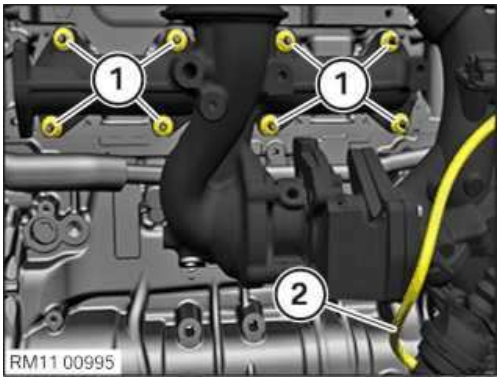
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- Unscrew the banjo bolt (1).
- Guide out oil feed line (2) from holder (3).

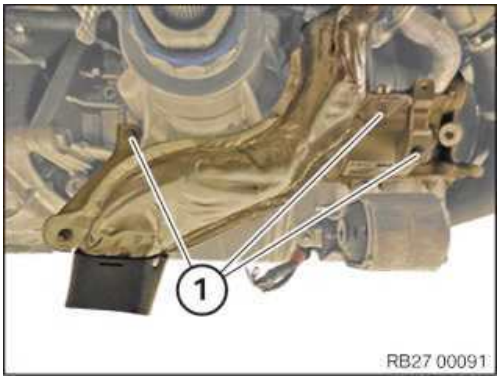


- Loosen screws (1).

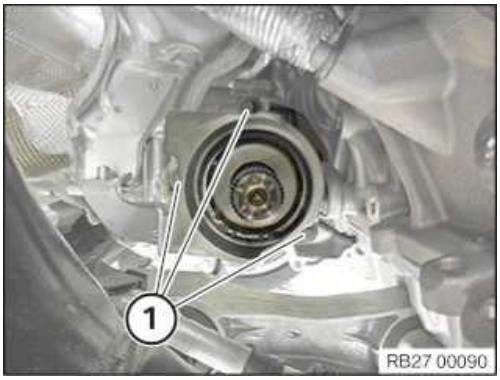


- Pull off the vacuum hose (2).
- Loosen nuts (1).
- Guide out the exhaust manifold and the high-pressure stage exhaust turbocharger to the top and remove them.

10 – Remove the intermediate shaft with the support tube

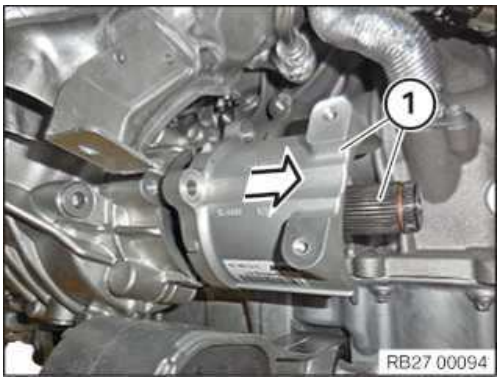


- With air duct installation: Loosen screws (1).
- Remove air duct



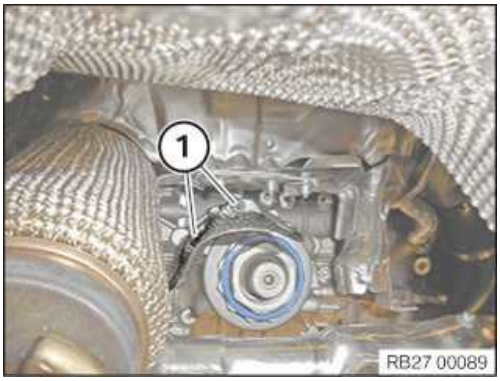
- Loosen screws (1).

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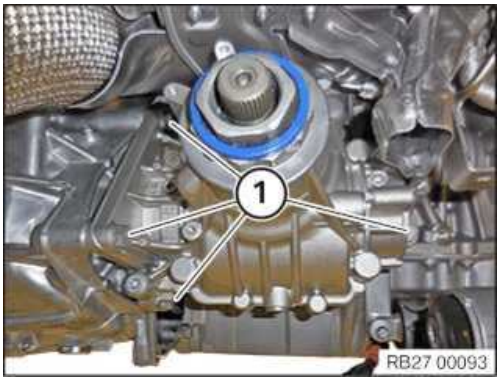


- Pull the intermediate shaft with the support tube (1) out of the transfer box.

11 – Remove transfer box (VTG)



- Loosen screws (1).
- Remove heat shield.



- Loosen screws (1).
- Remove the transfer box (VTG).

12 – Detach the engine from the automatic transmission

Prerequisite

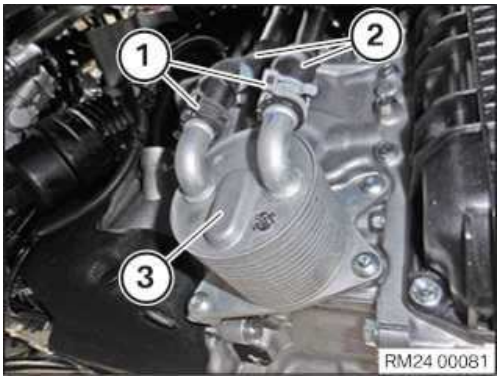
Engine has been removed.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Unfasten hose clamps (1).
- Disconnect coolant hoses (2) from transmission oil cooler (3).
- Catch the emerging coolant.

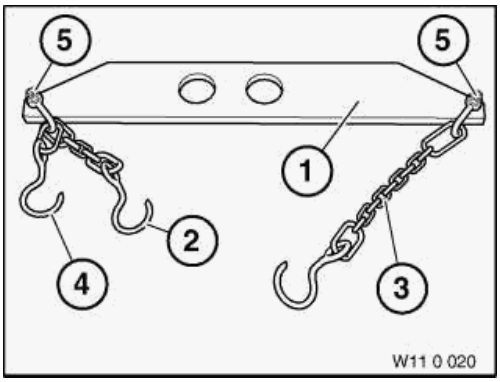
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- Crank engine with special tool **0 493 380 (11 6 480)** at vibration damper in direction of rotation.
- Unscrew the nut (1) of the torque converter.
- Crank engine further and release remaining 5 nuts.



- Stage the workshop crane **2 220 718**.



- Stage the lifting gear .



TECHNICAL INFORMATION

Conduct the following operation with the assistance of a second person.

- Secure the automatic transmission against dropping using a workshop crane **2 220 718** and lifting gear .
- Remove screws (arrows).
- Remove the automatic transmission with help from an auxiliary person and using the workshop crane **2 220 718** including lifting gear and put it to one side.

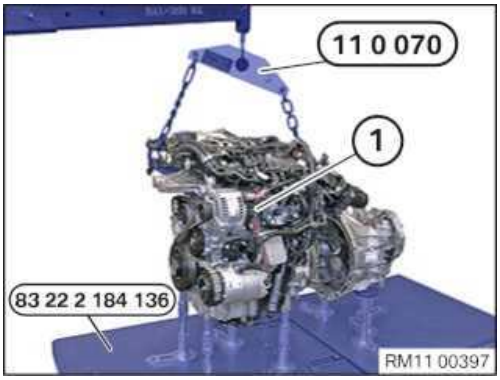
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- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

M8		Tightening torque	21,5 Nm



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Attach engine lifter to special tool and lift engine (1) off lifting table.

13 – Mount engine on assembly stand

CAUTION

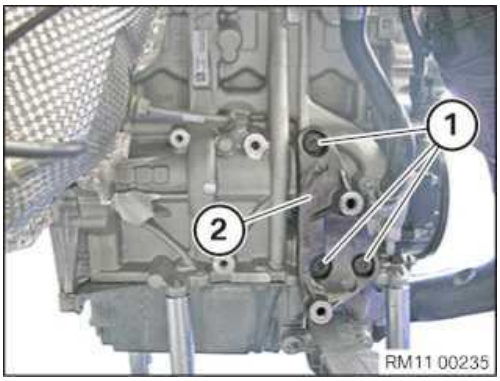
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Loosen screws (1).
- Guide out and remove holder (2).

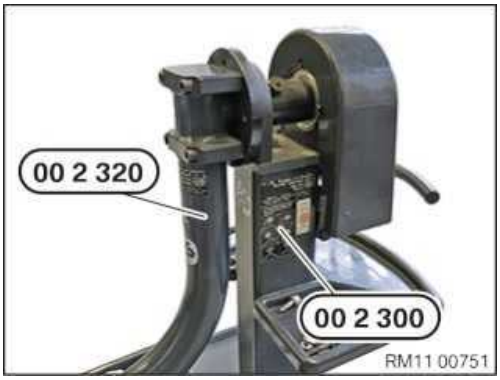
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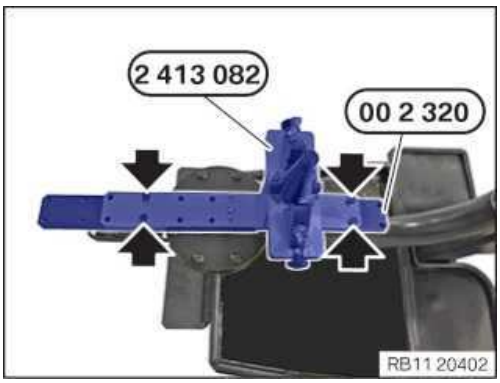
- Position the special tool **2 455 010** on the engine (1).
- Position the standard bolts **M10x30**.
- Tighten the standard bolts (arrows).
-

Special tool 2 455 010 to crankcase

M10x30		Tightening torque	38 Nm



- Prepare the assembly stand **0 495 187 (00 2 300)** with the special tool **0 495 196 (00 2 320)**.



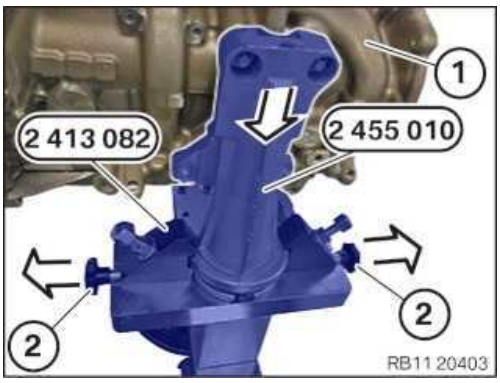
- Screw the special tool to the **0 495 196 (00 2 320)** special tool.
- Tighten screws (arrows).
-

Special tool 11 8 930 to special tool 00 2 320

M14x35		Tightening torque	160 Nm

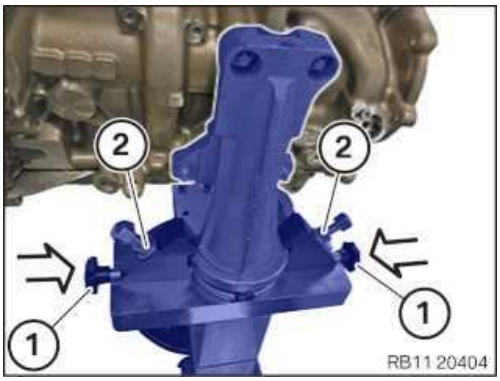


- Position the engine lifter with the special tool and the engine on the special tool **0 495 187 (00 2 300)**.



- Detach the holder (2) in the direction of the arrow.
- Position the engine (1) with the special tool **2 455 010** in the direction of the arrow on the special tool .

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- Lock the holder (1) in direction of arrow.
- Tighten nuts (2).

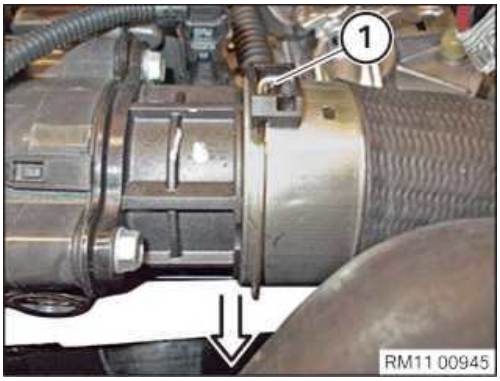
14 – Removing the intake plenum

TECHNICAL INFORMATION

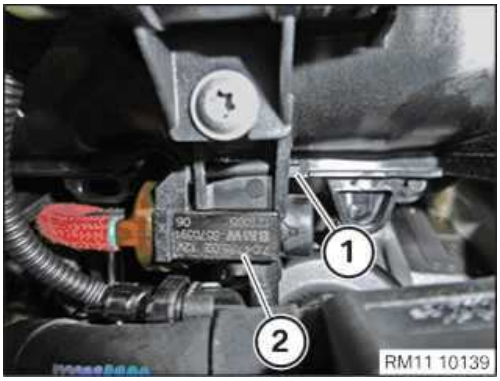
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Unlock the lock (1).

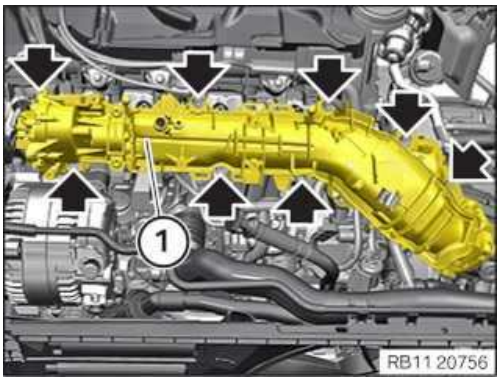


- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.

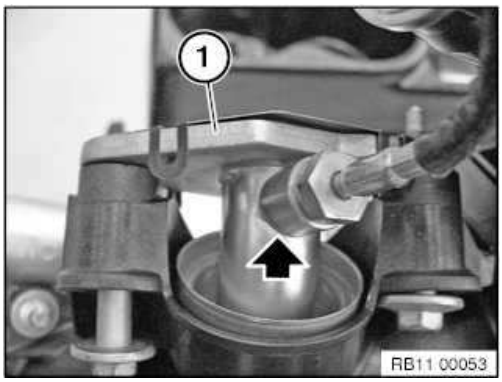


- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.

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- Release the screws (arrows) from the intake plenum (1).
- Guide the intake plenum (1) out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

15 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

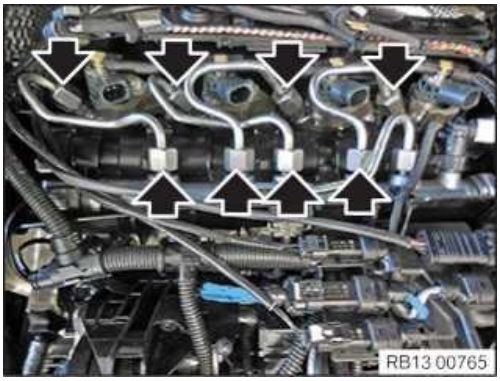
If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release the high pressure lines (arrows) with the special tool .
- Catch and dispose of escaping fuel.
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool .

16 – Detaching leakage oil line from injector

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

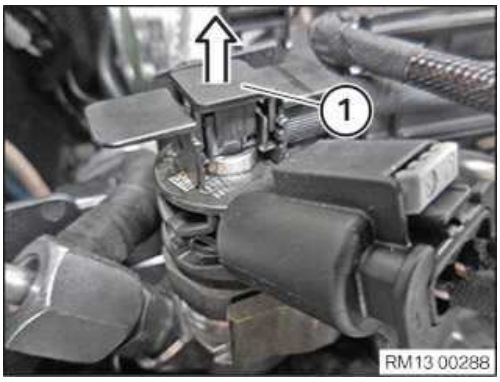
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

17 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

 **Electrostatic discharge.**

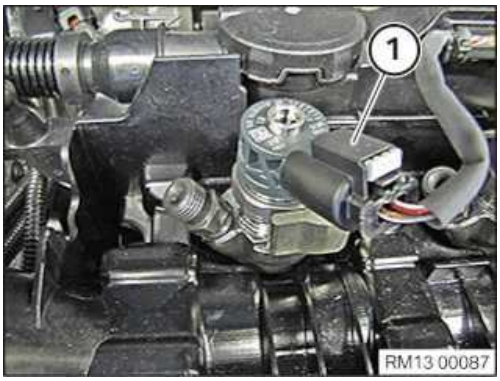
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

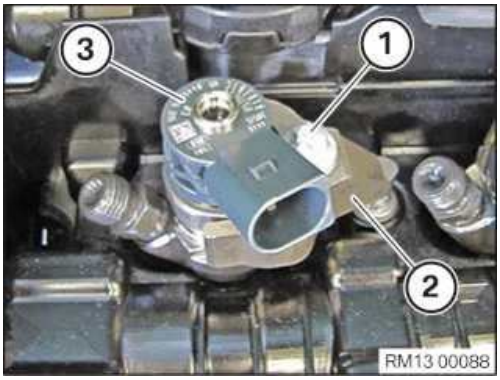
TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.

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- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

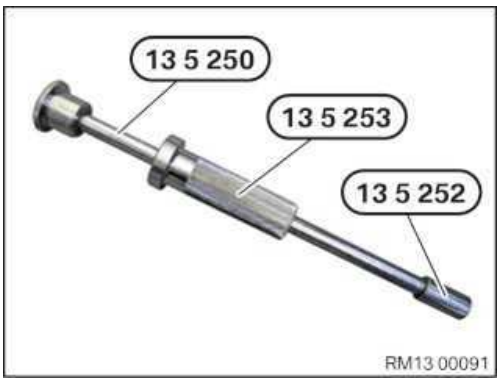
▶ **Loosen stuck injectors**

RISK OF DAMAGE

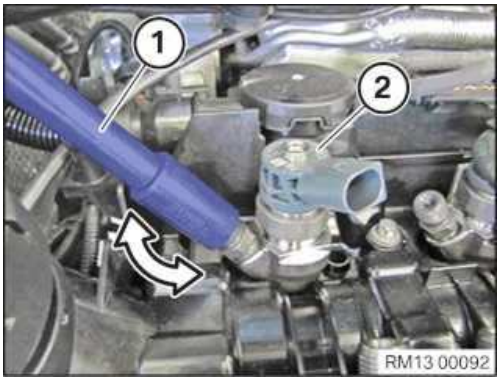
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)** back onto the special tool **0 493 321 (13 5 250)**.



- Screw the special tool (1) **0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1) **0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

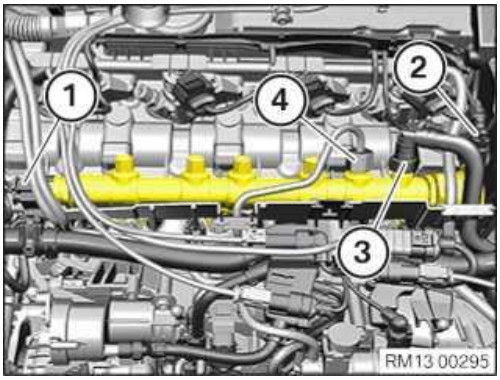
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

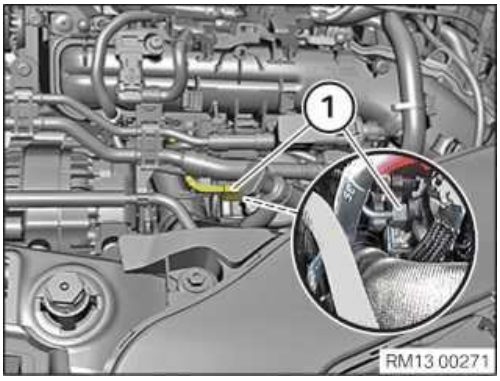
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

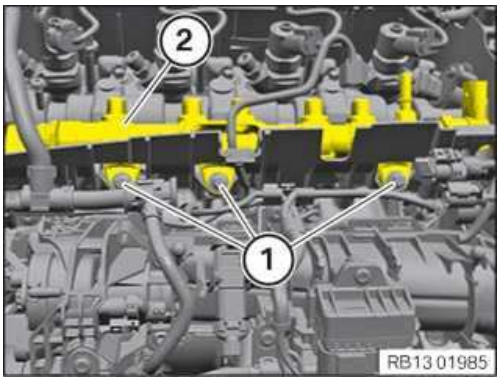


- Unlock and disconnect connector (1).
- Unlock and disconnect connector (2).
- Unlock and release fuel line (3).
- Loosen union nut (4) with special tool .
- Reset special tool early on to avoid bending pressure lines.



- Slacken the union nut (1) on the high pressure pump.

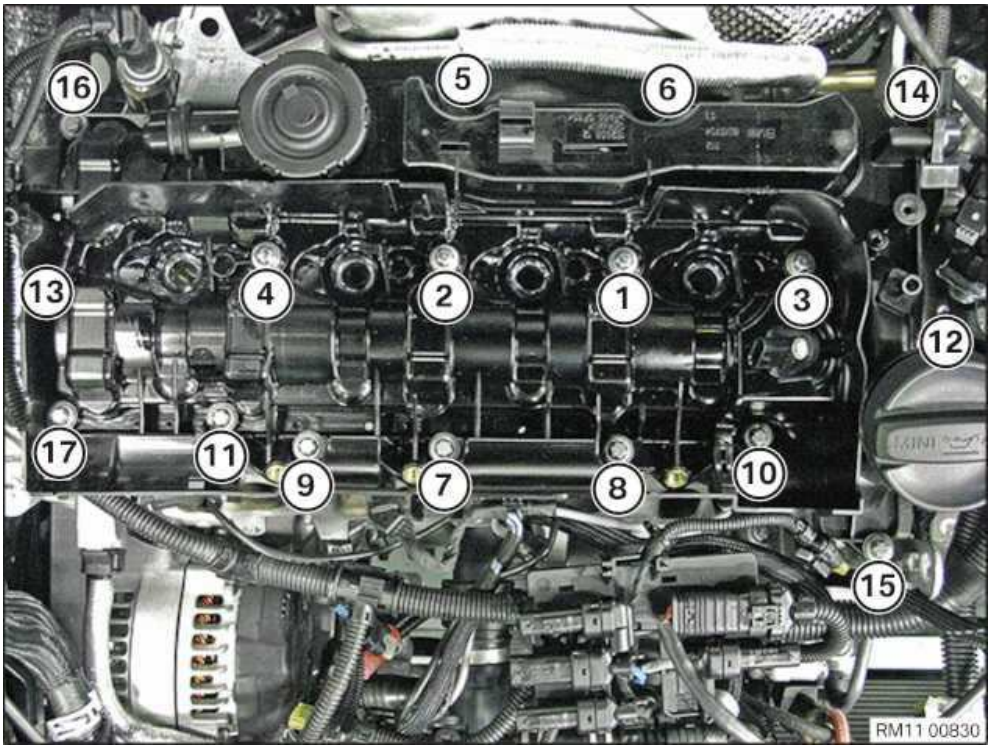
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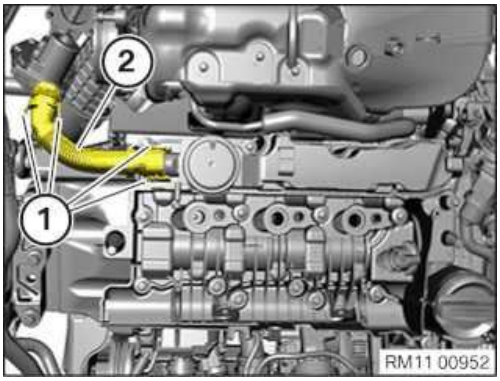
- Loosen screws (1).
- Carefully thread out and remove the rail (2).
- Make sure the pressure line of the high pressure pump is not bent.

19 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover

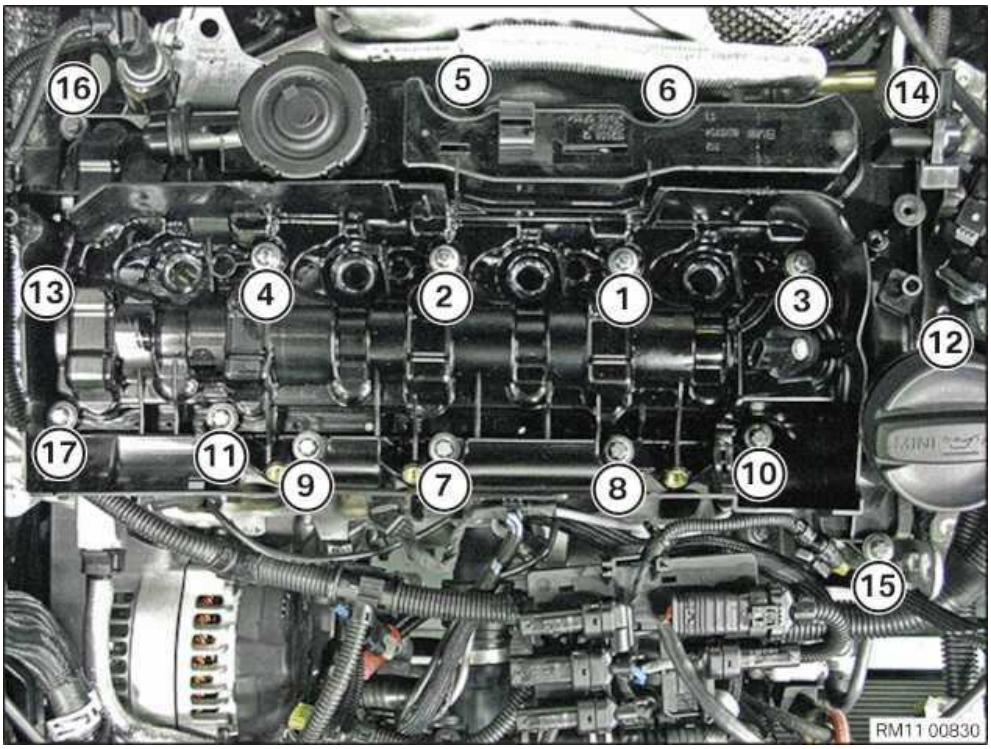


1 to 16 screws of the cylinder head cover.



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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- Loosen screws in the order (17) to (1).
- Remove cylinder head cover by lifting it out.

20 – Checking camshaft timing



- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

Damage to the engine.

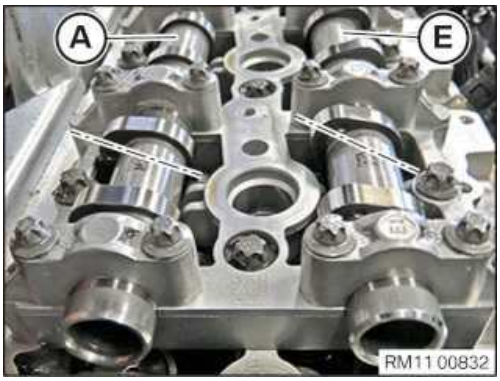
The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

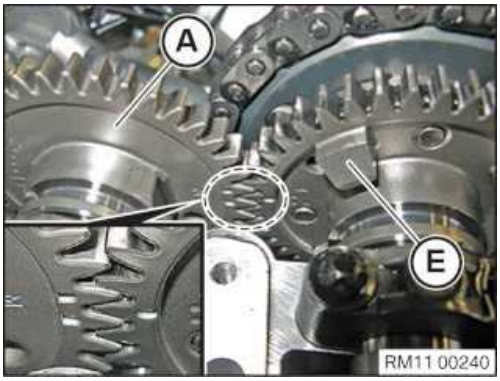
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- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.



- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

21 – Remove chain tensioner piston

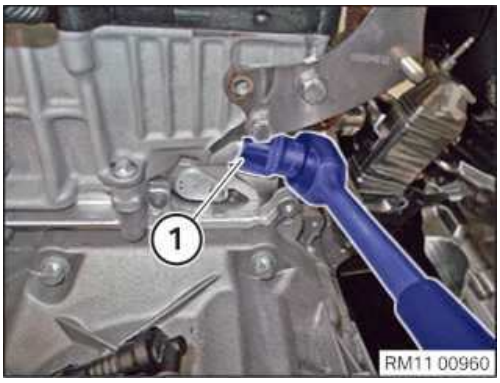
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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

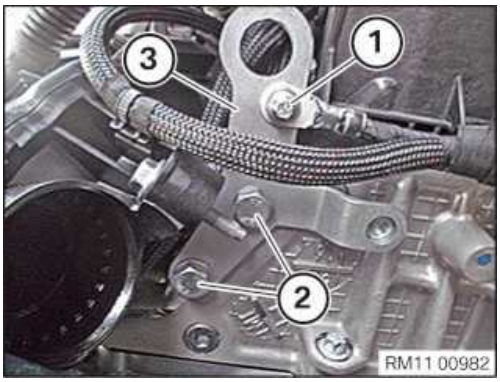


TECHNICAL INFORMATION

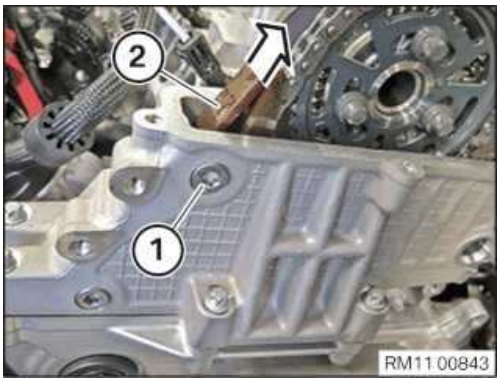
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

22 – Remove the timing chain guide rail

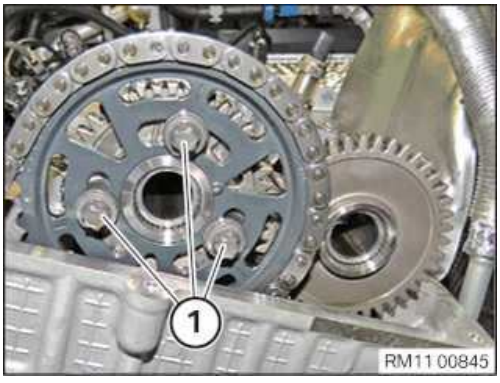


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

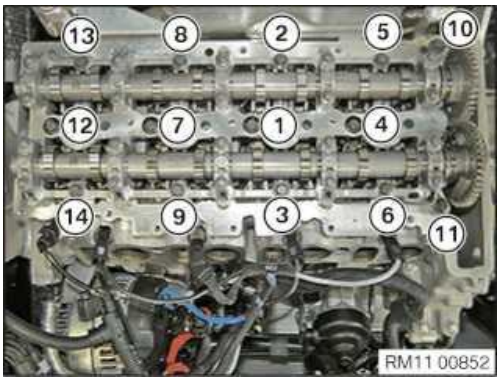
23 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

24 – Removing the camshaft support

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- Evenly loosen all screws in a sequence from (14) to (1).
- Loosen and remove all screws in a sequence from (14) to (1).
  Both camshafts can be removed with the camshaft carrier.
- Remove the camshaft support including camshafts towards the top.

25 – Removing glow elements

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Damage to the glow elements.

Excessive force may damage the glow elements and they may then have to be renewed.

- Handle glow elements with care and do not drop.
- Do not rest the cylinder head on glow elements. Glow elements protrude from the sealing surface of the cylinder head.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

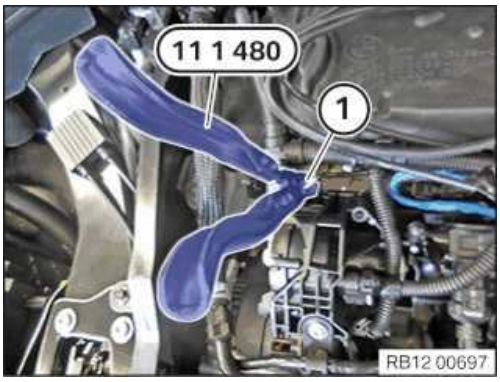
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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

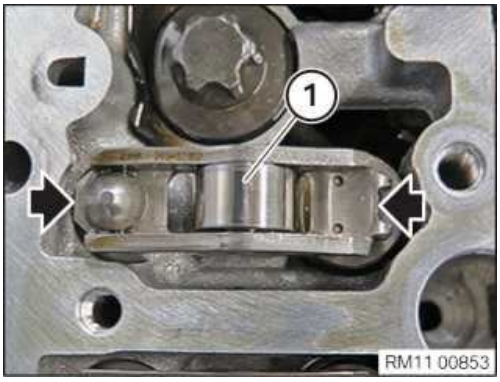


- Unlock and disconnect plug connection (1) using special tool **0 490 796 (11 1 480)**.



- Release the glow elements with the special tool or conventional tools.
- Feed out preheating elements and remove.

26 – Remove roller cam followers



- Guide out and remove all roller cam followers (1) (arrows).
- Place all roller cam followers (1) in order in special tool **0 495 105 (11 4 480)**.

  Roller cam followers that have already been used must be installed in same position again.

27 – Removing the hydraulic valve clearance compensating element

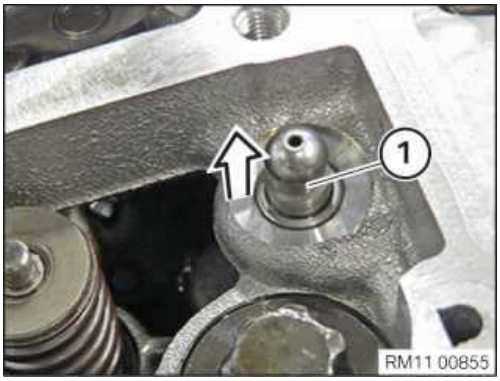
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RISK OF DAMAGE

Contaminant or foreign body.

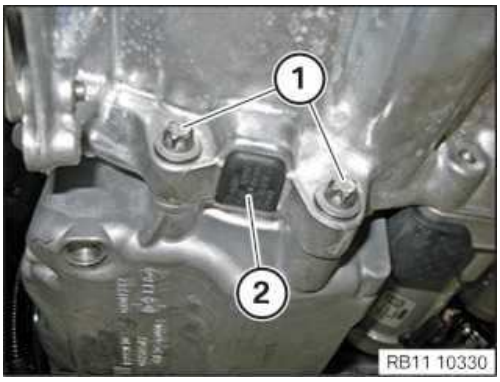
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

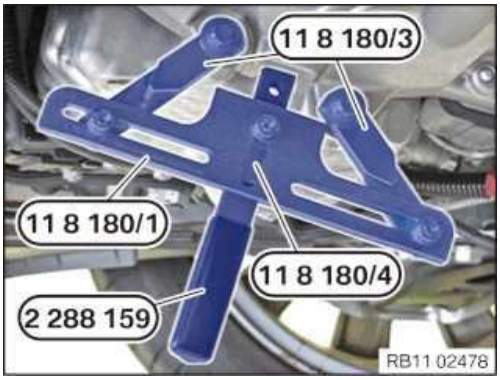


- Remove the hydraulic valve clearance compensating element (1) in the direction of the arrow and place on the special tool **0 495 105 (11 4 480)**.
- Repeat the process on all hydraulic valve clearance compensating elements.

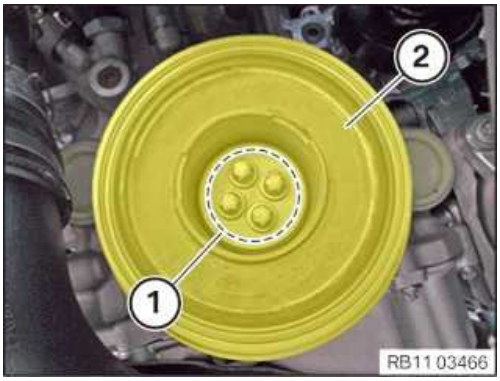
28 – Removing the vibration damper



- Release the transmission bolts (1).
- Remove the protective cap (2).



- Position special tool **0 493 587 (11 8 180)** as illustrated.
- Fasten the special tool **0 493 587 (11 8 180)** to the transmission with transmission bolts.



- Loosen screws in the area (1).
- Remove the vibration damper (2).

29 – Removing flywheel

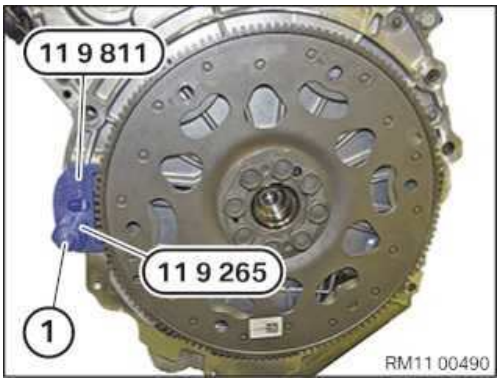
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CAUTION

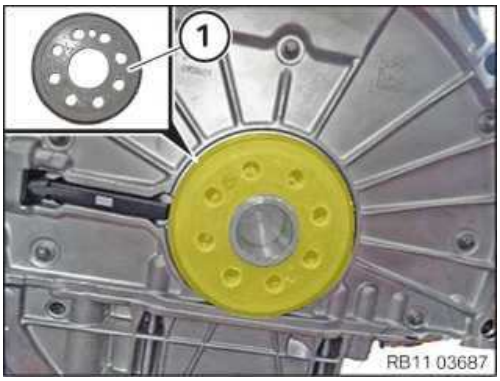
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Secure flywheel with a transmission bolt (1) and the special tools **0 496 171 (11 9 811)** and **0 494 793 (11 9 265)**.
- Unfasten flywheel bolts.
- Remove flywheel.



RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

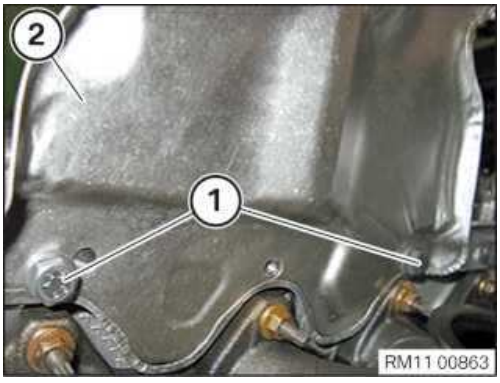
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Remove the increment wheel (1) from the crankshaft and set correctly.

30 – Remove rear timing case cover

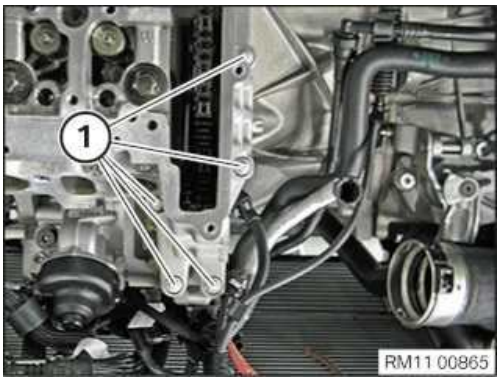
Prerequisite

Transmission is removed.



- Loosen screws (1).
- Feed out the heat shield (2) and place to one side.

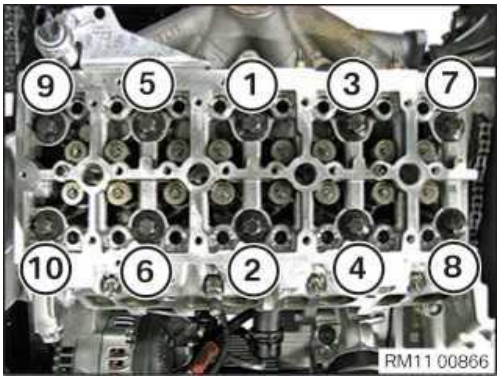
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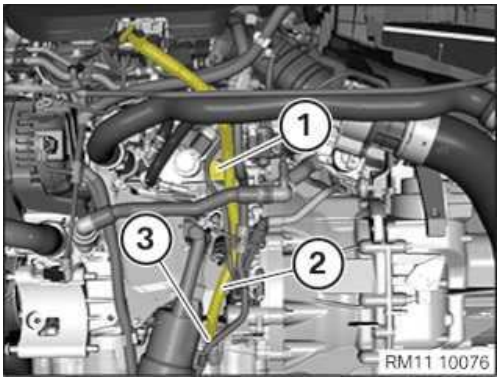
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

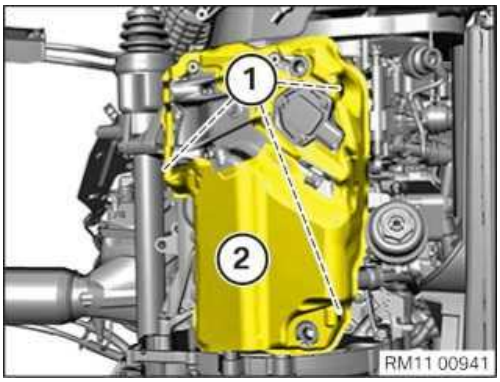
- Loosen screws (1).



- Loosen the cylinder head bolts in the sequence from (10) to (1).
- Remove cylinder head bolts (1) to (10) with washers.
- Remove cylinder head.

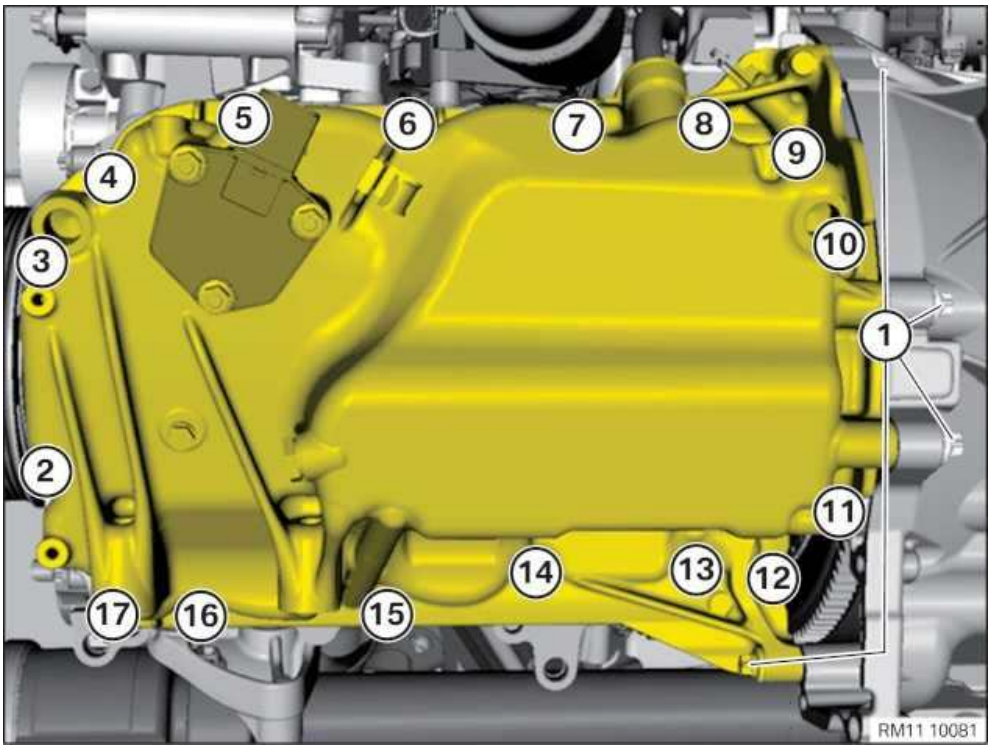


- Loosen screw (1).
- Disconnect the guide tube (2) for the oil dipstick toward the top from the oil sump and remove it.
- Remove sealing ring (3) from oil sump if necessary.

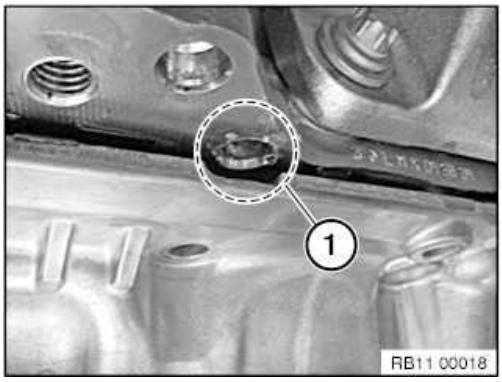


- Expanding rivets (1) on both sides of the acoustic cover (2).
- Feed out and remove the acoustic cover (2).

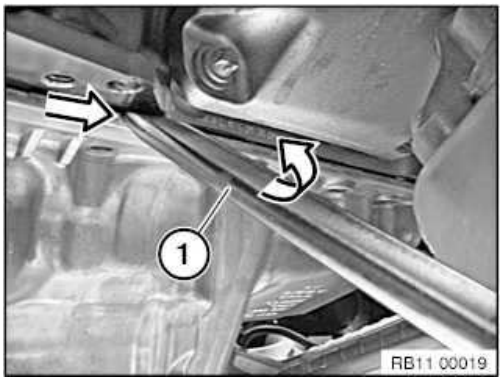
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- Loosen the transmission bolts (1) on the oil sump.
- Loosen screws (2) to (17).

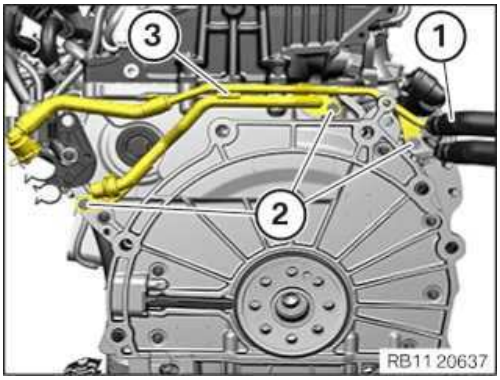


- Release oil sump only in area (1).



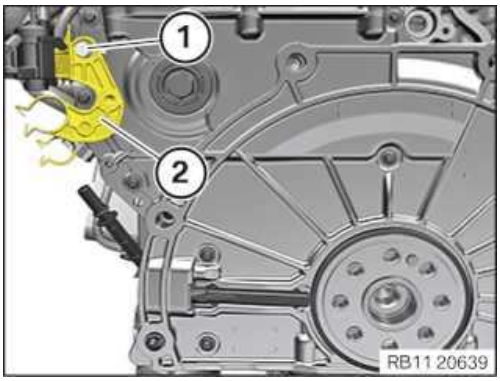
- Detach the oil sump with a suitable mounting lever (1) carefully at the point provided.
- Secure the oil sump against falling.

▶ **If installed: Remove coolant line of the SCR metering module**

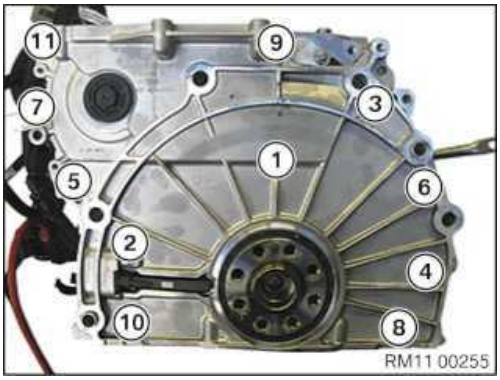


- Unlock and disconnect the coolant hose (1).
- Loosen screws (2).
- Remove the coolant line (3).

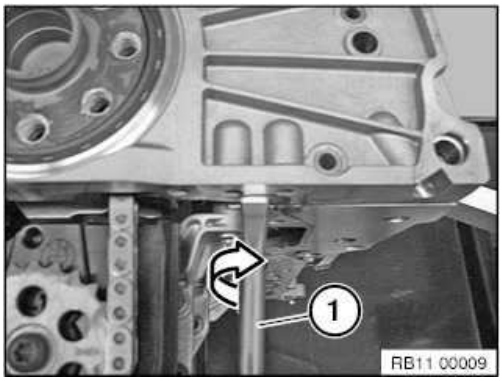
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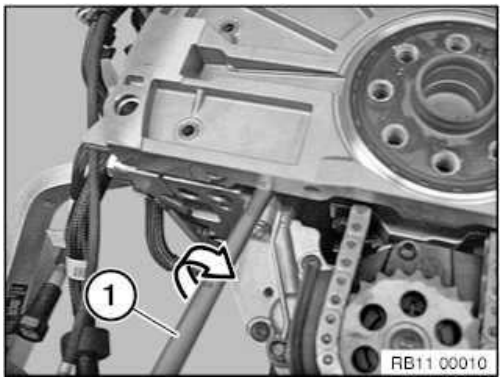
- Loosen screw (1).
- Guide out and remove holder (2).



- Loosen screws in the order (11) to (1).



- Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.



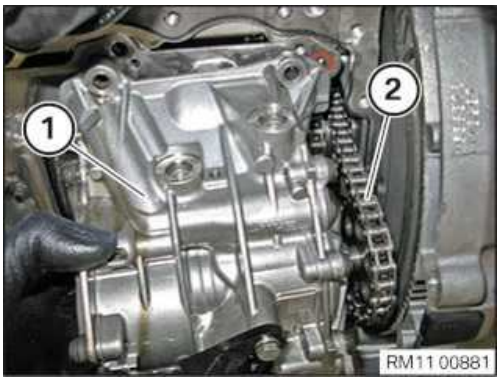
- Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.
- Remove the timing case cover.

31 – Remove the oil vacuum pump



- Loosen screws (1) of the oil vacuum pump (2).

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- Remove oil vacuum pump (1) and remove from the drive chain (2).

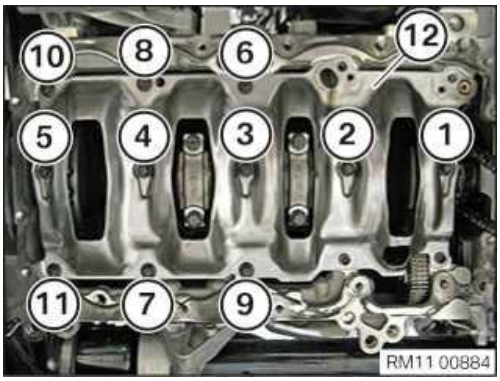
32 – Removing the oil deflector

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Loosen screws in the order (11) to (1).
- Guide out and remove the oil deflector (12).

MAIN WORK

33 – Remove counterbalance shafts

RISK OF DAMAGE

Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

- Comply with the regulations for the installation and disassembly.
- Perform work with care.

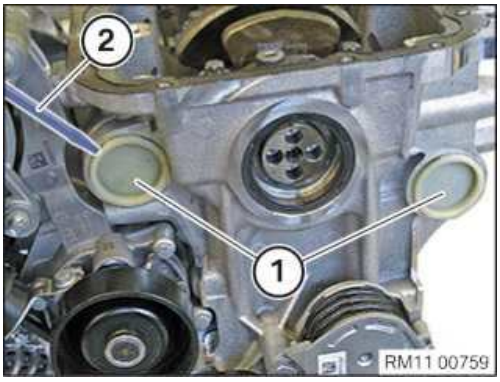
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RISK OF DAMAGE

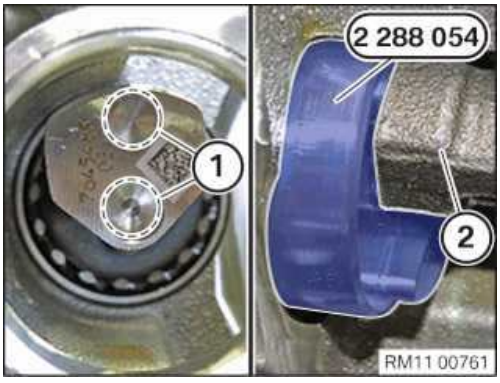
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

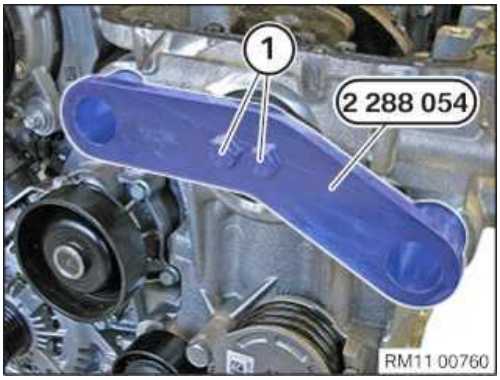
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Remove the sealing cap (1) with a suitable tool (2).



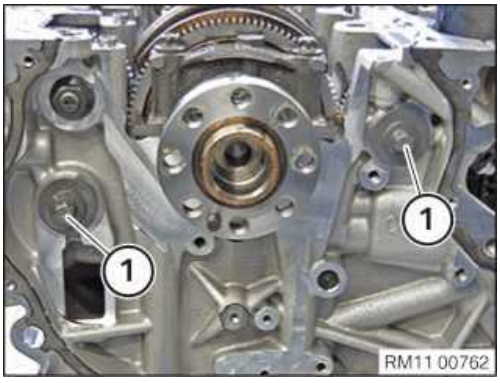
- Rotate the crankshaft to the **TDC of the first cylinder**.
- The special tool **2 288 054** must be positioned in the guides (1) of the counterbalance shafts (2).



- Secure special tool **2 288 054** with screws (1) to the crankshaft.
- Tighten the screws (1).

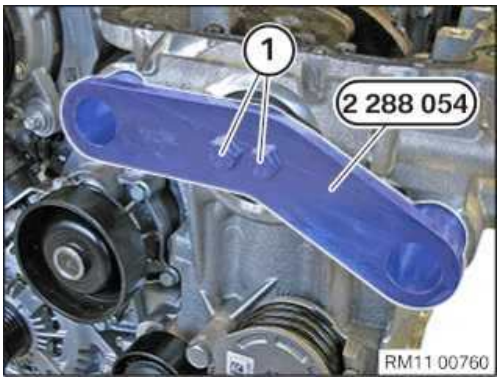
Special tool 2 288 054 to crankshaft

M10		Tightening torque	20 Nm

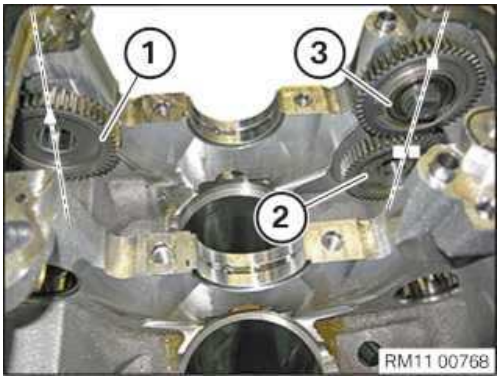


- Loosen screws (1).

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- Loosen screws (1).
- Guide the special tool **2 288 054** out and remove.



NOTICE

To provide a better overview: Illustration of surrounding parts in removed state.

- The identifications on the gears (1) , (2) and (3) must point vertically to the top towards the oil sump sealing surface.

Gear	Identification
1 intake side	Triangle and E
2 exhaust side	Two squares and A
3 exhaust side of intermediate wheel	One square

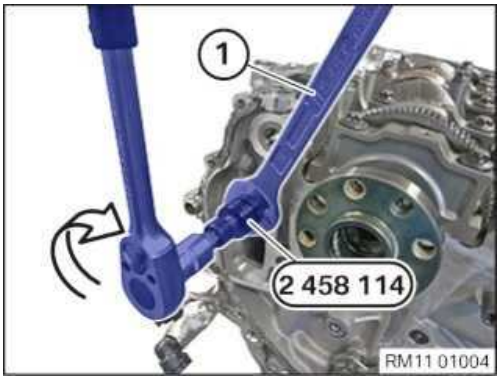


- The intermediate wheel of the exhaust side consists of a fixed wheel and a moving wheel and it must be pretensioned using special tool **0 495 131 (11 5 370)**.
- Pretension the intermediate wheel of the exhaust side using special tool **0 495 131 (11 5 370)** in the illustrated position.
- When reusing the intermediate wheel of the exhaust side, it must remain pretensioned in special tool **0 495 131 (11 5 370)** until its reinstallation.



- Screw in special tool **2 458 114** into the gear of the counterbalance shaft.

Note: The gears have been pressed onto the counterbalance shaft with a taper and they can exclusively be released using the special tool.

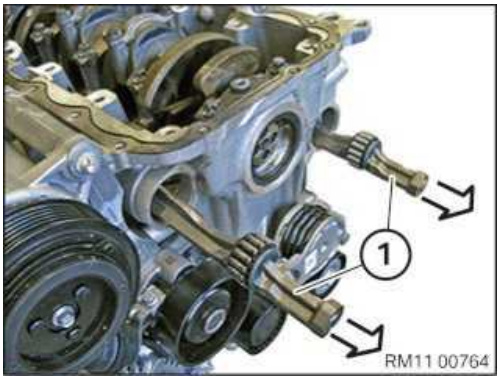


- Counter support special tool **2 458 114** with an open-end spanner (1).
- Screw the bolt of the special tool **2 458 114** in to detach the counterbalance shaft from the gear.

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- Release the counterbalance shaft of the intake side from the gear using special tool **2 458 114**.



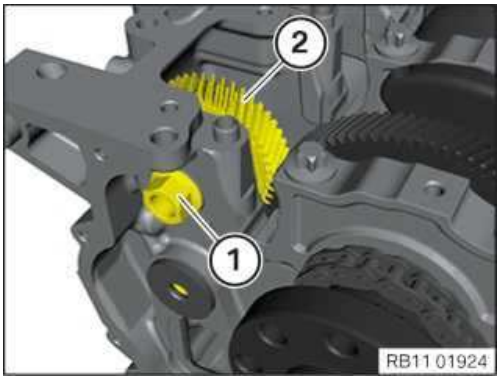
- Feed out the counterbalance shaft (1) in the direction of arrow out of the crankcase and remove.



- Remove the gear (1) of the intake side.



- Remove the gear (1) of the exhaust side.



- Unfasten nut (1).
- Remove the gear (2) using special tool **0 495 131 (11 5 370)**.

34 – Install counterbalance shafts

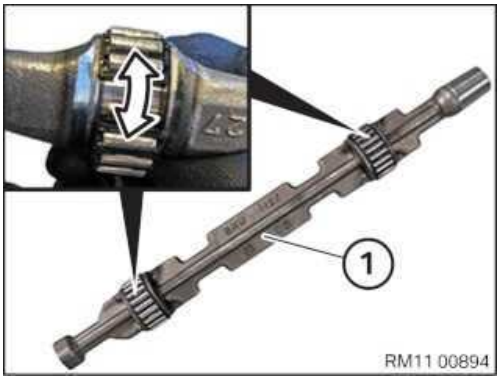
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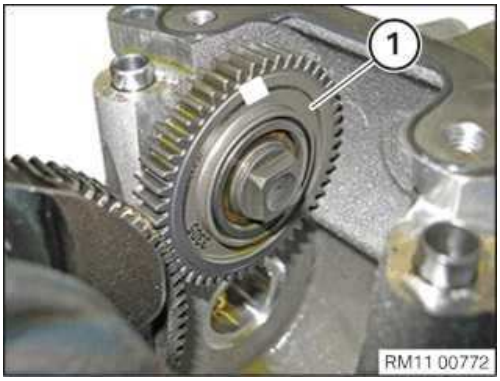
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

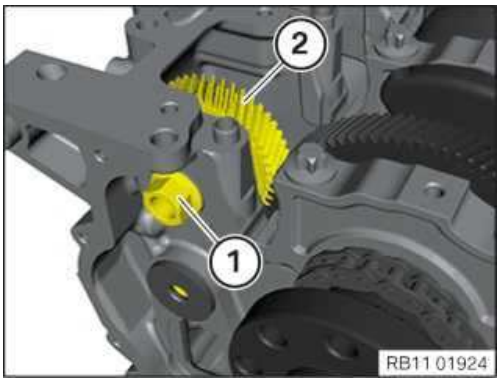
- If a new gear is installed, the ring gear must remain blocked until installation using the factory-mounted fixation (1) .



- Check both needle bearings (1) of counterbalance shaft for damage.
- Pull off damaged needle bearing (1) from the counterbalance shaft and renew it.

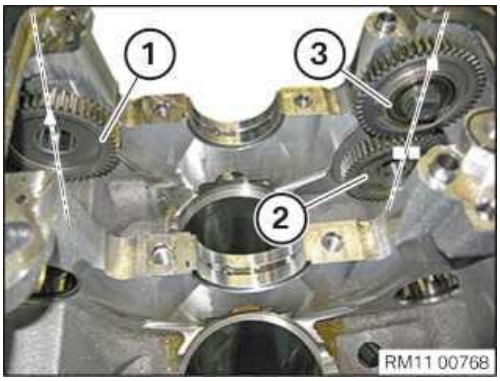


- Rotate the crankshaft to the **TDC of the first cylinder**.
- Replace the gear (1).
- **Parts:** Gear
- Position the intermediate wheel (1) such that the mark points vertically to the top.



- Tighten the nut (1) on the intermediate wheel (2) hand-tight.

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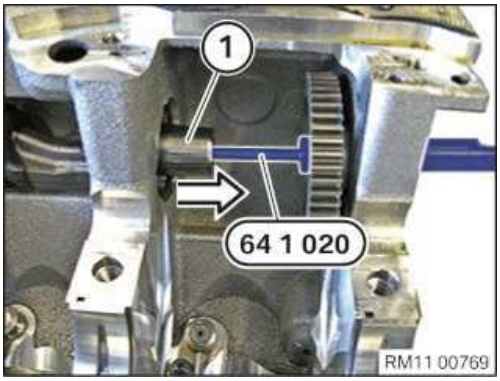
NOTICE

To provide a better overview: Illustration of surrounding parts in removed state.

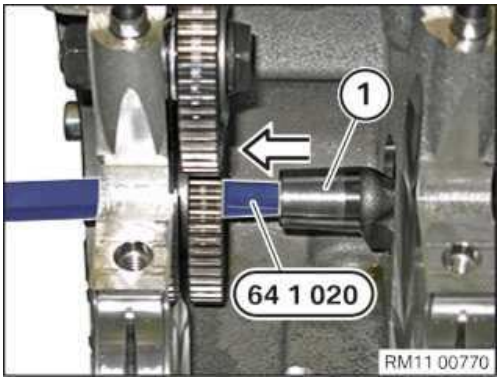
- The identifications on the gears (1) , (2) and (3) must point vertically to the top towards the oil sump sealing surface.

Gear	Marking	Identification
1 intake side	Triangle	E
2 exhaust side	Two rectangles	A
3 exhaust side of intermediate wheel	One square	

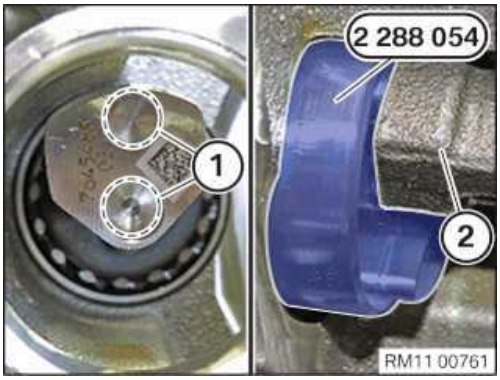
- Install the gear (1) identification **E** such that the marks point vertically to the top.
- Install the gear (2) identification **A** such that the marks point vertically to the top.



- Slide the special tool **0 493 681 (64 1 020)** or another suitable tool through the gear into the counterbalance shaft.
- Carefully insert the counterbalance shaft (1) into the gear on the intake side.

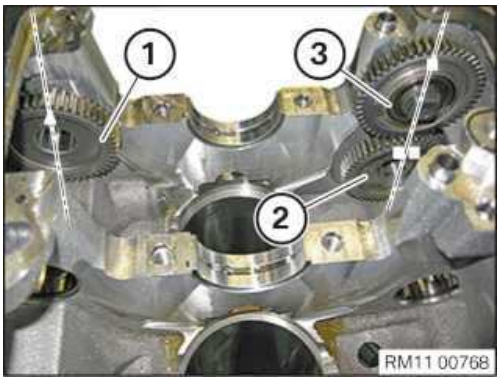


- Slide the special tool **0 493 681 (64 1 020)** or another suitable tool through the gear into the counterbalance shaft.
- Carefully insert the counterbalance shaft (1) into the gear on the exhaust side.



- The crankshaft must be at the **top dead centre of the first cylinder**.
- The special tool **2 288 054** must be positioned in the guides (1) of the counterbalance shafts (2).

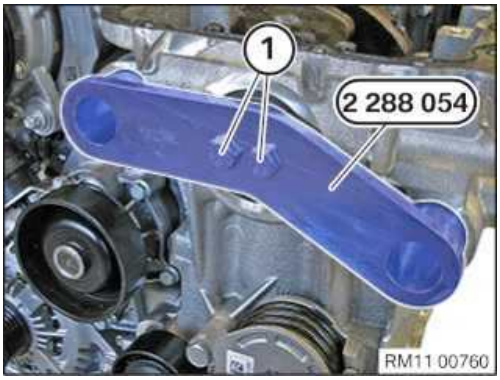
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NOTICE

To provide a better overview: Illustration of surrounding parts in removed state.

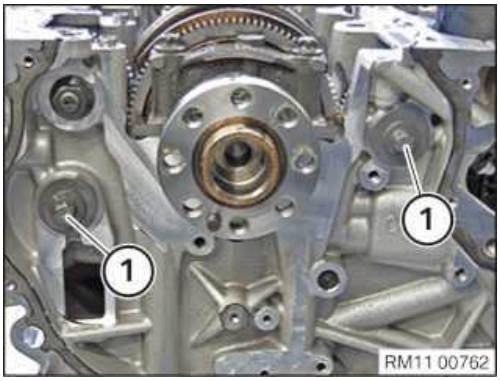
- The identifications on the gears (1) , (2) and (3) must point vertically to the top towards the oil sump sealing surface.



- Secure special tool **2 288 054** with screws (1) to the crankshaft.
- Tighten the screws (1).

Special tool 2 288 054 to crankshaft

M10		Tightening torque	20 Nm



- Renew screws (1).

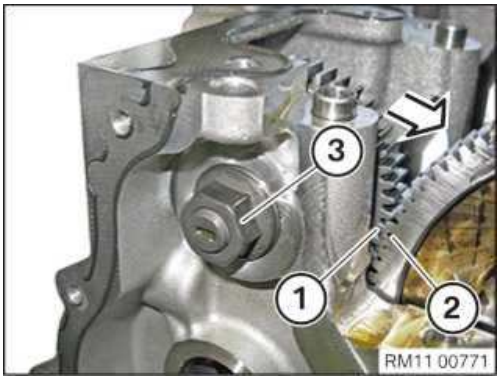
  Parts: Bolts
- Tighten the screws (1).

Gear to counterbalance shaft

M10	Renew screws.	1. Jointing torque	20 Nm
		2. Angle of rotation	180 °



- The gearing of the intermediate wheel engages in the gearing of the crankshaft and the counterbalance shaft.
- Relieve tension on special tool **0 495 131 (11 5 370)** and remove.

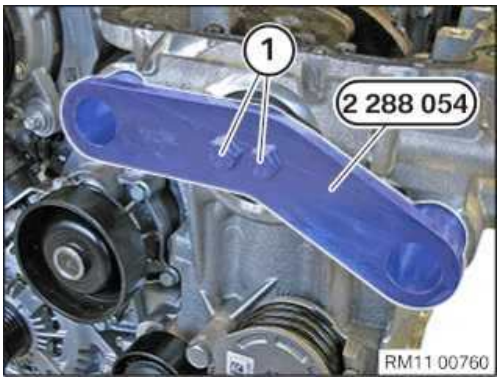


- Move the intermediate wheel (1) in the direction of arrow on the crankshaft (2) to the equipment.
- Tighten nut (3).

Idler gear to crankcase

M12x1.5		Tightening torque	10 Nm
		Angle of rotation	45 °

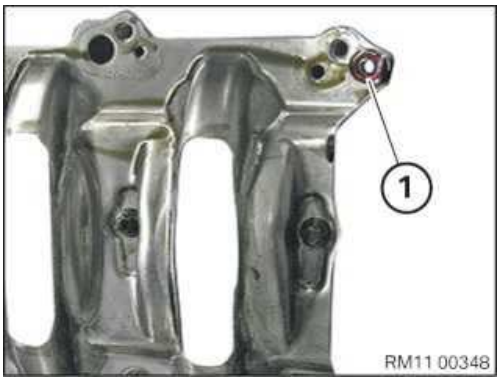
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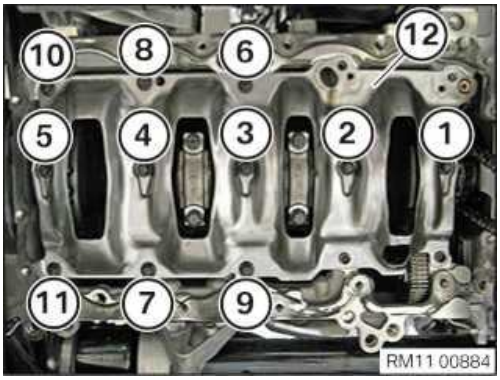
- Unscrew the bolts (1) and remove the special tool **2 288 054**.
-

POSTPROCESSES

35 – Installing the oil deflector



- Check sealing ring (1) for damage and replace oil deflector if necessary.
  Parts: Oil deflector



- Insert and install the oil deflector (12).
- Renew screws (1) to (11).
  Parts: Bolts
- Hand-tighten the bolts (1) to (5).
- Hand-tighten the bolts (6) to (11).
- Tighten the screws (1) to (5).

Oil deflector to crankshaft bearing cap

M8x14	Replace screws.	Tightening torque	35 Nm
		Release	180 °
		Tightening torque	15 Nm
		Angle of rotation	45 °

- Tighten the screws (6) to (11).

Oil deflector to crankcase

M8x14		Tightening torque	19 Nm

36 – Install the oil vacuum pump

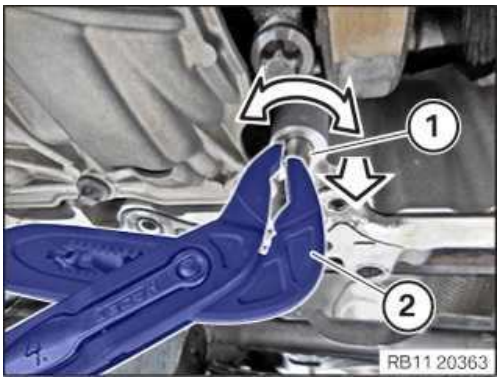
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

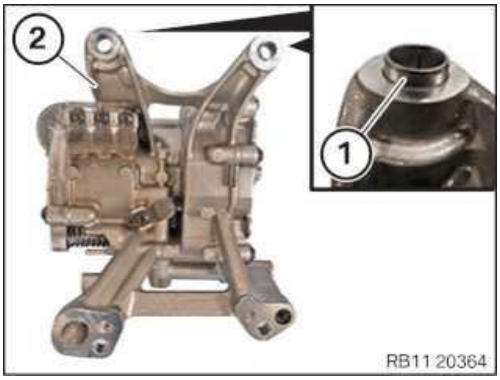
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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- Remove centering sleeves from the crankcase (1) using a standard tool (2).
- Renew the centring sleeves (1).

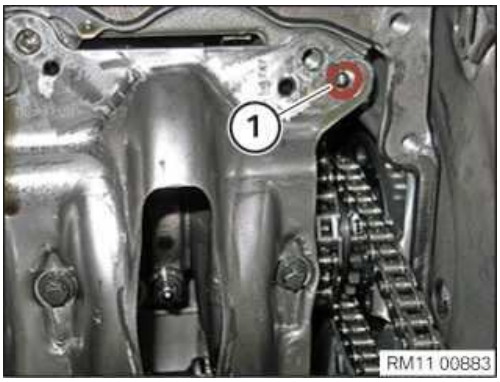
  Parts: Centring sleeves



- Install centering sleeves (1) in the oil vacuum pump (2).

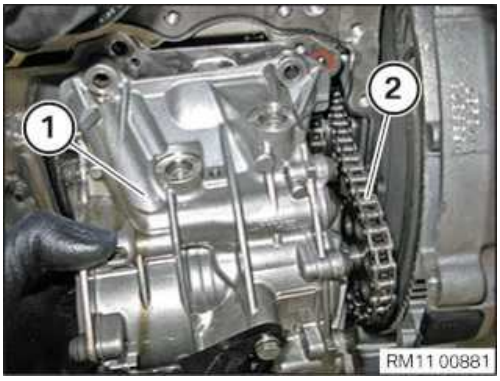


- Check the sealing ring (1) for damage and renew where required.
- Make sure the sealing ring (1) is installed correctly.



- Check sealing ring (1) for damage and replace oil deflector if necessary.

  Parts: Oil deflector



- Insert oil vacuum pump (1) into the drive chain (2).

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- Renew screws (1).

  Parts: Bolts

- Tighten the screws (1) of the oil vacuum pump (2).

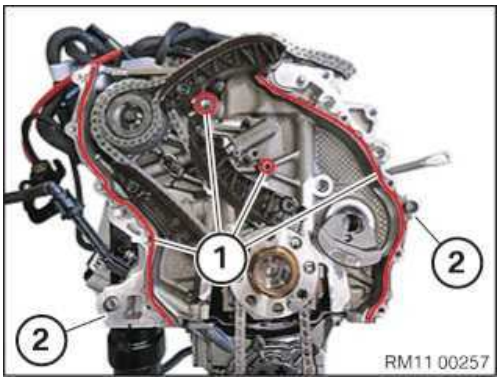
Oil vacuum pump to crankcaseB47

M8x35		Tightening torque	19 Nm

37 – Install the rear timing case cover

Prerequisite

Transmission is removed.



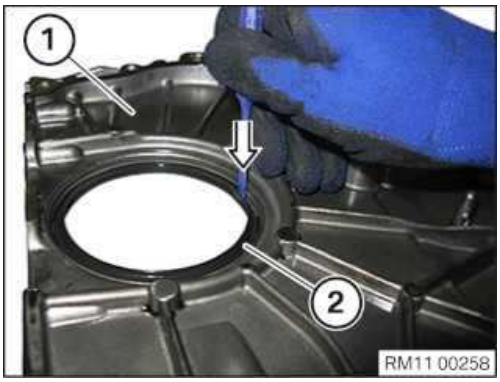
RISK OF DAMAGE

Damage to the surface.

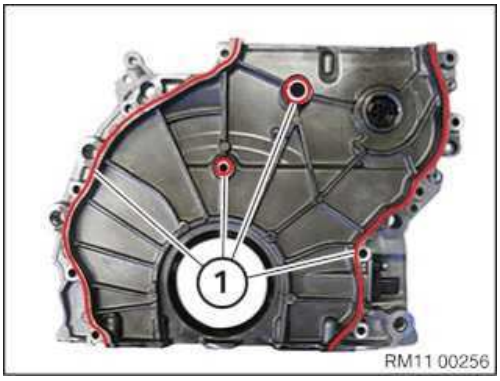
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Remove seal residue from the sealing surfaces (1) using special tool **0 495 102 (11 4 470)**.
- Check fitting sleeves (2) for damage and for tight fit; renew if necessary.

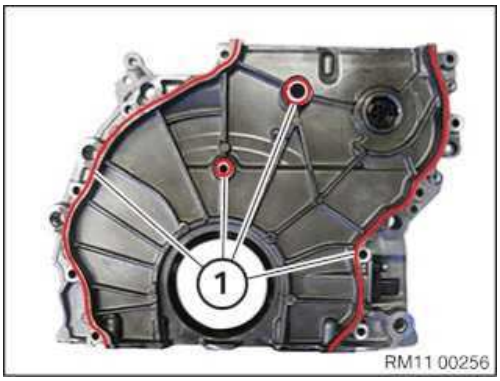


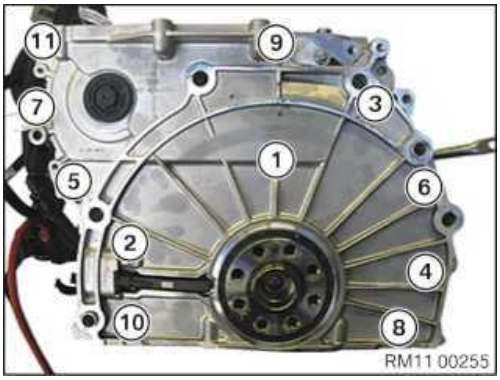
- Position the timing case cover (1) underneath.
- Position punch on inner side of crankshaft seal (2).
- Drive out crankshaft seal (2) outwards.



- Remove seal residue from the sealing surfaces (1) using special tool **0 495 102 (11 4 470)**.

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TECHNICAL INFORMATION

For more information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

- Apply sealing bead (1) with a height of approx. 1.5 mm to 2.0 mm on inner side of timing case cover in marked locations. Use liquid sealing compound for this.

  Application time of sealing bead (1) must not exceed 12 minutes.

- Mount the timing case cover without the crankshaft seal.
- Renew screws (1) to (11).

  Parts: Bolts
- Join the bolts in with the sequence (1) to (11).
- Tighten screws in the order (1) to (11).

Rear timing case cover to crankcase

M6	Renew screws.	Jointing torque	8 Nm
		Angle of rotation	90 °

▸ **Installing the rear crankshaft seal**

RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) on the radial shaft seal with the sharp-edged connector gearing of the output shaft will result in destruction and/or leaks.

- When inserting the output shaft, make sure that the connector gearing of the output shaft does not touch the sealing lip (inner) of the radial shaft seal.

RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) and applying oil to the radial shaft seal will lead to its destruction.

- Do not touch the sealing lip (inner) of the radial shaft seal.
- Do not apply oil to the radial shaft seal.
- Install the radial shaft seal dry.

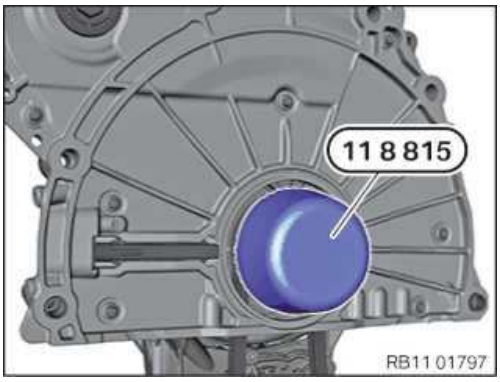
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RISK OF DAMAGE

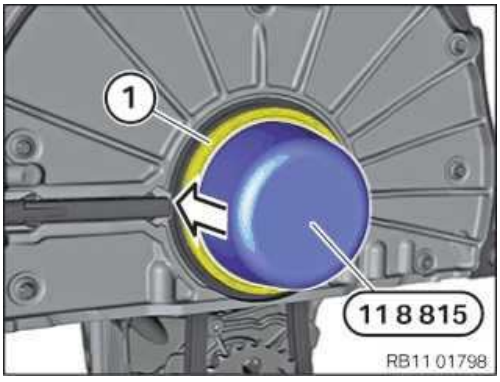
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Position special tool **0 496 137 (11 8 815)** on crankshaft. Make sure that the crankshaft sensor is not damaged.



- Fit the crankshaft seal (1) up to the timing case cover in the direction of the arrow using special tool **0 496 137 (11 8 815)** and position.
- Remove special tool **0 496 137 (11 8 815)**.



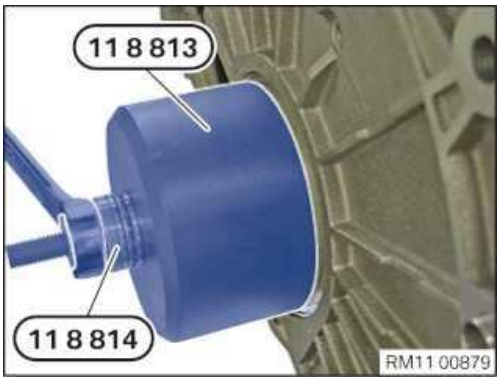
- Secure special tool **0 496 133 (11 8 811)** to the crankshaft using special tool **0 496 134 (11 8 812)**.



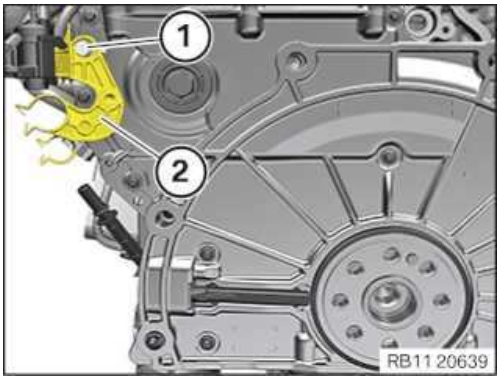
- Check the freedom of movement between the special tool **0 496 135 (11 8 813)** and the crankshaft sensor during installation.

  Otherwise there is a risk that the crankshaft sensor will be damaged.
- Slide on special tool **0 496 135 (11 8 813)**.
- Screw down special tool **0 496 136 (11 8 814)**.

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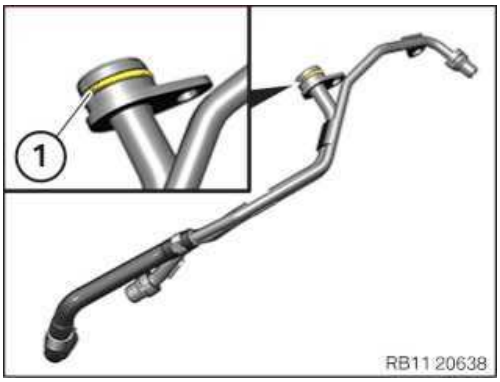


- Press in crankshaft seal with special tool **0 496 135 (11 8 813)**.
- Screw in special tool **0 496 135 (11 8 813)** up to timing case cover.



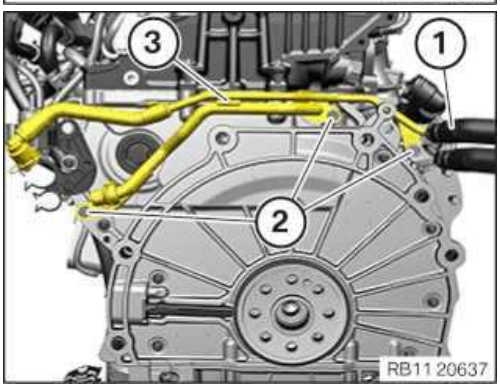
- Insert and install the holder (2).

▶ **If installed: Installing the coolant line of the SCR metering module**



- Renew the O-ring 1.

  Parts: O-ring



- Feed in and install coolant line (3).
- Tighten down screws (2).

SCR coolant lines to crankcase end cover

Hexagon screw M6x16		Tightening torque	8 Nm

- Connect and lock the coolant line (1).

  Coolant line (1) must audibly engage.

▶ **Cleaning the sealing surface**

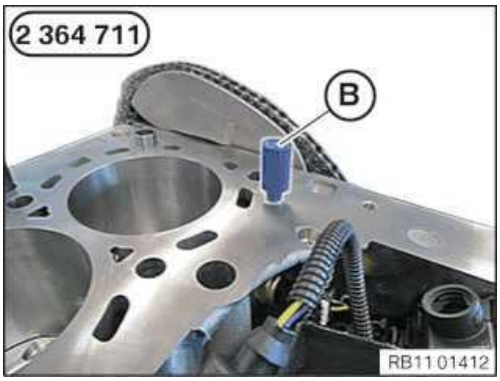
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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- Lock the front oil duct using special tool (B) from special tool **2 364 711**.



RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 103 (11 4 471)**.



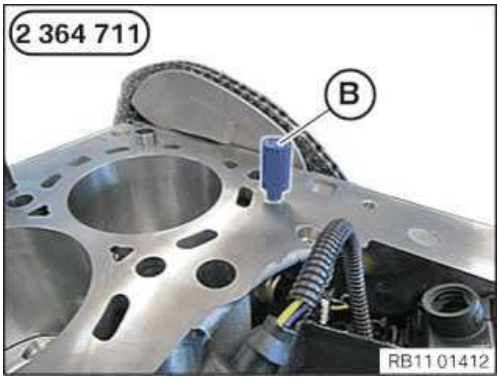
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

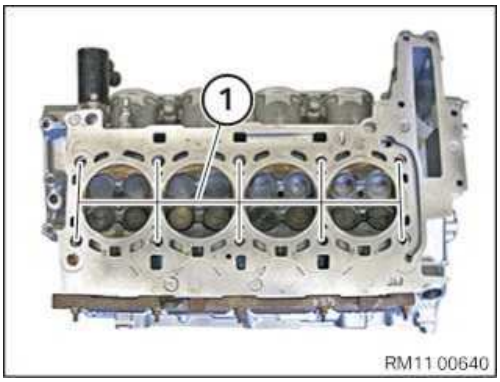
- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 104 (11 4 472)**.



- Remove special tool (B).

▸ **Renewing the cylinder head gasket**



RISK OF DAMAGE

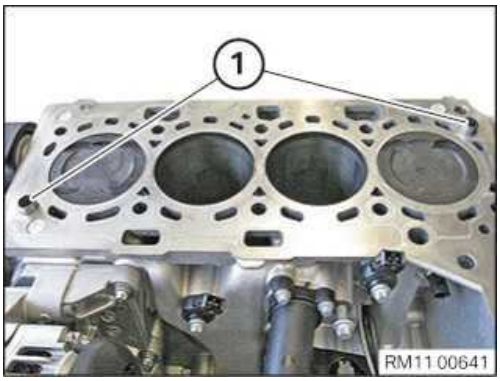
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

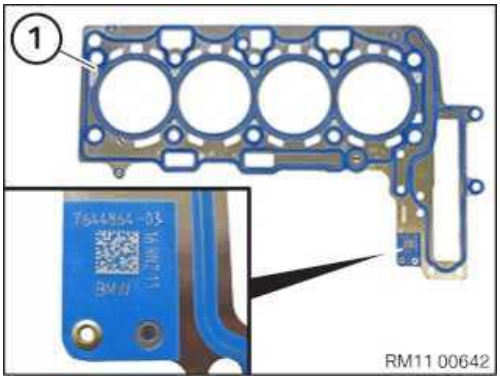
- Do not use any metal-cutting tools.

- Remove oil and dirt residue from the blind holes (1).

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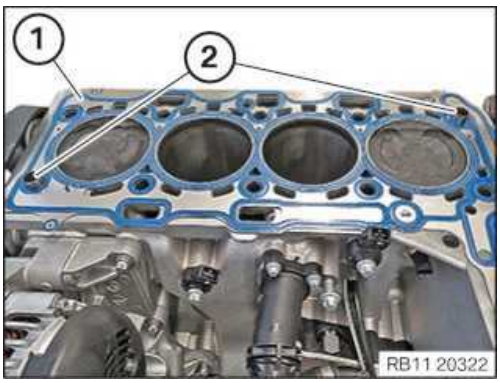


- Check the fitting sleeves (1) for secure fit and damage.



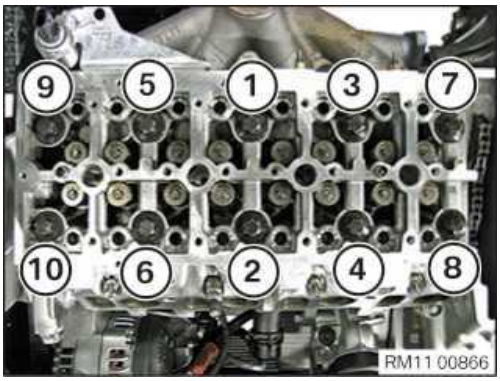
- Identify the cylinder head gasket (1) using the part number.

Note: If the cylinder head is reworked, an additional thicker gasket 0.3 mm is available for service personnel.



- Guide in the cylinder head gasket (1) and install.
- Ensure that the cylinder head gasket (1) is installed correctly in the fitting sleeves (2).

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CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Damage to threads.

Fluid in the threaded hole may damage the thread when screws are tightened in the threads.

- Dry threaded holes (e.g. using compressed air).

TECHNICAL INFORMATION

Do not remove bolt coating.

- Renew the cylinder head bolts (1).

  Parts: Cylinder head bolts
- Do **not** wash off coating of cylinder head bolts.
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

  No coolant, water or engine oil must be present in threaded holes of engine block.

TECHNICAL INFORMATION

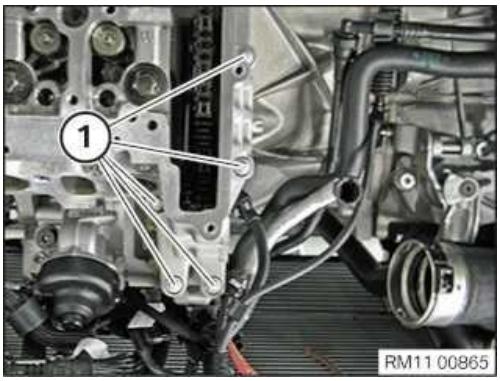
When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Feed in cylinder head bolts and install.
- Screw in cylinder head bolts in sequence (1) to (10).
- Tighten cylinder head bolts using special tools **0 490 504 (00 9 120)** and in sequence (1) to (10).

Cylinder head to crankcase

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

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- Tighten the cylinder head bolts (1).

Cylinder head bolt to timing case cover

M8x40		Tightening torque	19 Nm

-



TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

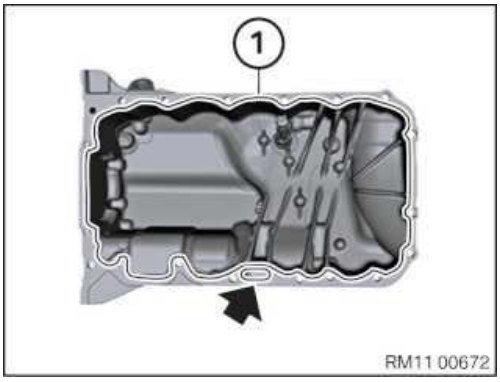
- Remove fine sealing remains on the sealing surface (1)and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.



TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove coarse sealing remains on the sealing surface (1)and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.



TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- Apply the sealing compound along the line (1) with a thickness of 2 mm to 2.5 mm.

  Apply the sealing compound along the inner edge.

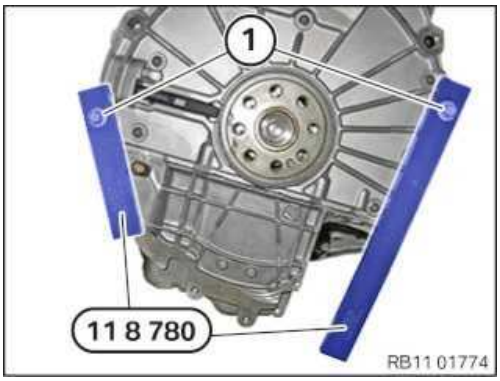
Sealing compound

Loctite 5970 liquid sealing compound	50 ml, Cartridge	83190404517

Overview of consumables (Electronic Parts Catalogue)

- Completely encircle the oil return orifice (arrow) with the sealing compound.

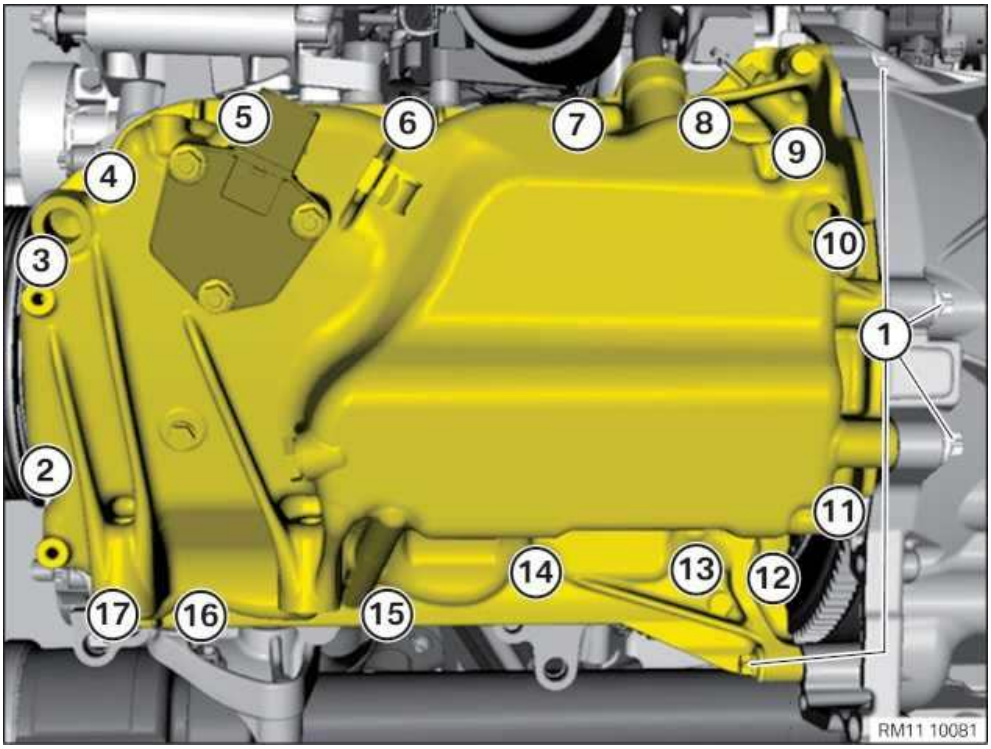
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TECHNICAL INFORMATION

The special tool 11 8 780 is only required when the transmission is removed.

- Position the special tool **0 496 120 (11 8 780)** with the transmission bolts (1) so that the oil sump is exactly flush with engine block.
- If necessary, renew fitting sleeves.



- Position and install oil sump.
- **Hand-tighten** oil sump screws (2) to (17) but do **not** tighten completely.
- Join transmission bolts (1) with 5 Nm.
- Tighten screws(2) to (17) of the oil sump.

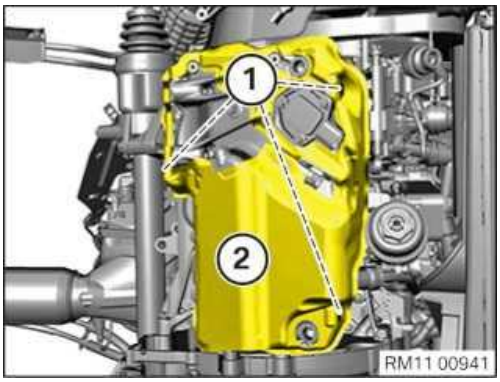
Oil sump to crankcase

M8x30		Tightening torque	2 Nr
M8x110		Tightening torque	2 Nr

- Tighten transmission bolts (1) on oil sump.

Transmission to oil sump

M8		Tightening torque	1 Nr



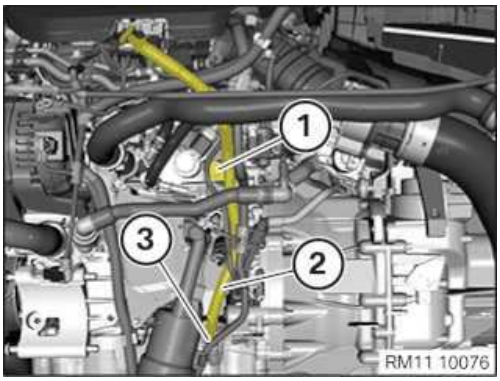
- Thread in and position the acoustic cover (2).
- Install the expanding rivet (1).



- Renew O-ring (1).

  Parts: O-ring

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- Guide in guide tube (2) for oil dipstick and insert it into oil sump.
- Make sure the sealing ring (3) is positioned correctly in the oil sump.
- Tighten down screw (1).

Guide tube for oil dipstick on engine

M8x16		Tightening torque	19 Nm

38 – Installing the flywheel

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

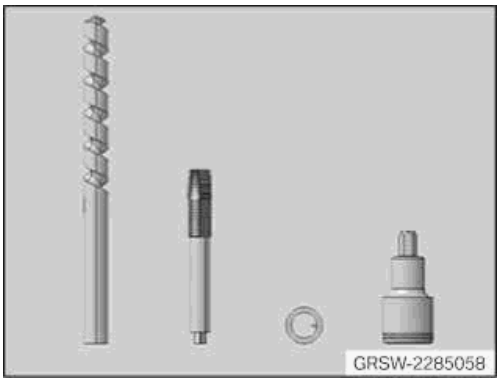


- Check fitting sleeve on the crankshaft for damage and replace if necessary.

TECHNICAL INFORMATION

Clean all threads with a screw tap.

- Clean all the screw threads (1).



- Use the set of special tools **2 285 058**.

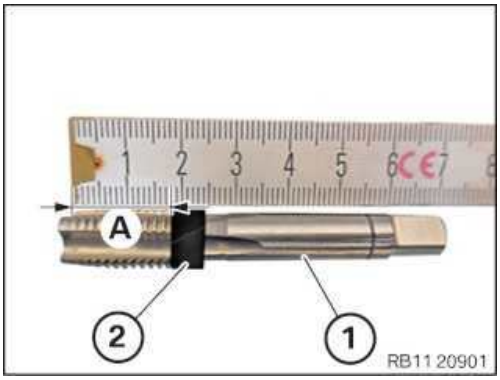
Description
Twist drill
Thread cutter M12x1.5
Depth
Insertion tool

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- Assemble tool set.

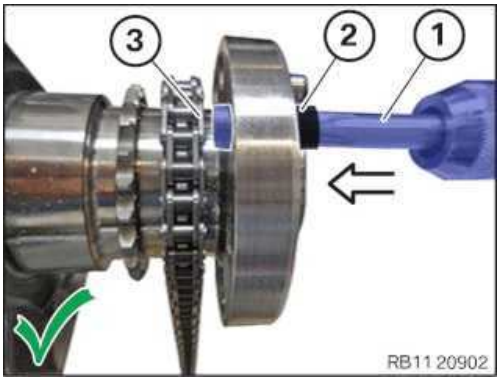
Number	Description
1	Tool holder
2	Thread cutter M12X1,5



- Mark the installation dimension (A) on thread cutter (1) from the set of special tools **2 285 058** using a commonly-available tool (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm



NOTICE

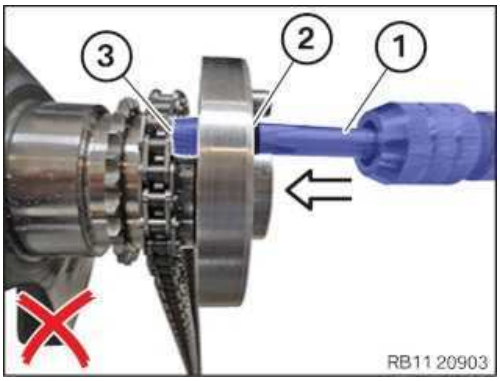
To provide a better overview: Shown with engine removed.

- Screw in the thread cutter (1) from the set of special tools **2 285 058** in direction of arrow up to the installation dimension (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm

- Make sure that the thread cutter does (1) **not** rest on the timing chain (3).

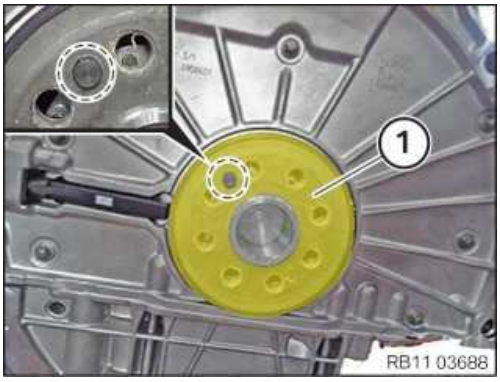


TECHNICAL INFORMATION

- **Carefully** handle the timing chain, to protect the timing chain and timing chain drive against damage.

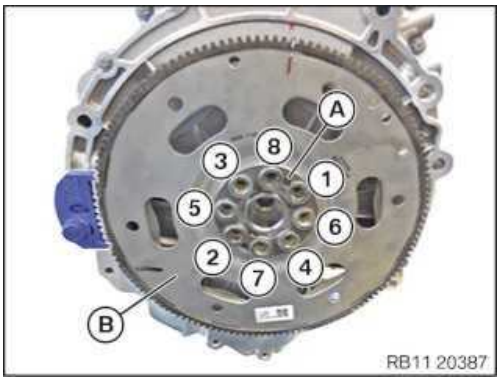
- Make sure the installation dimension (2) of the screw bore (1) is not exceeded.

  The thread cutter (1) may not rest on the timing chain (3).



- Important! Observe the marking shown during installation.
- Install special tool (1) on the crankshaft as shown.

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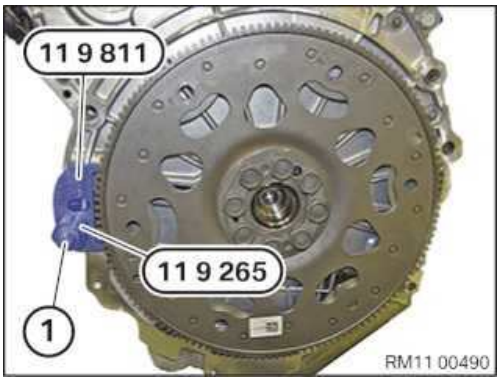


- Position flywheel (B) .
- Renew flywheel bolts (1) to (8).

  Parts: Flywheel bolts
- Screw in flywheel bolt (1) to (8) by hand.
- Observe tightening sequence. Begin at the dowel pin (A).
- Tighten flywheel bolts in sequence (1) to (8).

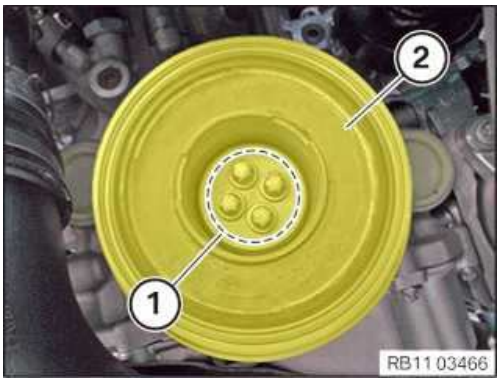
Flywheel to crankshaft

M12x1.5	Renew screws.	Tightening torque	120 Nm



- Loosen the transmission bolt (1).
- Guide out and remove the special tool **0 494 793 (11 9 265)** and **0 496 171 (11 9 811)** with the **standard** washer (5 mm).

39 – Installing the vibration damper

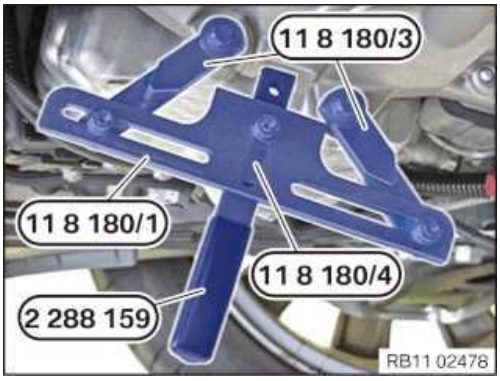


- Position vibration damper (2).
- Renew screws (1).

  Parts: Bolts
- Fasten the vibration damper (2) with the bolts (1).
- Tighten the screws (1).

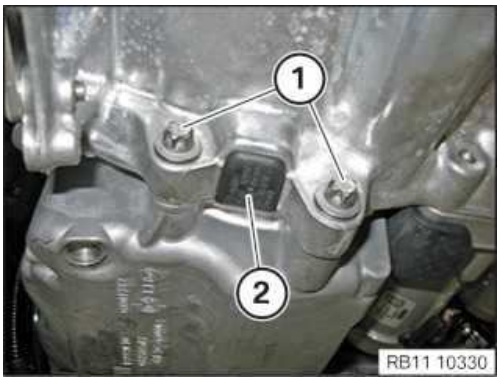
Vibration damper with belt pulley to crankshaft

M10x65	Renew screws. Tighten screws crosswise.	1. Jointing torque	40 Nm
		2. Angle of rotation	60 °
		3. Angle of rotation	60 °



- Release the transmission bolts and remove the special tool **0 493 587 (11 8 180)**.

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- Tighten transmission screws (1).

Transmission to engine

M8		Tightening torque	19 Nm

- Install protective cap (2).

40 – Installing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

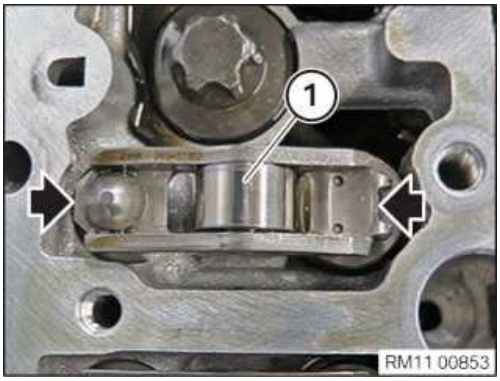


- Install the hydraulic valve clearance compensating element (1) in the direction of the arrow.
- Repeat the process on all hydraulic valve clearance compensating elements.

41 – Install the roller cam followers

TECHNICAL INFORMATION

- Note the installation position of the component. The component may be installed in various installation positions.



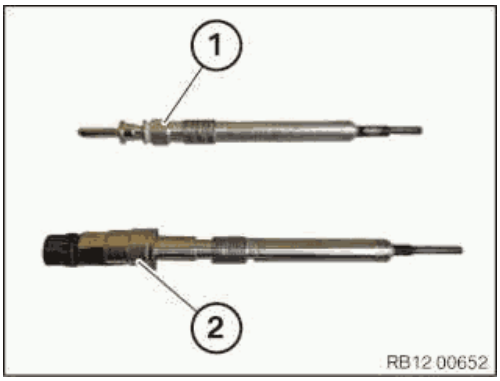
- Check all roller cam followers (1) for damage and replace if necessary.

  Parts: Roller cam followers
- Insert and install all roller cam followers (1).

  Roller cam followers (1) that have already been used must be installed in the same place.
- Note the mounting orientation of the roller cam followers (1).
- Oil all roller cam followers (1).

42 – Install glow elements

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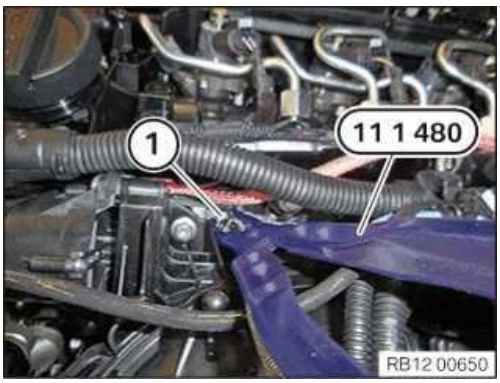
- Install glow elements (1) in cylinders 1, 2, 3 and 4.
- If fitted: Glow element (2) with the **combustion chamber pressure sensor** must be installed in cylinder **2**.



- Tighten the glow element with the special tool or conventional tools.

Glow elements to cylinder head

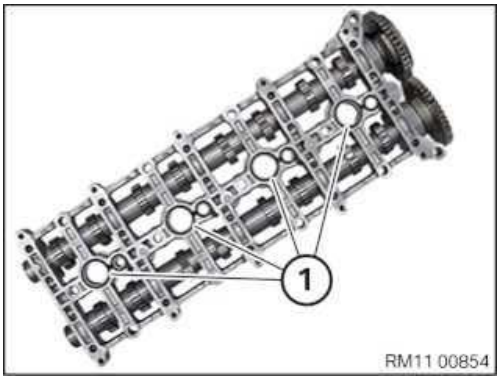
Glow element		Tightening torque	13 Nm



- Connect connectors (1) and lock.

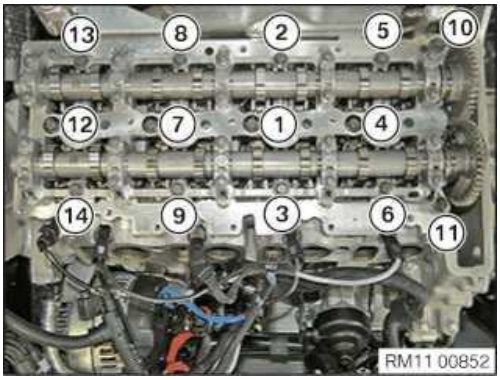
  The connector (1) must engage audibly.

43 – Installing the camshaft support



- Renew gaskets (1).

  Parts: gaskets



- Position the camshaft support including the camshafts.
- Tighten the screws in a sequence from (1) to (14) in several steps.

Camshaft carrier to cylinder head

M7x35		Tightening torque	13 Nm

44 – Adjusting the timing of the camshafts

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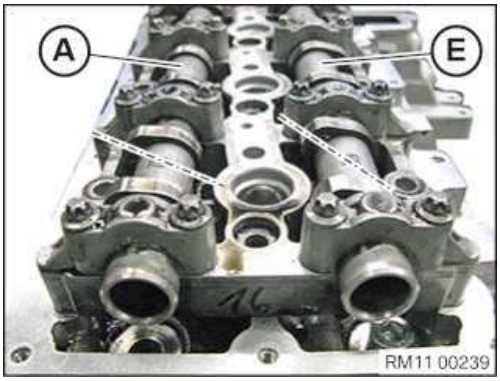


- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.



- Slide the special tool **2 288 380** completely into the bore hole of the oil sump.
- Use the special tool to block **2 288 380** the crankshaft in the TDC firing position at the first cylinder.



- The cam of the intake camshaft (E) at the first cylinder points up at an angle.
- The cam of the exhaust camshaft (A) at the first cylinder points outward at an angle.

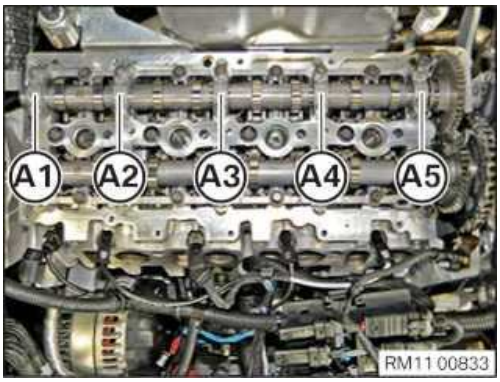
▶ **Remove exhaust camshaft.**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



TECHNICAL INFORMATION

The camshaft is tensioned by the valve springs. Tighten or loosen each screw on the camshaft bearing caps one at a time in the specified sequence and by half a turn only. Repeat procedure.

- Loosen all screws of the exhaust camshaft bearing caps (A1) to (A5) from the outside to the inside, step by step in 1/2 turns.
- Remove exhaust camshaft in upward direction.
- Place all components on special tool **0 495 105 (11 4 480)** in a tidy and orderly fashion.

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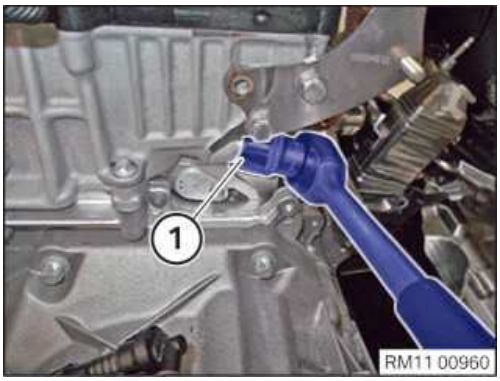
▶ **Remove chain tensioner piston**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

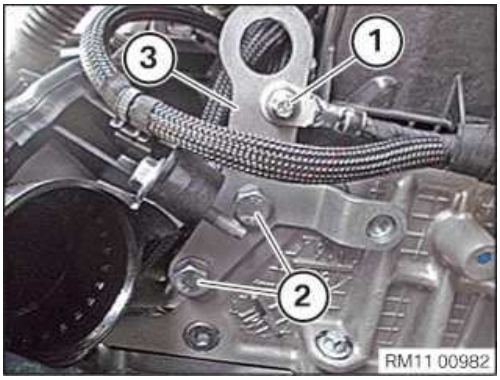


TECHNICAL INFORMATION

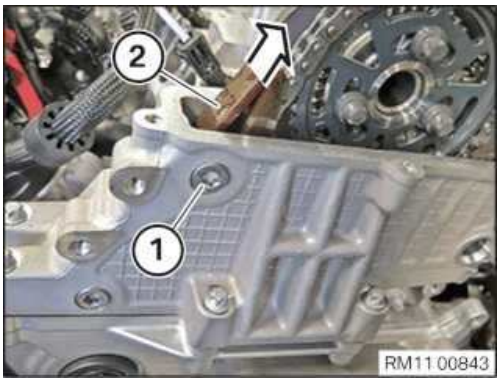
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

▶ **Remove the timing chain guide rail**

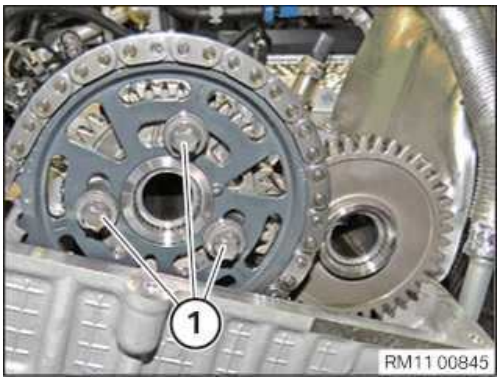


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

▶ **Removing the camshaft sprocket on the intake camshaft**



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

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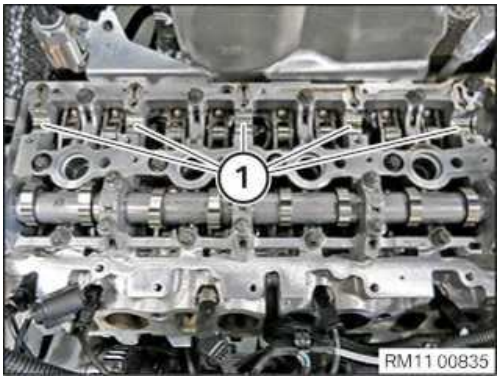
▶ **Install exhaust camshaft**

RISK OF DAMAGE

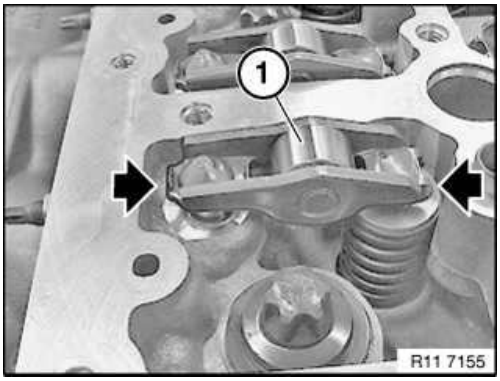
Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

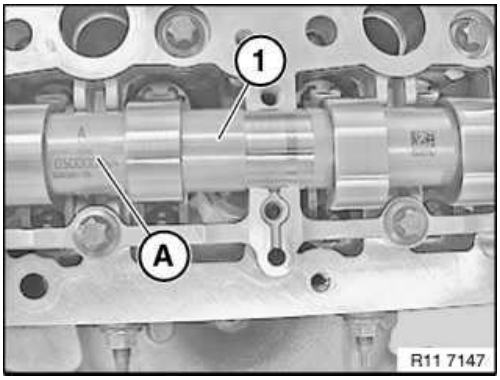
- Comply with the regulations for the installation and disassembly.
- Perform work with care.



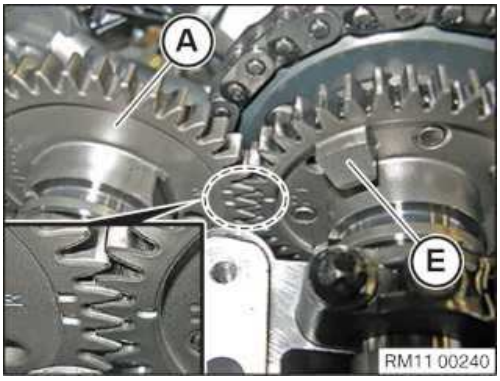
- Oil all bearing positions (1).



- Make sure the roller cam followers (1) have the correct mounting orientation.

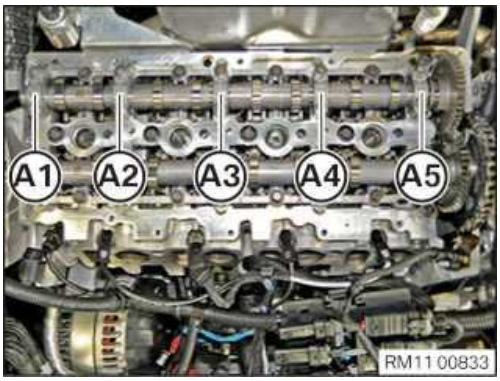


- Insert exhaust camshaft (1) so that the identification (A) points upwards.



- Insert the exhaust camshaft (A) so that the marks on the camshafts (A) and (E) correspond in the highlighted area.
- Position the camshafts (A) and (E) accordingly.

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- Tighten all exhaust camshaft bearing caps (A1) to (A5) from the inside to the outside by 1/2 a turn at a time.

Intake and exhaust camshaft in camshaft support

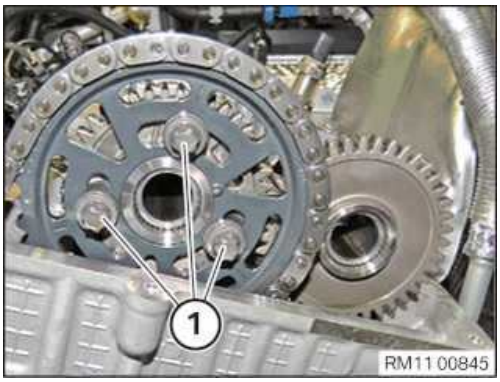
M6x31		Tightening torque	10 Nm



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

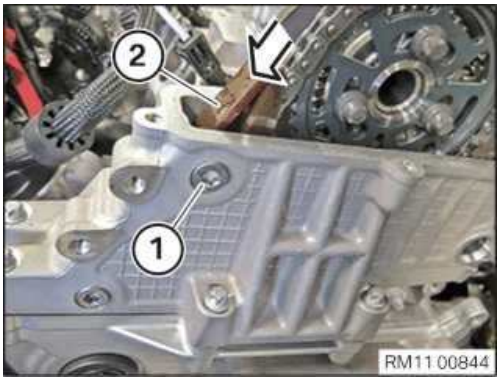
  Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

▶ **Installing the camshaft sprocket on the intake camshaft**



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

▶ **Install the timing chain guide rail**



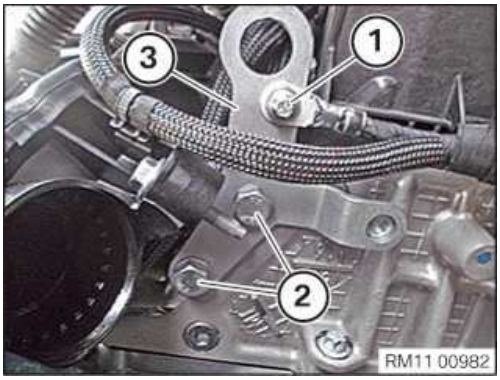
- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm



- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6			8 Nm

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▶ **Installing the chain tensioner piston**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Renew sealing ring (1).

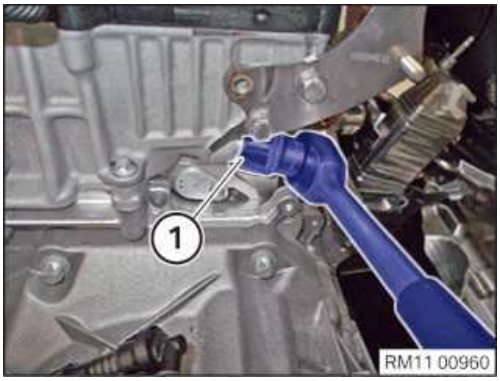
  Parts: Sealing ring



TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.

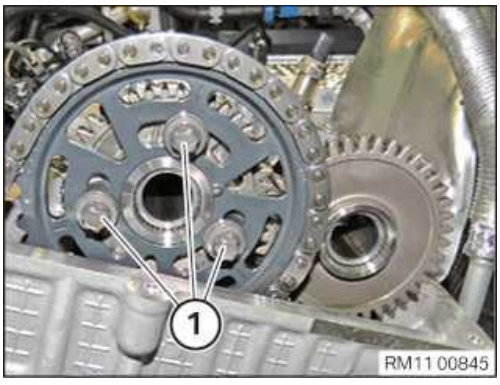


- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

▶ **Tightening the camshaft sprocket on the intake camshaft**



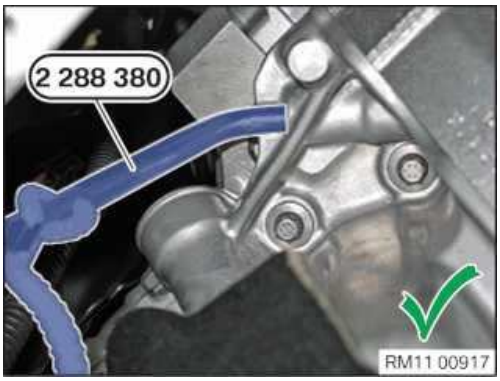
- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

45 – Removing the special tool to disconnect the crankshaft

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- Remove special tool **2 288 380**.

46 – Removing the special tool to secure the exhaust camshaft



- Remove the special tool **0 496 112 (11 8 760)** to fix the exhaust camshaft.

47 – Checking camshaft timing



- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

Damage to the engine.

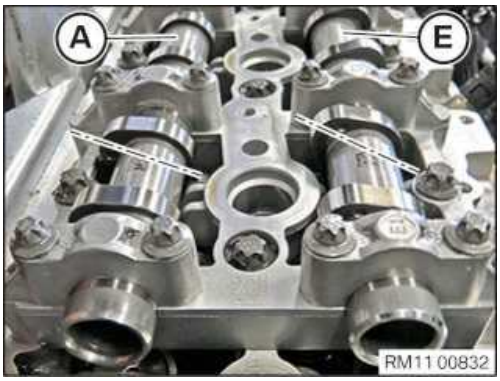
The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

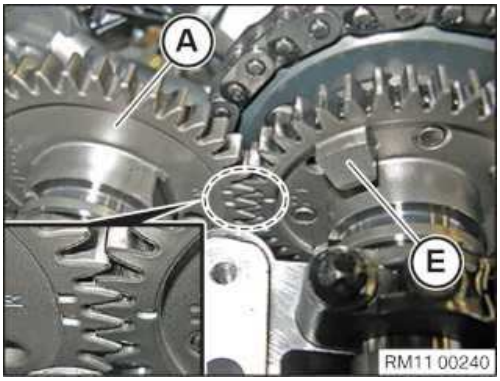
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- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

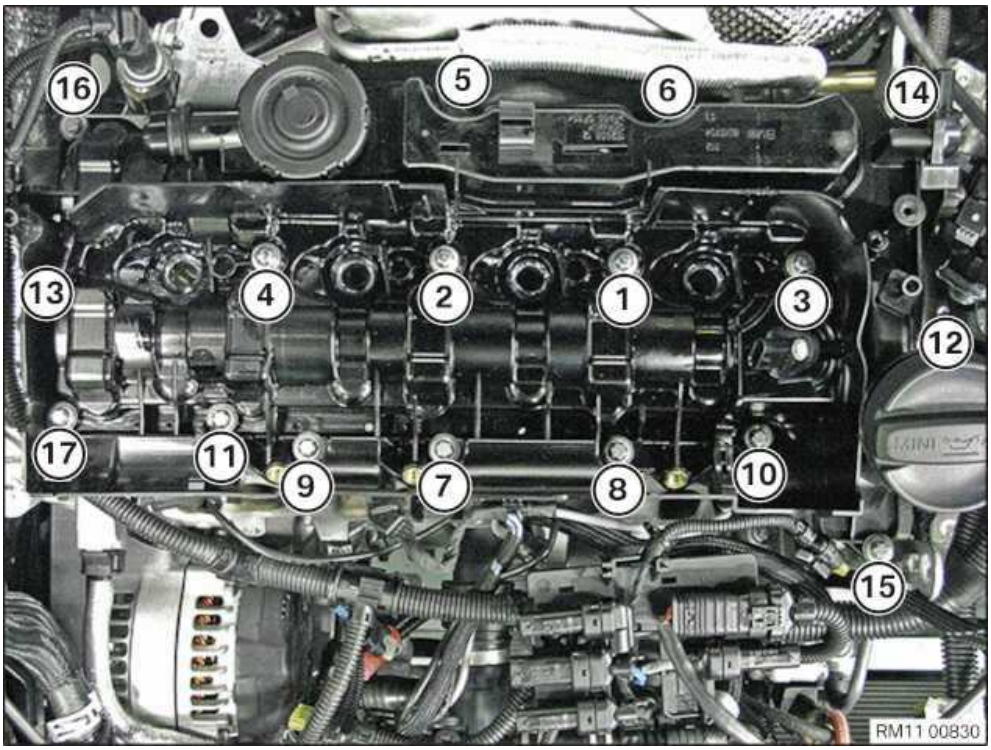
- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.



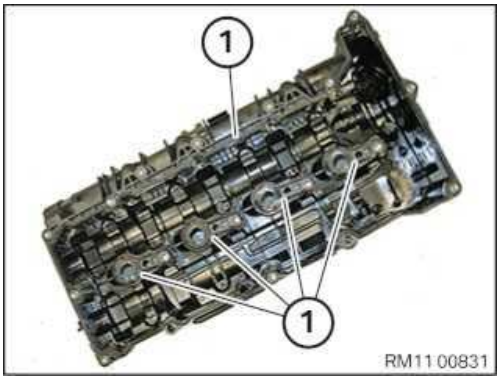
- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

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Overview: Screw connection of the cylinder head cover

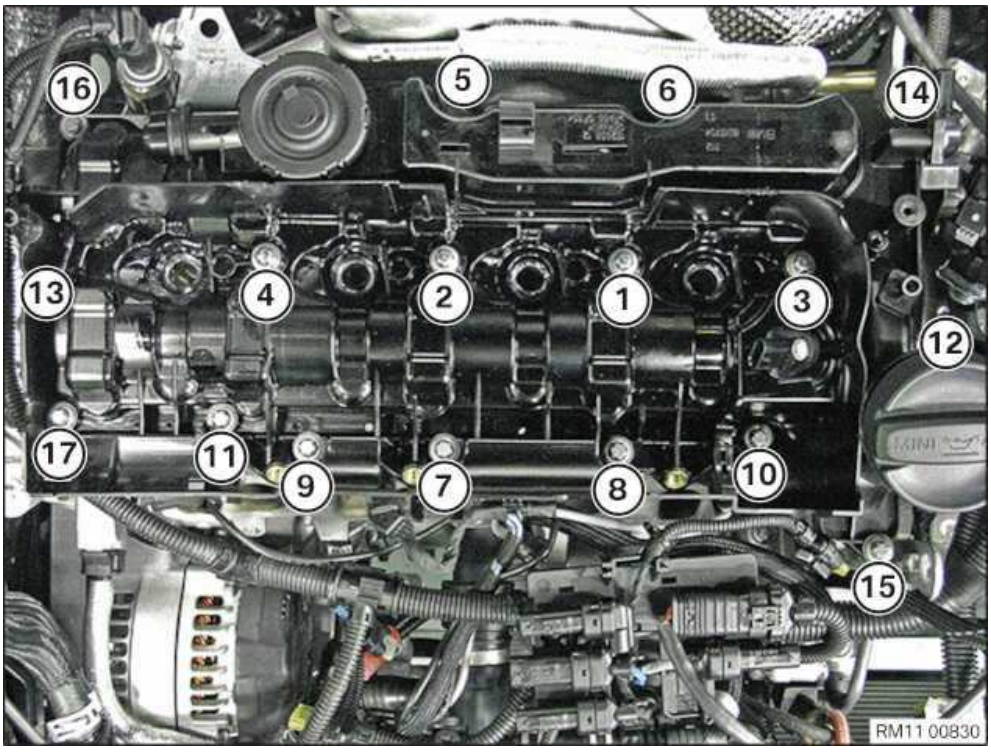


1 to 16 screws of the cylinder head cover.



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket



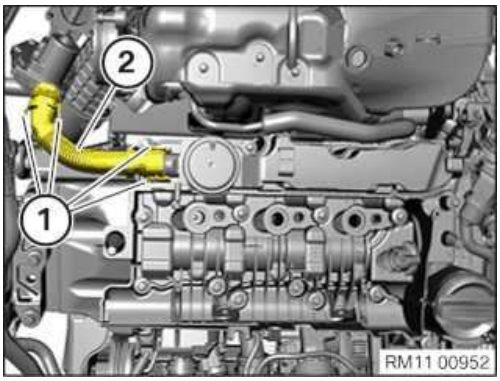
- Install cylinder head cover.
- Tighten screws in the order (1) to (17).

Cylinder head cover to cylinder head

M6		Tightening torque.	8, Nr

-

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- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

49 – Installing injectors of injection system

▸ **Cleaning the injector shafts**

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

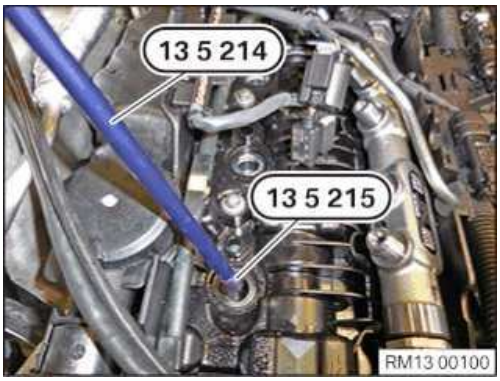
- Wear safety goggles.

RISK OF DAMAGE

Contaminant or foreign body.

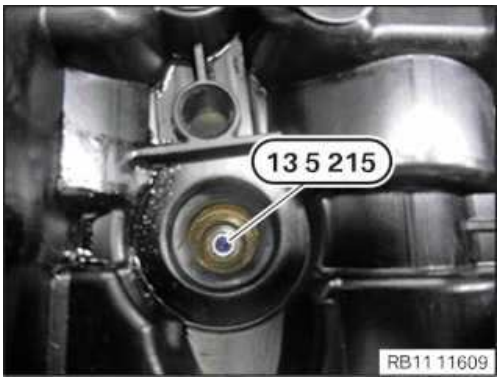
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.

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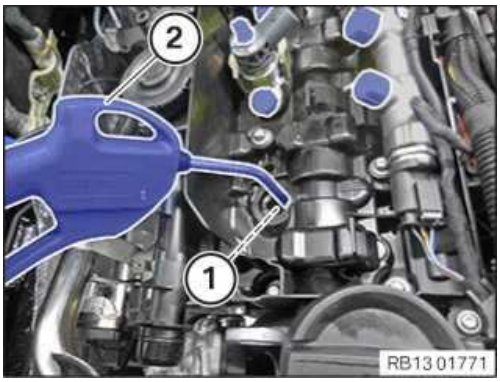
- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.



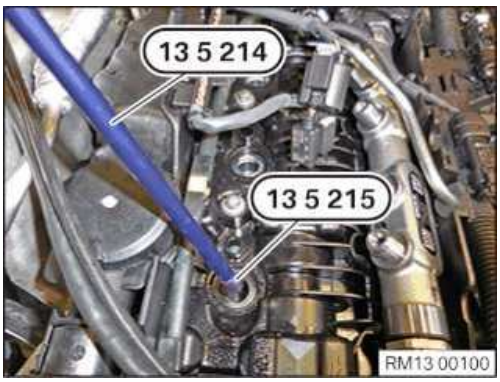
- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.



- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.



- Blow out injector shaft (1) with air gun (2).



- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

► **Check the placement of the clamping claw**

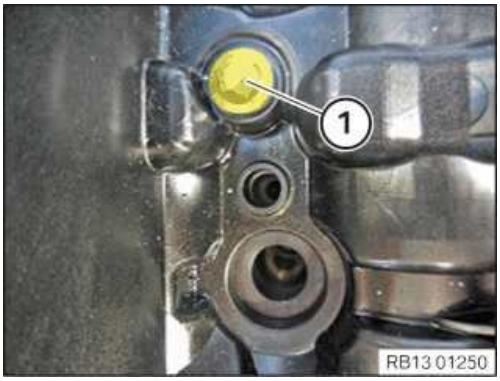
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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▸ **Prepare the injector for installation**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

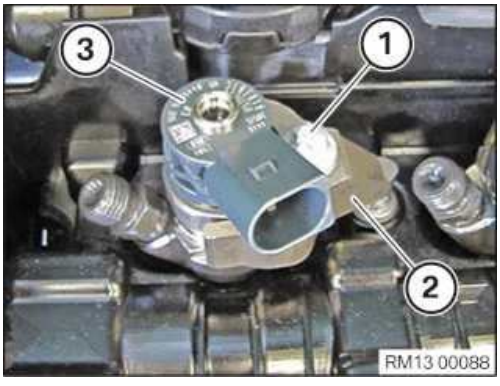


- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring
- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

Injector lubricating grease	50 g, Can	83230441070

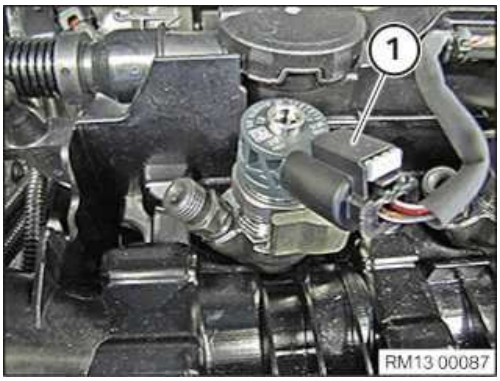


- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

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- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

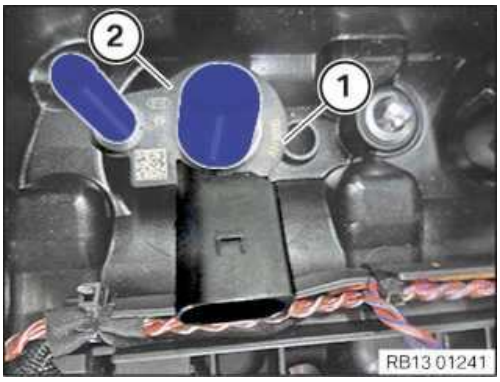
▶ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

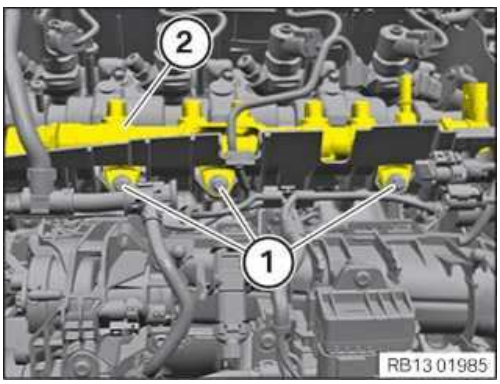


- Read off the adjustment value (1) on the new injector (2).



- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

50 – Installing the rail

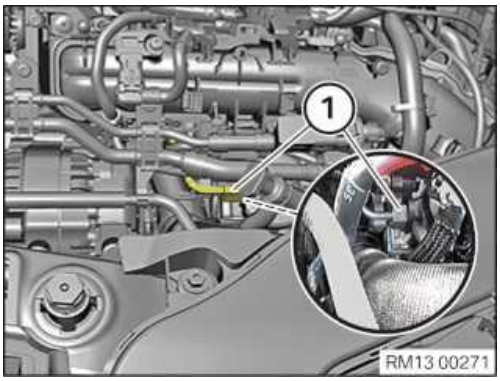


- Carefully insert and install the rail (2).
- Tighten the screws (1).

Rail on cylinder head cover

Torx screw M8x25		Tightening torque	19 Nm

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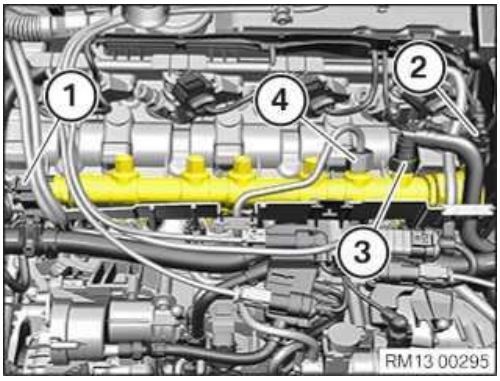
TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten union nut (1).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm



TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten union nut (4) with special tool .

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

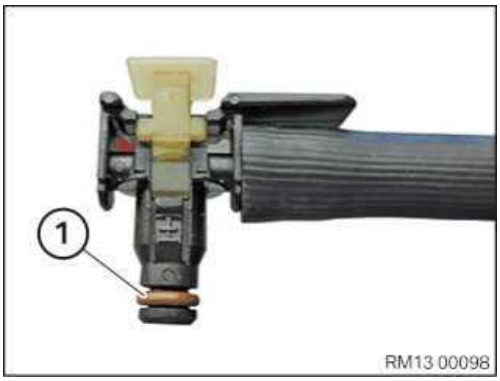
- Connect and lock the fuel line (3).

  Fuel line (3) must engage audibly.
- Connect connectors (2) and lock.

  The connector (2) must engage audibly.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

51 – Connect the leakage oil line on the injector



- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.

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- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

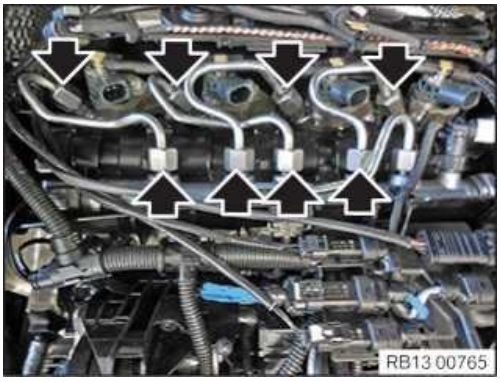
52 – Installing high pressure lines between rail and injectors

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Remove special tool .
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

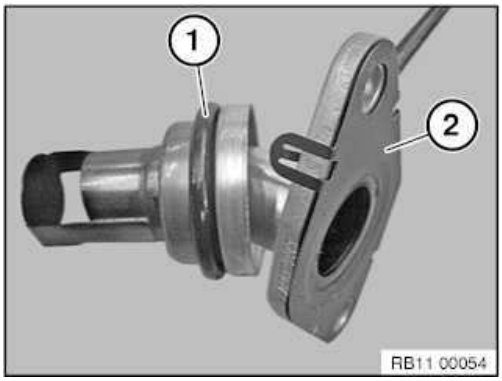
- Tighten the high pressure lines (arrows) with the special tool .

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

53 – Installing the intake plenum

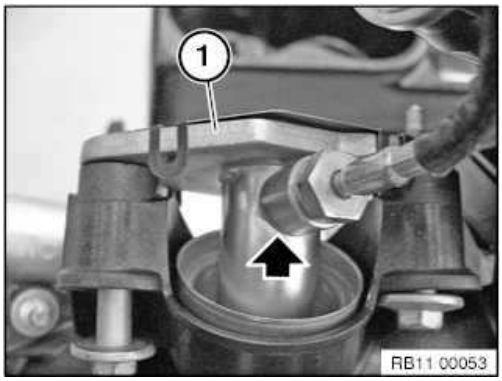


- Renew O-ring (1).

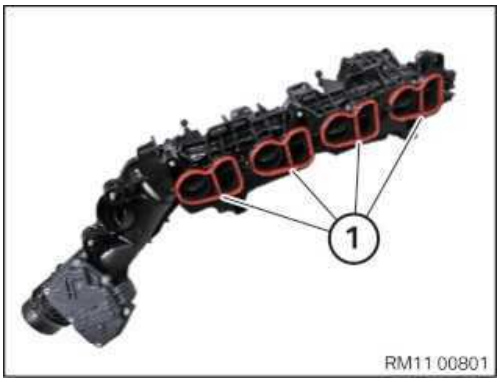
  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position the seal (2) and clip it in.

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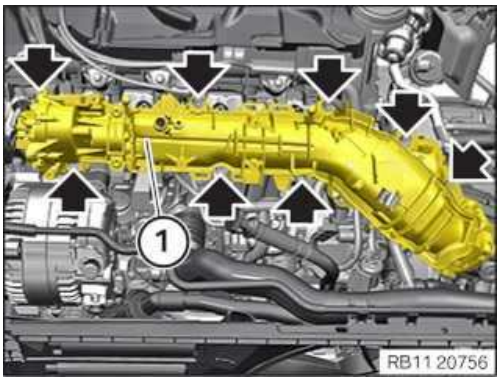


- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (1).

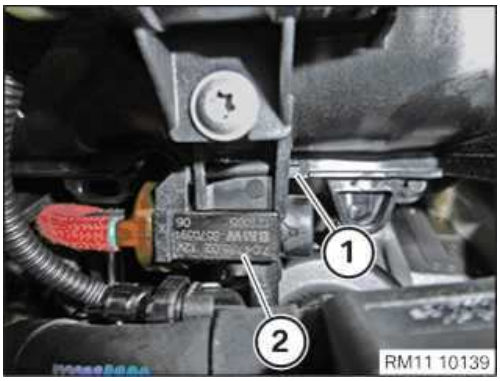
  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.



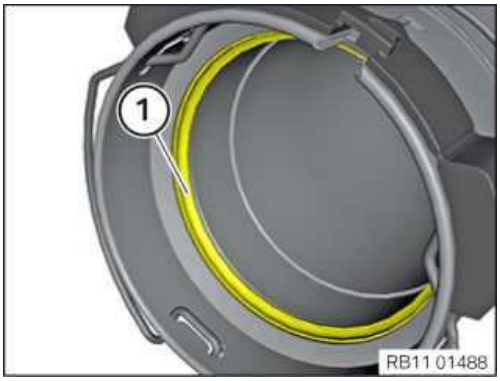
- Guide in and install intake (1) plenum.
- Tighten screws (arrows).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm



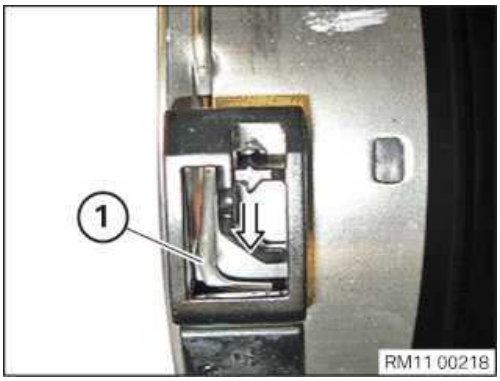
- Install the electric changeover valve (2) in the holder on the plenum from left to right.
- Lock (1) must engage audibly.



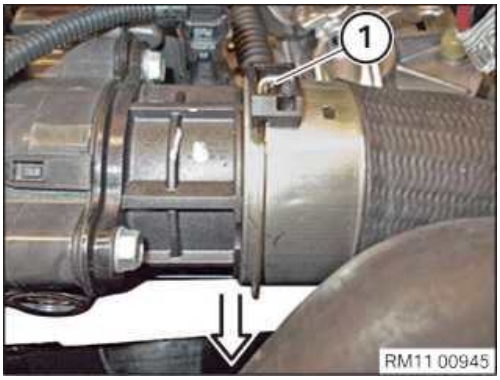
- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring

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- Engage the lock (1) on the bracket (arrow).



- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

54 – Remove the engine from the assembly stand

CAUTION

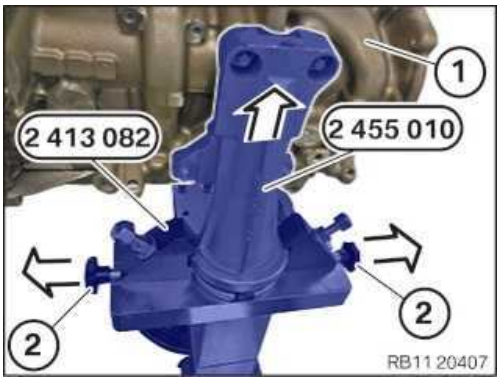
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Insert engine lifter with special tool and position engine (1).

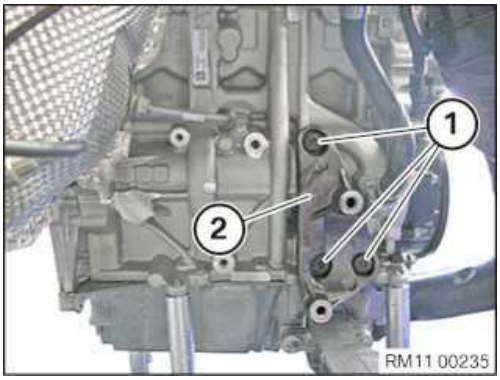


- Unscrew the nuts on special tool .
- Detach the holder (2) in the direction of the arrow.
- Detach the engine (1) with special tool **2 455 010** out of the special tool in the direction of arrow.

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- Remove conventional screws (arrows).
- Feed out the special tool **2 455 010** on the engine (1) and remove.



- Insert and install the holder (2).
- Tighten the screws (1).

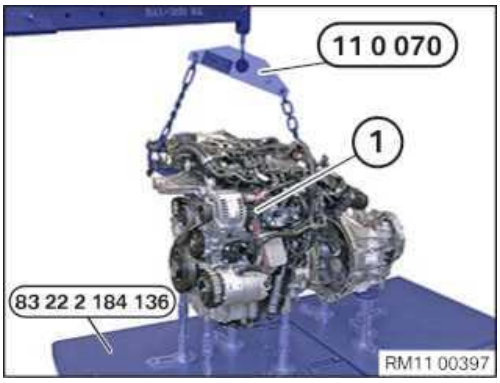
Holder to crankcase

M10		Tightening torque	38 Nm

55 – Mount engine on the automatic transmission

Prerequisite

Engine has been removed.



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Position the engine (1) on the lifting table **2 184 136** using the engine lifter and the special tool .
- Feed out engine lifter from engine (1) with special tool and push aside.

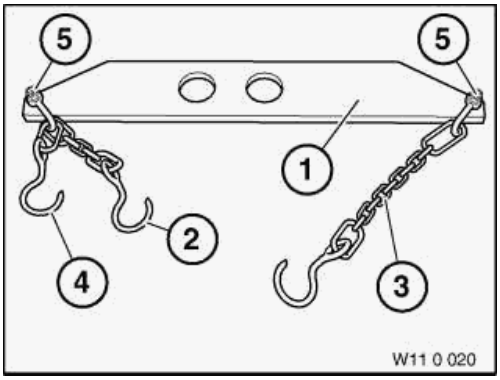


- Unscrew the bolts (1) of the special tool **2 459 012**.
- Feed out the special tool **2 459 012** at the cylinder head and remove.

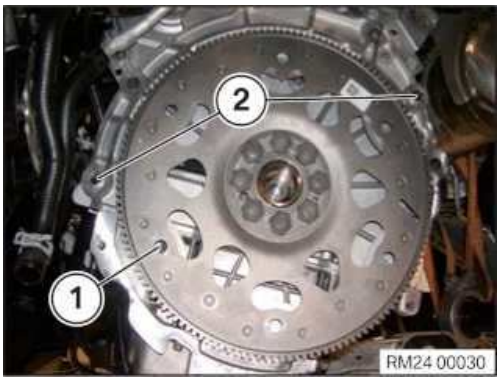
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- Stage the workshop crane **2 220 718**.



- Stage the lifting gear .



- The bore hole (1) of the flywheel must be accessible from the recess on the oil sump.
- Check for correct fit of fitting sleeves(2).

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TECHNICAL INFORMATION

Conduct the following operation with the assistance of a second person.

- Twist torque converter until bore hole in torque converter is flush with bore hole of flywheel.
- Flange-mount and screw automatic transmission on the engine with an auxiliary person and the workshop crane **2 220 718** with the lifting gear .
- Tighten screws (arrows).

Transmission to engine

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

- Feed out workshop crane **2 220 718** with the lifting gear from the automatic transmission and push it aside.

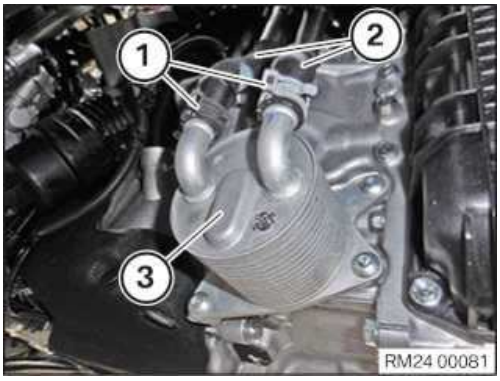


- Crank engine with special tool **0 493 380 (11 6 480)** at vibration damper in direction of rotation.
- Renew nuts (1).

  Parts: Nuts
- Tighten all 6 nuts (1) of the torque converter.

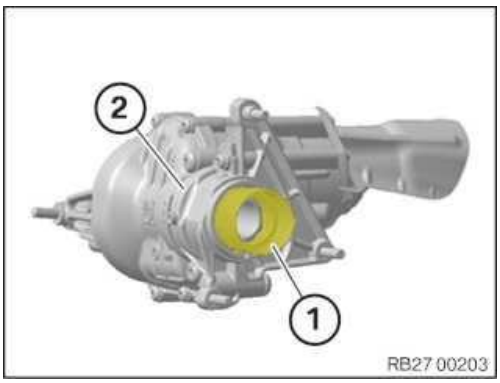
Torque converter to flywheel

M10	Replace nuts. Remove any adhesive residue from the threads.	Tightening torque	56 Nm



- Slide coolant hoses (1) onto transmission oil cooler (3).
- Secure hose clamps (1).

56 – Install the transfer box (VTG)



- If intermediate shaft (1) gets caught on transfer box (VTG) (2), renew intermediate shaft (1) and the radial shaft seals in the automatic or manual transmission.

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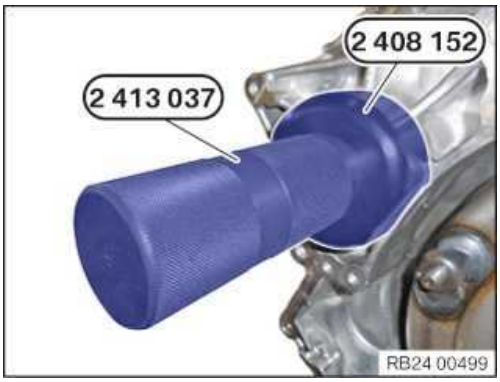
- Screw special tool **2 409 025** into the outer radial shaft seal.
- Turn the screw on the special tool **2 409 025** until the outer radial shaft seal has been pulled out.



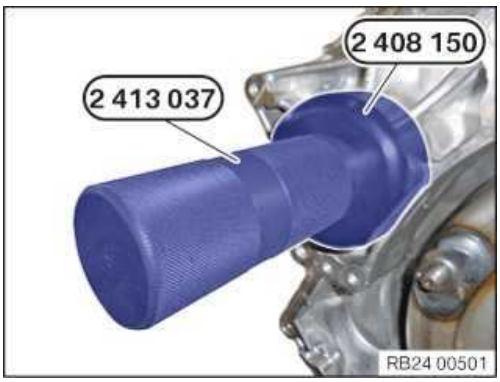
- Insert special tool **2 411 739** into the inner radial shaft seal.



- Screw special tool **2 411 739** into the inner radial shaft seal.
- Turn the screw on the special tool **2 411 739** until the inner radial shaft seal has been pulled out.

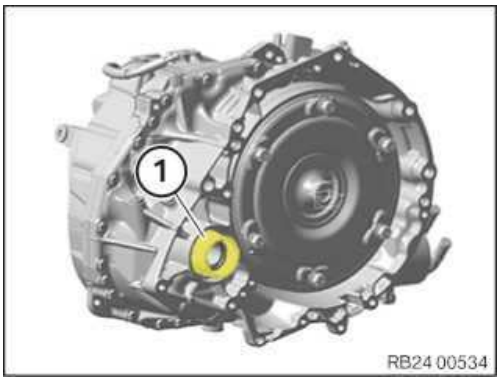


- Drive in the inner radial shaft seal using special tools **2 408 152** and **2 413 037** up to the limit position.



- Drive in the outer radial shaft seal using special tools **2 413 037** and **2 408 150** up to the limit position.

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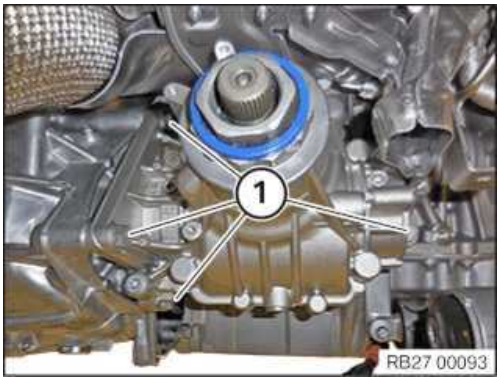
- If necessary, connect the new intermediate shaft (1) to the output flange of the automatic transmission or manual transmission.



- Coat the inside of the output flange (arrows) evenly with approx. 5 g of grease.

Expendable materials

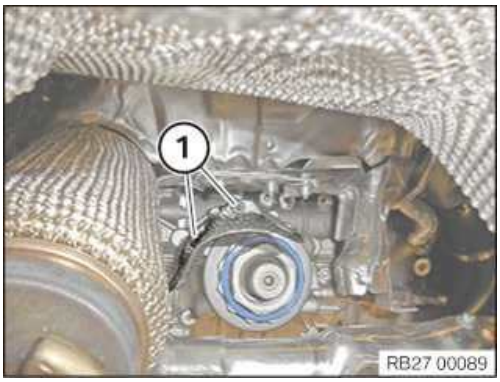
Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the transfer box (VTG).
- Tighten the screws (1).

Transfer box to transmission

M10		Tightening torque	56 Nm



- Install heat shield.
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Heat shield to transfer box

M6	Renew screws.	Tightening torque	6 Nm

▸ **Check the transfer box oil level**

RISK OF DAMAGE

Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.

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- Check transfer case oil level, correct:
- Open the oil filler plug (1).
- Check transfer box oil level.
- If necessary, top up transmission oil up to the lower edge of the oil filler plug opening (1).

Transmission oil

Technically suitable transfer box and electrical transmission oils	

Main group 27

- Tighten the oil filler plug (1).

Oil filler plug on transfer box (VTG)

M18x1.5		Tightening torque	35 Nm

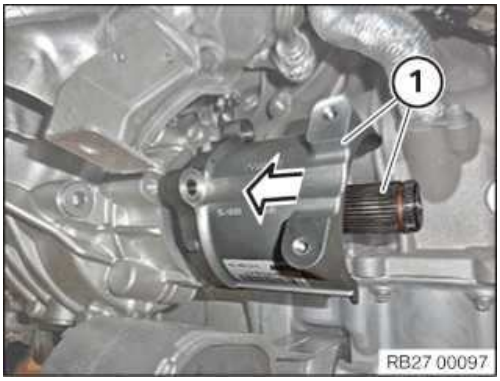
57 – Install the intermediate shaft with the support tube



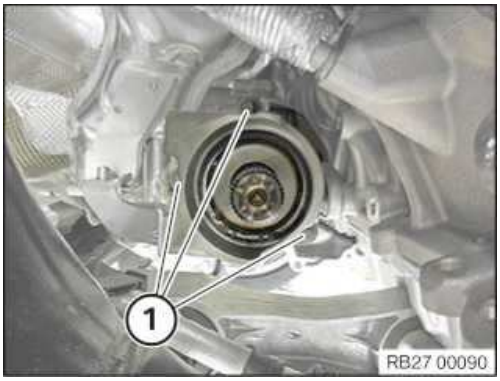
- Coat gearing of the intermediate shaft uniformly with 5 g of grease.

Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the intermediate shaft with support tube (1) in the transfer box.



- Position screws (1).

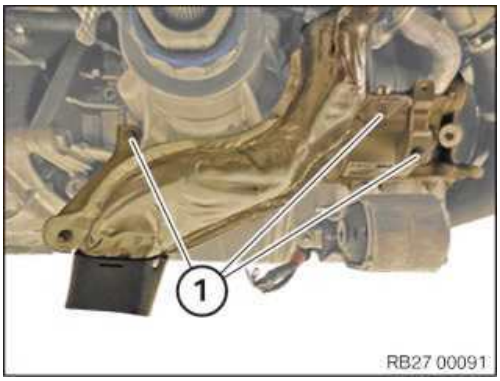
Note: Check for correct screw length! Bolt M8x35 8.8

- Tighten the screws (1).

Intermediate shaft to transfer box

M8x35		Tightening torque	19 Nm

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- If installed: Install air duct.
- Tighten the screws (1).

58 – Installing the high-pressure stage exhaust turbocharger

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

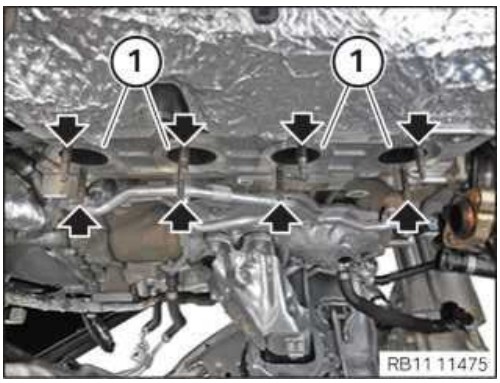
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

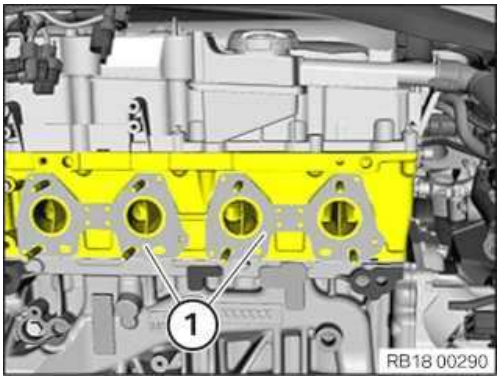


- Clean the sealing surfaces (1) on the cylinder head using special tool **0 495 102 (11 4 470)**.
- Check the stud bolts (arrows) on the cylinder head for correct fit.

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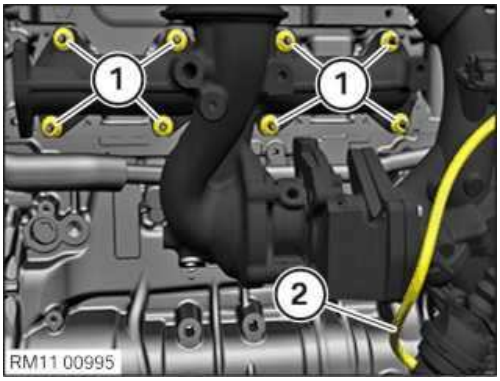
- Clean the sealing surfaces on the exhaust manifold using special tool **0 495 102 (11 4 470)**.



- Renew gasket (1).

  Parts: Gasket

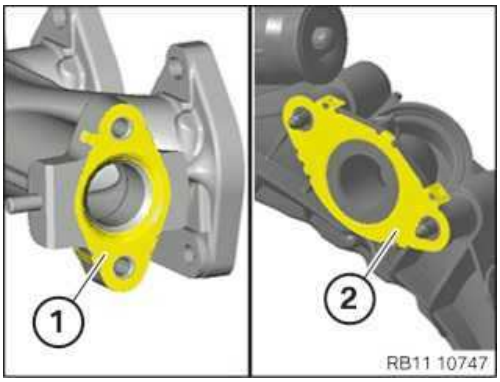
- Install new gasket (1).



- Feed in and install the exhaust manifold and the high-pressure stage exhaust turbocharger.
- Tighten nuts (1).

  Parts: Nuts

- Connect vacuum hose(2).

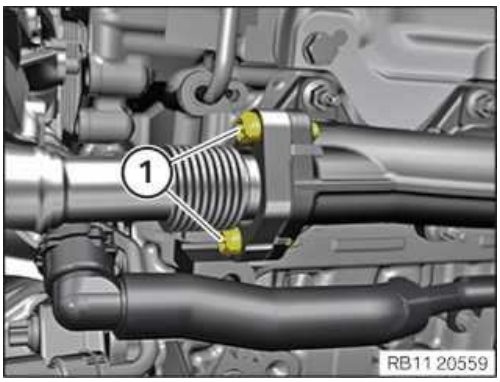


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket

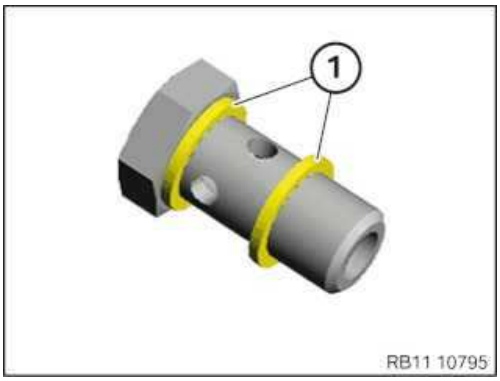


- Tighten the screws (1).

Exhaust-gas recirculation cooler to exhaust manifold

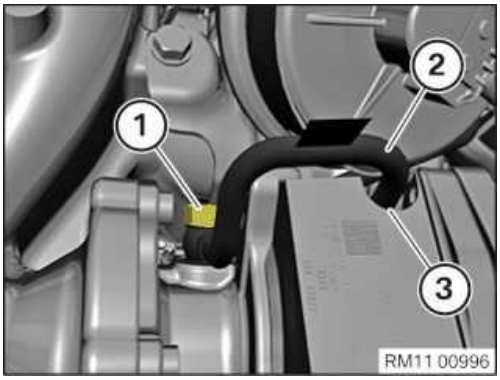
M8x28	Replace screws	Tightening torque	32 Nm

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- Renew sealing rings (1) of banjo bolt.

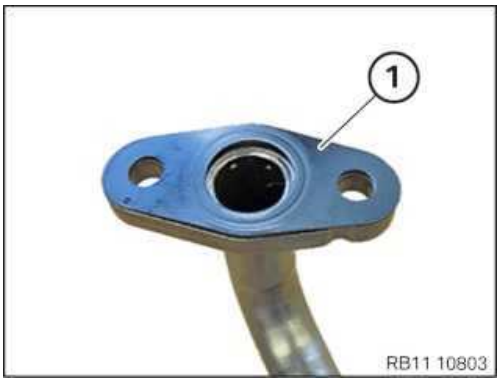
  Parts: Sealing ring



- Guide the oil feed line into the holder (3) and install it.
- Tighten down screw (1).

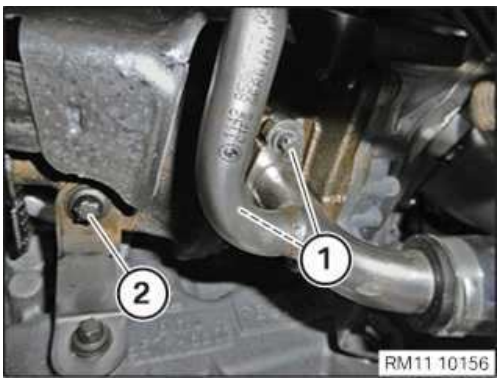


- Tighten bolt (1) from the right wheel arch.



- Renew seal (1) of oil return line.

  Parts: Gasket



- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

59 – Installing the low-pressure stage turbocharger

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RISK OF DAMAGE

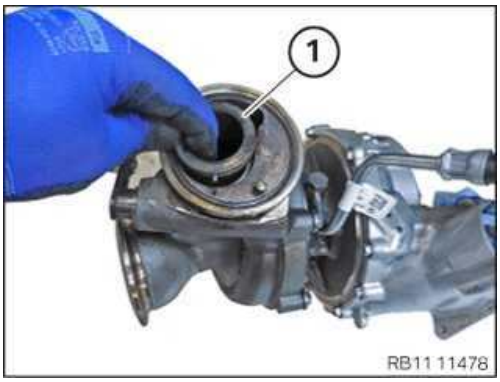
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

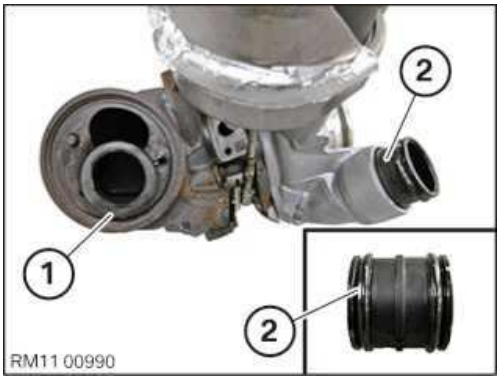
TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.



- Check the spacer plug (1) for damage, renew if necessary.

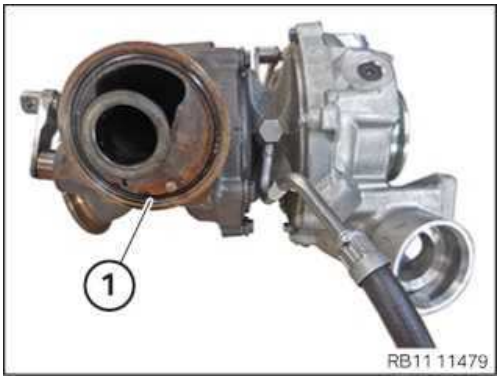
  Parts: Spacer ring
- Insert and install the spacer ring (1).
- Position spacer ring (1) correctly.



- Renew gasket (1).

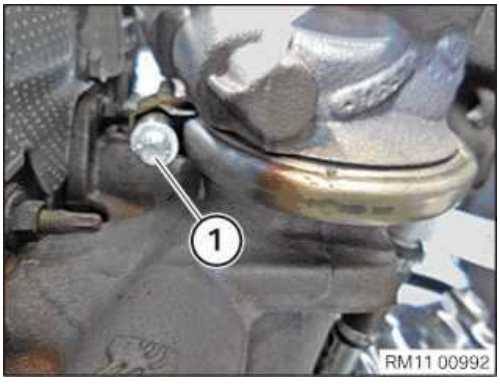
  Parts: Gasket
- Position the seal (1).
- Renew the sleeve(2).

  Parts: Holding sleeve



- Renew sealing ring (1).

  Parts: Sealing ring
- Affix the sealing rings on the exhaust turbocharger.



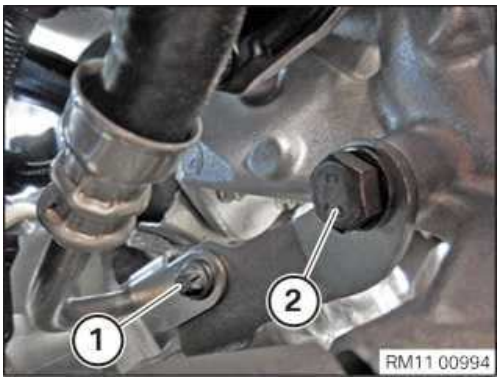
- Insert and install the low-pressure stage exhaust turbocharger on the exhaust manifold .
- Feed in and install V-band clamp .
- Tighten V-band clamp (2).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Screw in nut (1) with 2 **revolutions**.

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- Tighten down screw (1).

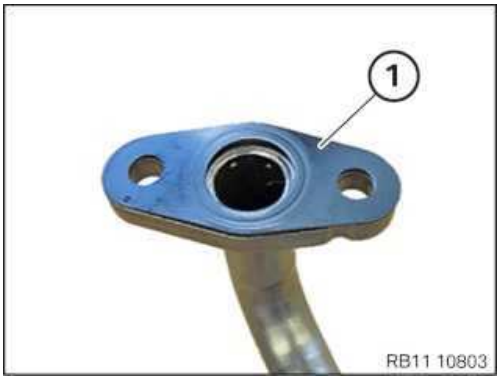
Oil feed line to bracket

Torx screw M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

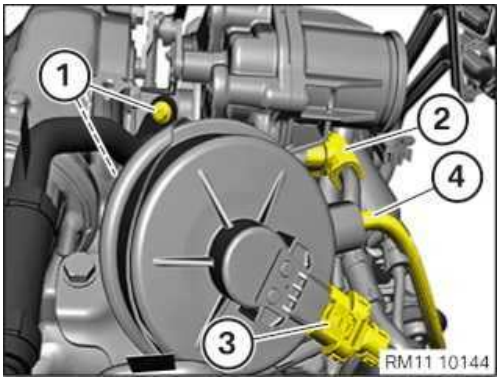
Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm



- Renew seal (1) on the oil return line.

  Parts: Gasket



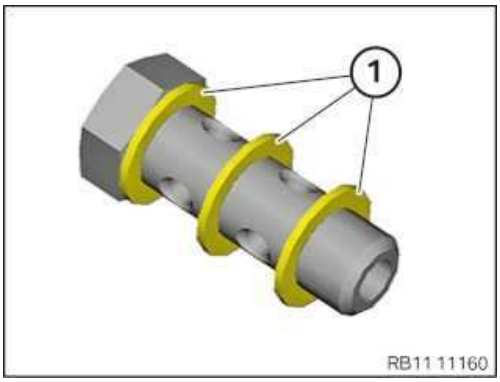
- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

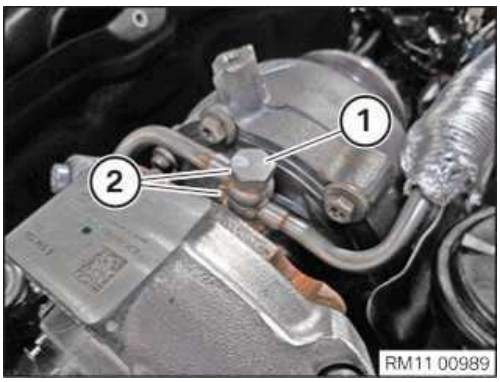
M6x12		Tightening torque	8 Nm

- Connect and lock connectors (2) and (3).

  The locks must engage audibly.
- Connect vacuum hose (4).

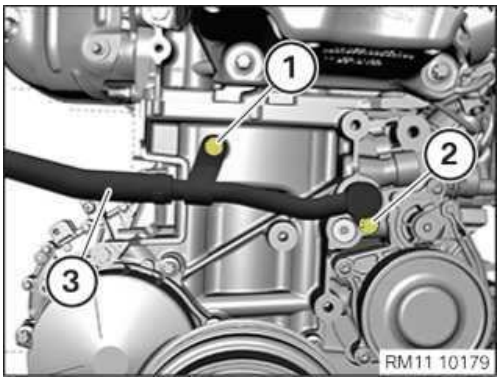


- Renew banjo bolt and sealing rings (1).
- **Parts:** Banjo bolt, sealing rings



- Install sealing rings (1).
- Tighten the banjo bolt (1).
- Ensure that the lines do not rest against the adjacent components.

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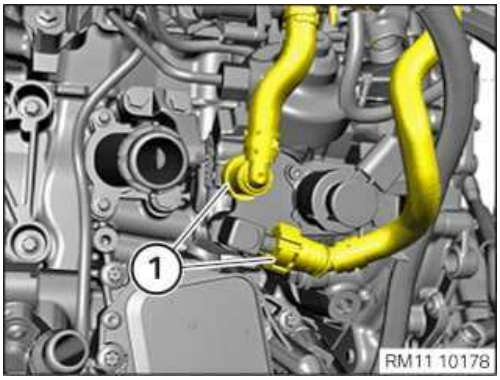


- Renew sealing ring of the coolant line (3).

  Parts: Sealing ring
- Coat the sealing ring and install the coolant line (3) .
- Tighten down screws (1) and (2).

Standard screw connection M6

M6		8 Nm



- Connect and lock fuel lines (1).

  The fuel lines (1) must audibly engage.

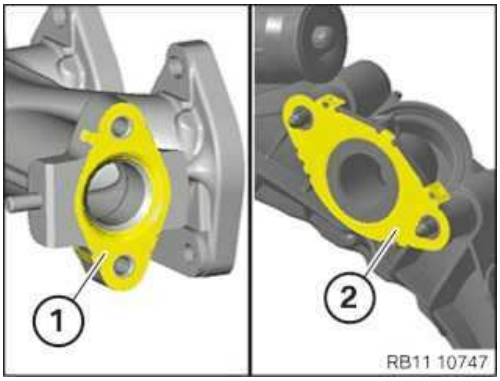
▶ **Installing the exhaust-gas recirculation cooler**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

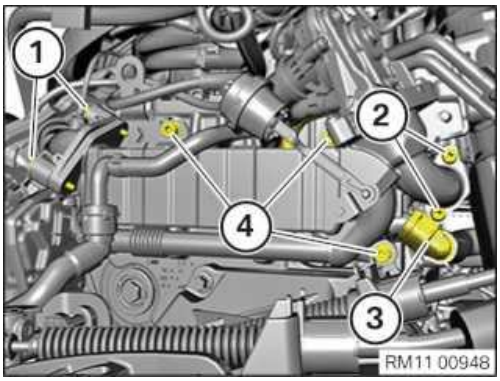


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket
- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket

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- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts
- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

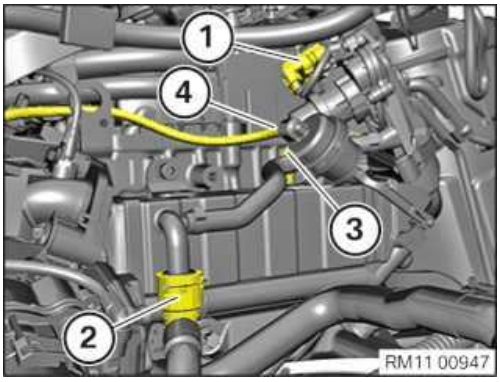
M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.
- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm



TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

▸ **Installing heat shield on exhaust turbocharger at bottom**

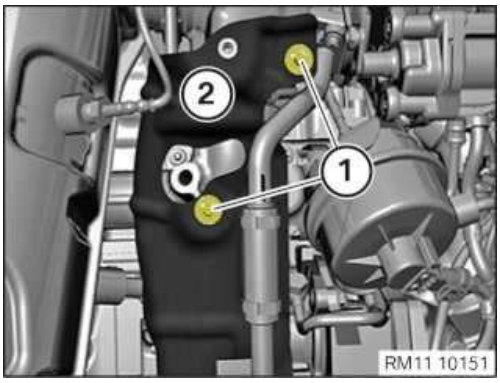
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WARNING

Hot surfaces.

Risk of burning!

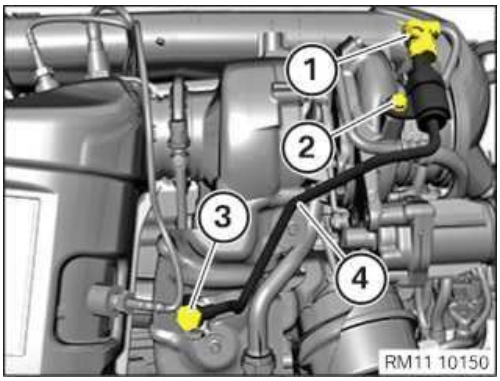
- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (2).
- Tighten the bolts (1) on the heat shield .

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm



- Position the exhaust gas pressure pipe (4).
- Hand-tighten the bolt (2).
- Renew sealing rings on the banjo bolt (3).

  Parts: Sealing ring
- Tighten the banjo bolt (3).

Banjo bolt for exhaust pressure pipe to exhaust manifold

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

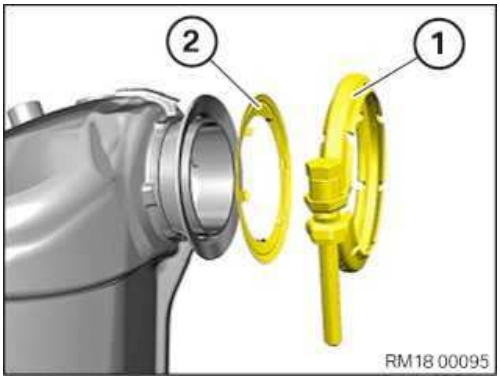
- Tighten down screw (2).

Standard screw connection M6

M6		8 Nm

- Connect connectors (1) and lock.

  Lock must audibly engage.



CAUTION

Heavy component.

Heavy components can lead to injury or damage.

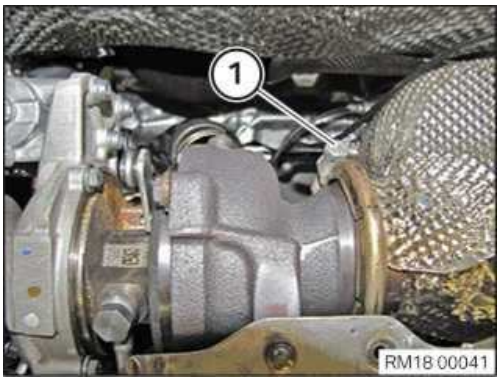
- Remove and install heavy components with the aid of another person/other persons.

- Renew the V-clip (1).

  Parts: V-band clamp
- Renew the gasket (2).

  Parts: Gasket

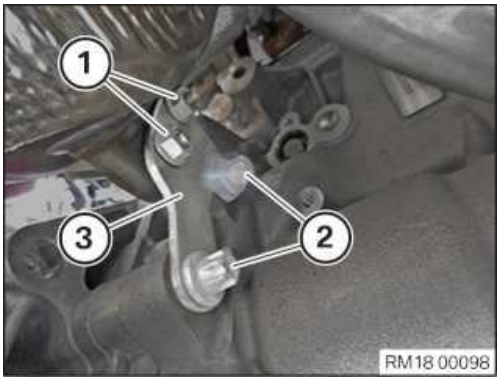
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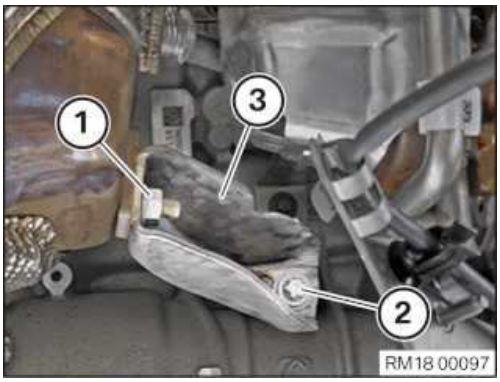
- Carefully insert and install the diesel particulate filter .
- Feed in and install V-band clamp (1).
- Make sure that the seal between the diesel particulate filter and the exhaust turbocharger is installed correctly.
- Align the diesel particulate filter on the exhaust turbocharger.
- Position V-clip (1).
- Hand-tighten the V-clip (1).



- Tighten nuts (1) by hand.



- Install holder (3).
- Hand-tighten the bolts (2).
- Tighten nuts (1) by hand.



- Install holder (3).
- Tighten the nut (1) hand-tight.
- Hand-tighten the bolt (2).



- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

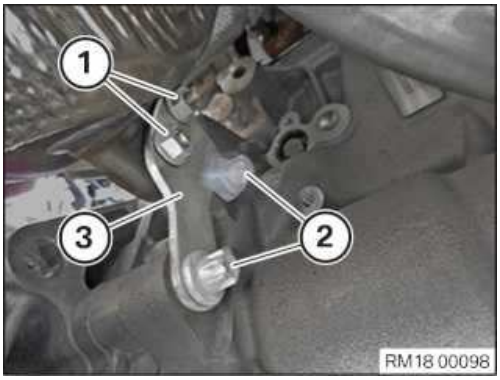
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- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screws (2).

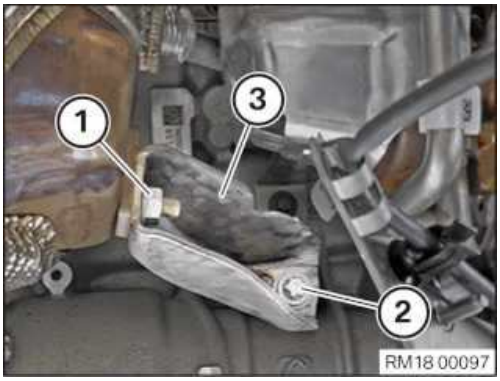
Diesel particulate filter holder to gearbox

M12x75		Tightening torque	66 Nm

- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screw (2).

Diesel particulate filter bracket to crankcase

M10x35		Tightening torque	38 Nm

- Tighten nut (1).

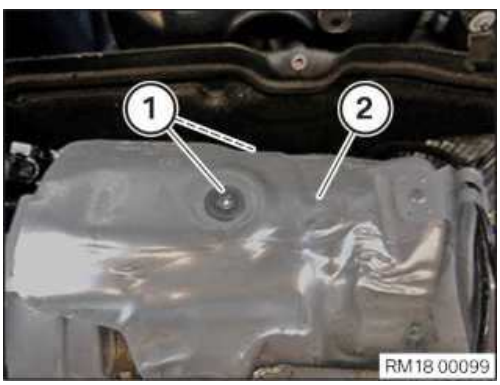
Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Remove fitting aid (1) for the flexible tube.

▶ **Install the heat shield on the exhaust turbocharger**



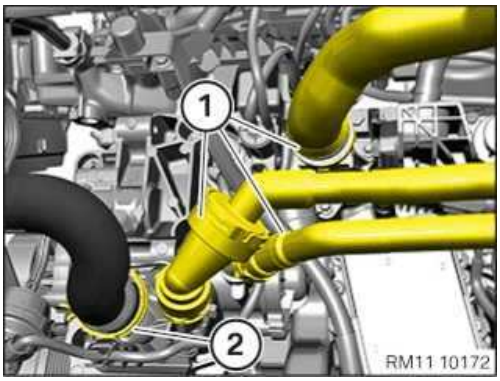
- Feed in and install the heat shield (2).
- Tighten the screws (1) at the top and bottom of the heat shield.

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

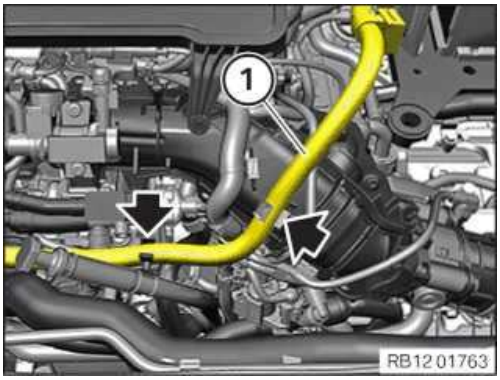
- Fasten the cable at the clips .

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- Install the coolant hose and secure with the clamp (2) .
- Connect and lock the coolant lines (1).

  The coolant lines (1) must engage audibly.



CAUTION

Improper routing of the positive battery cable.

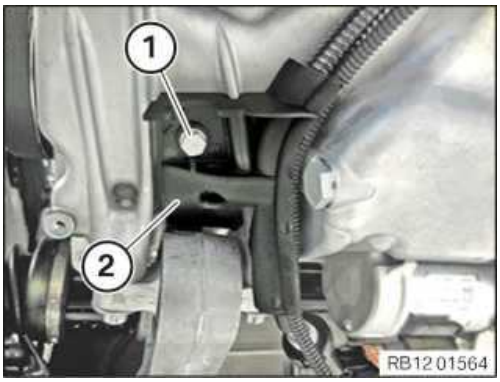
Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

- Insert the positive battery cable (1) into the clamps (arrows).



- Feed in and install positive battery cable at the clamps (1).



- Insert and install the holder (2).
- Tighten down screw (1).

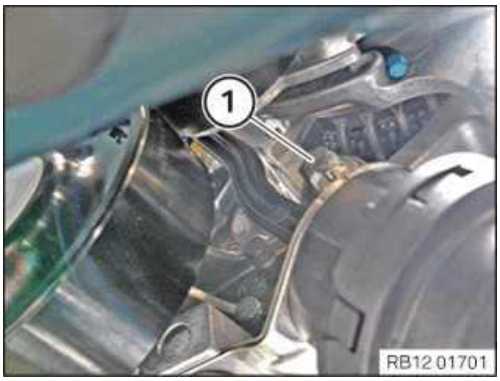
Bracket to oil sump

M6		Tightening torque	8 Nm



- Insert and install alternator (1) along with the screw (2) on the bottom of the alternator through the slot on the support.

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- Tighten the screw (1) below on the alternator.

Alternator to component carrier

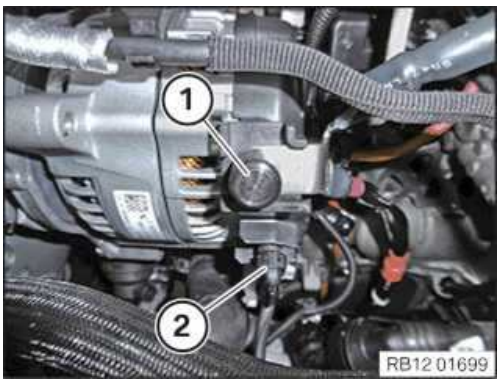
M10x75 / M10x125		Tightening torque	38 Nm



- Tighten the bolt (1) on top on the alternator.

Alternator to component carrier

M10x75 / M10x125		Tightening torque	38 Nm



- Mount positive battery cable to the alternator.
- Tighten nut.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

- Mount the cover (1).
- Connect the connector (2) to the alternator and lock audibly.



- Install air conditioning compressor (2) and position it correctly.
- Tighten the screws (1).

Air conditioning compressor in component carrier

M10		Tightening torque	38 Nm

▸ **Installing the drive belt for alternator**

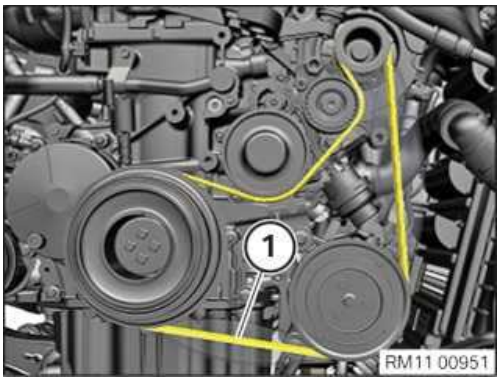
TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

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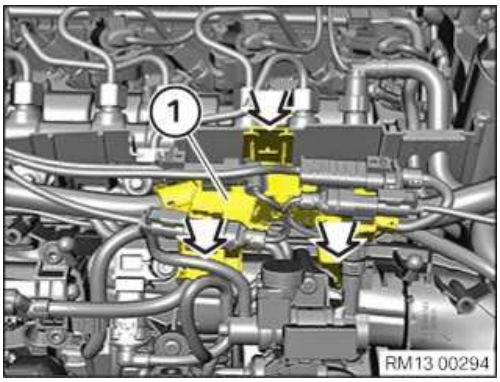


- Feed in the drive belt for the alternator (1) and install it.

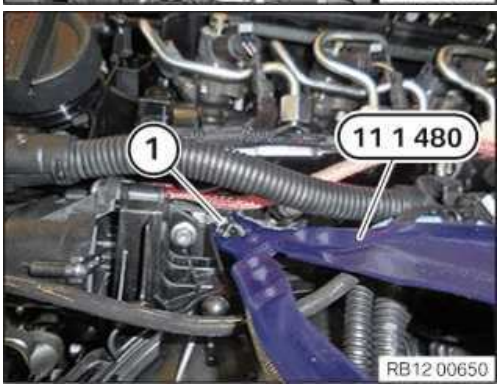


- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool **0 496 268 (11 0 390)** out of the belt tensioner and remove it.

▶ **Installing the cable clip for the intake plenum**

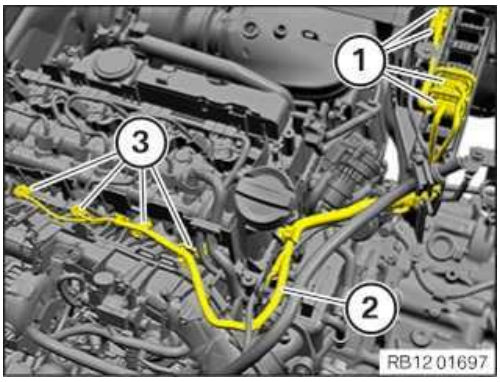


- Insert and install the cable clip (1) in the direction of the arrow.
- Make sure the cable clip (1) is fitted correctly.



- Connect and lock the connector (1) on the glow elements.

  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.

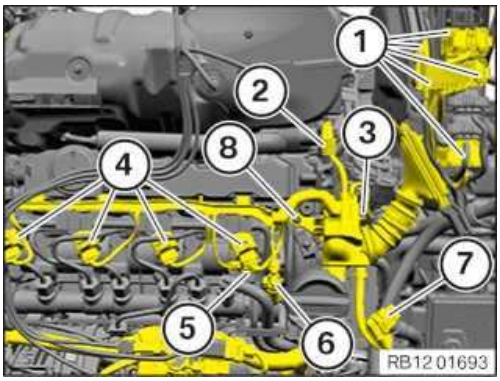


- Lay vehicle wiring harness and fasten with clamps.
- Route all connectors (1) to the integrated supply module (PDM) and to the DME control unit.
- Connect all connectors (3) to the glow elements and engage them audibly.
- Mount ground strap and tighten screw (2).

Ground cable to cylinder head

M6x12		Tightening torque	8 Nm

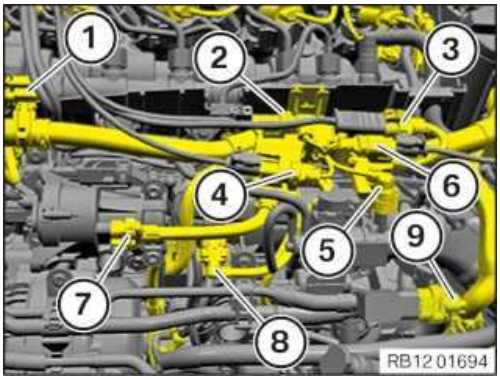
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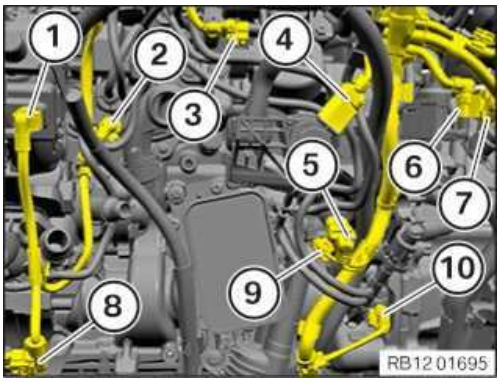
- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the integrated supply module (PDM) and to the DME control unit.
- Attach connector (2) to the differential pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust-gas recirculation valve and lock audibly.
- Attach connector (4) to the injectors and lock it audibly.
- Attach connector (5) to the camshaft sensor and lock it audibly.
- Attach connector (6) to the fuel pressure regulator and lock it audibly.
- Connect and audibly lock the connector (7) to the hot film air mass meter.
- Tighten down screw (8).

Wiring harness to cylinder head cover

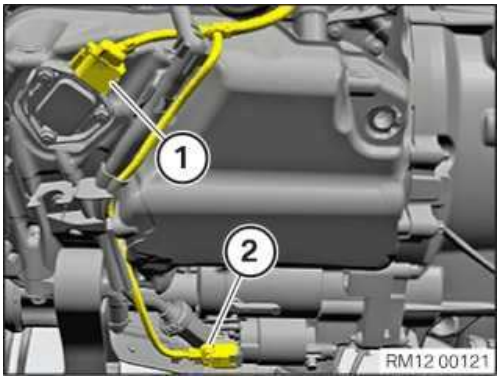
TS5x20		Tightening torque	3,5 Nm



- Connect the connector (1) to the rail pressure sensor and lock it audibly.
- Attach connector (2) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (3) to the front oxygen sensor and lock audibly.
- Attach connector (4) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Connect the connector (5) to the electric changeover valve and lock audibly.
- Attach connector (6) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (7) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (8) to the charging pressure sensor and lock it audibly.
- Attach connector (9) to the fuel pressure and temperature sensor and lock it audibly.

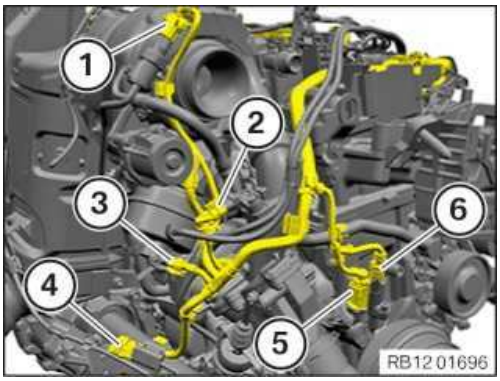


- Connect the connector (1) to the alternator and lock audibly.
- Connect the connector (2) to the electric changeover valve and lock audibly.
- Connect the connector (3) to the electric changeover valve and lock audibly.
- Connect the connector (4) to the high pressure pump and lock audibly.
- Connect the connector (5) to the oil pressure sensor and lock it audibly.
- Attach connector (6) to the throttle bodies and lock it audibly.
- Attach connector (7) to the intake air temperature sensor and lock it audibly.
- Connect the connector (8) to the air conditioning compressor and lock audibly.
- Connect the connector (9) to the solenoid valve and lock audibly.
- Connect the connector (10) to the crankshaft sensor and lock it audibly.

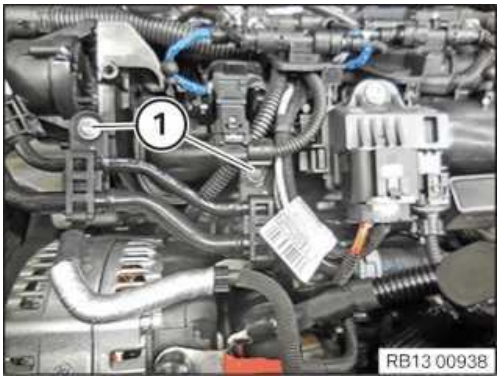


- Connect the connector (1) to the oil-level sensor and lock it audibly.
- Connect connector (2) to the starter motor and lock audibly.

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- Attach connector (1) to the exhaust turbocharger and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust gas pressure sensor and lock it audibly.
- Connect the connector (4) to the monitoring oxygen sensor and lock audibly.
- Attach connector (5) to the oil pressure switch and lock it audibly.
- Attach connector (6) to the switching valve and lock it audibly.

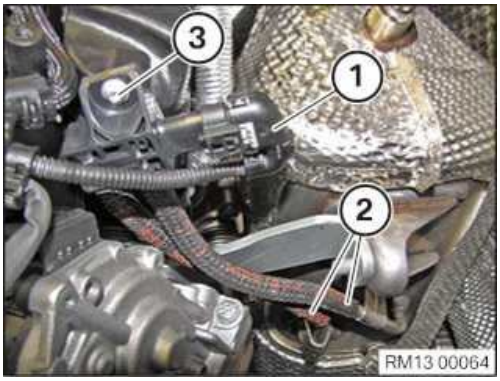


- Position the fuel line.
- Tighten the screws (1).

Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

61 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

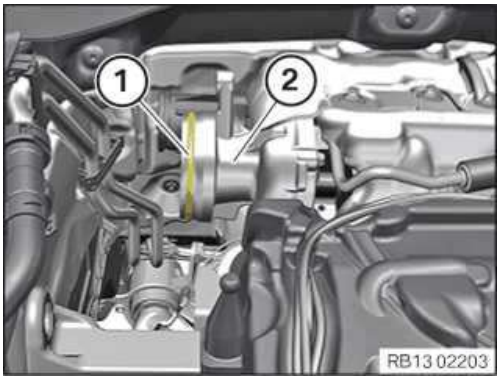
Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

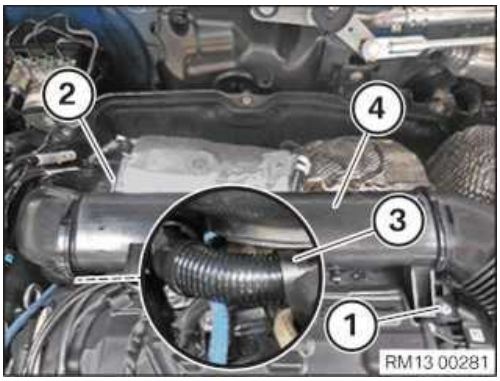
  The connector (1) must engage audibly.

62 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.

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- Feed in clean air pipe and install.
- Connect clean air pipe to the exhaust turbocharger and lock audibly in the clamps (2).
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Connect ventilation line (3) to the cylinder head cover and lock audibly.

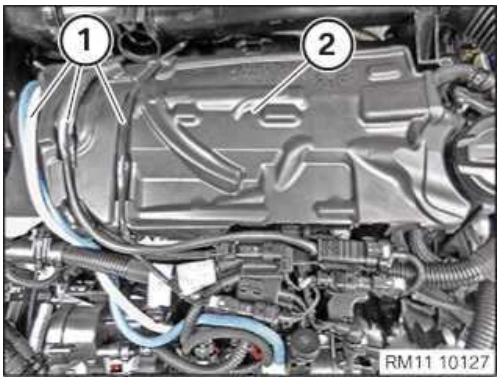


- Mount clean air pipe onto the intake filter housing.
- Tighten clamp (1) on the clean air pipe.

Clean air pipe to intake silencer housing

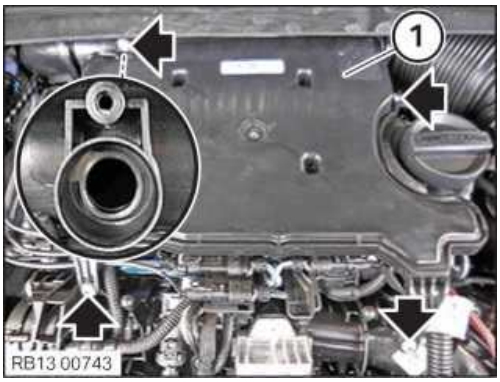
Clamp		Tightening torque	3 Nm

63 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the vehicle wiring harness (1) in the brackets.

64 – Install resonator



- Insert and install the resonator (1).
- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

65 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Check for correct installation of all rubber mounts in the acoustic cover (1).



- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

66 – Install engine



- See additional information.

Additional Information

Overview of Tightening Torques

Special tool to cylinder head Used in step 12

M8		Tightening torque	21,5 Nm

Special tool 2 455 010 to crankcase Used in step 13

M10x30		Tightening torque	38 Nm

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Special tool 11 8 930 to special tool 00 2 320

Used in step 13

M14x35		Tightening torque	160 Nm

Special tool 2 288 054 to crankshaft

Used in step 33 34

M10		Tightening torque	20 Nm

Gear to counterbalance shaft

Used in step 34

M10	Renew screws.	1. Jointing torque	20 Nm
		2. Angle of rotation	180 °

Idler gear to crankcase

Used in step 34

M12x1.5		Tightening torque	10 Nm
		Angle of rotation	45 °

Oil deflector to crankshaft bearing cap

Used in step 35

M8x14	Replace screws.	Tightening torque	35 Nm
		Release	180 °
		Tightening torque	15 Nm
		Angle of rotation	45 °

Oil deflector to crankcase

Used in step 35

M8x14		Tightening torque	19 Nm

Oil vacuum pump to crankcaseB47

Used in step 36

M8x35		Tightening torque	19 Nm

Rear timing case cover to crankcase

Used in step 37

M6	Renew screws.	Jointing torque	8 Nm
		Angle of rotation	90 °

SCR coolant lines to crankcase end cover

Used in step 37

Hexagon screw M6x16		Tightening torque	8 Nm

Cylinder head to crankcase

Used in step 37

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

Cylinder head bolt to timing case cover

Used in step 37

M8x40		Tightening torque	19 Nm

Oil sump to crankcase

Used in step 37

M8x30		Tightening torque	24 Nm
M8x110		Tightening torque	24 Nm

Transmission to oil sump

Used in step 37

M8		Tightening torque	19 Nm

Guide tube for oil dipstick on engine

Used in step 37

M8x16		Tightening torque	19 Nm

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Flywheel to crankshaft

Used in step 38

M12x1.5	Renew screws.	Tightening torque	120 Nm

Vibration damper with belt pulley to crankshaft

Used in step 39

M10x65	Renew screws. Tighten screws crosswise.	1. Jointing torque	40 Nm
		2. Angle of rotation	60 °
		3. Angle of rotation	60 °

Transmission to engine

Used in step 39

M8		Tightening torque	19 Nm

Glow elements to cylinder head

Used in step 42

Glow element		Tightening torque	13 Nm

Camshaft carrier to cylinder head

Used in step 43

M7x35		Tightening torque	13 Nm

Intake and exhaust camshaft in camshaft support

Used in step 44

M6x31		Tightening torque	10 Nm

Bearing journal to cylinder head

Used in step 44

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8

Used in step 44

M8		Tightening torque	19 Nm

Standard screw connection M6

Used in step 44 60

M6			8 Nm

Chain tensioner piston to cylinder head

Used in step 44

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft

Used in step 44

M7x17.			17 Nm

Cylinder head cover to cylinder head

Used in step 48

M6		Tightening torque.	8,5 Nm

Clamping claw facing to cylinder head cover

Used in step 49

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 49

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

Rail on cylinder head cover

Used in step 50

Torx screw M8x25		Tightening torque	19 Nm

High pressure line between high pressure pump and rail

Used in step 50

High-pressure pipe		Tightening torque	28 Nm

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High pressure lines between injector and rail

Used in step 52

High pressure lines		Tightening torque	28 Nm

Intake plenum to cylinder head

Used in step 53

M6		Tightening torque	11 Nm

Holder to crankcase

Used in step 54

M10		Tightening torque	38 Nm

Transmission to engine

Used in step 55

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

Torque converter to flywheel

Used in step 55

M10	Replace nuts. Remove any adhesive residue from the threads.	Tightening torque	56 Nm

Transfer box to transmission

Used in step 56

M10		Tightening torque	56 Nm

Heat shield to transfer box

Used in step 56

M6	Renew screws.	Tightening torque	6 Nm

Oil filler plug on transfer box (VTG)

Used in step 56

M18x1.5		Tightening torque	35 Nm

Intermediate shaft to transfer box

Used in step 57

M8x35		Tightening torque	19 Nm

Exhaust-gas recirculation cooler to exhaust manifold

Used in step 58 60

M8x28	Replace screws	Tightening torque	32 Nm

Oil return line to turbocharger

Used in step 58 59

M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase

Used in step 58

M8x16		Tightening torque	22 Nm

Exhaust turbocharger to exhaust manifold

Used in step 59

V-band clamp		Tightening torque	19 Nm

Oil feed line to bracket

Used in step 59

Torx screw M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase

Used in step 59

M8x16		Tightening torque	22 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 60

M8x20		Tightening torque	5 Nm
		Release angle	90 °

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Intake plenum to exhaust-gas recirculation cooler — Used in step 60

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to cylinder head — Used in step 60

M8x20		Tightening torque	19 Nm

Heat shield for exhaust turbocharger — Used in step 60

Torx screw BM 6x12		Tightening torque	10 Nm

Banjo bolt for exhaust pressure pipe to exhaust manifold — Used in step 60

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

Diesel particulate filter V-clip to exhaust turbocharger — Used in step 60

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Diesel particle filter to holder — Used in step 60

M8 hexagon nut		Tightening torque	19 Nm

Diesel particulate filter holder to gearbox — Used in step 60

M12x75		Tightening torque	66 Nm

Diesel particulate filter bracket to crankcase — Used in step 60

M10x35		Tightening torque	38 Nm

Heat shield for exhaust turbocharger — Used in step 60

Torx screw BM 6x12		Tightening torque	10 Nm

Bracket to oil sump — Used in step 60

M6		Tightening torque	8 Nm

Alternator to component carrier — Used in step 60

M10x75 / M10x125		Tightening torque	38 Nm

Positive battery cable to alternator — Used in step 60

M8		Tightening torque	19 Nm

Air conditioning compressor in component carrier — Used in step 60

M10		Tightening torque	38 Nm

Ground cable to cylinder head — Used in step 60

M6x12		Tightening torque	8 Nm

Wiring harness to cylinder head cover — Used in step 60

TS5x20		Tightening torque	3,5 Nm

Fuel line to intake plenum — Used in step 60

TS6x20		Tightening torque	5 Nm

Differential pressure sensor to holder — Used in step 61

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor — Used in step 61

Clamp 15–19mm		Tightening torque	3 Nm

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Clean air pipe to cylinder head cover

Used in step 62

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing

Used in step 62

Clamp		Tightening torque	3 Nm

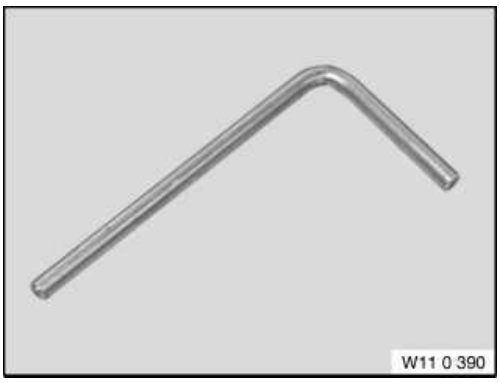
Resonator to manifold and clean air pipe

Used in step 64

Screw TS6	Renew screw.	Tightening torque	5 Nm

Overview of Special Tools

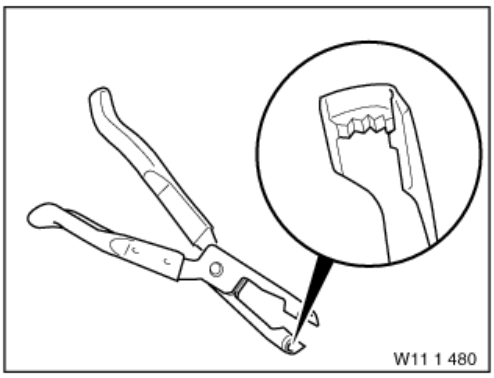
0 496 268 (11 0 390) Pin



Common Used in step 7 60

Usage	(roll pin) For securing new tensioning pulley (poly-V belt)
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 15 07 (390)

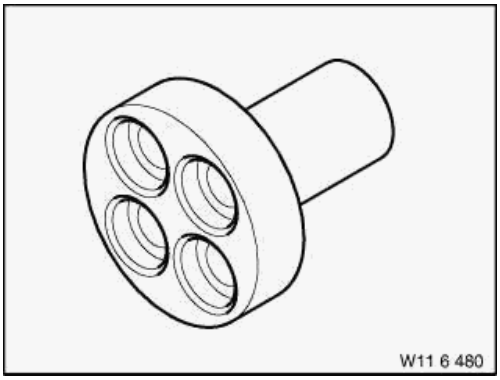
0 490 796 (11 1 480) Pliers



Common Used in step 7 25

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

0 493 380 (11 6 480) Connector



Common Used in step 12 20 44 47 55

Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

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2 220 718 Workshop crane



Common	Used in step 12 55
Usage	WSK 1000
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	06 01 11 (701)

2 459 012 Holder



Common	Used in step 12 55
Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

2 455 010 Engine support

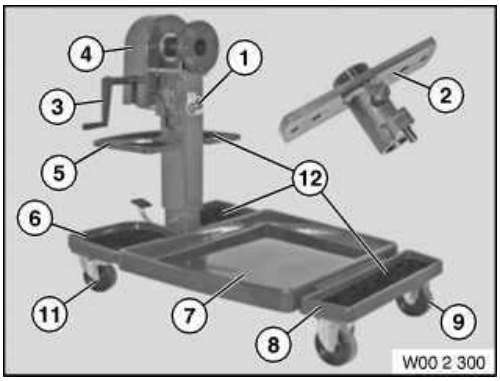


Common	Used in step 13 54
Usage	For accommodating engine on assembly stand. Engine: B3x, B4x, N47.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

0 495 187 (00 2 300) Assembly stand

Used in step 13

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Common

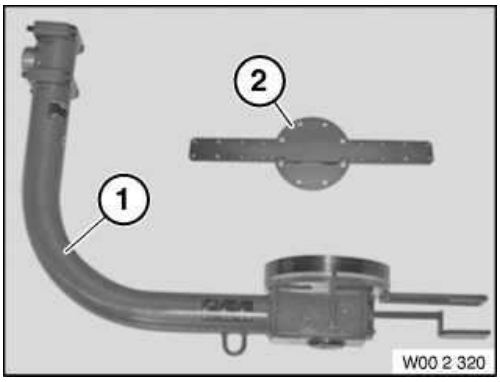
Usage	Assembly stand with universal flange for mounting engines from S85
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 188 (00 2 301)		**Assembly stand** available only as complete assembly stand 83 30 0 495 187.	
2	0 495 189 (00 2 302)	**2 299 563**	**Tool** (Universal flange). Do not use any more!!! Technically locked. Replaced with a new flange with material number 83 30 2 299 563. All flanges delivered until the end of 2011 will be replaced at no charge. From 2012, only the new flange will be supplied. Also applies to the complete engine mounting stand 00 2 300.	
3	0 495 200 (00 2 303)		**Crank**	
4	0 495 201 (00 2 304)		**Cover** (Protective hood)	
5	0 495 202 (00 2 305)		**oddments tray** (Oddments tray for small parts)	
6	0 495 203 (00 2 306)		**Shaped element** (Rear shaped pan)	
7	0 495 204 (00 2 307)		**Collection pan** (Oil collection pan)	
8	0 495 205 (00 2 308)		**Shaped element** (Front shaped pan)	
9	0 495 206 (00 2 309)		**Wheel** (Front wheel (without stop))	
10	0 495 207 (00 2 311)		**Wheel** (Rear wheel (with stop))	
11	0 495 208 (00 2 312)		**Mat** (Checker mat set)	
2	2 299 563		**Adapter** New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.	

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0 495 196 (00 2 320) Support arm



Common

Used in step 13

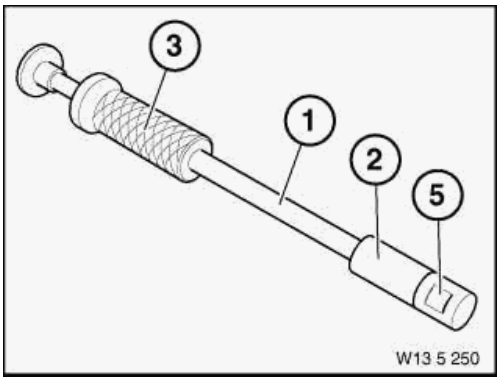
Usage	(Support arm with fixture) For mounting engines using the engine mounting bracket.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 197 (00 2 321)		**Support arm**	
2	0 495 198 (00 2 322)		**Panel** (take-up plate)	
3	0 495 380 (00 2 323)		**Panel** (fixture) Engine N73	
6	0 496 287 (00 2 326)		**Panel** (fixture) Engine: M73	
5	0 496 288 (00 2 327)	**0 496 373**	**Panel** (fixture) Engine: S62 Replaced by 11 5 420 (0 496 373)	
8	0 496 533 (00 2 328)		**Support** (Engine mount) Engine: N57, N57Top	
9	0 496 579 (00 2 329)	**0 496 680**	**Support** (Engine mount) Engine: N74 Replaced by 116160 (0 496 680)	
4	0 495 379 (00 2 324)		**Panel** (fixture) Engine M67TU	
5	0 495 381 (00 2 325)		**Panel** (fixture) Engine N62, N62TU	

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0 493 321 (13 5 250) Puller



Common

Used in step 17

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

0 493 339 (13 5 252) Bush



Common

Used in step 17

Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 340 (13 5 253) Weight



Common

Used in step 17

Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

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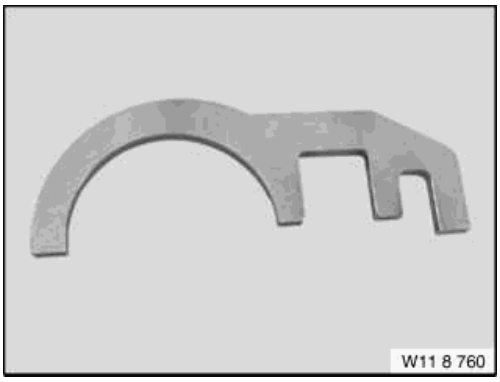
2 288 380 Locating stud



Common Used in step 20 44 45 47

Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 112 (11 8 760) Gauge



Common Used in step 20 44 46 47

Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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0 495 105 (11 4 480) oddments tray



Common

Used in step 26 27 44

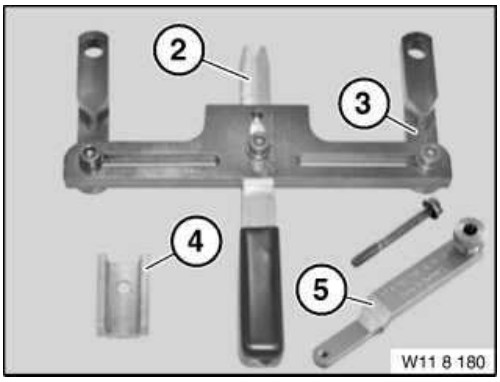
Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

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0 493 587 (11 8 180) Holder



Common

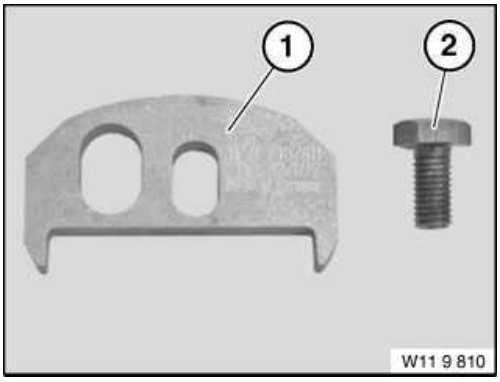
Used in step 28 39

Usage	(Counter support) Blocking flywheel when releasing and tightening down central bolts on vibration absorber
Included in the tool or work	
Storage location	B45
Replaced by	
In connection with	
SI-Number	01 12 99 (452)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
2	0 494 433 (11 8 182)		**Shaped part** (shaped part)	
5	0 494 716 (11 8 185)		**Adapter** (Adapter with adjusting sleeve) E46 M47TU	
1	0 494 432 (11 8 181)	**0 494 434**	**Basic body** (Basic body) E65/M67, E38/M67 Discontinuation Replaced by 11 8 183 (0 494 434)	
3	0 494 434 (11 8 183)		**Basic body**	
4	0 494 435 (11 8 184)		**Adapter** E65 / M67	

0 496 171 (11 9 811) Holder



Common

Used in step 29 38

Usage	Available only as a complete tool set 11 9 810 (83 30 0 496 170) - as of 13.01.12
Included in the tool or work	0 496 170
Storage location	C86
Replaced by	
In connection with	
SI-Number	01 07 07 (355)

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0 494 793 (11 9 265) Bush



Common	Used in step 29 38
Usage	
Included in the tool or work	0 493 938
Storage location	A44
Replaced by	
In connection with	
SI-Number	

2 288 054 Gauge



Common	Used in step 33 34
Usage	For positioning the counterbalance shafts during installation.
Included in the tool or work	
Storage location	C56
Replaced by	
In connection with	
SI-Number	01 06 14 (076)

0 495 131 (11 5 370) Tool



Common	Used in step 33 34
Usage	(Locating tool) For VANOS exhaust camshaft gear setting.
Included in the tool or work	
Storage location	A71
Replaced by	
In connection with	
SI-Number	01 02 05 (173)

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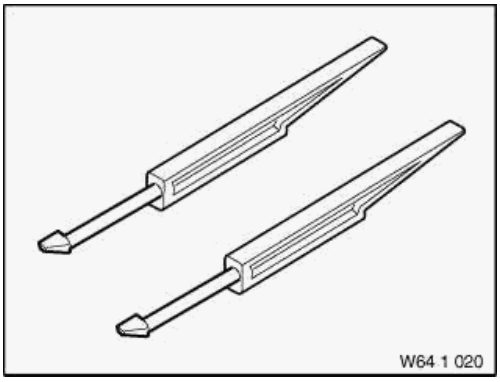
2 458 114 Extractor



Common Used in step 33

Usage	For the disassembly of the counterbalance shaft gears. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 21 17 (514)

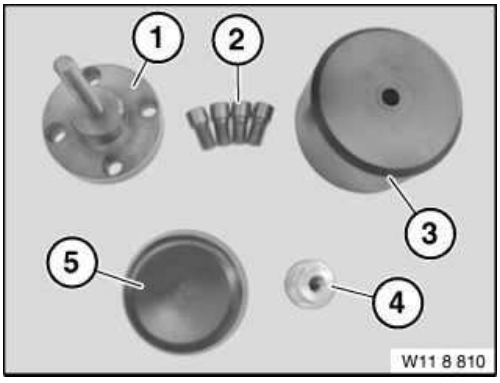
0 493 681 (64 1 020) Hook



Common Used in step 34

Usage	(release hook) For releasing and removing fresh air grille. For removing various covers.
Included in the tool or work	
Storage location	C2
Replaced by	
In connection with	
SI-Number	01 15 99 (483)

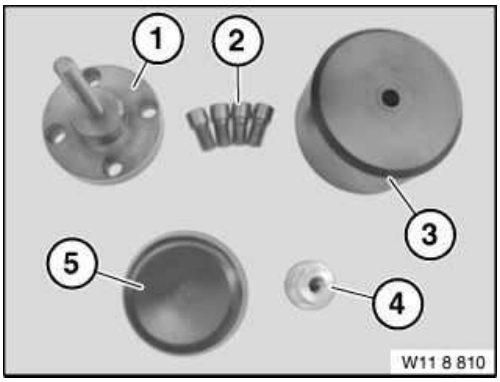
0 496 137 (11 8 815) Holding sleeve



Common Used in step 37

Usage	(Slip sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 133 (11 8 811) Basic body

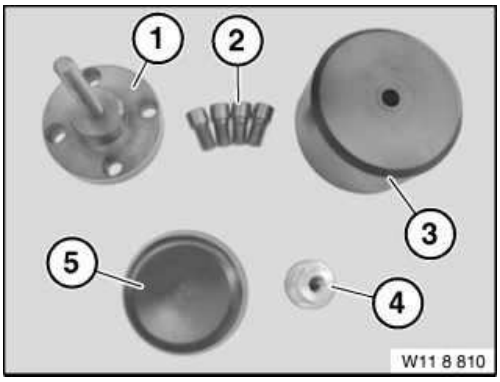


Common Used in step 37

Usage	Liquidation of existing inventory and then available only as a complete tool set 11 8 810 = 83 30 0 496 132 - as of 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

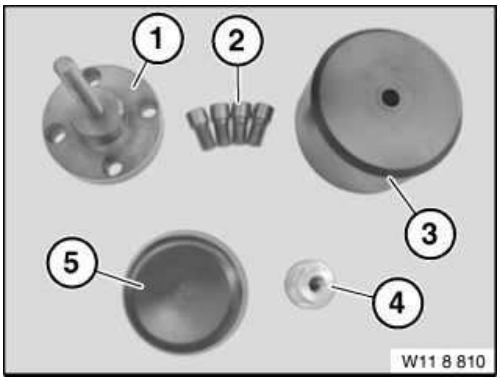
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0 496 134 (11 8 812) Screw



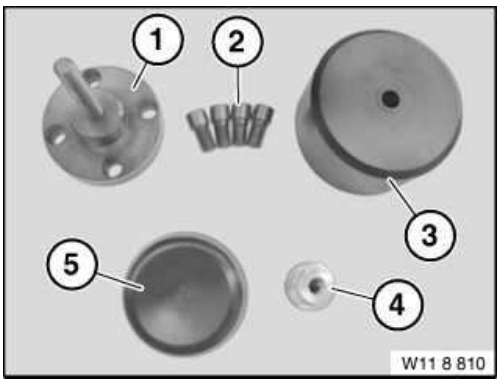
Common	Used in step 37
Usage	(Screw set) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 135 (11 8 813) Holding sleeve



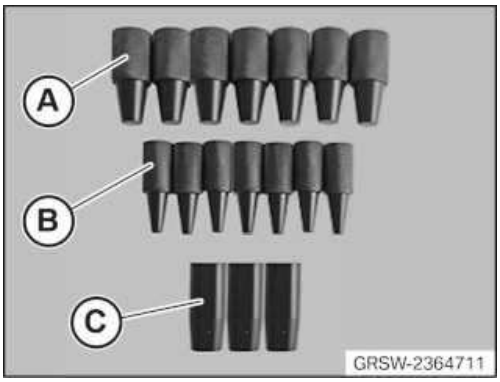
Common	Used in step 37
Usage	(Thrust sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 136 (11 8 814) Nut



Common	Used in step 37
Usage	(Nut with bearing) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

2 364 711 Plug



Common	Used in step 37
Usage	For closing the pressure oil holes for cleaning the cylinder head sealing surfaces.
Included in the tool or work	
Storage location	C20
Replaced by	
In connection with	
SI-Number	01 50 14 (203)

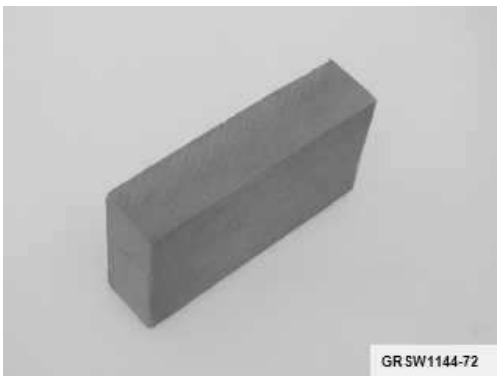
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0 495 103 (11 4 471) Scraper



Common	Used in step 37
Usage	
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

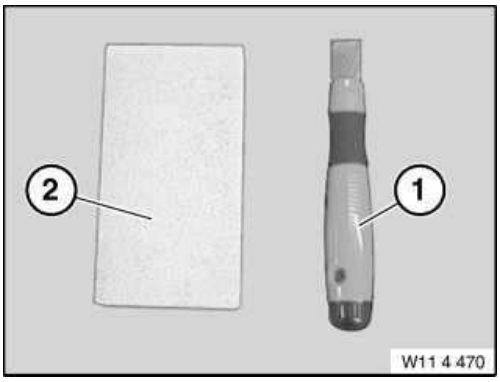
0 495 104 (11 4 472) Extractor



Common	Used in step 37
Usage	(grindstone)
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

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0 495 102 (11 4 470) Tool



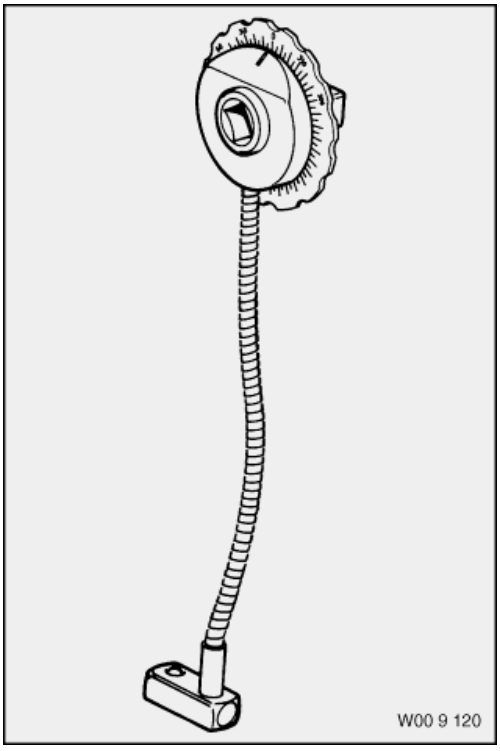
Common Used in step 37 58

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

0 490 504 (00 9 120) Torque angle measuring dial

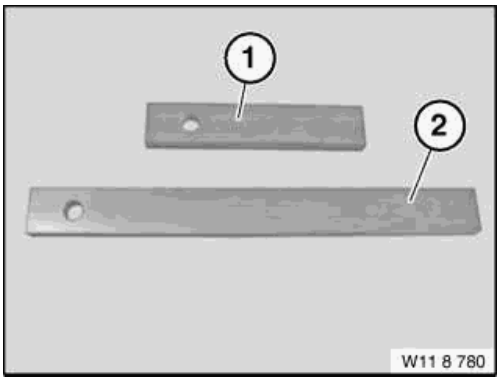


Common Used in step 37

Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

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0 496 120 (11 8 780) Plate



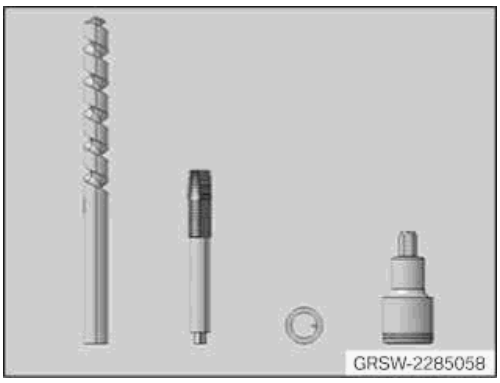
Common Used in step 37

Usage	(Mounting plates) For securing transmission oil sump when gearbox is removed.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 121 (11 8 781)		**Plate** (Mounting plate, short)Discontinued; only available via set 11 8 780 = 0496120.	
2	0 496 122 (11 8 782)		**Plate** (Mounting plate, long) Discontinued; only available via set 11 8 780 = 0496120.	

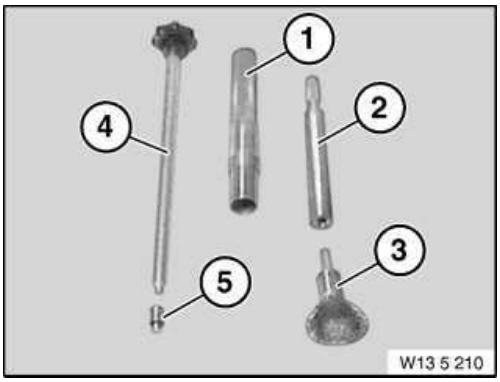
2 285 058 Tool set



Common Used in step 38

Usage	
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 02 14 (069)

0 493 763 (13 5 215) Plug

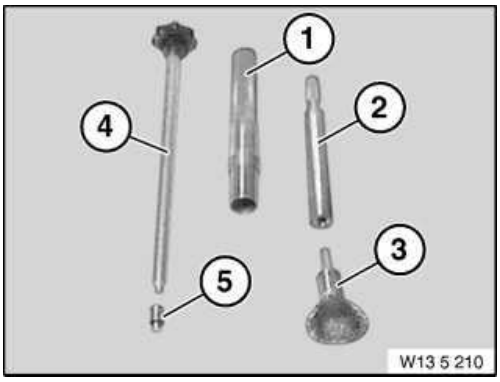


Common Used in step 49

Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

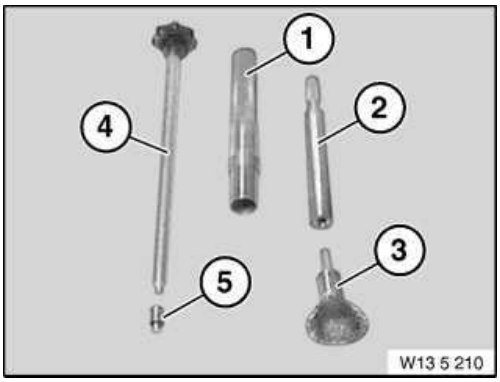
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0 493 762 (13 5 214) Rod



Common	Used in step 49
Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 758 (13 5 210) Tool



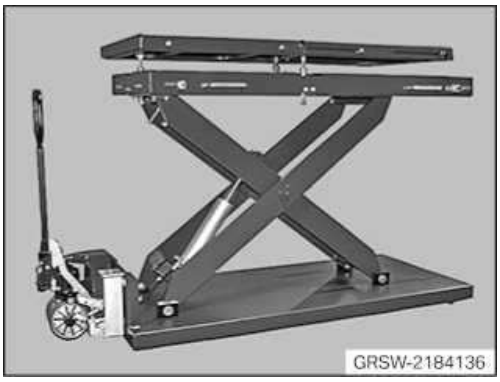
Common	Used in step 49
Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

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2 184 136 Mobile equipment table lift



Common	Used in step 55
Usage	Table lift MHT 1200
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	06 01 10 (649)

2 409 025 Puller



Common	Used in step 56
Usage	For disassembly of the outer radial shaft seal of the transmission output shaft, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A76
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

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2 411 739 Puller



Common	Used in step 56
Usage	For disassembly of the inner radial shaft seal of the output, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C78
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 408 152 Striking element



Common	Used in step 56
Usage	For installation of the right radial shaft seal transmission output shaft (inner). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

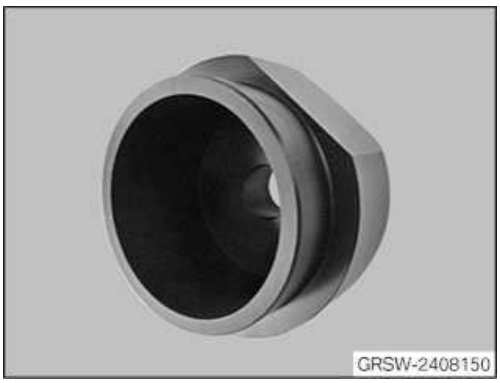
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2 413 037 Handle



Common	Used in step 56
Usage	Universal drift handle. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C77
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 408 150 Striking element

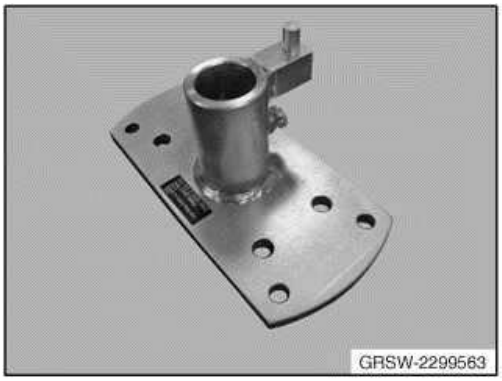


Common	Used in step 56
Usage	For installing the right radial shaft seal transmission output shaft (outer). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

Replacement tools:

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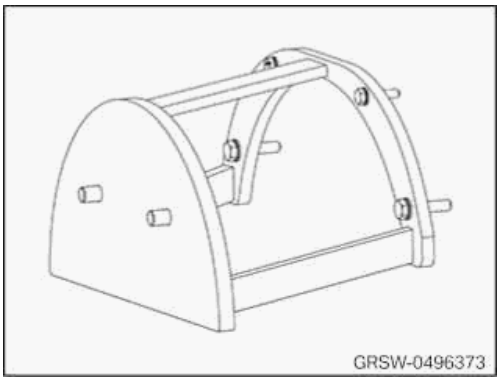
2 299 563 Adapter



Common Used in step 13

Usage	New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.
Included in the tool or work	0 495 187
Storage location	
Replaced by	
In connection with	
SI-Number	

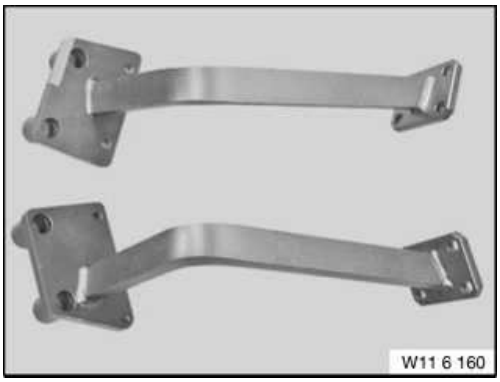
0 496 373 (11 5 420) Plate



Common Used in step 13

Usage	(Fixture) Engine S62
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	

0 496 680 (11 6 160) Support

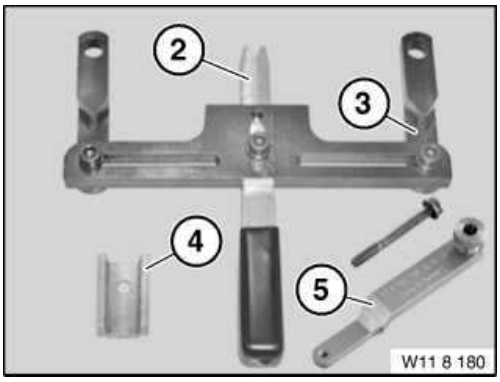


Common Used in step 13

Usage	For mounting N74 engine on the assembly stand. In combination with 00 2 300, 00 2 320
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	00 2 300; 00 2 320 = 0495196
SI-Number	01 31 09 (604)

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0 494 434 (11 8 183) Basic body



Common	Used in step 28 39
Usage	
Included in the tool or work	0 493 587
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Screw-in depth of thread cutter	Used in step 38
Screw-in depth	18 mm

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	7 60
EGR controller	7 60

General repair instructions	Used in step
11 00 ... Overview of consumables (Electronic Parts Catalogue)	37

Repair instructions	Used in step
11 00 050 Removing and installing engine	1 66
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11 00 050 Removing and installing engine	1 66
11 00 050 Removing and installing engine	1 66
11 00 050 Removing and installing engine	1 66
11 00 050 Removing and installing engine	1 66
11 00 050 Removing and installing engine	1 66
11 00 050 Removing and installing engine	1 66
31 10 001 Completely removing and installing front axle with engine and transmission	1 66
11 00 050 Removing and installing engine	1 66
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11 00 050 Removing and installing engine	1 66
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11 00 050 Remove and install engine 1 66
11 00 050 Remove and install engine 1 66
11 00 050 Remove and install engine 1 66
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG) 1 66
11 00 050 Remove and install engine 1 66
11 00 050 Remove and install engine 1 66
11 00 050 Remove and install engine 1 66
11 00 050 Remove and install engine 1 66
11 00 050 Removing and installing the engine (manual gearbox) 1 66
11 00 050 Remove and install engine (Automatic) 1 66
11 00 050 Remove and install engine 1 66
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11 00 050 Removing and installing engine 1 66
11 00 050 Removing and installing engine \PREMIUM 1 66
11 00 050 Removing and installing/replacing engine (N63) 1 66
11 00 050 Removing and installing engine 1 66
11 00 050 Removing and installing engine 1 66
11 00 050 Removing and installing engine 1 66
11 00 050 Remove and install engine 1 66
11 00 050 Remove and install engine (Automatic) 1 66
11 00 050 Remove and install engine (Automatic) 1 66
11 00 050 Remove and install engine 1 66
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11 00 050 Remove and install engine 1 66
11 00 050 Remove and install engine 1 66
11 00 050 Remove and install engine 1 66
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG) 1 66
11 00 050 Remove and install engine 1 66
61 35 ... Notes on ESD protection (Electro Static Discharge) 6 17 25 37
61 35 ... Notes on ESD protection (Electro Static Discharge) 37

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Operating materials	Used in step

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	44
Exhaust-gas recirculation cooler seal on exhaust manifold	60
Exhaust-gas recirculation cooler seal on intake plenum	60

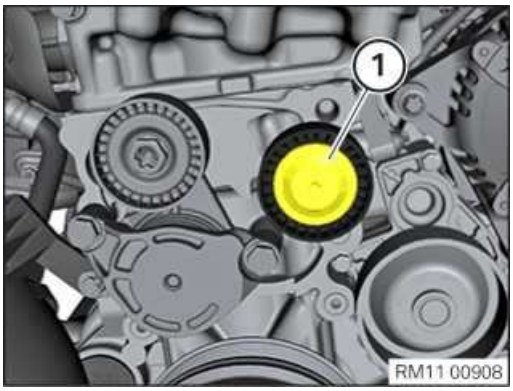
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11 28 626 Removing and installing/replacing deflecting element for drive belt (B47)

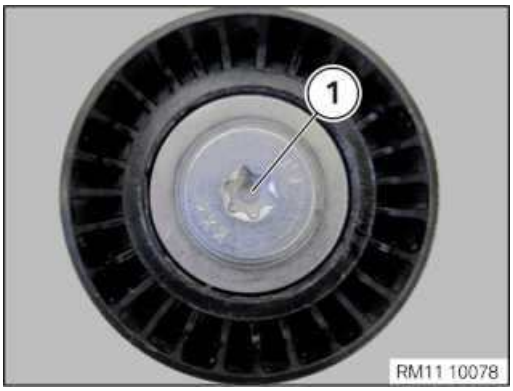
Necessary preliminary tasks:

- Remove engine with gearbox
- Relieve tension on drive belt.

Removal:



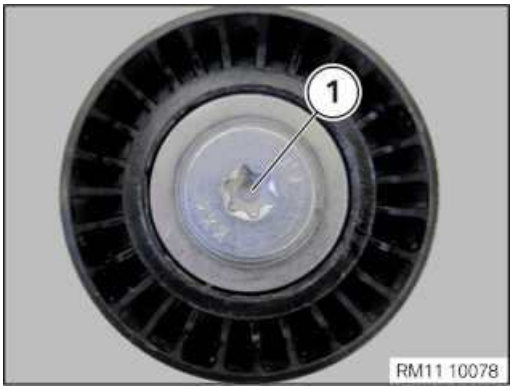
Unclip cover (1) from deflecting element.



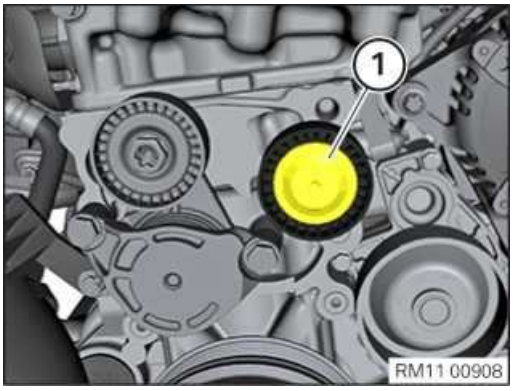
Release screwÂ (1).
Remove deflecting element.

Installation:

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Position deflecting element on the engine.
Tighten screw (1).
Tightening torque 11 28 3AZ.



Clip in cover (1).

Required follow-up work:

- Apply tension to drive belt.
- Install engine with gearbox

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11 28 010 Replace drive belt for alternator ()

Note:
If the drive belt is to be reused, the direction of rotation must be marked.

Caution!
Check drive belt for coolant and oil residues, replace if necessary.

Necessary preliminary work:

- Remove alternator
- Remove vibration damper
- Release drive belt for alternator

Removal:

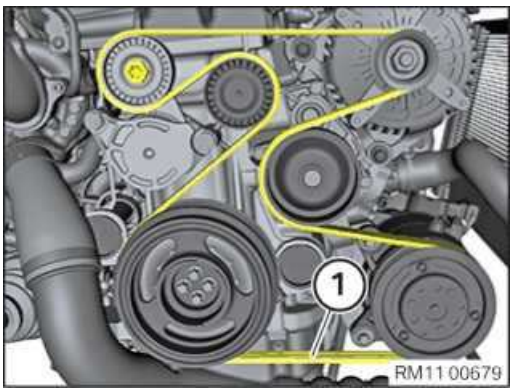
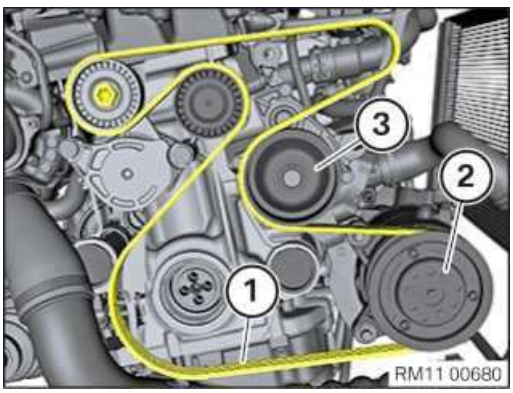
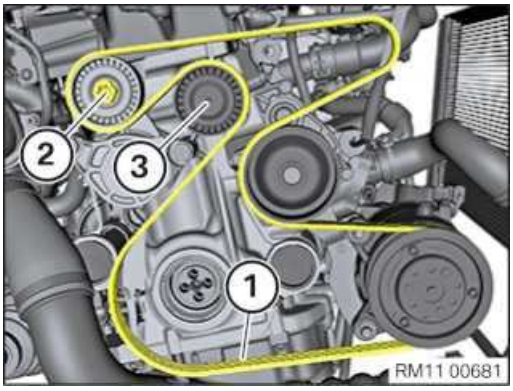


Figure shows the routing of the drive belt (1).



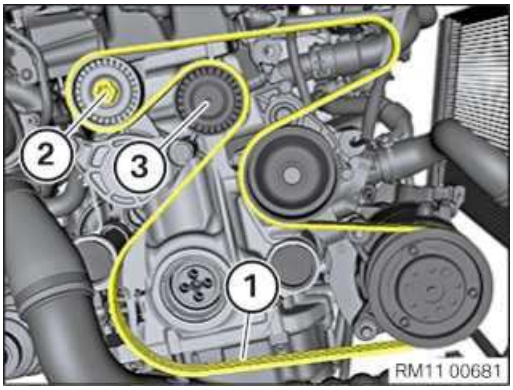
Feed out the drive belt (1) from the top at the air conditioning compressor (2) and the water pump (3).

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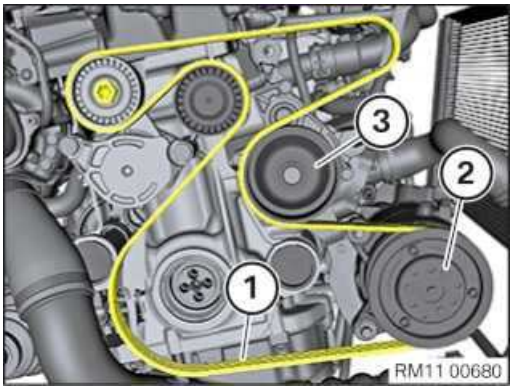


Feed out the drive belt (1) from the bottom at the belt tensioner (2) and the deflecting element (3) and remove.

Installation:



Position drive belt (1) from the bottom over the belt tensioner (2) and the deflecting element (3).



Position drive belt (1) from the top over the air conditioning compressor (2) and the water pump (3).

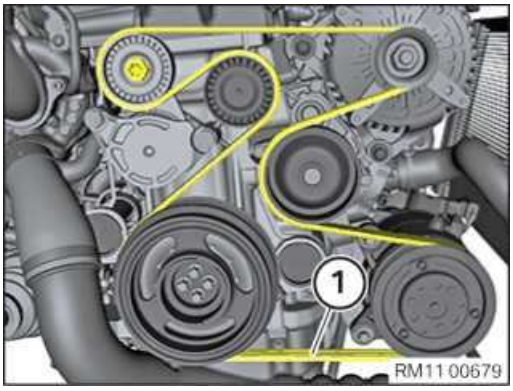


Figure shows the routing of the drive belt (1).

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Required follow-up work:

- Install alternator
- Install vibration damper
- Tension drive belt for alternator

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11 28 020 Replace tensioning device for drive belt of the alternator

PRELIMINARY WORK

1 – Disconnecting all battery earth leads



- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

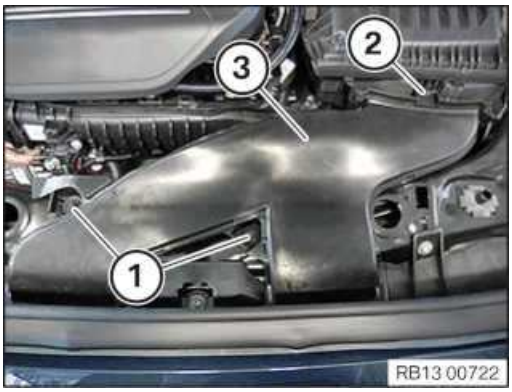
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

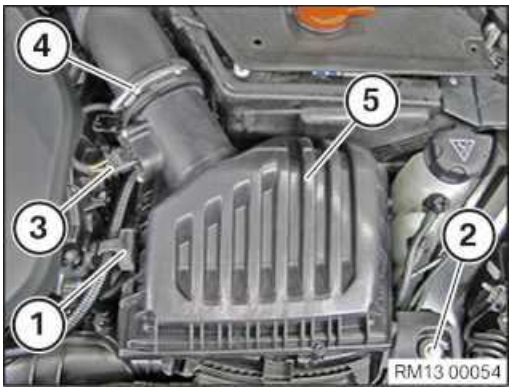
3 – Remove the intake neck for intake silencer housing



- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

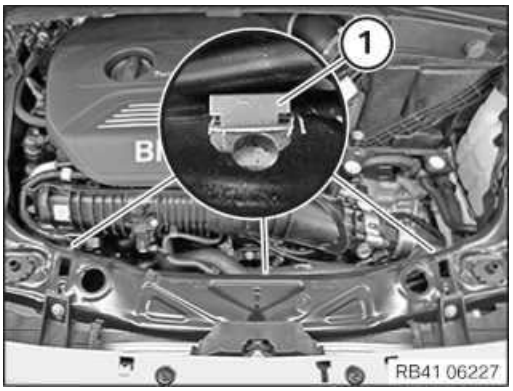
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4 – Removing intake silencer housing

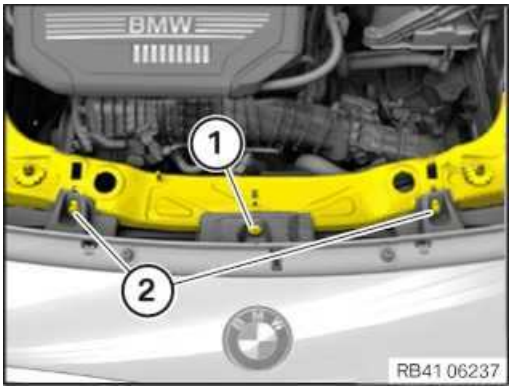


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

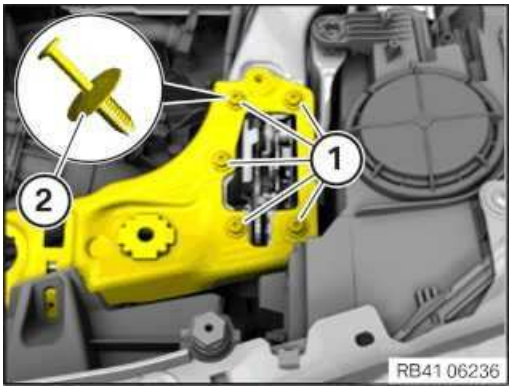
5 – Remove front cross connection



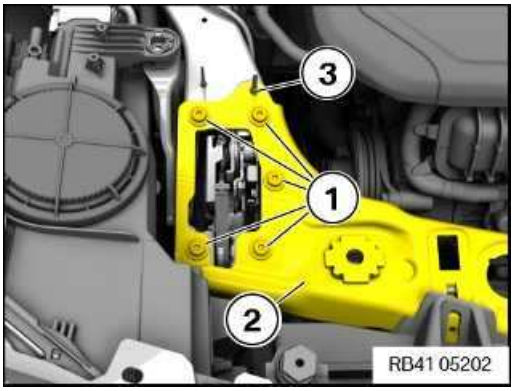
- Detach the clamps (1) for the Bowden cable of the bonnet locks from the cross connection.



- Loosen screw (1).
- Loosen screws (2).



- Loosen screws (1).
- Lever out expanding rivet (2).



- Loosen screws (1).
- Unclip the front cross connection (2) from the rubber retainer (3) and remove it upward.

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6 – Remove front right wheel

▶ **Removing the wheel**



- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Unscrew the wheel bolts (arrows) and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

7 – Removing the front right wheel arch cover

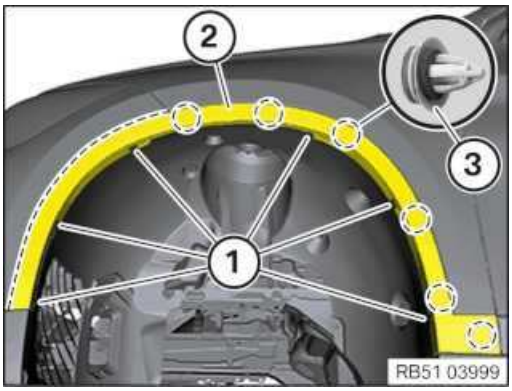
▶ **Remove the front wheel arch trim**

NOTICE

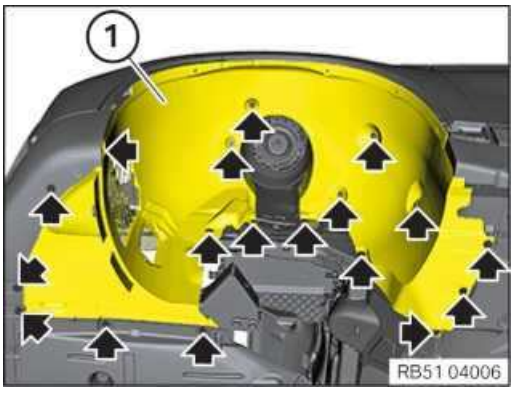
To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.



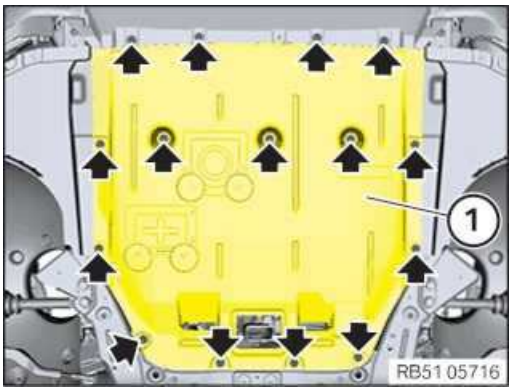
NOTICE

Description is for left component only. Procedure on the right side is identical.

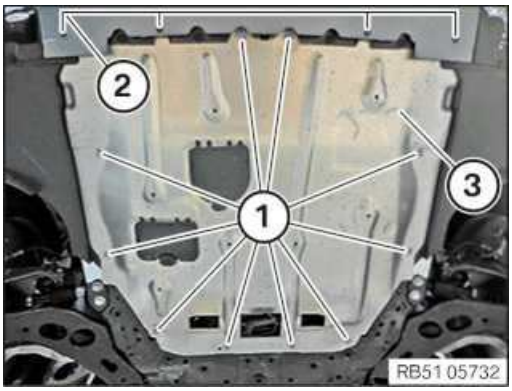
- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

8 – Removing the front underbody protection

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- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.



- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

9 – Removing the drive belt for alternator

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

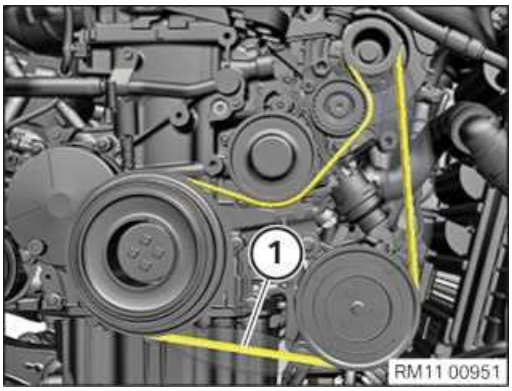
TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

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- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool **0 496 268 (11 0 390)**.

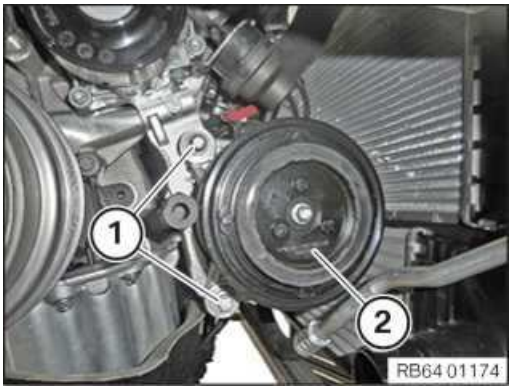


- Guide out the drive belt for the alternator (1) and remove it.

10 – Removing the alternator

Prerequisite

Battery earth lead is disconnected.

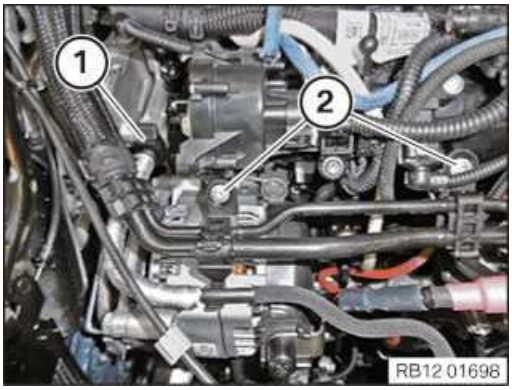


TECHNICAL INFORMATION

Secure component against falling.

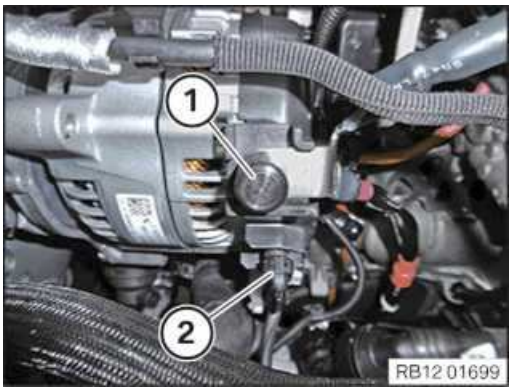
- Loosen screws (1).
- Detach the air conditioning compressor (2) from the component carrier and protect it from falling.

Note: Tie the air conditioning compressor up.



- Unlock the coolant ventilation line (1) and pull it off the cylinder head.
- Catch and dispose of escaping coolant.
- Loosen screws (2).
- Place fuel feed and return line to one side.

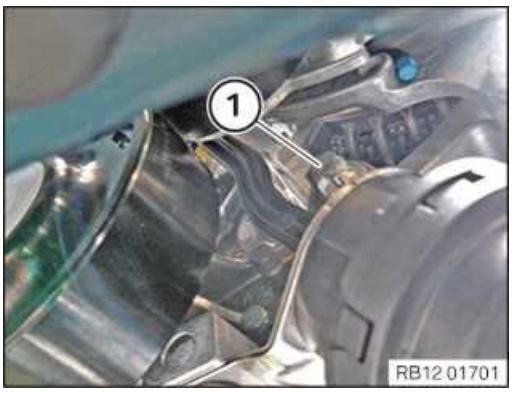
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- Remove the cover (1) and loosen the nut below.
- Disconnect positive battery cable from alternator.
- Unlock and disconnect the connector (2) from the alternator.



- Detach screw (1) on top on the alternator.



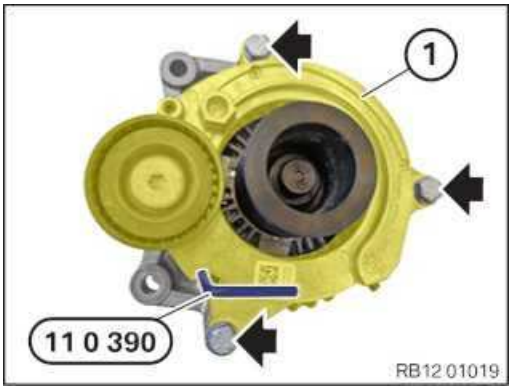
- Detach screw (1) below on the alternator.



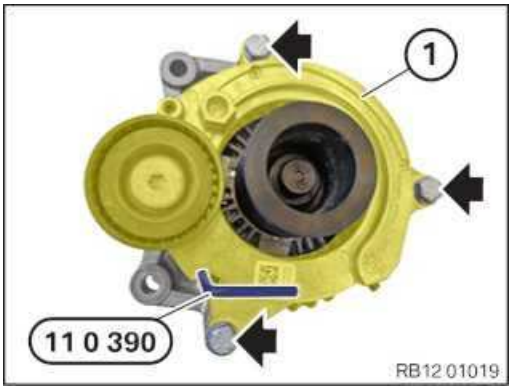
- Feed out alternator (1) along with the screw (2) on the bottom of the alternator through the slot on the support and remove.

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11 – Replace the belt tensioner



- Remove screws (arrows).
- Feed out and remove the tensioning device for the drive belt (1) on the alternator.



- Feed in and install the tensioning device for the drive belt (1) on the alternator.
- Tighten screws (arrows).

Belt tensioner to alternator

M8X30		Tightening torque	28 Nm

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POSTPROCESSES

12 – Installing the alternator

Prerequisite

Battery earth lead is disconnected.

CAUTION

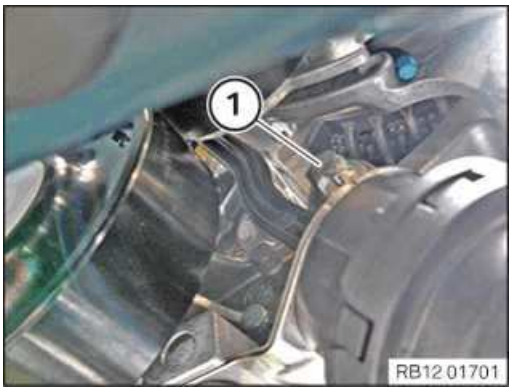
Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.



- Insert and install alternator (1) along with the screw (2) on the bottom of the alternator through the slot on the support.



- Tighten the screw (1) below on the alternator.

Alternator to component carrier

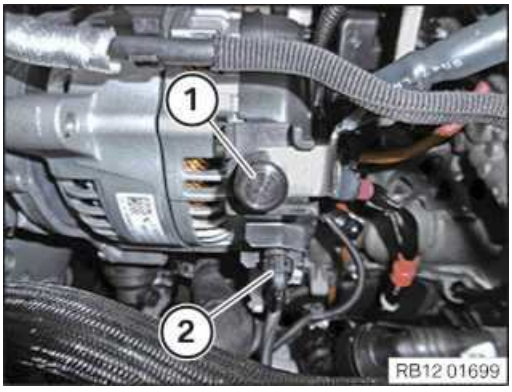
M10x75 / M10x125		Tightening torque	38 Nm



- Tighten the bolt (1) on top on the alternator.

Alternator to component carrier

M10x75 / M10x125		Tightening torque	38 Nm

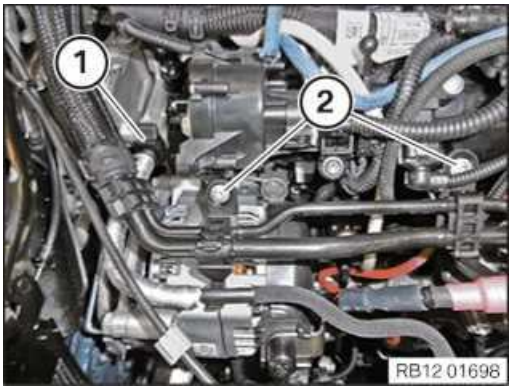


- Mount positive battery cable to the alternator.
- Tighten nut.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

- Mount the cover (1).
- Connect the connector (2) to the alternator and lock audibly.



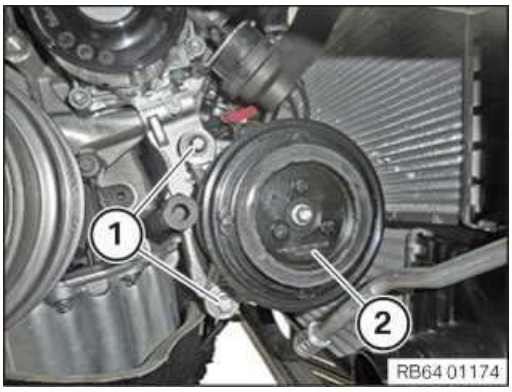
- Mount fuel supply and return line.
- Tighten down screws (2).

Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

- Connect the coolant ventilation line (1) to the cylinder head and audibly lock.

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- Correctly position the air conditioning compressor (2).
- Tighten the screws (1).

Air conditioning compressor in component carrier

M10		Tightening torque	38 Nm

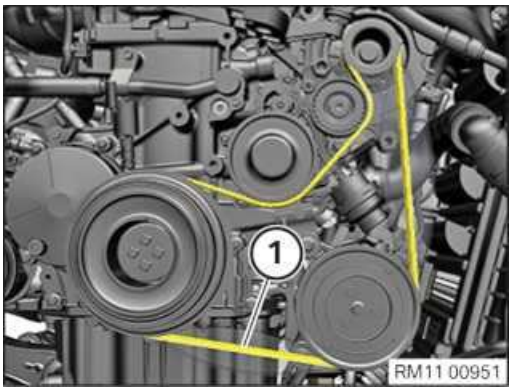
13 – Installing the drive belt for alternator

TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.



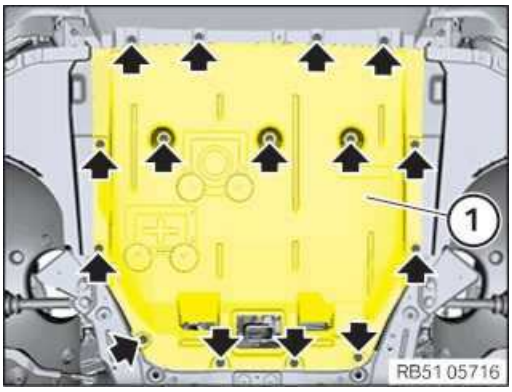
- Feed in the drive belt for the alternator (1) and install it.



- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool **0 496 268 (11 0 390)** out of the belt tensioner and remove it.

14 – Installing the front underbody protection

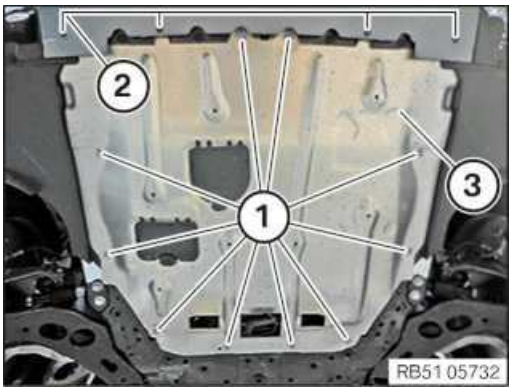
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- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm



- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

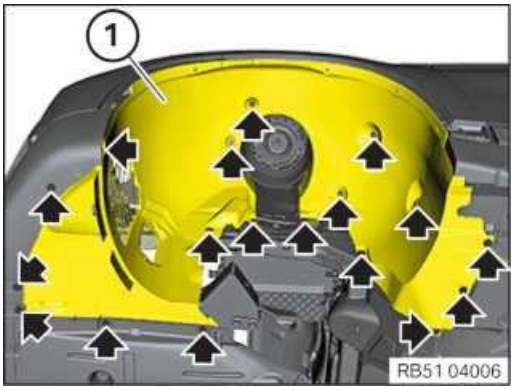
Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

15 – Installing the front right wheel arch cover

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

▸ **Installing front wheel arch trim**

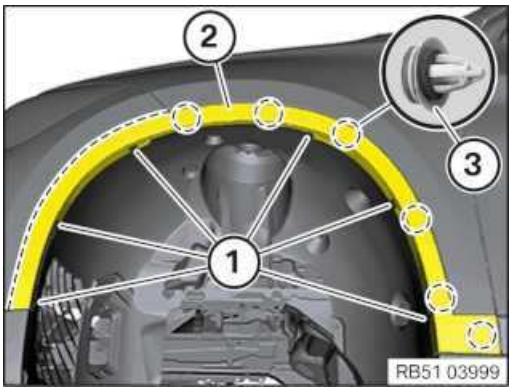
NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.

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- Check the clips (3) for damage and renew where required.

  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

16 – Installing the front right wheel

▶ **Mounting the wheel**

▷ **Clean the contact surfaces between the brake disc and the wheel rim**



TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

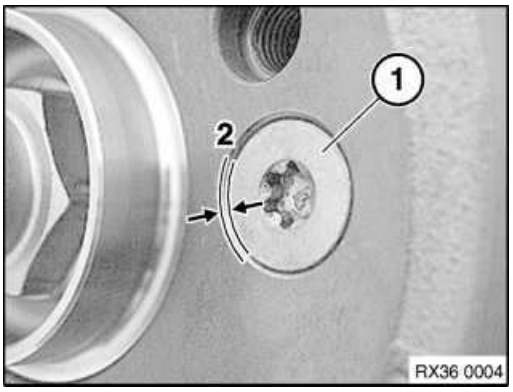
  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue in the area of the wheel bolt holes, remove and clean the brake disc.



- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

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- Renew mounting bolt (1).

  Parts: Mounting bolt

- Check that the mounting bolt (1) for the brake disc is securely seated.

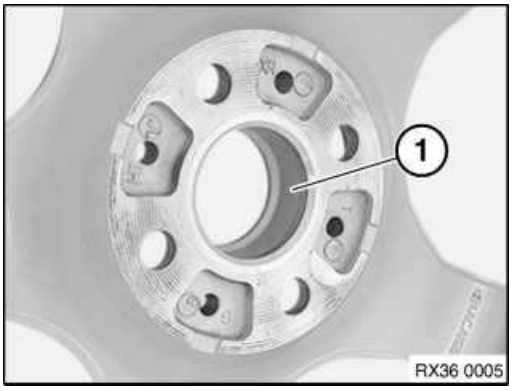
  The mounting bolt (1) for the brake disc may not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to rear wheel hub

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub

M8	Renew screw.	Tightening torque	16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring (1).

◁

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

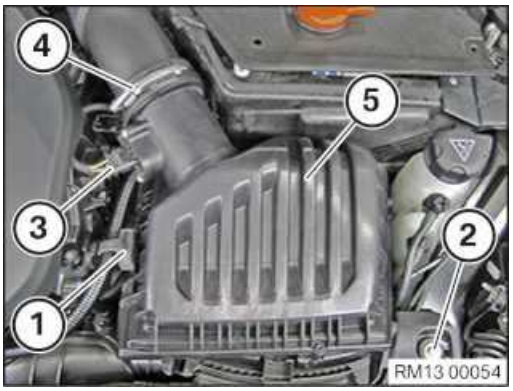
- Renew corroded wheel bolts.

  Parts: Wheel bolts
- Clean the wheel bolts.
- Check the wheel bolts and threads for damage, renew the wheel bolts if necessary.
- Join and tighten the wheel bolts (arrows).

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

17 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.

  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

Clean air pipe to intake silencer housing

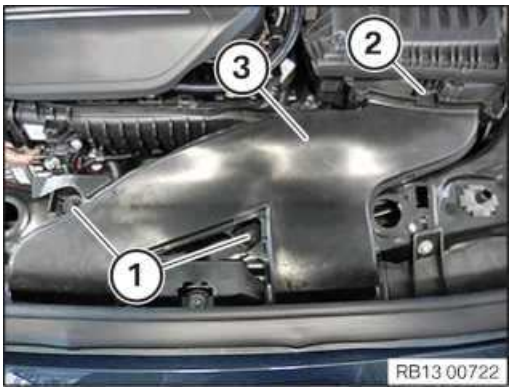
Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Insert and install the holder (1).

18 – Install the intake neck for the intake filter housing

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- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

19 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Check for correct installation of all rubber mounts in the acoustic cover (1).



- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

20 – Disconnecting all battery earth leads

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- See additional information.

Additional Information

Overview of Tightening Torques

Belt tensioner to alternator — Used in step 11

M8X30		Tightening torque	28 Nm

Alternator to component carrier — Used in step 12

M10x75 / M10x125		Tightening torque	38 Nm

Positive battery cable to alternator — Used in step 12

M8		Tightening torque	19 Nm

Fuel line to intake plenum — Used in step 12

TS6x20		Tightening torque	5 Nm

Air conditioning compressor in component carrier — Used in step 12

M10		Tightening torque	38 Nm

Underbody protection front — Used in step 14

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Wheel arch cover to body — Used in step 15

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body — Used in step 15

Plastic nut		Tightening torque	3 Nm

Brake disc to rear wheel hub — Used in step 16

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub — Used in step 16

M8	Renew screw.	Tightening torque	16 Nm

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Wheel bolts

Used in step 16

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Intake silencer housing to lock bridge

Used in step 17

M6X30		Tightening torque	8 Nm

Clean air pipe to intake silencer housing

Used in step 17

Clamp		Tightening torque	3 Nm

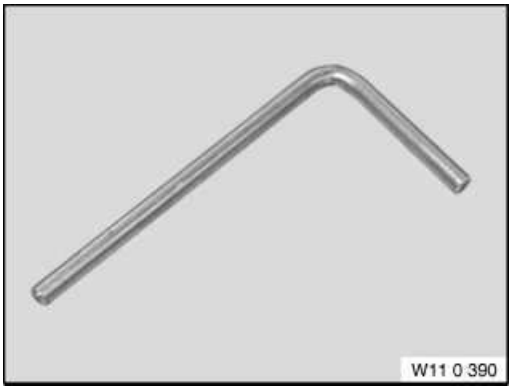
Intake neck to cross connection

Used in step 18

M6		Tightening torque	8 Nm

Overview of Special Tools

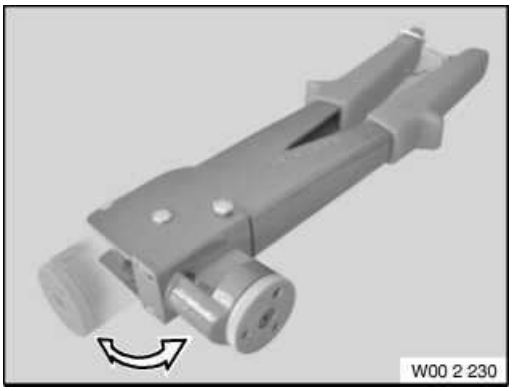
0 496 268 (11 0 390) Pin



Common Used in step 9 13

Usage	(roll pin) For securing new tensioning pulley (poly-V belt)
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 15 07 (390)

0 496 521 (00 2 230) Pliers



Common Used in step 15

Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

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2 344 011 Tool



Common	Used in step 16
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

0 495 221 (36 1 323) Wheel stud



Common	Used in step 6
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

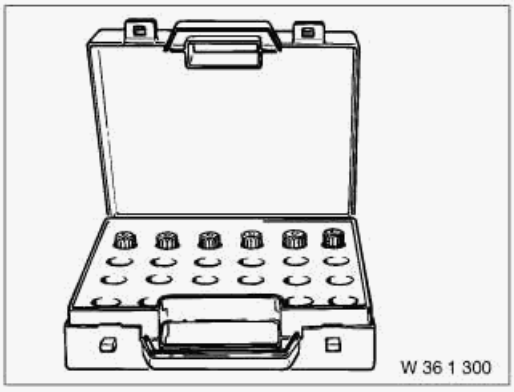
0 495 224 (36 1 326) Wheel stud



Common	Used in step 6
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 225 (36 1 327) Wheel stud



Common	Used in step 6
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud



Common	Used in step 6
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud



Common	Used in step 6
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

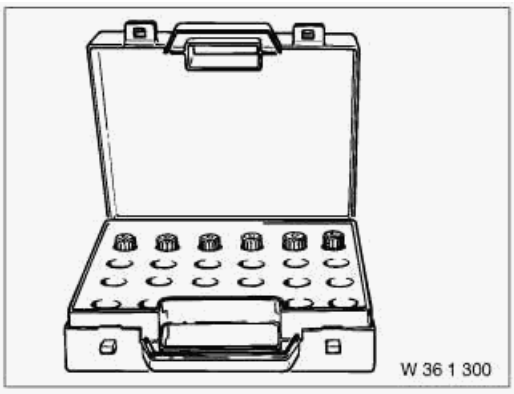
0 495 228 (36 1 331) Wheel stud



Common	Used in step 6
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 229 (36 1 332) Wheel stud



Common	Used in step 6
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud



Common	Used in step 6
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Links

Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	1 20
61 20 900 Disconnecting and connecting battery earth lead	1 20
61 20 900 Disconnecting and connecting battery earth lead	1 20
61 20 900 Disconnecting and connecting battery earth lead	1 20
61 20 900 Disconnecting and connecting battery earth lead	1 20
61 20 900 Disconnecting and connecting battery earth lead	1 20
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 20
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 20
61 20 900 Disconnecting and connecting battery earth lead	1 20
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 20
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	1 20
61 20 900 Disconnecting and connecting battery earth lead	1 20
61 20 900 Disconnecting and connecting battery earth lead	1 20
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61 20 900 Disconnecting and connecting battery earth lead	1	20
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61 20 900 Disconnecting and connecting battery earth lead	1	20
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1	20
61 20 900 Disconnecting and connecting battery earth lead	1	20
61 20 900 Disconnecting and connecting battery earth lead	1	20
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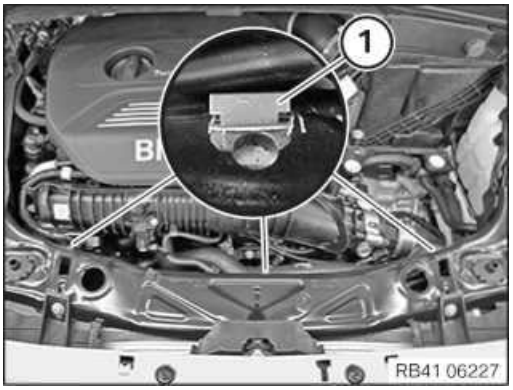
Operating materials	Used in step
2.0 Grease for wheel centring	16

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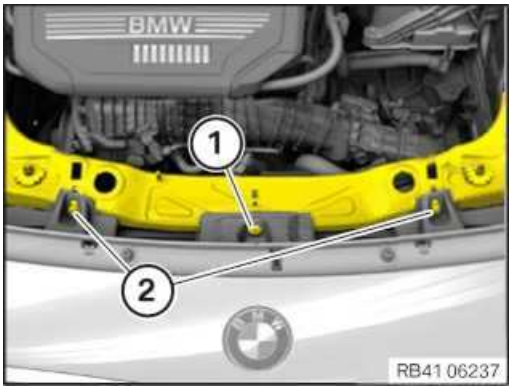
11 28 050 Replacing drive belt for air conditioning compressor

PRELIMINARY WORK

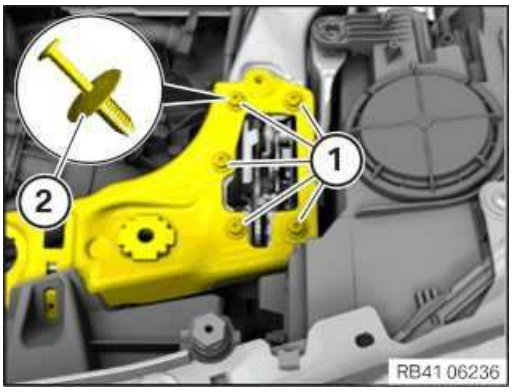
1 – Remove front cross connection



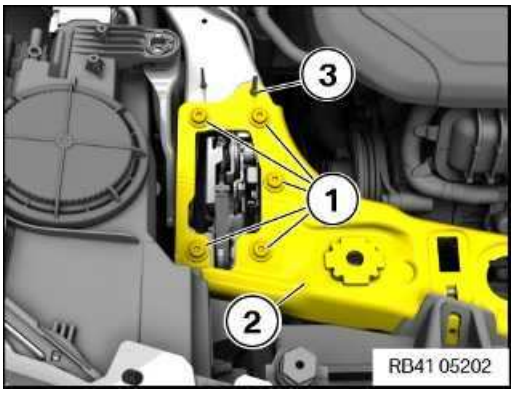
- Detach the clamps (1) for the Bowden cable of the bonnet locks from the cross connection.



- Loosen screw (1).
- Loosen screws (2).



- Loosen screws (1).
- Lever out expanding rivet (2).



- Loosen screws (1).
- Unclip the front cross connection (2) from the rubber retainer (3) and remove it upward.

2 – Remove front right wheel

TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

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TECHNICAL INFORMATION

Strictly observe the specified procedure to prevent clamping errors and imbalance.



- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

3 – Removing the front right wheel arch cover

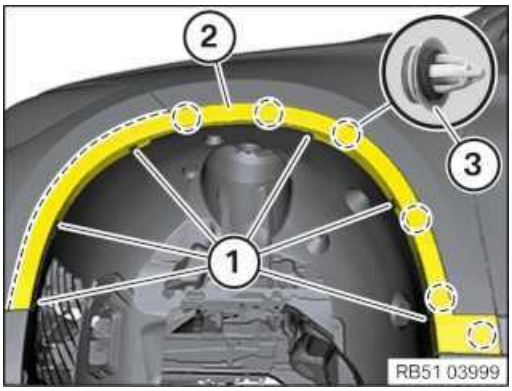
▶ **Remove the front wheel arch trim**

NOTICE

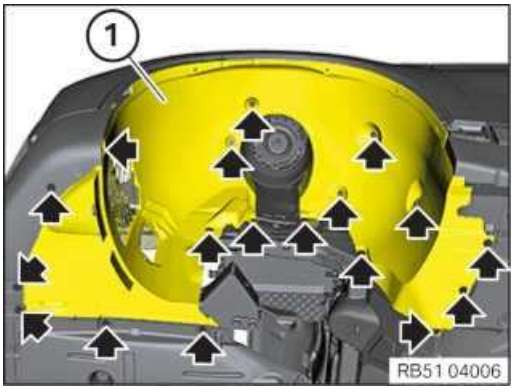
To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.



NOTICE

Description is for left component only. Procedure on the right side is identical.

- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

MAIN WORK

4 – Removing the drive belt for alternator

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CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

TECHNICAL INFORMATION

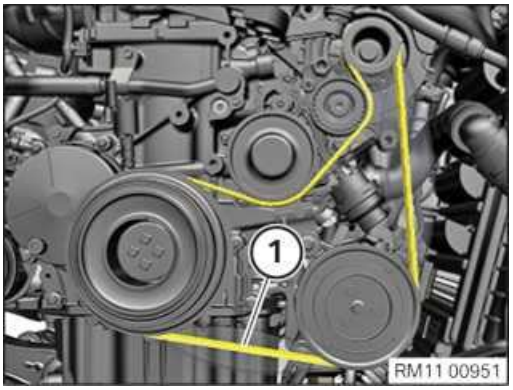
If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.



- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool **0 496 268 (11 0 390)**.



- Guide out the drive belt for the alternator (1) and remove it.

5 – Installing the drive belt for alternator

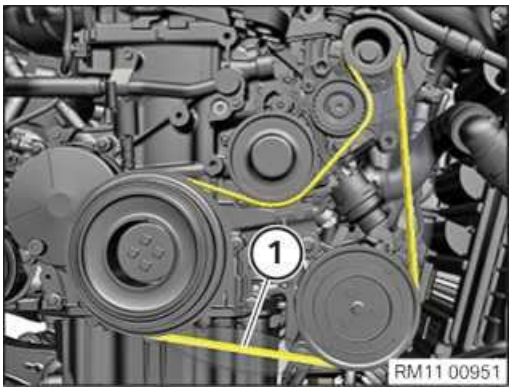
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TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.



- Feed in the drive belt for the alternator (1) and install it.



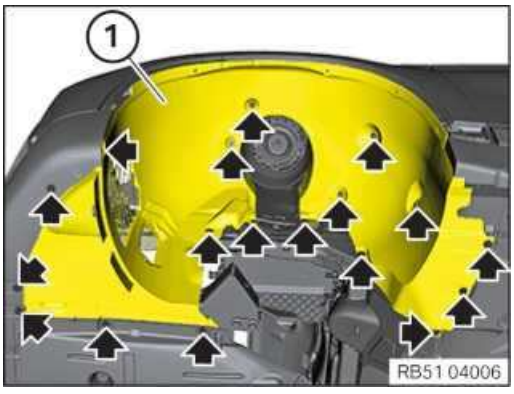
- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool **0 496 268 (11 0 390)** out of the belt tensioner and remove it.

POSTPROCESSES

6 – Installing the front right wheel arch cover

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

▸ **Installing front wheel arch trim**

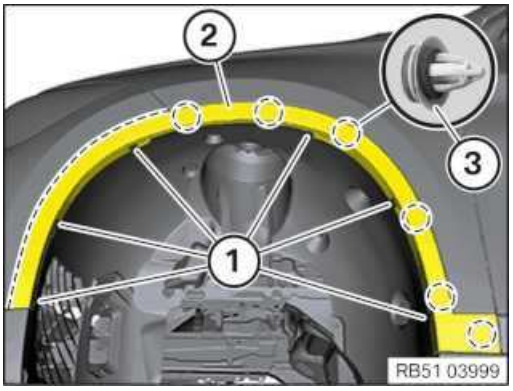
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NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Check the clips (3) for damage and renew where required.

  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

7 – Installing the front right wheel

▸ **Clean the contact surfaces between the brake disc and the wheel rim**



TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

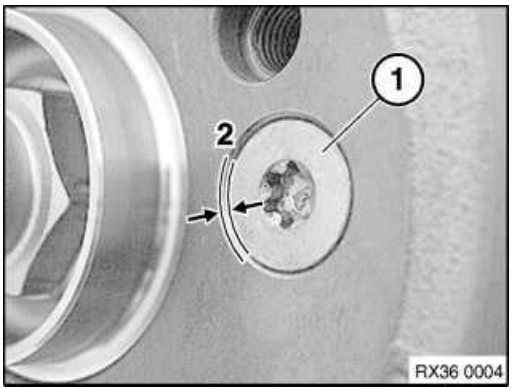
  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.



- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

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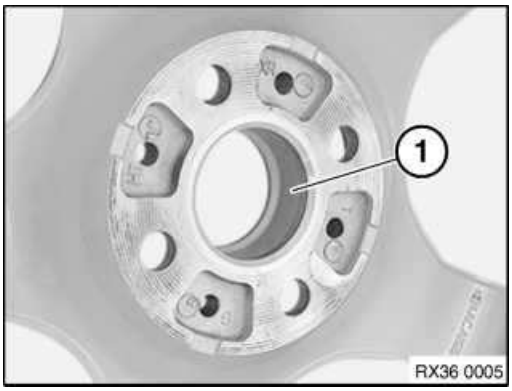


- Check the mounting bolt for the brake disc (1) for secure fit.

  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.



TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

  Parts: Wheel bolts

- Clean the wheel bolts and check the threads for damage. Renew the wheel bolts as needed.
- Mount wheel bolts and tighten.

Wheel bolts

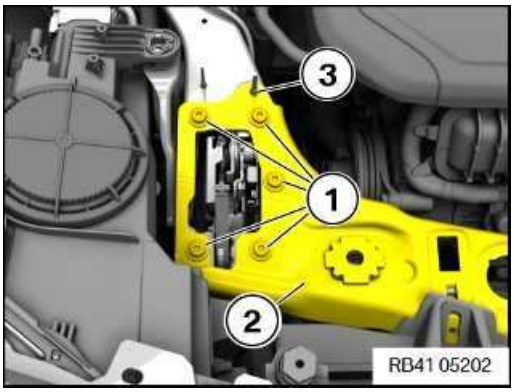
M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

8 – Install front cross connection

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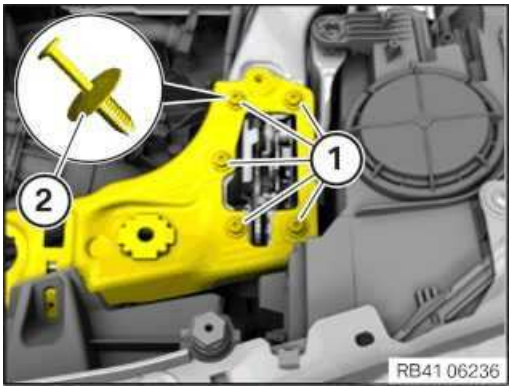
- Right side of vehicle only: Secure spray guard (1) on the cross connection (2) as pictured.



- Position front cross connection (2) and clip front cross connection (2) into the rubber retainer (3) at the same time.
- Tighten the screws (1).

Cross connection to carrier support

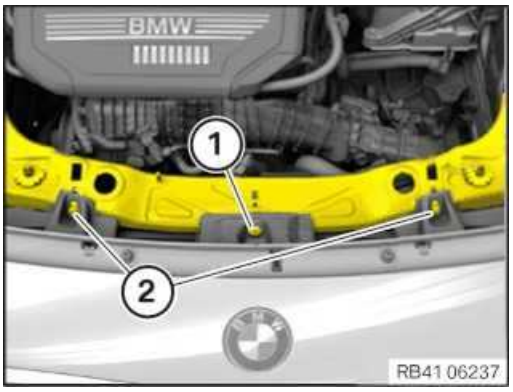
Screws M6x20		Tightening torque	11,8 Nm



- Tighten the screws (1).

Cross connection to carrier support

Screws M6x20		Tightening torque	11,8 Nm



- Position screws (3) on the rubber mounts for the radiator and tighten.

Screw connection for rubber mount of coolant radiator to coolant radiator

Bolt to rubber mount		Tightening torque	8 Nm

- Tighten down screws (2).

Air duct to upper connection

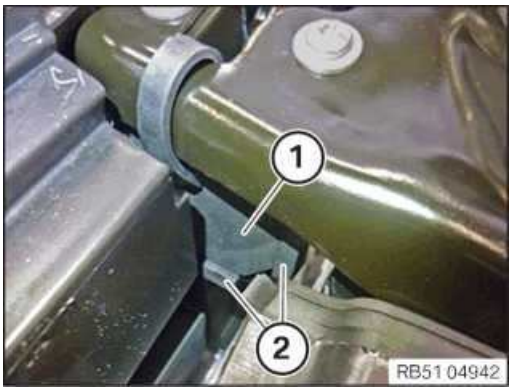
M6x20 screw		Tightening torque	11,8 Nm

- Tighten down screw (1).

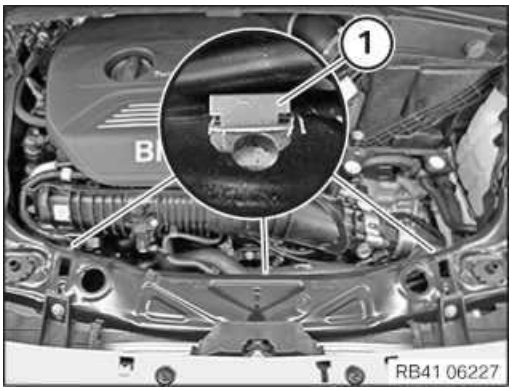
Bracing strut to upper connection

M8x20 screw		Tightening torque	28 Nm

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- Right side of vehicle only: Properly mount spray guard (1) to prevent corrosion.
- Secure spray guard (1) to the bridge with retaining tabs (2).



- Fasten the clamps (1) from the Bowden cable of the bonnet lock on the cross connection.

Additional Information

Overview of Tightening Torques

Wheel arch cover to body — Used in step 6

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body — Used in step 6

Plastic nut		Tightening torque	3 Nm

Brake disc to front wheel hub — Used in step 7

M8	Renew screw.		16 Nm

Wheel bolts — Used in step 7

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Cross connection to carrier support — Used in step 8

Screws M6x20		Tightening torque	11,8 Nm

Screw connection for rubber mount of coolant radiator to coolant radiator — Used in step 8

Bolt to rubber mount		Tightening torque	8 Nm

Air duct to upper connection — Used in step 8

M6x20 screw		Tightening torque	11,8 Nm

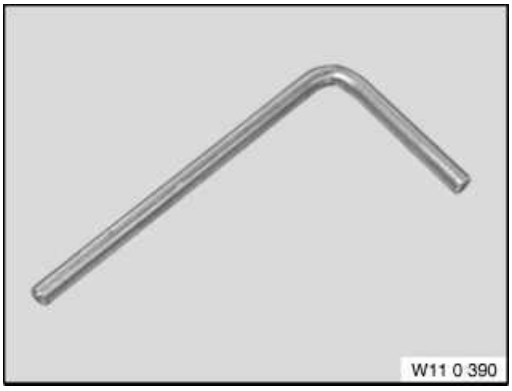
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Bracing strut to upper connection Used in step 8

M8x20 screw		Tightening torque	28 Nm

Overview of Special Tools

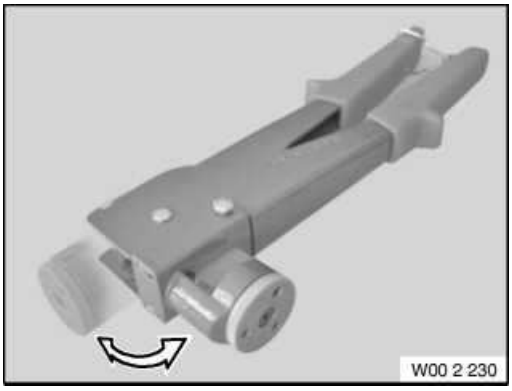
0 496 268 (11 0 390) Pin



Common Used in step 4 5

Usage	(roll pin) For securing new tensioning pulley (poly-V belt)
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 15 07 (390)

0 496 521 (00 2 230) Pliers



Common Used in step 6

Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

2 344 011 Tool



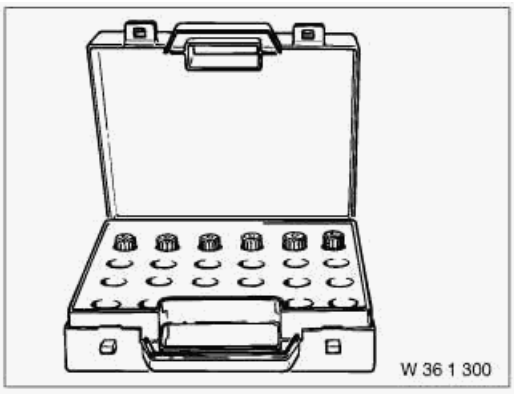
Common Used in step 7

Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

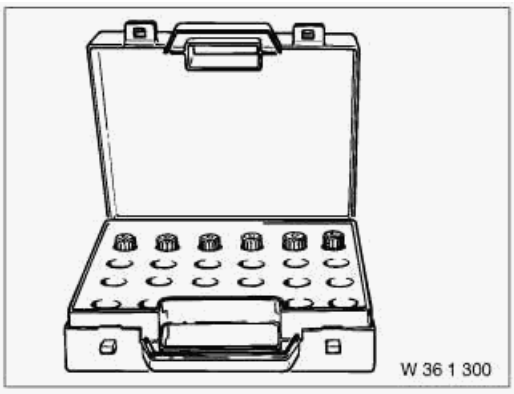
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0 495 221 (36 1 323) Wheel stud



Common	Used in step 2
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

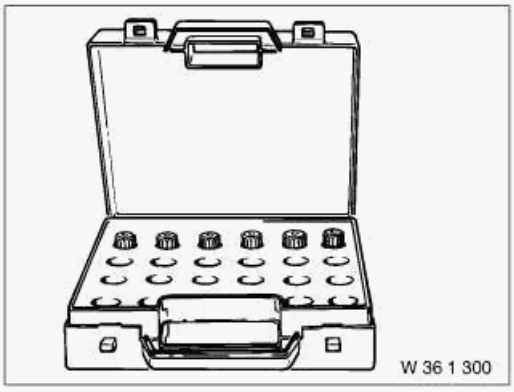
0 495 224 (36 1 326) Wheel stud



Common	Used in step 2
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 225 (36 1 327) Wheel stud



Common	Used in step 2
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

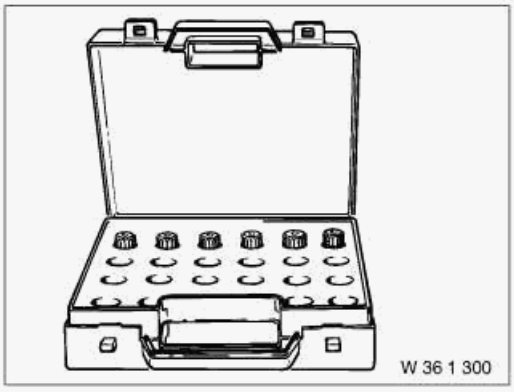
0 495 226 (36 1 328) Wheel stud



Common	Used in step 2
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 227 (36 1 329) Wheel stud



Common	Used in step 2
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud



Common	Used in step 2
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

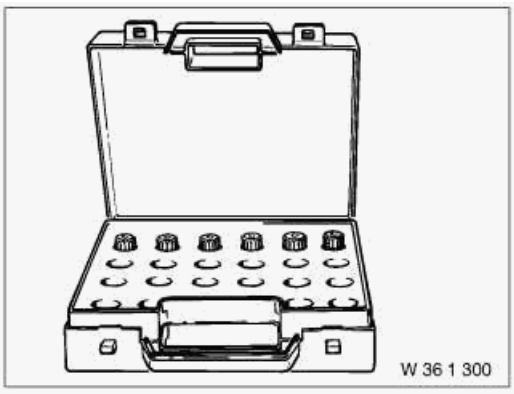
0 495 229 (36 1 332) Wheel stud



Common	Used in step 2
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 230 (36 1 333) Wheel stud



Common	Used in step 2
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Links

Operating materials	Used in step
2.0 Grease for wheel centring	7

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11 28 010 Replacing drive belt for alternator

PRELIMINARY WORK

1 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

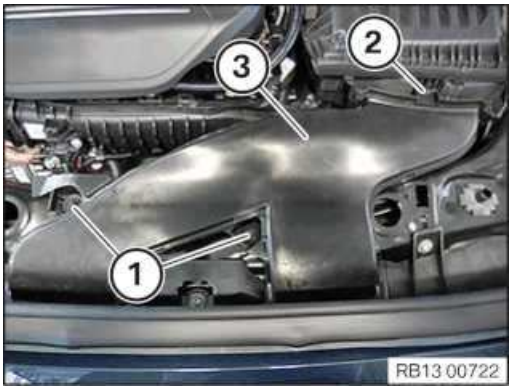
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

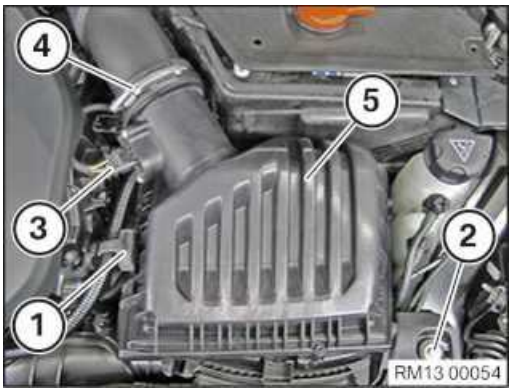
- Unclip the acoustic cover from the marked areas towards the top.

2 – Remove the intake neck for intake silencer housing



- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

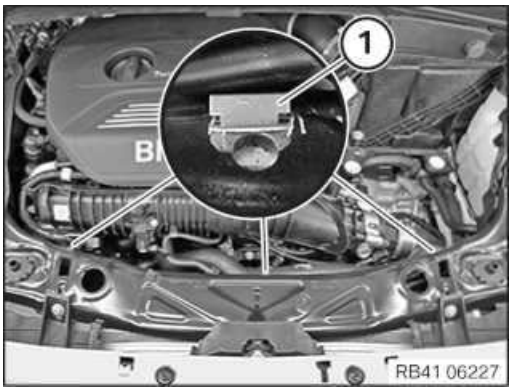
3 – Removing intake silencer housing



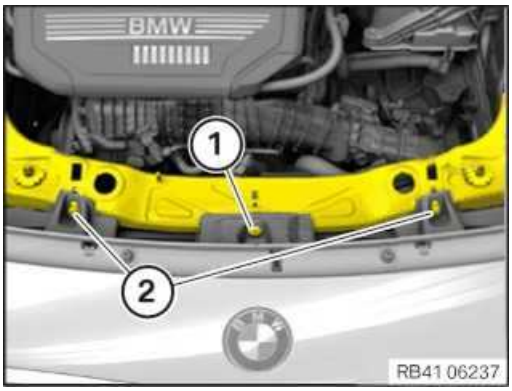
- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

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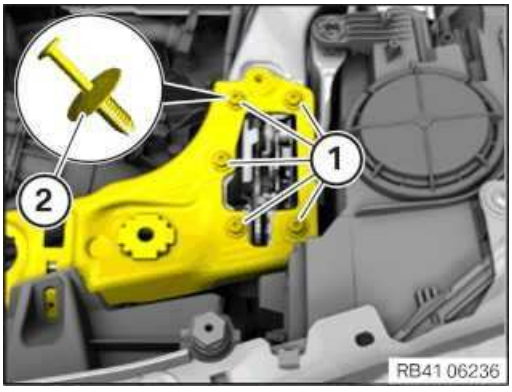
4 – Remove front cross connection



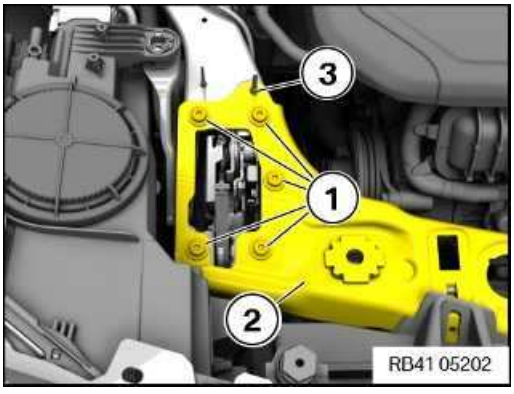
- Detach the clamps (1) for the Bowden cable of the bonnet locks from the cross connection.



- Loosen screw (1).
- Loosen screws (2).



- Loosen screws (1).
- Lever out expanding rivet (2).



- Loosen screws (1).
- Unclip the front cross connection (2) from the rubber retainer (3) and remove it upward.

5 – Remove front right wheel

▸ **Removing the wheel**

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- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Unscrew the wheel bolts (arrows) and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

6 – Removing the front right wheel arch cover

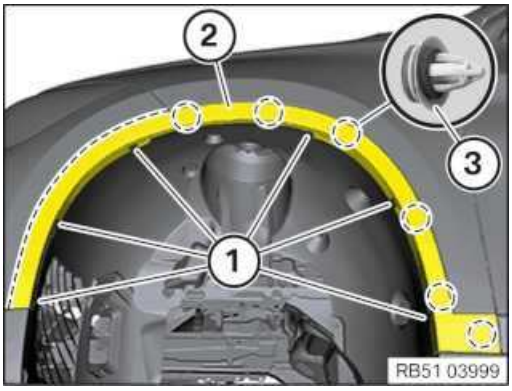
▶ **Remove the front wheel arch trim**

NOTICE

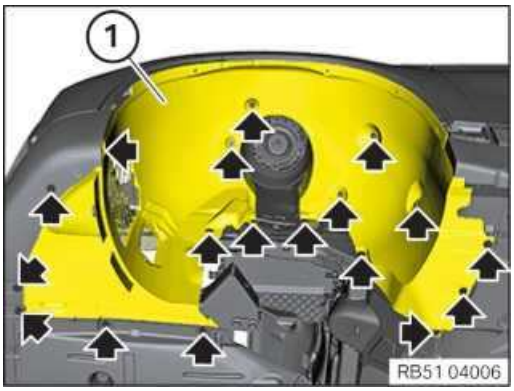
To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.



NOTICE

Description is for left component only. Procedure on the right side is identical.

- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

MAIN WORK

7 – Removing the drive belt for alternator

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CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

TECHNICAL INFORMATION

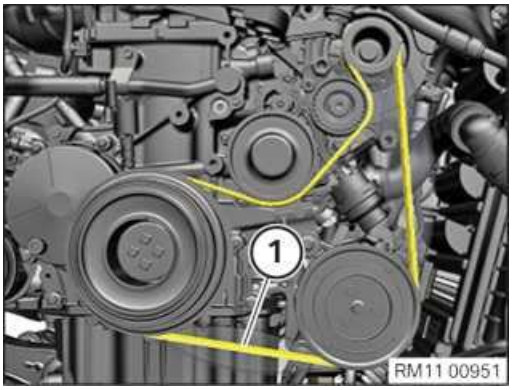
If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.



- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool **0 496 268 (11 0 390)**.



- Guide out the drive belt for the alternator (1) and remove it.

8 – Installing the drive belt for alternator

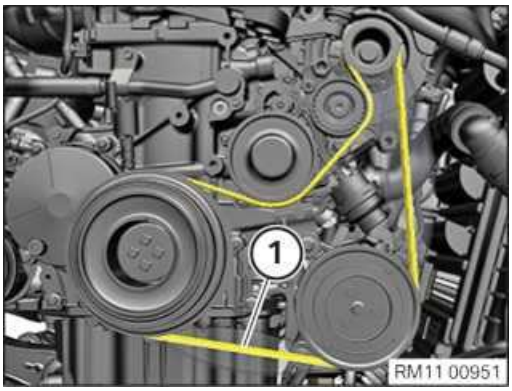
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TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.



- Feed in the drive belt for the alternator (1) and install it.



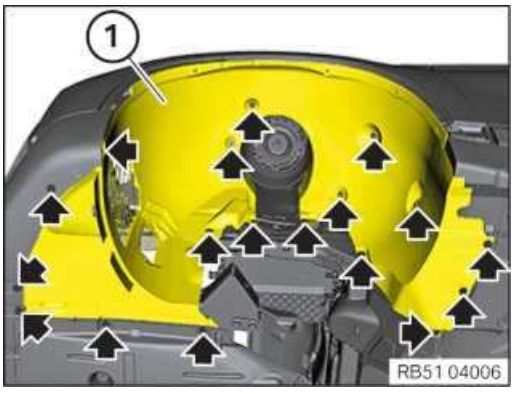
- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool **0 496 268 (11 0 390)** out of the belt tensioner and remove it.

POSTPROCESSES

9 – Installing the front right wheel arch cover

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

▸ **Installing front wheel arch trim**

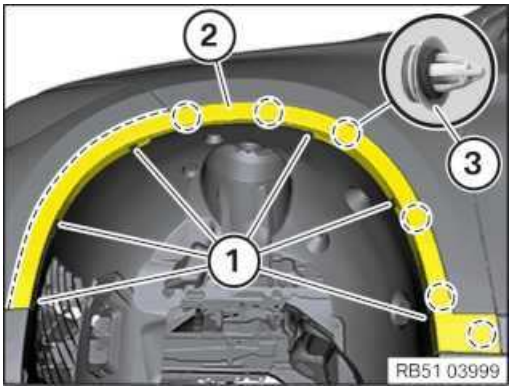
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NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Check the clips (3) for damage and renew where required.

  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

10 – Installing the front right wheel

▶ **Mounting the wheel**

▷ **Clean the contact surfaces between the brake disc and the wheel rim**



TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

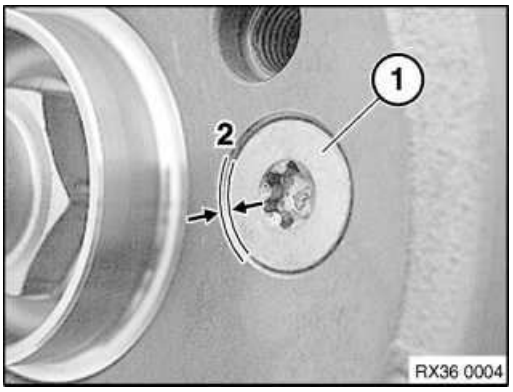
  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue in the area of the wheel bolt holes, remove and clean the brake disc.



- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

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- Renew mounting bolt (1).

  Parts: Mounting bolt

- Check that the mounting bolt (1) for the brake disc is securely seated.

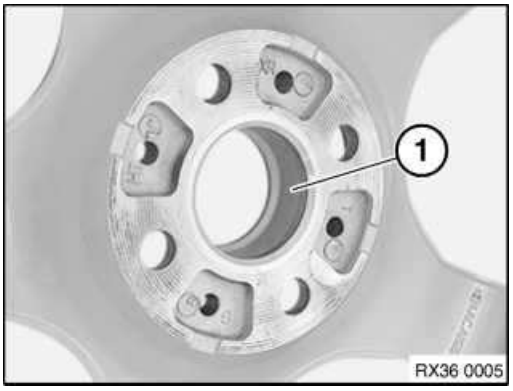
  The mounting bolt (1) for the brake disc may not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to rear wheel hub

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub

M8	Renew screw.	Tightening torque	16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring (1).

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

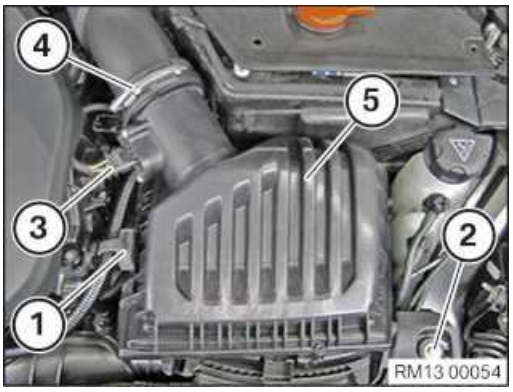
  Parts: Wheel bolts
- Clean the wheel bolts.
- Check the wheel bolts and threads for damage, renew the wheel bolts if necessary.
- Join and tighten the wheel bolts (arrows).

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

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11 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.

  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

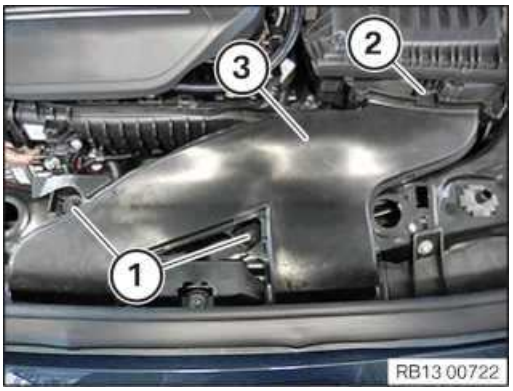
Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Insert and install the holder (1).

12 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

13 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Check for correct installation of all rubber mounts in the acoustic cover (1).

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- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

Additional Information

Overview of Tightening Torques

Wheel arch cover to body			Used in step 9
Screw		Tightening torque	2,5 Nm

Wheel arch cover to body			Used in step 9
Plastic nut		Tightening torque	3 Nm

Brake disc to rear wheel hub			Used in step 10
M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub			Used in step 10
M8	Renew screw.	Tightening torque	16 Nm

Wheel bolts			Used in step 10
M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Intake silencer housing to lock bridge			Used in step 11
M6X30		Tightening torque	8 Nm

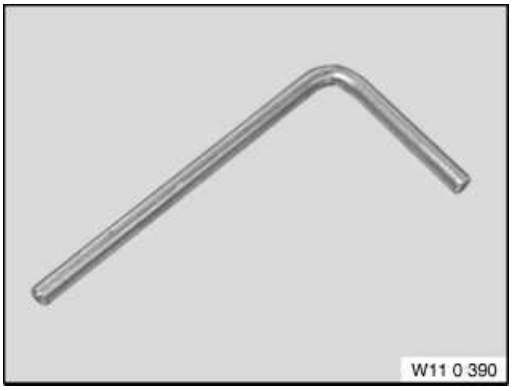
Clean air pipe to intake silencer housing			Used in step 11
Clamp		Tightening torque	3 Nm

Intake neck to cross connection			Used in step 12
M6		Tightening torque	8 Nm

Overview of Special Tools

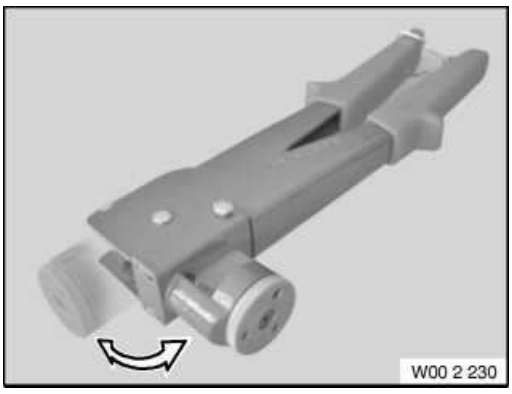
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0 496 268 (11 0 390) Pin



Common	Used in step 7 8
Usage	(roll pin) For securing new tensioning pulley (poly-V belt)
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 15 07 (390)

0 496 521 (00 2 230) Pliers



Common	Used in step 9
Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

2 344 011 Tool

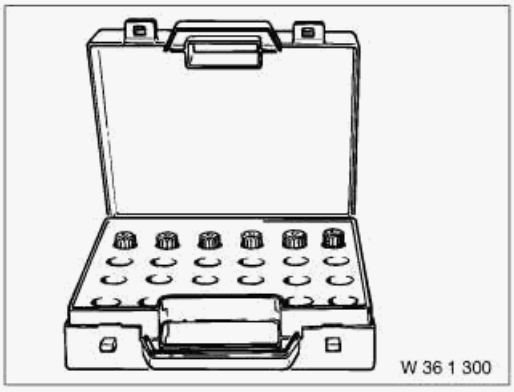


Common	Used in step 10
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

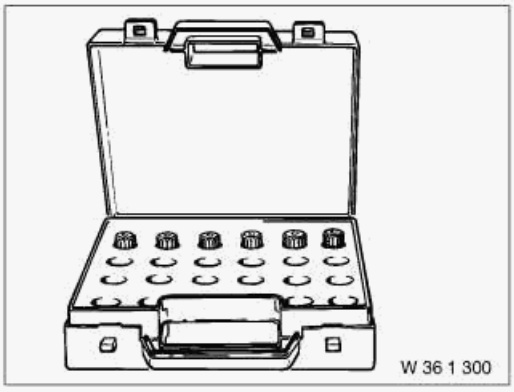
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0 495 221 (36 1 323) Wheel stud



Common	Used in step 5
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud



Common	Used in step 5
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

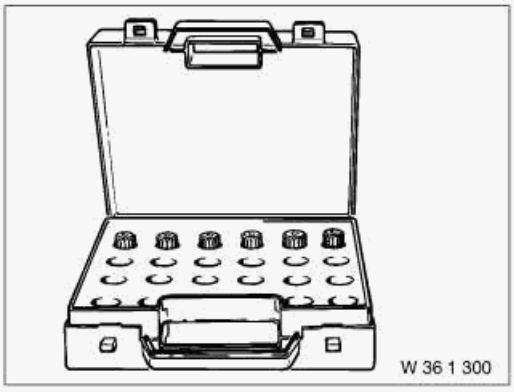
0 495 225 (36 1 327) Wheel stud



Common	Used in step 5
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

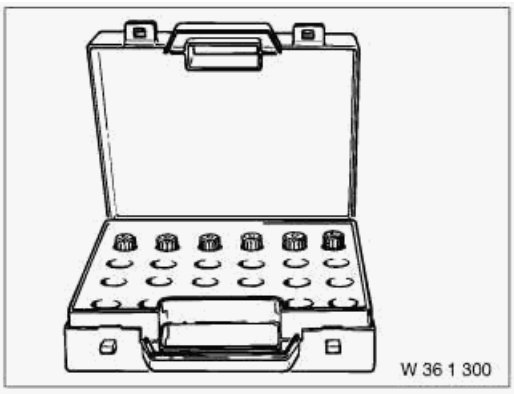
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0 495 226 (36 1 328) Wheel stud



Common	Used in step 5
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud



Common	Used in step 5
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud



Common	Used in step 5
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

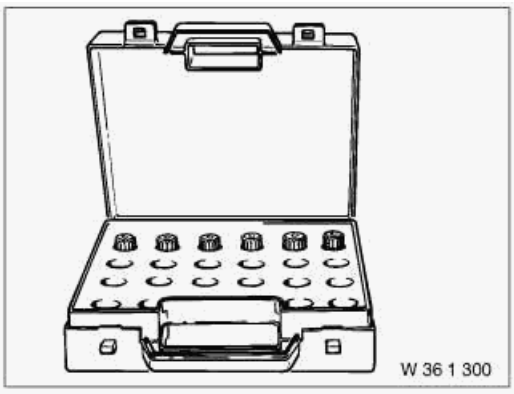
0 495 229 (36 1 332) Wheel stud



Common	Used in step 5
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 230 (36 1 333) Wheel stud



Common	Used in step 5
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Links

Operating materials	Used in step
2.0 Grease for wheel centring	10

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11 28 060 Replacing tensioning device drive belt for air conditioning compressor

PRELIMINARY WORK

1 – Disconnecting all battery earth leads



- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

Damage to the acoustic cover.

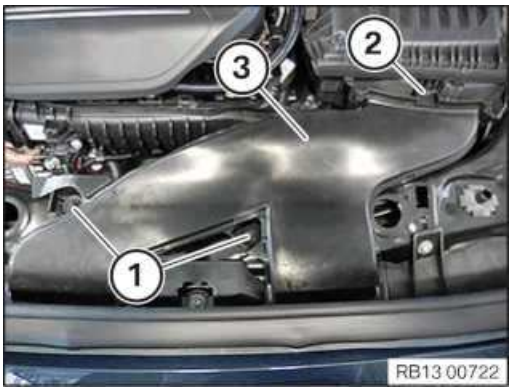
Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

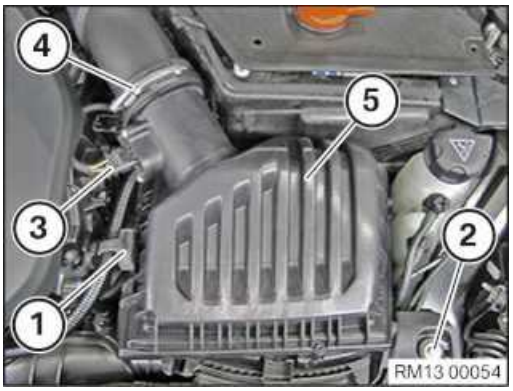
3 – Remove the intake neck for intake silencer housing

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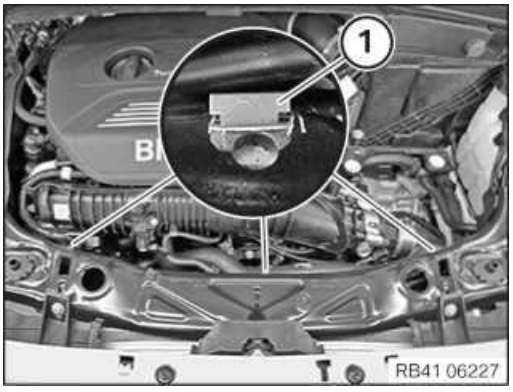
- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

4 – Removing intake silencer housing

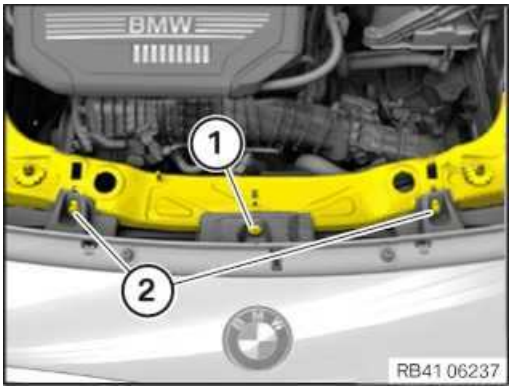


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

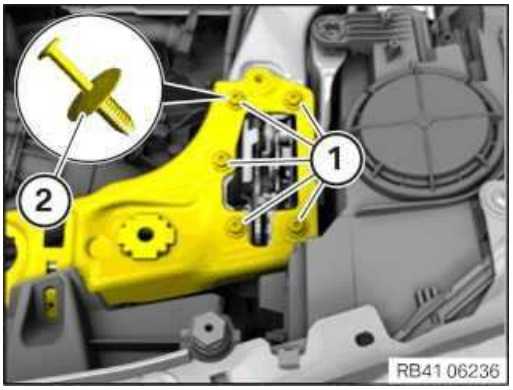
5 – Remove front cross connection



- Detach the clamps (1) for the Bowden cable of the bonnet locks from the cross connection.

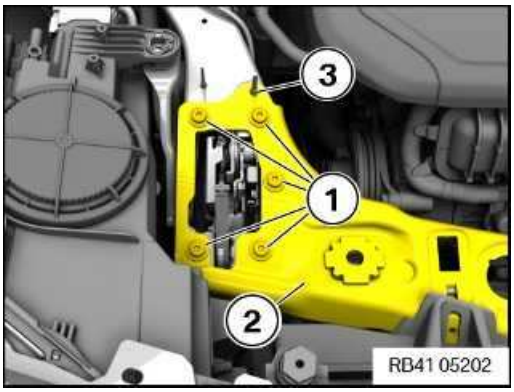


- Loosen screw (1).
- Loosen screws (2).



- Loosen screws (1).
- Lever out expanding rivet (2).

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- Loosen screws (1).
- Unclip the front cross connection (2) from the rubber retainer (3) and remove it upward.

6 – Remove front right wheel

▸ **Removing the wheel**



- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Unscrew the wheel bolts (arrows) and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

7 – Removing the front right wheel arch cover

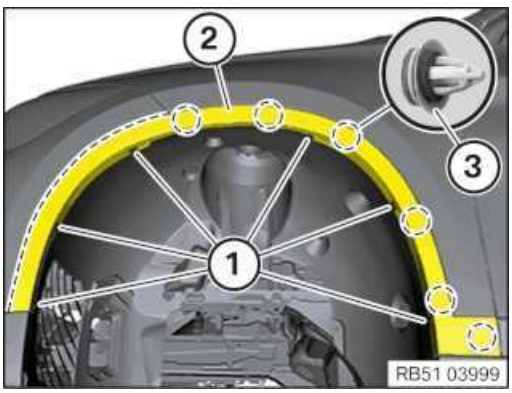
▸ **Remove the front wheel arch trim**

NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

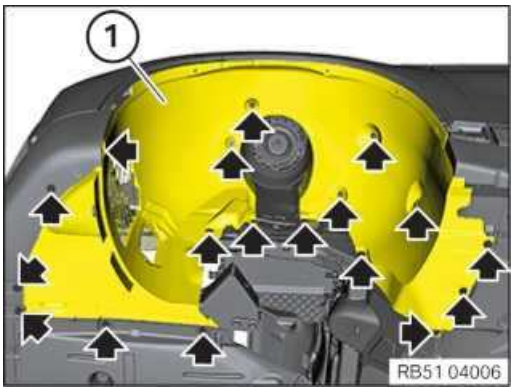
NOTICE

Description is for left component only. Procedure on the right side is identical.



- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.

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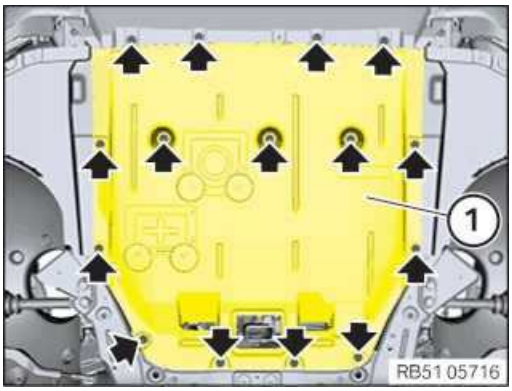


NOTICE

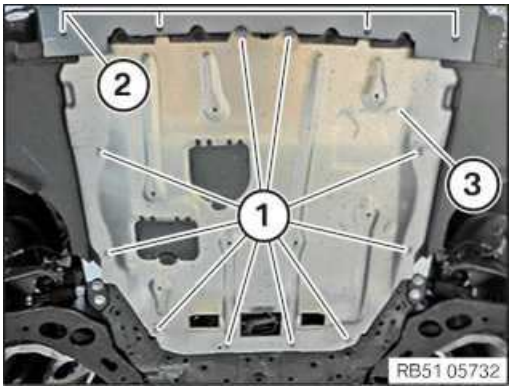
Description is for left component only. Procedure on the right side is identical.

- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

8 – Removing the front underbody protection



- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.



- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

9 – Removing the drive belt for alternator

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

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TECHNICAL INFORMATION

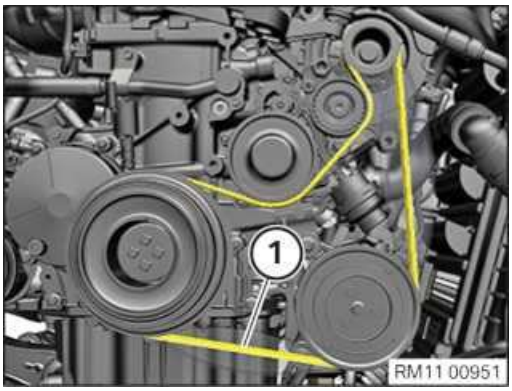
If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.



- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool **0 496 268 (11 0 390)**.

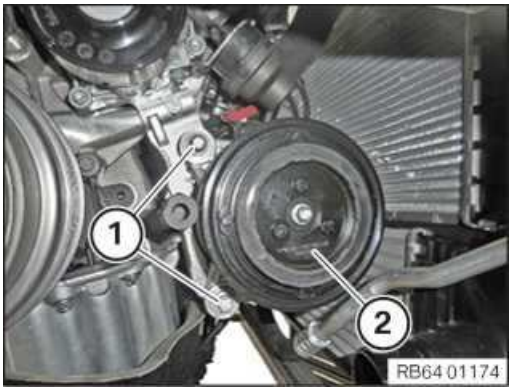


- Guide out the drive belt for the alternator (1) and remove it.

10 – Removing the alternator

Prerequisite

Battery earth lead is disconnected.



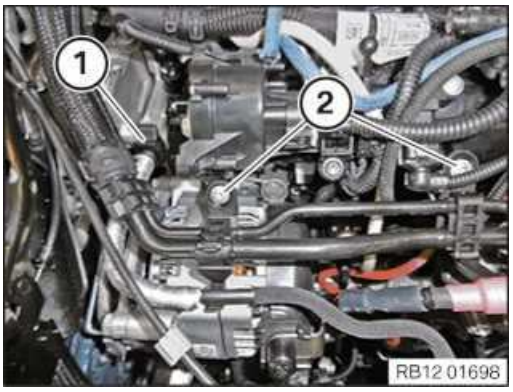
TECHNICAL INFORMATION

Secure component against falling.

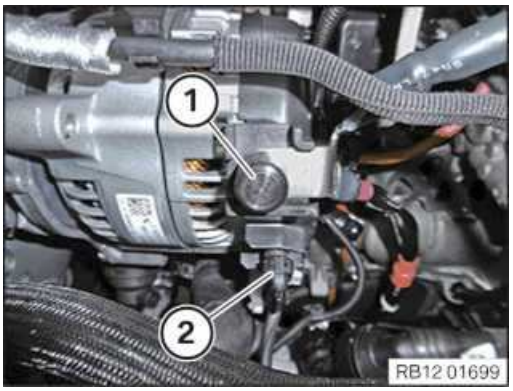
- Loosen screws (1).
- Detach the air conditioning compressor (2) from the component carrier and protect it from falling.

Note: Tie the air conditioning compressor up.

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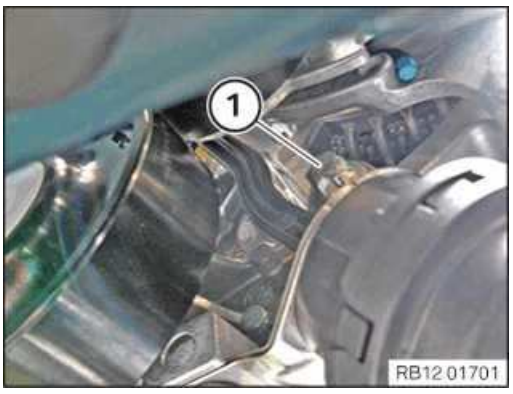
- Unlock the coolant ventilation line (1) and pull it off the cylinder head.
- Catch and dispose of escaping coolant.
- Loosen screws (2).
- Place fuel feed and return line to one side.



- Remove the cover (1) and loosen the nut below.
- Disconnect positive battery cable from alternator.
- Unlock and disconnect the connector (2) from the alternator.



- Detach screw (1) on top on the alternator.



- Detach screw (1) below on the alternator.

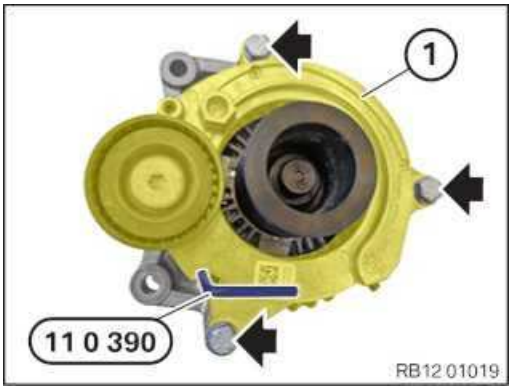


- Feed out alternator (1) along with the screw (2) on the bottom of the alternator through the slot on the support and remove.

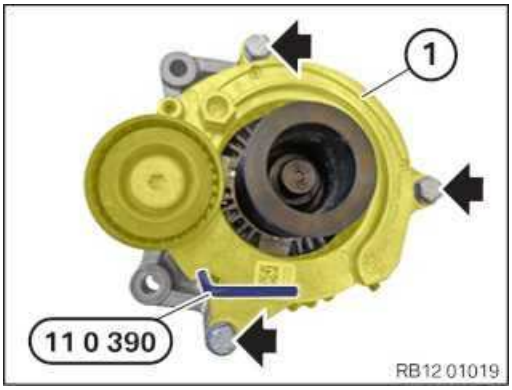
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MAIN WORK

11 – Replace the belt tensioner



- Remove screws (arrows).
- Feed out and remove the tensioning device for the drive belt (1) on the alternator.



- Feed in and install the tensioning device for the drive belt (1) on the alternator.
- Tighten screws (arrows).

Belt tensioner to alternator

M8X30		Tightening torque	28 Nm

POSTPROCESSES

12 – Installing the alternator

Prerequisite

Battery earth lead is disconnected.

CAUTION

Improper routing of the positive battery cable.

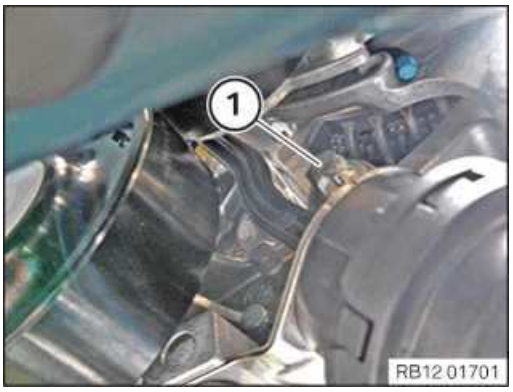
Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.



- Insert and install alternator (1) along with the screw (2) on the bottom of the alternator through the slot on the support.

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- Tighten the screw (1) below on the alternator.

Alternator to component carrier

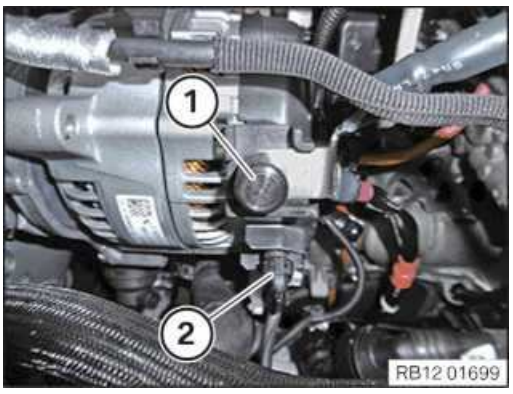
M10x75 / M10x125		Tightening torque	38 Nm



- Tighten the bolt (1) on top on the alternator.

Alternator to component carrier

M10x75 / M10x125		Tightening torque	38 Nm

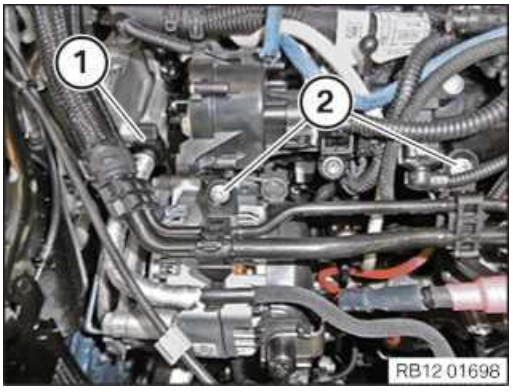


- Mount positive battery cable to the alternator.
- Tighten nut.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

- Mount the cover (1).
- Connect the connector (2) to the alternator and lock audibly.



- Mount fuel supply and return line.
- Tighten down screws (2).

Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

- Connect the coolant ventilation line (1) to the cylinder head and audibly lock.



- Correctly position the air conditioning compressor (2).
- Tighten the screws (1).

Air conditioning compressor in component carrier

M10		Tightening torque	38 Nm

13 – Installing the drive belt for alternator

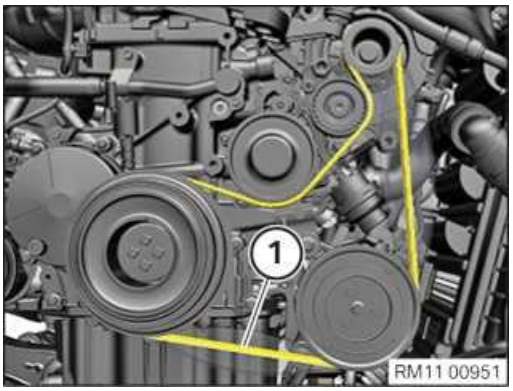
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TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

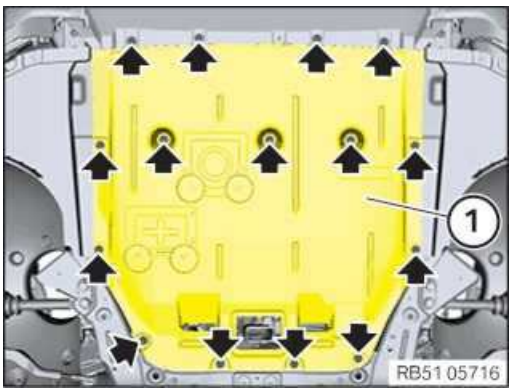


- Feed in the drive belt for the alternator (1) and install it.



- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool **0 496 268 (11 0 390)** out of the belt tensioner and remove it.

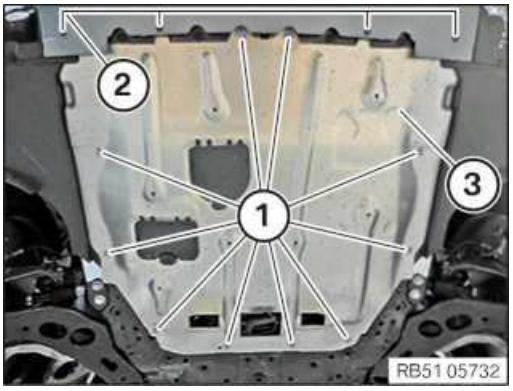
14 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm



- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

Underbody protection front

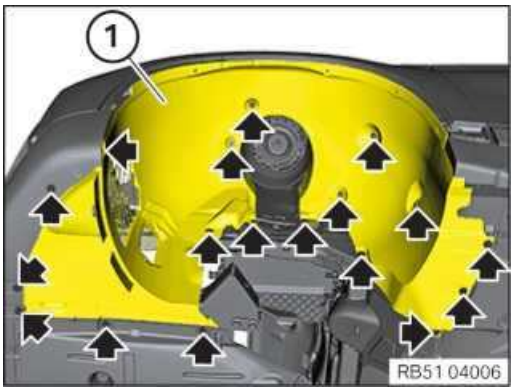
Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

15 – Installing the front right wheel arch cover

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NOTICE

Description is for left component only. Procedure on the right side is identical.



- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

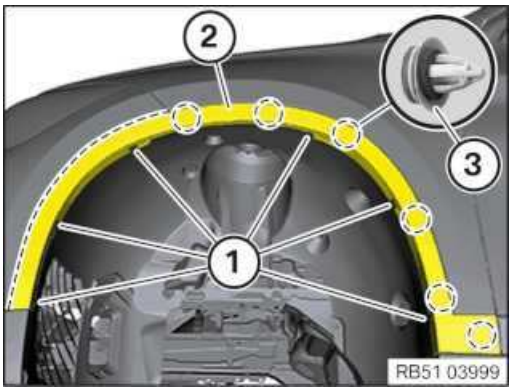
▶ **Installing front wheel arch trim**

NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Check the clips (3) for damage and renew where required.

  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

16 – Installing the front right wheel

▶ **Mounting the wheel**

▷ **Clean the contact surfaces between the brake disc and the wheel rim**

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TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

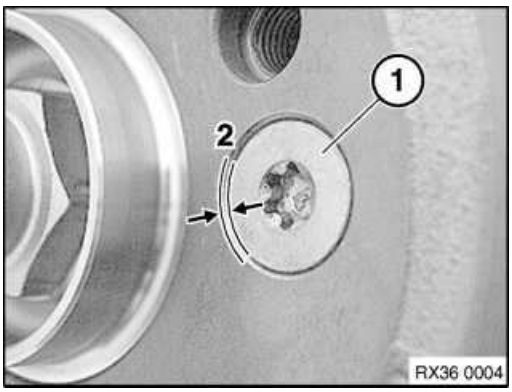
- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue in the area of the wheel bolt holes, remove and clean the brake disc.



- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).



- Renew mounting bolt (1).

  Parts: Mounting bolt
- Check that the mounting bolt (1) for the brake disc is securely seated.

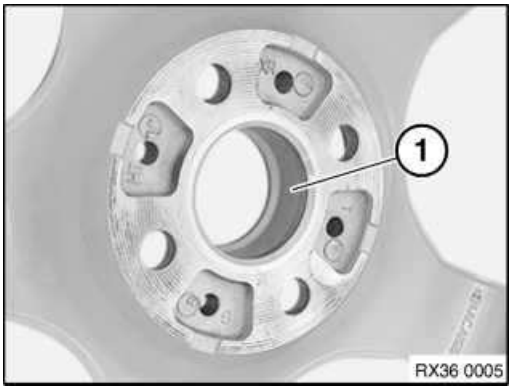
  The mounting bolt (1) for the brake disc may not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to rear wheel hub

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub

M8	Renew screw.	Tightening torque	16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring (1).

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

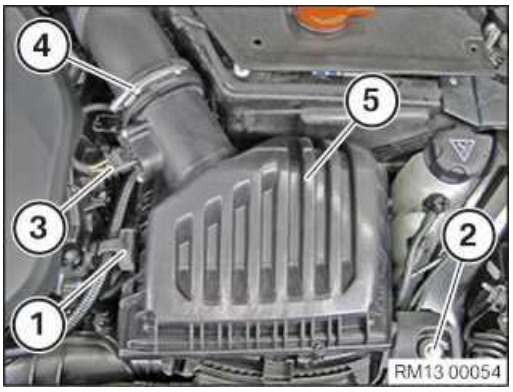
  Parts: Wheel bolts
- Clean the wheel bolts.
- Check the wheel bolts and threads for damage, renew the wheel bolts if necessary.
- Join and tighten the wheel bolts (arrows).

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

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17 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.

  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

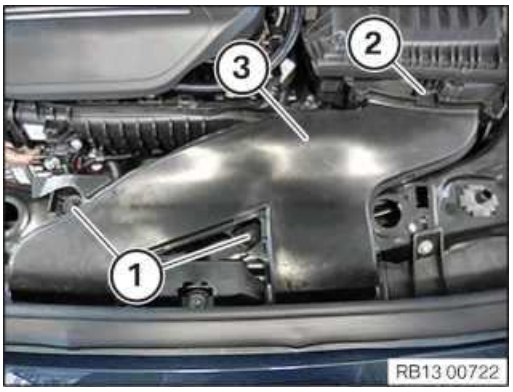
Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Insert and install the holder (1).

18 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

19 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Check for correct installation of all rubber mounts in the acoustic cover (1).



- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

20 – Disconnecting all battery earth leads

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- See additional information.

Additional Information

Overview of Tightening Torques

Belt tensioner to alternator — Used in step 11

M8X30		Tightening torque	28 Nm

Alternator to component carrier — Used in step 12

M10x75 / M10x125		Tightening torque	38 Nm

Positive battery cable to alternator — Used in step 12

M8		Tightening torque	19 Nm

Fuel line to intake plenum — Used in step 12

TS6x20		Tightening torque	5 Nm

Air conditioning compressor in component carrier — Used in step 12

M10		Tightening torque	38 Nm

Underbody protection front — Used in step 14

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Wheel arch cover to body — Used in step 15

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body — Used in step 15

Plastic nut		Tightening torque	3 Nm

Brake disc to rear wheel hub — Used in step 16

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub — Used in step 16

M8	Renew screw.	Tightening torque	16 Nm

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Wheel bolts

Used in step 16

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Intake silencer housing to lock bridge

Used in step 17

M6X30		Tightening torque	8 Nm

Clean air pipe to intake silencer housing

Used in step 17

Clamp		Tightening torque	3 Nm

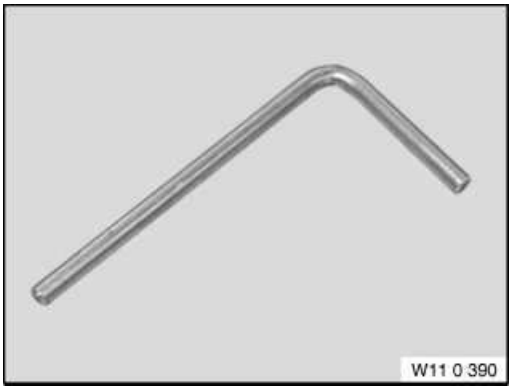
Intake neck to cross connection

Used in step 18

M6		Tightening torque	8 Nm

Overview of Special Tools

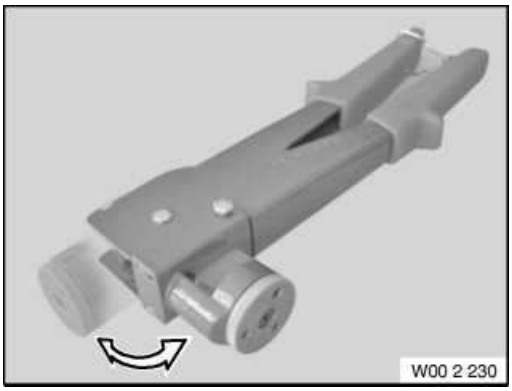
0 496 268 (11 0 390) Pin



Common Used in step 9 13

Usage	(roll pin) For securing new tensioning pulley (poly-V belt)
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 15 07 (390)

0 496 521 (00 2 230) Pliers



Common Used in step 15

Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

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2 344 011 Tool



Common	Used in step 16
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

0 495 221 (36 1 323) Wheel stud



Common	Used in step 6
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

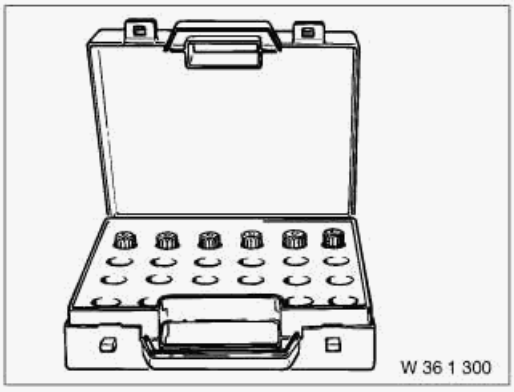
0 495 224 (36 1 326) Wheel stud



Common	Used in step 6
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 225 (36 1 327) Wheel stud



Common	Used in step 6
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud



Common	Used in step 6
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud



Common	Used in step 6
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

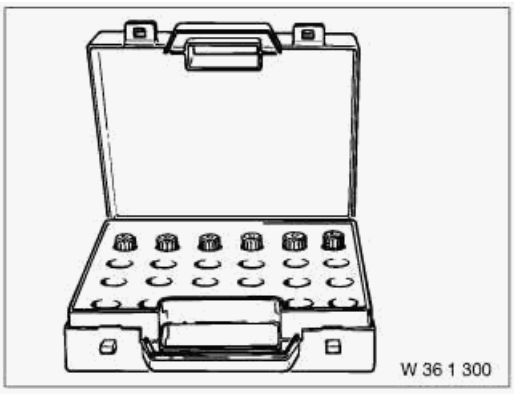
0 495 228 (36 1 331) Wheel stud



Common	Used in step 6
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 229 (36 1 332) Wheel stud



Common	Used in step 6
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud



Common	Used in step 6
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Links

Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	1 20
61 20 900 Disconnecting and connecting battery earth lead	1 20
61 20 900 Disconnecting and connecting battery earth lead	1 20
61 20 900 Disconnecting and connecting battery earth lead	1 20
61 20 900 Disconnecting and connecting battery earth lead	1 20
61 20 900 Disconnecting and connecting battery earth lead	1 20
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 20
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 20
61 20 900 Disconnecting and connecting battery earth lead	1 20
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 20
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	1 20
61 20 900 Disconnecting and connecting battery earth lead	1 20
61 20 900 Disconnecting and connecting battery earth lead	1 20
61 20 900 Disconnecting and connecting battery earth lead	1 20

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61 20 900 Disconnecting and connecting battery earth lead	1	20
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61 20 900 Disconnecting and connecting battery earth lead	1	20
61 20 900 Disconnecting and connecting battery earth lead	1	20
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1	20
61 20 900 Disconnecting and connecting battery earth lead	1	20
61 20 900 Disconnecting and connecting battery earth lead	1	20
61 20 900 Disconnecting and connecting battery earth lead	1	20
61 20 900 Disconnecting and connecting battery earth lead	1	20
61 20 900 Disconnecting and connecting battery earth lead	1	20
61 20 900 Disconnecting and connecting battery earth lead	1	20

Operating materials	Used in step
2.0 Grease for wheel centring	16

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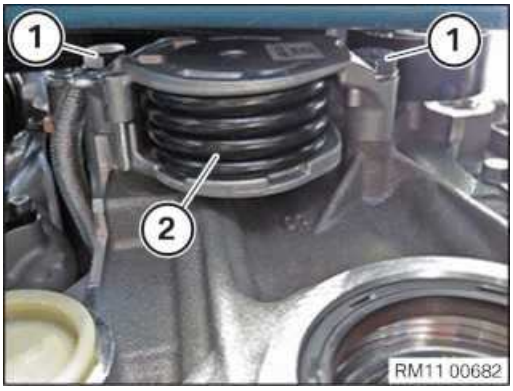
11 28 020 Replacing tensioning device for alternator drive belt (B47)

Warning!
Tensioning device is subject to spring bias **(danger of injury!)**.

Necessary preliminary tasks:

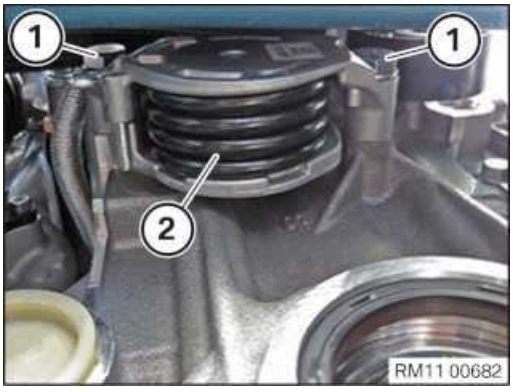
- Remove drive belt

Removal:



Release screws (1) from belt tensioner (2).
Remove belt tensioner (2).

Installation:



Install belt tensioner (2).
Tighten down screws (1).
Tightening torque: 11 28 1AZ.

Required follow-up work:

- Install drive belt

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11 28 ... Tensioning/releasing of drive belt for alternator (B47)

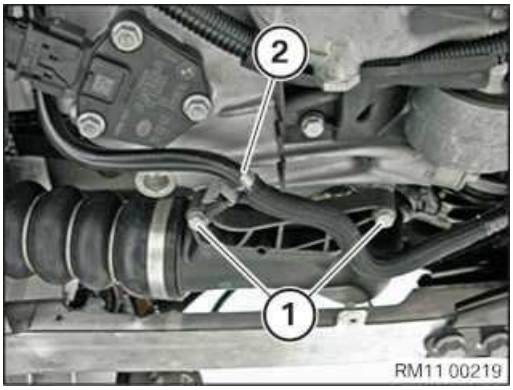
Special tools required:

- 2 365 291
- 11 0 390

Necessary preliminary tasks:

- Remove upper bulkhead cover
- Remove front right wheel arch cover
- Remove front underbody protection

Removal:

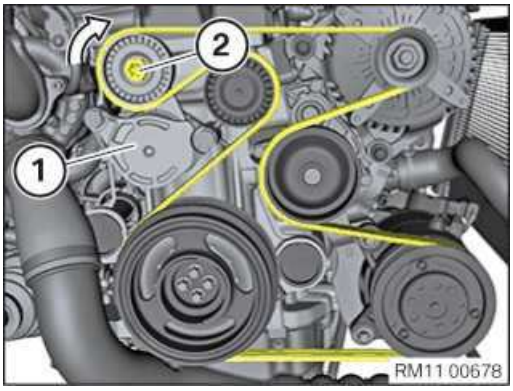


Loosen screws (1).
Unclip line (2).



Release screw (1).

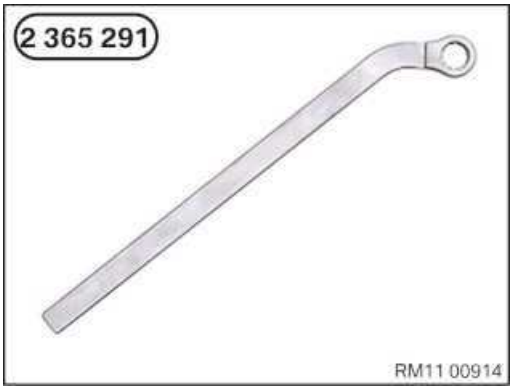
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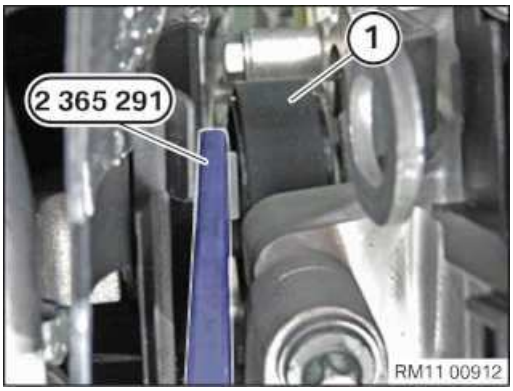
Safety information:

- Danger of injury when tensioning or releasing the drive belt.

Release belt tensioner (1) on screw (2) in direction of arrow (refer to following operations).



Special tool 2 365 291 to relieve belt tensioner.



Position special tool 2 365 291 on deflecting element (1) of belt tensioner.



Unclip fuel lines on holder.

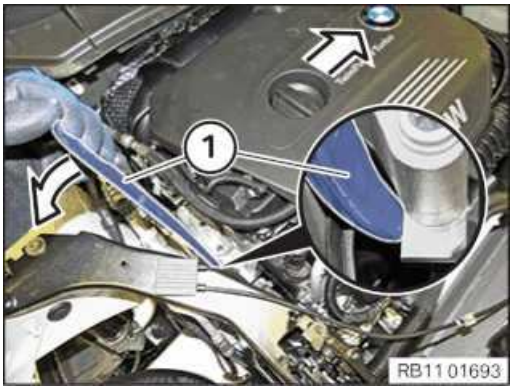
Relieve belt tensioner with special tool 2 365 291 in direction of arrow.

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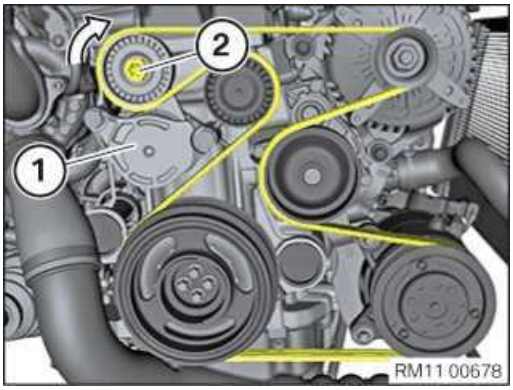
Operation needs to be carried out by a second person helping.

Secure belt tensioner (1) in place with special tool 11 0 390 .



Note:
If the special tool 11 0 390 cannot be mounted, then the engine on the engine mount must be pressed slightly (max. 3 mm) with the mounting lever (1) in the direction of the arrow.

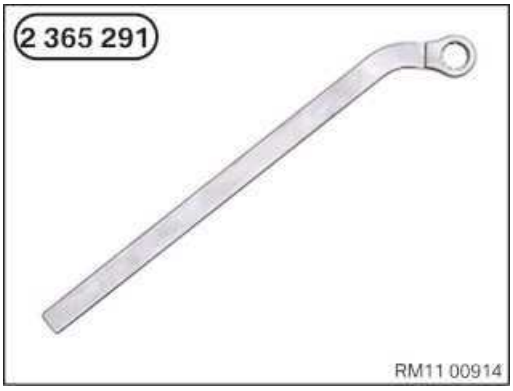
Installation:



Safety information:

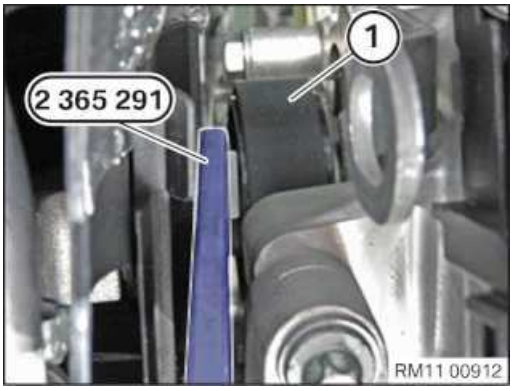
- Danger of injury when tensioning or releasing the drive belt.

Release belt tensioner (1) on screw (2) in direction of arrow (refer to following operations).



Special tool 2 365 291 for relieving belt tensioner.

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Position special tool 2 365 291 on deflecting element (1) of belt tensioner.



Unclip fuel lines on holder.

Relieve belt tensioner using special tool 2 365 291 in direction of arrow.



Operation needs to be carried out by a second person helping.

Remove special tool 11 0 390 from belt tensioner (1).

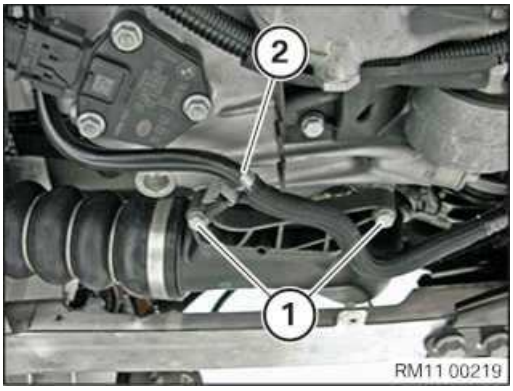


Note:
If the special tool 11 0 390 cannot be removed, then the engine on the engine mount must be pressed slightly (max. 3 mm) with the mounting lever (1) in the direction of the arrow.

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Tighten screw (1).



Tighten down screws (1).
Tightening torque: 11 00 2AZ.
Clip in line (2).

Required follow-up work:

- Install front underbody protection
- Install front right wheel arch cover
- Install upper bulkhead cover

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11 31 505 Adjusting camshaft timing (B47)

Special tools required:

- 11 6 480
- 2 288 380
- 11 4 480
- 11 8 760

Important!

Risk of damage to engine.

Notes for checking and setting the timing must be observed without fail.

Necessary preliminary tasks:

- Remove front right wheel arch panel.
- Remove cylinder head cover.
- Remove exhaust-gas recirculation cooler



Crank engine at central bolt with special tool 11 6 480 **Important!**

Do not turn the engine back.



Remove protective cap on oil sump.

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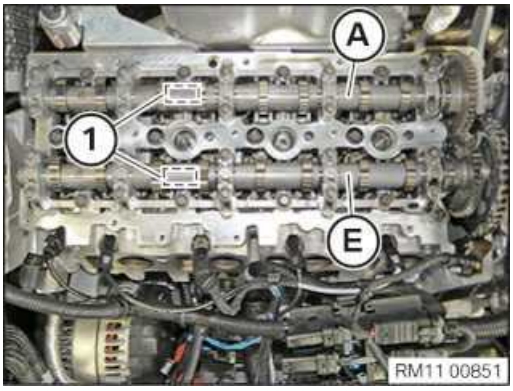


Important!

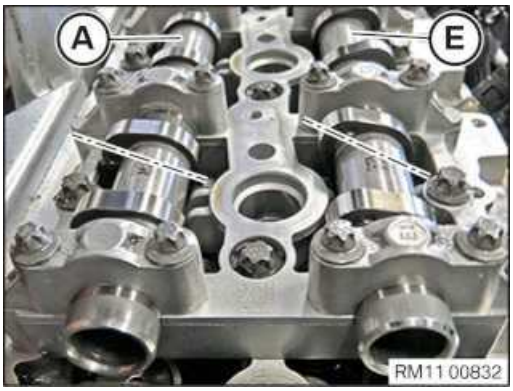
In vehicles with manual gearbox, there is an additional bore hole in front of the dowel hole, which can be confused with the dowel hole.

It must be possible to slide special tool 2 288 380 up to the crank in the oil sump.

Block crankshaft with cylinder no. 1 in TDC firing position with special tool2 288 380 .

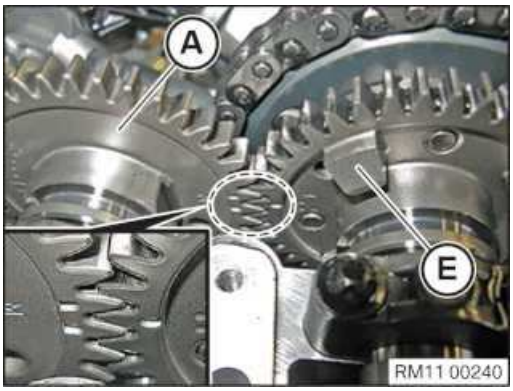


It must be possible to read the part number (1) on the exhaust and intake camshafts (A and E) from above.



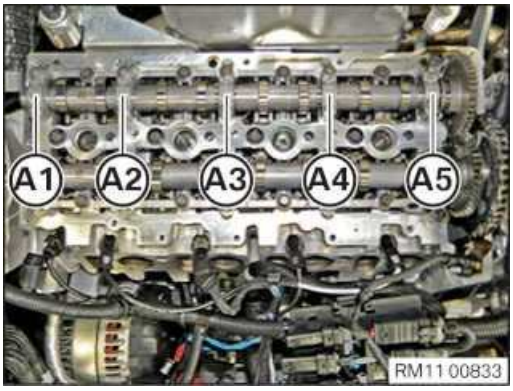
The cam on the intake camshaft (E) points obliquely upwards at cylinder No. 1.

The cam on the exhaust camshaft (A) points obliquely outward to the left at cylinder No. 1.



Marks on both camshafts (A and E) must match up (see graphic).*Note:* The exhaust camshaft must be removed if the marks do not match up (are not aligned).

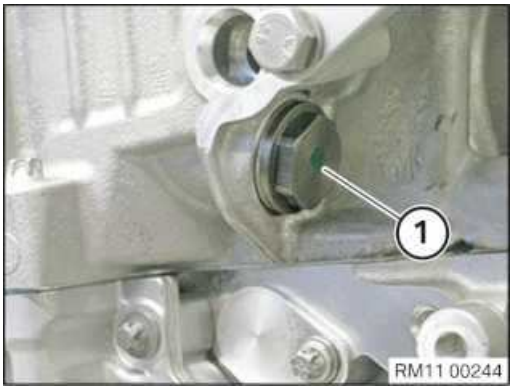
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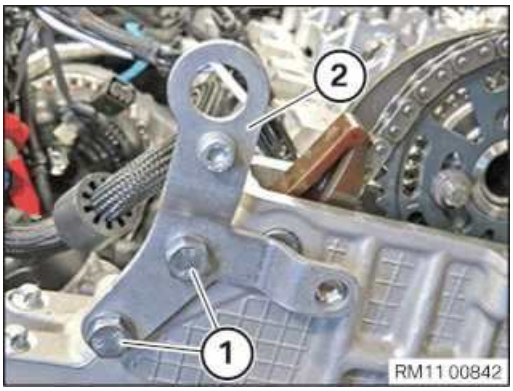
If necessary, release all bolts of camshaft bearing caps **A1** to **A5** by 1/2 a turn at a time, working from the outside inwards.

Remove exhaust camshaft in upward direction.

Place all components on special tool 11 4 480 in a tidy and orderly fashion.

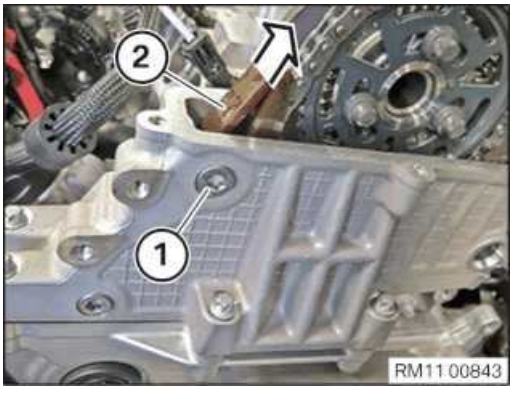


Release chain tensioner (1).



Release screws (1).

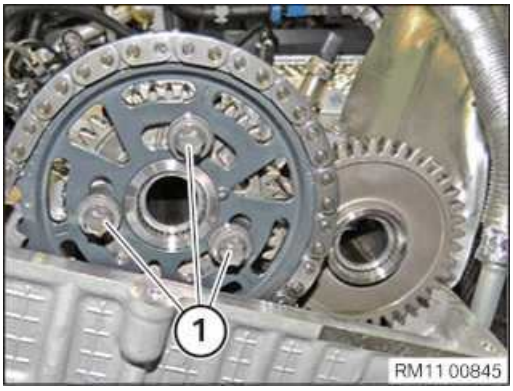
Remove suspension element (2).



Remove bearing journal (1).

Remove guide rail (2) in direction of arrow.

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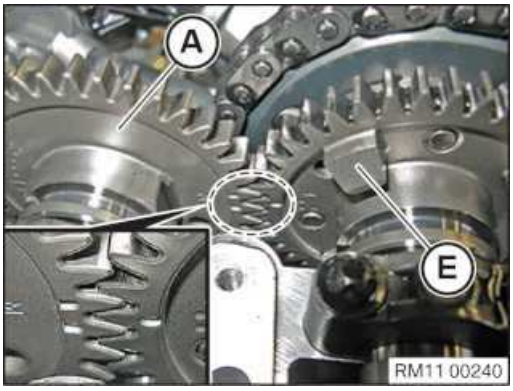


Important!

Protect timing chain to prevent it from falling.

Risk of damage to oil spray nozzle.

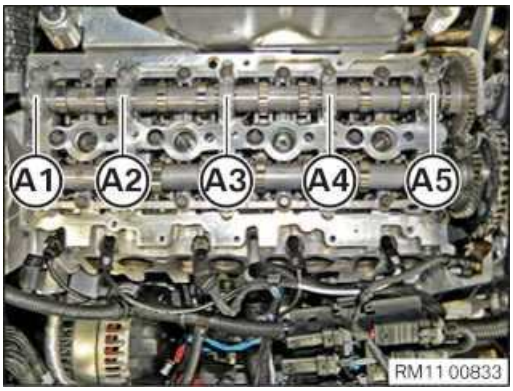
Remove camshaft bolts (1) and detach camshaft sprocket.



Position camshafts (A and E) accordingly (see graphic).

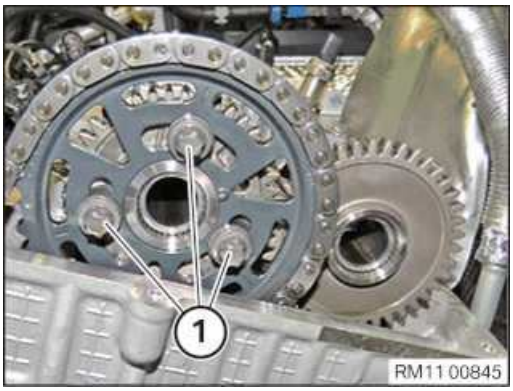
If necessary, insert exhaust camshaft (A) so that both marks match up (see graphic).

Note:
Check installation position of roller cam followers.



Tighten down all camshaft bearing caps **A1** to **A5** by 1/2 a turn at a time, working from the inside outwards.

Tightening torque: 11 31 2AZ.



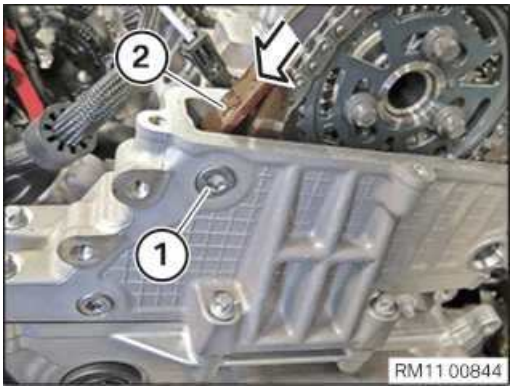
Place the camshaft sprocket with timing chain on the intake camshaft such that bolts (1) are located in the centre of the elongated holes.

Insert bolts (1).

Tighten bolts (1) to 10 Nm.

Release bolts (1) again by a 90° turn.

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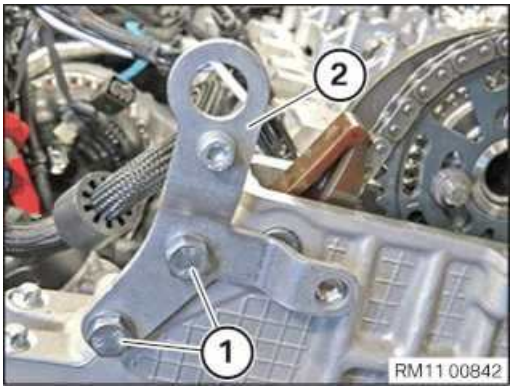


Parts: Replace bearing journal.

Install guide rail (2) in the direction of the arrow.

Note:
Make sure guide rail (2) is correctly installed in the lower bearing journal.

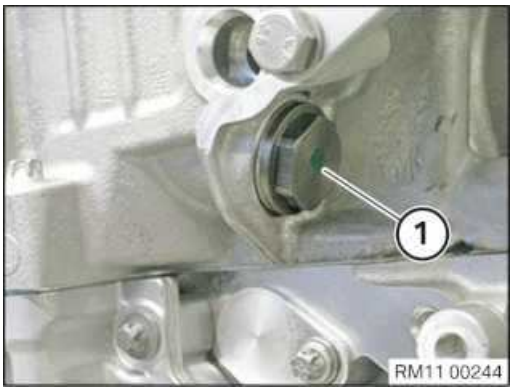
Tightening torque: 11 12 6AZ.



Install suspension element (2).

Tighten down screws (1).

Tightening torque: 11 00 4AZ.



Parts: Replace sealing ring.

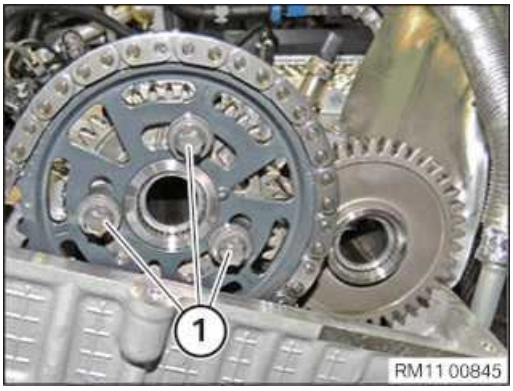
Install chain tensioner (1) and tighten down.

Tightening torque: 11 12 5AZ.



Place special tool 11 8 760 on exhaust camshaft.**Note:**
Special tool 11 8 760 must lie flush on cylinder head.

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Tighten down screws (1).

Tightening torque: 11 31 1AZ.



Crank engine with special tool 11 6 480 twice in direction of rotation.

Check timing of camshafts.

Important!

Do not turn the engine back.

Important!

Special tool 2 288 380 must be removed before starting engine.

Required follow-up work:

- Install exhaust-gas recirculation cooler.
- Install cylinder head cover.
- Install front right wheel arch panel.

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11 31 505 Adjusting the timing of the camshaft (s) (for work no. 11 31 005/508)

PRELIMINARY WORK

1 – Checking camshaft timing

- See additional information.

2 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

RISK OF DAMAGE



Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

TECHNICAL INFORMATION

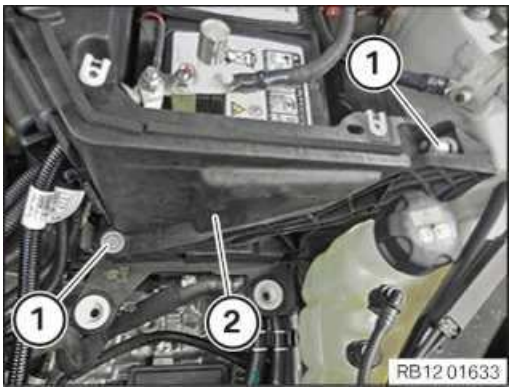
Follow instructions for removing and installing control units.

For additional information see: 12 00 ... Notes on removal and installation of control units

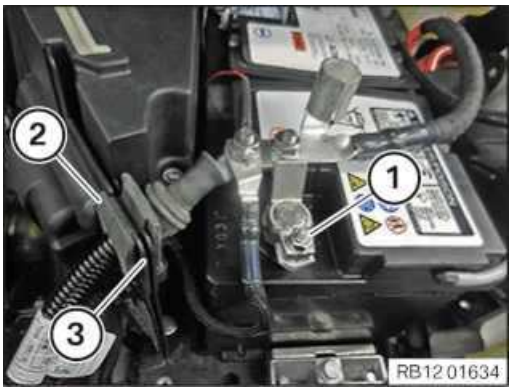
TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.

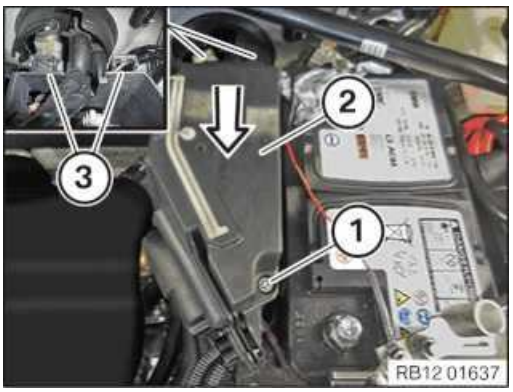
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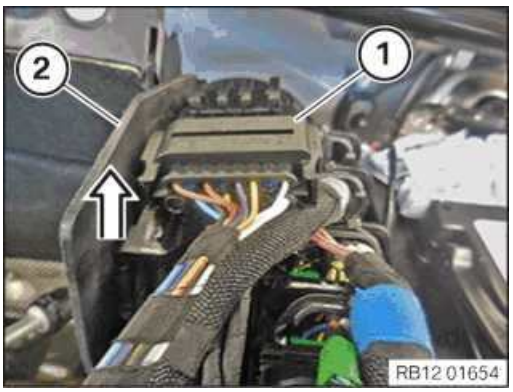
- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.



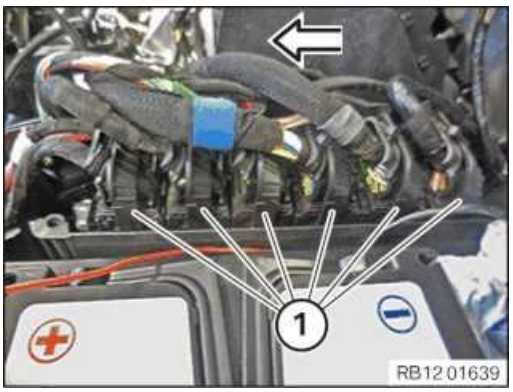
- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).

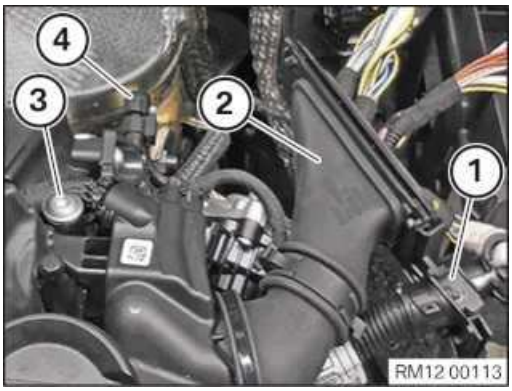


- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

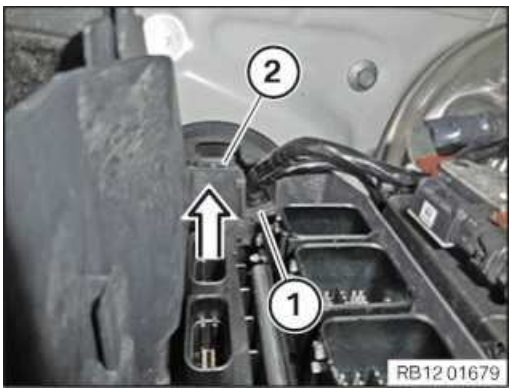
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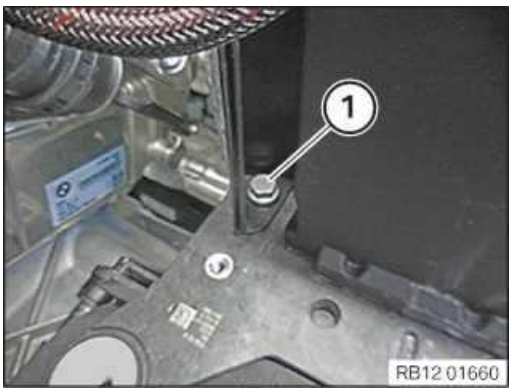
- Unlock and loosen connector (1).



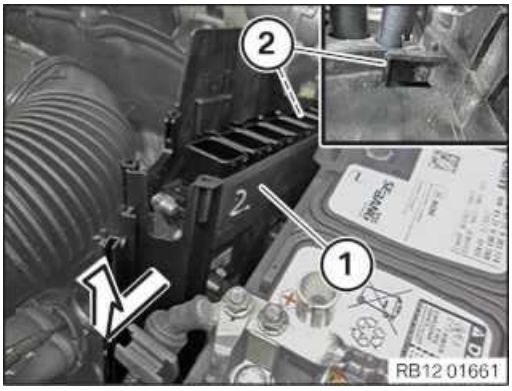
- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.



- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.



- Loosen screw (1).



- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

3 – Remove vehicle battery

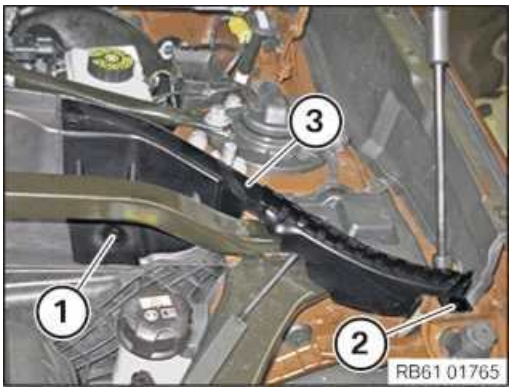
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WARNING

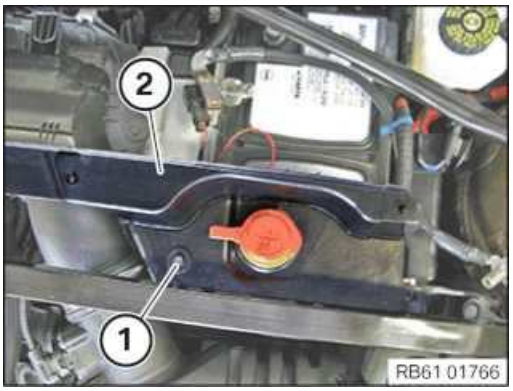
Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

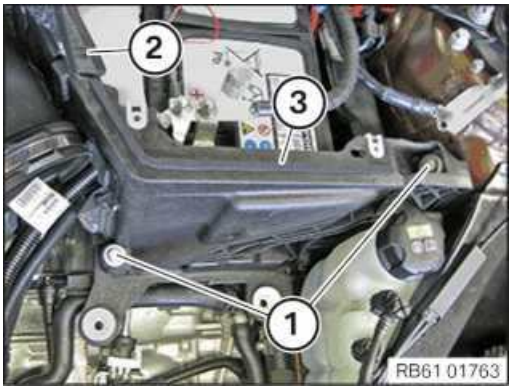
- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.



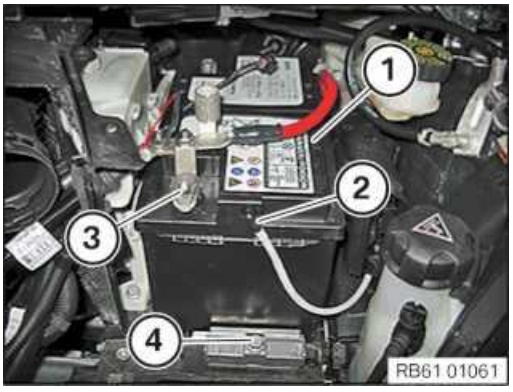
- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).



- Loosen screw (1).
- Remove the cover (2).



- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.



- Pull off the vent hose (2).
- Slacken the nut (3) on the positive battery terminal and remove the positive battery terminal.

WARNING

Unprotected battery terminals.

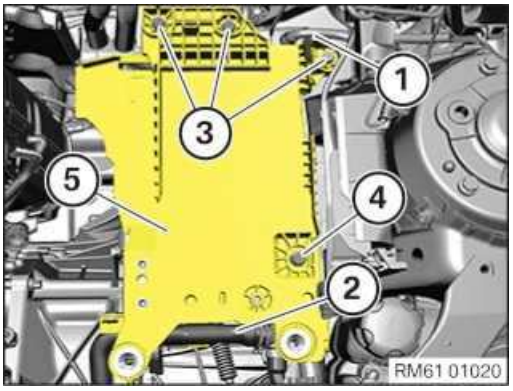
Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

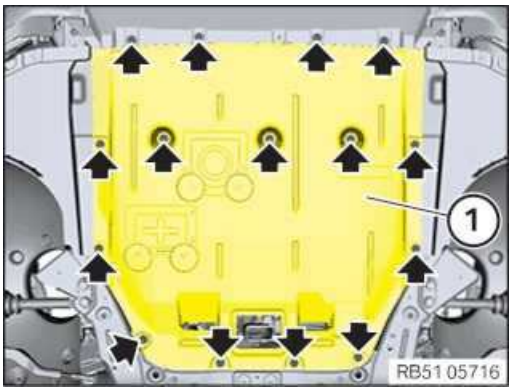
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4 – Remove battery holder

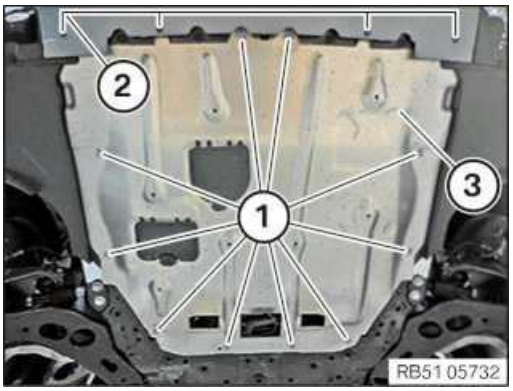


- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

5 – Removing the front underbody protection

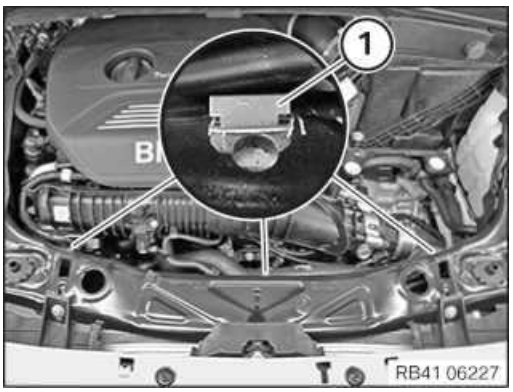


- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.



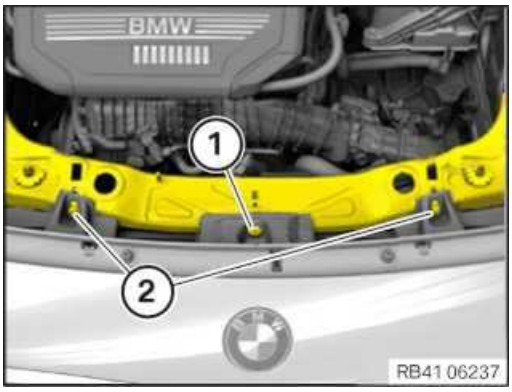
- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

6 – Remove front cross connection

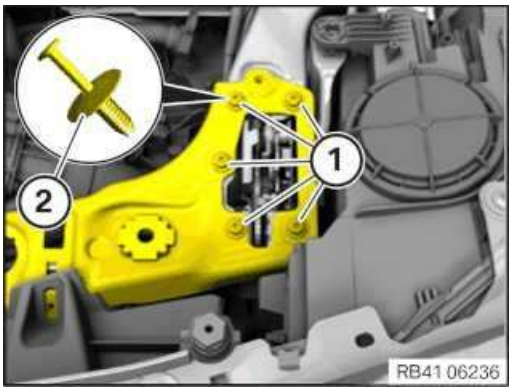


- Detach the clamps (1) for the Bowden cable of the bonnet locks from the cross connection.

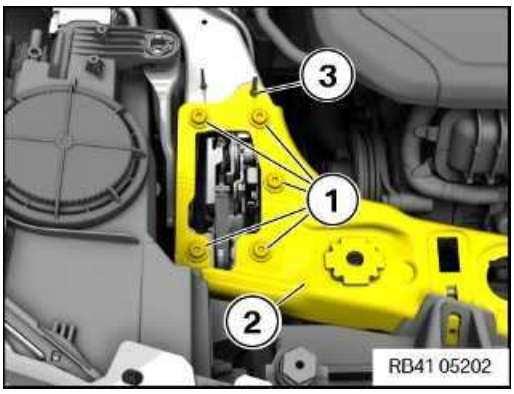
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- Loosen screw (1).
- Loosen screws (2).



- Loosen screws (1).
- Lever out expanding rivet (2).



- Loosen screws (1).
- Unclip the front cross connection (2) from the rubber retainer (3) and remove it upward.

7 – Draining coolant

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

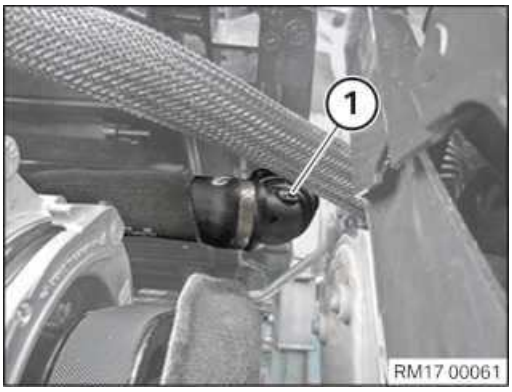
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TECHNICAL INFORMATION

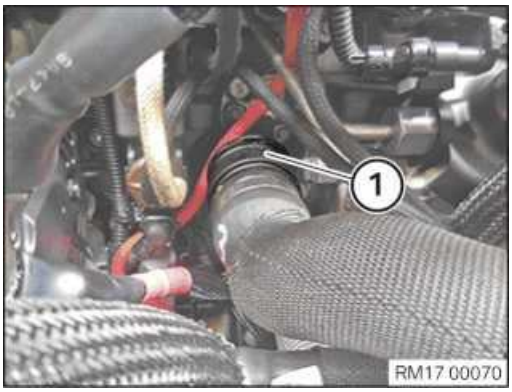
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Loosen sealing cap (1).



- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.



- Unlock the coolant line (1) and pull it off the connecting branch.
- Catch and dispose of escaping coolant.

8 – Removing the exhaust-gas recirculation cooler

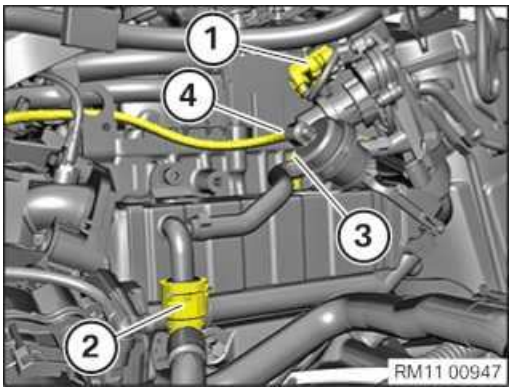
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

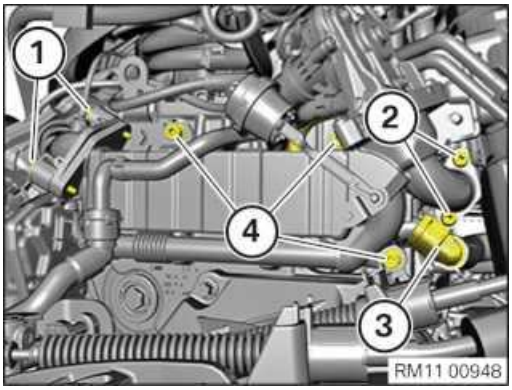
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TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.

MAIN WORK

9 – Adjusting the timing of the camshafts



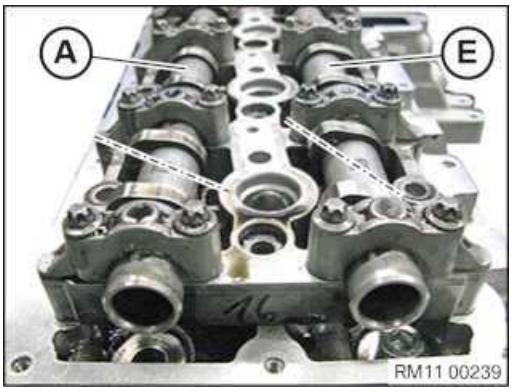
- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.



- Slide the special tool **2 288 380** completely into the bore hole of the oil sump.
- Use the special tool to block **2 288 380** the crankshaft in the TDC firing position at the first cylinder.

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- The cam of the intake camshaft (E) at the first cylinder points up at an angle.
- The cam of the exhaust camshaft (A) at the first cylinder points outward at an angle.

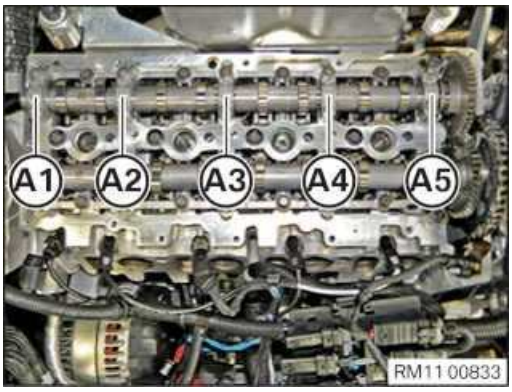
▸ **Remove exhaust camshaft.**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



TECHNICAL INFORMATION

The camshaft is tensioned by the valve springs. Tighten or loosen each screw on the camshaft bearing caps one at a time in the specified sequence and by half a turn only. Repeat procedure.

- Loosen all screws of the exhaust camshaft bearing caps (A1) to (A5) from the outside to the inside, step by step in 1/2 turns.
- Remove exhaust camshaft in upward direction.
- Place all components on special tool **0 495 105 (11 4 480)** in a tidy and orderly fashion.

▸ **Remove chain tensioner piston**

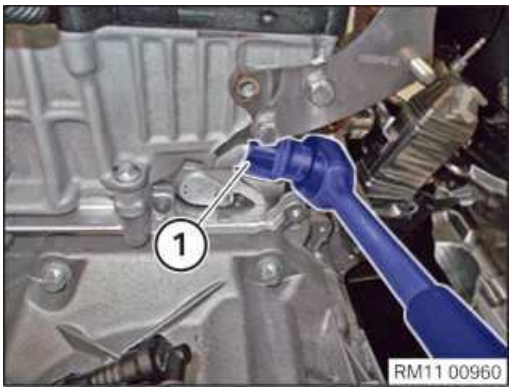
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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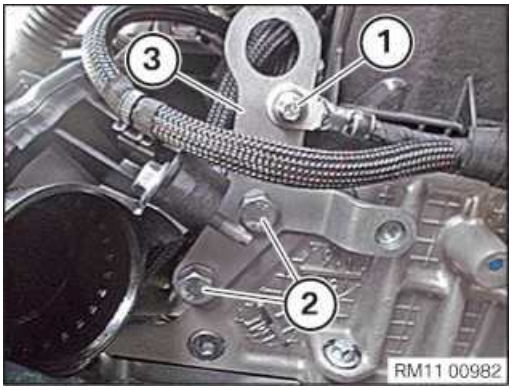


TECHNICAL INFORMATION

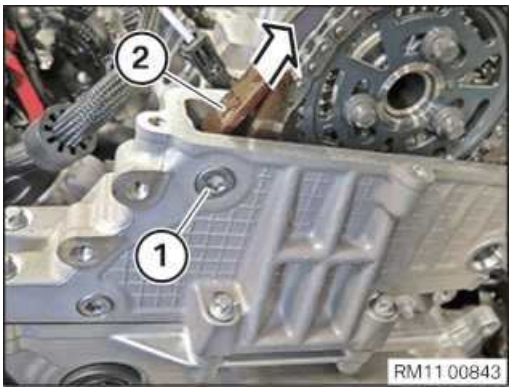
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

▸ **Remove the timing chain guide rail**

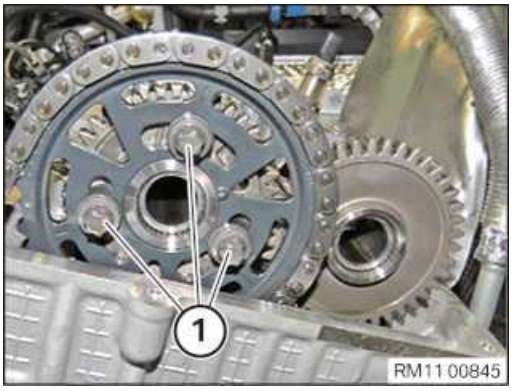


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

▸ **Removing the camshaft sprocket on the intake camshaft**



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

▸ **Install exhaust camshaft**

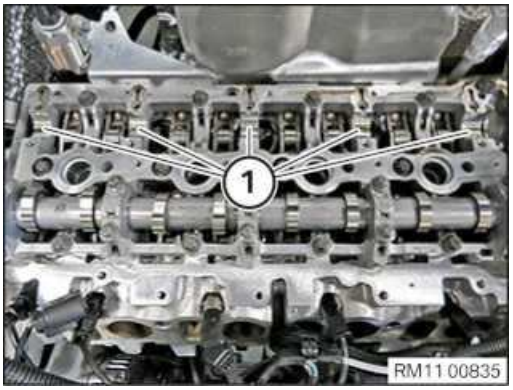
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RISK OF DAMAGE

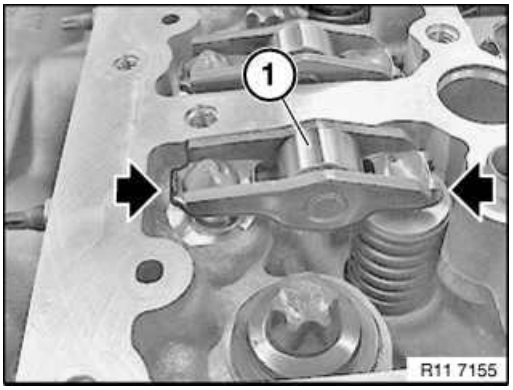
Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

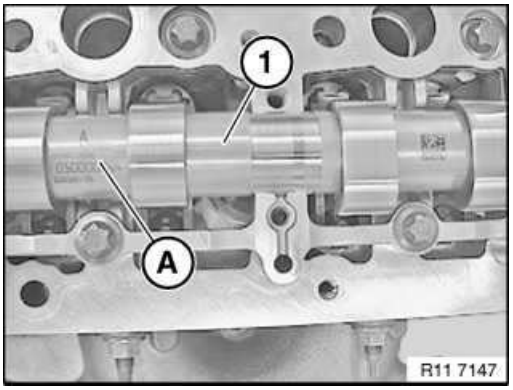
- Comply with the regulations for the installation and disassembly.
- Perform work with care.



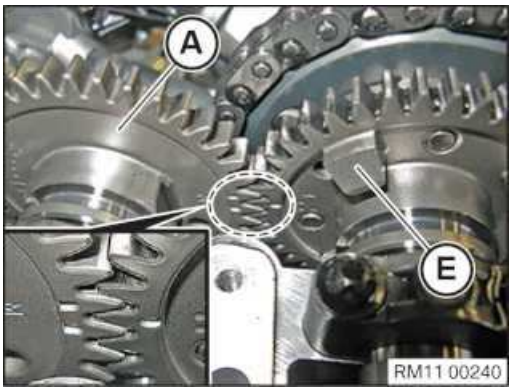
- Oil all bearing positions (1).



- Make sure the roller cam followers (1) have the correct mounting orientation.

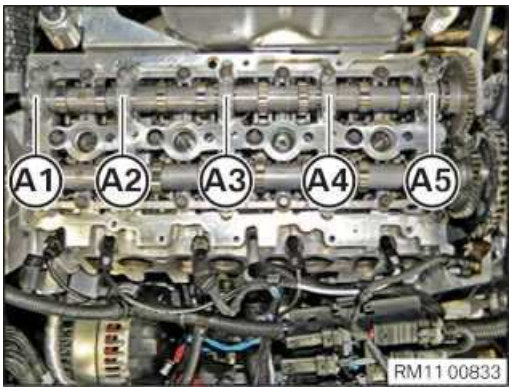


- Insert exhaust camshaft (1) so that the identification (A) points upwards.



- Insert the exhaust camshaft (A) so that the marks on the camshafts (A) and (E) correspond in the highlighted area.
- Position the camshafts (A) and (E) accordingly.

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- Tighten all exhaust camshaft bearing caps (A1) to (A5) from the inside to the outside by 1/2 a turn at a time.

Intake and exhaust camshaft in camshaft support

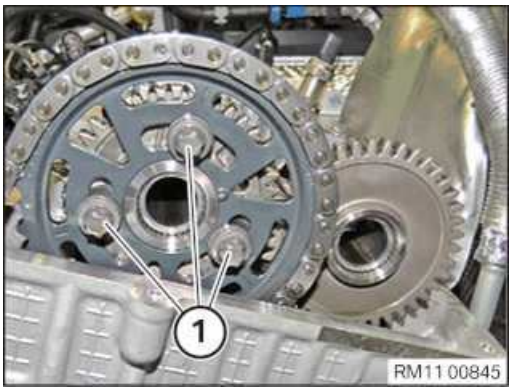
M6x31		Tightening torque	10 Nm



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

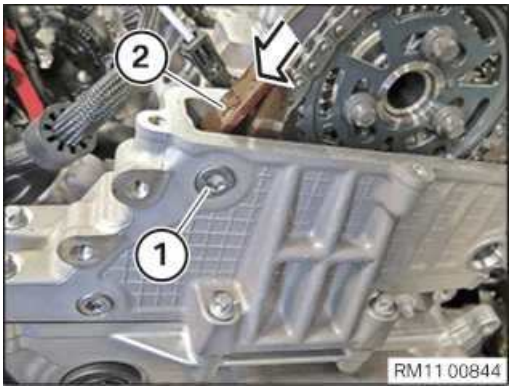
  Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

▸ **Installing the camshaft sprocket on the intake camshaft**



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

▸ **Install the timing chain guide rail**



- Position the guide rail (2) in the direction of the arrow.

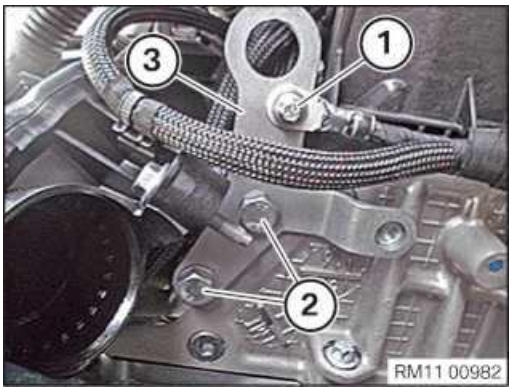
  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

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- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6		8 Nm

▸ **Installing the chain tensioner piston**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Renew sealing ring (1).

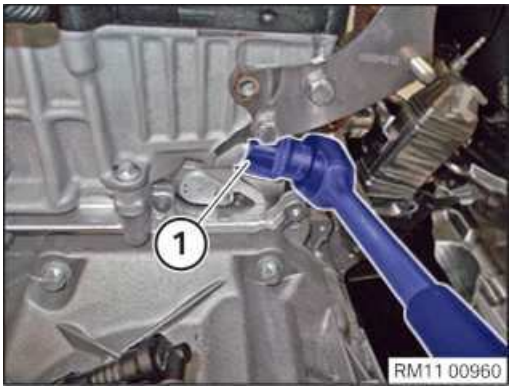
  Parts: Sealing ring



TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.



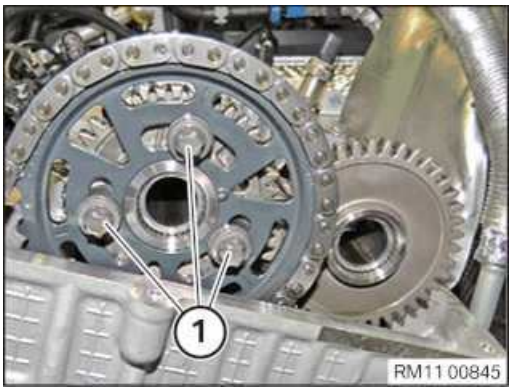
- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

▸ **Tightening the camshaft sprocket on the intake camshaft**

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- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

POSTPROCESSES

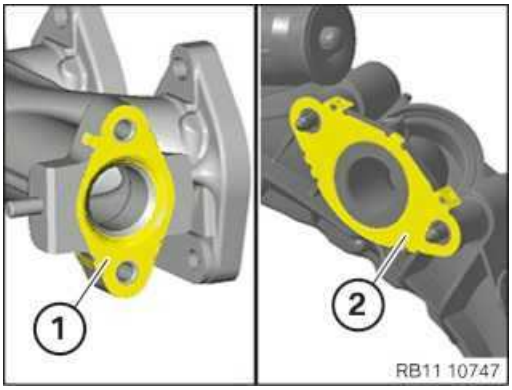
10 – Installing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



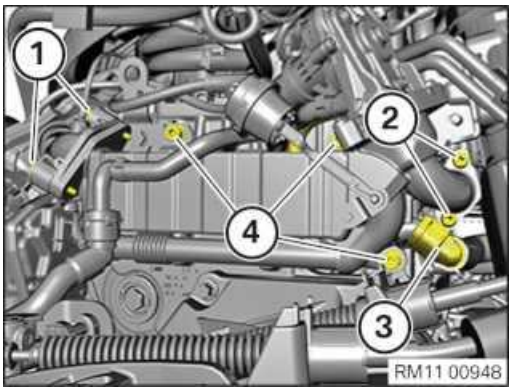
- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket

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- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts
- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm

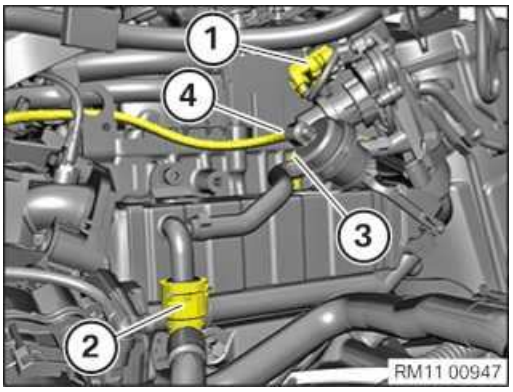
- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.
- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm

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TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

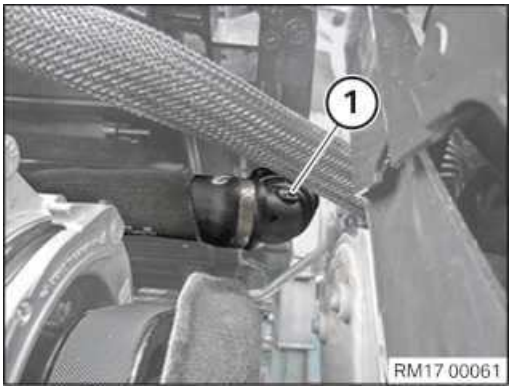
- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

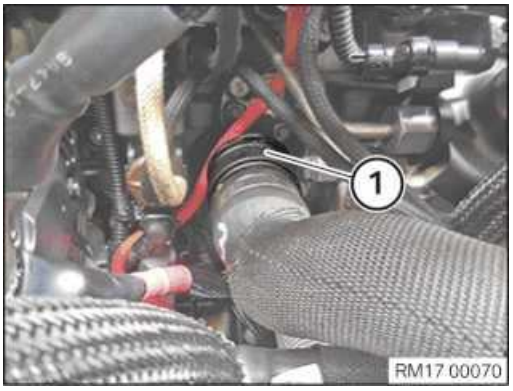
11 – Connect the coolant line

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Connect the right coolant line (1) to the radiator and lock audibly.



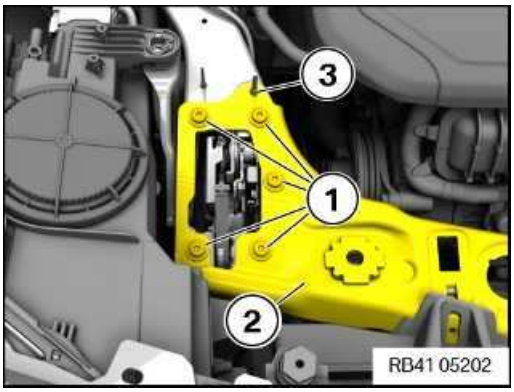
- Connect the coolant line (1) to the connecting branch and lock audibly.

12 – Install front cross connection

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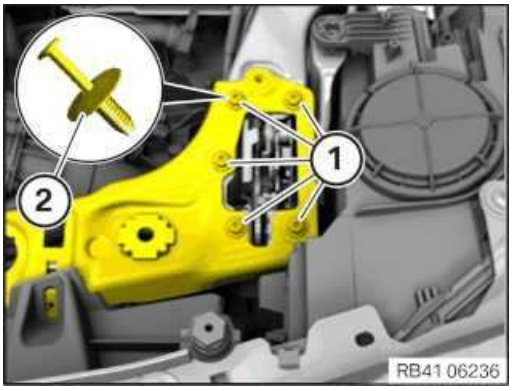
- Right side of vehicle only: Secure spray guard (1) on the cross connection (2) as pictured.



- Position front cross connection (2) and clip front cross connection (2) into the rubber retainer (3) at the same time.
- Tighten the screws (1).

Cross connection to carrier support

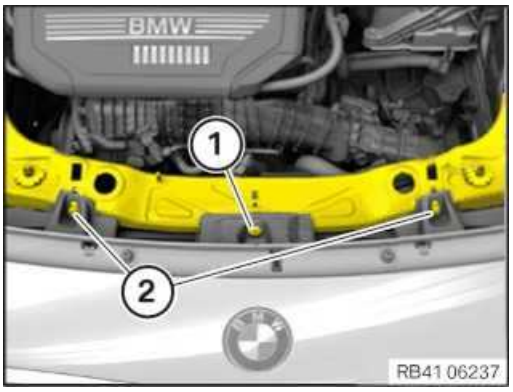
Screws M6x20		Tightening torque	11,8 Nm



- Tighten the screws (1).

Cross connection to carrier support

Screws M6x20		Tightening torque	11,8 Nm



- Position screws (3) on the rubber mounts for the radiator and tighten.

Screw connection for rubber mount of coolant radiator to coolant radiator

Bolt to rubber mount		Tightening torque	8 Nm

- Tighten down screws (2).

Air duct to upper connection

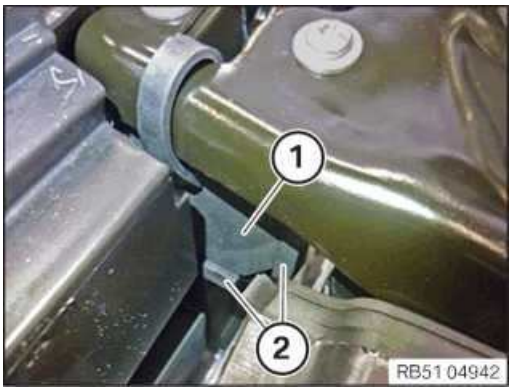
M6x20 screw		Tightening torque	11,8 Nm

- Tighten down screw (1).

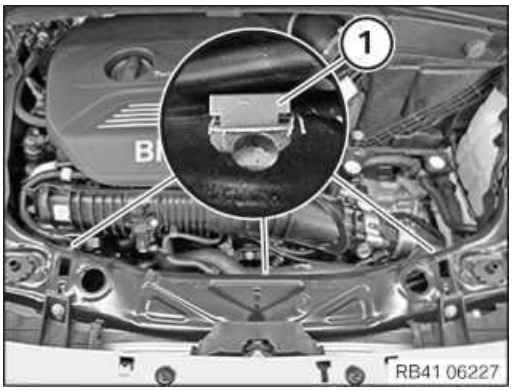
Bracing strut to upper connection

M8x20 screw		Tightening torque	28 Nm

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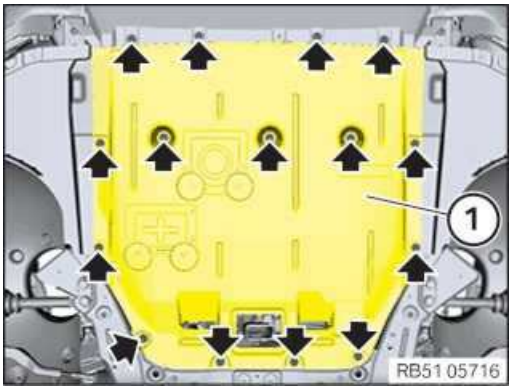


- Right side of vehicle only: Properly mount spray guard (1) to prevent corrosion.
- Secure spray guard (1) to the bridge with retaining tabs (2).



- Fasten the clamps (1) from the Bowden cable of the bonnet lock on the cross connection.

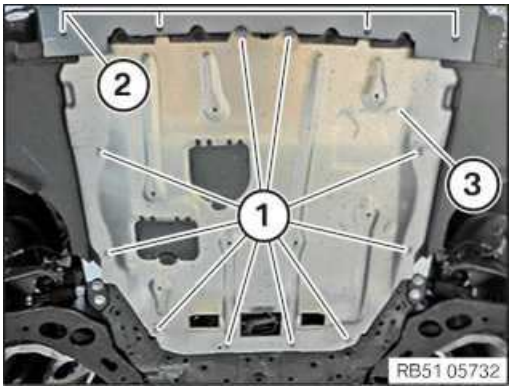
13 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm



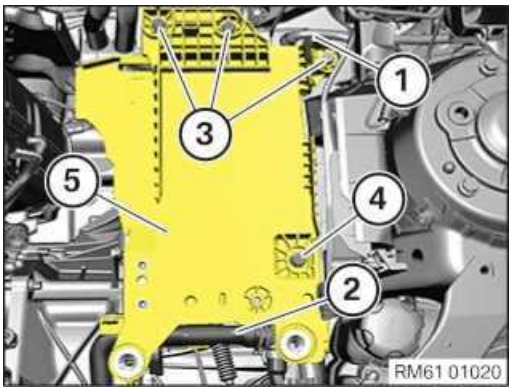
- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

14 – Install the battery holder

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- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

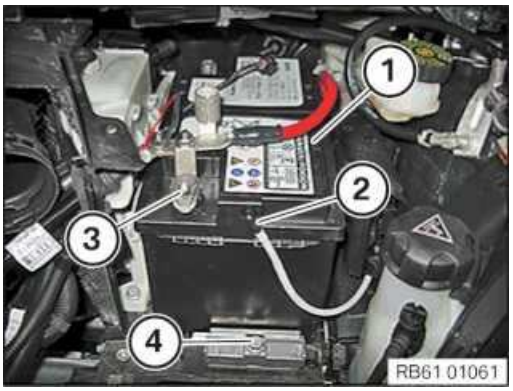
- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

15 – Install vehicle battery



- Install vehicle battery (1).
- Position the bracket and tighten with the screw (4) .

Battery terminal rail to battery tray

M8		19 Nm

- Position the vent hose (2) and clip it in.
- Position the positive battery terminal and tighten with the nut (3) .

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

▸ **Check the vent holes of the battery**

WARNING

Gas emission.

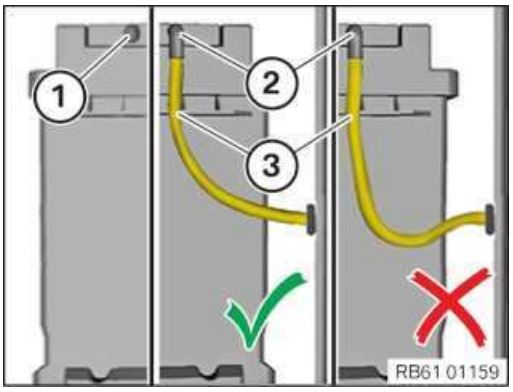
Danger of injury! Danger of explosion!

- Assign the vent holes correctly.
- Route the vent hose correctly.

TECHNICAL INFORMATION

The battery has two vent holes, opposite:
One vent hole (1) must be closed correctly with a dummy plug.
The vent hose (3) must be correctly connected and routed at the other vent hole (2).

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Check

- Check if the vent hole (1) is correctly closed with a dummy plug.

Result

» No dummy plug.

Measure

- Close the vent hole (1) correctly with a dummy plug.

Check

- Check if the vent hole (2) has a correctly connected vent hose (3).

Result

» The vent hose (3) is not correctly connected.

Measure

- At the vent hole (2), connect the vent hose (3) correctly.

Check

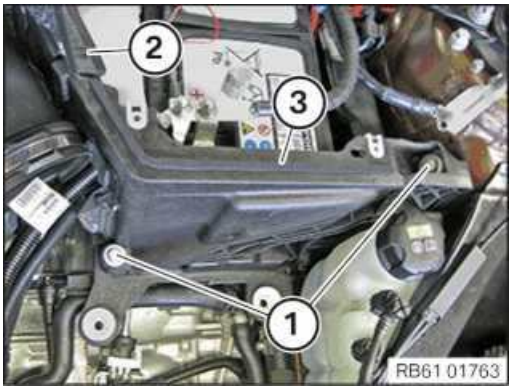
- Check if the vent hose (3) is routed to the outside with a downhill gradient (**no siphon formation!**).

Result

» The vent hose (3) is not correctly routed as shown in the image on the right.

Measure

- Route the vent hose (3) correctly as shown in the centre image.



- Insert tension strut (3) and tighten with screws (1).

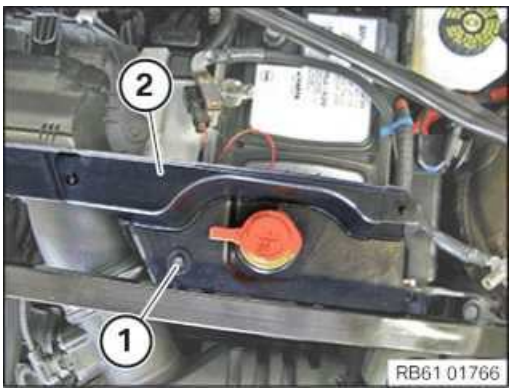
Trailing link

M8		Tightening torque	19 Nm

- Tighten down screw (2).

Battery cover

M8		2,8 Nm

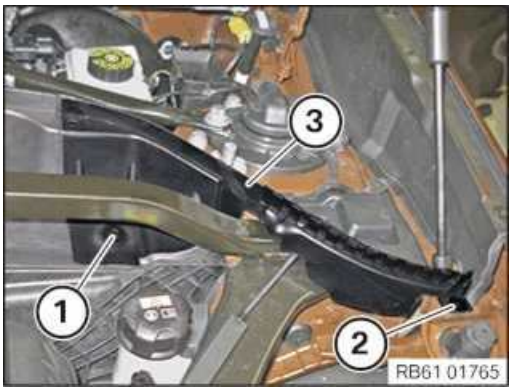


- Position the cover (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm

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- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm

16 – Install electronics box

Prerequisite

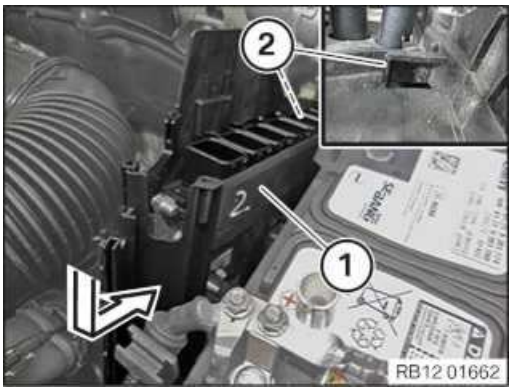
Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

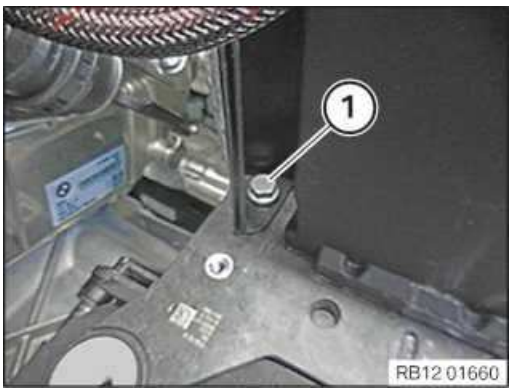
- Route all cables without abrasions, do not trap and crush.



- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.



- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).

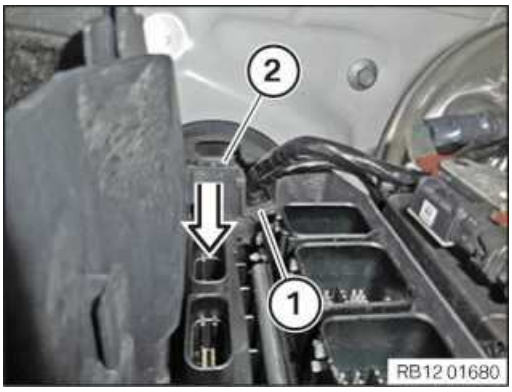


- Tighten down screw (1).

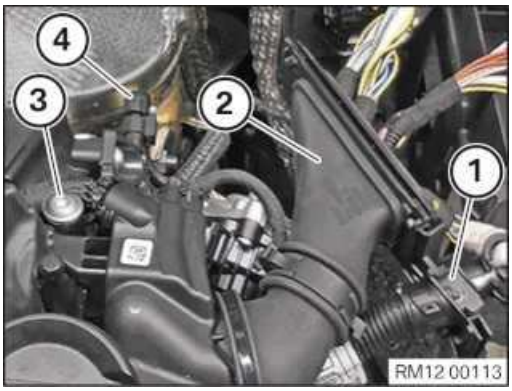
Electronics box to battery tray

M8X16		Tightening torque	15 Nm

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- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.

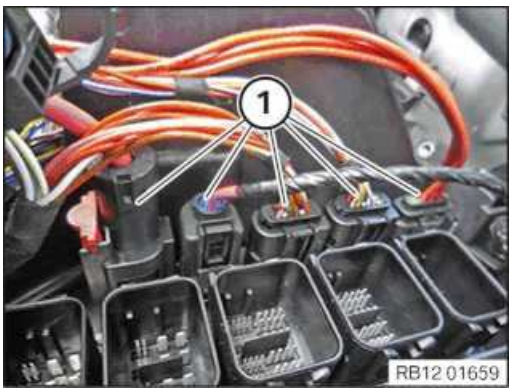


- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

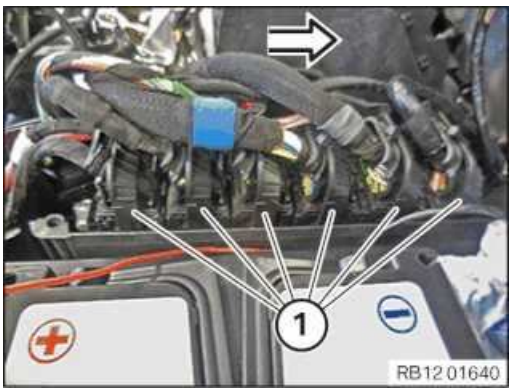
Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

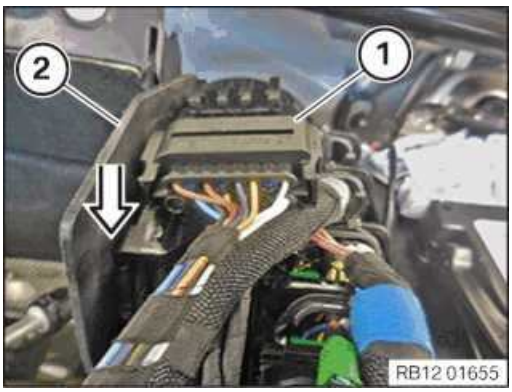
- Attach connector (4) to the differential pressure sensor and lock it audibly.



- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.

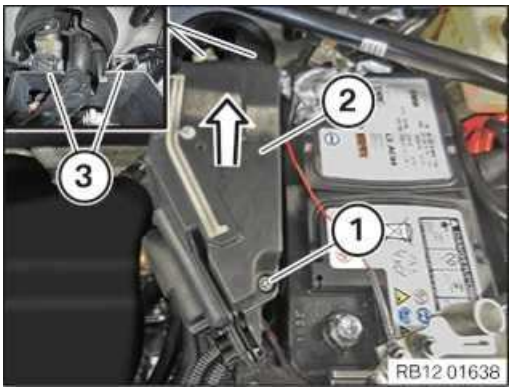


- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.

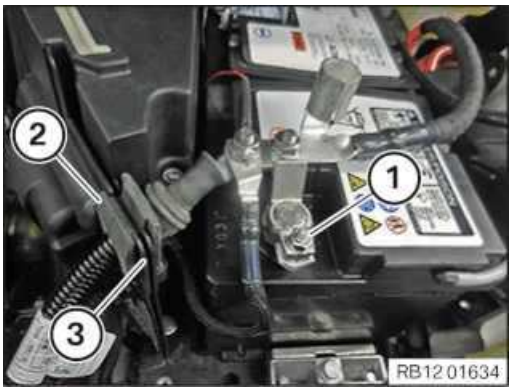
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- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

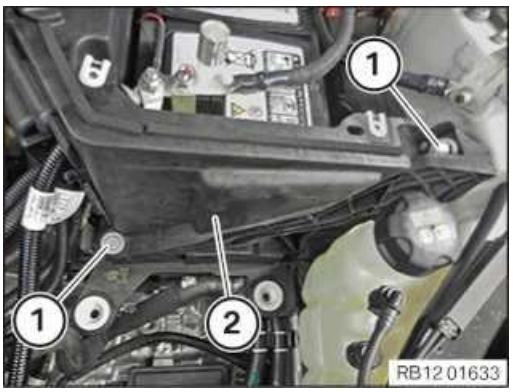
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm



- Feed in and install tension strut (2).
- Tighten the screws (1).

Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

17 – Fill and bleed the coolant circuit

▶ **Filling and bleed the high-temperature coolant circuit**



- See additional information.

Additional Information

Overview of Tightening Torques

Intake and exhaust camshaft in camshaft support Used in step 9

M6x31		Tightening torque	10 Nm

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Bearing journal to cylinder head

Used in step 9

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8

Used in step 9

M8		Tightening torque	19 Nm

Standard screw connection M6

Used in step 9

M6			8 Nm

Chain tensioner piston to cylinder head

Used in step 9

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft

Used in step 9

M7x17.			17 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 10

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler

Used in step 10

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to exhaust manifold

Used in step 10

M8x28	Replace screws	Tightening torque	32 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 10

M8x20		Tightening torque	19 Nm

Cross connection to carrier support

Used in step 12

Screws M6x20		Tightening torque	11,8 Nm

Screw connection for rubber mount of coolant radiator to coolant radiator

Used in step 12

Bolt to rubber mount		Tightening torque	8 Nm

Air duct to upper connection

Used in step 12

M6x20 screw		Tightening torque	11,8 Nm

Bracing strut to upper connection

Used in step 12

M8x20 screw		Tightening torque	28 Nm

Underbody protection front

Used in step 13

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Battery holder to engine support

Used in step 14

Hexagon screw M8x30		Tightening torque	19 Nm

Battery terminal rail to battery tray

Used in step 15

M8			19 Nm

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Battery terminal with IBS positive battery terminal / negative battery terminal Used in step 15

NutM6			5 Nm

Trailing link Used in step 15

M8		Tightening torque	19 Nm

Battery cover Used in step 15

M8			2,8 Nm

Electronics box to battery tray Used in step 16

M8X16		Tightening torque	15 Nm

Wiring harness to cylinder head cover Used in step 16

TS5x20		Tightening torque	3,5 Nm

Cover to electronics box Used in step 16

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery Used in step 16

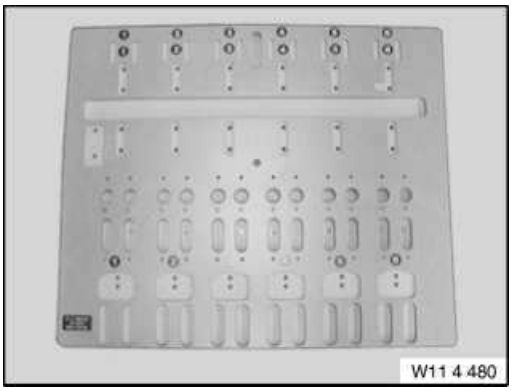
NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray Used in step 16

M8		Tightening torque	19 Nm

Overview of Special Tools

0 495 105 (11 4 480) oddments tray



Common Used in step 9

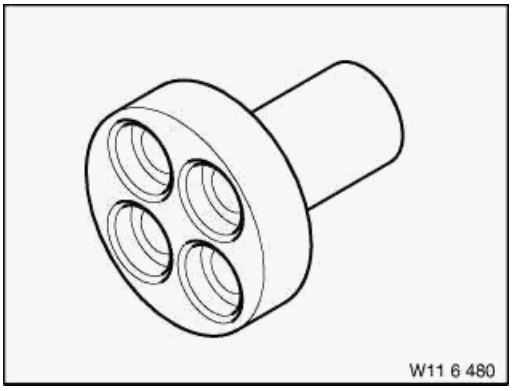
Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

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0 493 380 (11 6 480) Connector



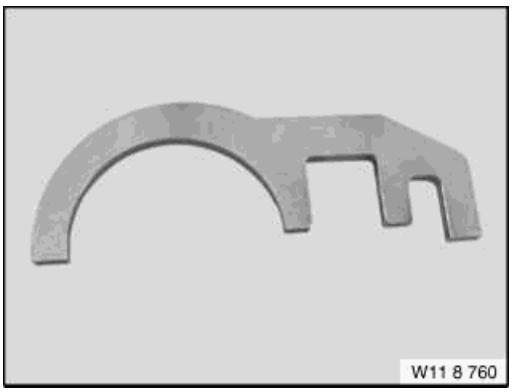
Common	Used in step 9
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

2 288 380 Locating stud



Common	Used in step 9
Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 112 (11 8 760) Gauge



Common	Used in step 9
Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	8 10
EGR controller	8 10

General repair instructions	Used in step
61 00 ... Safety information for handling vehicle battery	
61 20 ... Battery replacement information	
61 20 ... Notes on AGM battery	
61 00 ... Notes for disconnecting and connecting the vehicle battery	
61 12 ... Notes on intelligent battery sensor (IBS)	

Repair instructions	Used in step

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11 31 005 Check the timing of the camshaft(s)	1
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11 31 005 Check the timing of the camshaft(s)	1
61 35 ... Notes on ESD protection (Electro Static Discharge)	2
17 00 008 Draining and topping up coolant for high-temperature circuit	17
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17 00 008 Draining and topping up coolant for high-temperature circuit	17
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	17
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	17
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17 00 039 Bleed the cooling system and check for watertightness with the special tool (coolant circuit for low temperature)	17
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	17
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17 00 039 Bleeding the cooling system (B36, B38, B46, B48)	17
17 00 039 Bleeding cooling system (B37, B47)	17
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	17
17 00 039 Filling and bleeding the high-temperature cooling system vacuum filler device (B48)	17
17 00 008 Draining and topping up the high-temperature coolant circuit	17
17 00 008 Draining and topping up the high-temperature coolant circuit	17
17 00 016 Draining and topping up coolant circuit for Range Extender \PREMIUM	17
17 00 008 Draining and topping up the high-temperature coolant circuit	17
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	17
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Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	9
Exhaust-gas recirculation cooler seal on exhaust manifold	10
Exhaust-gas recirculation cooler seal on intake plenum	10

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11 31 005 Check the timing of the camshaft (s)

PRELIMINARY WORK

1 – Disconnecting all battery earth leads

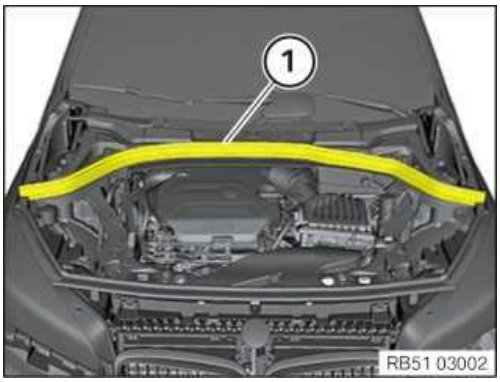


- See additional information.

2 – Remove the seal for the rear bonnet

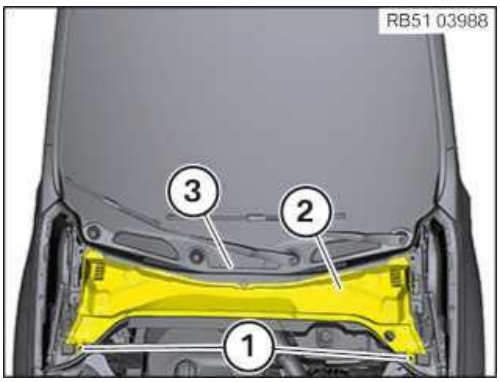
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Pull off rear bonnet seal (1) towards the top and remove.

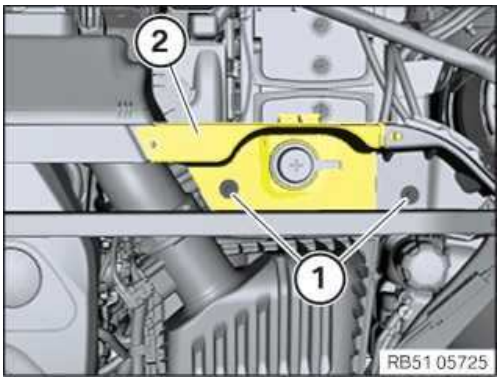
3 – Removing front cowl panel cover



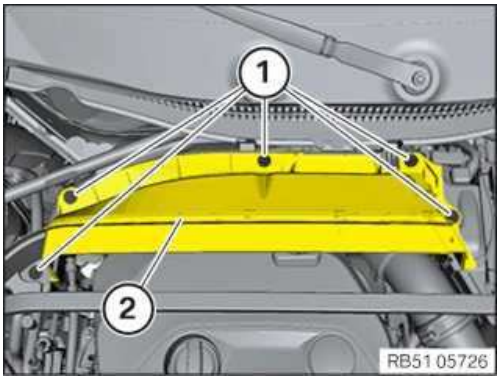
- Loosen the expanding rivet (1).
- Feed out and remove front cowl panel cover (2) from the rear cowl panel cover(3).

4 – Removing the upper bulkhead cover

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- Loosen screws (1).
- Guide out and remove the cover (2).

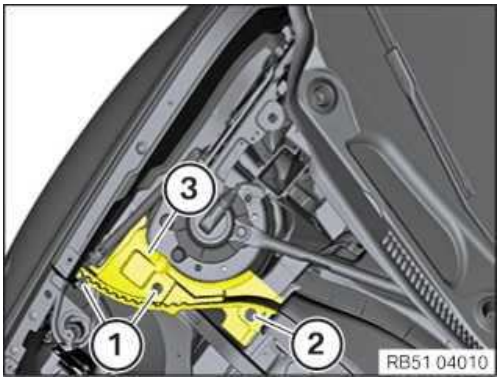


- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

5 – Remove suspension cross-brace

TECHNICAL INFORMATION

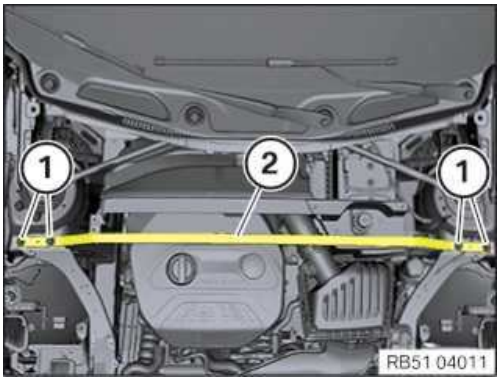
Driving without the strut brace/front end or tension strut is not permitted.



NOTICE

Description is for right component only. The procedure on the left side is identical.

- Loosen expanding rivet (1).
- Loosen screw (2).
- Remove the cover (3).



- Loosen screws (1).
- Remove strut brace (2).

6 – Removing the acoustic cover

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

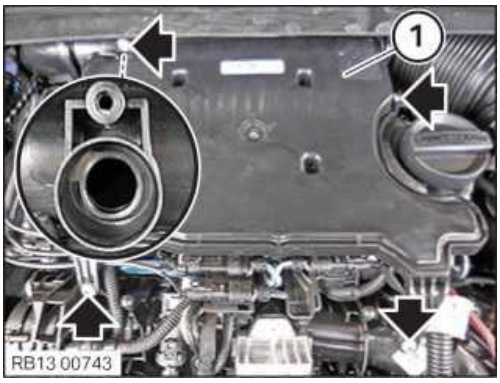
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

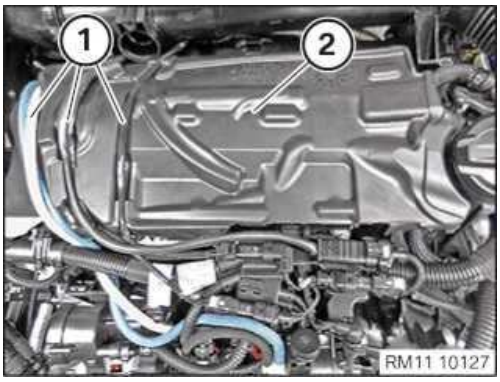
- Unclip the acoustic cover from the marked areas towards the top.

7 – Remove resonator



- Remove screws (arrows).
- Guide out and remove the resonator (1).

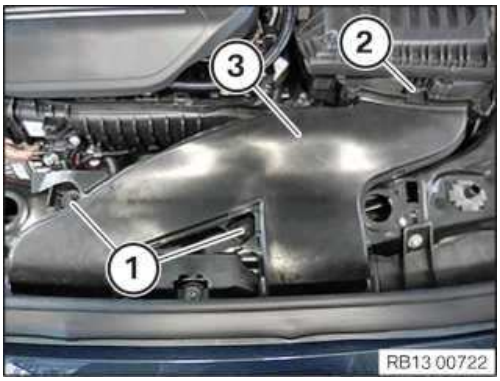
8 – Remove the acoustic cover for the injectors



- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

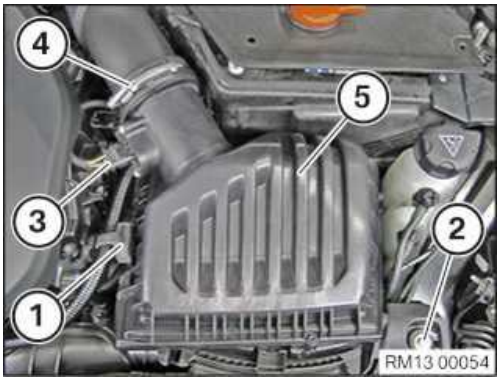
9 – Remove the intake neck for intake silencer housing

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- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

10 – Removing intake silencer housing

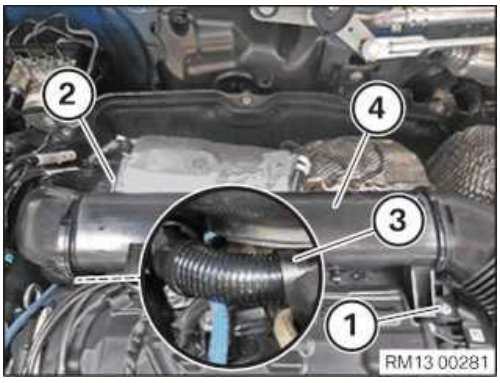


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

11 – Removing clean air pipe



- Detach clamp (1) on the clean air pipe.
- Pull off the clean air pipe from the intake silencer housing.

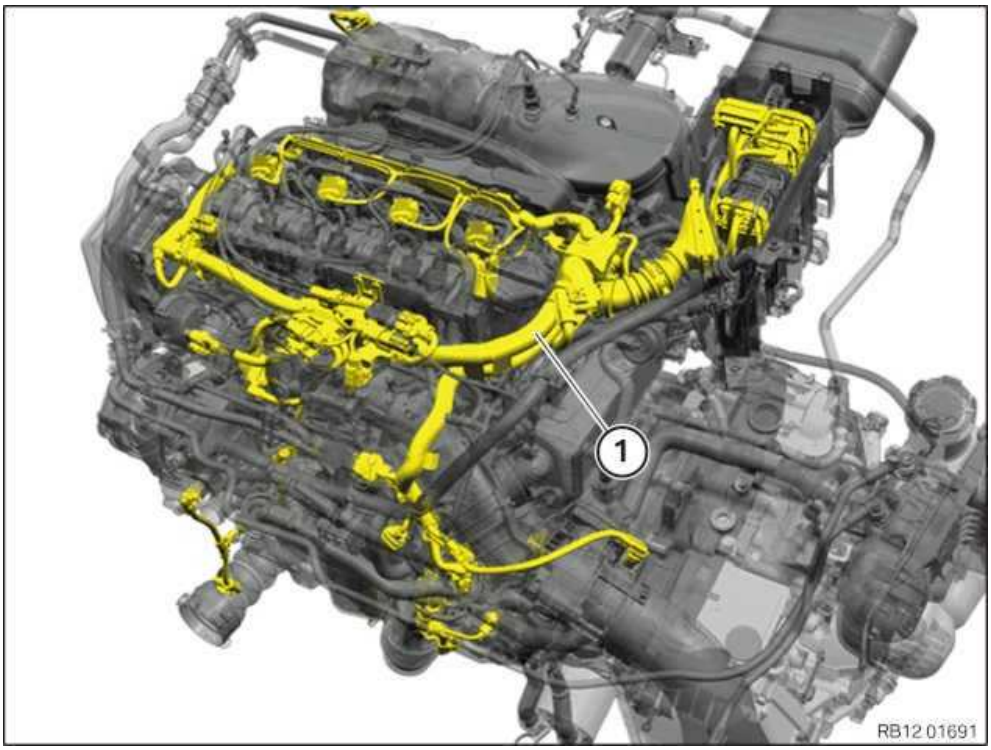


- Loosen screw (1).
- Loosen clamp (2).
- Unlock the ventilation line (3) and pull it off the cylinder head cover.
- Feed out clean air pipe and remove.

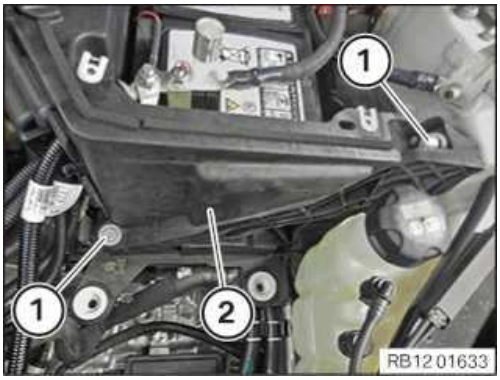
12 – Releasing the wiring harness section for the intake plenum

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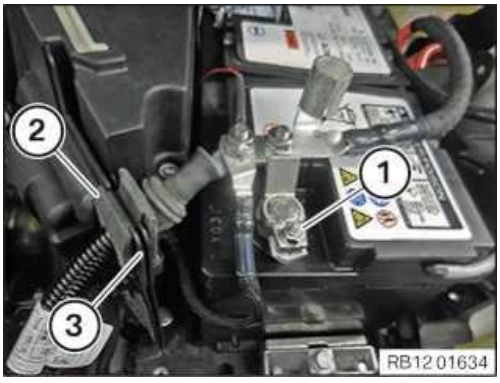
Overview: Wiring harness section for the engine



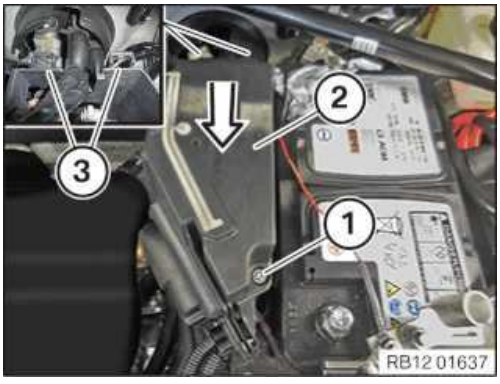
1 Wiring harness section for the engine



- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.

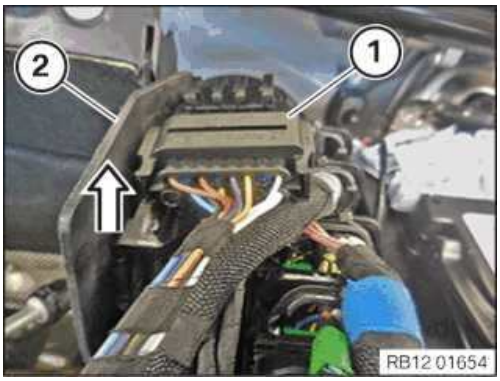


- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

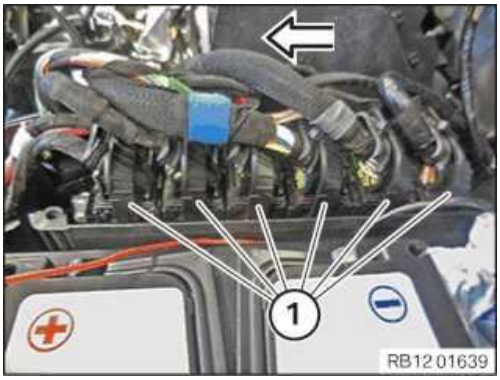


- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.

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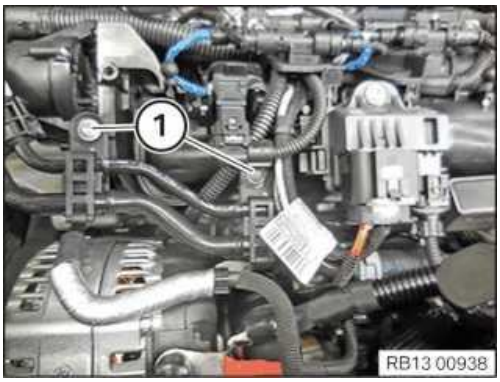
- Guide the connector (1)out of the electronics box (2) in the direction of arrow and remove it.
- Unlock and loosen connector (1).



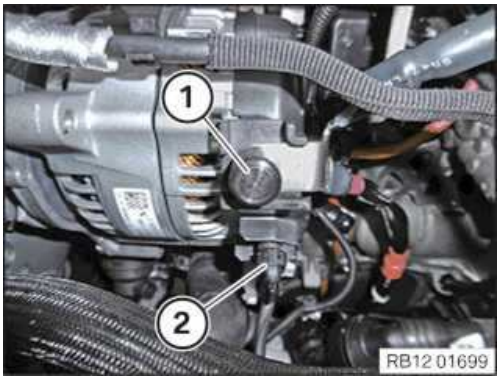
- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



- Unlock and loosen connector (1).

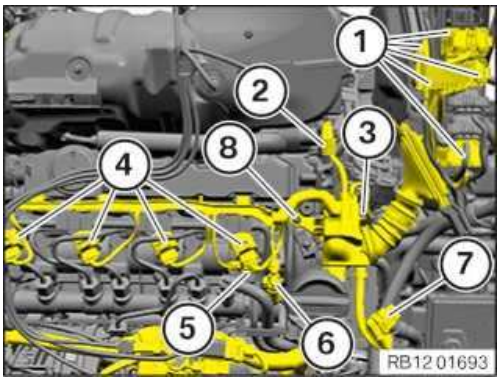


- Loosen screws (1).

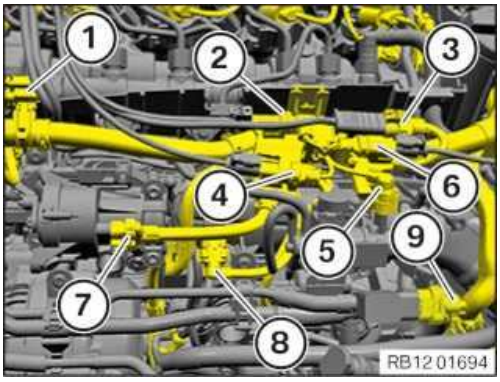


- Release the positive battery cable (1) on the alternator and place to one side.
- Unlock connector (2) and pull off.

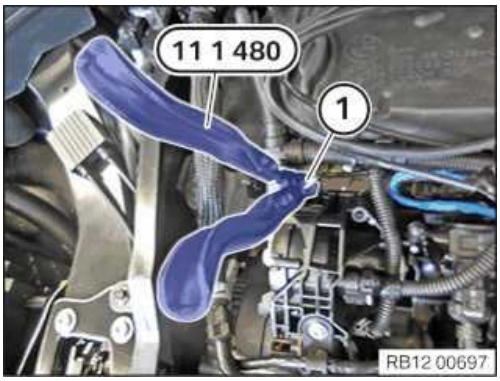
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- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock the connector (2) and disconnect it from the differential pressure sensor.
- Unlock the connector (3) and disconnect it from the exhaust-gas recirculation valve.
- Unlock the connector (4) and pull off from the injectors.
- Unlock the connector (5) and disconnect it from the camshaft sensor.
- Unlock the connector (6) and disconnect it from the fuel pressure regulator.
- Unlock connector (7) and pull off from hot film air mass meter.
- Loosen screw (8).

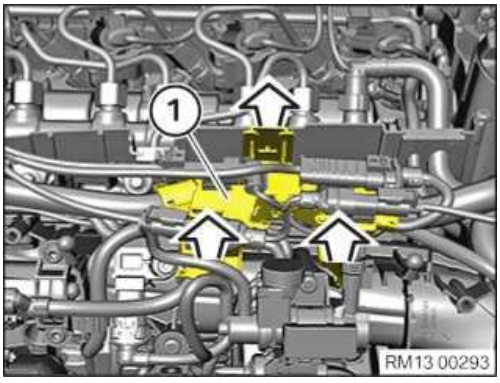


- Unlock connector (1) and pull off from the rail pressure sensor.
- Unlock the connector (2) and disconnect it from the exhaust temperature sensor before the diesel particulate filter.
- Unlock and disconnect the connector (3) from the front oxygen sensor.
- Unlock the connector (4) and disconnect it from the exhaust temperature sensor after the diesel particulate filter.
- Unlock and disconnect the connector (5) from the electric changeover valve.
- Unlock the connector (6) and disconnect it from the exhaust temperature sensor for the exhaust-gas recirculation cooler.
- Unlock the connector (7) and disconnect it from the servomotor for the swirl flaps.
- Unlock the connector (8) and pull it off the charging pressure sensor.
- Unlock the connector (9) and disconnect from the fuel pressure and temperature sensor.



- Unlock the connectors (1) of all glow elements with the special tool **0 490 796 (11 1 480)** and release them.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.

▶ **Removing the cable clips from the intake plenum**



- Detach the cable clip (1) in the direction of the arrow.
- Guide out the cable clip (1) in direction of arrow and set it aside.

13 – Removing the intake plenum

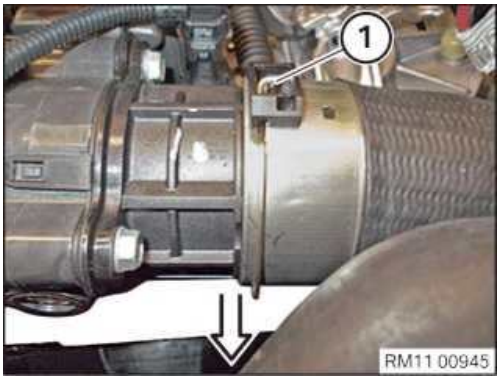
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TECHNICAL INFORMATION

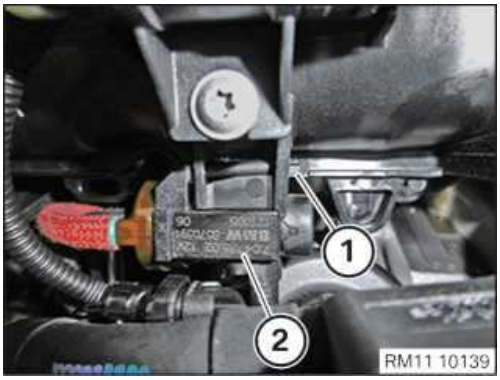
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



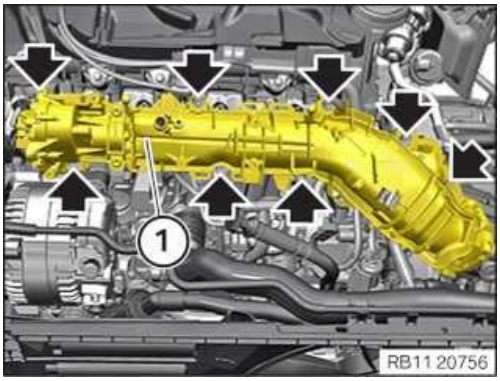
- Unlock the lock (1).



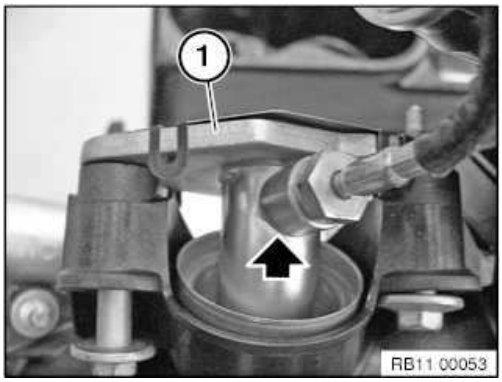
- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.



- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



- Release the screws (arrows) from the intake plenum (1).
- Guide the intake plenum (1) out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

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14 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

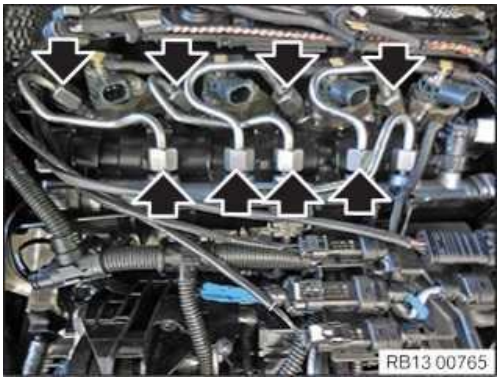
TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release the high pressure lines (arrows) with the special tool .
- Catch and dispose of escaping fuel.
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool .

15 – Detaching leakage oil line from injector

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Contaminant or foreign body.

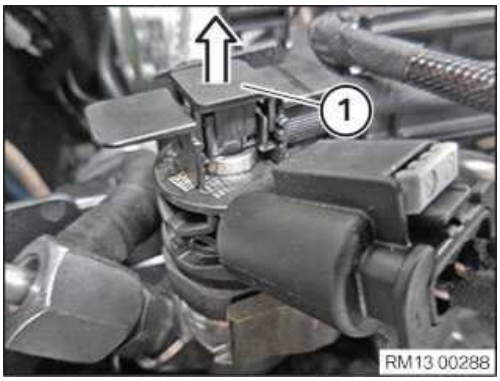
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

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- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

16 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

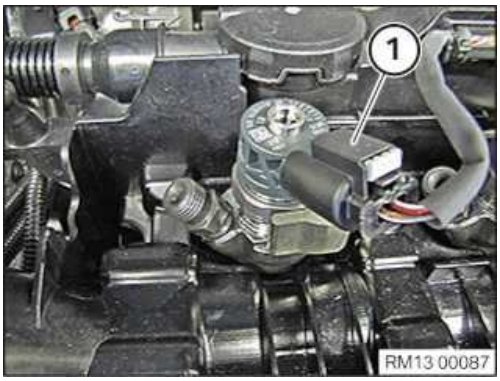
Electrostatic discharge.

Damage to or destruction of electrical components.

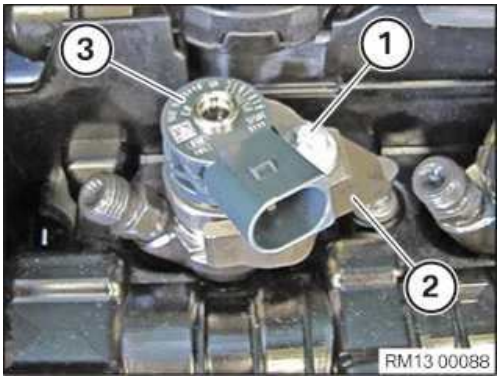
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.



- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

▶ **Loosen stuck injectors**

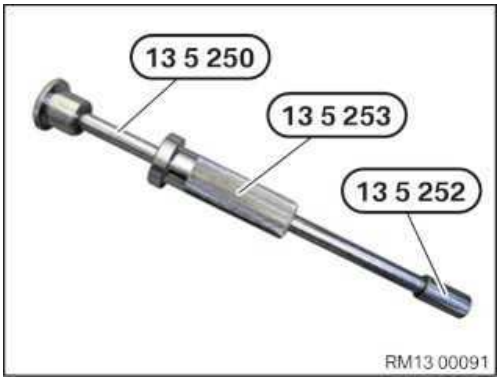
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RISK OF DAMAGE

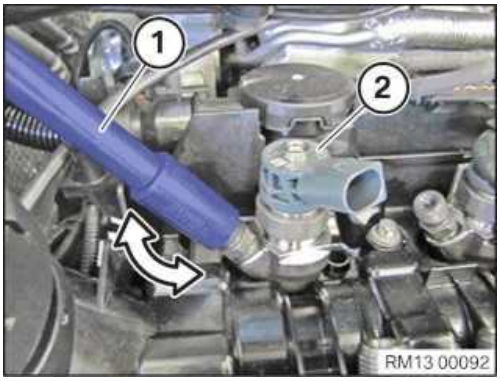
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)**back onto the special tool **0 493 321 (13 5 250)**.



- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

17 – Remove high-pressure rail

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

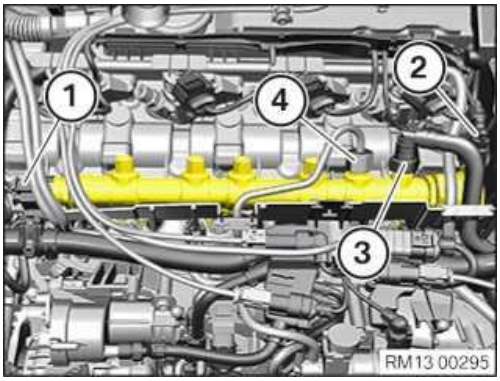
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TECHNICAL INFORMATION

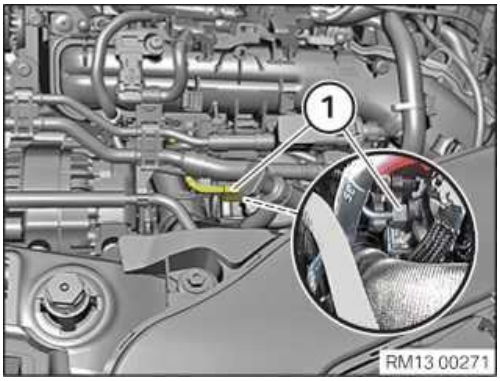
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

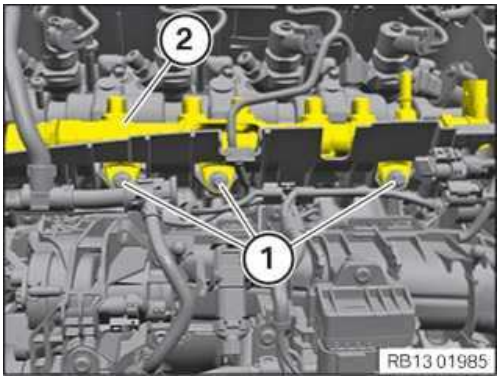
Reset special tool in early to avoid bending pressure lines.



- Unlock and disconnect connector (1).
- Unlock and disconnect connector (2).
- Unlock and release fuel line (3).
- Loosen union nut (4) with special tool .
- Reset special tool early on to avoid bending pressure lines.



- Slacken the union nut (1) on the high pressure pump.



- Loosen screws (1).
- Carefully thread out and remove the rail (2).
- Make sure the pressure line of the high pressure pump is not bent.

18 – Remove differential pressure sensor

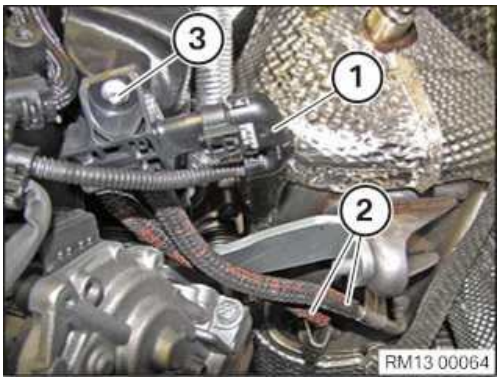
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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

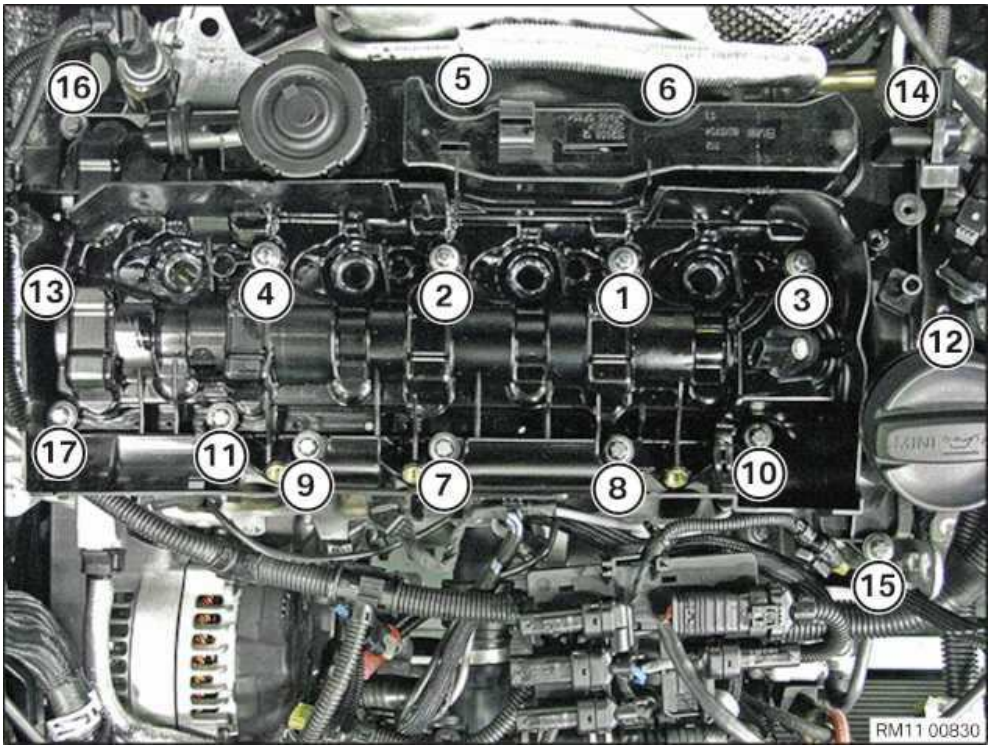
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

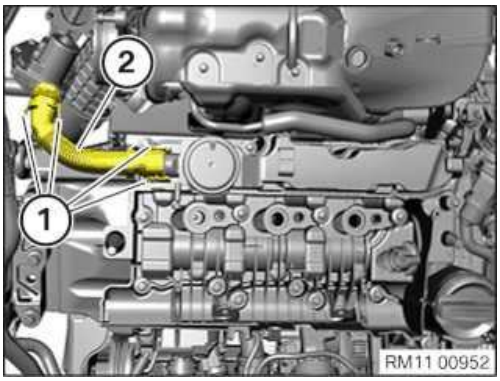
19 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover

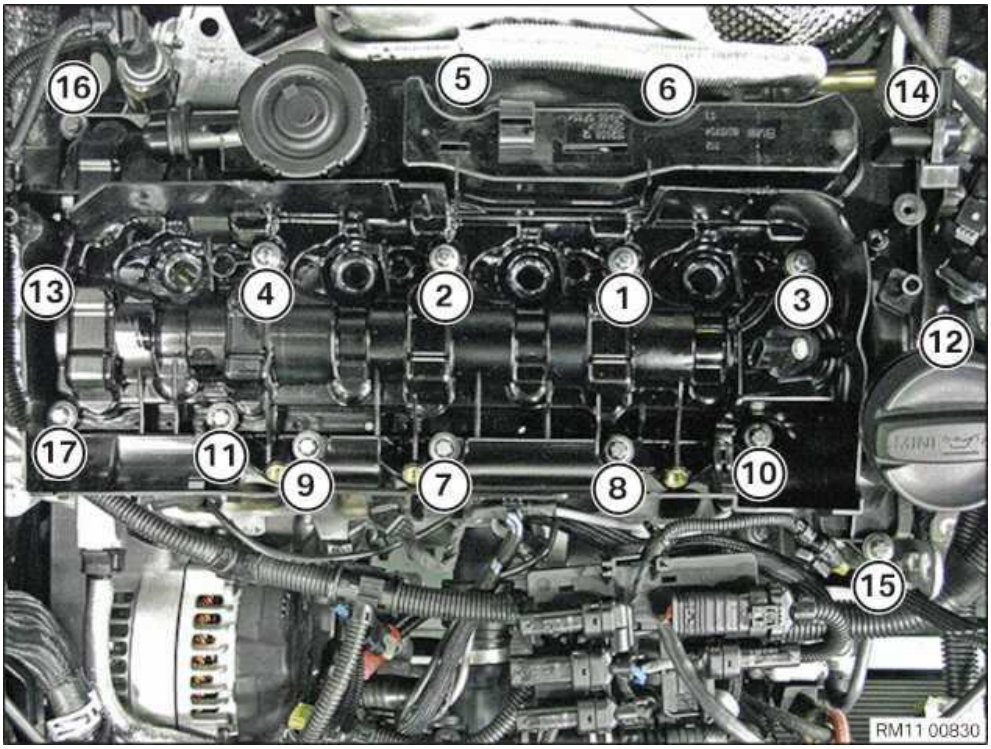


1 to 16 screws of the cylinder head cover.

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- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).



- Loosen screws in the order (17) to (1).
- Remove cylinder head cover by lifting it out.

20 – Remove front right wheel

TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

TECHNICAL INFORMATION

Strictly observe the specified procedure to prevent clamping errors and imbalance.



- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

21 – Removing the front right wheel arch cover

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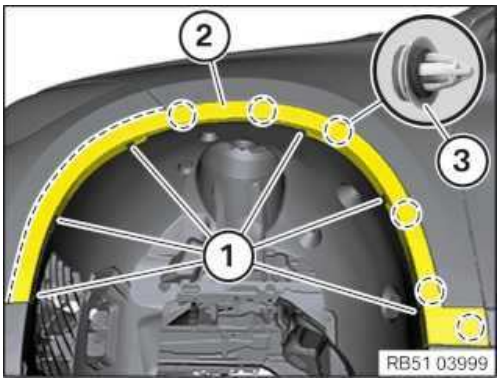
▶ **Remove the front wheel arch trim**

NOTICE

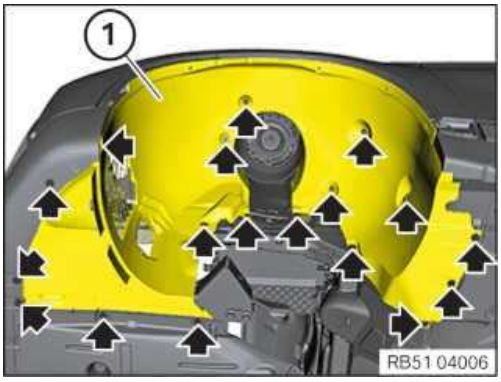
To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.

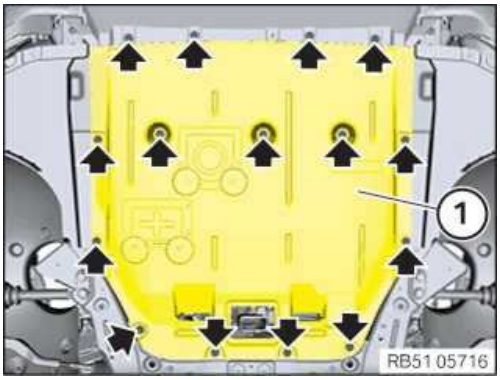


NOTICE

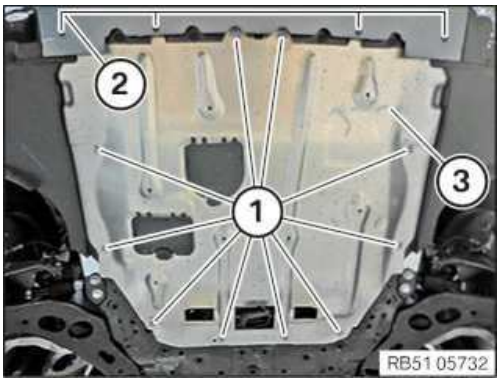
Description is for left component only. Procedure on the right side is identical.

- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

22 – Removing the front underbody protection



- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.



- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

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23 – Checking camshaft timing



- Remove protective cap (1) from oil sump.

- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

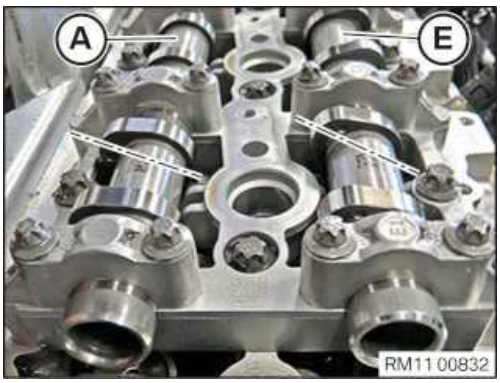
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

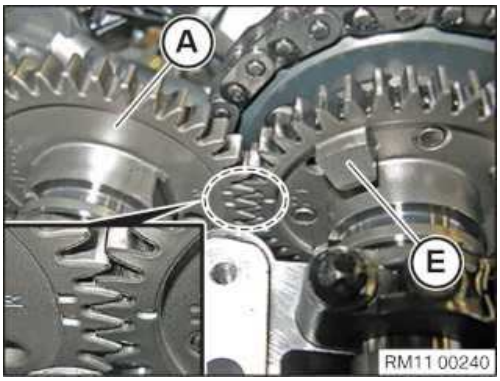


- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.

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- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

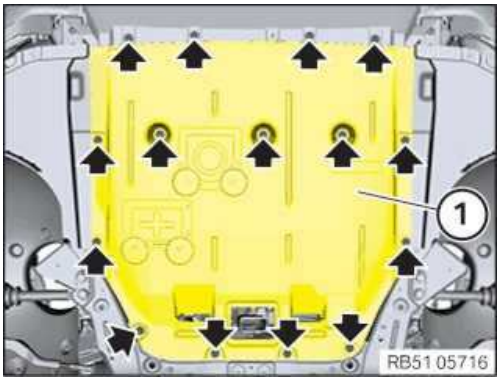
- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.



- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

POSTPROCESSES

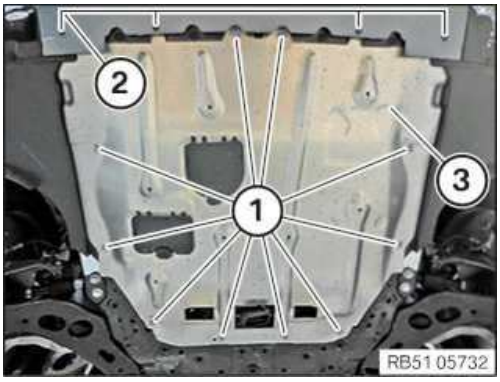
24 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm



- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

Underbody protection front

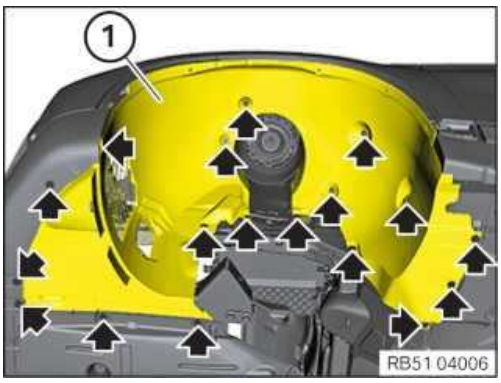
Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

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25 – Installing the front right wheel arch cover

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

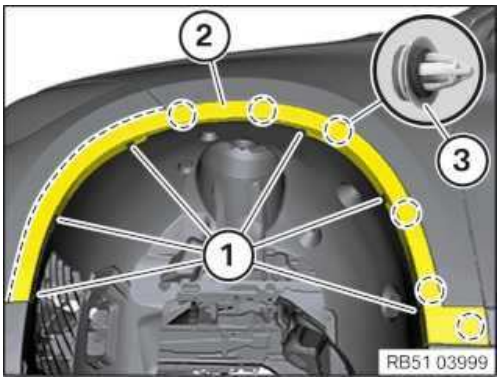
▸ **Installing front wheel arch trim**

NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Check the clips (3) for damage and renew where required.
  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

26 – Installing the front right wheel

▸ **Clean the contact surfaces between the brake disc and the wheel rim**

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TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

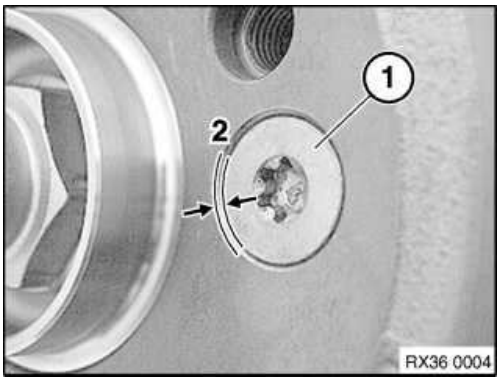
- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.



- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

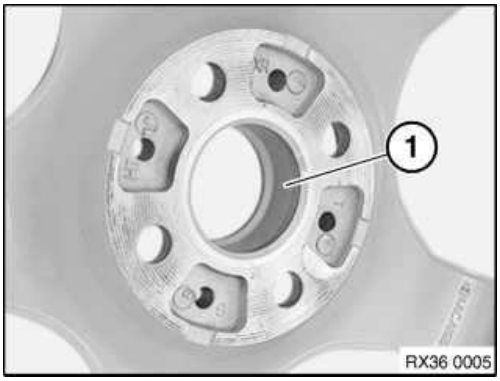


- Check the mounting bolt for the brake disc (1) for secure fit.

  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

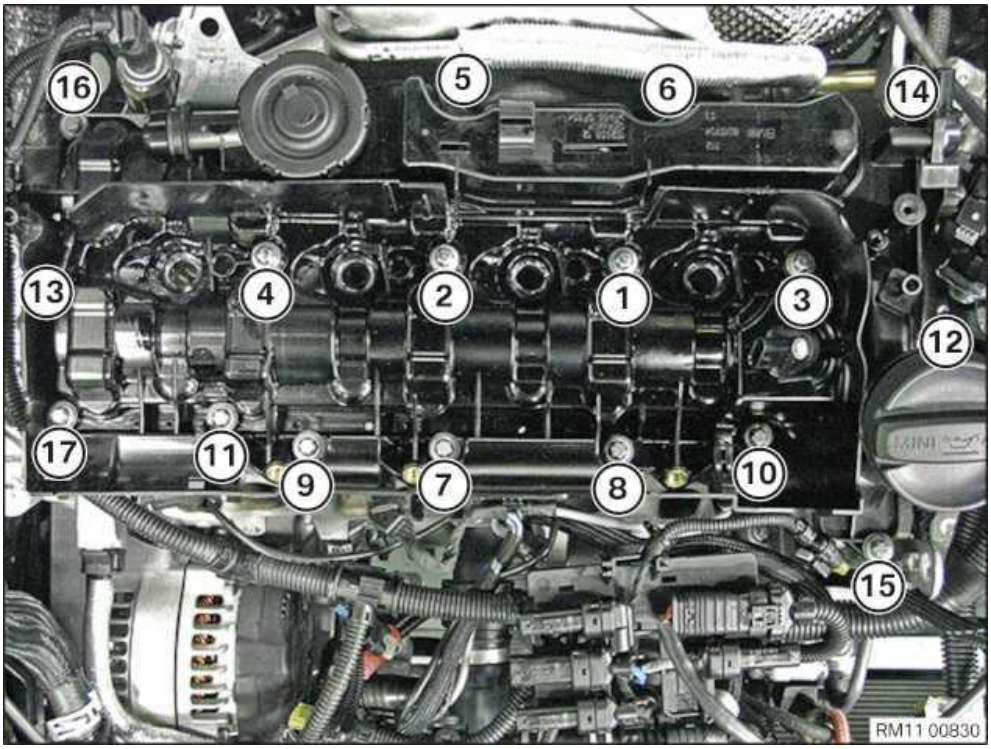
  Parts: Wheel bolts
- Clean the wheel bolts and check the threads for damage. Renew the wheel bolts as needed.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

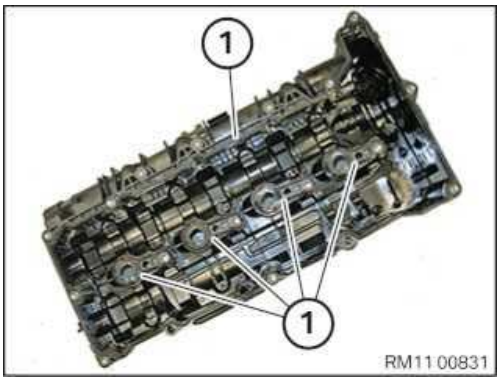
27 – Installing cylinder head cover

Overview: Screw connection of the cylinder head cover



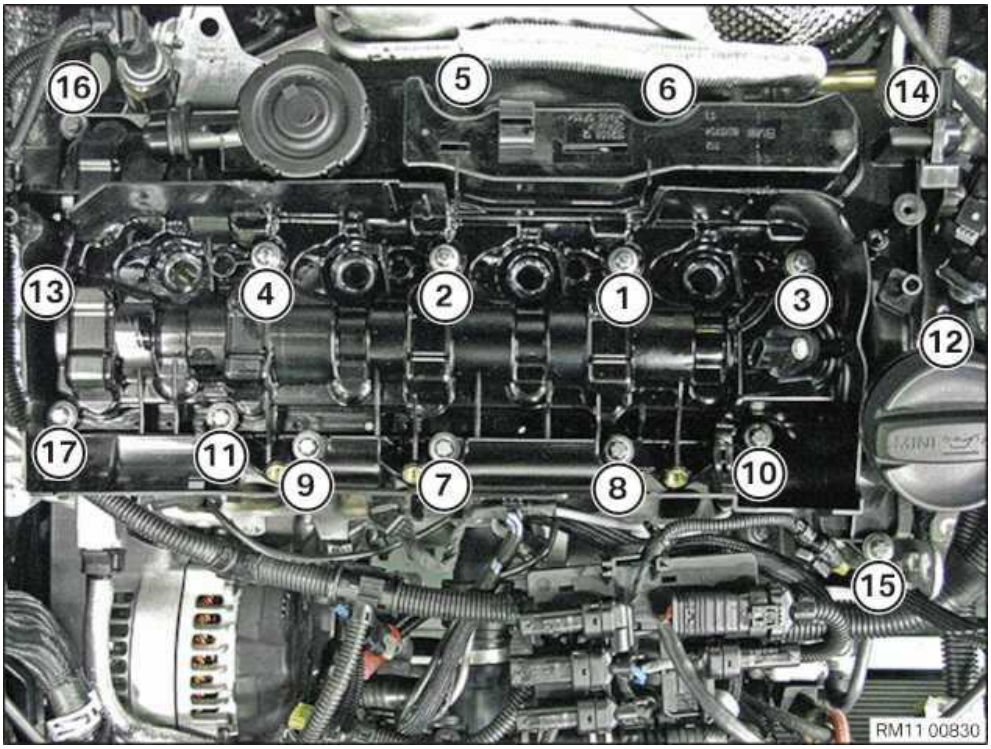
1 to 16 screws of the cylinder head cover.

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- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket

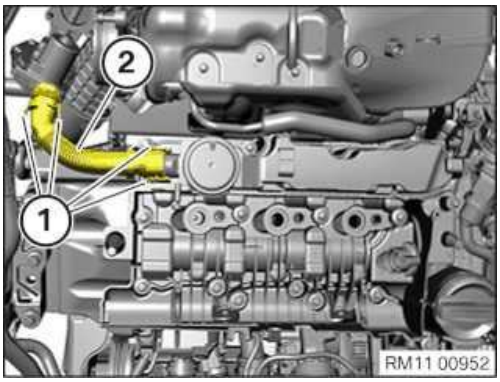


- Install cylinder head cover.
- Tighten screws in the order (1) to (17).

Cylinder head cover to cylinder head

M6		Tightening torque.	8, Nr

-

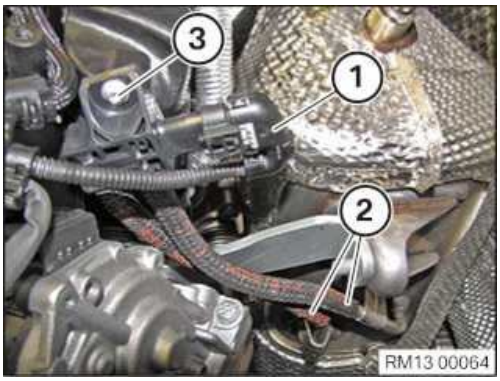


- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

28 – Installing differential pressure sensor

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- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

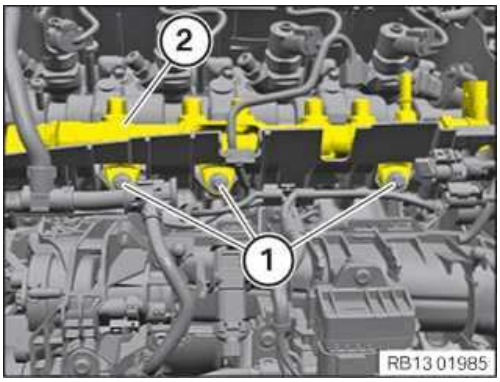
Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

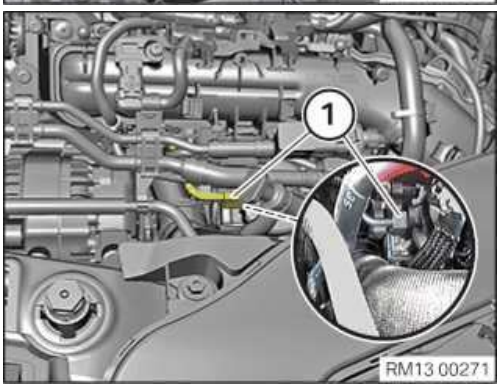
29 – Installing the rail



- Carefully insert and install the rail (2).
- Tighten the screws (1).

Rail on cylinder head cover

Torx screw M8x25		Tightening torque	19 Nm



TECHNICAL INFORMATION

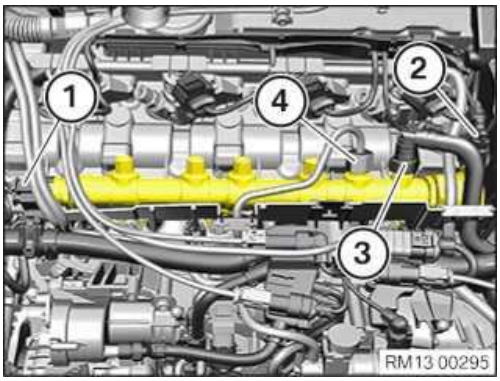
Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten union nut (1).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

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TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten union nut (4) with special tool .

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Connect and lock the fuel line (3).

  Fuel line (3) must engage audibly.
- Connect connectors (2) and lock.

  The connector (2) must engage audibly.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

30 – Installing injectors of injection system

▸ **Cleaning the injector shafts**

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.



- Wear safety goggles.

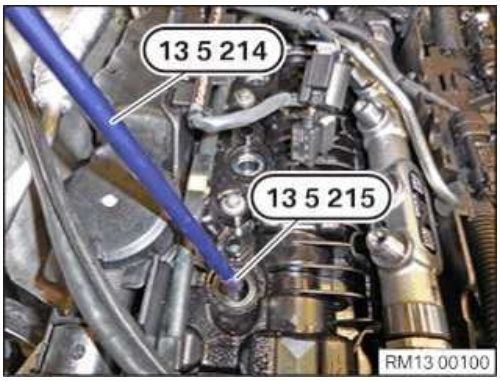
RISK OF DAMAGE

Contaminant or foreign body.

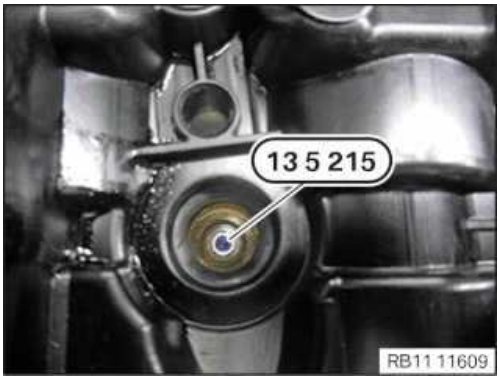
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.



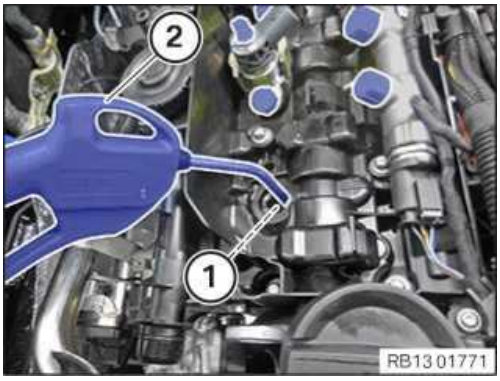
- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.



- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.

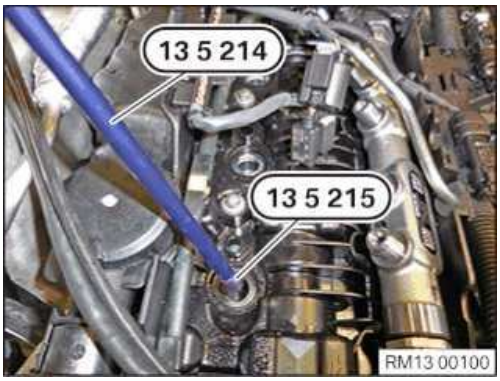


- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.



- Blow out injector shaft (1) with air gun (2).

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- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

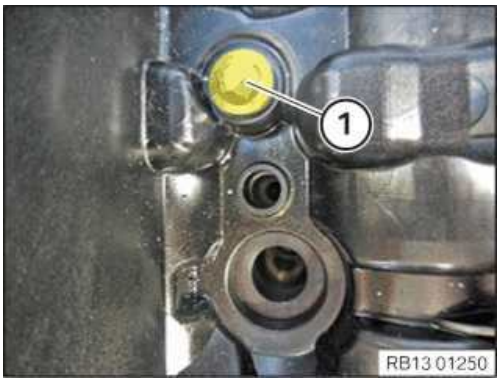
▸ **Check the placement of the clamping claw**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▸ **Prepare the injector for installation**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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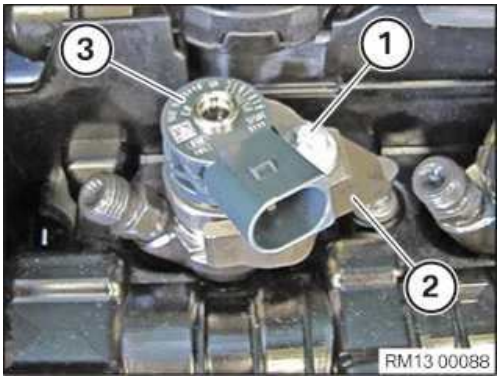
- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring

- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

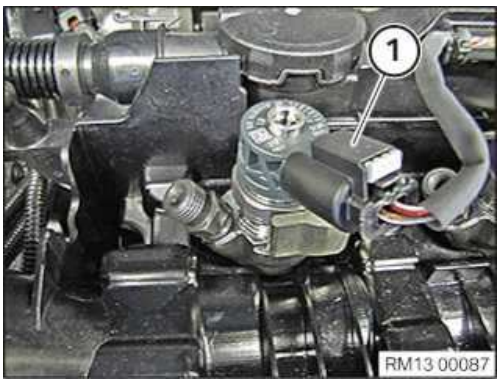
Injector lubricating grease	50 g, Can	83230441070



- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

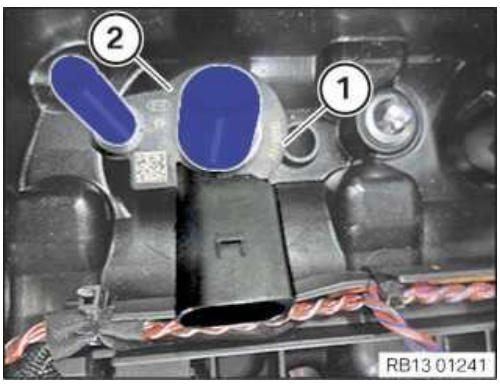
▸ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



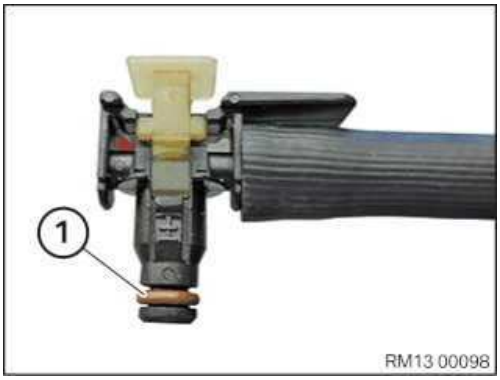
- Read off the adjustment value (1) on the new injector (2).

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- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

31 – Connect the leakage oil line on the injector



- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.



- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

32 – Installing high pressure lines between rail and injectors

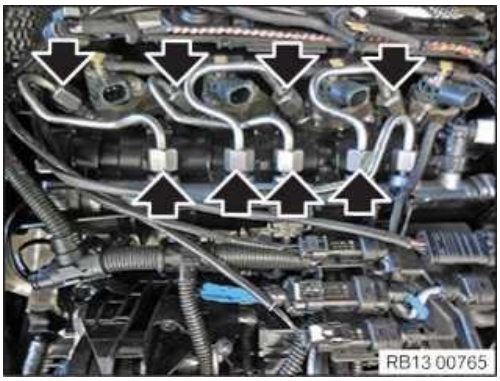
TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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- Remove special tool .
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

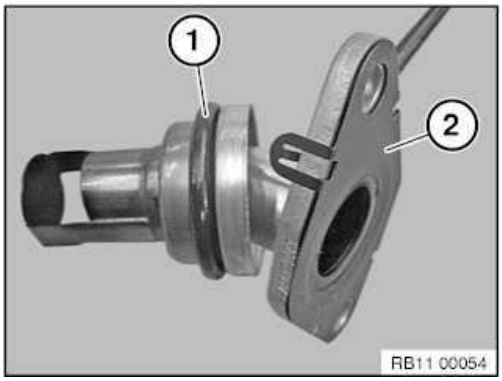
- Tighten the high pressure lines (arrows) with the special tool .

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

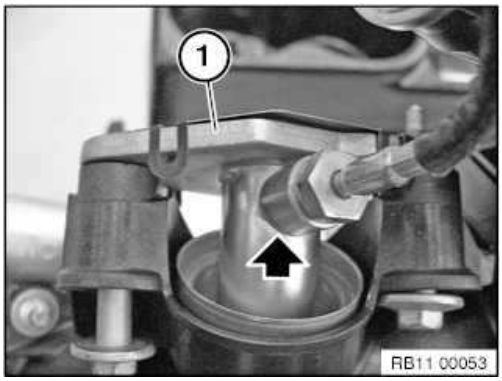
33 – Installing the intake plenum



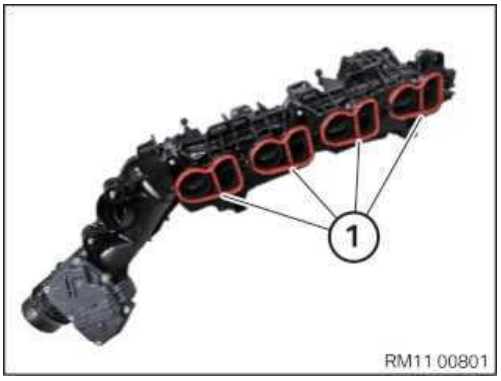
- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position the seal (2) and clip it in.



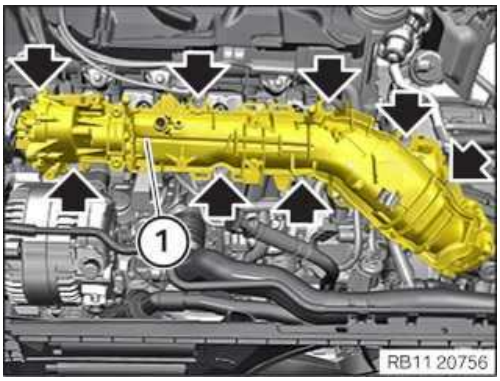
- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (1).

  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.

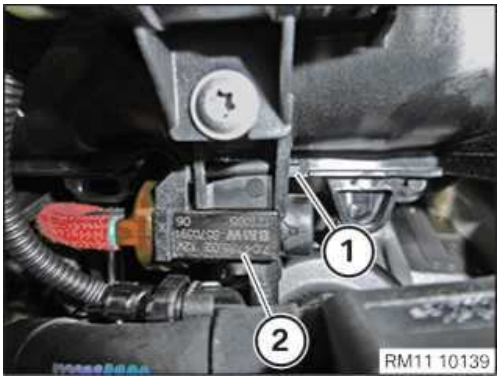
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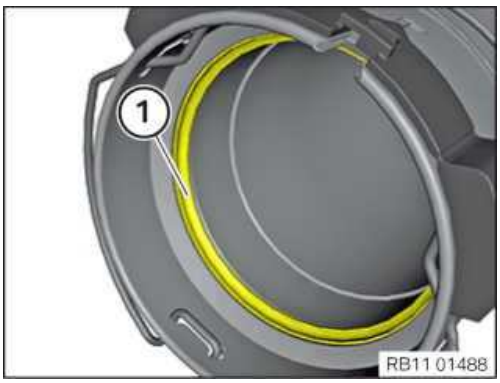
- Guide in and install intake (1) plenum.
- Tighten screws (arrows).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm

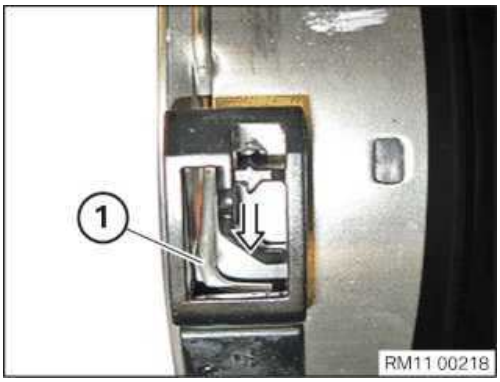


- Install the electric changeover valve (2) in the holder on the plenum from left to right.
- Lock (1) must engage audibly.

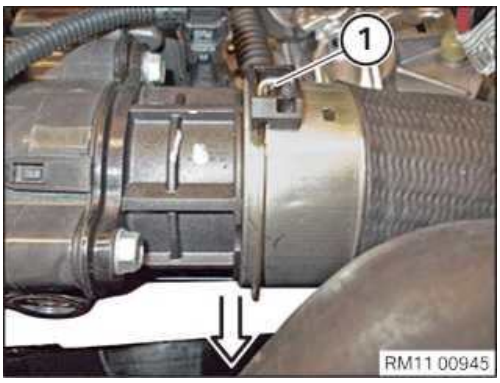


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring



- Engage the lock (1) on the bracket (arrow).



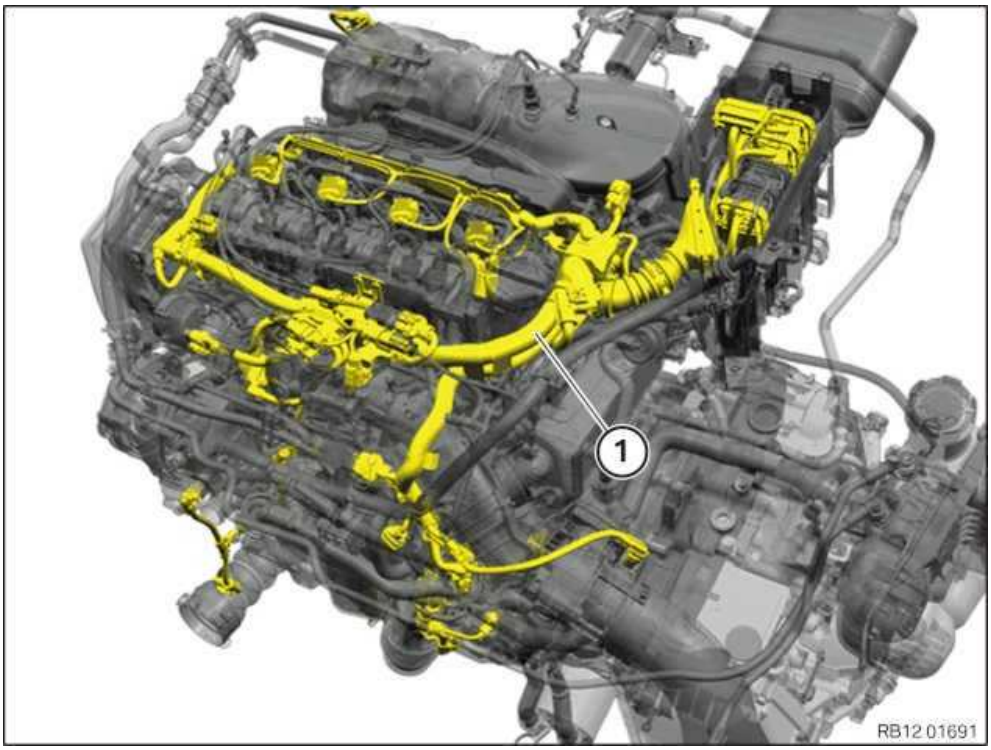
- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

34 – Fastening the wiring harness section for the intake plenum

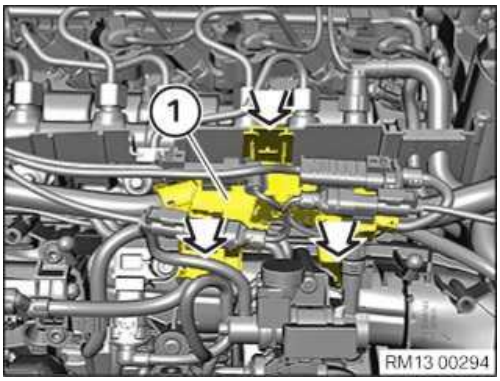
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Overview: Wiring harness section for the engine

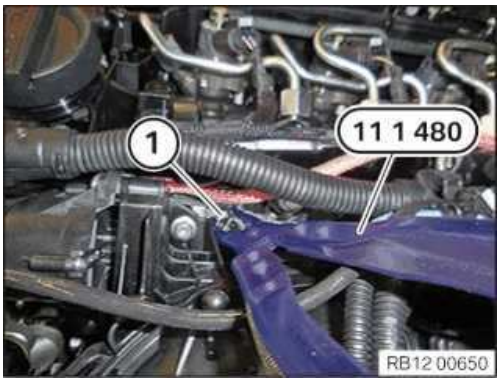


1 Wiring harness section for the engine

▶ **Installing the cable clip for the intake plenum**

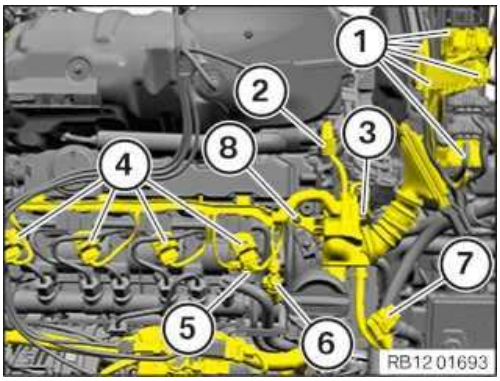


- Insert and install the cable clip (1) in the direction of the arrow.
- Make sure the cable clip (1) is fitted correctly.



- Connect and lock the connector (1) on the glow elements.
  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.

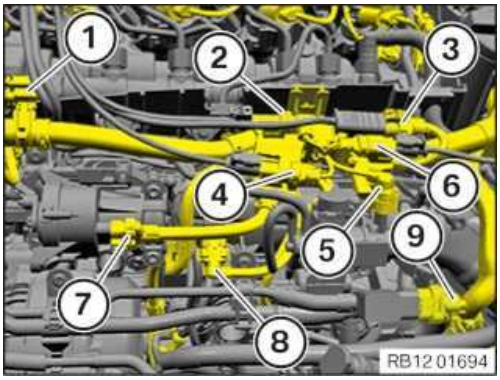
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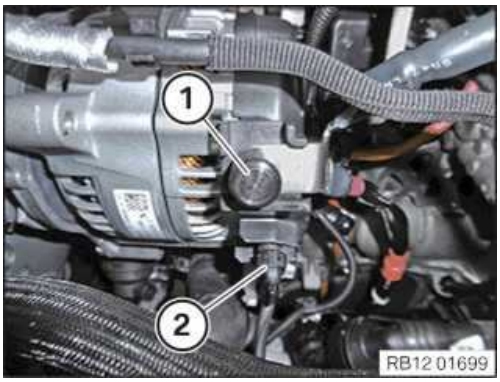
- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the DME control unit and remove the integrated supply module (PDM).
- Attach connector (2) to the differential pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust-gas recirculation valve and lock audibly.
- Attach connector (4) to the injectors and lock it audibly.
- Attach connector (5) to the camshaft sensor and lock it audibly.
- Attach connector (6) to the fuel pressure regulator and lock it audibly.
- Connect and audibly lock the connector (7) to the hot film air mass meter.
- Tighten down screw (8).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm



- Connect the connector (1) to the rail pressure sensor and lock it audibly.
- Attach connector (2) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (3) to the front oxygen sensor and lock audibly.
- Attach connector (4) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Connect the connector (5) to the electric changeover valve and lock audibly.
- Attach connector (6) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (7) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (8) to the charging pressure sensor and lock it audibly.
- Attach connector (9) to the fuel pressure and temperature sensor and lock it audibly.

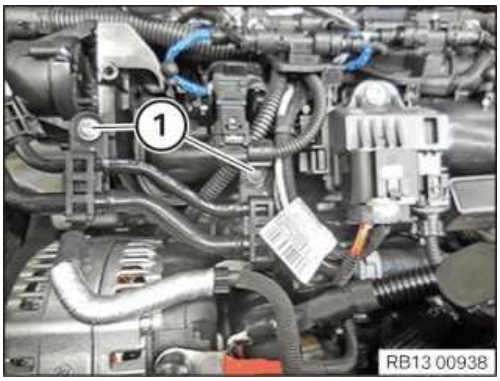


- Connect and lock the connector (2).

  Lock must snap audibly into place.
- Connect the positive battery cable (1) and tighten.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

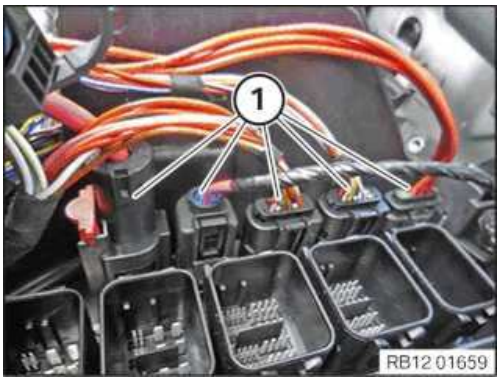


- Position the fuel line.
- Tighten the screws (1).

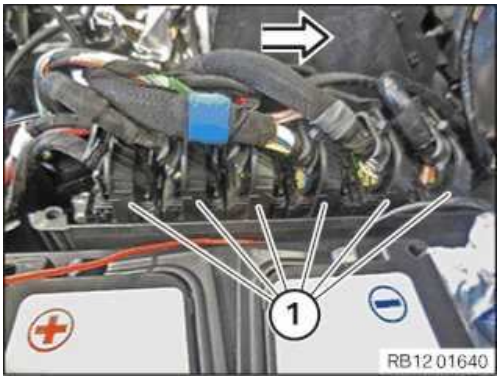
Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

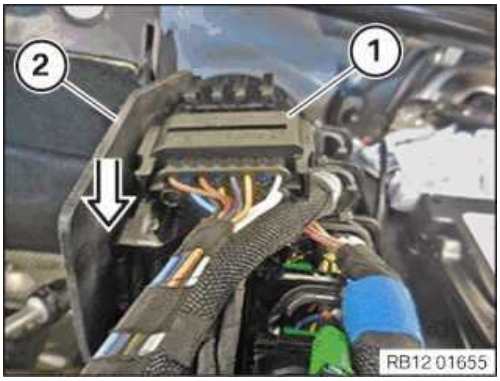
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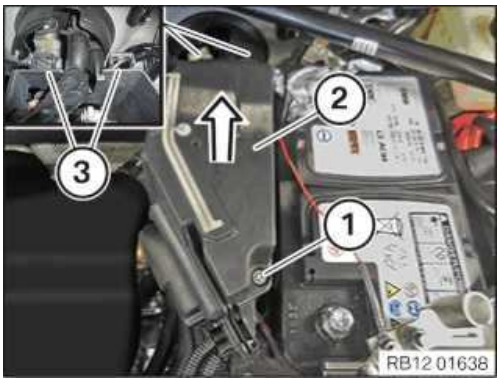
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



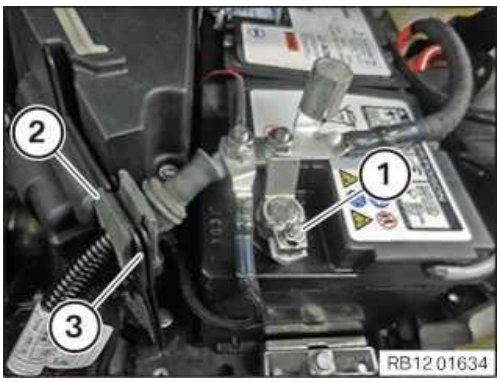
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert and install the cover (2) into the guides (3) in the direction of the arrow.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

RF5x26.5		Tightening torque	2,5 Nm

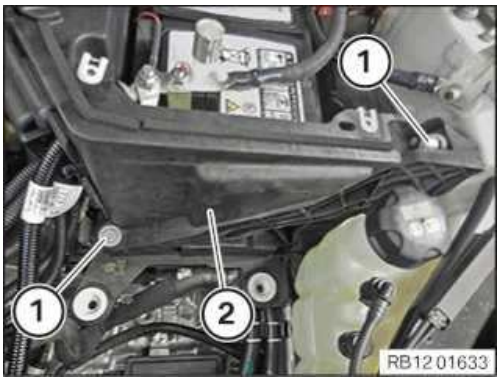


- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

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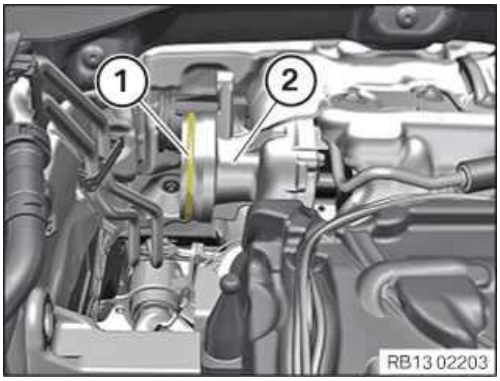


- Feed in and install tension strut (2).
- Tighten the screws (1).

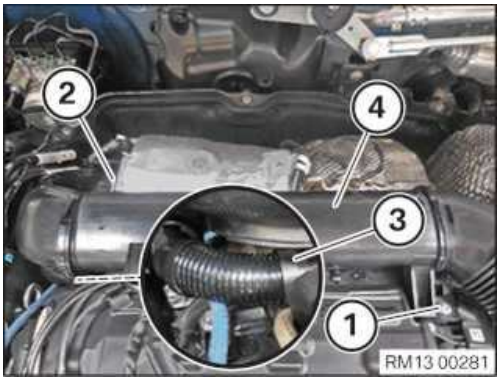
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

35 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.



- Feed in clean air pipe and install.
- Connect clean air pipe to the exhaust turbocharger and lock audibly in the clamps (2).
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Connect ventilation line (3) to the cylinder head cover and lock audibly.



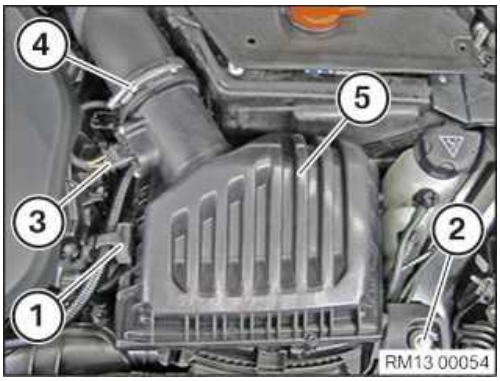
- Mount clean air pipe onto the intake filter housing.
- Tighten clamp (1) on the clean air pipe.

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

36 – Installing intake silencer housing

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- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

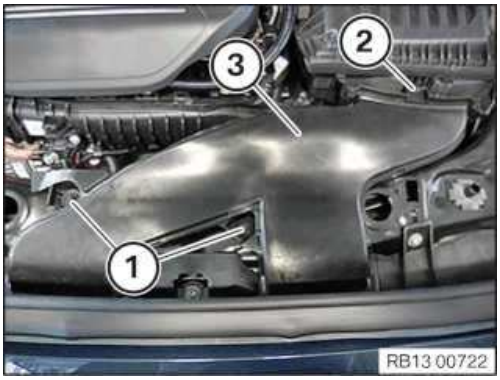
- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

37 – Install the intake neck for the intake filter housing

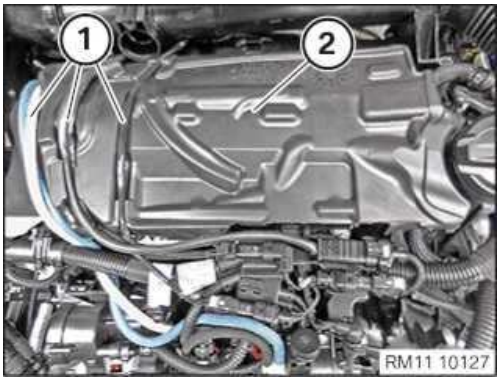


- Insert and install the intake neck (3).
  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

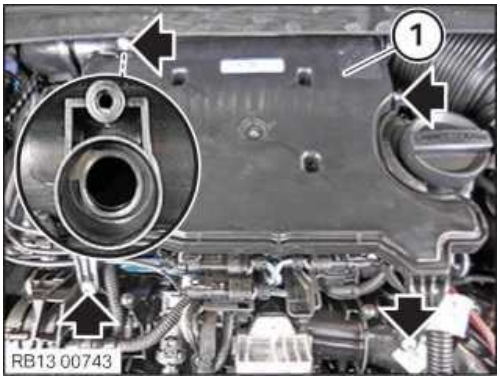
M6		Tightening torque	8 Nm

38 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the vehicle wiring harness (1) in the brackets.

39 – Install resonator



- Insert and install the resonator (1).
- Renew the bolts (arrows).
  Parts: Bolts
- Tighten screws (arrows).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

40 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Check for correct installation of all rubber mounts in the acoustic cover (1).

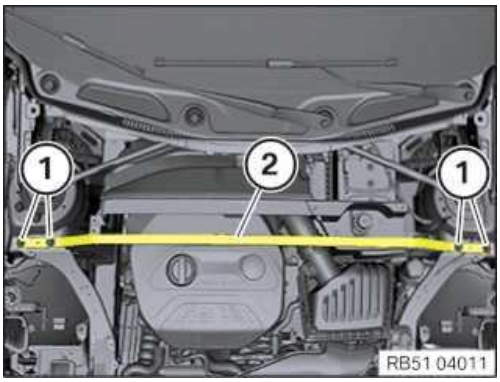


- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

41 – Install strut brace

TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.



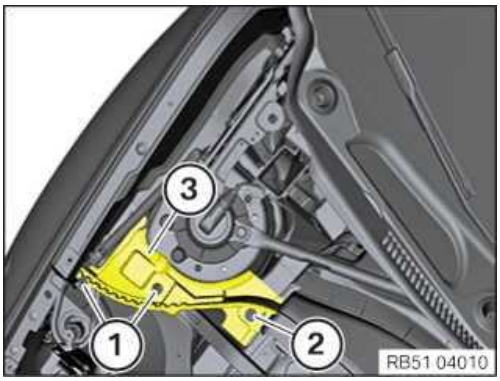
- Install the strut brace (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-brace to spring strut dome

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

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NOTICE

Description is for right component only. The procedure on the left side is identical.

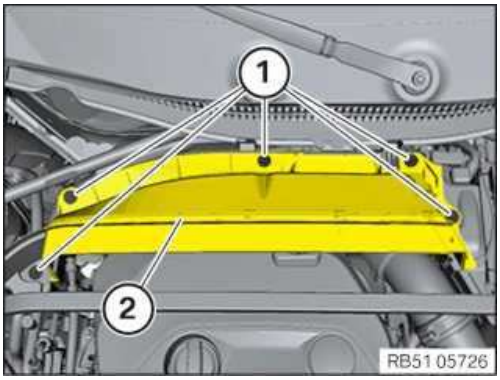
- Install the cover (3).
- Tighten down screw (2).

Cover on body

Hexagon screw		Tightening torque	3 Nm

- Install the expanding rivet (1).

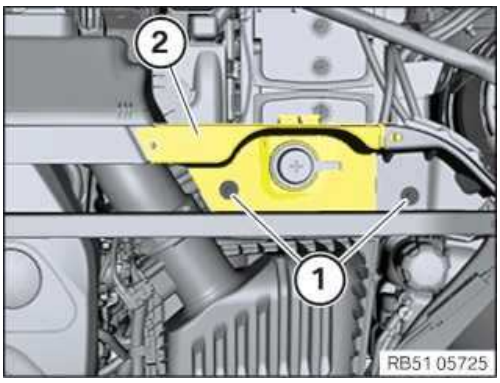
42 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Cover of top bulkhead

Screw		Tightening torque	2,6 Nm

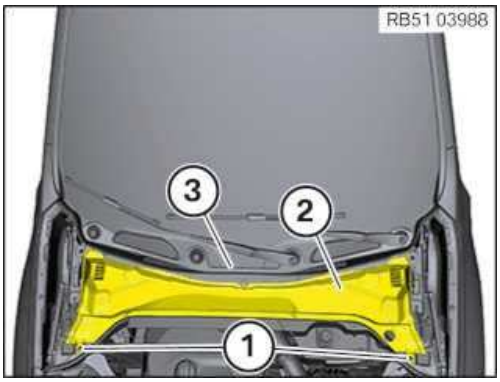


- Guide in and install cover (2).
- Tighten down screw (1).

Cover of remote positive terminal

Screw		Tightening torque	2,6 Nm

43 – Installing front cowl panel cover



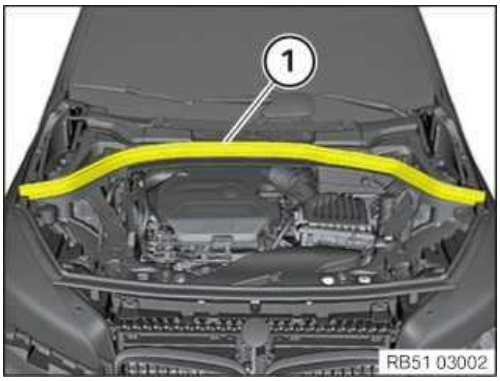
- Insert and install cowl panel cover at front (2) into cowl panel cover at rear (3).
- Check cowl panel cover at front is correctly seated (2).
- Secure expanding rivet (1).

44 – Install the seal for the bonnet

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

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- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

45 – Disconnecting all battery earth leads



- See additional information.

Additional Information

Overview of Tightening Torques

Underbody protection front — Used in step 24

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Wheel arch cover to body — Used in step 25

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body — Used in step 25

Plastic nut		Tightening torque	3 Nm

Brake disc to front wheel hub — Used in step 26

M8	Renew screw.		16 Nm

Wheel bolts — Used in step 26

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Cylinder head cover to cylinder head — Used in step 27

M6		Tightening torque.	8,5 Nm

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Differential pressure sensor to holder

Used in step 28

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor

Used in step 28

Clamp 15–19mm		Tightening torque	3 Nm

Rail on cylinder head cover

Used in step 29

Torx screw M8x25		Tightening torque	19 Nm

High pressure line between high pressure pump and rail

Used in step 29

High-pressure pipe		Tightening torque	28 Nm

Clamping claw facing to cylinder head cover

Used in step 30

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 30

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

High pressure lines between injector and rail

Used in step 32

High pressure lines		Tightening torque	28 Nm

Intake plenum to cylinder head

Used in step 33

M6		Tightening torque	11 Nm

Wiring harness to cylinder head cover

Used in step 34

TS5x20		Tightening torque	3,5 Nm

Positive battery cable to alternator

Used in step 34

M8		Tightening torque	19 Nm

Fuel line to intake plenum

Used in step 34

TS6x20		Tightening torque	5 Nm

Cover to electronics box

Used in step 34

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery

Used in step 34

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray

Used in step 34

M8		Tightening torque	19 Nm

Clean air pipe to cylinder head cover

Used in step 35

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing

Used in step 35 36

Clamp		Tightening torque	3 Nm

Intake silencer housing to lock bridge

Used in step 36

M6X30		Tightening torque	8 Nm

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Intake neck to cross connection

Used in step 37

M6		Tightening torque	8 Nm

Resonator to manifold and clean air pipe

Used in step 39

Screw TS6	Renew screw.	Tightening torque	5 Nm

Cross-brace to spring strut dome

Used in step 41

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

Cover on body

Used in step 41

Hexagon screw		Tightening torque	3 Nm

Cover of top bulkhead

Used in step 42

Screw		Tightening torque	2,6 Nm

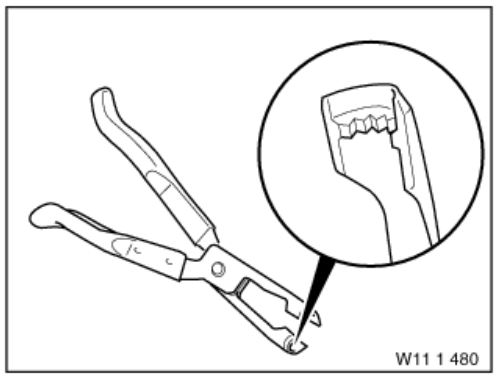
Cover of remote positive terminal

Used in step 42

Screw		Tightening torque	2,6 Nm

Overview of Special Tools

0 490 796 (11 1 480) Pliers



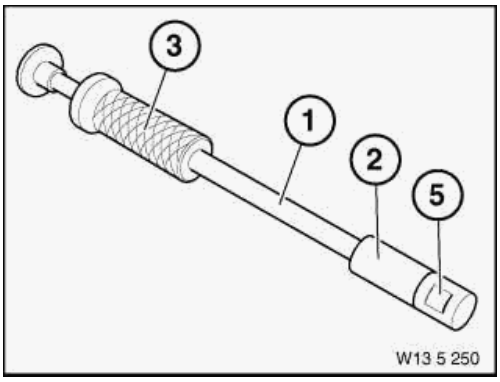
Common

Used in step 12

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

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0 493 321 (13 5 250) Puller



Common

Used in step 16

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

0 493 339 (13 5 252) Bush



Common

Used in step 16

Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 340 (13 5 253) Weight



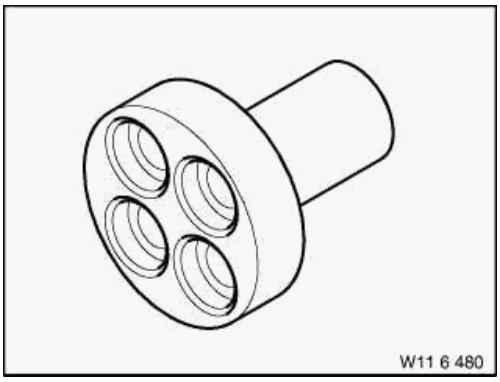
Common

Used in step 16

Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 493 380 (11 6 480) Connector



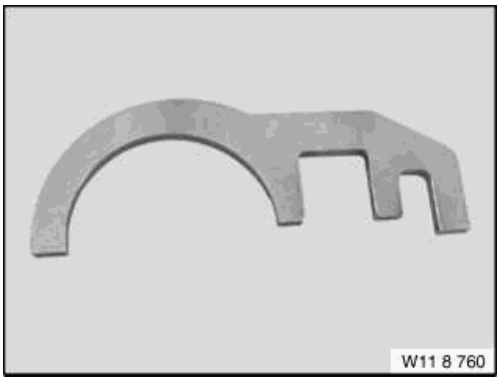
Common	Used in step 23
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

2 288 380 Locating stud



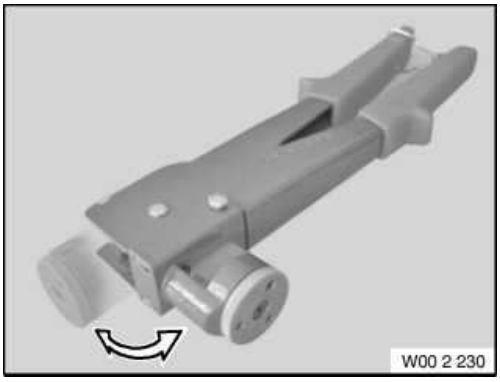
Common	Used in step 23
Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 112 (11 8 760) Gauge



Common	Used in step 23
Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 521 (00 2 230) Pliers



Common	Used in step 25
Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

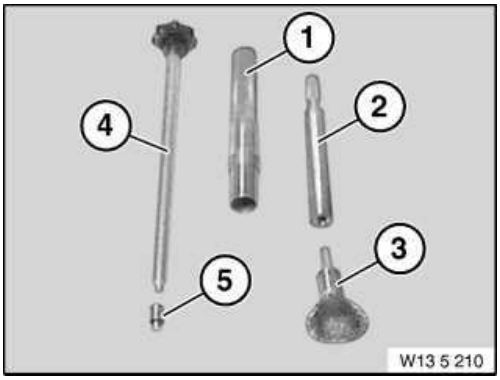
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2 344 011 Tool



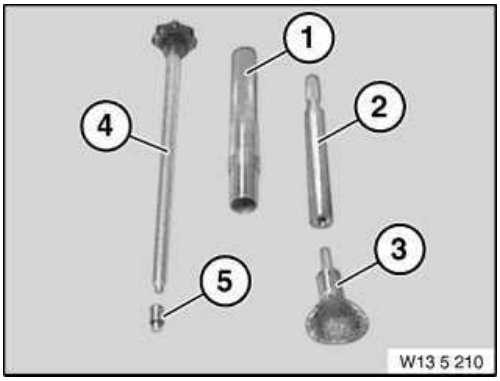
Common	Used in step 26
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

0 493 763 (13 5 215) Plug



Common	Used in step 30
Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

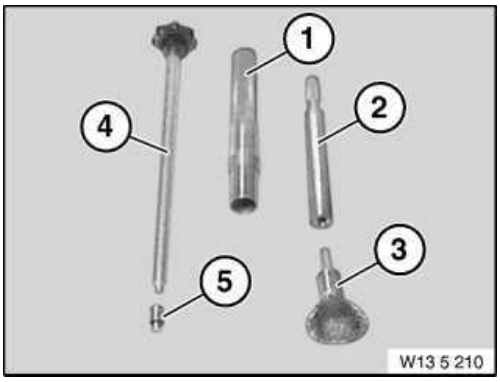
0 493 762 (13 5 214) Rod



Common	Used in step 30
Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 493 758 (13 5 210) Tool



Common

Used in step 30

Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

Replacement tools:

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0 495 221 (36 1 323) Wheel stud



Common	Used in step 20
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud



Common	Used in step 20
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud



Common	Used in step 20
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

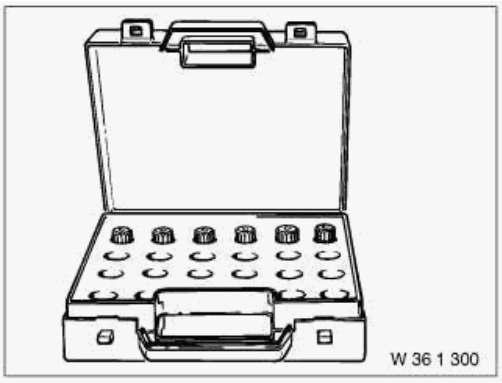
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0 495 226 (36 1 328) Wheel stud



Common	Used in step 20
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud



Common	Used in step 20
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud



Common	Used in step 20
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 229 (36 1 332) Wheel stud



Common	Used in step 20
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 230 (36 1 333) Wheel stud



Common	Used in step 20
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Links

Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	1 45
61 20 900 Disconnecting and connecting battery earth lead	1 45
61 20 900 Disconnecting and connecting battery earth lead	1 45
61 20 900 Disconnecting and connecting battery earth lead	1 45
61 20 900 Disconnecting and connecting battery earth lead	1 45
61 20 900 Disconnecting and connecting battery earth lead	1 45
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 45
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 45
61 20 900 Disconnecting and connecting battery earth lead	1 45
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 45
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	1 45
61 20 900 Disconnecting and connecting battery earth lead	1 45
61 20 900 Disconnecting and connecting battery earth lead	1 45
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61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 45
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61 20 900 Disconnecting and connecting battery earth lead	1 45
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61 20 900 Disconnecting and connecting battery earth lead	1 45
61 20 900 Disconnecting and connecting battery earth lead	1 45
61 20 900 Disconnecting and connecting battery earth lead	1 45
61 35 ... Notes on ESD protection (Electro Static Discharge)	16 18

Operating materials	Used in step
2.0 Grease for wheel centring	26

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11 31 005 Checking camshaft timing (B47)

Special tools required:

- 11 6 480
- 2 288 380
- 11 8 760

Important!

Risk of damage to engine.

Notes for checking and setting the timing must be observed without fail.

Necessary preliminary tasks:

- Remove cylinder head cover.
- Remove front right wheel arch panel.



Crank engine with special tool 11 6 480 to TDC firing position of cylinder no. 1.**Important!**

Do not crank engine back.



Remove protective cap (1) on oil sump.

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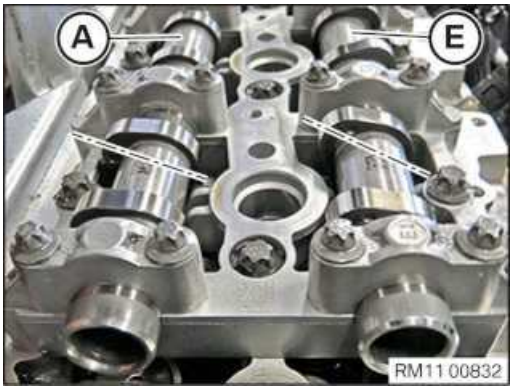
Crank engine at central bolt with special tool 11 6 480

Important!

On vehicles with manual gearbox, an additional bore hole that can be confused with dowel hole is located in front of dowel hole.

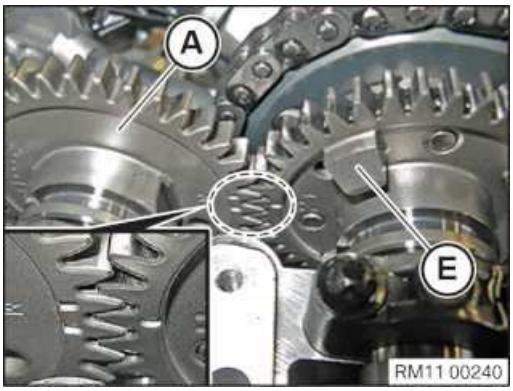
It must be possible to slide special tool 2 288 380 up to the crank in the oil sump.

Use special tool 2 288 380 to block the crankshaft in the TDC firing position Cylinder 1



The cam on the intake camshaft (E) points obliquely upwards at cylinder No. 1.

The cam on the exhaust camshaft (A) points obliquely outward to the left at cylinder No. 1.



Marks on both camshafts (A and E) must match up (see graphic).



Place special tool 11 8 760 on exhaust camshaft.

Note:

Special tool 11 8 760 must lie flush on cylinder head.

If necessary, adjust camshaft timing.

Important!

2 288 380 Remove special tool before starting engine.

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Install protective cap (1).

Required follow-up work:

- Install cylinder head cover.
- Install front right wheel arch panel.
- Reassemble the vehicle.

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11 31 090 Installing and removing or replacing chain tensioner piston (B47)

Necessary preliminary tasks:

- Remove exhaust-gas recirculation cooler

Removal:



Release chain tensioner (1).**Important!**

Have a cleaning cloth ready. A small quantity of engine oil will emerge after the screw connection has been released.

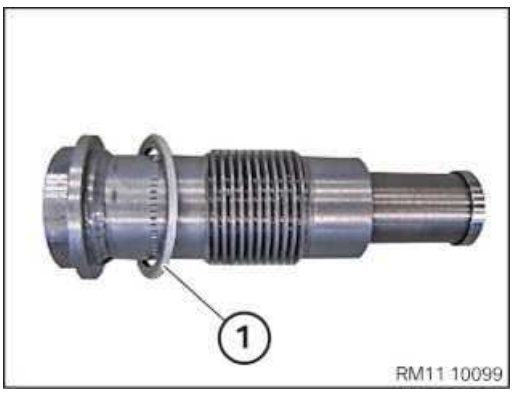
Make sure no oil runs into the clutch housing.

Installation:



If the chain tensioner is reused, its oil chamber must be drained. Place chain tensioner on a level support and slowly compress.

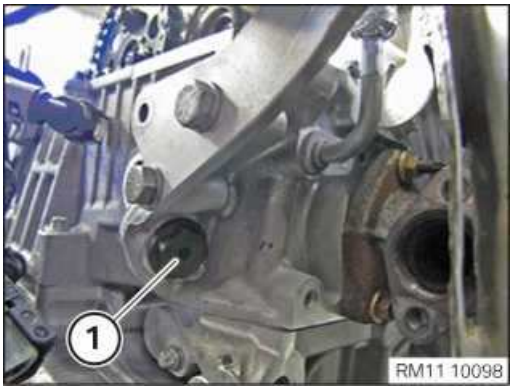
Repeat process twice.



Replace the sealing ring.

Part: Replace sealing ring (1).

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Tighten chain tensioner (1).
Tightening torque: 11 12 5AZ.

Required follow-up work:

- Install exhaust-gas recirculation cooler

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11 31 ... Notes for checking and adjusting the timings (B37, B38, B47, B48)

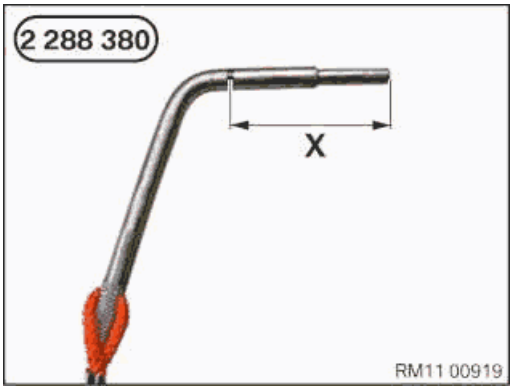
Special tools required:

- 2 288 380

Important!

Risk of damage to engine.

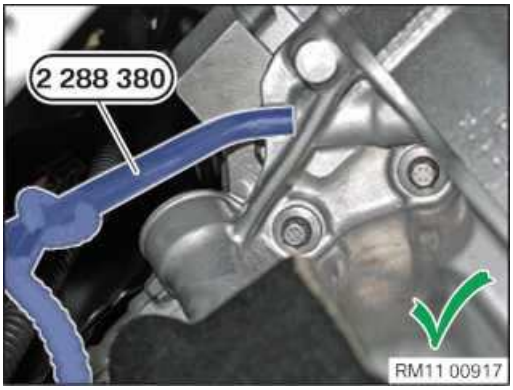
The notes for checking and adjusting the timing must be strictly observed!



Vehicles with manual transmission:

Dimension (x) = 56 mm.

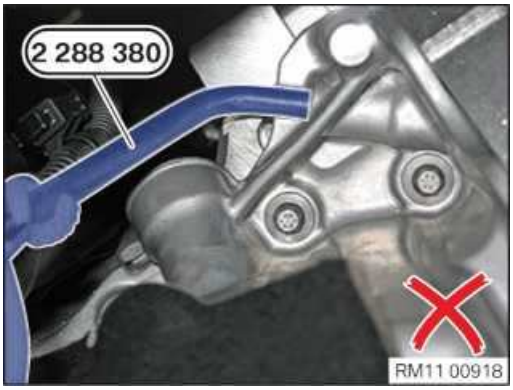
Insert the special tool 2 288 380 up to dimension (X) into the dowel hole.



Vehicles with manual transmission:

Special tool 2 288 380 correctly positioned.

The engine is located at the first cylinder at top dead centre.



Vehicles with manual transmission:

Special tool 2 288 380 incorrectly positioned.

The TDC setting of the first cylinder has not been acheived.

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Vehicles with automatic transmission:

Dimension (Y) = 66 mm.

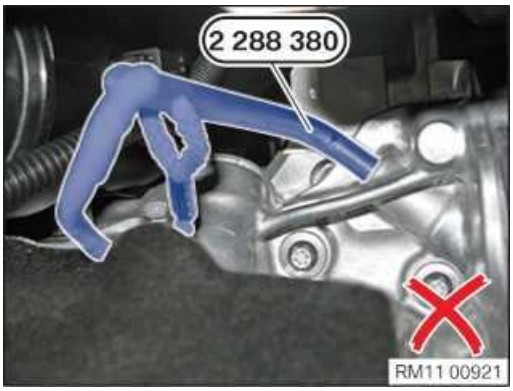
Insert the special tool 2 288 380 up to dimension (Y) into the dowel hole.



Vehicles with automatic transmission:

Special tool 2 288 380 correctly positioned.

The engine is located at the first cylinder at top dead centre.



Vehicles with automatic transmission:

Special tool 2 288 380 incorrectly positioned.

The TDC setting of the first cylinder has not been acheived.

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11 31 ... Notes on checking and adjusting the timing (B36, B37, B38, B46, B47, B48)

Special tools required:

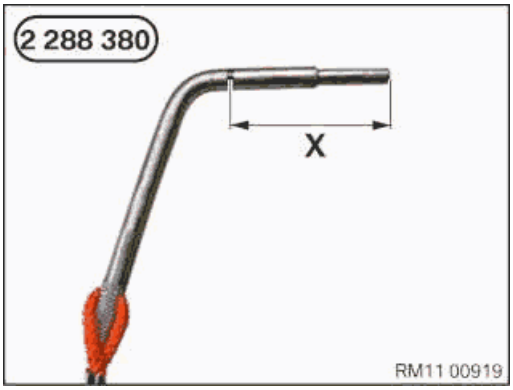
- 2 288 380

Attention!

Risk of damage to engine.

The notes for checking and adjusting the timing must be strictly observed!

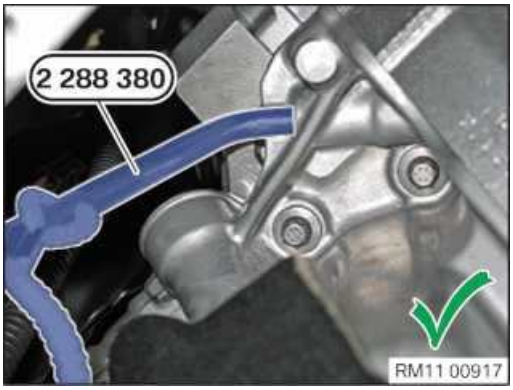
If the crankshaft is fixed properly, it is not possible to turn the engine forwards or backwards on the vibration damper.



Vehicles with manual transmission:

Dimension (x) = 56 mm.

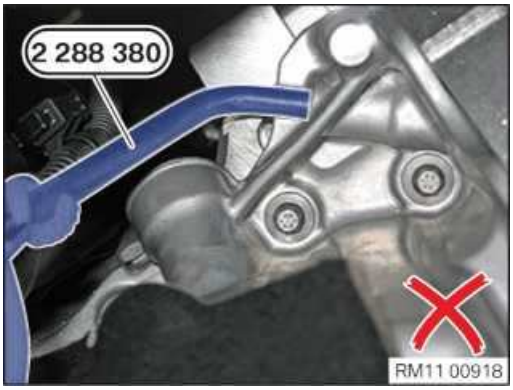
Insert the special tool 2 288 380 up to dimension (X) into the dowel hole.



Vehicles with manual transmission:

Special tool 2 288 380 correctly positioned.

The engine is located at the first cylinder at top dead centre.



Vehicles with manual transmission:

Special tool 2 288 380 incorrectly positioned.

The TDC setting of the first cylinder has not been acheived.

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Vehicles with automatic transmission:

Dimension (Y) = 66 mm.

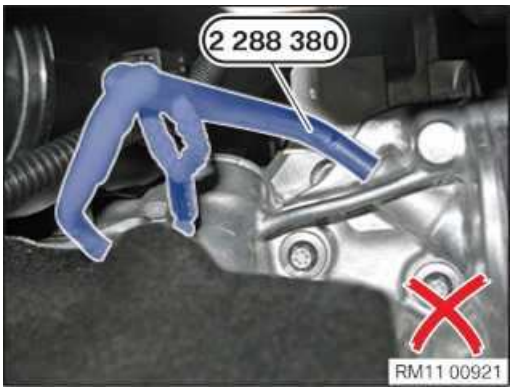
Insert the special tool 2 288 380 up to dimension (Y) into the dowel hole.



Vehicles with automatic transmission:

Special tool 2 288 380 correctly positioned.

The engine is located at the first cylinder at top dead centre.



Vehicles with automatic transmission:

Special tool 2 288 380 incorrectly positioned.

The TDC setting of the first cylinder has not been acheived.

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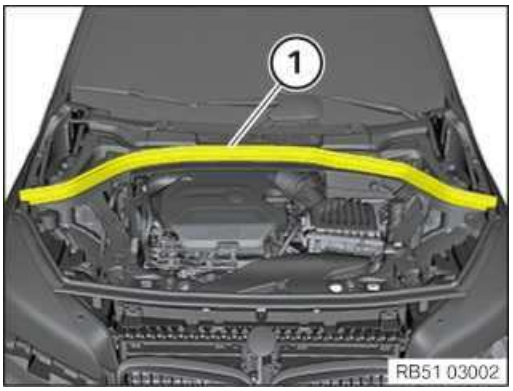
11 31 090 Remove and install/replace chain tensioner piston

PRELIMINARY WORK

1 – Remove the seal for the rear bonnet

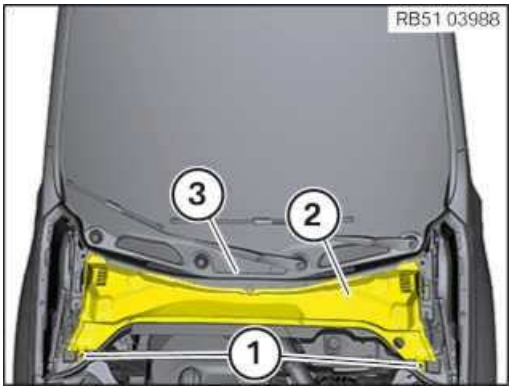
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



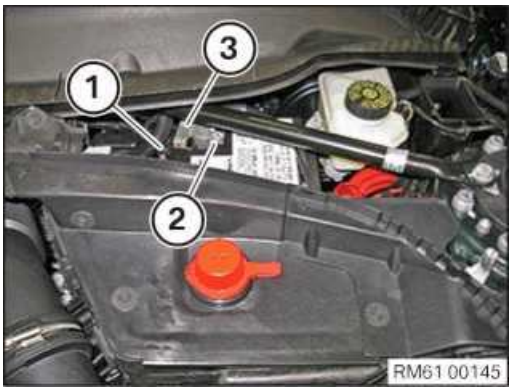
- Pull off rear bonnet seal (1) towards the top and remove.

2 – Removing front cowl panel cover



- Loosen the expanding rivet (1).
- Feed out and remove front cowl panel cover (2) from the rear cowl panel cover(3).

3 – Disconnecting the battery earth lead



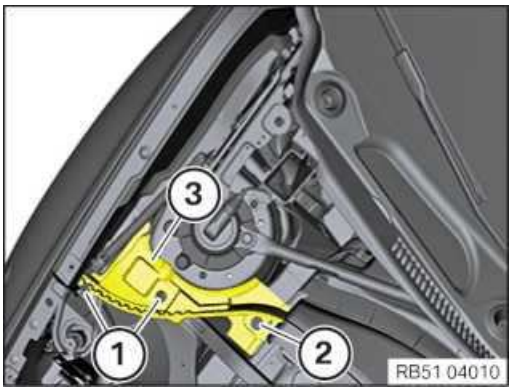
- Unlock plug connection (1) and disconnect.
- Unfasten nut (2).
- Remove the battery earth lead (3) and secure to one side.

4 – Remove suspension cross-brace

TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.

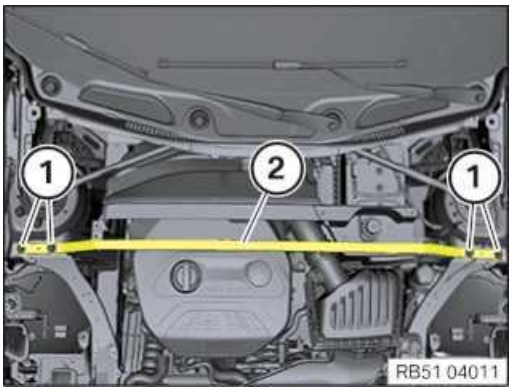
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NOTICE

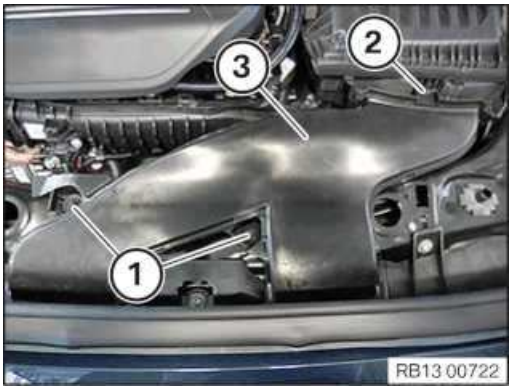
Description is for right component only. The procedure on the left side is identical.

- Loosen expanding rivet (1).
- Loosen screw (2).
- Remove the cover (3).



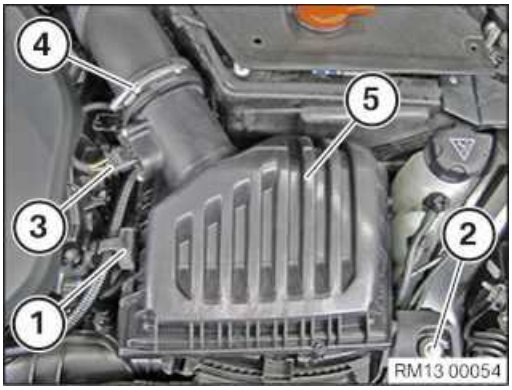
- Loosen screws (1).
- Remove strut brace (2).

5 – Remove the intake neck for intake silencer housing



- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

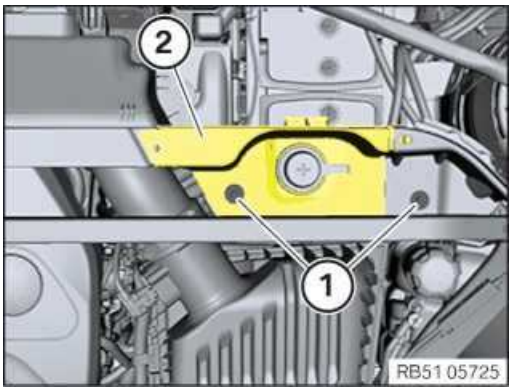
6 – Removing intake silencer housing



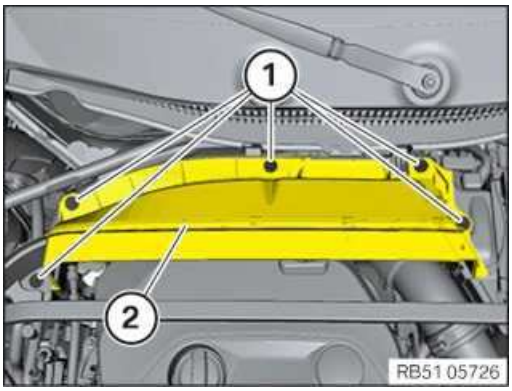
- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

7 – Removing the upper bulkhead cover

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- Loosen screws (1).
- Guide out and remove the cover (2).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

8 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

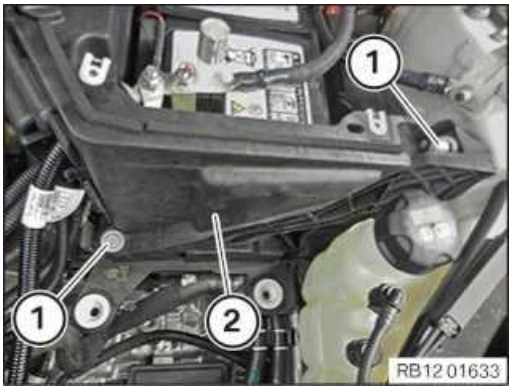
TECHNICAL INFORMATION

Follow instructions for removing and installing control units.
For additional information see: 12 00 ... Notes on removal and installation of control units

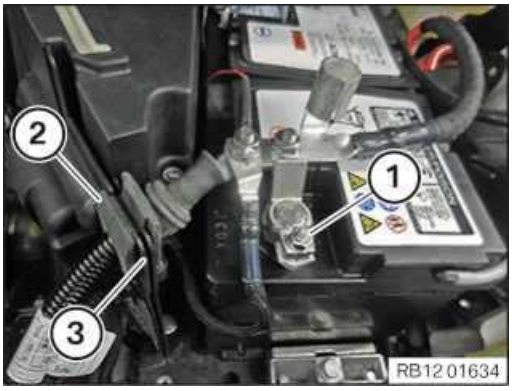
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TECHNICAL INFORMATION

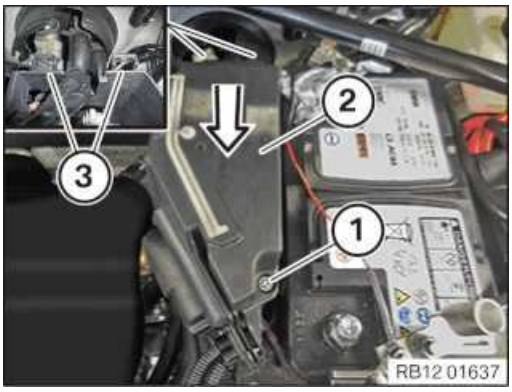
Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.



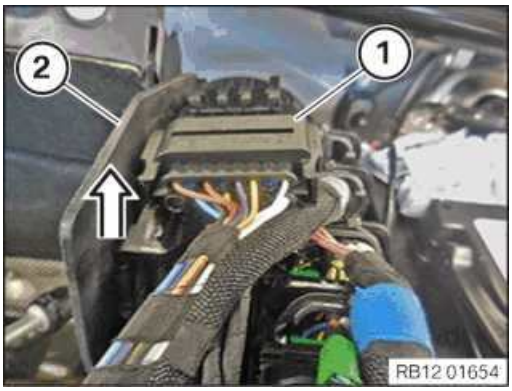
- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.



- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

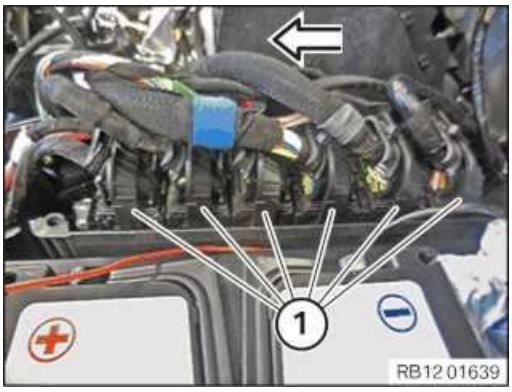


- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.

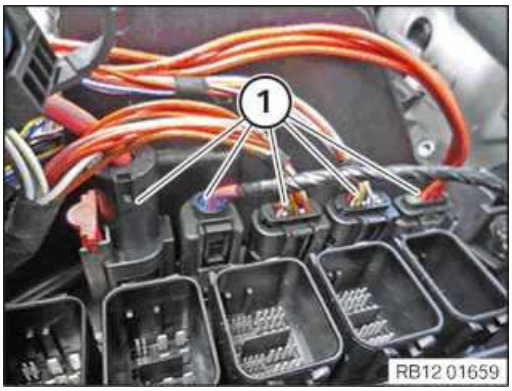


- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).

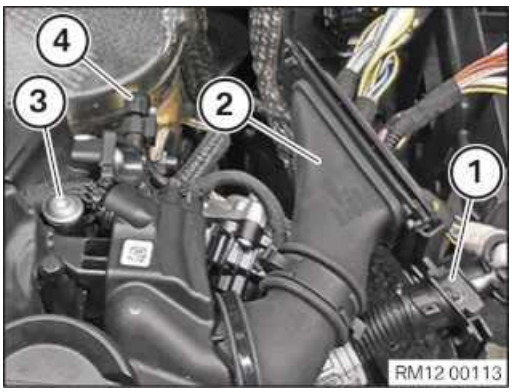
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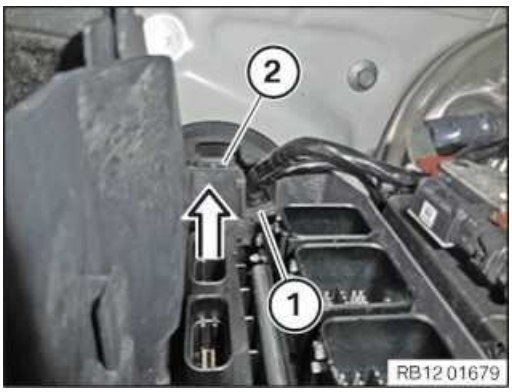
- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



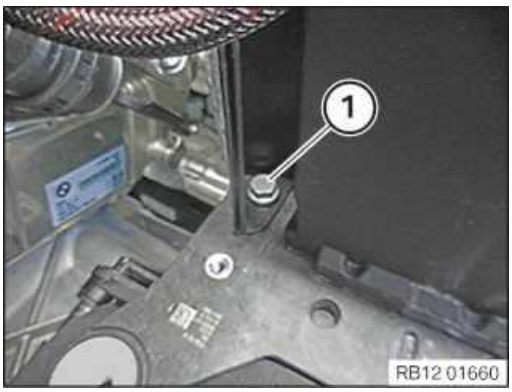
- Unlock and loosen connector (1).



- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.

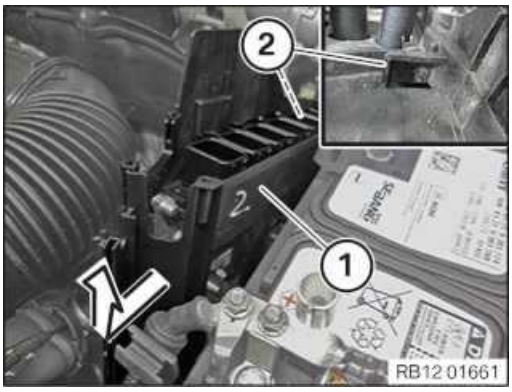


- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.



- Loosen screw (1).

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- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

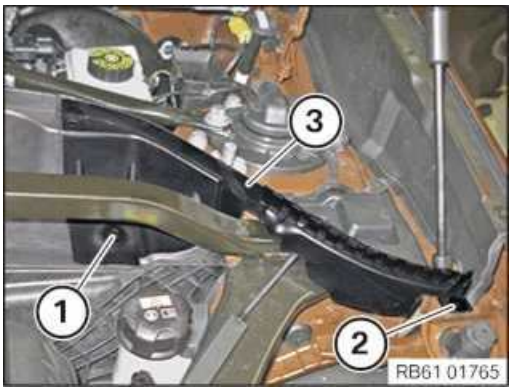
9 – Remove vehicle battery

WARNING

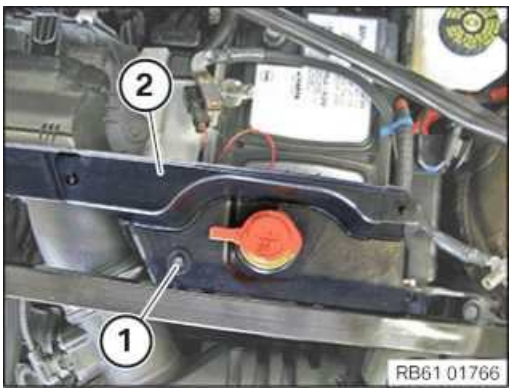
Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

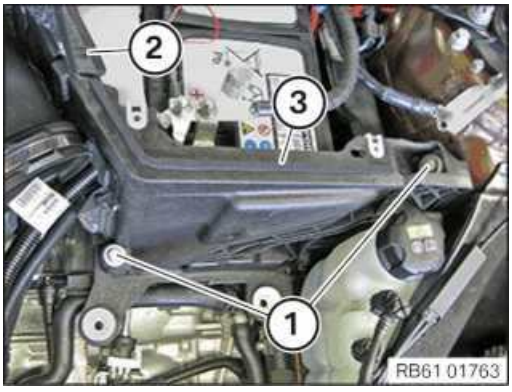
- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.



- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

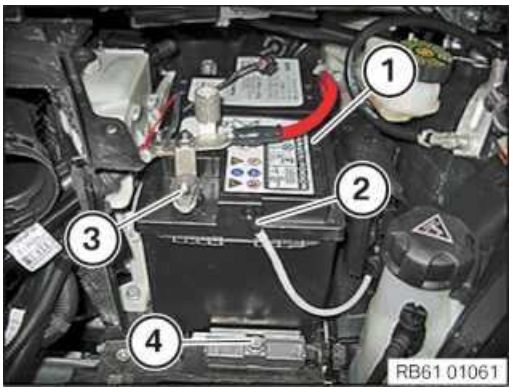


- Loosen screw (1).
- Remove the cover (2).



- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.

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- Pull off the vent hose (2).
- Slacken the nut (3) on the positive battery terminal and remove the positive battery terminal.

WARNING

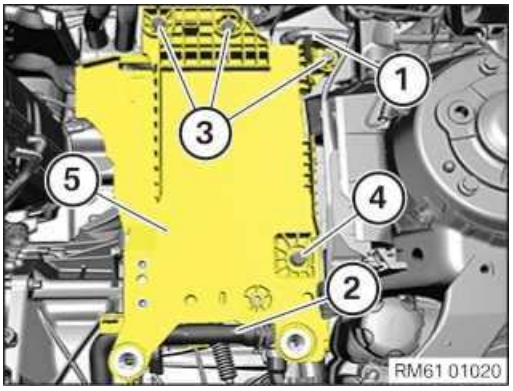
Unprotected battery terminals.

Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

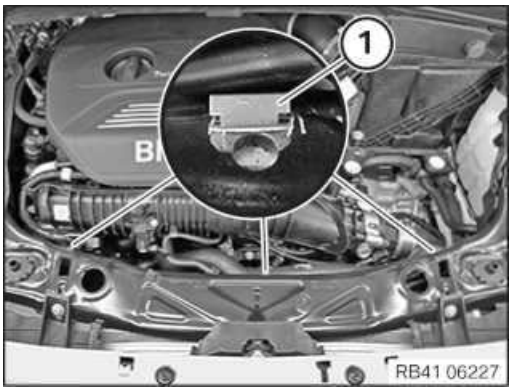
- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

10 – Remove battery holder

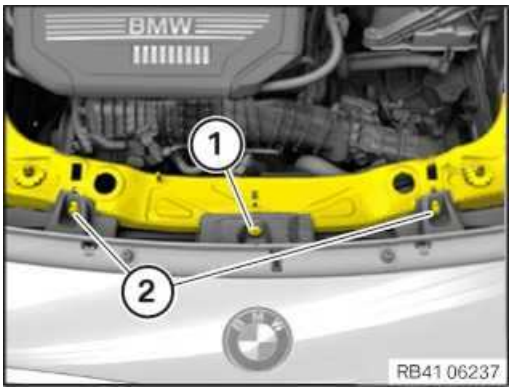


- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

11 – Remove front cross connection

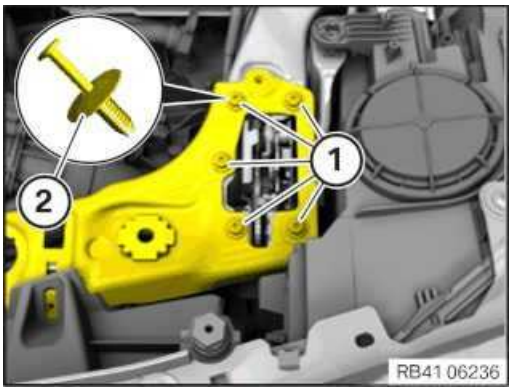


- Detach the clamps (1) for the Bowden cable of the bonnet locks from the cross connection.

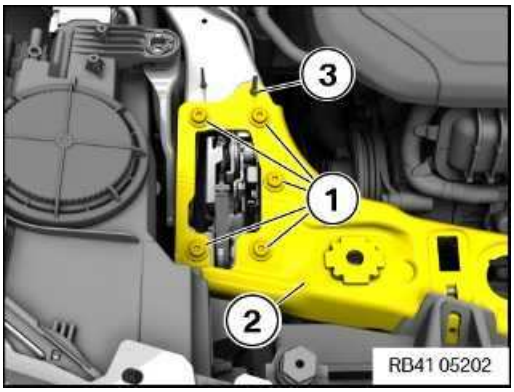


- Loosen screw (1).
- Loosen screws (2).

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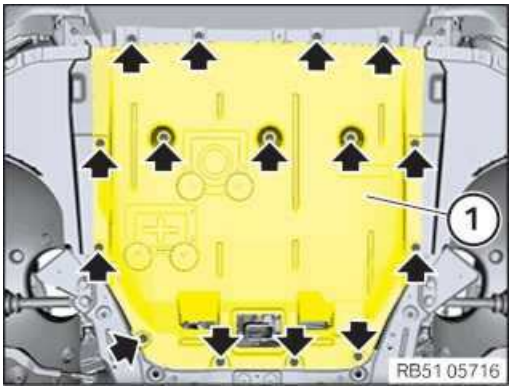


- Loosen screws (1).
- Lever out expanding rivet (2).

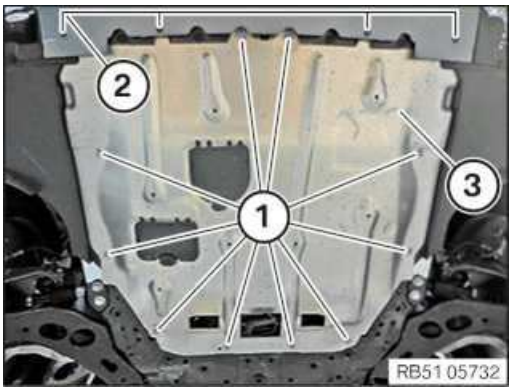


- Loosen screws (1).
- Unclip the front cross connection (2) from the rubber retainer (3) and remove it upward.

12 – Removing the front underbody protection



- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.



- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

13 – Draining coolant

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

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TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

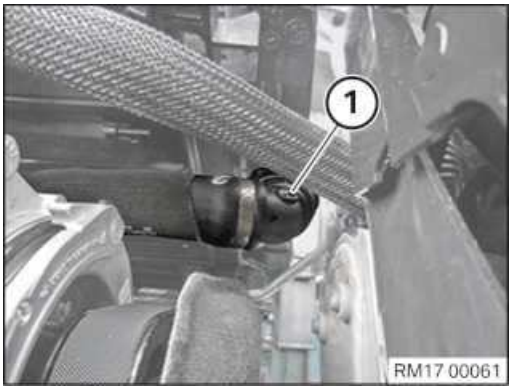
In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

TECHNICAL INFORMATION

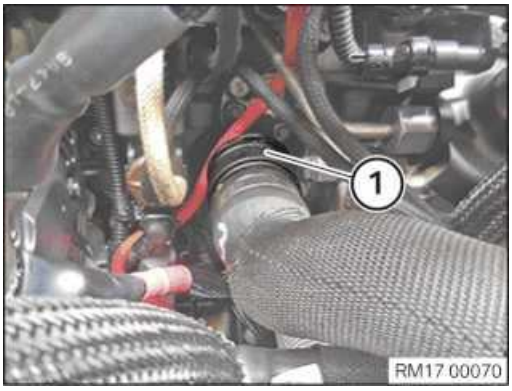
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Loosen sealing cap (1).



- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.



- Unlock the coolant line (1) and pull it off the connecting branch.
- Catch and dispose of escaping coolant.

14 – Removing the exhaust-gas recirculation cooler

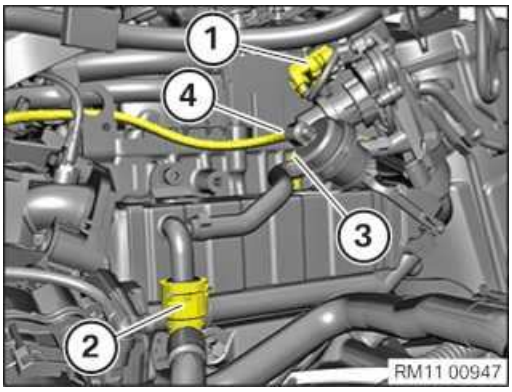
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WARNING

Hot surfaces.

Risk of burning!

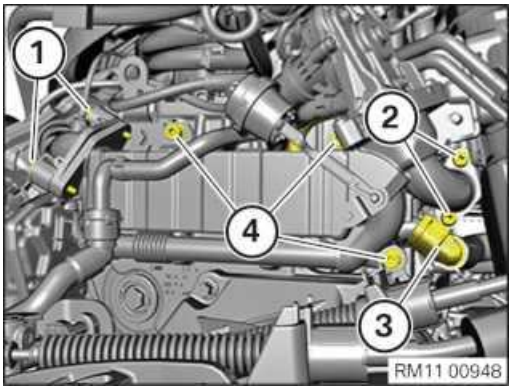
- Perform all work only on components that have cooled down.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.

MAIN WORK

15 – Remove chain tensioner piston

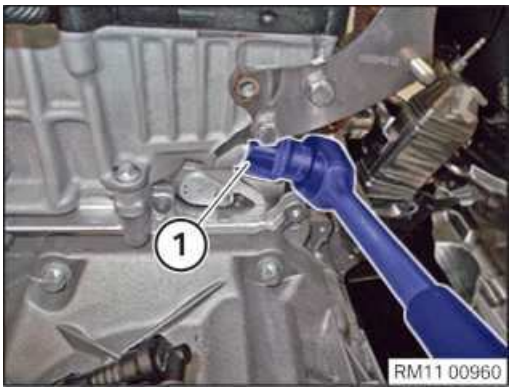
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

16 – Installing the chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Renew sealing ring (1).

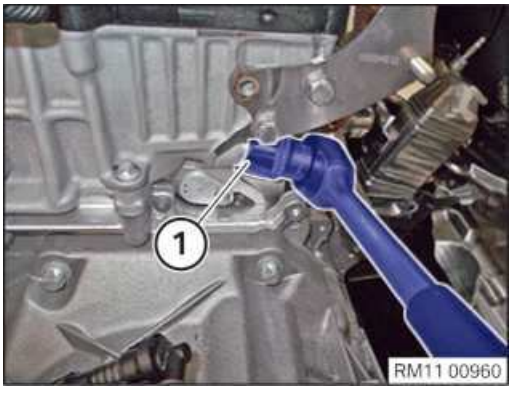
  Parts: Sealing ring



TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.



- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

POSTPROCESSES

17 – Installing the exhaust-gas recirculation cooler

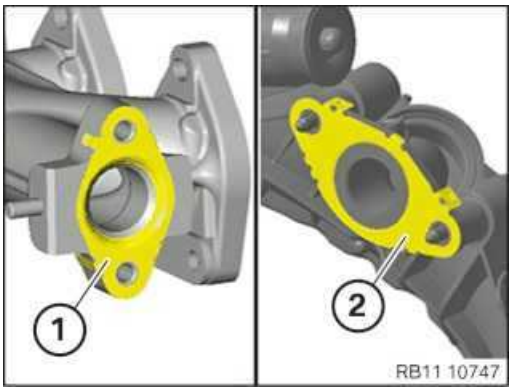
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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



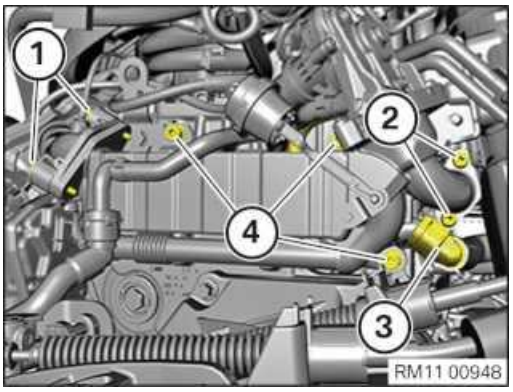
- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket

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- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts
- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm

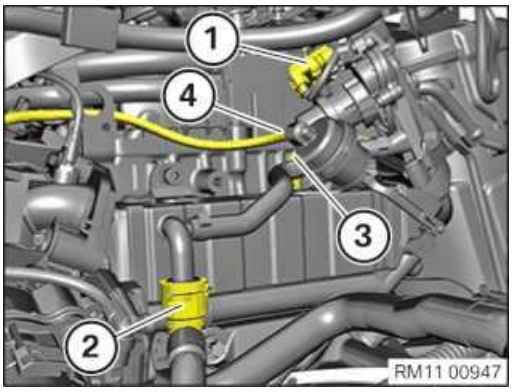
- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.
- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm

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TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

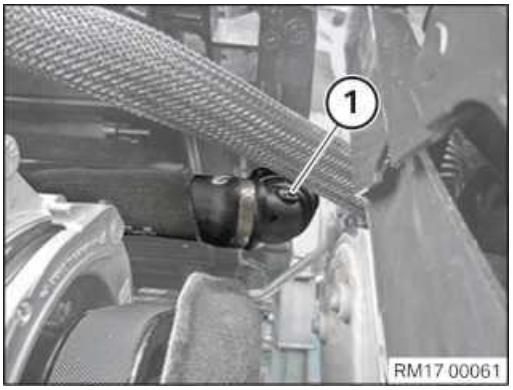
- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

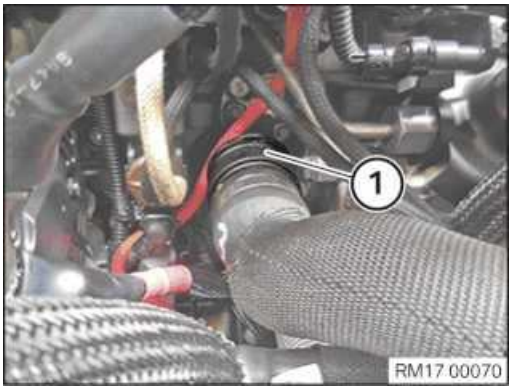
18 – Connect the coolant line

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Connect the right coolant line (1) to the radiator and lock audibly.



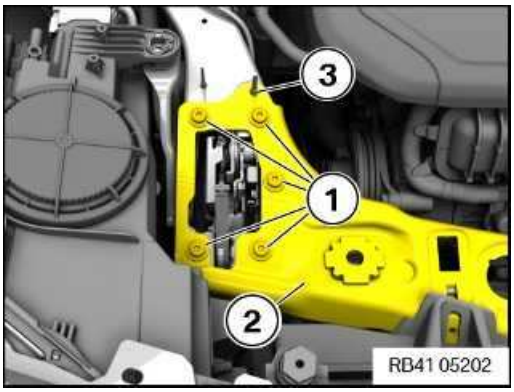
- Connect the coolant line (1) to the connecting branch and lock audibly.

19 – Install front cross connection

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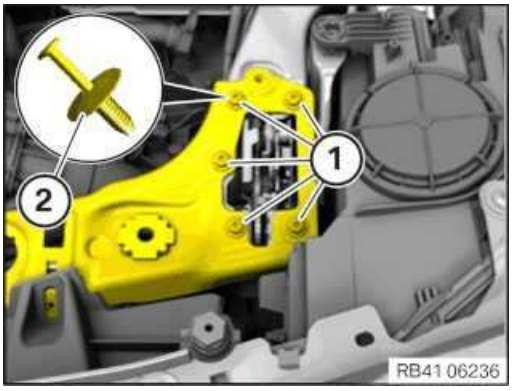
- Right side of vehicle only: Secure spray guard (1) on the cross connection (2) as pictured.



- Position front cross connection (2) and clip front cross connection (2) into the rubber retainer (3) at the same time.
- Tighten the screws (1).

Cross connection to carrier support

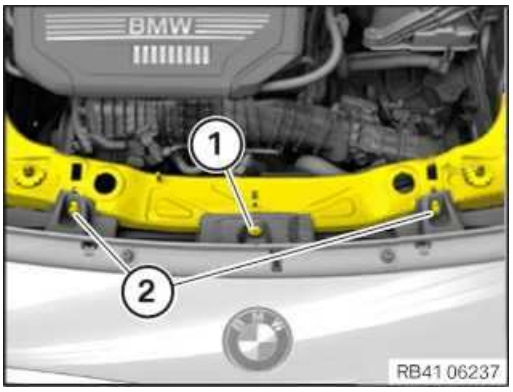
Screws M6x20		Tightening torque	11,8 Nm



- Tighten the screws (1).

Cross connection to carrier support

Screws M6x20		Tightening torque	11,8 Nm



- Position screws (3) on the rubber mounts for the radiator and tighten.

Screw connection for rubber mount of coolant radiator to coolant radiator

Bolt to rubber mount		Tightening torque	8 Nm

- Tighten down screws (2).

Air duct to upper connection

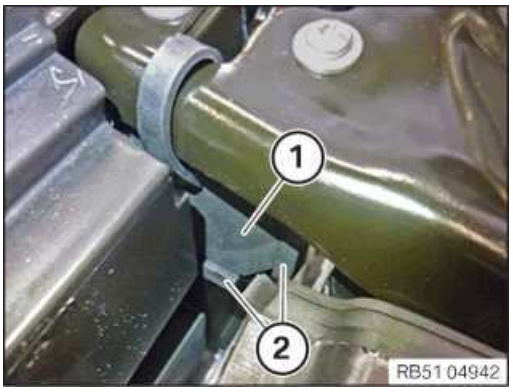
M6x20 screw		Tightening torque	11,8 Nm

- Tighten down screw (1).

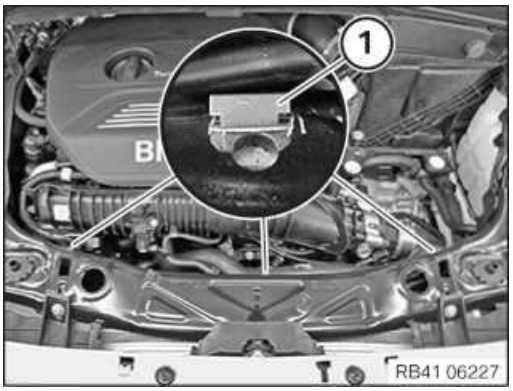
Bracing strut to upper connection

M8x20 screw		Tightening torque	28 Nm

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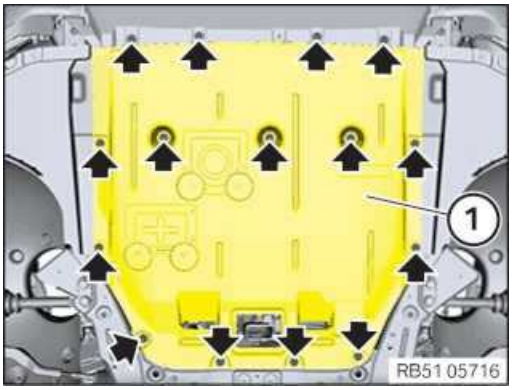


- Right side of vehicle only: Properly mount spray guard (1) to prevent corrosion.
- Secure spray guard (1) to the bridge with retaining tabs (2).



- Fasten the clamps (1) from the Bowden cable of the bonnet lock on the cross connection.

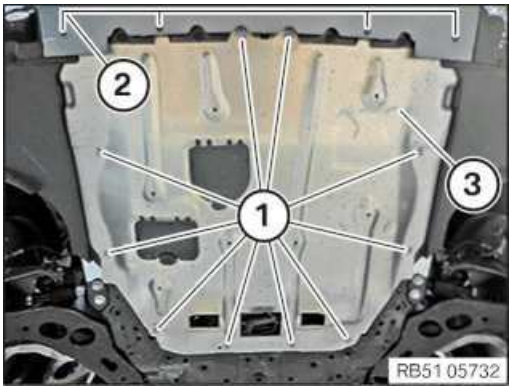
20 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm



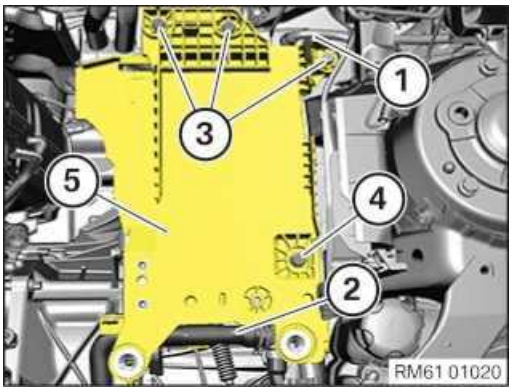
- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

21 – Install the battery holder

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- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

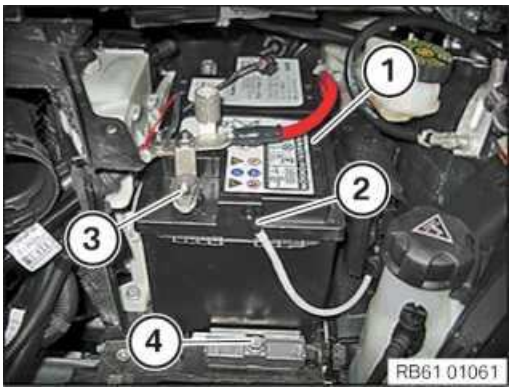
- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

22 – Install vehicle battery



- Install vehicle battery (1).
- Position the bracket and tighten with the screw (4) .

Battery terminal rail to battery tray

M8		19 Nm

- Position the vent hose (2) and clip it in.
- Position the positive battery terminal and tighten with the nut (3) .

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

▸ **Check the vent holes of the battery**

WARNING

Gas emission.

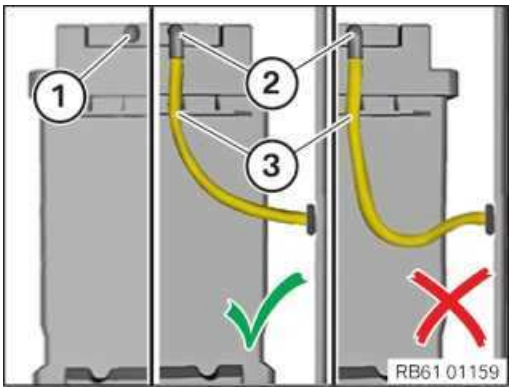
Danger of injury! Danger of explosion!

- Assign the vent holes correctly.
- Route the vent hose correctly.

TECHNICAL INFORMATION

The battery has two vent holes, opposite:
One vent hole (1) must be closed correctly with a dummy plug.
The vent hose (3) must be correctly connected and routed at the other vent hole (2).

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Check

- Check if the vent hole (1) is correctly closed with a dummy plug.

Result

» No dummy plug.

Measure

- Close the vent hole (1) correctly with a dummy plug.

Check

- Check if the vent hole (2) has a correctly connected vent hose (3).

Result

» The vent hose (3) is not correctly connected.

Measure

- At the vent hole (2), connect the vent hose (3) correctly.

Check

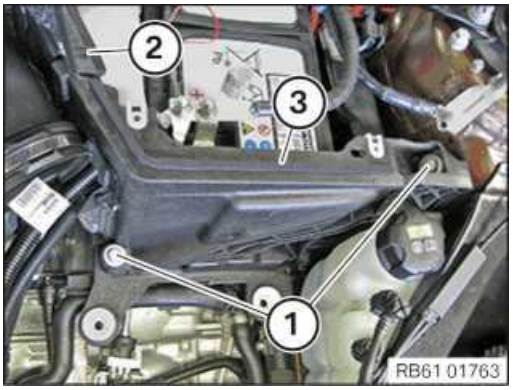
- Check if the vent hose (3) is routed to the outside with a downhill gradient (**no siphon formation!**).

Result

» The vent hose (3) is not correctly routed as shown in the image on the right.

Measure

- Route the vent hose (3) correctly as shown in the centre image.



- Insert tension strut (3) and tighten with screws (1).

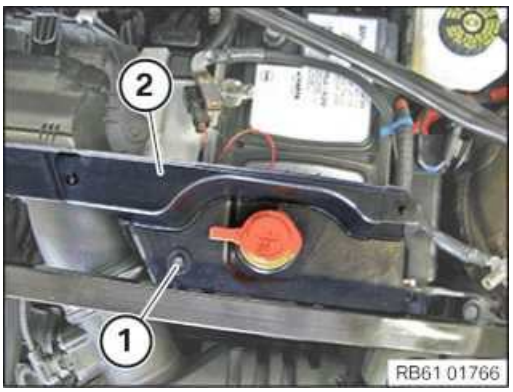
Trailing link

M8		Tightening torque	19 Nm

- Tighten down screw (2).

Battery cover

M8		2,8 Nm

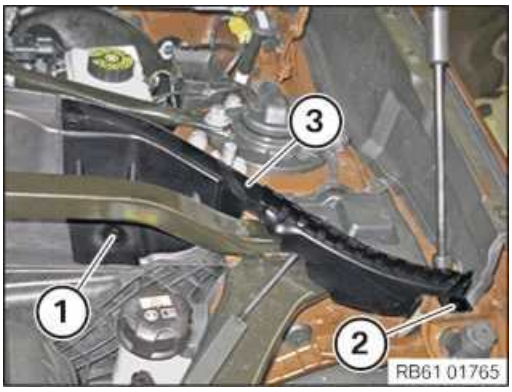


- Position the cover (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm

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- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm

23 – Install electronics box

Prerequisite

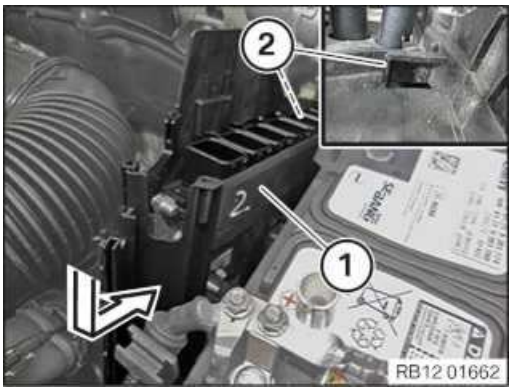
Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

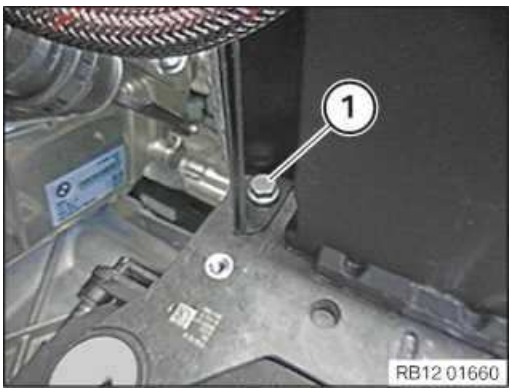
- Route all cables without abrasions, do not trap and crush.



- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.



- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).

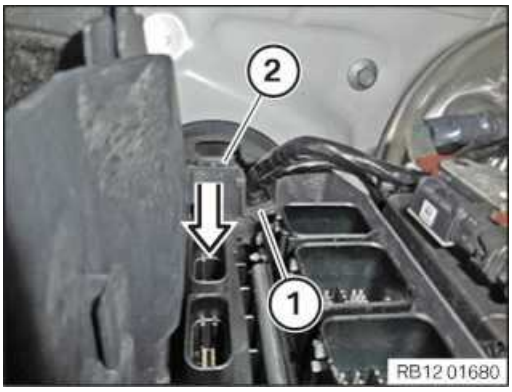


- Tighten down screw (1).

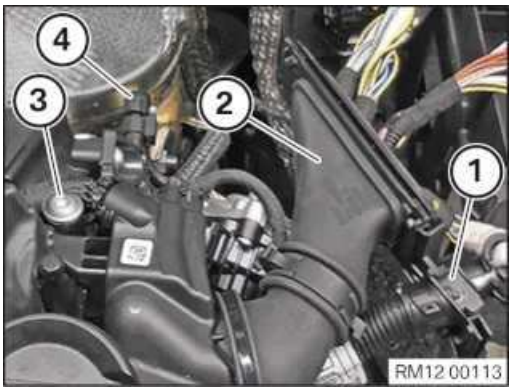
Electronics box to battery tray

M8X16		Tightening torque	15 Nm

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- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.

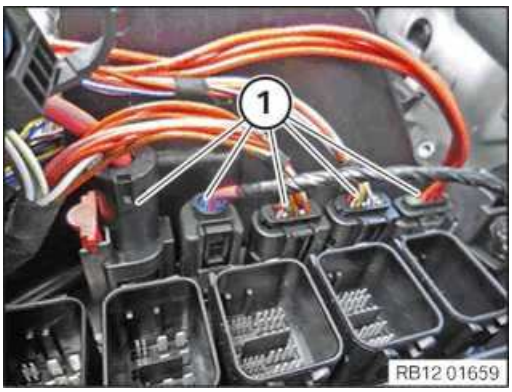


- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

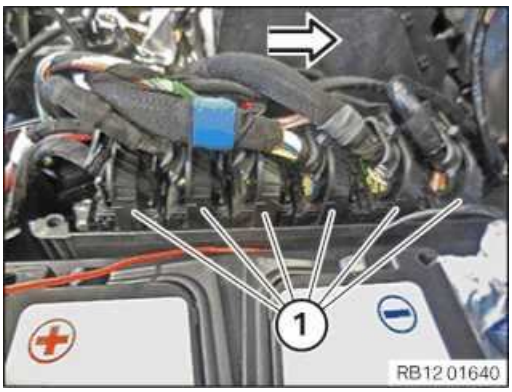
Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

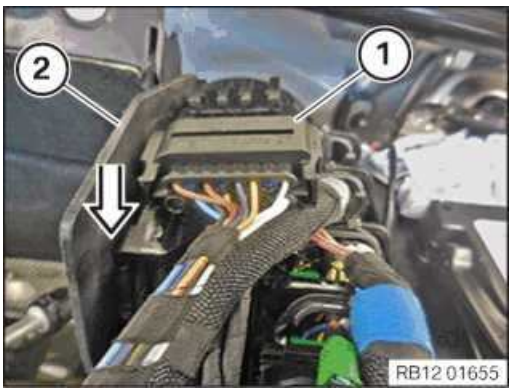
- Attach connector (4) to the differential pressure sensor and lock it audibly.



- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.

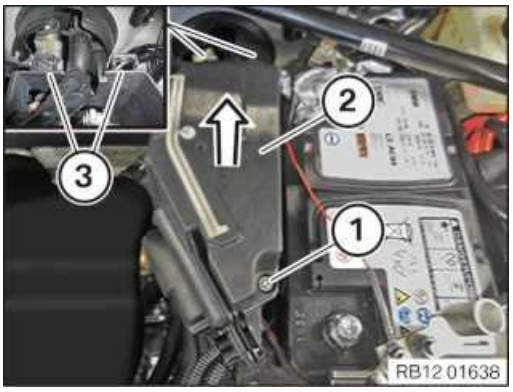


- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.

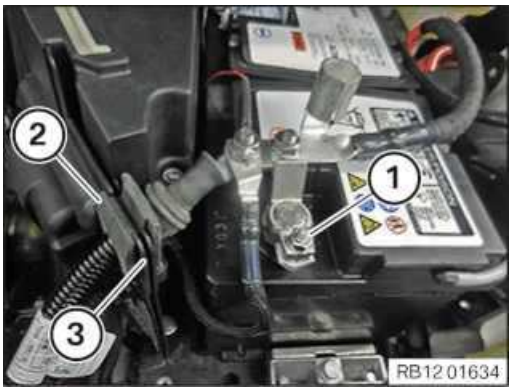
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- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

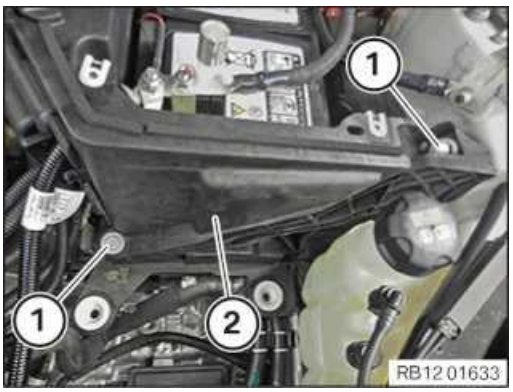
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

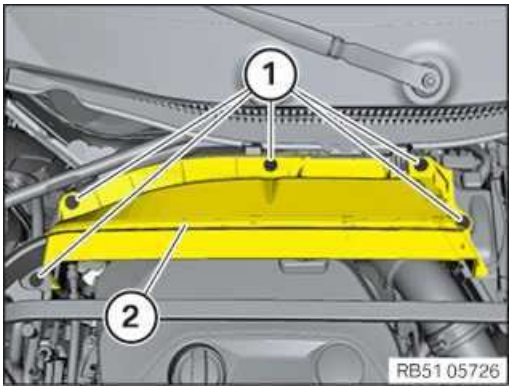


- Feed in and install tension strut (2).
- Tighten the screws (1).

Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

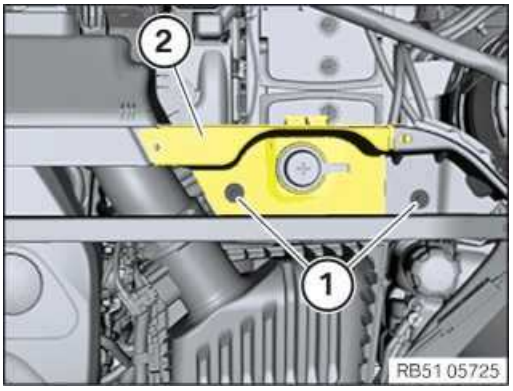
24 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Cover of top bulkhead

Screw		Tightening torque	2,6 Nm



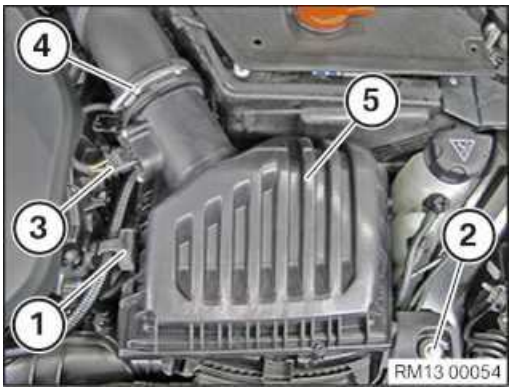
- Guide in and install cover (2).
- Tighten down screw (1).

Cover of remote positive terminal

Screw		Tightening torque	2,6 Nm

25 – Installing intake silencer housing

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- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

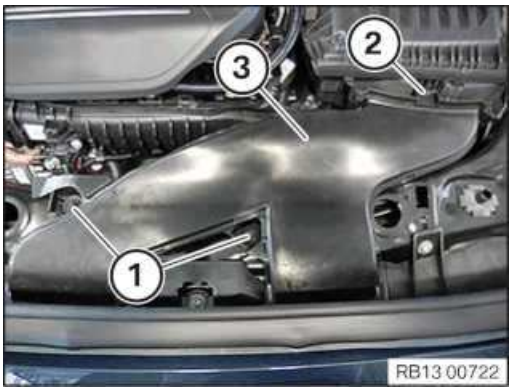
- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

26 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).
  The lock (2) must audibly engage.
- Tighten nuts (1).

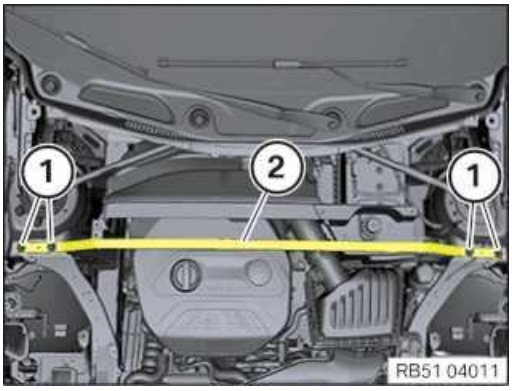
Intake neck to cross connection

M6		Tightening torque	8 Nm

27 – Install strut brace

TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.

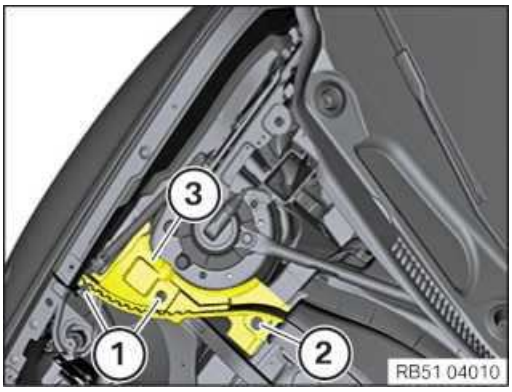


- Install the strut brace (2).
- Renew screws (1).
  Parts: Bolts
- Tighten the screws (1).

Cross-brace to spring strut dome

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

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NOTICE

Description is for right component only. The procedure on the left side is identical.

- Install the cover (3).
- Tighten down screw (2).

Cover on body

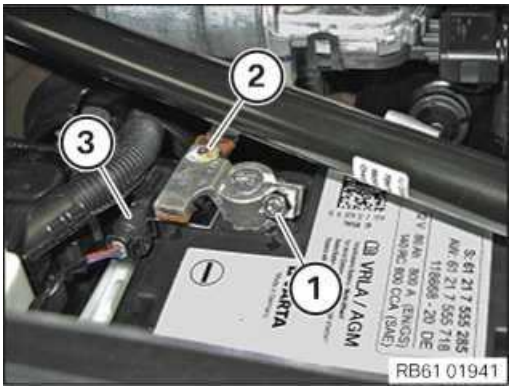
Hexagon screw		Tightening torque	3 Nm

- Install the expanding rivet (1).

28 – Connecting the battery earth lead

TECHNICAL INFORMATION

For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)



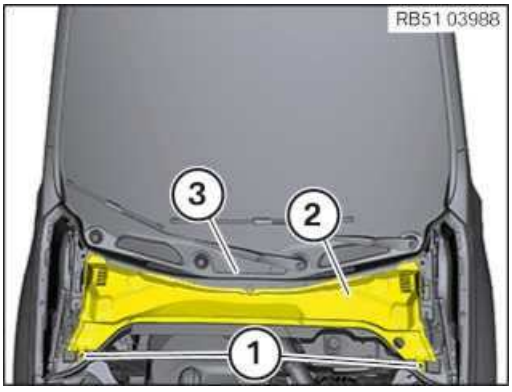
- Remove the protective cover of the positive battery terminal.
- Position the battery earth lead (2).
- Tighten nut (1).

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6			5 Nm

- If required, connect the connector (3).

29 – Installing front cowl panel cover



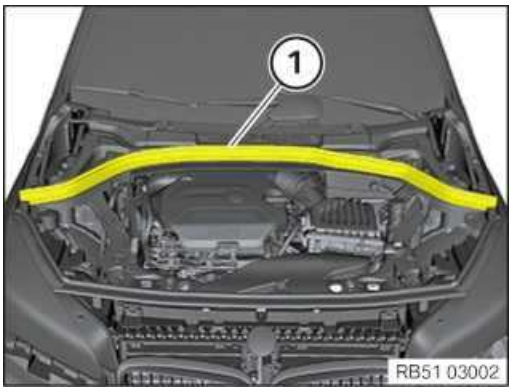
- Insert and install cowl panel cover at front (2) into cowl panel cover at rear (3).
- Check cowl panel cover at front is correctly seated (2).
- Secure expanding rivet (1).

30 – Install the seal for the bonnet

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

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- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

31 – Fill and bleed the coolant circuit

▶ **Filling and bleed the high-temperature coolant circuit**



- See additional information.

Additional Information

Overview of Tightening Torques

Chain tensioner piston to cylinder head — Used in step 16

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Exhaust-gas recirculation cooler to cylinder head — Used in step 17

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler — Used in step 17

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to exhaust manifold — Used in step 17

M8x28	Replace screws	Tightening torque	32 Nm

Exhaust-gas recirculation cooler to cylinder head — Used in step 17

M8x20		Tightening torque	19 Nm

Cross connection to carrier support — Used in step 19

Screws M6x20		Tightening torque	11,8 Nm

Screw connection for rubber mount of coolant radiator to coolant radiator — Used in step 19

Bolt to rubber mount		Tightening torque	8 Nm

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Air duct to upper connection

Used in step 19

M6x20 screw		Tightening torque	11,8 Nm

Bracing strut to upper connection

Used in step 19

M8x20 screw		Tightening torque	28 Nm

Underbody protection front

Used in step 20

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Battery holder to engine support

Used in step 21

Hexagon screw M8x30		Tightening torque	19 Nm

Battery terminal rail to battery tray

Used in step 22

M8			19 Nm

Battery terminal with IBS positive battery terminal / negative battery terminal

Used in step 22 28

NutM6			5 Nm

Trailing link

Used in step 22

M8		Tightening torque	19 Nm

Battery cover

Used in step 22

M8			2,8 Nm

Electronics box to battery tray

Used in step 23

M8X16		Tightening torque	15 Nm

Wiring harness to cylinder head cover

Used in step 23

TS5x20		Tightening torque	3,5 Nm

Cover to electronics box

Used in step 23

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery

Used in step 23

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray

Used in step 23

M8		Tightening torque	19 Nm

Cover of top bulkhead

Used in step 24

Screw		Tightening torque	2,6 Nm

Cover of remote positive terminal

Used in step 24

Screw		Tightening torque	2,6 Nm

Intake silencer housing to lock bridge

Used in step 25

M6X30		Tightening torque	8 Nm

Clean air pipe to intake silencer housing

Used in step 25

Clamp		Tightening torque	3 Nm

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Intake neck to cross connection — Used in step 26

M6		Tightening torque	8 Nm

Cross-brace to spring strut dome — Used in step 27

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

Cover on body — Used in step 27

Hexagon screw		Tightening torque	3 Nm

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	14 17
EGR controller	14 17

General repair instructions	Used in step
61 20 ... Notes on AGM battery	28
61 12 ... Notes on intelligent battery sensor (IBS)	28
61 00 ... Notes for disconnecting and connecting battery	28
61 00 ... Safety information for handling vehicle battery	
61 20 ... Battery replacement information	

Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	8
17 00 008 Draining and topping up coolant for high-temperature circuit	31
17 00 008 Draining and topping up coolant for high-temperature circuit	31
17 00 008 Draining and topping up coolant for high-temperature circuit	31
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	31
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	31
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	31
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	31
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17 00 039 Bleed the cooling system and check it for watertightness with the special tool	31
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	31
17 00 039 Bleed the cooling system and check for watertightness with the special tool (coolant circuit for low temperature)	31
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	31
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	31
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	31
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	31
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	31
17 00 039 Bleeding the cooling system (B36, B38, B46, B48)	31
17 00 039 Bleeding cooling system (B37, B47)	31
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	31
17 00 039 Filling and bleeding the high-temperature cooling system vacuum filler device (B48)	31
17 00 008 Draining and topping up the high-temperature coolant circuit	31
17 00 008 Draining and topping up the high-temperature coolant circuit	31
17 00 016 Draining and topping up coolant circuit for Range Extender \PREMIUM	31
17 00 008 Draining and topping up the high-temperature coolant circuit	31
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	31
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	31
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	31
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	31
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	31

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	16
Exhaust-gas recirculation cooler seal on exhaust manifold	17
Exhaust-gas recirculation cooler seal on intake plenum	17

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11 31 028 Removing and installing / replacing exhaust camshaft

PRELIMINARY WORK

1 – Disconnecting all battery earth leads

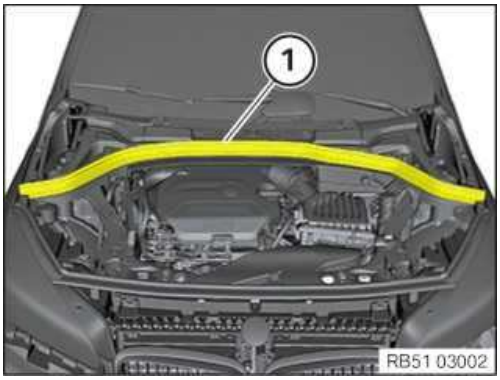


- See additional information.

2 – Remove the seal for the rear bonnet

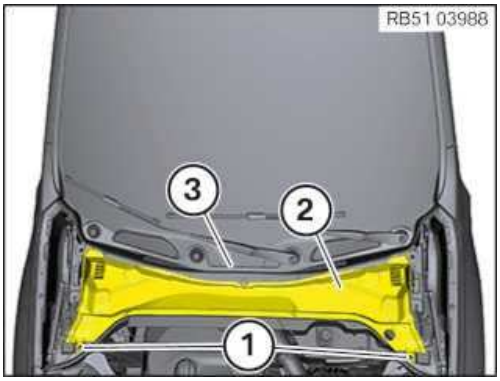
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Pull off rear bonnet seal (1) towards the top and remove.

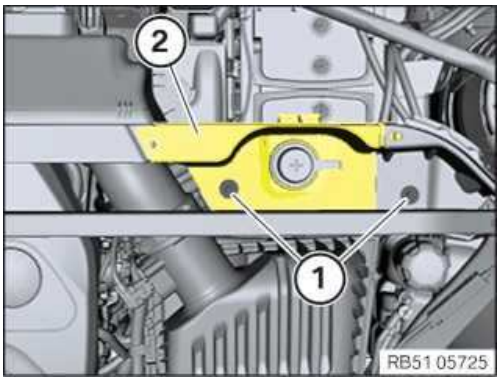
3 – Removing front cowl panel cover



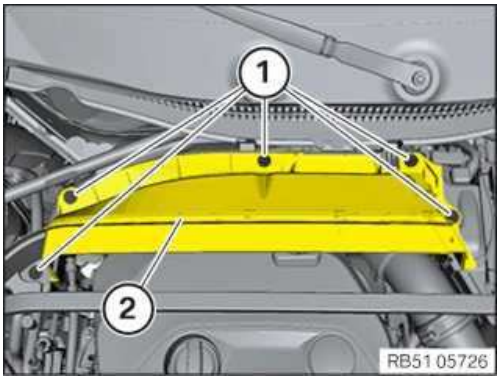
- Loosen the expanding rivet (1).
- Feed out and remove front cowl panel cover (2) from the rear cowl panel cover(3).

4 – Removing the upper bulkhead cover

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- Loosen screws (1).
- Guide out and remove the cover (2).

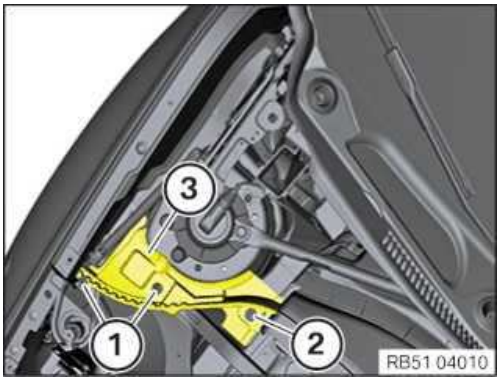


- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

5 – Remove suspension cross-brace

TECHNICAL INFORMATION

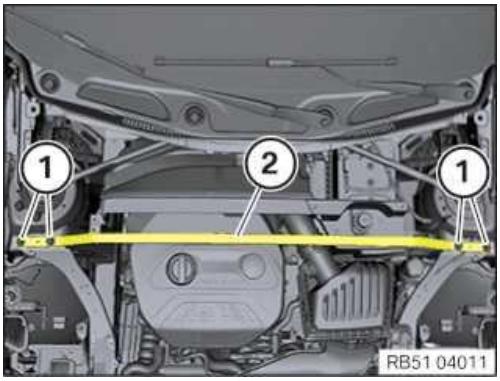
Driving without the strut brace/front end or tension strut is not permitted.



NOTICE

Description is for right component only. The procedure on the left side is identical.

- Loosen expanding rivet (1).
- Loosen screw (2).
- Remove the cover (3).



- Loosen screws (1).
- Remove strut brace (2).

6 – Removing the acoustic cover

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

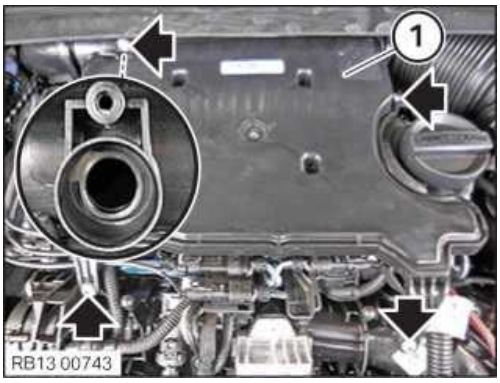
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

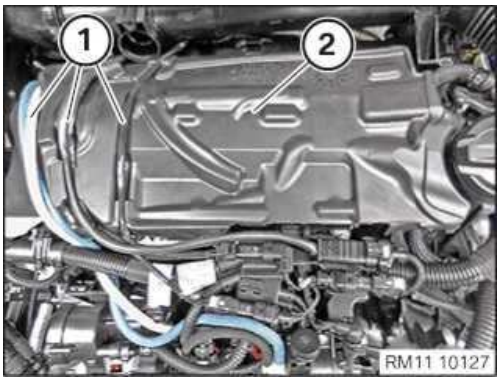
- Unclip the acoustic cover from the marked areas towards the top.

7 – Remove resonator



- Remove screws (arrows).
- Guide out and remove the resonator (1).

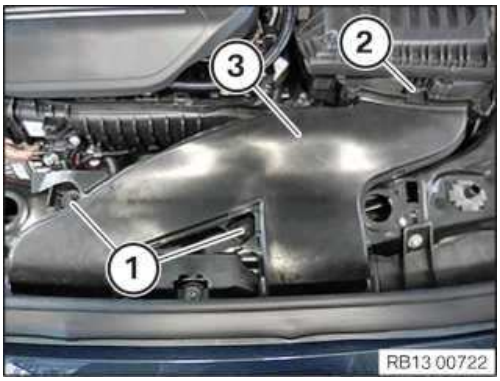
8 – Remove the acoustic cover for the injectors



- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

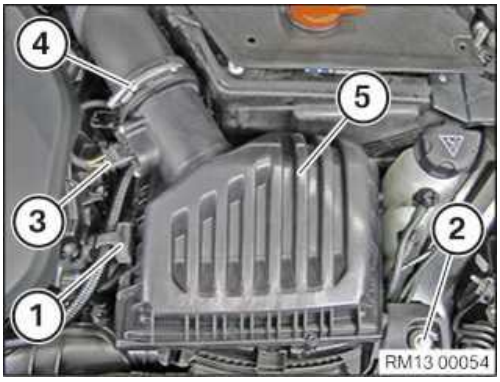
9 – Remove the intake neck for intake silencer housing

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- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

10 – Removing intake silencer housing

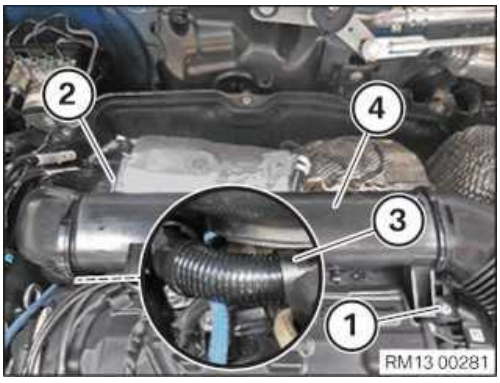


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

11 – Removing clean air pipe



- Detach clamp (1) on the clean air pipe.
- Pull off the clean air pipe from the intake silencer housing.

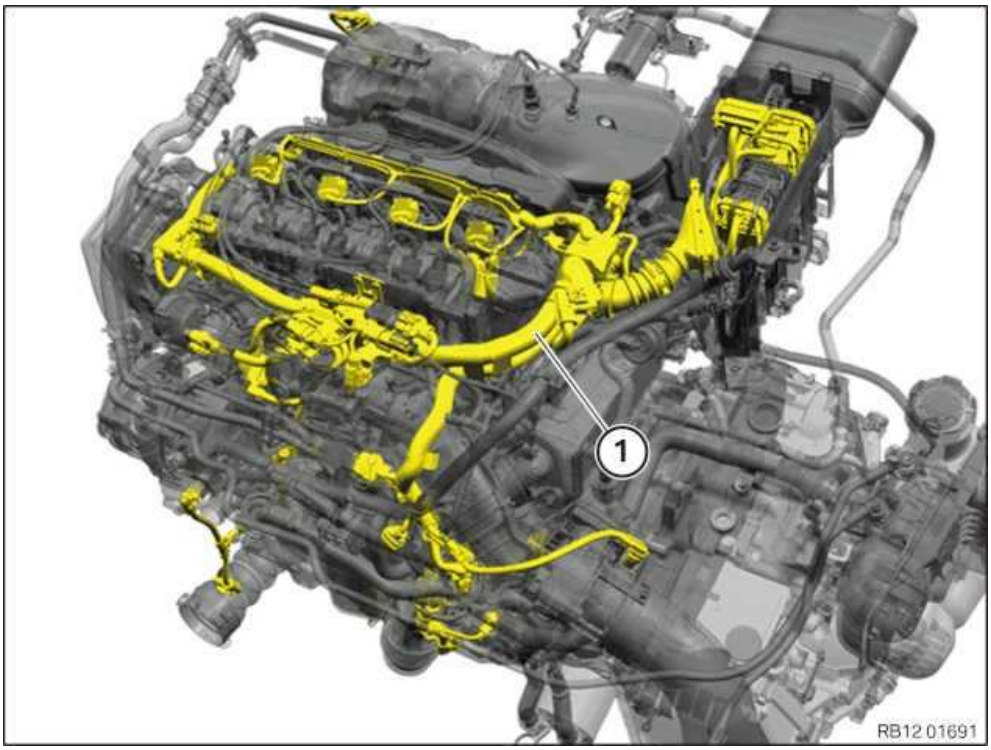


- Loosen screw (1).
- Loosen clamp (2).
- Unlock the ventilation line (3) and pull it off the cylinder head cover.
- Feed out clean air pipe and remove.

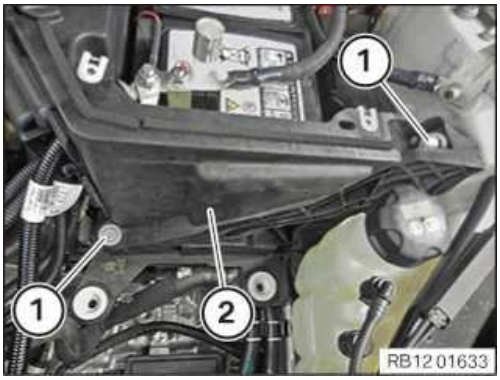
12 – Releasing the wiring harness section for the intake plenum

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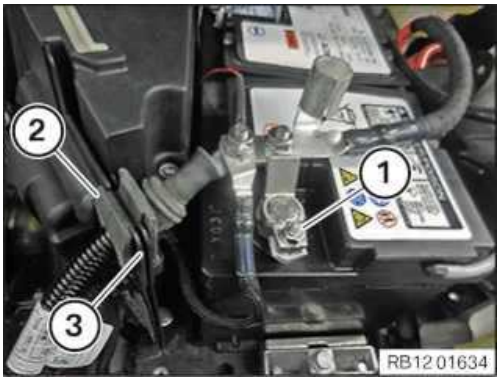
Overview: Wiring harness section for the engine



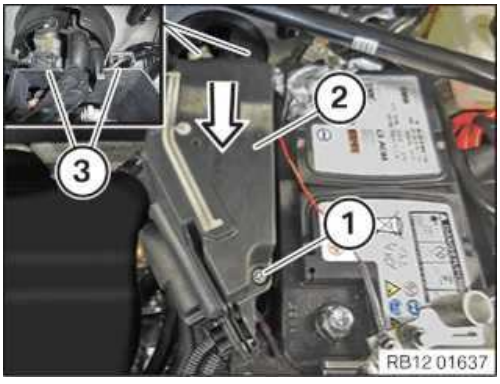
1 Wiring harness section for the engine



- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.

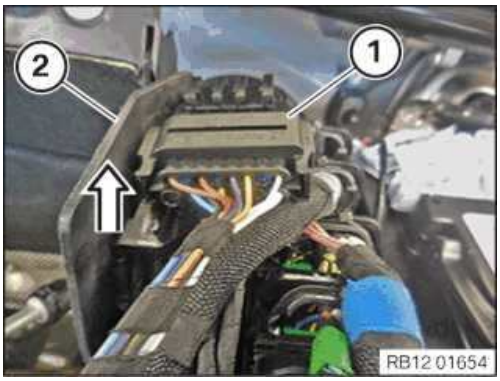


- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

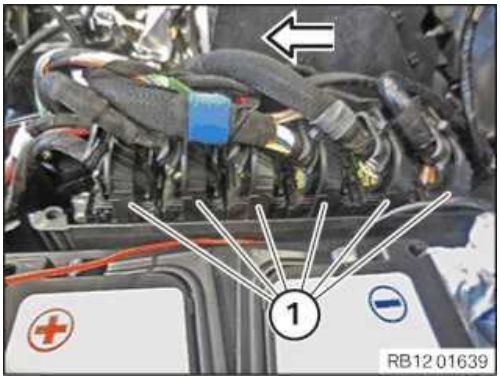


- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.

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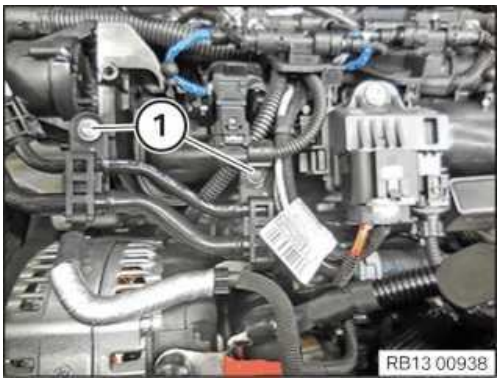
- Guide the connector (1)out of the electronics box (2) in the direction of arrow and remove it.
- Unlock and loosen connector (1).



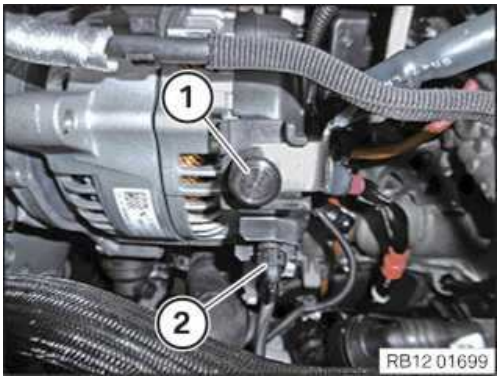
- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



- Unlock and loosen connector (1).

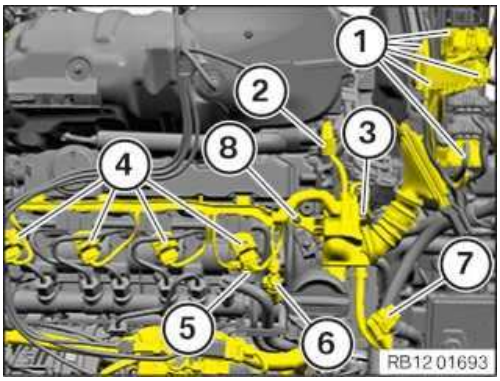


- Loosen screws (1).

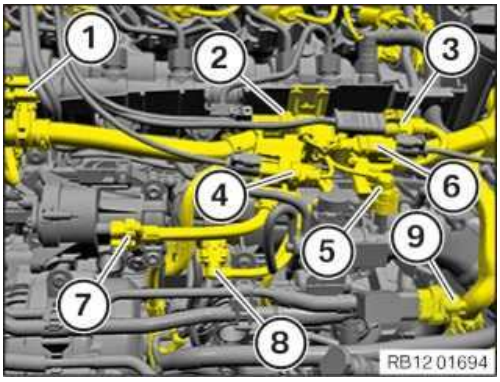


- Release the positive battery cable (1) on the alternator and place to one side.
- Unlock connector (2) and pull off.

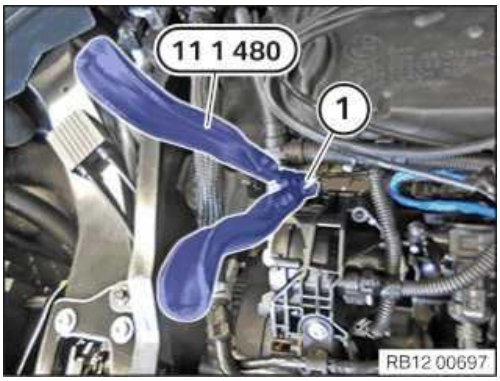
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- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock the connector (2) and disconnect it from the differential pressure sensor.
- Unlock the connector (3) and disconnect it from the exhaust-gas recirculation valve.
- Unlock the connector (4) and pull off from the injectors.
- Unlock the connector (5) and disconnect it from the camshaft sensor.
- Unlock the connector (6) and disconnect it from the fuel pressure regulator.
- Unlock connector (7) and pull off from hot film air mass meter.
- Loosen screw (8).

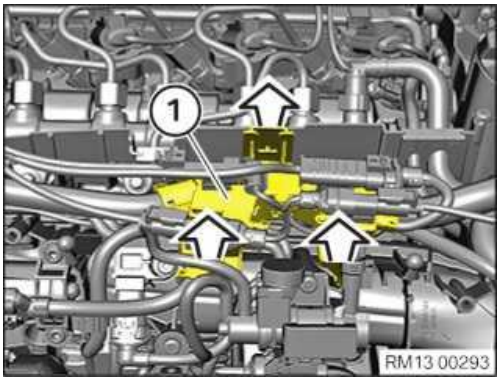


- Unlock connector (1) and pull off from the rail pressure sensor.
- Unlock the connector (2) and disconnect it from the exhaust temperature sensor before the diesel particulate filter.
- Unlock and disconnect the connector (3) from the front oxygen sensor.
- Unlock the connector (4) and disconnect it from the exhaust temperature sensor after the diesel particulate filter.
- Unlock and disconnect the connector (5) from the electric changeover valve.
- Unlock the connector (6) and disconnect it from the exhaust temperature sensor for the exhaust-gas recirculation cooler.
- Unlock the connector (7) and disconnect it from the servomotor for the swirl flaps.
- Unlock the connector (8) and pull it off the charging pressure sensor.
- Unlock the connector (9) and disconnect from the fuel pressure and temperature sensor.



- Unlock the connectors (1) of all glow elements with the special tool **0 490 796 (11 1 480)** and release them.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.

▶ **Removing the cable clips from the intake plenum**



- Detach the cable clip (1) in the direction of the arrow.
- Guide out the cable clip (1) in direction of arrow and set it aside.

13 – Removing the intake plenum

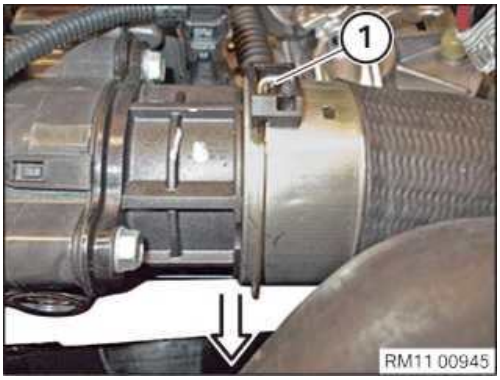
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TECHNICAL INFORMATION

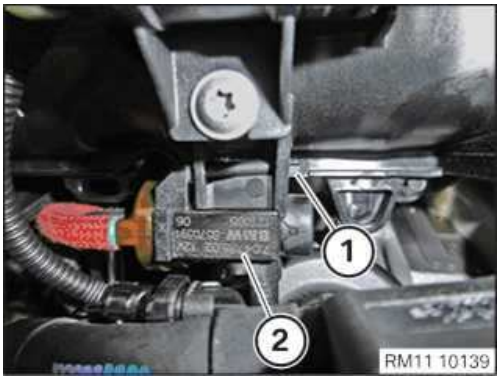
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



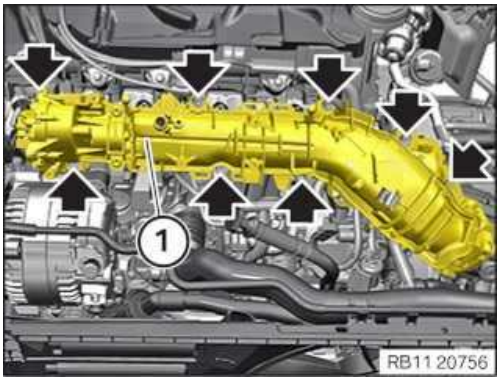
- Unlock the lock (1).



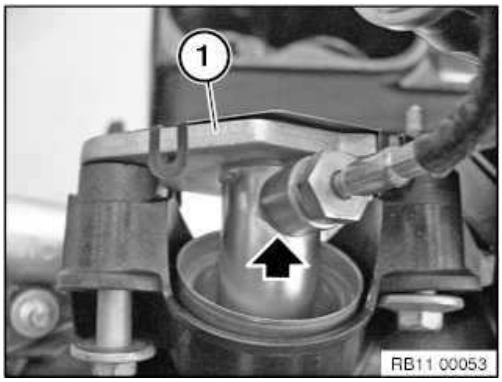
- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.



- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



- Release the screws (arrows) from the intake plenum (1).
- Guide the intake plenum (1) out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

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14 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

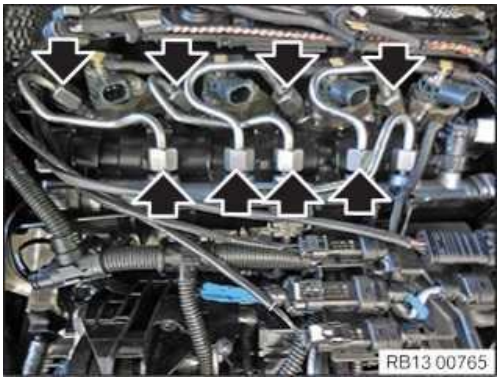
TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release the high pressure lines (arrows) with the special tool .
- Catch and dispose of escaping fuel.
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool .

15 – Detaching leakage oil line from injector

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Contaminant or foreign body.

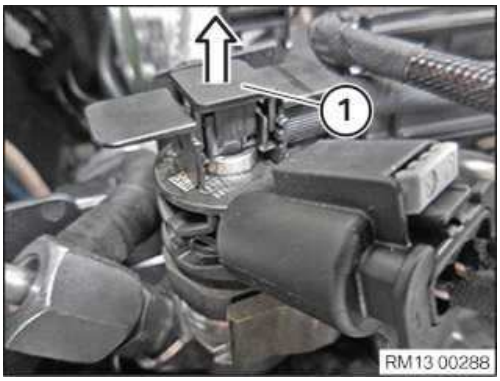
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

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- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

16 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

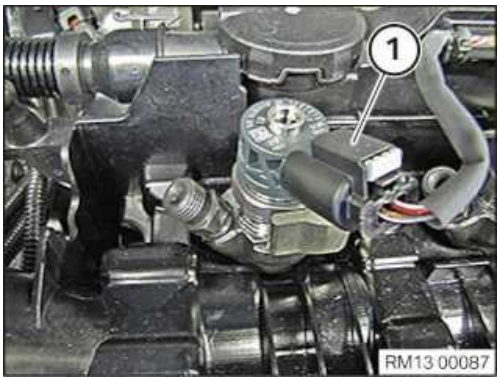
Electrostatic discharge.

Damage to or destruction of electrical components.

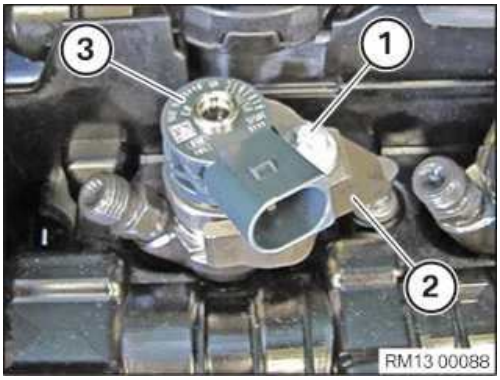
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.



- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

▶ **Loosen stuck injectors**

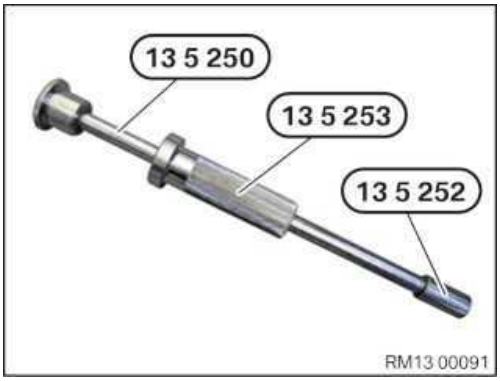
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RISK OF DAMAGE

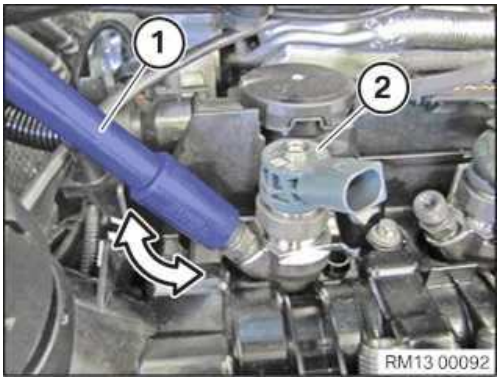
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)**back onto the special tool **0 493 321 (13 5 250)**.



- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

17 – Remove differential pressure sensor

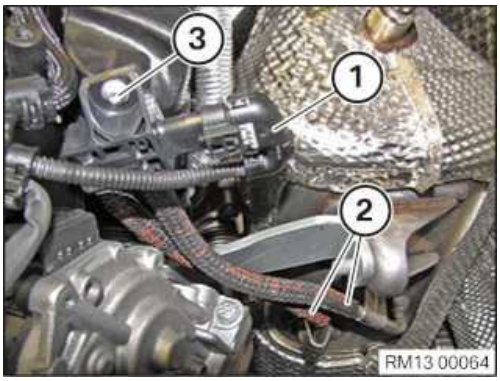
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

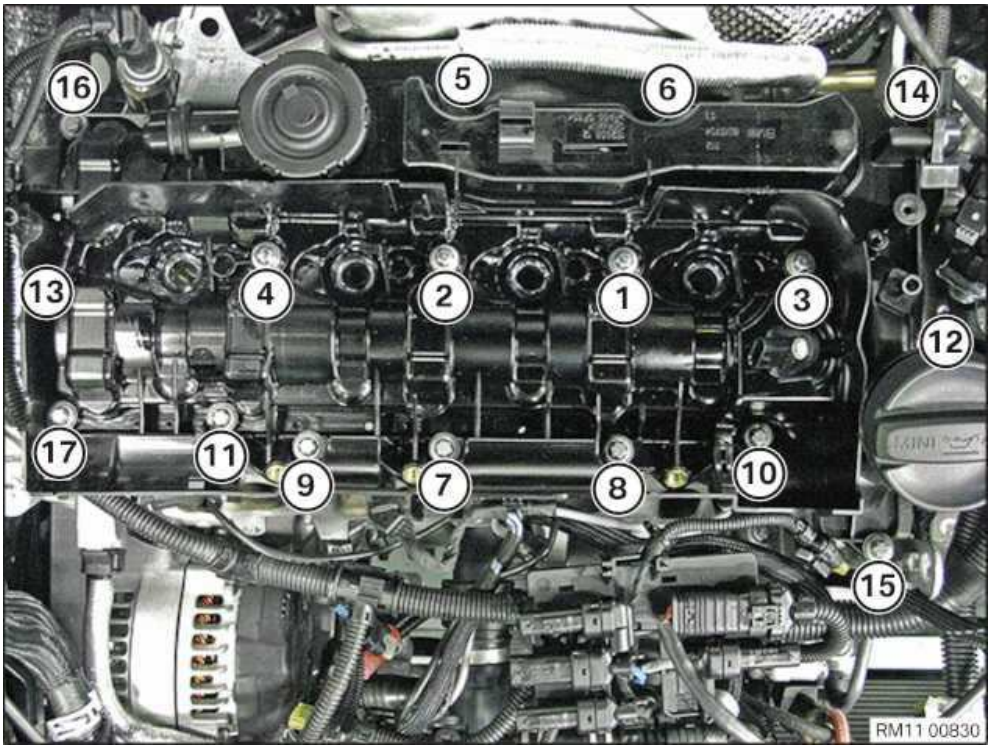
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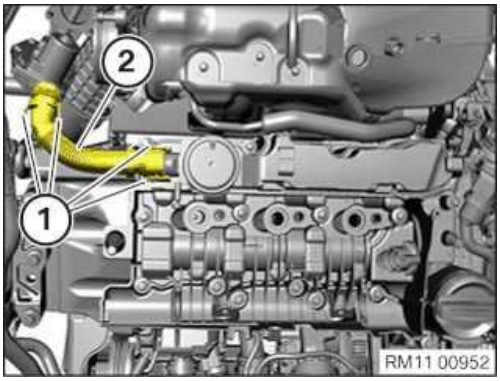
- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

18 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover

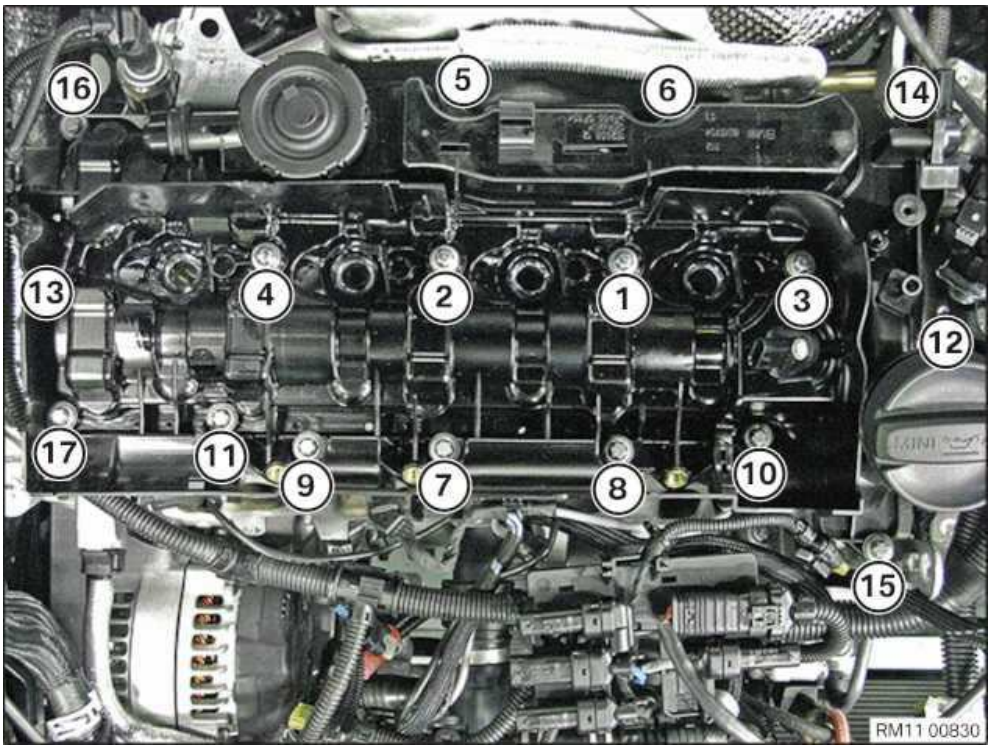


1 to 16 screws of the cylinder head cover.



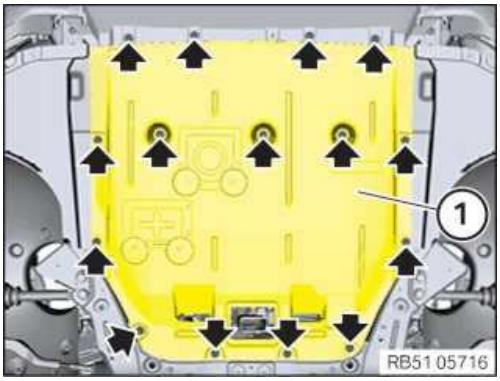
- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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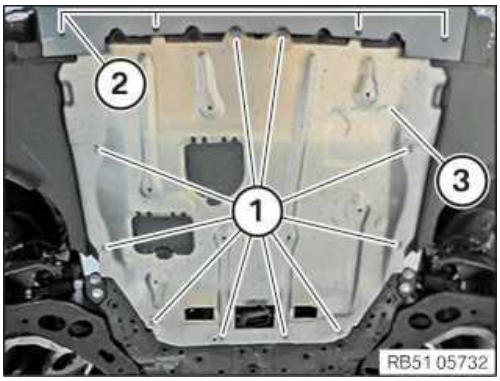


- Loosen screws in the order (17) to (1).
- Remove cylinder head cover by lifting it out.

19 – Removing the front underbody protection



- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.



- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

20 – Remove front right wheel

TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

TECHNICAL INFORMATION

Strictly observe the specified procedure to prevent clamping errors and imbalance.

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- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

21 – Removing the front right wheel arch cover

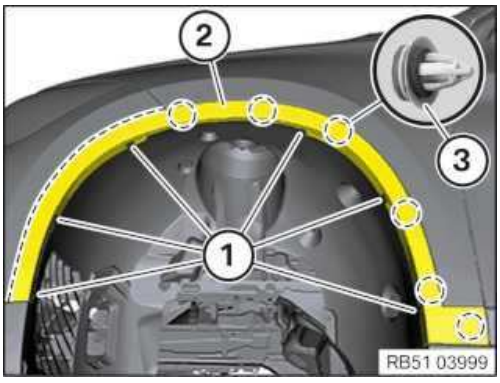
▶ **Remove the front wheel arch trim**

NOTICE

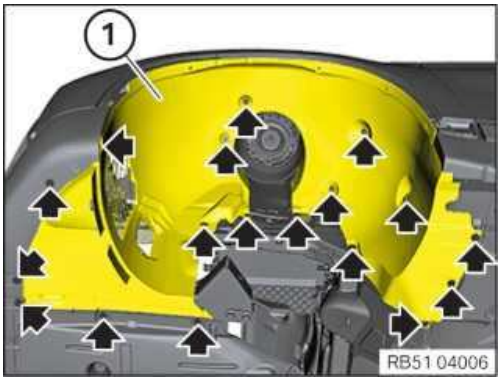
To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.



NOTICE

Description is for left component only. Procedure on the right side is identical.

- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

22 – Checking camshaft timing

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- Remove protective cap (1) from oil sump.

- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

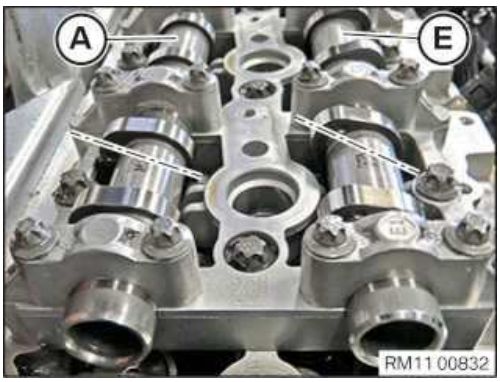
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

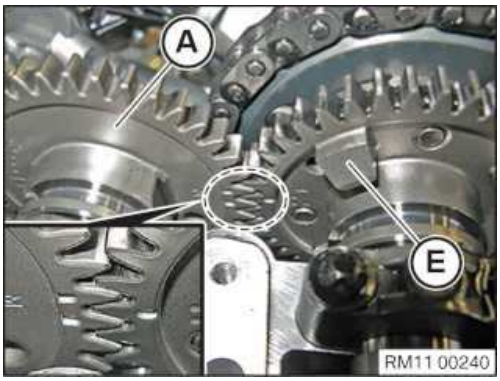


- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.

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- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.



- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

MAIN WORK

23 – Remove exhaust camshaft.

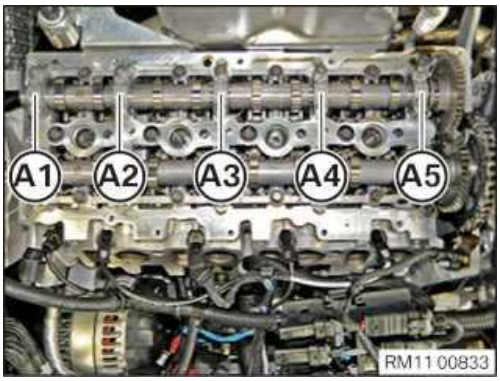
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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TECHNICAL INFORMATION

The camshaft is tensioned by the valve springs. Tighten or loosen each screw on the camshaft bearing caps one at a time in the specified sequence and by half a turn only. Repeat procedure.

- Loosen all screws of the exhaust camshaft bearing caps (A1) to (A5) from the outside to the inside, step by step in 1/2 turns.
- Remove exhaust camshaft in upward direction.
- Place all components on special tool **0 495 105 (11 4 480)** in a tidy and orderly fashion.

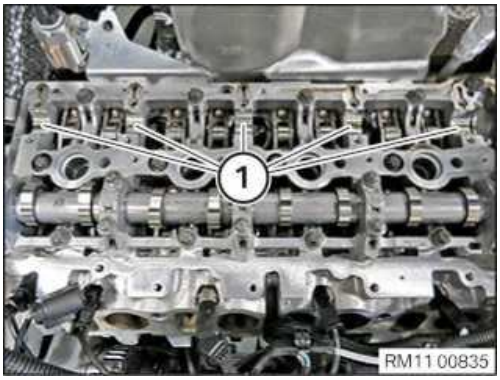
24 – Install exhaust camshaft

RISK OF DAMAGE

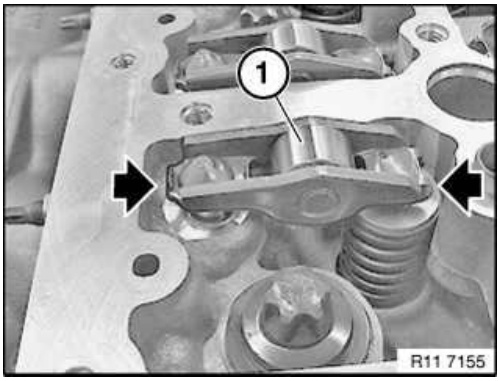
Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

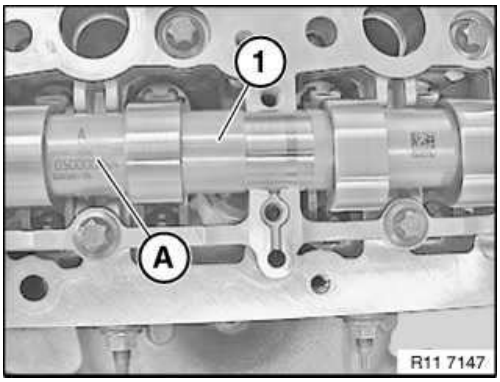
- Comply with the regulations for the installation and disassembly.
- Perform work with care.



- Oil all bearing positions (1).

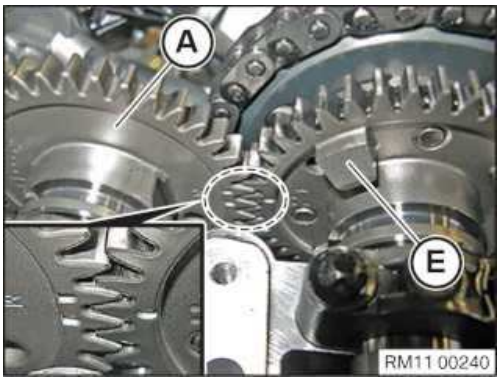


- Make sure the roller cam followers (1) have the correct mounting orientation.

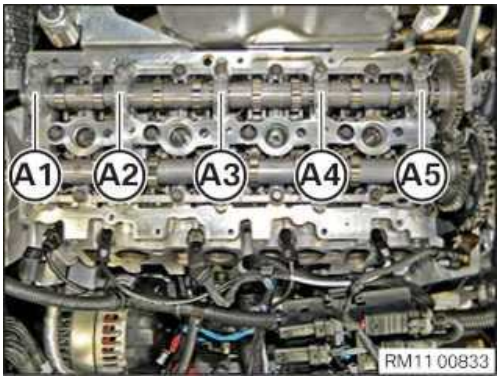


- Insert exhaust camshaft (1) so that the identification (A) points upwards.

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- Insert the exhaust camshaft (A) so that the marks on the camshafts (A) and (E) correspond in the highlighted area.
- Position the camshafts (A) and (E) accordingly.



- Tighten all exhaust camshaft bearing caps (A1) to (A5) from the inside to the outside by 1/2 a turn at a time.

Intake and exhaust camshaft in camshaft support

M6x31		Tightening torque	10 Nm

POSTPROCESSES

25 – Checking camshaft timing



- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

Damage to the engine.

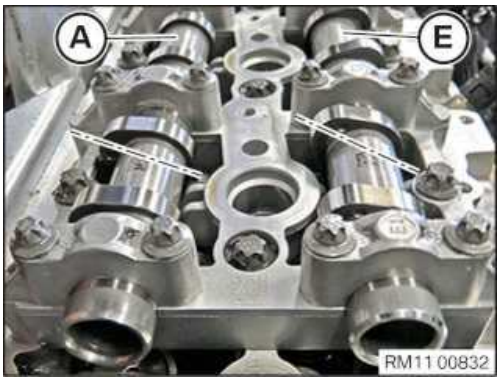
The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

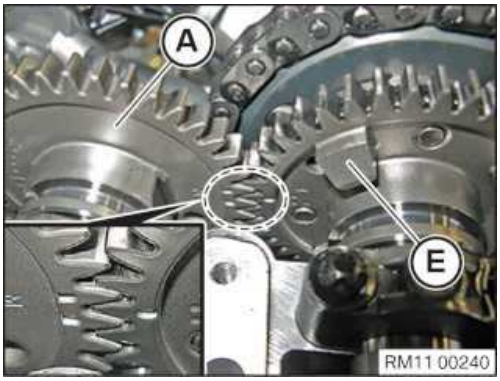
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- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

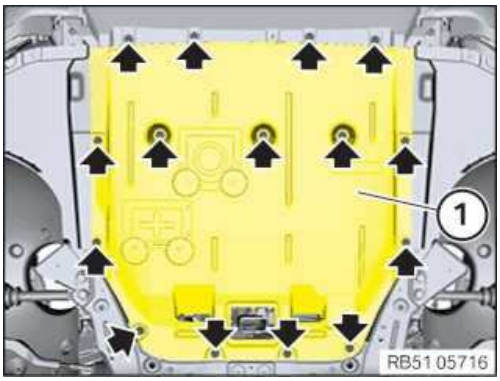
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.



- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

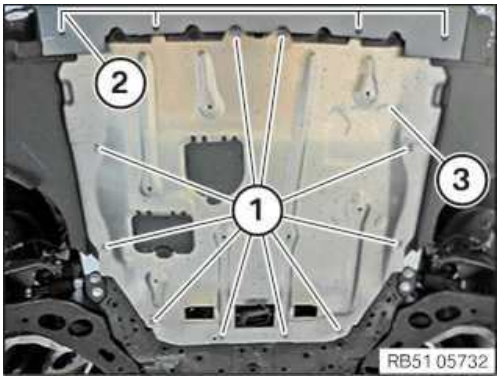
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- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm



- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

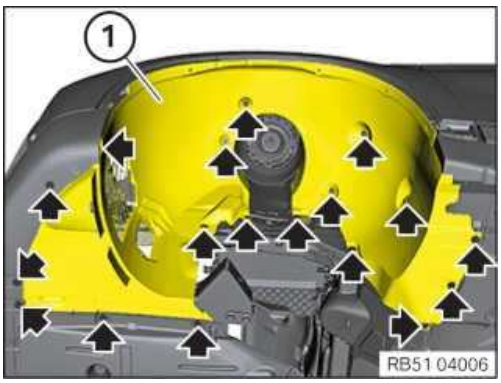
Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

27 – Installing the front right wheel arch cover

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

▸ **Installing front wheel arch trim**

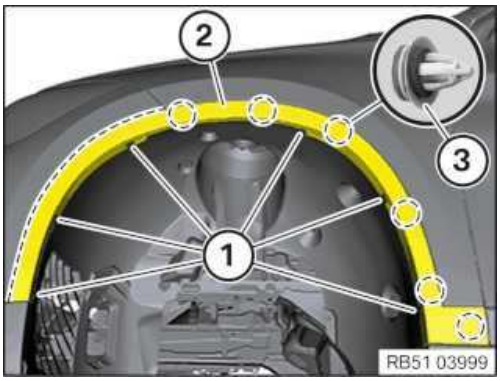
NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.

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- Check the clips (3) for damage and renew where required.

  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

28 – Installing the front right wheel

▸ **Clean the contact surfaces between the brake disc and the wheel rim**



TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

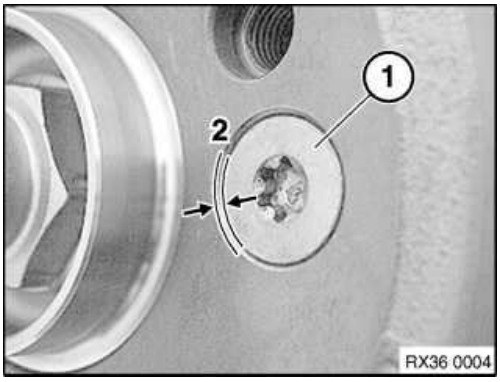
- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.



- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).



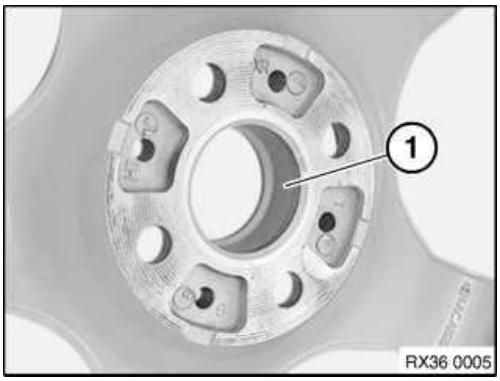
- Check the mounting bolt for the brake disc (1) for secure fit.

  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm

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- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.



TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

  Parts: Wheel bolts

- Clean the wheel bolts and check the threads for damage. Renew the wheel bolts as needed.
- Mount wheel bolts and tighten.

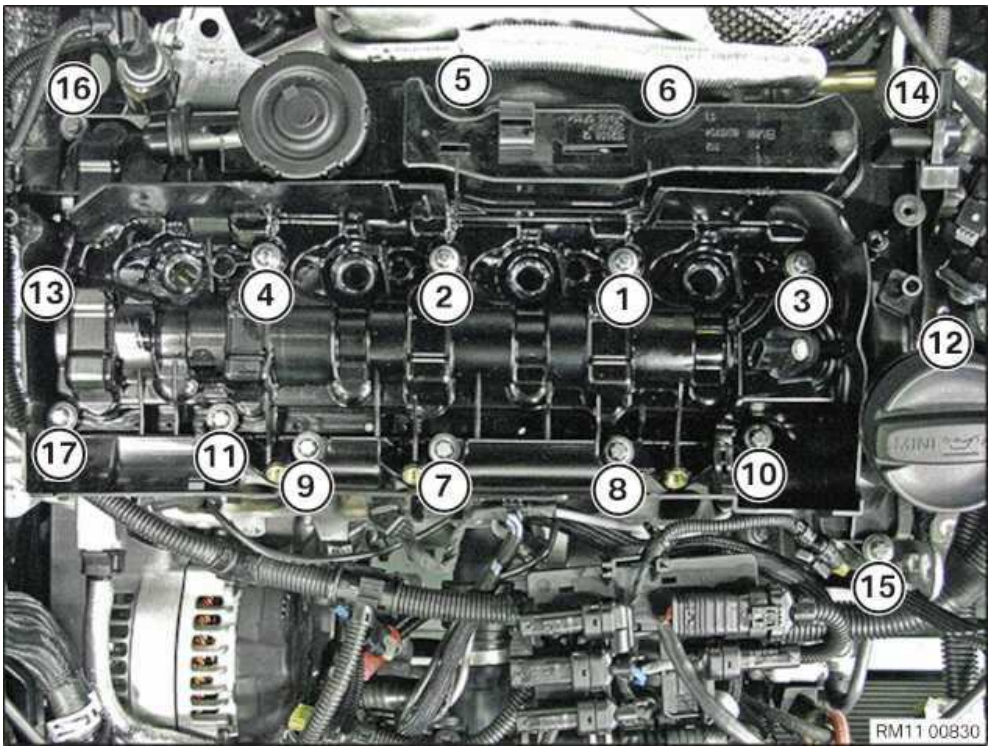
Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

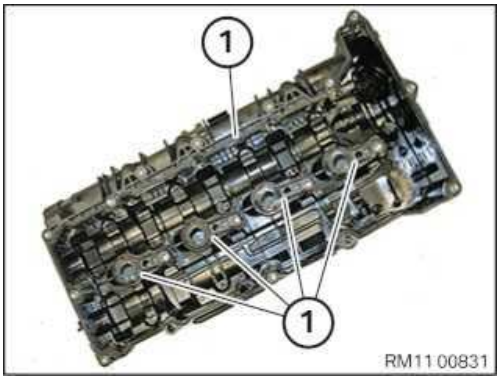
29 – Installing cylinder head cover

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Overview: Screw connection of the cylinder head cover

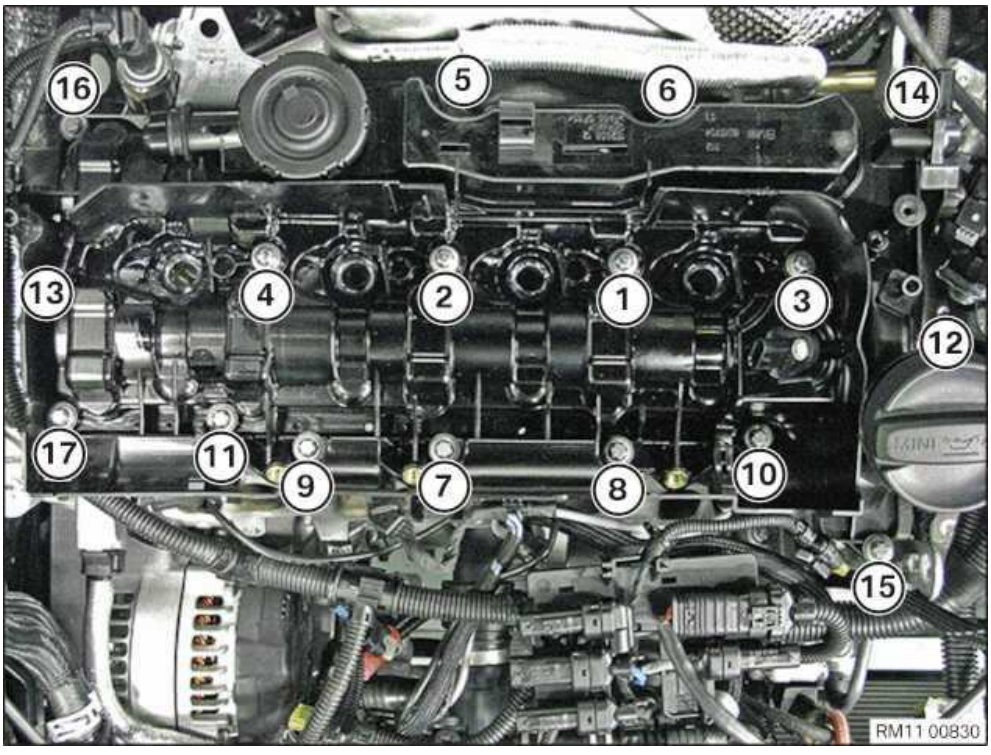


1 to 16 screws of the cylinder head cover.



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket



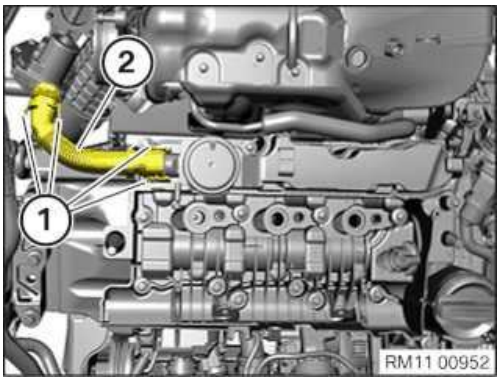
- Install cylinder head cover.
- Tighten screws in the order (1) to (17).

Cylinder head cover to cylinder head

M6		Tightening torque.	8, Nr

-

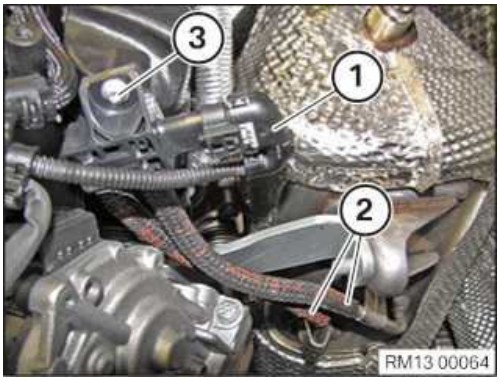
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- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

30 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

31 – Installing injectors of injection system

▶ **Cleaning the injector shafts**

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.



- Wear safety goggles.

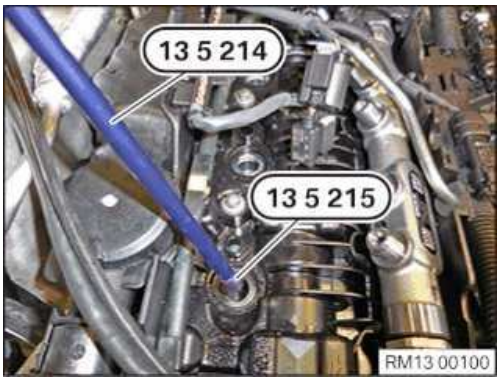
RISK OF DAMAGE

Contaminant or foreign body.

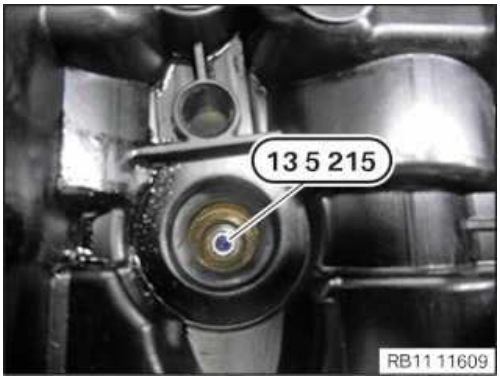
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.



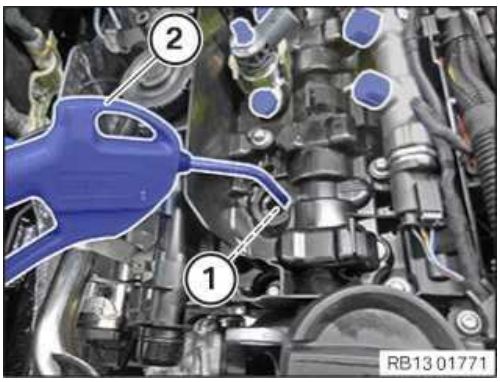
- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.



- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.

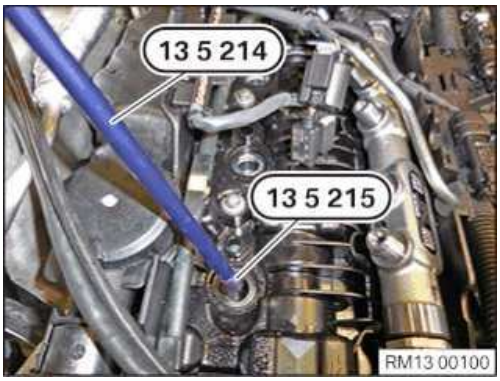


- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.



- Blow out injector shaft (1) with air gun (2).

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- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

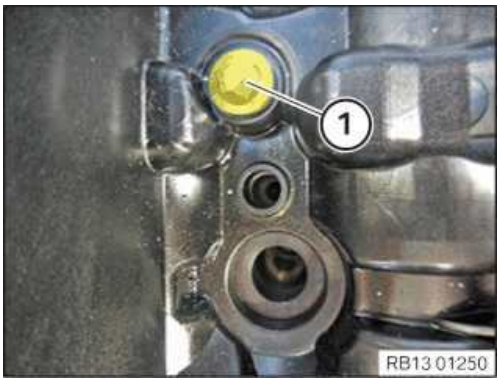
▸ **Check the placement of the clamping claw**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▸ **Prepare the injector for installation**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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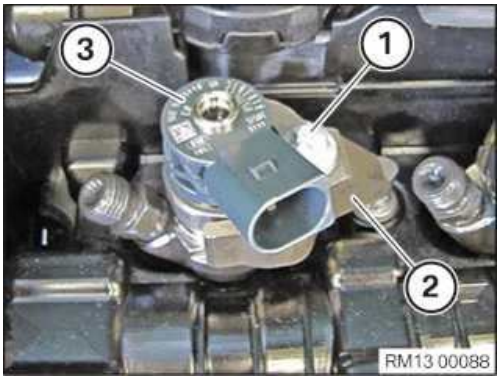
- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring

- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

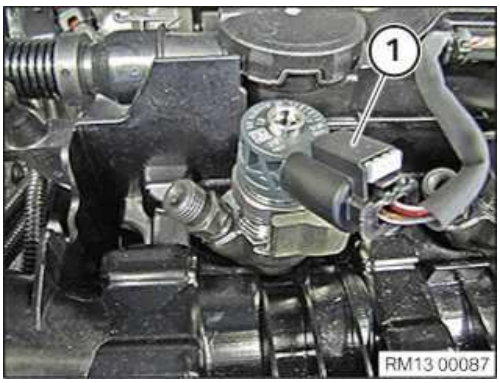
Injector lubricating grease	50 g, Can	83230441070



- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

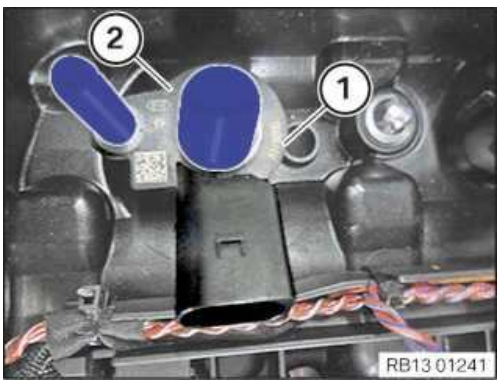
▸ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



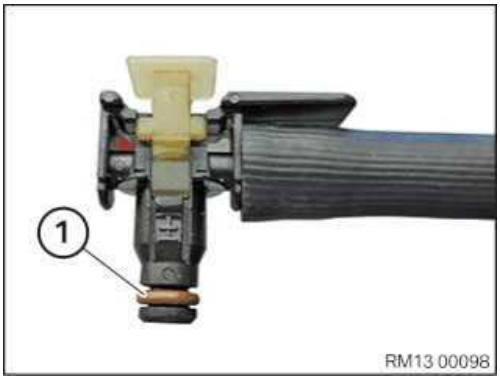
- Read off the adjustment value (1) on the new injector (2).

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- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

32 – Connect the leakage oil line on the injector



- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.



- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

33 – Installing high pressure lines between rail and injectors

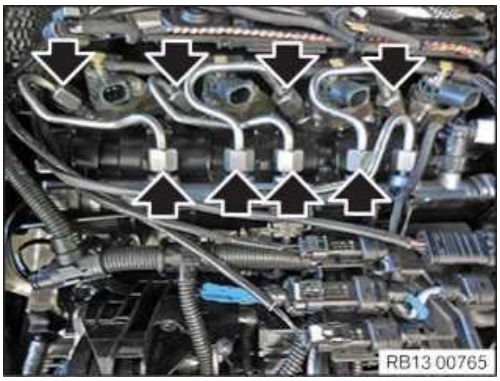
TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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- Remove special tool .
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

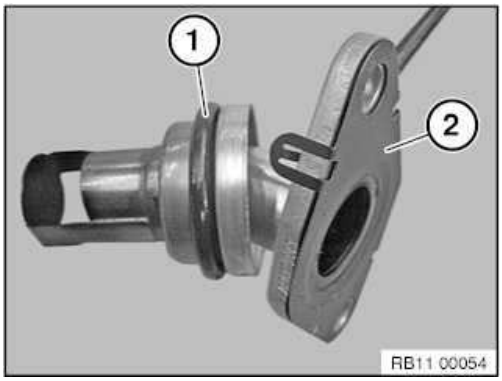
- Tighten the high pressure lines (arrows) with the special tool .

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

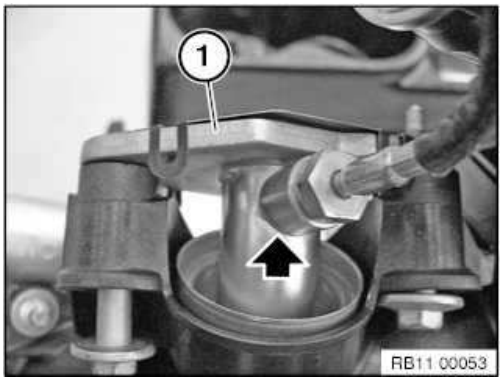
34 – Installing the intake plenum



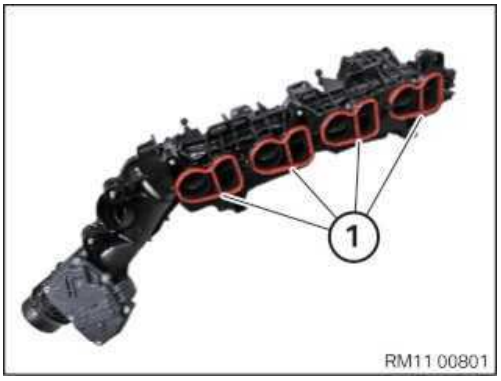
- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position the seal (2) and clip it in.



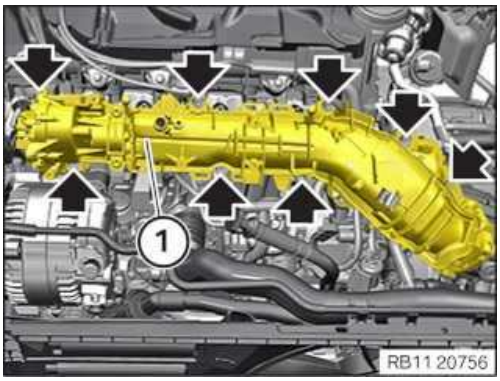
- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (1).

  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.

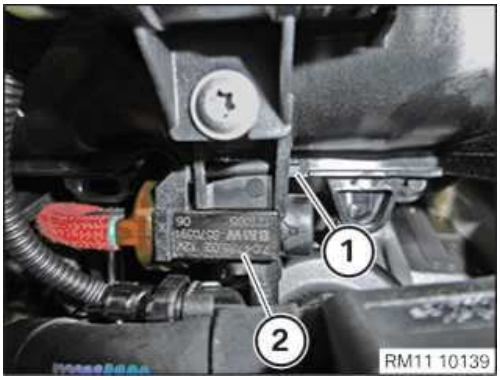
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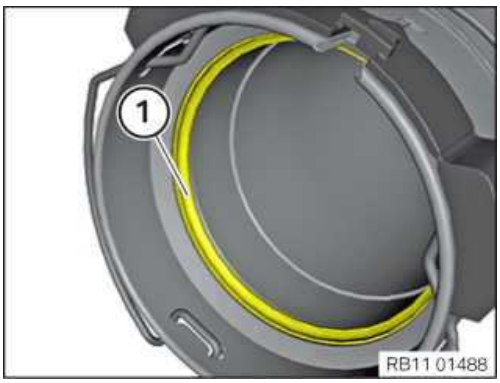
- Guide in and install intake (1) plenum.
- Tighten screws (arrows).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm

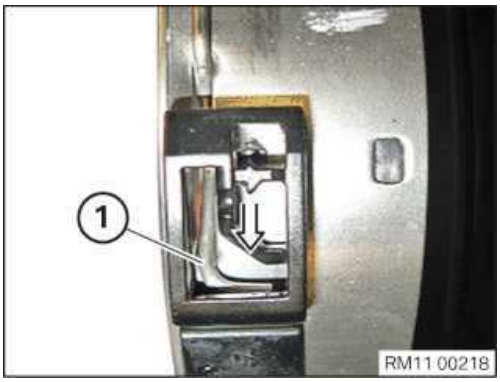


- Install the electric changeover valve (2) in the holder on the plenum from left to right.
- Lock (1) must engage audibly.

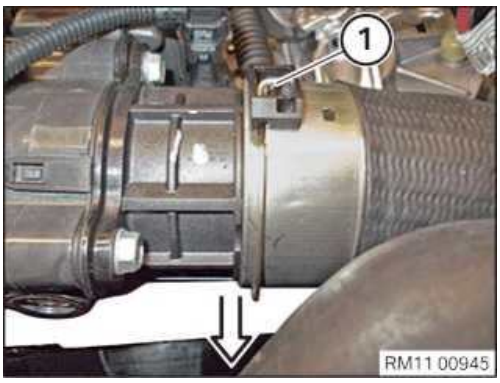


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring



- Engage the lock (1) on the bracket (arrow).



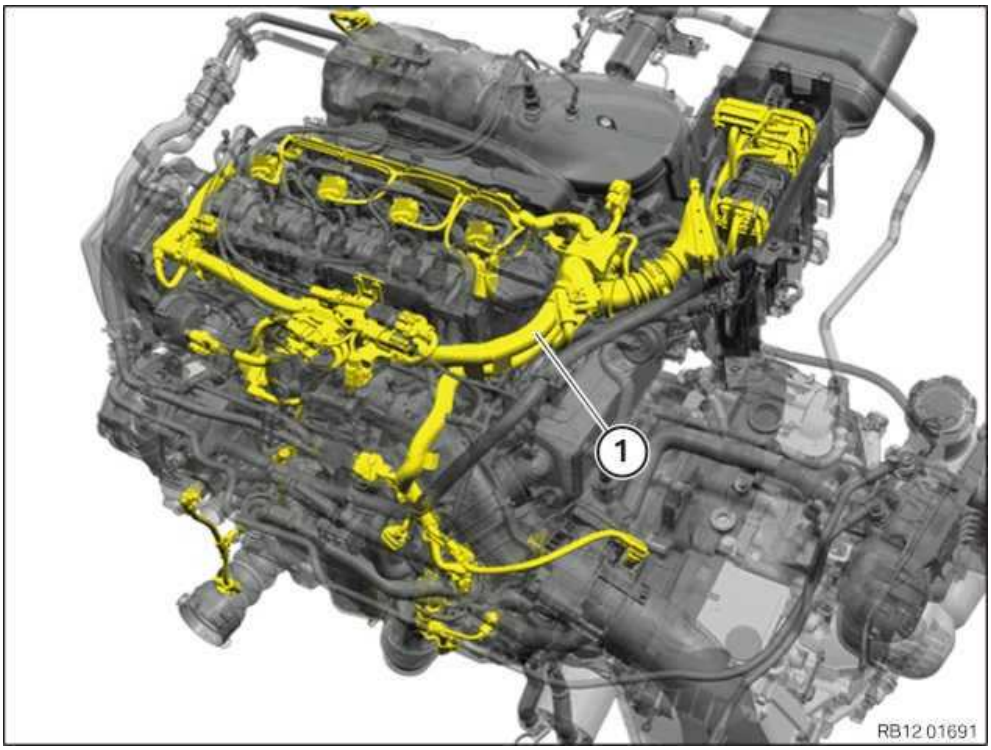
- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

35 – Fastening the wiring harness section for the intake plenum

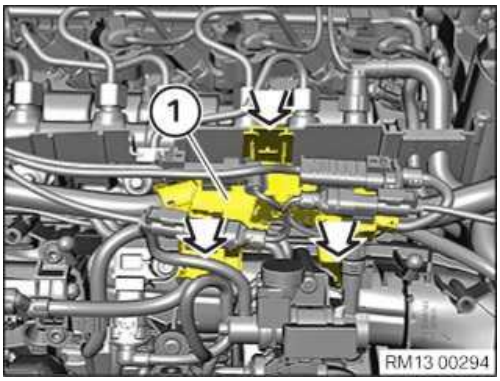
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Overview: Wiring harness section for the engine

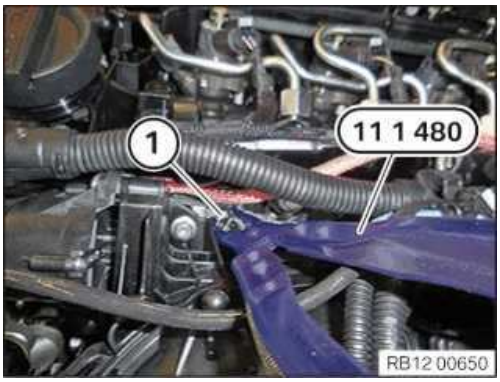


1 Wiring harness section for the engine

▶ **Installing the cable clip for the intake plenum**

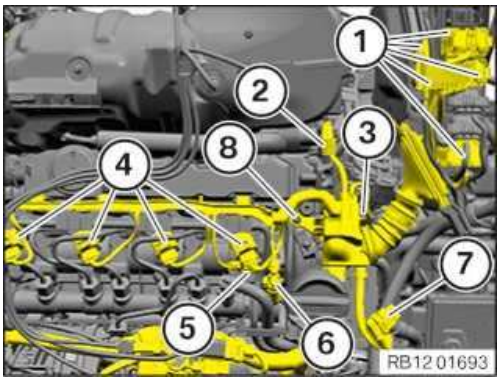


- Insert and install the cable clip (1) in the direction of the arrow.
- Make sure the cable clip (1) is fitted correctly.



- Connect and lock the connector (1) on the glow elements.
  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.

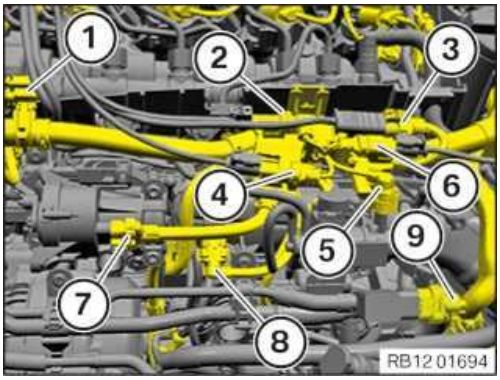
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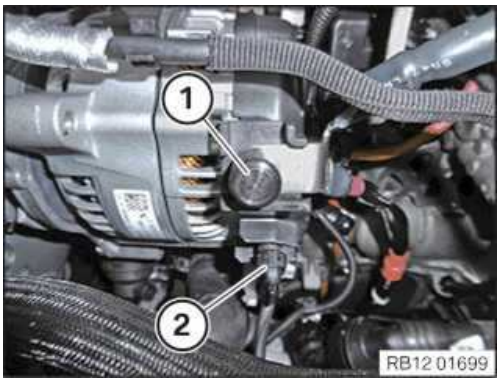
- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the DME control unit and remove the integrated supply module (PDM).
- Attach connector (2) to the differential pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust-gas recirculation valve and lock audibly.
- Attach connector (4) to the injectors and lock it audibly.
- Attach connector (5) to the camshaft sensor and lock it audibly.
- Attach connector (6) to the fuel pressure regulator and lock it audibly.
- Connect and audibly lock the connector (7) to the hot film air mass meter.
- Tighten down screw (8).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm



- Connect the connector (1) to the rail pressure sensor and lock it audibly.
- Attach connector (2) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (3) to the front oxygen sensor and lock audibly.
- Attach connector (4) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Connect the connector (5) to the electric changeover valve and lock audibly.
- Attach connector (6) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (7) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (8) to the charging pressure sensor and lock it audibly.
- Attach connector (9) to the fuel pressure and temperature sensor and lock it audibly.

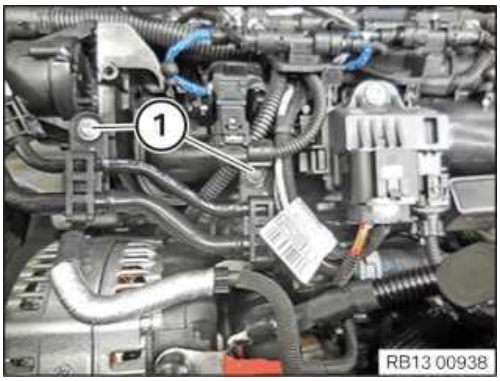


- Connect and lock the connector (2).

  Lock must snap audibly into place.
- Connect the positive battery cable (1) and tighten.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

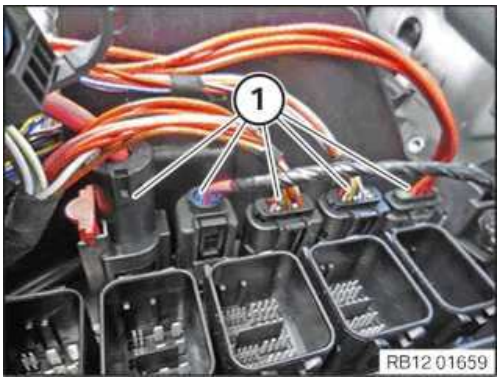


- Position the fuel line.
- Tighten the screws (1).

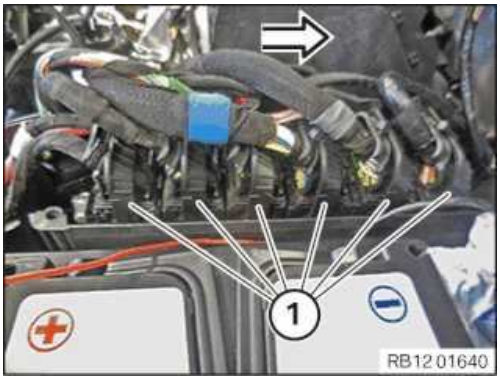
Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

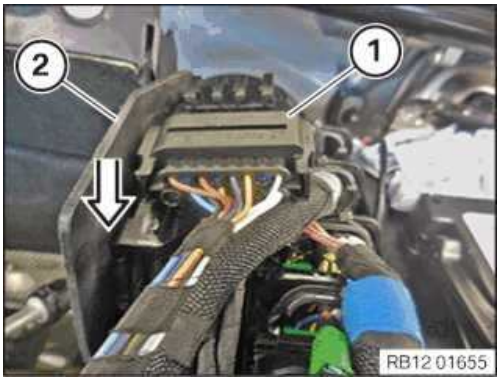
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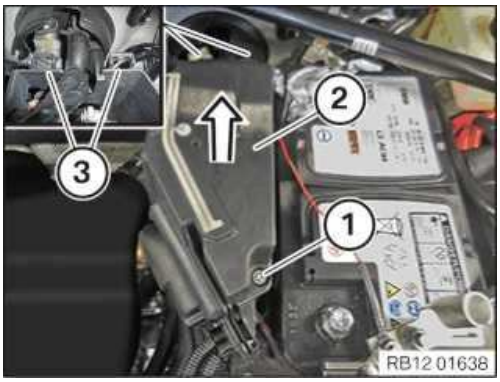
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



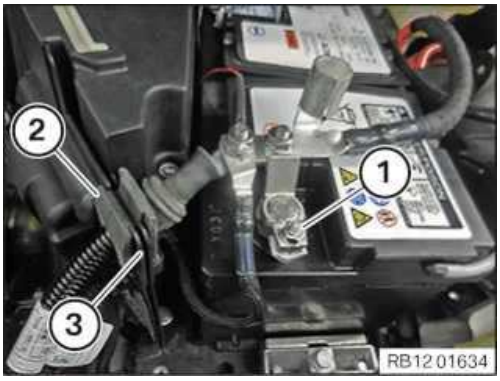
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert and install the cover (2) into the guides (3) in the direction of the arrow.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

RF5x26.5		Tightening torque	2,5 Nm

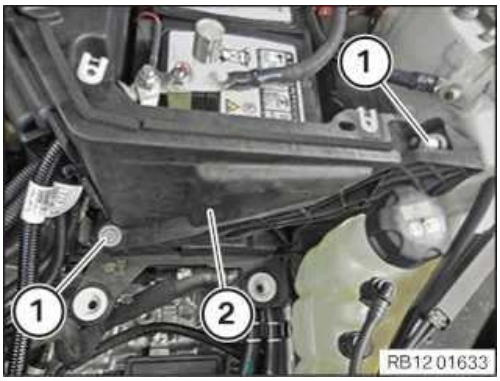


- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

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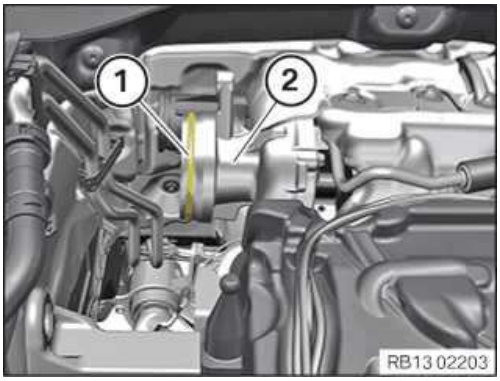


- Feed in and install tension strut (2).
- Tighten the screws (1).

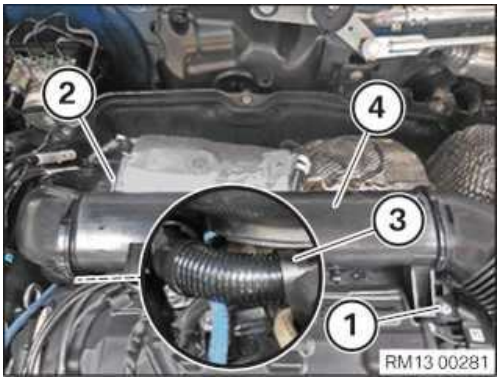
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

36 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.



- Feed in clean air pipe and install.
- Connect clean air pipe to the exhaust turbocharger and lock audibly in the clamps (2).
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Connect ventilation line (3) to the cylinder head cover and lock audibly.



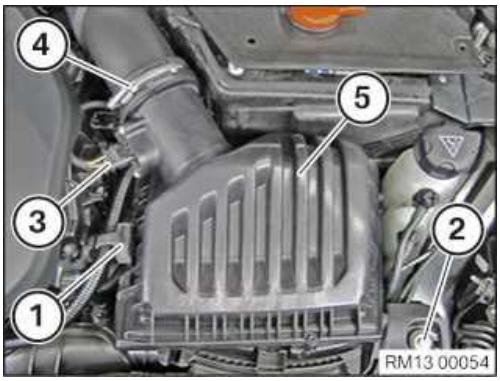
- Mount clean air pipe onto the intake filter housing.
- Tighten clamp (1) on the clean air pipe.

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

37 – Installing intake silencer housing

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- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

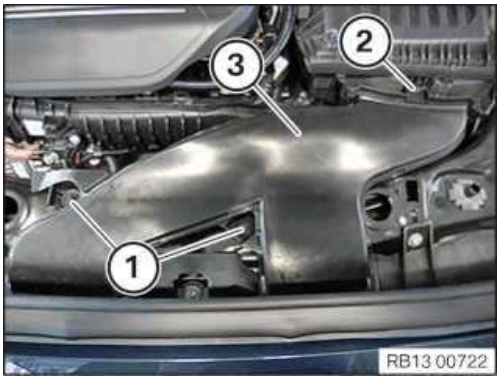
- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

38 – Install the intake neck for the intake filter housing

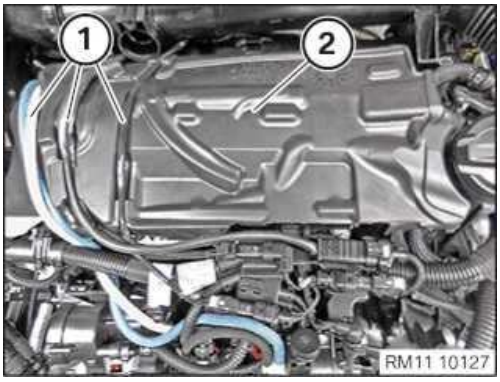


- Insert and install the intake neck (3).
  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

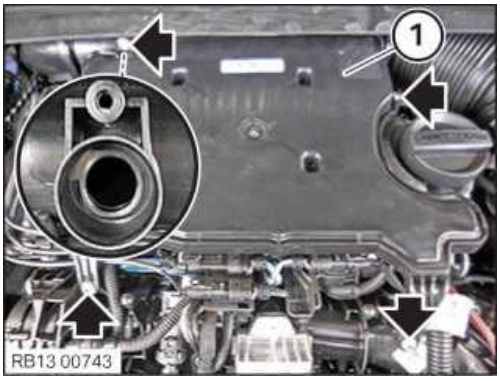
M6		Tightening torque	8 Nm

39 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the vehicle wiring harness (1) in the brackets.

40 – Install resonator



- Insert and install the resonator (1).
- Renew the bolts (arrows).
  Parts: Bolts
- Tighten screws (arrows).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

41 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Check for correct installation of all rubber mounts in the acoustic cover (1).

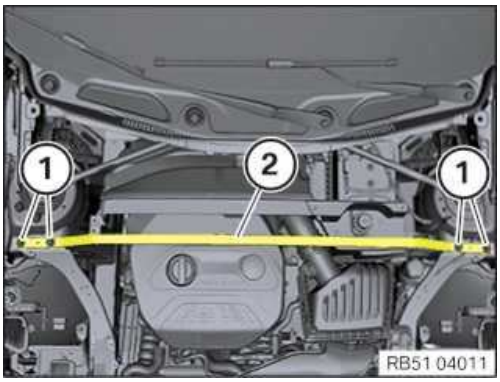


- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

42 – Install strut brace

TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.



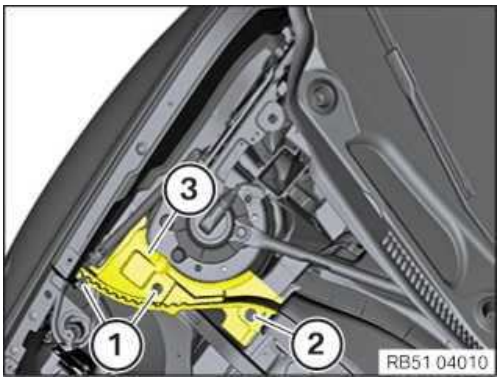
- Install the strut brace (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-brace to spring strut dome

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

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NOTICE

Description is for right component only. The procedure on the left side is identical.

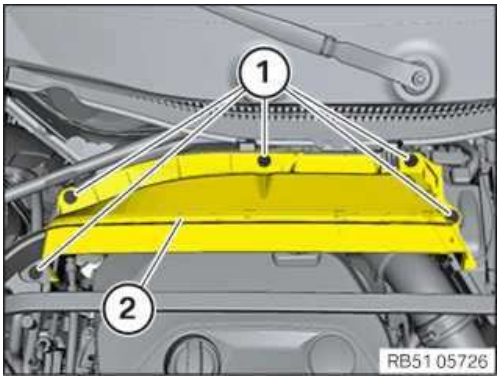
- Install the cover (3).
- Tighten down screw (2).

Cover on body

Hexagon screw		Tightening torque	3 Nm

- Install the expanding rivet (1).

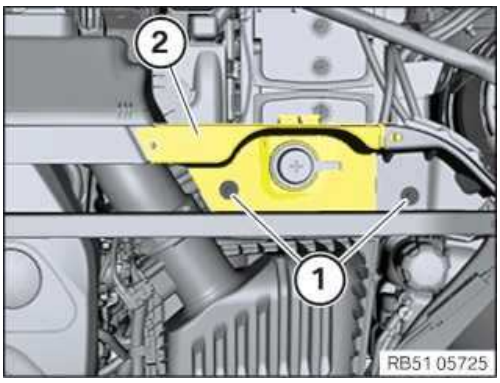
43 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Cover of top bulkhead

Screw		Tightening torque	2,6 Nm

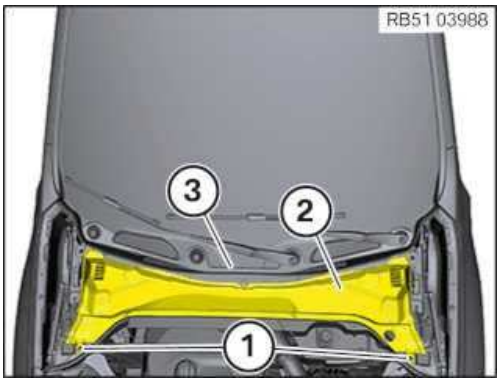


- Guide in and install cover (2).
- Tighten down screw (1).

Cover of remote positive terminal

Screw		Tightening torque	2,6 Nm

44 – Installing front cowl panel cover



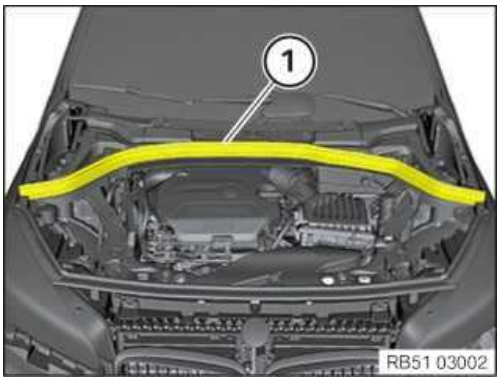
- Insert and install cowl panel cover at front (2) into cowl panel cover at rear (3).
- Check cowl panel cover at front is correctly seated (2).
- Secure expanding rivet (1).

45 – Install the seal for the bonnet

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

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- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

46 – Disconnecting all battery earth leads



- See additional information.

Additional Information

Overview of Tightening Torques

Intake and exhaust camshaft in camshaft support — Used in step 24

M6x31		Tightening torque	10 Nm

Underbody protection front — Used in step 26

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Wheel arch cover to body — Used in step 27

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body — Used in step 27

Plastic nut		Tightening torque	3 Nm

Brake disc to front wheel hub — Used in step 28

M8	Renew screw.		16 Nm

Wheel bolts — Used in step 28

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

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Cylinder head cover to cylinder head

Used in step 29

M6		Tightening torque.	8,5 Nm

Differential pressure sensor to holder

Used in step 30

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor

Used in step 30

Clamp 15–19mm		Tightening torque	3 Nm

Clamping claw facing to cylinder head cover

Used in step 31

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 31

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

High pressure lines between injector and rail

Used in step 33

High pressure lines		Tightening torque	28 Nm

Intake plenum to cylinder head

Used in step 34

M6		Tightening torque	11 Nm

Wiring harness to cylinder head cover

Used in step 35

TS5x20		Tightening torque	3,5 Nm

Positive battery cable to alternator

Used in step 35

M8		Tightening torque	19 Nm

Fuel line to intake plenum

Used in step 35

TS6x20		Tightening torque	5 Nm

Cover to electronics box

Used in step 35

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery

Used in step 35

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray

Used in step 35

M8		Tightening torque	19 Nm

Clean air pipe to cylinder head cover

Used in step 36

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing

Used in step 36 37

Clamp		Tightening torque	3 Nm

Intake silencer housing to lock bridge

Used in step 37

M6X30		Tightening torque	8 Nm

Intake neck to cross connection

Used in step 38

M6		Tightening torque	8 Nm

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Resonator to manifold and clean air pipe

Used in step 40

Screw TS6	Renew screw.	Tightening torque	5 Nm

Cross-brace to spring strut dome

Used in step 42

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

Cover on body

Used in step 42

Hexagon screw		Tightening torque	3 Nm

Cover of top bulkhead

Used in step 43

Screw		Tightening torque	2,6 Nm

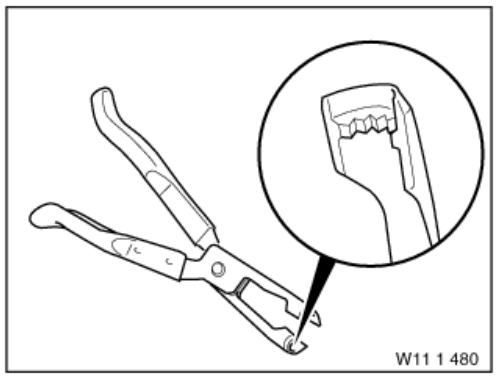
Cover of remote positive terminal

Used in step 43

Screw		Tightening torque	2,6 Nm

Overview of Special Tools

0 490 796 (11 1 480) Pliers



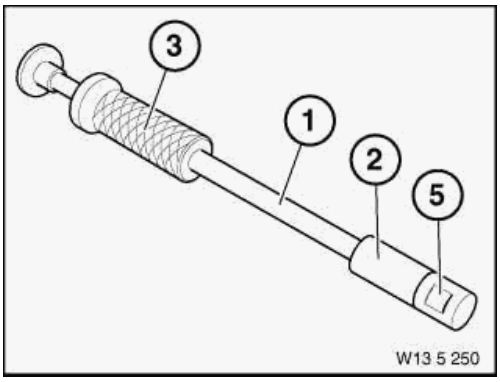
Common

Used in step 12

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

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0 493 321 (13 5 250) Puller



Common

Used in step 16

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

0 493 339 (13 5 252) Bush



Common

Used in step 16

Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 340 (13 5 253) Weight



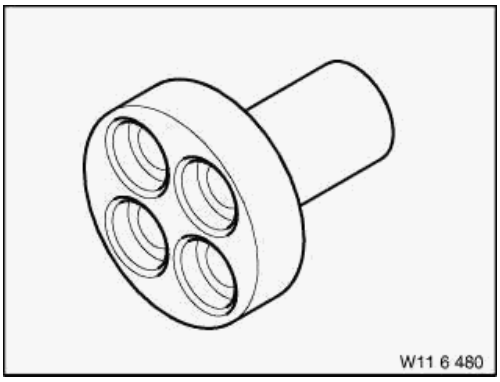
Common

Used in step 16

Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 493 380 (11 6 480) Connector



Common Used in step 22 25

Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

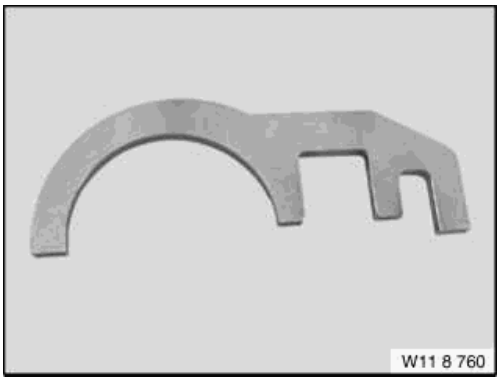
2 288 380 Locating stud



Common Used in step 22 25

Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 112 (11 8 760) Gauge



Common Used in step 22 25

Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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0 495 105 (11 4 480) oddments tray



Common

Used in step 23

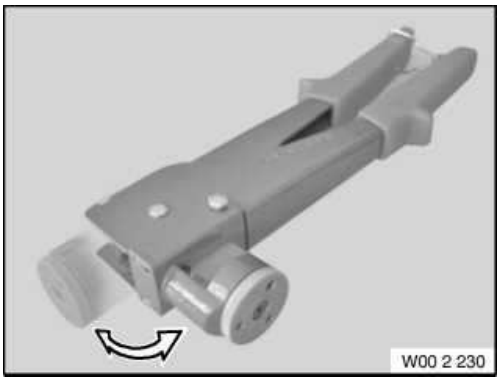
Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

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0 496 521 (00 2 230) Pliers



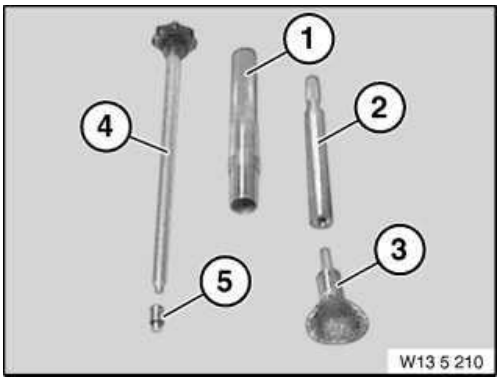
Common	Used in step 27
Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

2 344 011 Tool



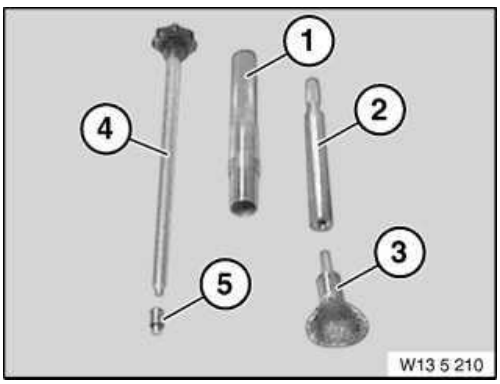
Common	Used in step 28
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

0 493 763 (13 5 215) Plug



Common	Used in step 31
Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

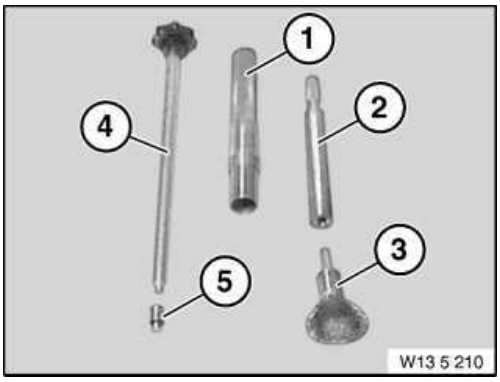
0 493 762 (13 5 214) Rod



Common	Used in step 31
Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 493 758 (13 5 210) Tool



Common Used in step 31

Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

Replacement tools:

0 495 221 (36 1 323) Wheel stud



Common Used in step 20

Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 224 (36 1 326) Wheel stud



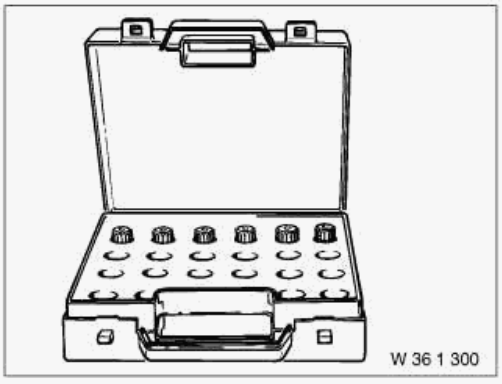
Common	Used in step 20
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud



Common	Used in step 20
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud



Common	Used in step 20
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 227 (36 1 329) Wheel stud



Common	Used in step 20
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud



Common	Used in step 20
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 229 (36 1 332) Wheel stud



Common	Used in step 20
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud



Common	Used in step 20
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Links

Repair instructions	Used in step

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61 20 900 Disconnecting and connecting battery earth lead	1 46
61 20 900 Disconnecting and connecting battery earth lead	1 46
61 20 900 Disconnecting and connecting battery earth lead	1 46
61 20 900 Disconnecting and connecting battery earth lead	1 46
61 20 900 Disconnecting and connecting battery earth lead	1 46
61 20 900 Disconnecting and connecting battery earth lead	1 46
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 46
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 46
61 20 900 Disconnecting and connecting battery earth lead	1 46
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 46
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	1 46
61 20 900 Disconnecting and connecting battery earth lead	1 46
61 20 900 Disconnecting and connecting battery earth lead	1 46
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61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 46
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61 20 900 Disconnecting and connecting battery earth lead	1 46
61 20 900 Disconnecting and connecting battery earth lead	1 46
61 20 900 Disconnecting and connecting battery earth lead	1 46
61 20 900 Disconnecting and connecting battery earth lead	1 46
61 35 ... Notes on ESD protection (Electro Static Discharge)	16 17

Operating materials	Used in step
2.0 Grease for wheel centring	28

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11 31 022 Removing and installing/replacing both camshafts

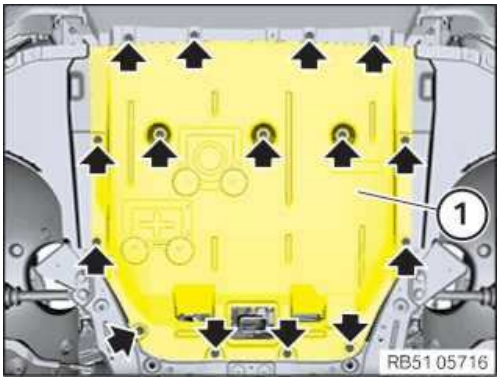
PRELIMINARY WORK

1 – Disconnecting all battery earth leads

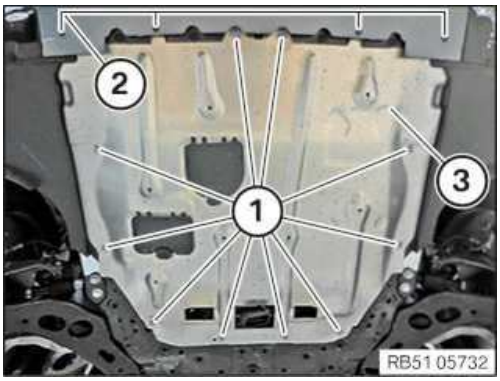


- See additional information.

2 – Removing the front underbody protection

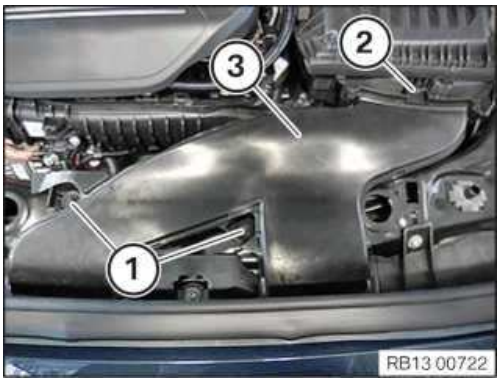


- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.



- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

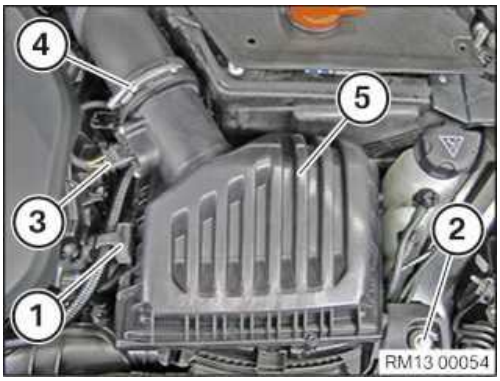
3 – Remove the intake neck for intake silencer housing



- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

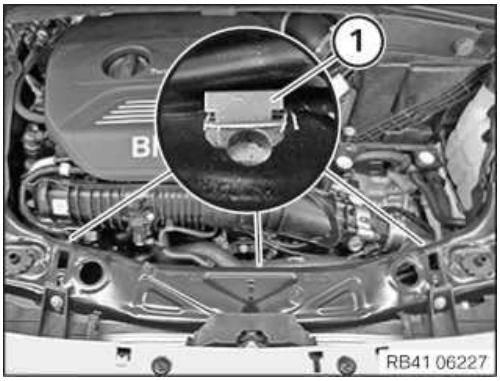
4 – Removing intake silencer housing

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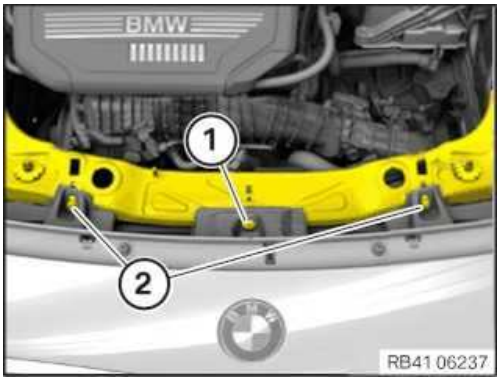


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

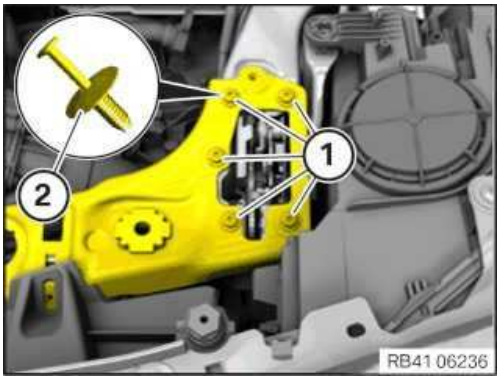
5 – Remove front cross connection



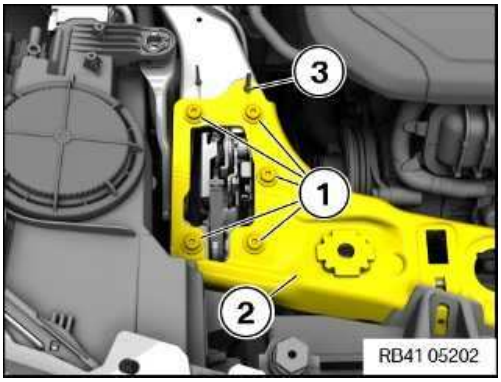
- Detach the clamps (1) for the Bowden cable of the bonnet locks from the cross connection.



- Loosen screw (1).
- Loosen screws (2).



- Loosen screws (1).
- Lever out expanding rivet (2).



- Loosen screws (1).
- Unclip the front cross connection (2) from the rubber retainer (3) and remove it upward.

6 – Draining coolant

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WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

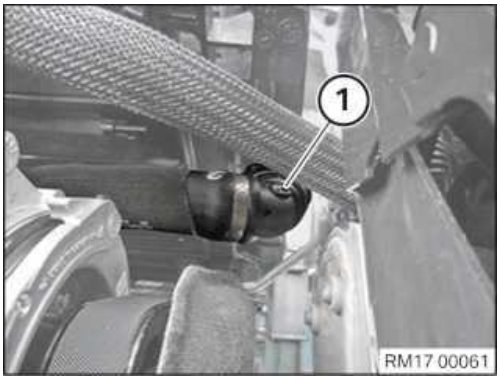
In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

TECHNICAL INFORMATION

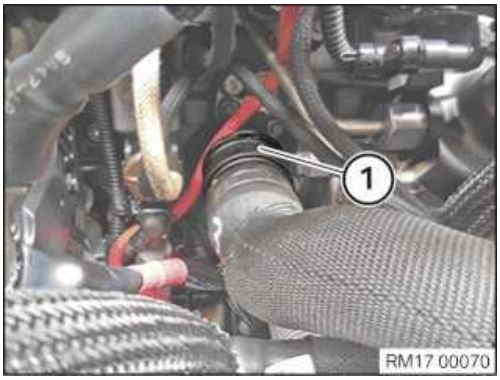
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Loosen sealing cap (1).



- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.



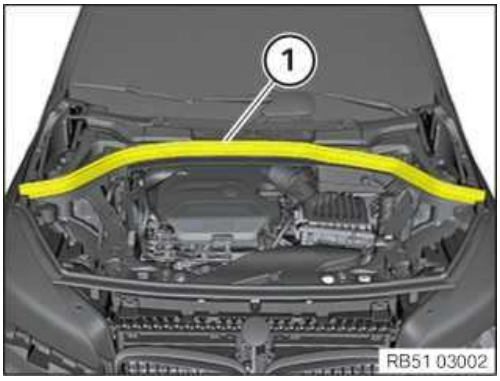
- Unlock the coolant line (1) and pull it off the connecting branch.
- Catch and dispose of escaping coolant.

7 – Remove the seal for the rear bonnet

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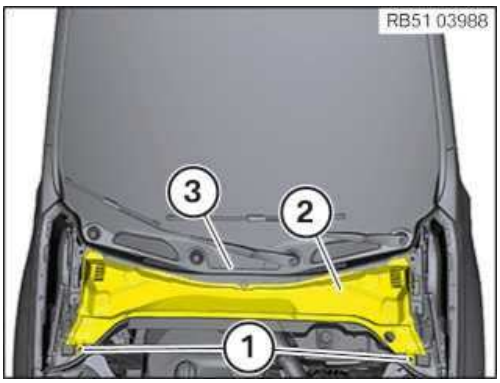
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



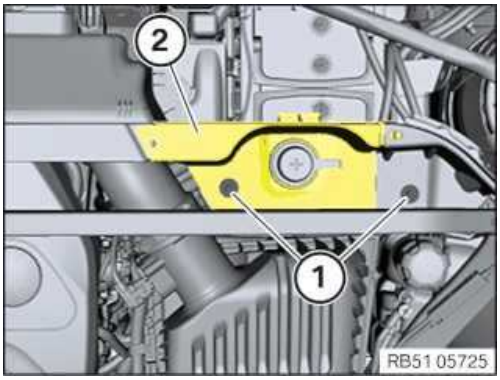
- Pull off rear bonnet seal (1) towards the top and remove.

8 – Removing front cowl panel cover

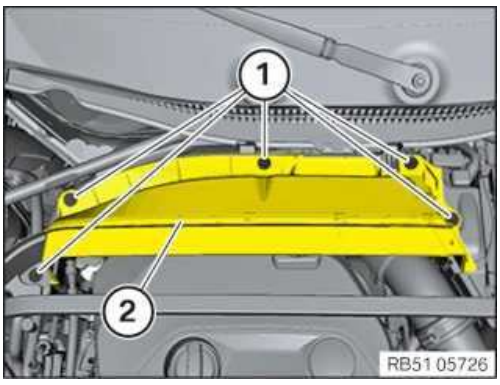


- Loosen the expanding rivet (1).
- Feed out and remove front cowl panel cover (2) from the rear cowl panel cover(3).

9 – Removing the upper bulkhead cover



- Loosen screws (1).
- Guide out and remove the cover (2).



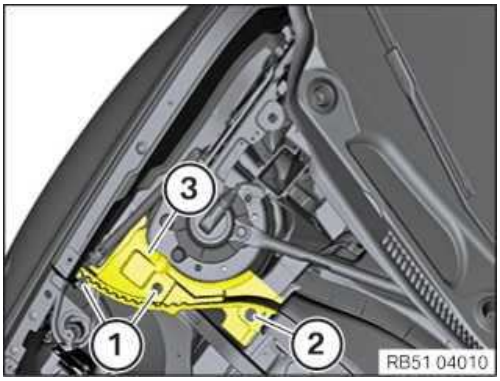
- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

10 – Remove suspension cross-brace

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TECHNICAL INFORMATION

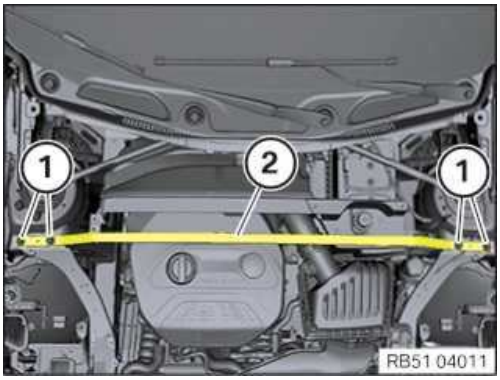
Driving without the strut brace/front end or tension strut is not permitted.



NOTICE

Description is for right component only. The procedure on the left side is identical.

- Loosen expanding rivet (1).
- Loosen screw (2).
- Remove the cover (3).



- Loosen screws (1).
- Remove strut brace (2).

11 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

Damage to the acoustic cover.

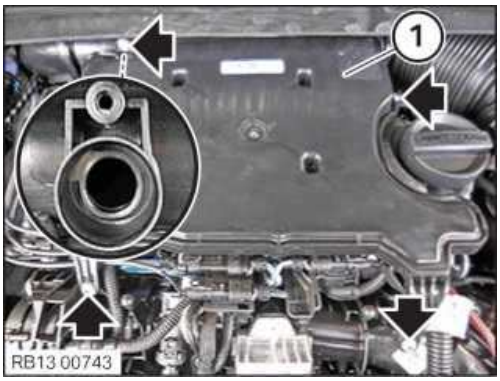
Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

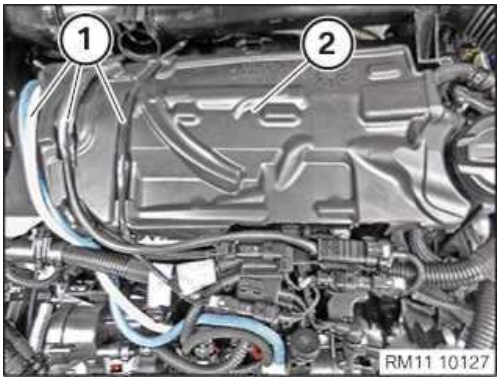
12 – Remove resonator

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- Remove screws (arrows).
- Guide out and remove the resonator (1).

13 – Remove the acoustic cover for the injectors

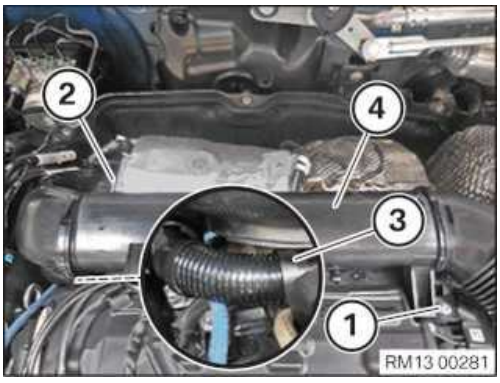


- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

14 – Removing clean air pipe



- Detach clamp (1) on the clean air pipe.
- Pull off the clean air pipe from the intake silencer housing.



- Loosen screw (1).
- Loosen clamp (2).
- Unlock the ventilation line (3) and pull it off the cylinder head cover.
- Feed out clean air pipe and remove.

15 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

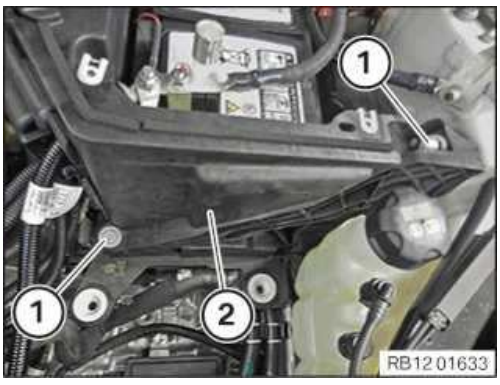
TECHNICAL INFORMATION

Follow instructions for removing and installing control units.

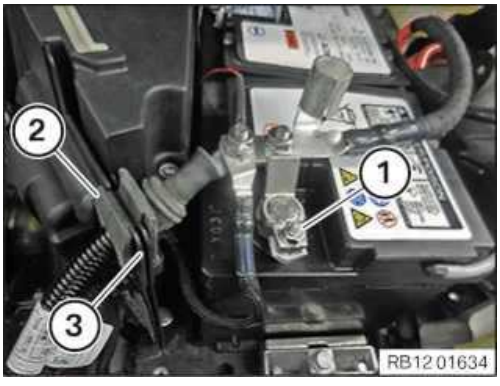
For additional information see: 12 00 ... Notes on removal and installation of control units

TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.

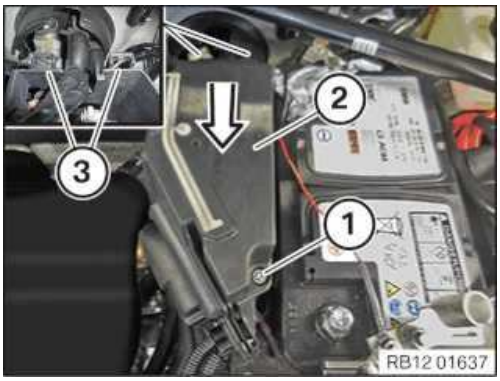


- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.

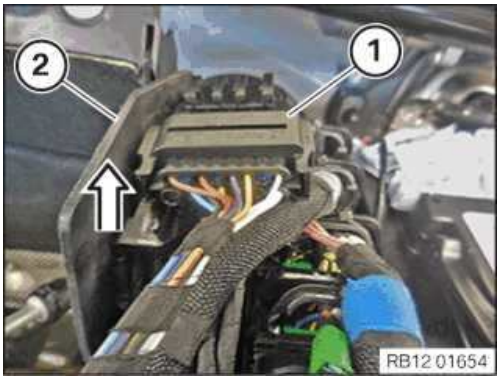


- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

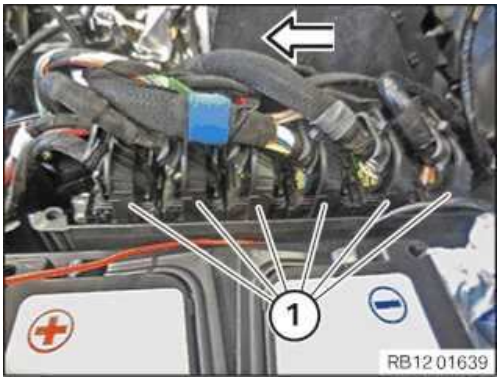
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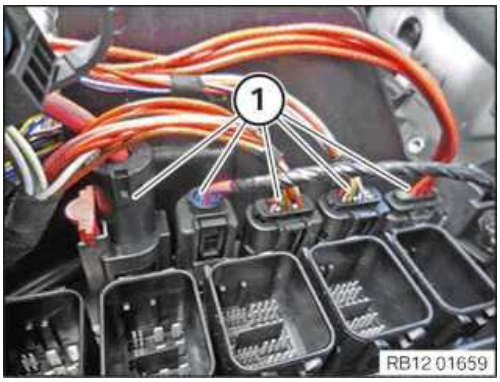
- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



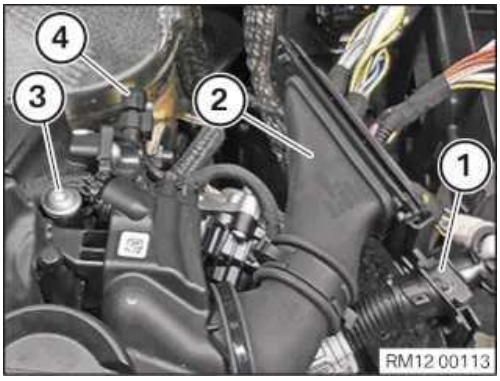
- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).



- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

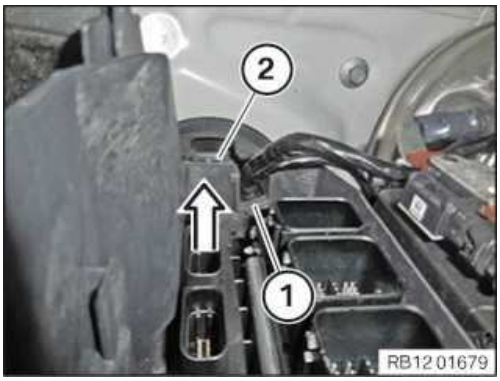


- Unlock and loosen connector (1).

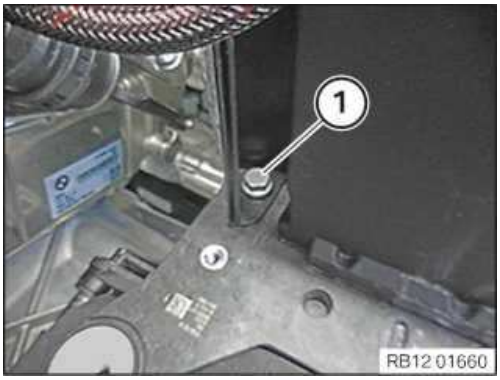


- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.

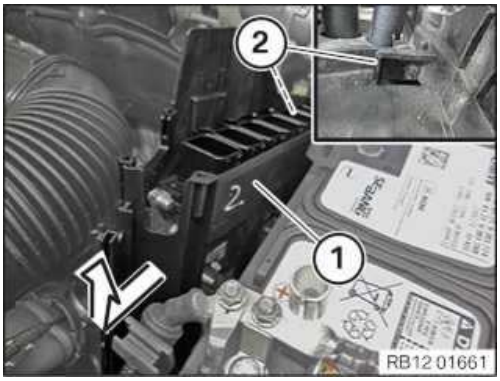
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- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.



- Loosen screw (1).



- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

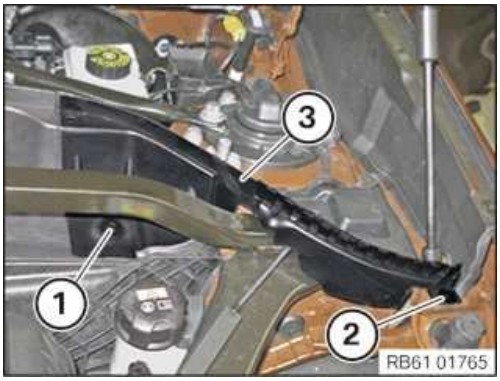
16 – Remove vehicle battery

WARNING

Working on 12 V vehicle electrical system.

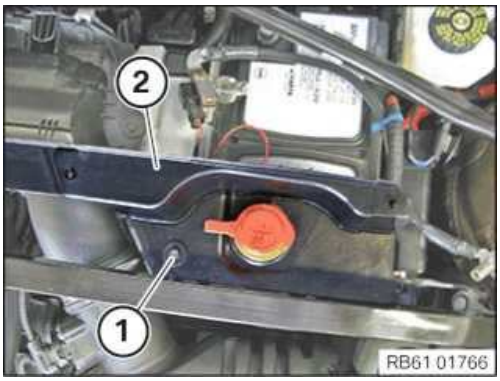
Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

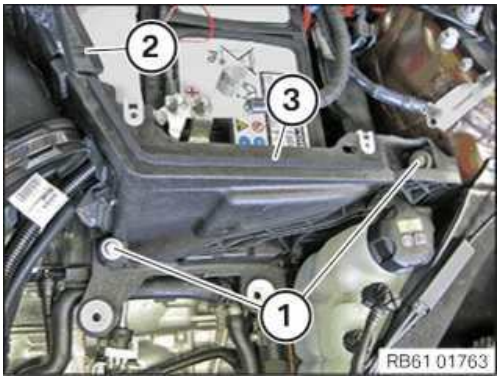


- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

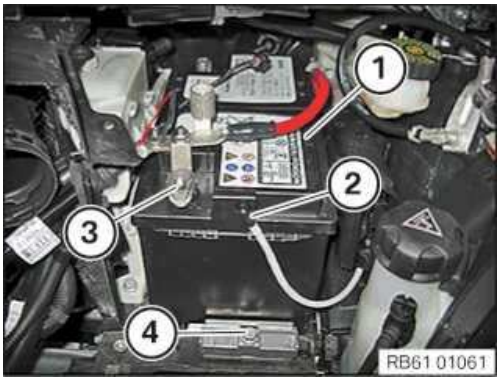
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- Loosen screw (1).
- Remove the cover (2).



- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.



- Pull off the vent hose (2).
- Slacken the nut (3) on the positive battery terminal and remove the positive battery terminal.

WARNING

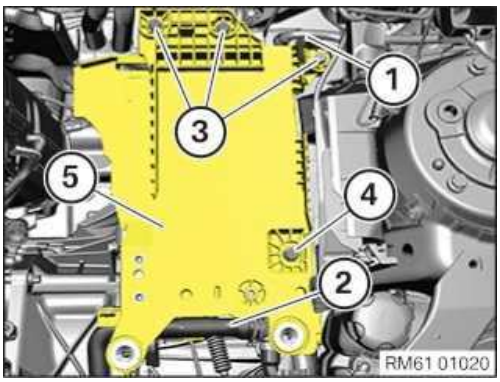
Unprotected battery terminals.

Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

17 – Remove battery holder

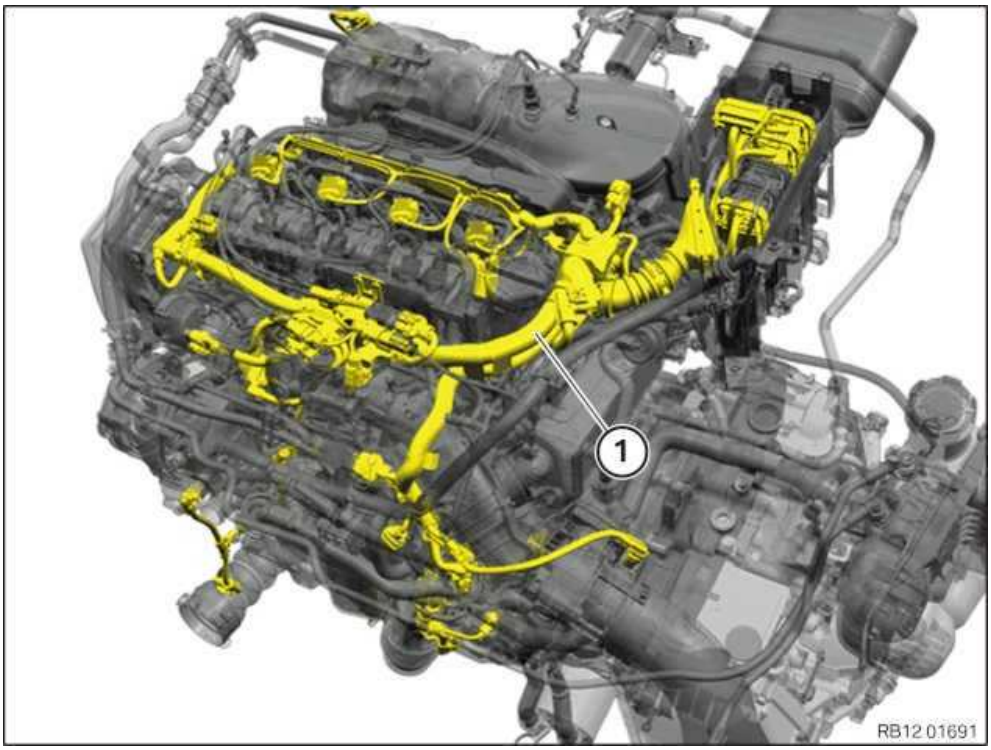


- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

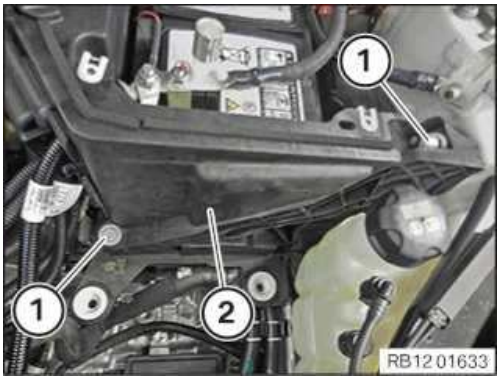
18 – Releasing the wiring harness section for the intake plenum

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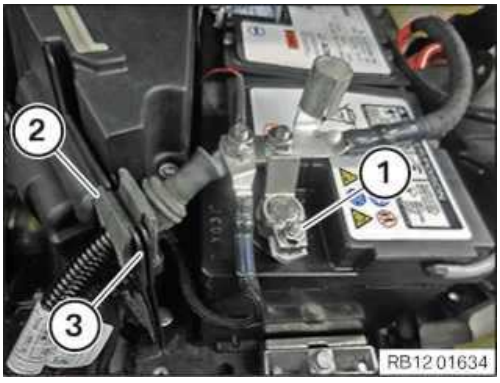
Overview: Wiring harness section for the engine



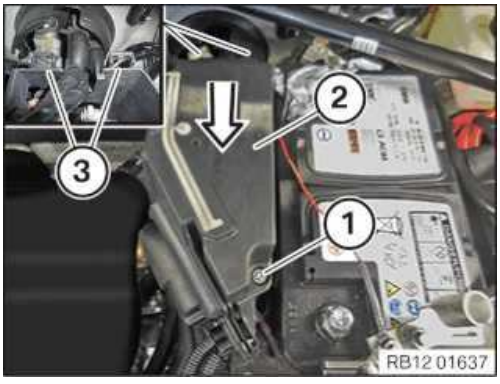
1 Wiring harness section for the engine



- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.

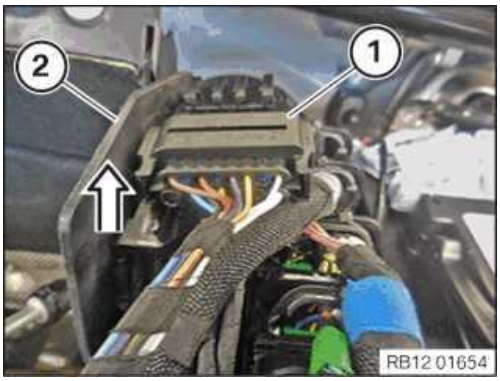


- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

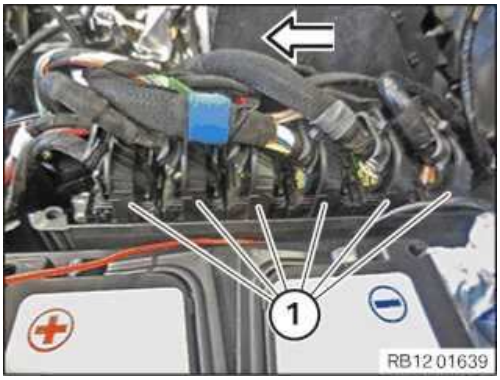


- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.

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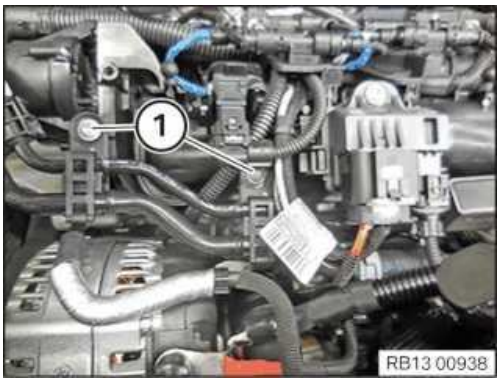
- Guide the connector (1)out of the electronics box (2) in the direction of arrow and remove it.
- Unlock and loosen connector (1).



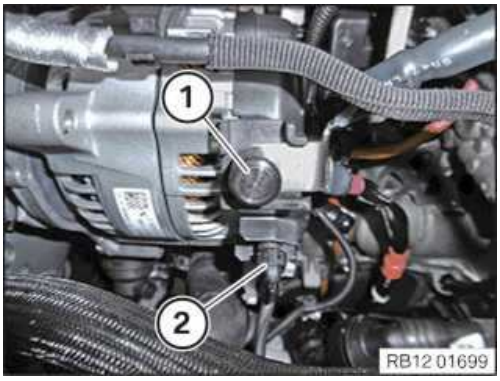
- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



- Unlock and loosen connector (1).

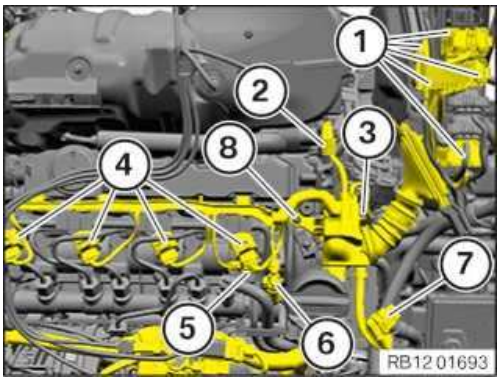


- Loosen screws (1).

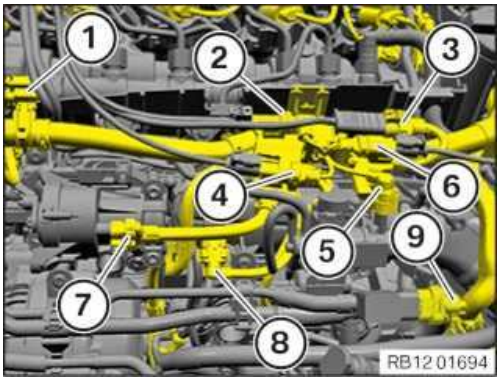


- Release the positive battery cable (1) on the alternator and place to one side.
- Unlock connector (2) and pull off.

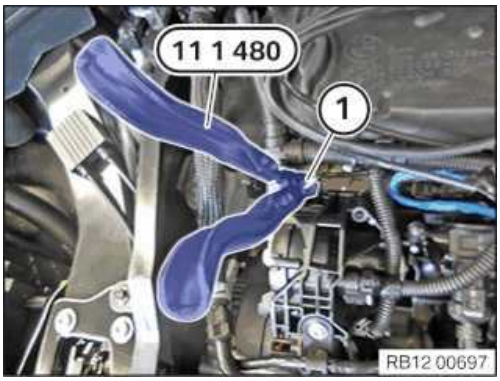
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- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock the connector (2) and disconnect it from the differential pressure sensor.
- Unlock the connector (3) and disconnect it from the exhaust-gas recirculation valve.
- Unlock the connector (4) and pull off from the injectors.
- Unlock the connector (5) and disconnect it from the camshaft sensor.
- Unlock the connector (6) and disconnect it from the fuel pressure regulator.
- Unlock connector (7) and pull off from hot film air mass meter.
- Loosen screw (8).

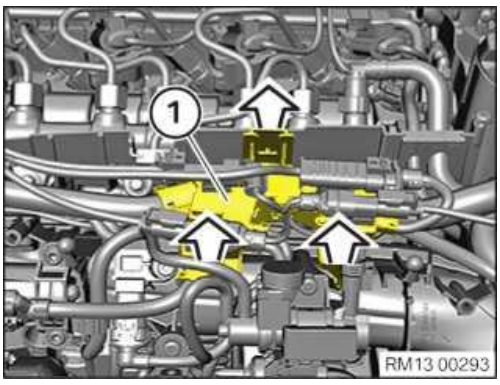


- Unlock connector (1) and pull off from the rail pressure sensor.
- Unlock the connector (2) and disconnect it from the exhaust temperature sensor before the diesel particulate filter.
- Unlock and disconnect the connector (3) from the front oxygen sensor.
- Unlock the connector (4) and disconnect it from the exhaust temperature sensor after the diesel particulate filter.
- Unlock and disconnect the connector (5) from the electric changeover valve.
- Unlock the connector (6) and disconnect it from the exhaust temperature sensor for the exhaust-gas recirculation cooler.
- Unlock the connector (7) and disconnect it from the servomotor for the swirl flaps.
- Unlock the connector (8) and pull it off the charging pressure sensor.
- Unlock the connector (9) and disconnect from the fuel pressure and temperature sensor.



- Unlock the connectors (1) of all glow elements with the special tool **0 490 796 (11 1 480)** and release them.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.

▶ **Removing the cable clips from the intake plenum**



- Detach the cable clip (1) in the direction of the arrow.
- Guide out the cable clip (1) in direction of arrow and set it aside.

19 – Removing the exhaust-gas recirculation cooler

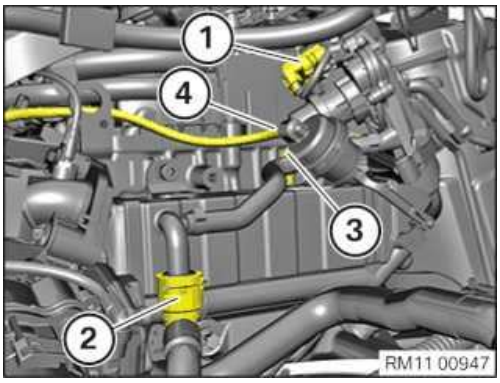
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WARNING

Hot surfaces.

Risk of burning!

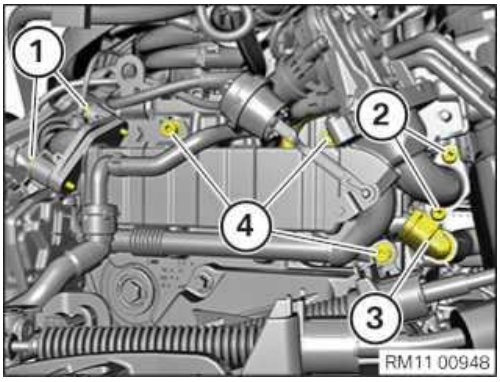
- Perform all work only on components that have cooled down.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.

20 – Removing the intake plenum

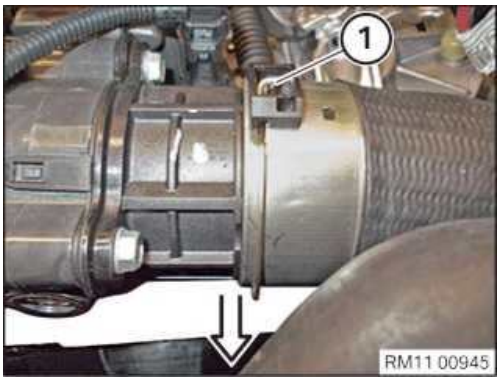
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

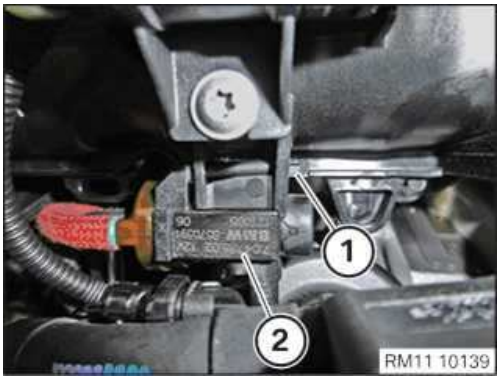


- Unlock the lock (1).

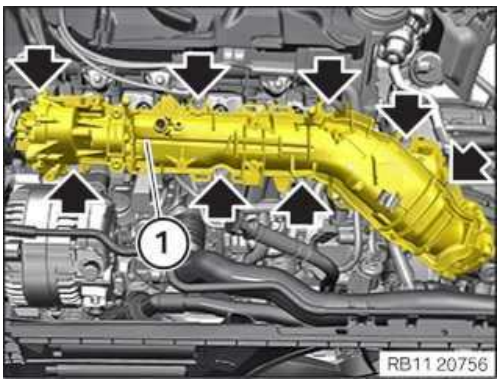
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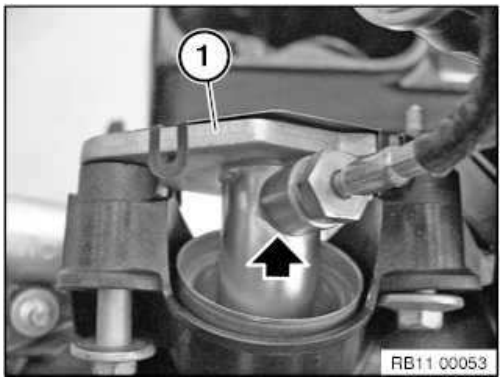
- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.



- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



- Release the screws (arrows) from the intake plenum (1).
- Guide the intake plenum (1) out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

21 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

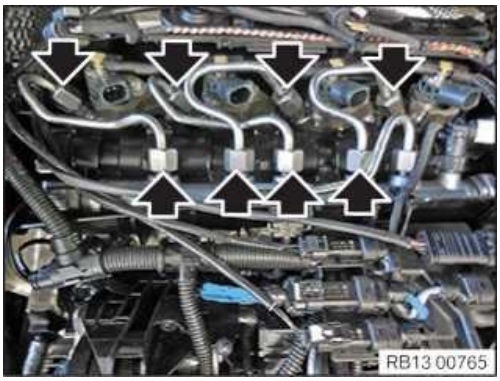
TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

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- Release the high pressure lines (arrows) with the special tool .
- Catch and dispose of escaping fuel.
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool .

22 – Detaching leakage oil line from injector

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Contaminant or foreign body.

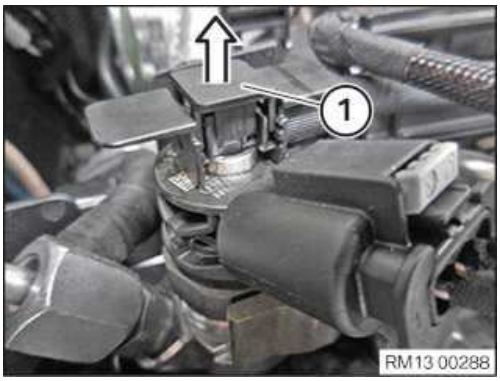
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

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- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

23 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

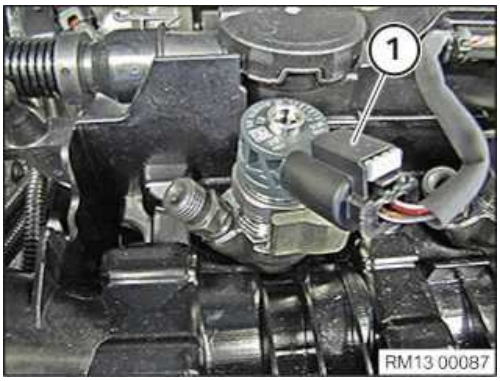
Electrostatic discharge.

Damage to or destruction of electrical components.

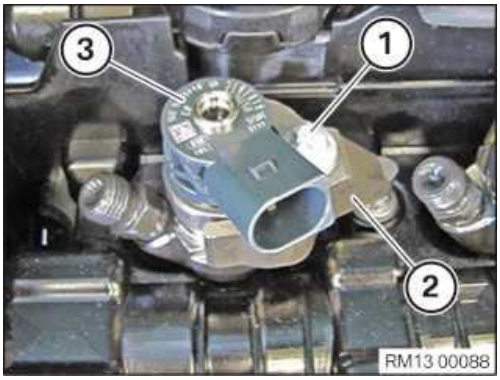
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.



- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

▶ **Loosen stuck injectors**

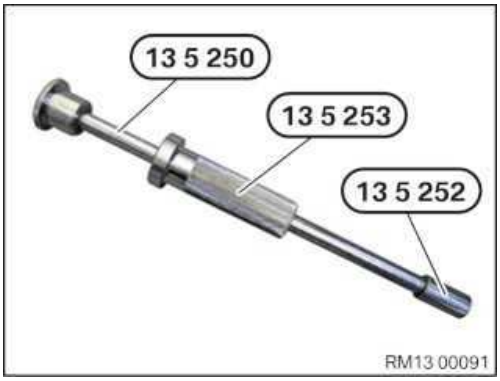
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RISK OF DAMAGE

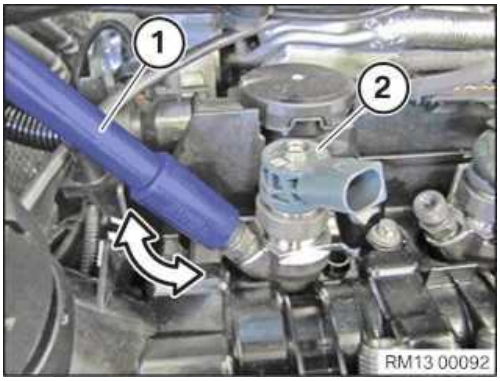
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)**back onto the special tool **0 493 321 (13 5 250)**.



- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

24 – Remove differential pressure sensor

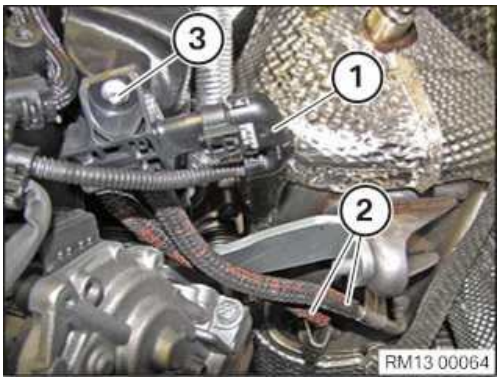
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

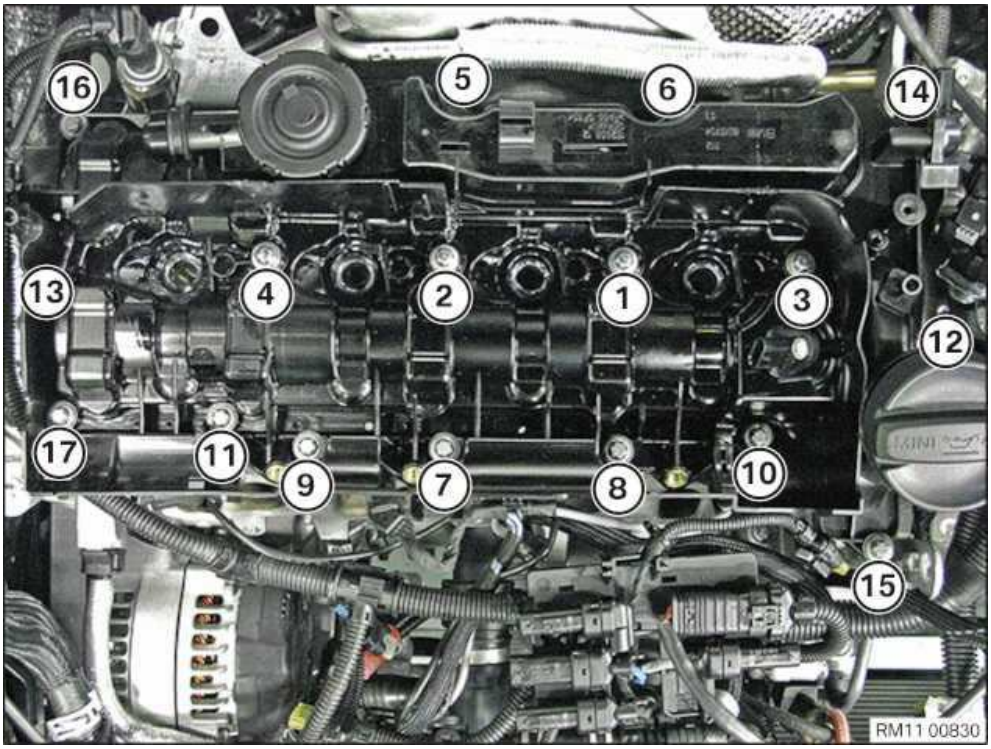
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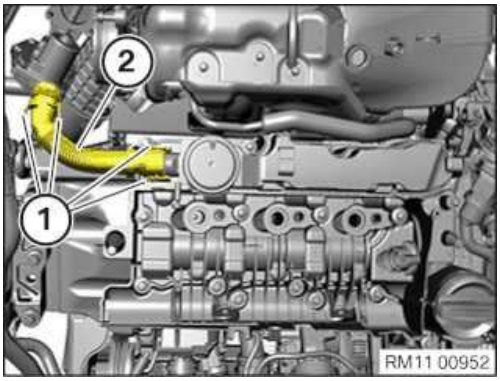
- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

25 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover

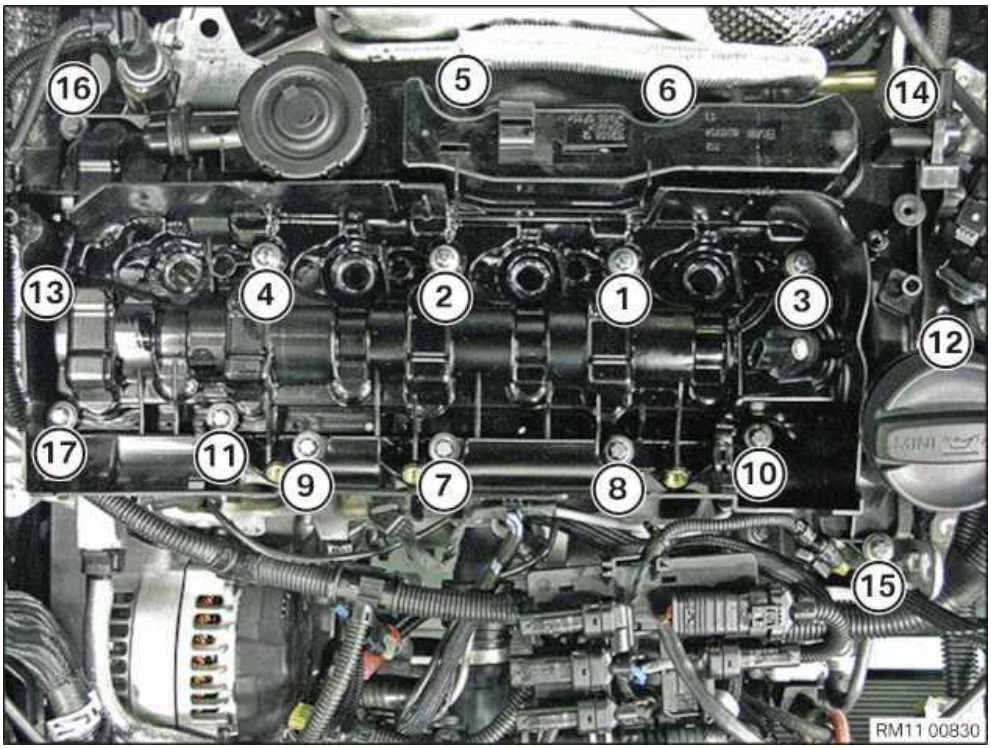


1 to 16 screws of the cylinder head cover.



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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- Loosen screws in the order (17) to (1).
- Remove cylinder head cover by lifting it out.

26 – Remove front right wheel

TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

TECHNICAL INFORMATION

Strictly observe the specified procedure to prevent clamping errors and imbalance.



- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

27 – Removing the front right wheel arch cover

▸ **Remove the front wheel arch trim**

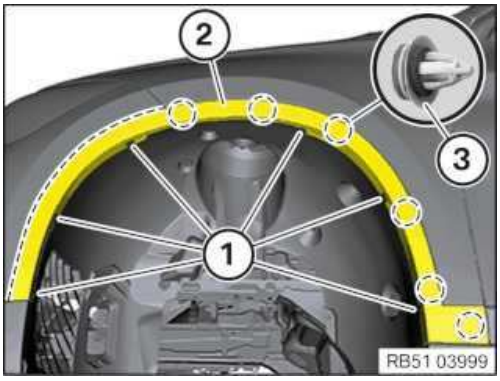
NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

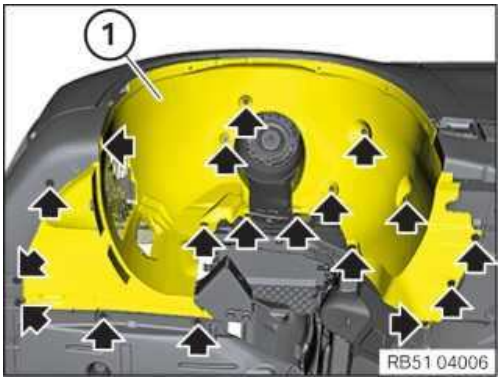
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NOTICE

Description is for left component only. Procedure on the right side is identical.



- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.



NOTICE

Description is for left component only. Procedure on the right side is identical.

- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

28 – Checking camshaft timing



- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

Damage to the engine.

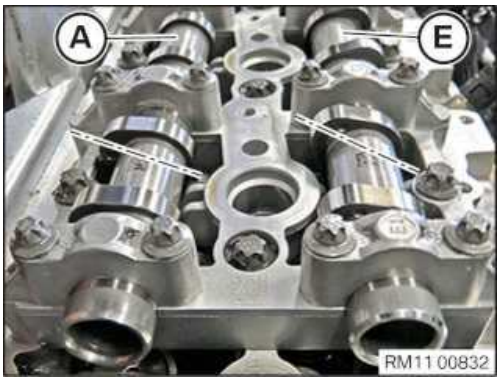
The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

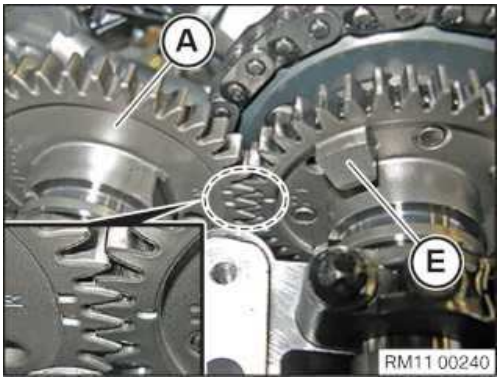
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- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.



- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

29 – Remove chain tensioner piston

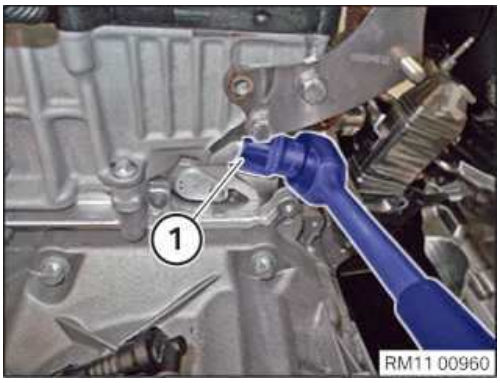
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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

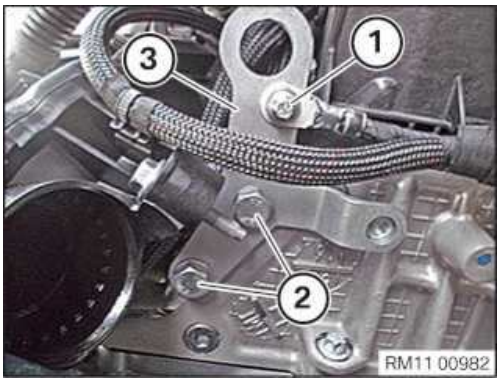


TECHNICAL INFORMATION

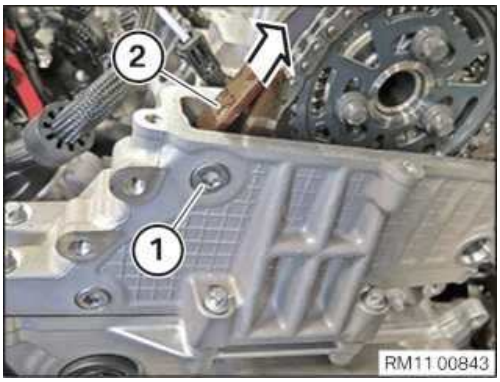
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

30 – Remove the timing chain guide rail

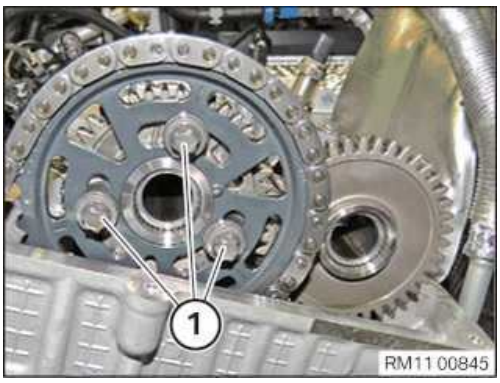


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

31 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

MAIN WORK

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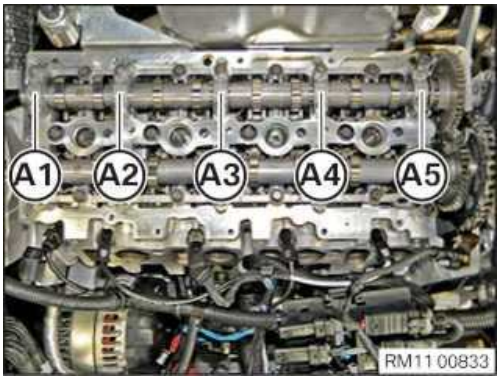
32 – Remove exhaust camshaft.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

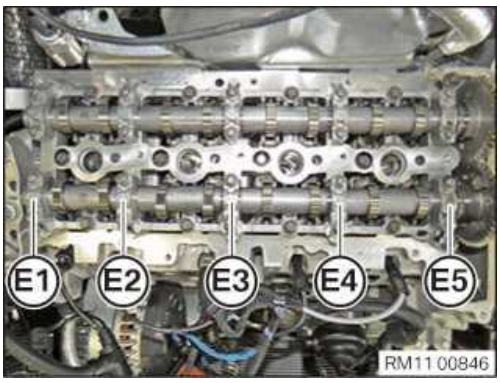


TECHNICAL INFORMATION

The camshaft is tensioned by the valve springs. Tighten or loosen each screw on the camshaft bearing caps one at a time in the specified sequence and by half a turn only. Repeat procedure.

- Loosen all screws of the exhaust camshaft bearing caps (A1) to (A5) from the outside to the inside, step by step in 1/2 turns.
- Remove exhaust camshaft in upward direction.
- Place all components on special tool **0 495 105 (11 4 480)** in a tidy and orderly fashion.

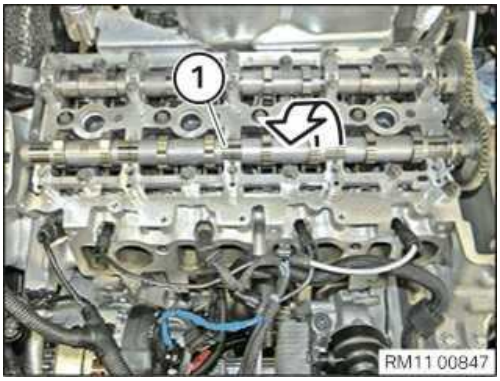
33 – Removing the intake camshafts



TECHNICAL INFORMATION

The camshaft is tensioned by the valve springs. Tighten or loosen each screw on the camshaft bearing caps one at a time in the specified sequence and by half a turn only. Repeat procedure.

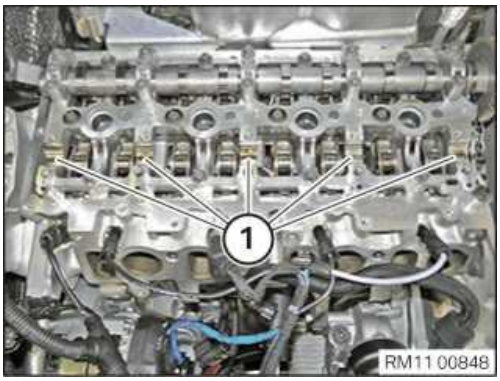
- Loosen all screws of the intake camshaft bearing caps (E1) to (E5) from the outside towards the inside by 1/2 a turn at a time.
- Place all components on special tool **0 495 105 (11 4 480)** in a tidy and orderly fashion.



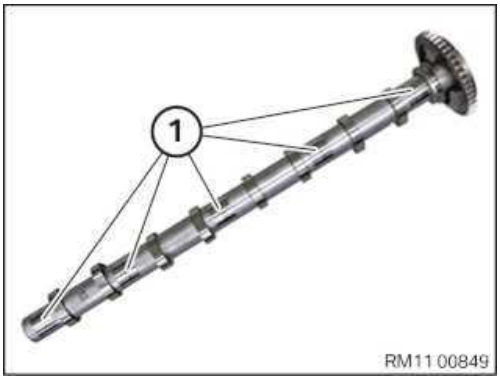
- Remove the intake camshaft (1).

34 – Install intake camshaft

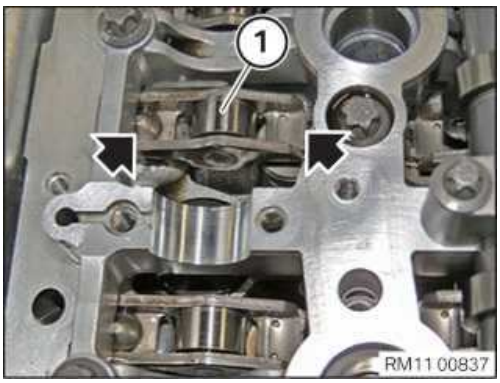
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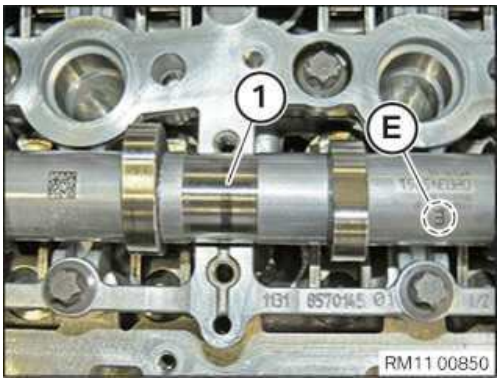
- Oil all bearing positions (1).



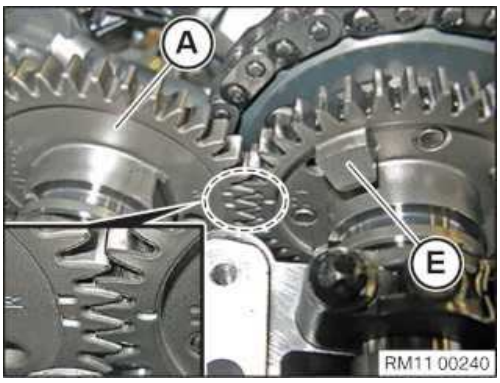
- Oil all bearing positions (1) of the intake camshaft.



- Check the installation position of the roller cam followers (1) **(risk of damage!)** .

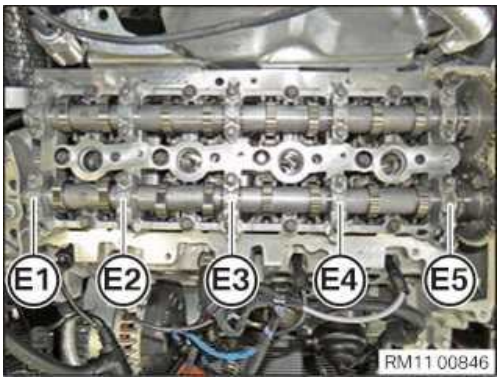


- Make sure the identification (E) of the intake camshaft points upwards.
- Insert the intake camshaft (1).



- Insert the intake camshaft (A) so that the marks on the camshafts (A) and (E) correspond in the highlighted area.
- Position the camshafts (A) and (E) accordingly.

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- Tighten all intake camshaft bearing caps (E1) to (E5) from the inside to the outside by 1/2 a turn at a time.

Intake and exhaust camshaft in camshaft support

M6x31		Tightening torque	10 Nm

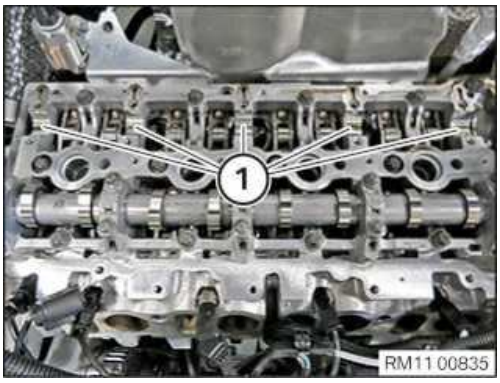
35 – Install exhaust camshaft

RISK OF DAMAGE

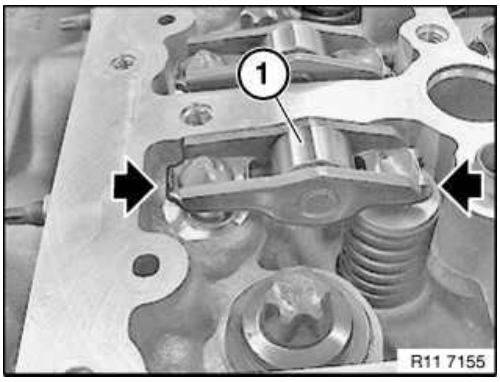
Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

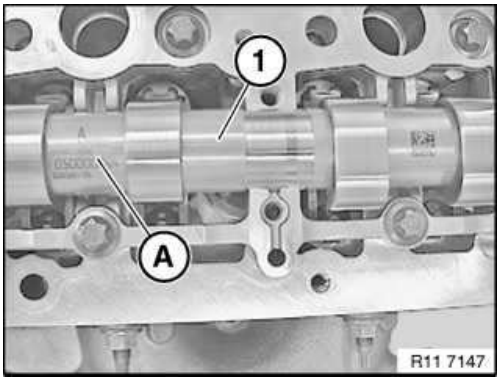
- Comply with the regulations for the installation and disassembly.
- Perform work with care.



- Oil all bearing positions (1).

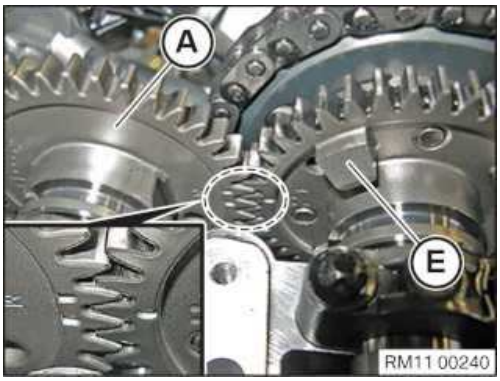


- Make sure the roller cam followers (1) have the correct mounting orientation.

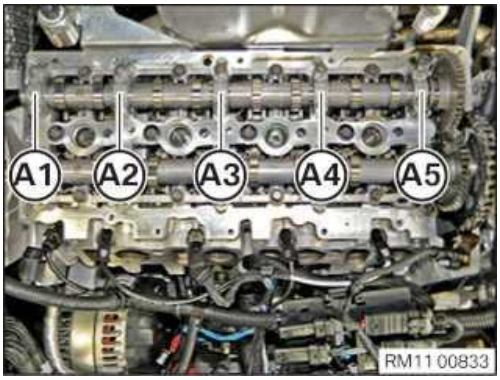


- Insert exhaust camshaft (1) so that the identification (A) points upwards.

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- Insert the exhaust camshaft (A) so that the marks on the camshafts (A) and (E) correspond in the highlighted area.
- Position the camshafts (A) and (E) accordingly.



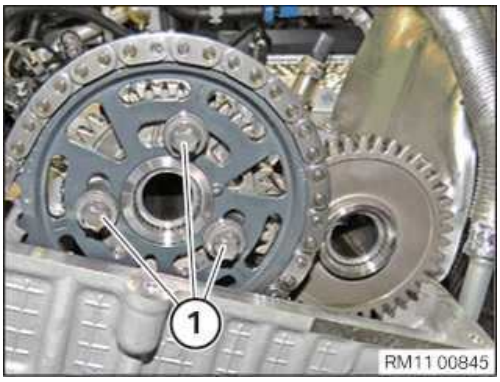
- Tighten all exhaust camshaft bearing caps (A1) to (A5) from the inside to the outside by 1/2 a turn at a time.

Intake and exhaust camshaft in camshaft support

M6x31		Tightening torque	10 Nm

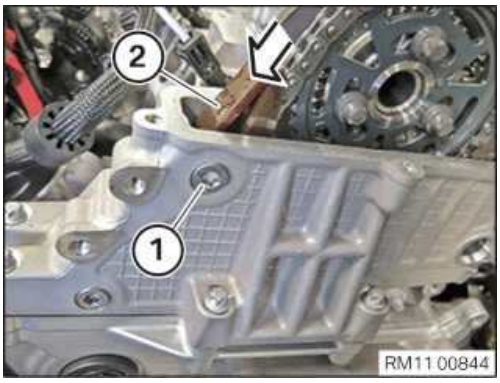
POSTPROCESSES

36 – Installing the camshaft sprocket on the intake camshaft



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

37 – Install the timing chain guide rail



- Position the guide rail (2) in the direction of the arrow.

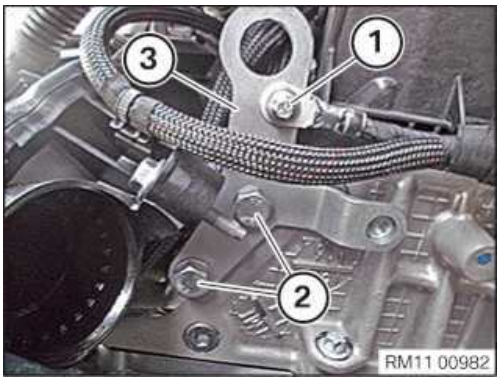
  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

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- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6		8 Nm

38 – Installing the chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Renew sealing ring (1).

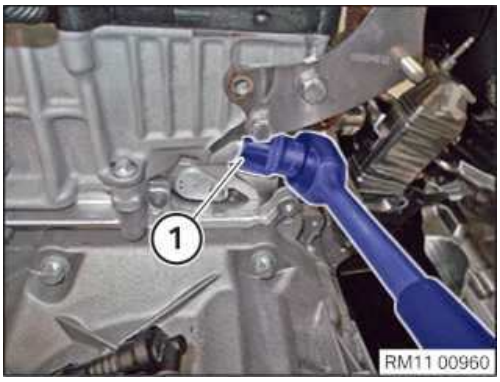
  Parts: Sealing ring



TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.



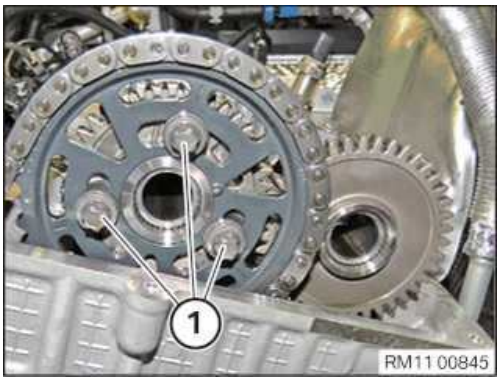
- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

39 – Tightening the camshaft sprocket on the intake camshaft

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- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

40 – Checking camshaft timing



- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

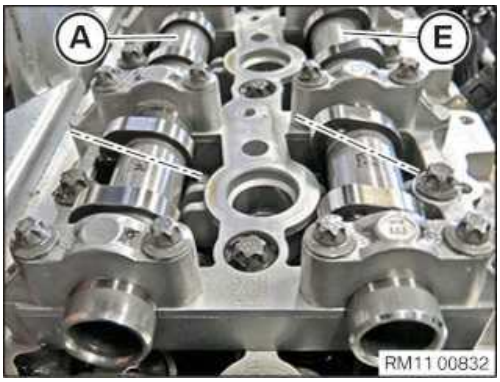
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

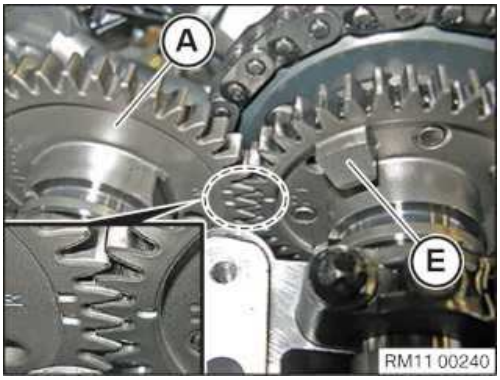


- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

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- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.



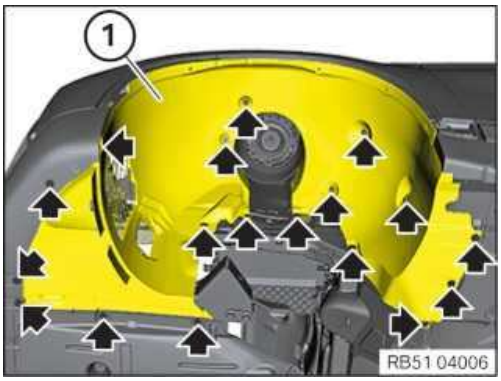
- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

41 – Installing the front right wheel arch cover

NOTICE

Description is for left component only. Procedure on the right side is identical.

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- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

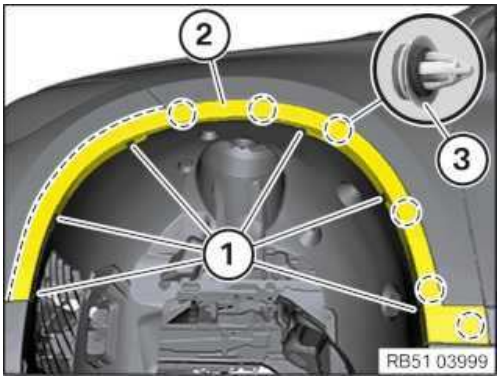
▸ **Installing front wheel arch trim**

NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Check the clips (3) for damage and renew where required.

  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

42 – Installing the front right wheel

▸ **Clean the contact surfaces between the brake disc and the wheel rim**



TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

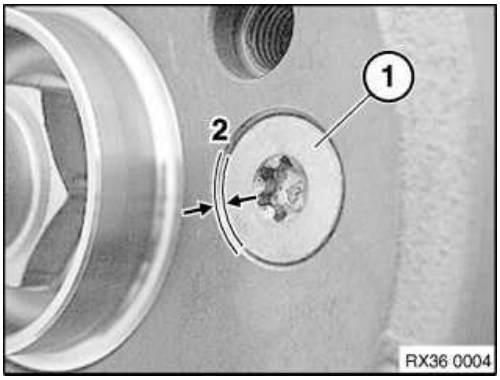
  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.

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- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

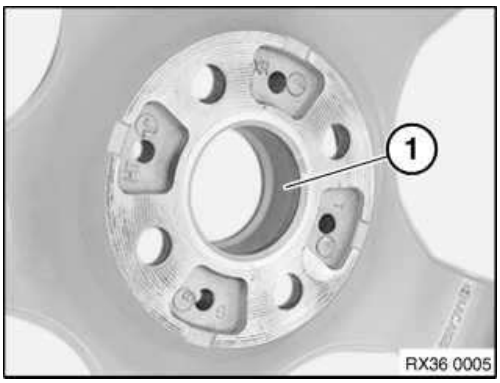


- Check the mounting bolt for the brake disc (1) for secure fit.

  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

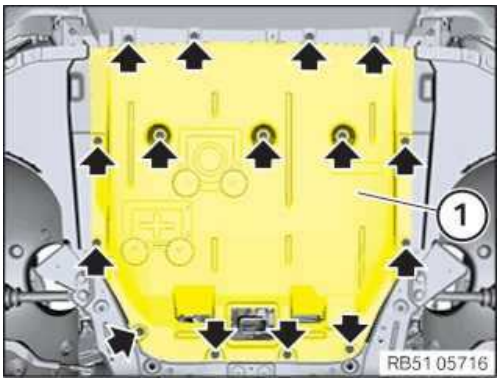
- Renew corroded wheel bolts.

  Parts: Wheel bolts
- Clean the wheel bolts and check the threads for damage. Renew the wheel bolts as needed.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

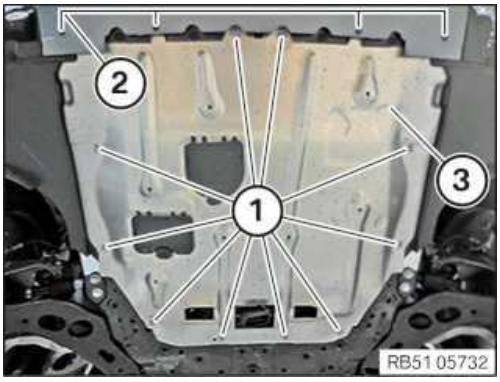
43 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm



- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

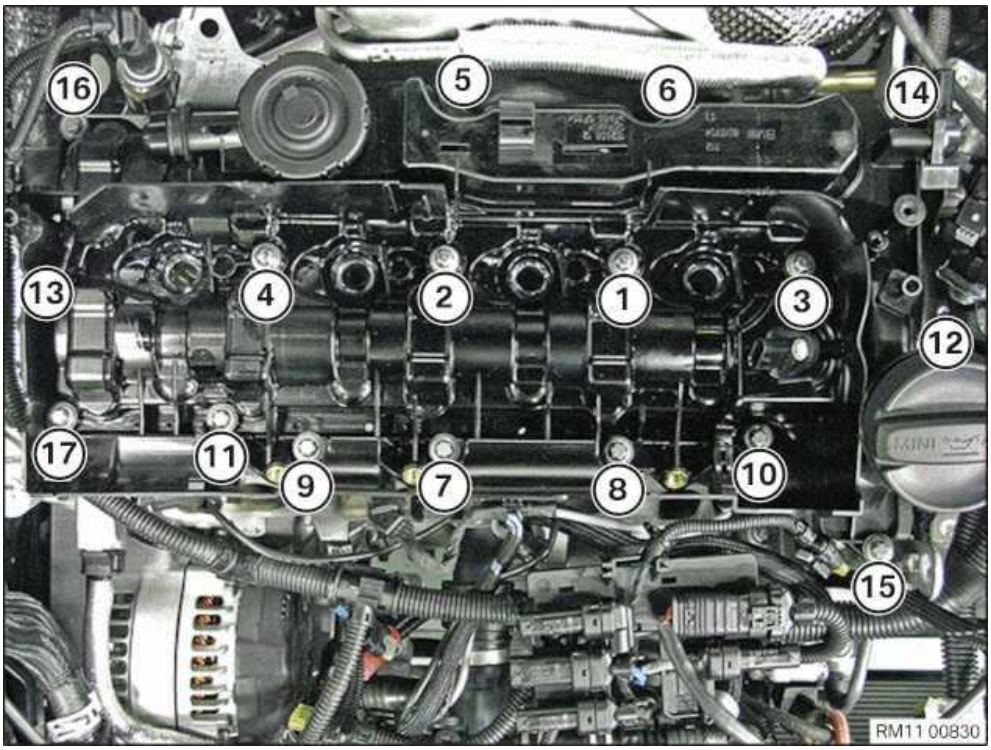
Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

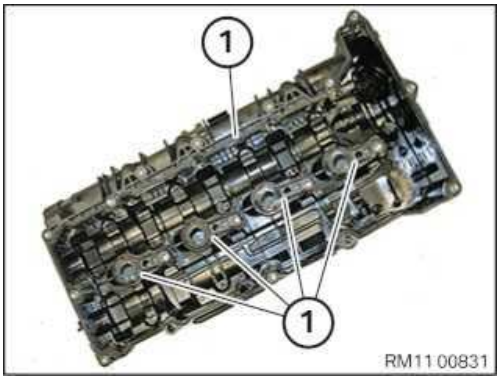
44 – Installing cylinder head cover

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Overview: Screw connection of the cylinder head cover

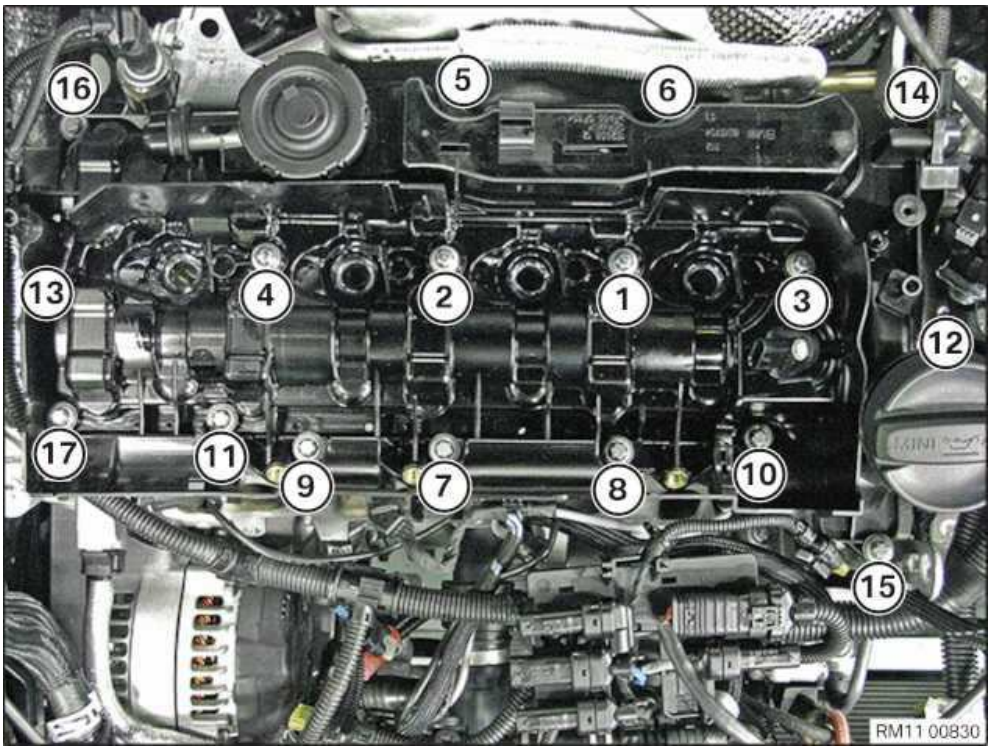


1 to 16 screws of the cylinder head cover.



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket



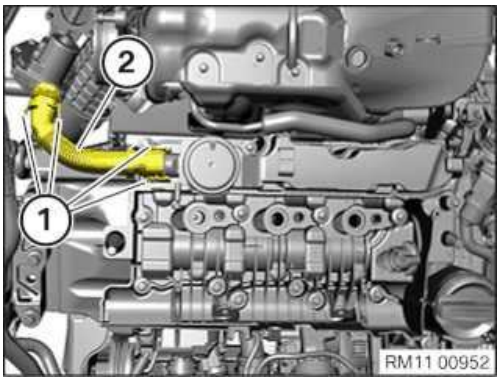
- Install cylinder head cover.
- Tighten screws in the order (1) to (17).

Cylinder head cover to cylinder head

M6		Tightening torque.	8, Nr

-

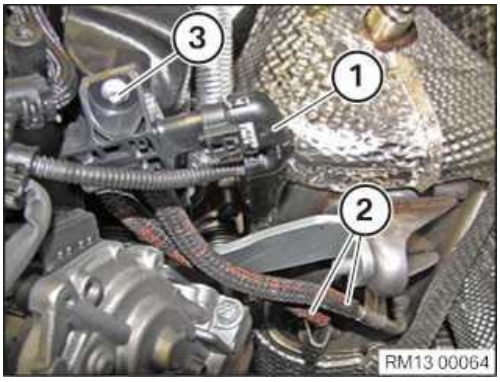
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- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

45 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

46 – Installing injectors of injection system

▶ **Cleaning the injector shafts**

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.



- Wear safety goggles.

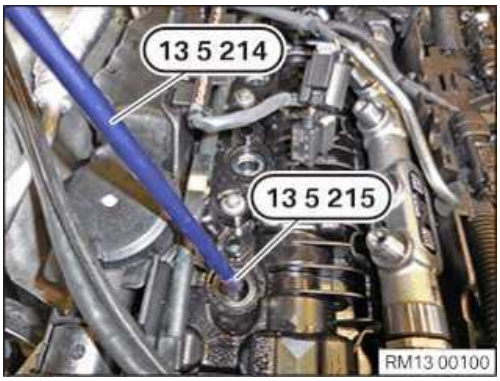
RISK OF DAMAGE

Contaminant or foreign body.

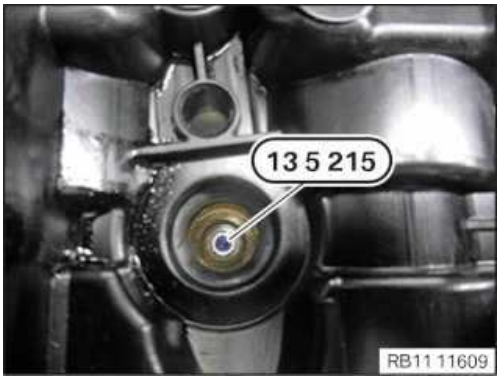
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.



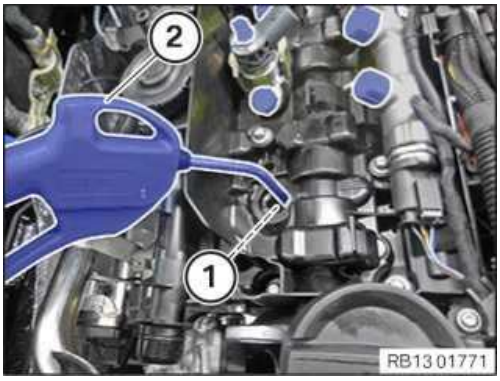
- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.



- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.

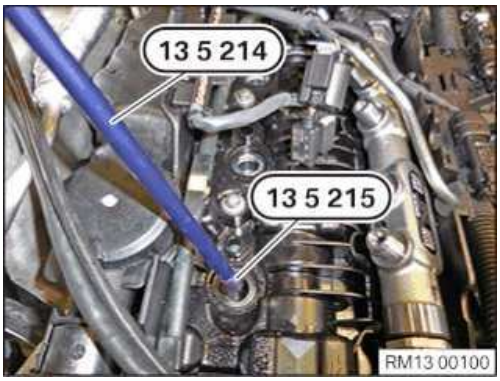


- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.



- Blow out injector shaft (1) with air gun (2).

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- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

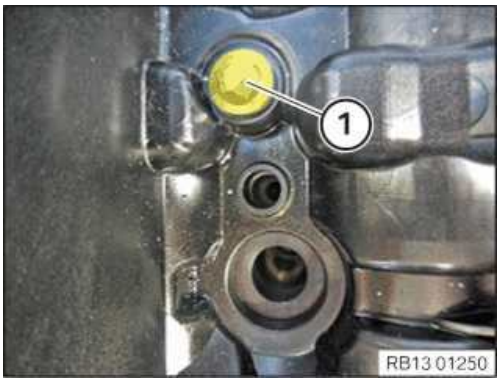
▶ **Check the placement of the clamping claw**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▶ **Prepare the injector for installation**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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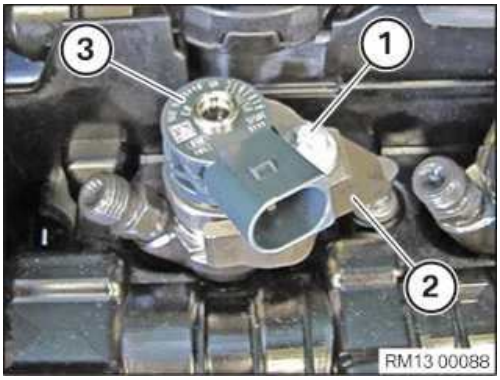
- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring

- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

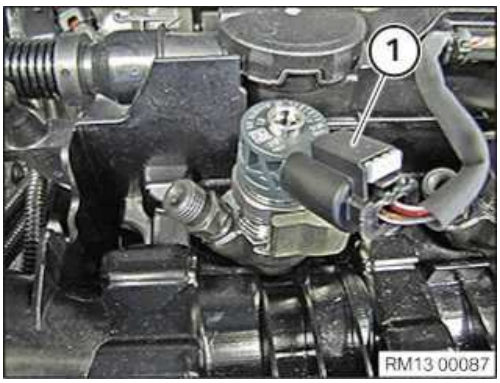
Injector lubricating grease	50 g, Can	83230441070



- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

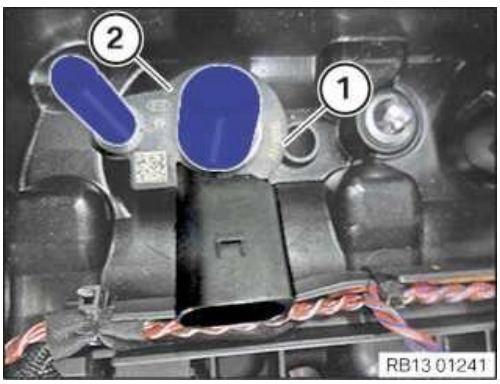
▶ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



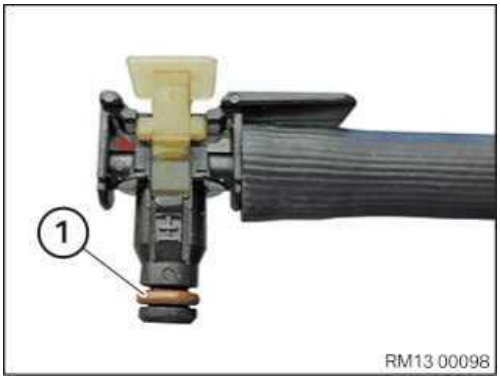
- Read off the adjustment value (1) on the new injector (2).

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- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

47 – Connect the leakage oil line on the injector



- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.



- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

48 – Installing high pressure lines between rail and injectors

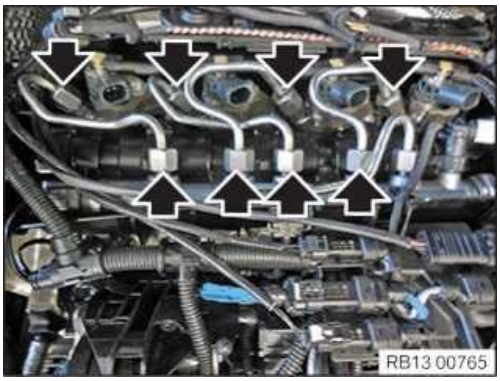
TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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- Remove special tool .
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

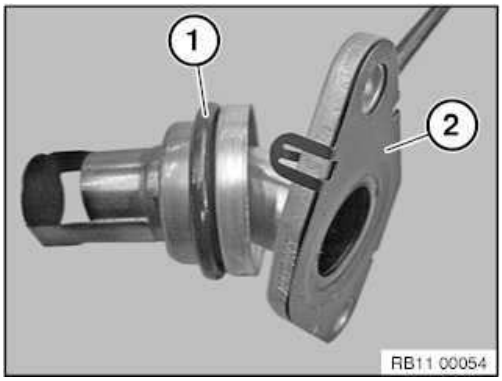
- Tighten the high pressure lines (arrows) with the special tool .

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

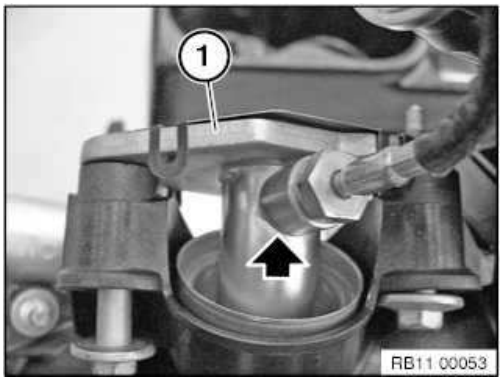
49 – Installing the intake plenum



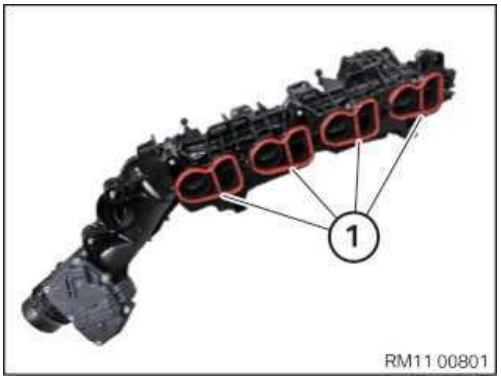
- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position the seal (2) and clip it in.



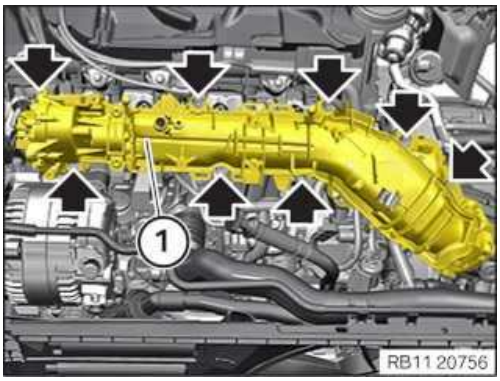
- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (1).

  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.

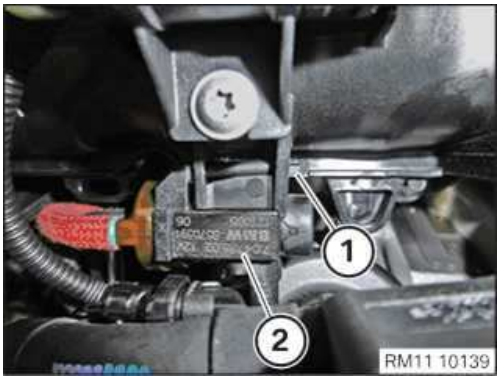
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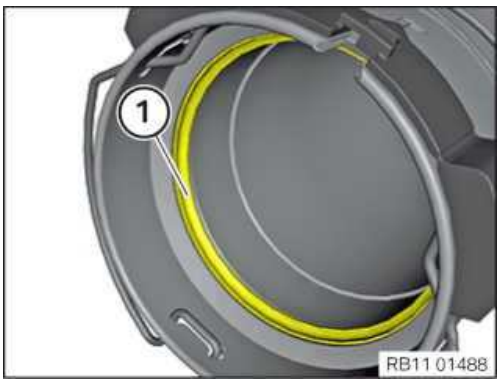
- Guide in and install intake (1) plenum.
- Tighten screws (arrows).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm

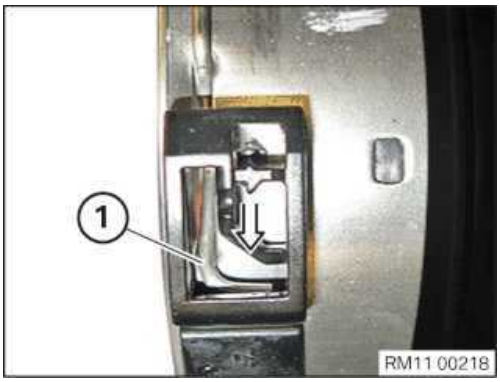


- Install the electric changeover valve (2) in the holder on the plenum from left to right.
- Lock (1) must engage audibly.

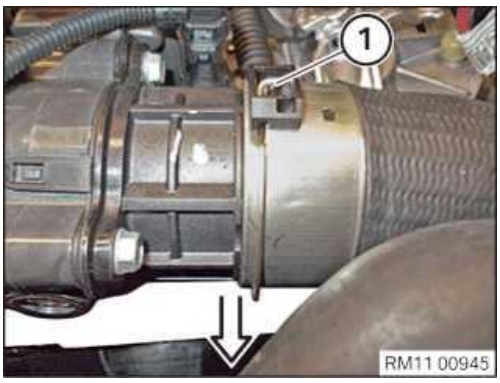


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring



- Engage the lock (1) on the bracket (arrow).



- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

50 – Installing the exhaust-gas recirculation cooler

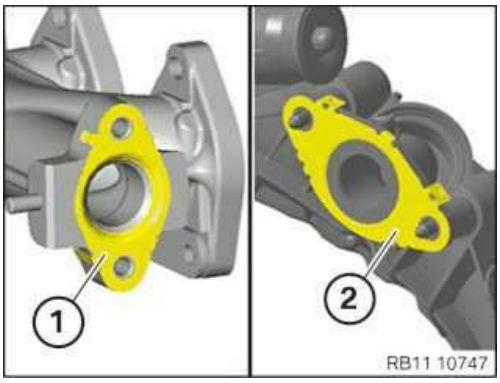
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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

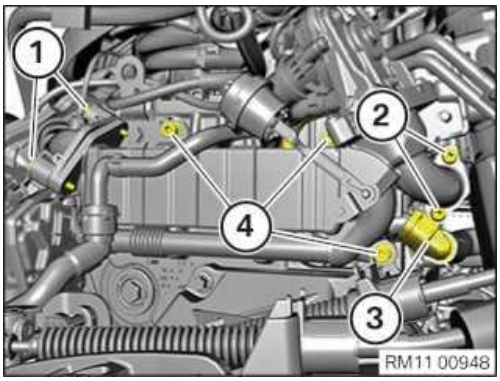


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket



- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts

- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

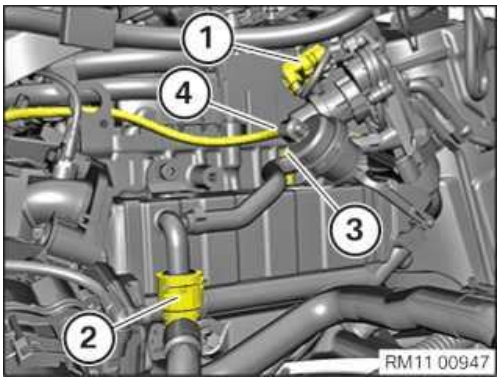
  The coolant hose (3) must audibly engage.

- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm

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TECHNICAL INFORMATION

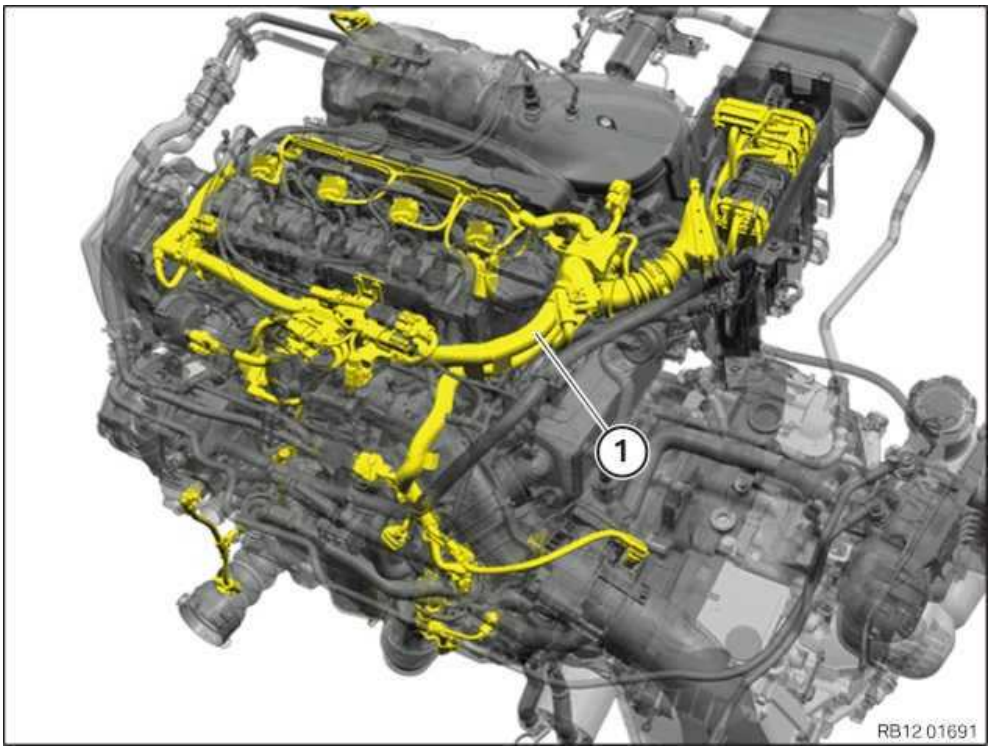
Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

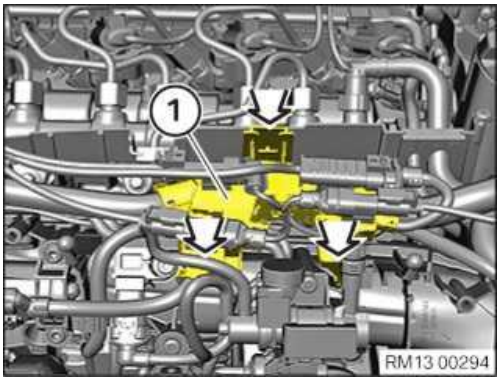
51 – Fastening the wiring harness section for the intake plenum

Overview: Wiring harness section for the engine



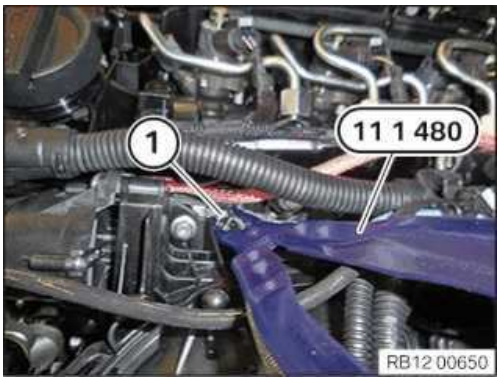
1 Wiring harness section for the engine

▶ **Installing the cable clip for the intake plenum**



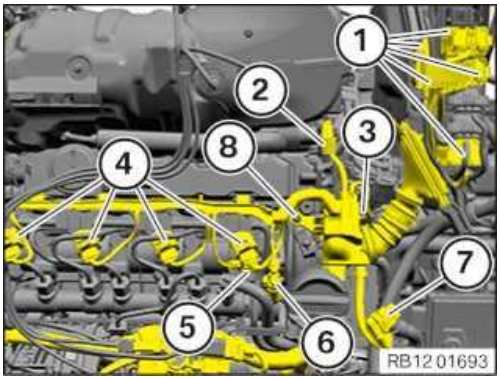
- Insert and install the cable clip (1) in the direction of the arrow.
- Make sure the cable clip (1) is fitted correctly.

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- Connect and lock the connector (1) on the glow elements.

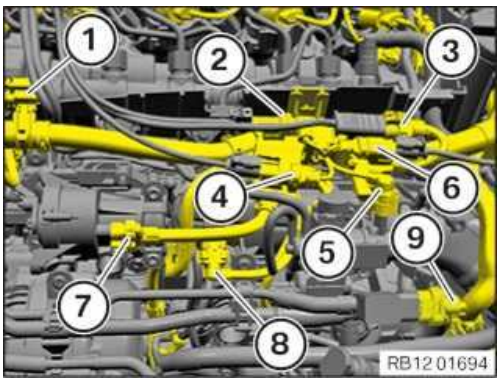
  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.



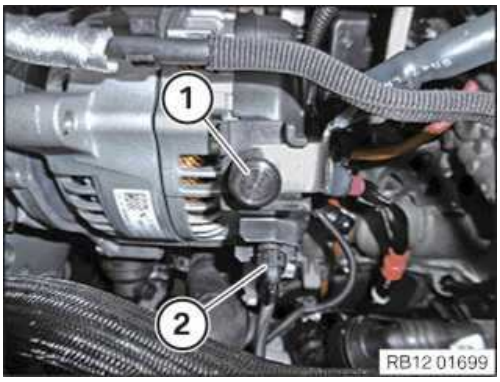
- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the DME control unit and remove the integrated supply module (PDM).
- Attach connector (2) to the differential pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust-gas recirculation valve and lock audibly.
- Attach connector (4) to the injectors and lock it audibly.
- Attach connector (5) to the camshaft sensor and lock it audibly.
- Attach connector (6) to the fuel pressure regulator and lock it audibly.
- Connect and audibly lock the connector (7) to the hot film air mass meter.
- Tighten down screw (8).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm



- Connect the connector (1) to the rail pressure sensor and lock it audibly.
- Attach connector (2) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (3) to the front oxygen sensor and lock audibly.
- Attach connector (4) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Connect the connector (5) to the electric changeover valve and lock audibly.
- Attach connector (6) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (7) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (8) to the charging pressure sensor and lock it audibly.
- Attach connector (9) to the fuel pressure and temperature sensor and lock it audibly.



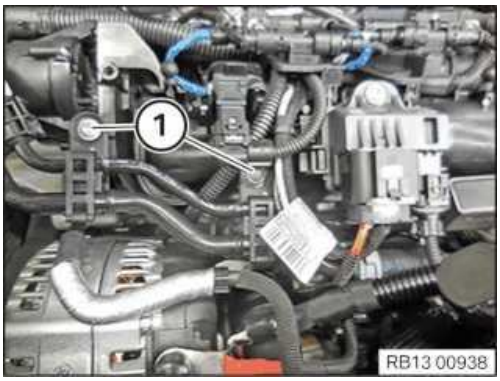
- Connect and lock the connector (2).

  Lock must snap audibly into place.
- Connect the positive battery cable (1) and tighten.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

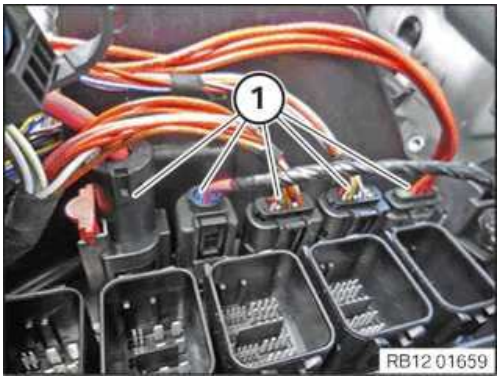
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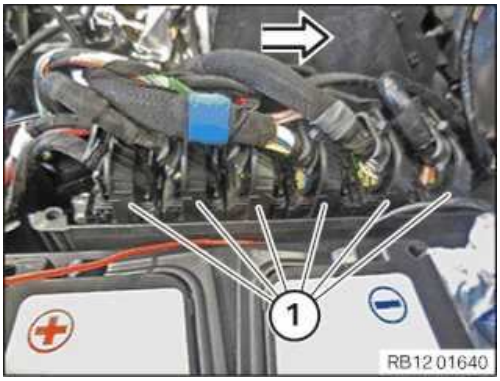
- Position the fuel line.
- Tighten the screws (1).

Fuel line to intake plenum

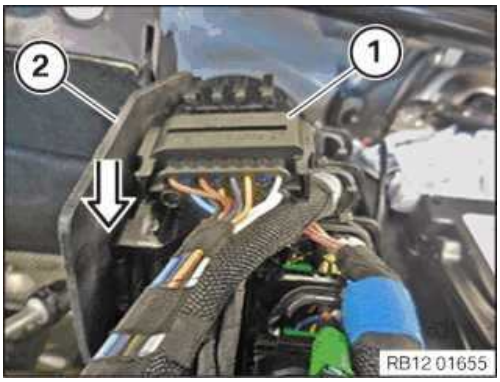
TS6x20		Tightening torque	5 Nm



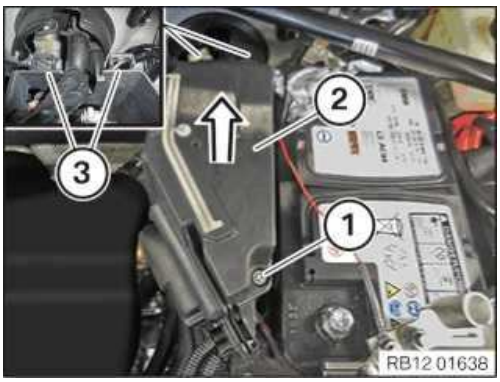
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.

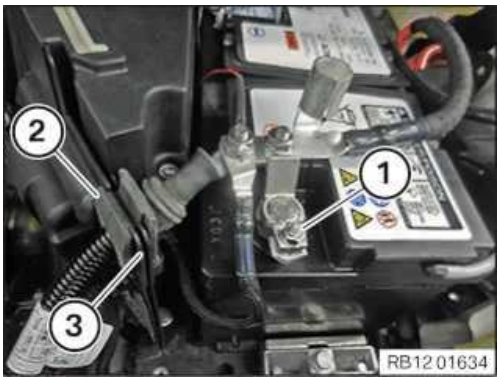


- Insert and install the cover (2) into the guides (3) in the direction of the arrow.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

RF5x26.5		Tightening torque	2,5 Nm

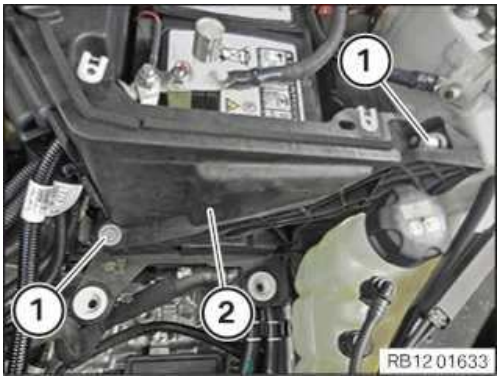
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- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

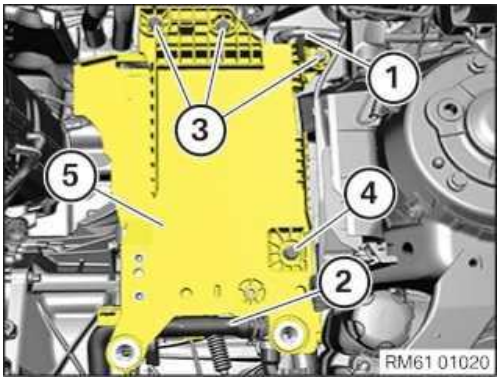


- Feed in and install tension strut (2).
- Tighten the screws (1).

Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

52 – Install the battery holder



- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

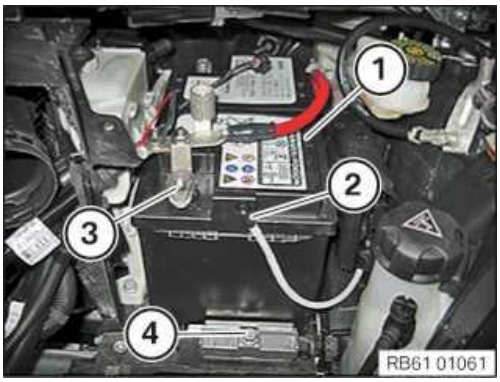
- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

53 – Install vehicle battery



- Install vehicle battery (1).
- Position the bracket and tighten with the screw (4) .

Battery terminal rail to battery tray

M8		19 Nm

- Position the vent hose (2) and clip it in.
- Position the positive battery terminal and tighten with the nut (3) .

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

▸ **Check the vent holes of the battery**

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WARNING

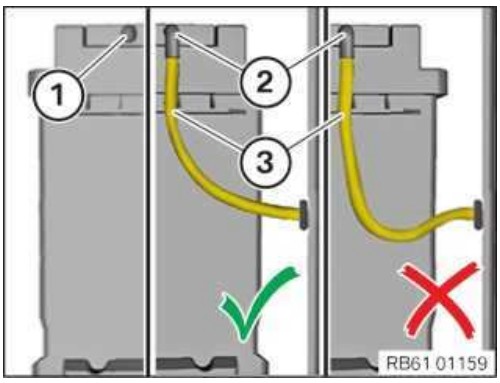
Gas emission.

Danger of injury! Danger of explosion!

- Assign the vent holes correctly.
- Route the vent hose correctly.

TECHNICAL INFORMATION

The battery has two vent holes, opposite:
One vent hole (1) must be closed correctly with a dummy plug.
The vent hose (3) must be correctly connected and routed at the other vent hole (2).



Check

- Check if the vent hole (1) is correctly closed with a dummy plug.

Result

» No dummy plug.

Measure

- Close the vent hole (1) correctly with a dummy plug.

Check

- Check if the vent hole (2) has a correctly connected vent hose (3).

Result

» The vent hose (3) is not correctly connected.

Measure

- At the vent hole (2), connect the vent hose (3) correctly.

Check

- Check if the vent hose (3) is routed to the outside with a downhill gradient (**no siphon formation!**).

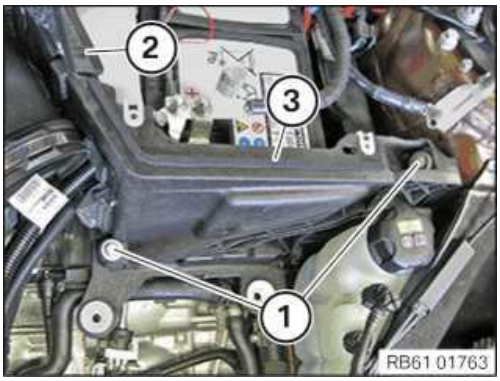
Result

» The vent hose (3) is not correctly routed as shown in the image on the right.

Measure

- Route the vent hose (3) correctly as shown in the centre image.

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- Insert tension strut (3) and tighten with screws (1).

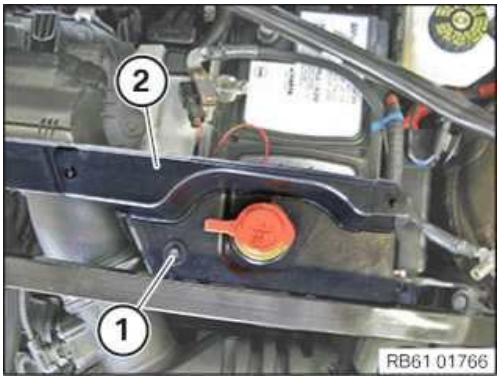
Trailing link

M8		Tightening torque	19 Nm

- Tighten down screw (2).

Battery cover

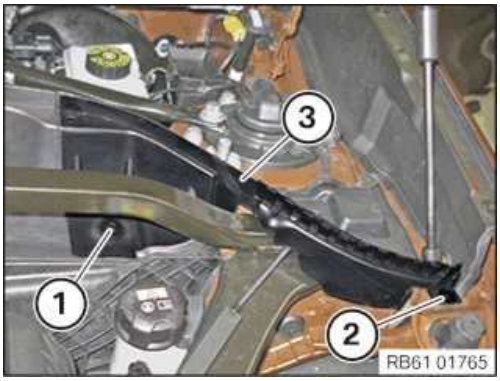
M8		2,8 Nm



- Position the cover (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm

54 – Install electronics box

Prerequisite

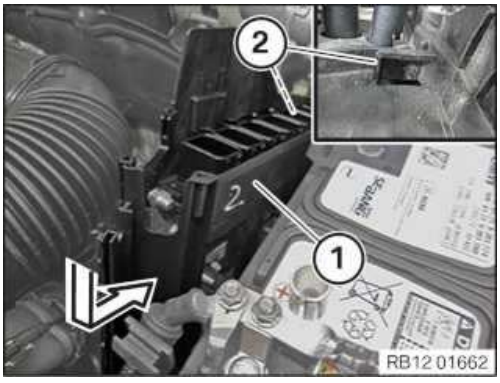
Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.

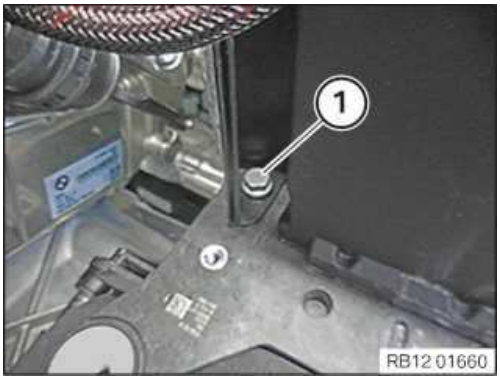


- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.

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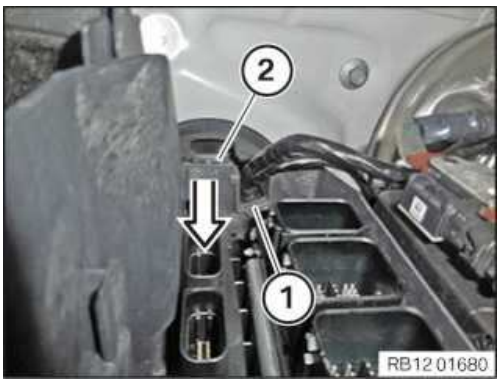
- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).



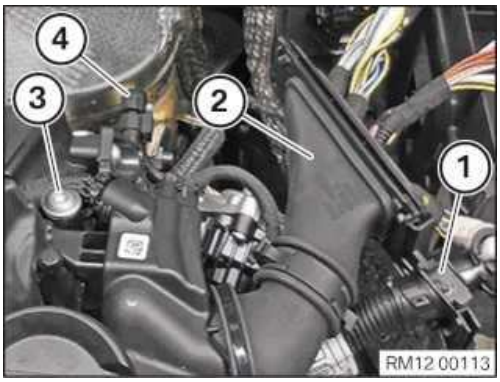
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.

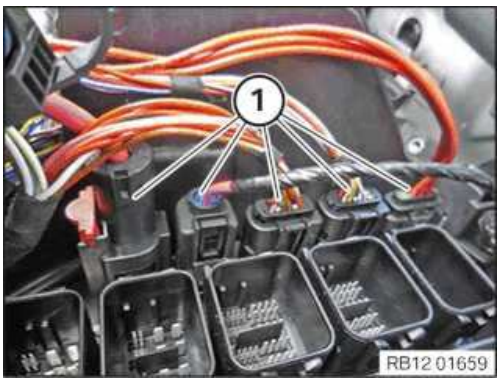


- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

Wiring harness to cylinder head cover

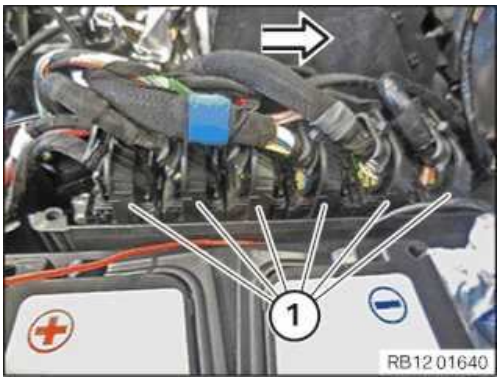
TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.

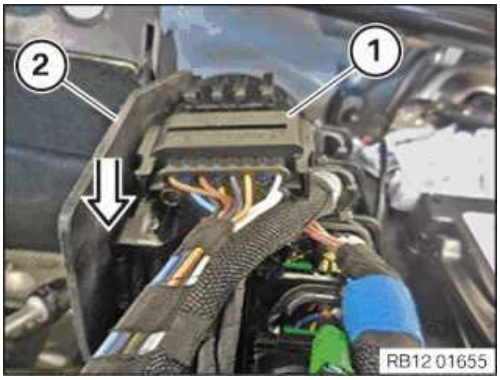


- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.

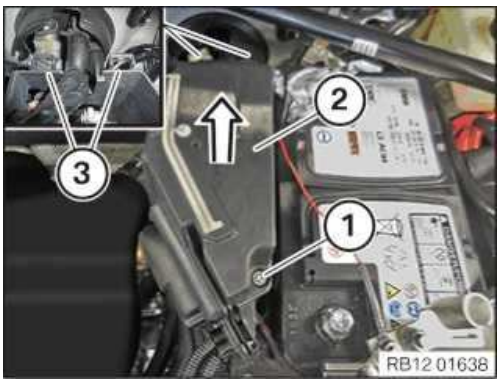
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- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



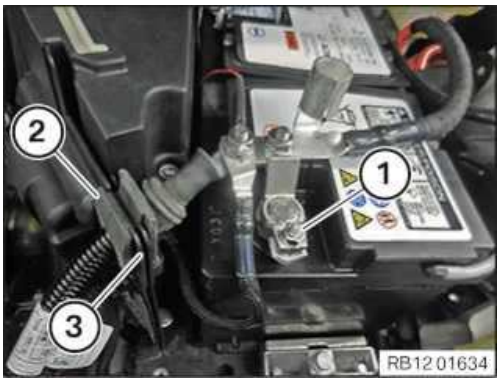
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

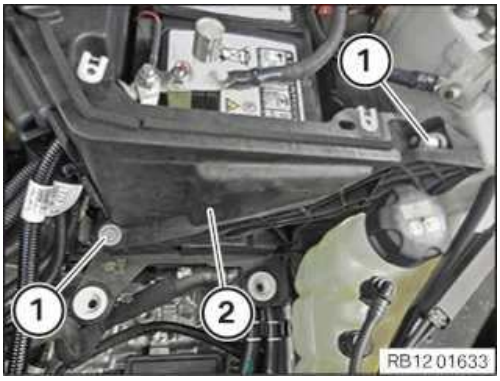
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

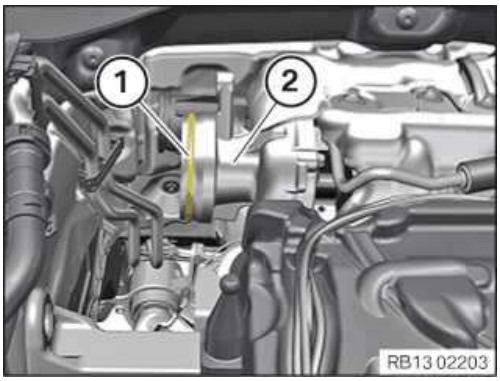


- Feed in and install tension strut (2).
- Tighten the screws (1).

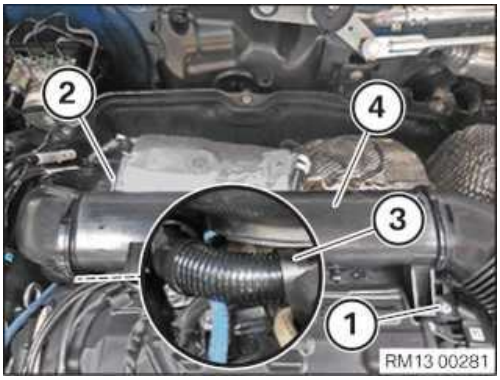
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

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- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.



- Feed in clean air pipe and install.
- Connect clean air pipe to the exhaust turbocharger and lock audibly in the clamps (2).
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Connect ventilation line (3) to the cylinder head cover and lock audibly.



- Mount clean air pipe onto the intake filter housing.
- Tighten clamp (1) on the clean air pipe.

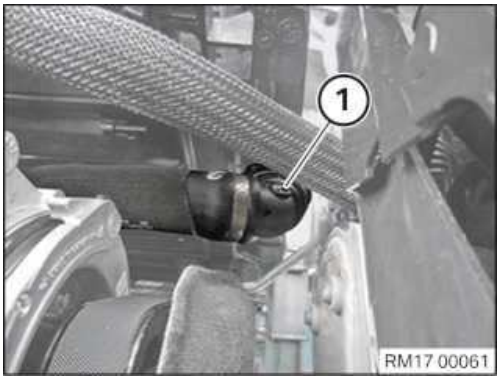
Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

56 – Connect the coolant line

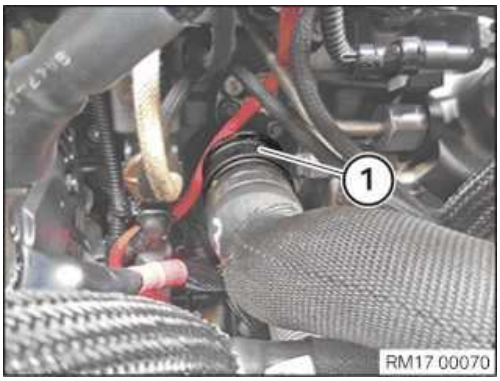
TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Connect the right coolant line (1) to the radiator and lock audibly.

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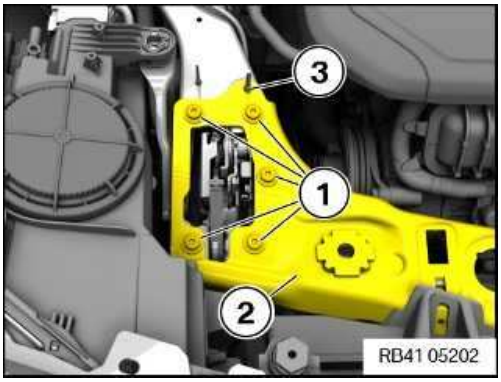


- Connect the coolant line (1) to the connecting branch and lock audibly.

57 – Install front cross connection



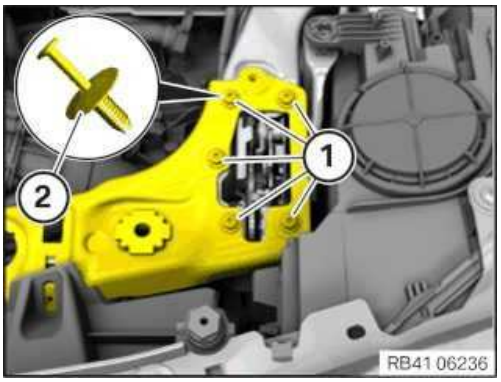
- Right side of vehicle only: Secure spray guard (1) on the cross connection (2) as pictured.



- Position front cross connection (2) and clip front cross connection (2) into the rubber retainer (3) at the same time.
- Tighten the screws (1).

Cross connection to carrier support

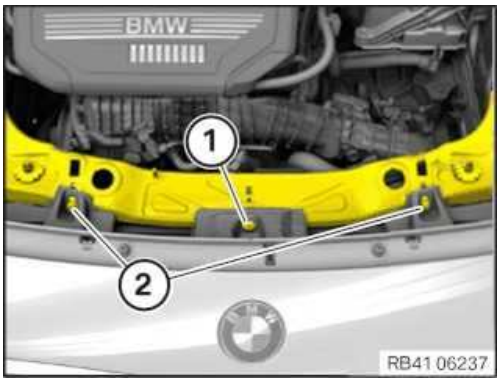
Screws M6x20		Tightening torque	11,8 Nm



- Tighten the screws (1).

Cross connection to carrier support

Screws M6x20		Tightening torque	11,8 Nm



- Position screws (3) on the rubber mounts for the radiator and tighten.

Screw connection for rubber mount of coolant radiator to coolant radiator

Bolt to rubber mount		Tightening torque	8 Nm

- Tighten down screws (2).

Air duct to upper connection

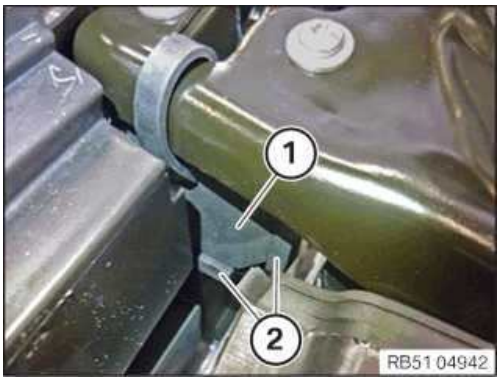
M6x20 screw		Tightening torque	11,8 Nm

- Tighten down screw (1).

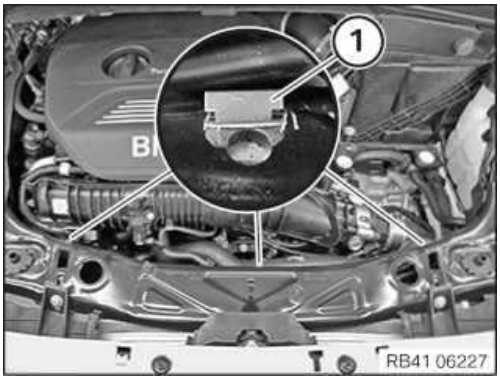
Bracing strut to upper connection

M8x20 screw		Tightening torque	28 Nm

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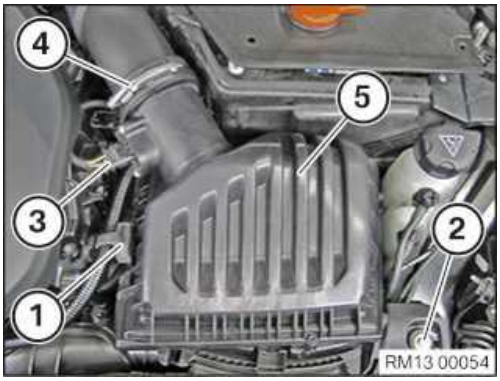


- Right side of vehicle only: Properly mount spray guard (1) to prevent corrosion.
- Secure spray guard (1) to the bridge with retaining tabs (2).



- Fasten the clamps (1) from the Bowden cable of the bonnet lock on the cross connection.

58 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.

  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

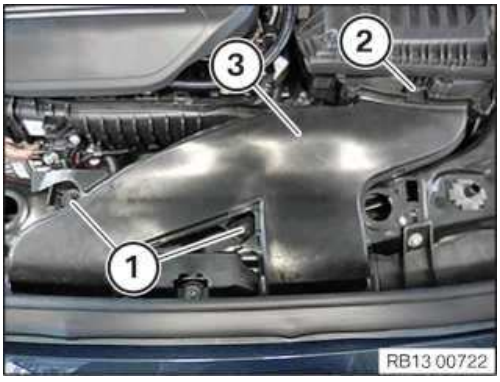
Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Insert and install the holder (1).

59 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).

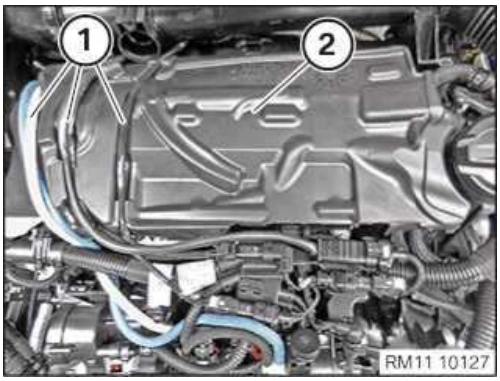
  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

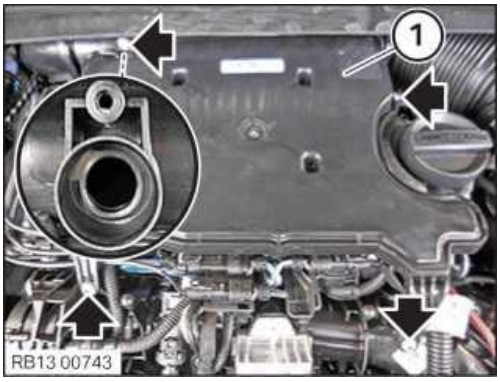
60 – Install the acoustic cover for the injectors

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- Feed the acoustic cover (2) in and install.
- Fasten the vehicle wiring harness (1) in the brackets.

61 – Install resonator



- Insert and install the resonator (1).
- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

62 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Check for correct installation of all rubber mounts in the acoustic cover (1).

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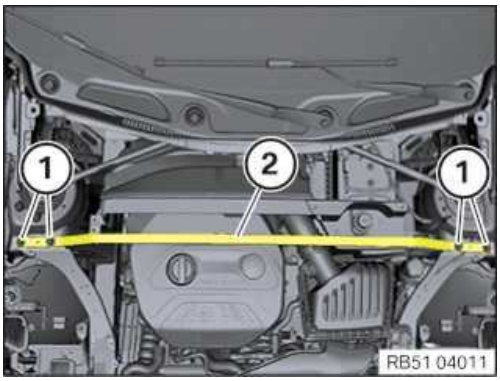


- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

63 – Install strut brace

TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.

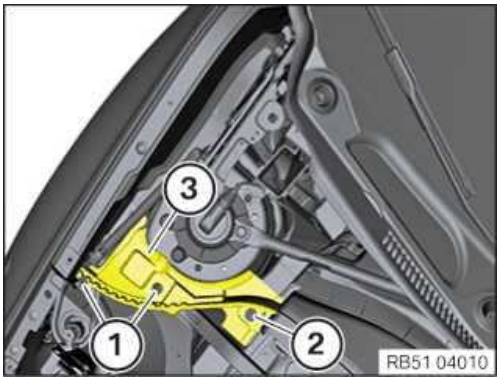


- Install the strut brace (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-brace to spring strut dome

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °



NOTICE

Description is for right component only. The procedure on the left side is identical.

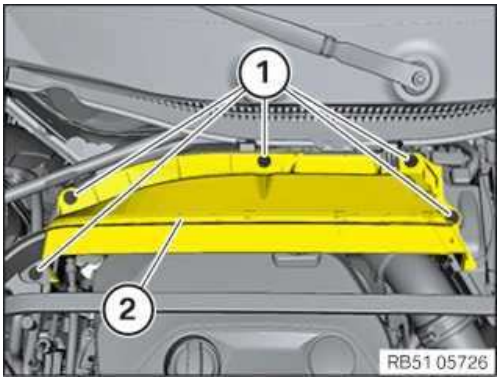
- Install the cover (3).
- Tighten down screw (2).

Cover on body

Hexagon screw		Tightening torque	3 Nm

- Install the expanding rivet (1).

64 – Installing the upper bulkhead cover

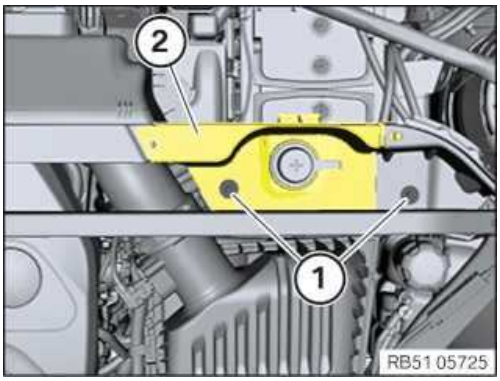


- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Cover of top bulkhead

Screw		Tightening torque	2,6 Nm

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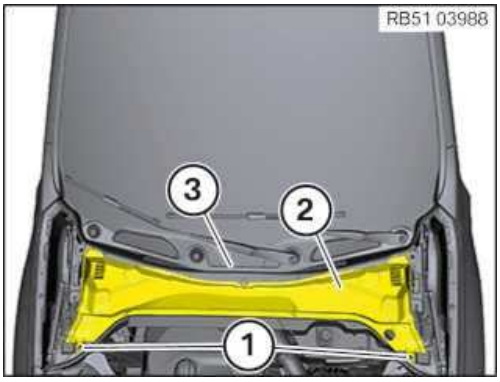


- Guide in and install cover (2).
- Tighten down screw (1).

Cover of remote positive terminal

Screw		Tightening torque	2,6 Nm

65 – Installing front cowl panel cover

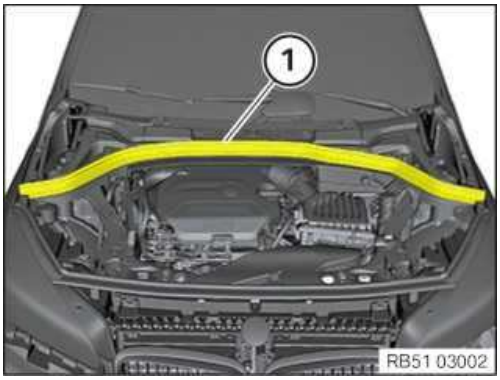


- Insert and install cowl panel cover at front (2) into cowl panel cover at rear (3).
- Check cowl panel cover at front is correctly seated (2).
- Secure expanding rivet (1).

66 – Install the seal for the bonnet

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

67 – Disconnecting all battery earth leads



- See additional information.

68 – Fill and bleed the coolant circuit

▸ **Filling and bleed the high-temperature coolant circuit**

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- See additional information.

Additional Information

Overview of Tightening Torques

Intake and exhaust camshaft in camshaft support — Used in step 34 35

M6x31		Tightening torque	10 Nm

Bearing journal to cylinder head — Used in step 37

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8 — Used in step 37

M8		Tightening torque	19 Nm

Standard screw connection M6 — Used in step 37

M6			8 Nm

Chain tensioner piston to cylinder head — Used in step 38

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft — Used in step 39

M7x17.			17 Nm

Wheel arch cover to body — Used in step 41

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body — Used in step 41

Plastic nut		Tightening torque	3 Nm

Brake disc to front wheel hub — Used in step 42

M8	Renew screw.		16 Nm

Wheel bolts — Used in step 42

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

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Underbody protection front

Used in step 43

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Cylinder head cover to cylinder head

Used in step 44

M6		Tightening torque.	8,5 Nm

Differential pressure sensor to holder

Used in step 45

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor

Used in step 45

Clamp 15–19mm		Tightening torque	3 Nm

Clamping claw facing to cylinder head cover

Used in step 46

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 46

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

High pressure lines between injector and rail

Used in step 48

High pressure lines		Tightening torque	28 Nm

Intake plenum to cylinder head

Used in step 49

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 50

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler

Used in step 50

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to exhaust manifold

Used in step 50

M8x28	Replace screws	Tightening torque	32 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 50

M8x20		Tightening torque	19 Nm

Wiring harness to cylinder head cover

Used in step 51 54

TS5x20		Tightening torque	3,5 Nm

Positive battery cable to alternator

Used in step 51

M8		Tightening torque	19 Nm

Fuel line to intake plenum

Used in step 51

TS6x20		Tightening torque	5 Nm

Cover to electronics box

Used in step 51 54

RF5x26.5		Tightening torque	2,5 Nm

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Positive battery terminal to battery

Used in step 51 54

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray

Used in step 51 54

M8		Tightening torque	19 Nm

Battery holder to engine support

Used in step 52

Hexagon screw M8x30		Tightening torque	19 Nm

Battery terminal rail to battery tray

Used in step 53

M8			19 Nm

Battery terminal with IBS positive battery terminal / negative battery terminal

Used in step 53

NutM6			5 Nm

Trailing link

Used in step 53

M8		Tightening torque	19 Nm

Battery cover

Used in step 53

M8			2,8 Nm

Electronics box to battery tray

Used in step 54

M8X16		Tightening torque	15 Nm

Clean air pipe to cylinder head cover

Used in step 55

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing

Used in step 55 58

Clamp		Tightening torque	3 Nm

Cross connection to carrier support

Used in step 57

Screws M6x20		Tightening torque	11,8 Nm

Screw connection for rubber mount of coolant radiator to coolant radiator

Used in step 57

Bolt to rubber mount		Tightening torque	8 Nm

Air duct to upper connection

Used in step 57

M6x20 screw		Tightening torque	11,8 Nm

Bracing strut to upper connection

Used in step 57

M8x20 screw		Tightening torque	28 Nm

Intake silencer housing to lock bridge

Used in step 58

M6X30		Tightening torque	8 Nm

Intake neck to cross connection

Used in step 59

M6		Tightening torque	8 Nm

Resonator to manifold and clean air pipe

Used in step 61

Screw TS6	Renew screw.	Tightening torque	5 Nm

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Cross-brace to spring strut dome

Used in step 63

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

Cover on body

Used in step 63

Hexagon screw		Tightening torque	3 Nm

Cover of top bulkhead

Used in step 64

Screw		Tightening torque	2,6 Nm

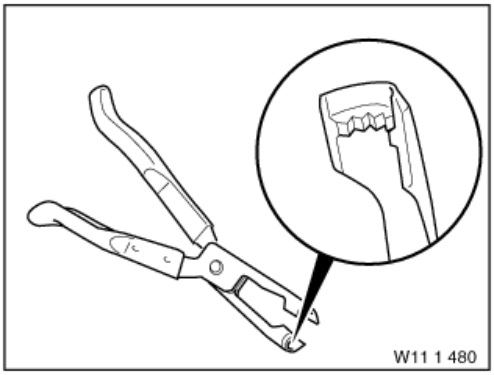
Cover of remote positive terminal

Used in step 64

Screw		Tightening torque	2,6 Nm

Overview of Special Tools

0 490 796 (11 1 480) Pliers



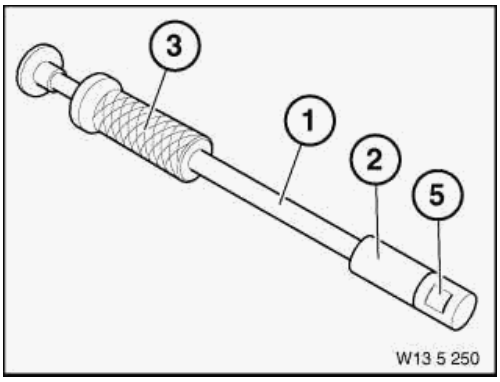
Common

Used in step 18

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

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0 493 321 (13 5 250) Puller



Common

Used in step 23

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

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0 493 339 (13 5 252) Bush



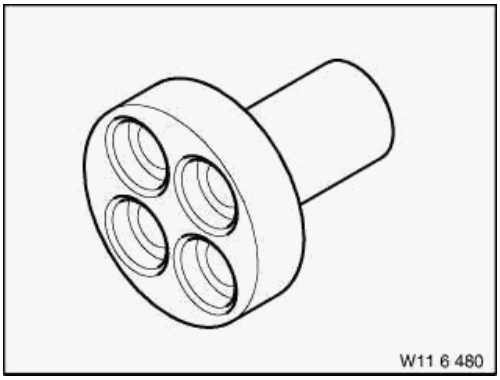
Common	Used in step 23
Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 340 (13 5 253) Weight



Common	Used in step 23
Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 380 (11 6 480) Connector



Common	Used in step 28 40
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

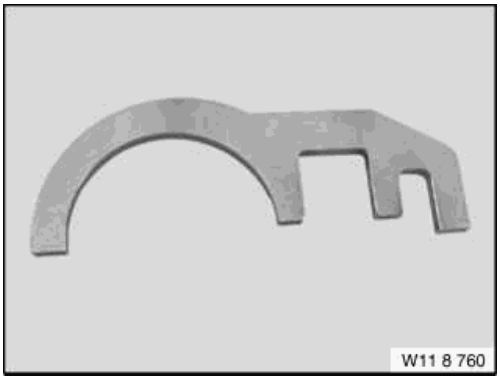
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2 288 380 Locating stud



Common	Used in step 28 40
Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 112 (11 8 760) Gauge



Common	Used in step 28 40
Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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0 495 105 (11 4 480) oddments tray



Common

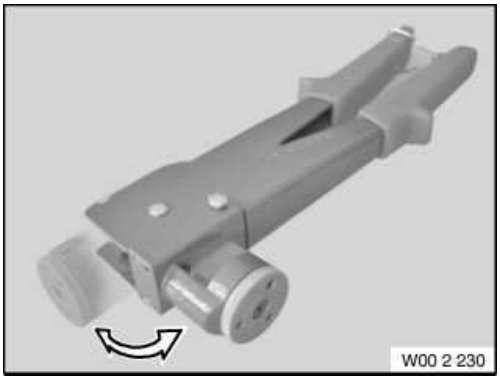
Used in step 32 33

Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

0 496 521 (00 2 230) Pliers



Common

Used in step 41

Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

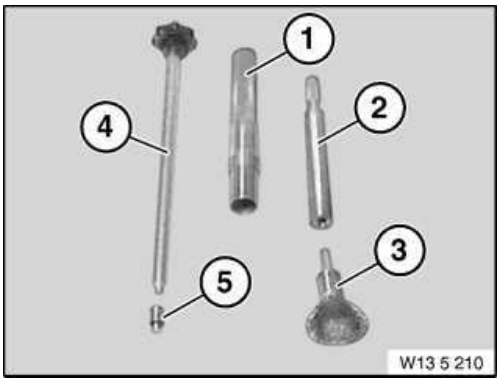
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2 344 011 Tool



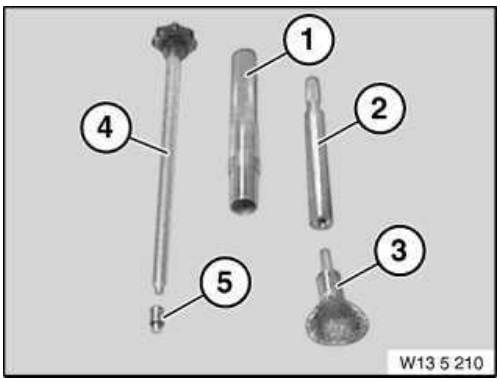
Common	Used in step 42
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

0 493 763 (13 5 215) Plug



Common	Used in step 46
Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

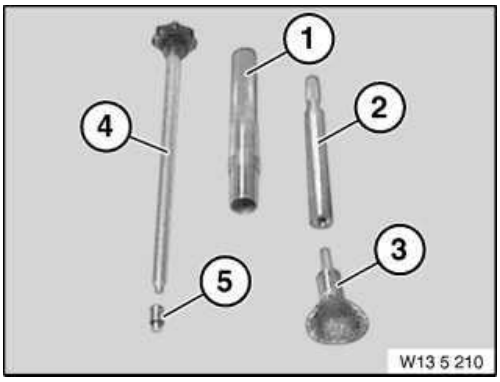
0 493 762 (13 5 214) Rod



Common	Used in step 46
Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 493 758 (13 5 210) Tool



Common

Used in step 46

Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

Replacement tools:

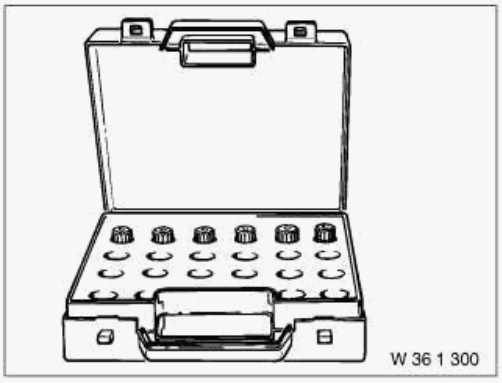
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0 495 221 (36 1 323) Wheel stud



Common	Used in step 26
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud



Common	Used in step 26
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud



Common	Used in step 26
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 226 (36 1 328) Wheel stud



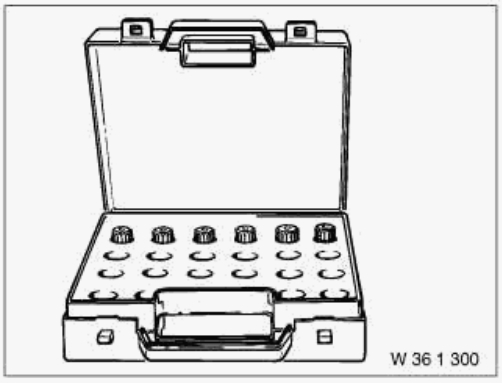
Common	Used in step 26
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud



Common	Used in step 26
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud



Common	Used in step 26
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 229 (36 1 332) Wheel stud



Common	Used in step 26
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud



Common	Used in step 26
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	19 50
EGR controller	19 50

Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	1 67
61 20 900 Disconnecting and connecting battery earth lead	1 67
61 20 900 Disconnecting and connecting battery earth lead	1 67
61 20 900 Disconnecting and connecting battery earth lead	1 67
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61 20 900 Disconnecting and connecting battery earth lead 1 67
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads) 1 67
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads) 1 67
61 20 900 Disconnecting and connecting battery earth lead 1 67
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Operating materials	Used in step
2.0 Grease for wheel centring	42

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	38
Exhaust-gas recirculation cooler seal on exhaust manifold	50
Exhaust-gas recirculation cooler seal on intake plenum	50

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11 31 025 Removing and installing/replacing intake camshaft

PRELIMINARY WORK

1 – Disconnecting all battery earth leads

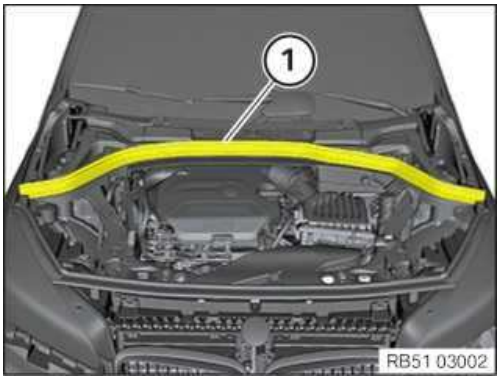


- See additional information.

2 – Remove the seal for the rear bonnet

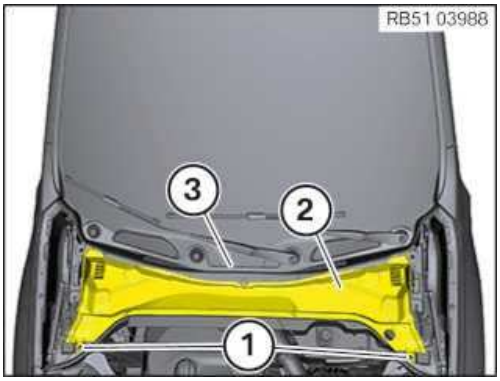
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Pull off rear bonnet seal (1) towards the top and remove.

3 – Removing front cowl panel cover



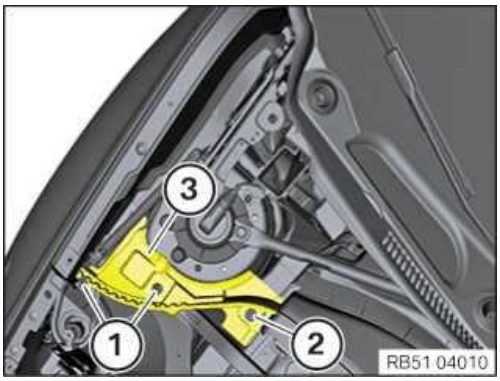
- Loosen the expanding rivet (1).
- Feed out and remove front cowl panel cover (2) from the rear cowl panel cover(3).

4 – Remove suspension cross-brace

TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.

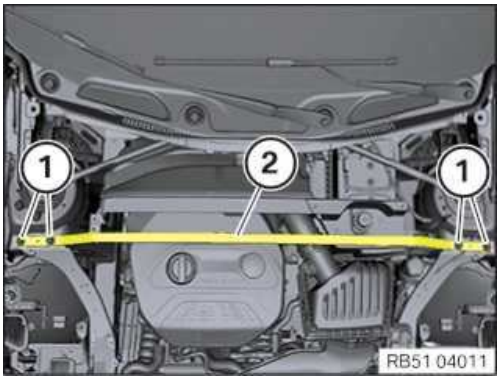
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NOTICE

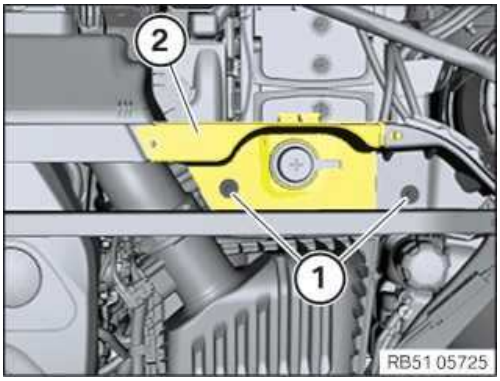
Description is for right component only. The procedure on the left side is identical.

- Loosen expanding rivet (1).
- Loosen screw (2).
- Remove the cover (3).

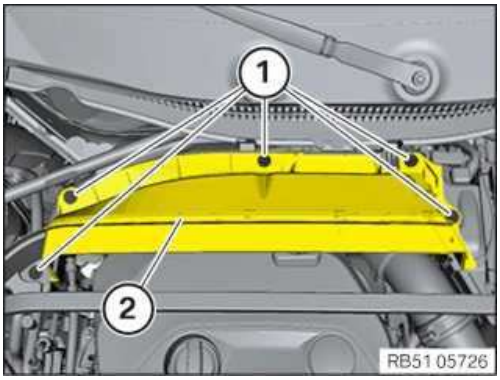


- Loosen screws (1).
- Remove strut brace (2).

5 – Removing the upper bulkhead cover

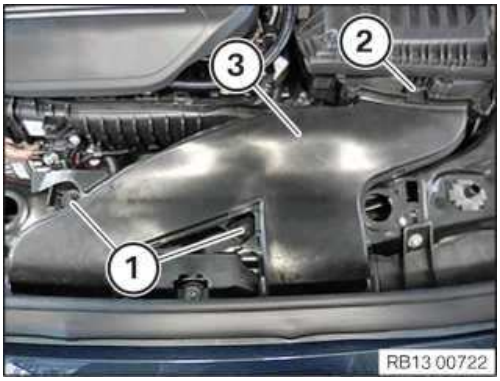


- Loosen screws (1).
- Guide out and remove the cover (2).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

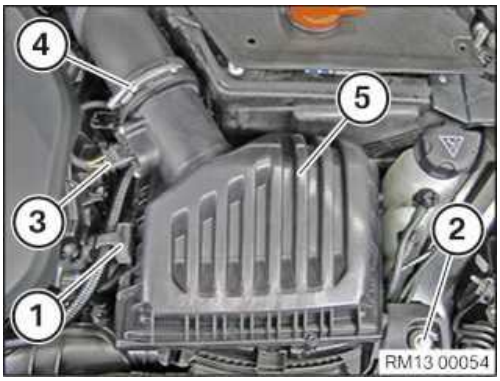
6 – Remove the intake neck for intake silencer housing



- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

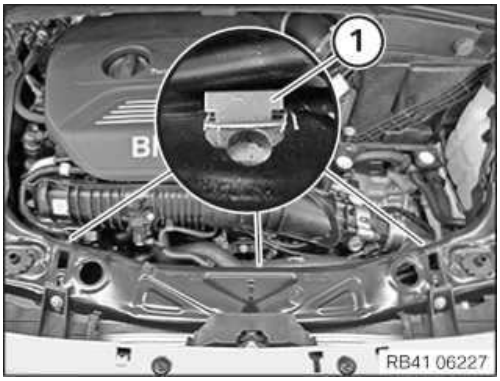
7 – Removing intake silencer housing

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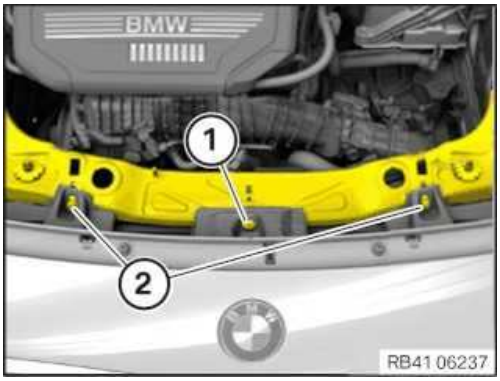


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

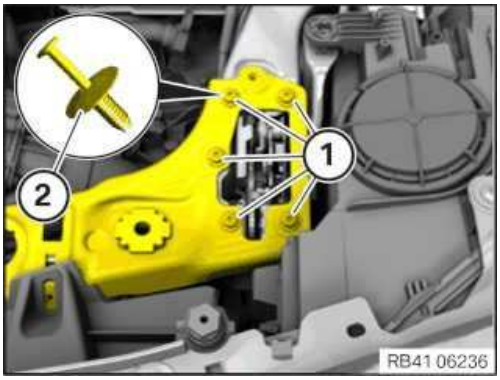
8 – Remove front cross connection



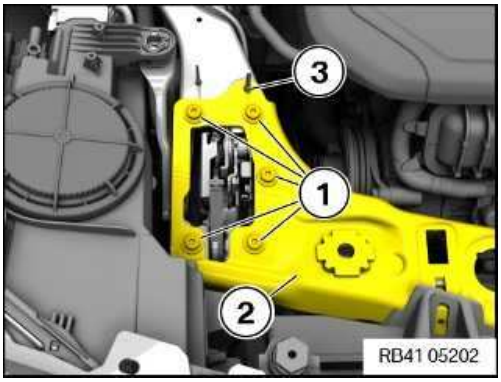
- Detach the clamps (1) for the Bowden cable of the bonnet locks from the cross connection.



- Loosen screw (1).
- Loosen screws (2).



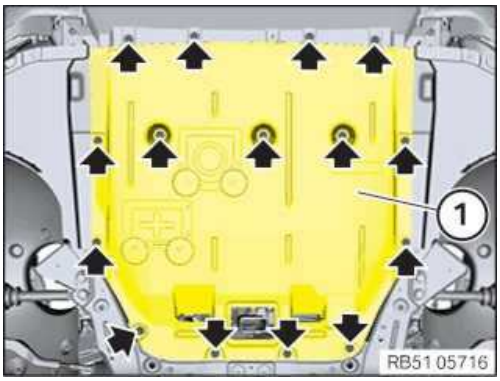
- Loosen screws (1).
- Lever out expanding rivet (2).



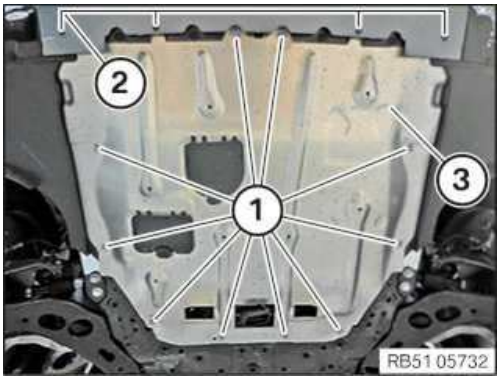
- Loosen screws (1).
- Unclip the front cross connection (2) from the rubber retainer (3) and remove it upward.

9 – Removing the front underbody protection

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- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.



- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

10 – Draining coolant

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

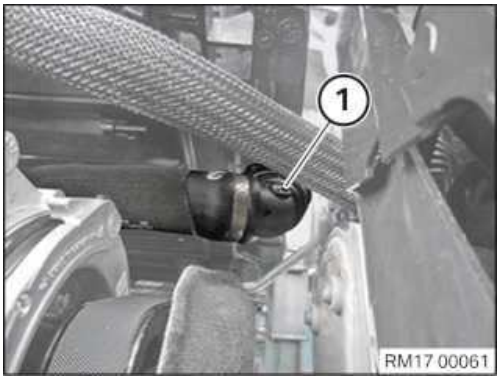
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

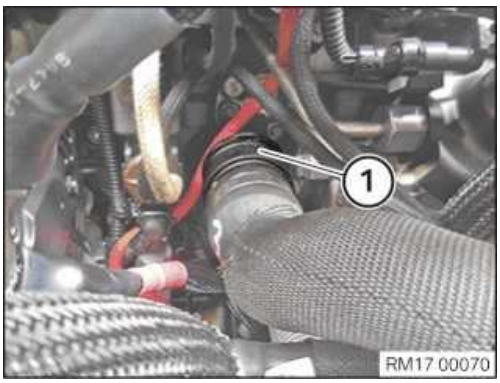
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- Loosen sealing cap (1).



- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.



- Unlock the coolant line (1) and pull it off the connecting branch.
- Catch and dispose of escaping coolant.

11 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

Damage to the acoustic cover.

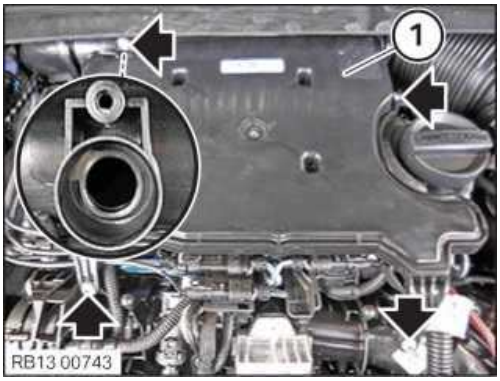
Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

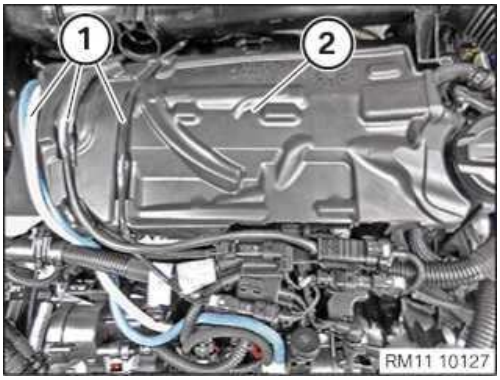
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12 – Remove resonator



- Remove screws (arrows).
- Guide out and remove the resonator (1).

13 – Remove the acoustic cover for the injectors

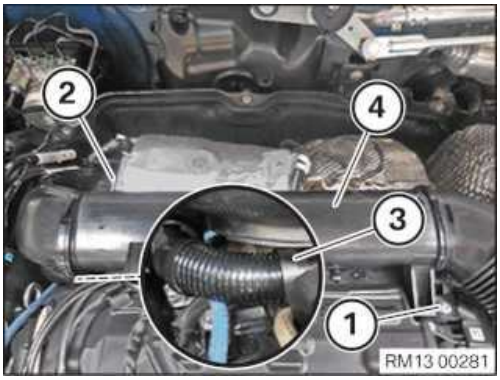


- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

14 – Removing clean air pipe



- Detach clamp (1) on the clean air pipe.
- Pull off the clean air pipe from the intake silencer housing.



- Loosen screw (1).
- Loosen clamp (2).
- Unlock the ventilation line (3) and pull it off the cylinder head cover.
- Feed out clean air pipe and remove.

15 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

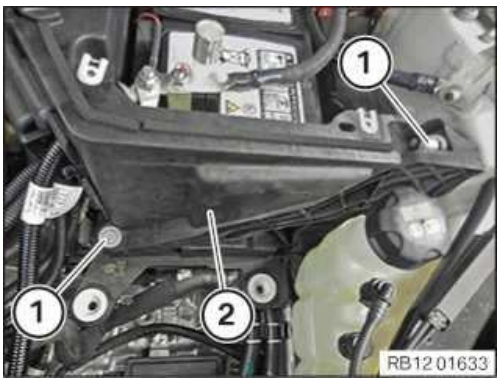
TECHNICAL INFORMATION

Follow instructions for removing and installing control units.

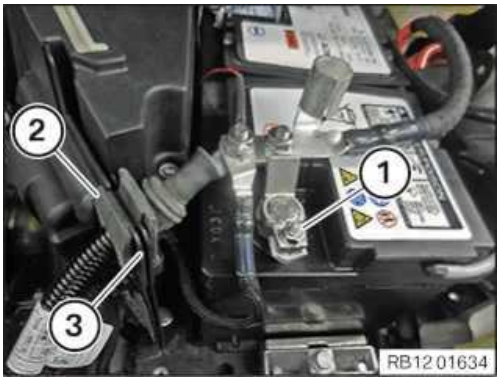
For additional information see: 12 00 ... Notes on removal and installation of control units

TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.

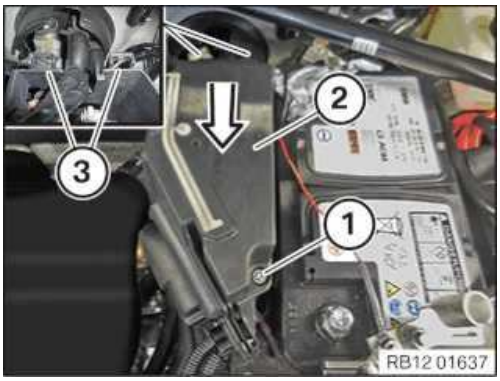


- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.

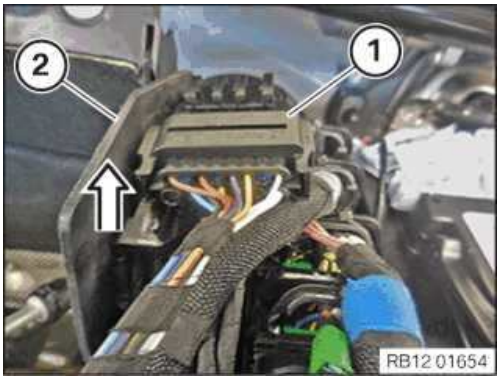


- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

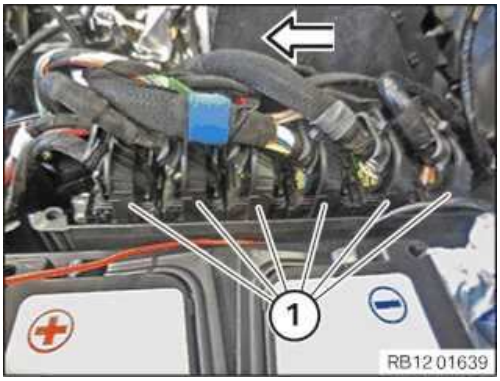
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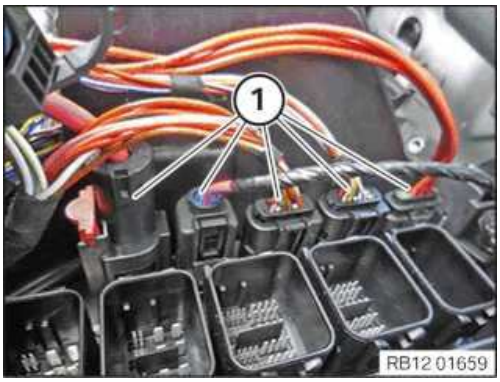
- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



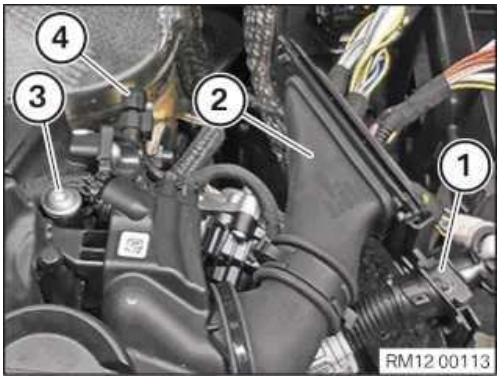
- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).



- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

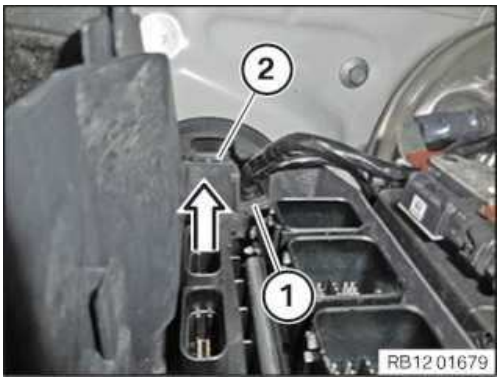


- Unlock and loosen connector (1).

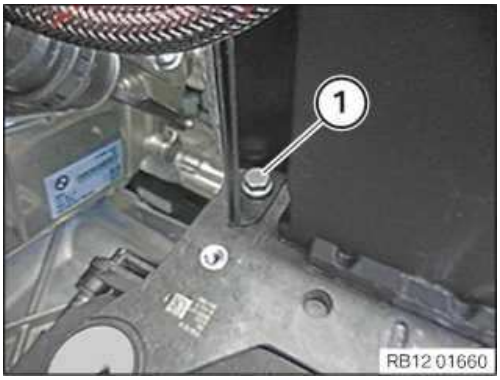


- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.

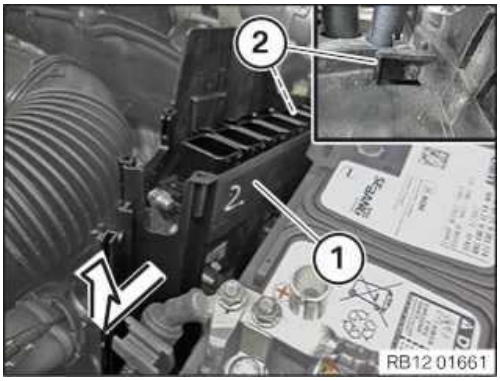
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- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.



- Loosen screw (1).



- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

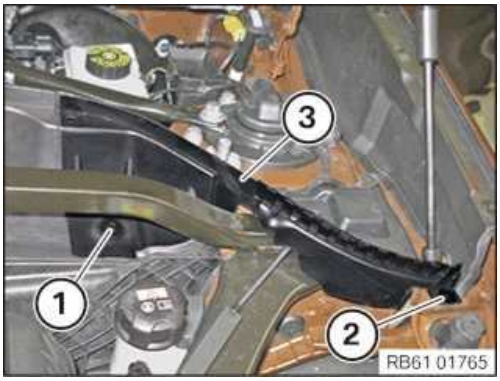
16 – Remove vehicle battery

WARNING

Working on 12 V vehicle electrical system.

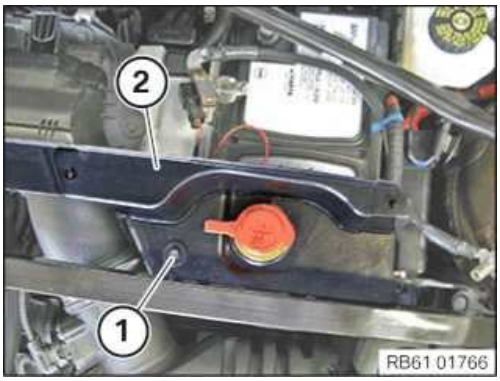
Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

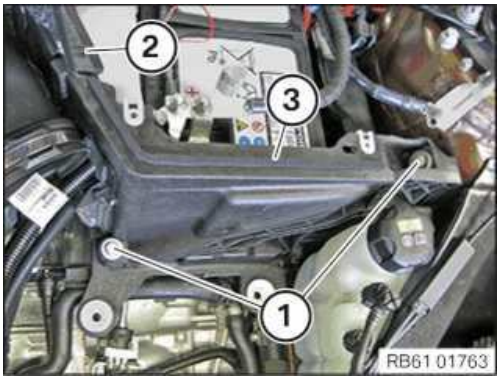


- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

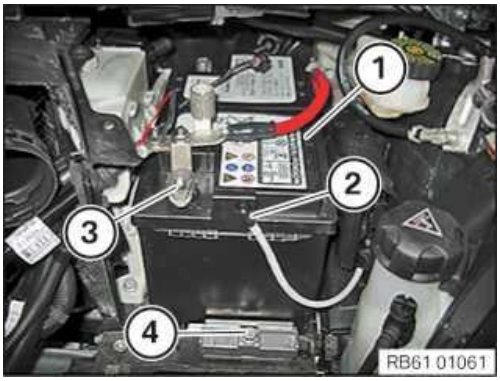
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- Loosen screw (1).
- Remove the cover (2).



- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.



- Pull off the vent hose (2).
- Slacken the nut (3) on the positive battery terminal and remove the positive battery terminal.

WARNING

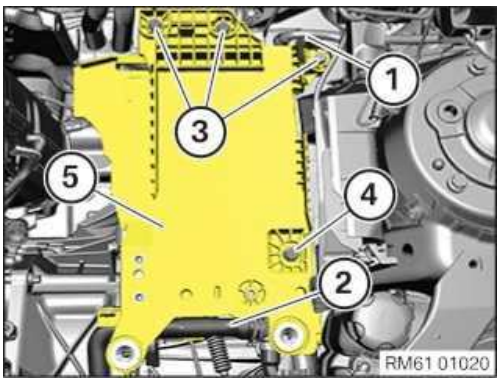
Unprotected battery terminals.

Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

17 – Remove battery holder

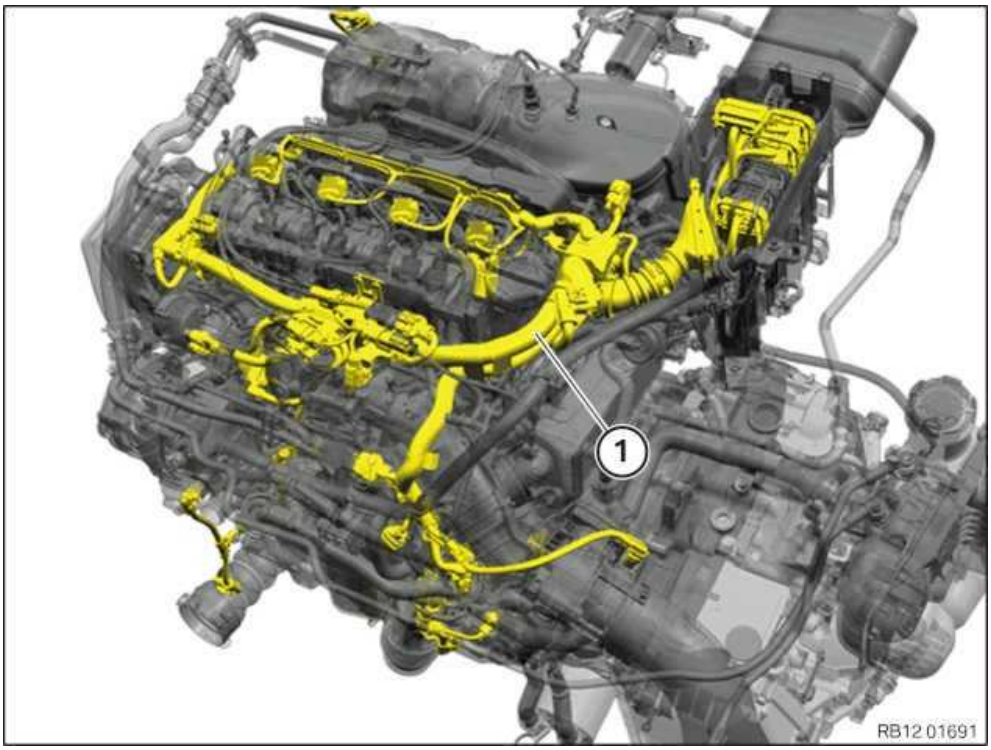


- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

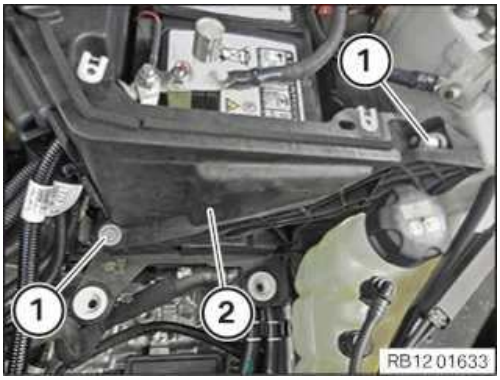
18 – Releasing the wiring harness section for the intake plenum

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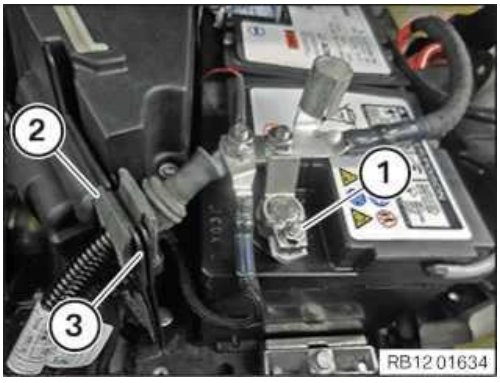
Overview: Wiring harness section for the engine



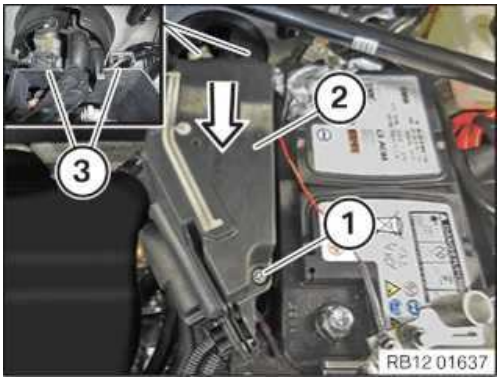
1 Wiring harness section for the engine



- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.

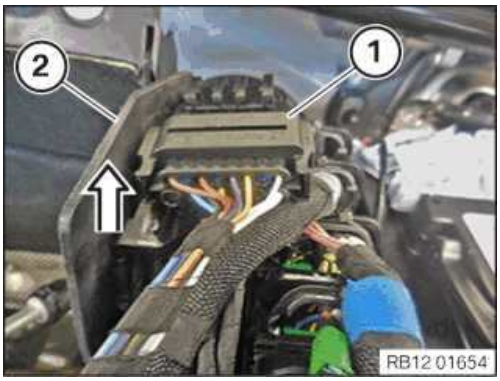


- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

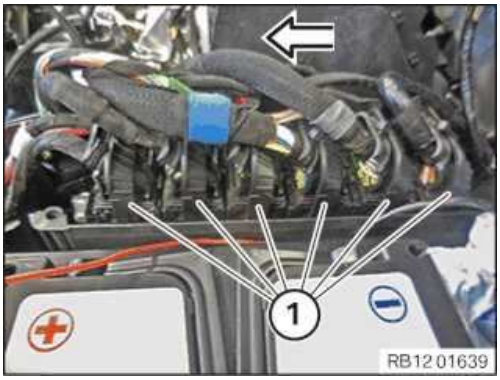


- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.

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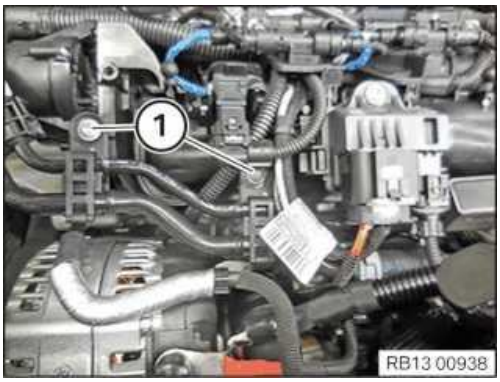
- Guide the connector (1)out of the electronics box (2) in the direction of arrow and remove it.
- Unlock and loosen connector (1).



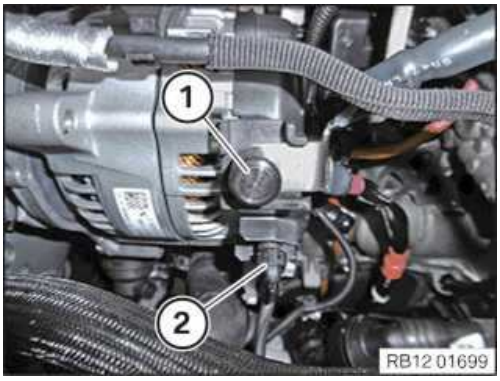
- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



- Unlock and loosen connector (1).

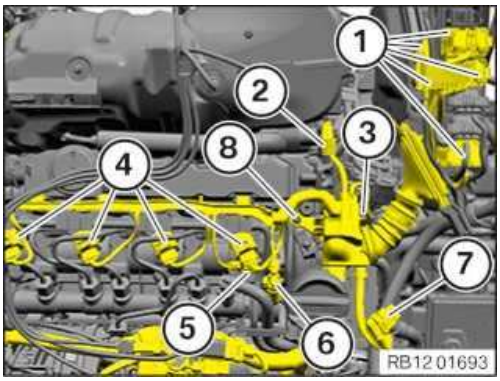


- Loosen screws (1).

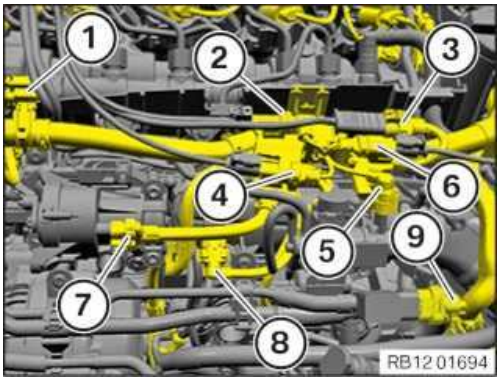


- Release the positive battery cable (1) on the alternator and place to one side.
- Unlock connector (2) and pull off.

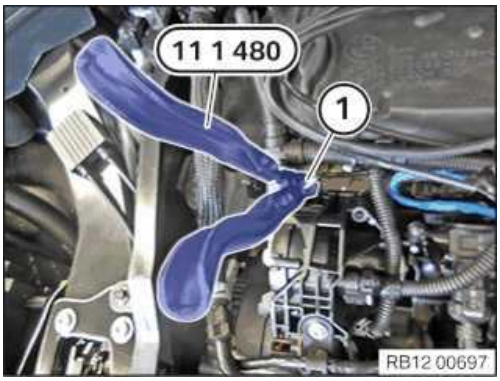
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- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock the connector (2) and disconnect it from the differential pressure sensor.
- Unlock the connector (3) and disconnect it from the exhaust-gas recirculation valve.
- Unlock the connector (4) and pull off from the injectors.
- Unlock the connector (5) and disconnect it from the camshaft sensor.
- Unlock the connector (6) and disconnect it from the fuel pressure regulator.
- Unlock connector (7) and pull off from hot film air mass meter.
- Loosen screw (8).

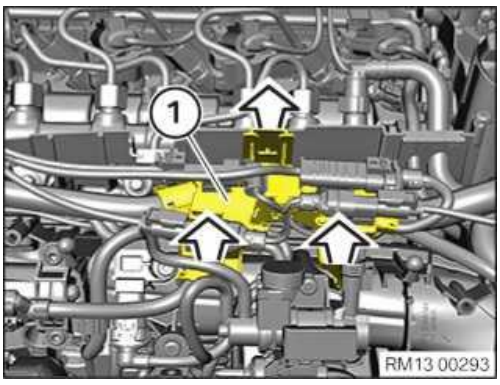


- Unlock connector (1) and pull off from the rail pressure sensor.
- Unlock the connector (2) and disconnect it from the exhaust temperature sensor before the diesel particulate filter.
- Unlock and disconnect the connector (3) from the front oxygen sensor.
- Unlock the connector (4) and disconnect it from the exhaust temperature sensor after the diesel particulate filter.
- Unlock and disconnect the connector (5) from the electric changeover valve.
- Unlock the connector (6) and disconnect it from the exhaust temperature sensor for the exhaust-gas recirculation cooler.
- Unlock the connector (7) and disconnect it from the servomotor for the swirl flaps.
- Unlock the connector (8) and pull it off the charging pressure sensor.
- Unlock the connector (9) and disconnect from the fuel pressure and temperature sensor.



- Unlock the connectors (1) of all glow elements with the special tool **0 490 796 (11 1 480)** and release them.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.

▶ **Removing the cable clips from the intake plenum**



- Detach the cable clip (1) in the direction of the arrow.
- Guide out the cable clip (1) in direction of arrow and set it aside.

19 – Removing the exhaust-gas recirculation cooler

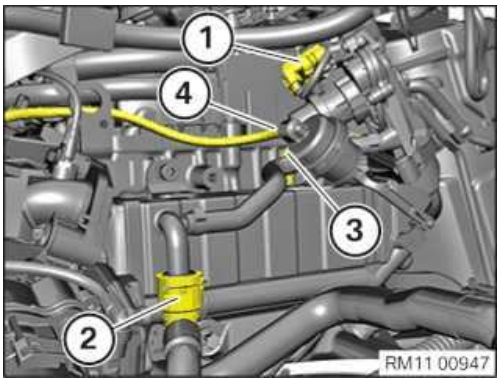
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WARNING

Hot surfaces.

Risk of burning!

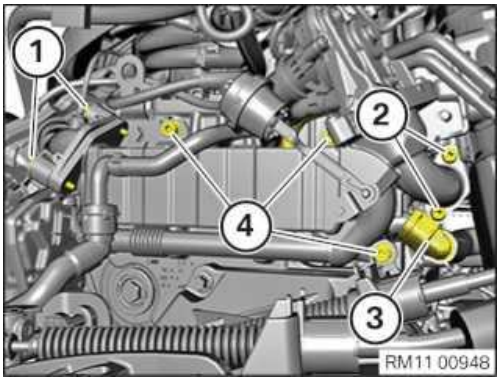
- Perform all work only on components that have cooled down.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.

20 – Removing the intake plenum

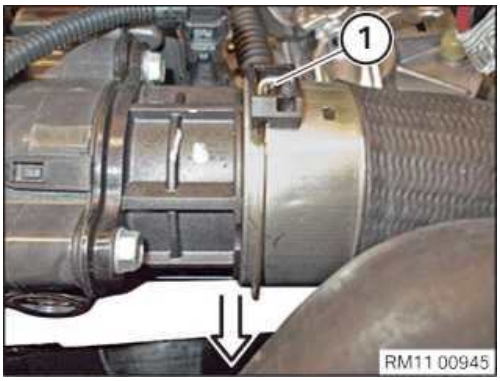
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

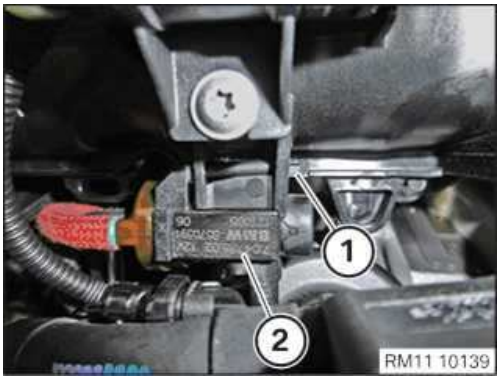


- Unlock the lock (1).

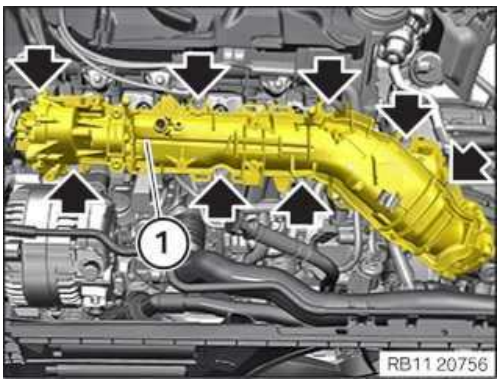
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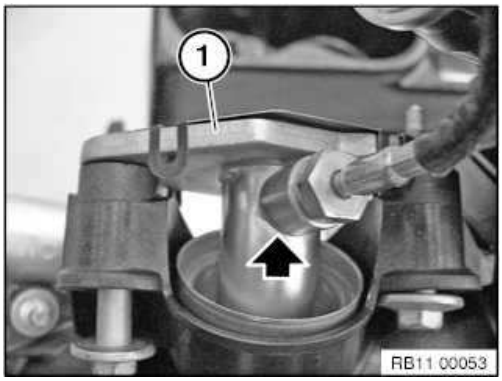
- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.



- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



- Release the screws (arrows) from the intake plenum (1).
- Guide the intake plenum (1) out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

21 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

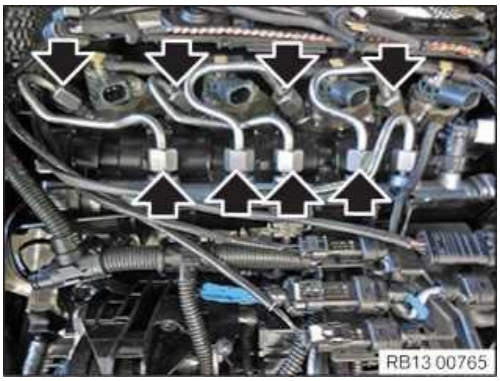
TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

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- Release the high pressure lines (arrows) with the special tool .
- Catch and dispose of escaping fuel.
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool .

22 – Detaching leakage oil line from injector

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Contaminant or foreign body.

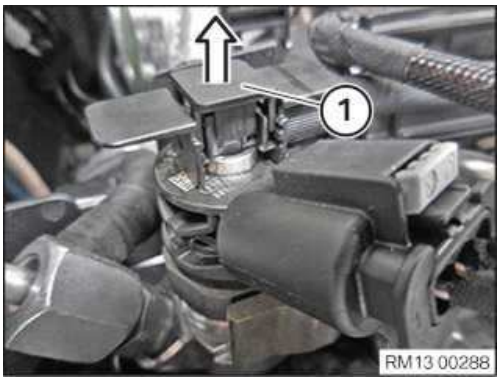
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

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- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

23 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

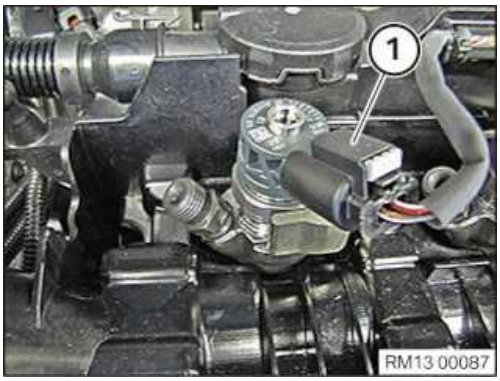
Electrostatic discharge.

Damage to or destruction of electrical components.

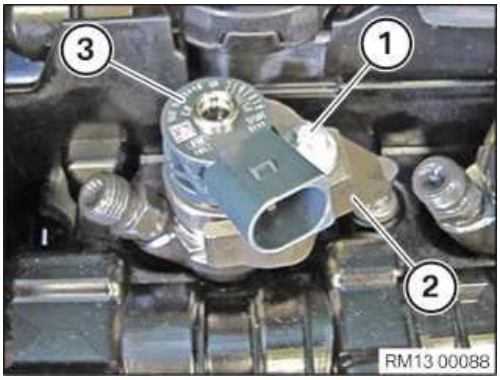
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.



- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

▶ **Loosen stuck injectors**

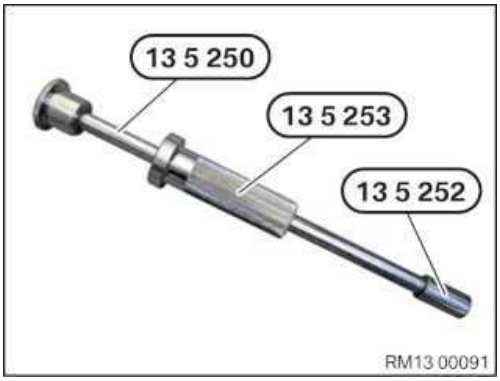
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RISK OF DAMAGE

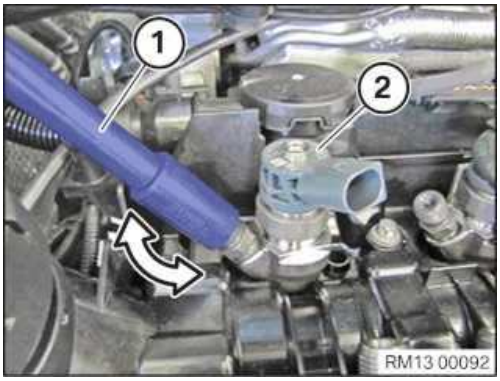
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)**back onto the special tool **0 493 321 (13 5 250)**.



- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

24 – Remove differential pressure sensor

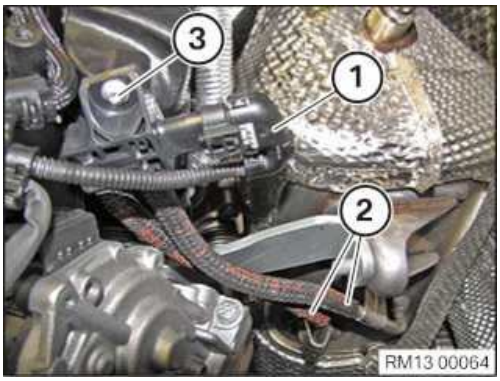
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

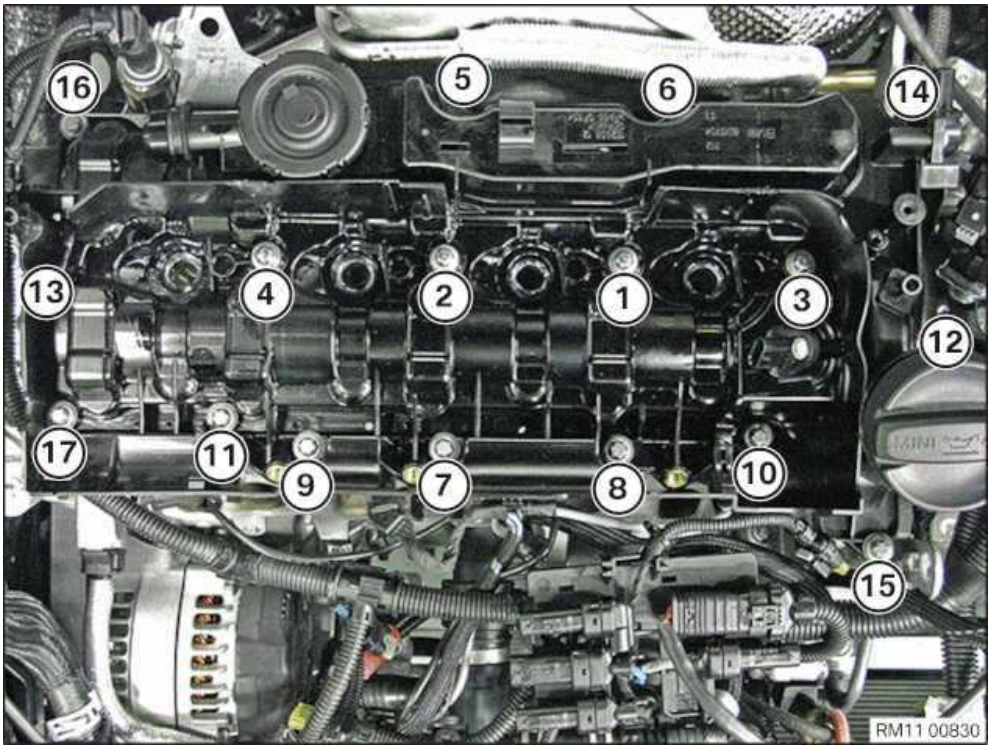
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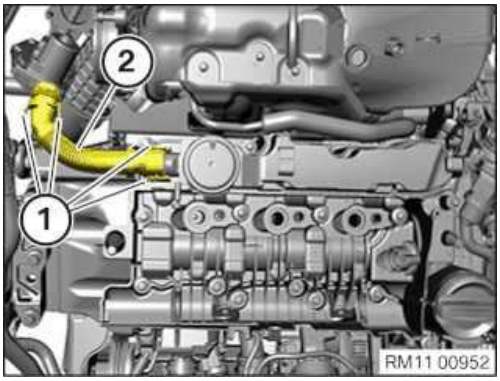
- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

25 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover

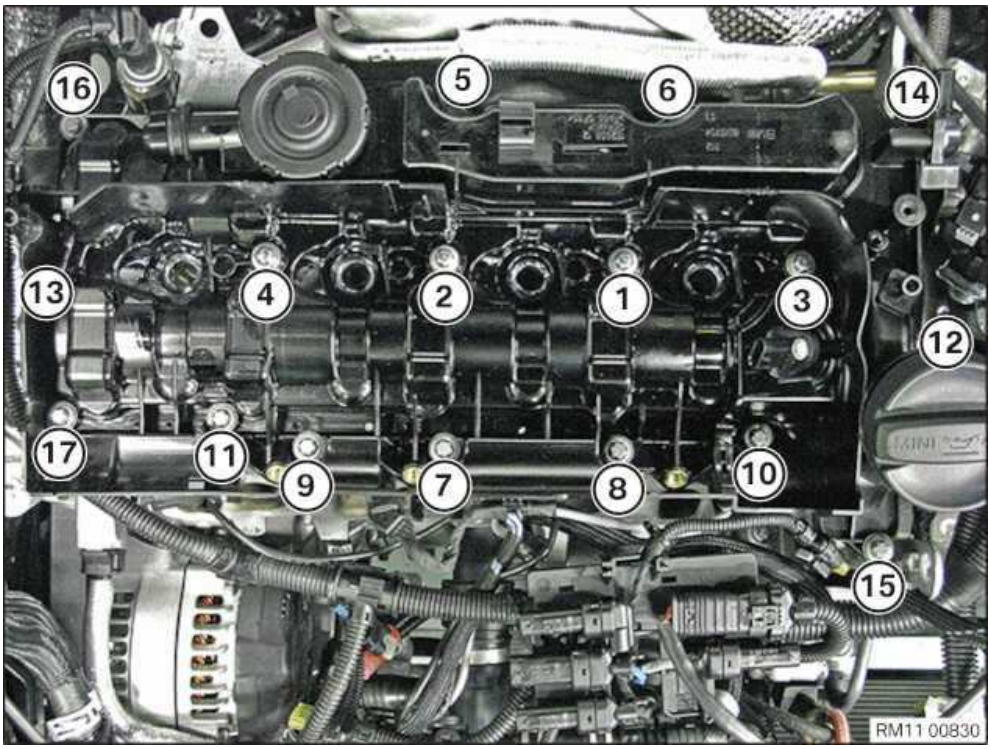


1 to 16 screws of the cylinder head cover.



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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- Loosen screws in the order (17) to (1).
- Remove cylinder head cover by lifting it out.

26 – Remove front right wheel

TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

TECHNICAL INFORMATION

Strictly observe the specified procedure to prevent clamping errors and imbalance.



- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

27 – Removing the front right wheel arch cover

▸ **Remove the front wheel arch trim**

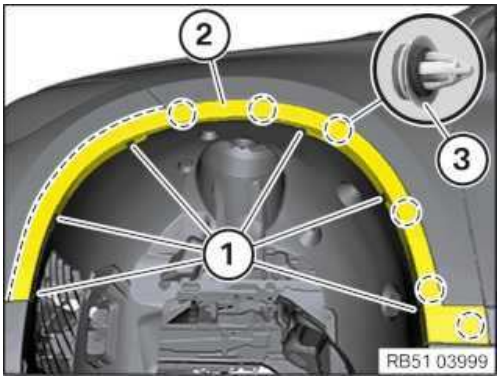
NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

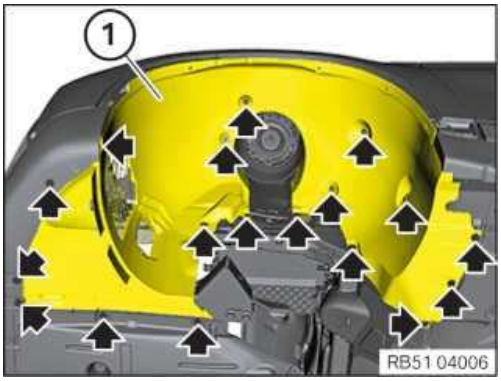
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NOTICE

Description is for left component only. Procedure on the right side is identical.



- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.



NOTICE

Description is for left component only. Procedure on the right side is identical.

- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

28 – Checking camshaft timing



- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

Damage to the engine.

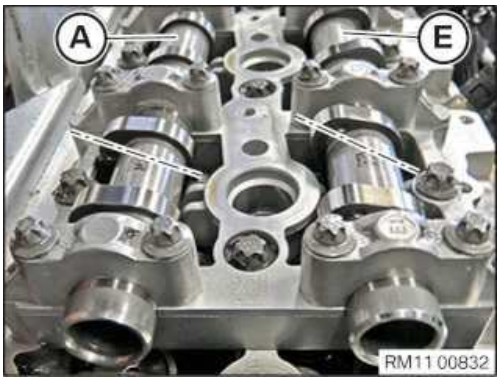
The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

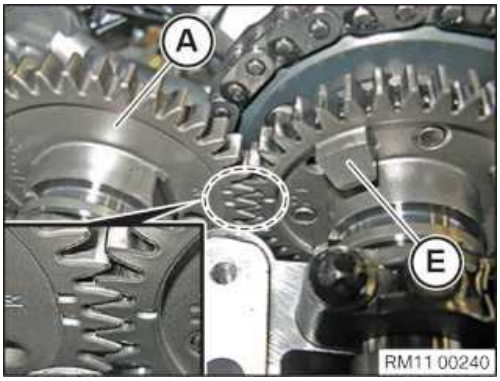
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- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.



- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

29 – Remove chain tensioner piston

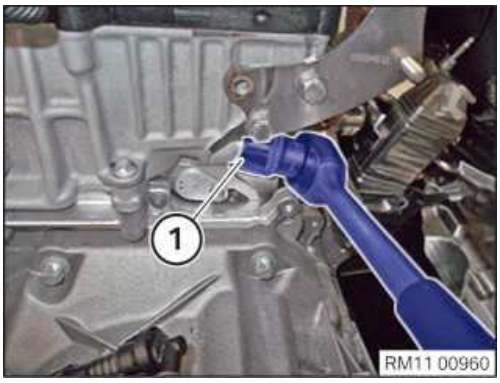
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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

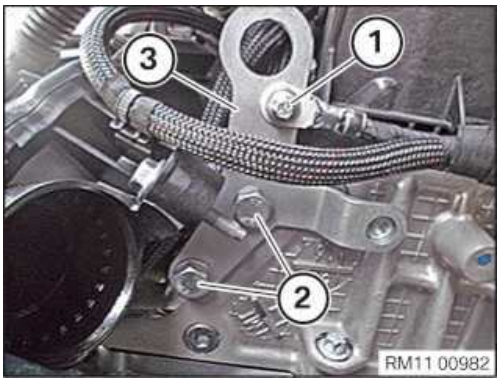


TECHNICAL INFORMATION

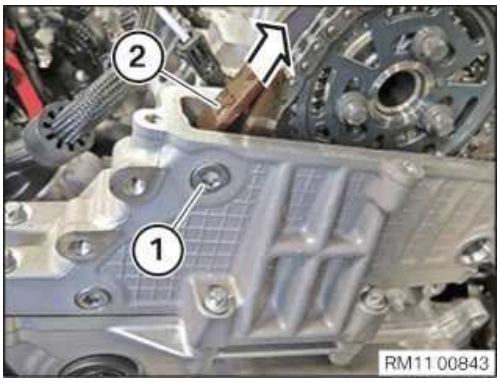
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

30 – Remove the timing chain guide rail

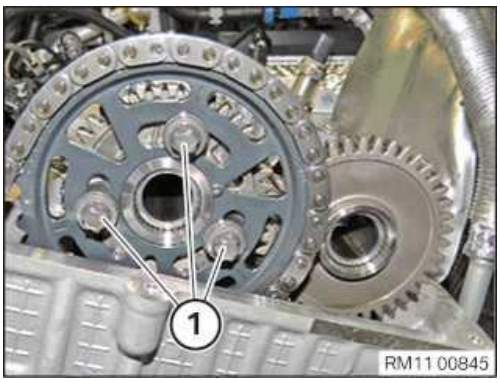


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

31 – Removing the camshaft sprocket on the intake camshaft

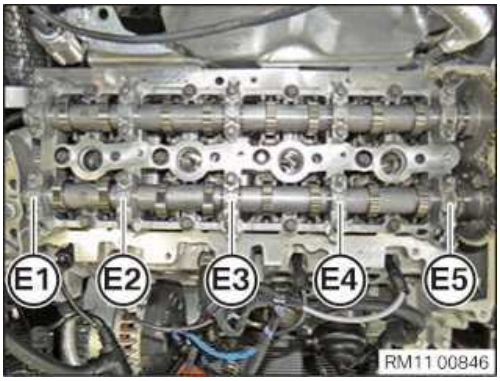


- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

MAIN WORK

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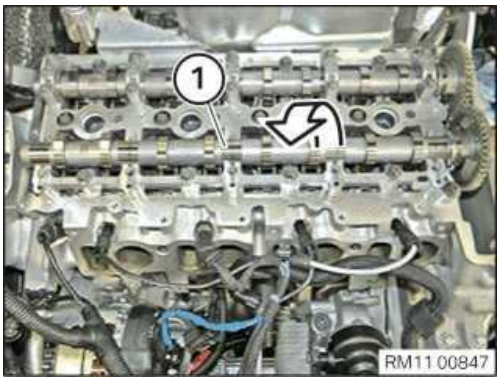
32 – Removing the intake camshafts



TECHNICAL INFORMATION

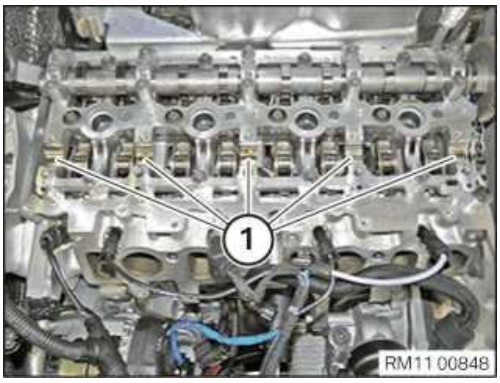
The camshaft is tensioned by the valve springs. Tighten or loosen each screw on the camshaft bearing caps one at a time in the specified sequence and by half a turn only. Repeat procedure.

- Loosen all screws of the intake camshaft bearing caps (E1) to (E5) from the outside towards the inside by 1/2 a turn at a time.
- Place all components on special tool **0 495 105 (11 4 480)** in a tidy and orderly fashion.

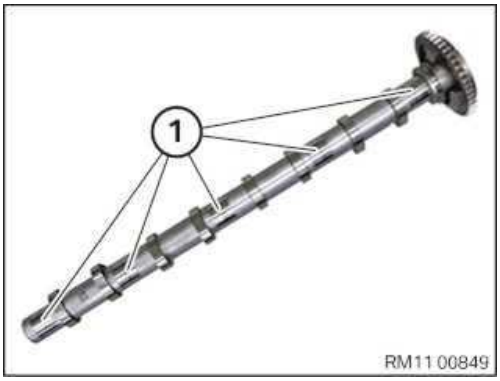


- Remove the intake camshaft (1).

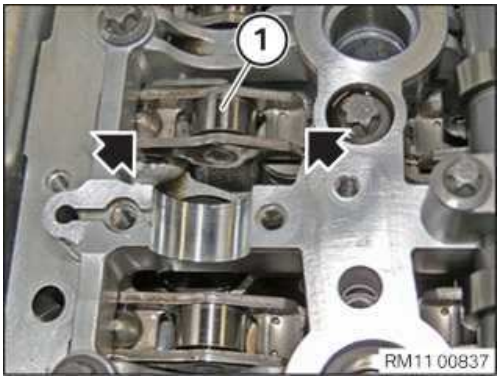
33 – Install intake camshaft



- Oil all bearing positions (1).

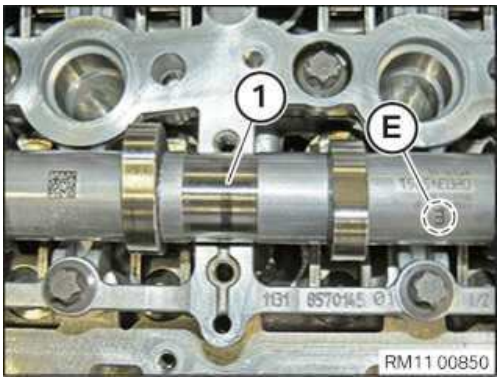


- Oil all bearing positions (1) of the intake camshaft.

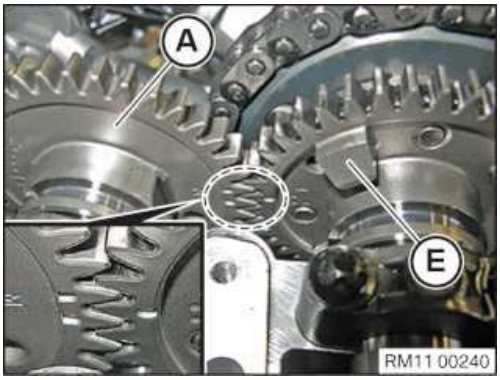


- Check the installation position of the roller cam followers (1) **(risk of damage!)** .

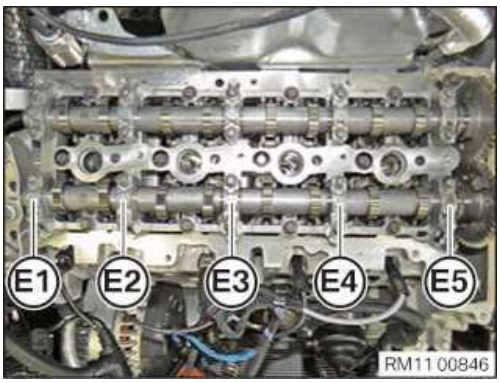
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- Make sure the identification (E) of the intake camshaft points upwards.
- Insert the intake camshaft (1).



- Insert the intake camshaft (A) so that the marks on the camshafts (A) and (E) correspond in the highlighted area.
- Position the camshafts (A) and (E) accordingly.



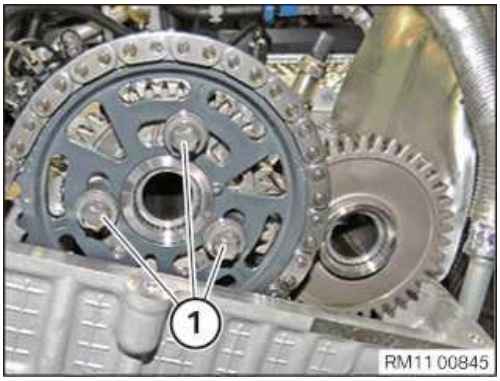
- Tighten all intake camshaft bearing caps (E1) to (E5) from the inside to the outside by 1/2 a turn at a time.

Intake and exhaust camshaft in camshaft support

M6x31		Tightening torque	10 Nm

POSTPROCESSES

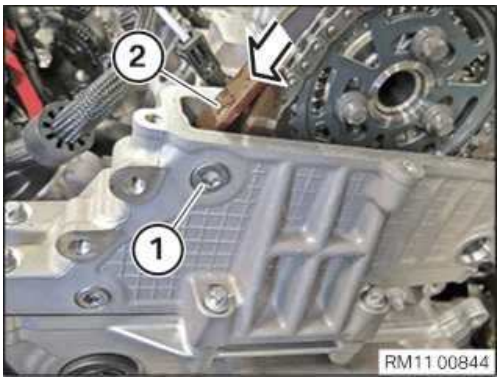
34 – Installing the camshaft sprocket on the intake camshaft



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

35 – Install the timing chain guide rail

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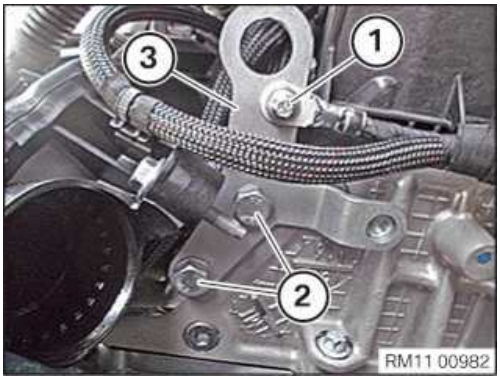
- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm



- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6		8 Nm

36 – Installing the chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Renew sealing ring (1).

  Parts: Sealing ring

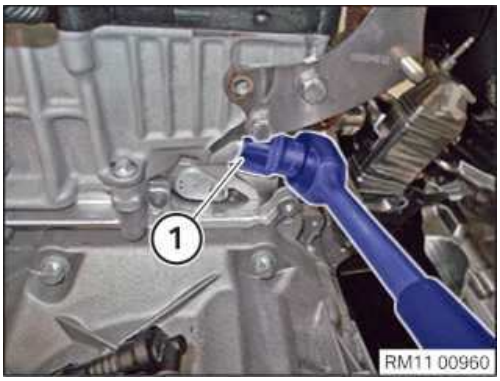


TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.

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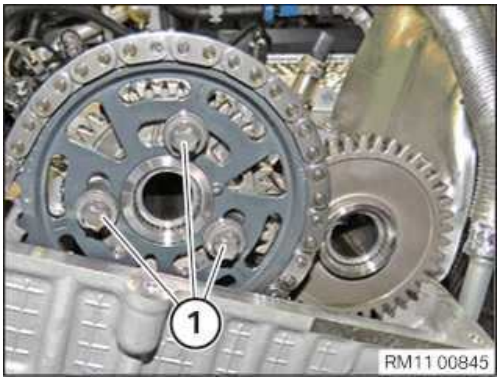


- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

37 – Tightening the camshaft sprocket on the intake camshaft



- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

38 – Checking camshaft timing



- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

Damage to the engine.

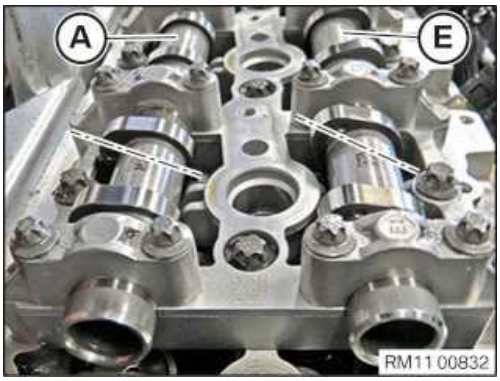
The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

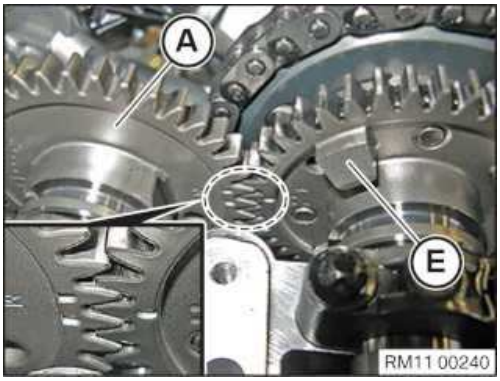
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- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

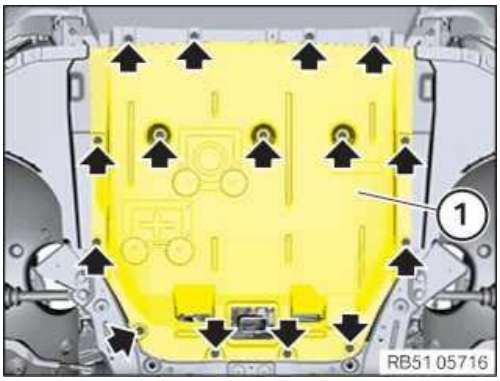
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.



- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

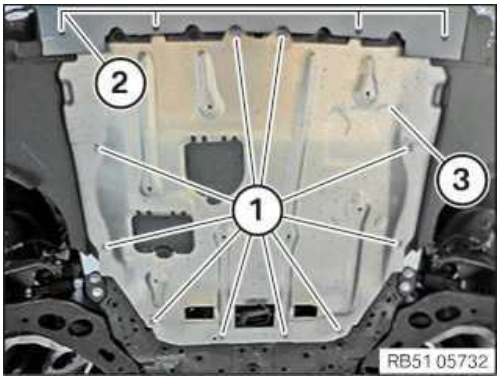
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- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm



- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

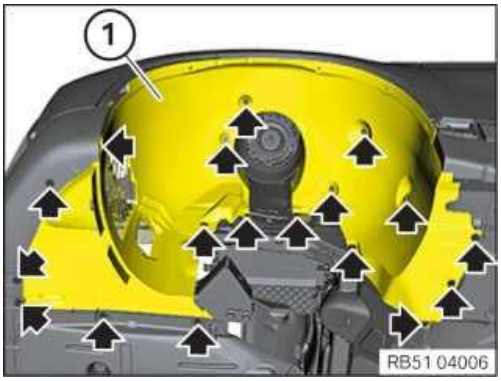
Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

40 – Installing the front right wheel arch cover

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

▸ **Installing front wheel arch trim**

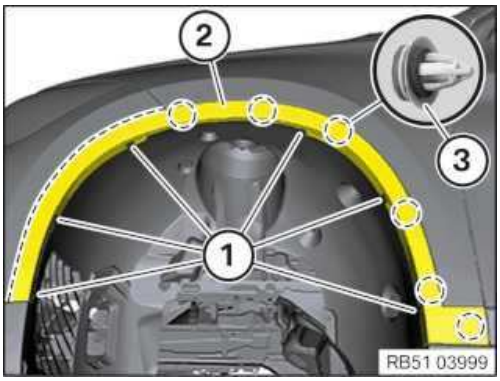
NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.

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- Check the clips (3) for damage and renew where required.

  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

41 – Installing the front right wheel

▸ **Clean the contact surfaces between the brake disc and the wheel rim**



TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

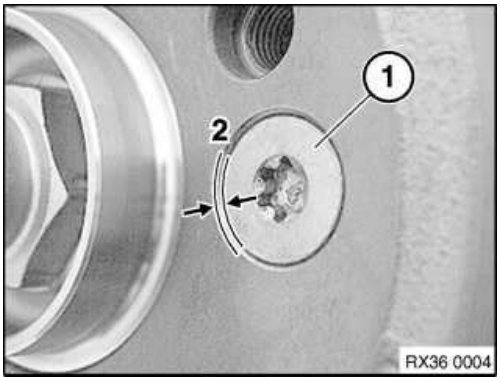
- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.



- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).



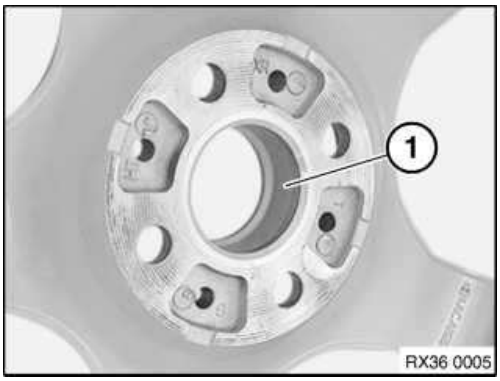
- Check the mounting bolt for the brake disc (1) for secure fit.

  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm

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- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.



TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

  Parts: Wheel bolts

- Clean the wheel bolts and check the threads for damage. Renew the wheel bolts as needed.
- Mount wheel bolts and tighten.

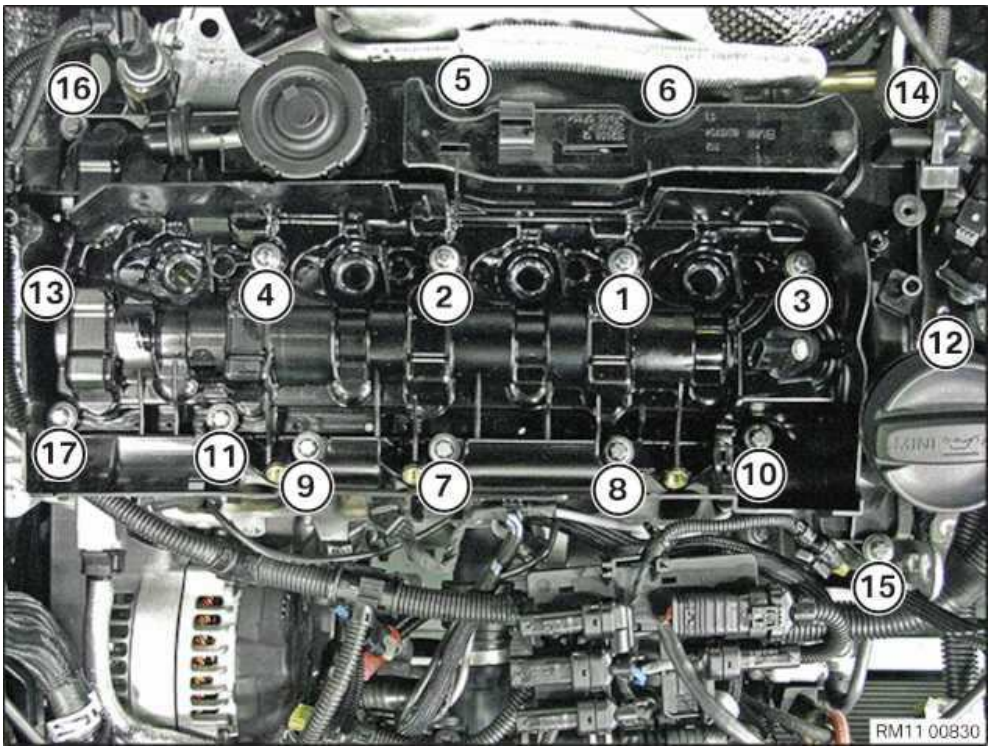
Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

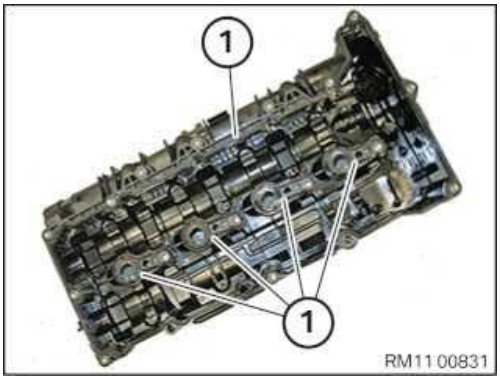
42 – Installing cylinder head cover

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Overview: Screw connection of the cylinder head cover

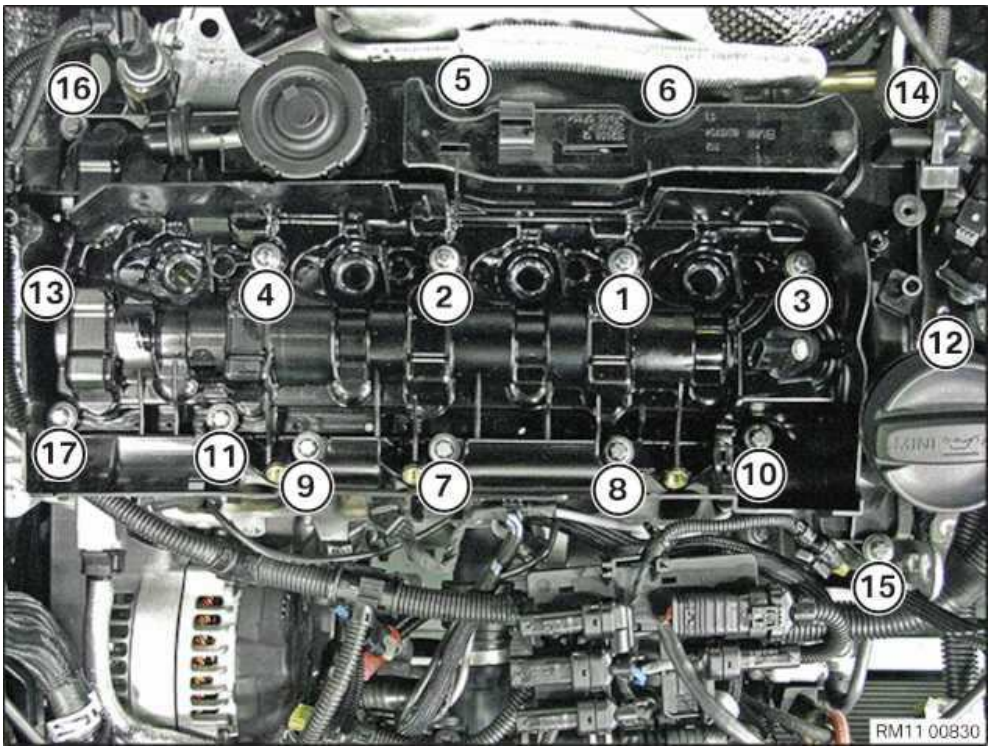


1 to 16 screws of the cylinder head cover.



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket



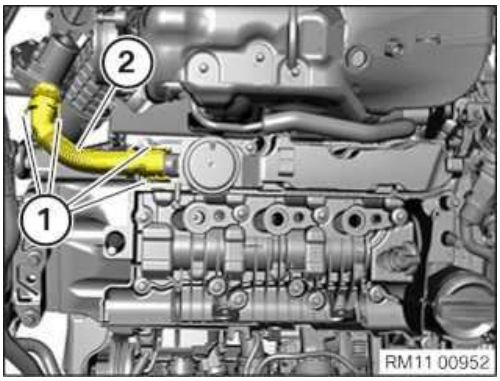
- Install cylinder head cover.
- Tighten screws in the order (1) to (17).

Cylinder head cover to cylinder head

M6		Tightening torque.	8, Nr

-

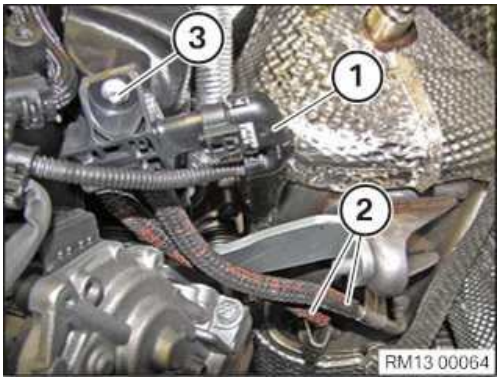
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- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

43 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

44 – Installing injectors of injection system

▶ **Cleaning the injector shafts**

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.



- Wear safety goggles.

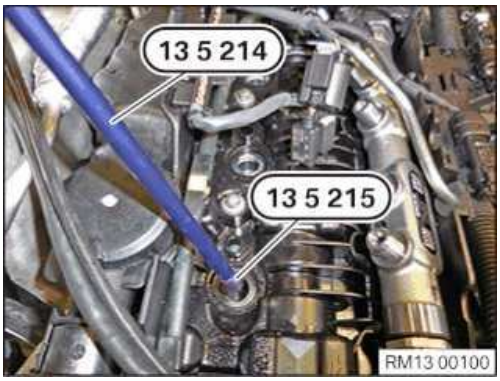
RISK OF DAMAGE

Contaminant or foreign body.

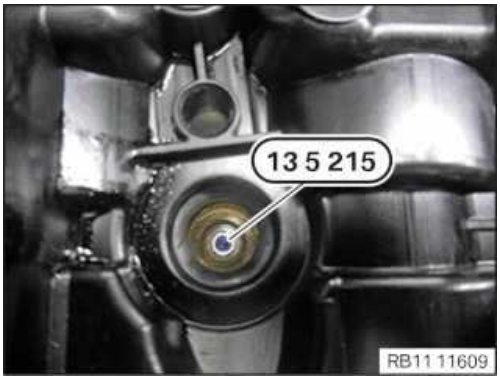
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.



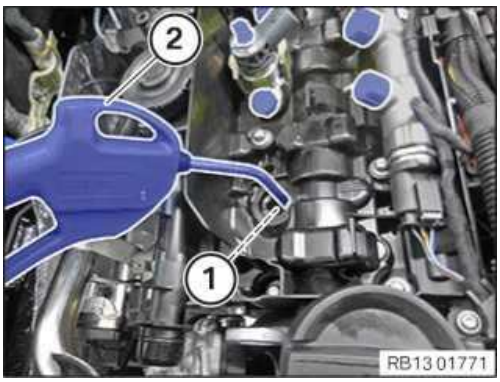
- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.



- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.

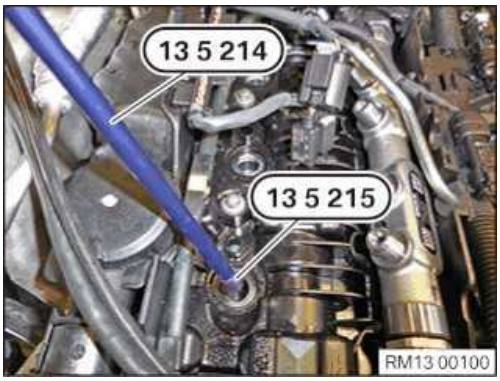


- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.



- Blow out injector shaft (1) with air gun (2).

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- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

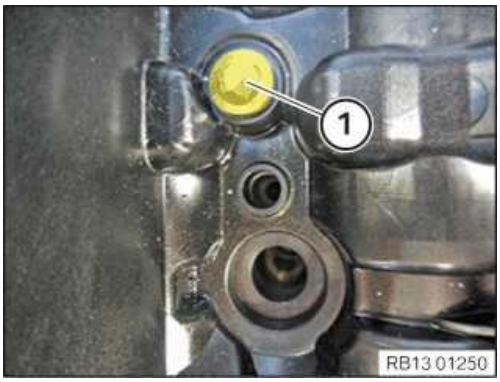
▸ **Check the placement of the clamping claw**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▸ **Prepare the injector for installation**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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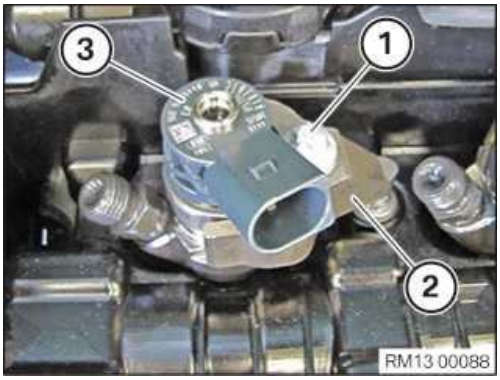
- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring

- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

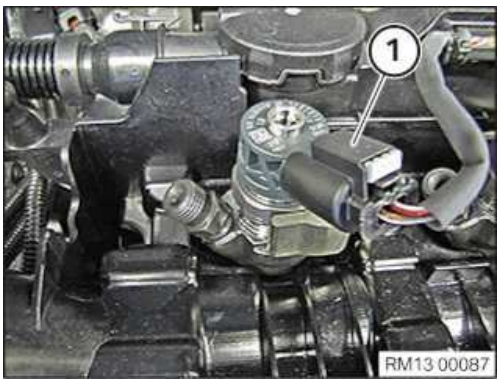
Injector lubricating grease	50 g, Can	83230441070



- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

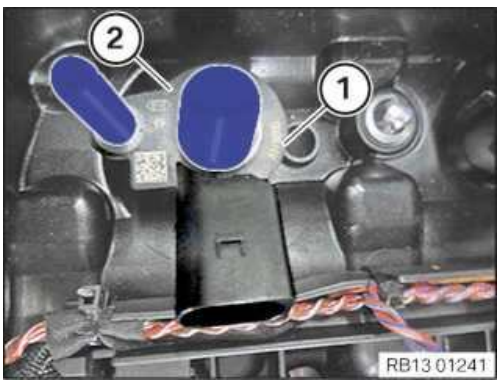
▸ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



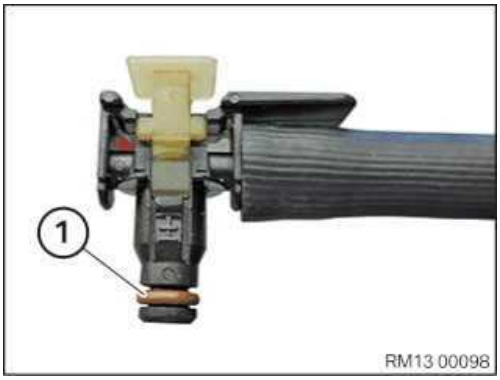
- Read off the adjustment value (1) on the new injector (2).

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- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

45 – Connect the leakage oil line on the injector



- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.



- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

46 – Installing high pressure lines between rail and injectors

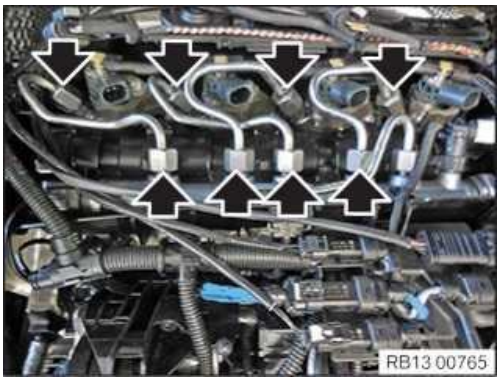
TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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- Remove special tool .
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

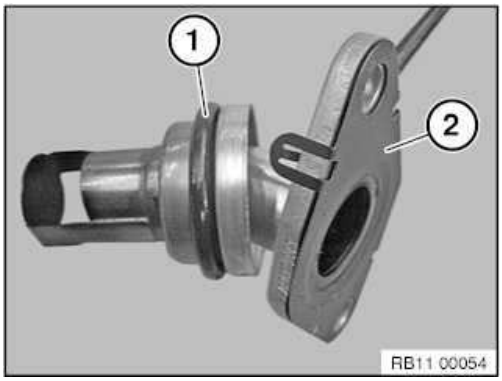
- Tighten the high pressure lines (arrows) with the special tool .

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

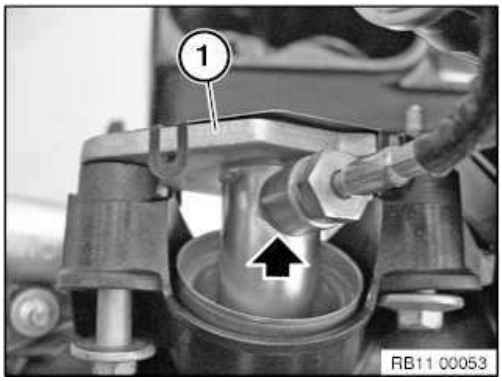
47 – Installing the intake plenum



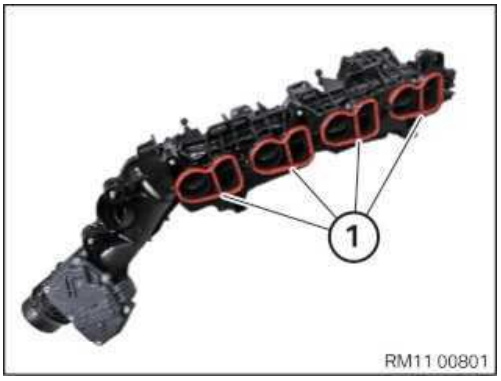
- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position the seal (2) and clip it in.



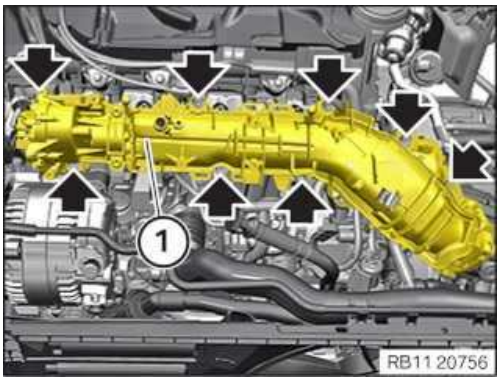
- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (1).

  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.

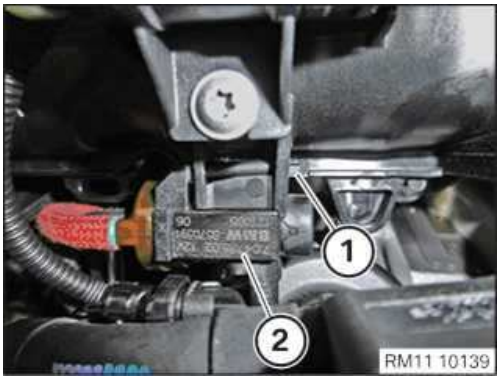
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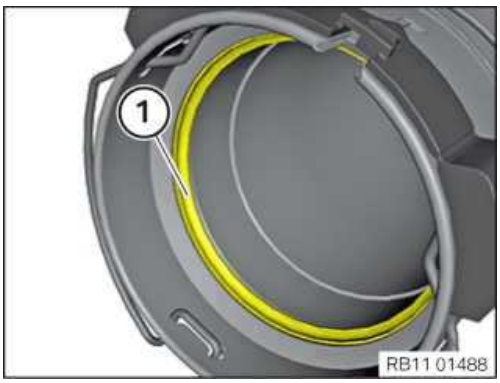
- Guide in and install intake (1) plenum.
- Tighten screws (arrows).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm

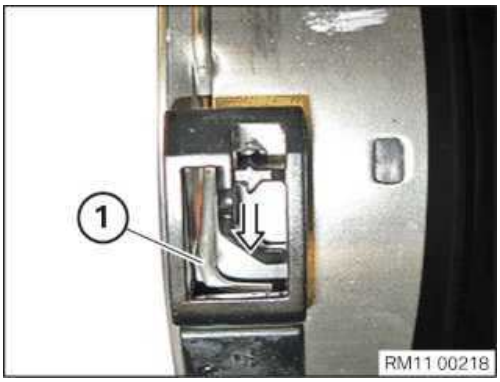


- Install the electric changeover valve (2) in the holder on the plenum from left to right.
- Lock (1) must engage audibly.

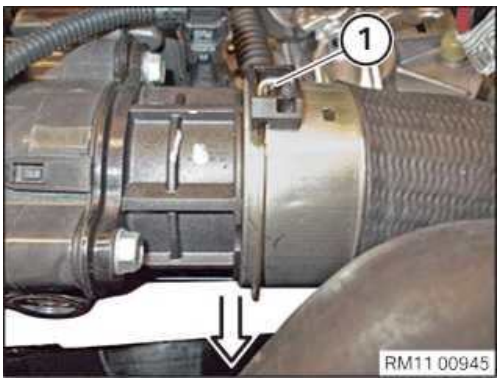


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring



- Engage the lock (1) on the bracket (arrow).



- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

48 – Installing the exhaust-gas recirculation cooler

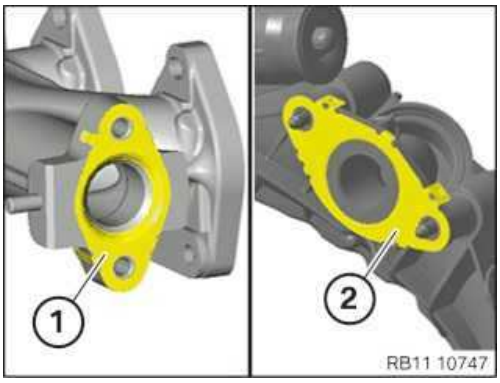
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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

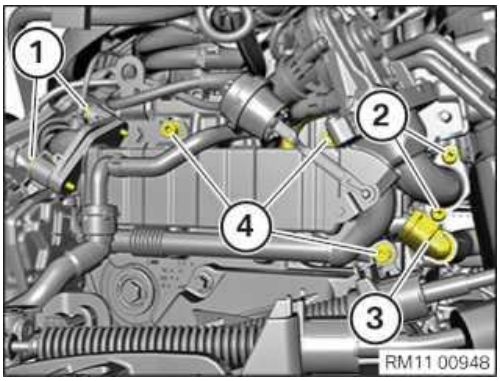


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket



- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts

- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

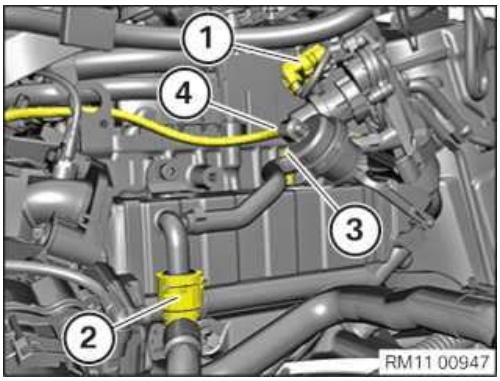
  The coolant hose (3) must audibly engage.

- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm

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TECHNICAL INFORMATION

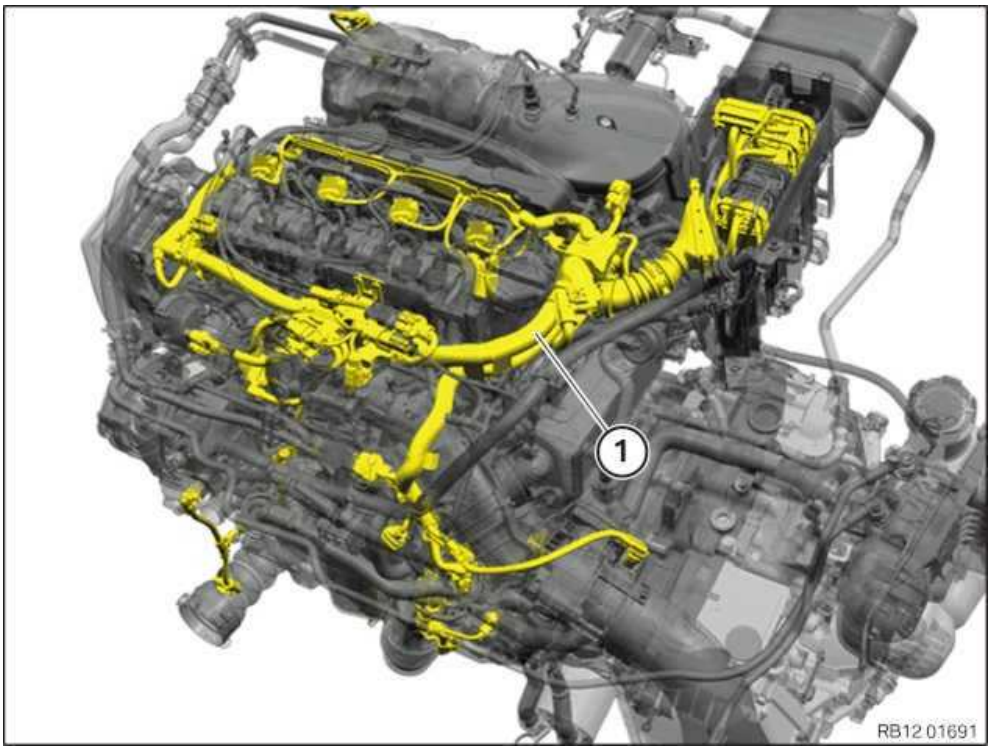
Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

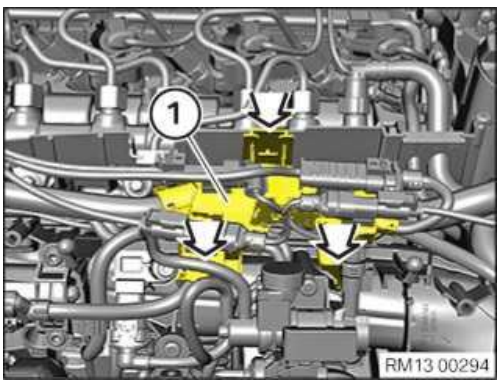
  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

49 – Fastening the wiring harness section for the intake plenum

Overview: Wiring harness section for the engine



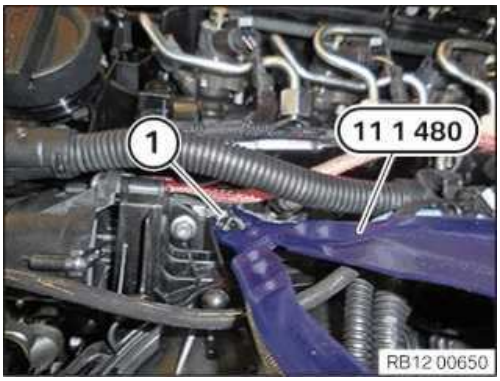
1 Wiring harness section for the engine



▸ **Installing the cable clip for the intake plenum**

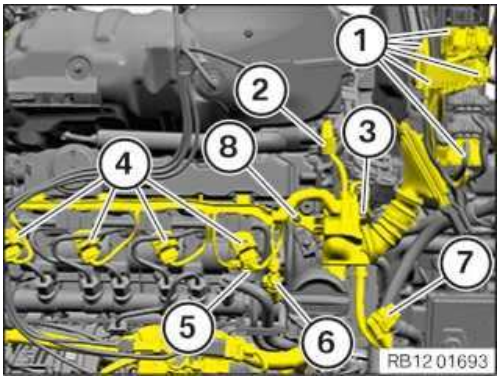
- Insert and install the cable clip (1) in the direction of the arrow.
- Make sure the cable clip (1) is fitted correctly.

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- Connect and lock the connector (1) on the glow elements.

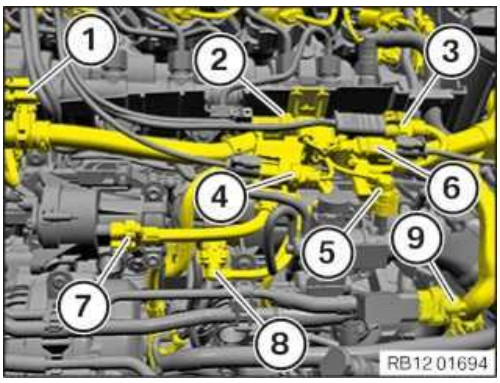
  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.



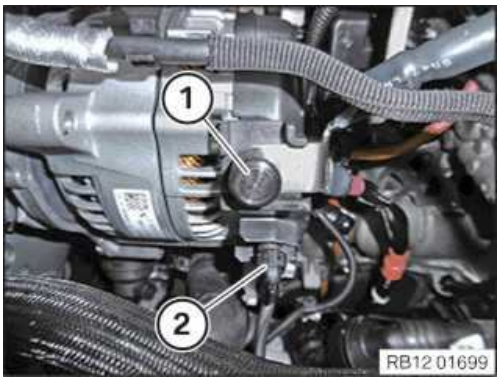
- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the DME control unit and remove the integrated supply module (PDM).
- Attach connector (2) to the differential pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust-gas recirculation valve and lock audibly.
- Attach connector (4) to the injectors and lock it audibly.
- Attach connector (5) to the camshaft sensor and lock it audibly.
- Attach connector (6) to the fuel pressure regulator and lock it audibly.
- Connect and audibly lock the connector (7) to the hot film air mass meter.
- Tighten down screw (8).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm



- Connect the connector (1) to the rail pressure sensor and lock it audibly.
- Attach connector (2) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (3) to the front oxygen sensor and lock audibly.
- Attach connector (4) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Connect the connector (5) to the electric changeover valve and lock audibly.
- Attach connector (6) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (7) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (8) to the charging pressure sensor and lock it audibly.
- Attach connector (9) to the fuel pressure and temperature sensor and lock it audibly.



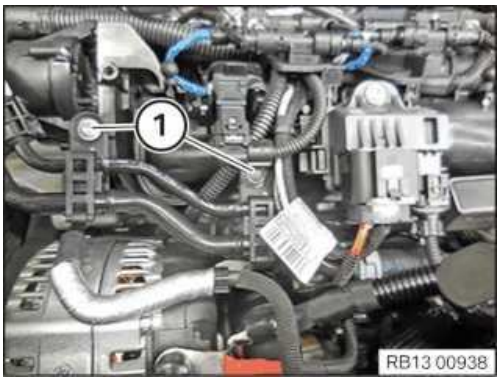
- Connect and lock the connector (2).

  Lock must snap audibly into place.
- Connect the positive battery cable (1) and tighten.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

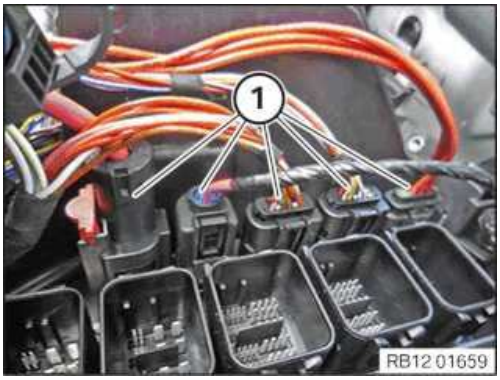
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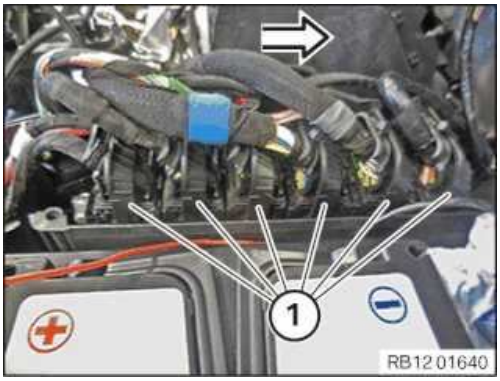
- Position the fuel line.
- Tighten the screws (1).

Fuel line to intake plenum

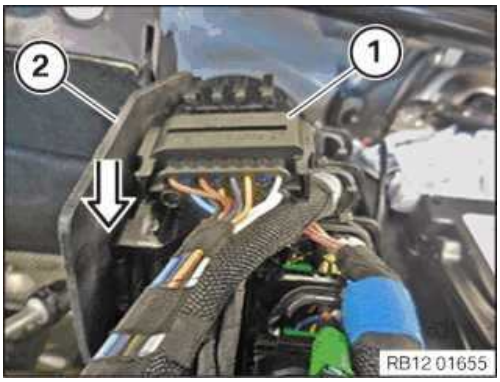
TS6x20		Tightening torque	5 Nm



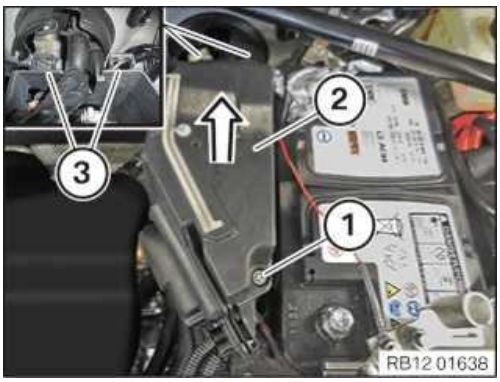
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.

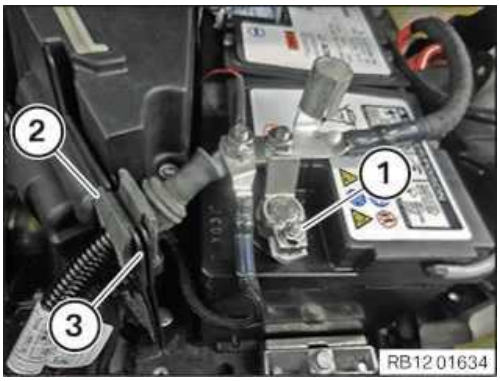


- Insert and install the cover (2) into the guides (3) in the direction of the arrow.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

RF5x26.5		Tightening torque	2,5 Nm

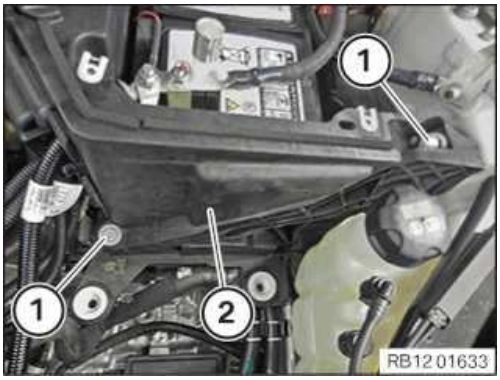
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- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

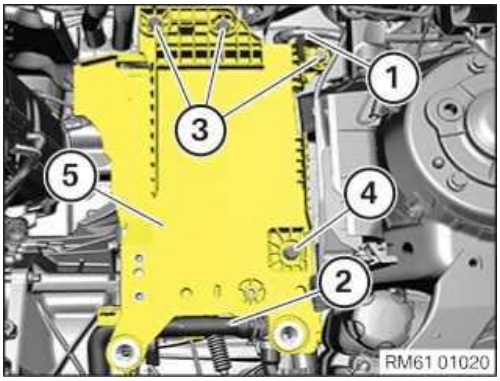


- Feed in and install tension strut (2).
- Tighten the screws (1).

Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

50 – Install the battery holder



- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

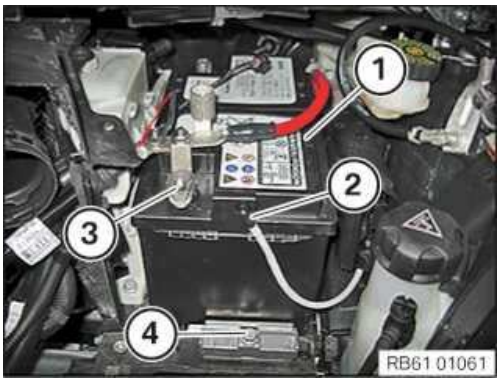
- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

51 – Install vehicle battery



- Install vehicle battery (1).
- Position the bracket and tighten with the screw (4) .

Battery terminal rail to battery tray

M8		19 Nm

- Position the vent hose (2) and clip it in.
- Position the positive battery terminal and tighten with the nut (3) .

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

▸ **Check the vent holes of the battery**

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WARNING

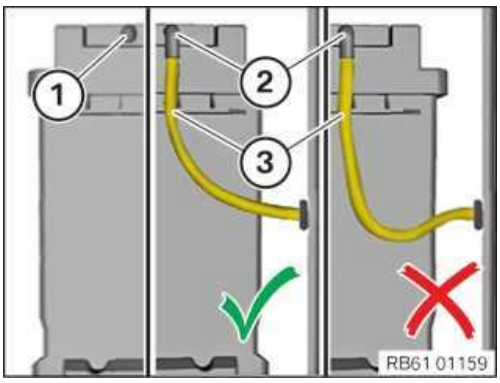
Gas emission.

Danger of injury! Danger of explosion!

- Assign the vent holes correctly.
- Route the vent hose correctly.

TECHNICAL INFORMATION

The battery has two vent holes, opposite:
One vent hole (1) must be closed correctly with a dummy plug.
The vent hose (3) must be correctly connected and routed at the other vent hole (2).



Check

- Check if the vent hole (1) is correctly closed with a dummy plug.

Result

» No dummy plug.

Measure

- Close the vent hole (1) correctly with a dummy plug.

Check

- Check if the vent hole (2) has a correctly connected vent hose (3).

Result

» The vent hose (3) is not correctly connected.

Measure

- At the vent hole (2), connect the vent hose (3) correctly.

Check

- Check if the vent hose (3) is routed to the outside with a downhill gradient (**no siphon formation!**).

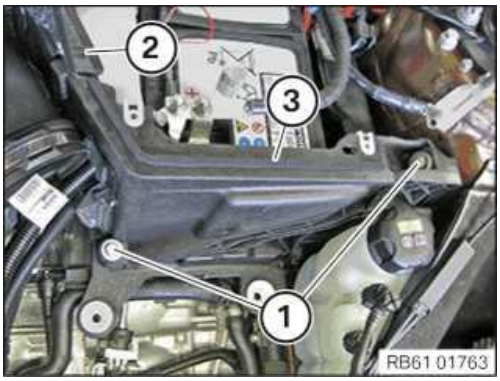
Result

» The vent hose (3) is not correctly routed as shown in the image on the right.

Measure

- Route the vent hose (3) correctly as shown in the centre image.

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- Insert tension strut (3) and tighten with screws (1).

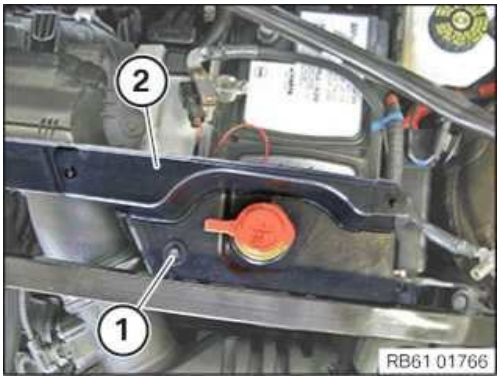
Trailing link

M8		Tightening torque	19 Nm

- Tighten down screw (2).

Battery cover

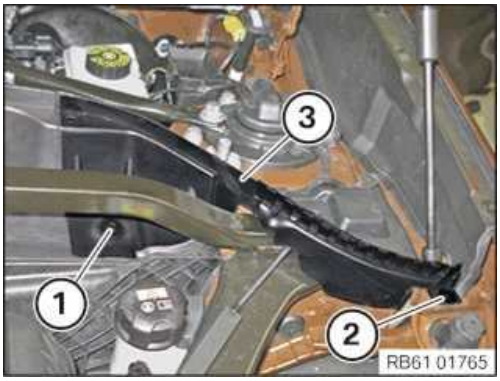
M8		2,8 Nm



- Position the cover (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm

52 – Install electronics box

Prerequisite

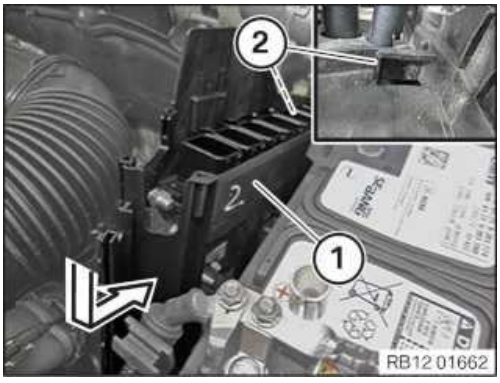
Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.

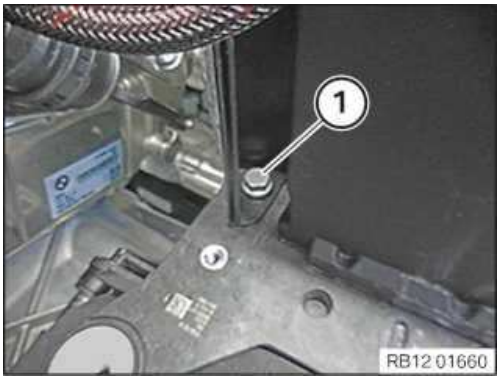


- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.

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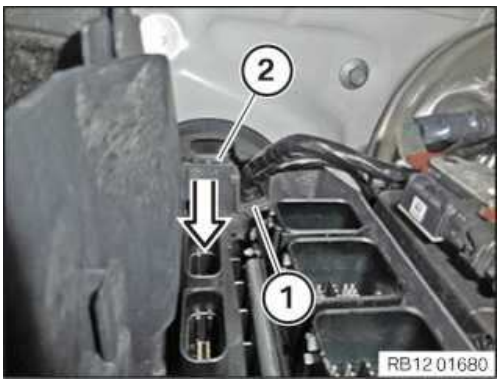
- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).



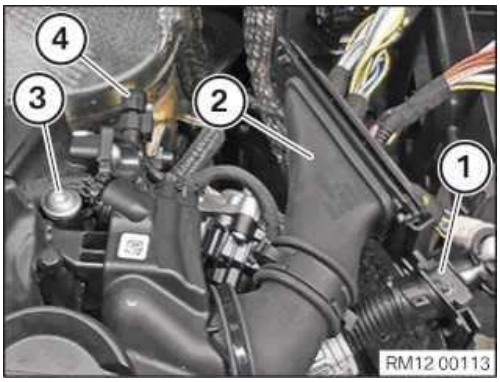
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.

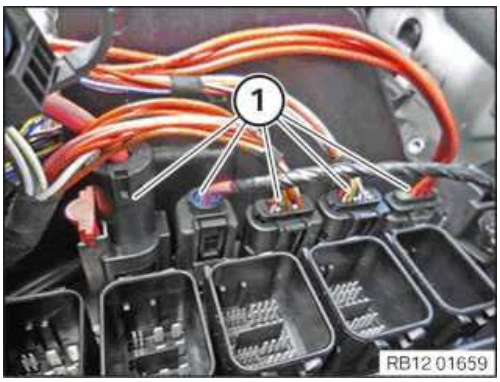


- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

Wiring harness to cylinder head cover

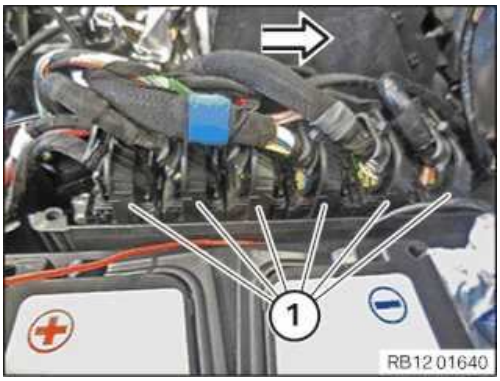
TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.

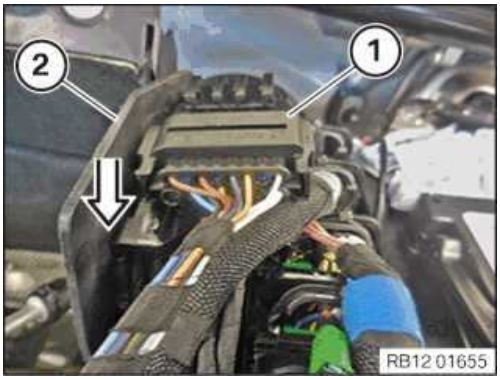


- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.

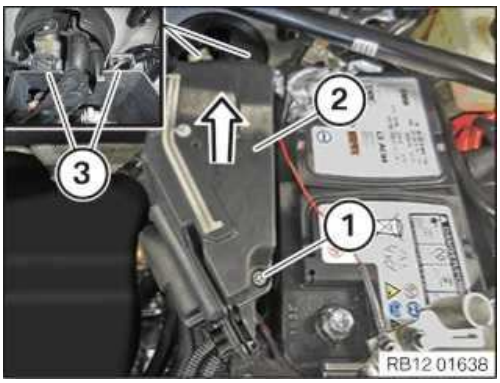
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- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



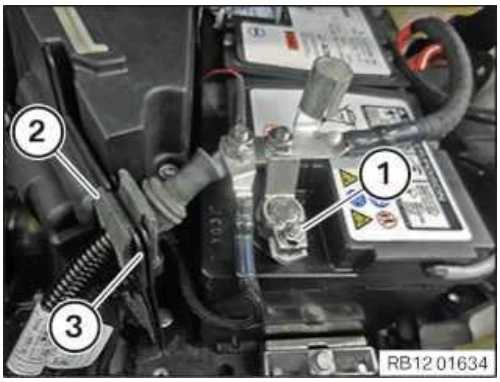
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

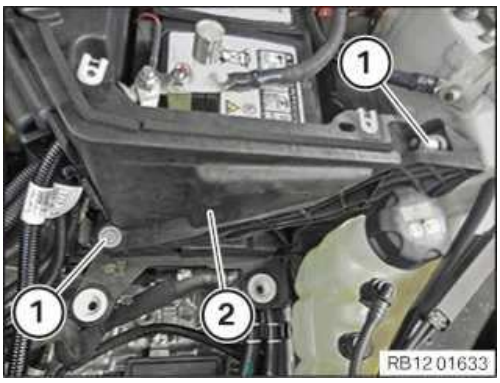
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm



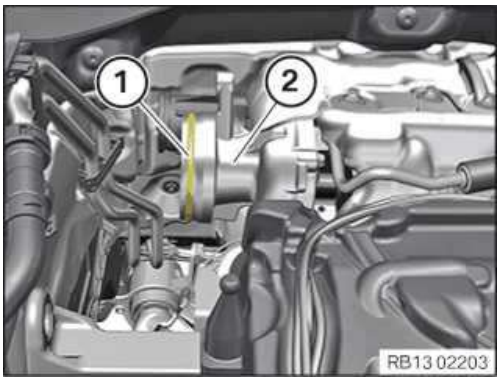
- Feed in and install tension strut (2).
- Tighten the screws (1).

Tension strut to spring strut dome/battery tray

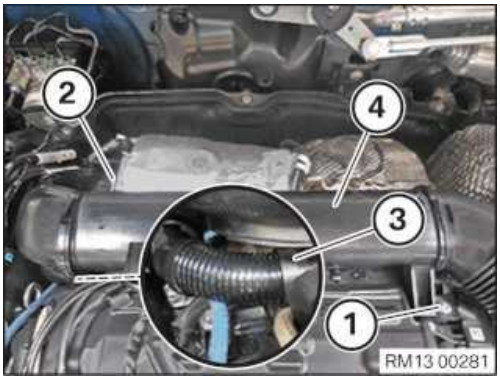
M8		Tightening torque	19 Nm

53 – Installing clean air pipe

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- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.



- Feed in clean air pipe and install.
- Connect clean air pipe to the exhaust turbocharger and lock audibly in the clamps (2).
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Connect ventilation line (3) to the cylinder head cover and lock audibly.



- Mount clean air pipe onto the intake filter housing.
- Tighten clamp (1) on the clean air pipe.

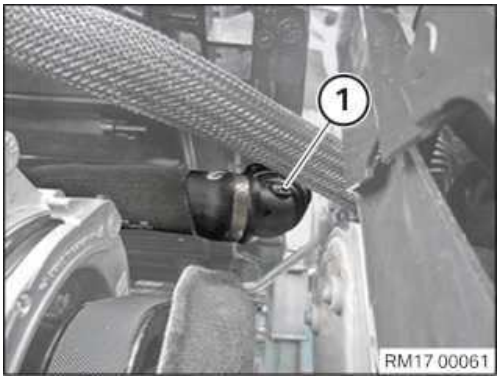
Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

54 – Connect the coolant line

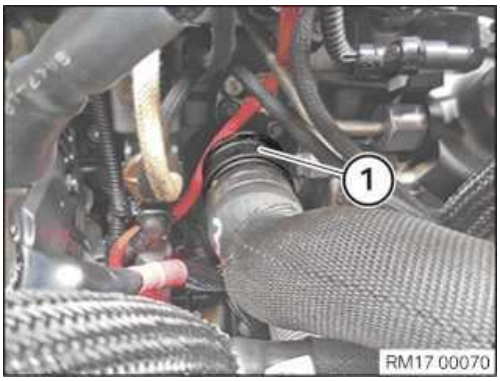
TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Connect the right coolant line (1) to the radiator and lock audibly.

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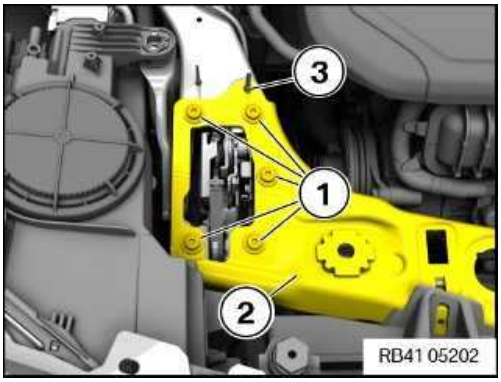


- Connect the coolant line (1) to the connecting branch and lock audibly.

55 – Install front cross connection



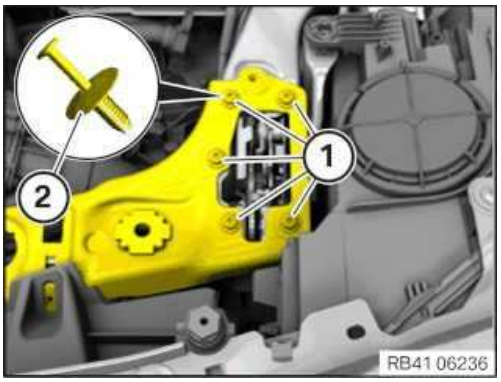
- Right side of vehicle only: Secure spray guard (1) on the cross connection (2) as pictured.



- Position front cross connection (2) and clip front cross connection (2) into the rubber retainer (3) at the same time.
- Tighten the screws (1).

Cross connection to carrier support

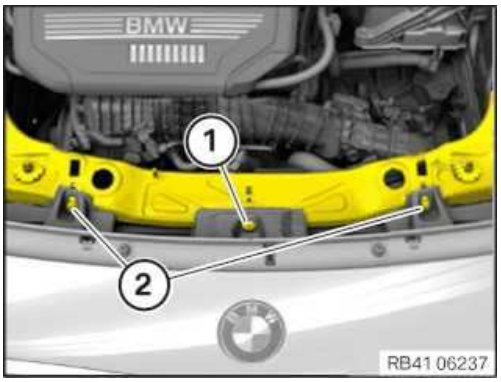
Screws M6x20		Tightening torque	11,8 Nm



- Tighten the screws (1).

Cross connection to carrier support

Screws M6x20		Tightening torque	11,8 Nm



- Position screws (3) on the rubber mounts for the radiator and tighten.

Screw connection for rubber mount of coolant radiator to coolant radiator

Bolt to rubber mount		Tightening torque	8 Nm

- Tighten down screws (2).

Air duct to upper connection

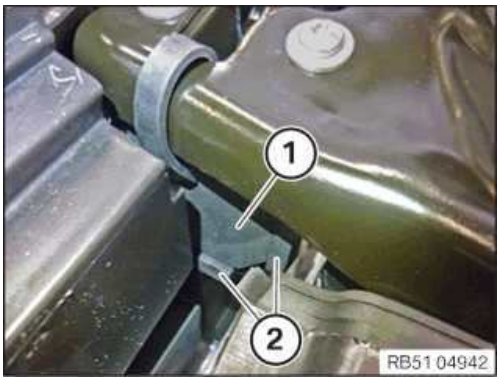
M6x20 screw		Tightening torque	11,8 Nm

- Tighten down screw (1).

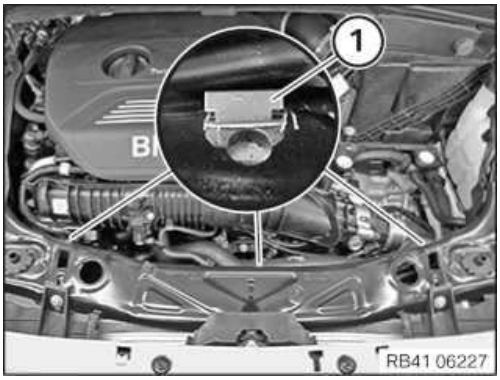
Bracing strut to upper connection

M8x20 screw		Tightening torque	28 Nm

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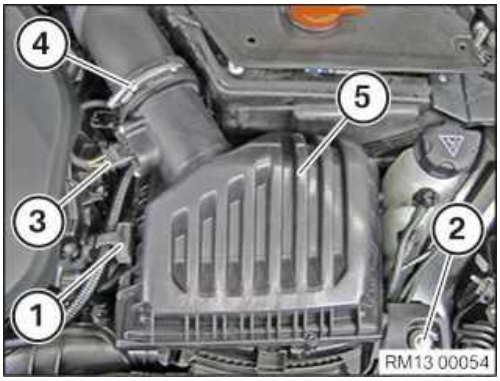


- Right side of vehicle only: Properly mount spray guard (1) to prevent corrosion.
- Secure spray guard (1) to the bridge with retaining tabs (2).



- Fasten the clamps (1) from the Bowden cable of the bonnet lock on the cross connection.

56 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.

  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

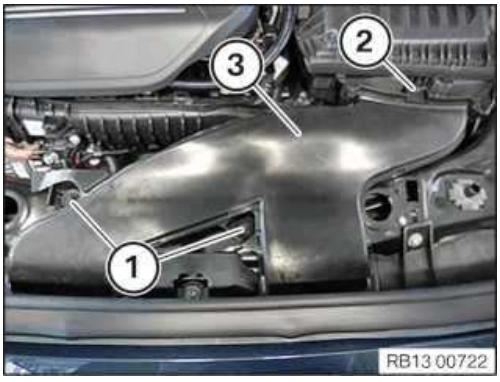
Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Insert and install the holder (1).

57 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).

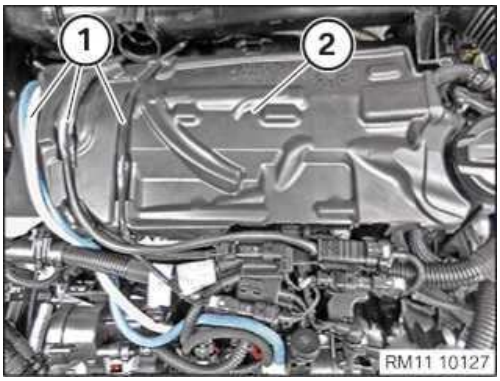
  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

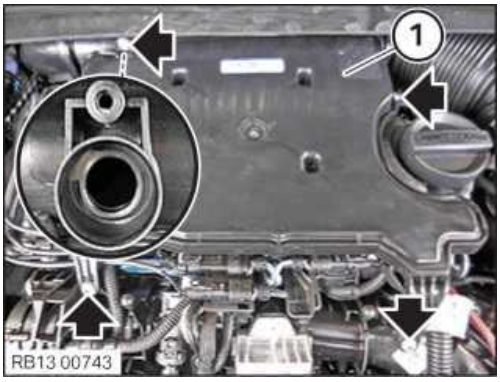
58 – Install the acoustic cover for the injectors

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- Feed the acoustic cover (2) in and install.
- Fasten the vehicle wiring harness (1) in the brackets.

59 – Install resonator



- Insert and install the resonator (1).
- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

60 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Check for correct installation of all rubber mounts in the acoustic cover (1).

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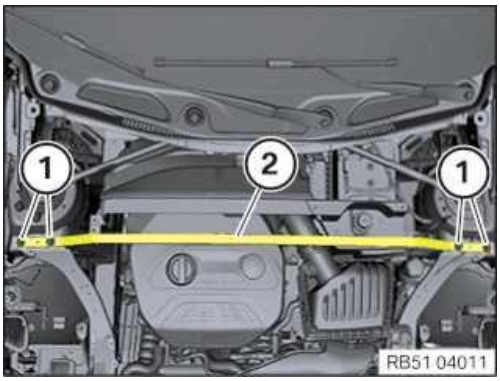


- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

61 – Install strut brace

TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.

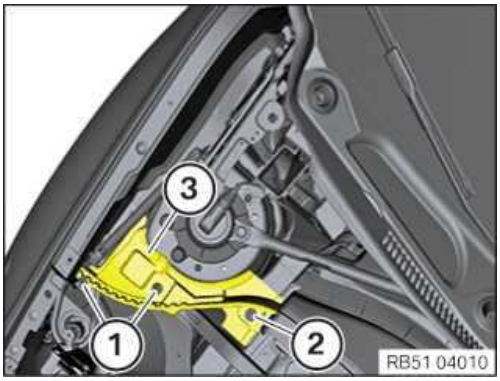


- Install the strut brace (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-brace to spring strut dome

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °



NOTICE

Description is for right component only. The procedure on the left side is identical.

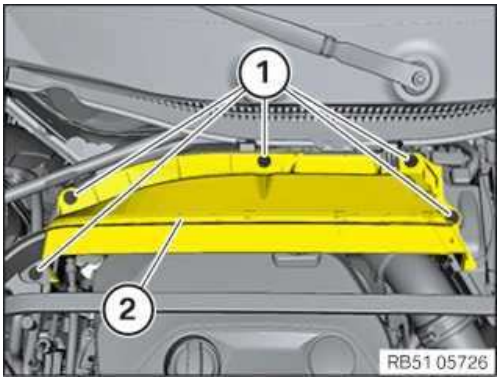
- Install the cover (3).
- Tighten down screw (2).

Cover on body

Hexagon screw		Tightening torque	3 Nm

- Install the expanding rivet (1).

62 – Installing the upper bulkhead cover

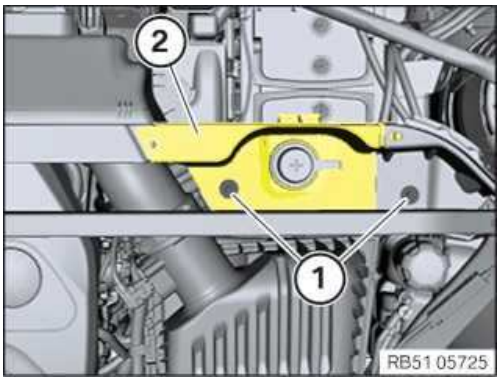


- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Cover of top bulkhead

Screw		Tightening torque	2,6 Nm

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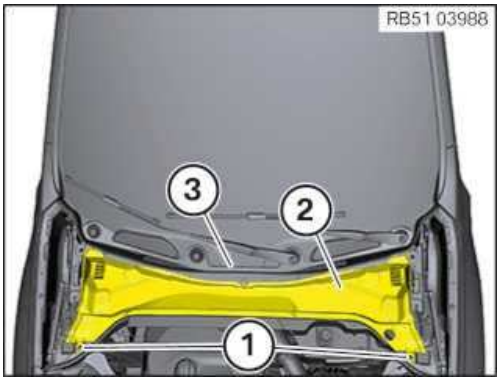


- Guide in and install cover (2).
- Tighten down screw (1).

Cover of remote positive terminal

Screw		Tightening torque	2,6 Nm

63 – Installing front cowl panel cover

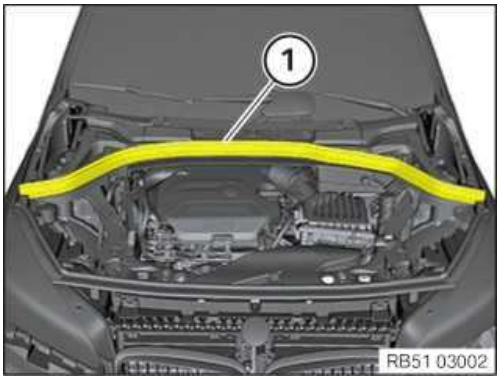


- Insert and install cowl panel cover at front (2) into cowl panel cover at rear (3).
- Check cowl panel cover at front is correctly seated (2).
- Secure expanding rivet (1).

64 – Install the seal for the bonnet

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

65 – Disconnecting all battery earth leads



- See additional information.

66 – Fill and bleed the coolant circuit

▸ **Filling and bleed the high-temperature coolant circuit**

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- See additional information.

Additional Information

Overview of Tightening Torques

Intake and exhaust camshaft in camshaft support — Used in step 33

M6x31		Tightening torque	10 Nm

Bearing journal to cylinder head — Used in step 35

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8 — Used in step 35

M8		Tightening torque	19 Nm

Standard screw connection M6 — Used in step 35

M6			8 Nm

Chain tensioner piston to cylinder head — Used in step 36

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft — Used in step 37

M7x17.			17 Nm

Underbody protection front — Used in step 39

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Wheel arch cover to body — Used in step 40

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body — Used in step 40

Plastic nut		Tightening torque	3 Nm

Brake disc to front wheel hub — Used in step 41

M8	Renew screw.		16 Nm

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Wheel bolts

Used in step 41

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Cylinder head cover to cylinder head

Used in step 42

M6		Tightening torque.	8,5 Nm

Differential pressure sensor to holder

Used in step 43

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor

Used in step 43

Clamp 15–19mm		Tightening torque	3 Nm

Clamping claw facing to cylinder head cover

Used in step 44

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 44

Screw		Jointing torque Angle of rotation	8 Nm 120 °

High pressure lines between injector and rail

Used in step 46

High pressure lines		Tightening torque	28 Nm

Intake plenum to cylinder head

Used in step 47

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 48

M8x20		Tightening torque Release angle	5 Nm 90 °

Intake plenum to exhaust-gas recirculation cooler

Used in step 48

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to exhaust manifold

Used in step 48

M8x28	Replace screws	Tightening torque	32 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 48

M8x20		Tightening torque	19 Nm

Wiring harness to cylinder head cover

Used in step 49 52

TS5x20		Tightening torque	3,5 Nm

Positive battery cable to alternator

Used in step 49

M8		Tightening torque	19 Nm

Fuel line to intake plenum

Used in step 49

TS6x20		Tightening torque	5 Nm

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Cover to electronics box

Used in step 49 52

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery

Used in step 49 52

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray

Used in step 49 52

M8		Tightening torque	19 Nm

Battery holder to engine support

Used in step 50

Hexagon screw M8x30		Tightening torque	19 Nm

Battery terminal rail to battery tray

Used in step 51

M8			19 Nm

Battery terminal with IBS positive battery terminal / negative battery terminal

Used in step 51

NutM6			5 Nm

Trailing link

Used in step 51

M8		Tightening torque	19 Nm

Battery cover

Used in step 51

M8			2,8 Nm

Electronics box to battery tray

Used in step 52

M8X16		Tightening torque	15 Nm

Clean air pipe to cylinder head cover

Used in step 53

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing

Used in step 53 56

Clamp		Tightening torque	3 Nm

Cross connection to carrier support

Used in step 55

Screws M6x20		Tightening torque	11,8 Nm

Screw connection for rubber mount of coolant radiator to coolant radiator

Used in step 55

Bolt to rubber mount		Tightening torque	8 Nm

Air duct to upper connection

Used in step 55

M6x20 screw		Tightening torque	11,8 Nm

Bracing strut to upper connection

Used in step 55

M8x20 screw		Tightening torque	28 Nm

Intake silencer housing to lock bridge

Used in step 56

M6X30		Tightening torque	8 Nm

Intake neck to cross connection

Used in step 57

M6		Tightening torque	8 Nm

Resonator to manifold and clean air pipe

Used in step 59

Screw TS6	Renew screw.	Tightening torque	5 Nm

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Cross-brace to spring strut dome

Used in step 61

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

Cover on body

Used in step 61

Hexagon screw		Tightening torque	3 Nm

Cover of top bulkhead

Used in step 62

Screw		Tightening torque	2,6 Nm

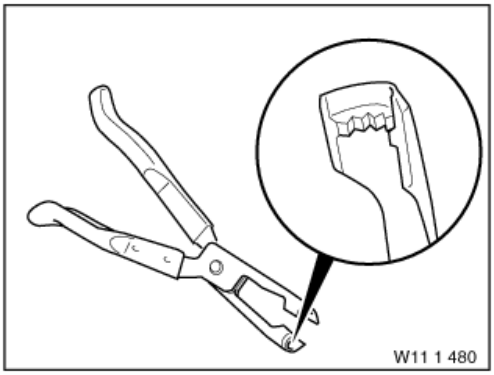
Cover of remote positive terminal

Used in step 62

Screw		Tightening torque	2,6 Nm

Overview of Special Tools

0 490 796 (11 1 480) Pliers



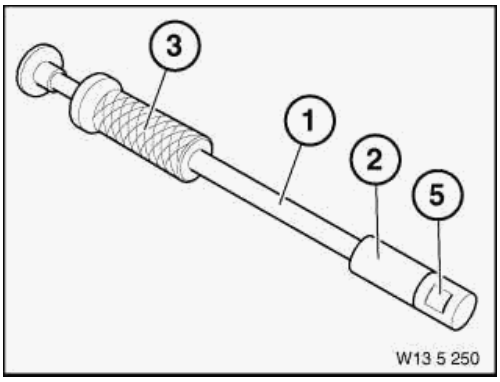
Common

Used in step 18

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

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0 493 321 (13 5 250) Puller



Common

Used in step 23

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

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0 493 339 (13 5 252) Bush



Common Used in step 23

Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

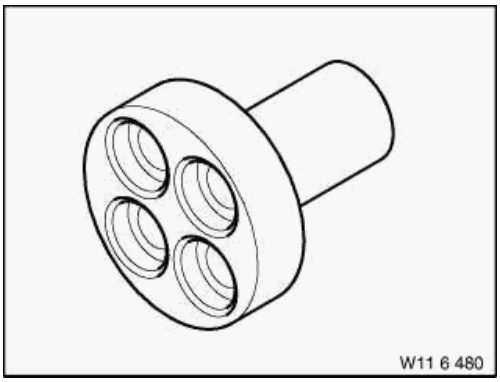
0 493 340 (13 5 253) Weight



Common Used in step 23

Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 380 (11 6 480) Connector



Common Used in step 28 38

Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

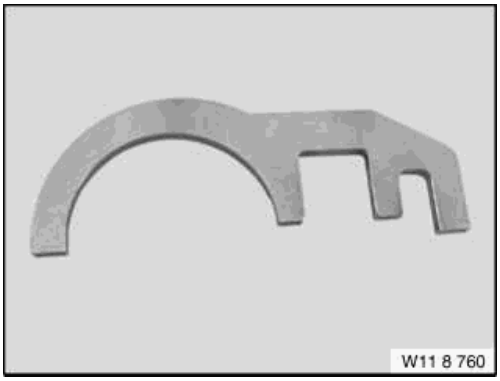
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2 288 380 Locating stud



Common	Used in step 28 38
Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 112 (11 8 760) Gauge



Common	Used in step 28 38
Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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0 495 105 (11 4 480) oddments tray



Common

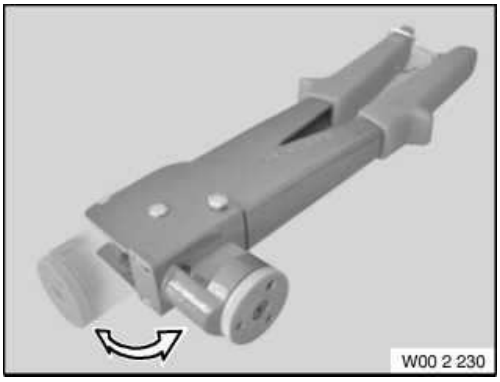
Used in step 32

Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

0 496 521 (00 2 230) Pliers



Common

Used in step 40

Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

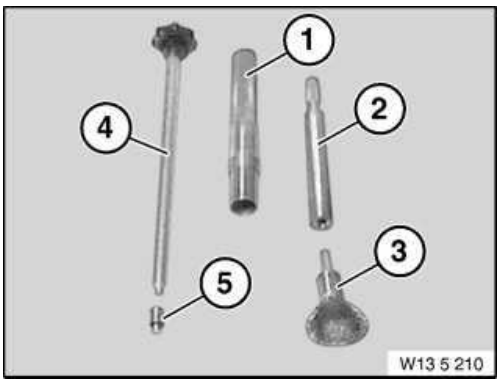
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2 344 011 Tool



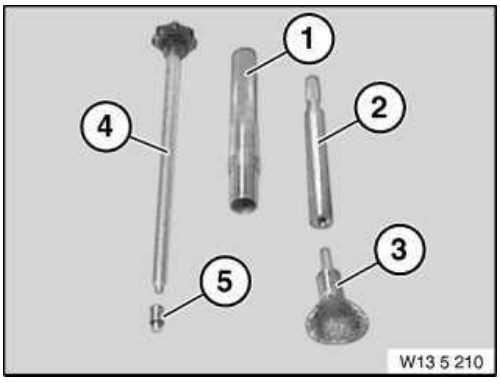
Common	Used in step 41
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

0 493 763 (13 5 215) Plug



Common	Used in step 44
Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

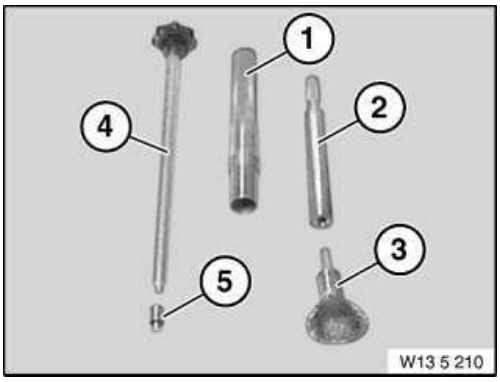
0 493 762 (13 5 214) Rod



Common	Used in step 44
Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 493 758 (13 5 210) Tool



Common

Used in step 44

Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

Replacement tools:

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0 495 221 (36 1 323) Wheel stud



Common	Used in step 26
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud



Common	Used in step 26
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud



Common	Used in step 26
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

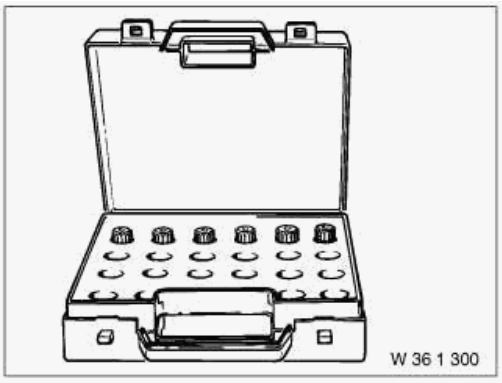
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0 495 226 (36 1 328) Wheel stud



Common	Used in step 26
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud



Common	Used in step 26
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud



Common	Used in step 26
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

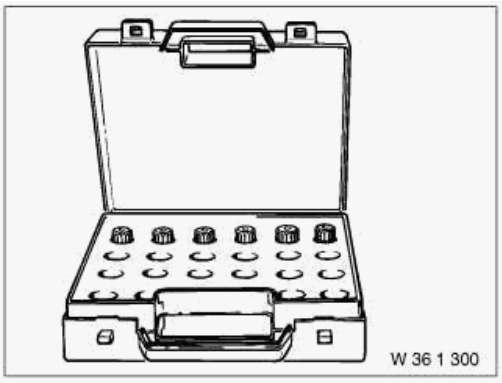
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0 495 229 (36 1 332) Wheel stud



Common	Used in step 26
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud



Common	Used in step 26
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	19 48
EGR controller	19 48

Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	1 65
61 20 900 Disconnecting and connecting battery earth lead	1 65
61 20 900 Disconnecting and connecting battery earth lead	1 65
61 20 900 Disconnecting and connecting battery earth lead	1 65
61 20 900 Disconnecting and connecting battery earth lead	1 65
61 20 900 Disconnecting and connecting battery earth lead	1 65
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 65

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61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads) 1 65

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61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads) 1 65
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle) 1 65
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61 35 ... Notes on ESD protection (Electro Static Discharge) 15 23 24
17 00 008 Draining and topping up coolant for high-temperature circuit 66
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17 00 008 Draining and topping up coolant for high-temperature circuit 66
17 00 039 Bleed the cooling system and check it for watertightness with the special tool 66
17 00 039 Bleed the cooling system and check it for watertightness with the special tool 66
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17 00 039 Bleed the cooling system and check it for watertightness with the special tool	66
17 00 039 Bleeding the cooling system (B36, B38, B46, B48)	66
17 00 039 Bleeding cooling system (B37, B47)	66
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	66
17 00 039 Filling and bleeding the high-temperature cooling system vacuum filler device (B48)	66
17 00 008 Draining and topping up the high-temperature coolant circuit	66
17 00 008 Draining and topping up the high-temperature coolant circuit	66
17 00 016 Draining and topping up coolant circuit for Range Extender \PREMIUM	66
17 00 008 Draining and topping up the high-temperature coolant circuit	66
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	66
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	66
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17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	66

Operating materials	Used in step
2.0 Grease for wheel centring	41

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	36
Exhaust-gas recirculation cooler seal on exhaust manifold	48
Exhaust-gas recirculation cooler seal on intake plenum	48

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11 31 091 Removing and installing/replacing the hydraulic chain tensioner

PRELIMINARY WORK

1 – Removing engine



- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

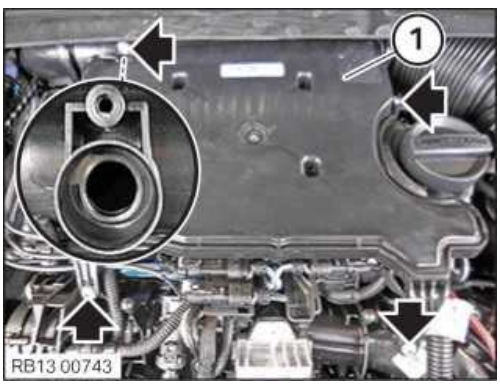
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

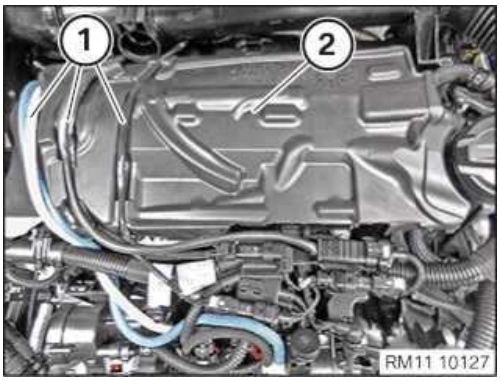
3 – Remove resonator



- Remove screws (arrows).
- Guide out and remove the resonator (1).

4 – Remove the acoustic cover for the injectors

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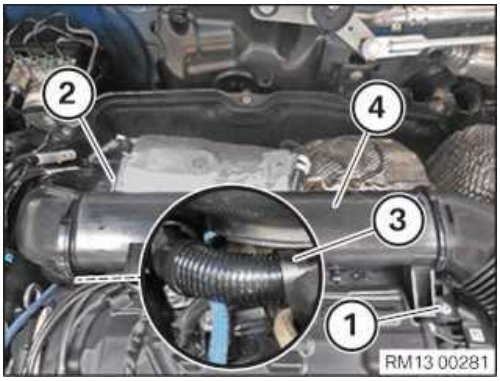


- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

5 – Removing clean air pipe



- Detach clamp (1) on the clean air pipe.
- Pull off the clean air pipe from the intake silencer housing.



- Loosen screw (1).
- Loosen clamp (2).
- Unlock the ventilation line (3) and pull it off the cylinder head cover.
- Feed out clean air pipe and remove.

6 – Remove differential pressure sensor

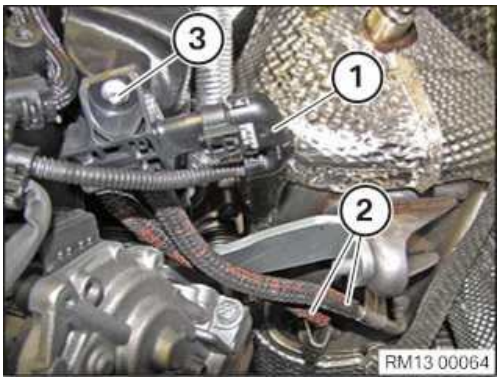
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

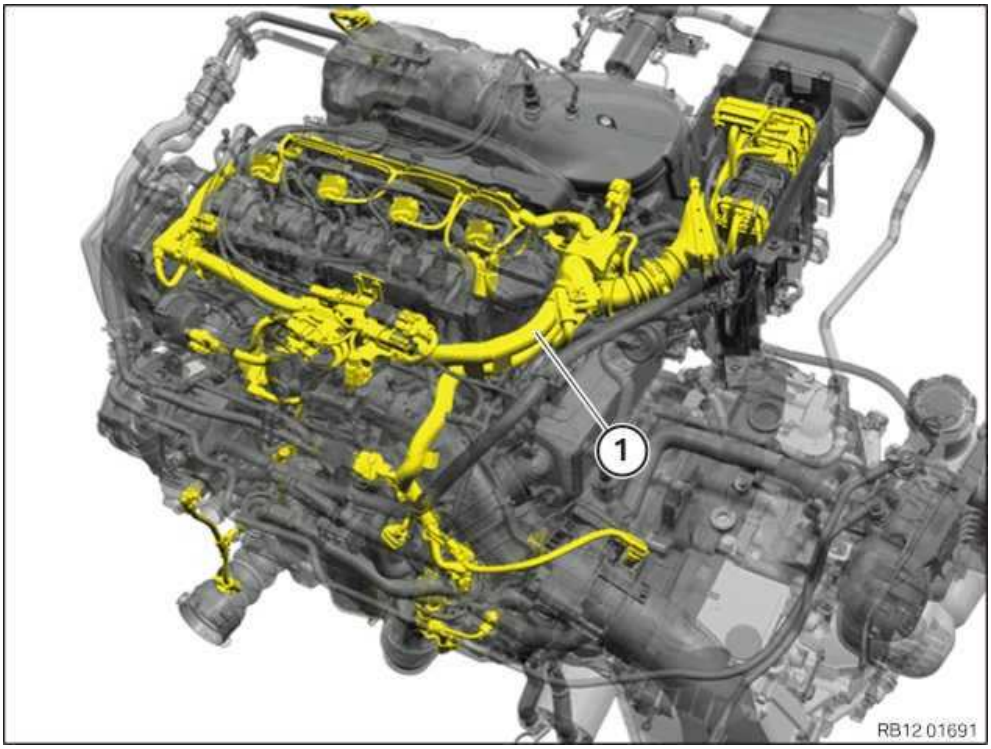
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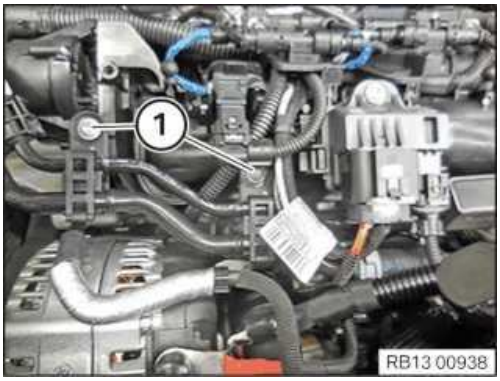
- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

7 – Removing assemblies (on lifting table)

Overview: Wiring harness section for the engine

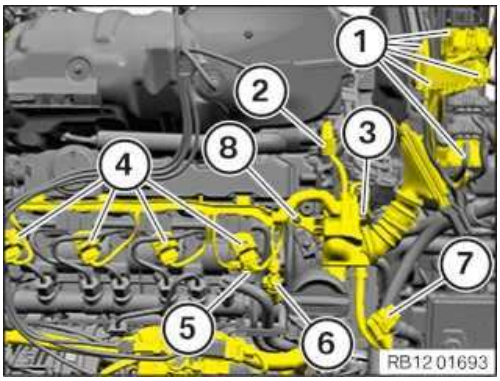


1 Wiring harness section for the engine

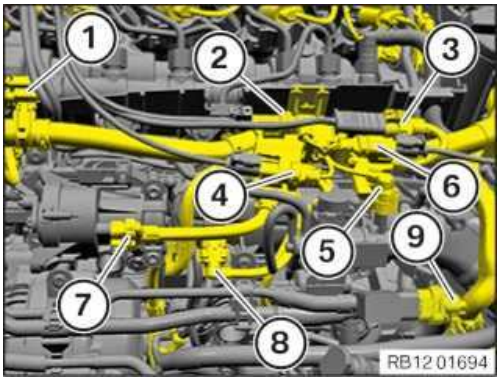


- Loosen screws (1).

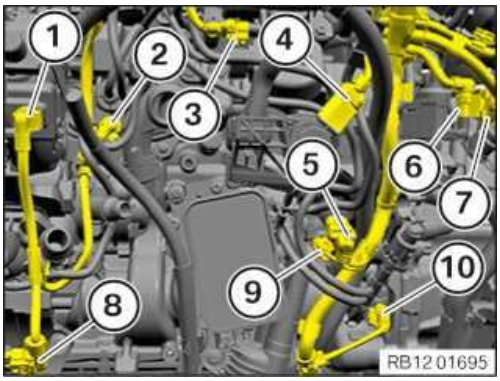
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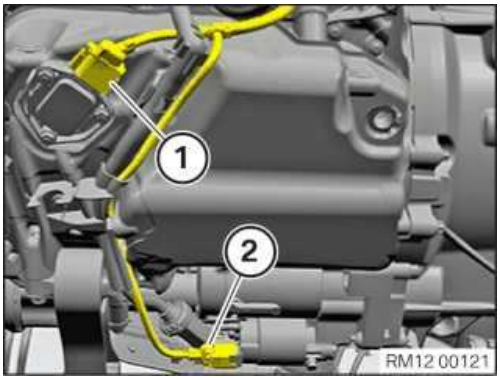
- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock the connector (2) and disconnect it from the differential pressure sensor.
- Unlock the connector (3) and disconnect it from the exhaust-gas recirculation valve.
- Unlock the connector (4) and pull off from the injectors.
- Unlock the connector (5) and disconnect it from the camshaft sensor.
- Unlock the connector (6) and disconnect it from the fuel pressure regulator.
- Unlock connector (7) and pull off from hot film air mass meter.
- Loosen screw (8).



- Unlock connector (1) and pull off from the rail pressure sensor.
- Unlock the connector (2) and disconnect it from the exhaust temperature sensor before the diesel particulate filter.
- Unlock connector (3) and pull it off from the front oxygen sensor.
- Unlock the connector (4) and disconnect it from the exhaust temperature sensor after the diesel particulate filter.
- Unlock and disconnect the connector (5) from the electric changeover valve.
- Unlock the connector (6) and disconnect it from the exhaust temperature sensor for the exhaust-gas recirculation cooler.
- Unlock the connector (7) and disconnect it from the servomotor for the swirl flaps.
- Unlock the connector (8) and pull it off the charging pressure sensor.
- Unlock the connector (9) and disconnect from the fuel pressure and temperature sensor.

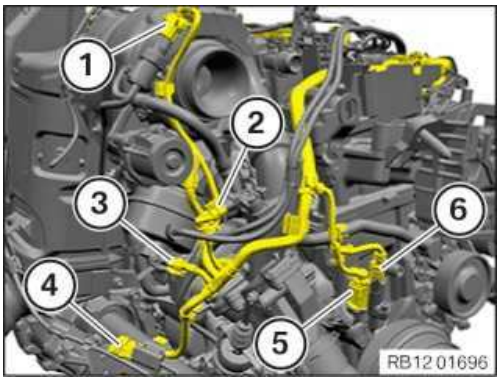


- Unlock and disconnect the connector (1) from the alternator.
- Unlock and disconnect the connector (2) from the electric changeover valve.
- Unlock and disconnect the connector (3) from the electric changeover valve.
- Unlock the connector (4) and pull it off the high pressure pump.
- Unlock the connector (5) and disconnect it from the oil pressure sensor.
- Unlock connector (6) and pull off from throttle body.
- Unlock the connector (7) and disconnect it from the intake air temperature sensor.
- Unlock the connector (8) and disconnect it from the air conditioning compressor.
- Unlock and disconnect the connector (9) from the solenoid valve.
- Unlock the connector (10) and pull it off the crankshaft sensor.



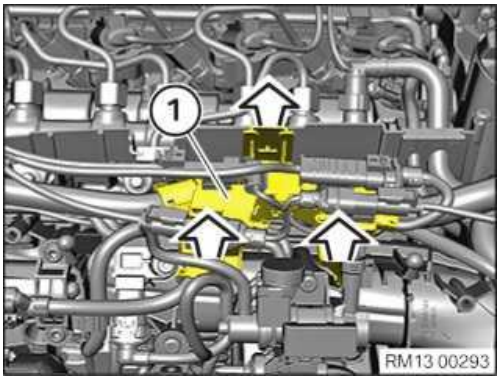
- Unlock the connector (1) and pull off of the oil-level sensor.
- Unlock connector (2) and remove from starter motor.

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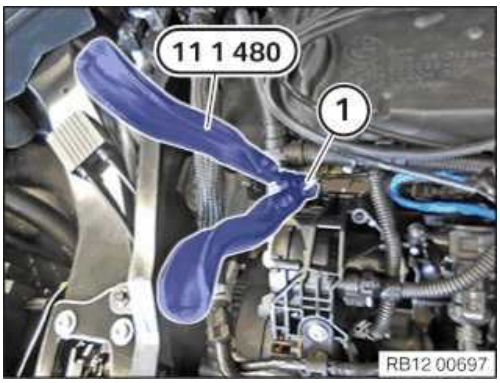


- Unlock the connector (1) and disconnect it from the exhaust gas pressure sensor.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock the connector (3) and pull it off the exhaust turbocharger.
- Unlock the connector (3) and disconnect it from the differential pressure sensor.
- Unlock connector (4) and pull it off from the monitoring oxygen sensor.
- Unlock the connector (5) and pull it off the oil pressure switch .
- Unlock connector (6) and disconnect from switching valve.
- Detach, feed out and remove the wiring harness from the clamps.

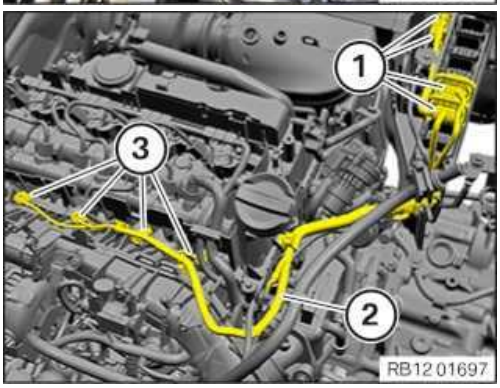
▶ **Removing the cable clips from the intake plenum**



- Detach the cable clip (1) in the direction of the arrow.
- Guide out the cable clip (1) in direction of arrow and set it aside.



- Unlock the connectors (1) of all glow elements with the special tool **0 490 796 (11 1 480)** and release them.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.



- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Pull off all connectors (3) from glow element using special tool **0 490 796 (11 1 480)**.
- Loosen screw (2) and remove the ground strap.
- Detach, feed out and remove the wiring harness from the clamps.

▶ **Removing the drive belt for alternator**

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

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CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

TECHNICAL INFORMATION

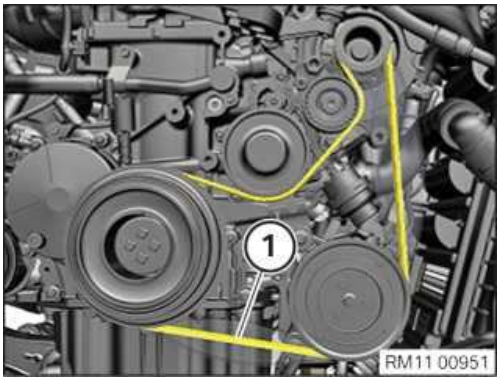
If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

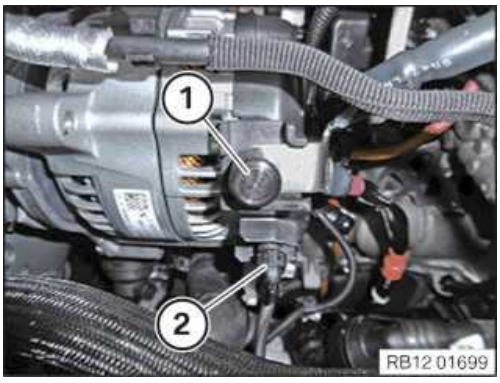
The drive belt must be replaced if contaminated with coolant- and oil residues.



- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool **0 496 268 (11 0 390)**.



- Guide out the drive belt for the alternator (1) and remove it.

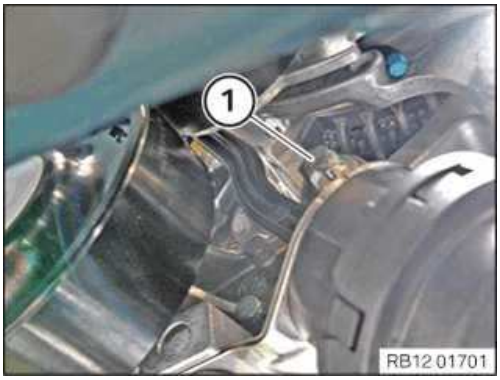


- Remove the cover (1) and loosen the nut below.
- Disconnect positive battery cable from alternator.
- Unlock and disconnect the connector (2) from the alternator.

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- Detach screw (1) on top on the alternator.



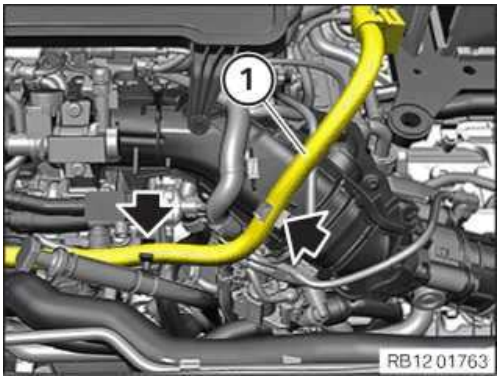
- Detach screw (1) below on the alternator.



- Feed out alternator (1) along with the screw (2) on the bottom of the alternator through the slot on the support and remove.

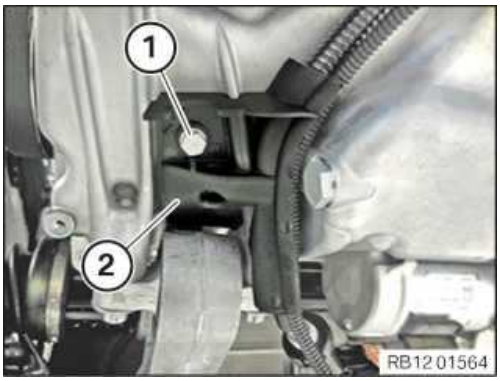


- Loosen screws (1).
- Feed out and remove the air conditioning compressor (2).



- Release the positive battery cable (1) from the clamps (arrows).

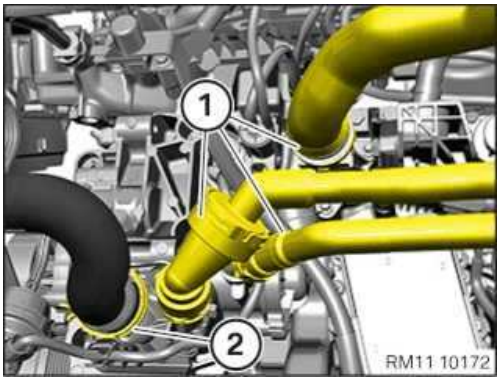
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- Loosen screw (1).
- Guide out and remove holder (2).



- Feed out positive battery cable from the clamps (1) and remove.



- Unlock and disconnect coolant lines (1).
- Guide out the coolant lines (1) and remove it.
- Detach the clamp (2).
- Guide the coolant hose out and remove.

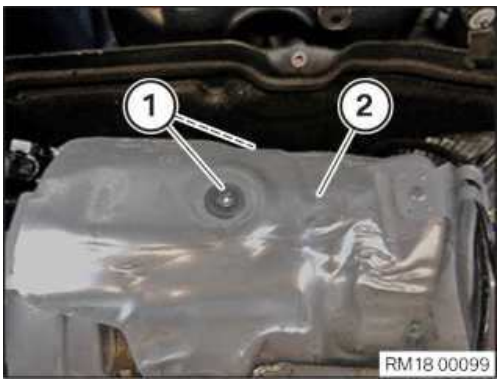
▶ **Removing heat shield from top exhaust turbocharger**

WARNING

Hot surfaces.

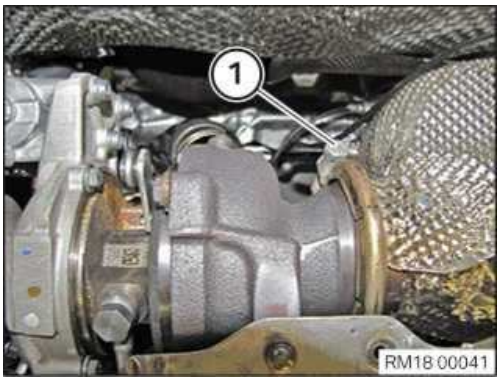
Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from holders.
- Release the screws (1) at the top and bottom of the heat shield.
- Feed out and remove the heat shield (2).

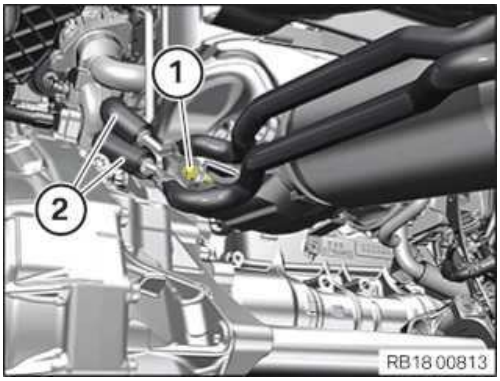
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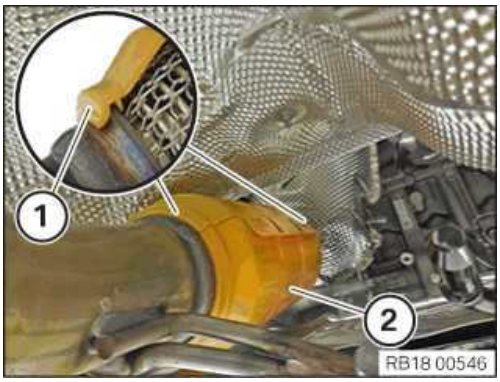
- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.



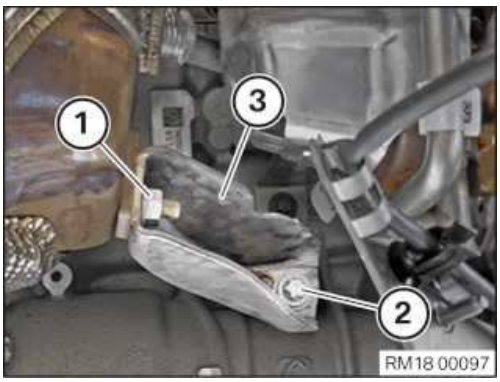
- Loosen nuts (1).



- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.

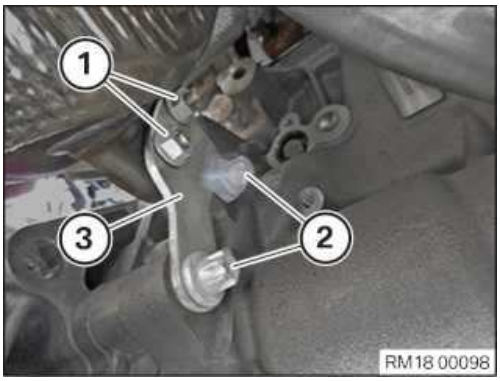


- Mount fitting aid (2).
- Make sure that the fitting aid is correctly position on the edges (1) of the flexible tube.



- Loosen nut (1).
- Loosen screw (2).
- Remove holder (3).

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- Loosen nuts (1).
- Loosen screws (2).
- Remove holder (3).
- Guide out and remove diesel particulate filter .

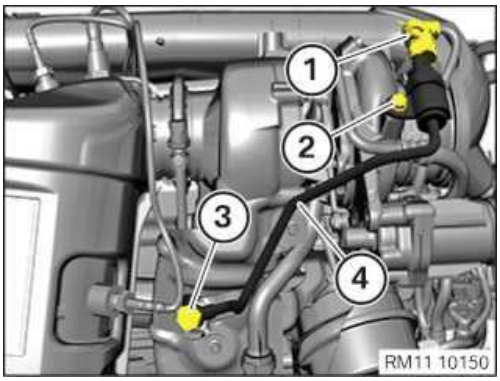
▶ **Remove the heat shield from the exhaust turbocharger at the bottom**

WARNING

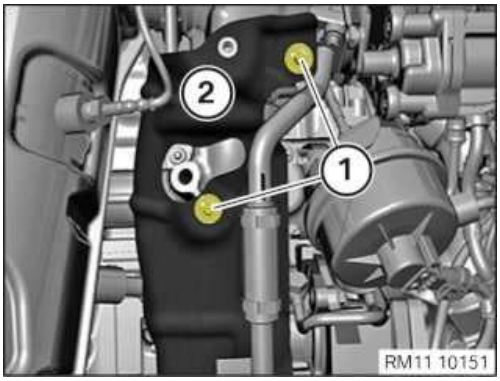
Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Unlock and disconnect connector (1).
- Unscrew the banjo bolt (3).
- The seals of the banjo bolt (3) must be renewed.
- Loosen screw (2).
- Remove the exhaust gas pressure pipe (4).



- Unscrew the bolts (1) on the heat shield .
- Feed out and remove the heat shield (2).

▶ **Removing the exhaust-gas recirculation cooler**

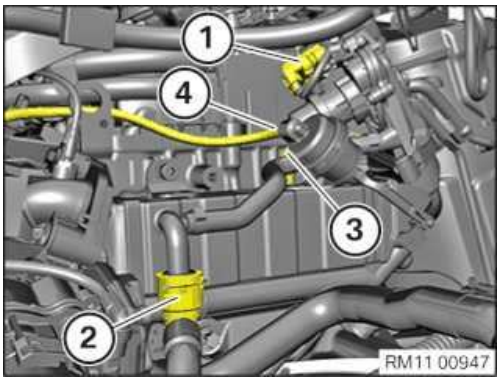
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

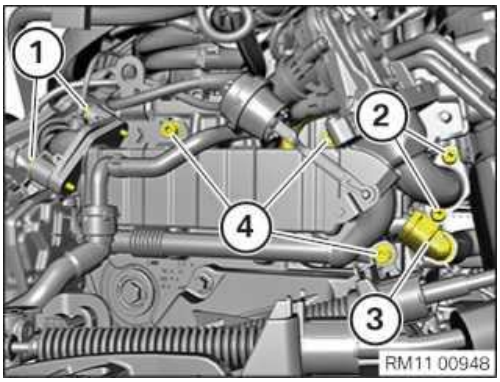
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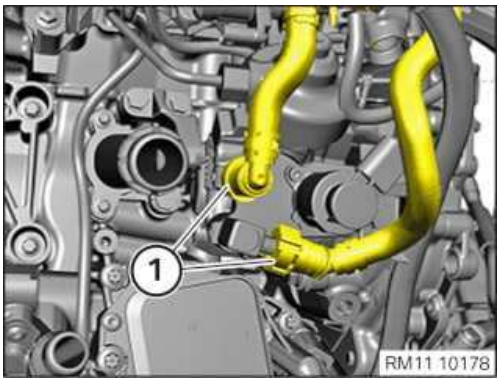
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

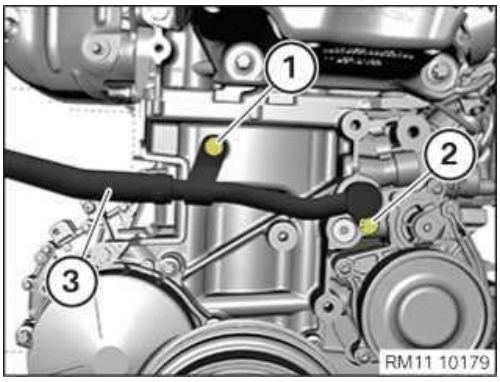
- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.



- Unlock the fuel lines (1) and disconnect from the high pressure pump.
- Remove the fuel lines.



- Loosen screws (1) and (2).
- Remove coolant line (3).

8 – Removing the low-pressure stage turbocharger

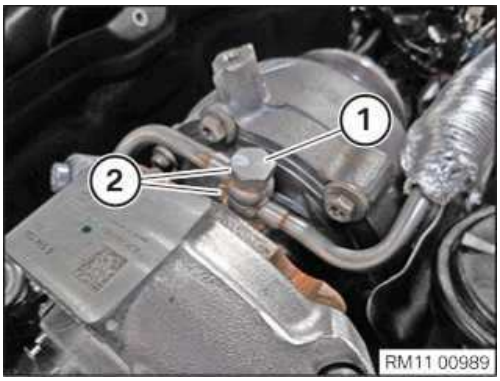
WARNING

Hot surfaces.

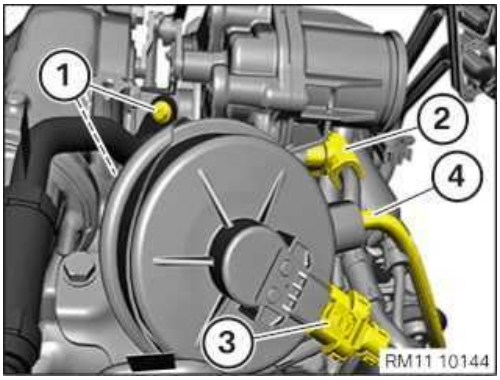
Risk of burning!

- Perform all work only on components that have cooled down.

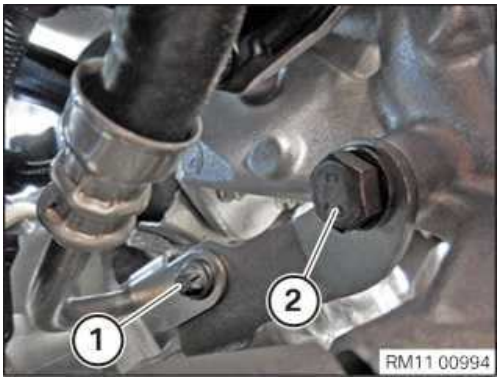
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- Release the banjo bolt (1) of the oil feed lines.
- Remove sealing rings (2).
- Place oil feed lines to one side.



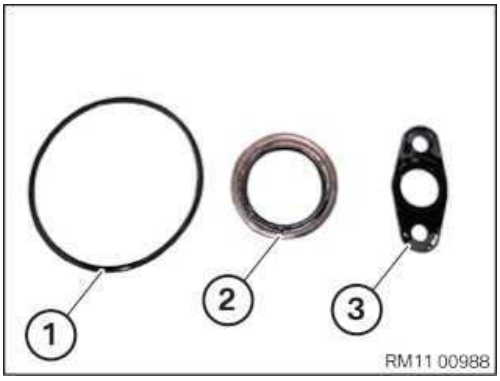
- Release the screws (1) of the oil return line.
- Unlock and disconnect the plug connections (2) and (3).
- Pull off the vacuum hose (4) carefully.



- Undo the bolt (1) of the oil feed line.
- Loosen screw (2).

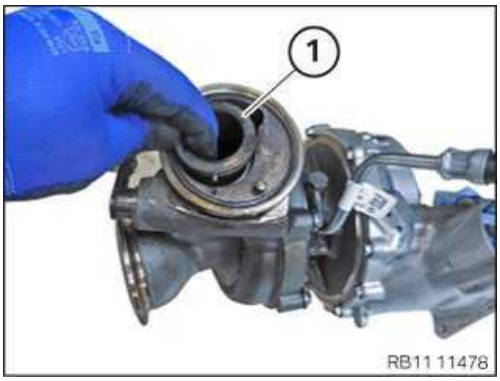


- Loosen screw (1).
- Remove the V hose clamp.
- Guide the low-pressure stage turbocharger out towards the top and remove.



- Remove seals (1), (2) and (3).

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- Remove the spacer ring (1).

9 – Removing the high-pressure stage exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

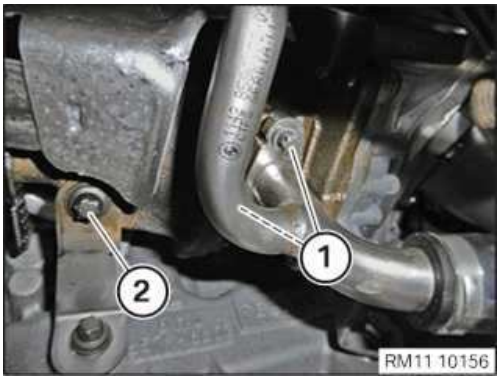
- Perform all work only on components that have cooled down.

CAUTION

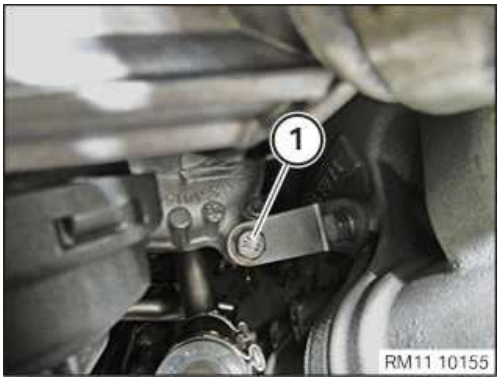
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

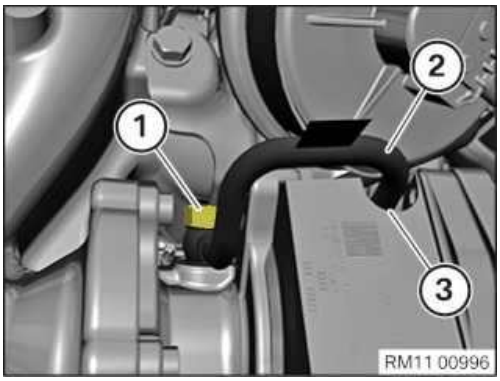


- Unscrew the bolts (1) on the oil return line .
- Loosen screw (2).

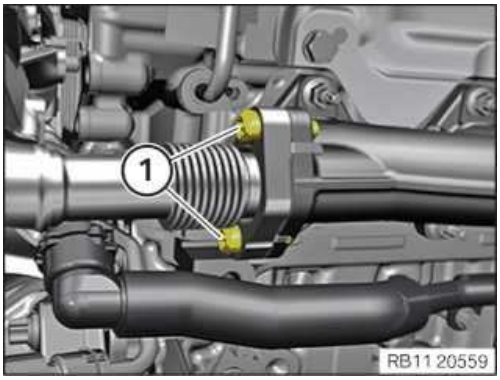


- Release screw (1) from the right wheel arch.

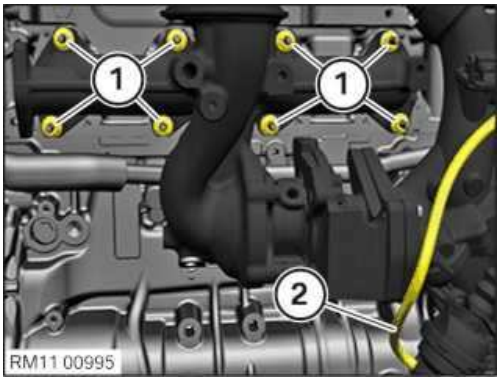
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- Unscrew the banjo bolt (1).
- Guide out oil feed line (2) from holder (3).

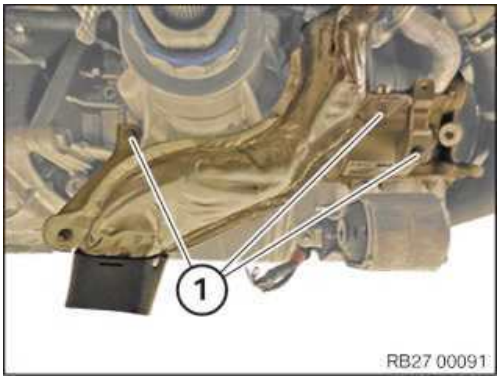


- Loosen screws (1).

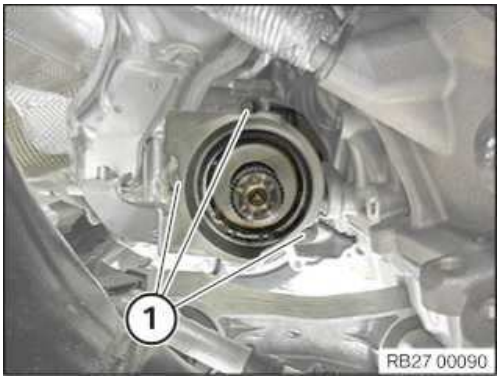


- Pull off the vacuum hose (2).
- Loosen nuts (1).
- Guide out the exhaust manifold and the high-pressure stage exhaust turbocharger to the top and remove them.

10 – Remove the intermediate shaft with the support tube

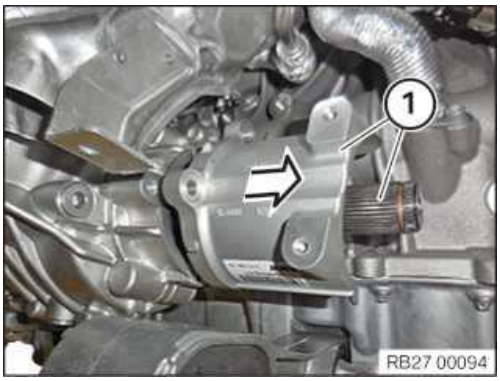


- With air duct installation: Loosen screws (1).
- Remove air duct



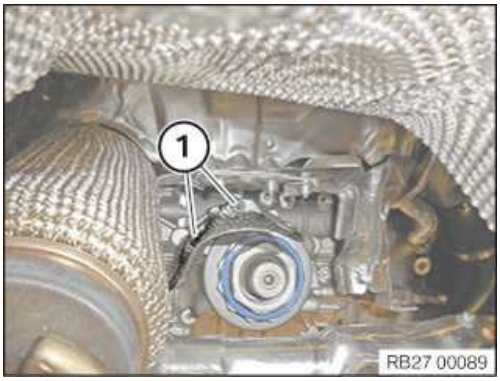
- Loosen screws (1).

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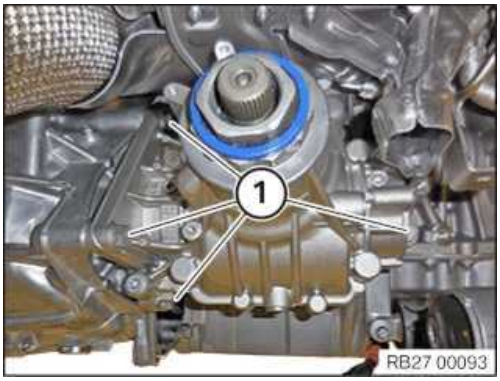


- Pull the intermediate shaft with the support tube (1) out of the transfer box.

11 – Remove transfer box (VTG)



- Loosen screws (1).
- Remove heat shield.



- Loosen screws (1).
- Remove the transfer box (VTG).

12 – Detach the engine from the automatic transmission

Prerequisite

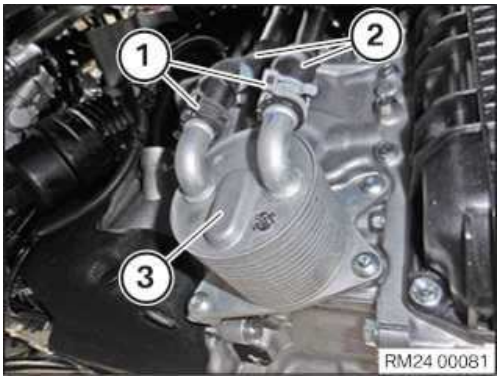
Engine has been removed.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Unfasten hose clamps (1).
- Disconnect coolant hoses (2) from transmission oil cooler (3).
- Catch the emerging coolant.

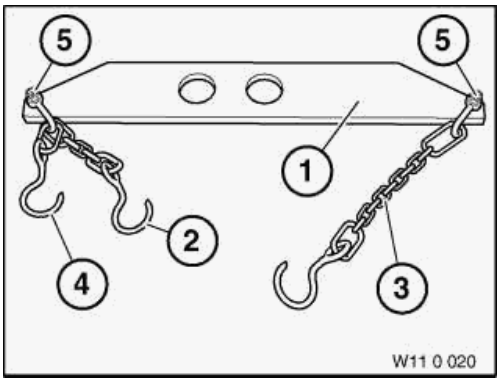
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- Crank engine with special tool **0 493 380 (11 6 480)** at vibration damper in direction of rotation.
- Unscrew the nut (1) of the torque converter.
- Crank engine further and release remaining 5 nuts.



- Stage the workshop crane **2 220 718**.



- Stage the lifting gear .



TECHNICAL INFORMATION

Conduct the following operation with the assistance of a second person.

- Secure the automatic transmission against dropping using a workshop crane **2 220 718** and lifting gear .
- Remove screws (arrows).
- Remove the automatic transmission with help from an auxiliary person and using the workshop crane **2 220 718** including lifting gear and put it to one side.

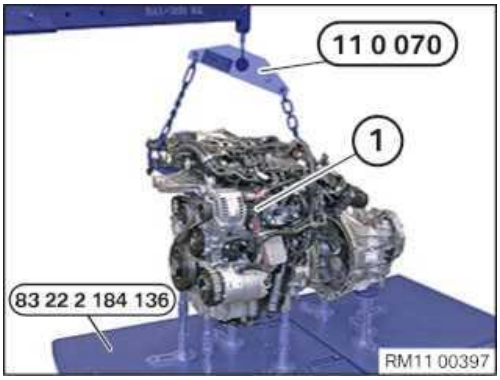
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- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

M8		Tightening torque	21,5 Nm



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Attach engine lifter to special tool and lift engine (1) off lifting table.

13 – Mount engine on assembly stand

CAUTION

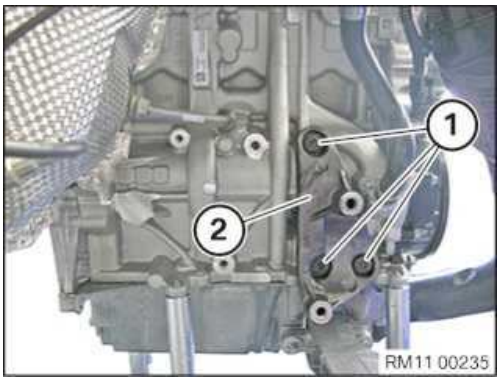
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Loosen screws (1).
- Guide out and remove holder (2).

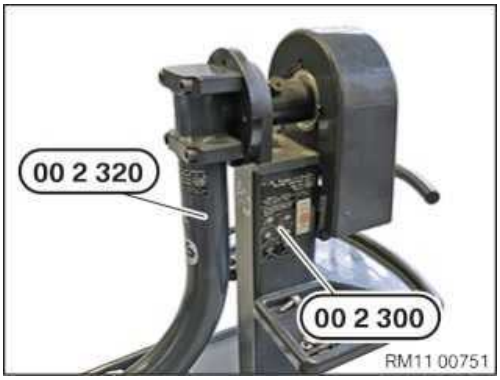
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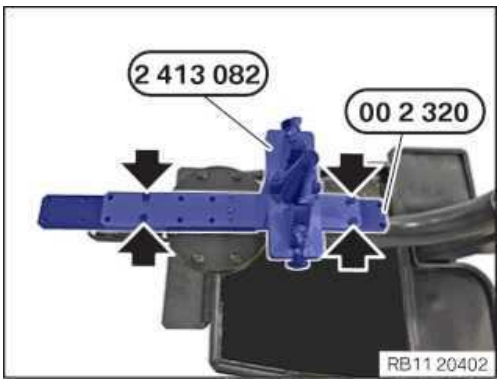
- Position the special tool **2 455 010** on the engine (1).
- Position the standard bolts **M10x30**.
- Tighten the standard bolts (arrows).
-

Special tool 2 455 010 to crankcase

M10x30		Tightening torque	38 Nm



- Prepare the assembly stand **0 495 187 (00 2 300)** with the special tool **0 495 196 (00 2 320)**.



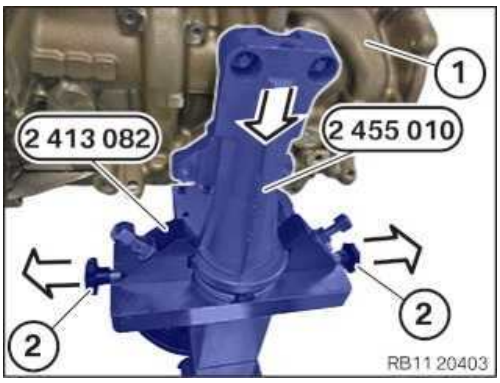
- Screw the special tool to the **0 495 196 (00 2 320)** special tool.
- Tighten screws (arrows).
-

Special tool 11 8 930 to special tool 00 2 320

M14x35		Tightening torque	160 Nm

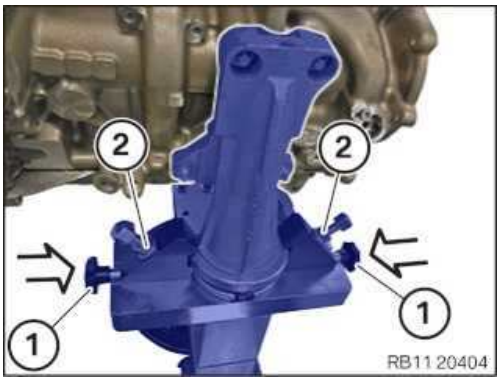


- Position the engine lifter with the special tool and the engine on the special tool **0 495 187 (00 2 300)**.



- Detach the holder (2) in the direction of the arrow.
- Position the engine (1) with the special tool **2 455 010** in the direction of the arrow on the special tool .

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- Lock the holder (1) in direction of arrow.
- Tighten nuts (2).

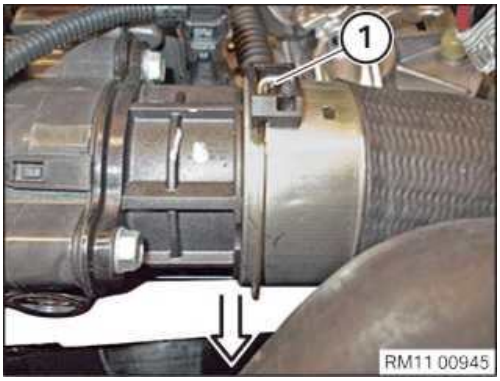
14 – Removing the intake plenum

TECHNICAL INFORMATION

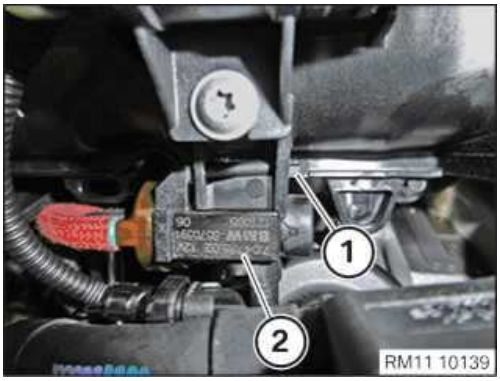
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Unlock the lock (1).

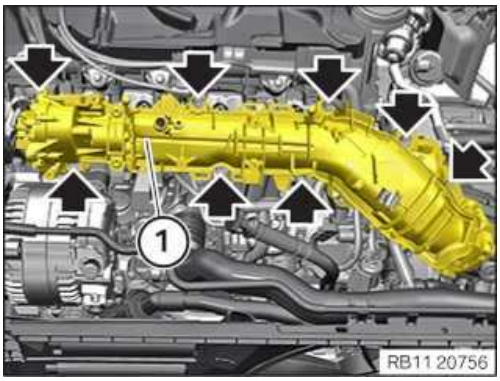


- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.

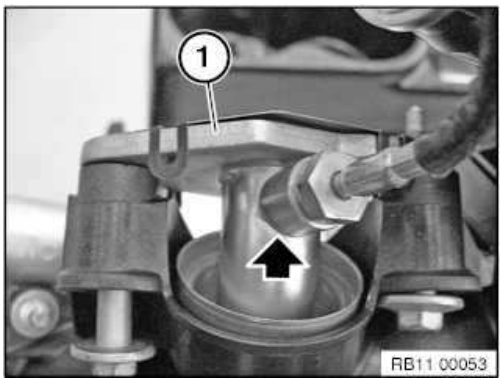


- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.

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- Release the screws (arrows) from the intake plenum (1).
- Guide the intake plenum (1) out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

15 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

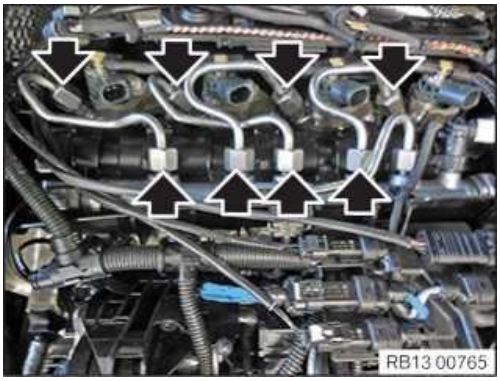
If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release the high pressure lines (arrows) with the special tool .
- Catch and dispose of escaping fuel.
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool .

16 – Detaching leakage oil line from injector

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

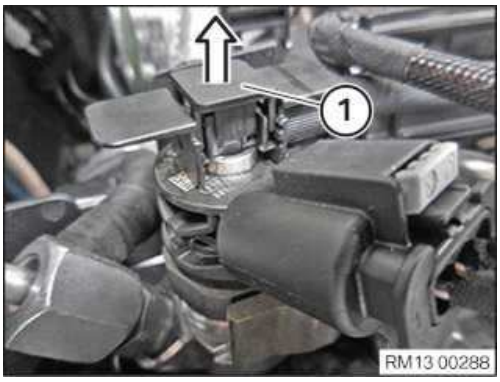
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

17 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

 **Electrostatic discharge.**

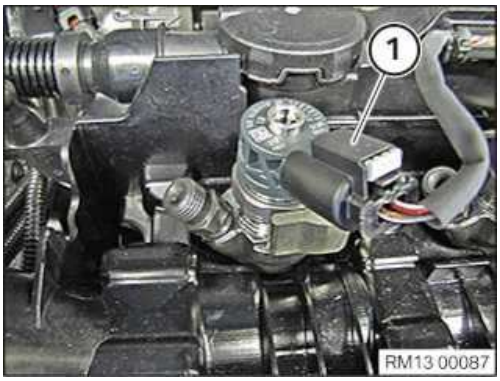
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

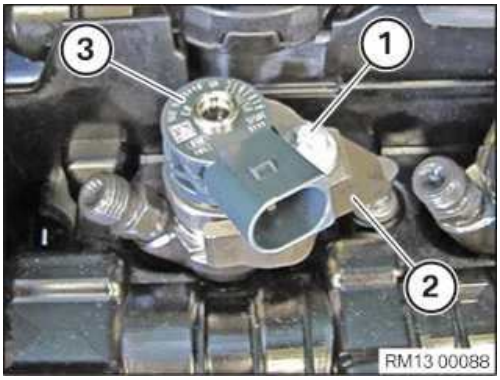
TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.

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- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

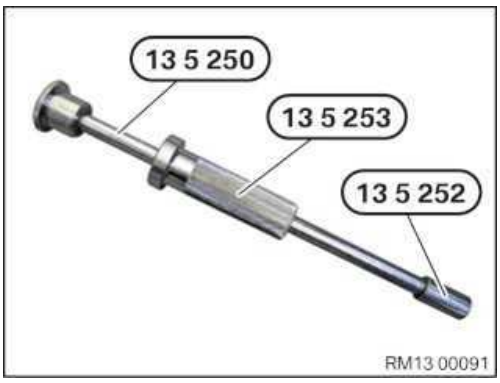
▶ **Loosen stuck injectors**

RISK OF DAMAGE

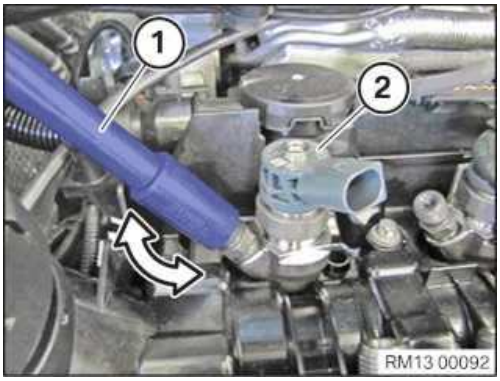
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)** back onto the special tool **0 493 321 (13 5 250)**.



- Screw the special tool (1) **0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1) **0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

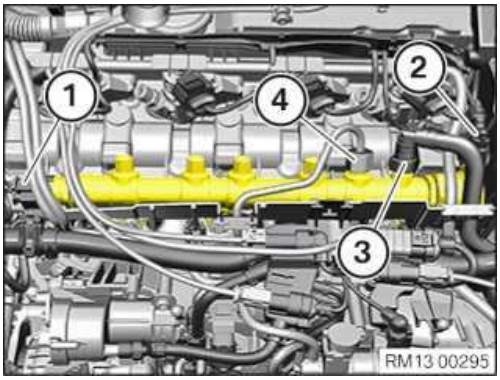
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

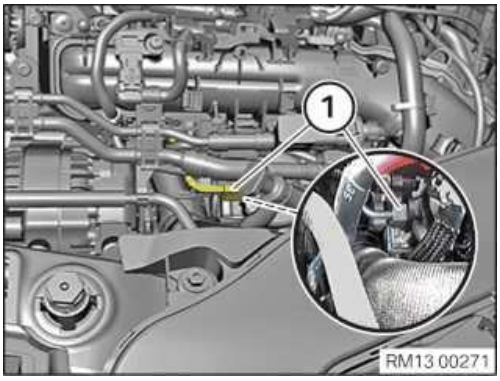
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

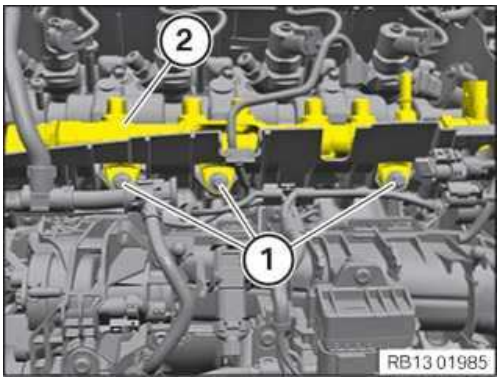


- Unlock and disconnect connector (1).
- Unlock and disconnect connector (2).
- Unlock and release fuel line (3).
- Loosen union nut (4) with special tool .
- Reset special tool early on to avoid bending pressure lines.



- Slacken the union nut (1) on the high pressure pump.

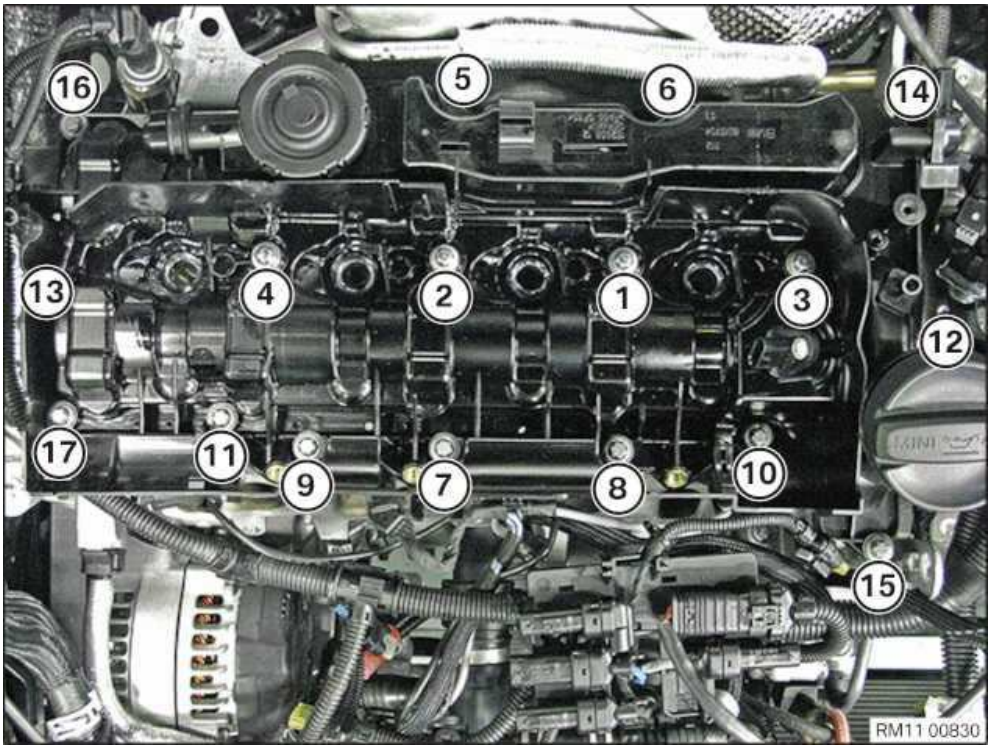
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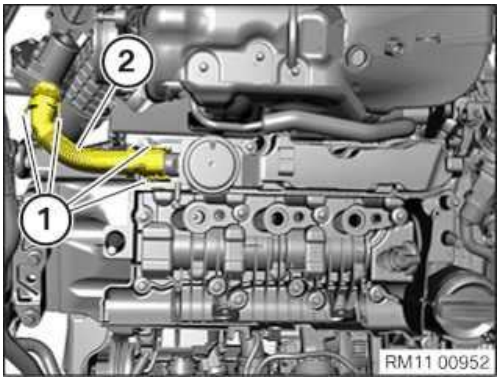
- Loosen screws (1).
- Carefully thread out and remove the rail (2).
- Make sure the pressure line of the high pressure pump is not bent.

19 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover

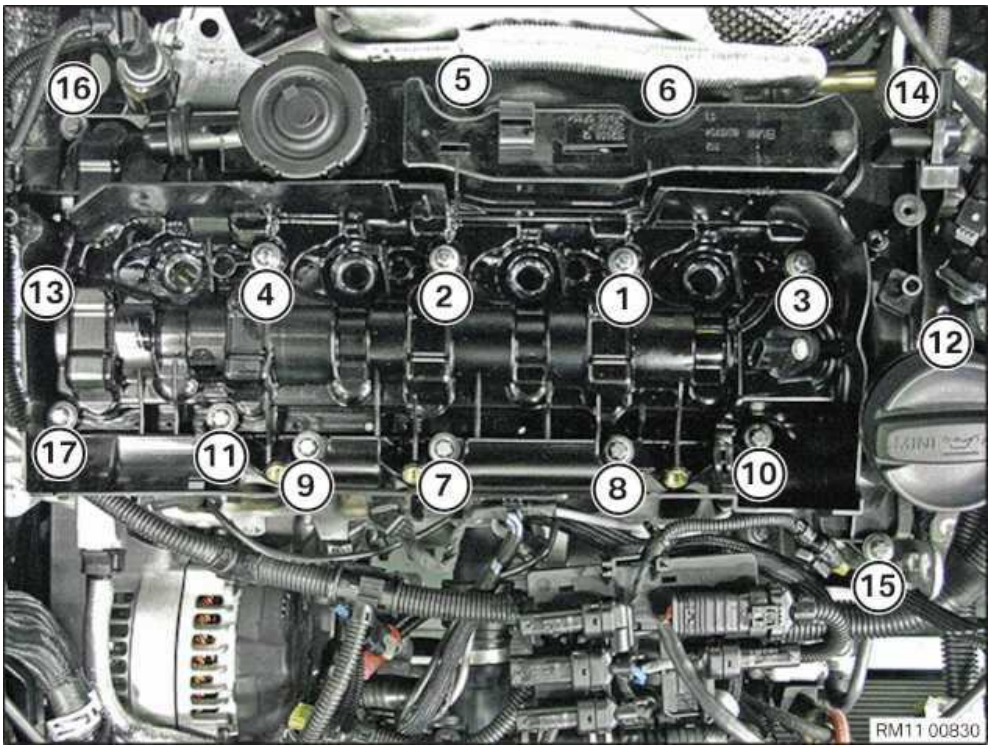


1 to 16 screws of the cylinder head cover.



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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- Loosen screws in the order (17) to (1).
- Remove cylinder head cover by lifting it out.

20 – Checking camshaft timing



- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

Damage to the engine.

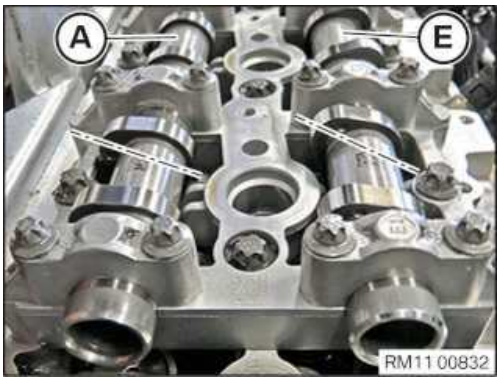
The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

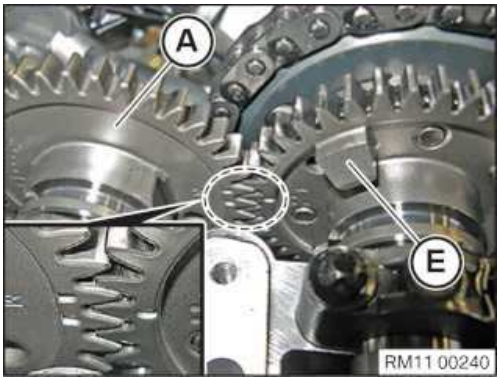
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- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.



- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

21 – Remove chain tensioner piston

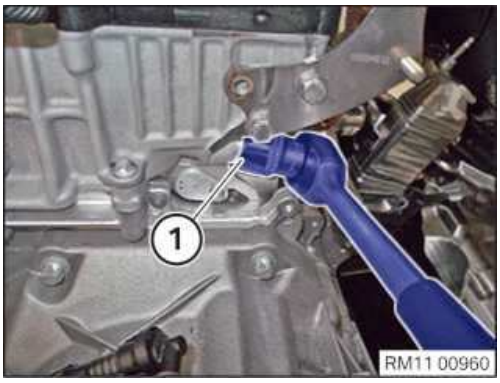
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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

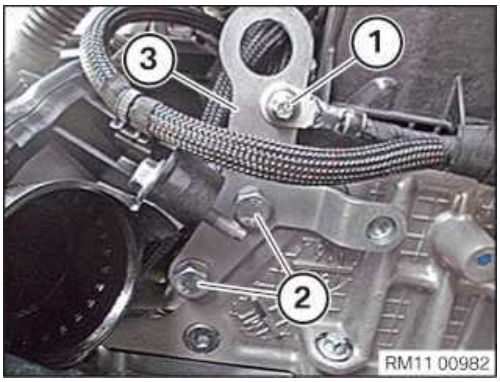


TECHNICAL INFORMATION

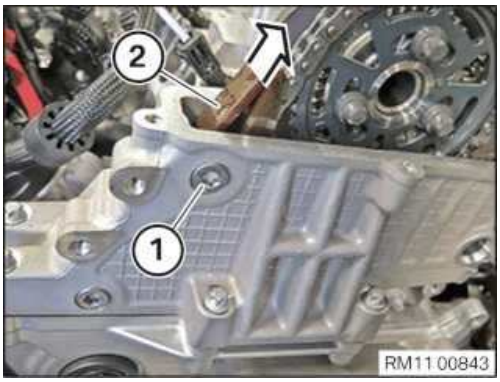
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

22 – Remove the timing chain guide rail

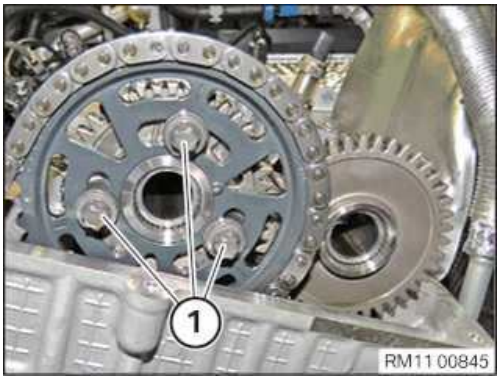


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

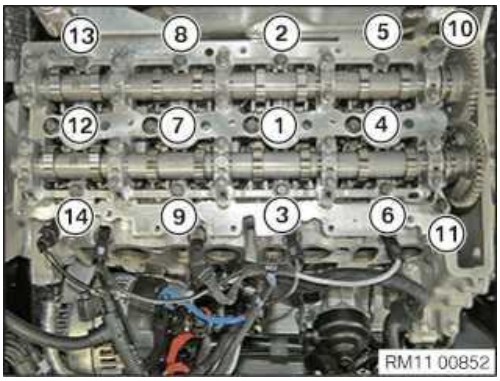
23 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

24 – Removing the camshaft support

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- Evenly loosen all screws in a sequence from (14) to (1).
- Loosen and remove all screws in a sequence from (14) to (1).
  Both camshafts can be removed with the camshaft carrier.
- Remove the camshaft support including camshafts towards the top.

25 – Removing glow elements

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Damage to the glow elements.

Excessive force may damage the glow elements and they may then have to be renewed.

- Handle glow elements with care and do not drop.
- Do not rest the cylinder head on glow elements. Glow elements protrude from the sealing surface of the cylinder head.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

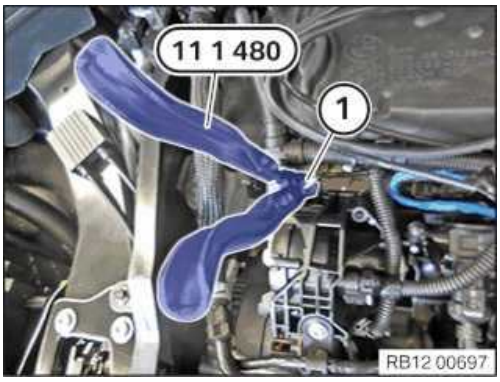
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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

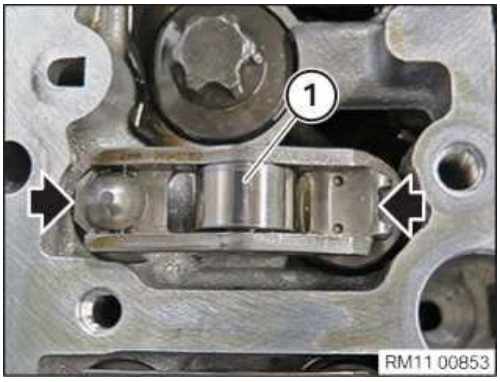


- Unlock and disconnect plug connection (1) using special tool **0 490 796 (11 1 480)**.



- Release the glow elements with the special tool or conventional tools.
- Feed out preheating elements and remove.

26 – Remove roller cam followers



- Guide out and remove all roller cam followers (1) (arrows).
- Place all roller cam followers (1) in order in special tool **0 495 105 (11 4 480)**.

  Roller cam followers that have already been used must be installed in same position again.

27 – Removing the hydraulic valve clearance compensating element

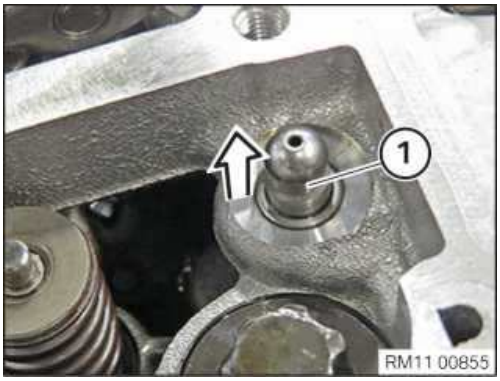
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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Remove the hydraulic valve clearance compensating element (1) in the direction of the arrow and place on the special tool **0 495 105 (11 4 480)**.
- Repeat the process on all hydraulic valve clearance compensating elements.

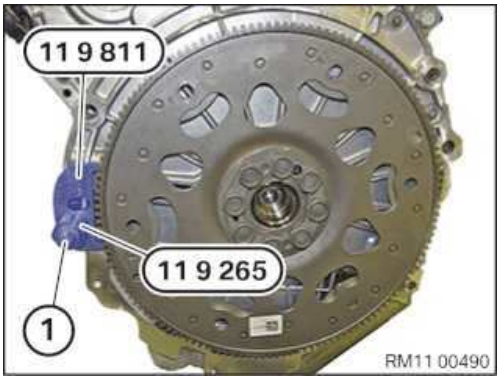
28 – Removing flywheel

CAUTION

Heavy component.

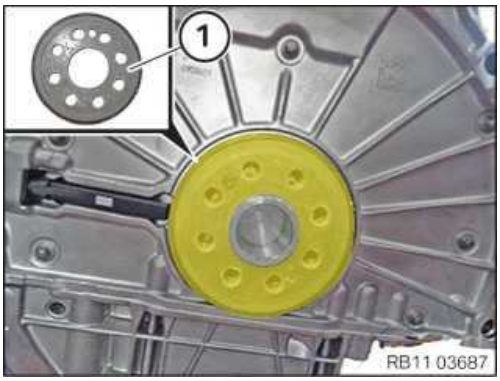
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Secure flywheel with a transmission bolt (1) and the special tools **0 496 171 (11 9 811)** and **0 494 793 (11 9 265)**.
- Unfasten flywheel bolts.
- Remove flywheel.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

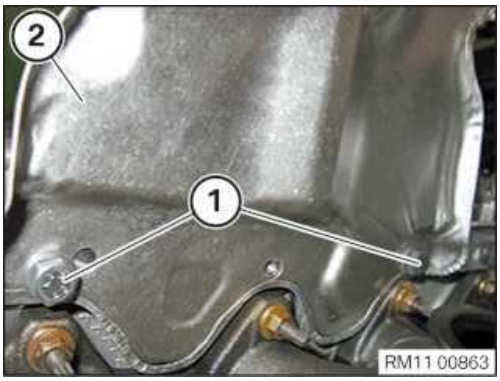
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Remove the increment wheel (1) from the crankshaft and set correctly.

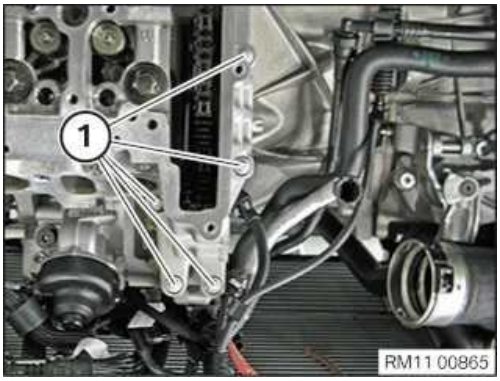
29 – Remove rear timing case cover

Prerequisite

Transmission is removed.



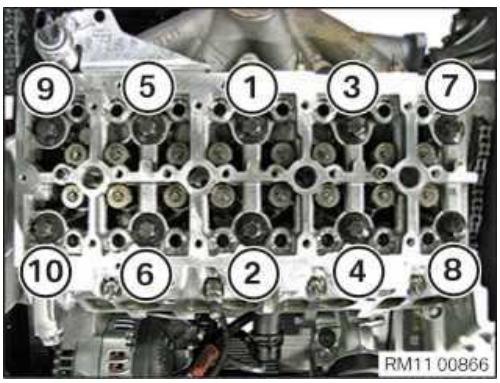
- Loosen screws (1).
- Feed out the heat shield (2) and place to one side.



TECHNICAL INFORMATION

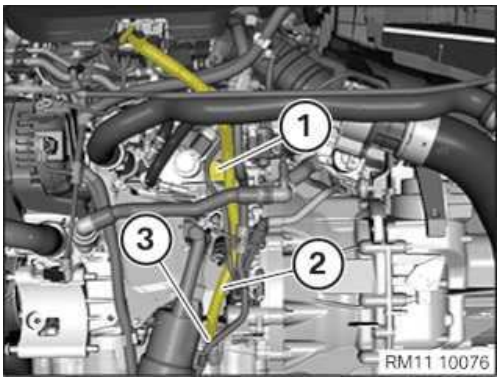
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screws (1).

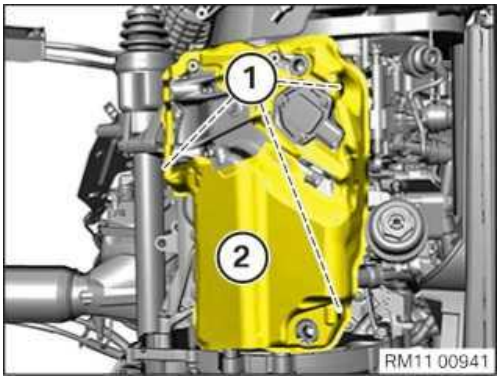


- Loosen the cylinder head bolts in the sequence from (10) to (1).
- Remove cylinder head bolts (1) to (10) with washers.
- Remove cylinder head.

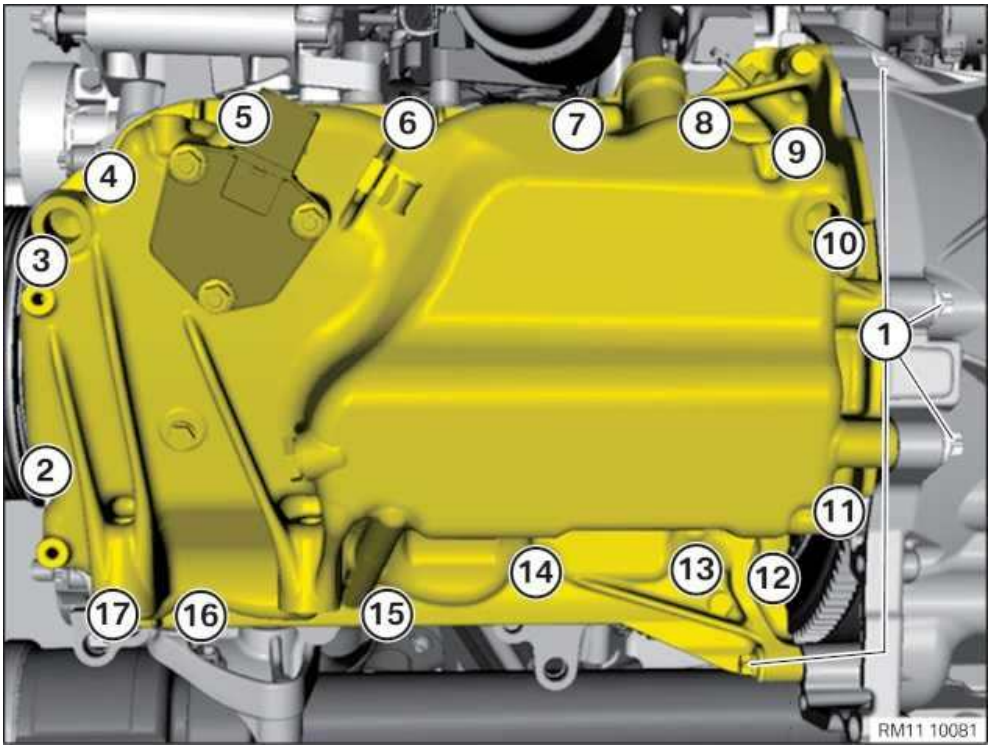
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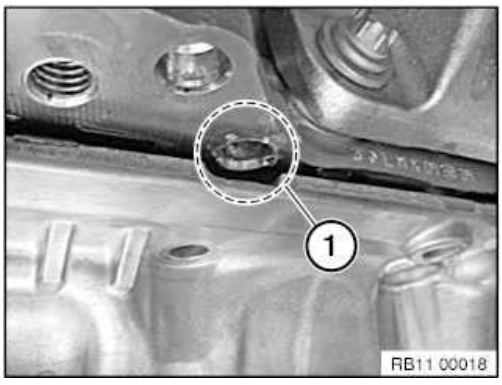
- Loosen screw (1).
- Disconnect the guide tube (2) for the oil dipstick toward the top from the oil sump and remove it.
- Remove sealing ring (3) from oil sump if necessary.



- Expanding rivets (1) on both sides of the acoustic cover (2).
- Feed out and remove the acoustic cover (2).

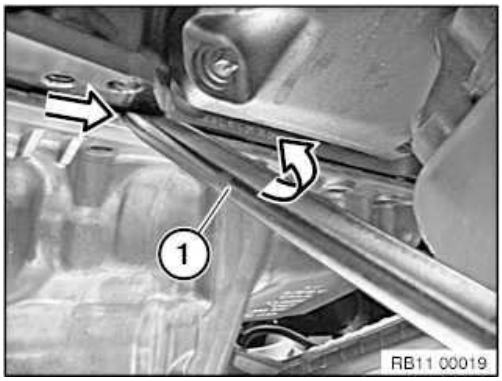


- Loosen the transmission bolts (1) on the oil sump.
- Loosen screws (2) to (17).



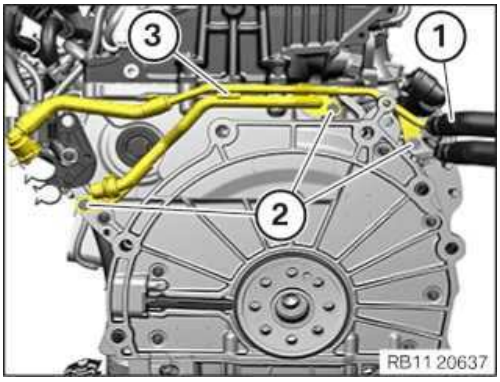
- Release oil sump only in area (1).

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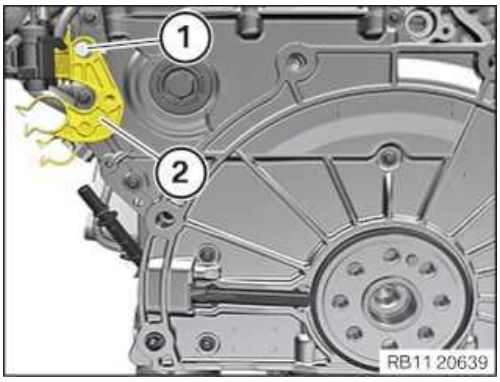


- Detach the oil sump with a suitable mounting lever (1) carefully at the point provided.
- Secure the oil sump against falling.

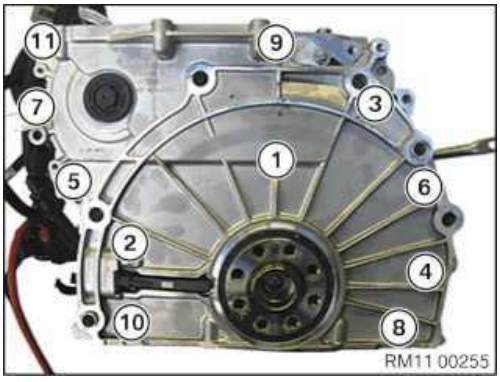
▶ **If installed: Remove coolant line of the SCR metering module**



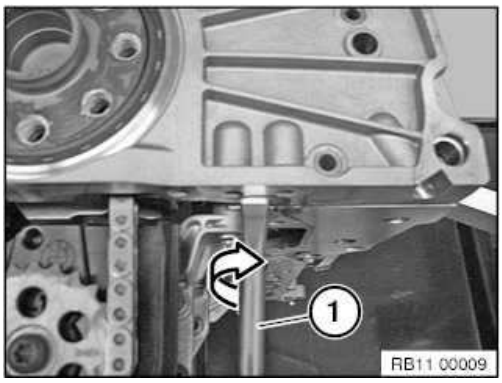
- Unlock and disconnect the coolant hose (1).
- Loosen screws (2).
- Remove the coolant line (3).



- Loosen screw (1).
- Guide out and remove holder (2).

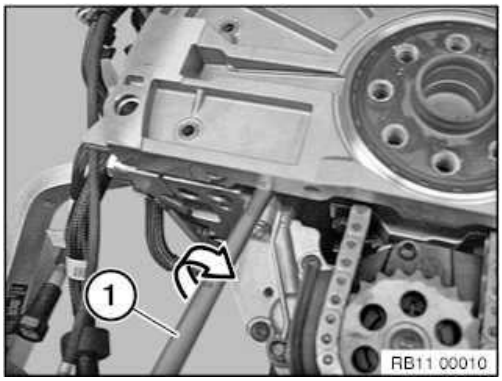


- Loosen screws in the order (11) to (1).



- Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.

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- Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.
- Remove the timing case cover.

MAIN WORK

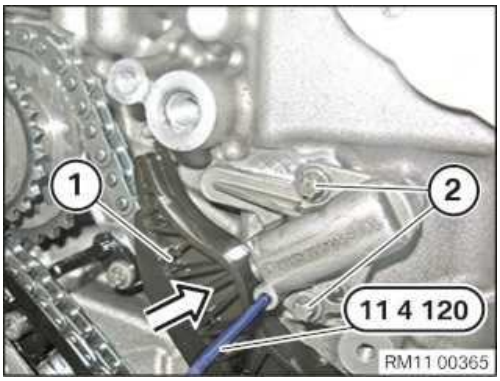
30 – Removing the hydraulic chain tensioner for the bottom timing chain

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.



- Press the hydraulic chain tensioner with tensioning rail (1) by hand in the direction of the arrow until the special tool **0 491 012 (11 4 120)** can be positioned.
- Loosen screws (2).
- Remove hydraulic chain tensioner.

31 – Installing the hydraulic chain tensioner for the bottom timing chain

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

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CAUTION

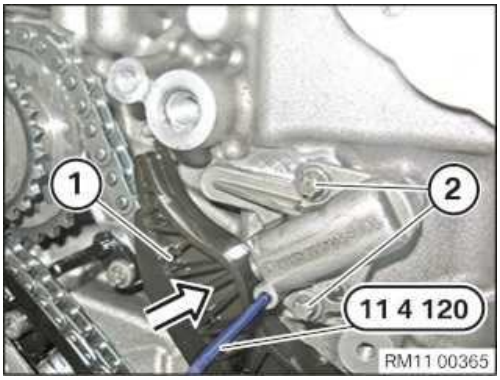
Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

- Wear safety goggles.

- Clean sealing surfaces (1) with compressed air.



- Install the hydraulic chain tensioner.
- Tighten down screws (2).

Hydraulic chain tensioner to crankcase

M6x22		Tightening torque	9 Nm

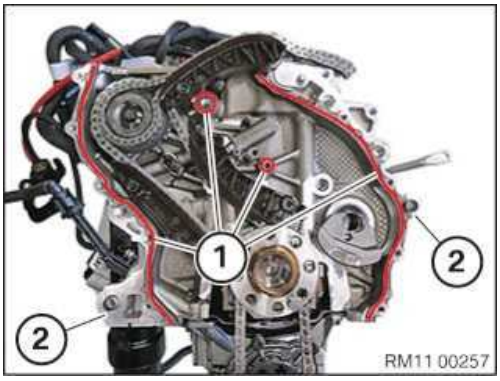
- Press the hydraulic chain tensioner with tensioning rail (1) in the direction of the arrow and remove the special tool **0 491 012 (11 4 120)**.

POSTPROCESSES

32 – Install the rear timing case cover

Prerequisite

Transmission is removed.



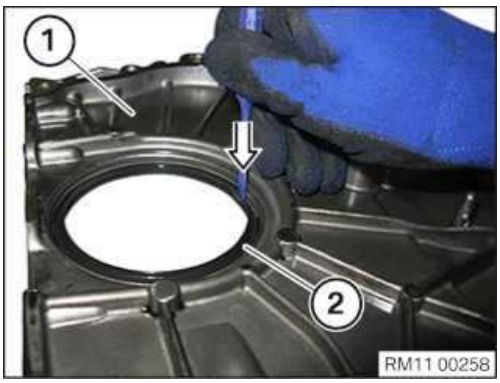
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

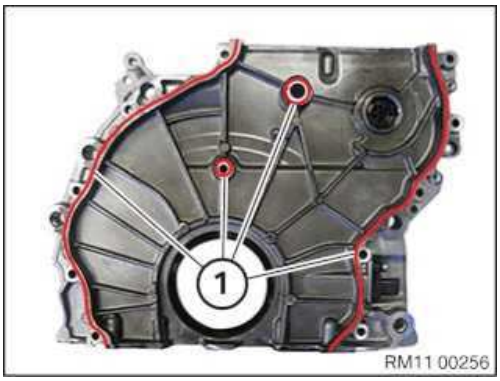
- Do not use any metal-cutting tools.

- Remove seal residue from the sealing surfaces (1) using special tool **0 495 102 (11 4 470)**.
- Check fitting sleeves (2) for damage and for tight fit; renew if necessary.

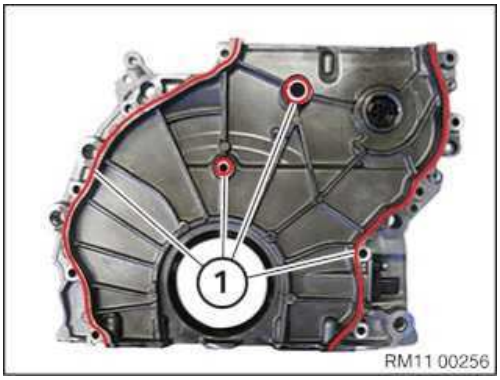


- Position the timing case cover (1) underneath.
- Position punch on inner side of crankshaft seal (2).
- Drive out crankshaft seal (2) outwards.

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- Remove seal residue from the sealing surfaces (1) using special tool **0 495 102 (11 4 470)**.

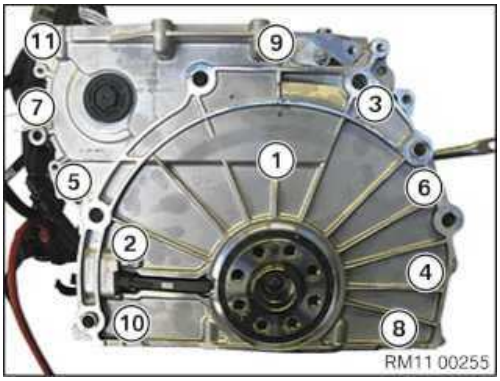


TECHNICAL INFORMATION

For more information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

- Apply sealing bead (1) with a height of approx. 1.5 mm to 2.0 mm on inner side of timing case cover in marked locations. Use liquid sealing compound for this.

  Application time of sealing bead (1) must not exceed 12 minutes.



- Mount the timing case cover without the crankshaft seal.
- Renew screws (1) to (11).

  Parts: Bolts
- Join the bolts in with the sequence (1) to (11).
- Tighten screws in the order (1) to (11).

Rear timing case cover to crankcase

M6	Renew screws.	Jointing torque	8 Nm
		Angle of rotation	90 °

▸ **Installing the rear crankshaft seal**

RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) on the radial shaft seal with the sharp-edged connector gearing of the output shaft will result in destruction and/or leaks.

- When inserting the output shaft, make sure that the connector gearing of the output shaft does not touch the sealing lip (inner) of the radial shaft seal.

RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) and applying oil to the radial shaft seal will lead to its destruction.

- Do not touch the sealing lip (inner) of the radial shaft seal.
- Do not apply oil to the radial shaft seal.
- Install the radial shaft seal dry.

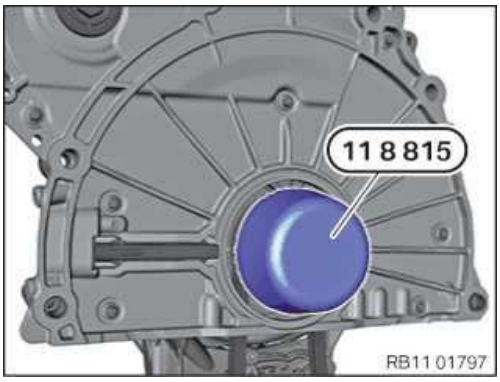
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RISK OF DAMAGE

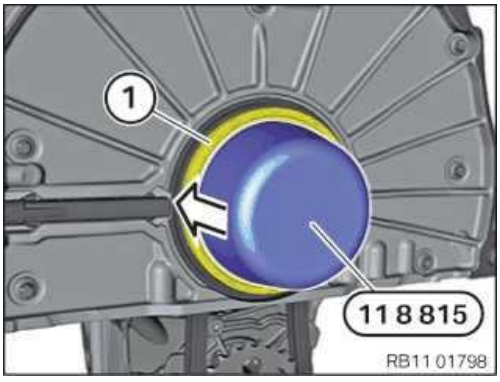
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Position special tool **0 496 137 (11 8 815)** on crankshaft. Make sure that the crankshaft sensor is not damaged.



- Fit the crankshaft seal (1) up to the timing case cover in the direction of the arrow using special tool **0 496 137 (11 8 815)** and position.
- Remove special tool **0 496 137 (11 8 815)**.



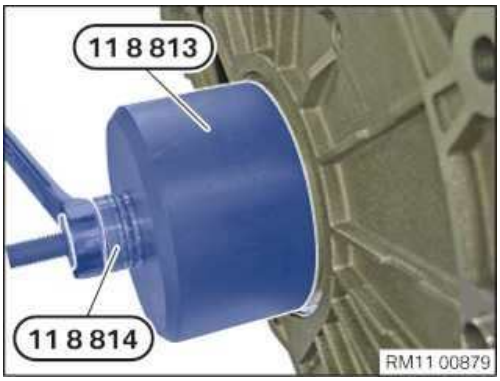
- Secure special tool **0 496 133 (11 8 811)** to the crankshaft using special tool **0 496 134 (11 8 812)**.



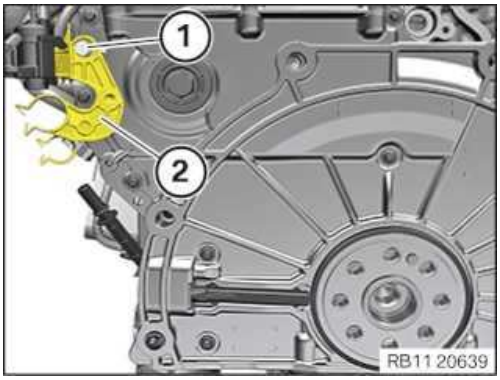
- Check the freedom of movement between the special tool **0 496 135 (11 8 813)** and the crankshaft sensor during installation.

  Otherwise there is a risk that the crankshaft sensor will be damaged.
- Slide on special tool **0 496 135 (11 8 813)**.
- Screw down special tool **0 496 136 (11 8 814)**.

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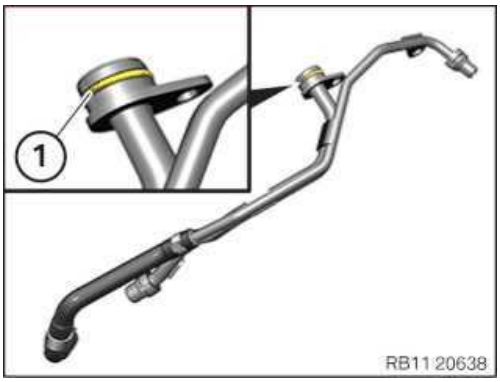


- Press in crankshaft seal with special tool **0 496 135 (11 8 813)**.
- Screw in special tool **0 496 135 (11 8 813)** up to timing case cover.



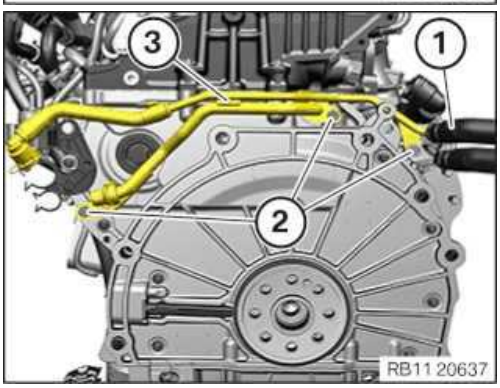
- Insert and install the holder (2).

▶ **If installed: Installing the coolant line of the SCR metering module**



- Renew the O-ring 1.

  Parts: O-ring



- Feed in and install coolant line (3).
- Tighten down screws (2).

SCR coolant lines to crankcase end cover

Hexagon screw M6x16		Tightening torque	8 Nm

- Connect and lock the coolant line (1).

  Coolant line (1) must audibly engage.

▶ **Cleaning the sealing surface**

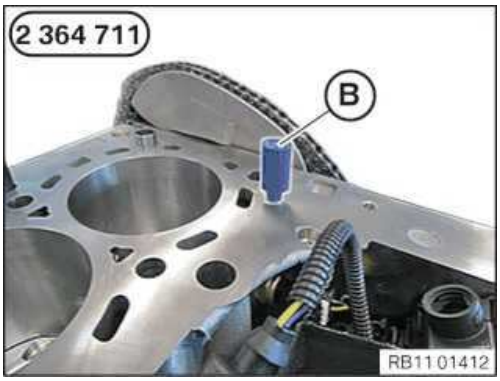
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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- Lock the front oil duct using special tool (B) from special tool **2 364 711**.



RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 103 (11 4 471)**.



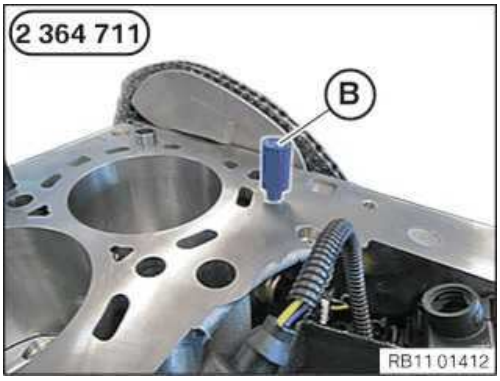
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

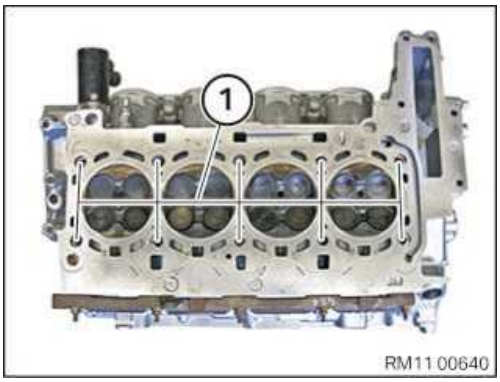
- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 104 (11 4 472)**.



- Remove special tool (B).

▸ **Renewing the cylinder head gasket**



RISK OF DAMAGE

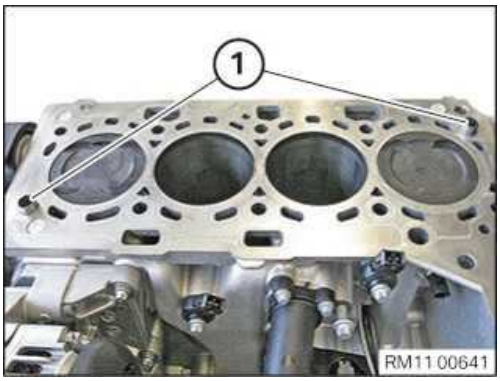
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

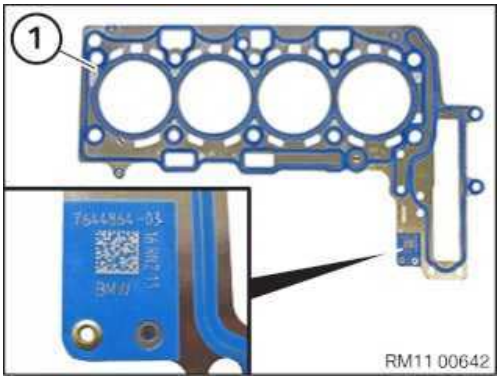
- Do not use any metal-cutting tools.

- Remove oil and dirt residue from the blind holes (1).

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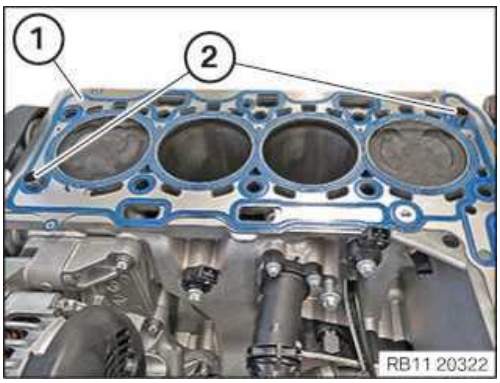


- Check the fitting sleeves (1) for secure fit and damage.



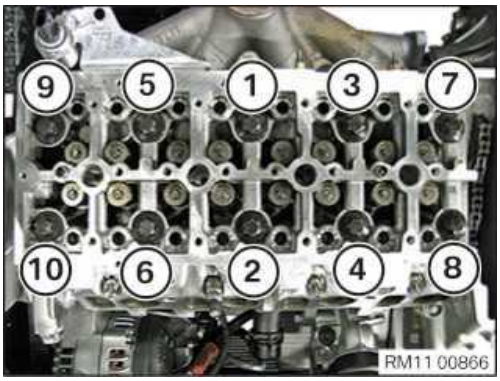
- Identify the cylinder head gasket (1) using the part number.

Note: If the cylinder head is reworked, an additional thicker gasket 0.3 mm is available for service personnel.



- Guide in the cylinder head gasket (1) and install.
- Ensure that the cylinder head gasket (1) is installed correctly in the fitting sleeves (2).

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CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Damage to threads.

Fluid in the threaded hole may damage the thread when screws are tightened in the threads.

- Dry threaded holes (e.g. using compressed air).

TECHNICAL INFORMATION

Do not remove bolt coating.

- Renew the cylinder head bolts (1).

  Parts: Cylinder head bolts
- Do **not** wash off coating of cylinder head bolts.
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

  No coolant, water or engine oil must be present in threaded holes of engine block.

TECHNICAL INFORMATION

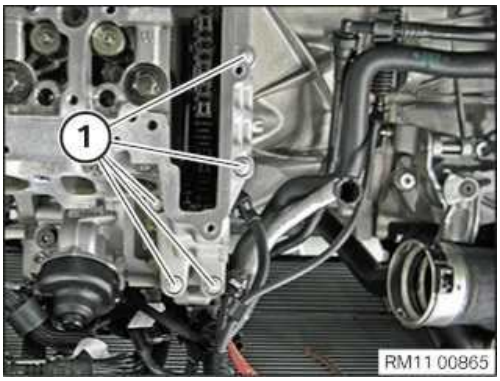
When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Feed in cylinder head bolts and install.
- Screw in cylinder head bolts in sequence (1) to (10).
- Tighten cylinder head bolts using special tools **0 490 504 (00 9 120)** and in sequence (1) to (10).

Cylinder head to crankcase

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

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- Tighten the cylinder head bolts (1).

Cylinder head bolt to timing case cover

M8x40		Tightening torque	19 Nm

-



TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

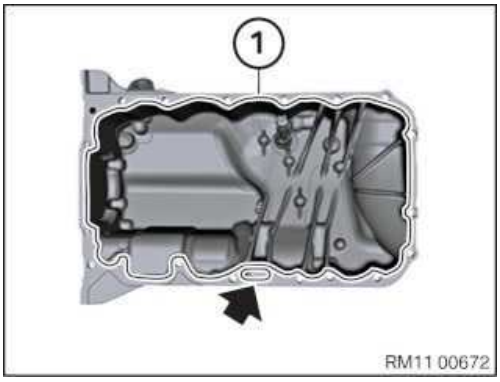
- Remove fine sealing remains on the sealing surface (1)and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.



TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove coarse sealing remains on the sealing surface (1)and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.



TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- Apply the sealing compound along the line (1) with a thickness of 2 mm to 2.5 mm.

  Apply the sealing compound along the inner edge.

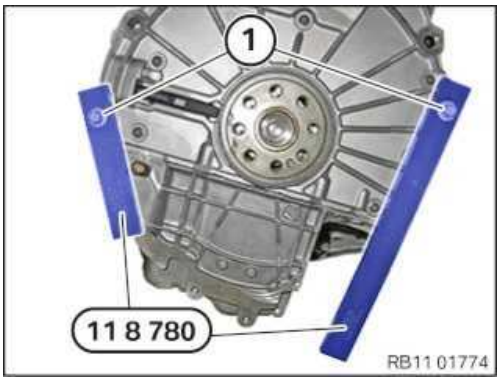
Sealing compound

Loctite 5970 liquid sealing compound	50 ml, Cartridge	83190404517

Overview of consumables (Electronic Parts Catalogue)

- Completely encircle the oil return orifice (arrow) with the sealing compound.

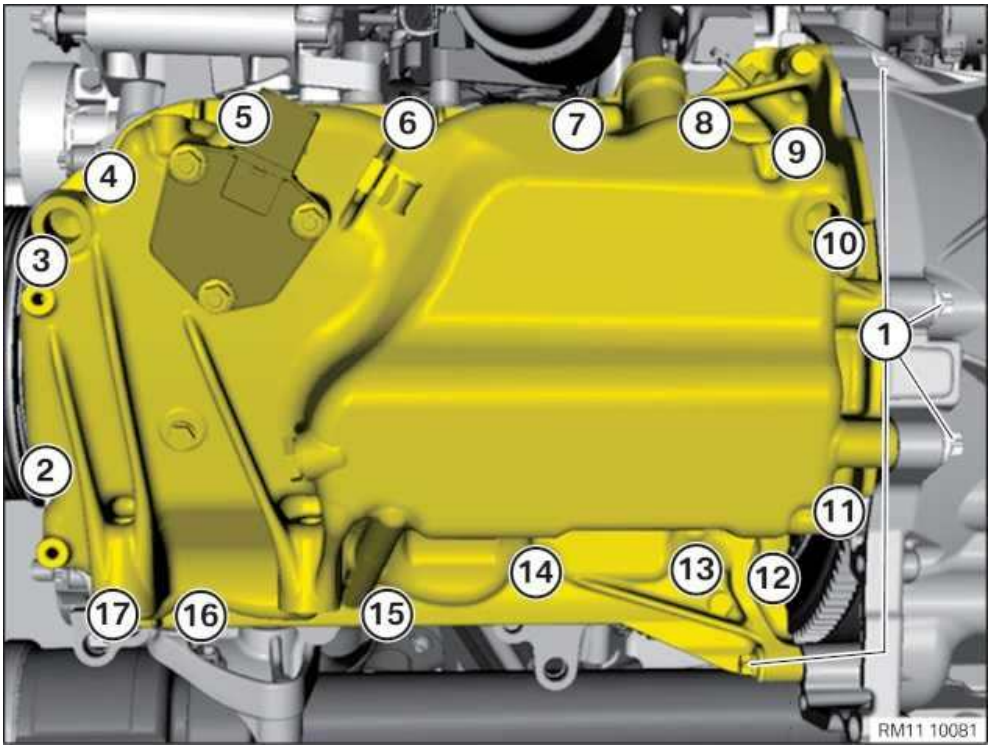
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TECHNICAL INFORMATION

The special tool 11 8 780 is only required when the transmission is removed.

- Position the special tool **0 496 120 (11 8 780)** with the transmission bolts (1) so that the oil sump is exactly flush with engine block.
- If necessary, renew fitting sleeves.



- Position and install oil sump.
- **Hand-tighten** oil sump screws (2) to (17) but do **not** tighten completely.
- Join transmission bolts (1) with 5 Nm.
- Tighten screws(2) to (17) of the oil sump.

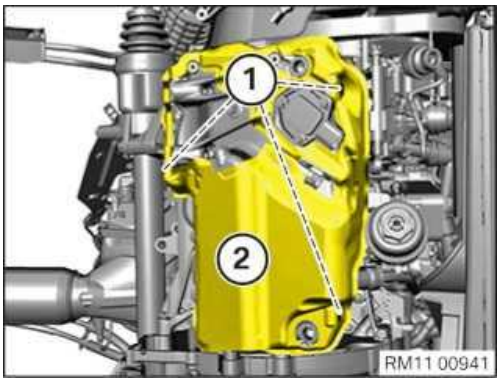
Oil sump to crankcase

M8x30		Tightening torque	2 Nr
M8x110		Tightening torque	2 Nr

- Tighten transmission bolts (1) on oil sump.

Transmission to oil sump

M8		Tightening torque	1 Nr



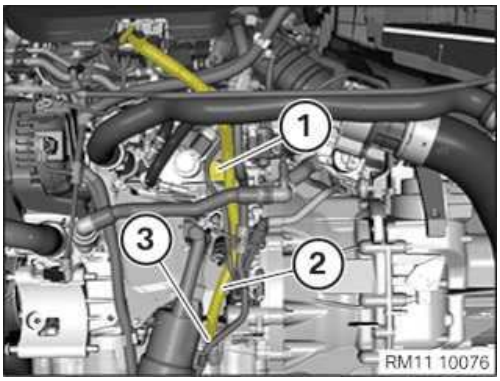
- Thread in and position the acoustic cover (2).
- Install the expanding rivet (1).



- Renew O-ring (1).

  Parts: O-ring

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- Guide in guide tube (2) for oil dipstick and insert it into oil sump.
- Make sure the sealing ring (3) is positioned correctly in the oil sump.
- Tighten down screw (1).

Guide tube for oil dipstick on engine

M8x16		Tightening torque	19 Nm

33 – Installing the flywheel

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

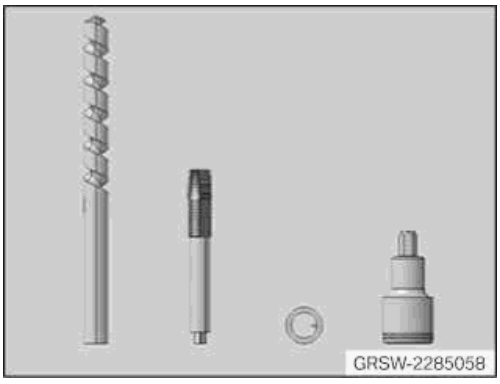


- Check fitting sleeve on the crankshaft for damage and replace if necessary.

TECHNICAL INFORMATION

Clean all threads with a screw tap.

- Clean all the screw threads (1).



- Use the set of special tools **2 285 058**.

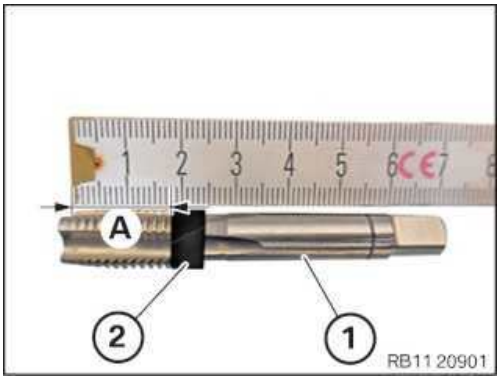
Description
Twist drill
Thread cutter M12x1.5
Depth
Insertion tool

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- Assemble tool set.

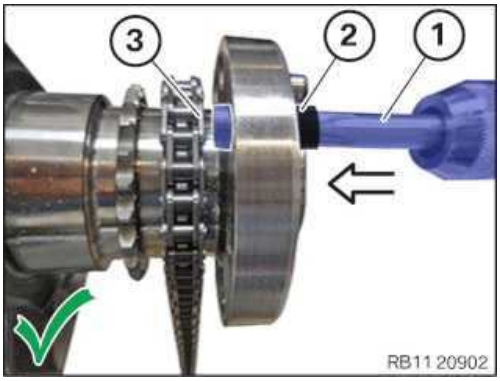
Number	Description
1	Tool holder
2	Thread cutter M12X1,5



- Mark the installation dimension (A) on thread cutter (1) from the set of special tools **2 285 058** using a commonly-available tool (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm



NOTICE

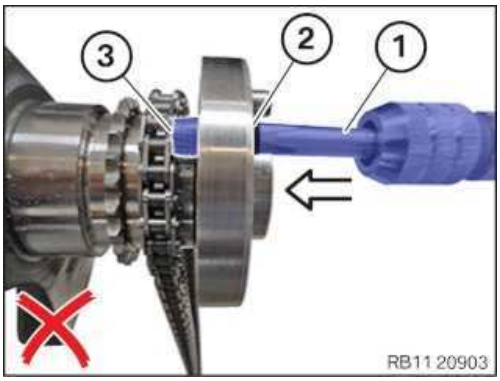
To provide a better overview: Shown with engine removed.

- Screw in the thread cutter (1) from the set of special tools **2 285 058** in direction of arrow up to the installation dimension (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm

- Make sure that the thread cutter does (1) **not** rest on the timing chain (3).

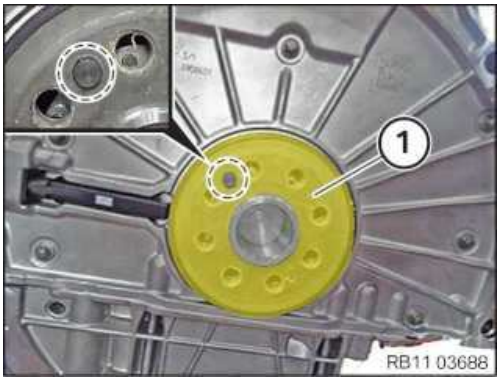


TECHNICAL INFORMATION

- **Carefully** handle the timing chain, to protect the timing chain and timing chain drive against damage.

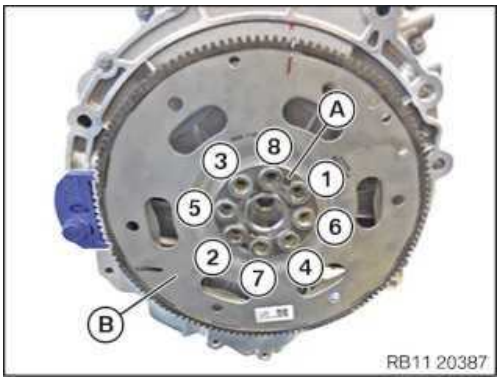
- Make sure the installation dimension (2) of the screw bore (1) is not exceeded.

  The thread cutter (1) may not rest on the timing chain (3).



- Important! Observe the marking shown during installation.
- Install special tool (1) on the crankshaft as shown.

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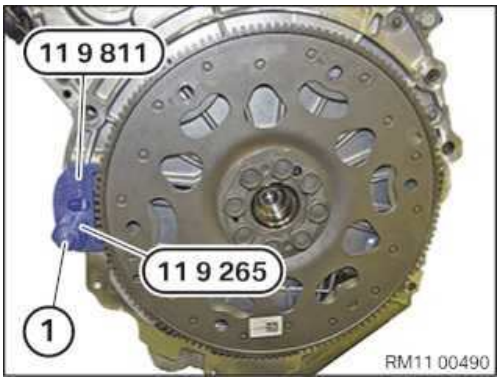


- Position flywheel (B) .
- Renew flywheel bolts (1) to (8).

  Parts: Flywheel bolts
- Screw in flywheel bolt (1) to (8) by hand.
- Observe tightening sequence. Begin at the dowel pin (A).
- Tighten flywheel bolts in sequence (1) to (8).

Flywheel to crankshaft

M12x1.5	Renew screws.	Tightening torque	120 Nm



- Loosen the transmission bolt (1).
- Guide out and remove the special tool **0 494 793 (11 9 265)** and **0 496 171 (11 9 811)** with the **standard** washer (5 mm).

34 – Installing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



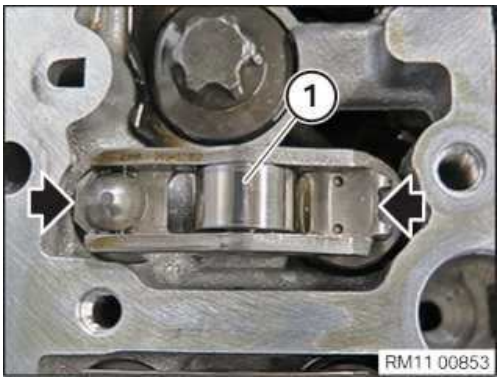
- Install the hydraulic valve clearance compensating element (1) in the direction of the arrow.
- Repeat the process on all hydraulic valve clearance compensating elements.

35 – Install the roller cam followers

TECHNICAL INFORMATION

- Note the installation position of the component. The component may be installed in various installation positions.

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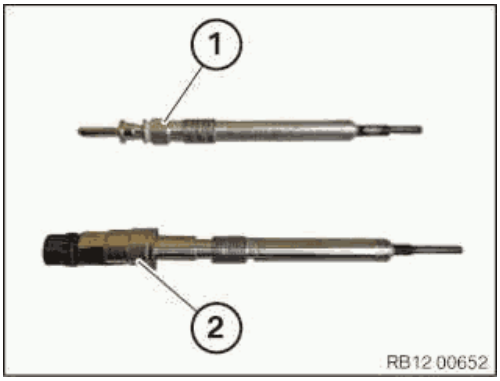


- Check all roller cam followers (1) for damage and replace if necessary.

  Parts: Roller cam followers
- Insert and install all roller cam followers (1).

  Roller cam followers (1) that have already been used must be installed in the same place.
- Note the mounting orientation of the roller cam followers (1).
- Oil all roller cam followers (1).

36 – Install glow elements



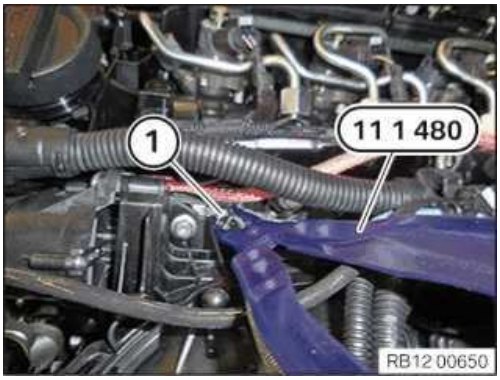
- Install glow elements (1) in cylinders 1, 2, 3 and 4.
- If fitted: Glow element (2) with the **combustion chamber pressure sensor** must be installed in cylinder **2**.



- Tighten the glow element with the special tool or conventional tools.

Glow elements to cylinder head

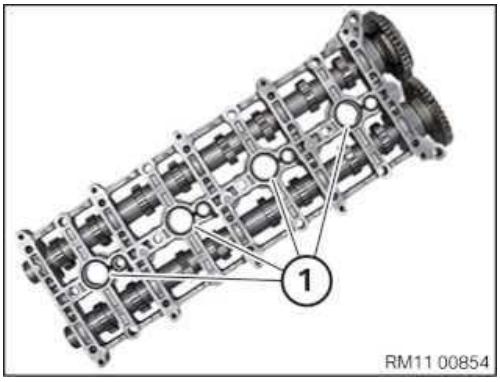
Glow element		Tightening torque	13 Nm



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

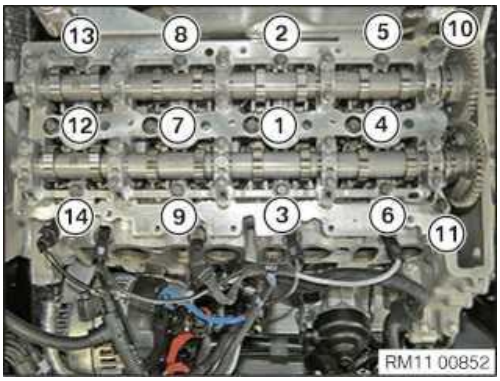
37 – Installing the camshaft support



- Renew gaskets (1).

  Parts: gaskets

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- Position the camshaft support including the camshafts.
- Tighten the screws in a sequence from (1) to (14) in several steps.

Camshaft carrier to cylinder head

M7x35		Tightening torque	13 Nm

38 – Adjusting the timing of the camshafts

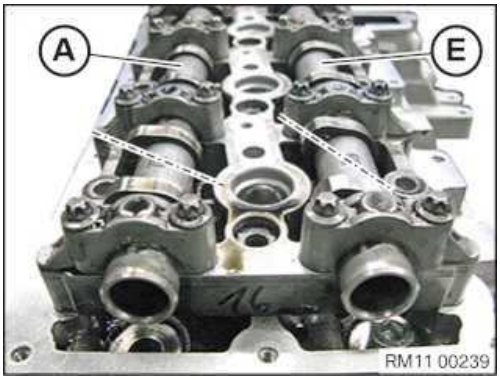


- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.



- Slide the special tool **2 288 380** completely into the bore hole of the oil sump.
- Use the special tool to block **2 288 380** the crankshaft in the TDC firing position at the first cylinder.



- The cam of the intake camshaft (E) at the first cylinder points up at an angle.
- The cam of the exhaust camshaft (A) at the first cylinder points outward at an angle.

▶ **Remove exhaust camshaft.**

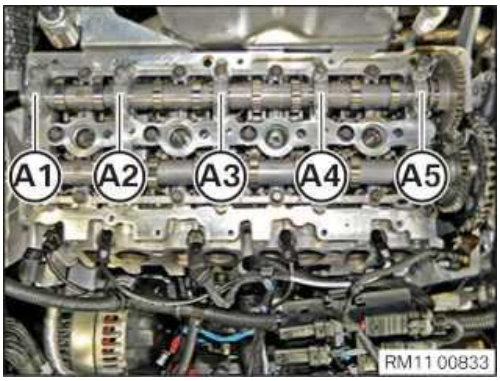
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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TECHNICAL INFORMATION

The camshaft is tensioned by the valve springs. Tighten or loosen each screw on the camshaft bearing caps one at a time in the specified sequence and by half a turn only. Repeat procedure.

- Loosen all screws of the exhaust camshaft bearing caps (A1) to (A5) from the outside to the inside, step by step in 1/2 turns.
- Remove exhaust camshaft in upward direction.
- Place all components on special tool **0 495 105 (11 4 480)** in a tidy and orderly fashion.

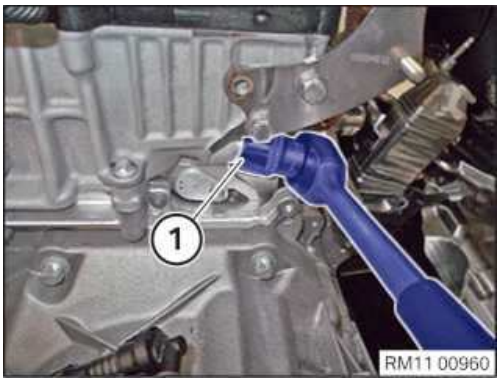
▸ **Remove chain tensioner piston**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

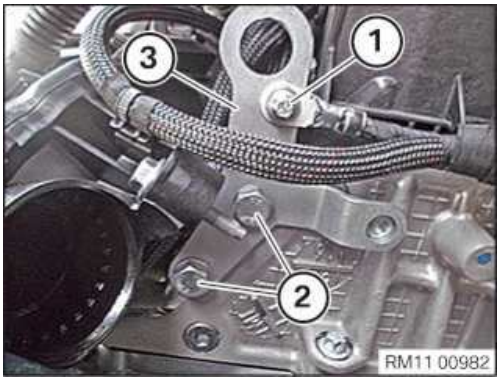


TECHNICAL INFORMATION

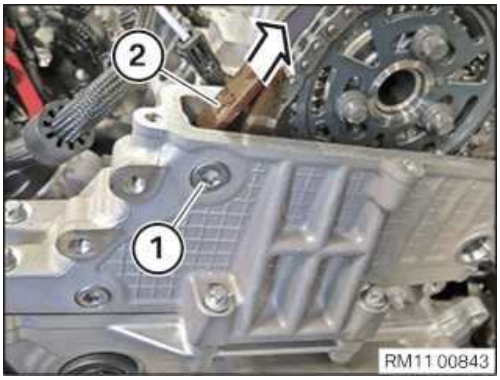
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

▸ **Remove the timing chain guide rail**



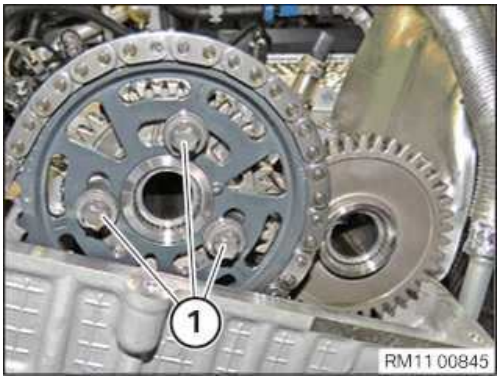
- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

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▶ **Removing the camshaft sprocket on the intake camshaft**



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

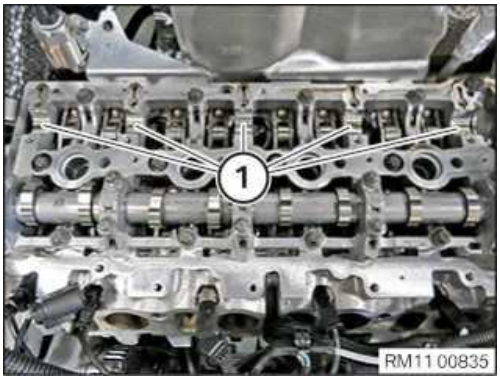
▶ **Install exhaust camshaft**

RISK OF DAMAGE

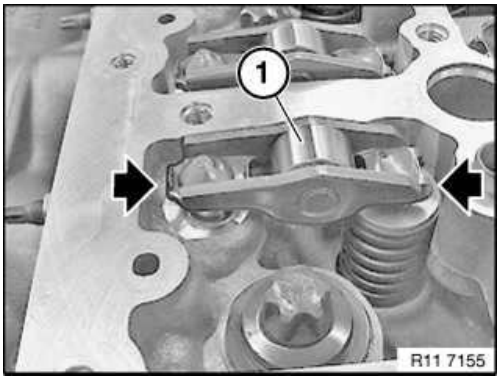
Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

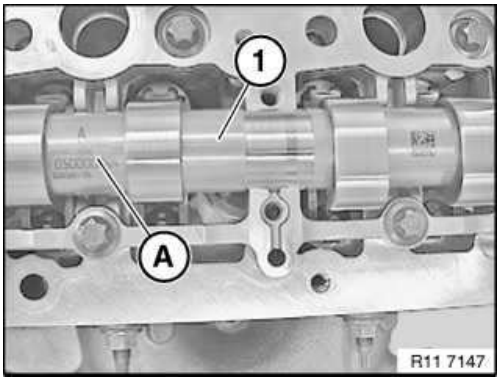
- Comply with the regulations for the installation and disassembly.
- Perform work with care.



- Oil all bearing positions (1).

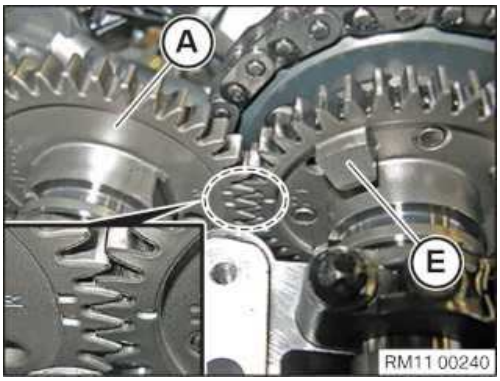


- Make sure the roller cam followers (1) have the correct mounting orientation.

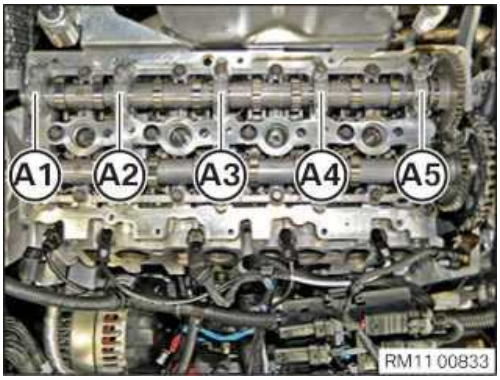


- Insert exhaust camshaft (1) so that the identification (A) points upwards.

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- Insert the exhaust camshaft (A) so that the marks on the camshafts (A) and (E) correspond in the highlighted area.
- Position the camshafts (A) and (E) accordingly.



- Tighten all exhaust camshaft bearing caps (A1) to (A5) from the inside to the outside by 1/2 a turn at a time.

Intake and exhaust camshaft in camshaft support

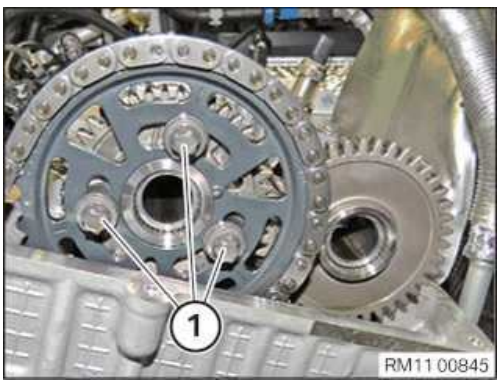
M6x31		Tightening torque	10 Nm



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

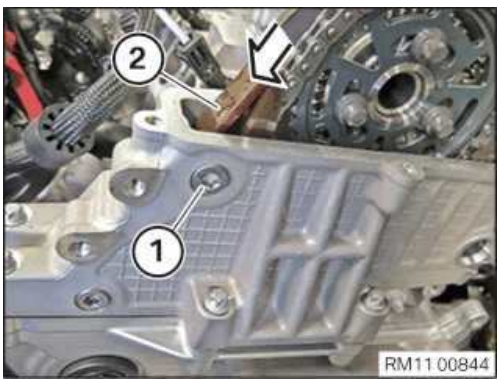
  Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

▶ **Installing the camshaft sprocket on the intake camshaft**



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

▶ **Install the timing chain guide rail**



- Position the guide rail (2) in the direction of the arrow.

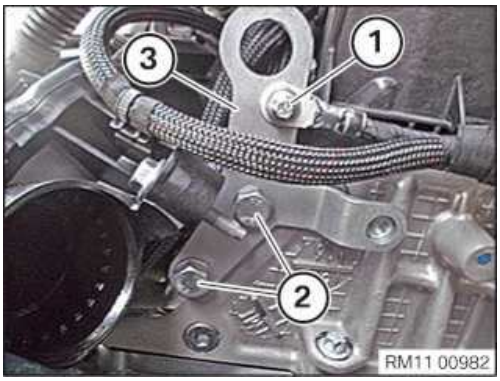
  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

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- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6		8 Nm

▸ **Installing the chain tensioner piston**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Renew sealing ring (1).

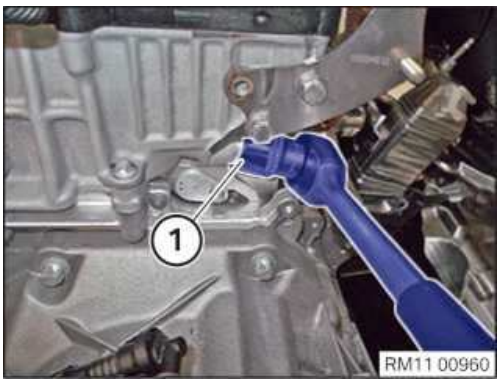
  Parts: Sealing ring



TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.



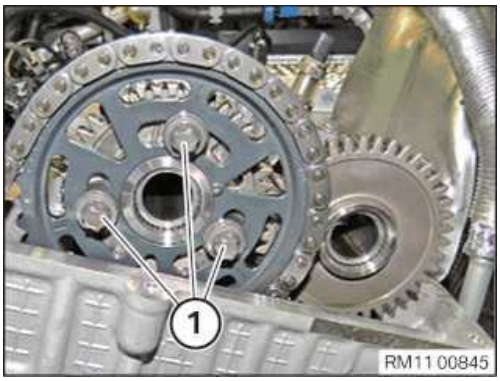
- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

▸ **Tightening the camshaft sprocket on the intake camshaft**

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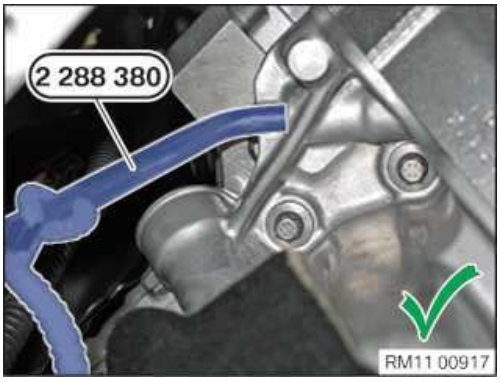


- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

39 – Removing the special tool to disconnect the crankshaft



- Remove special tool **2 288 380**.

40 – Removing the special tool to secure the exhaust camshaft



- Remove the special tool **0 496 112 (11 8 760)** to fix the exhaust camshaft.

41 – Checking camshaft timing



- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**

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RISK OF DAMAGE

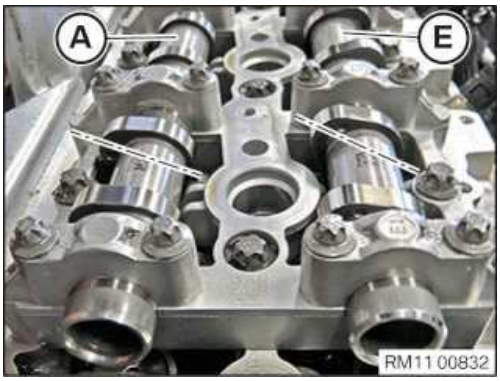
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

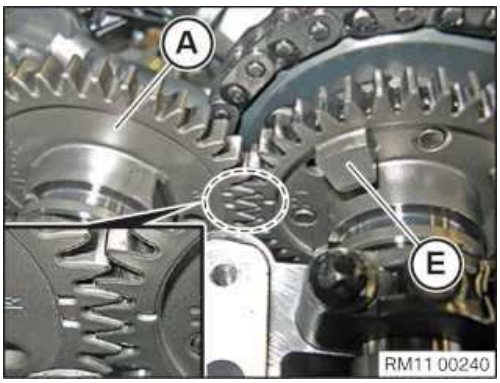
  Do **not** crank the engine in reverse.



- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

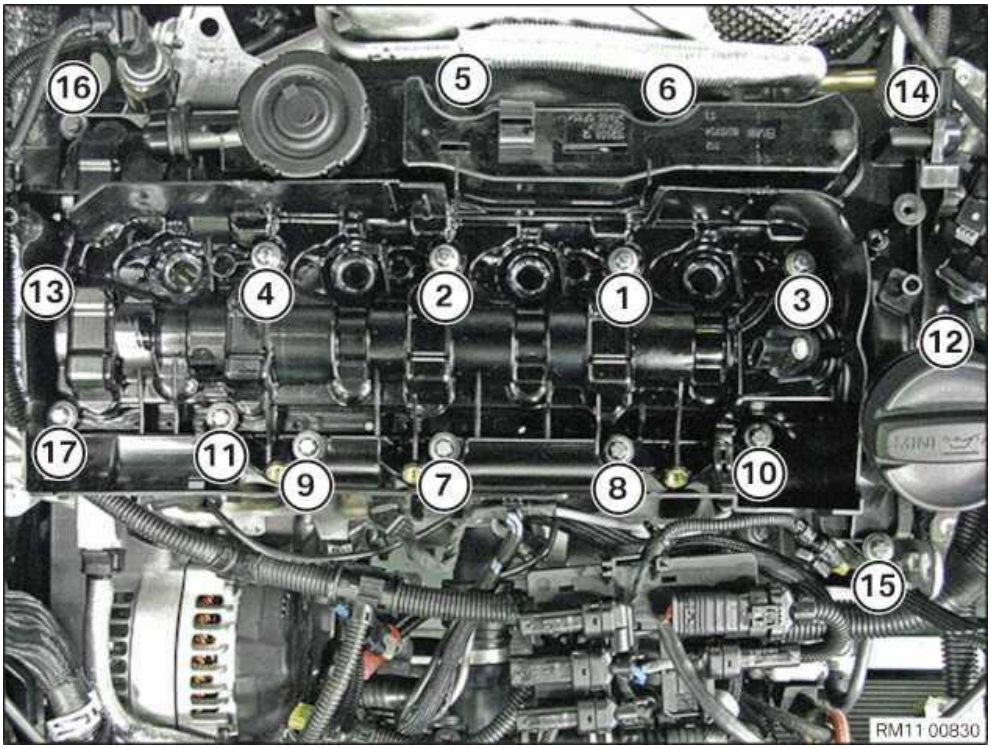
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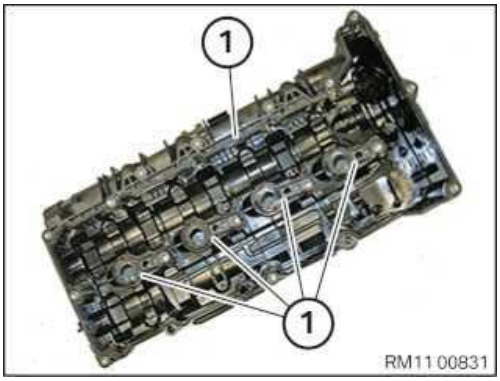
- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

42 – Installing cylinder head cover

Overview: Screw connection of the cylinder head cover



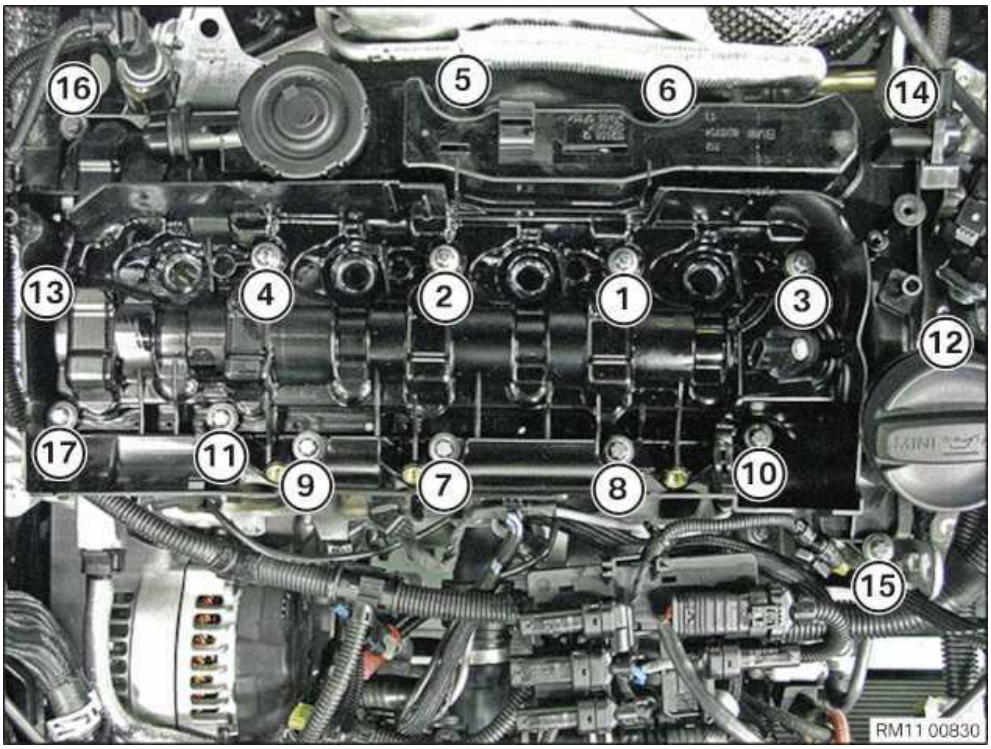
1 to 16 screws of the cylinder head cover.



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket

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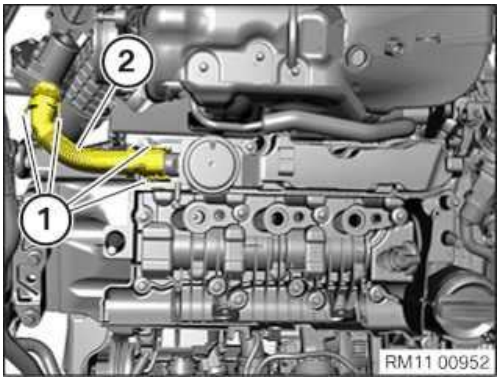


- Install cylinder head cover.
- Tighten screws in the order (1) to (17).

Cylinder head cover to cylinder head

M6		Tightening torque.	8, Nr

-



- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

43 – Installing injectors of injection system

▶ Cleaning the injector shafts

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

- Wear safety goggles.

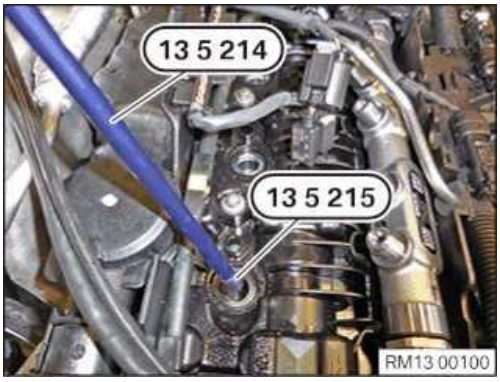
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RISK OF DAMAGE

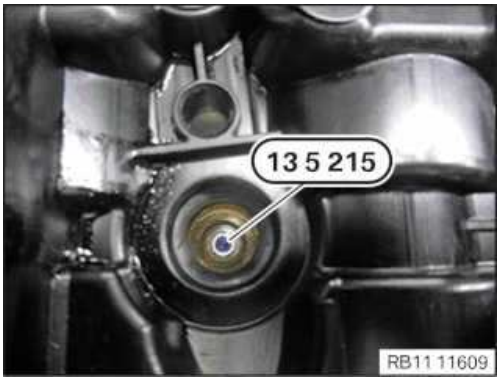
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.



- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.

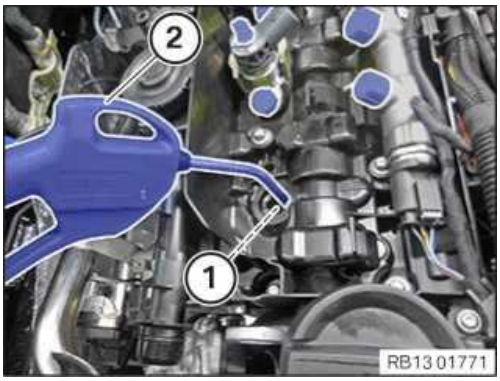


- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.

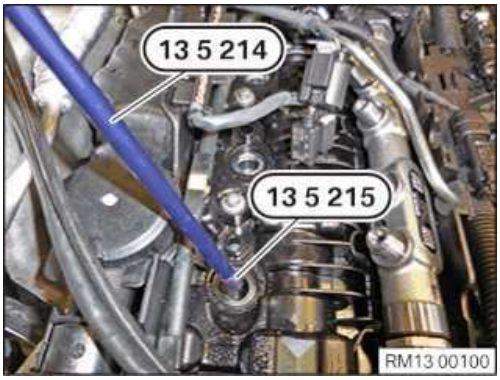


- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.

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- Blow out injector shaft (1) with air gun (2).



- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

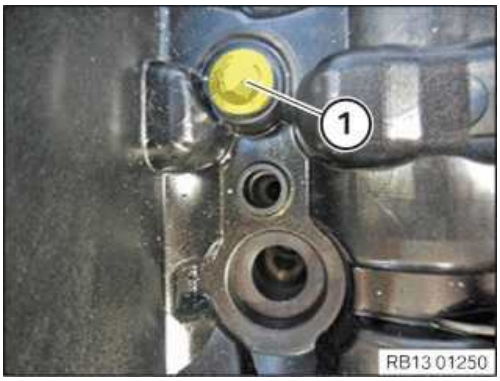
▸ **Check the placement of the clamping claw**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▸ **Prepare the injector for installation**

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

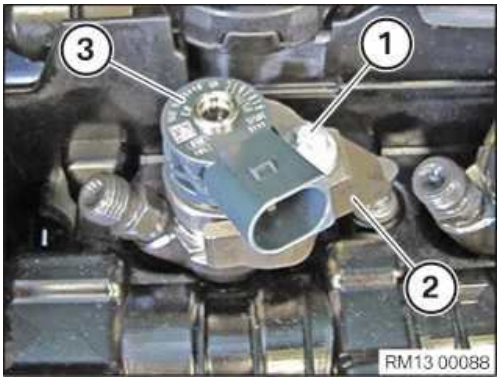


- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring
- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

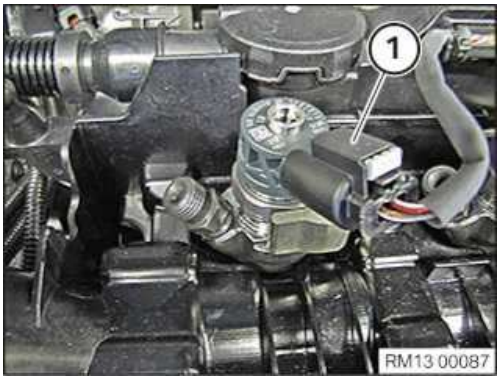
Injector lubricating grease	50 g, Can	83230441070



- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

▸ **Replacement: Perform injection quantity compensation**

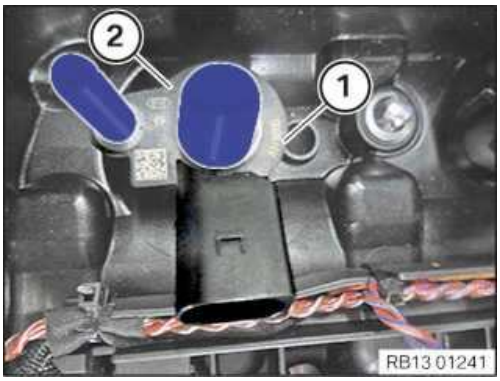
TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

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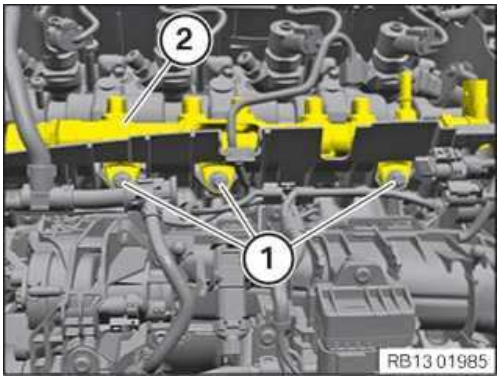


- Read off the adjustment value (1) on the new injector (2).



- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

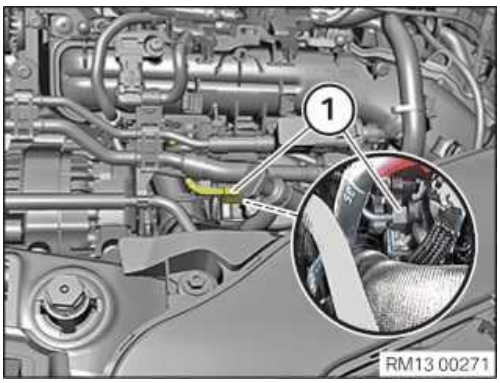
44 – Installing the rail



- Carefully insert and install the rail (2).
- Tighten the screws (1).

Rail on cylinder head cover

Torx screw M8x25		Tightening torque	19 Nm



TECHNICAL INFORMATION

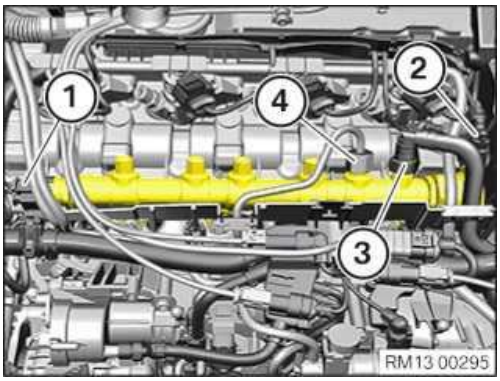
Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten union nut (1).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

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TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten union nut (4) with special tool .

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

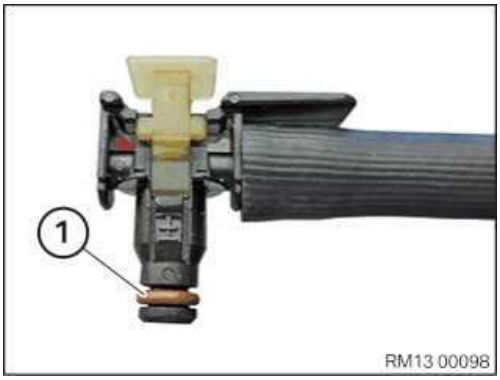
- Connect and lock the fuel line (3).

  Fuel line (3) must engage audibly.
- Connect connectors (2) and lock.

  The connector (2) must engage audibly.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

45 – Connect the leakage oil line on the injector



- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.



- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

46 – Installing high pressure lines between rail and injectors

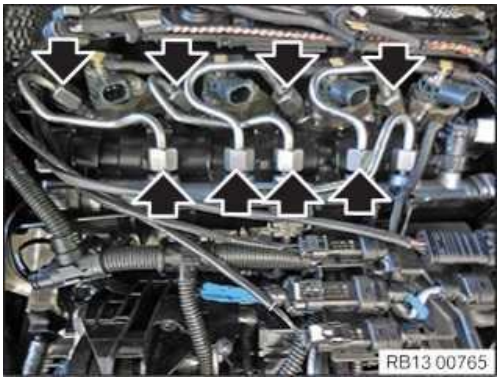
TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

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TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Remove special tool .
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

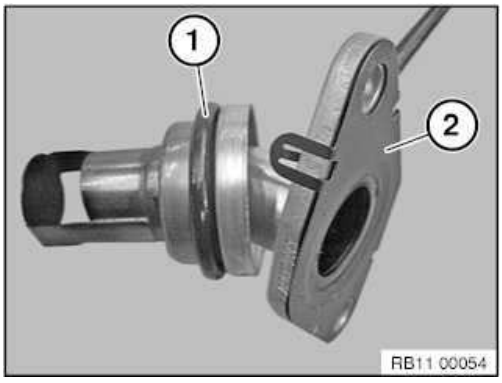
- Tighten the high pressure lines (arrows) with the special tool .

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

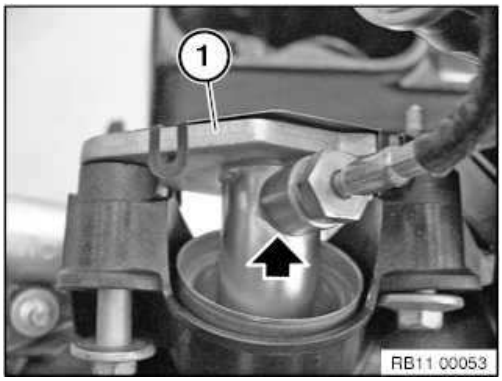
47 – Installing the intake plenum



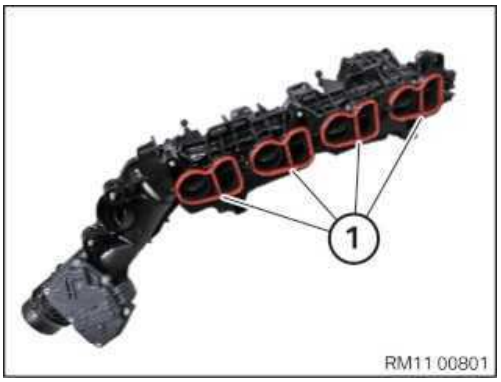
- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position the seal (2) and clip it in.



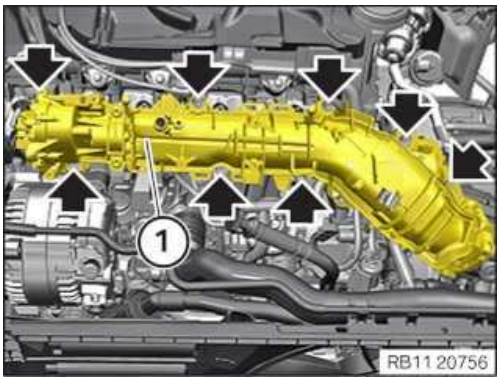
- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (1).

  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.

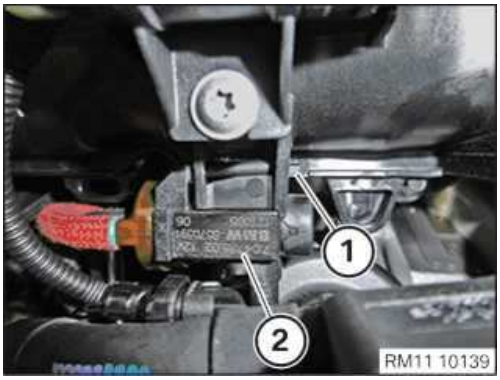
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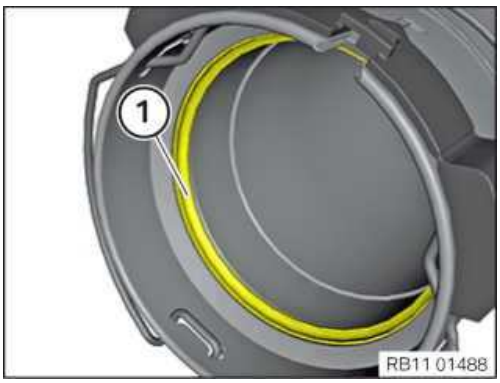
- Guide in and install intake (1) plenum.
- Tighten screws (arrows).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm

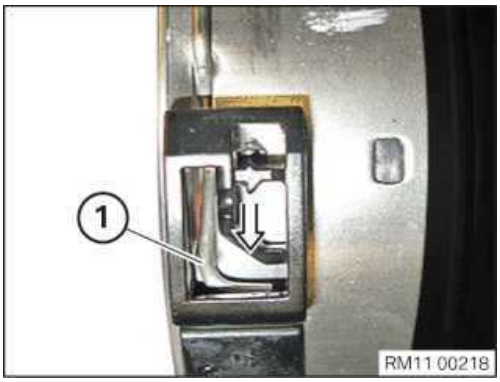


- Install the electric changeover valve (2) in the holder on the plenum from left to right.
- Lock (1) must engage audibly.

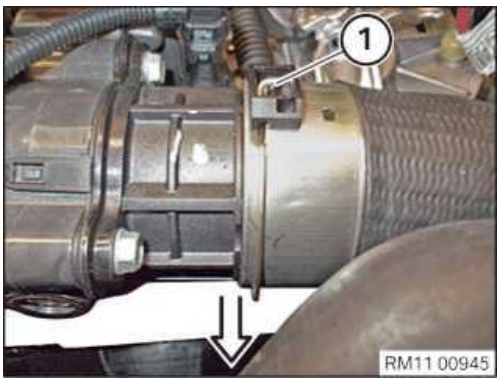


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring



- Engage the lock (1) on the bracket (arrow).



- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

48 – Remove the engine from the assembly stand

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CAUTION

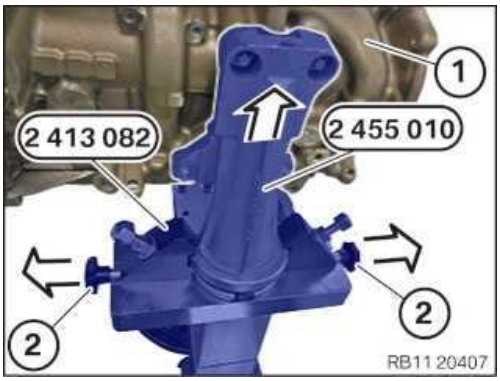
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



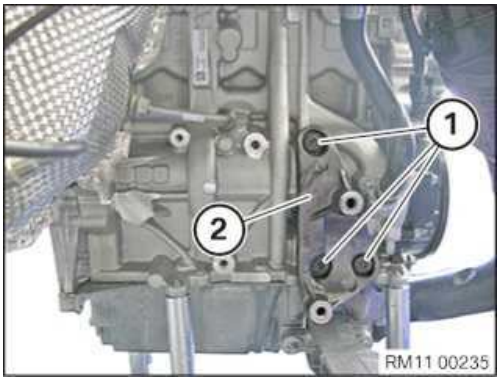
- Insert engine lifter with special tool and position engine (1).



- Unscrew the nuts on special tool .
- Detach the holder (2) in the direction of the arrow.
- Detach the engine (1) with special tool **2 455 010** out of the special tool in the direction of arrow.



- Remove conventional screws (arrows).
- Feed out the special tool **2 455 010** on the engine (1) and remove.



- Insert and install the holder (2).
- Tighten the screws (1).

Holder to crankcase

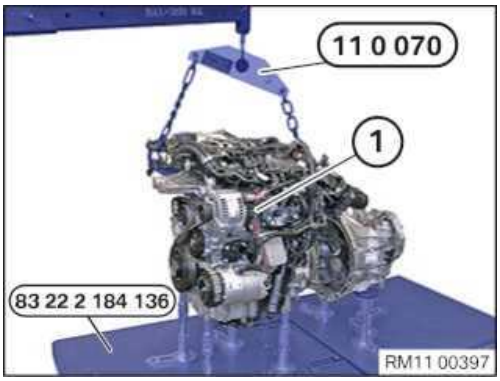
M10		Tightening torque	38 Nm

49 – Mount engine on the automatic transmission

Prerequisite

Engine has been removed.

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NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

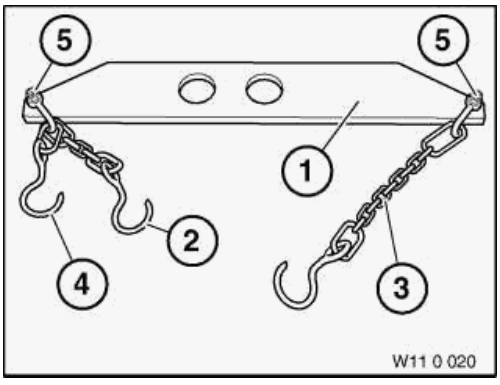
- Position the engine (1) on the lifting table **2 184 136** using the engine lifter and the special tool .
- Feed out engine lifter from engine (1) with special tool and push aside.



- Unscrew the bolts (1) of the special tool **2 459 012**.
- Feed out the special tool **2 459 012** at the cylinder head and remove.

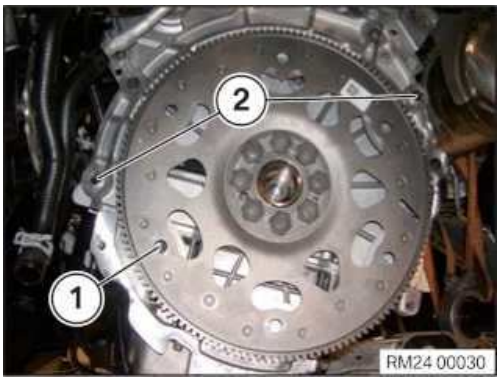


- Stage the workshop crane **2 220 718**.



- Stage the lifting gear .

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- The bore hole (1) of the flywheel must be accessible from the recess on the oil sump.
- Check for correct fit of fitting sleeves(2).



TECHNICAL INFORMATION

Conduct the following operation with the assistance of a second person.

- Twist torque converter until bore hole in torque converter is flush with bore hole of flywheel.
- Flange-mount and screw automatic transmission on the engine with an auxiliary person and the workshop crane **2 220 718** with the lifting gear .
- Tighten screws (arrows).

Transmission to engine

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

- Feed out workshop crane **2 220 718** with the lifting gear from the automatic transmission and push it aside.

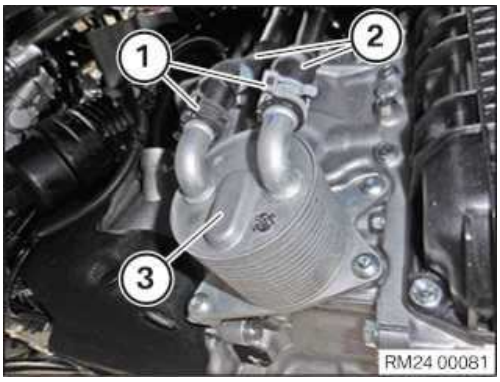


- Crank engine with special tool **0 493 380 (11 6 480)** at vibration damper in direction of rotation.
- Renew nuts (1).

  Parts: Nuts
- Tighten all 6 nuts (1) of the torque converter.

Torque converter to flywheel

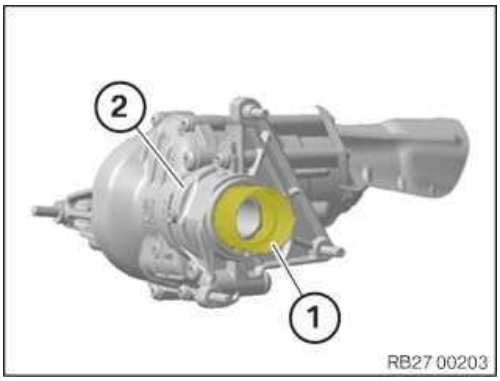
M10	Replace nuts. Remove any adhesive residue from the threads.	Tightening torque	56 Nm



- Slide coolant hoses (1) onto transmission oil cooler (3).
- Secure hose clamps (1).

50 – Install the transfer box (VTG)

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- If intermediate shaft (1) gets caught on transfer box (VTG) (2), renew intermediate shaft (1) and the radial shaft seals in the automatic or manual transmission.



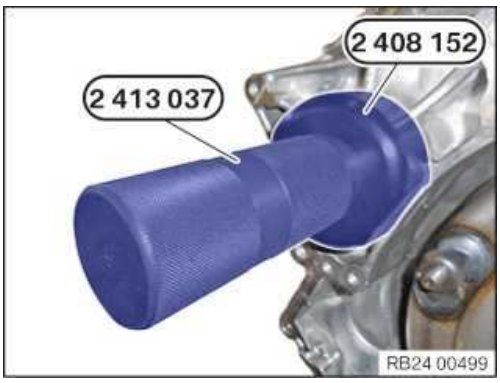
- Screw special tool **2 409 025** into the outer radial shaft seal.
- Turn the screw on the special tool **2 409 025** until the outer radial shaft seal has been pulled out.



- Insert special tool **2 411 739** into the inner radial shaft seal.

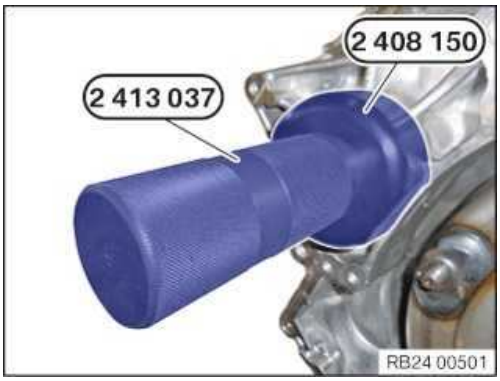


- Screw special tool **2 411 739** into the inner radial shaft seal.
- Turn the screw on the special tool **2 411 739** until the inner radial shaft seal has been pulled out.

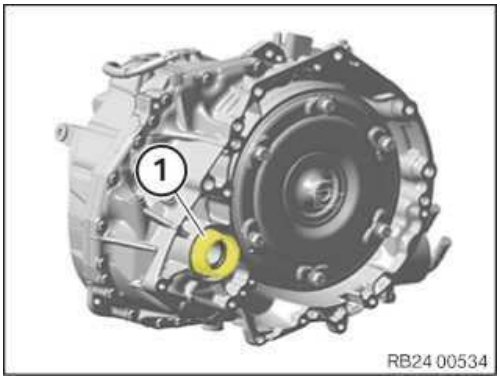


- Drive in the inner radial shaft seal using special tools **2 408 152** and **2 413 037** up to the limit position.

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- Drive in the outer radial shaft seal using special tools **2 413 037** and **2 408 150** up to the limit position.



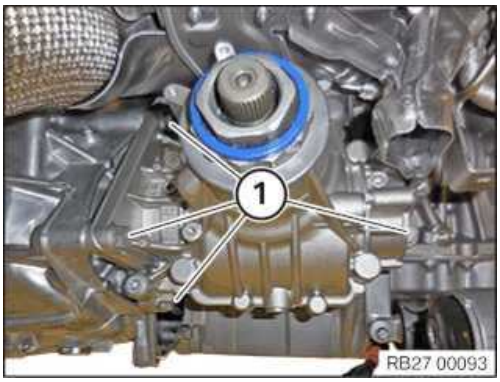
- If necessary, connect the new intermediate shaft (1) to the output flange of the automatic transmission or manual transmission.



- Coat the inside of the output flange (arrows) evenly with approx. 5 g of grease.

Expendable materials

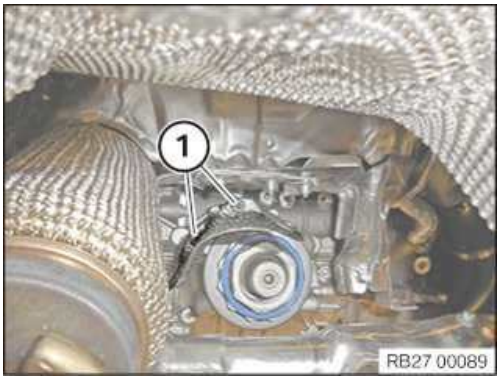
Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the transfer box (VTG).
- Tighten the screws (1).

Transfer box to transmission

M10		Tightening torque	56 Nm



- Install heat shield.
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Heat shield to transfer box

M6	Renew screws.	Tightening torque	6 Nm

▸ **Check the transfer box oil level**

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RISK OF DAMAGE

Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.



- Check transfer case oil level, correct:
- Open the oil filler plug (1).
- Check transfer box oil level.
- If necessary, top up transmission oil up to the lower edge of the oil filler plug opening (1).

Transmission oil

Technically suitable transfer box and electrical transmission oils	

Main group 27

- Tighten the oil filler plug (1).

Oil filler plug on transfer box (VTG)

M18x1.5		Tightening torque	35 Nm

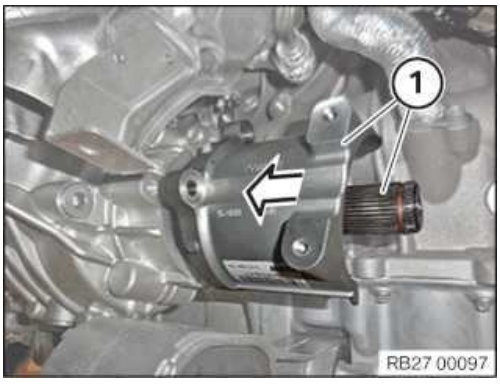
51 – Install the intermediate shaft with the support tube



- Coat gearing of the intermediate shaft uniformly with 5 g of grease.

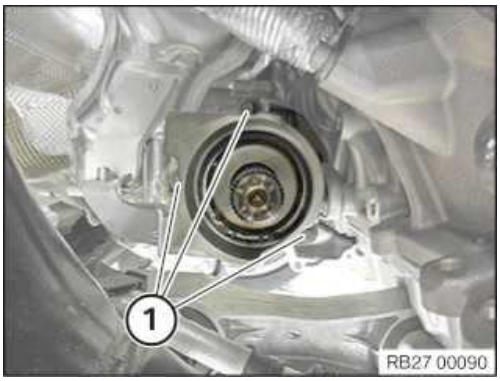
Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the intermediate shaft with support tube (1) in the transfer box.

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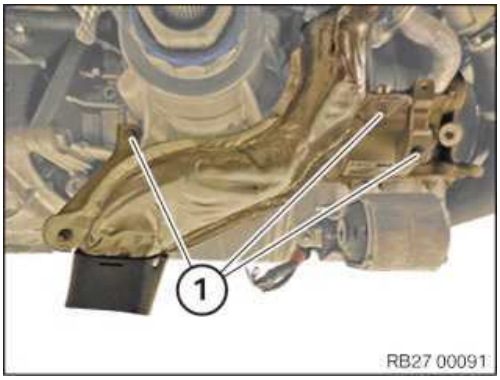
- Position screws (1).

Note: Check for correct screw length! Bolt M8x35 8.8

- Tighten the screws (1).

Intermediate shaft to transfer box

M8x35		Tightening torque	19 Nm



- If installed: Install air duct.
- Tighten the screws (1).

52 – Installing the high-pressure stage exhaust turbocharger

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to the surface.

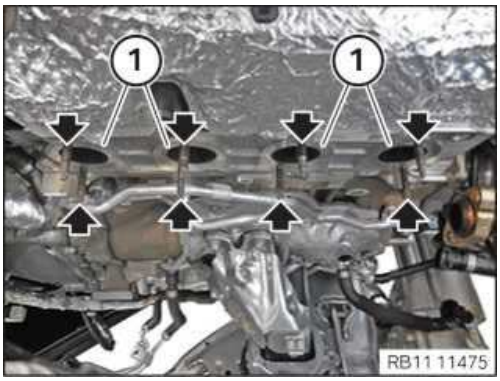
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

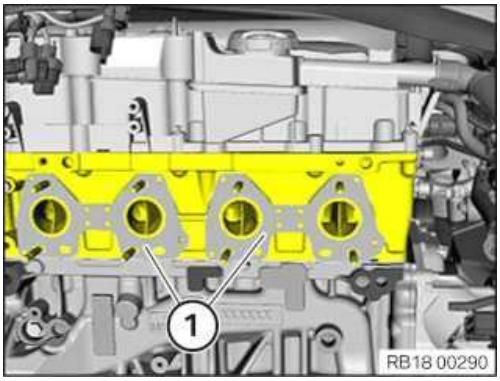
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- Clean the sealing surfaces (1) on the cylinder head using special tool **0 495 102 (11 4 470)**.
- Check the stud bolts (arrows) on the cylinder head for correct fit.

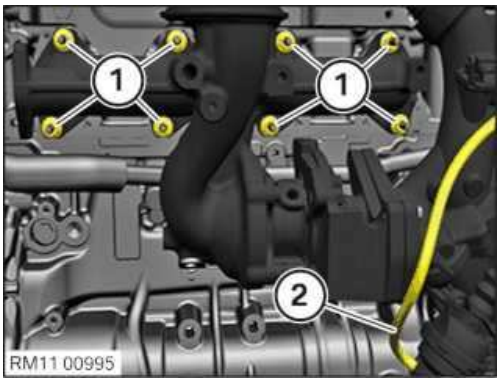


- Clean the sealing surfaces on the exhaust manifold using special tool **0 495 102 (11 4 470)**.



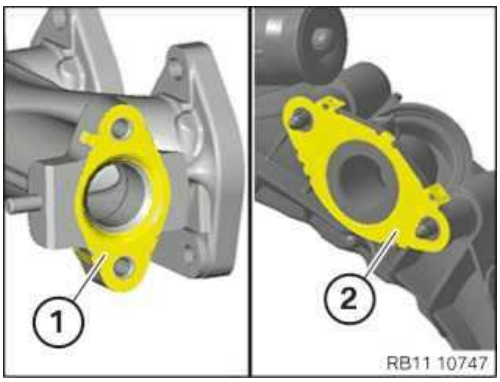
- Renew gasket (1).

  Parts: Gasket
- Install new gasket (1).



- Feed in and install the exhaust manifold and the high-pressure stage exhaust turbocharger.
- Tighten nuts (1).

  Parts: Nuts
- Connect vacuum hose(2).

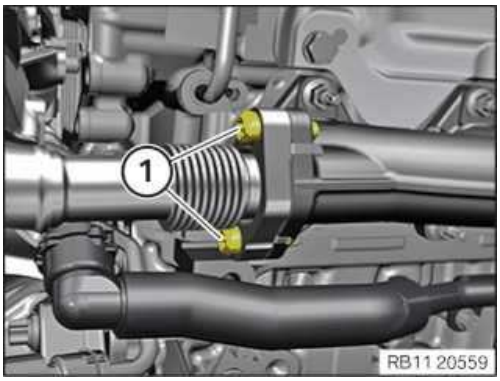


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket
- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket

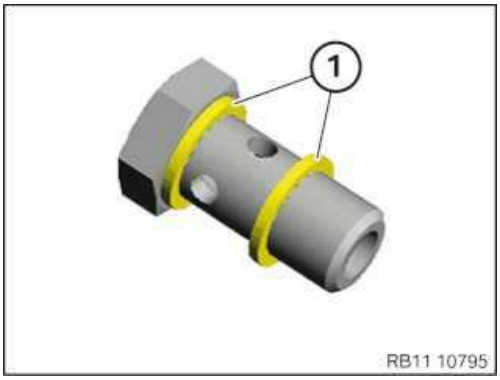
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- Tighten the screws (1).

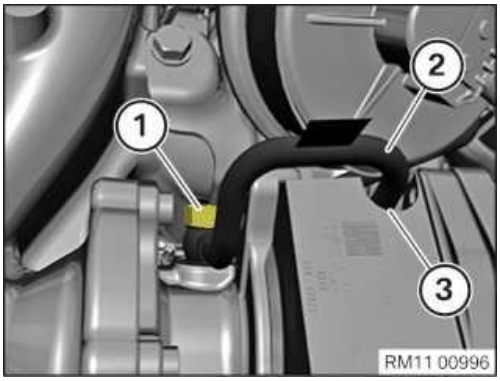
Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm



- Renew sealing rings (1) of banjo bolt.

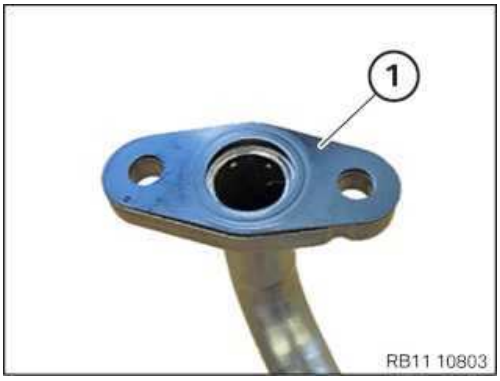
  Parts: Sealing ring



- Guide the oil feed line into the holder (3) and install it.
- Tighten down screw (1).



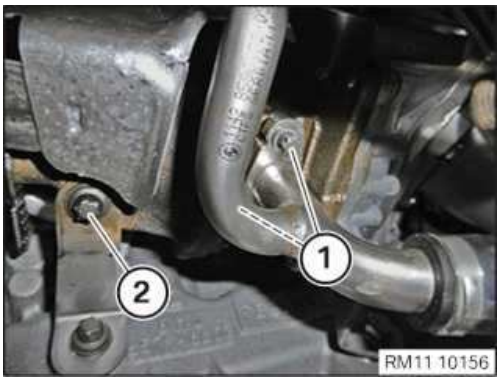
- Tighten bolt (1) from the right wheel arch.



- Renew seal (1) of oil return line.

  Parts: Gasket

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- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

53 – Installing the low-pressure stage turbocharger

RISK OF DAMAGE

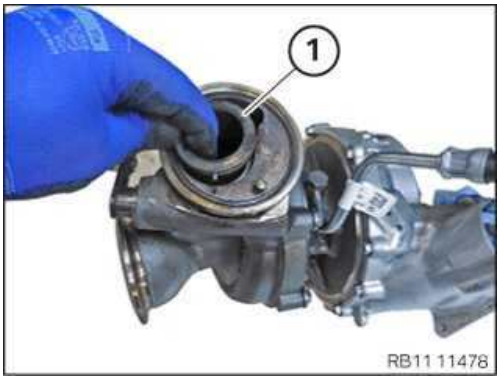
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.



- Check the spacer plug (1) for damage, renew if necessary.

  Parts: Spacer ring
- Insert and install the spacer ring (1).
- Position spacer ring (1) correctly.

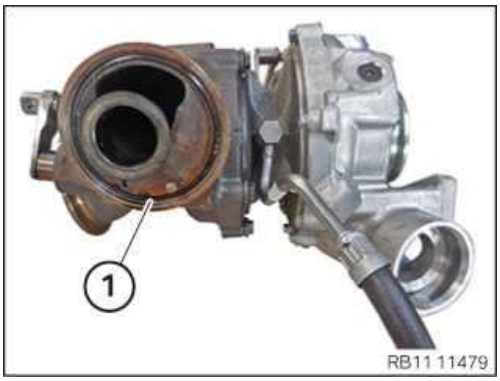


- Renew gasket (1).

  Parts: Gasket
- Position the seal (1).
- Renew the sleeve(2).

  Parts: Holding sleeve

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- Renew sealing ring (1).

  Parts: Sealing ring

- Affix the sealing rings on the exhaust turbocharger.

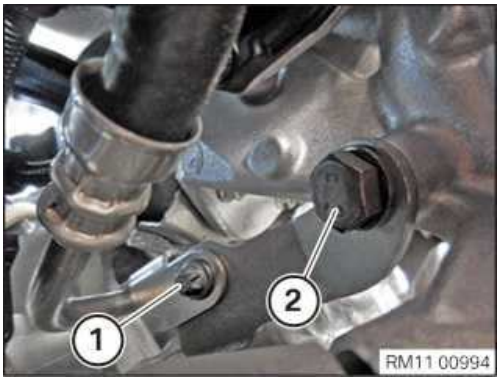


- Insert and install the low-pressure stage exhaust turbocharger on the exhaust manifold .
- Feed in and install V-band clamp .
- Tighten V-band clamp (2).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Screw in nut (1) with 2 **revolutions**.



- Tighten down screw (1).

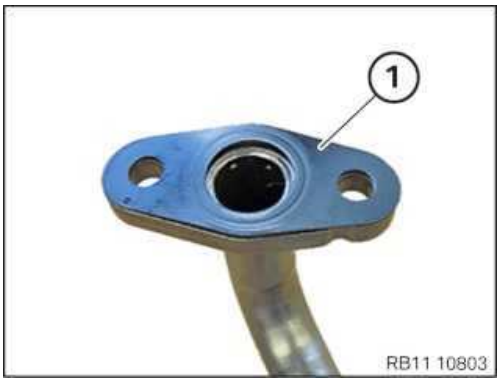
Oil feed line to bracket

Torx screw M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

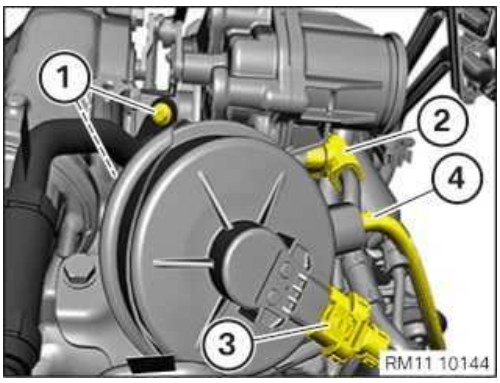
Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm



- Renew seal (1) on the oil return line.

  Parts: Gasket



- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

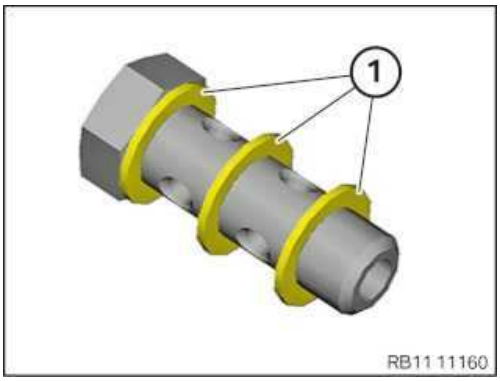
M6x12		Tightening torque	8 Nm

- Connect and lock connectors (2) and (3).

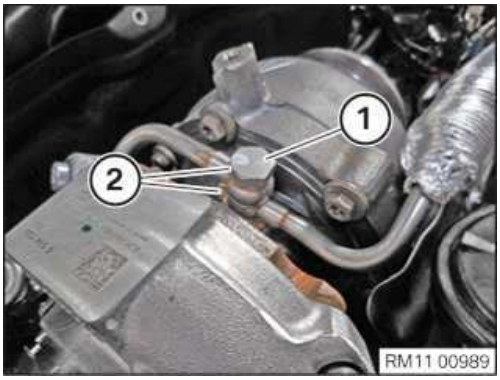
  The locks must engage audibly.

- Connect vacuum hose (4).

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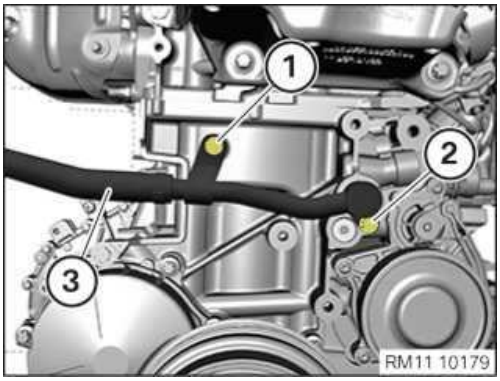


- Renew banjo bolt and sealing rings (1).
- **Parts:** Banjo bolt, sealing rings



- Install sealing rings (1).
- Tighten the banjo bolt (1).
- Ensure that the lines do not rest against the adjacent components.

54 – Attaching assemblies (on lifting table)

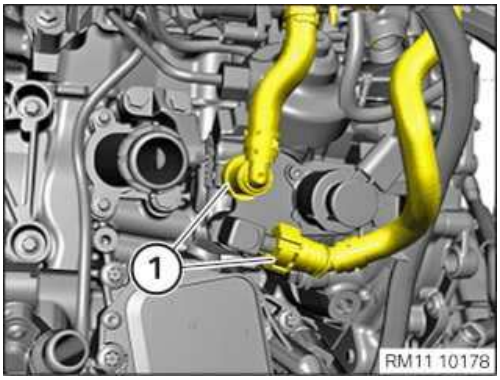


- Renew sealing ring of the coolant line (3).

  Parts: Sealing ring
- Coat the sealing ring and install the coolant line (3) .
- Tighten down screws (1) and (2).

Standard screw connection M6

M6		8 Nm



- Connect and lock fuel lines (1).

  The fuel lines (1) must audibly engage.

▸ **Installing the exhaust-gas recirculation cooler**

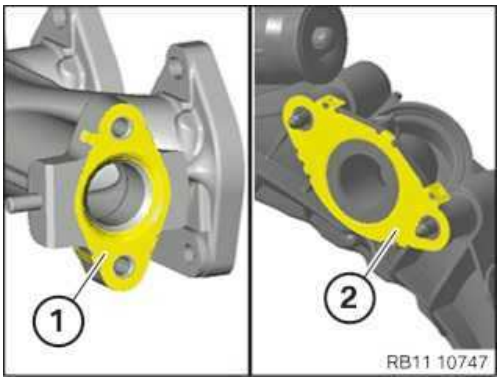
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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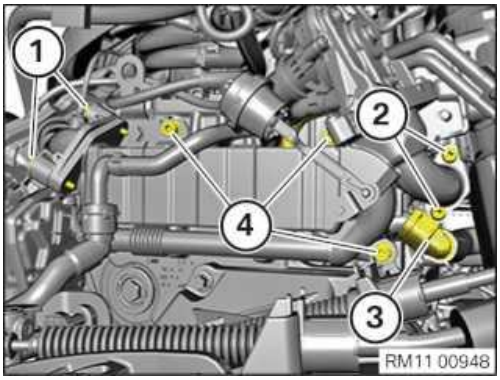


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket



- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts

- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

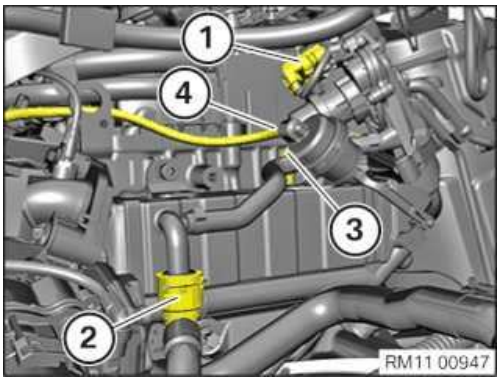
  The coolant hose (3) must audibly engage.

- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm

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TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

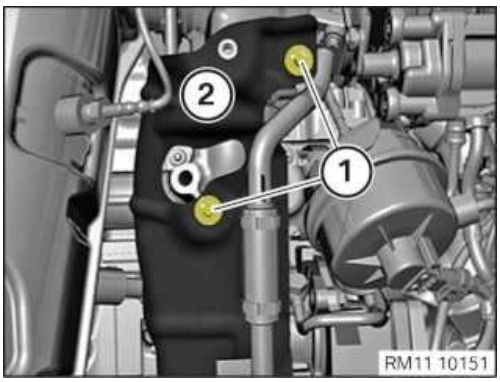
▶ **Installing heat shield on exhaust turbocharger at bottom**

WARNING

Hot surfaces.

Risk of burning!

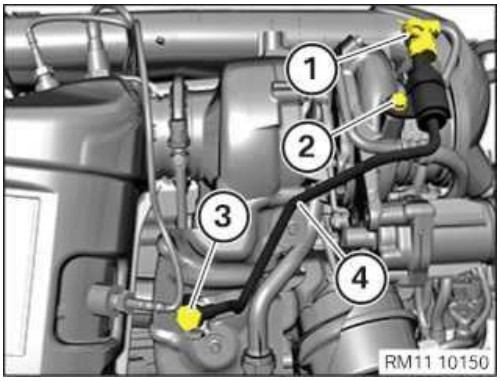
- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (2).
- Tighten the bolts (1) on the heat shield .

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm



- Position the exhaust gas pressure pipe (4).
- Hand-tighten the bolt (2).
- Renew sealing rings on the banjo bolt (3).

  Parts: Sealing ring
- Tighten the banjo bolt (3).

Banjo bolt for exhaust pressure pipe to exhaust manifold

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

- Tighten down screw (2).

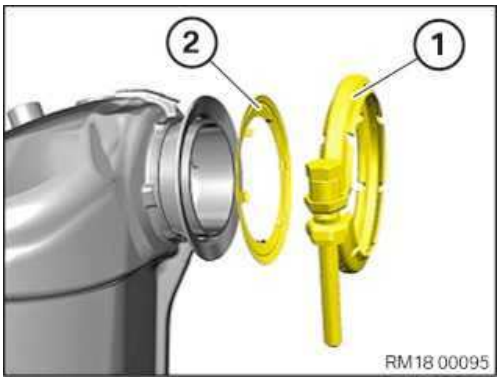
Standard screw connection M6

M6		8 Nm

- Connect connectors (1) and lock.

  Lock must audibly engage.

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CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

- Renew the V-clip (1).

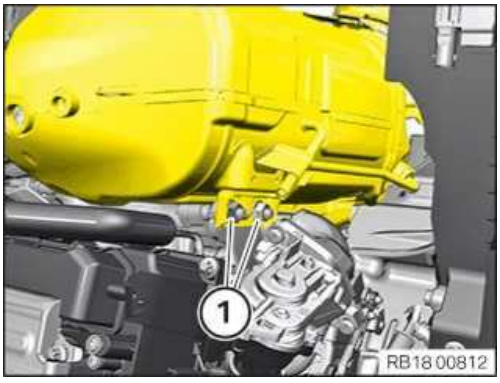
  Parts: V-band clamp

- Renew the gasket (2).

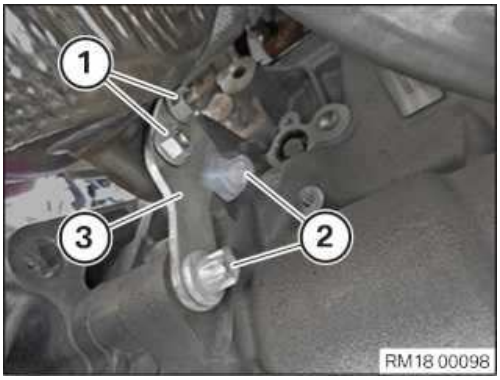
  Parts: Gasket



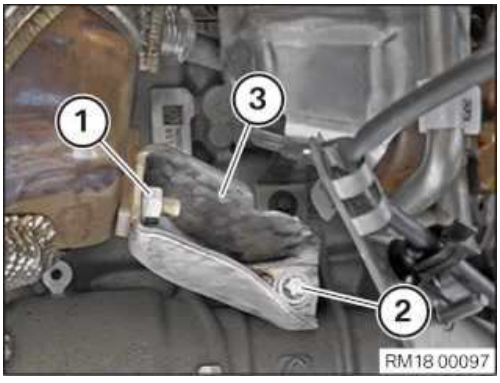
- Carefully insert and install the diesel particulate filter .
- Feed in and install V-band clamp (1).
- Make sure that the seal between the diesel particulate filter and the exhaust turbocharger is installed correctly.
- Align the diesel particulate filter on the exhaust turbocharger.
- Position V-clip (1).
- Hand-tighten the V-clip (1).



- Tighten nuts (1) by hand.

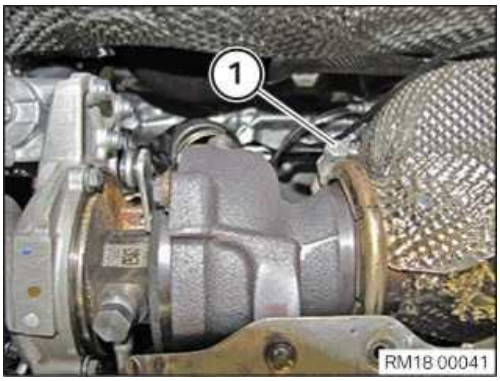


- Install holder (3).
- Hand-tighten the bolts (2).
- Tighten nuts (1) by hand.



- Install holder (3).
- Tighten the nut (1) hand-tight.
- Hand-tighten the bolt (2).

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- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

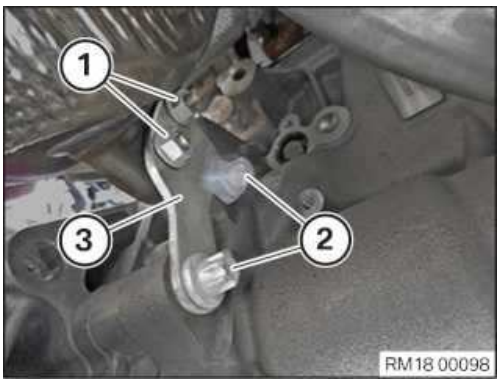
V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm



- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screws (2).

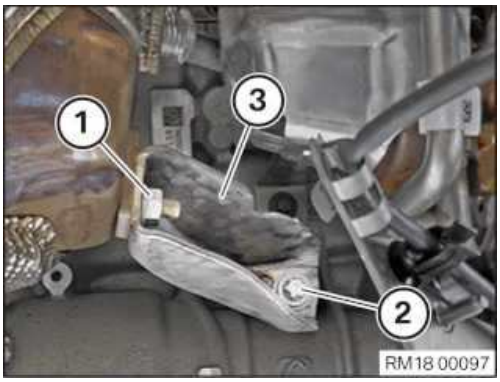
Diesel particulate filter holder to gearbox

M12x75		Tightening torque	66 Nm

- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screw (2).

Diesel particulate filter bracket to crankcase

M10x35		Tightening torque	38 Nm

- Tighten nut (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Remove fitting aid (1) for the flexible tube.

▸ **Install the heat shield on the exhaust turbocharger**

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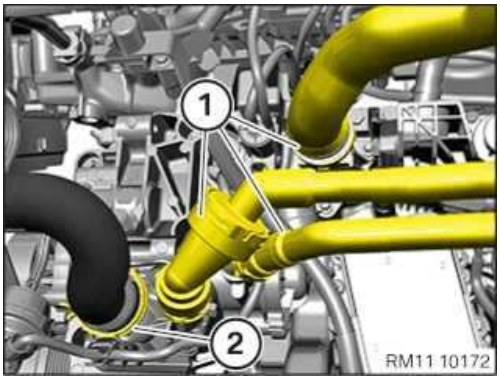


- Feed in and install the heat shield (2).
- Tighten the screws (1) at the top and bottom of the heat shield.

Heat shield for exhaust turbocharger

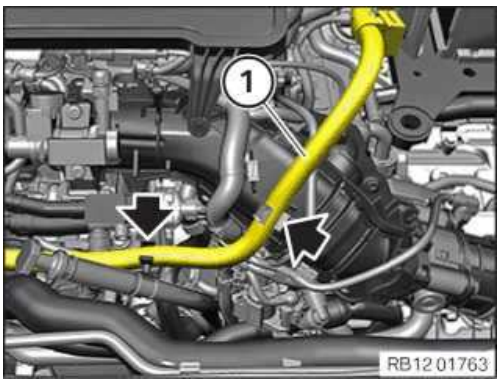
Torx screw BM 6x12		Tightening torque	10 Nm

- Fasten the cable at the clips .



- Install the coolant hose and secure with the clamp (2) .
- Connect and lock the coolant lines (1).

  The coolant lines (1) must engage audibly.



CAUTION

Improper routing of the positive battery cable.

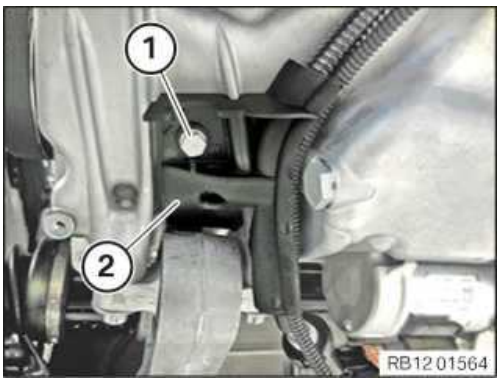
Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

- Insert the positive battery cable (1) into the clamps (arrows).



- Feed in and install positive battery cable at the clamps (1).



- Insert and install the holder (2).
- Tighten down screw (1).

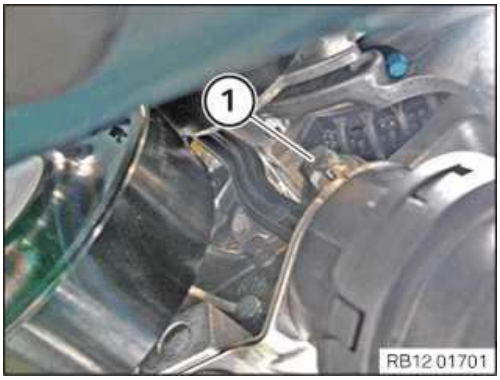
Bracket to oil sump

M6		Tightening torque	8 Nm

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- Insert and install alternator (1) along with the screw (2) on the bottom of the alternator through the slot on the support.



- Tighten the screw (1) below on the alternator.

Alternator to component carrier

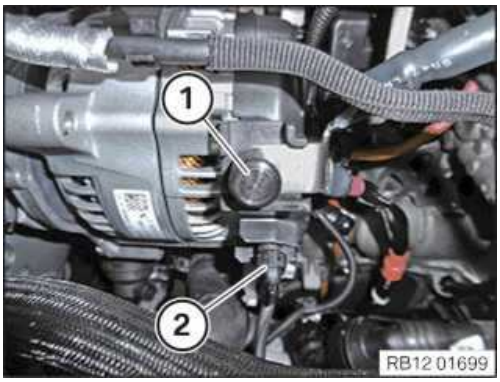
M10x75 / M10x125		Tightening torque	38 Nm



- Tighten the bolt (1) on top on the alternator.

Alternator to component carrier

M10x75 / M10x125		Tightening torque	38 Nm

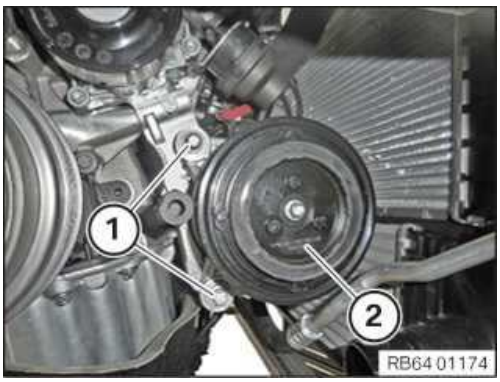


- Mount positive battery cable to the alternator.
- Tighten nut.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

- Mount the cover (1).
- Connect the connector (2) to the alternator and lock audibly.



- Install air conditioning compressor (2) and position it correctly.
- Tighten the screws (1).

Air conditioning compressor in component carrier

M10		Tightening torque	38 Nm

▸ **Installing the drive belt for alternator**

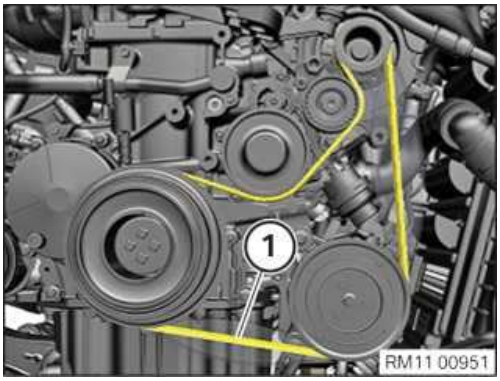
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TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

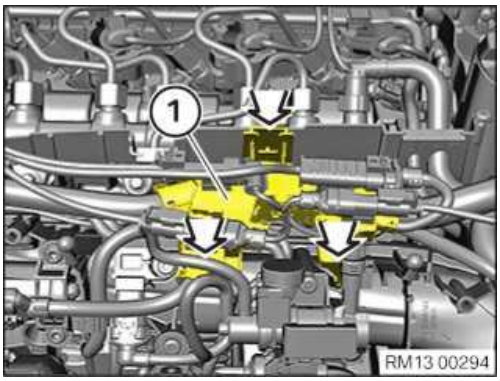


- Feed in the drive belt for the alternator (1) and install it.

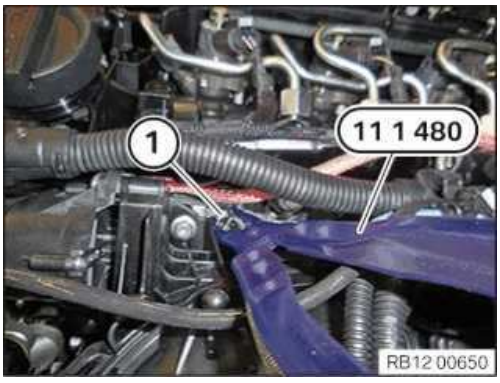


- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool **0 496 268 (11 0 390)** out of the belt tensioner and remove it.

▶ **Installing the cable clip for the intake plenum**



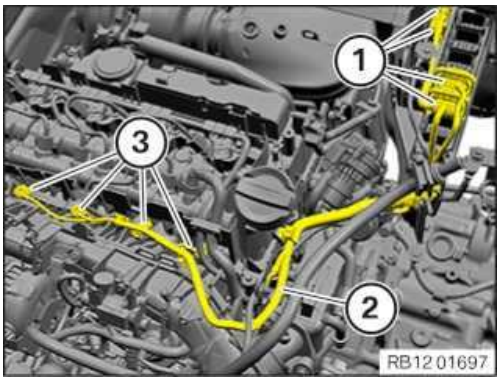
- Insert and install the cable clip (1) in the direction of the arrow.
- Make sure the cable clip (1) is fitted correctly.



- Connect and lock the connector (1) on the glow elements.

  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.

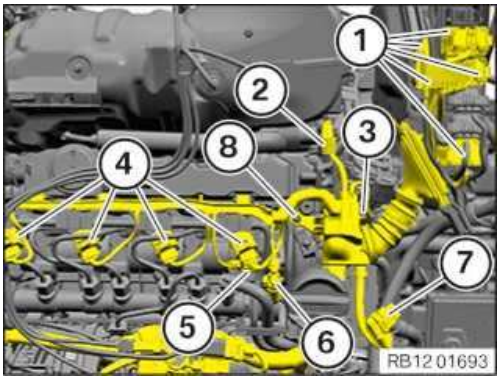
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- Lay vehicle wiring harness and fasten with clamps.
- Route all connectors (1) to the integrated supply module (PDM) and to the DME control unit.
- Connect all connectors (3) to the glow elements and engage them audibly.
- Mount ground strap and tighten screw (2).

Ground cable to cylinder head

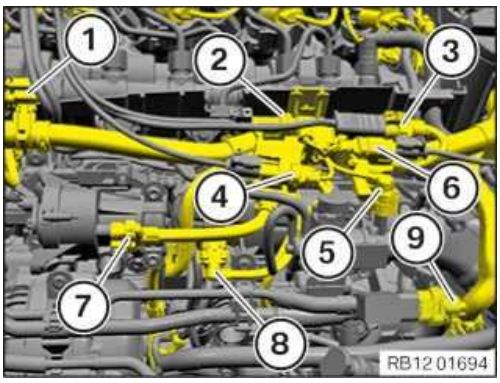
M6x12		Tightening torque	8 Nm



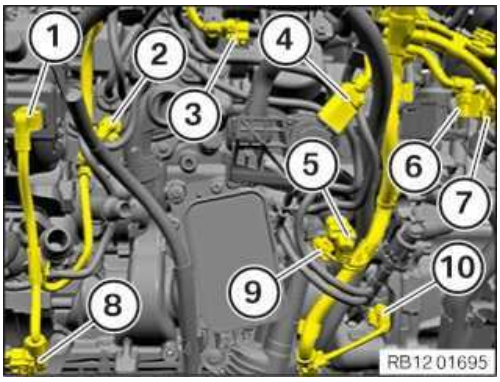
- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the integrated supply module (PDM) and to the DME control unit.
- Attach connector (2) to the differential pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust-gas recirculation valve and lock audibly.
- Attach connector (4) to the injectors and lock it audibly.
- Attach connector (5) to the camshaft sensor and lock it audibly.
- Attach connector (6) to the fuel pressure regulator and lock it audibly.
- Connect and audibly lock the connector (7) to the hot film air mass meter.
- Tighten down screw (8).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

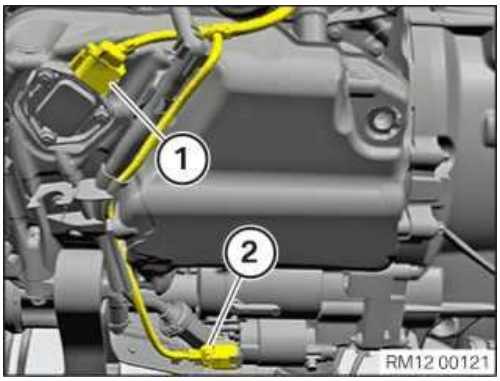


- Connect the connector (1) to the rail pressure sensor and lock it audibly.
- Attach connector (2) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (3) to the front oxygen sensor and lock audibly.
- Attach connector (4) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Connect the connector (5) to the electric changeover valve and lock audibly.
- Attach connector (6) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (7) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (8) to the charging pressure sensor and lock it audibly.
- Attach connector (9) to the fuel pressure and temperature sensor and lock it audibly.

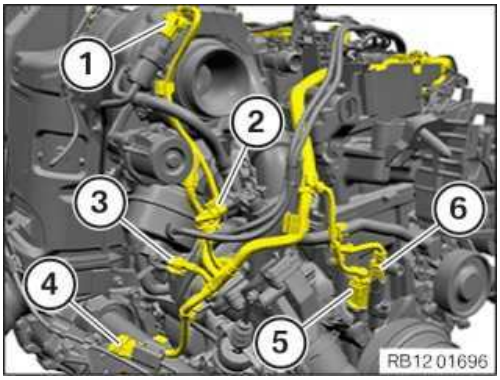


- Connect the connector (1) to the alternator and lock audibly.
- Connect the connector (2) to the electric changeover valve and lock audibly.
- Connect the connector (3) to the electric changeover valve and lock audibly.
- Connect the connector (4) to the high pressure pump and lock audibly.
- Connect the connector (5) to the oil pressure sensor and lock it audibly.
- Attach connector (6) to the throttle bodies and lock it audibly.
- Attach connector (7) to the intake air temperature sensor and lock it audibly.
- Connect the connector (8) to the air conditioning compressor and lock audibly.
- Connect the connector (9) to the solenoid valve and lock audibly.
- Connect the connector (10) to the crankshaft sensor and lock it audibly.

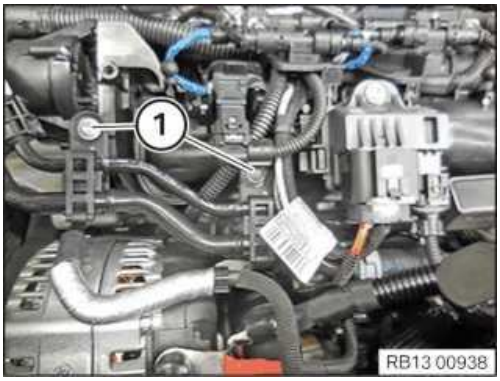
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- Connect the connector (1) to the oil-level sensor and lock it audibly.
- Connect connector (2) to the starter motor and lock audibly.



- Attach connector (1) to the exhaust turbocharger and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust gas pressure sensor and lock it audibly.
- Connect the connector (4) to the monitoring oxygen sensor and lock audibly.
- Attach connector (5) to the oil pressure switch and lock it audibly.
- Attach connector (6) to the switching valve and lock it audibly.

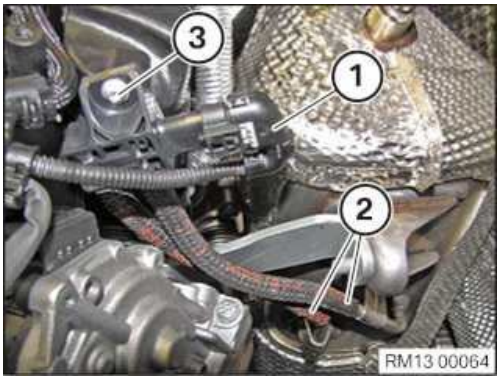


- Position the fuel line.
- Tighten the screws (1).

Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

55 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

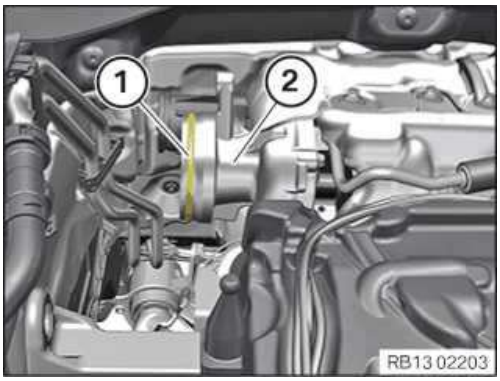
Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

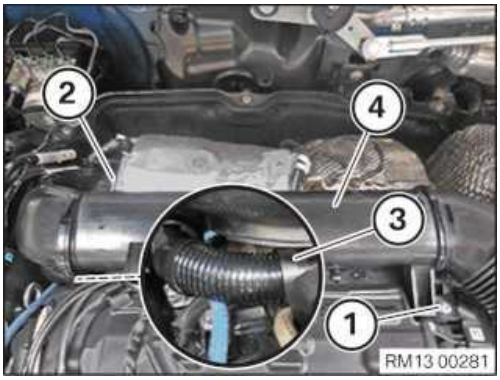
  The connector (1) must engage audibly.

56 – Installing clean air pipe

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- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.



- Feed in clean air pipe and install.
- Connect clean air pipe to the exhaust turbocharger and lock audibly in the clamps (2).
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Connect ventilation line (3) to the cylinder head cover and lock audibly.

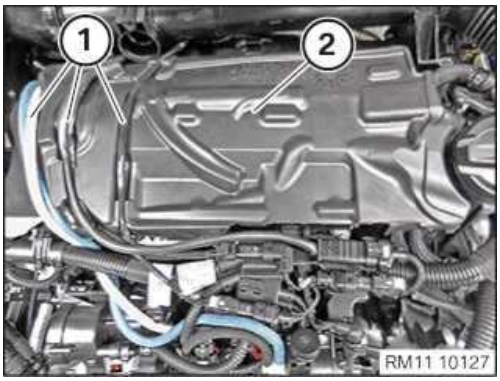


- Mount clean air pipe onto the intake filter housing.
- Tighten clamp (1) on the clean air pipe.

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

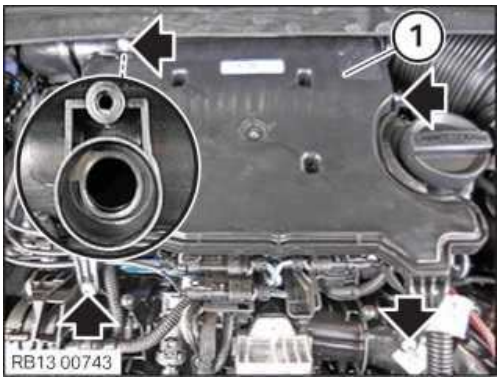
57 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the vehicle wiring harness (1) in the brackets.

58 – Install resonator

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- Insert and install the resonator (1).
- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

59 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Check for correct installation of all rubber mounts in the acoustic cover (1).



- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

60 – Install engine

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- See additional information.

Additional Information

Overview of Tightening Torques

Special tool to cylinder head — Used in step 12

M8		Tightening torque	21,5 Nm

Special tool 2 455 010 to crankcase — Used in step 13

M10x30		Tightening torque	38 Nm

Special tool 11 8 930 to special tool 00 2 320 — Used in step 13

M14x35		Tightening torque	160 Nm

Hydraulic chain tensioner to crankcase — Used in step 31

M6x22		Tightening torque	9 Nm

Rear timing case cover to crankcase — Used in step 32

M6	Renew screws.	Jointing torque	8 Nm
		Angle of rotation	90 °

SCR coolant lines to crankcase end cover — Used in step 32

Hexagon screw M6x16		Tightening torque	8 Nm

Cylinder head to crankcase — Used in step 32

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

Cylinder head bolt to timing case cover — Used in step 32

M8x40		Tightening torque	19 Nm

Oil sump to crankcase — Used in step 32

M8x30		Tightening torque	24 Nm
M8x110		Tightening torque	24 Nm

Transmission to oil sump — Used in step 32

M8		Tightening torque	19 Nm

Guide tube for oil dipstick on engine — Used in step 32

M8x16		Tightening torque	19 Nm

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Flywheel to crankshaft

Used in step 33

M12x1.5	Renew screws.	Tightening torque	120 Nm

Glow elements to cylinder head

Used in step 36

Glow element		Tightening torque	13 Nm

Camshaft carrier to cylinder head

Used in step 37

M7x35		Tightening torque	13 Nm

Intake and exhaust camshaft in camshaft support

Used in step 38

M6x31		Tightening torque	10 Nm

Bearing journal to cylinder head

Used in step 38

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8

Used in step 38

M8		Tightening torque	19 Nm

Standard screw connection M6

Used in step 38 54

M6			8 Nm

Chain tensioner piston to cylinder head

Used in step 38

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft

Used in step 38

M7x17.			17 Nm

Cylinder head cover to cylinder head

Used in step 42

M6		Tightening torque.	8,5 Nm

Clamping claw facing to cylinder head cover

Used in step 43

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 43

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

Rail on cylinder head cover

Used in step 44

Torx screw M8x25		Tightening torque	19 Nm

High pressure line between high pressure pump and rail

Used in step 44

High-pressure pipe		Tightening torque	28 Nm

High pressure lines between injector and rail

Used in step 46

High pressure lines		Tightening torque	28 Nm

Intake plenum to cylinder head

Used in step 47

M6		Tightening torque	11 Nm

Holder to crankcase

Used in step 48

M10		Tightening torque	38 Nm

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Transmission to engine

Used in step 49

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

Torque converter to flywheel

Used in step 49

M10	Replace nuts. Remove any adhesive residue from the threads.	Tightening torque	56 Nm

Transfer box to transmission

Used in step 50

M10		Tightening torque	56 Nm

Heat shield to transfer box

Used in step 50

M6	Renew screws.	Tightening torque	6 Nm

Oil filler plug on transfer box (VTG)

Used in step 50

M18x1.5		Tightening torque	35 Nm

Intermediate shaft to transfer box

Used in step 51

M8x35		Tightening torque	19 Nm

Exhaust-gas recirculation cooler to exhaust manifold

Used in step 52 54

M8x28	Replace screws	Tightening torque	32 Nm

Oil return line to turbocharger

Used in step 52 53

M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase

Used in step 52

M8x16		Tightening torque	22 Nm

Exhaust turbocharger to exhaust manifold

Used in step 53

V-band clamp		Tightening torque	19 Nm

Oil feed line to bracket

Used in step 53

Torx screw M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase

Used in step 53

M8x16		Tightening torque	22 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 54

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler

Used in step 54

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 54

M8x20		Tightening torque	19 Nm

Heat shield for exhaust turbocharger

Used in step 54

Torx screw BM 6x12		Tightening torque	10 Nm

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Banjo bolt for exhaust pressure pipe to exhaust manifold — Used in step 54

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

Diesel particulate filter V-clip to exhaust turbocharger — Used in step 54

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Diesel particle filter to holder — Used in step 54

M8 hexagon nut		Tightening torque	19 Nm

Diesel particulate filter holder to gearbox — Used in step 54

M12x75		Tightening torque	66 Nm

Diesel particulate filter bracket to crankcase — Used in step 54

M10x35		Tightening torque	38 Nm

Heat shield for exhaust turbocharger — Used in step 54

Torx screw BM 6x12		Tightening torque	10 Nm

Bracket to oil sump — Used in step 54

M6		Tightening torque	8 Nm

Alternator to component carrier — Used in step 54

M10x75 / M10x125		Tightening torque	38 Nm

Positive battery cable to alternator — Used in step 54

M8		Tightening torque	19 Nm

Air conditioning compressor in component carrier — Used in step 54

M10		Tightening torque	38 Nm

Ground cable to cylinder head — Used in step 54

M6x12		Tightening torque	8 Nm

Wiring harness to cylinder head cover — Used in step 54

TS5x20		Tightening torque	3,5 Nm

Fuel line to intake plenum — Used in step 54

TS6x20		Tightening torque	5 Nm

Differential pressure sensor to holder — Used in step 55

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor — Used in step 55

Clamp 15–19mm		Tightening torque	3 Nm

Clean air pipe to cylinder head cover — Used in step 56

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 56

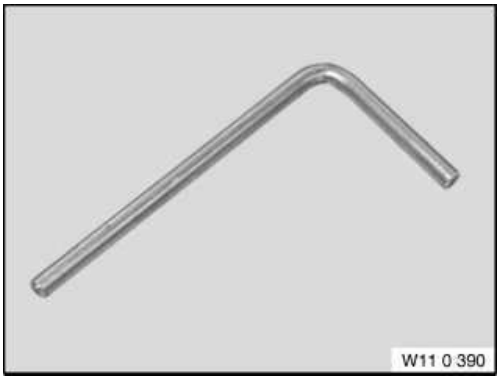
Clamp		Tightening torque	3 Nm

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Resonator to manifold and clean air pipe			Used in step 58
Screw TS6	Renew screw.	Tightening torque	5 Nm

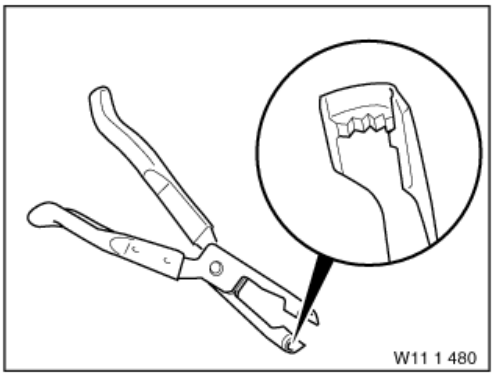
Overview of Special Tools

0 496 268 (11 0 390) Pin



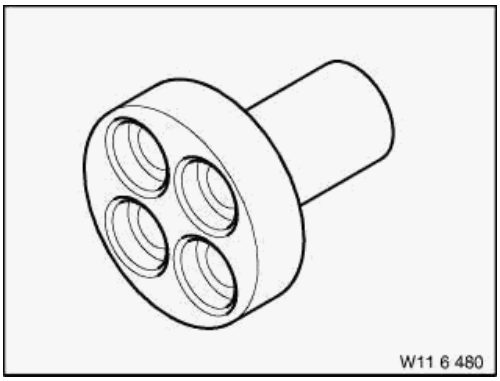
Common	Used in step 7 54
Usage	(roll pin) For securing new tensioning pulley (poly-V belt)
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 15 07 (390)

0 490 796 (11 1 480) Pliers



Common	Used in step 7 25
Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

0 493 380 (11 6 480) Connector



Common	Used in step 12 20 38 41 49
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

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2 220 718 Workshop crane



Common	Used in step 12 49
Usage	WSK 1000
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	06 01 11 (701)

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2 459 012 Holder



Common Used in step 12 49

Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

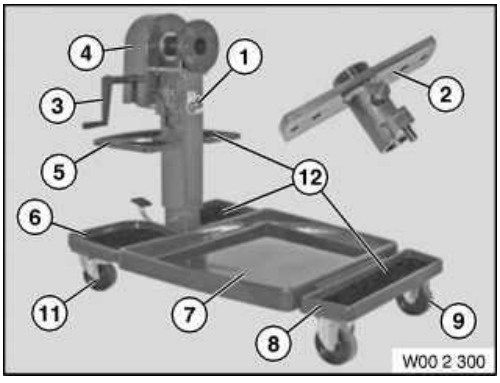
2 455 010 Engine support



Common Used in step 13 48

Usage	For accommodating engine on assembly stand. Engine: B3x, B4x, N47.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

0 495 187 (00 2 300) Assembly stand



Common Used in step 13

Usage	Assembly stand with universal flange for mounting engines from S85
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 25 04 (155)

Consisting of

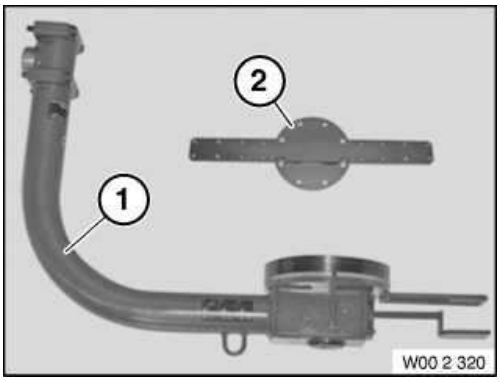
Pos	BMW Order number	Replaced by	Designation	In Connection with

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1	0 495 188 (00 2 301)		**Assembly stand** available only as complete assembly stand 83 30 0 495 187.	
2	0 495 189 (00 2 302)	**2 299 563**	**Tool** (Universal flange). Do not use any more!!! Technically locked. Replaced with a new flange with material number 83 30 2 299 563. All flanges delivered until the end of 2011 will be replaced at no charge. From 2012, only the new flange will be supplied. Also applies to the complete engine mounting stand 00 2 300.	
3	0 495 200 (00 2 303)		**Crank**	
4	0 495 201 (00 2 304)		**Cover** (Protective hood)	
5	0 495 202 (00 2 305)		**oddments tray** (Oddments tray for small parts)	
6	0 495 203 (00 2 306)		**Shaped element** (Rear shaped pan)	
7	0 495 204 (00 2 307)		**Collection pan** (Oil collection pan)	
8	0 495 205 (00 2 308)		**Shaped element** (Front shaped pan)	
9	0 495 206 (00 2 309)		**Wheel** (Front wheel (without stop))	
10	0 495 207 (00 2 311)		**Wheel** (Rear wheel (with stop))	
11	0 495 208 (00 2 312)		**Mat** (Checker mat set)	
2	2 299 563		**Adapter** New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.	

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0 495 196 (00 2 320) Support arm



Common

Used in step 13

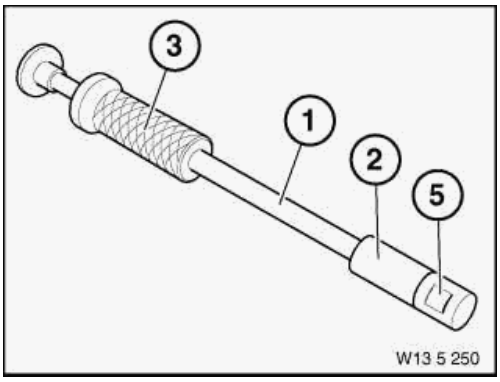
Usage	(Support arm with fixture) For mounting engines using the engine mounting bracket.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 197 (00 2 321)		**Support arm**	
2	0 495 198 (00 2 322)		**Panel** (take-up plate)	
3	0 495 380 (00 2 323)		**Panel** (fixture) Engine N73	
6	0 496 287 (00 2 326)		**Panel** (fixture) Engine: M73	
5	0 496 288 (00 2 327)	**0 496 373**	**Panel** (fixture) Engine: S62 Replaced by 11 5 420 (0 496 373)	
8	0 496 533 (00 2 328)		**Support** (Engine mount) Engine: N57, N57Top	
9	0 496 579 (00 2 329)	**0 496 680**	**Support** (Engine mount) Engine: N74 Replaced by 116160 (0 496 680)	
4	0 495 379 (00 2 324)		**Panel** (fixture) Engine M67TU	
5	0 495 381 (00 2 325)		**Panel** (fixture) Engine N62, N62TU	

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0 493 321 (13 5 250) Puller



Common

Used in step 17

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

0 493 339 (13 5 252) Bush



Common

Used in step 17

Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 340 (13 5 253) Weight



Common

Used in step 17

Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

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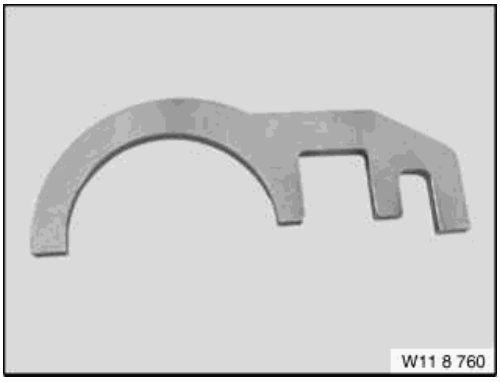
2 288 380 Locating stud



Common Used in step 20 38 39 41

Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 112 (11 8 760) Gauge



Common Used in step 20 38 40 41

Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 495 105 (11 4 480) oddments tray



Common Used in step 26 27 38

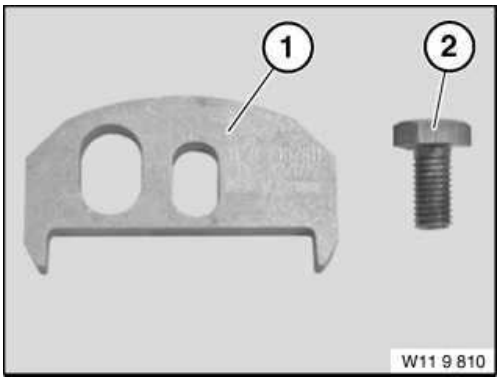
Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

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0 496 171 (11 9 811) Holder



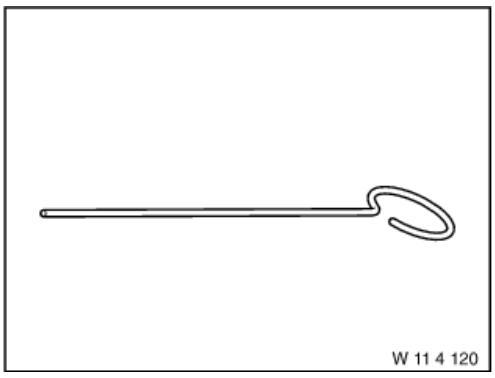
Common	Used in step 28 33
Usage	Available only as a complete tool set 11 9 810 (83 30 0 496 170) - as of 13.01.12
Included in the tool or work	0 496 170
Storage location	C86
Replaced by	
In connection with	
SI-Number	01 07 07 (355)

0 494 793 (11 9 265) Bush



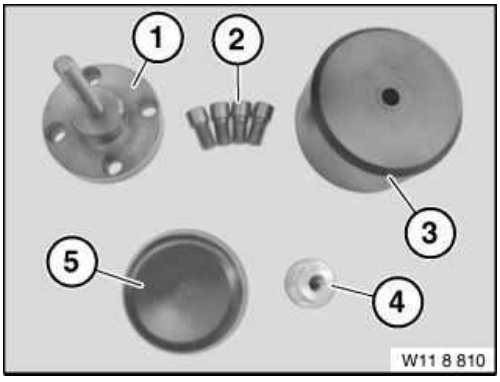
Common	Used in step 28 33
Usage	
Included in the tool or work	0 493 938
Storage location	A44
Replaced by	
In connection with	
SI-Number	

0 491 012 (11 4 120) Pin



Common	Used in step 30 31
Usage	(lock pin) For chain tensioners, for locking the chain tensioner piston (e.g. during cylinder head removal and fitting)
Included in the tool or work	
Storage location	B1
Replaced by	
In connection with	
SI-Number	01 12 93 (701)

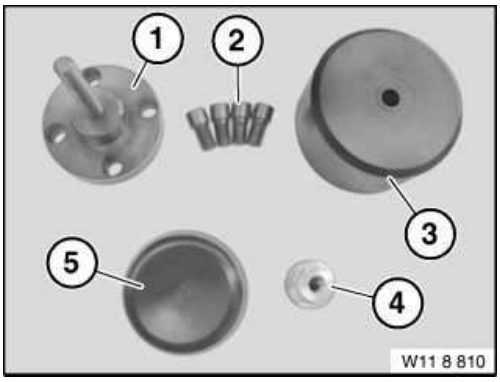
0 496 137 (11 8 815) Holding sleeve



Common	Used in step 32
Usage	(Slip sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

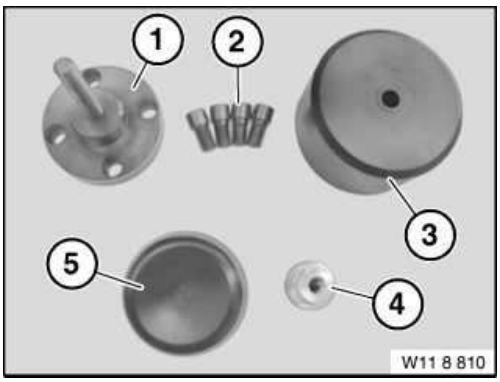
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0 496 133 (11 8 811) Basic body



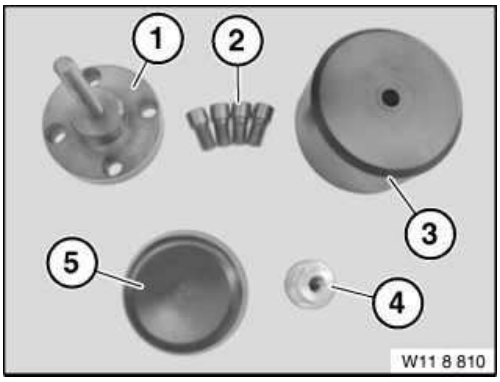
Common	Used in step 32
Usage	Liquidation of existing inventory and then available only as a complete tool set 11 8 810 = 83 30 0 496 132 - as of 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 134 (11 8 812) Screw



Common	Used in step 32
Usage	(Screw set) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

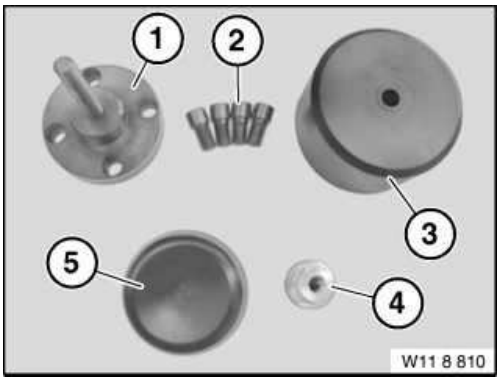
0 496 135 (11 8 813) Holding sleeve



Common	Used in step 32
Usage	(Thrust sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

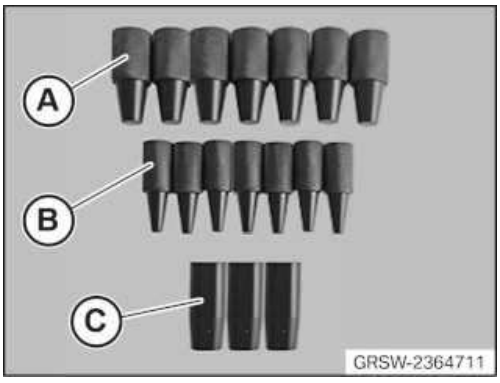
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0 496 136 (11 8 814) Nut



Common	Used in step 32
Usage	(Nut with bearing) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

2 364 711 Plug



Common	Used in step 32
Usage	For closing the pressure oil holes for cleaning the cylinder head sealing surfaces.
Included in the tool or work	
Storage location	C20
Replaced by	
In connection with	
SI-Number	01 50 14 (203)

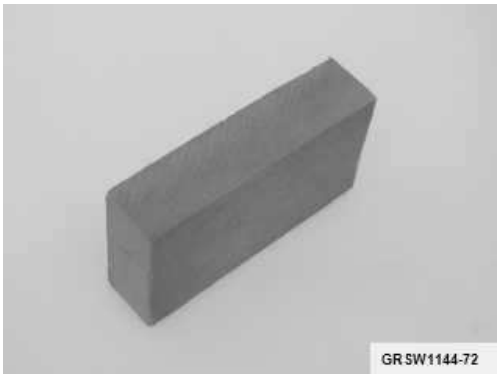
0 495 103 (11 4 471) Scraper



Common	Used in step 32
Usage	
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

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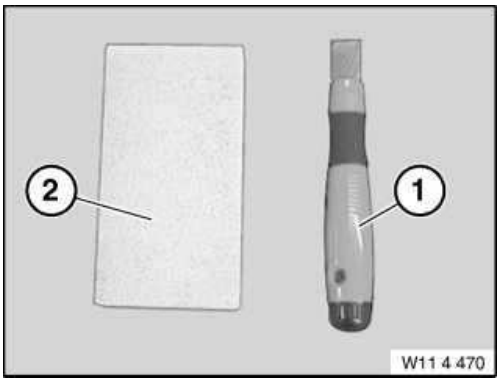
0 495 104 (11 4 472) Extractor



Common Used in step 32

Usage	(grindstone)
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

0 495 102 (11 4 470) Tool



Common Used in step 32 52

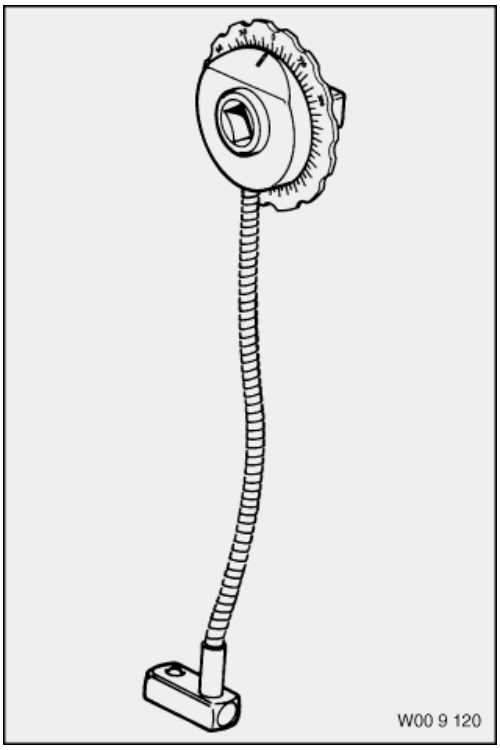
Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

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0 490 504 (00 9 120) Torque angle measuring dial



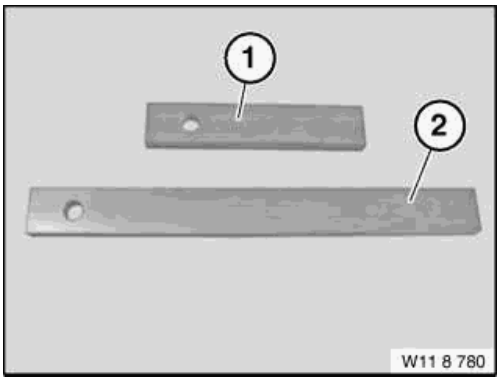
Common

Used in step 32

Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

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0 496 120 (11 8 780) Plate



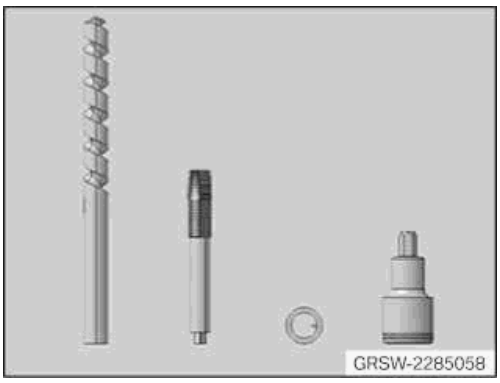
Common Used in step 32

Usage	(Mounting plates) For securing transmission oil sump when gearbox is removed.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 121 (11 8 781)		**Plate** (Mounting plate, short)Discontinued; only available via set 11 8 780 = 0496120.	
2	0 496 122 (11 8 782)		**Plate** (Mounting plate, long) Discontinued; only available via set 11 8 780 = 0496120.	

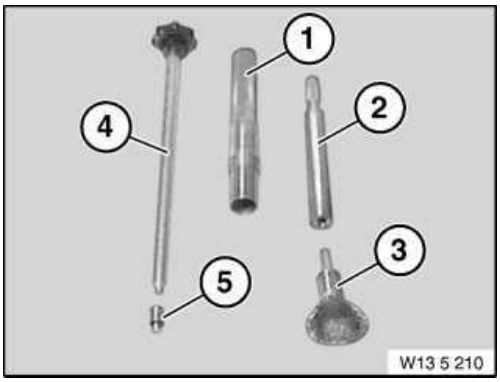
2 285 058 Tool set



Common Used in step 33

Usage	
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 02 14 (069)

0 493 763 (13 5 215) Plug

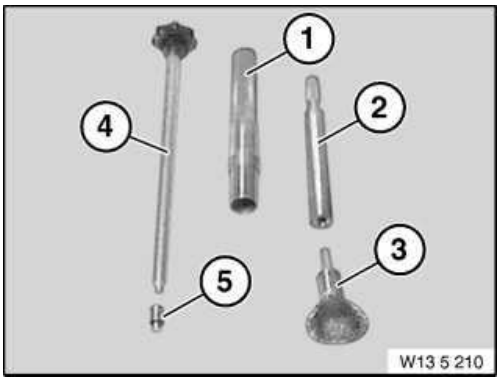


Common Used in step 43

Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 493 762 (13 5 214) Rod

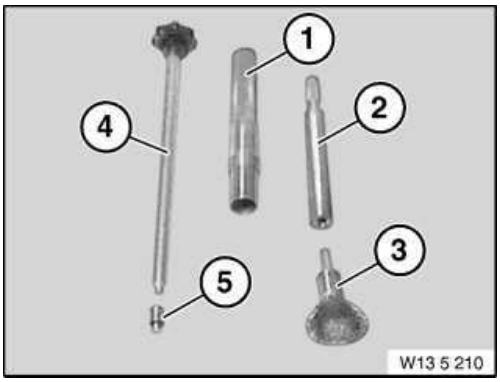


Common

Used in step 43

Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 758 (13 5 210) Tool



Common

Used in step 43

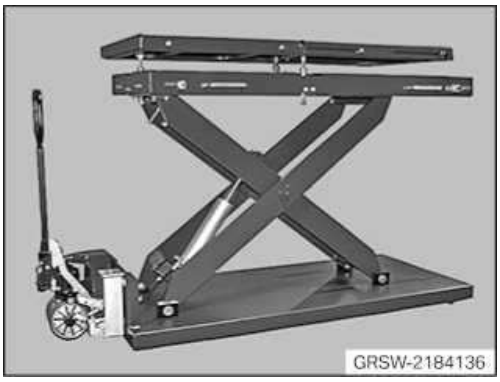
Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

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2 184 136 Mobile equipment table lift



Common	Used in step 49
Usage	Table lift MHT 1200
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	06 01 10 (649)

2 409 025 Puller



Common	Used in step 50
Usage	For disassembly of the outer radial shaft seal of the transmission output shaft, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A76
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

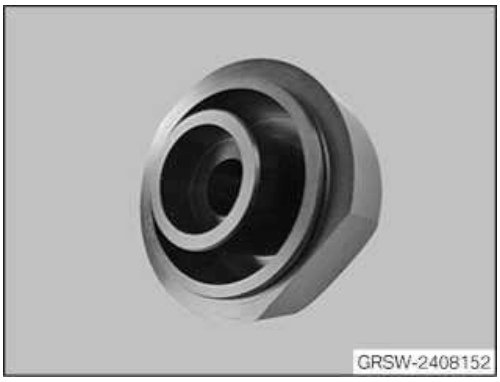
2 411 739 Puller



Common	Used in step 50
Usage	For disassembly of the inner radial shaft seal of the output, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C78
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

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2 408 152 Striking element



Common	Used in step 50
Usage	For installation of the right radial shaft seal transmission output shaft (inner). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

2 413 037 Handle



Common	Used in step 50
Usage	Universal drift handle. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C77
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 408 150 Striking element

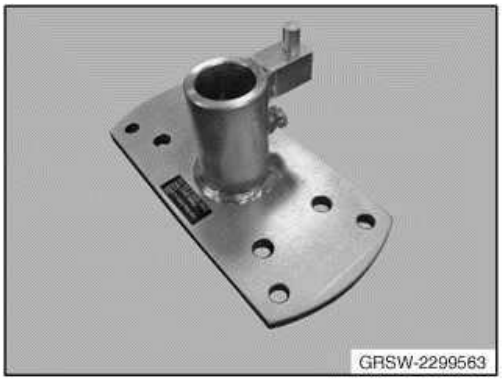


Common	Used in step 50
Usage	For installing the right radial shaft seal transmission output shaft (outer). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

Replacement tools:

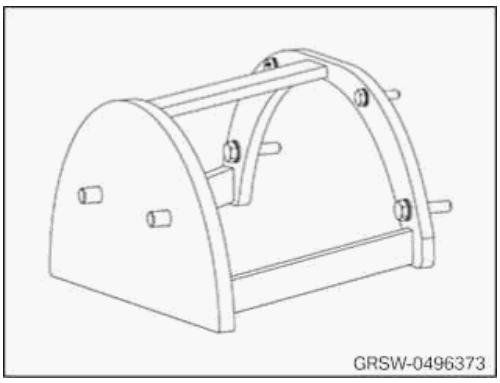
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2 299 563 Adapter



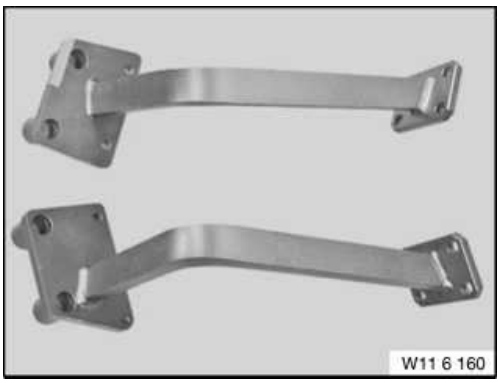
Common	Used in step 13
Usage	New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.
Included in the tool or work	0 495 187
Storage location	
Replaced by	
In connection with	
SI-Number	

0 496 373 (11 5 420) Plate



Common	Used in step 13
Usage	(Fixture) Engine S62
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	

0 496 680 (11 6 160) Support



Common	Used in step 13
Usage	For mounting N74 engine on the assembly stand. In combination with 00 2 300, 00 2 320
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	00 2 300; 00 2 320 = 0495196
SI-Number	01 31 09 (604)

Overview Technical Data

Screw-in depth of thread cutter	Used in step 33
Screw-in depth	18 mm

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	7 54
EGR controller	7 54

General repair instructions	Used in step
11 00 ... Overview of consumables (Electronic Parts Catalogue)	32

Repair instructions	Used in step
11 00 050 Removing and installing engine	1 60

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11 00 050 Removing and installing engine 1 60

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11 00 050 Removing and installing engine 1 60
31 10 001 Completely removing and installing front axle with engine and transmission 1 60
11 00 050 Removing and installing engine 1 60
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11 00 050 Removing and installing the engine with a double-clutch transmission (DKG) 1 60
11 00 050 Remove and install engine 1 60
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11 00 050 Remove and install engine 1 60
11 00 050 Removing and installing the engine (manual gearbox) 1 60
11 00 050 Remove and install engine (Automatic) 1 60
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11 00 050 Remove and install engine	1 60
11 00 050 Removing and installing engine	1 60
11 00 050 Removing and installing engine \PREMIUM	1 60
11 00 050 Removing and installing/replacing engine (N63)	1 60
11 00 050 Removing and installing engine	1 60
11 00 050 Removing and installing engine	1 60
11 00 050 Removing and installing engine	1 60
11 00 050 Remove and install engine	1 60
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11 00 050 Remove and install engine	1 60
11 00 050 Remove and install engine (Automatic)	1 60
11 00 050 Remove and install engine (Automatic)	1 60
11 00 050 Remove and install engine	1 60
11 00 050 Remove and install engine	1 60
11 00 050 Remove and install engine	1 60
11 00 050 Remove and install engine	1 60
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG)	1 60
11 00 050 Remove and install engine	1 60
61 35 ... Notes on ESD protection (Electro Static Discharge)	6 17 25 32
61 35 ... Notes on ESD protection (Electro Static Discharge)	32

Operating materials	Used in step

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	38
Exhaust-gas recirculation cooler seal on exhaust manifold	54
Exhaust-gas recirculation cooler seal on intake plenum	54

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11 31 091 Removing and installing/replacing the hydraulic chain tensioner

PRELIMINARY WORK

1 – Removing engine



- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

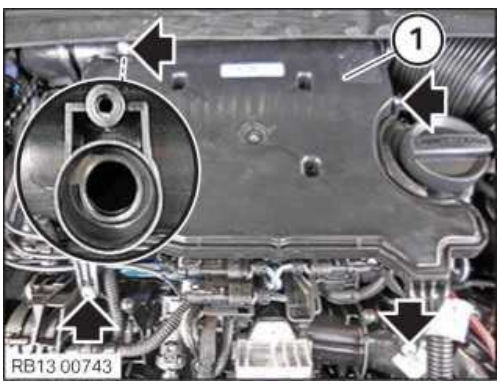
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

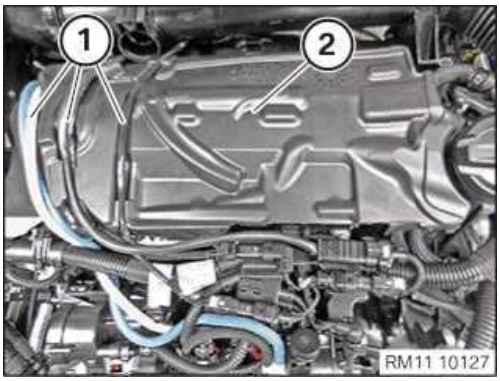
3 – Remove resonator



- Remove screws (arrows).
- Guide out and remove the resonator (1).

4 – Remove the acoustic cover for the injectors

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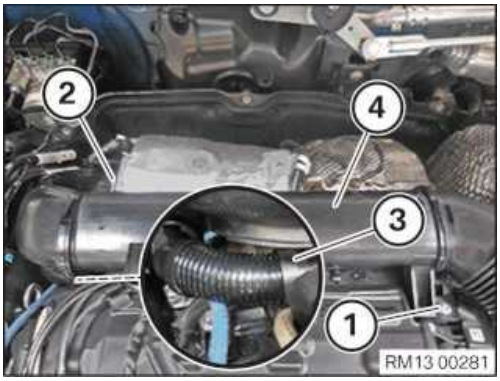


- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

5 – Removing clean air pipe



- Detach clamp (1) on the clean air pipe.
- Pull off the clean air pipe from the intake silencer housing.



- Loosen screw (1).
- Loosen clamp (2).
- Unlock the ventilation line (3) and pull it off the cylinder head cover.
- Feed out clean air pipe and remove.

6 – Remove differential pressure sensor

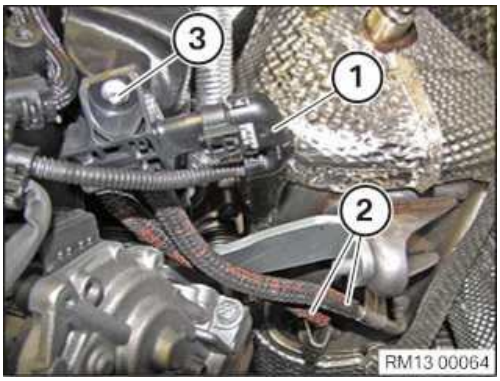
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

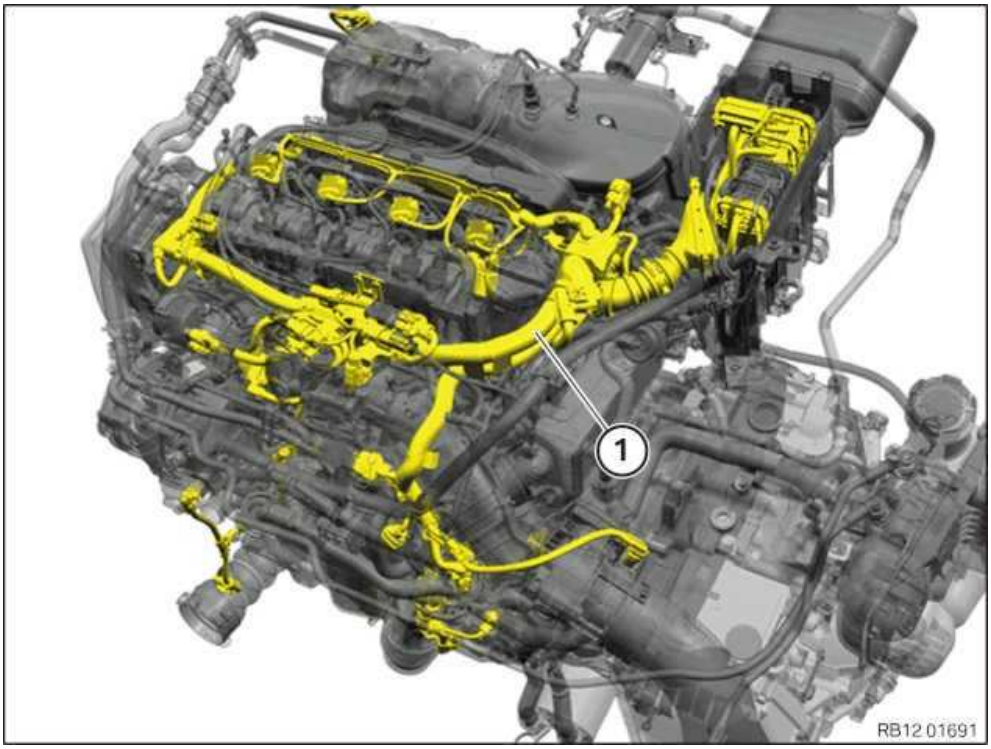
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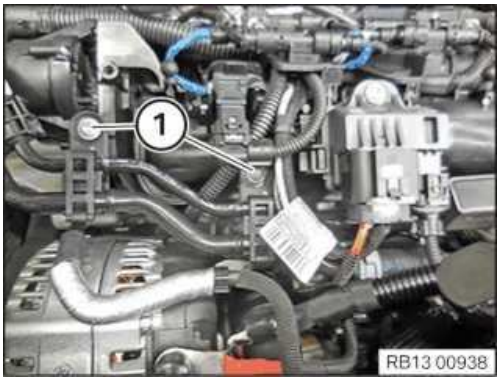
- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

7 – Removing assemblies (on lifting table)

Overview: Wiring harness section for the engine

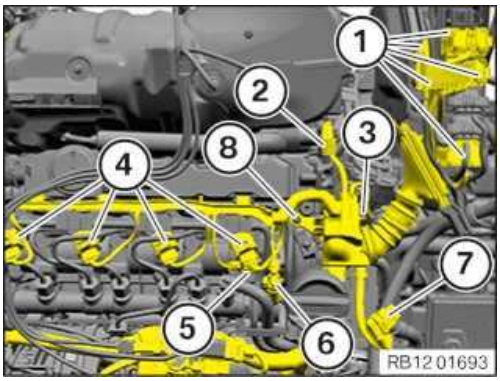


1 Wiring harness section for the engine

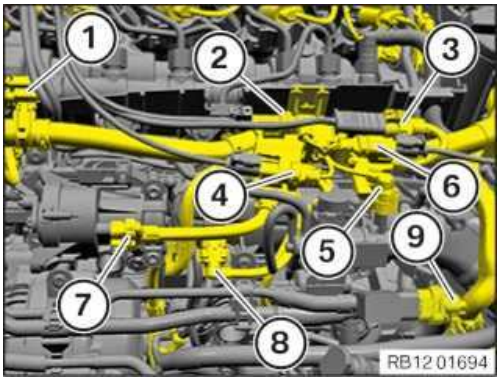


- Loosen screws (1).

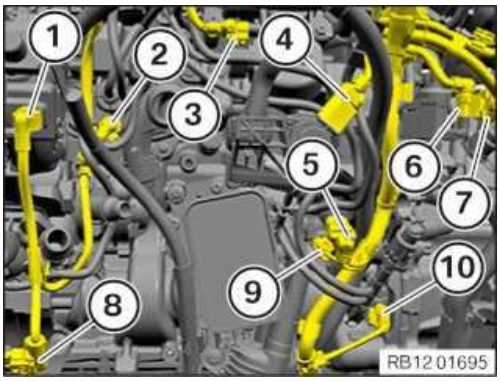
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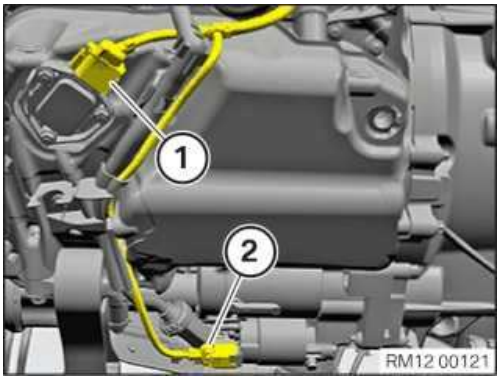
- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock the connector (2) and disconnect it from the differential pressure sensor.
- Unlock the connector (3) and disconnect it from the exhaust-gas recirculation valve.
- Unlock the connector (4) and pull off from the injectors.
- Unlock the connector (5) and disconnect it from the camshaft sensor.
- Unlock the connector (6) and disconnect it from the fuel pressure regulator.
- Unlock connector (7) and pull off from hot film air mass meter.
- Loosen screw (8).



- Unlock connector (1) and pull off from the rail pressure sensor.
- Unlock the connector (2) and disconnect it from the exhaust temperature sensor before the diesel particulate filter.
- Unlock connector (3) and pull it off from the front oxygen sensor.
- Unlock the connector (4) and disconnect it from the exhaust temperature sensor after the diesel particulate filter.
- Unlock and disconnect the connector (5) from the electric changeover valve.
- Unlock the connector (6) and disconnect it from the exhaust temperature sensor for the exhaust-gas recirculation cooler.
- Unlock the connector (7) and disconnect it from the servomotor for the swirl flaps.
- Unlock the connector (8) and pull it off the charging pressure sensor.
- Unlock the connector (9) and disconnect from the fuel pressure and temperature sensor.

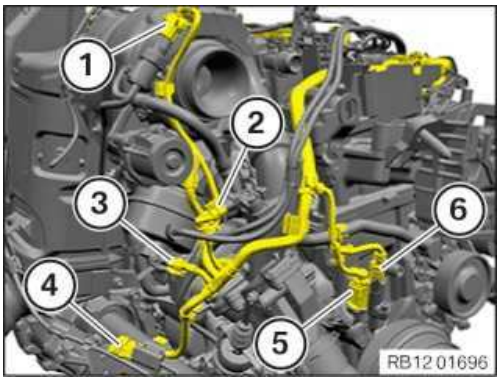


- Unlock and disconnect the connector (1) from the alternator.
- Unlock and disconnect the connector (2) from the electric changeover valve.
- Unlock and disconnect the connector (3) from the electric changeover valve.
- Unlock the connector (4) and pull it off the high pressure pump.
- Unlock the connector (5) and disconnect it from the oil pressure sensor.
- Unlock connector (6) and pull off from throttle body.
- Unlock the connector (7) and disconnect it from the intake air temperature sensor.
- Unlock the connector (8) and disconnect it from the air conditioning compressor.
- Unlock and disconnect the connector (9) from the solenoid valve.
- Unlock the connector (10) and pull it off the crankshaft sensor.



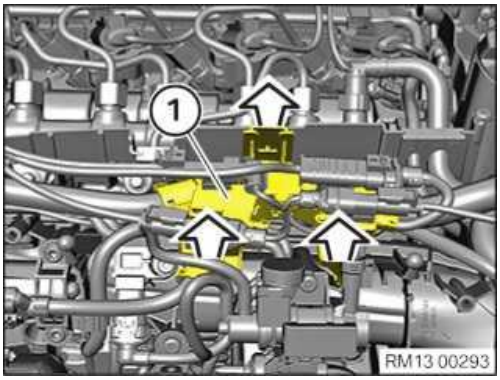
- Unlock the connector (1) and pull off of the oil-level sensor.
- Unlock connector (2) and remove from starter motor.

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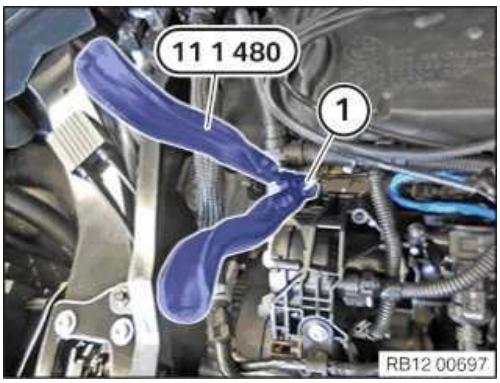


- Unlock the connector (1) and disconnect it from the exhaust gas pressure sensor.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock the connector (3) and pull it off the exhaust turbocharger.
- Unlock the connector (3) and disconnect it from the differential pressure sensor.
- Unlock connector (4) and pull it off from the monitoring oxygen sensor.
- Unlock the connector (5) and pull it off the oil pressure switch .
- Unlock connector (6) and disconnect from switching valve.
- Detach, feed out and remove the wiring harness from the clamps.

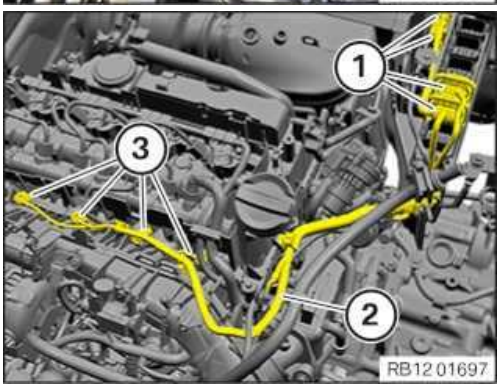
▶ **Removing the cable clips from the intake plenum**



- Detach the cable clip (1) in the direction of the arrow.
- Guide out the cable clip (1) in direction of arrow and set it aside.



- Unlock the connectors (1) of all glow elements with the special tool **0 490 796 (11 1 480)** and release them.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.



- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Pull off all connectors (3) from glow element using special tool **0 490 796 (11 1 480)**.
- Loosen screw (2) and remove the ground strap.
- Detach, feed out and remove the wiring harness from the clamps.

▶ **Removing the drive belt for alternator**

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

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CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

TECHNICAL INFORMATION

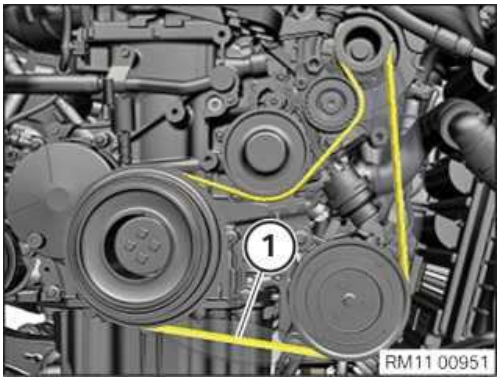
If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

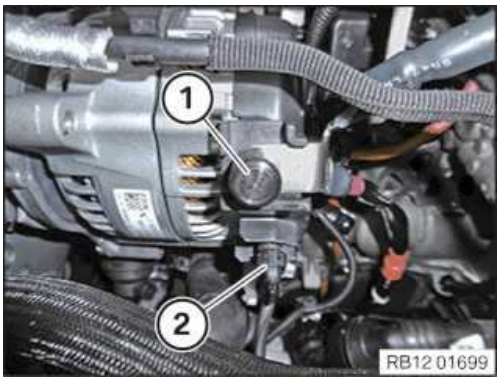
The drive belt must be replaced if contaminated with coolant- and oil residues.



- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool **0 496 268 (11 0 390)**.



- Guide out the drive belt for the alternator (1) and remove it.

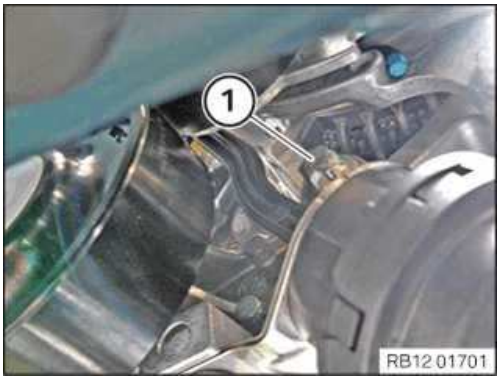


- Remove the cover (1) and loosen the nut below.
- Disconnect positive battery cable from alternator.
- Unlock and disconnect the connector (2) from the alternator.

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- Detach screw (1) on top on the alternator.



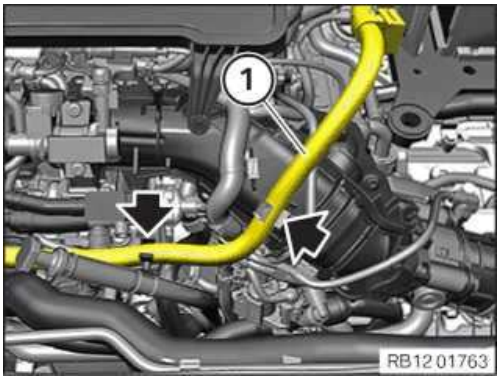
- Detach screw (1) below on the alternator.



- Feed out alternator (1) along with the screw (2) on the bottom of the alternator through the slot on the support and remove.

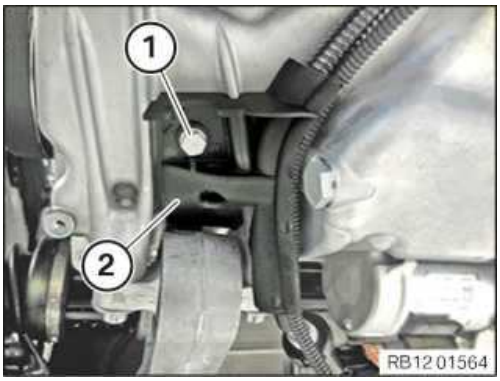


- Loosen screws (1).
- Feed out and remove the air conditioning compressor (2).



- Release the positive battery cable (1) from the clamps (arrows).

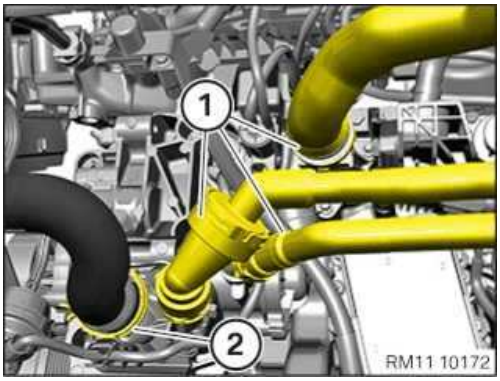
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- Loosen screw (1).
- Guide out and remove holder (2).



- Feed out positive battery cable from the clamps (1) and remove.



- Unlock and disconnect coolant lines (1).
- Guide out the coolant lines (1) and remove it.
- Detach the clamp (2).
- Guide the coolant hose out and remove.

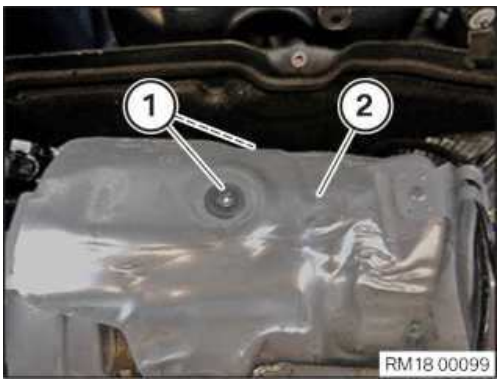
▶ **Removing heat shield from top exhaust turbocharger**

WARNING

Hot surfaces.

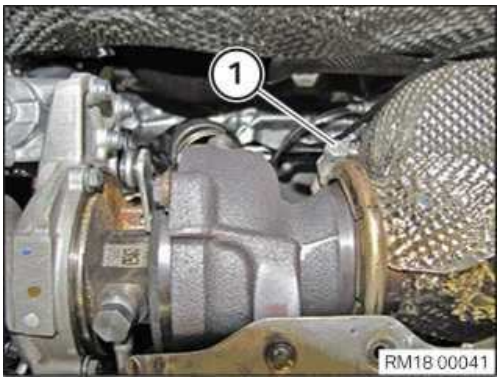
Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from holders.
- Release the screws (1) at the top and bottom of the heat shield.
- Feed out and remove the heat shield (2).

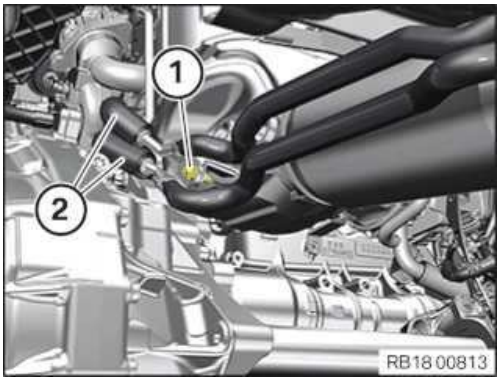
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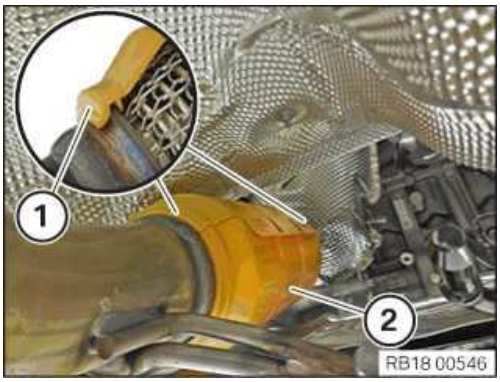
- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.



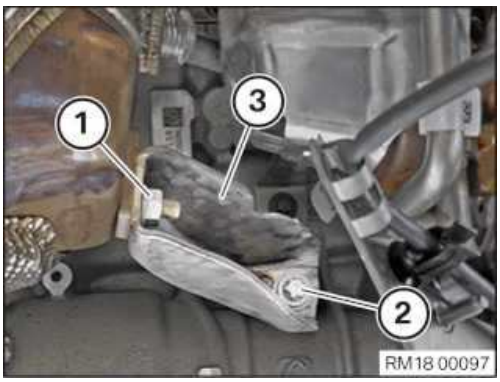
- Loosen nuts (1).



- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.

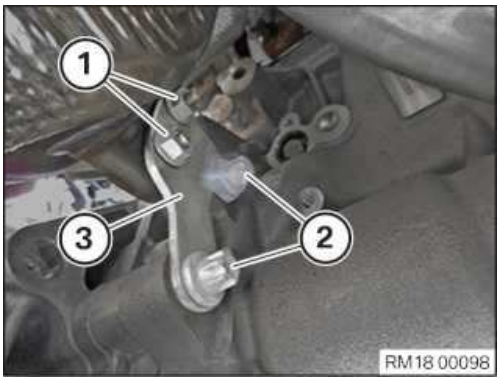


- Mount fitting aid (2).
- Make sure that the fitting aid is correctly position on the edges (1) of the flexible tube.



- Loosen nut (1).
- Loosen screw (2).
- Remove holder (3).

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- Loosen nuts (1).
- Loosen screws (2).
- Remove holder (3).
- Guide out and remove diesel particulate filter .

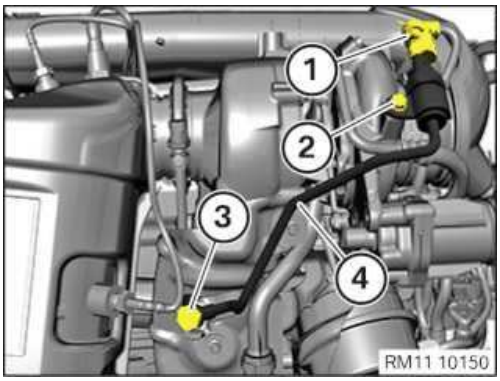
▶ **Remove the heat shield from the exhaust turbocharger at the bottom**

WARNING

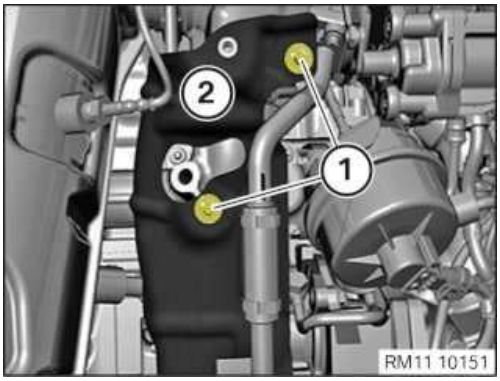
Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Unlock and disconnect connector (1).
- Unscrew the banjo bolt (3).
- The seals of the banjo bolt (3) must be renewed.
- Loosen screw (2).
- Remove the exhaust gas pressure pipe (4).



- Unscrew the bolts (1) on the heat shield .
- Feed out and remove the heat shield (2).

▶ **Removing the exhaust-gas recirculation cooler**

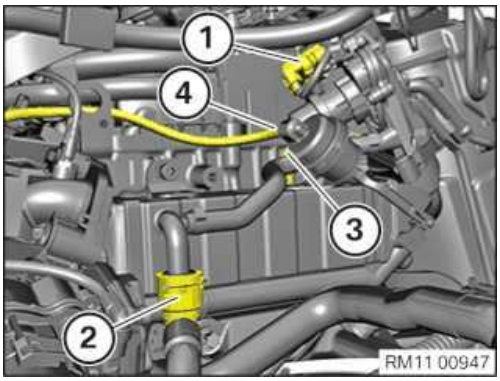
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

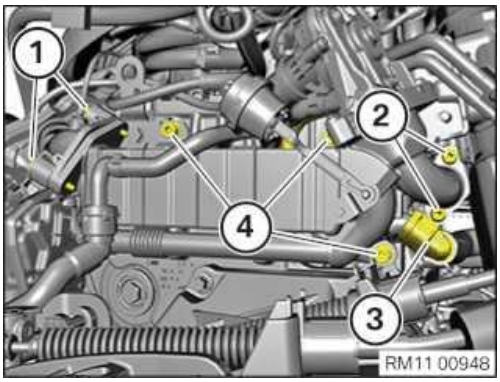
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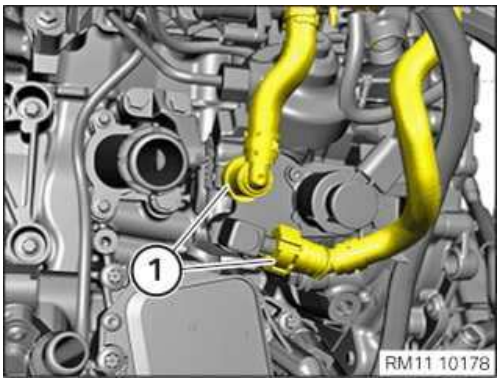
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

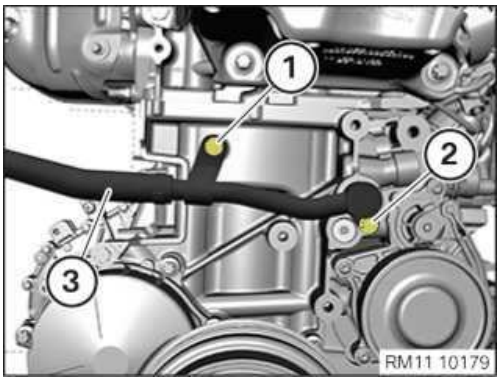
- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.



- Unlock the fuel lines (1) and disconnect from the high pressure pump.
- Remove the fuel lines.



- Loosen screws (1) and (2).
- Remove coolant line (3).

8 – Removing the low-pressure stage turbocharger

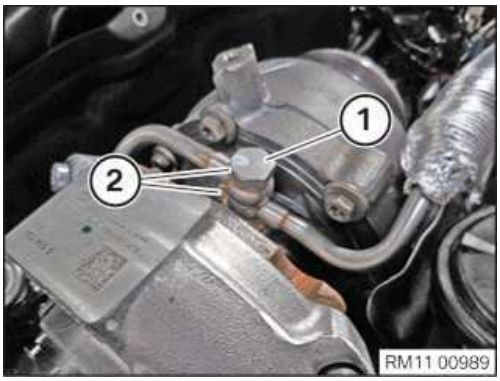
WARNING

Hot surfaces.

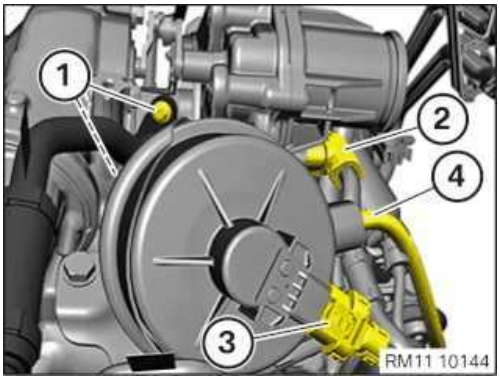
Risk of burning!

- Perform all work only on components that have cooled down.

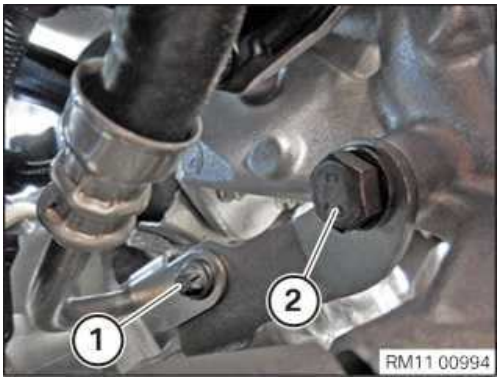
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- Release the banjo bolt (1) of the oil feed lines.
- Remove sealing rings (2).
- Place oil feed lines to one side.



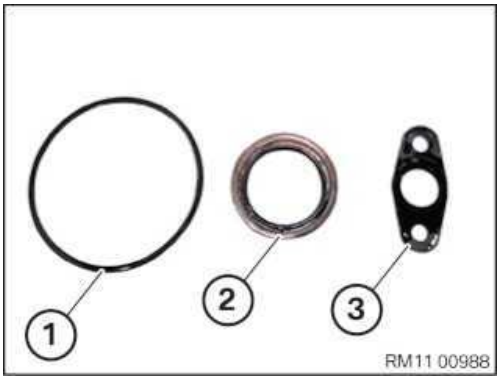
- Release the screws (1) of the oil return line.
- Unlock and disconnect the plug connections (2) and (3).
- Pull off the vacuum hose (4) carefully.



- Undo the bolt (1) of the oil feed line.
- Loosen screw (2).

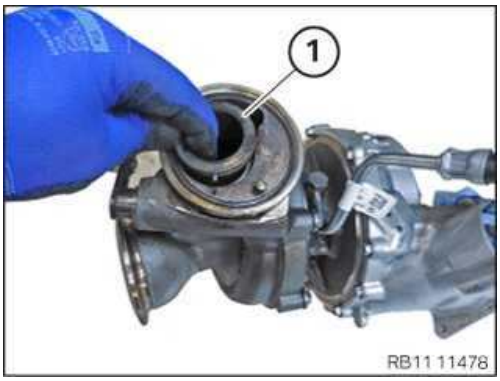


- Loosen screw (1).
- Remove the V hose clamp.
- Guide the low-pressure stage turbocharger out towards the top and remove.



- Remove seals (1), (2) and (3).

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- Remove the spacer ring (1).

9 – Removing the high-pressure stage exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

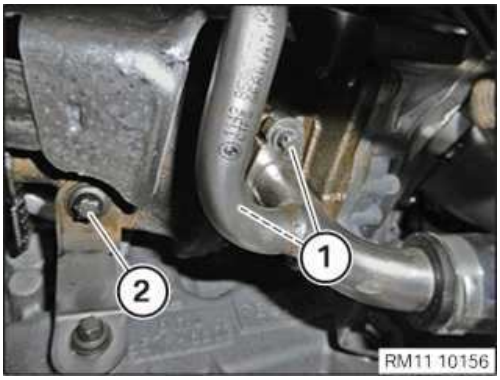
- Perform all work only on components that have cooled down.

CAUTION

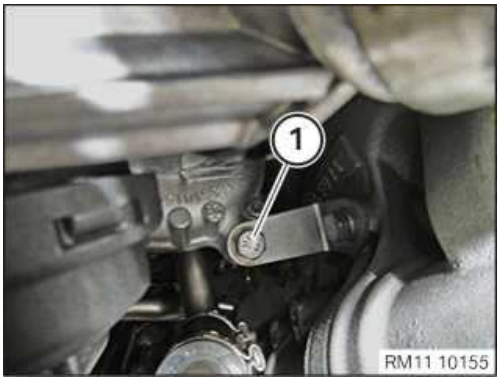
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

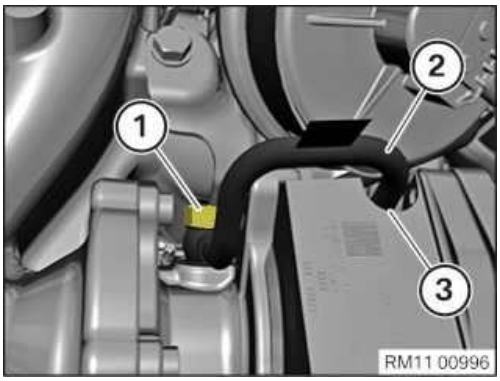


- Unscrew the bolts (1) on the oil return line .
- Loosen screw (2).

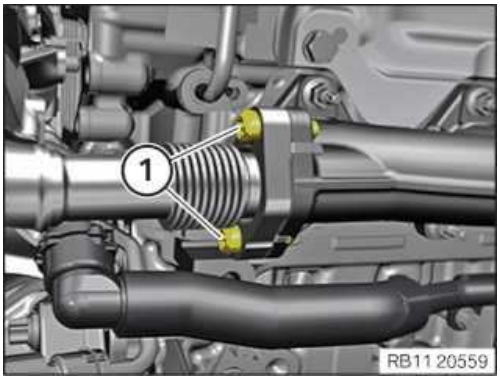


- Release screw (1) from the right wheel arch.

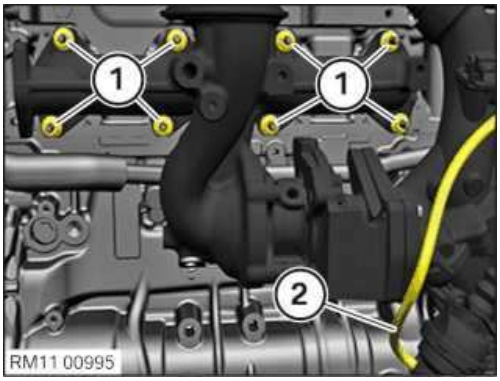
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- Unscrew the banjo bolt (1).
- Guide out oil feed line (2) from holder (3).

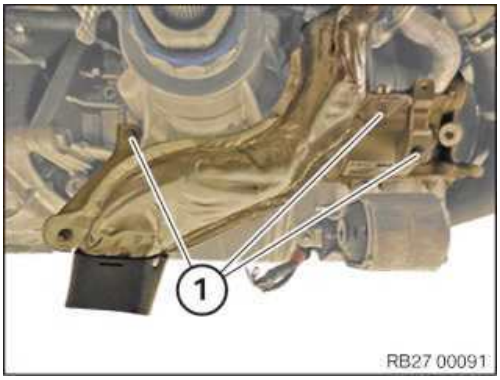


- Loosen screws (1).

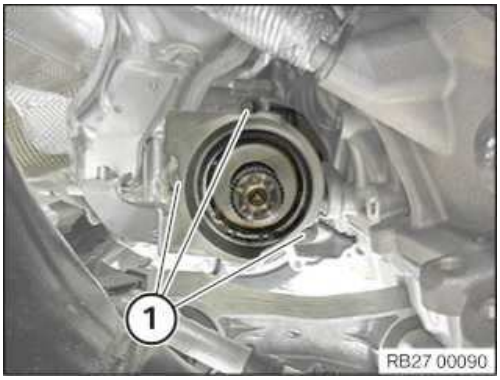


- Pull off the vacuum hose (2).
- Loosen nuts (1).
- Guide out the exhaust manifold and the high-pressure stage exhaust turbocharger to the top and remove them.

10 – Remove the intermediate shaft with the support tube

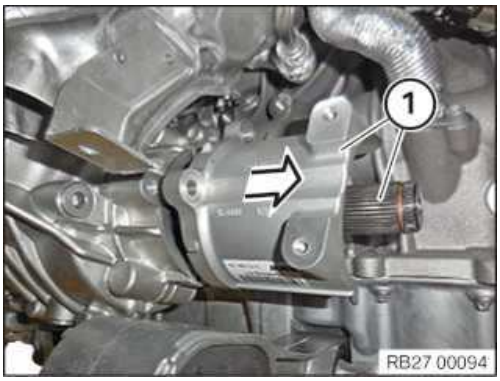


- With air duct installation: Loosen screws (1).
- Remove air duct



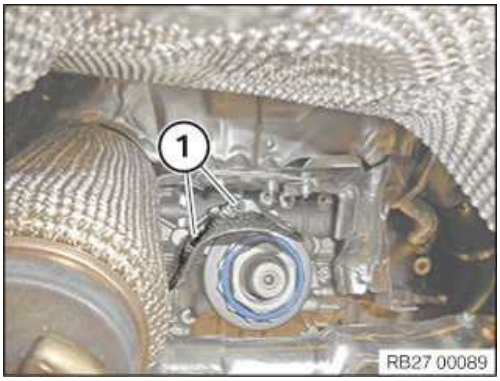
- Loosen screws (1).

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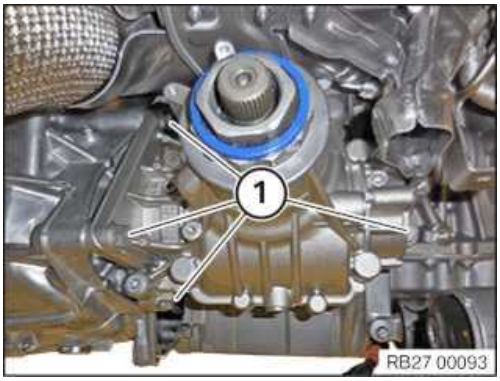


- Pull the intermediate shaft with the support tube (1) out of the transfer box.

11 – Remove transfer box (VTG)



- Loosen screws (1).
- Remove heat shield.



- Loosen screws (1).
- Remove the transfer box (VTG).

12 – Detach the engine from the manual gearbox

Prerequisite

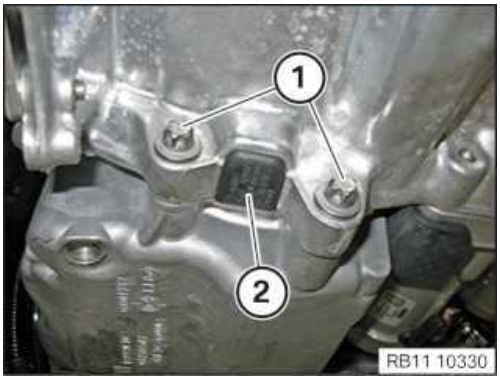
Engine has been removed.

CAUTION

Heavy component.

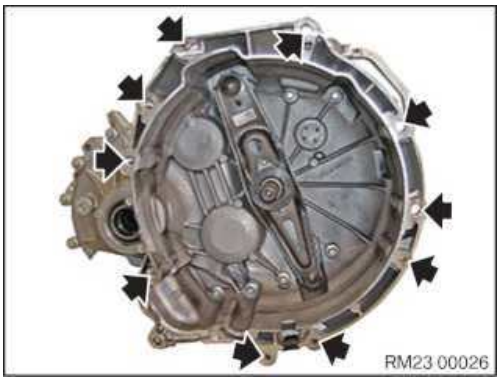
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

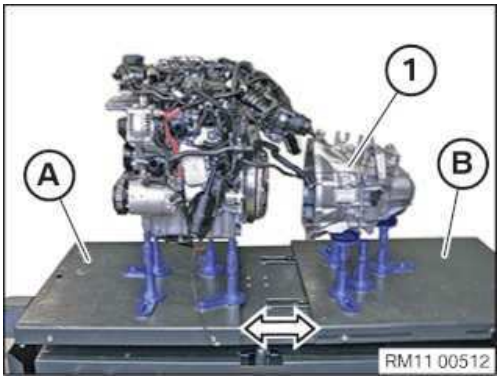


- Loosen screws (1).
- Remove protective cap (2).

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- Remove screws (arrows).



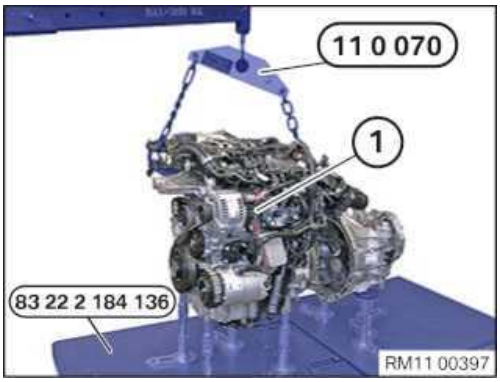
- Slide the table top (B) in the direction of the arrow and slide the manual gearbox (1) to the side.



- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

M8		Tightening torque	21,5 Nm



- Attach engine lifter to special tool and lift engine (1) off lifting table.

13 – Mount engine on assembly stand

CAUTION

Heavy component.

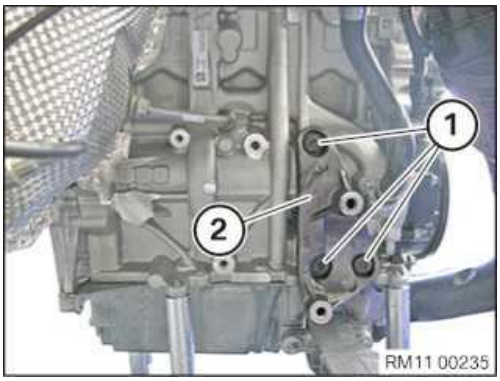
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

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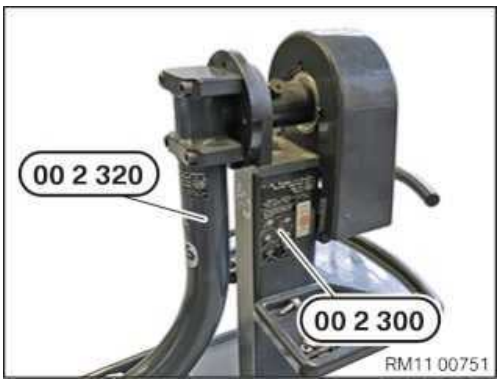
- Loosen screws (1).
- Guide out and remove holder (2).



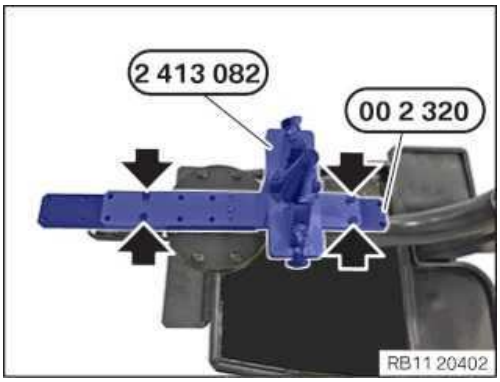
- Position the special tool **2 455 010** on the engine (1).
- Position the standard bolts **M10x30**.
- Tighten the standard bolts (arrows).
-

Special tool 2 455 010 to crankcase

M10x30		Tightening torque	38 Nm



- Prepare the assembly stand **0 495 187 (00 2 300)** with the special tool **0 495 196 (00 2 320)**.



- Screw the special tool to the **0 495 196 (00 2 320)** special tool.
- Tighten screws (arrows).
-

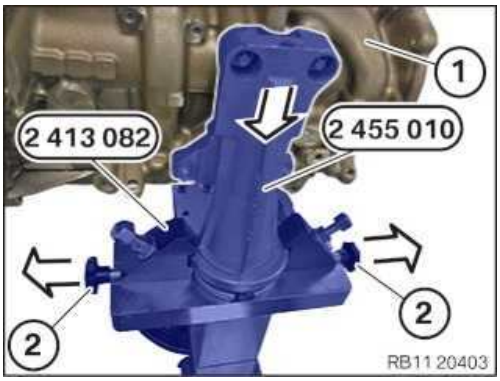
Special tool 11 8 930 to special tool 00 2 320

M14x35		Tightening torque	160 Nm

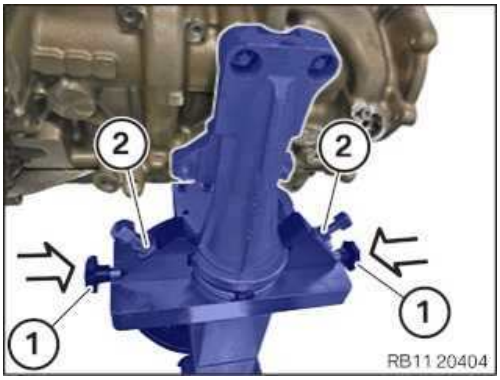


- Position the engine lifter with the special tool and the engine on the special tool **0 495 187 (00 2 300)**.

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- Detach the holder (2) in the direction of the arrow.
- Position the engine (1) with the special tool **2 455 010** in the direction of the arrow on the special tool .



- Lock the holder (1) in direction of arrow.
- Tighten nuts (2).

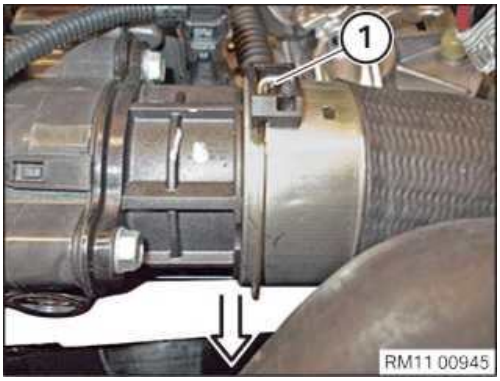
14 – Removing the intake plenum

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

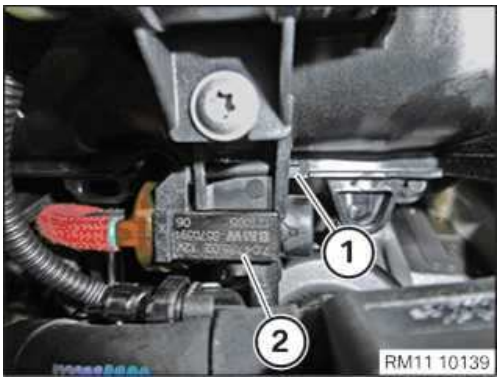


- Unlock the lock (1).

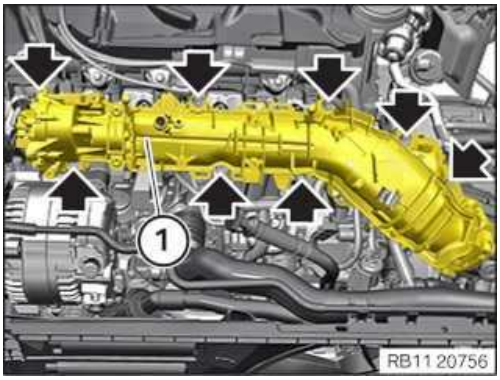


- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.

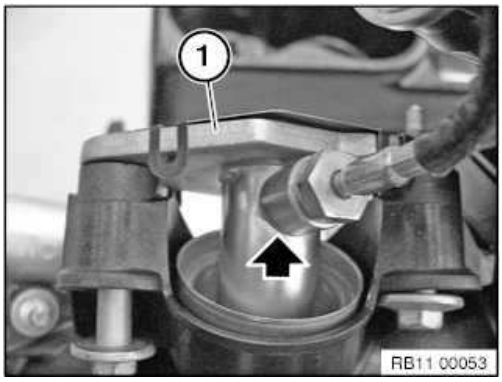
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- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



- Release the screws (arrows) from the intake plenum (1).
- Guide the intake plenum (1) out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

15 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

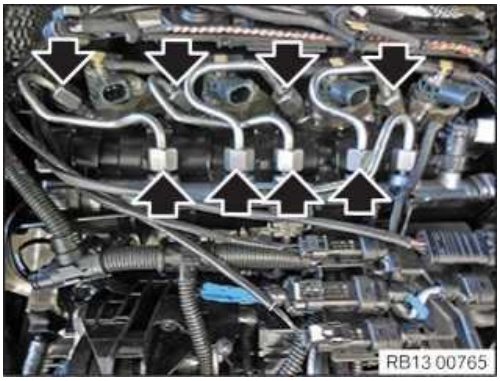
If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release the high pressure lines (arrows) with the special tool .
- Catch and dispose of escaping fuel.
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool .

16 – Detaching leakage oil line from injector

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

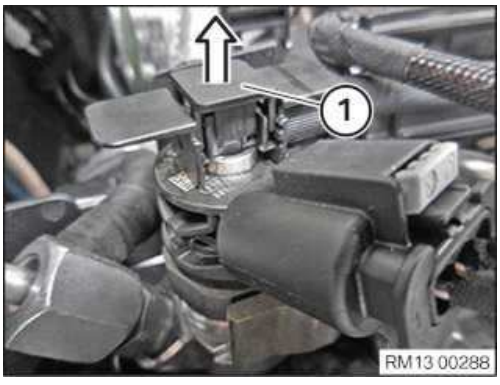
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

17 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

 **Electrostatic discharge.**

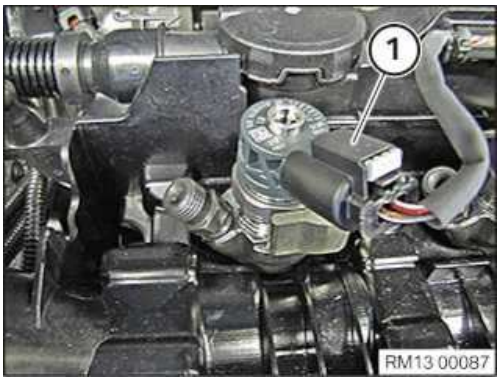
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

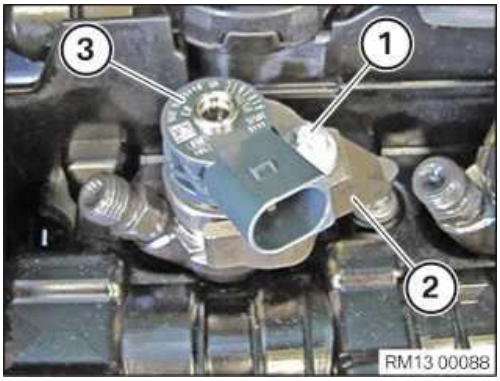
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TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.



- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

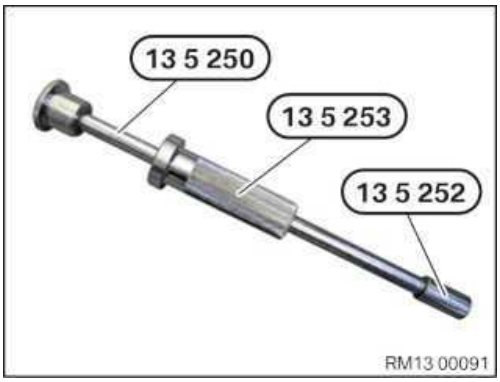
▶ **Loosen stuck injectors**

RISK OF DAMAGE

Contaminant or foreign body.

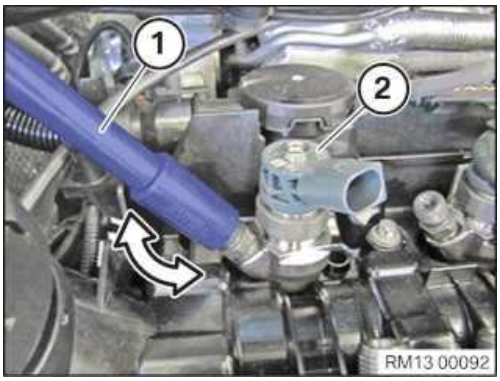
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)** back onto the special tool **0 493 321 (13 5 250)**.

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- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

18 – Remove high-pressure rail

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

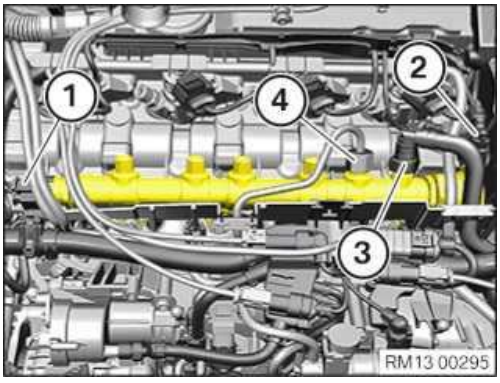
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

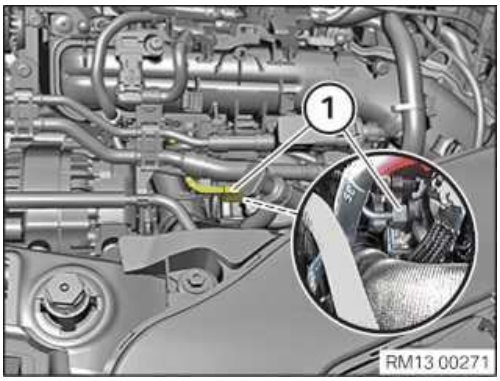
TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

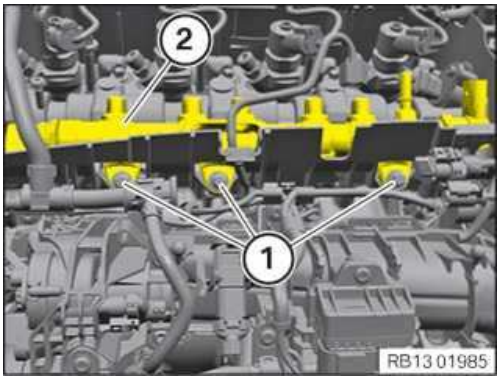


- Unlock and disconnect connector (1).
- Unlock and disconnect connector (2).
- Unlock and release fuel line (3).
- Loosen union nut (4) with special tool .
- Reset special tool early on to avoid bending pressure lines.

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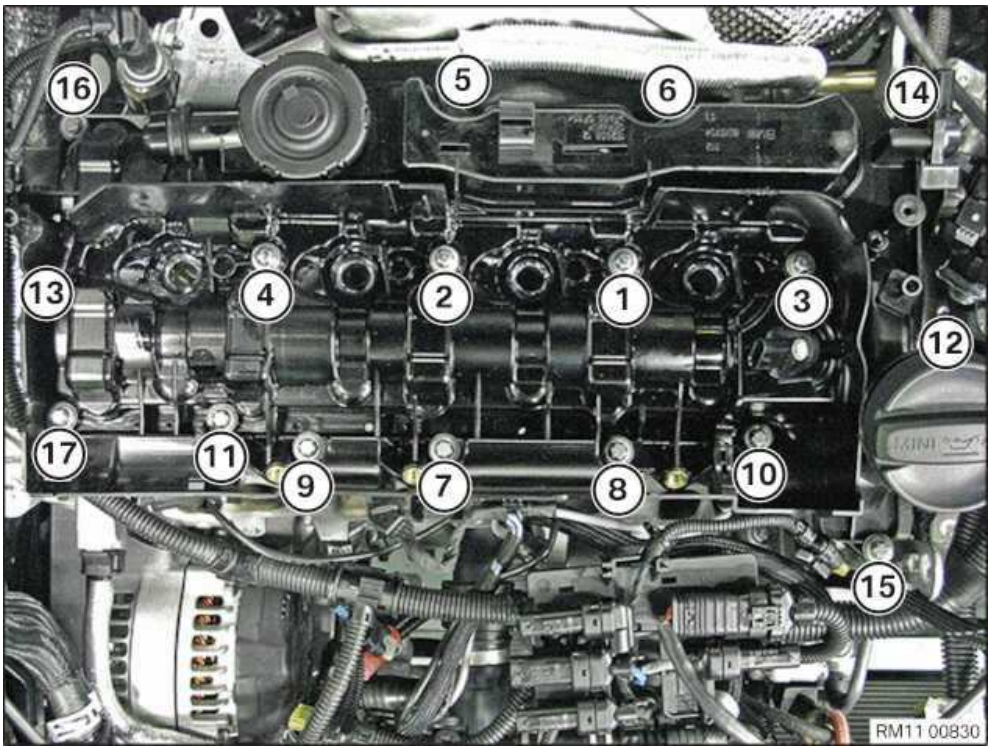
- Slacken the union nut (1) on the high pressure pump.



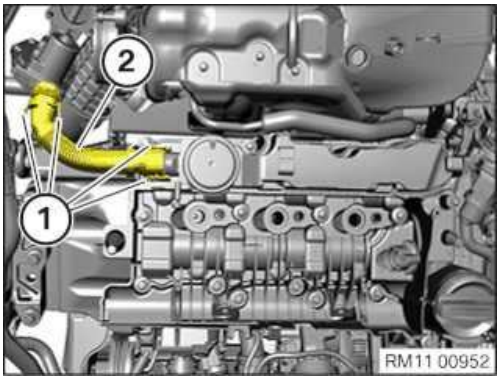
- Loosen screws (1).
- Carefully thread out and remove the rail (2).
- Make sure the pressure line of the high pressure pump is not bent.

19 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover

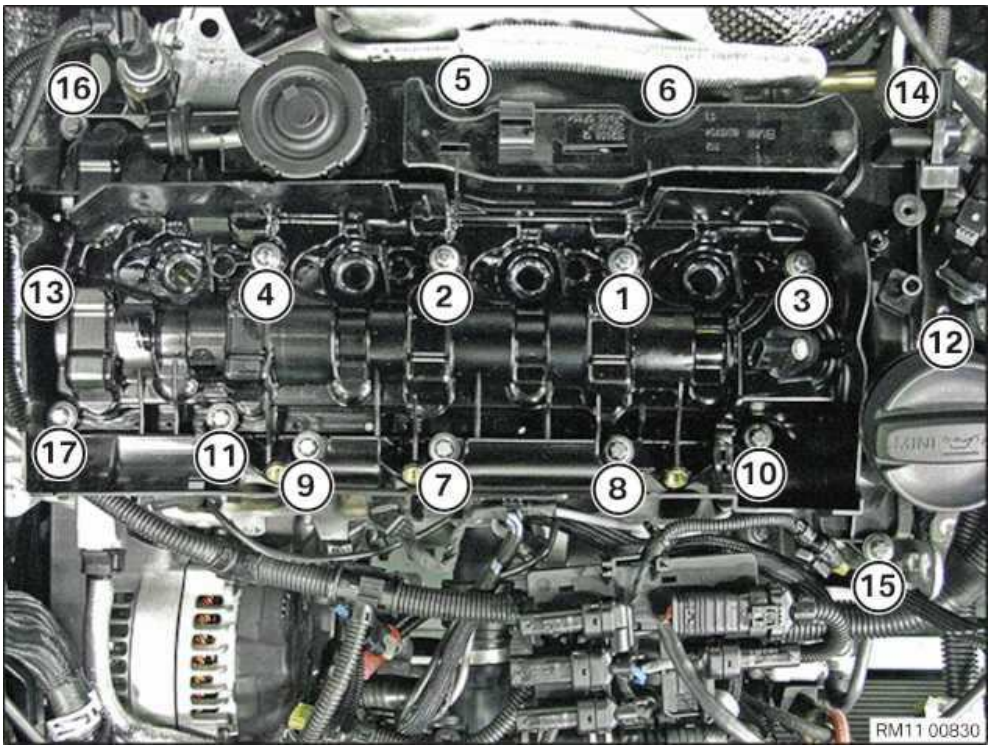


1 to 16 screws of the cylinder head cover.



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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- Loosen screws in the order (17) to (1).
- Remove cylinder head cover by lifting it out.

20 – Checking camshaft timing



- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

Damage to the engine.

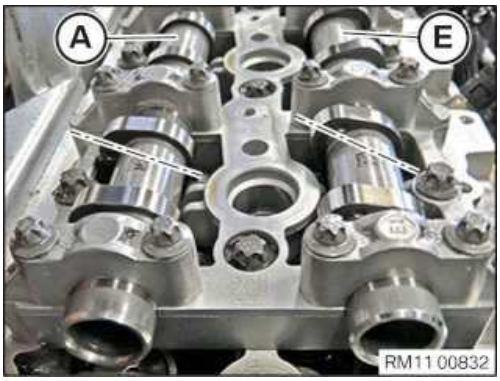
The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

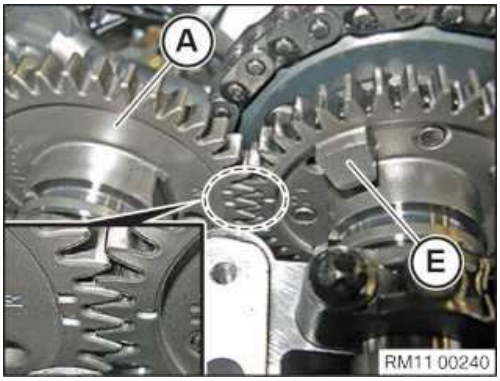
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- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.



- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

21 – Remove chain tensioner piston

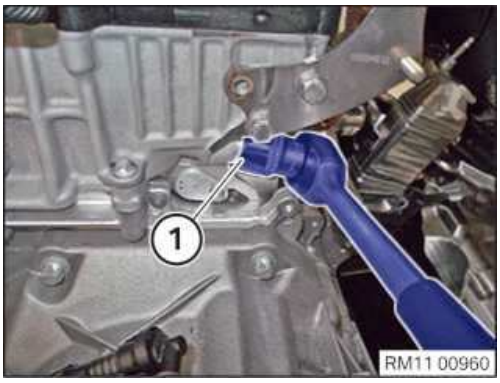
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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

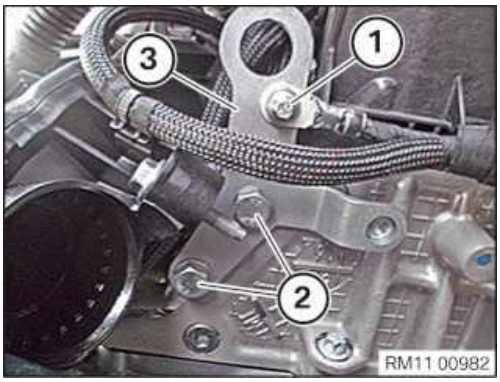


TECHNICAL INFORMATION

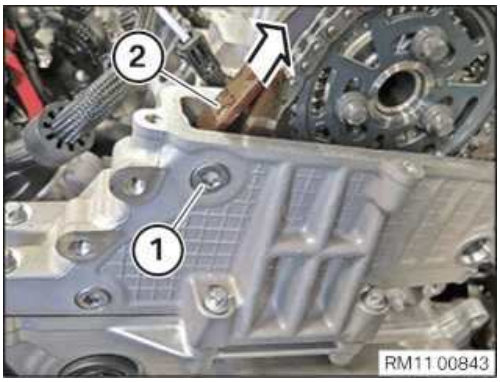
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

22 – Remove the timing chain guide rail

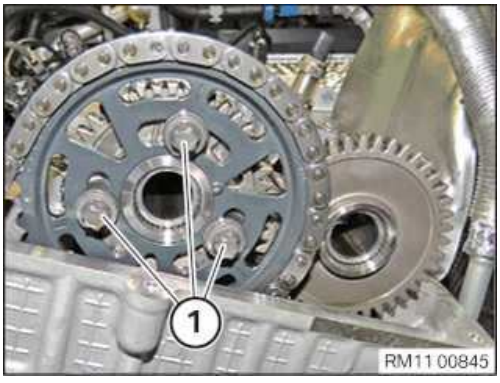


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

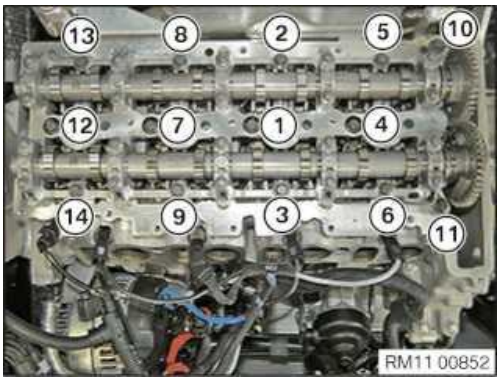
23 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

24 – Removing the camshaft support

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- Evenly loosen all screws in a sequence from (14) to (1).
- Loosen and remove all screws in a sequence from (14) to (1).
  Both camshafts can be removed with the camshaft carrier.
- Remove the camshaft support including camshafts towards the top.

25 – Removing glow elements

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Damage to the glow elements.

Excessive force may damage the glow elements and they may then have to be renewed.

- Handle glow elements with care and do not drop.
- Do not rest the cylinder head on glow elements. Glow elements protrude from the sealing surface of the cylinder head.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

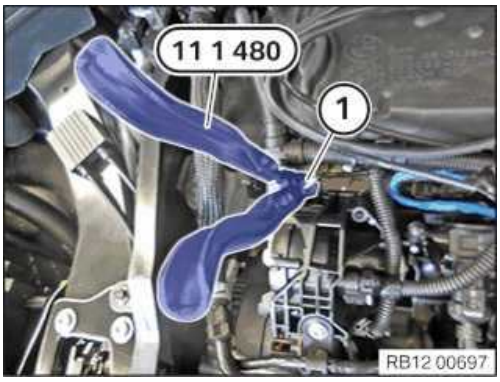
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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

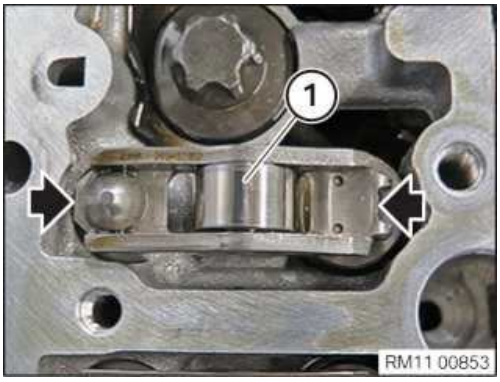


- Unlock and disconnect plug connection (1) using special tool **0 490 796 (11 1 480)**.



- Release the glow elements with the special tool or conventional tools.
- Feed out preheating elements and remove.

26 – Remove roller cam followers



- Guide out and remove all roller cam followers (1) (arrows).
- Place all roller cam followers (1) in order in special tool **0 495 105 (11 4 480)**.

  Roller cam followers that have already been used must be installed in same position again.

27 – Removing the hydraulic valve clearance compensating element

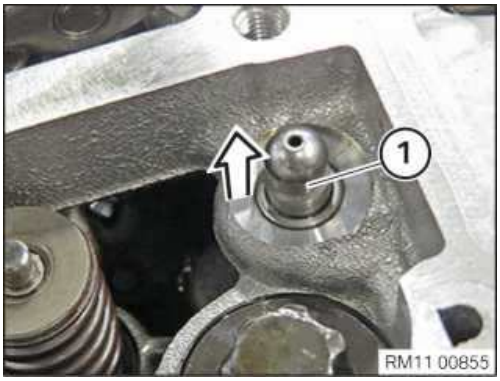
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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Remove the hydraulic valve clearance compensating element (1) in the direction of the arrow and place on the special tool **0 495 105 (11 4 480)**.
- Repeat the process on all hydraulic valve clearance compensating elements.

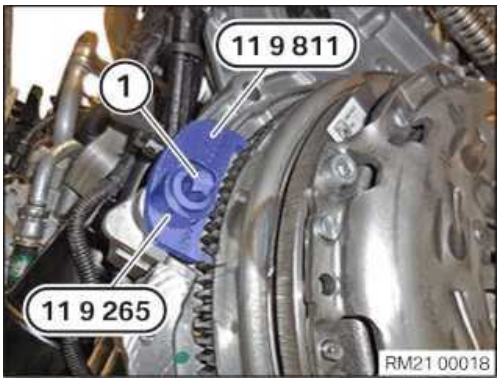
28 – Remove clutch

CAUTION

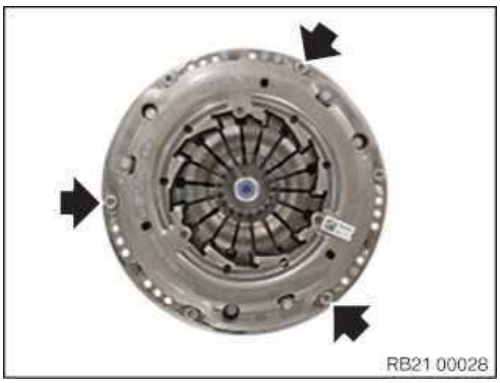
Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

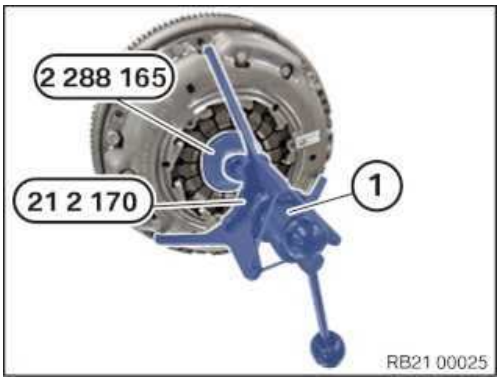


- Block flywheel with transmission bolt (1) and special tools **0 496 171 (11 9 811)** and **0 494 793 (11 9 265)**.

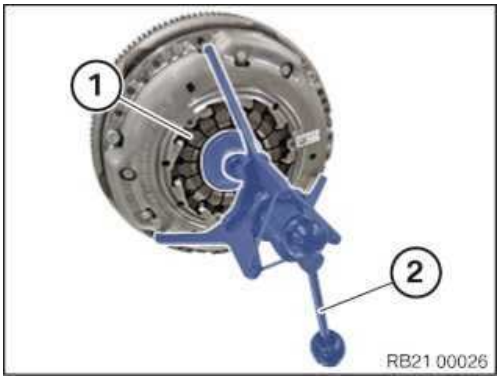


- Detach 3 screws to attach special tool and **2 288 165**.

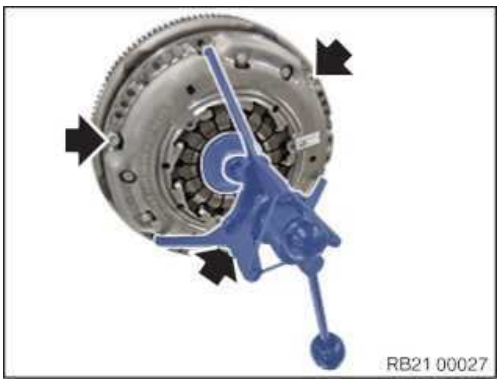
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- Position special tool and **2 288 165** and tighten on the knurled screw (1).



- Screw in the spindle (2) until the diaphragm spring (1) is preloaded and the clutch disc is free of tension.



- Loosen the remaining 3 screws and remove the clutch with clutch disc from the flywheel.

29 – Removing flywheel

CAUTION

Heavy component.

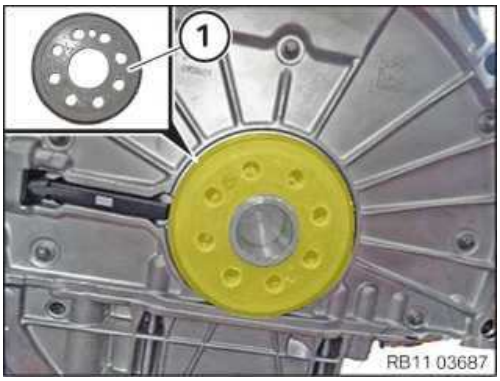
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Secure the flywheel with a transmission bolt (1) and with special tools **0 496 171 (11 9 811)** and **0 494 793 (11 9 265)**.
- Unscrew the flywheel bolts with the special tool **0 491 018 (11 4 180)**.
- Remove flywheel.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

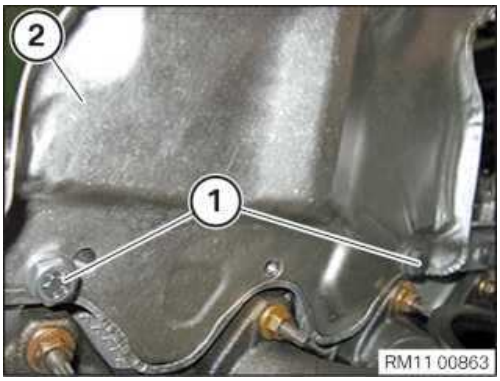
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Remove the increment wheel (1) from the crankshaft and lay it down correctly.

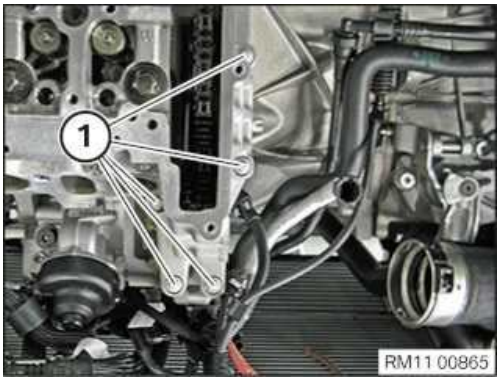
30 – Remove rear timing case cover

Prerequisite

Transmission is removed.



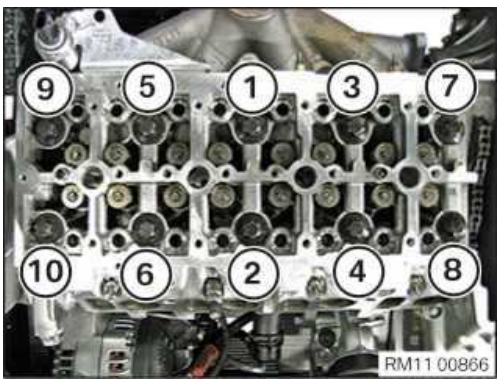
- Loosen screws (1).
- Feed out the heat shield (2) and place to one side.



TECHNICAL INFORMATION

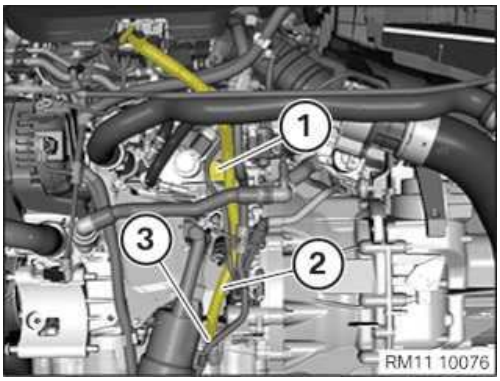
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screws (1).

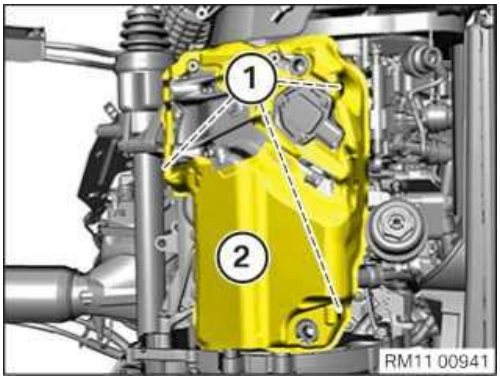


- Loosen the cylinder head bolts in the sequence from (10) to (1).
- Remove cylinder head bolts (1) to (10) with washers.
- Remove cylinder head.

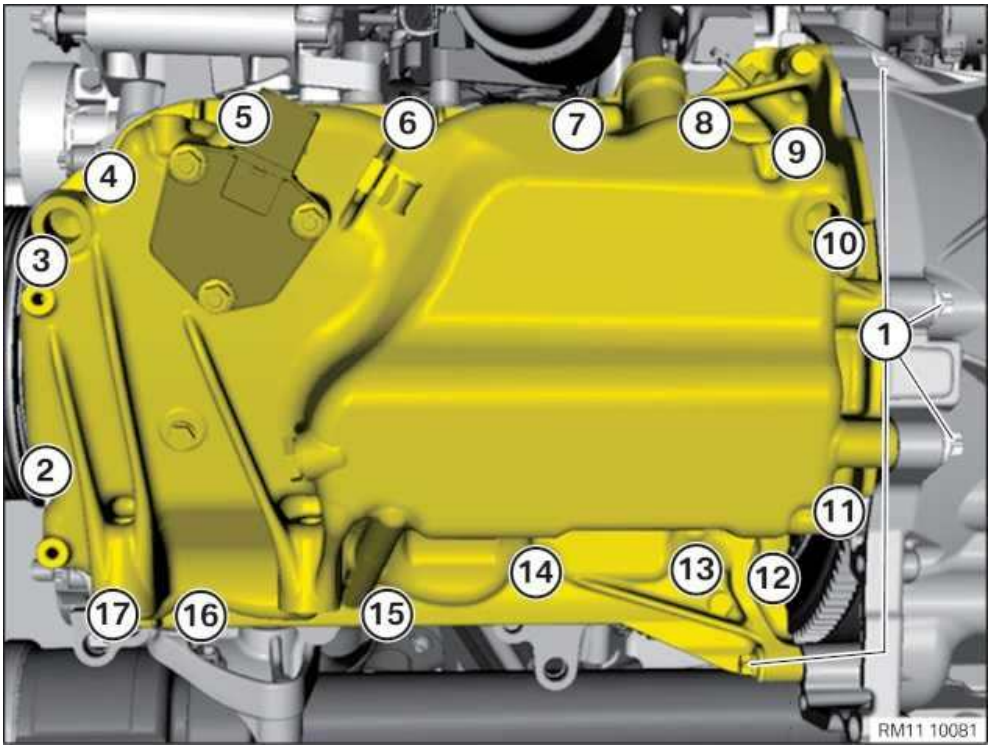
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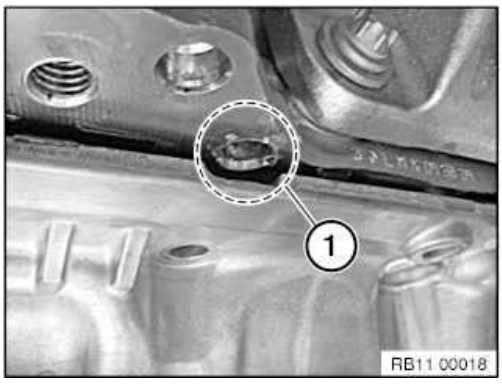
- Loosen screw (1).
- Disconnect the guide tube (2) for the oil dipstick toward the top from the oil sump and remove it.
- Remove sealing ring (3) from oil sump if necessary.



- Expanding rivets (1) on both sides of the acoustic cover (2).
- Feed out and remove the acoustic cover (2).

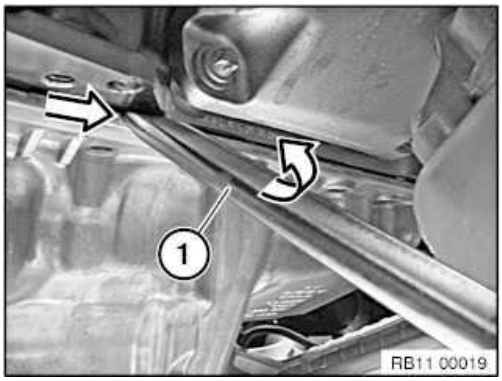


- Loosen the transmission bolts (1) on the oil sump.
- Loosen screws (2) to (17).



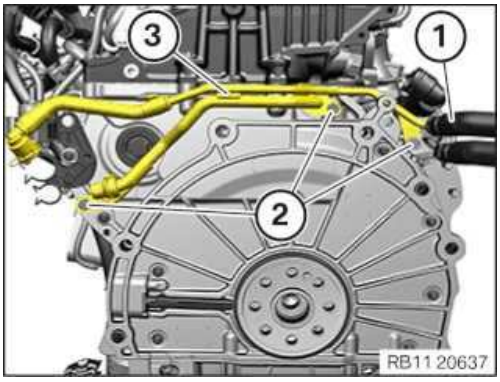
- Release oil sump only in area (1).

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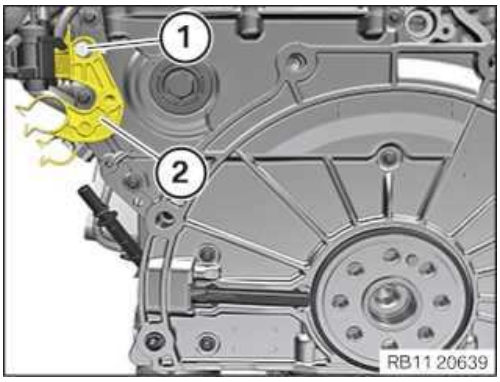


- Detach the oil sump with a suitable mounting lever (1) carefully at the point provided.
- Secure the oil sump against falling.

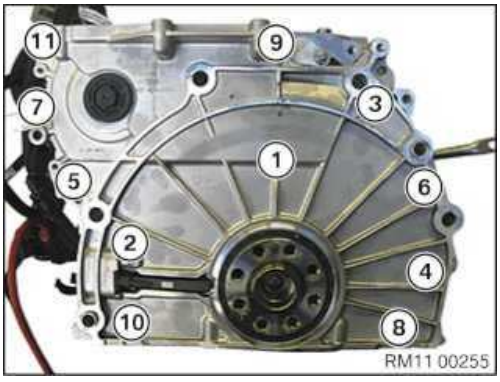
▶ **If installed: Remove coolant line of the SCR metering module**



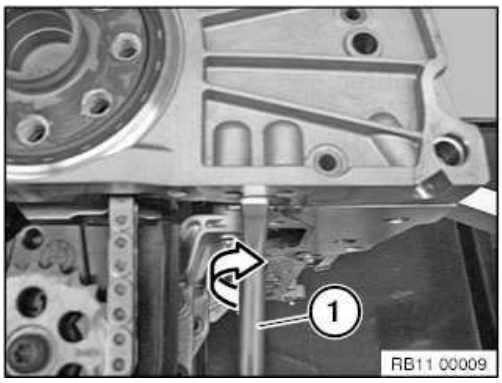
- Unlock and disconnect the coolant hose (1).
- Loosen screws (2).
- Remove the coolant line (3).



- Loosen screw (1).
- Guide out and remove holder (2).

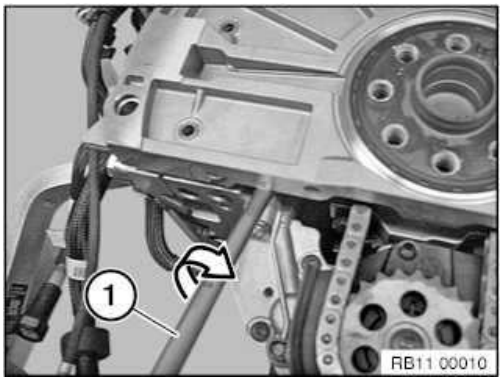


- Loosen screws in the order (11) to (1).



- Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.

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- Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.
- Remove the timing case cover.

MAIN WORK

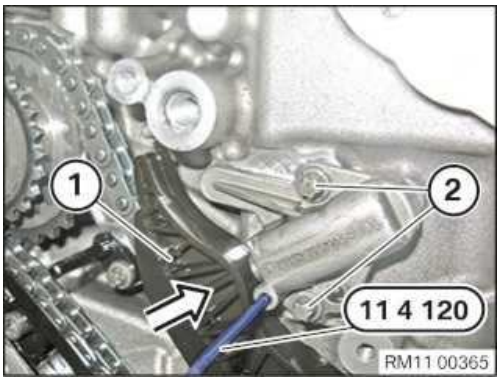
31 – Removing the hydraulic chain tensioner for the bottom timing chain

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.



- Press the hydraulic chain tensioner with tensioning rail (1) by hand in the direction of the arrow until the special tool **0 491 012 (11 4 120)** can be positioned.
- Loosen screws (2).
- Remove hydraulic chain tensioner.

32 – Installing the hydraulic chain tensioner for the bottom timing chain

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

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CAUTION

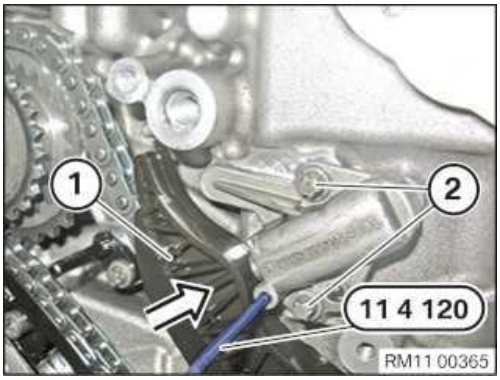
Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

- Wear safety goggles.

- Clean sealing surfaces (1) with compressed air.



- Install the hydraulic chain tensioner.
- Tighten down screws (2).

Hydraulic chain tensioner to crankcase

M6x22		Tightening torque	9 Nm

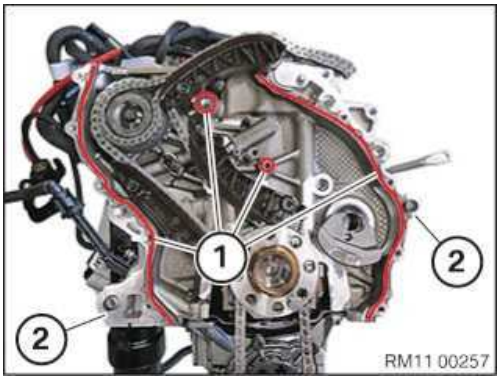
- Press the hydraulic chain tensioner with tensioning rail (1) in the direction of the arrow and remove the special tool **0 491 012 (11 4 120)**.

POSTPROCESSES

33 – Install the rear timing case cover

Prerequisite

Transmission is removed.



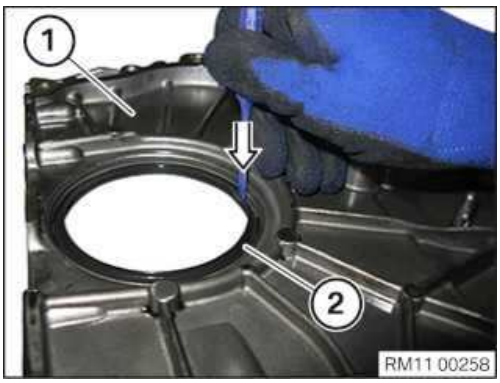
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

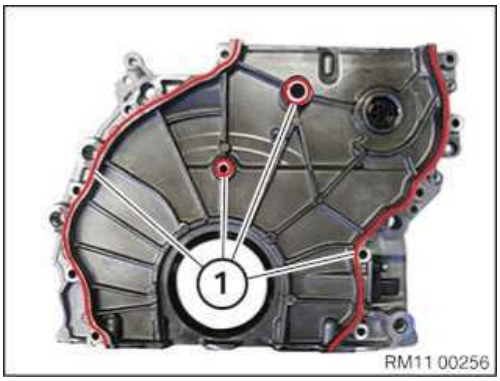
- Do not use any metal-cutting tools.

- Remove seal residue from the sealing surfaces (1) using special tool **0 495 102 (11 4 470)**.
- Check fitting sleeves (2) for damage and for tight fit; renew if necessary.

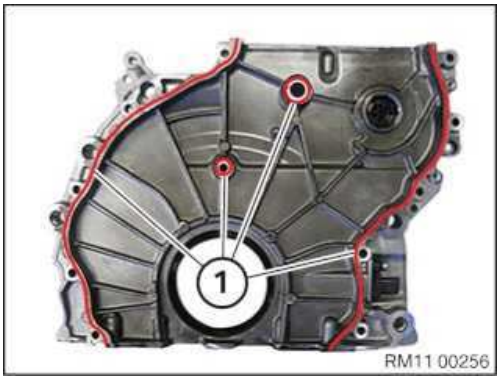


- Position the timing case cover (1) underneath.
- Position punch on inner side of crankshaft seal (2).
- Drive out crankshaft seal (2) outwards.

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- Remove seal residue from the sealing surfaces (1) using special tool **0 495 102 (11 4 470)**.

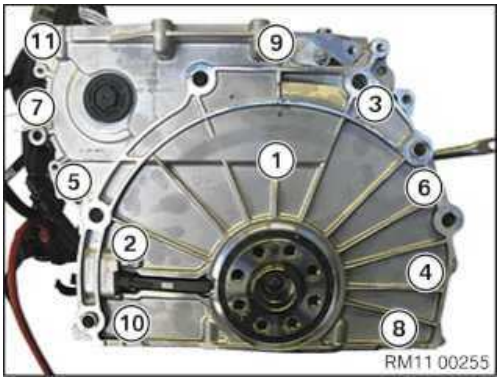


TECHNICAL INFORMATION

For more information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

- Apply sealing bead (1) with a height of approx. 1.5 mm to 2.0 mm on inner side of timing case cover in marked locations. Use liquid sealing compound for this.

  Application time of sealing bead (1) must not exceed 12 minutes.



- Mount the timing case cover without the crankshaft seal.
- Renew screws (1) to (11).

  Parts: Bolts
- Join the bolts in with the sequence (1) to (11).
- Tighten screws in the order (1) to (11).

Rear timing case cover to crankcase

M6	Renew screws.	Jointing torque	8 Nm
		Angle of rotation	90 °

▸ **Installing the rear crankshaft seal**

RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) on the radial shaft seal with the sharp-edged connector gearing of the output shaft will result in destruction and/or leaks.

- When inserting the output shaft, make sure that the connector gearing of the output shaft does not touch the sealing lip (inner) of the radial shaft seal.

RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) and applying oil to the radial shaft seal will lead to its destruction.

- Do not touch the sealing lip (inner) of the radial shaft seal.
- Do not apply oil to the radial shaft seal.
- Install the radial shaft seal dry.

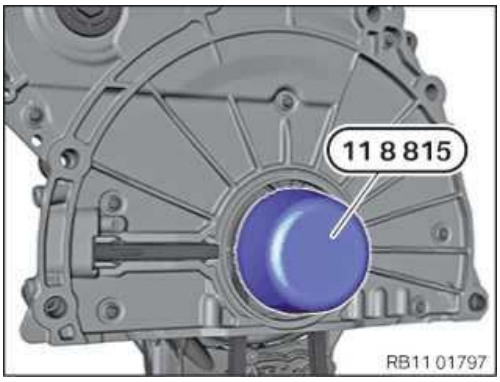
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RISK OF DAMAGE

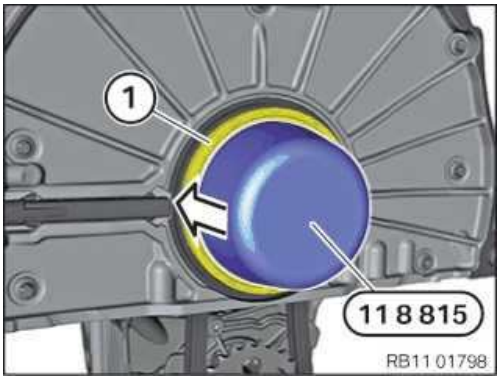
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Position special tool **0 496 137 (11 8 815)** on crankshaft. Make sure that the crankshaft sensor is not damaged.



- Fit the crankshaft seal (1) up to the timing case cover in the direction of the arrow using special tool **0 496 137 (11 8 815)** and position.
- Remove special tool **0 496 137 (11 8 815)**.



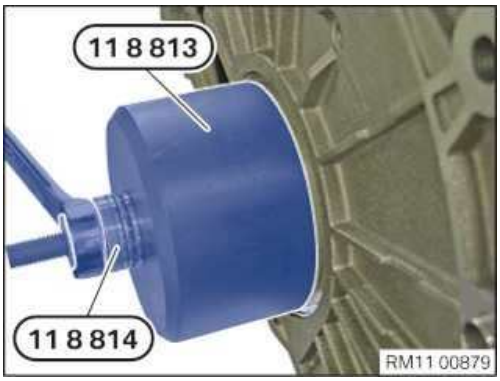
- Secure special tool **0 496 133 (11 8 811)** to the crankshaft using special tool **0 496 134 (11 8 812)**.



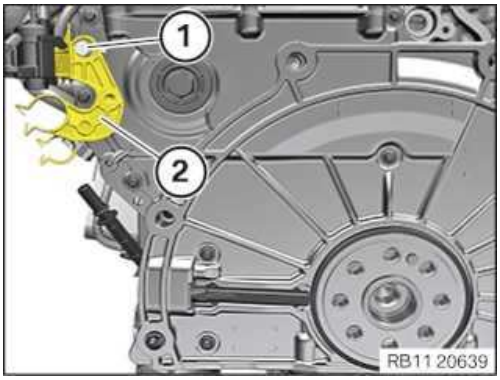
- Check the freedom of movement between the special tool **0 496 135 (11 8 813)** and the crankshaft sensor during installation.

  Otherwise there is a risk that the crankshaft sensor will be damaged.
- Slide on special tool **0 496 135 (11 8 813)**.
- Screw down special tool **0 496 136 (11 8 814)**.

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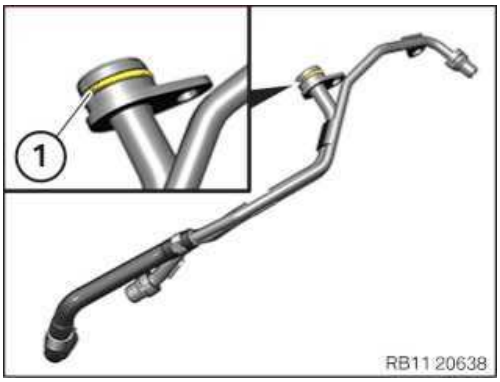


- Press in crankshaft seal with special tool **0 496 135 (11 8 813)**.
- Screw in special tool **0 496 135 (11 8 813)** up to timing case cover.



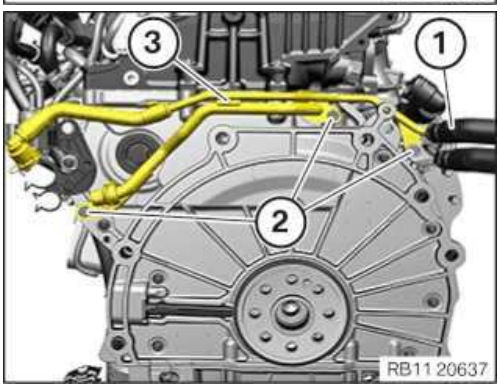
- Insert and install the holder (2).

▶ **If installed: Installing the coolant line of the SCR metering module**



- Renew the O-ring 1.

  Parts: O-ring



- Feed in and install coolant line (3).
- Tighten down screws (2).

SCR coolant lines to crankcase end cover

Hexagon screw M6x16		Tightening torque	8 Nm

- Connect and lock the coolant line (1).

  Coolant line (1) must audibly engage.

▶ **Cleaning the sealing surface**

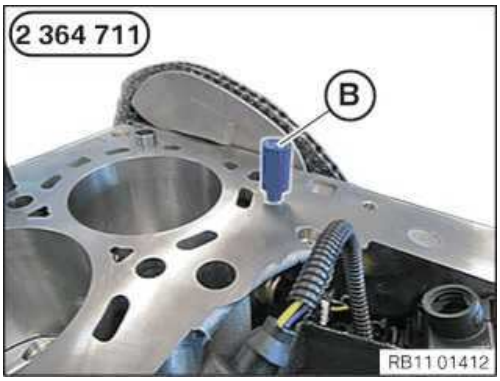
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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- Lock the front oil duct using special tool (B) from special tool **2 364 711**.



RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 103 (11 4 471)**.



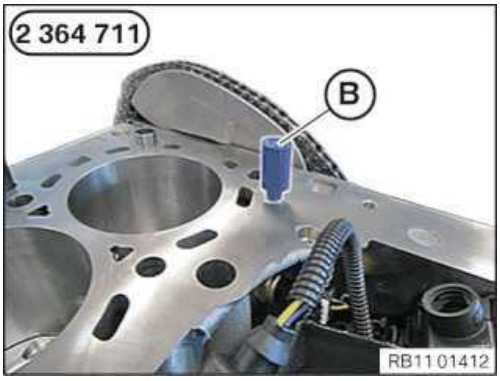
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

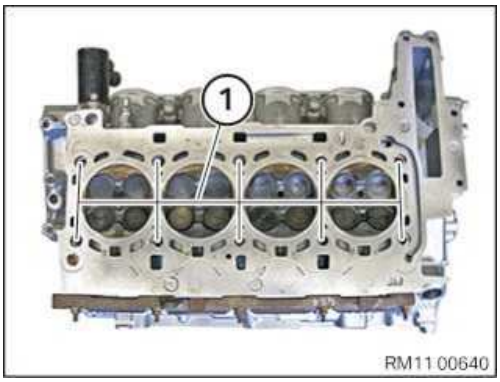
- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 104 (11 4 472)**.



- Remove special tool (B).

▸ **Renewing the cylinder head gasket**



RISK OF DAMAGE

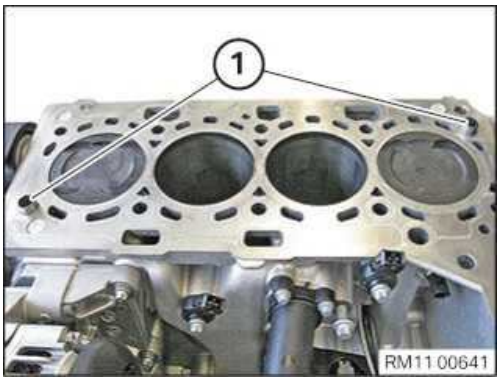
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

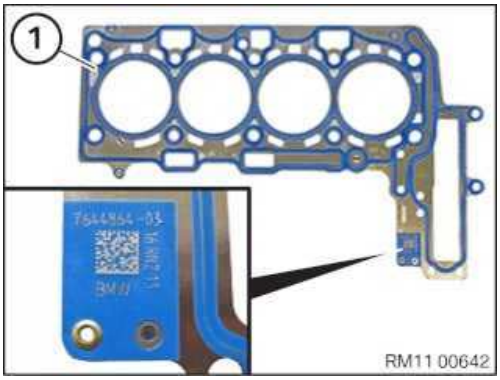
- Do not use any metal-cutting tools.

- Remove oil and dirt residue from the blind holes (1).

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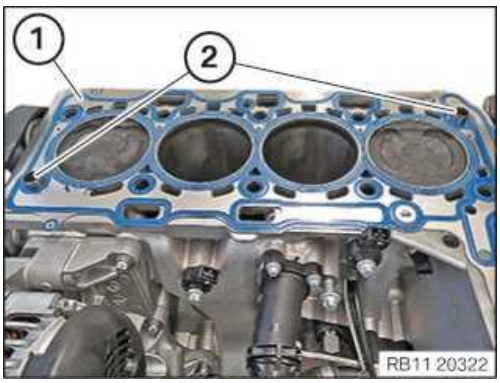


- Check the fitting sleeves (1) for secure fit and damage.



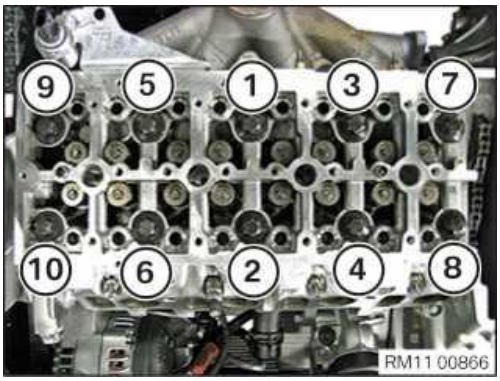
- Identify the cylinder head gasket (1) using the part number.

Note: If the cylinder head is reworked, an additional thicker gasket 0.3 mm is available for service personnel.



- Guide in the cylinder head gasket (1) and install.
- Ensure that the cylinder head gasket (1) is installed correctly in the fitting sleeves (2).

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CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Damage to threads.

Fluid in the threaded hole may damage the thread when screws are tightened in the threads.

- Dry threaded holes (e.g. using compressed air).

TECHNICAL INFORMATION

Do not remove bolt coating.

- Renew the cylinder head bolts (1).

  Parts: Cylinder head bolts
- Do **not** wash off coating of cylinder head bolts.
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

  No coolant, water or engine oil must be present in threaded holes of engine block.

TECHNICAL INFORMATION

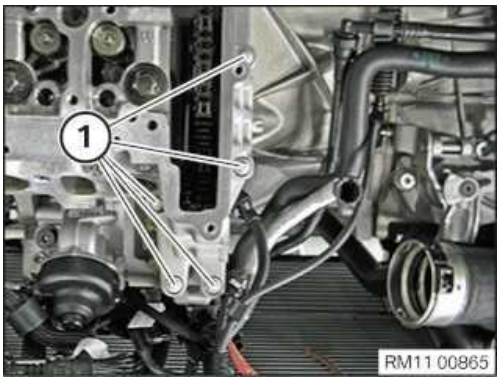
When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Feed in cylinder head bolts and install.
- Screw in cylinder head bolts in sequence (1) to (10).
- Tighten cylinder head bolts using special tools **0 490 504 (00 9 120)** and in sequence (1) to (10).

Cylinder head to crankcase

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

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- Tighten the cylinder head bolts (1).

Cylinder head bolt to timing case cover

M8x40		Tightening torque	19 Nm

-



TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

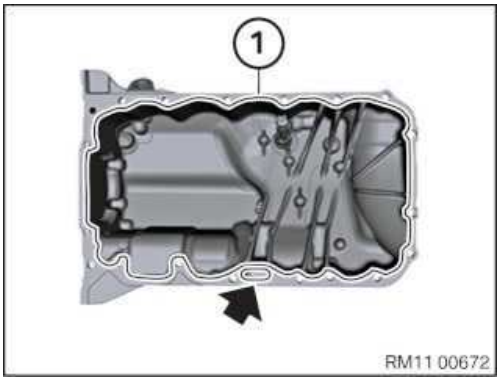
- Remove fine sealing remains on the sealing surface (1)and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.



TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove coarse sealing remains on the sealing surface (1)and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.



TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- Apply the sealing compound along the line (1) with a thickness of 2 mm to 2.5 mm.

  Apply the sealing compound along the inner edge.

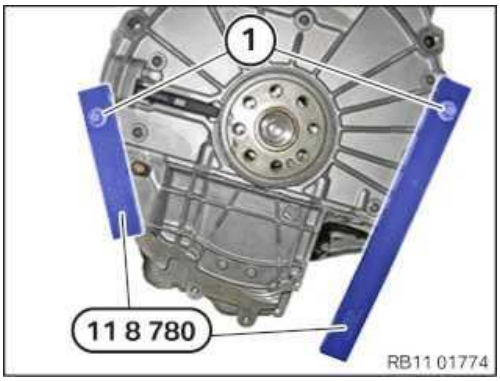
Sealing compound

Loctite 5970 liquid sealing compound	50 ml, Cartridge	83190404517

Overview of consumables (Electronic Parts Catalogue)

- Completely encircle the oil return orifice (arrow) with the sealing compound.

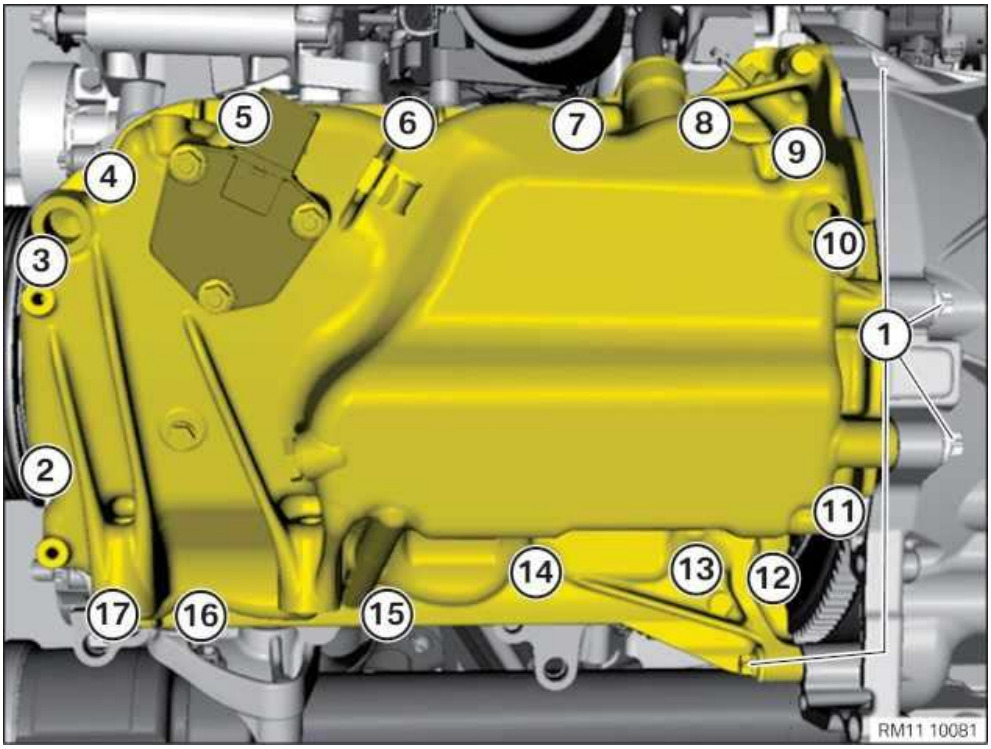
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TECHNICAL INFORMATION

The special tool 11 8 780 is only required when the transmission is removed.

- Position the special tool **0 496 120 (11 8 780)** with the transmission bolts (1) so that the oil sump is exactly flush with engine block.
- If necessary, renew fitting sleeves.



- Position and install oil sump.
- **Hand-tighten** oil sump screws (2) to (17) but do **not** tighten completely.
- Join transmission bolts (1) with 5 Nm.
- Tighten screws(2) to (17) of the oil sump.

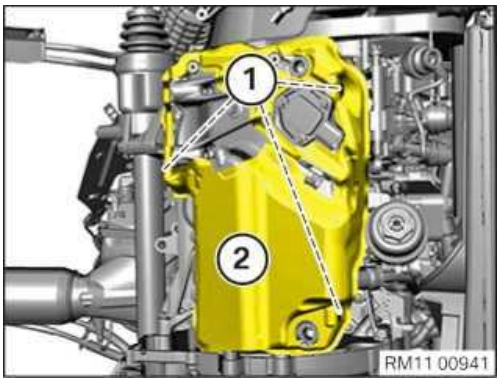
Oil sump to crankcase

M8x30		Tightening torque	2 Nr
M8x110		Tightening torque	2 Nr

- Tighten transmission bolts (1) on oil sump.

Transmission to oil sump

M8		Tightening torque	1 Nr



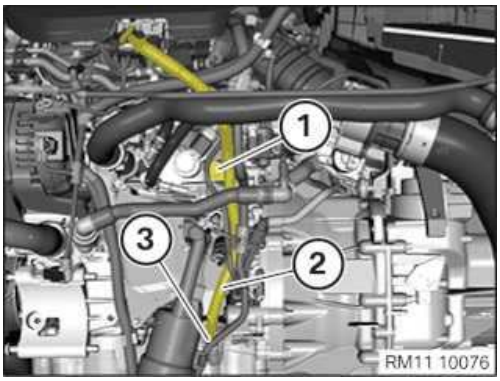
- Thread in and position the acoustic cover (2).
- Install the expanding rivet (1).



- Renew O-ring (1).

  Parts: O-ring

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- Guide in guide tube (2) for oil dipstick and insert it into oil sump.
- Make sure the sealing ring (3) is positioned correctly in the oil sump.
- Tighten down screw (1).

Guide tube for oil dipstick on engine

M8x16		Tightening torque	19 Nm

34 – Installing the flywheel

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



TECHNICAL INFORMATION

Clean all threads with a screw tap.

- Clean all screw threads (1).



- Use the set of special tools **2 285 058**.

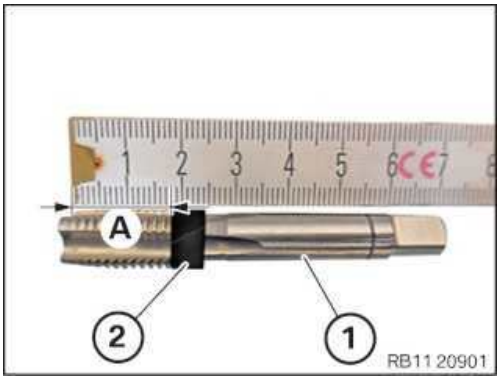
Description
Twist drill
Thread cutter M12x1.5
Depth
Insertion tool

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- Assemble tool set.

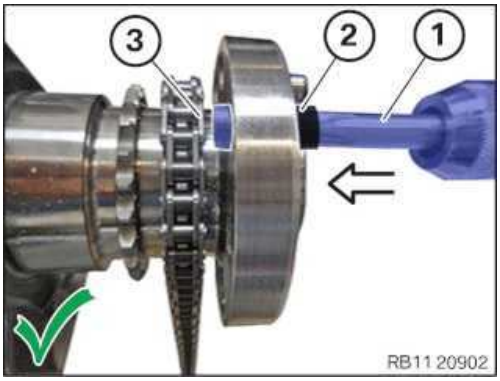
Number	Description
1	Tool holder
2	Thread cutter M12X1,5



- Mark the screw-in depth (A) on thread cutter (1) from the set of special tools **2 285 058** with a standard tool (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm



NOTICE

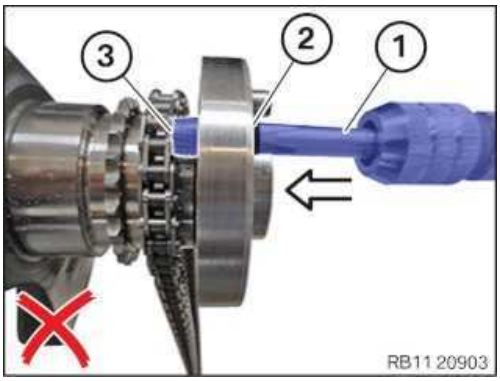
To provide a better overview: Shown with engine removed.

- Screw in the thread cutter (1) from the set of special tools **2 285 058** in direction of arrow up to the screw-in depth (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm

- Make sure that the thread cutter does (1) **not** rest on the timing chain (3).

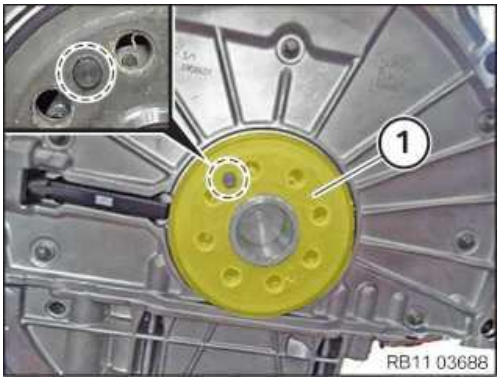


TECHNICAL INFORMATION

- **Carefully** handle the timing chain, to protect the timing chain and timing chain drive against damage.

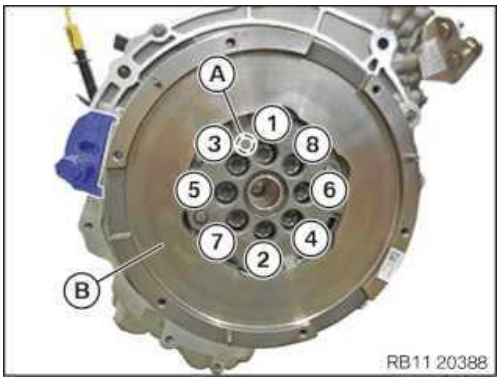
- Make sure that the screw-in depth (2) of the screw tap (1) is not exceeded.

  The thread cutter (1) may not rest on the timing chain (3).



- During the installation, note the mark shown without fail.
- Install special tool (1) on the crankshaft as shown.

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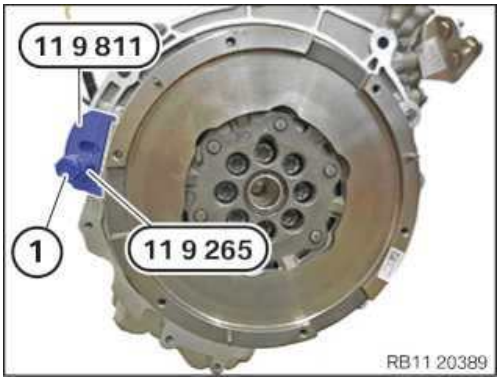


- Position flywheel (B) .
- Renew flywheel bolts (1) to (8).

  Parts: Flywheel bolts
- Tighten flywheel bolts hand-tight with special tool **0 491 018 (11 4 180)**.
- Observe tightening sequence. While doing so, begin with dowel pin (A).
- Tighten the flywheel bolts using the special tool **0 491 018 (11 4 180)** in sequence (1) to (8).

Flywheel to crankshaft

M12x1.5	Renew screws.	Tightening torque	120 Nm



- Loosen the transmission bolt (1).
- Feed out and remove special tools **0 494 793 (11 9 265)** and **0 496 171 (11 9 811)** with the **standard** (5 mm) washer.

35 – Install clutch

CAUTION

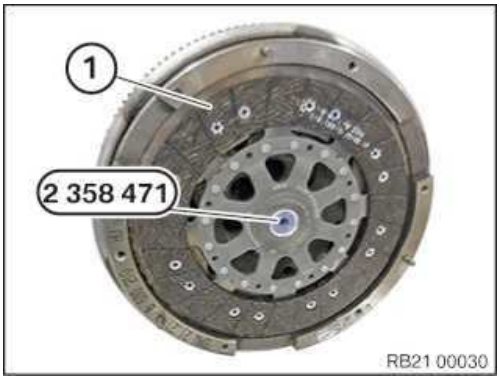
Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

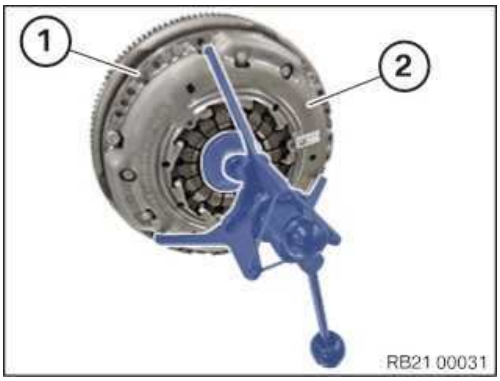
TECHNICAL INFORMATION

Handle the clutch disc carefully. Install the surfaces of the clutch disc in the correct mounting orientation.
Clean friction surfaces of the flywheel and the pressure plate with BMW-approved brake cleaner.
Note designation for ”engine side” / ”transmission side”.

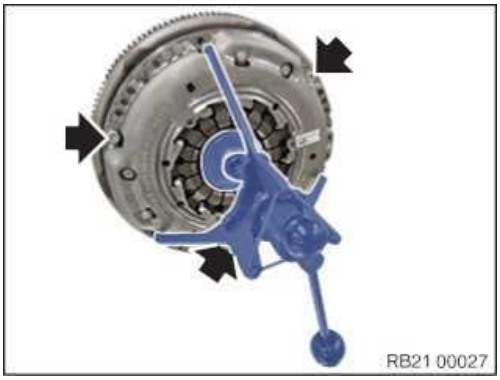


- Centre the clutch disc (1) using special tool .

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- Mount the clutch (2) together with the special tool to the flywheel.
- Observe the dowel pins (1).
- The clutch (2) must be secured via the dowel pins (1).

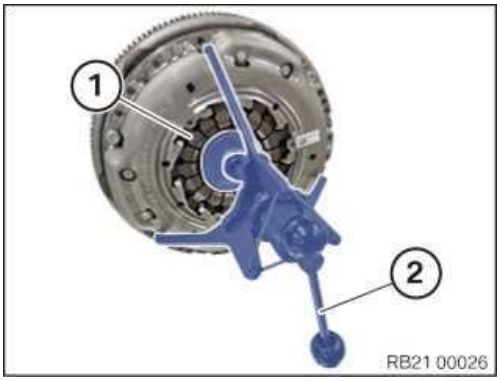


- Renew the bolts (arrows).

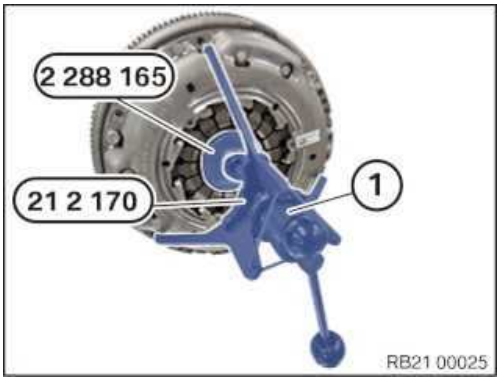
  Parts: Bolts
- Install and tighten screws (arrows).

Clutch to flywheel

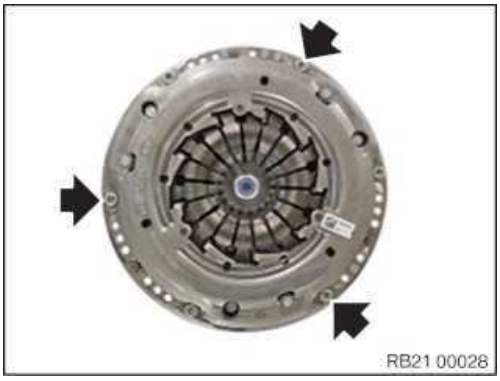
M8	Renew screws.	Jointing torque	15 Nm
		Angle of rotation	90 °



- Loosen the spindle (2) until the diaphragm spring (1) is fully relieved.



- Unscrew the knurled screw (1) and remove the special tool with **2 288 165** from the clutch.



- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Clutch to flywheel

M8	Renew screws.	Jointing torque	15 Nm
		Angle of rotation	90 °

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- Withdraw special tool from clutch disc with aid of accompanying screw.

36 – Installing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

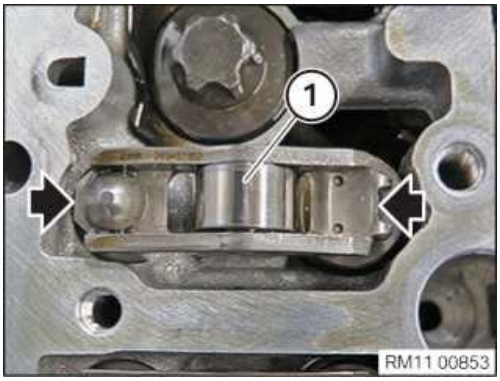


- Install the hydraulic valve clearance compensating element (1) in the direction of the arrow.
- Repeat the process on all hydraulic valve clearance compensating elements.

37 – Install the roller cam followers

TECHNICAL INFORMATION

- Note the installation position of the component. The component may be installed in various installation positions.



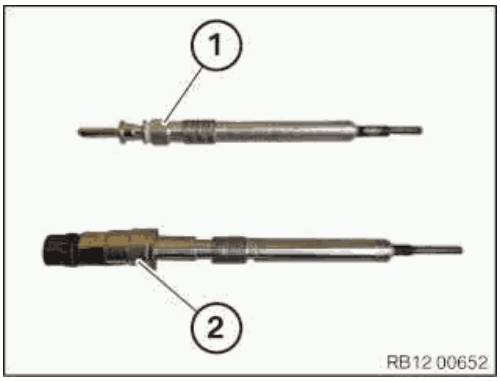
- Check all roller cam followers (1) for damage and replace if necessary.

  Parts: Roller cam followers
- Insert and install all roller cam followers (1).

  Roller cam followers (1) that have already been used must be installed in the same place.
- Note the mounting orientation of the roller cam followers (1).
- Oil all roller cam followers (1).

38 – Install glow elements

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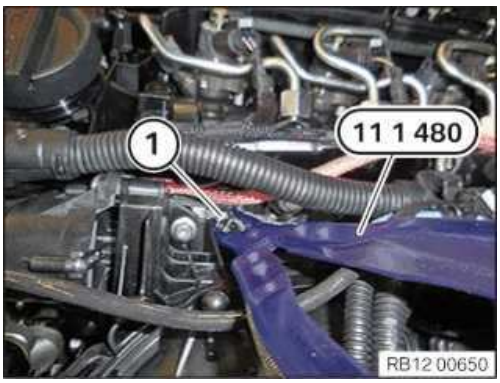
- Install glow elements (1) in cylinders 1, 2, 3 and 4.
- If fitted: Glow element (2) with the **combustion chamber pressure sensor** must be installed in cylinder **2**.



- Tighten the glow element with the special tool or conventional tools.

Glow elements to cylinder head

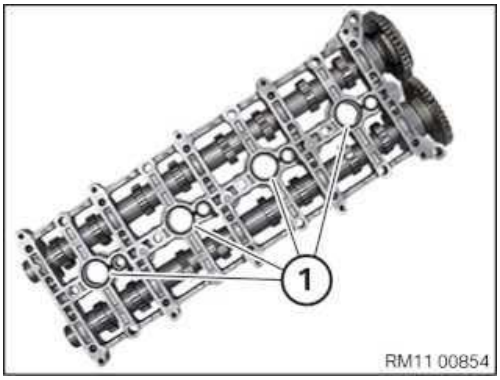
Glow element		Tightening torque	13 Nm



- Connect connectors (1) and lock.

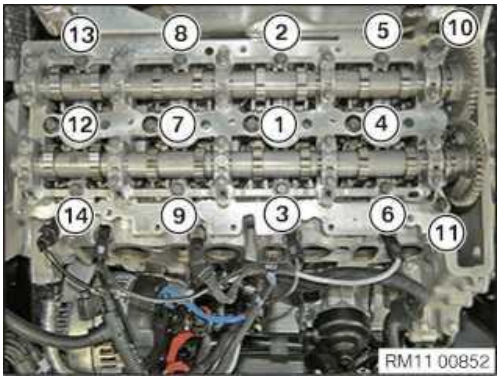
  The connector (1) must engage audibly.

39 – Installing the camshaft support



- Renew gaskets (1).

  Parts: gaskets



- Position the camshaft support including the camshafts.
- Tighten the screws in a sequence from (1) to (14) in several steps.

Camshaft carrier to cylinder head

M7x35		Tightening torque	13 Nm

40 – Adjusting the timing of the camshafts

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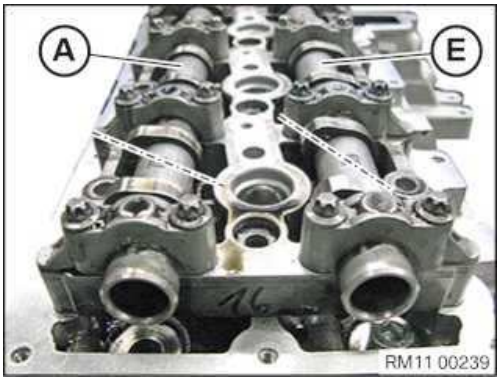


- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.



- Slide the special tool **2 288 380** completely into the bore hole of the oil sump.
- Use the special tool to block **2 288 380** the crankshaft in the TDC firing position at the first cylinder.



- The cam of the intake camshaft (E) at the first cylinder points up at an angle.
- The cam of the exhaust camshaft (A) at the first cylinder points outward at an angle.

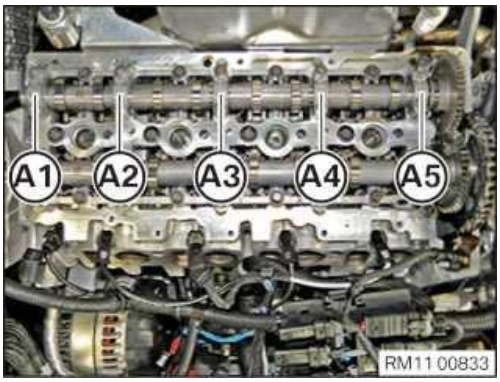
▸ **Remove exhaust camshaft.**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



TECHNICAL INFORMATION

The camshaft is tensioned by the valve springs. Tighten or loosen each screw on the camshaft bearing caps one at a time in the specified sequence and by half a turn only. Repeat procedure.

- Loosen all screws of the exhaust camshaft bearing caps (A1) to (A5) from the outside to the inside, step by step in 1/2 turns.
- Remove exhaust camshaft in upward direction.
- Place all components on special tool **0 495 105 (11 4 480)** in a tidy and orderly fashion.

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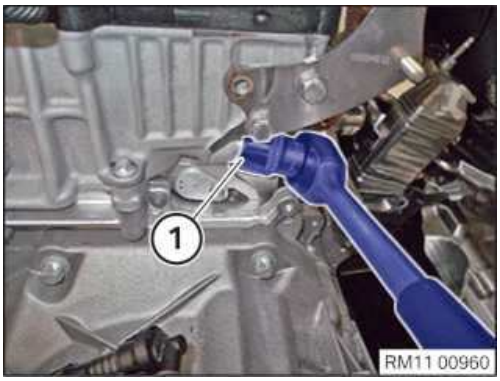
▶ **Remove chain tensioner piston**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

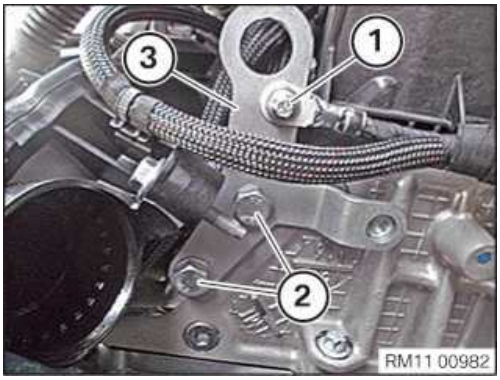


TECHNICAL INFORMATION

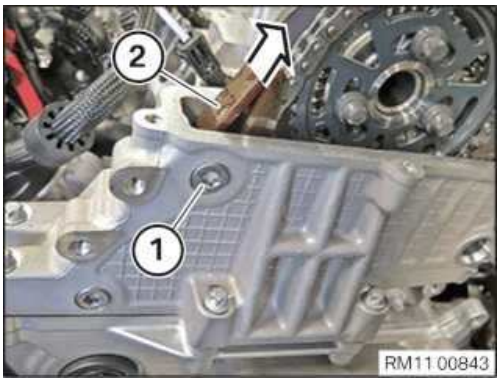
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

▶ **Remove the timing chain guide rail**

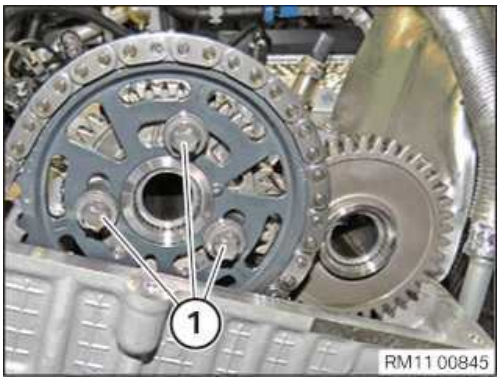


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

▶ **Removing the camshaft sprocket on the intake camshaft**



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

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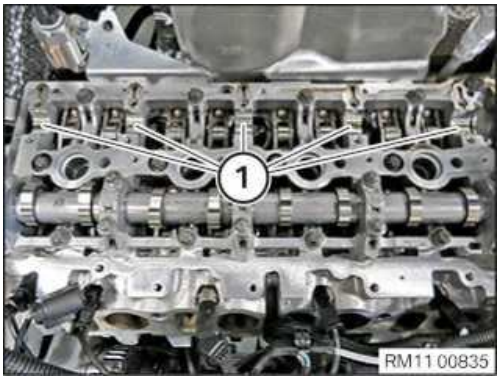
▶ **Install exhaust camshaft**

RISK OF DAMAGE

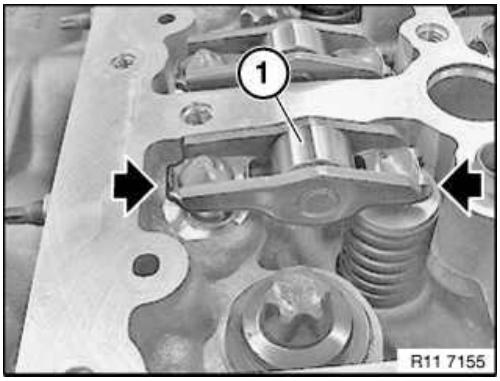
Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

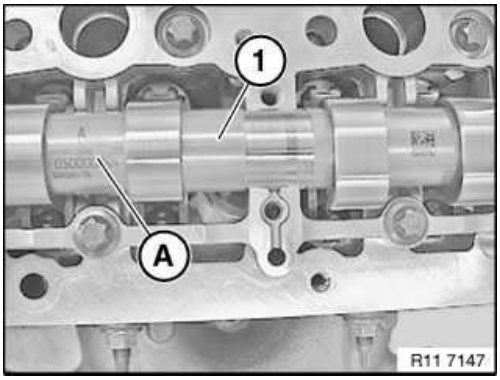
- Comply with the regulations for the installation and disassembly.
- Perform work with care.



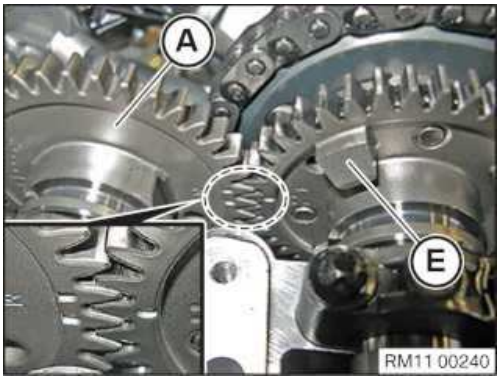
- Oil all bearing positions (1).



- Make sure the roller cam followers (1) have the correct mounting orientation.

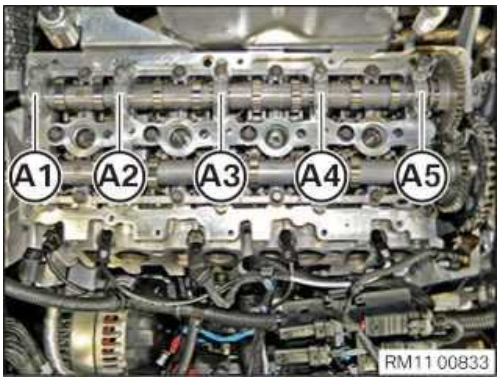


- Insert exhaust camshaft (1) so that the identification (A) points upwards.



- Insert the exhaust camshaft (A) so that the marks on the camshafts (A) and (E) correspond in the highlighted area.
- Position the camshafts (A) and (E) accordingly.

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- Tighten all exhaust camshaft bearing caps (A1) to (A5) from the inside to the outside by 1/2 a turn at a time.

Intake and exhaust camshaft in camshaft support

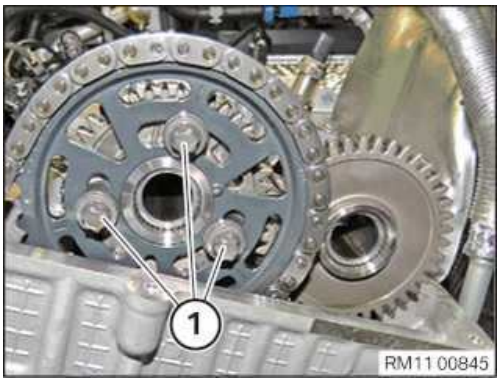
M6x31		Tightening torque	10 Nm



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

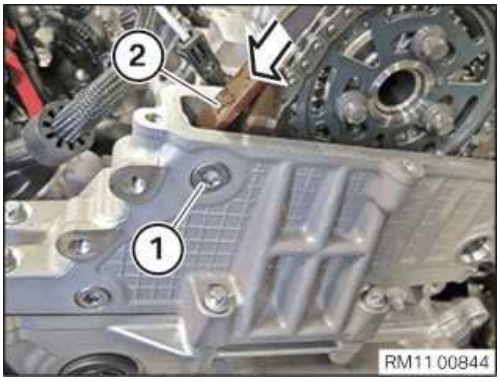
  Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

▶ **Installing the camshaft sprocket on the intake camshaft**



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

▶ **Install the timing chain guide rail**



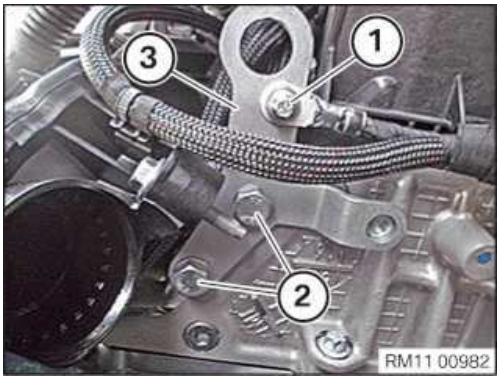
- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm



- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6			8 Nm

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▶ **Installing the chain tensioner piston**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Renew sealing ring (1).

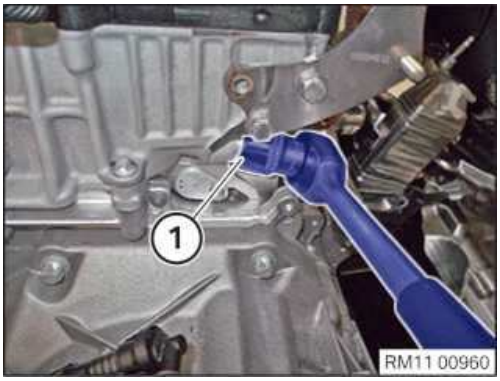
  Parts: Sealing ring



TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.

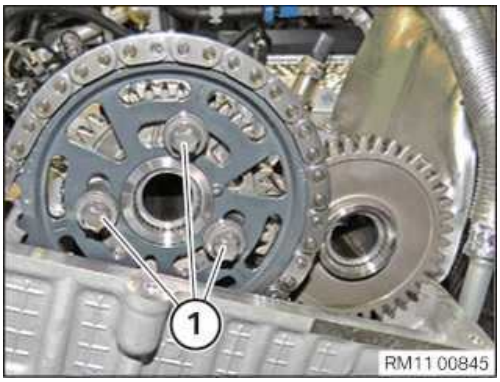


- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

▶ **Tightening the camshaft sprocket on the intake camshaft**



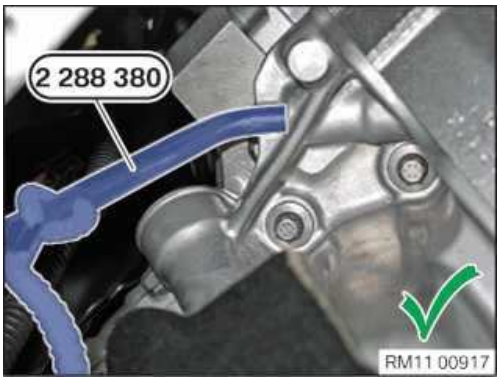
- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

41 – Removing the special tool to disconnect the crankshaft

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- Remove special tool **2 288 380**.

42 – Removing the special tool to secure the exhaust camshaft



- Remove the special tool **0 496 112 (11 8 760)** to fix the exhaust camshaft.

43 – Checking camshaft timing



- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

Damage to the engine.

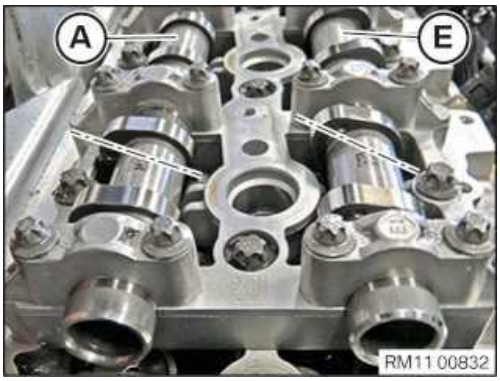
The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

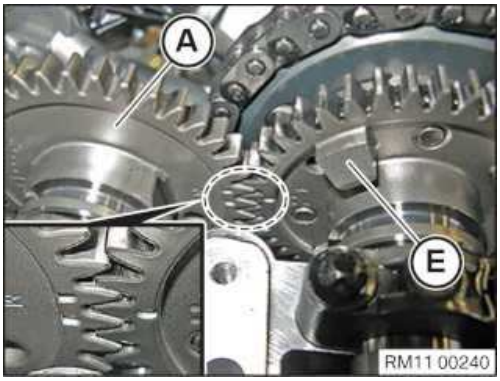
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- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

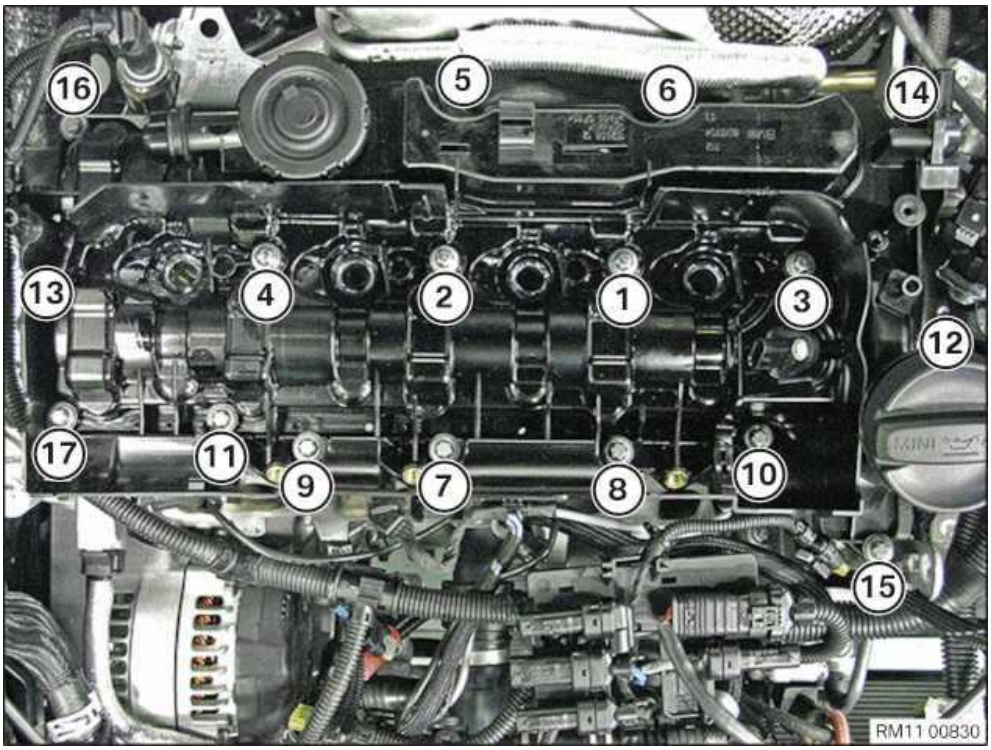
- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.



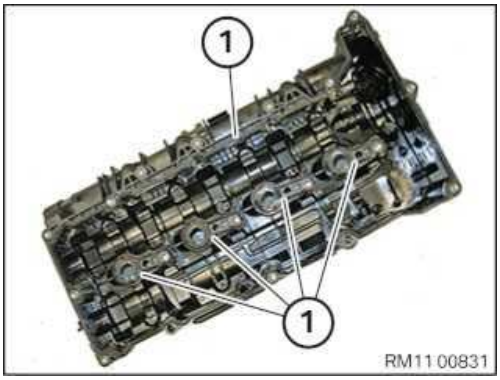
- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

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Overview: Screw connection of the cylinder head cover

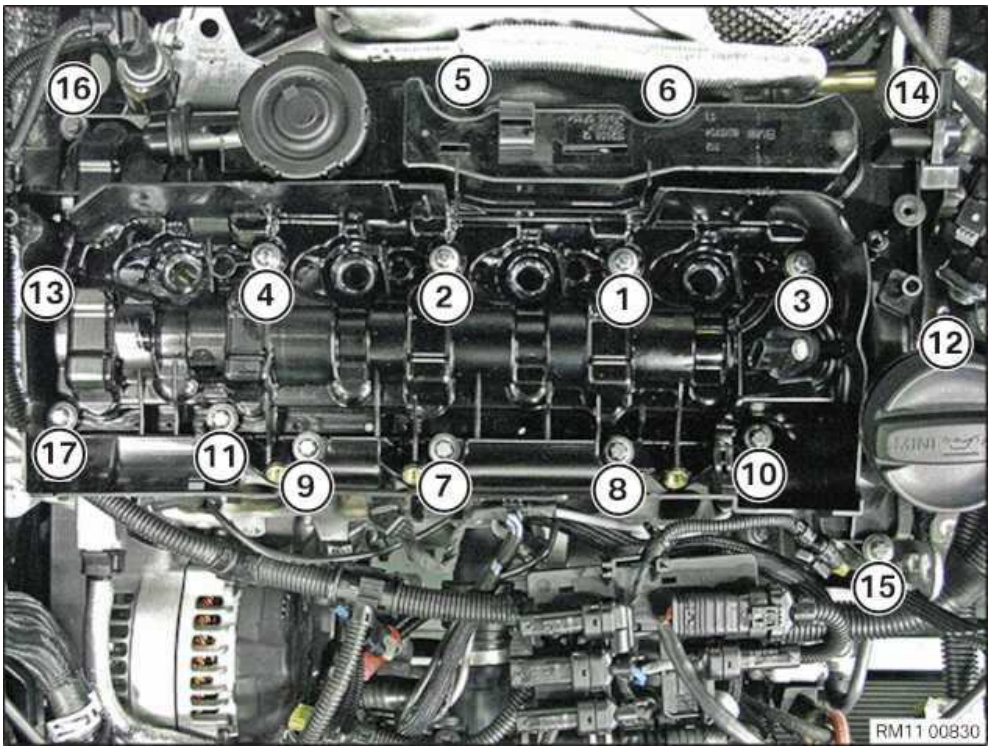


1 to 16 screws of the cylinder head cover.



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket



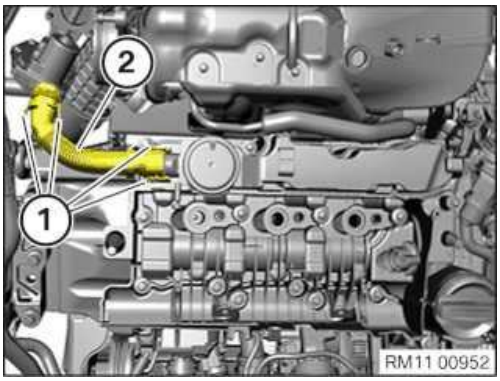
- Install cylinder head cover.
- Tighten screws in the order (1) to (17).

Cylinder head cover to cylinder head

M6		Tightening torque.	8, Nr

-

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- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

45 – Installing injectors of injection system

▶ **Cleaning the injector shafts**

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

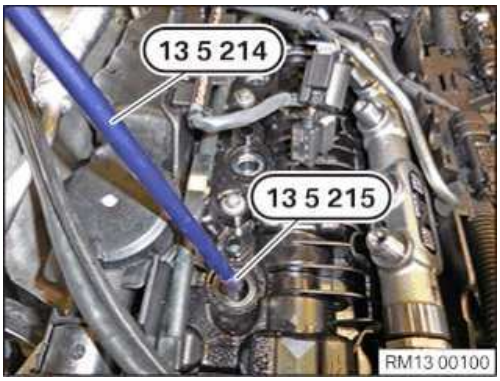
- Wear safety goggles.

RISK OF DAMAGE

Contaminant or foreign body.

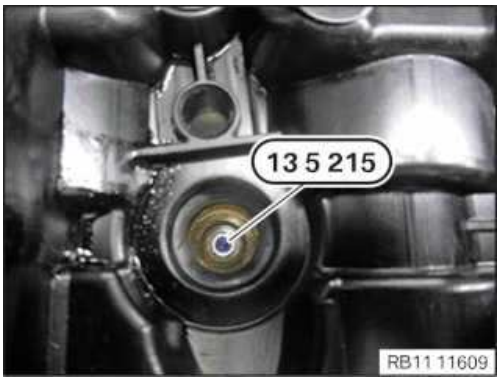
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.

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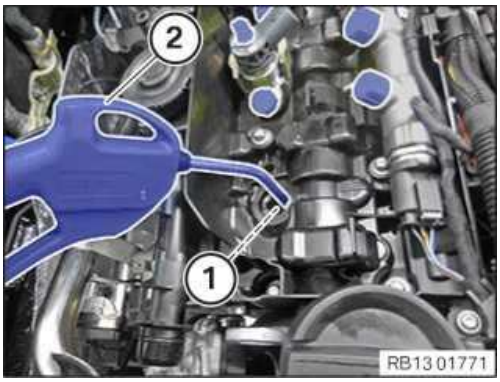
- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.



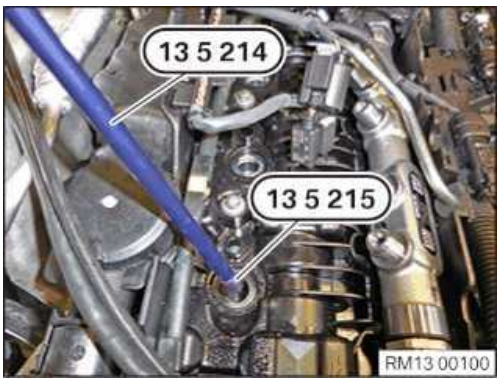
- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.



- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.



- Blow out injector shaft (1) with air gun (2).



- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

► **Check the placement of the clamping claw**

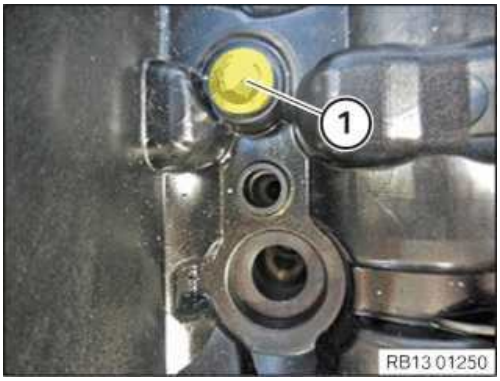
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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▸ **Prepare the injector for installation**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

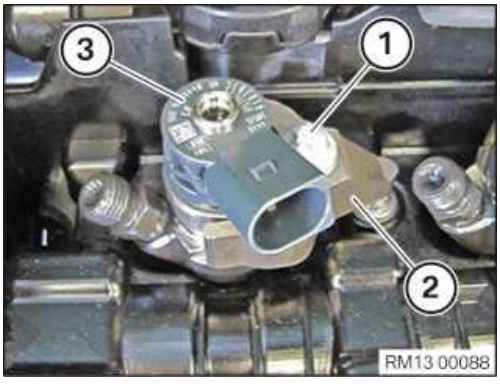


- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring
- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

Injector lubricating grease	50 g, Can	83230441070

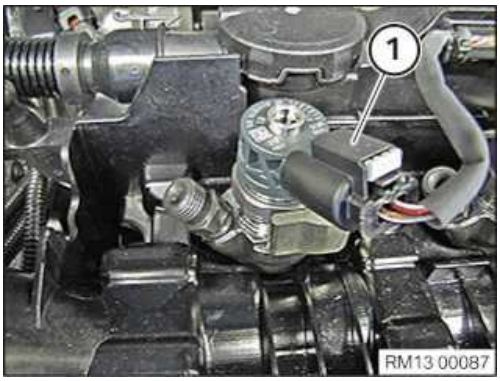


- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

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- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

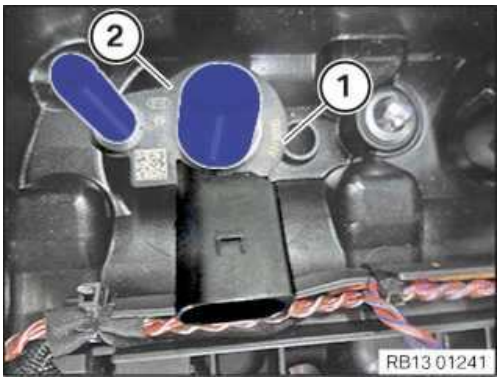
▶ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

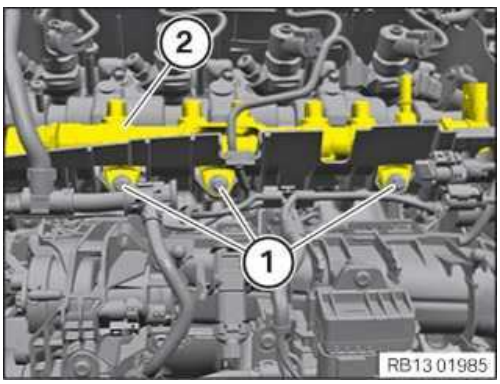


- Read off the adjustment value (1) on the new injector (2).



- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

46 – Installing the rail

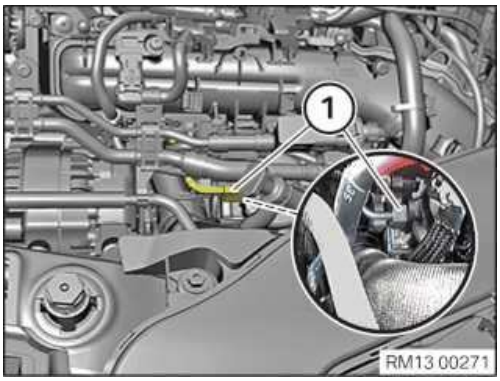


- Carefully insert and install the rail (2).
- Tighten the screws (1).

Rail on cylinder head cover

Torx screw M8x25		Tightening torque	19 Nm

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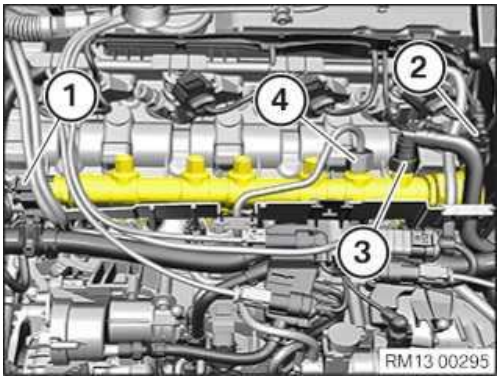
TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten union nut (1).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm



TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten union nut (4) with special tool .

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

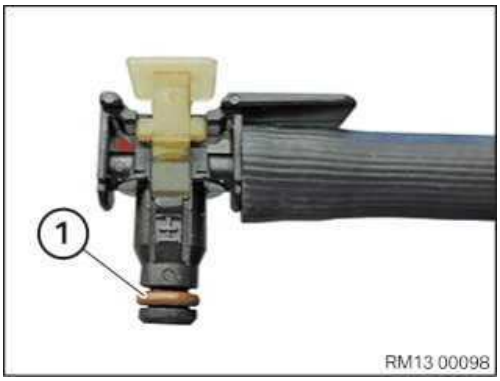
- Connect and lock the fuel line (3).

  Fuel line (3) must engage audibly.
- Connect connectors (2) and lock.

  The connector (2) must engage audibly.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

47 – Connect the leakage oil line on the injector



- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.

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- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

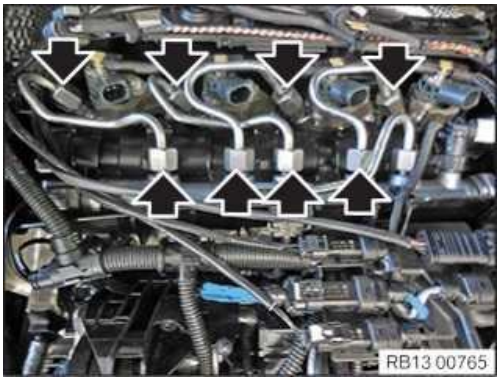
48 – Installing high pressure lines between rail and injectors

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Remove special tool .
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

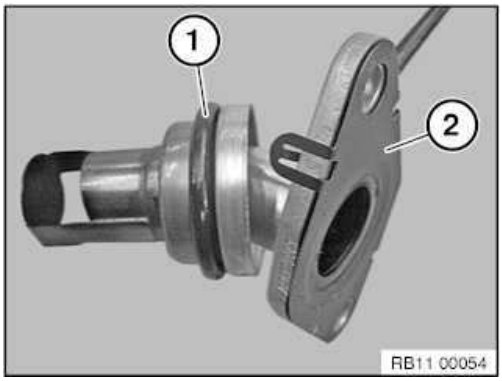
- Tighten the high pressure lines (arrows) with the special tool .

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

49 – Installing the intake plenum

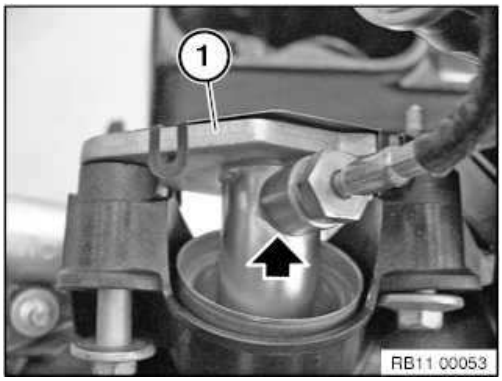


- Renew O-ring (1).

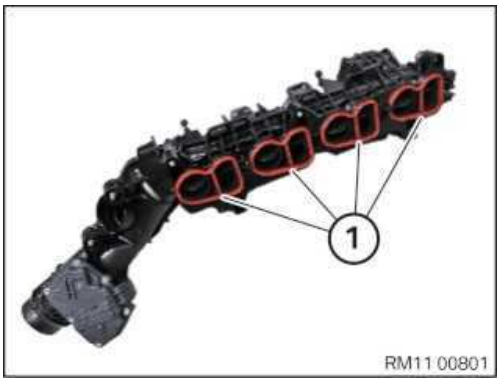
  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position the seal (2) and clip it in.

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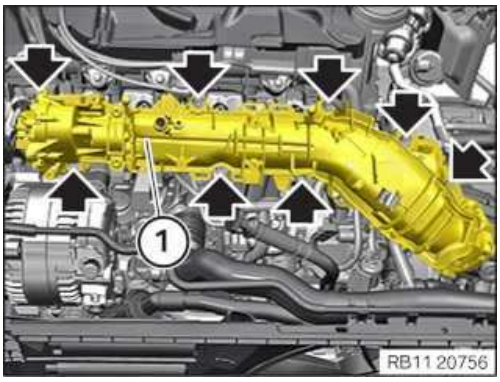
- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (1).

  Parts: Gasket

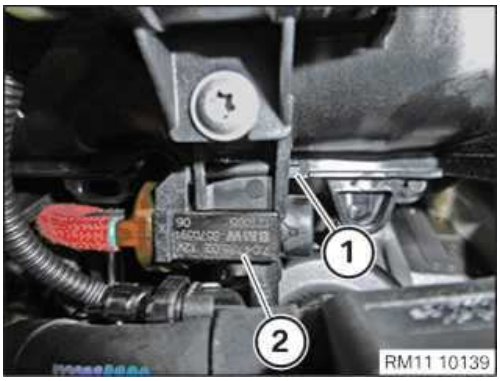
- Ensure that the seal (1) is firmly mounted on the intake plenum.



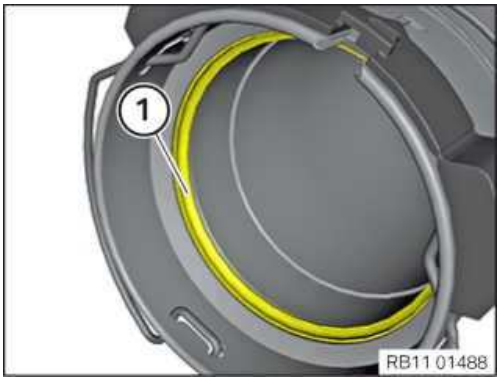
- Guide in and install intake (1) plenum.
- Tighten screws (arrows).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm



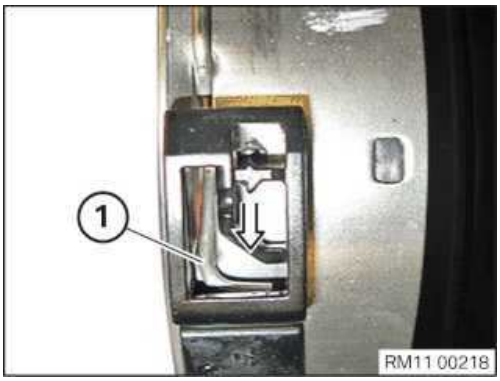
- Install the electric changeover valve (2) in the holder on the plenum from left to right.
- Lock (1) must engage audibly.



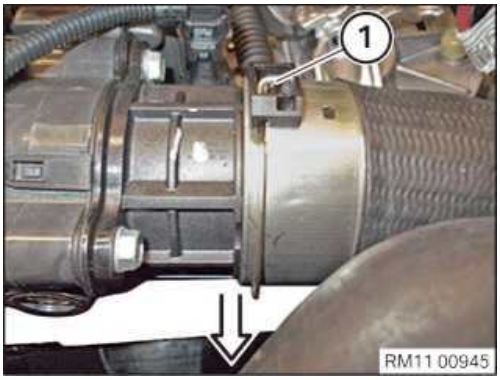
- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring

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- Engage the lock (1) on the bracket (arrow).



- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

50 – Remove the engine from the assembly stand

CAUTION

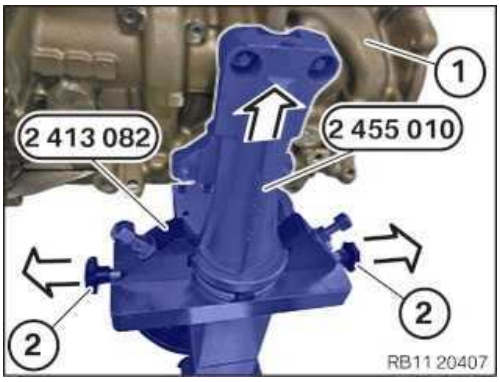
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Insert engine lifter with special tool and position engine (1).

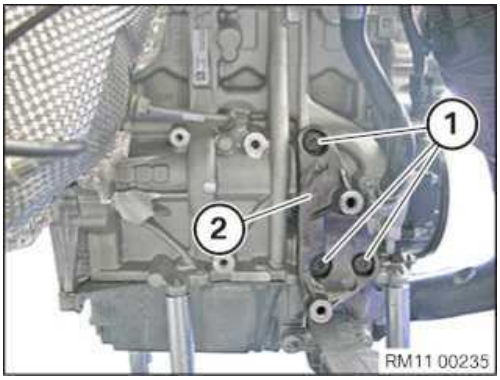


- Unscrew the nuts on special tool .
- Detach the holder (2) in the direction of the arrow.
- Detach the engine (1) with special tool **2 455 010** out of the special tool in the direction of arrow.

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- Remove conventional screws (arrows).
- Feed out the special tool **2 455 010** on the engine (1) and remove.



- Insert and install the holder (2).
- Tighten the screws (1).

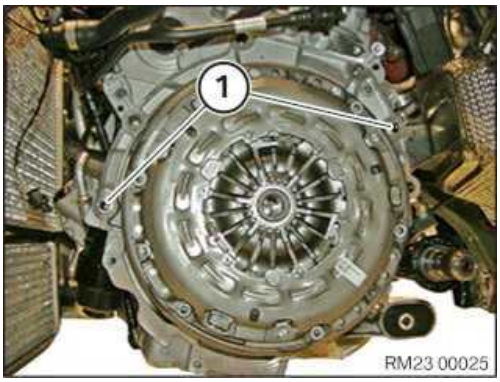
Holder to crankcase

M10		Tightening torque	38 Nm

51 – Mounting engine on manual gearbox

Prerequisite

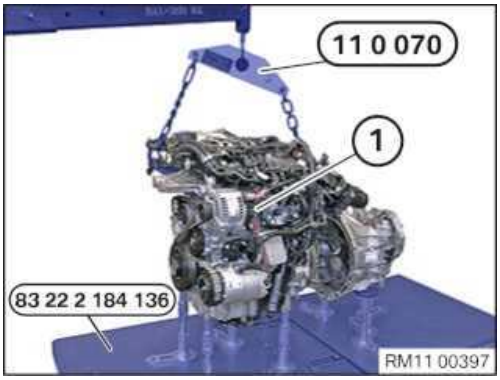
Engine has been removed.



- Check for correct fit of fitting sleeves(1).
- Replace damaged fitting sleeves.

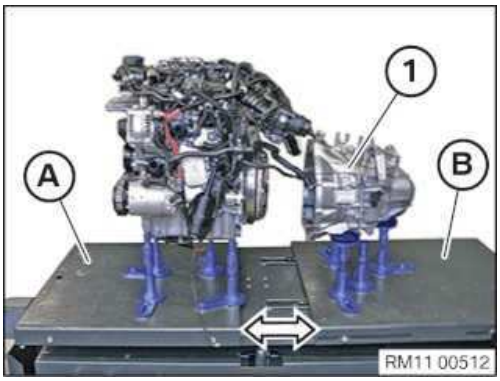


- Remove any grease from the transmission input shaft (arrow) and clean the shaft.
- Do not grease transmission input shaft.
- Check the clutch disc for frictional corrosion in the gearing and renew if necessary.

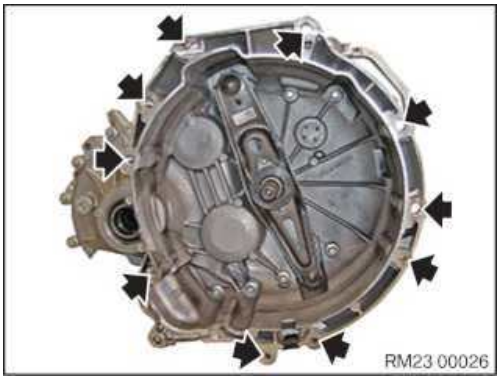


- Position the engine (1) on the lifting table **2 184 136** using the engine lifter and the special tool .
- Feed out engine lifter from engine (1) with special tool and push aside.

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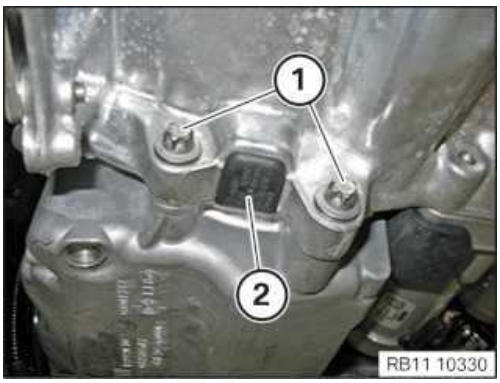
- Push table top (B) in direction of arrow and position manual gearbox (1) on engine.



- Tighten screws (arrows).

Transmission to engine

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm



- Tighten the screws (1).

Transmission to oil sump

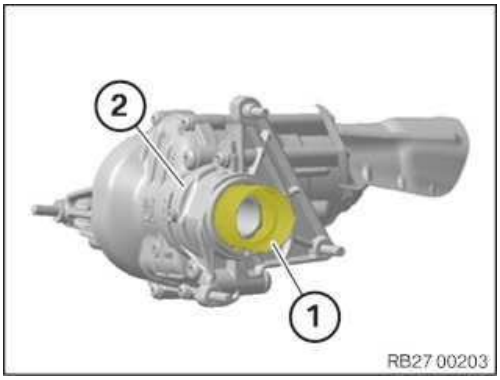
M8		Tightening torque	19 Nm

- Install the protective cap (2).



- Unscrew the bolts (1) of the special tool **2 459 012**.
- Feed out the special tool **2 459 012** at the cylinder head and remove.

52 – Install the transfer box (VTG)



- If intermediate shaft (1) gets caught on transfer box (VTG) (2), renew intermediate shaft (1) and the radial shaft seals in the automatic or manual transmission.

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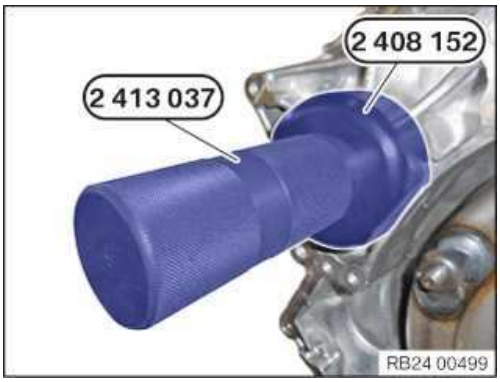
- Screw special tool **2 409 025** into the outer radial shaft seal.
- Turn the screw on the special tool **2 409 025** until the outer radial shaft seal has been pulled out.



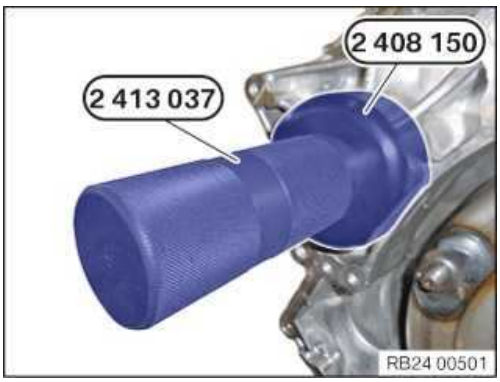
- Insert special tool **2 411 739** into the inner radial shaft seal.



- Screw special tool **2 411 739** into the inner radial shaft seal.
- Turn the screw on the special tool **2 411 739** until the inner radial shaft seal has been pulled out.

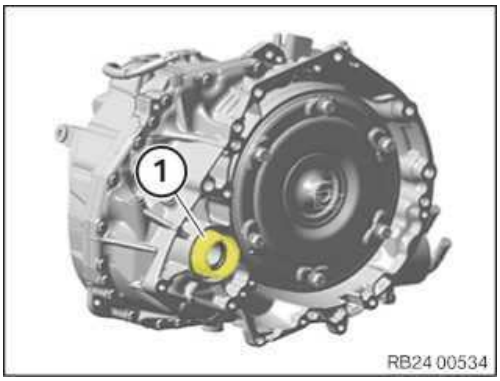


- Drive in the inner radial shaft seal using special tools **2 408 152** and **2 413 037** up to the limit position.



- Drive in the outer radial shaft seal using special tools **2 413 037** and **2 408 150** up to the limit position.

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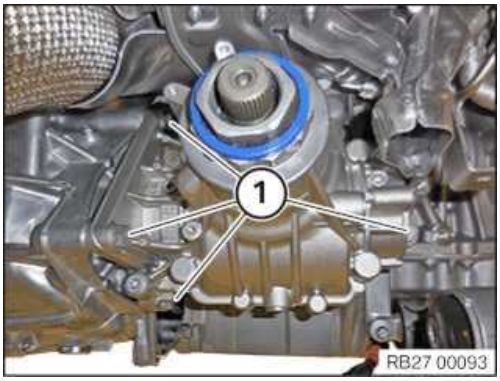
- If necessary, connect the new intermediate shaft (1) to the output flange of the automatic transmission or manual transmission.



- Coat the inside of the output flange (arrows) evenly with approx. 5 g of grease.

Expendable materials

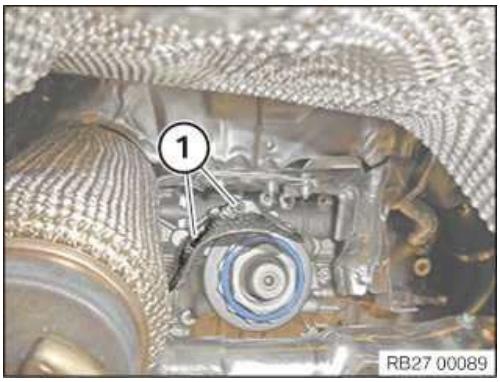
Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the transfer box (VTG).
- Tighten the screws (1).

Transfer box to transmission

M10		Tightening torque	56 Nm



- Install heat shield.
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Heat shield to transfer box

M6	Renew screws.	Tightening torque	6 Nm

▸ **Check the transfer box oil level**

RISK OF DAMAGE

Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.

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- Check transfer case oil level, correct:
- Open the oil filler plug (1).
- Check transfer box oil level.
- If necessary, top up transmission oil up to the lower edge of the oil filler plug opening (1).

Transmission oil

Technically suitable transfer box and electrical transmission oils	

Main group 27

- Tighten the oil filler plug (1).

Oil filler plug on transfer box (VTG)

M18x1.5		Tightening torque	35 Nm

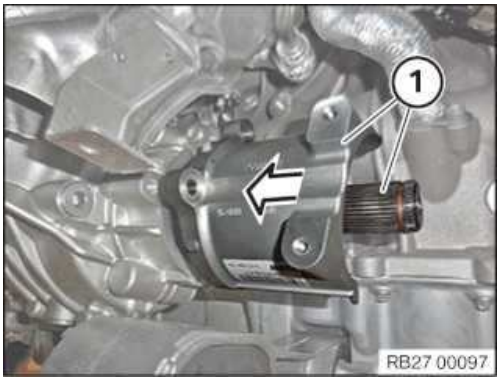
53 – Install the intermediate shaft with the support tube



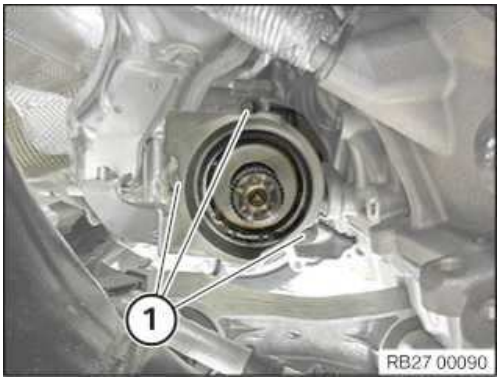
- Coat gearing of the intermediate shaft uniformly with 5 g of grease.

Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the intermediate shaft with support tube (1) in the transfer box.



- Position screws (1).

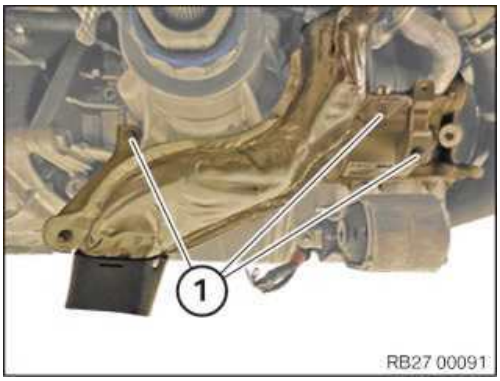
Note: Check for correct screw length! Bolt M8x35 8.8

- Tighten the screws (1).

Intermediate shaft to transfer box

M8x35		Tightening torque	19 Nm

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- If installed: Install air duct.
- Tighten the screws (1).

54 – Installing the high-pressure stage exhaust turbocharger

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

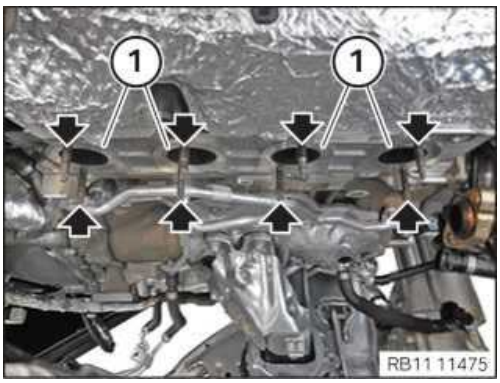
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

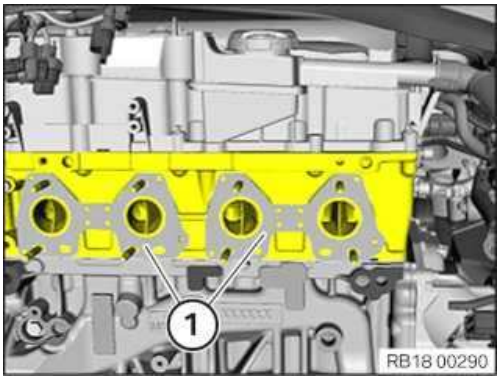


- Clean the sealing surfaces (1) on the cylinder head using special tool **0 495 102 (11 4 470)**.
- Check the stud bolts (arrows) on the cylinder head for correct fit.

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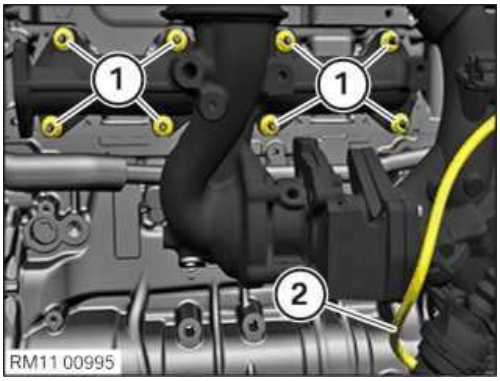
- Clean the sealing surfaces on the exhaust manifold using special tool **0 495 102 (11 4 470)**.



- Renew gasket (1).

  Parts: Gasket

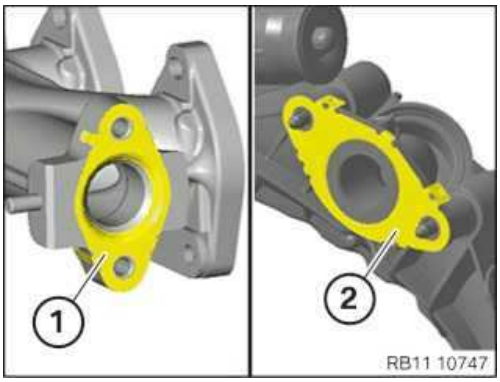
- Install new gasket (1).



- Feed in and install the exhaust manifold and the high-pressure stage exhaust turbocharger.
- Tighten nuts (1).

  Parts: Nuts

- Connect vacuum hose(2).

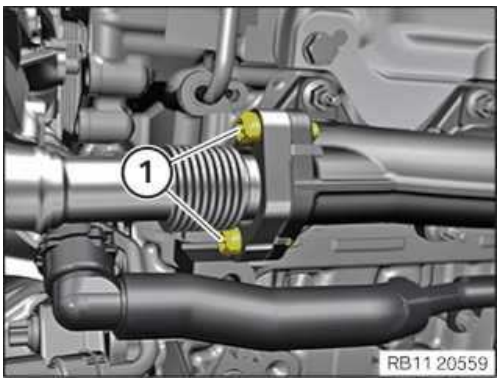


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket

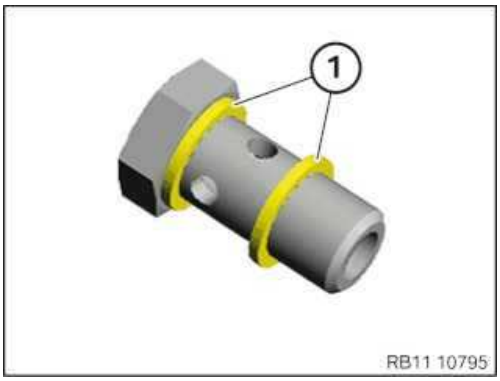


- Tighten the screws (1).

Exhaust-gas recirculation cooler to exhaust manifold

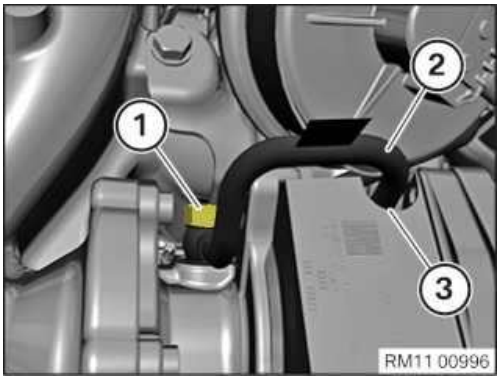
M8x28	Replace screws	Tightening torque	32 Nm

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- Renew sealing rings (1) of banjo bolt.

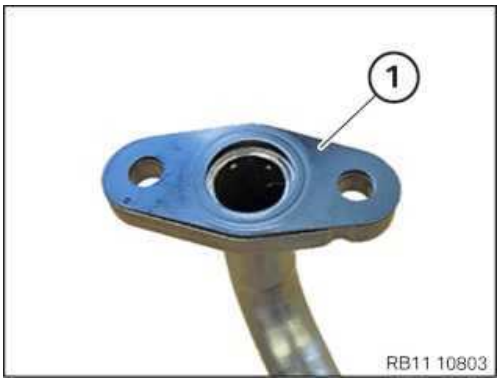
  Parts: Sealing ring



- Guide the oil feed line into the holder (3) and install it.
- Tighten down screw (1).

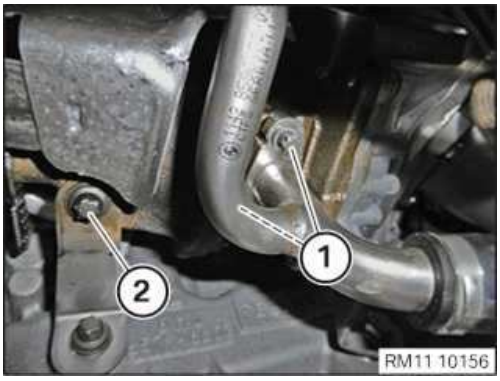


- Tighten bolt (1) from the right wheel arch.



- Renew seal (1) of oil return line.

  Parts: Gasket



- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

55 – Installing the low-pressure stage turbocharger

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RISK OF DAMAGE

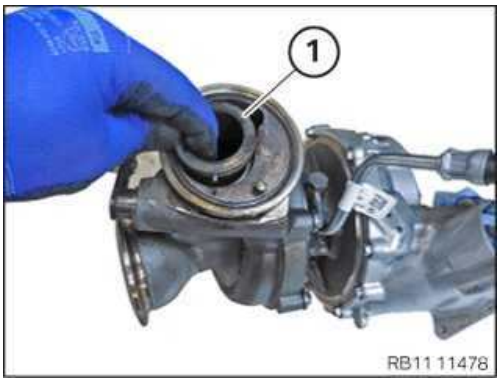
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

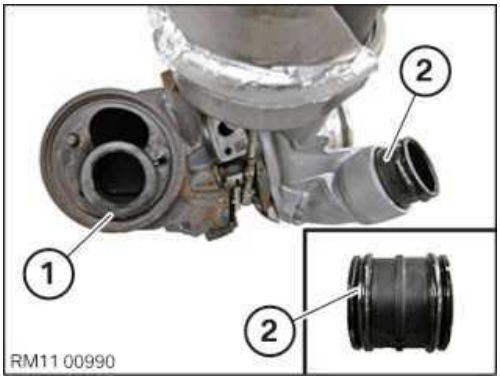
TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.



- Check the spacer plug (1) for damage, renew if necessary.

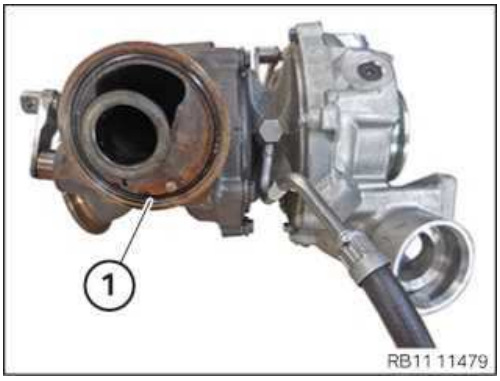
  Parts: Spacer ring
- Insert and install the spacer ring (1).
- Position spacer ring (1) correctly.



- Renew gasket (1).

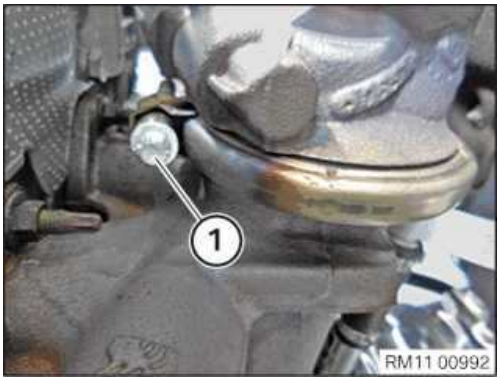
  Parts: Gasket
- Position the seal (1).
- Renew the sleeve(2).

  Parts: Holding sleeve



- Renew sealing ring (1).

  Parts: Sealing ring
- Affix the sealing rings on the exhaust turbocharger.



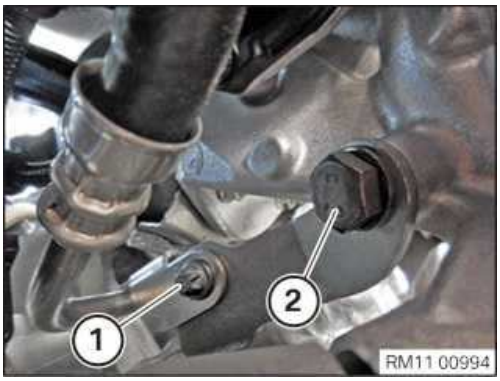
- Insert and install the low-pressure stage exhaust turbocharger on the exhaust manifold .
- Feed in and install V-band clamp .
- Tighten V-band clamp (2).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Screw in nut (1) with 2 **revolutions**.

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- Tighten down screw (1).

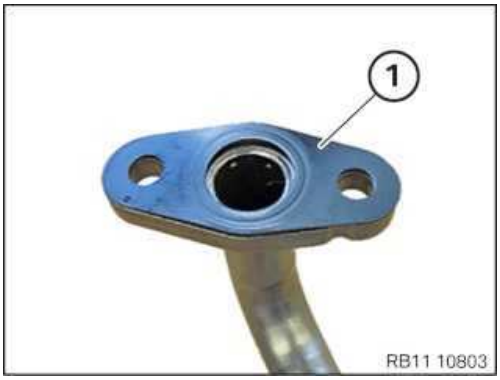
Oil feed line to bracket

Torx screw M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

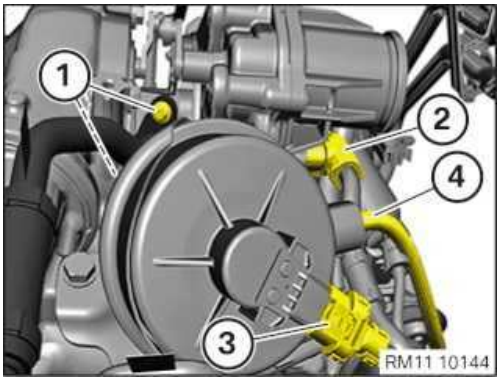
Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm



- Renew seal (1) on the oil return line.

  Parts: Gasket



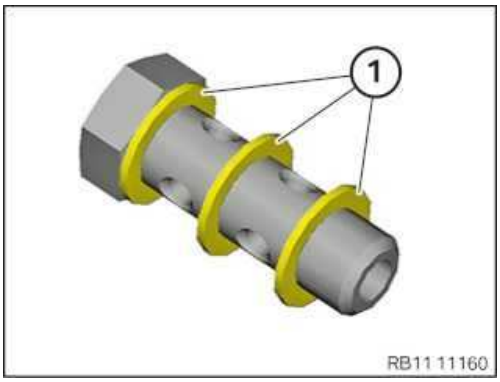
- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

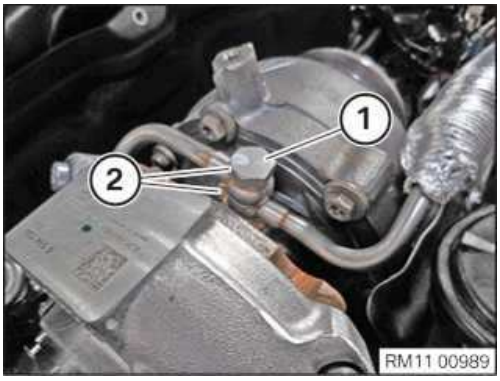
M6x12		Tightening torque	8 Nm

- Connect and lock connectors (2) and (3).

  The locks must engage audibly.
- Connect vacuum hose (4).

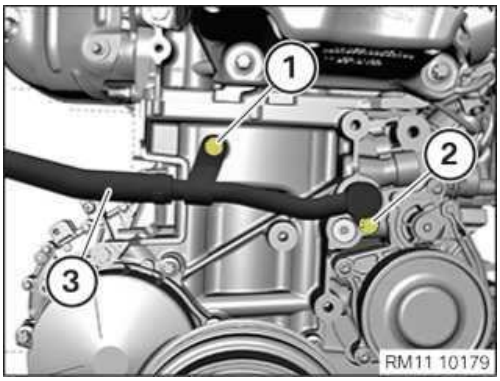


- Renew banjo bolt and sealing rings (1).
- **Parts:** Banjo bolt, sealing rings



- Install sealing rings (1).
- Tighten the banjo bolt (1).
- Ensure that the lines do not rest against the adjacent components.

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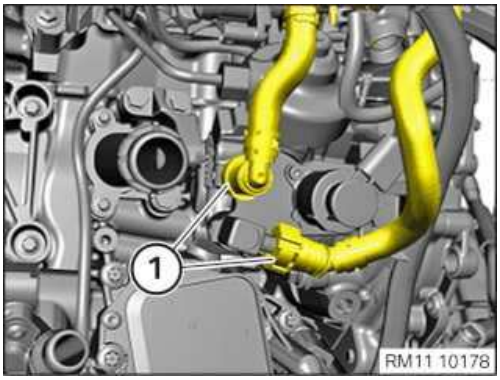


- Renew sealing ring of the coolant line (3).

  Parts: Sealing ring
- Coat the sealing ring and install the coolant line (3) .
- Tighten down screws (1) and (2).

Standard screw connection M6

M6		8 Nm



- Connect and lock fuel lines (1).

  The fuel lines (1) must audibly engage.

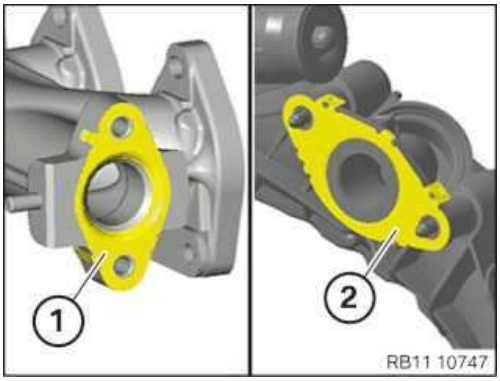
▶ **Installing the exhaust-gas recirculation cooler**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

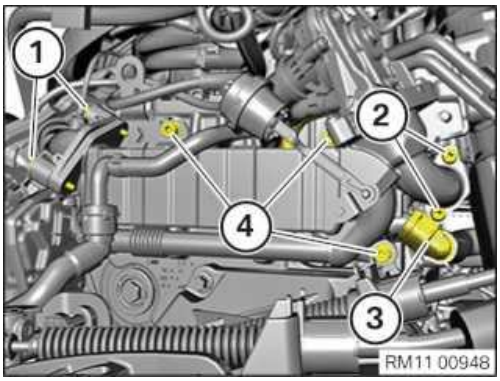


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket
- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket

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- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts
- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

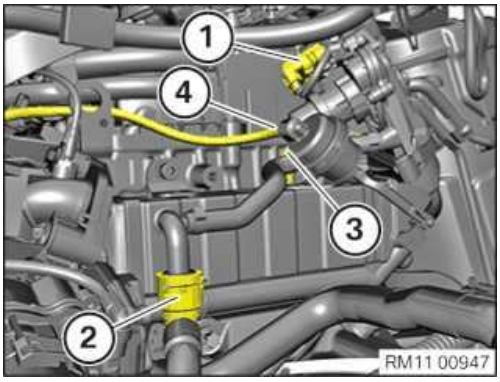
M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.
- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm



TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

▸ **Installing heat shield on exhaust turbocharger at bottom**

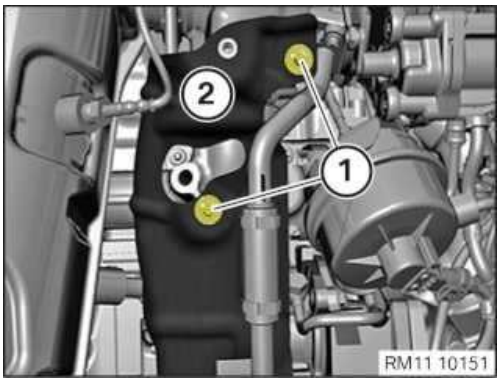
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WARNING

Hot surfaces.

Risk of burning!

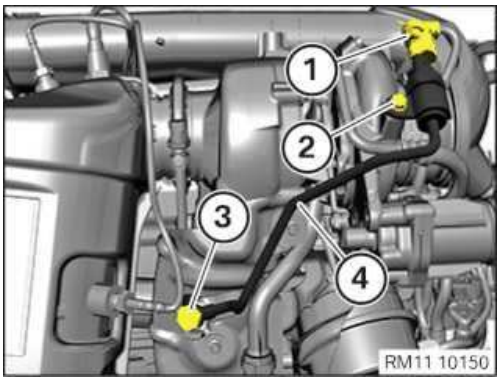
- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (2).
- Tighten the bolts (1) on the heat shield .

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm



- Position the exhaust gas pressure pipe (4).
- Hand-tighten the bolt (2).
- Renew sealing rings on the banjo bolt (3).

  Parts: Sealing ring
- Tighten the banjo bolt (3).

Banjo bolt for exhaust pressure pipe to exhaust manifold

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

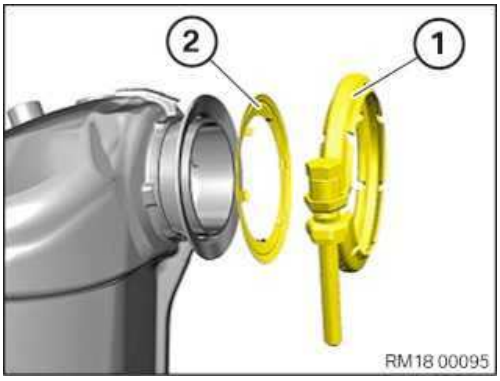
- Tighten down screw (2).

Standard screw connection M6

M6		8 Nm

- Connect connectors (1) and lock.

  Lock must audibly engage.



CAUTION

Heavy component.

Heavy components can lead to injury or damage.

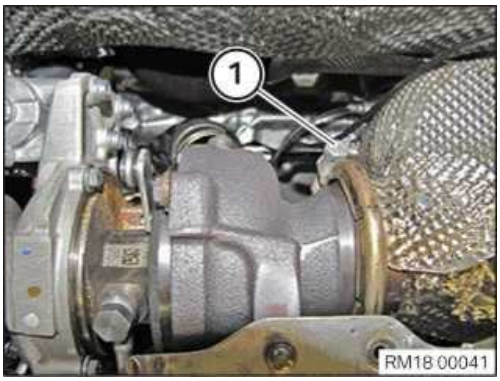
- Remove and install heavy components with the aid of another person/other persons.

- Renew the V-clip (1).

  Parts: V-band clamp
- Renew the gasket (2).

  Parts: Gasket

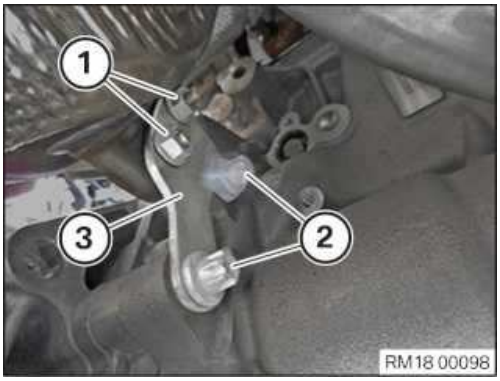
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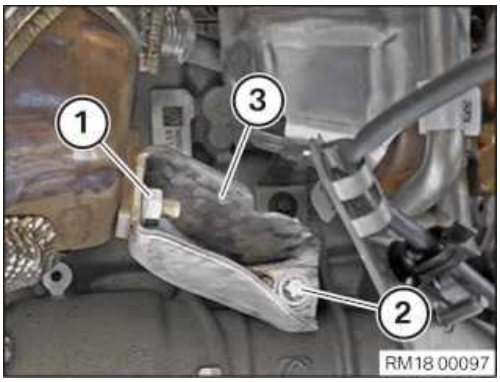
- Carefully insert and install the diesel particulate filter .
- Feed in and install V-band clamp (1).
- Make sure that the seal between the diesel particulate filter and the exhaust turbocharger is installed correctly.
- Align the diesel particulate filter on the exhaust turbocharger.
- Position V-clip (1).
- Hand-tighten the V-clip (1).



- Tighten nuts (1) by hand.



- Install holder (3).
- Hand-tighten the bolts (2).
- Tighten nuts (1) by hand.



- Install holder (3).
- Tighten the nut (1) hand-tight.
- Hand-tighten the bolt (2).



- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

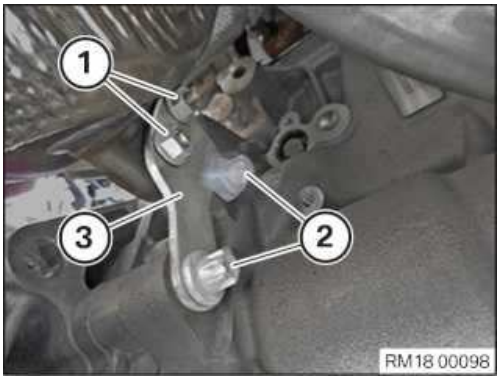
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- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screws (2).

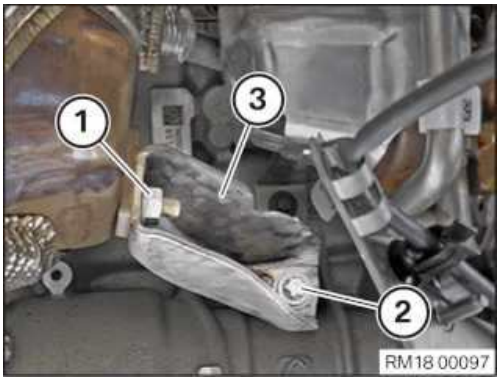
Diesel particulate filter holder to gearbox

M12x75		Tightening torque	66 Nm

- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screw (2).

Diesel particulate filter bracket to crankcase

M10x35		Tightening torque	38 Nm

- Tighten nut (1).

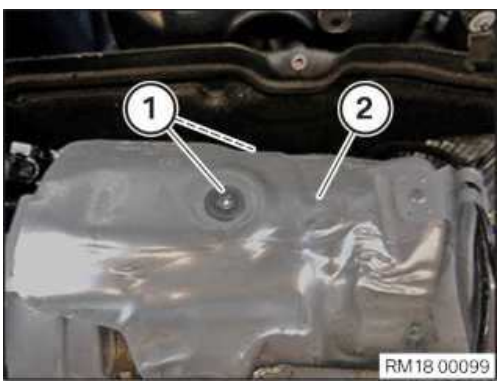
Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Remove fitting aid (1) for the flexible tube.

▶ **Install the heat shield on the exhaust turbocharger**



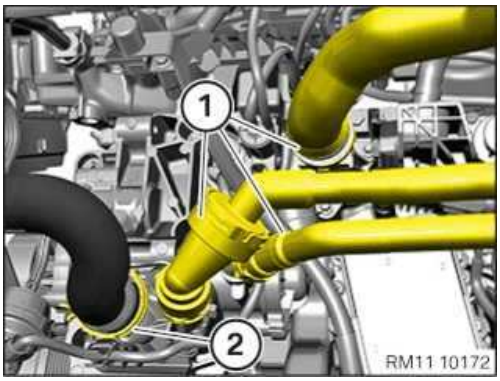
- Feed in and install the heat shield (2).
- Tighten the screws (1) at the top and bottom of the heat shield.

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

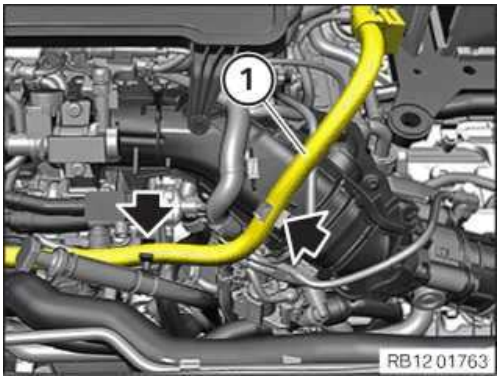
- Fasten the cable at the clips .

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- Install the coolant hose and secure with the clamp (2) .
- Connect and lock the coolant lines (1).

  The coolant lines (1) must engage audibly.



CAUTION

Improper routing of the positive battery cable.

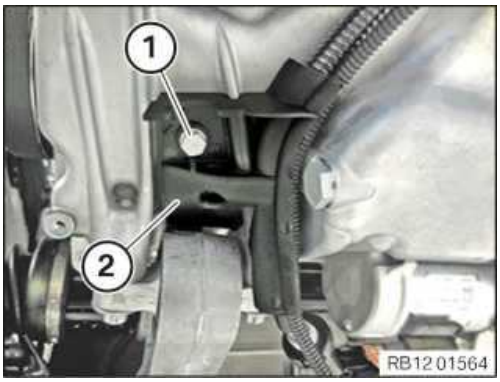
Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

- Insert the positive battery cable (1) into the clamps (arrows).



- Feed in and install positive battery cable at the clamps (1).



- Insert and install the holder (2).
- Tighten down screw (1).

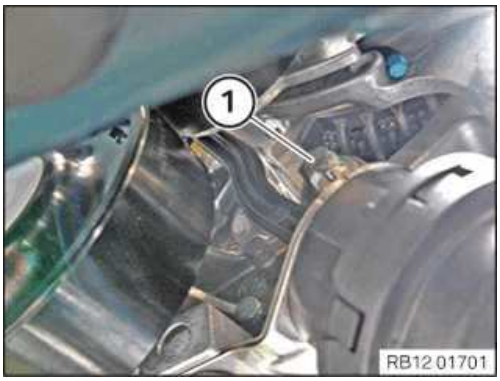
Bracket to oil sump

M6		Tightening torque	8 Nm



- Insert and install alternator (1) along with the screw (2) on the bottom of the alternator through the slot on the support.

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- Tighten the screw (1) below on the alternator.

Alternator to component carrier

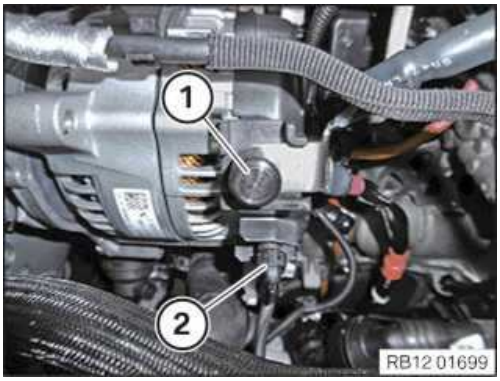
M10x75 / M10x125		Tightening torque	38 Nm



- Tighten the bolt (1) on top on the alternator.

Alternator to component carrier

M10x75 / M10x125		Tightening torque	38 Nm



- Mount positive battery cable to the alternator.
- Tighten nut.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

- Mount the cover (1).
- Connect the connector (2) to the alternator and lock audibly.



- Install air conditioning compressor (2) and position it correctly.
- Tighten the screws (1).

Air conditioning compressor in component carrier

M10		Tightening torque	38 Nm

▸ **Installing the drive belt for alternator**

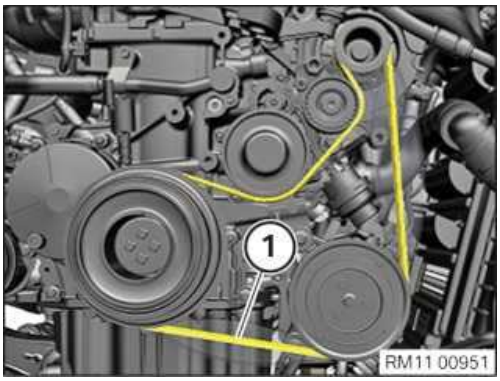
TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

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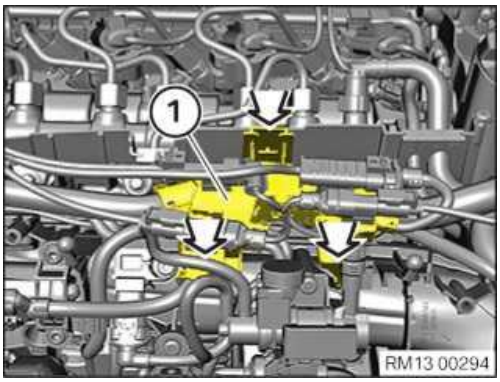


- Feed in the drive belt for the alternator (1) and install it.

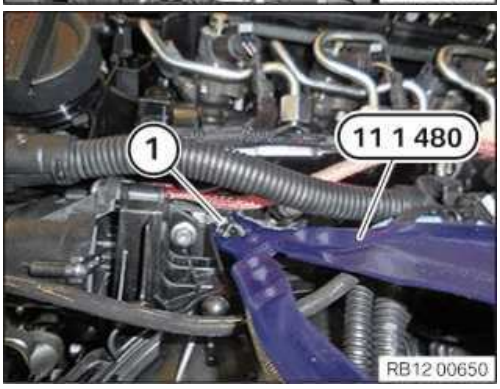


- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool **0 496 268 (11 0 390)** out of the belt tensioner and remove it.

▶ **Installing the cable clip for the intake plenum**

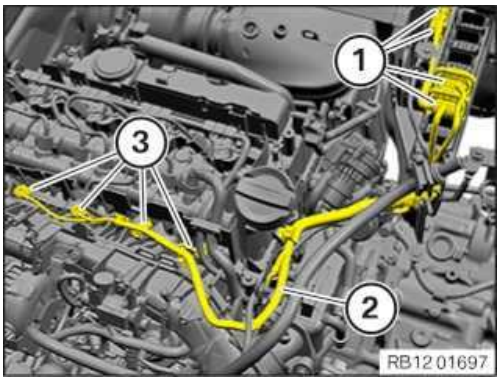


- Insert and install the cable clip (1) in the direction of the arrow.
- Make sure the cable clip (1) is fitted correctly.



- Connect and lock the connector (1) on the glow elements.

  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.

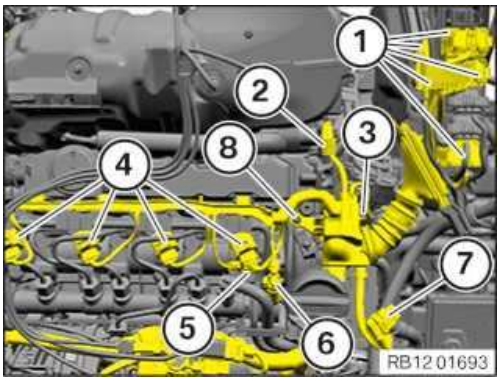


- Lay vehicle wiring harness and fasten with clamps.
- Route all connectors (1) to the integrated supply module (PDM) and to the DME control unit.
- Connect all connectors (3) to the glow elements and engage them audibly.
- Mount ground strap and tighten screw (2).

Ground cable to cylinder head

M6x12		Tightening torque	8 Nm

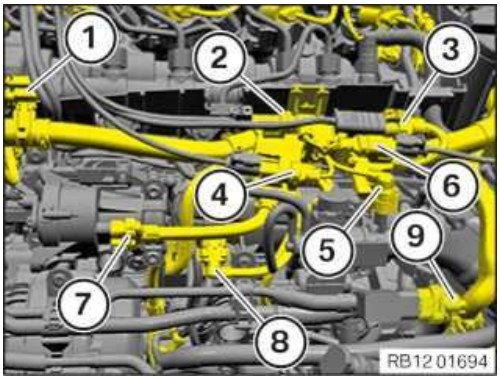
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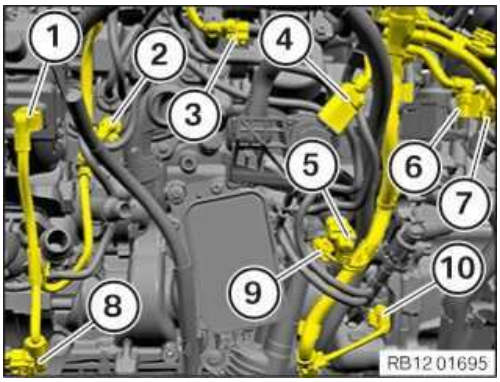
- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the integrated supply module (PDM) and to the DME control unit.
- Attach connector (2) to the differential pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust-gas recirculation valve and lock audibly.
- Attach connector (4) to the injectors and lock it audibly.
- Attach connector (5) to the camshaft sensor and lock it audibly.
- Attach connector (6) to the fuel pressure regulator and lock it audibly.
- Connect and audibly lock the connector (7) to the hot film air mass meter.
- Tighten down screw (8).

Wiring harness to cylinder head cover

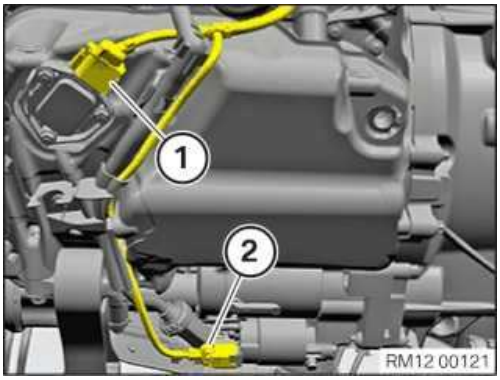
TS5x20		Tightening torque	3,5 Nm



- Connect the connector (1) to the rail pressure sensor and lock it audibly.
- Attach connector (2) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (3) to the front oxygen sensor and lock audibly.
- Attach connector (4) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Connect the connector (5) to the electric changeover valve and lock audibly.
- Attach connector (6) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (7) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (8) to the charging pressure sensor and lock it audibly.
- Attach connector (9) to the fuel pressure and temperature sensor and lock it audibly.

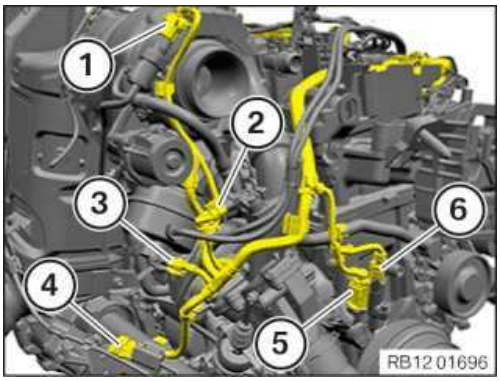


- Connect the connector (1) to the alternator and lock audibly.
- Connect the connector (2) to the electric changeover valve and lock audibly.
- Connect the connector (3) to the electric changeover valve and lock audibly.
- Connect the connector (4) to the high pressure pump and lock audibly.
- Connect the connector (5) to the oil pressure sensor and lock it audibly.
- Attach connector (6) to the throttle bodies and lock it audibly.
- Attach connector (7) to the intake air temperature sensor and lock it audibly.
- Connect the connector (8) to the air conditioning compressor and lock audibly.
- Connect the connector (9) to the solenoid valve and lock audibly.
- Connect the connector (10) to the crankshaft sensor and lock it audibly.

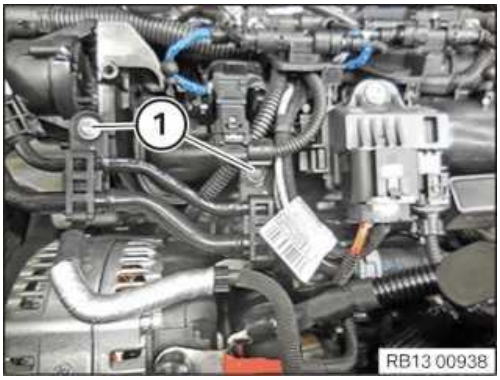


- Connect the connector (1) to the oil-level sensor and lock it audibly.
- Connect connector (2) to the starter motor and lock audibly.

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- Attach connector (1) to the exhaust turbocharger and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust gas pressure sensor and lock it audibly.
- Connect the connector (4) to the monitoring oxygen sensor and lock audibly.
- Attach connector (5) to the oil pressure switch and lock it audibly.
- Attach connector (6) to the switching valve and lock it audibly.

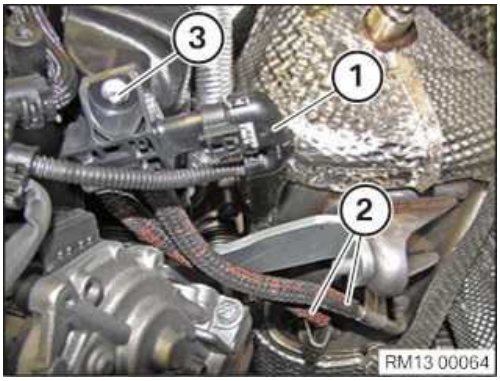


- Position the fuel line.
- Tighten the screws (1).

Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

57 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

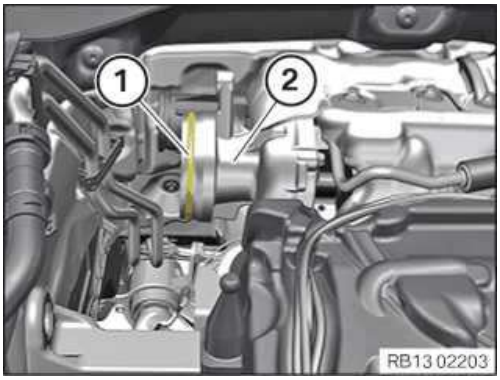
Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

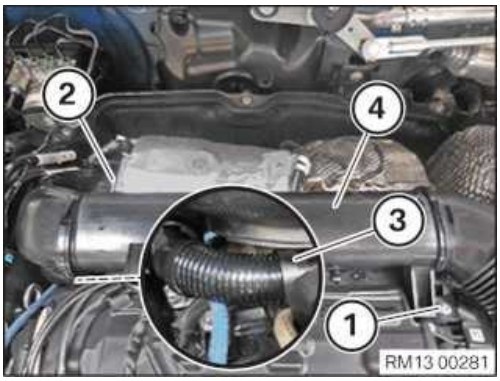
  The connector (1) must engage audibly.

58 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.

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- Feed in clean air pipe and install.
- Connect clean air pipe to the exhaust turbocharger and lock audibly in the clamps (2).
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Connect ventilation line (3) to the cylinder head cover and lock audibly.

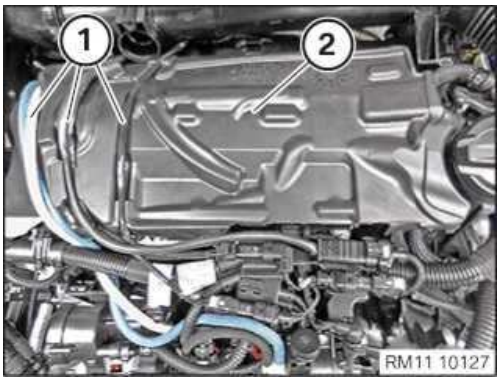


- Mount clean air pipe onto the intake filter housing.
- Tighten clamp (1) on the clean air pipe.

Clean air pipe to intake silencer housing

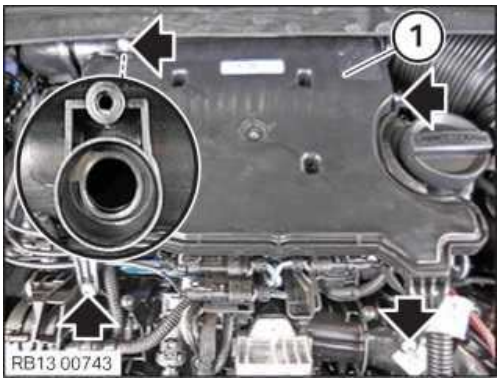
Clamp		Tightening torque	3 Nm

59 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the vehicle wiring harness (1) in the brackets.

60 – Install resonator



- Insert and install the resonator (1).
- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

61 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Check for correct installation of all rubber mounts in the acoustic cover (1).



- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

62 – Install engine



- See additional information.

Additional Information

Overview of Tightening Torques

Special tool to cylinder head Used in step 12

M8		Tightening torque	21,5 Nm

Special tool 2 455 010 to crankcase Used in step 13

M10x30		Tightening torque	38 Nm

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Special tool 11 8 930 to special tool 00 2 320

Used in step 13

M14x35		Tightening torque	160 Nm

Hydraulic chain tensioner to crankcase

Used in step 32

M6x22		Tightening torque	9 Nm

Rear timing case cover to crankcase

Used in step 33

M6	Renew screws.	Jointing torque	8 Nm
		Angle of rotation	90 °

SCR coolant lines to crankcase end cover

Used in step 33

Hexagon screw M6x16		Tightening torque	8 Nm

Cylinder head to crankcase

Used in step 33

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

Cylinder head bolt to timing case cover

Used in step 33

M8x40		Tightening torque	19 Nm

Oil sump to crankcase

Used in step 33

M8x30		Tightening torque	24 Nm
M8x110		Tightening torque	24 Nm

Transmission to oil sump

Used in step 33 51

M8		Tightening torque	19 Nm

Guide tube for oil dipstick on engine

Used in step 33

M8x16		Tightening torque	19 Nm

Flywheel to crankshaft

Used in step 34

M12x1.5	Renew screws.	Tightening torque	120 Nm

Clutch to flywheel

Used in step 35

M8	Renew screws.	Jointing torque	15 Nm
		Angle of rotation	90 °

Glow elements to cylinder head

Used in step 38

Glow element		Tightening torque	13 Nm

Camshaft carrier to cylinder head

Used in step 39

M7x35		Tightening torque	13 Nm

Intake and exhaust camshaft in camshaft support

Used in step 40

M6x31		Tightening torque	10 Nm

Bearing journal to cylinder head

Used in step 40

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8

Used in step 40

M8		Tightening torque	19 Nm

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Standard screw connection M6

Used in step 40 56

M6			8 Nm

Chain tensioner piston to cylinder head

Used in step 40

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft

Used in step 40

M7x17.			17 Nm

Cylinder head cover to cylinder head

Used in step 44

M6		Tightening torque.	8,5 Nm

Clamping claw facing to cylinder head cover

Used in step 45

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 45

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

Rail on cylinder head cover

Used in step 46

Torx screw M8x25		Tightening torque	19 Nm

High pressure line between high pressure pump and rail

Used in step 46

High-pressure pipe		Tightening torque	28 Nm

High pressure lines between injector and rail

Used in step 48

High pressure lines		Tightening torque	28 Nm

Intake plenum to cylinder head

Used in step 49

M6		Tightening torque	11 Nm

Holder to crankcase

Used in step 50

M10		Tightening torque	38 Nm

Transmission to engine

Used in step 51

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

Transfer box to transmission

Used in step 52

M10		Tightening torque	56 Nm

Heat shield to transfer box

Used in step 52

M6	Renew screws.	Tightening torque	6 Nm

Oil filler plug on transfer box (VTG)

Used in step 52

M18x1.5		Tightening torque	35 Nm

Intermediate shaft to transfer box

Used in step 53

M8x35		Tightening torque	19 Nm

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Exhaust-gas recirculation cooler to exhaust manifold

Used in step 54 56

M8x28	Replace screws	Tightening torque	32 Nm

Oil return line to turbocharger

Used in step 54 55

M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase

Used in step 54

M8x16		Tightening torque	22 Nm

Exhaust turbocharger to exhaust manifold

Used in step 55

V-band clamp		Tightening torque	19 Nm

Oil feed line to bracket

Used in step 55

Torx screw M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase

Used in step 55

M8x16		Tightening torque	22 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 56

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler

Used in step 56

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 56

M8x20		Tightening torque	19 Nm

Heat shield for exhaust turbocharger

Used in step 56

Torx screw BM 6x12		Tightening torque	10 Nm

Banjo bolt for exhaust pressure pipe to exhaust manifold

Used in step 56

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

Diesel particulate filter V-clip to exhaust turbocharger

Used in step 56

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Diesel particle filter to holder

Used in step 56

M8 hexagon nut		Tightening torque	19 Nm

Diesel particulate filter holder to gearbox

Used in step 56

M12x75		Tightening torque	66 Nm

Diesel particulate filter bracket to crankcase

Used in step 56

M10x35		Tightening torque	38 Nm

Heat shield for exhaust turbocharger

Used in step 56

Torx screw BM 6x12		Tightening torque	10 Nm

Bracket to oil sump

Used in step 56

M6		Tightening torque	8 Nm

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Alternator to component carrier — Used in step 56

M10x75 / M10x125		Tightening torque	38 Nm

Positive battery cable to alternator — Used in step 56

M8		Tightening torque	19 Nm

Air conditioning compressor in component carrier — Used in step 56

M10		Tightening torque	38 Nm

Ground cable to cylinder head — Used in step 56

M6x12		Tightening torque	8 Nm

Wiring harness to cylinder head cover — Used in step 56

TS5x20		Tightening torque	3,5 Nm

Fuel line to intake plenum — Used in step 56

TS6x20		Tightening torque	5 Nm

Differential pressure sensor to holder — Used in step 57

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor — Used in step 57

Clamp 15–19mm		Tightening torque	3 Nm

Clean air pipe to cylinder head cover — Used in step 58

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 58

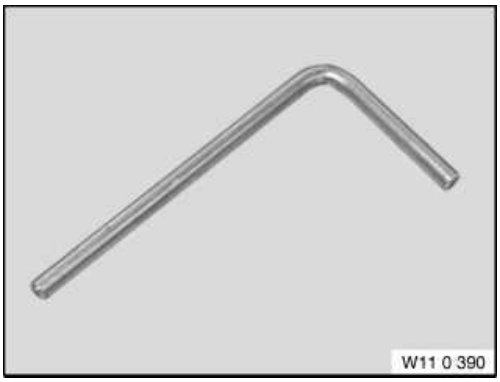
Clamp		Tightening torque	3 Nm

Resonator to manifold and clean air pipe — Used in step 60

Screw TS6	Renew screw.	Tightening torque	5 Nm

Overview of Special Tools

0 496 268 (11 0 390) Pin

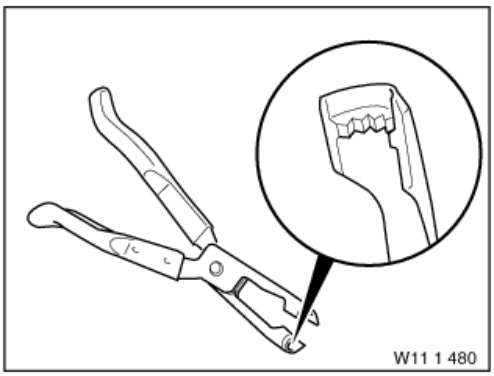


Common — Used in step 7 56

Usage	(roll pin) For securing new tensioning pulley (poly-V belt)
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 15 07 (390)

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0 490 796 (11 1 480) Pliers



Common	Used in step 7 25
Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

2 459 012 Holder



Common	Used in step 12 51
Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

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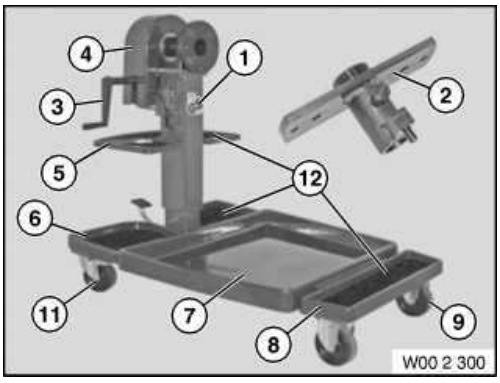
2 455 010 Engine support



Common Used in step 13 50

Usage	For accommodating engine on assembly stand. Engine: B3x, B4x, N47.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

0 495 187 (00 2 300) Assembly stand



Common Used in step 13

Usage	Assembly stand with universal flange for mounting engines from S85
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 25 04 (155)

Consisting of

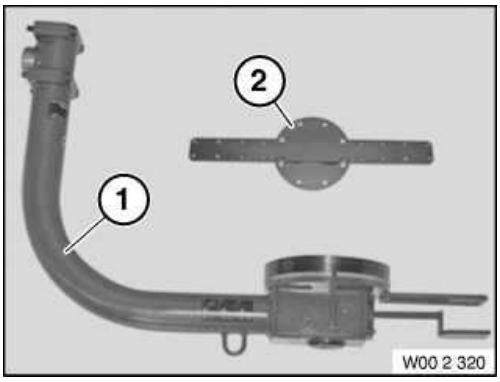
Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 188 (00 2 301)		**Assembly stand** available only as complete assembly stand 83 30 0 495 187.	

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2	0 495 189 (00 2 302)	**2 299 563**	**Tool** (Universal flange). Do not use any more!!! Technically locked. Replaced with a new flange with material number 83 30 2 299 563. All flanges delivered until the end of 2011 will be replaced at no charge. From 2012, only the new flange will be supplied. Also applies to the complete engine mounting stand 00 2 300.	
3	0 495 200 (00 2 303)		**Crank**	
4	0 495 201 (00 2 304)		**Cover** (Protective hood)	
5	0 495 202 (00 2 305)		**oddments tray** (Oddments tray for small parts)	
6	0 495 203 (00 2 306)		**Shaped element** (Rear shaped pan)	
7	0 495 204 (00 2 307)		**Collection pan** (Oil collection pan)	
8	0 495 205 (00 2 308)		**Shaped element** (Front shaped pan)	
9	0 495 206 (00 2 309)		**Wheel** (Front wheel (without stop))	
10	0 495 207 (00 2 311)		**Wheel** (Rear wheel (with stop))	
11	0 495 208 (00 2 312)		**Mat** (Checker mat set)	
2	2 299 563		**Adapter** New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.	

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0 495 196 (00 2 320) Support arm



Common

Used in step 13

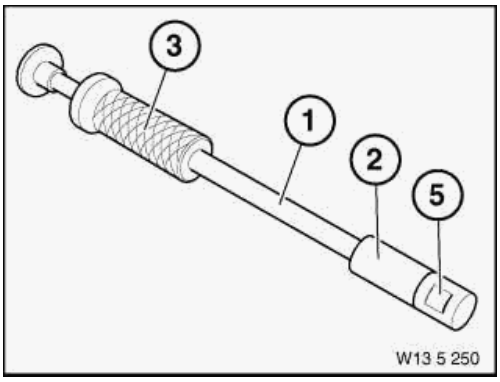
Usage	(Support arm with fixture) For mounting engines using the engine mounting bracket.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 197 (00 2 321)		**Support arm**	
2	0 495 198 (00 2 322)		**Panel** (take-up plate)	
3	0 495 380 (00 2 323)		**Panel** (fixture) Engine N73	
6	0 496 287 (00 2 326)		**Panel** (fixture) Engine: M73	
5	0 496 288 (00 2 327)	**0 496 373**	**Panel** (fixture) Engine: S62 Replaced by 11 5 420 (0 496 373)	
8	0 496 533 (00 2 328)		**Support** (Engine mount) Engine: N57, N57Top	
9	0 496 579 (00 2 329)	**0 496 680**	**Support** (Engine mount) Engine: N74 Replaced by 116160 (0 496 680)	
4	0 495 379 (00 2 324)		**Panel** (fixture) Engine M67TU	
5	0 495 381 (00 2 325)		**Panel** (fixture) Engine N62, N62TU	

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0 493 321 (13 5 250) Puller



Common

Used in step 17

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

0 493 339 (13 5 252) Bush



Common

Used in step 17

Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

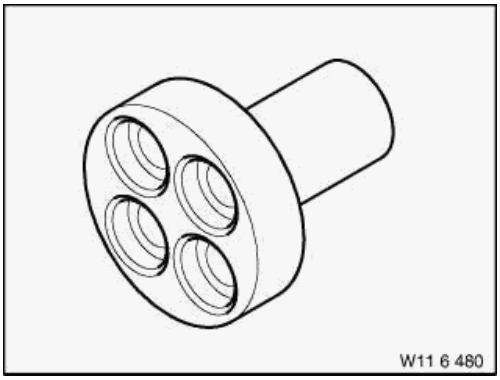
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0 493 340 (13 5 253) Weight



Common	Used in step 17
Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 380 (11 6 480) Connector



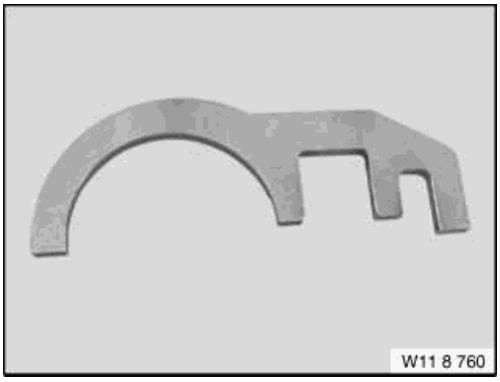
Common	Used in step 20 40 43
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

2 288 380 Locating stud



Common	Used in step 20 40 41 43
Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 112 (11 8 760) Gauge



Common	Used in step 20 40 42 43
Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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0 495 105 (11 4 480) oddments tray



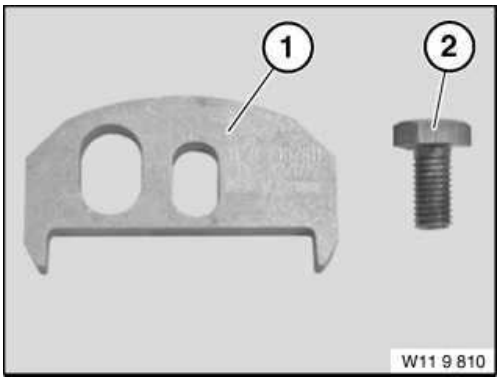
Common Used in step 26 27 40

Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

0 496 171 (11 9 811) Holder



Common Used in step 28 29 34

Usage	Available only as a complete tool set 11 9 810 (83 30 0 496 170) - as of 13.01.12
Included in the tool or work	0 496 170
Storage location	C86
Replaced by	
In connection with	
SI-Number	01 07 07 (355)

0 494 793 (11 9 265) Bush



Common Used in step 28 29 34

Usage	
Included in the tool or work	0 493 938
Storage location	A44
Replaced by	
In connection with	
SI-Number	

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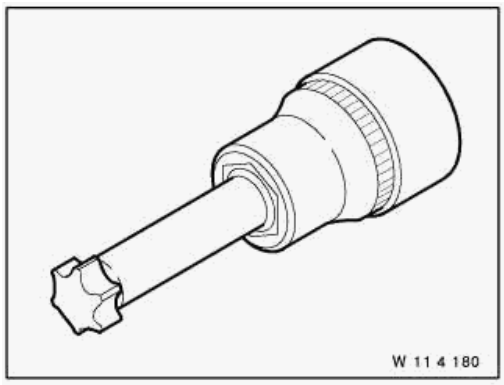
2 288 165 Synchronising key



Common Used in step 28 35

Usage	Conversion kit for 21 2 170, for orders till 02.2014. Orders as of March 2014 do not require the conversion, as the new thrust piece has been accounted for.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 09 14 (088)

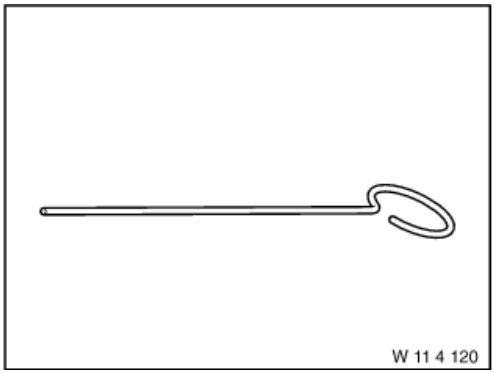
0 491 018 (11 4 180) Socket WAF 46



Common Used in step 29 34

Usage	(screwdriver bit Torx T60) For releasing and tightening down dual-mass flywheel - model year: from Jan 94
Included in the tool or work	
Storage location	C9
Replaced by	
In connection with	
SI-Number	01 02 94 (777)

0 491 012 (11 4 120) Pin

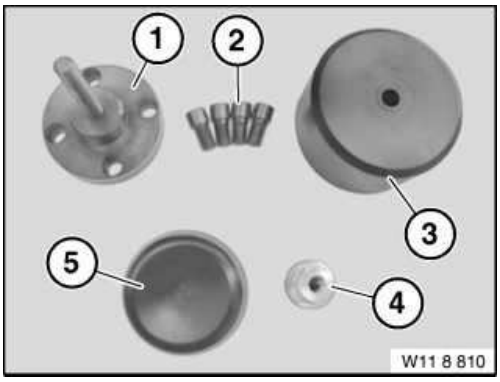


Common Used in step 31 32

Usage	(lock pin) For chain tensioners, for locking the chain tensioner piston (e.g. during cylinder head removal and fitting)
Included in the tool or work	
Storage location	B1
Replaced by	
In connection with	
SI-Number	01 12 93 (701)

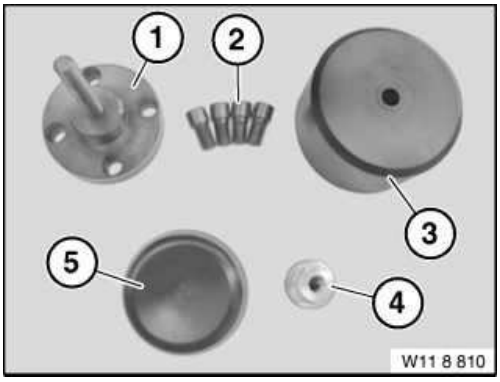
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0 496 137 (11 8 815) Holding sleeve



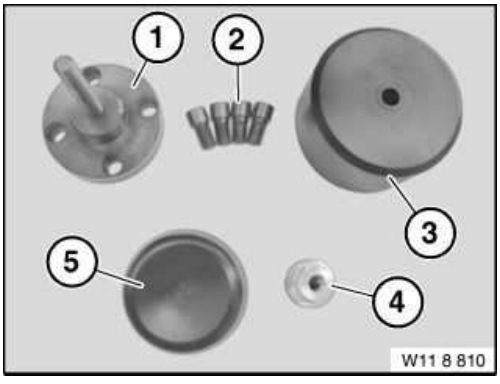
Common	Used in step 33
Usage	(Slip sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 133 (11 8 811) Basic body



Common	Used in step 33
Usage	Liquidation of existing inventory and then available only as a complete tool set 11 8 810 = 83 30 0 496 132 - as of 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

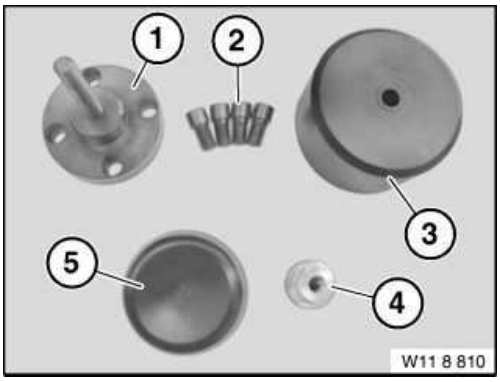
0 496 134 (11 8 812) Screw



Common	Used in step 33
Usage	(Screw set) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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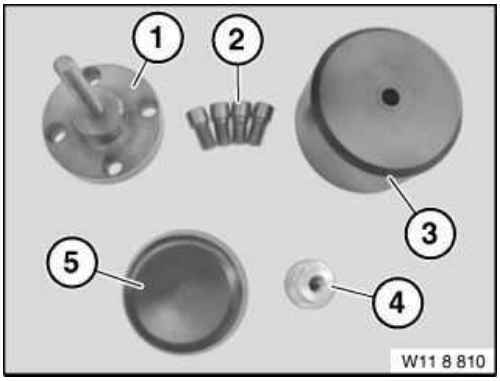
0 496 135 (11 8 813) Holding sleeve



Common Used in step 33

Usage	(Thrust sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

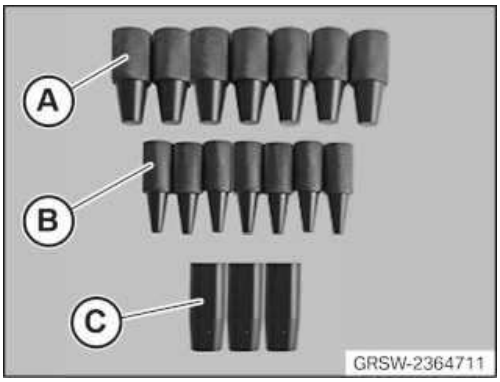
0 496 136 (11 8 814) Nut



Common Used in step 33

Usage	(Nut with bearing) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

2 364 711 Plug



Common Used in step 33

Usage	For closing the pressure oil holes for cleaning the cylinder head sealing surfaces.
Included in the tool or work	
Storage location	C20
Replaced by	
In connection with	
SI-Number	01 50 14 (203)

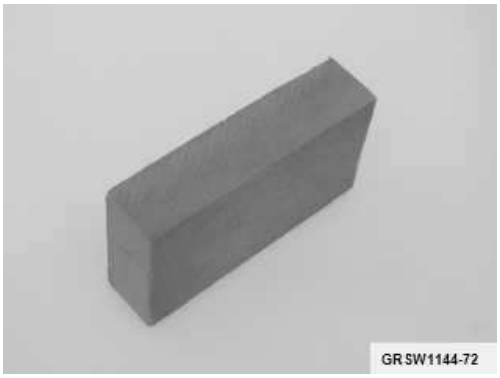
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0 495 103 (11 4 471) Scraper



Common	Used in step 33
Usage	
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

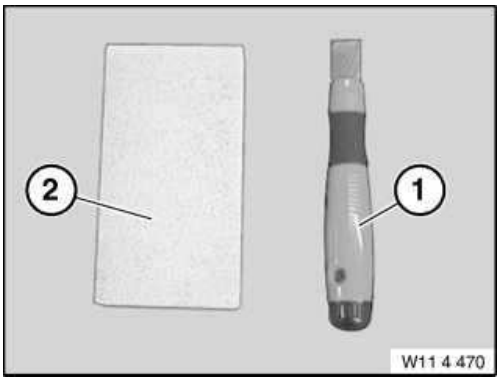
0 495 104 (11 4 472) Extractor



Common	Used in step 33
Usage	(grindstone)
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

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0 495 102 (11 4 470) Tool



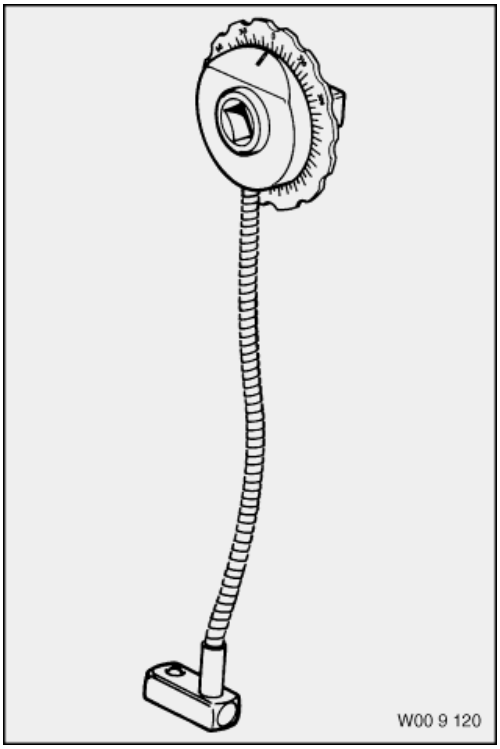
Common Used in step 33 54

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

0 490 504 (00 9 120) Torque angle measuring dial

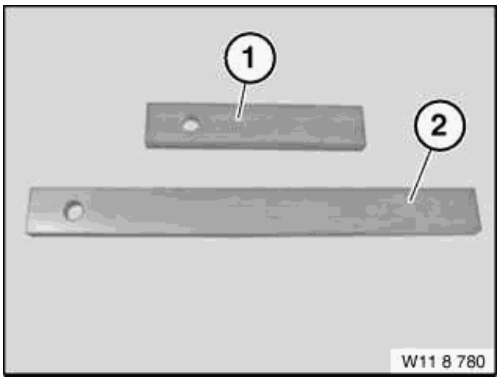


Common Used in step 33

Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

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0 496 120 (11 8 780) Plate



Common

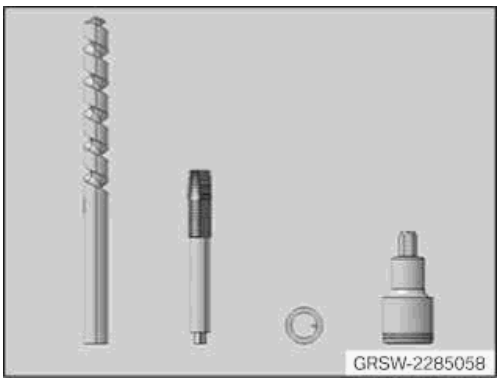
Used in step 33

Usage	(Mounting plates) For securing transmission oil sump when gearbox is removed.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 121 (11 8 781)		**Plate** (Mounting plate, short)Discontinued; only available via set 11 8 780 = 0496120.	
2	0 496 122 (11 8 782)		**Plate** (Mounting plate, long) Discontinued; only available via set 11 8 780 = 0496120.	

2 285 058 Tool set



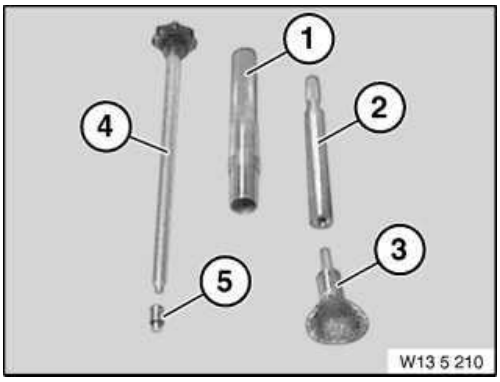
Common

Used in step 34

Usage	
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 02 14 (069)

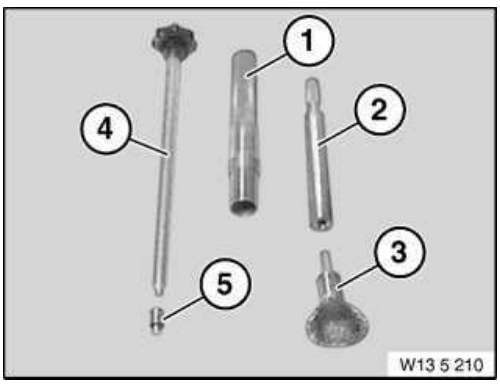
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0 493 763 (13 5 215) Plug



Common	Used in step 45
Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

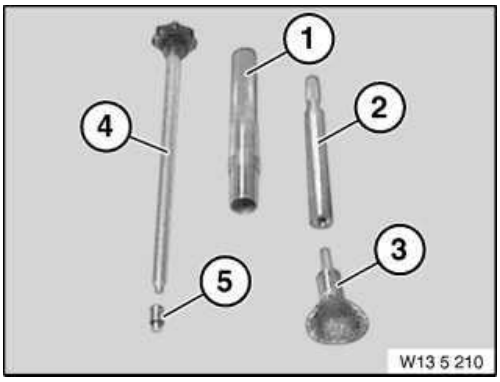
0 493 762 (13 5 214) Rod



Common	Used in step 45
Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 493 758 (13 5 210) Tool



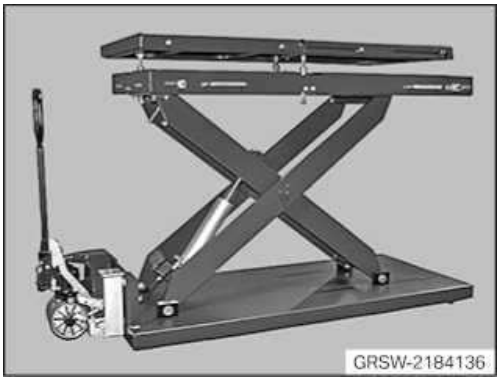
Common Used in step 45

Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

2 184 136 Mobile equipment table lift



Common Used in step 51

Usage	Table lift MHT 1200
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	06 01 10 (649)

2 409 025 Puller



Common Used in step 52

Usage	For disassembly of the outer radial shaft seal of the transmission output shaft, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A76
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

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2 411 739 Puller



Common	Used in step 52
Usage	For disassembly of the inner radial shaft seal of the output, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C78
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 408 152 Striking element



Common	Used in step 52
Usage	For installation of the right radial shaft seal transmission output shaft (inner). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

2 413 037 Handle



Common	Used in step 52
Usage	Universal drift handle. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C77
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

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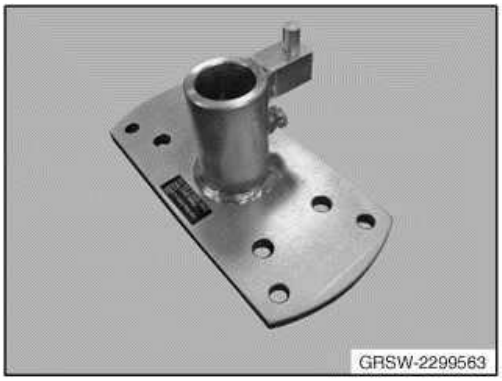
2 408 150 Striking element



Common	Used in step 52
Usage	For installing the right radial shaft seal transmission output shaft (outer). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

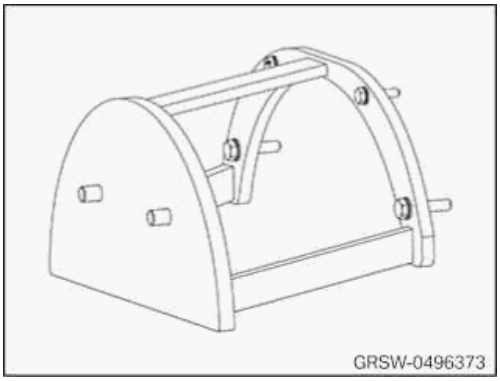
Replacement tools:

2 299 563 Adapter



Common	Used in step 13
Usage	New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.
Included in the tool or work	0 495 187
Storage location	
Replaced by	
In connection with	
SI-Number	

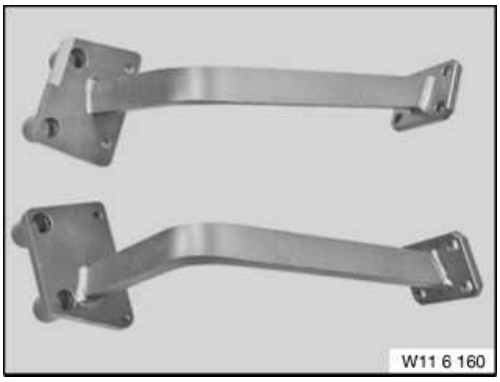
0 496 373 (11 5 420) Plate



Common	Used in step 13
Usage	(Fixture) Engine S62
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	

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0 496 680 (11 6 160) Support



Common	Used in step 13
Usage	For mounting N74 engine on the assembly stand. In combination with 00 2 300, 00 2 320
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	00 2 300; 00 2 320 = 0495196
SI-Number	01 31 09 (604)

Overview Technical Data

Screw-in depth of thread cutter	Used in step 34
Screw-in depth	18 mm

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	7 56
EGR controller	7 56

General repair instructions	Used in step
11 00 ... Overview of consumables (Electronic Parts Catalogue)	33

Repair instructions	Used in step
11 00 050 Removing and installing engine	1 62
11 00 050 Removing and installing engine	1 62
11 00 050 Removing and installing engine	1 62
11 00 050 Removing and installing engine	1 62
11 00 050 Removing and installing engine	1 62
11 00 050 Removing and installing engine	1 62
11 00 050 Removing and installing engine	1 62
11 00 050 Removing and installing engine	1 62
11 00 050 Removing and installing engine	1 62
31 10 001 Completely removing and installing front axle with engine and transmission	1 62
11 00 050 Removing and installing engine	1 62
11 00 050 Removing and installing engine	1 62
11 00 050 Removing and installing engine	1 62

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11 00 050 Removing and installing engine 1 62

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11 00 050 Removing and installing engine 1 62
11 00 050 Remove and install engine 1 62
11 00 050 Remove and install engine 1 62
11 00 050 Remove and install engine 1 62
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG) 1 62
11 00 050 Remove and install engine 1 62
11 00 050 Remove and install engine 1 62
11 00 050 Remove and install engine 1 62
11 00 050 Remove and install engine 1 62
11 00 050 Removing and installing the engine (manual gearbox) 1 62
11 00 050 Remove and install engine (Automatic) 1 62
11 00 050 Remove and install engine 1 62
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11 00 050 Remove and install engine 1 62
11 00 050 Removing and installing engine 1 62
11 00 050 Removing and installing engine \PREMIUM 1 62
11 00 050 Removing and installing/replacing engine (N63) 1 62
11 00 050 Removing and installing engine 1 62
11 00 050 Removing and installing engine 1 62
11 00 050 Removing and installing engine 1 62
11 00 050 Remove and install engine 1 62
11 00 050 Remove and install engine (Automatic) 1 62
11 00 050 Remove and install engine (Automatic) 1 62
11 00 050 Remove and install engine 1 62
11 00 050 Remove and install engine 1 62

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11 00 050 Remove and install engine (Automatic)	1 62
11 00 050 Remove and install engine (Automatic)	1 62
11 00 050 Remove and install engine	1 62
11 00 050 Remove and install engine	1 62
11 00 050 Remove and install engine	1 62
11 00 050 Remove and install engine	1 62
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG)	1 62
11 00 050 Remove and install engine	1 62
61 35 ... Notes on ESD protection (Electro Static Discharge)	6 17 25 33
61 35 ... Notes on ESD protection (Electro Static Discharge)	33

Operating materials	Used in step

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	40
Exhaust-gas recirculation cooler seal on exhaust manifold	56
Exhaust-gas recirculation cooler seal on intake plenum	56

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11 31 052 Replacing both timing chains

PRELIMINARY WORK

1 – Removing engine



- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

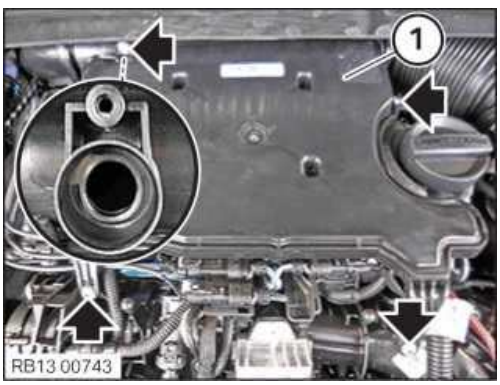
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

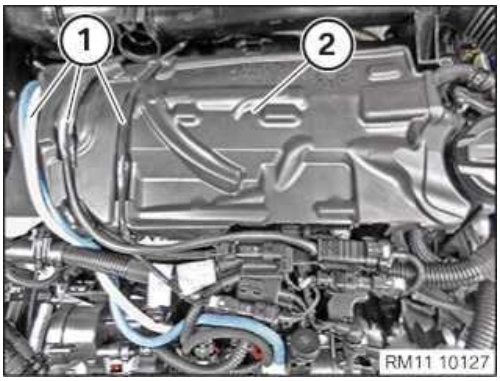
3 – Remove resonator



- Remove screws (arrows).
- Guide out and remove the resonator (1).

4 – Remove the acoustic cover for the injectors

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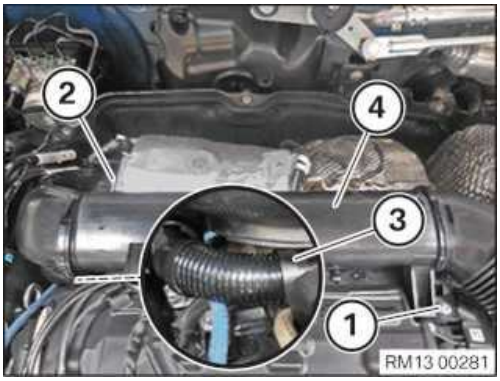


- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

5 – Removing clean air pipe



- Detach clamp (1) on the clean air pipe.
- Pull off the clean air pipe from the intake silencer housing.



- Loosen screw (1).
- Loosen clamp (2).
- Unlock the ventilation line (3) and pull it off the cylinder head cover.
- Feed out clean air pipe and remove.

6 – Remove differential pressure sensor

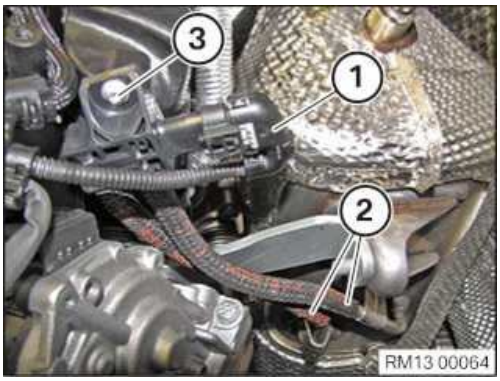
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

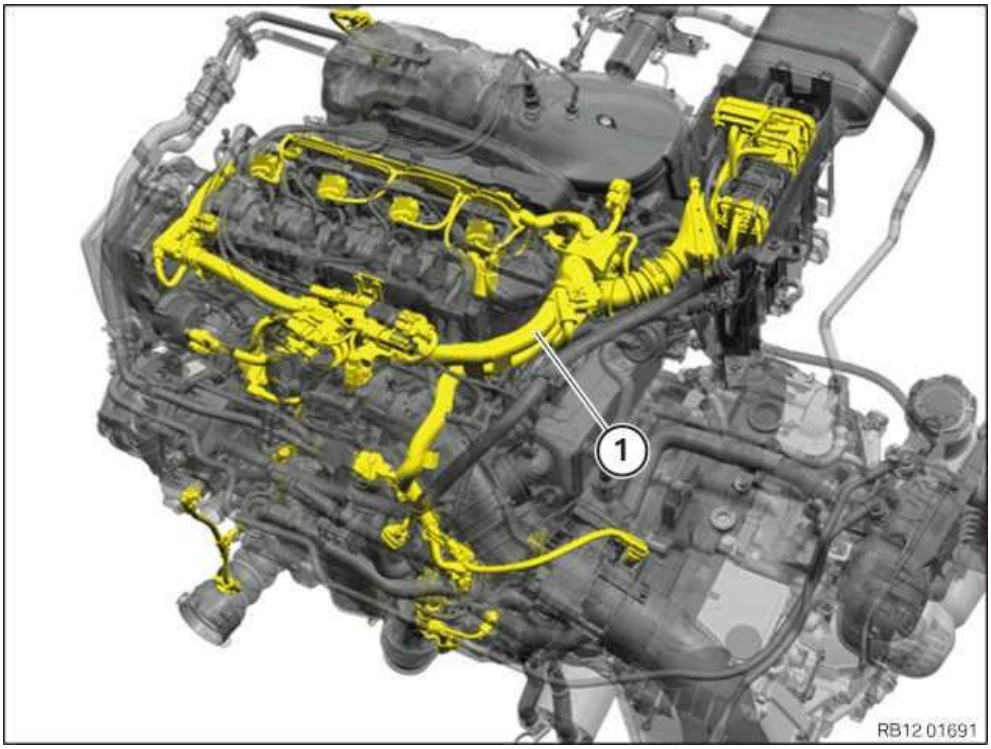
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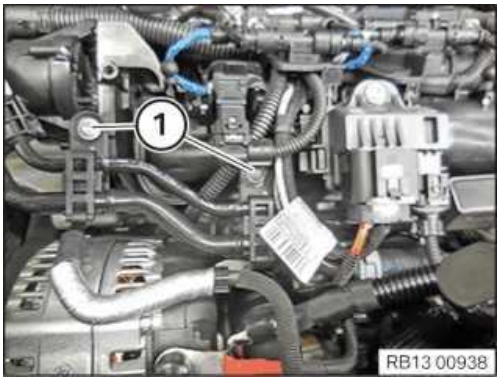
- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

7 – Removing assemblies (on lifting table)

Overview: Wiring harness section for the engine

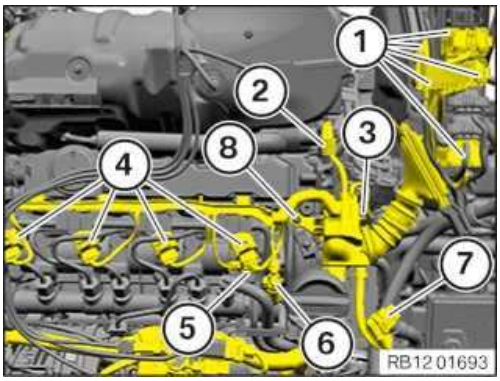


1 Wiring harness section for the engine

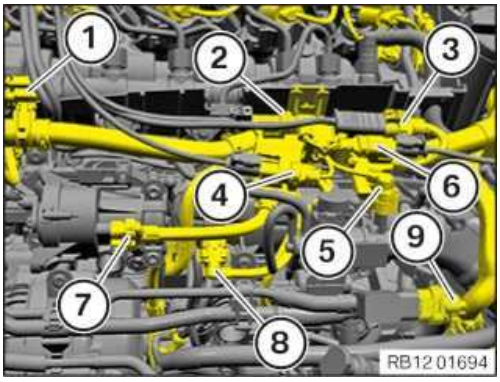


- Loosen screws (1).

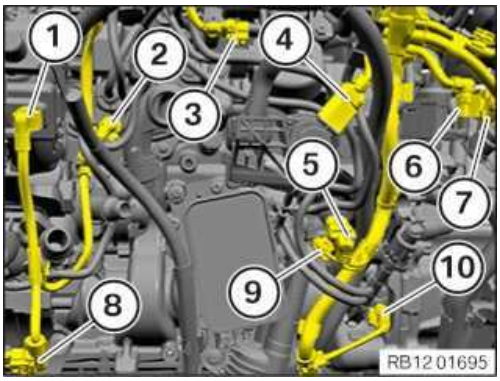
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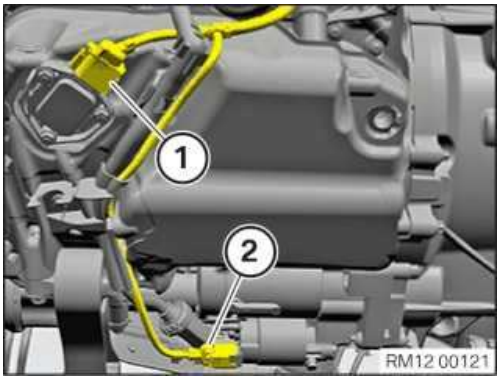
- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock the connector (2) and disconnect it from the differential pressure sensor.
- Unlock the connector (3) and disconnect it from the exhaust-gas recirculation valve.
- Unlock the connector (4) and pull off from the injectors.
- Unlock the connector (5) and disconnect it from the camshaft sensor.
- Unlock the connector (6) and disconnect it from the fuel pressure regulator.
- Unlock connector (7) and pull off from hot film air mass meter.
- Loosen screw (8).



- Unlock connector (1) and pull off from the rail pressure sensor.
- Unlock the connector (2) and disconnect it from the exhaust temperature sensor before the diesel particulate filter.
- Unlock connector (3) and pull it off from the front oxygen sensor.
- Unlock the connector (4) and disconnect it from the exhaust temperature sensor after the diesel particulate filter.
- Unlock and disconnect the connector (5) from the electric changeover valve.
- Unlock the connector (6) and disconnect it from the exhaust temperature sensor for the exhaust-gas recirculation cooler.
- Unlock the connector (7) and disconnect it from the servomotor for the swirl flaps.
- Unlock the connector (8) and pull it off the charging pressure sensor.
- Unlock the connector (9) and disconnect from the fuel pressure and temperature sensor.

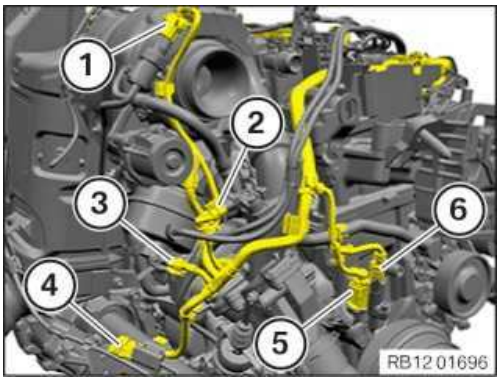


- Unlock and disconnect the connector (1) from the alternator.
- Unlock and disconnect the connector (2) from the electric changeover valve.
- Unlock and disconnect the connector (3) from the electric changeover valve.
- Unlock the connector (4) and pull it off the high pressure pump.
- Unlock the connector (5) and disconnect it from the oil pressure sensor.
- Unlock connector (6) and pull off from throttle body.
- Unlock the connector (7) and disconnect it from the intake air temperature sensor.
- Unlock the connector (8) and disconnect it from the air conditioning compressor.
- Unlock and disconnect the connector (9) from the solenoid valve.
- Unlock the connector (10) and pull it off the crankshaft sensor.



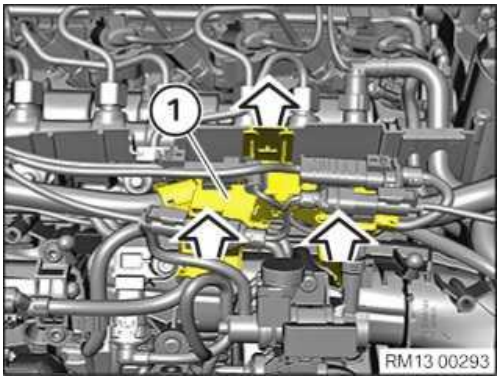
- Unlock the connector (1) and pull off of the oil-level sensor.
- Unlock connector (2) and remove from starter motor.

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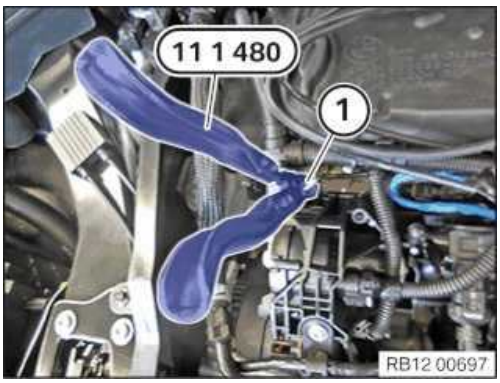


- Unlock the connector (1) and disconnect it from the exhaust gas pressure sensor.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock the connector (3) and pull it off the exhaust turbocharger.
- Unlock the connector (3) and disconnect it from the differential pressure sensor.
- Unlock connector (4) and pull it off from the monitoring oxygen sensor.
- Unlock the connector (5) and pull it off the oil pressure switch .
- Unlock connector (6) and disconnect from switching valve.
- Detach, feed out and remove the wiring harness from the clamps.

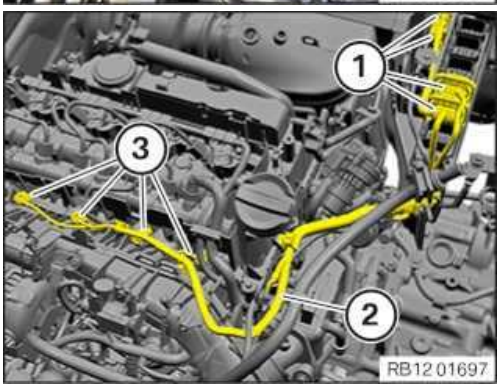
▶ **Removing the cable clips from the intake plenum**



- Detach the cable clip (1) in the direction of the arrow.
- Guide out the cable clip (1) in direction of arrow and set it aside.



- Unlock the connectors (1) of all glow elements with the special tool **0 490 796 (11 1 480)** and release them.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.



- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Pull off all connectors (3) from glow element using special tool **0 490 796 (11 1 480)**.
- Loosen screw (2) and remove the ground strap.
- Detach, feed out and remove the wiring harness from the clamps.

▶ **Removing the drive belt for alternator**

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

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CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

TECHNICAL INFORMATION

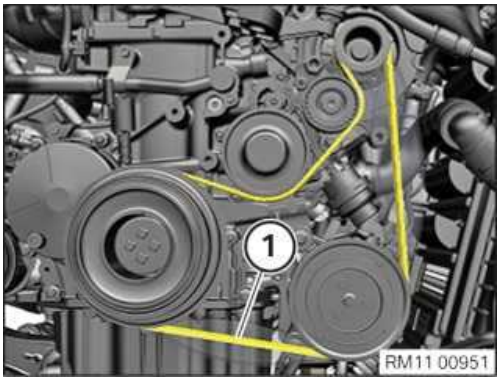
If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

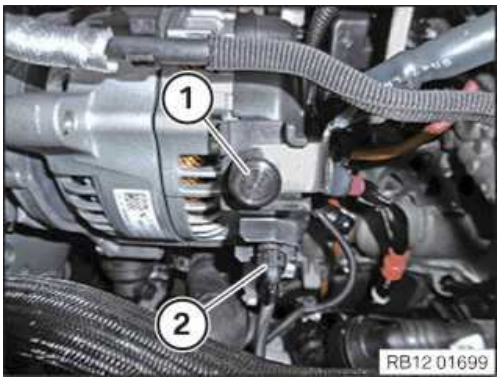
The drive belt must be replaced if contaminated with coolant- and oil residues.



- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool **0 496 268 (11 0 390)**.



- Guide out the drive belt for the alternator (1) and remove it.

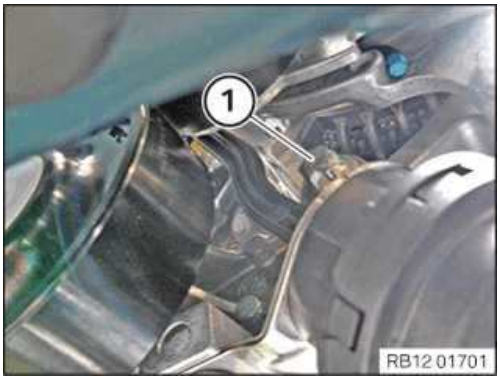


- Remove the cover (1) and loosen the nut below.
- Disconnect positive battery cable from alternator.
- Unlock and disconnect the connector (2) from the alternator.

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- Detach screw (1) on top on the alternator.



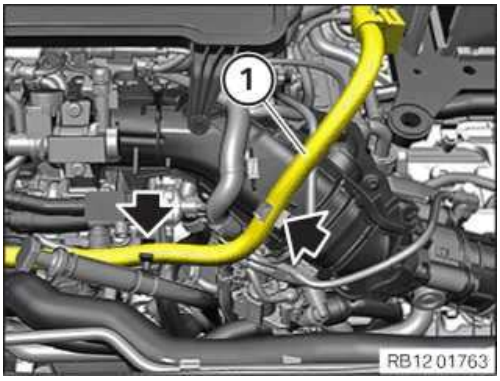
- Detach screw (1) below on the alternator.



- Feed out alternator (1) along with the screw (2) on the bottom of the alternator through the slot on the support and remove.

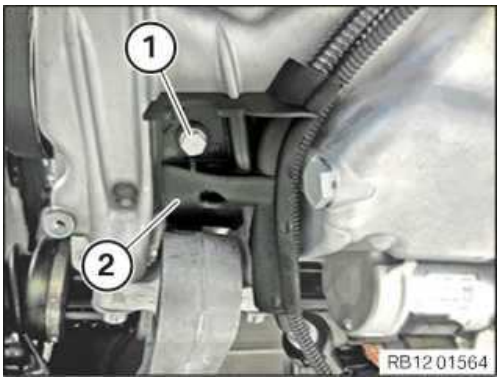


- Loosen screws (1).
- Feed out and remove the air conditioning compressor (2).



- Release the positive battery cable (1) from the clamps (arrows).

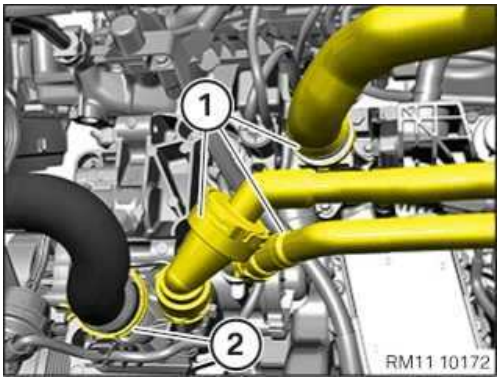
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- Loosen screw (1).
- Guide out and remove holder (2).



- Feed out positive battery cable from the clamps (1) and remove.



- Unlock and disconnect coolant lines (1).
- Guide out the coolant lines (1) and remove it.
- Detach the clamp (2).
- Guide the coolant hose out and remove.

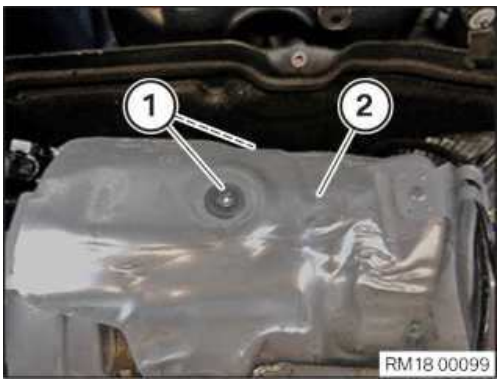
▶ **Removing heat shield from top exhaust turbocharger**

WARNING

Hot surfaces.

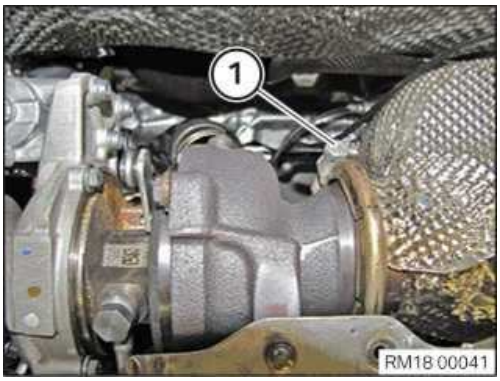
Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from holders.
- Release the screws (1) at the top and bottom of the heat shield.
- Feed out and remove the heat shield (2).

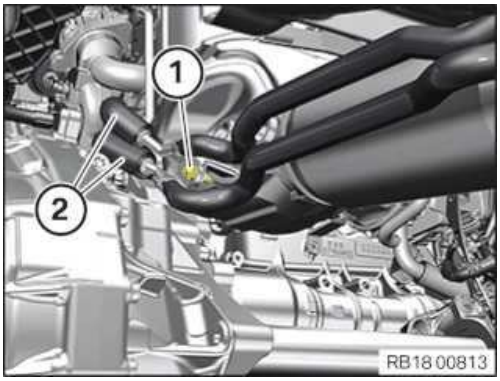
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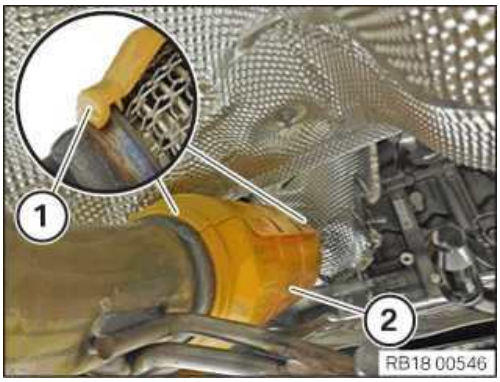
- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.



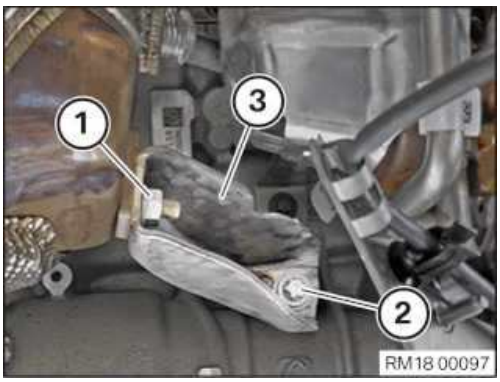
- Loosen nuts (1).



- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.

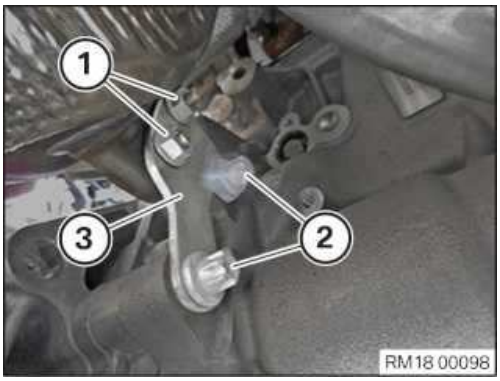


- Mount fitting aid (2).
- Make sure that the fitting aid is correctly position on the edges (1) of the flexible tube.



- Loosen nut (1).
- Loosen screw (2).
- Remove holder (3).

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- Loosen nuts (1).
- Loosen screws (2).
- Remove holder (3).
- Guide out and remove diesel particulate filter .

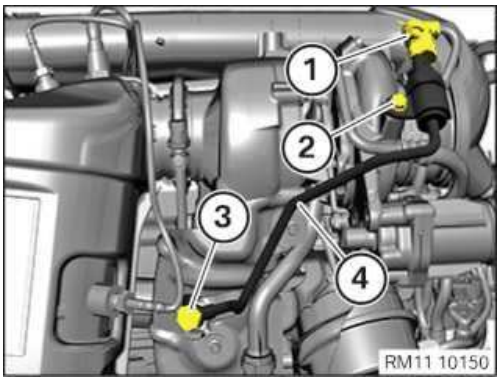
▶ **Remove the heat shield from the exhaust turbocharger at the bottom**

WARNING

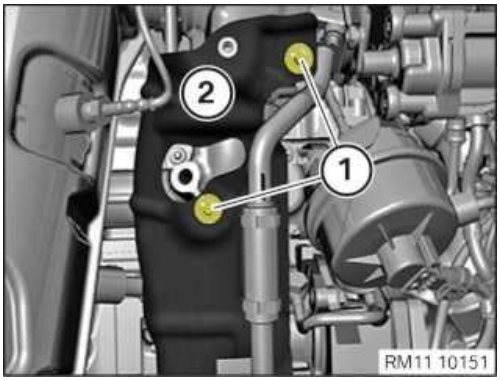
Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Unlock and disconnect connector (1).
- Unscrew the banjo bolt (3).
- The seals of the banjo bolt (3) must be renewed.
- Loosen screw (2).
- Remove the exhaust gas pressure pipe (4).



- Unscrew the bolts (1) on the heat shield .
- Feed out and remove the heat shield (2).

▶ **Removing the exhaust-gas recirculation cooler**

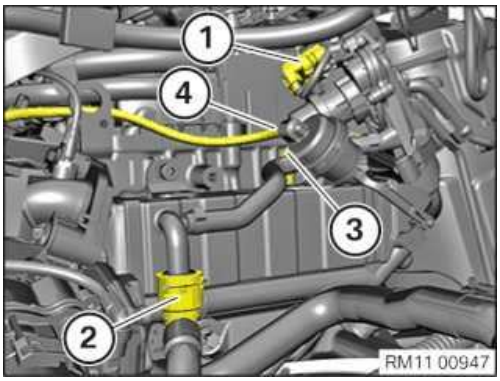
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

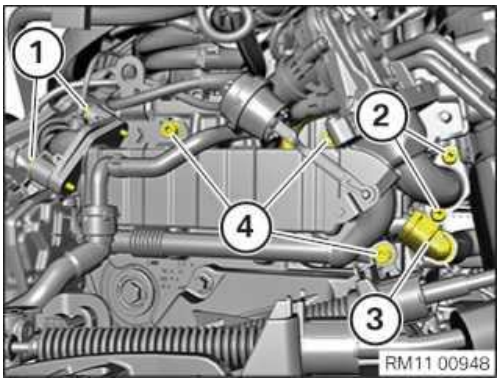
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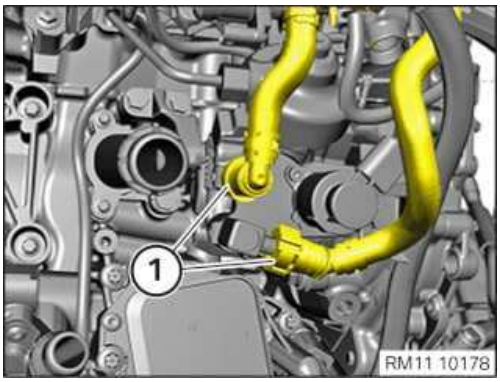
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

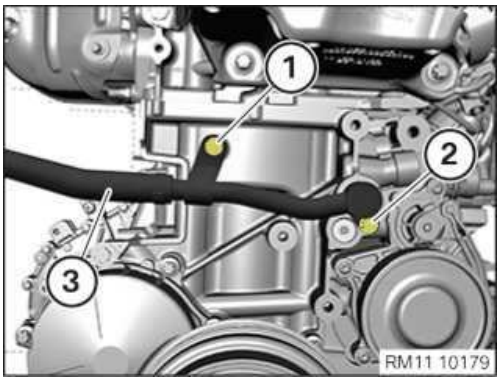
- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.



- Unlock the fuel lines (1) and disconnect from the high pressure pump.
- Remove the fuel lines.



- Loosen screws (1) and (2).
- Remove coolant line (3).

8 – Removing the low-pressure stage turbocharger

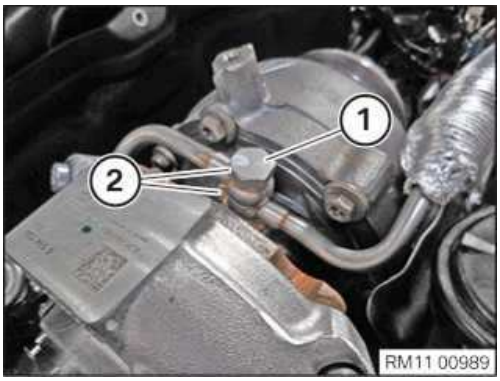
WARNING

Hot surfaces.

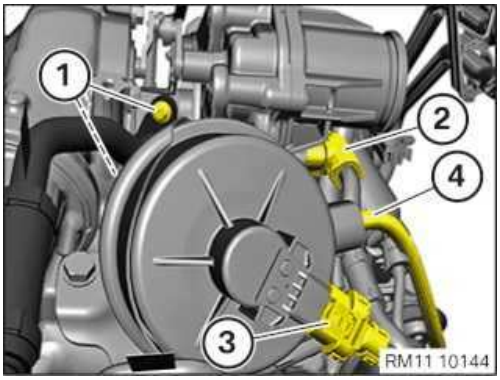
Risk of burning!

- Perform all work only on components that have cooled down.

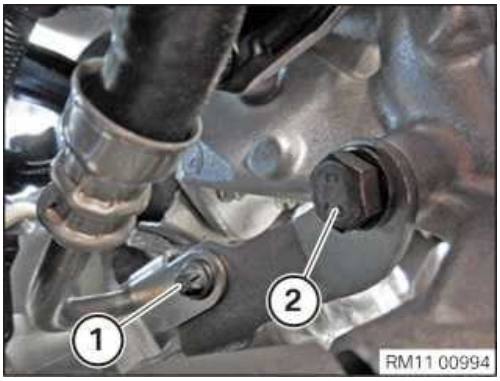
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- Release the banjo bolt (1) of the oil feed lines.
- Remove sealing rings (2).
- Place oil feed lines to one side.



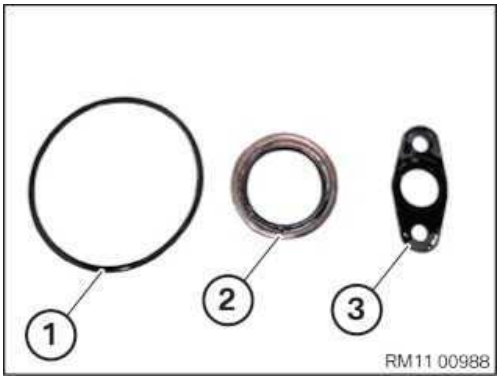
- Release the screws (1) of the oil return line.
- Unlock and disconnect the plug connections (2) and (3).
- Pull off the vacuum hose (4) carefully.



- Undo the bolt (1) of the oil feed line.
- Loosen screw (2).

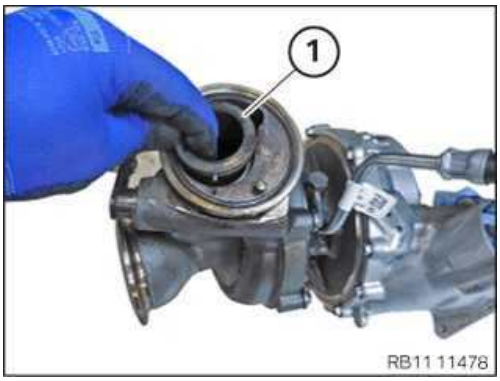


- Loosen screw (1).
- Remove the V hose clamp.
- Guide the low-pressure stage turbocharger out towards the top and remove.



- Remove seals (1), (2) and (3).

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- Remove the spacer ring (1).

9 – Removing the high-pressure stage exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

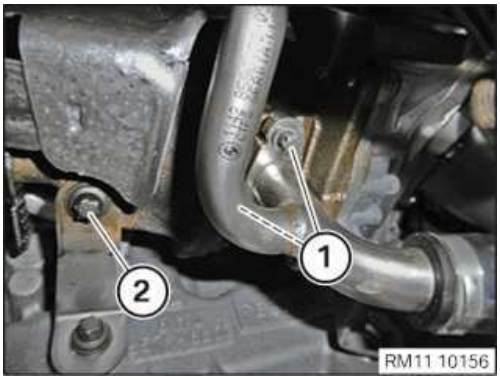
- Perform all work only on components that have cooled down.

CAUTION

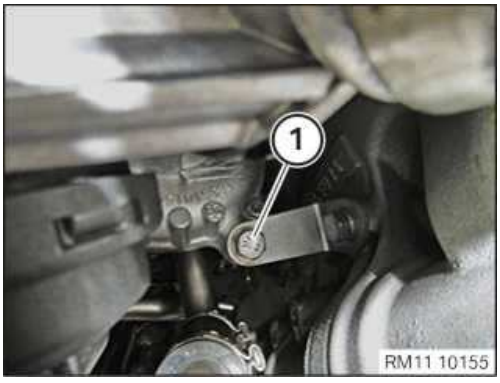
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

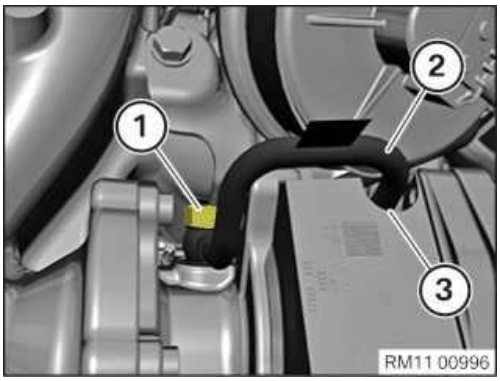


- Unscrew the bolts (1) on the oil return line .
- Loosen screw (2).

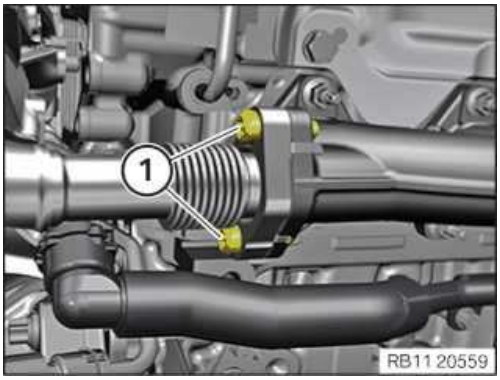


- Release screw (1) from the right wheel arch.

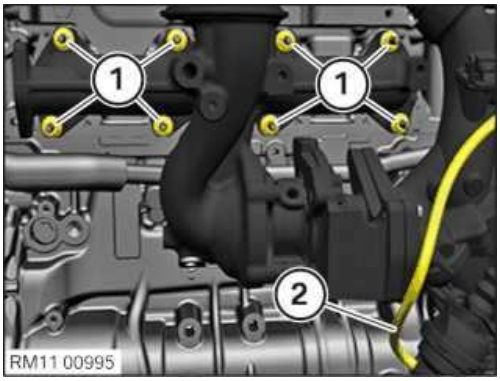
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- Unscrew the banjo bolt (1).
- Guide out oil feed line (2) from holder (3).

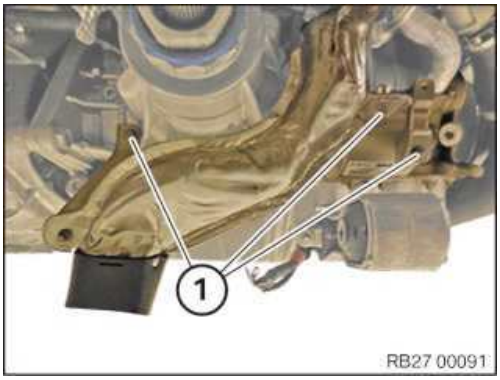


- Loosen screws (1).

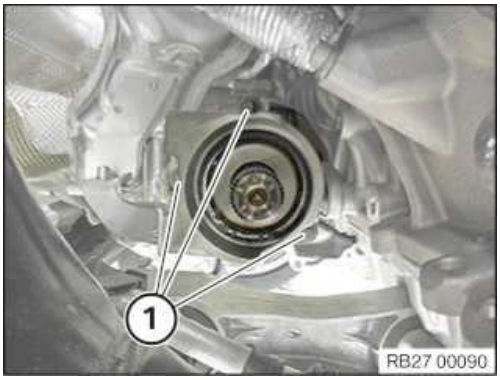


- Pull off the vacuum hose (2).
- Loosen nuts (1).
- Guide out the exhaust manifold and the high-pressure stage exhaust turbocharger to the top and remove them.

10 – Remove the intermediate shaft with the support tube

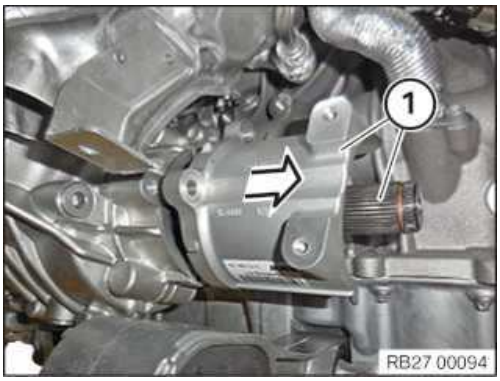


- With air duct installation: Loosen screws (1).
- Remove air duct



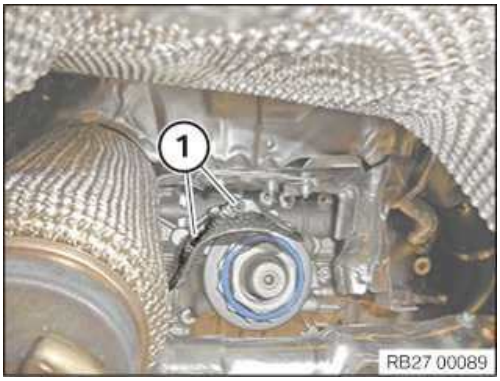
- Loosen screws (1).

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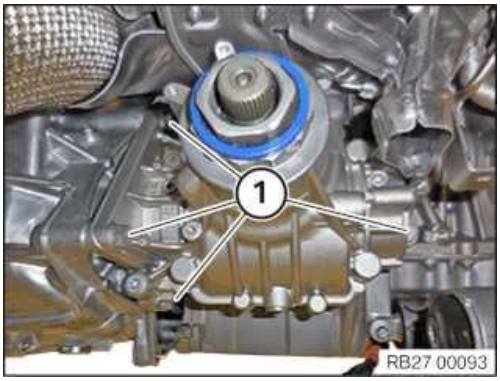


- Pull the intermediate shaft with the support tube (1) out of the transfer box.

11 – Remove transfer box (VTG)



- Loosen screws (1).
- Remove heat shield.



- Loosen screws (1).
- Remove the transfer box (VTG).

12 – Detach the engine from the manual gearbox

Prerequisite

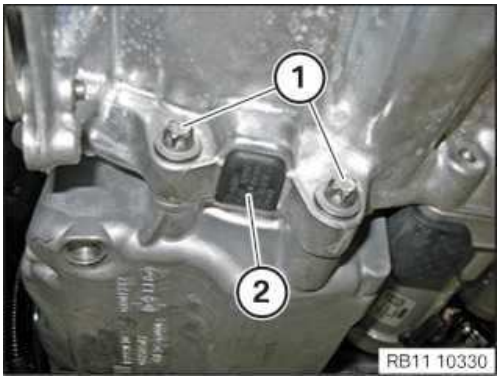
Engine has been removed.

CAUTION

Heavy component.

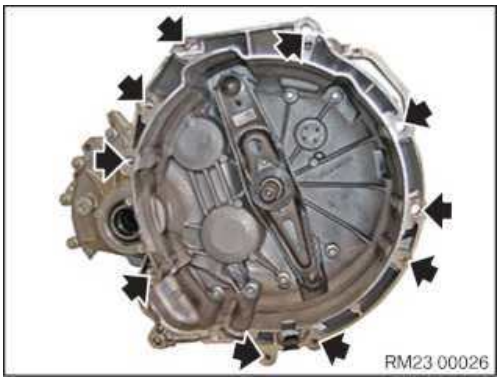
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

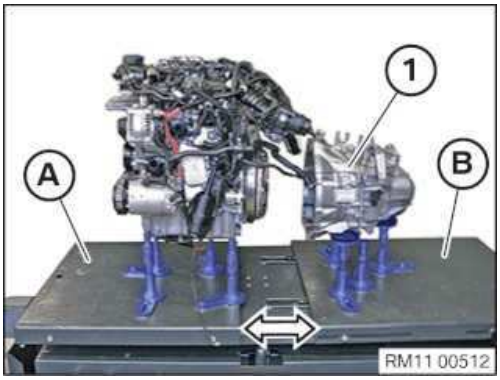


- Loosen screws (1).
- Remove protective cap (2).

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- Remove screws (arrows).



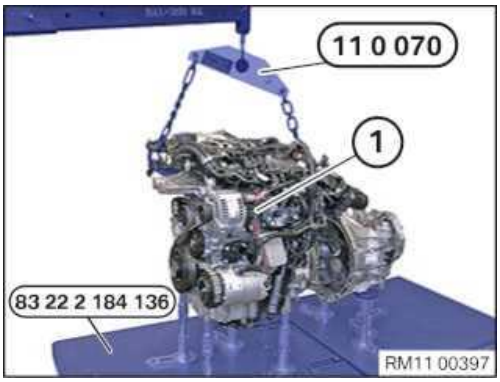
- Slide the table top (B) in the direction of the arrow and slide the manual gearbox (1) to the side.



- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

M8		Tightening torque	21,5 Nm



- Attach engine lifter to special tool and lift engine (1) off lifting table.

13 – Mount engine on assembly stand

CAUTION

Heavy component.

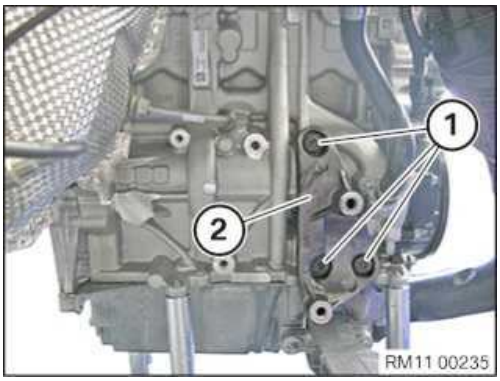
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

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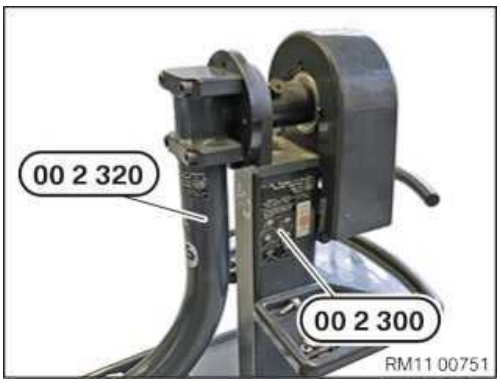
- Loosen screws (1).
- Guide out and remove holder (2).



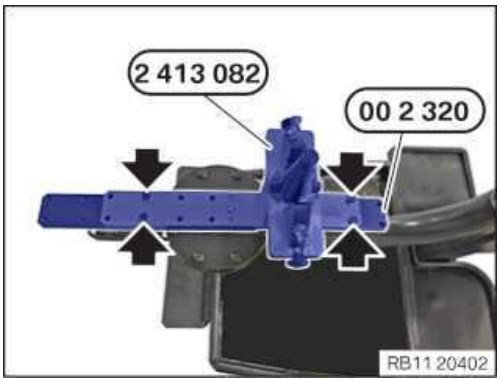
- Position the special tool **2 455 010** on the engine (1).
- Position the standard bolts **M10x30**.
- Tighten the standard bolts (arrows).
-

Special tool 2 455 010 to crankcase

M10x30		Tightening torque	38 Nm



- Prepare the assembly stand **0 495 187 (00 2 300)** with the special tool **0 495 196 (00 2 320)**.



- Screw the special tool to the **0 495 196 (00 2 320)** special tool.
- Tighten screws (arrows).
-

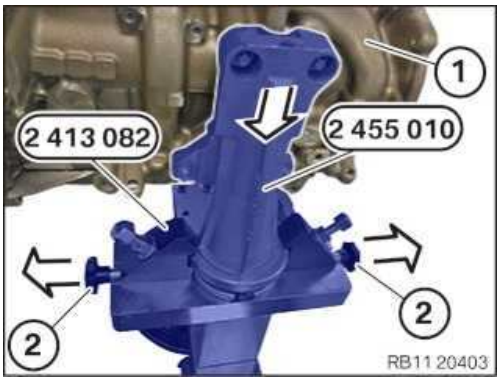
Special tool 11 8 930 to special tool 00 2 320

M14x35		Tightening torque	160 Nm

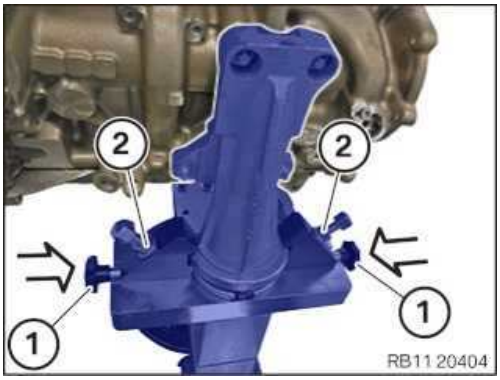


- Position the engine lifter with the special tool and the engine on the special tool **0 495 187 (00 2 300)**.

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- Detach the holder (2) in the direction of the arrow.
- Position the engine (1) with the special tool **2 455 010** in the direction of the arrow on the special tool .



- Lock the holder (1) in direction of arrow.
- Tighten nuts (2).

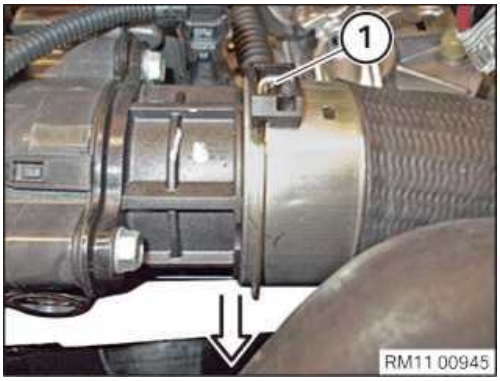
14 – Removing the intake plenum

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

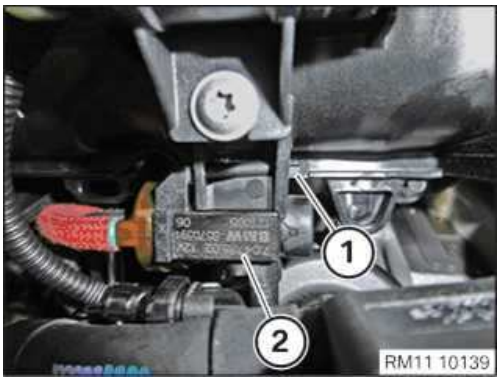


- Unlock the lock (1).

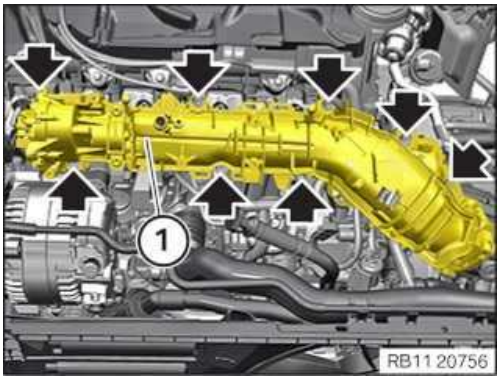


- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.

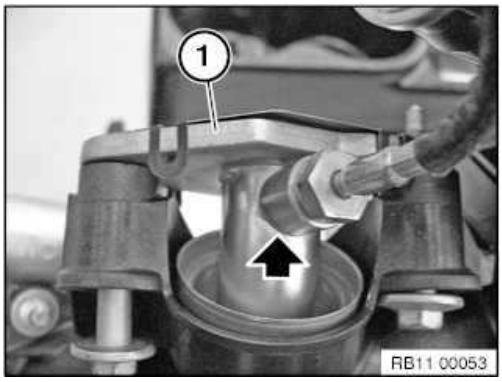
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- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



- Release the screws (arrows) from the intake plenum (1).
- Guide the intake plenum (1) out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

15 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

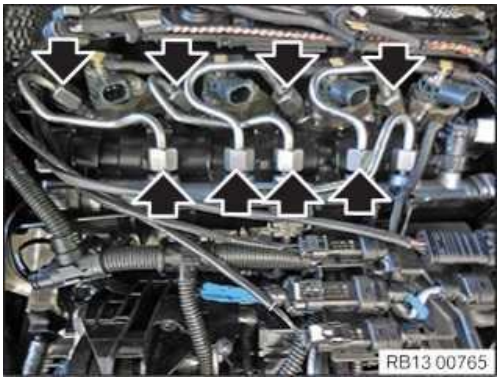
If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release the high pressure lines (arrows) with the special tool .
- Catch and dispose of escaping fuel.
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool .

16 – Detaching leakage oil line from injector

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

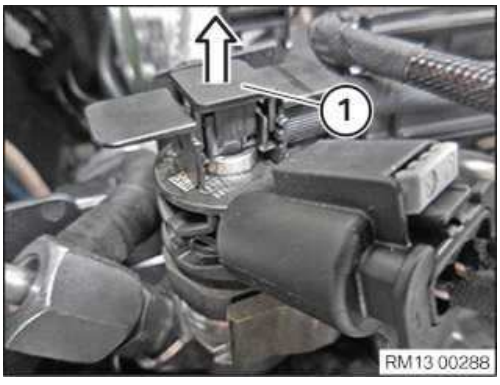
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

17 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

 **Electrostatic discharge.**

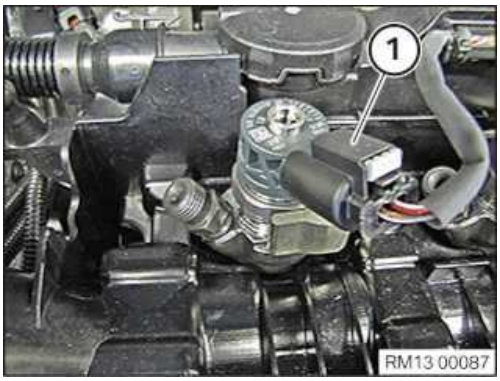
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

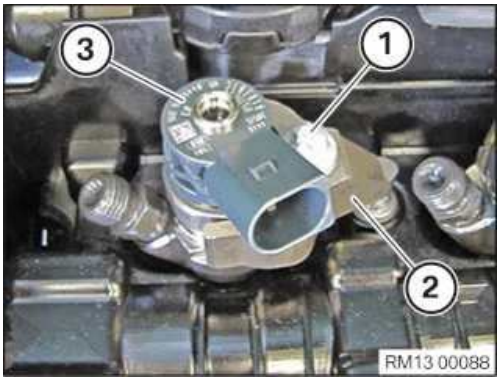
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TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.



- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

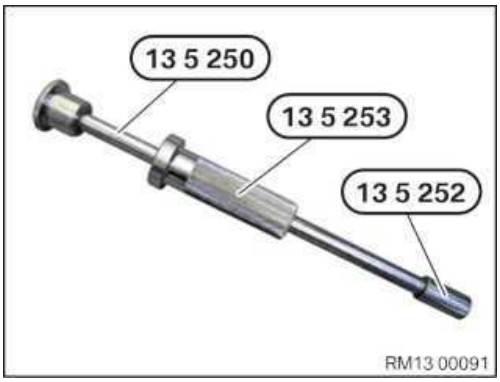
▶ **Loosen stuck injectors**

RISK OF DAMAGE

Contaminant or foreign body.

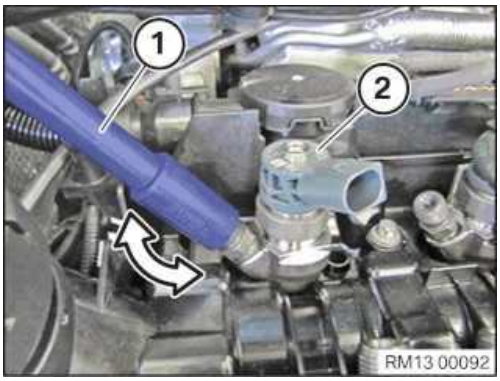
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)** back onto the special tool **0 493 321 (13 5 250)**.

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- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

18 – Remove high-pressure rail

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

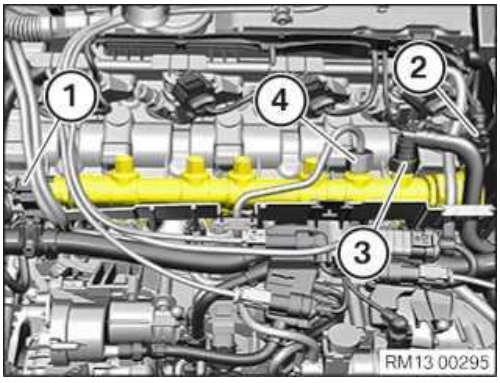
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

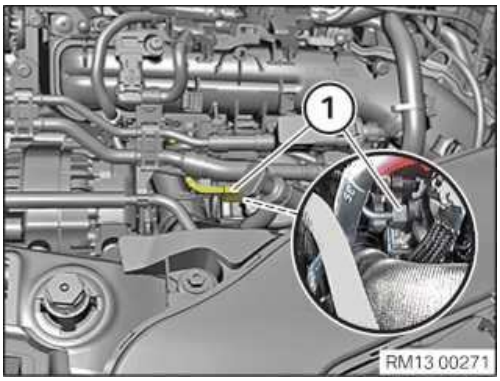
TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

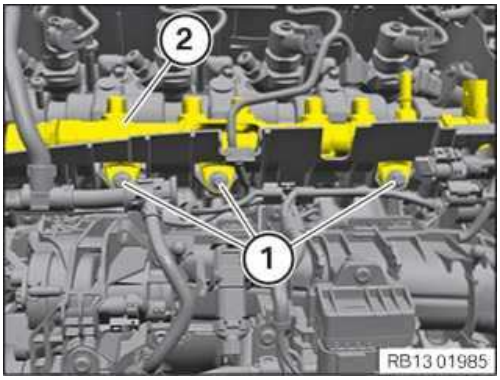


- Unlock and disconnect connector (1).
- Unlock and disconnect connector (2).
- Unlock and release fuel line (3).
- Loosen union nut (4) with special tool .
- Reset special tool early on to avoid bending pressure lines.

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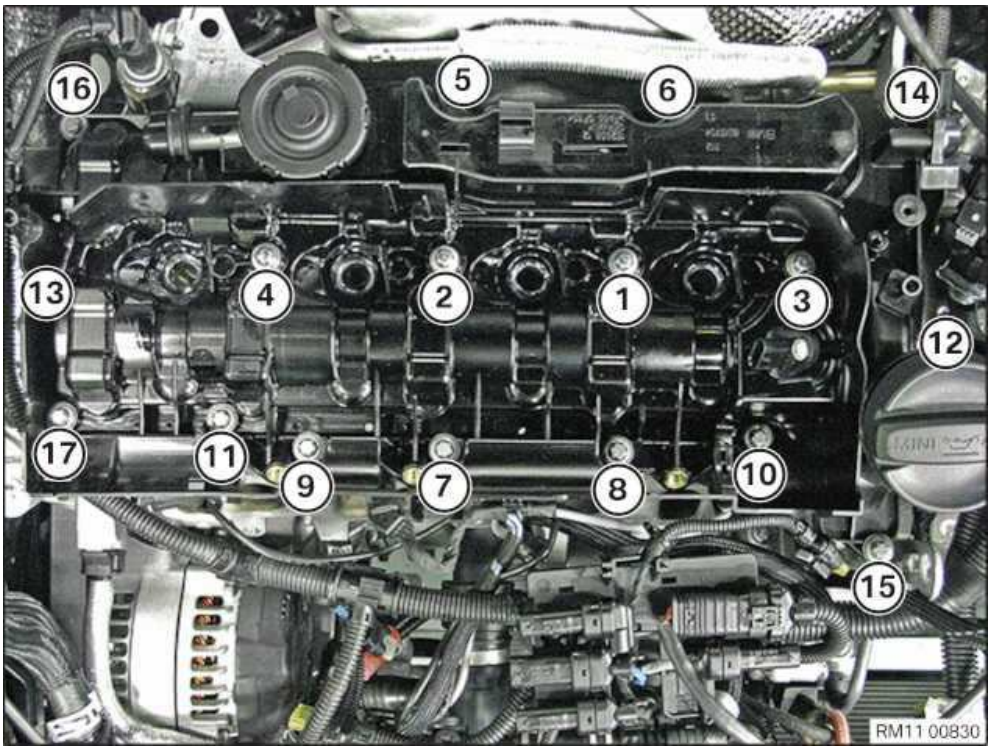
- Slacken the union nut (1) on the high pressure pump.



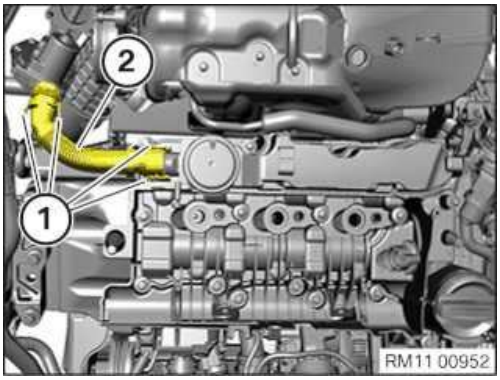
- Loosen screws (1).
- Carefully thread out and remove the rail (2).
- Make sure the pressure line of the high pressure pump is not bent.

19 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover

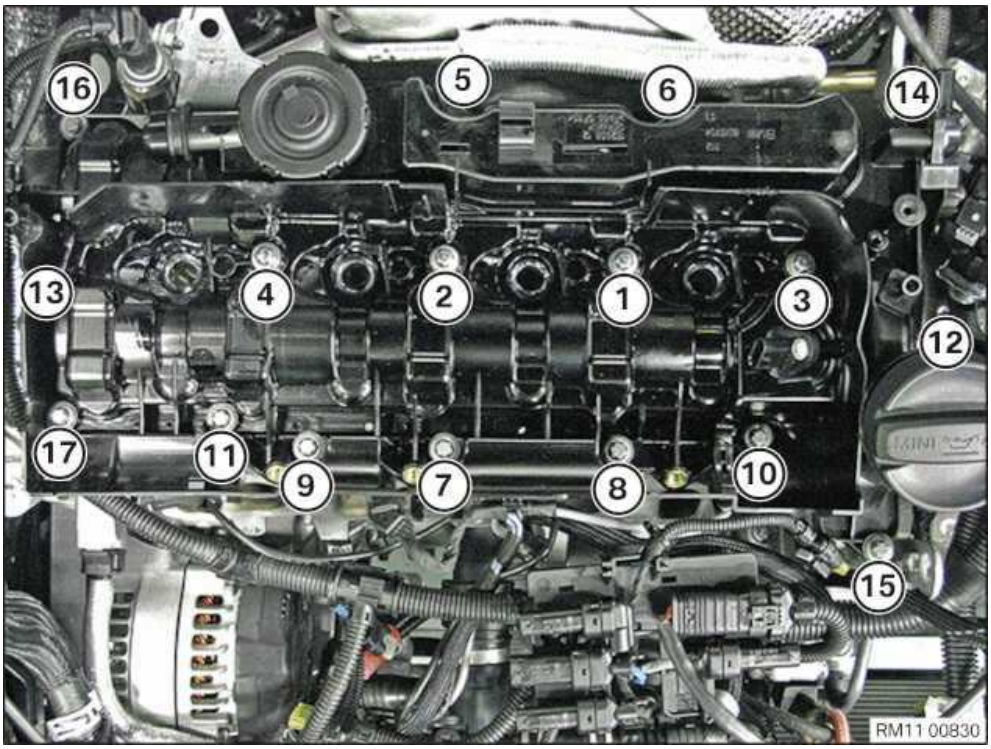


1 to 16 screws of the cylinder head cover.



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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- Loosen screws in the order (17) to (1).
- Remove cylinder head cover by lifting it out.

20 – Checking camshaft timing



- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

Damage to the engine.

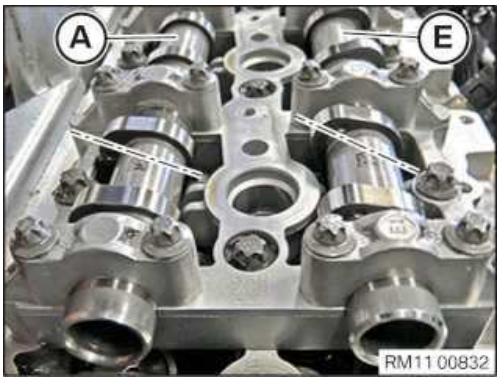
The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

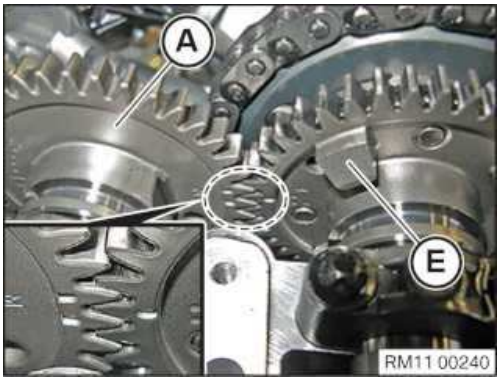
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- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.



- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

21 – Remove chain tensioner piston

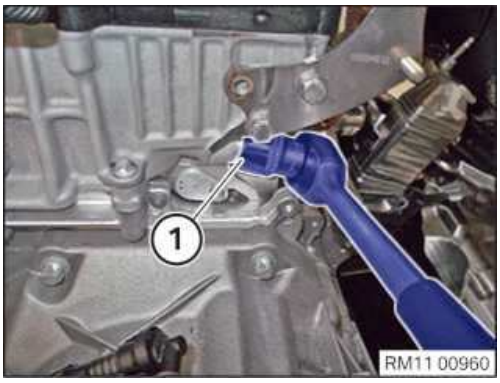
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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

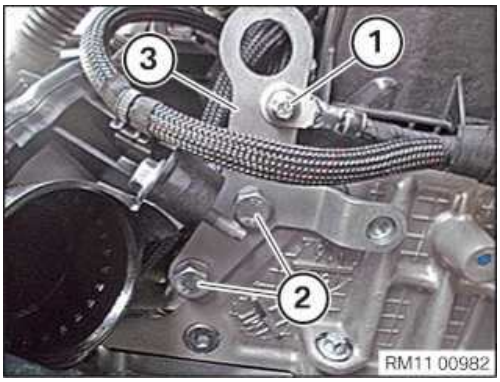


TECHNICAL INFORMATION

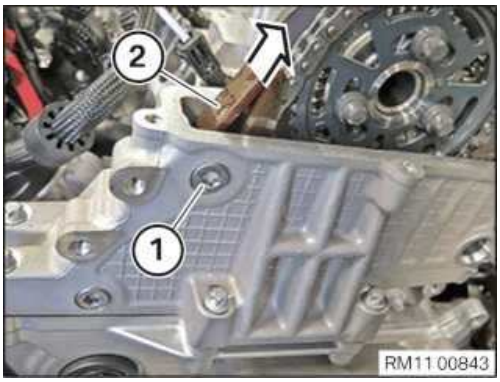
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

22 – Remove the timing chain guide rail

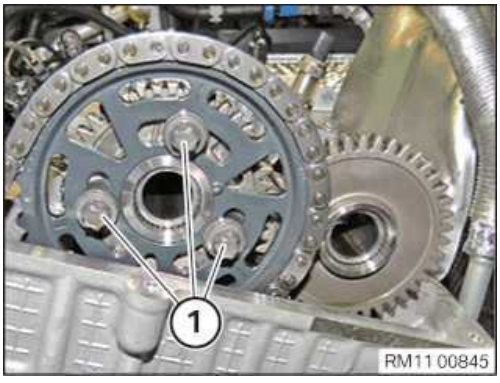


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

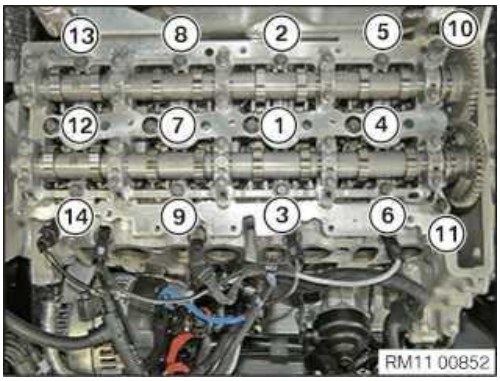
23 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

24 – Removing the camshaft support

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- Evenly loosen all screws in a sequence from (14) to (1).
- Loosen and remove all screws in a sequence from (14) to (1).
  Both camshafts can be removed with the camshaft carrier.
- Remove the camshaft support including camshafts towards the top.

25 – Removing glow elements

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Damage to the glow elements.

Excessive force may damage the glow elements and they may then have to be renewed.

- Handle glow elements with care and do not drop.
- Do not rest the cylinder head on glow elements. Glow elements protrude from the sealing surface of the cylinder head.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

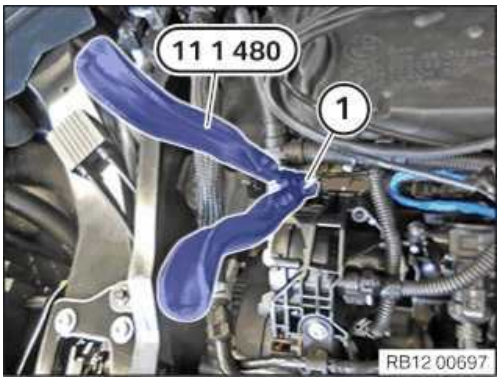
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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

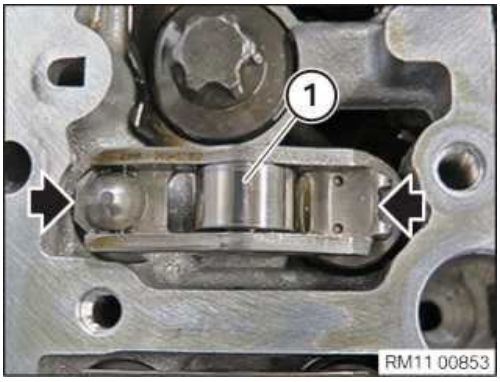


- Unlock and disconnect plug connection (1) using special tool **0 490 796 (11 1 480)**.



- Release the glow elements with the special tool or conventional tools.
- Feed out preheating elements and remove.

26 – Remove roller cam followers



- Guide out and remove all roller cam followers (1) (arrows).
- Place all roller cam followers (1) in order in special tool **0 495 105 (11 4 480)**.

  Roller cam followers that have already been used must be installed in same position again.

27 – Removing the hydraulic valve clearance compensating element

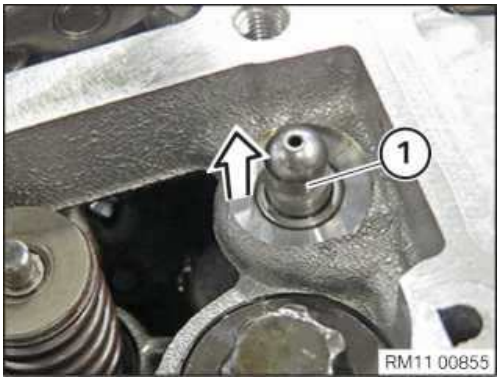
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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Remove the hydraulic valve clearance compensating element (1) in the direction of the arrow and place on the special tool **0 495 105 (11 4 480)**.
- Repeat the process on all hydraulic valve clearance compensating elements.

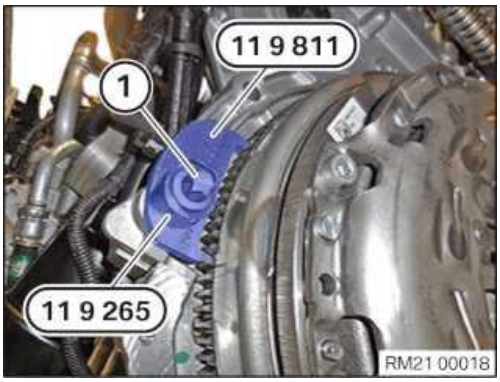
28 – Remove clutch

CAUTION

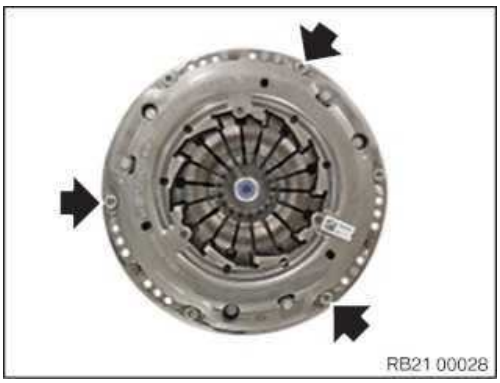
Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

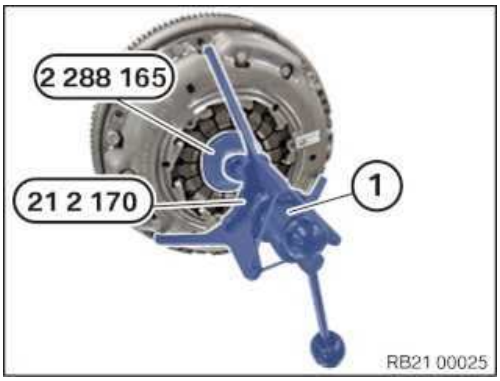


- Block flywheel with transmission bolt (1) and special tools **0 496 171 (11 9 811)** and **0 494 793 (11 9 265)**.

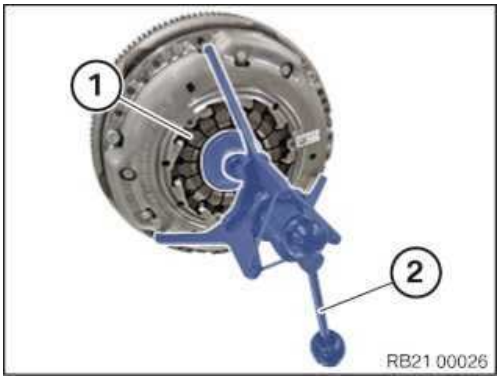


- Detach 3 screws to attach special tool and **2 288 165**.

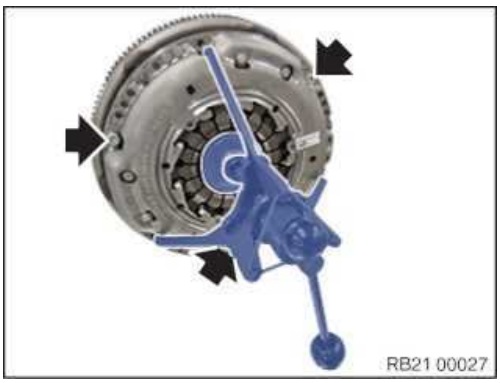
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- Position special tool and **2 288 165** and tighten on the knurled screw (1).



- Screw in the spindle (2) until the diaphragm spring (1) is preloaded and the clutch disc is free of tension.



- Loosen the remaining 3 screws and remove the clutch with clutch disc from the flywheel.

29 – Removing flywheel

CAUTION

Heavy component.

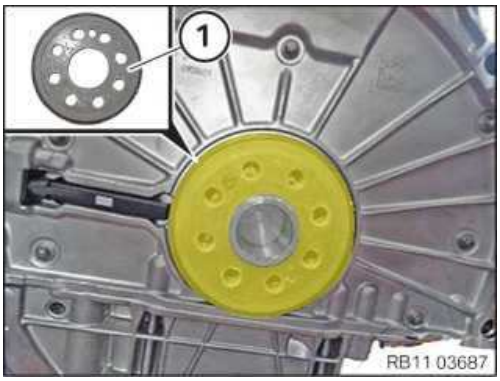
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Secure the flywheel with a transmission bolt (1) and with special tools **0 496 171 (11 9 811)** and **0 494 793 (11 9 265)**.
- Unscrew the flywheel bolts with the special tool **0 491 018 (11 4 180)**.
- Remove flywheel.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

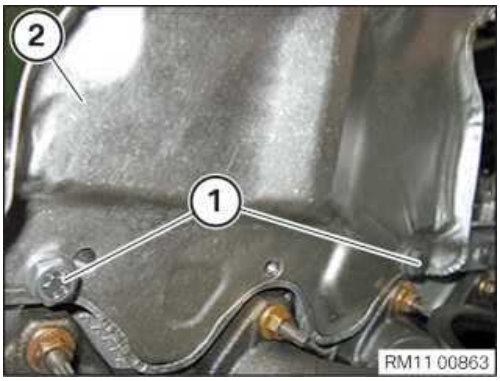
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Remove the increment wheel (1) from the crankshaft and lay it down correctly.

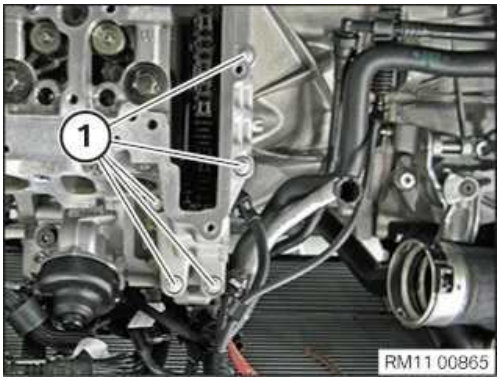
30 – Remove rear timing case cover

Prerequisite

Transmission is removed.



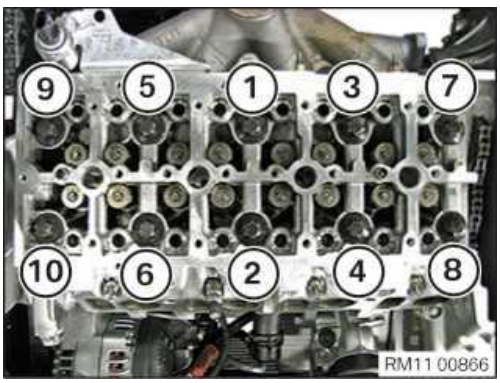
- Loosen screws (1).
- Feed out the heat shield (2) and place to one side.



TECHNICAL INFORMATION

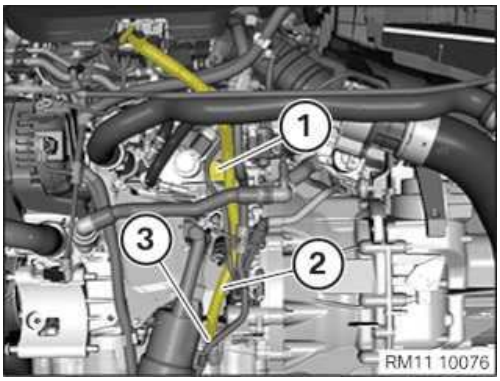
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screws (1).

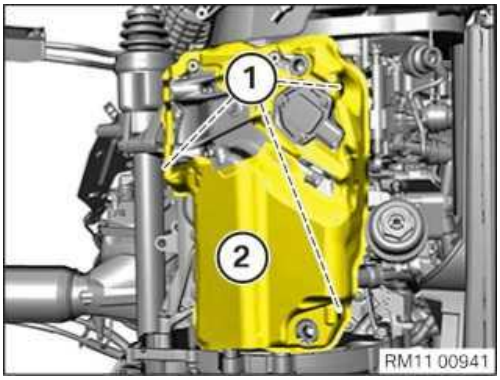


- Loosen the cylinder head bolts in the sequence from (10) to (1).
- Remove cylinder head bolts (1) to (10) with washers.
- Remove cylinder head.

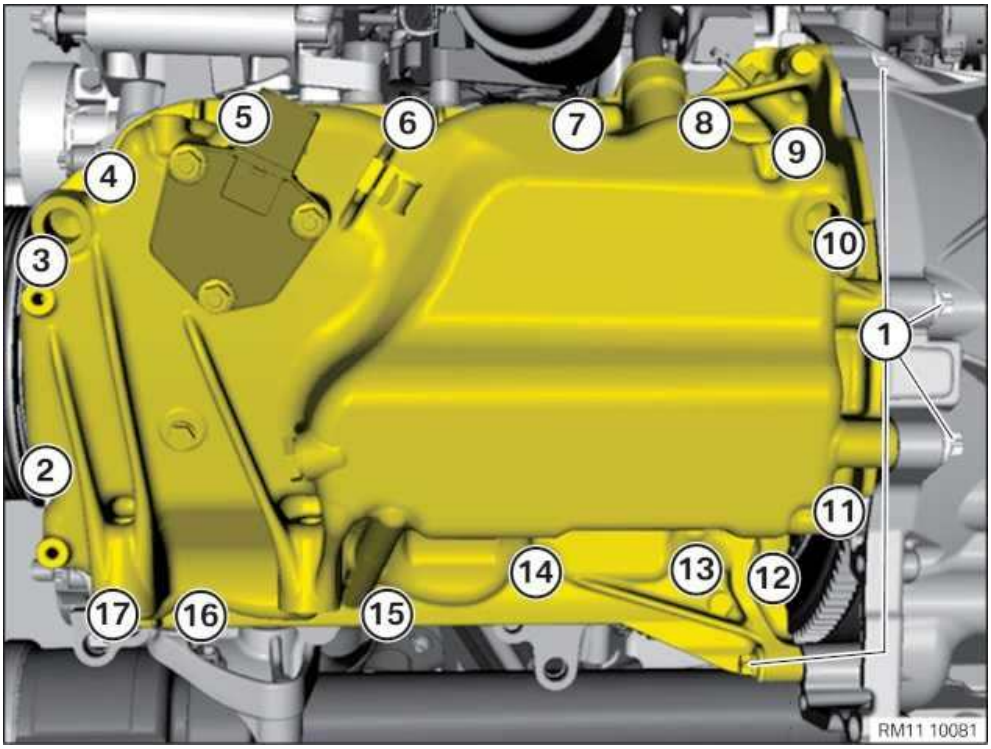
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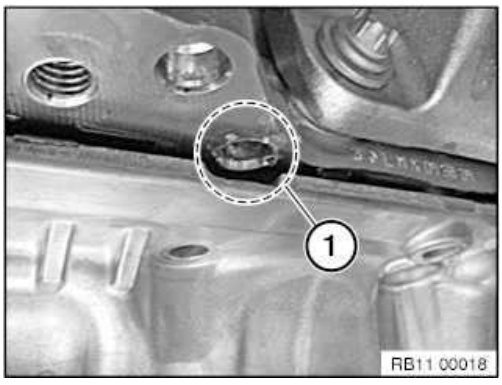
- Loosen screw (1).
- Disconnect the guide tube (2) for the oil dipstick toward the top from the oil sump and remove it.
- Remove sealing ring (3) from oil sump if necessary.



- Expanding rivets (1) on both sides of the acoustic cover (2).
- Feed out and remove the acoustic cover (2).

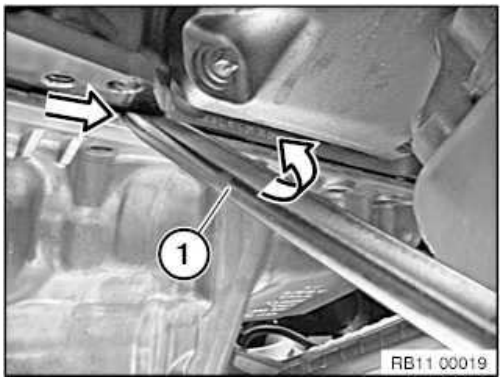


- Loosen the transmission bolts (1) on the oil sump.
- Loosen screws (2) to (17).



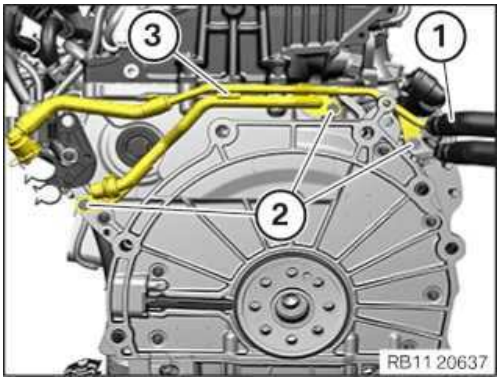
- Release oil sump only in area (1).

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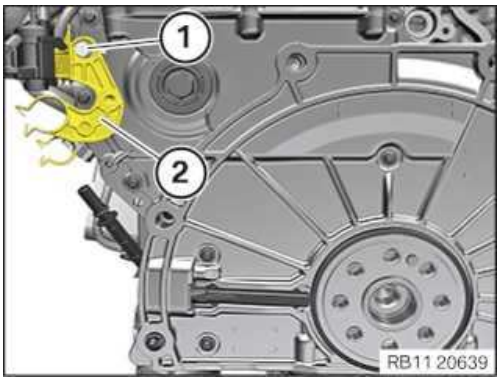


- Detach the oil sump with a suitable mounting lever (1) carefully at the point provided.
- Secure the oil sump against falling.

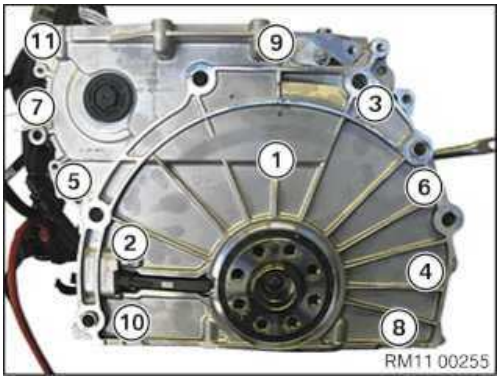
▶ **If installed: Remove coolant line of the SCR metering module**



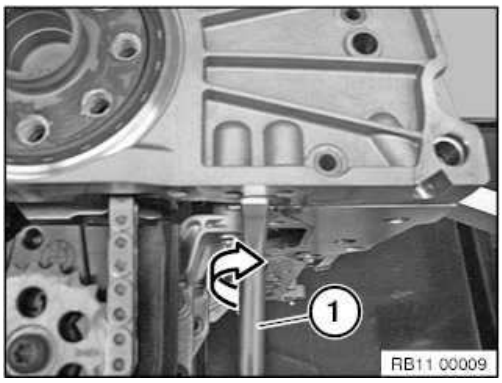
- Unlock and disconnect the coolant hose (1).
- Loosen screws (2).
- Remove the coolant line (3).



- Loosen screw (1).
- Guide out and remove holder (2).

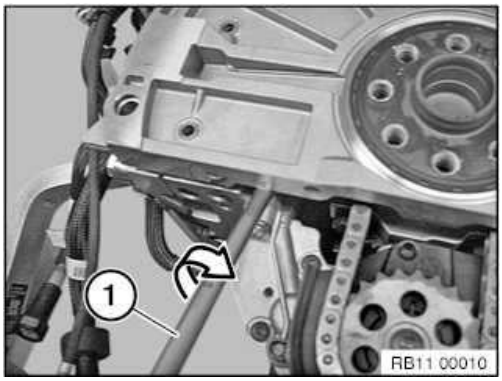


- Loosen screws in the order (11) to (1).



- Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.

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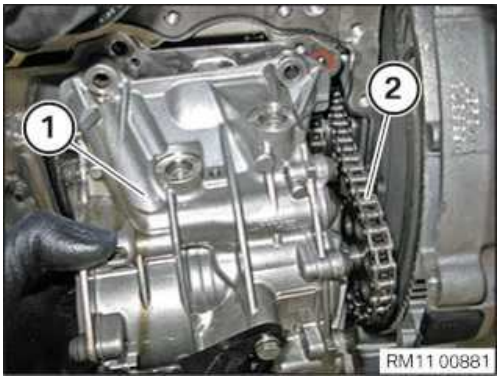


- Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.
- Remove the timing case cover.

31 – Remove the oil vacuum pump



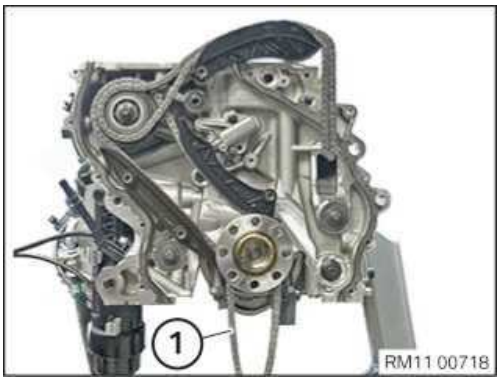
- Loosen screws (1) of the oil vacuum pump (2).



- Remove oil vacuum pump (1) and remove from the drive chain (2).

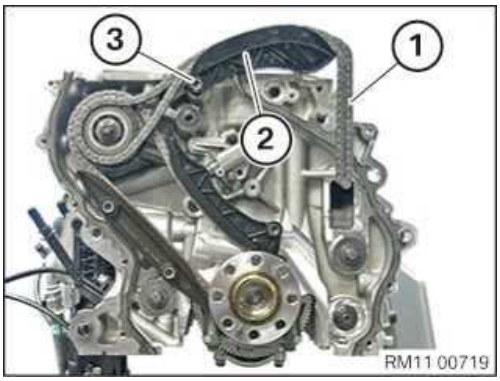
MAIN WORK

32 – Remove both timing chains



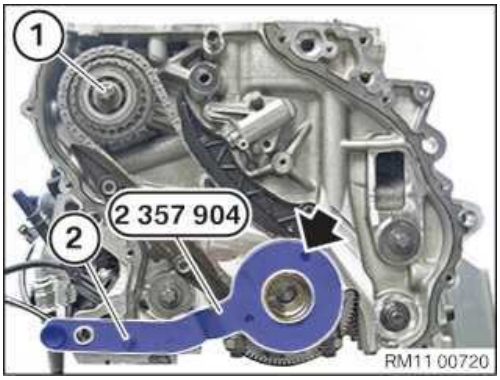
- Remove drive chain (1) for oil pump.

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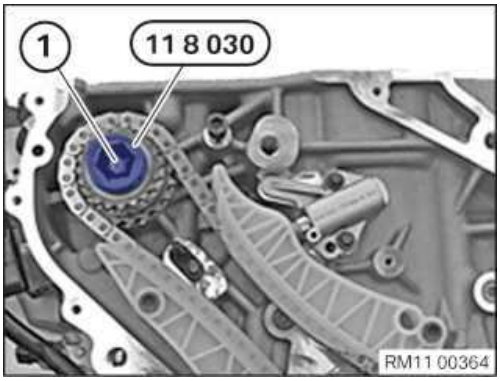


- Remove the timing chain (1) for the camshafts.
- Remove the tensioning rail (2) from the bearing journal (3).

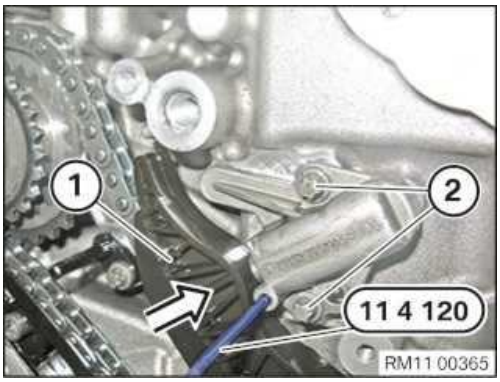
  Bearing journal (3) does not have to be disassembled.



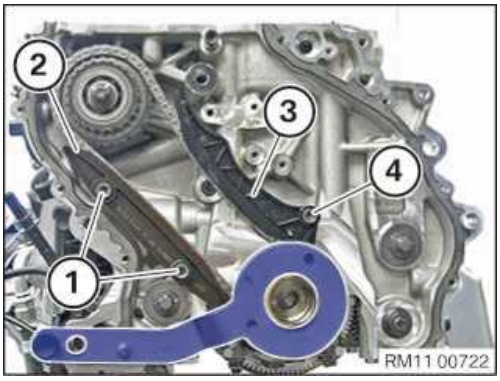
- Secure crankshaft to release central bolt (1) of high pressure pump.
- Position crankshaft with guide pin (arrow).
- Secure special tool **2 357 904** with bolt (2) on crankcase.
- Release central bolt (1) of high pressure pump; do not remove.



- Screw special tool **0 496 725 (11 8 030)** into sprocket of high pressure pump.
- Unscrew central bolt (1) of high pressure pump until central bolt can be supported on special tool **0 496 725 (11 8 030)**.
- Continue turning central bolt (1) until camshaft sprocket is released from high pressure pump shaft.



- Press chain tensioner in with tensioning rail (1) by hand in the direction of the arrow until the special tool **0 491 012 (11 4 120)** can be positioned.
- Loosen screws (2).
- Remove chain tensioner.

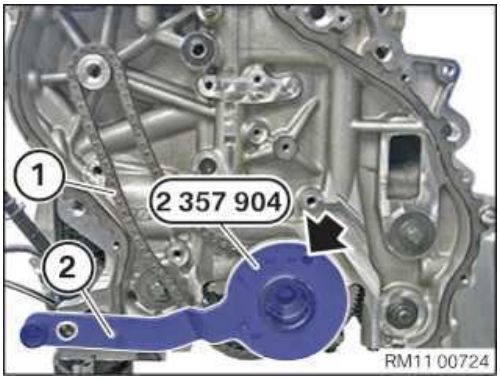


- Loosen both bearing journals (1).
- Remove the guide rail (2).
- Loosen the bearing journals (4).
- Remove the tensioning rail (3).

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- Remove bolt and camshaft sprocket (1) of high pressure pump.

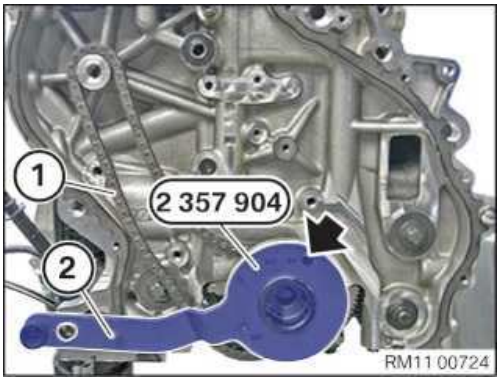


NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Unscrew the bolt (2) and remove the special tool **2 357 904**.
- Remove the timing chain (1).

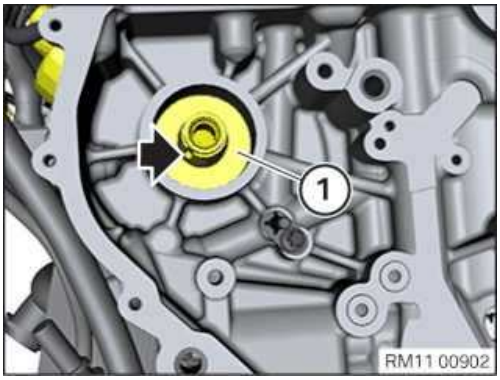
33 – Install both timing chains



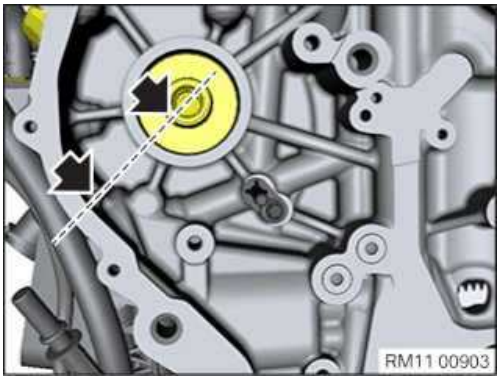
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Position the timing chain (1).
- Secure crankshaft with special tool **2 357 904**.
- Secure special tool **2 357 904** with bolt (2) on crankcase.

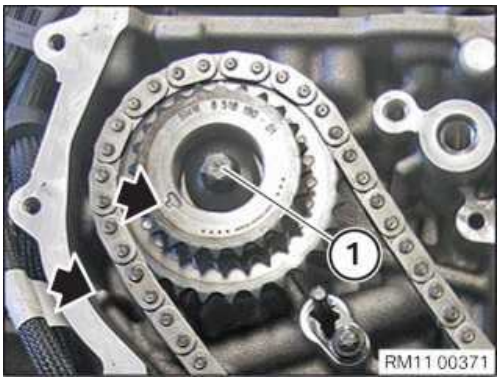


- Note spline groove on high pressure pump (1).

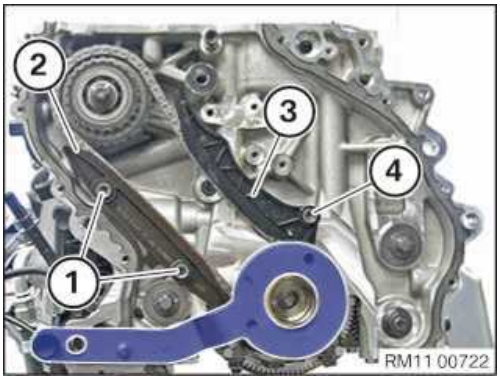


- Mark and groove (arrows) on high pressure pump and crankcase must align.

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- Position the impeller with timing chain on the high pressure pump.
- Screw in and fasten central bolt (1) of high pressure pump.
- Mark and cast lug (arrows) must align.



- Position tensioning rail (3).
- Replace bearing journal.

  Parts: Bearing journal
- Tighten the bearing journals (4).

Bearing journal of tensioning and guide rail

M8	*Replace bearing journal.*	Tightening torque	20 Nm

- Position the guide rail (2).
- Replace bearing journal.

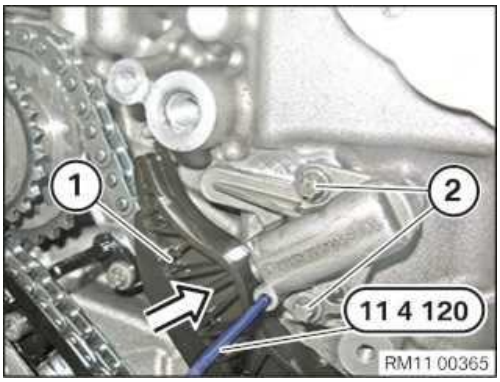
  Parts: Bearing journal
- Tighten both bearing journals (1).

Bearing journal of tensioning and guide rail

M8	*Replace bearing journal.*	Tightening torque	20 Nm



- Clean sealing surfaces (1) with compressed air.



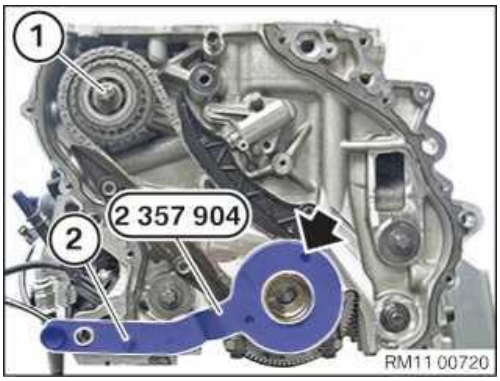
- Position hydraulic chain tensioner.
- Tighten down screws (2).

Chain tensioner to crankcase

M6x22		Tightening torque	10 Nm

- Press chain tensioner in by hand with tensioning rail (1) in direction of arrow until special tool **0 491 012 (11 4 120)** can be removed.

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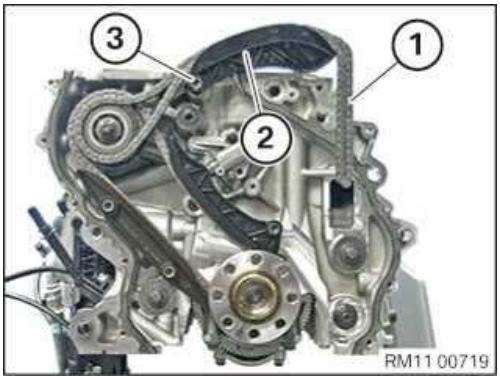


- To fasten central bolt (1) of high pressure pump, crankshaft must remain secured with special tool **2 357 904** and bolt (2).
- Renew central bolt (1).

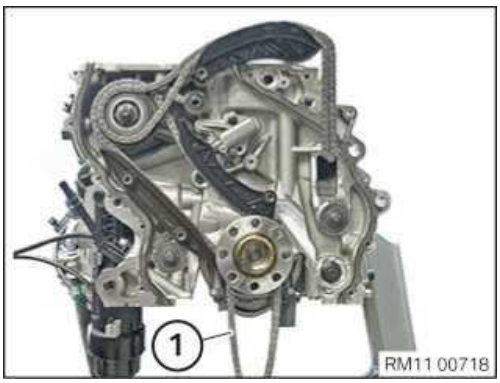
  Parts: Central bolt
- Tighten central bolt (1).

Camshaft sprocket on high pressure pump

M12		Tightening torque	65 Nm



- Position tensioning rail (2) on bearing journal (3).
- Position camshaft timing chain (1).



- Mount drive chain (1) for oil pump on crankshaft.

POSTPROCESSES

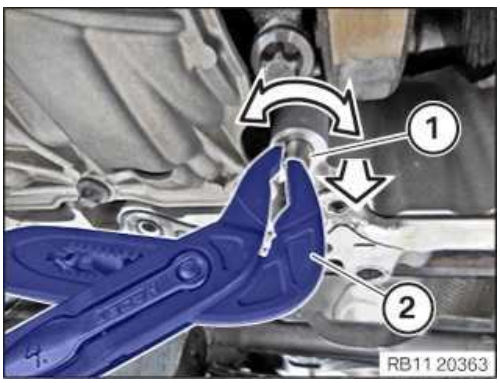
34 – Install the oil vacuum pump

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

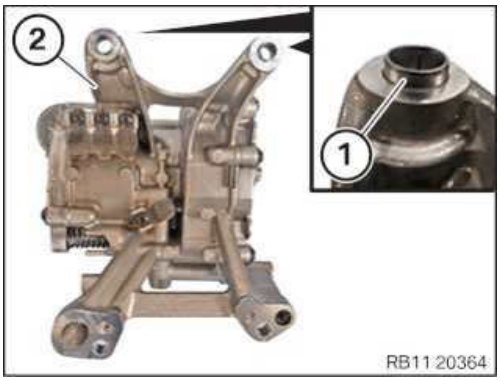
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Remove centering sleeves from the crankcase (1) using a standard tool (2).
- Renew the centring sleeves (1).

  Parts: Centring sleeves

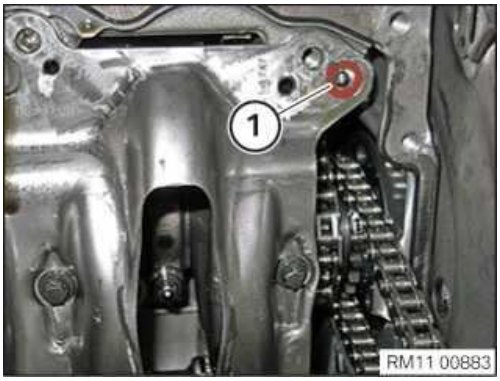
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- Install centering sleeves (1) in the oil vacuum pump (2).

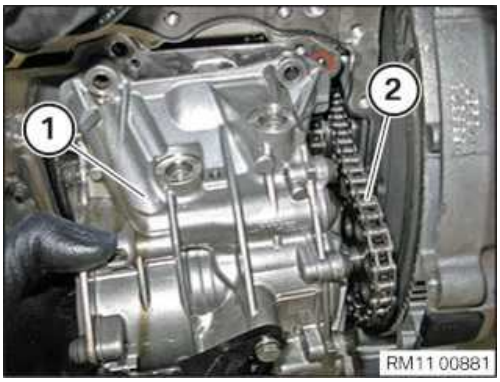


- Check the sealing ring (1) for damage and renew where required.
- Make sure the sealing ring (1) is installed correctly.



- Check sealing ring (1) for damage and replace oil deflector if necessary.

  Parts: Oil deflector



- Insert oil vacuum pump (1) into the drive chain (2).



- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1) of the oil vacuum pump (2).

Oil vacuum pump to crankcaseB47

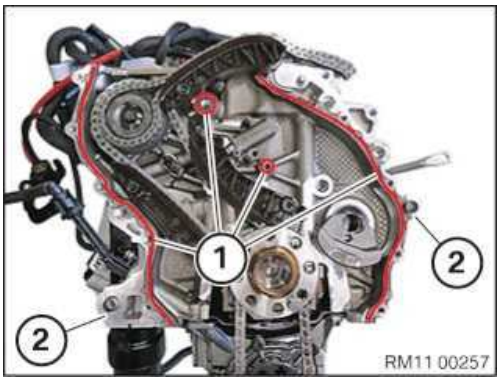
M8x35		Tightening torque	19 Nm

35 – Install the rear timing case cover

Prerequisite

Transmission is removed.

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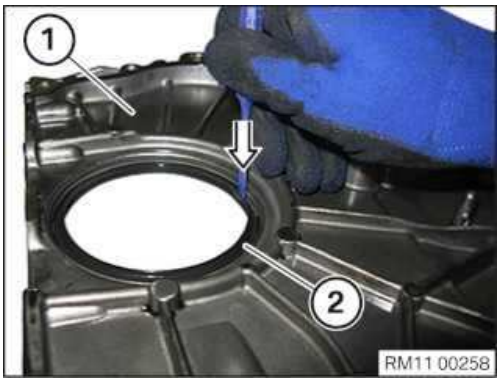
RISK OF DAMAGE

Damage to the surface.

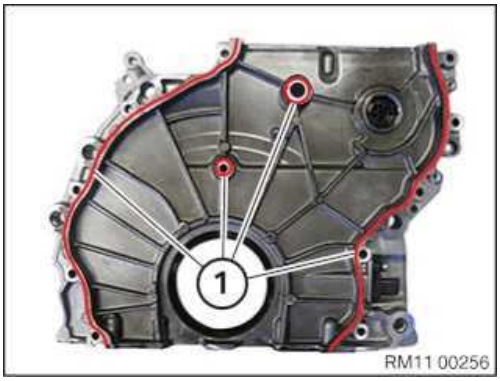
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

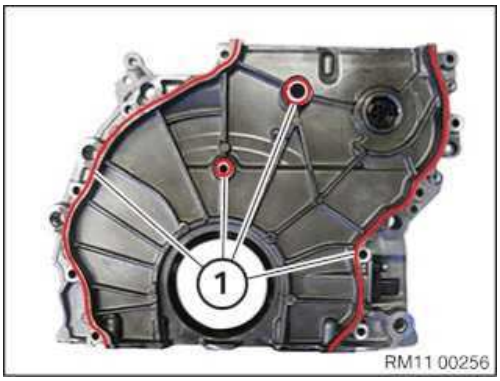
- Remove seal residue from the sealing surfaces (1) using special tool **0 495 102 (11 4 470)**.
- Check fitting sleeves (2) for damage and for tight fit; renew if necessary.



- Position the timing case cover (1) underneath.
- Position punch on inner side of crankshaft seal (2).
- Drive out crankshaft seal (2) outwards.



- Remove seal residue from the sealing surfaces (1) using special tool **0 495 102 (11 4 470)**.

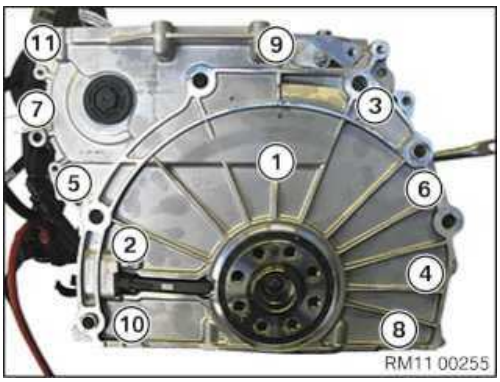


TECHNICAL INFORMATION

For more information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

- Apply sealing bead (1) with a height of approx. 1.5 mm to 2.0 mm on inner side of timing case cover in marked locations. Use liquid sealing compound for this.

  Application time of sealing bead (1) must not exceed 12 minutes.



- Mount the timing case cover without the crankshaft seal.
- Renew screws (1) to (11).

  Parts: Bolts
- Join the bolts in with the sequence (1) to (11).
- Tighten screws in the order (1) to (11).

Rear timing case cover to crankcase

M6	Renew screws.	Jointing torque	8 Nm
		Angle of rotation	90 °

▸ **Installing the rear crankshaft seal**

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RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) on the radial shaft seal with the sharp-edged connector gearing of the output shaft will result in destruction and/or leaks.

- When inserting the output shaft, make sure that the connector gearing of the output shaft does not touch the sealing lip (inner) of the radial shaft seal.

RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) and applying oil to the radial shaft seal will lead to its destruction.

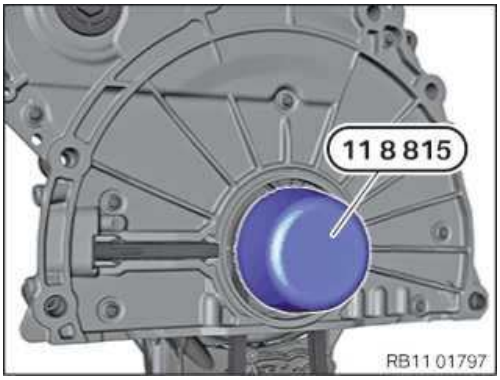
- Do not touch the sealing lip (inner) of the radial shaft seal.
- Do not apply oil to the radial shaft seal.
- Install the radial shaft seal dry.

RISK OF DAMAGE

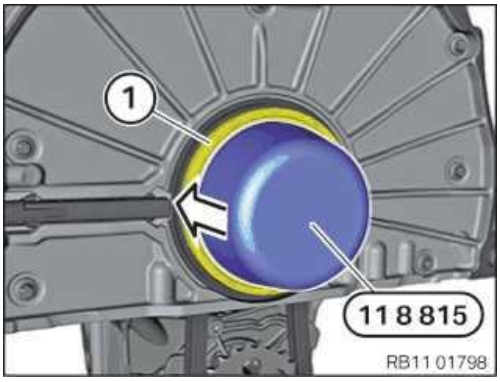
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Position special tool **0 496 137 (11 8 815)** on crankshaft. Make sure that the crankshaft sensor is not damaged.



- Fit the crankshaft seal (1) up to the timing case cover in the direction of the arrow using special tool **0 496 137 (11 8 815)** and position.
- Remove special tool **0 496 137 (11 8 815)**.

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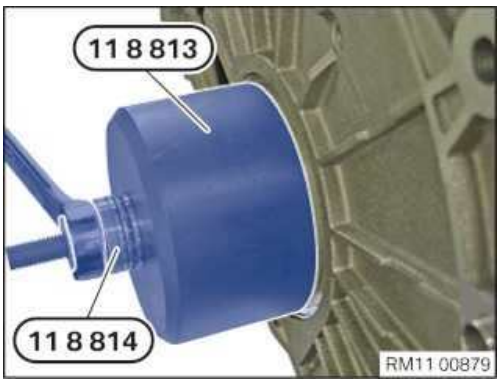


- Secure special tool **0 496 133 (11 8 811)** to the crankshaft using special tool **0 496 134 (11 8 812)**.

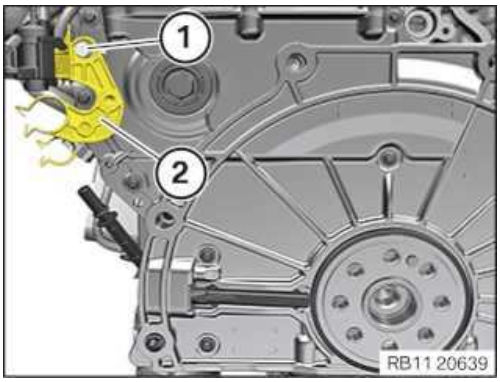


- Check the freedom of movement between the special tool **0 496 135 (11 8 813)** and the crankshaft sensor during installation.

  Otherwise there is a risk that the crankshaft sensor will be damaged.
- Slide on special tool **0 496 135 (11 8 813)**.
- Screw down special tool**0 496 136 (11 8 814)**.

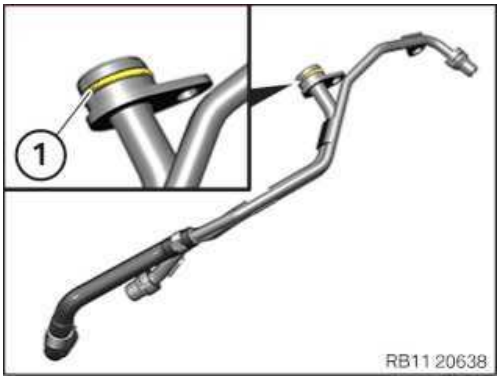


- Press in crankshaft seal with special tool **0 496 135 (11 8 813)**.
- Screw in special tool **0 496 135 (11 8 813)** up to timing case cover.



- Insert and install the holder (2).

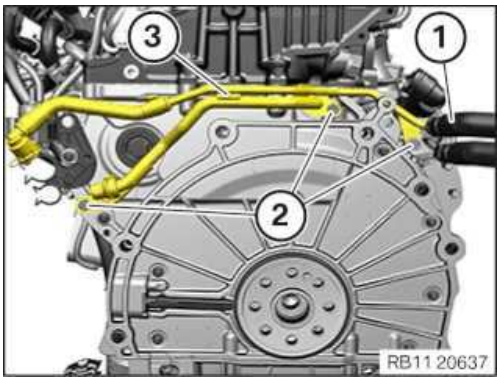
▶ **If installed: Installing the coolant line of the SCR metering module**



- Renew the O-ring 1.

  Parts: O-ring

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- Feed in and install coolant line (3).
- Tighten down screws (2).

SCR coolant lines to crankcase end cover

Hexagon screw M6x16		Tightening torque	8 Nm

- Connect and lock the coolant line (1).

  Coolant line (1) must audibly engage.

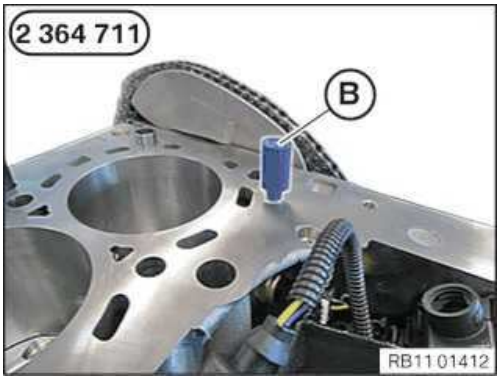
▸ **Cleaning the sealing surface**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Lock the front oil duct using special tool (B) from special tool **2 364 711**.



RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 103 (11 4 471)**.



RISK OF DAMAGE

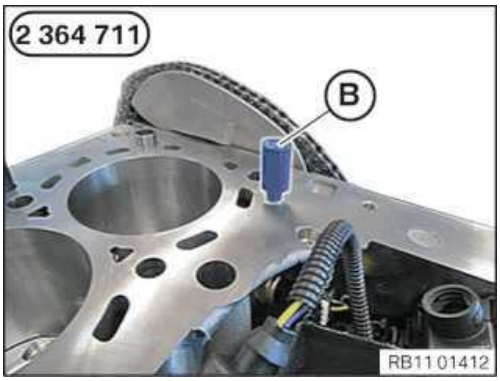
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

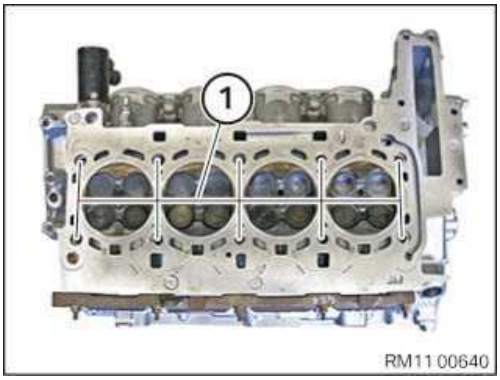
- Clean the sealing surface using special tool **0 495 104 (11 4 472)**.

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- Remove special tool (B).

▶ **Renewing the cylinder head gasket**



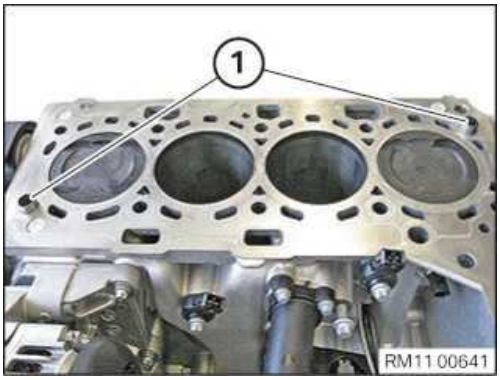
RISK OF DAMAGE

Damage to the surface.

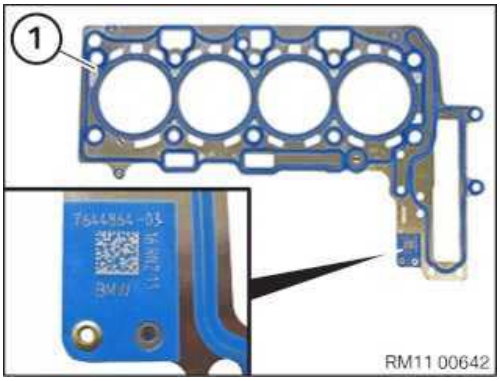
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Remove oil and dirt residue from the blind holes (1).

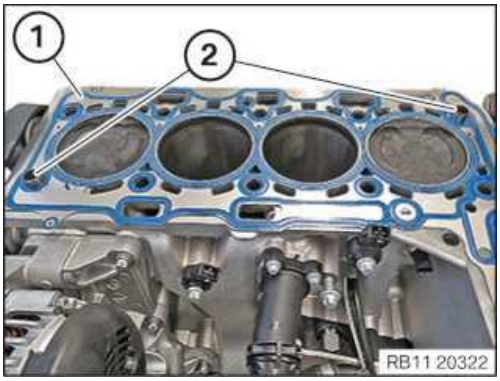


- Check the fitting sleeves (1) for secure fit and damage.



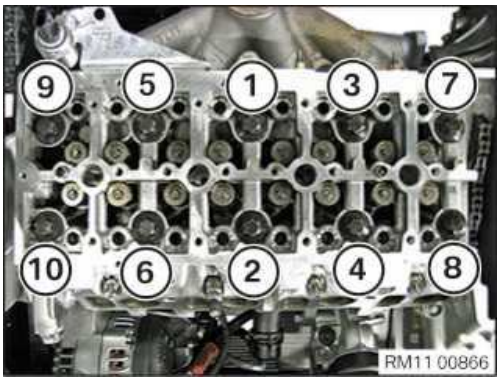
- Identify the cylinder head gasket (1) using the part number.

Note: If the cylinder head is reworked, an additional thicker gasket 0.3 mm is available for service personnel.



- Guide in the cylinder head gasket (1) and install.
- Ensure that the cylinder head gasket (1) is installed correctly in the fitting sleeves (2).

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CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Damage to threads.

Fluid in the threaded hole may damage the thread when screws are tightened in the threads.

- Dry threaded holes (e.g. using compressed air).

TECHNICAL INFORMATION

Do not remove bolt coating.

- Renew the cylinder head bolts (1).

  Parts: Cylinder head bolts
- Do **not** wash off coating of cylinder head bolts.
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

  No coolant, water or engine oil must be present in threaded holes of engine block.

TECHNICAL INFORMATION

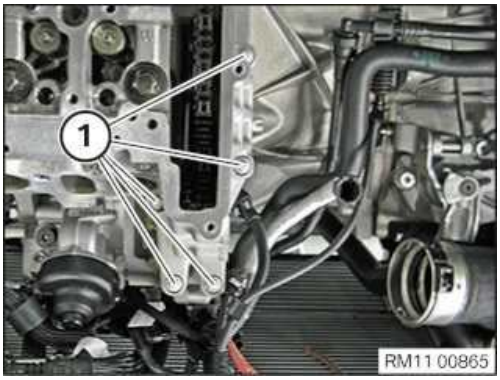
When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Feed in cylinder head bolts and install.
- Screw in cylinder head bolts in sequence (1) to (10).
- Tighten cylinder head bolts using special tools **0 490 504 (00 9 120)** and in sequence (1) to (10).

Cylinder head to crankcase

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

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- Tighten the cylinder head bolts (1).

Cylinder head bolt to timing case cover

M8x40		Tightening torque	19 Nm

-



TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

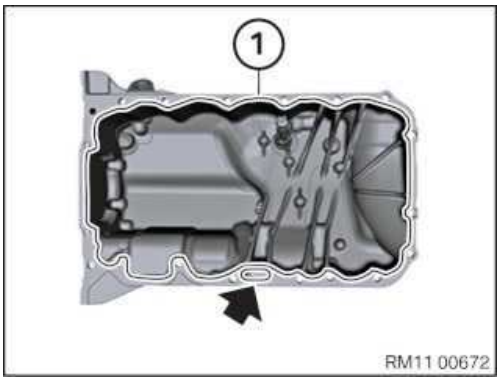
- Remove fine sealing remains on the sealing surface (1)and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.



TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove coarse sealing remains on the sealing surface (1)and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.



TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- Apply the sealing compound along the line (1) with a thickness of 2 mm to 2.5 mm.

  Apply the sealing compound along the inner edge.

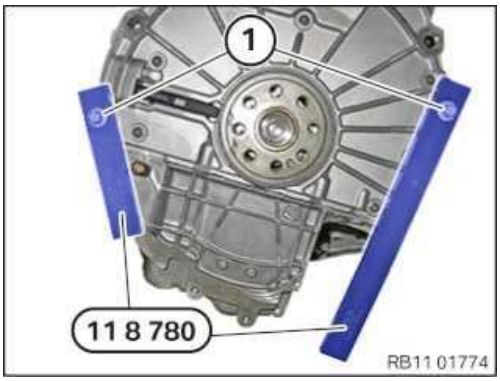
Sealing compound

Loctite 5970 liquid sealing compound	50 ml, Cartridge	83190404517

Overview of consumables (Electronic Parts Catalogue)

- Completely encircle the oil return orifice (arrow) with the sealing compound.

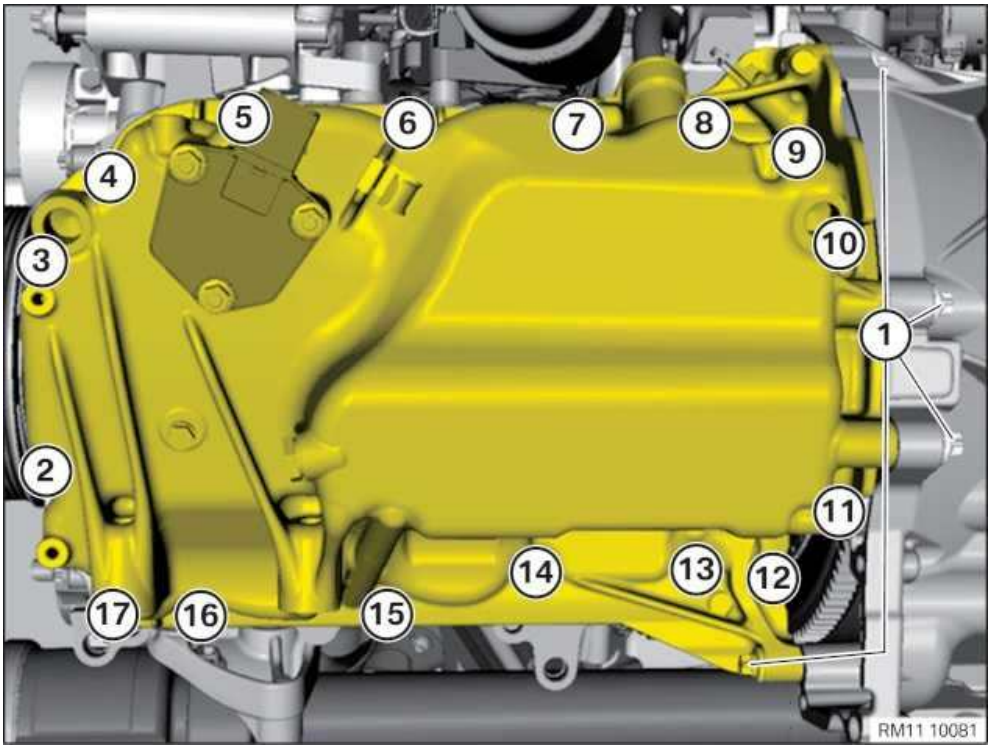
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TECHNICAL INFORMATION

The special tool 11 8 780 is only required when the transmission is removed.

- Position the special tool **0 496 120 (11 8 780)** with the transmission bolts (1) so that the oil sump is exactly flush with engine block.
- If necessary, renew fitting sleeves.



- Position and install oil sump.
- **Hand-tighten** oil sump screws (2) to (17) but do **not** tighten completely.
- Join transmission bolts (1) with 5 Nm.
- Tighten screws(2) to (17) of the oil sump.

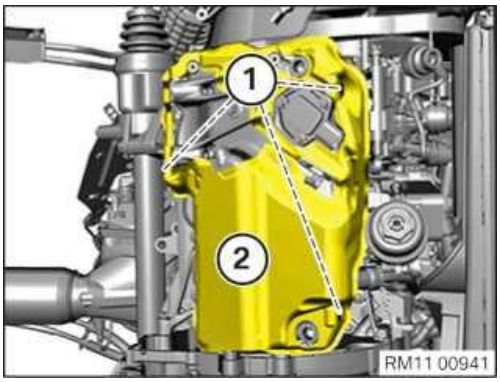
Oil sump to crankcase

M8x30		Tightening torque	2 Nr
M8x110		Tightening torque	2 Nr

- Tighten transmission bolts (1) on oil sump.

Transmission to oil sump

M8		Tightening torque	1 Nr



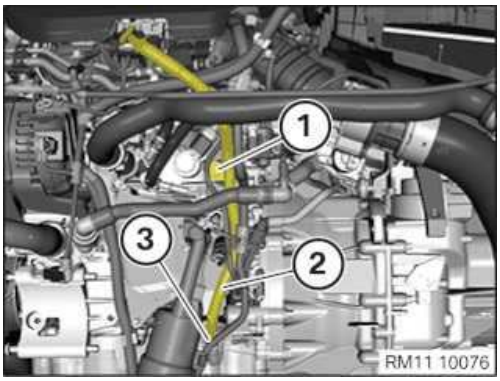
- Thread in and position the acoustic cover (2).
- Install the expanding rivet (1).



- Renew O-ring (1).

  Parts: O-ring

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- Guide in guide tube (2) for oil dipstick and insert it into oil sump.
- Make sure the sealing ring (3) is positioned correctly in the oil sump.
- Tighten down screw (1).

Guide tube for oil dipstick on engine

M8x16		Tightening torque	19 Nm

36 – Installing the flywheel

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



TECHNICAL INFORMATION

Clean all threads with a screw tap.

- Clean all screw threads (1).



- Use the set of special tools **2 285 058**.

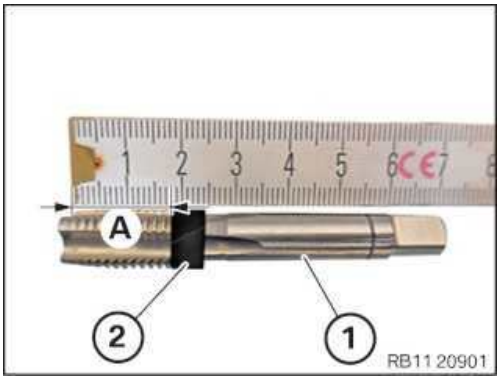
Description
Twist drill
Thread cutter M12x1.5
Depth
Insertion tool

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- Assemble tool set.

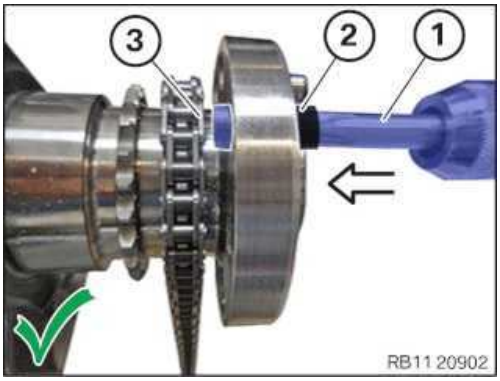
Number	Description
1	Tool holder
2	Thread cutter M12X1,5



- Mark the screw-in depth (A) on thread cutter (1) from the set of special tools **2 285 058** with a standard tool (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm



NOTICE

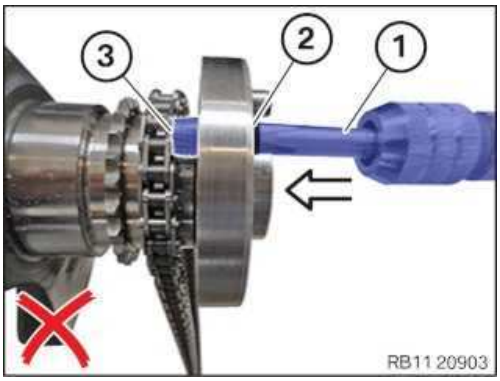
To provide a better overview: Shown with engine removed.

- Screw in the thread cutter (1) from the set of special tools **2 285 058** in direction of arrow up to the screw-in depth (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm

- Make sure that the thread cutter does (1) **not** rest on the timing chain (3).

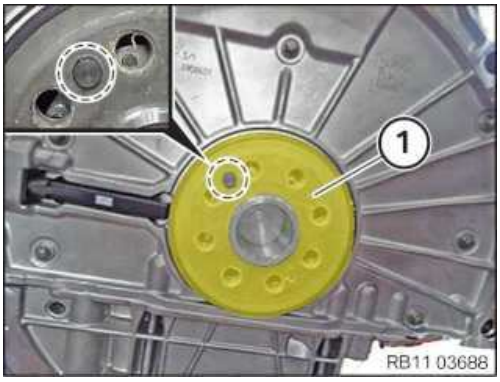


TECHNICAL INFORMATION

- **Carefully** handle the timing chain, to protect the timing chain and timing chain drive against damage.

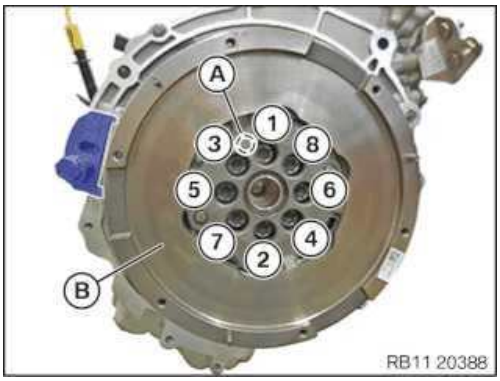
- Make sure that the screw-in depth (2) of the screw tap (1) is not exceeded.

  The thread cutter (1) may not rest on the timing chain (3).



- During the installation, note the mark shown without fail.
- Install special tool (1) on the crankshaft as shown.

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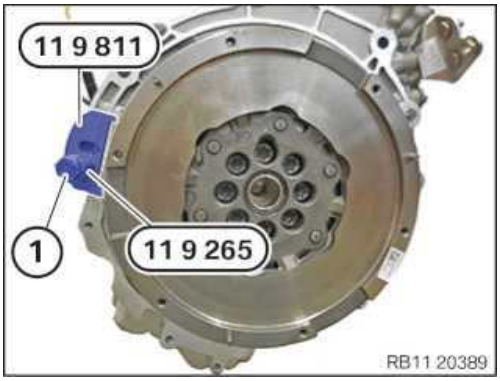


- Position flywheel (B) .
- Renew flywheel bolts (1) to (8).

  Parts: Flywheel bolts
- Tighten flywheel bolts hand-tight with special tool **0 491 018 (11 4 180)**.
- Observe tightening sequence. While doing so, begin with dowel pin (A).
- Tighten the flywheel bolts using the special tool **0 491 018 (11 4 180)** in sequence (1) to (8).

Flywheel to crankshaft

M12x1.5	Renew screws.	Tightening torque	120 Nm



- Loosen the transmission bolt (1).
- Feed out and remove special tools **0 494 793 (11 9 265)** and **0 496 171 (11 9 811)** with the **standard** (5 mm) washer.

37 – Install clutch

CAUTION

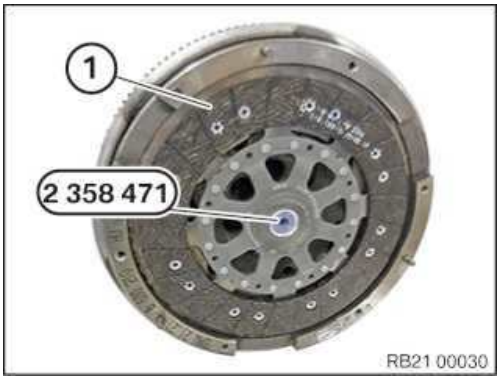
Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

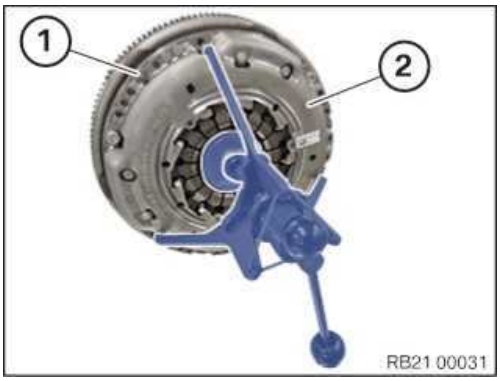
TECHNICAL INFORMATION

Handle the clutch disc carefully. Install the surfaces of the clutch disc in the correct mounting orientation.
Clean friction surfaces of the flywheel and the pressure plate with BMW-approved brake cleaner.
Note designation for ”engine side” / ”transmission side”.

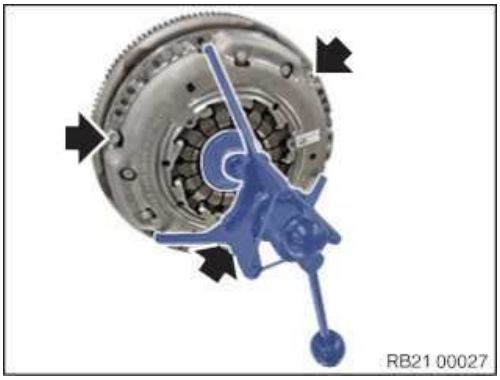


- Centre the clutch disc (1) using special tool .

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- Mount the clutch (2) together with the special tool to the flywheel.
- Observe the dowel pins (1).
- The clutch (2) must be secured via the dowel pins (1).

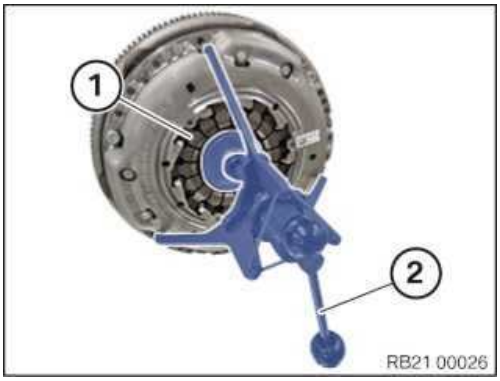


- Renew the bolts (arrows).

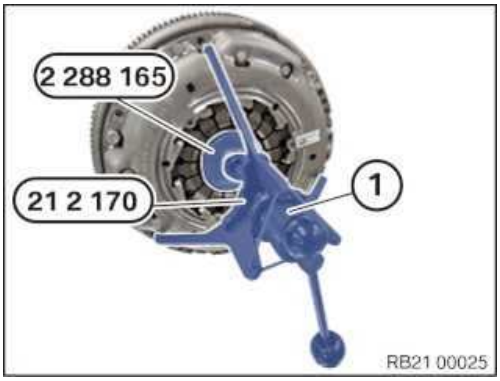
  Parts: Bolts
- Install and tighten screws (arrows).

Clutch to flywheel

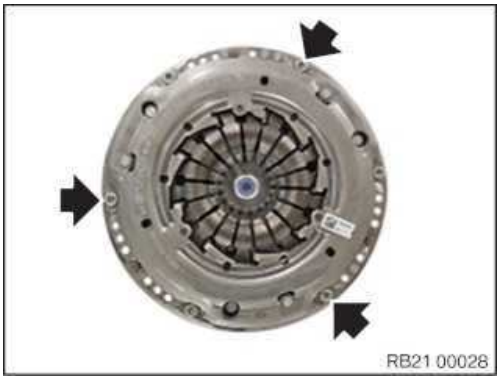
M8	Renew screws.	Jointing torque	15 Nm
		Angle of rotation	90 °



- Loosen the spindle (2) until the diaphragm spring (1) is fully relieved.



- Unscrew the knurled screw (1) and remove the special tool with **2 288 165** from the clutch.



- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Clutch to flywheel

M8	Renew screws.	Jointing torque	15 Nm
		Angle of rotation	90 °

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- Withdraw special tool from clutch disc with aid of accompanying screw.

38 – Installing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

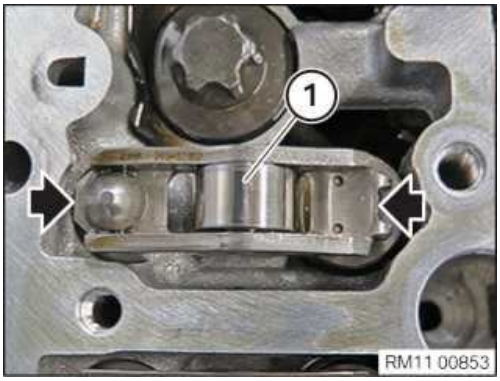


- Install the hydraulic valve clearance compensating element (1) in the direction of the arrow.
- Repeat the process on all hydraulic valve clearance compensating elements.

39 – Install the roller cam followers

TECHNICAL INFORMATION

- Note the installation position of the component. The component may be installed in various installation positions.



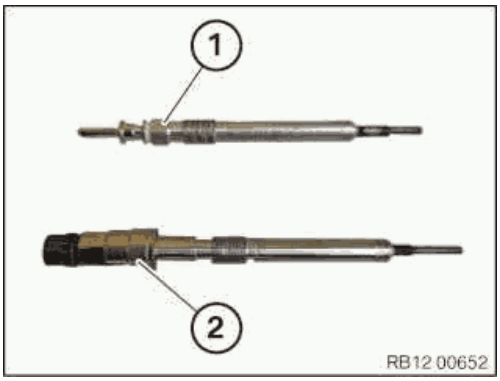
- Check all roller cam followers (1) for damage and replace if necessary.

  Parts: Roller cam followers
- Insert and install all roller cam followers (1).

  Roller cam followers (1) that have already been used must be installed in the same place.
- Note the mounting orientation of the roller cam followers (1).
- Oil all roller cam followers (1).

40 – Install glow elements

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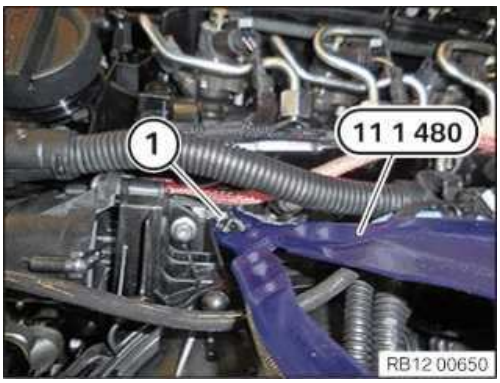
- Install glow elements (1) in cylinders 1, 2, 3 and 4.
- If fitted: Glow element (2) with the **combustion chamber pressure sensor** must be installed in cylinder **2**.



- Tighten the glow element with the special tool or conventional tools.

Glow elements to cylinder head

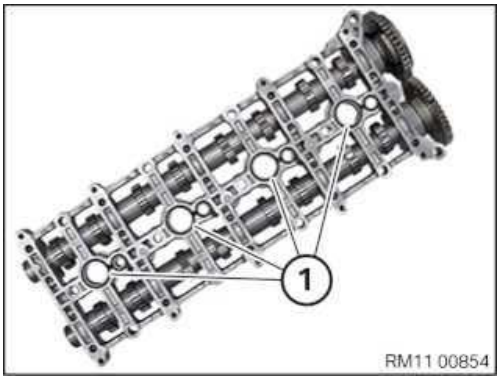
Glow element		Tightening torque	13 Nm



- Connect connectors (1) and lock.

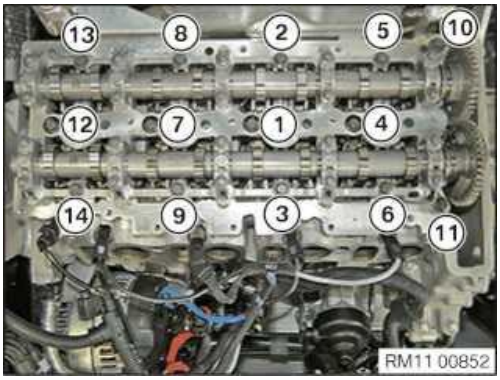
  The connector (1) must engage audibly.

41 – Installing the camshaft support



- Renew gaskets (1).

  Parts: gaskets



- Position the camshaft support including the camshafts.
- Tighten the screws in a sequence from (1) to (14) in several steps.

Camshaft carrier to cylinder head

M7x35		Tightening torque	13 Nm

42 – Adjusting the timing of the camshafts

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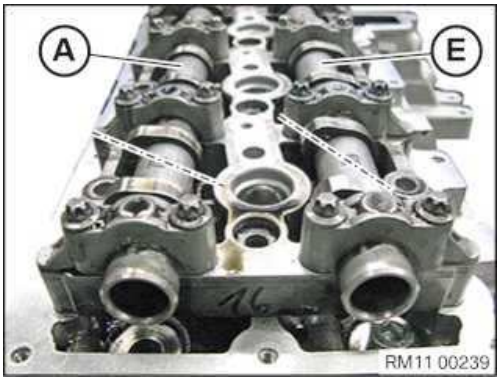


- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.



- Slide the special tool **2 288 380** completely into the bore hole of the oil sump.
- Use the special tool to block **2 288 380** the crankshaft in the TDC firing position at the first cylinder.



- The cam of the intake camshaft (E) at the first cylinder points up at an angle.
- The cam of the exhaust camshaft (A) at the first cylinder points outward at an angle.

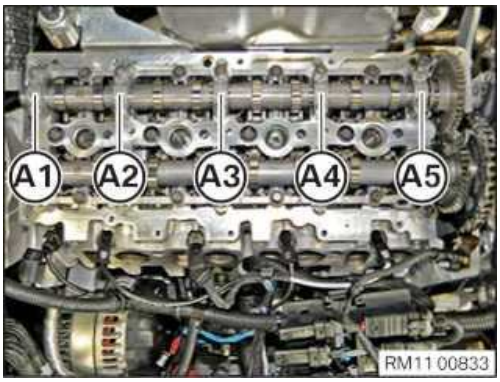
▸ **Remove exhaust camshaft.**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



TECHNICAL INFORMATION

The camshaft is tensioned by the valve springs. Tighten or loosen each screw on the camshaft bearing caps one at a time in the specified sequence and by half a turn only. Repeat procedure.

- Loosen all screws of the exhaust camshaft bearing caps (A1) to (A5) from the outside to the inside, step by step in 1/2 turns.
- Remove exhaust camshaft in upward direction.
- Place all components on special tool **0 495 105 (11 4 480)** in a tidy and orderly fashion.

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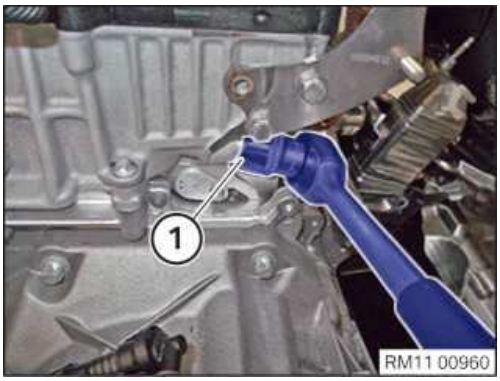
▶ **Remove chain tensioner piston**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

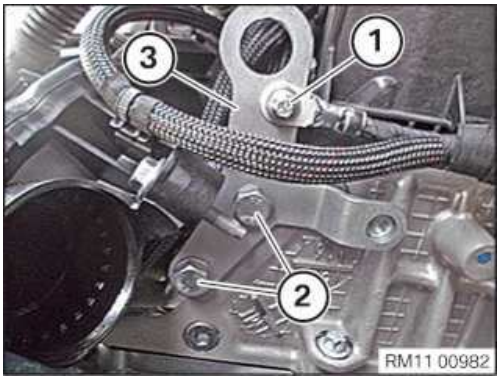


TECHNICAL INFORMATION

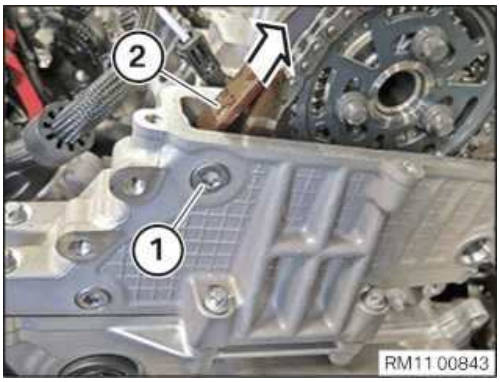
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

▶ **Remove the timing chain guide rail**

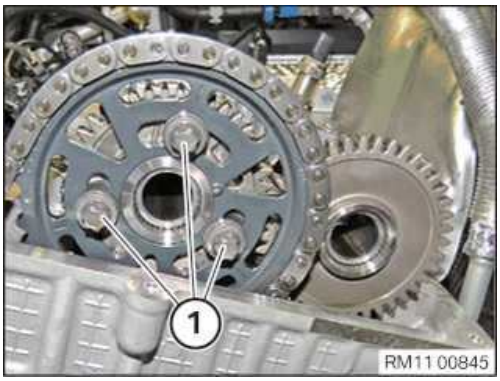


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

▶ **Removing the camshaft sprocket on the intake camshaft**



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

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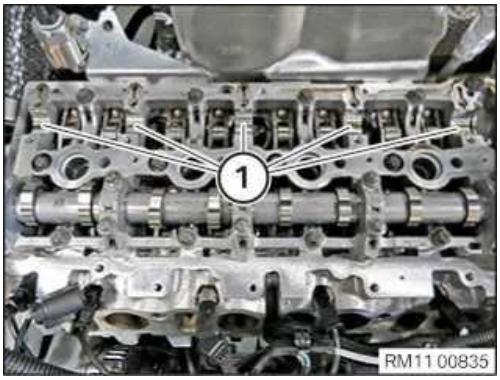
▶ **Install exhaust camshaft**

RISK OF DAMAGE

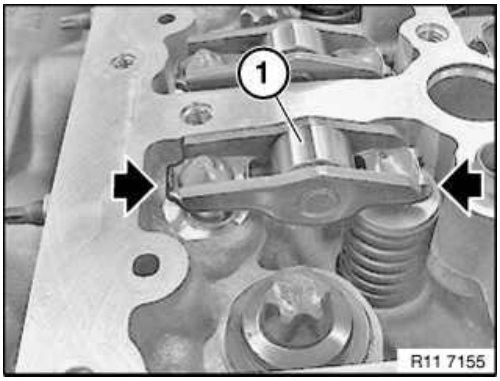
Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

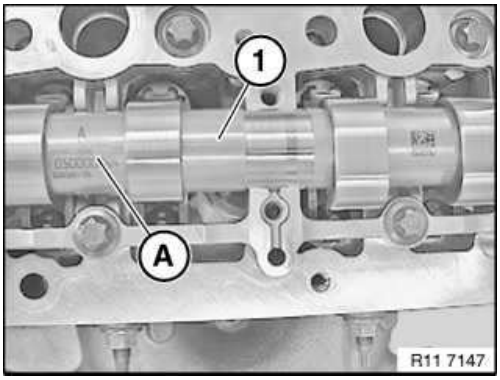
- Comply with the regulations for the installation and disassembly.
- Perform work with care.



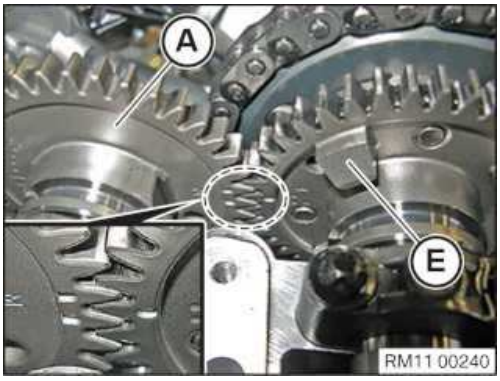
- Oil all bearing positions (1).



- Make sure the roller cam followers (1) have the correct mounting orientation.

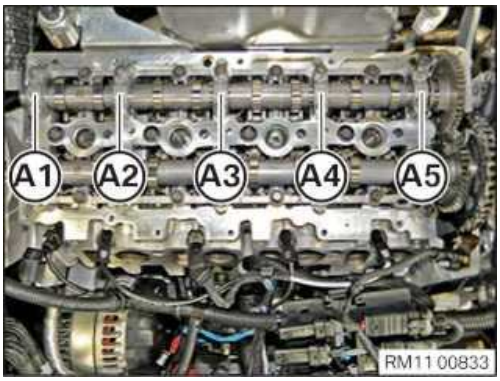


- Insert exhaust camshaft (1) so that the identification (A) points upwards.



- Insert the exhaust camshaft (A) so that the marks on the camshafts (A) and (E) correspond in the highlighted area.
- Position the camshafts (A) and (E) accordingly.

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- Tighten all exhaust camshaft bearing caps (A1) to (A5) from the inside to the outside by 1/2 a turn at a time.

Intake and exhaust camshaft in camshaft support

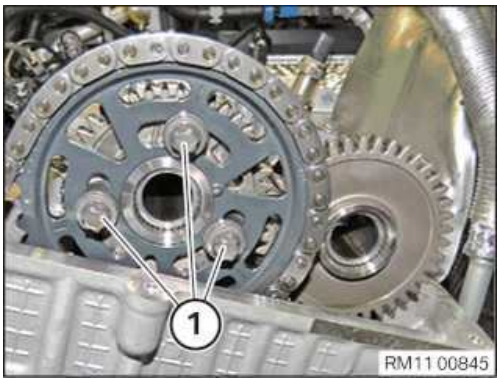
M6x31		Tightening torque	10 Nm



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

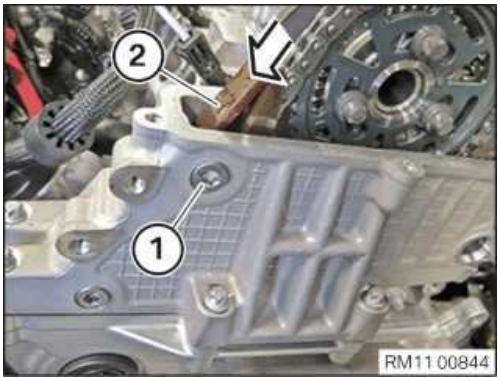
  Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

▶ **Installing the camshaft sprocket on the intake camshaft**



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

▶ **Install the timing chain guide rail**



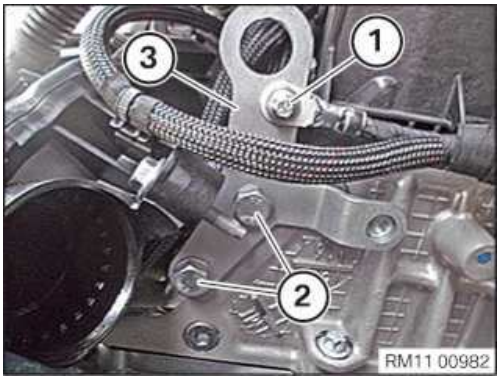
- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm



- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6			8 Nm

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▶ **Installing the chain tensioner piston**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Renew sealing ring (1).

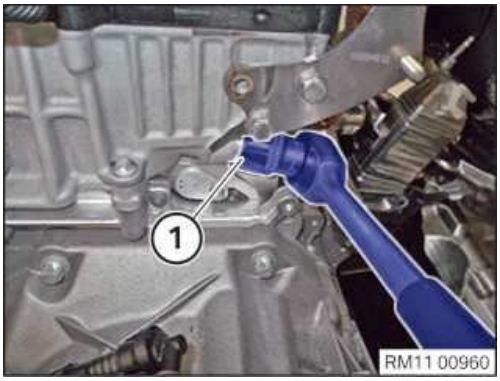
  Parts: Sealing ring



TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.

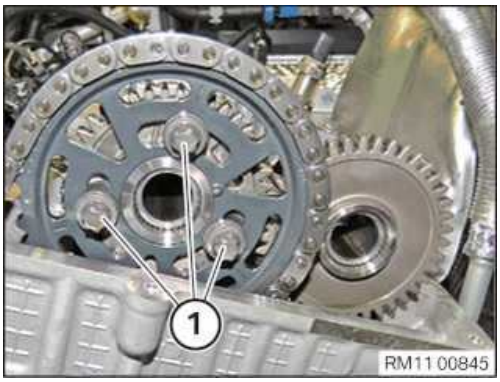


- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

▶ **Tightening the camshaft sprocket on the intake camshaft**



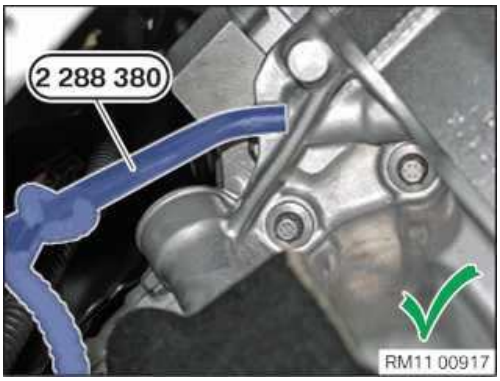
- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

43 – Removing the special tool to disconnect the crankshaft

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- Remove special tool **2 288 380**.

44 – Removing the special tool to secure the exhaust camshaft



- Remove the special tool **0 496 112 (11 8 760)** to fix the exhaust camshaft.

45 – Checking camshaft timing



- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

Damage to the engine.

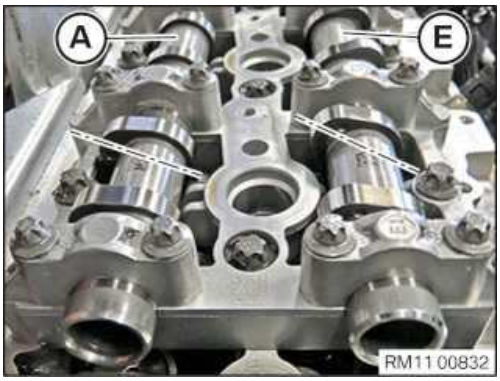
The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

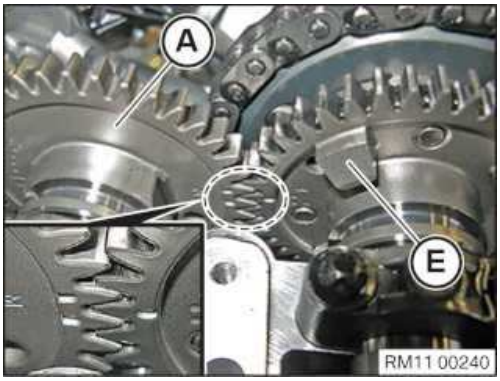
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- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

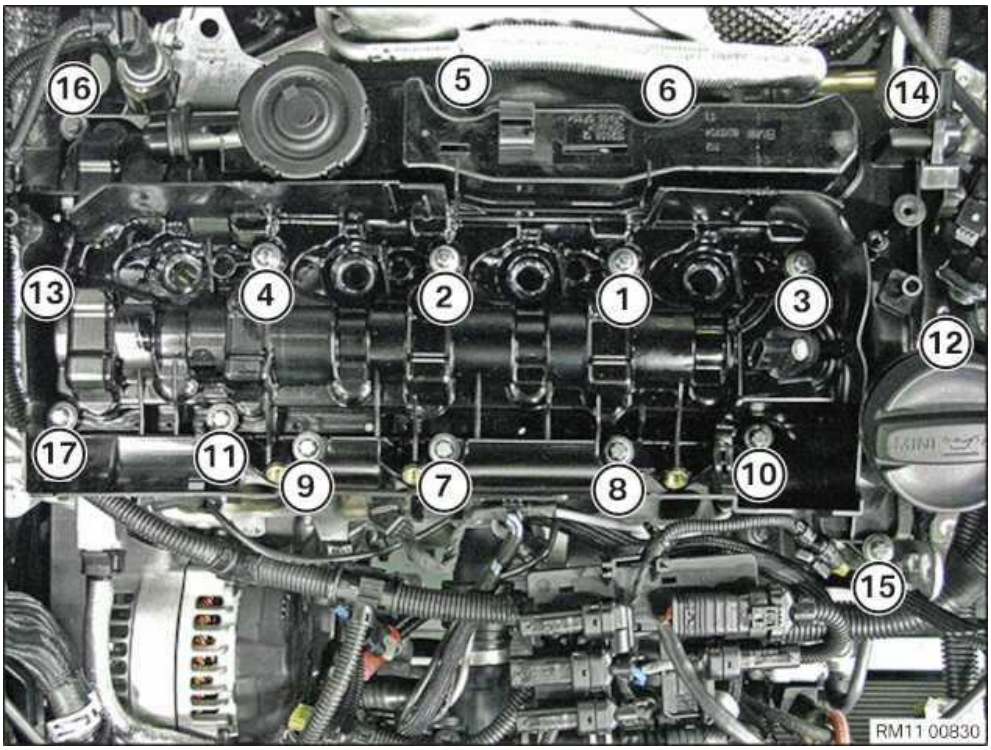
- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.



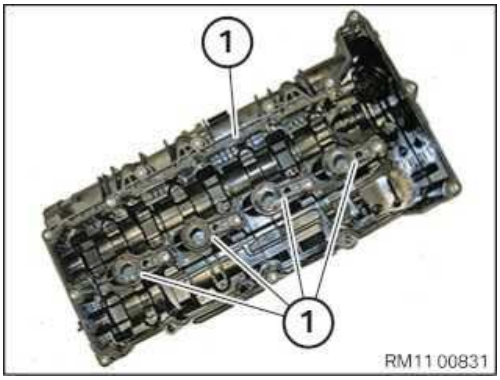
- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

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Overview: Screw connection of the cylinder head cover

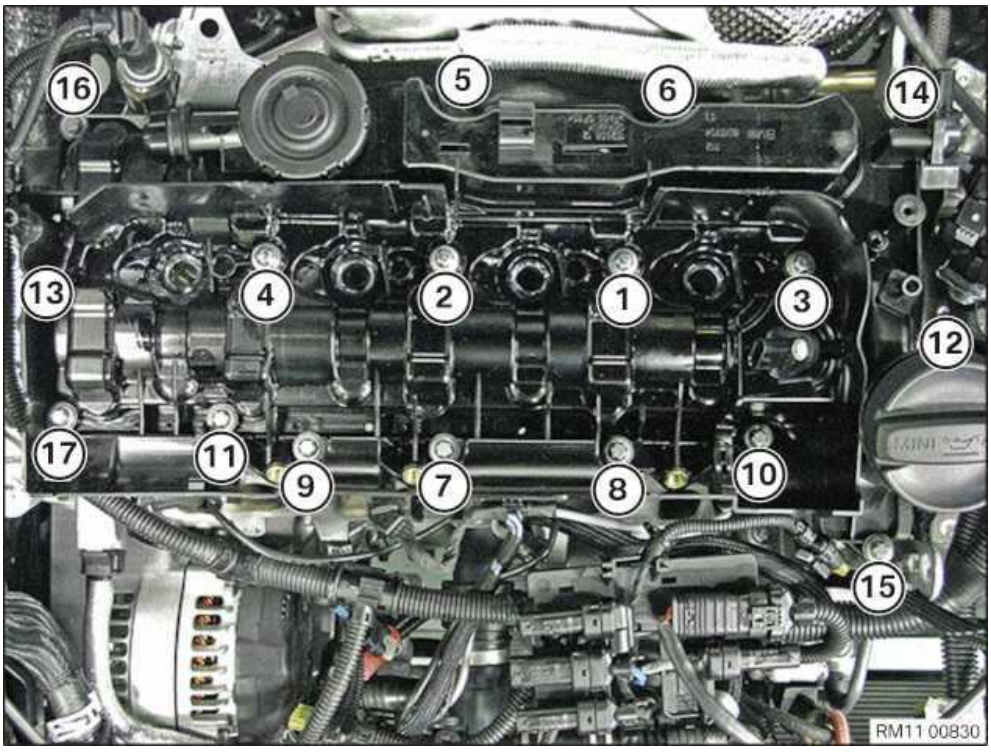


1 to 16 screws of the cylinder head cover.



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket



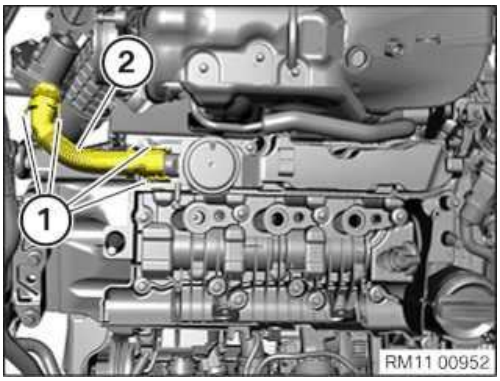
- Install cylinder head cover.
- Tighten screws in the order (1) to (17).

Cylinder head cover to cylinder head

M6		Tightening torque.	8, Nr

-

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- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

47 – Installing injectors of injection system

▶ **Cleaning the injector shafts**

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

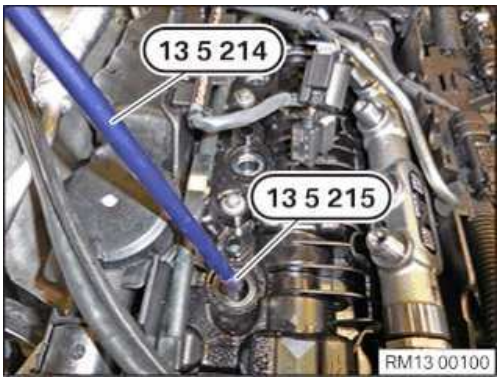
- Wear safety goggles.

RISK OF DAMAGE

Contaminant or foreign body.

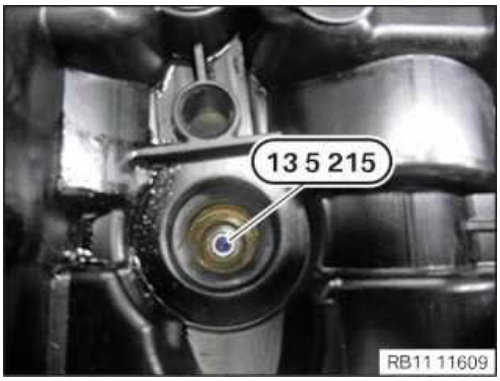
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.

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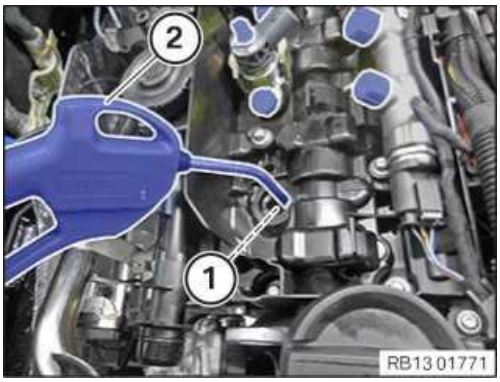
- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.



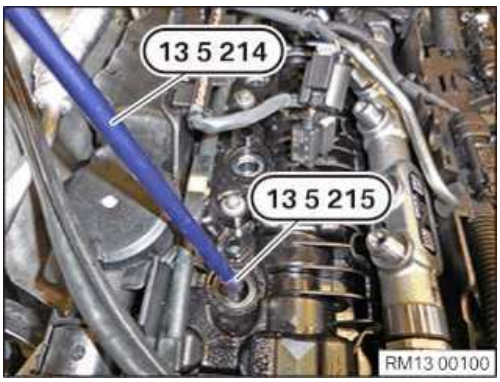
- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.



- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.



- Blow out injector shaft (1) with air gun (2).



- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

► **Check the placement of the clamping claw**

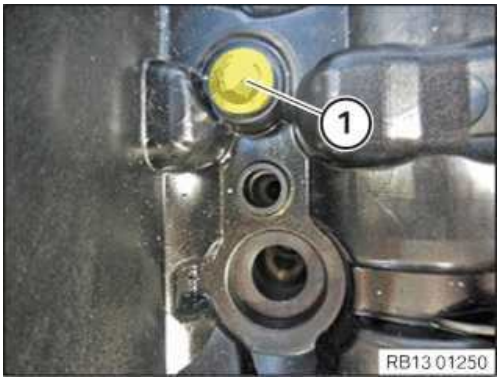
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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▸ **Prepare the injector for installation**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

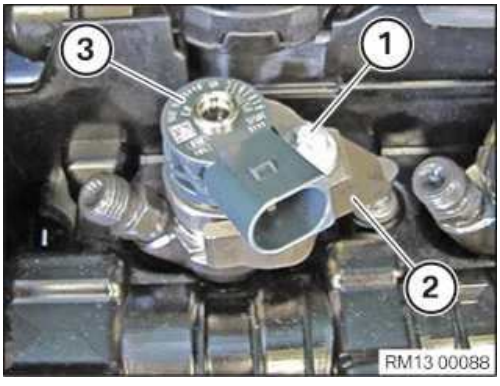


- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring
- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

Injector lubricating grease	50 g, Can	83230441070

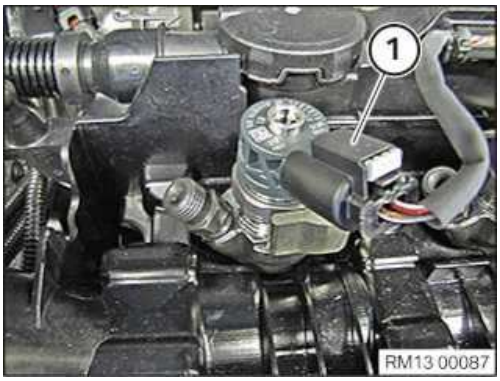


- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

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- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

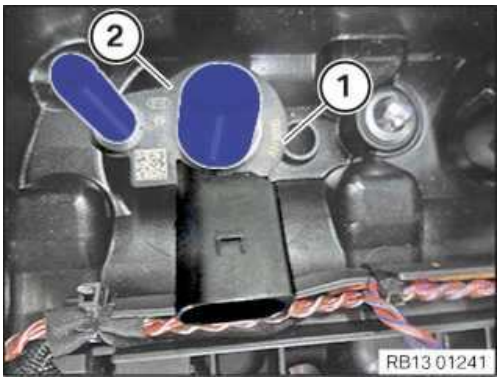
▶ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

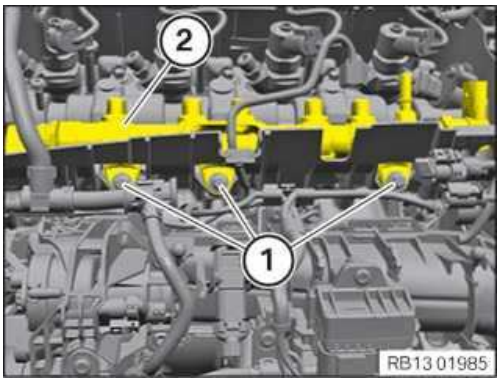


- Read off the adjustment value (1) on the new injector (2).



- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

48 – Installing the rail

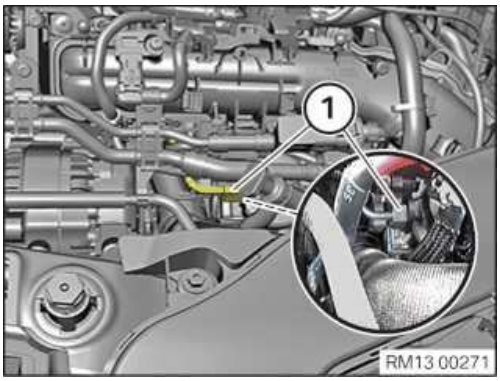


- Carefully insert and install the rail (2).
- Tighten the screws (1).

Rail on cylinder head cover

Torx screw M8x25		Tightening torque	19 Nm

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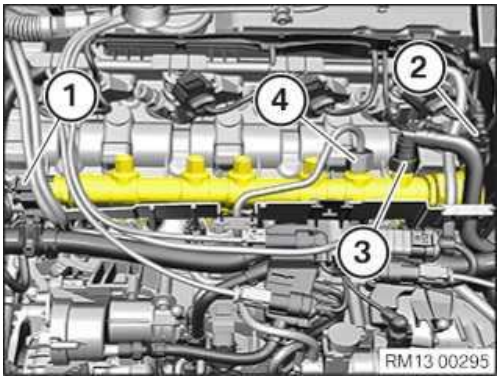
TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten union nut (1).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm



TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten union nut (4) with special tool .

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

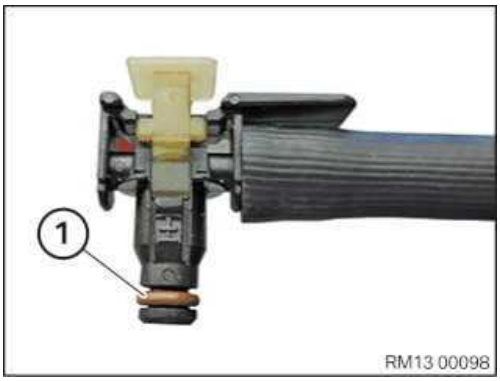
- Connect and lock the fuel line (3).

  Fuel line (3) must engage audibly.
- Connect connectors (2) and lock.

  The connector (2) must engage audibly.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

49 – Connect the leakage oil line on the injector



- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.

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- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

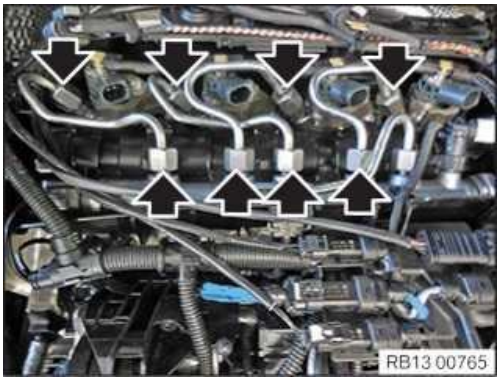
50 – Installing high pressure lines between rail and injectors

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Remove special tool .
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

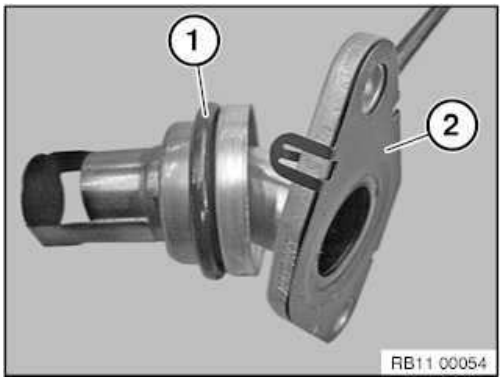
- Tighten the high pressure lines (arrows) with the special tool .

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

51 – Installing the intake plenum

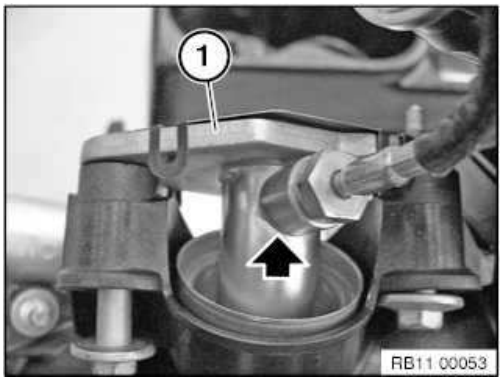


- Renew O-ring (1).

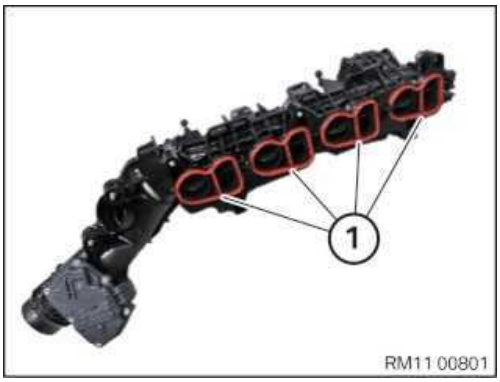
  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position the seal (2) and clip it in.

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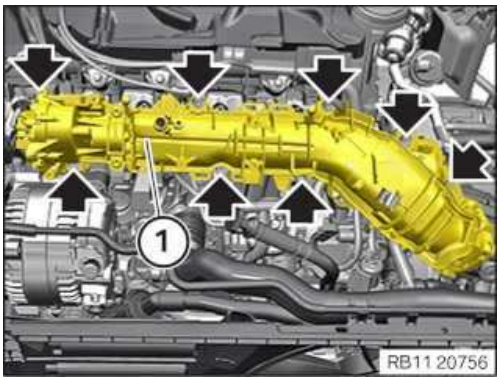


- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (1).

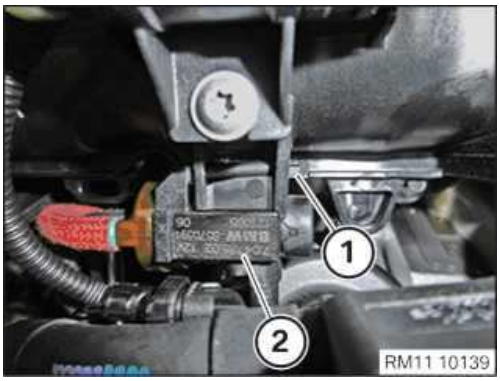
  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.



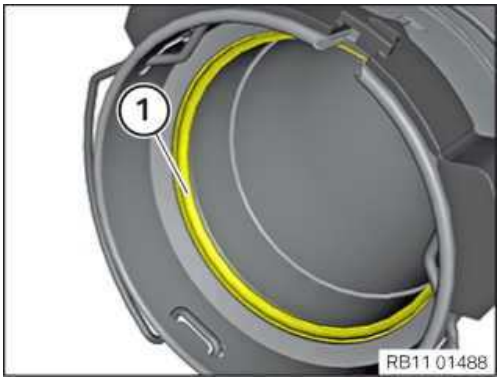
- Guide in and install intake (1) plenum.
- Tighten screws (arrows).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm



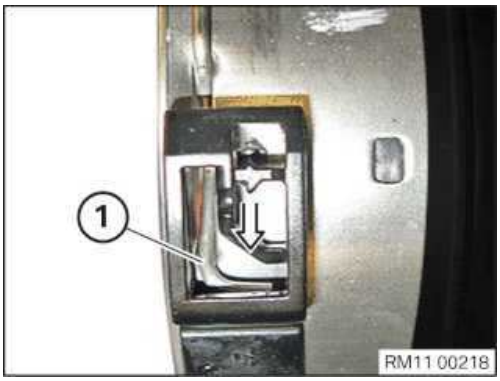
- Install the electric changeover valve (2) in the holder on the plenum from left to right.
- Lock (1) must engage audibly.



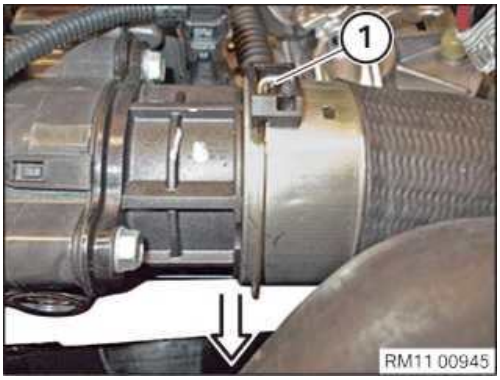
- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring

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- Engage the lock (1) on the bracket (arrow).



- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

52 – Remove the engine from the assembly stand

CAUTION

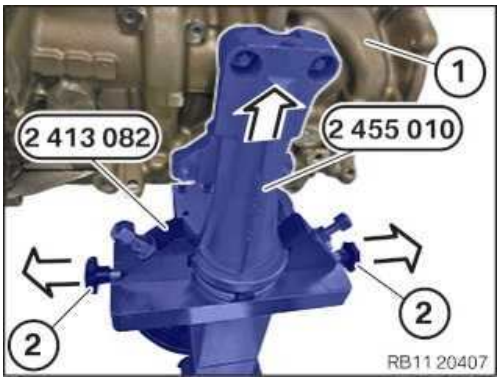
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Insert engine lifter with special tool and position engine (1).

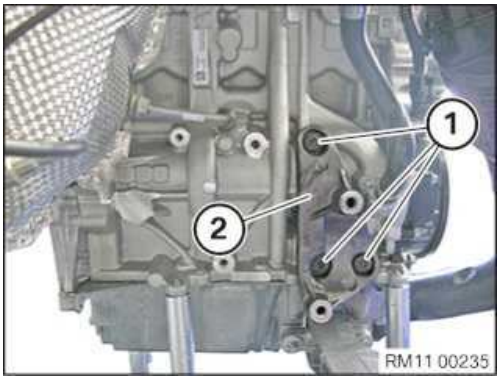


- Unscrew the nuts on special tool .
- Detach the holder (2) in the direction of the arrow.
- Detach the engine (1) with special tool **2 455 010** out of the special tool in the direction of arrow.

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- Remove conventional screws (arrows).
- Feed out the special tool **2 455 010** on the engine (1) and remove.



- Insert and install the holder (2).
- Tighten the screws (1).

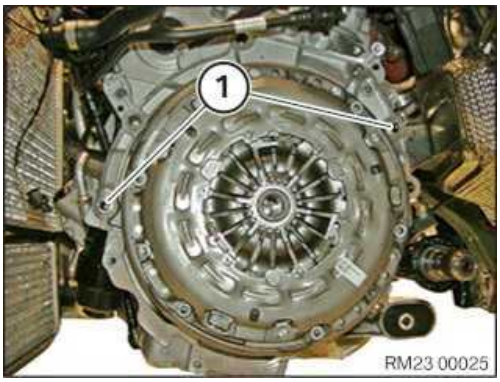
Holder to crankcase

M10		Tightening torque	38 Nm

53 – Mounting engine on manual gearbox

Prerequisite

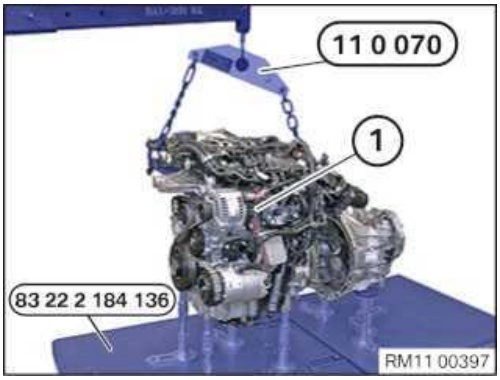
Engine has been removed.



- Check for correct fit of fitting sleeves(1).
- Replace damaged fitting sleeves.

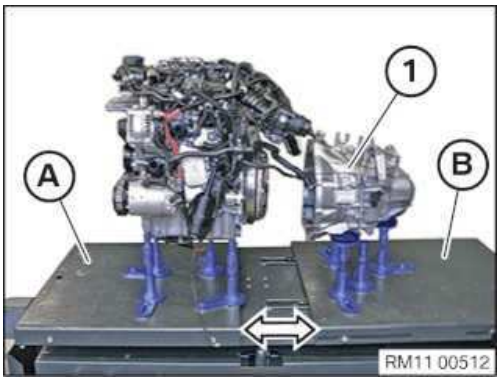


- Remove any grease from the transmission input shaft (arrow) and clean the shaft.
- Do not grease transmission input shaft.
- Check the clutch disc for frictional corrosion in the gearing and renew if necessary.

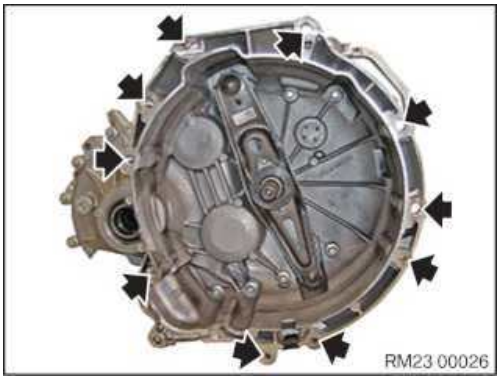


- Position the engine (1) on the lifting table **2 184 136** using the engine lifter and the special tool .
- Feed out engine lifter from engine (1) with special tool and push aside.

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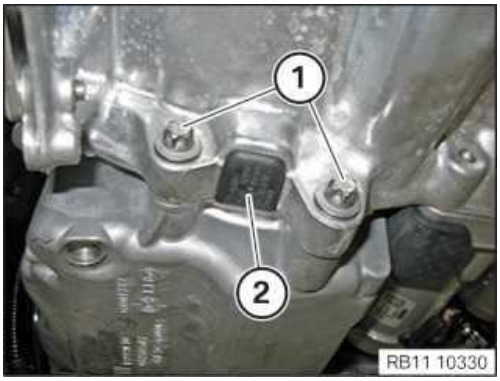
- Push table top (B) in direction of arrow and position manual gearbox (1) on engine.



- Tighten screws (arrows).

Transmission to engine

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm



- Tighten the screws (1).

Transmission to oil sump

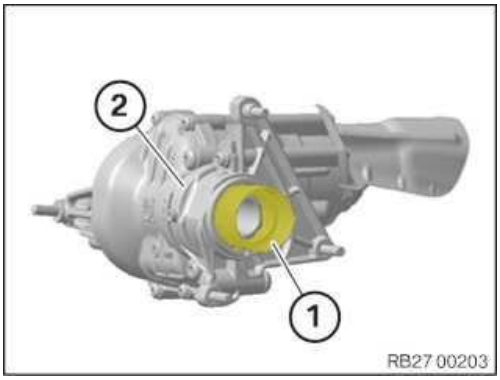
M8		Tightening torque	19 Nm

- Install the protective cap (2).



- Unscrew the bolts (1) of the special tool **2 459 012**.
- Feed out the special tool **2 459 012** at the cylinder head and remove.

54 – Install the transfer box (VTG)



- If intermediate shaft (1) gets caught on transfer box (VTG) (2), renew intermediate shaft (1) and the radial shaft seals in the automatic or manual transmission.

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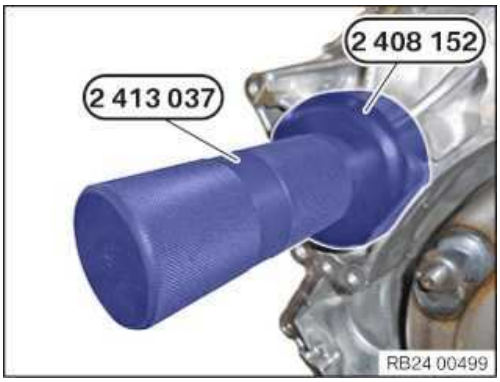
- Screw special tool **2 409 025** into the outer radial shaft seal.
- Turn the screw on the special tool **2 409 025** until the outer radial shaft seal has been pulled out.



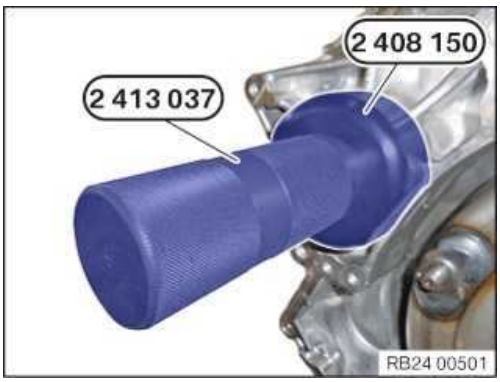
- Insert special tool **2 411 739** into the inner radial shaft seal.



- Screw special tool **2 411 739** into the inner radial shaft seal.
- Turn the screw on the special tool **2 411 739** until the inner radial shaft seal has been pulled out.

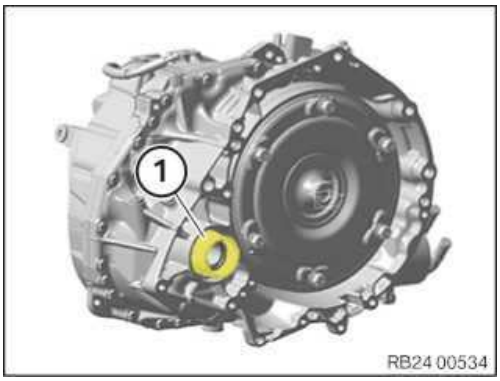


- Drive in the inner radial shaft seal using special tools **2 408 152** and **2 413 037** up to the limit position.



- Drive in the outer radial shaft seal using special tools **2 413 037** and **2 408 150** up to the limit position.

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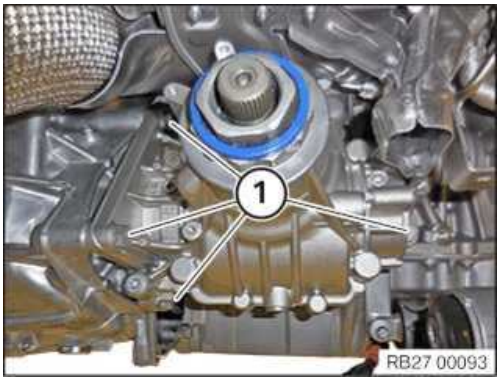
- If necessary, connect the new intermediate shaft (1) to the output flange of the automatic transmission or manual transmission.



- Coat the inside of the output flange (arrows) evenly with approx. 5 g of grease.

Expendable materials

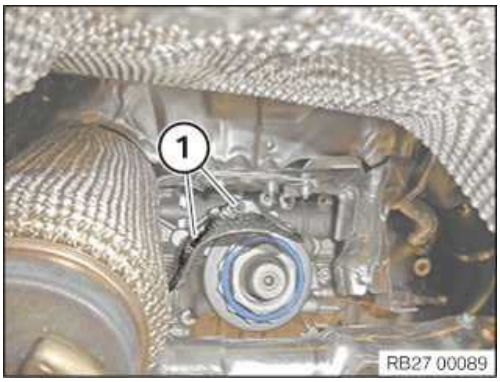
Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the transfer box (VTG).
- Tighten the screws (1).

Transfer box to transmission

M10		Tightening torque	56 Nm



- Install heat shield.
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Heat shield to transfer box

M6	Renew screws.	Tightening torque	6 Nm

▸ **Check the transfer box oil level**

RISK OF DAMAGE

Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.

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- Check transfer case oil level, correct:
- Open the oil filler plug (1).
- Check transfer box oil level.
- If necessary, top up transmission oil up to the lower edge of the oil filler plug opening (1).

Transmission oil

Technically suitable transfer box and electrical transmission oils	

Main group 27

- Tighten the oil filler plug (1).

Oil filler plug on transfer box (VTG)

M18x1.5		Tightening torque	35 Nm

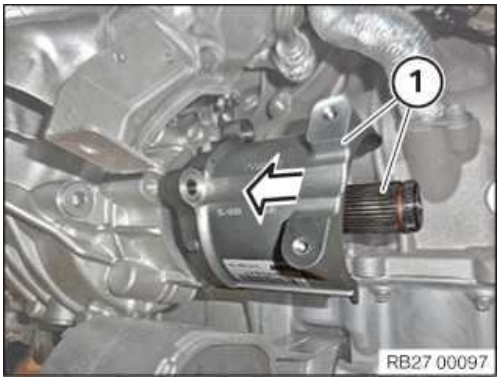
55 – Install the intermediate shaft with the support tube



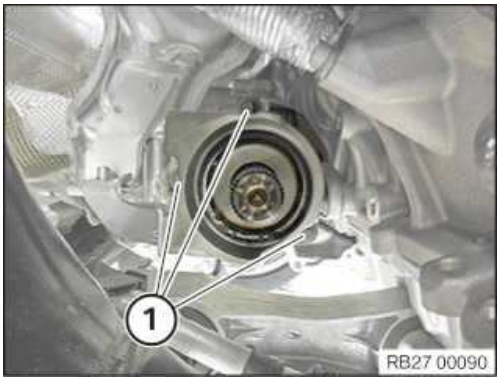
- Coat gearing of the intermediate shaft uniformly with 5 g of grease.

Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the intermediate shaft with support tube (1) in the transfer box.



- Position screws (1).

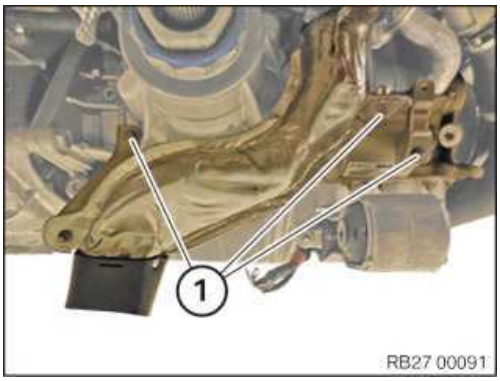
Note: Check for correct screw length! Bolt M8x35 8.8

- Tighten the screws (1).

Intermediate shaft to transfer box

M8x35		Tightening torque	19 Nm

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- If installed: Install air duct.
- Tighten the screws (1).

56 – Installing the high-pressure stage exhaust turbocharger

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

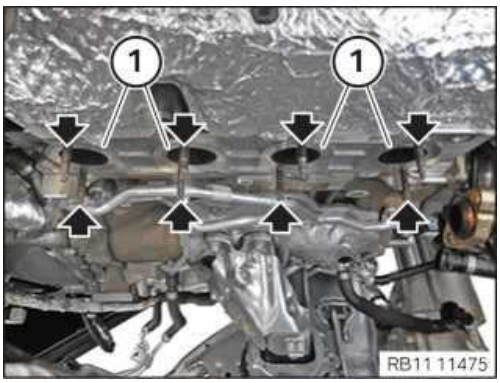
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

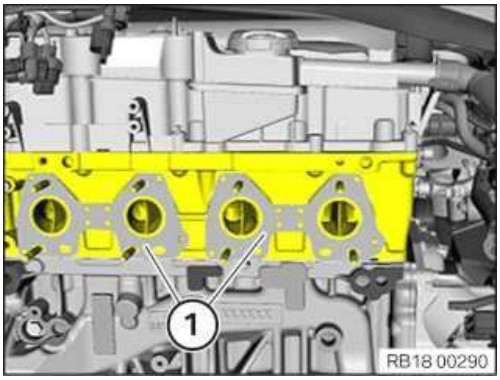


- Clean the sealing surfaces (1) on the cylinder head using special tool **0 495 102 (11 4 470)**.
- Check the stud bolts (arrows) on the cylinder head for correct fit.

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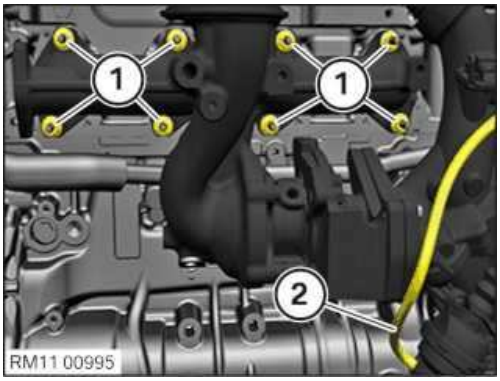
- Clean the sealing surfaces on the exhaust manifold using special tool **0 495 102 (11 4 470)**.



- Renew gasket (1).

  Parts: Gasket

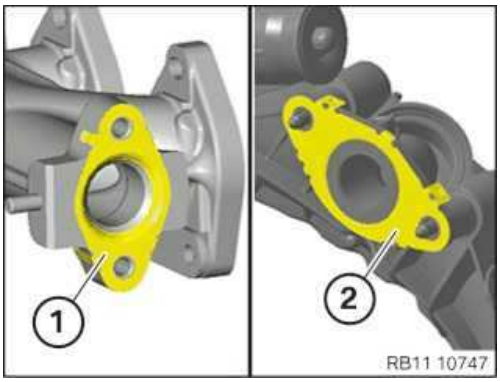
- Install new gasket (1).



- Feed in and install the exhaust manifold and the high-pressure stage exhaust turbocharger.
- Tighten nuts (1).

  Parts: Nuts

- Connect vacuum hose(2).

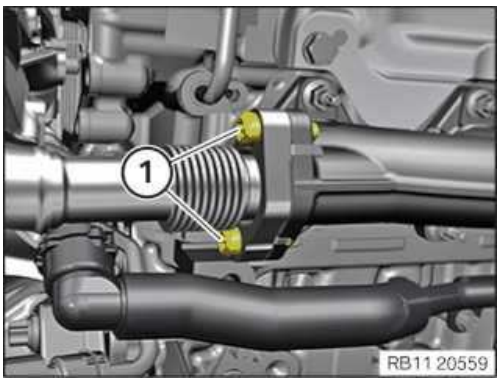


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket

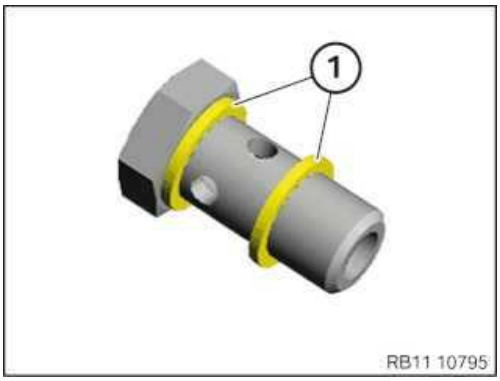


- Tighten the screws (1).

Exhaust-gas recirculation cooler to exhaust manifold

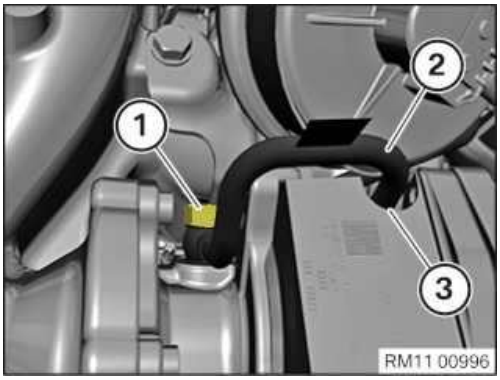
M8x28	Replace screws	Tightening torque	32 Nm

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- Renew sealing rings (1) of banjo bolt.

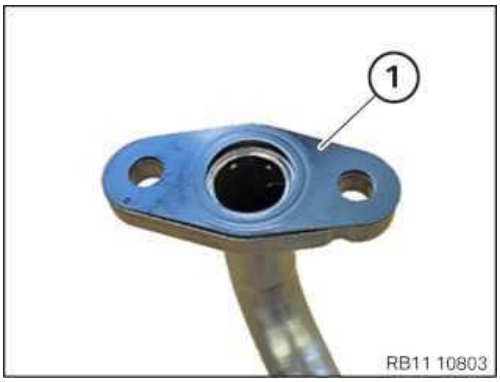
  Parts: Sealing ring



- Guide the oil feed line into the holder (3) and install it.
- Tighten down screw (1).

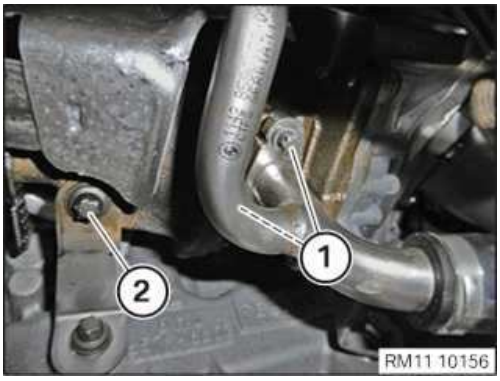


- Tighten bolt (1) from the right wheel arch.



- Renew seal (1) of oil return line.

  Parts: Gasket



- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

57 – Installing the low-pressure stage turbocharger

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RISK OF DAMAGE

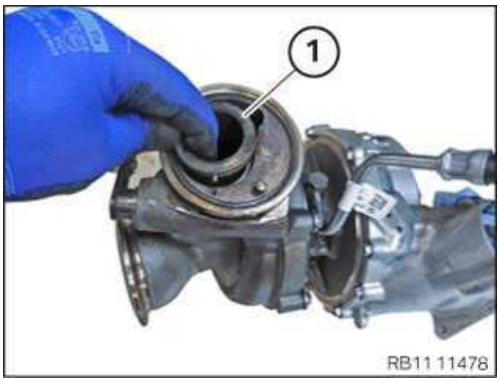
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

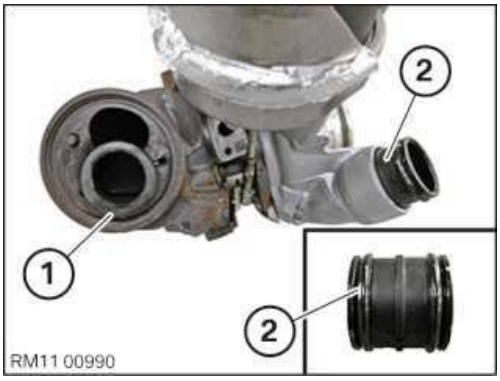
TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.



- Check the spacer plug (1) for damage, renew if necessary.

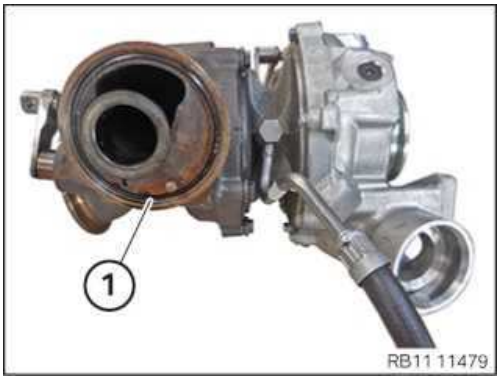
  Parts: Spacer ring
- Insert and install the spacer ring (1).
- Position spacer ring (1) correctly.



- Renew gasket (1).

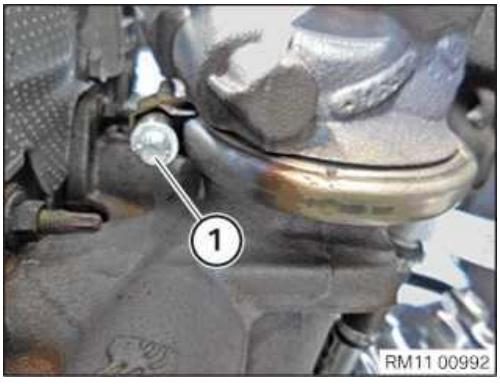
  Parts: Gasket
- Position the seal (1).
- Renew the sleeve(2).

  Parts: Holding sleeve



- Renew sealing ring (1).

  Parts: Sealing ring
- Affix the sealing rings on the exhaust turbocharger.



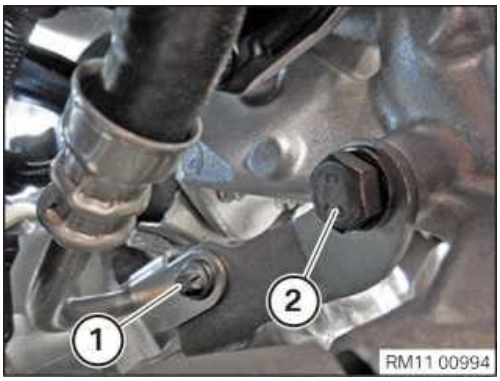
- Insert and install the low-pressure stage exhaust turbocharger on the exhaust manifold .
- Feed in and install V-band clamp .
- Tighten V-band clamp (2).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Screw in nut (1) with 2 **revolutions**.

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- Tighten down screw (1).

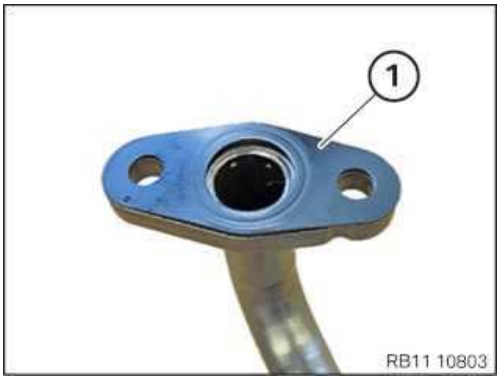
Oil feed line to bracket

Torx screw M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

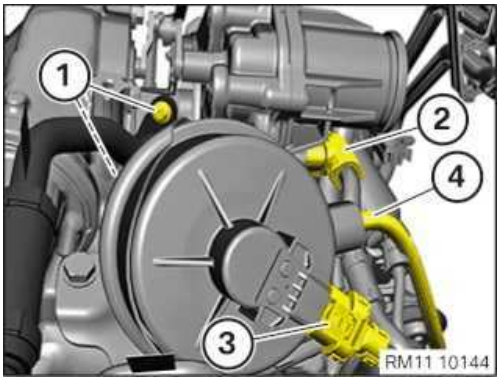
Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm



- Renew seal (1) on the oil return line.

  Parts: Gasket



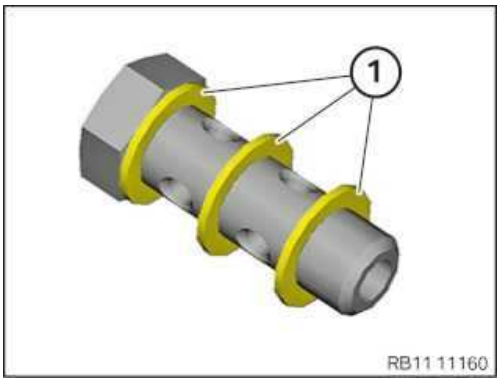
- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

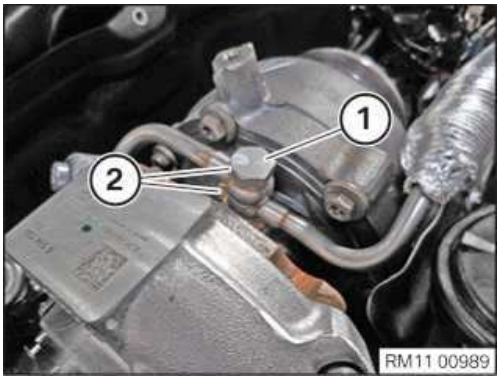
M6x12		Tightening torque	8 Nm

- Connect and lock connectors (2) and (3).

  The locks must engage audibly.
- Connect vacuum hose (4).

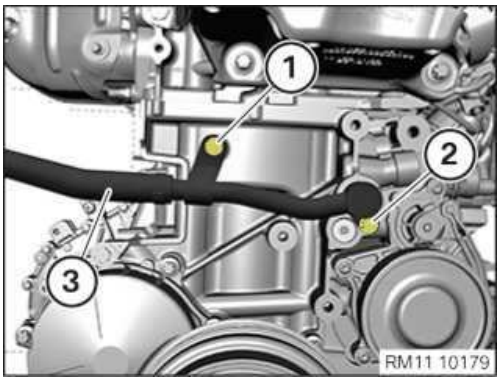


- Renew banjo bolt and sealing rings (1).
- **Parts:** Banjo bolt, sealing rings



- Install sealing rings (1).
- Tighten the banjo bolt (1).
- Ensure that the lines do not rest against the adjacent components.

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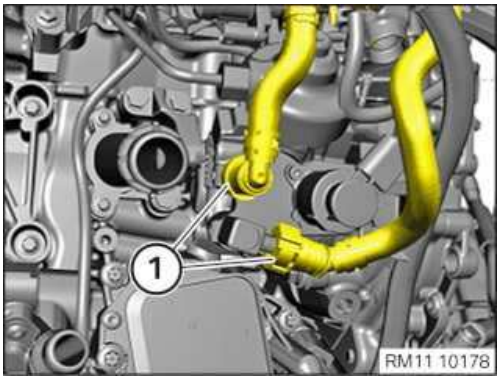


- Renew sealing ring of the coolant line (3).

  Parts: Sealing ring
- Coat the sealing ring and install the coolant line (3) .
- Tighten down screws (1) and (2).

Standard screw connection M6

M6		8 Nm



- Connect and lock fuel lines (1).

  The fuel lines (1) must audibly engage.

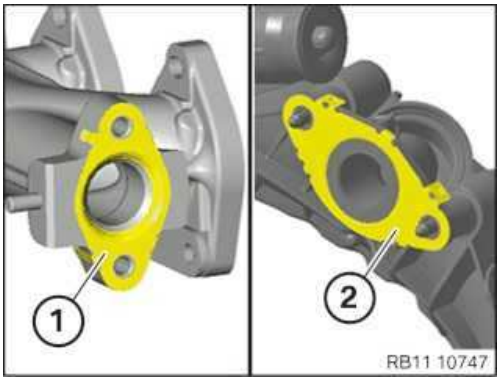
▶ **Installing the exhaust-gas recirculation cooler**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

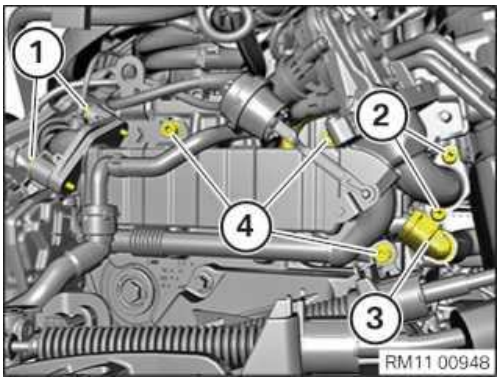


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket
- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket

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- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts
- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

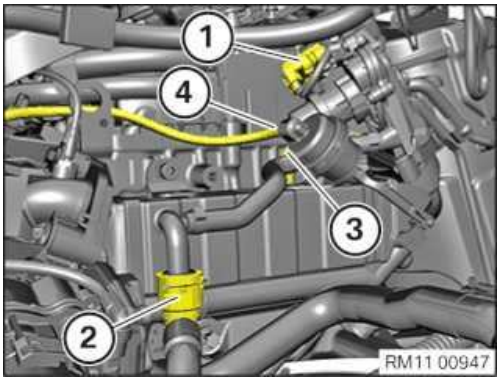
M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.
- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm



TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

▸ **Installing heat shield on exhaust turbocharger at bottom**

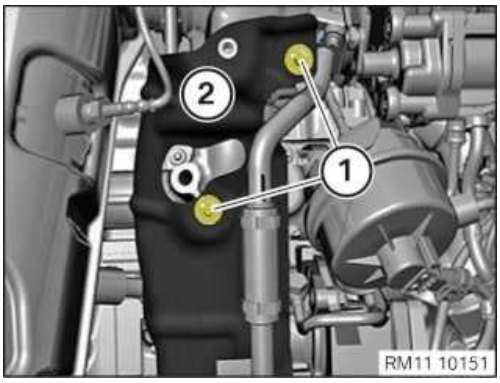
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WARNING

Hot surfaces.

Risk of burning!

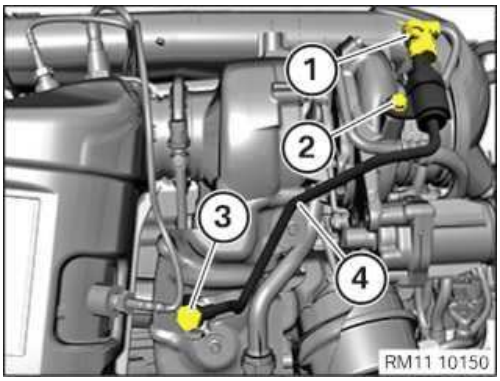
- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (2).
- Tighten the bolts (1) on the heat shield .

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm



- Position the exhaust gas pressure pipe (4).
- Hand-tighten the bolt (2).
- Renew sealing rings on the banjo bolt (3).

  Parts: Sealing ring
- Tighten the banjo bolt (3).

Banjo bolt for exhaust pressure pipe to exhaust manifold

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

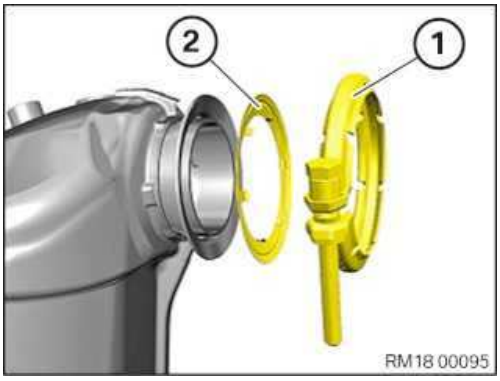
- Tighten down screw (2).

Standard screw connection M6

M6		8 Nm

- Connect connectors (1) and lock.

  Lock must audibly engage.



CAUTION

Heavy component.

Heavy components can lead to injury or damage.

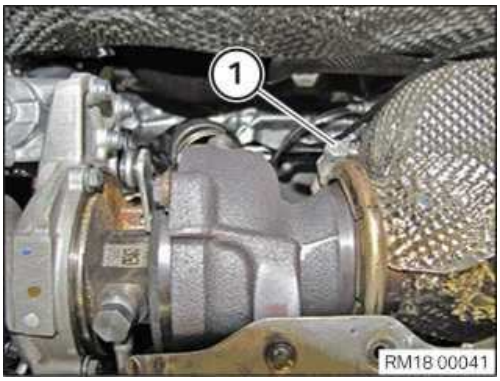
- Remove and install heavy components with the aid of another person/other persons.

- Renew the V-clip (1).

  Parts: V-band clamp
- Renew the gasket (2).

  Parts: Gasket

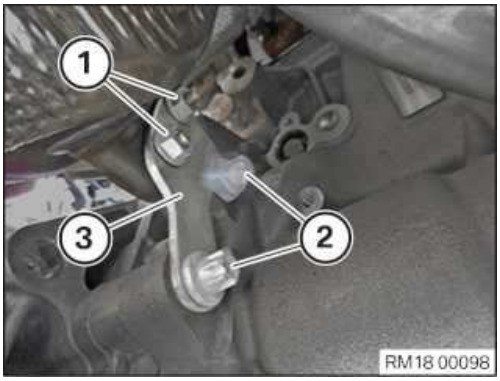
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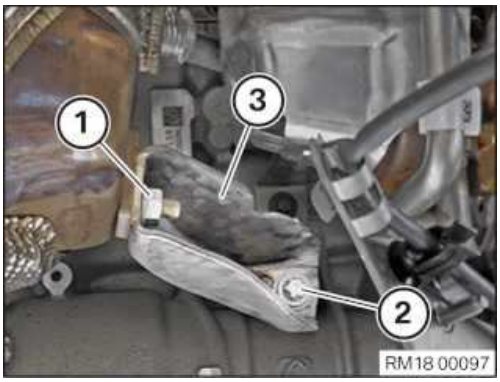
- Carefully insert and install the diesel particulate filter .
- Feed in and install V-band clamp (1).
- Make sure that the seal between the diesel particulate filter and the exhaust turbocharger is installed correctly.
- Align the diesel particulate filter on the exhaust turbocharger.
- Position V-clip (1).
- Hand-tighten the V-clip (1).



- Tighten nuts (1) by hand.



- Install holder (3).
- Hand-tighten the bolts (2).
- Tighten nuts (1) by hand.



- Install holder (3).
- Tighten the nut (1) hand-tight.
- Hand-tighten the bolt (2).



- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

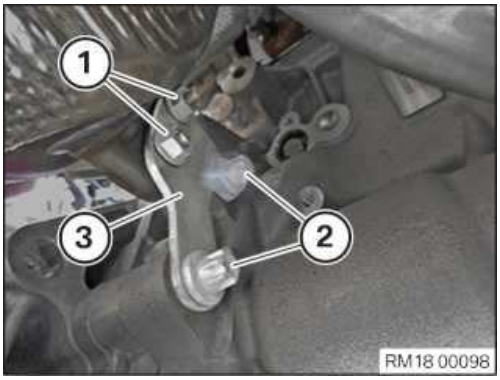
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- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screws (2).

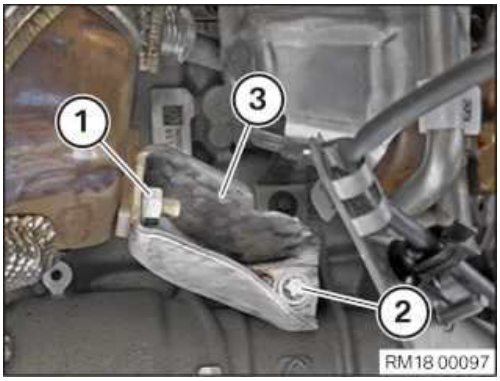
Diesel particulate filter holder to gearbox

M12x75		Tightening torque	66 Nm

- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screw (2).

Diesel particulate filter bracket to crankcase

M10x35		Tightening torque	38 Nm

- Tighten nut (1).

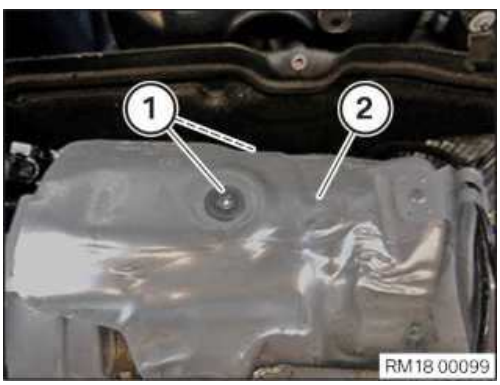
Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Remove fitting aid (1) for the flexible tube.

▶ **Install the heat shield on the exhaust turbocharger**



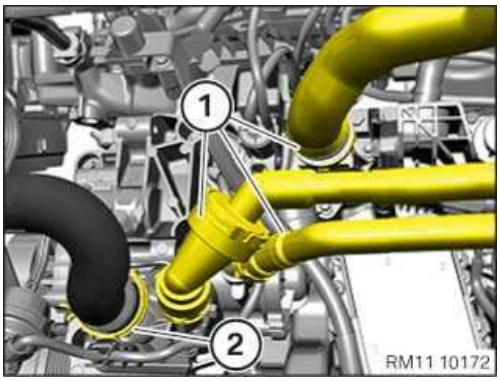
- Feed in and install the heat shield (2).
- Tighten the screws (1) at the top and bottom of the heat shield.

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

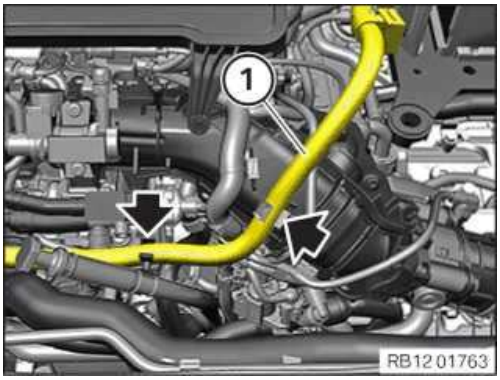
- Fasten the cable at the clips .

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- Install the coolant hose and secure with the clamp (2) .
- Connect and lock the coolant lines (1).

  The coolant lines (1) must engage audibly.



CAUTION

Improper routing of the positive battery cable.

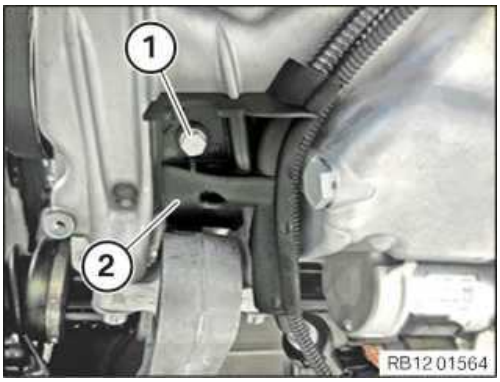
Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

- Insert the positive battery cable (1) into the clamps (arrows).



- Feed in and install positive battery cable at the clamps (1).



- Insert and install the holder (2).
- Tighten down screw (1).

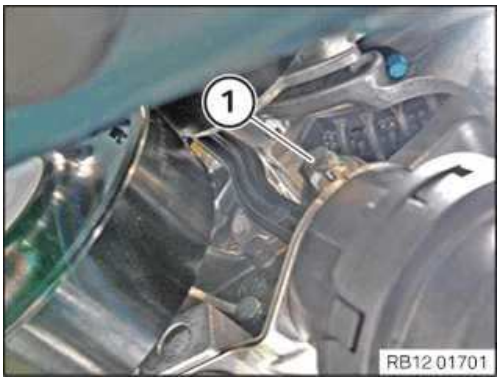
Bracket to oil sump

M6		Tightening torque	8 Nm



- Insert and install alternator (1) along with the screw (2) on the bottom of the alternator through the slot on the support.

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- Tighten the screw (1) below on the alternator.

Alternator to component carrier

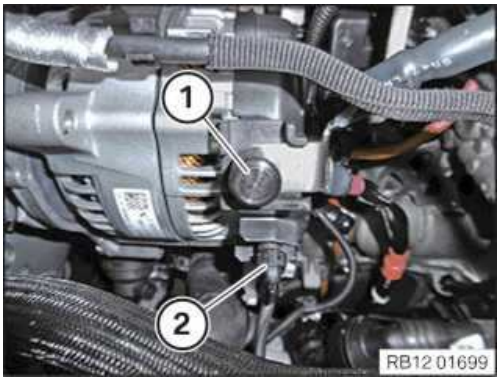
M10x75 / M10x125		Tightening torque	38 Nm



- Tighten the bolt (1) on top on the alternator.

Alternator to component carrier

M10x75 / M10x125		Tightening torque	38 Nm



- Mount positive battery cable to the alternator.
- Tighten nut.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

- Mount the cover (1).
- Connect the connector (2) to the alternator and lock audibly.



- Install air conditioning compressor (2) and position it correctly.
- Tighten the screws (1).

Air conditioning compressor in component carrier

M10		Tightening torque	38 Nm

▸ **Installing the drive belt for alternator**

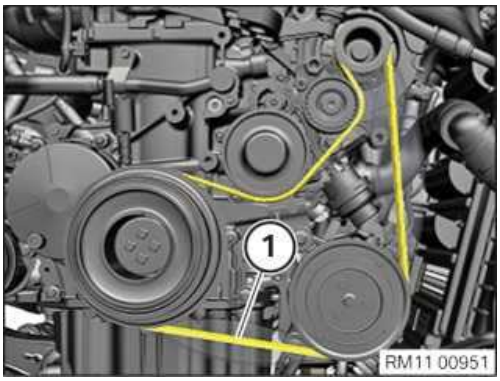
TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

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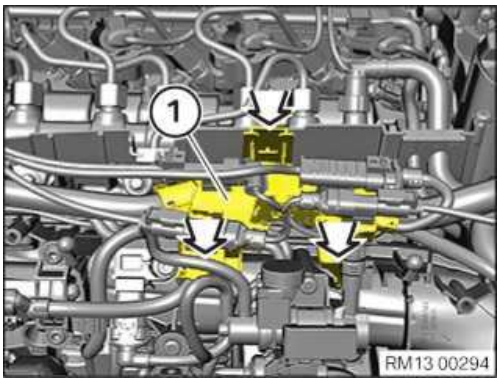


- Feed in the drive belt for the alternator (1) and install it.

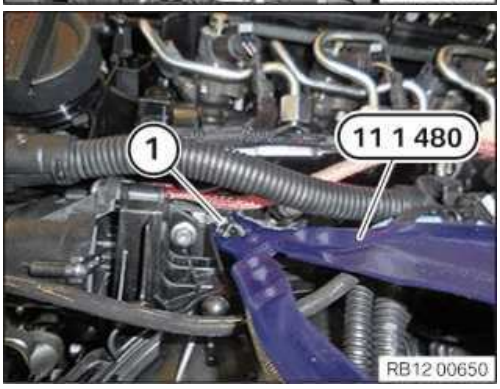


- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool **0 496 268 (11 0 390)** out of the belt tensioner and remove it.

▶ **Installing the cable clip for the intake plenum**

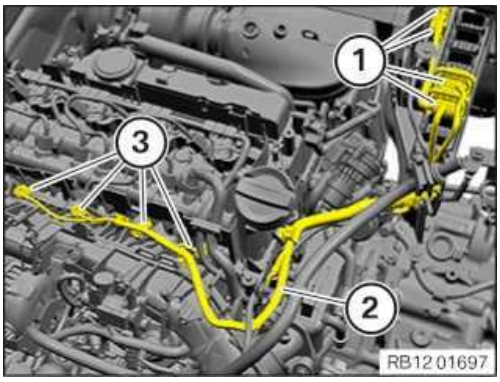


- Insert and install the cable clip (1) in the direction of the arrow.
- Make sure the cable clip (1) is fitted correctly.



- Connect and lock the connector (1) on the glow elements.

  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.

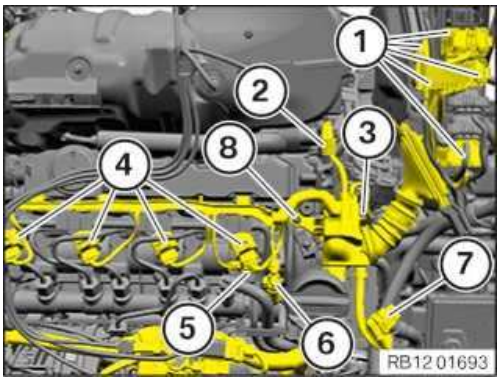


- Lay vehicle wiring harness and fasten with clamps.
- Route all connectors (1) to the integrated supply module (PDM) and to the DME control unit.
- Connect all connectors (3) to the glow elements and engage them audibly.
- Mount ground strap and tighten screw (2).

Ground cable to cylinder head

M6x12		Tightening torque	8 Nm

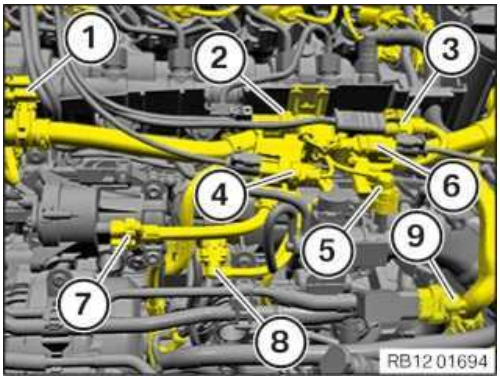
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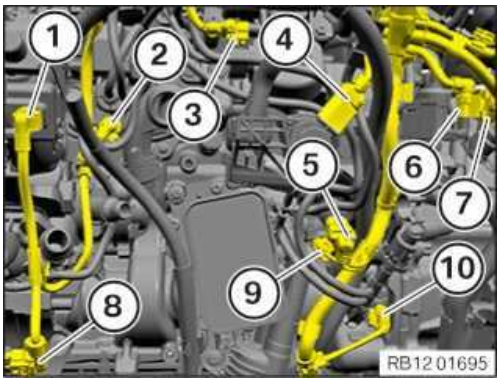
- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the integrated supply module (PDM) and to the DME control unit.
- Attach connector (2) to the differential pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust-gas recirculation valve and lock audibly.
- Attach connector (4) to the injectors and lock it audibly.
- Attach connector (5) to the camshaft sensor and lock it audibly.
- Attach connector (6) to the fuel pressure regulator and lock it audibly.
- Connect and audibly lock the connector (7) to the hot film air mass meter.
- Tighten down screw (8).

Wiring harness to cylinder head cover

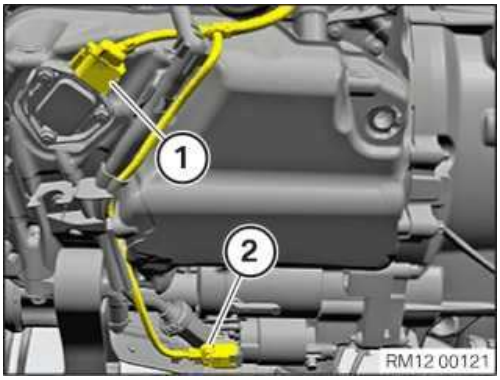
TS5x20		Tightening torque	3,5 Nm



- Connect the connector (1) to the rail pressure sensor and lock it audibly.
- Attach connector (2) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (3) to the front oxygen sensor and lock audibly.
- Attach connector (4) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Connect the connector (5) to the electric changeover valve and lock audibly.
- Attach connector (6) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (7) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (8) to the charging pressure sensor and lock it audibly.
- Attach connector (9) to the fuel pressure and temperature sensor and lock it audibly.

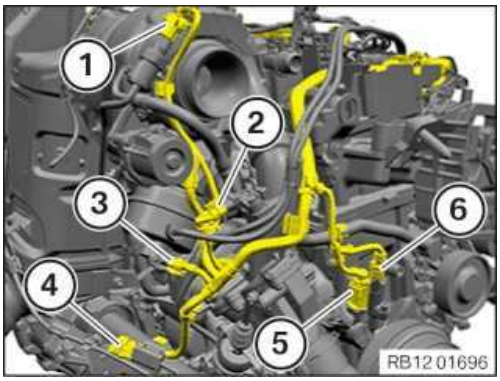


- Connect the connector (1) to the alternator and lock audibly.
- Connect the connector (2) to the electric changeover valve and lock audibly.
- Connect the connector (3) to the electric changeover valve and lock audibly.
- Connect the connector (4) to the high pressure pump and lock audibly.
- Connect the connector (5) to the oil pressure sensor and lock it audibly.
- Attach connector (6) to the throttle bodies and lock it audibly.
- Attach connector (7) to the intake air temperature sensor and lock it audibly.
- Connect the connector (8) to the air conditioning compressor and lock audibly.
- Connect the connector (9) to the solenoid valve and lock audibly.
- Connect the connector (10) to the crankshaft sensor and lock it audibly.

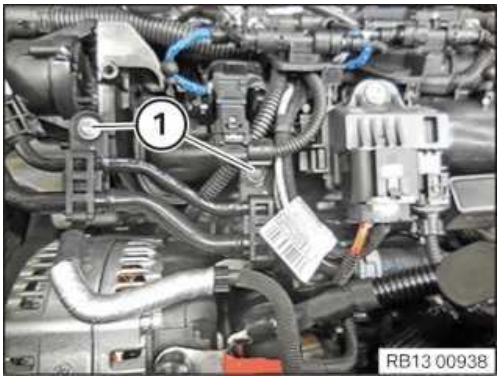


- Connect the connector (1) to the oil-level sensor and lock it audibly.
- Connect connector (2) to the starter motor and lock audibly.

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- Attach connector (1) to the exhaust turbocharger and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust gas pressure sensor and lock it audibly.
- Connect the connector (4) to the monitoring oxygen sensor and lock audibly.
- Attach connector (5) to the oil pressure switch and lock it audibly.
- Attach connector (6) to the switching valve and lock it audibly.

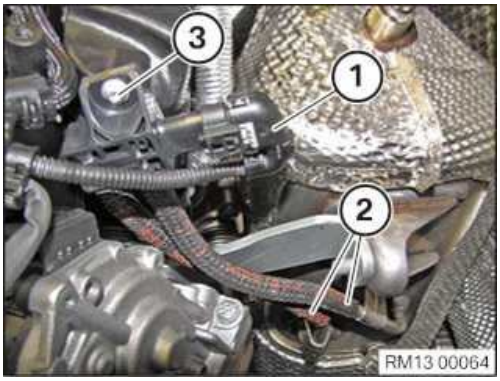


- Position the fuel line.
- Tighten the screws (1).

Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

59 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

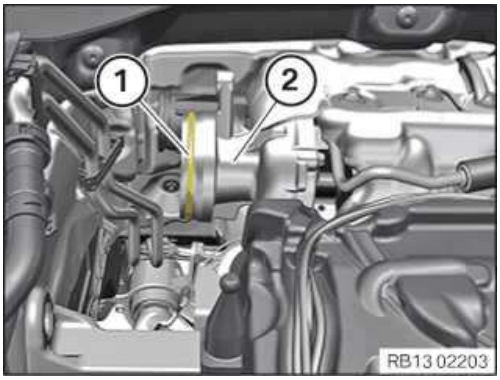
Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

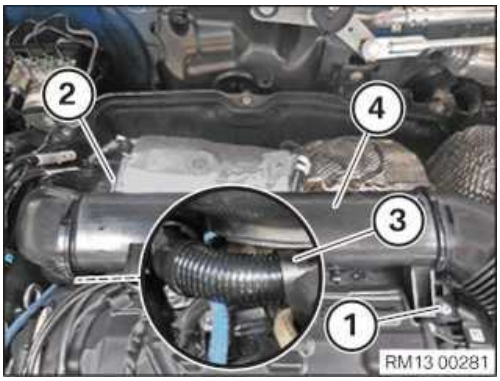
  The connector (1) must engage audibly.

60 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.

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- Feed in clean air pipe and install.
- Connect clean air pipe to the exhaust turbocharger and lock audibly in the clamps (2).
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Connect ventilation line (3) to the cylinder head cover and lock audibly.

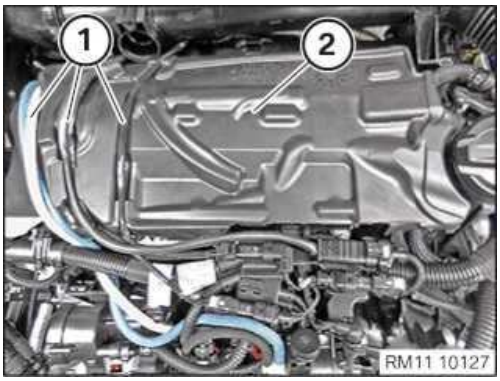


- Mount clean air pipe onto the intake filter housing.
- Tighten clamp (1) on the clean air pipe.

Clean air pipe to intake silencer housing

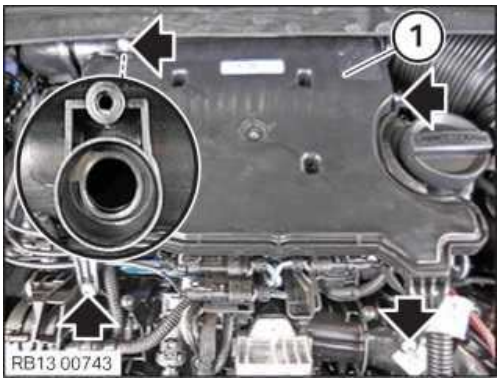
Clamp		Tightening torque	3 Nm

61 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the vehicle wiring harness (1) in the brackets.

62 – Install resonator



- Insert and install the resonator (1).
- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

63 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Check for correct installation of all rubber mounts in the acoustic cover (1).



- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

64 – Install engine



- See additional information.

Additional Information

Overview of Tightening Torques

Special tool to cylinder head Used in step 12

M8		Tightening torque	21,5 Nm

Special tool 2 455 010 to crankcase Used in step 13

M10x30		Tightening torque	38 Nm

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Special tool 11 8 930 to special tool 00 2 320

Used in step 13

M14x35		Tightening torque	160 Nm

Bearing journal of tensioning and guide rail

Used in step 33

M8	*Replace bearing journal.*	Tightening torque	20 Nm

Chain tensioner to crankcase

Used in step 33

M6x22		Tightening torque	10 Nm

Camshaft sprocket on high pressure pump

Used in step 33

M12		Tightening torque	65 Nm

Oil vacuum pump to crankcaseB47

Used in step 34

M8x35		Tightening torque	19 Nm

Rear timing case cover to crankcase

Used in step 35

M6	Renew screws.	Jointing torque	8 Nm
		Angle of rotation	90 °

SCR coolant lines to crankcase end cover

Used in step 35

Hexagon screw M6x16		Tightening torque	8 Nm

Cylinder head to crankcase

Used in step 35

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

Cylinder head bolt to timing case cover

Used in step 35

M8x40		Tightening torque	19 Nm

Oil sump to crankcase

Used in step 35

M8x30		Tightening torque	24 Nm
M8x110		Tightening torque	24 Nm

Transmission to oil sump

Used in step 35 53

M8		Tightening torque	19 Nm

Guide tube for oil dipstick on engine

Used in step 35

M8x16		Tightening torque	19 Nm

Flywheel to crankshaft

Used in step 36

M12x1.5	Renew screws.	Tightening torque	120 Nm

Clutch to flywheel

Used in step 37

M8	Renew screws.	Jointing torque	15 Nm
		Angle of rotation	90 °

Glow elements to cylinder head

Used in step 40

Glow element		Tightening torque	13 Nm

Camshaft carrier to cylinder head

Used in step 41

M7x35		Tightening torque	13 Nm

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Intake and exhaust camshaft in camshaft support

Used in step 42

M6x31		Tightening torque	10 Nm

Bearing journal to cylinder head

Used in step 42

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8

Used in step 42

M8		Tightening torque	19 Nm

Standard screw connection M6

Used in step 42 58

M6			8 Nm

Chain tensioner piston to cylinder head

Used in step 42

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft

Used in step 42

M7x17.			17 Nm

Cylinder head cover to cylinder head

Used in step 46

M6		Tightening torque.	8,5 Nm

Clamping claw facing to cylinder head cover

Used in step 47

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 47

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

Rail on cylinder head cover

Used in step 48

Torx screw M8x25		Tightening torque	19 Nm

High pressure line between high pressure pump and rail

Used in step 48

High-pressure pipe		Tightening torque	28 Nm

High pressure lines between injector and rail

Used in step 50

High pressure lines		Tightening torque	28 Nm

Intake plenum to cylinder head

Used in step 51

M6		Tightening torque	11 Nm

Holder to crankcase

Used in step 52

M10		Tightening torque	38 Nm

Transmission to engine

Used in step 53

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

Transfer box to transmission

Used in step 54

M10		Tightening torque	56 Nm

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Heat shield to transfer box — Used in step 54

M6	Renew screws.	Tightening torque	6 Nm

Oil filler plug on transfer box (VTG) — Used in step 54

M18x1.5		Tightening torque	35 Nm

Intermediate shaft to transfer box — Used in step 55

M8x35		Tightening torque	19 Nm

Exhaust-gas recirculation cooler to exhaust manifold — Used in step 56 58

M8x28	Replace screws	Tightening torque	32 Nm

Oil return line to turbocharger — Used in step 56 57

M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase — Used in step 56

M8x16		Tightening torque	22 Nm

Exhaust turbocharger to exhaust manifold — Used in step 57

V-band clamp		Tightening torque	19 Nm

Oil feed line to bracket — Used in step 57

Torx screw M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase — Used in step 57

M8x16		Tightening torque	22 Nm

Exhaust-gas recirculation cooler to cylinder head — Used in step 58

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler — Used in step 58

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to cylinder head — Used in step 58

M8x20		Tightening torque	19 Nm

Heat shield for exhaust turbocharger — Used in step 58

Torx screw BM 6x12		Tightening torque	10 Nm

Banjo bolt for exhaust pressure pipe to exhaust manifold — Used in step 58

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

Diesel particulate filter V-clip to exhaust turbocharger — Used in step 58

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Diesel particle filter to holder — Used in step 58

M8 hexagon nut		Tightening torque	19 Nm

Diesel particulate filter holder to gearbox — Used in step 58

M12x75		Tightening torque	66 Nm

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Diesel particulate filter bracket to crankcase — Used in step 58

M10x35		Tightening torque	38 Nm

Heat shield for exhaust turbocharger — Used in step 58

Torx screw BM 6x12		Tightening torque	10 Nm

Bracket to oil sump — Used in step 58

M6		Tightening torque	8 Nm

Alternator to component carrier — Used in step 58

M10x75 / M10x125		Tightening torque	38 Nm

Positive battery cable to alternator — Used in step 58

M8		Tightening torque	19 Nm

Air conditioning compressor in component carrier — Used in step 58

M10		Tightening torque	38 Nm

Ground cable to cylinder head — Used in step 58

M6x12		Tightening torque	8 Nm

Wiring harness to cylinder head cover — Used in step 58

TS5x20		Tightening torque	3,5 Nm

Fuel line to intake plenum — Used in step 58

TS6x20		Tightening torque	5 Nm

Differential pressure sensor to holder — Used in step 59

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor — Used in step 59

Clamp 15–19mm		Tightening torque	3 Nm

Clean air pipe to cylinder head cover — Used in step 60

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 60

Clamp		Tightening torque	3 Nm

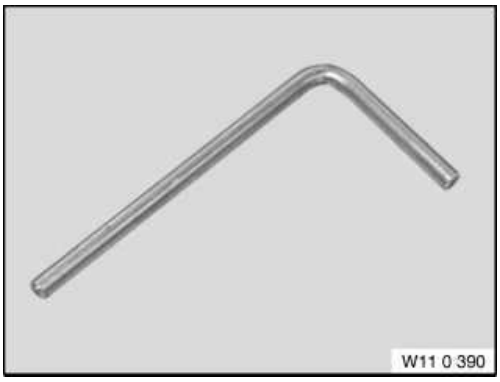
Resonator to manifold and clean air pipe — Used in step 62

Screw TS6	Renew screw.	Tightening torque	5 Nm

Overview of Special Tools

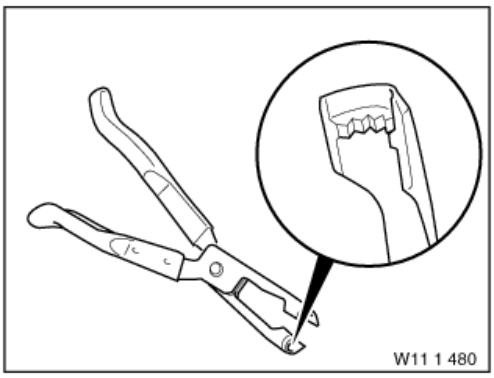
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0 496 268 (11 0 390) Pin



Common	Used in step 7 58
Usage	(roll pin) For securing new tensioning pulley (poly-V belt)
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 15 07 (390)

0 490 796 (11 1 480) Pliers



Common	Used in step 7 25
Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

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2 459 012 Holder



Common Used in step 12 53

Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

2 455 010 Engine support



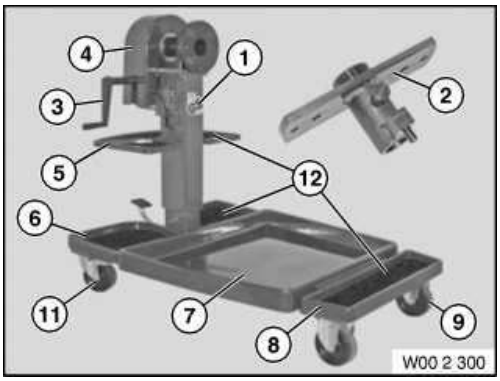
Common Used in step 13 52

Usage	For accommodating engine on assembly stand. Engine: B3x, B4x, N47.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

0 495 187 (00 2 300) Assembly stand

Used in step 13

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Common

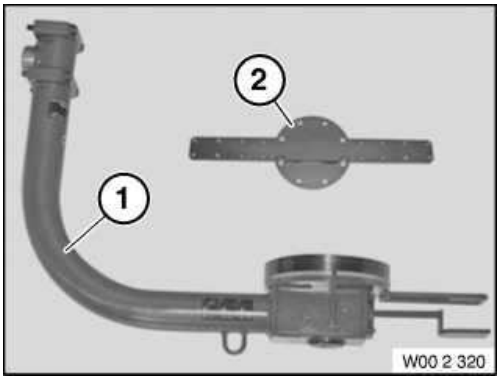
Usage	Assembly stand with universal flange for mounting engines from S85
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 188 (00 2 301)		**Assembly stand** available only as complete assembly stand 83 30 0 495 187.	
2	0 495 189 (00 2 302)	**2 299 563**	**Tool** (Universal flange). Do not use any more!!! Technically locked. Replaced with a new flange with material number 83 30 2 299 563. All flanges delivered until the end of 2011 will be replaced at no charge. From 2012, only the new flange will be supplied. Also applies to the complete engine mounting stand 00 2 300.	
3	0 495 200 (00 2 303)		**Crank**	
4	0 495 201 (00 2 304)		**Cover** (Protective hood)	
5	0 495 202 (00 2 305)		**oddments tray** (Oddments tray for small parts)	
6	0 495 203 (00 2 306)		**Shaped element** (Rear shaped pan)	
7	0 495 204 (00 2 307)		**Collection pan** (Oil collection pan)	
8	0 495 205 (00 2 308)		**Shaped element** (Front shaped pan)	
9	0 495 206 (00 2 309)		**Wheel** (Front wheel (without stop))	
10	0 495 207 (00 2 311)		**Wheel** (Rear wheel (with stop))	
11	0 495 208 (00 2 312)		**Mat** (Checker mat set)	
2	2 299 563		**Adapter** New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.	

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0 495 196 (00 2 320) Support arm



Common

Used in step 13

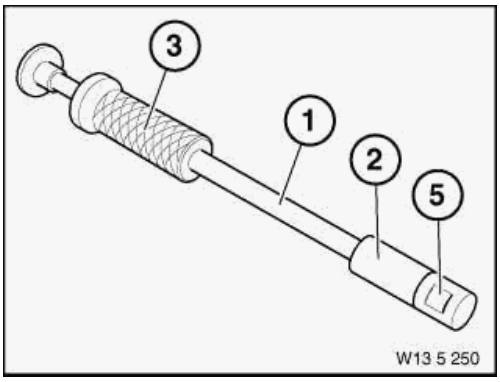
Usage	(Support arm with fixture) For mounting engines using the engine mounting bracket.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 197 (00 2 321)		**Support arm**	
2	0 495 198 (00 2 322)		**Panel** (take-up plate)	
3	0 495 380 (00 2 323)		**Panel** (fixture) Engine N73	
6	0 496 287 (00 2 326)		**Panel** (fixture) Engine: M73	
5	0 496 288 (00 2 327)	**0 496 373**	**Panel** (fixture) Engine: S62 Replaced by 11 5 420 (0 496 373)	
8	0 496 533 (00 2 328)		**Support** (Engine mount) Engine: N57, N57Top	
9	0 496 579 (00 2 329)	**0 496 680**	**Support** (Engine mount) Engine: N74 Replaced by 116160 (0 496 680)	
4	0 495 379 (00 2 324)		**Panel** (fixture) Engine M67TU	
5	0 495 381 (00 2 325)		**Panel** (fixture) Engine N62, N62TU	

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0 493 321 (13 5 250) Puller



Common

Used in step 17

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

0 493 339 (13 5 252) Bush



Common

Used in step 17

Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

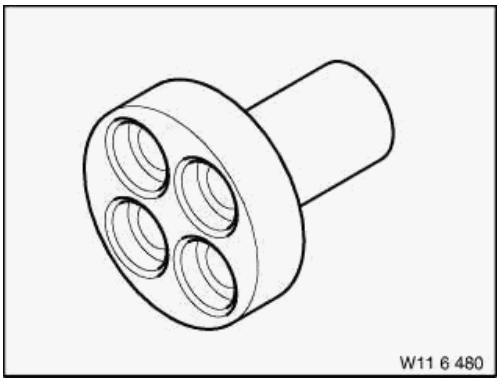
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0 493 340 (13 5 253) Weight



Common	Used in step 17
Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 380 (11 6 480) Connector



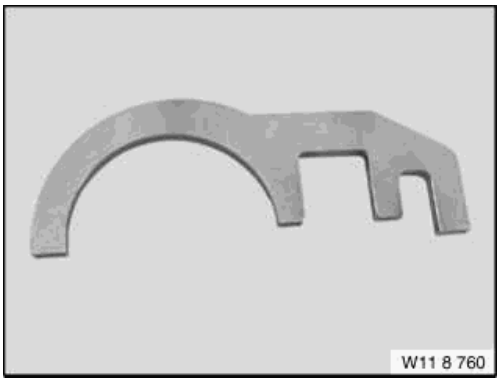
Common	Used in step 20 42 45
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

2 288 380 Locating stud



Common	Used in step 20 42 43 45
Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 112 (11 8 760) Gauge



Common	Used in step 20 42 44 45
Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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0 495 105 (11 4 480) oddments tray



Common

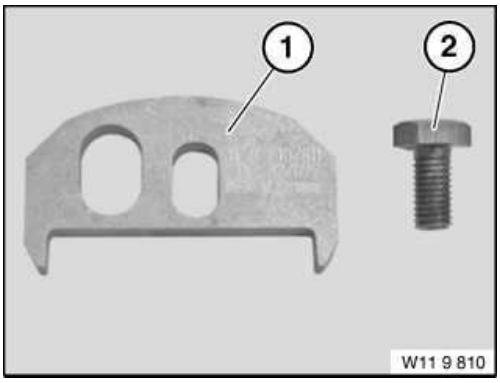
Used in step 26 27 42

Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

0 496 171 (11 9 811) Holder



Common

Used in step 28 29 36

Usage	Available only as a complete tool set 11 9 810 (83 30 0 496 170) - as of 13.01.12
Included in the tool or work	0 496 170
Storage location	C86
Replaced by	
In connection with	
SI-Number	01 07 07 (355)

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0 494 793 (11 9 265) Bush



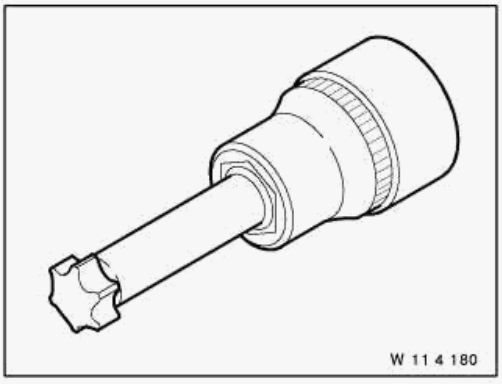
Common	Used in step 28 29 36
Usage	
Included in the tool or work	0 493 938
Storage location	A44
Replaced by	
In connection with	
SI-Number	

2 288 165 Synchronising key



Common	Used in step 28 37
Usage	Conversion kit for 21 2 170, for orders till 02.2014. Orders as of March 2014 do not require the conversion, as the new thrust piece has been accounted for.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 09 14 (088)

0 491 018 (11 4 180) Socket WAF 46



Common	Used in step 29 36
Usage	(screwdriver bit Torx T60) For releasing and tightening down dual-mass flywheel - model year: from Jan 94
Included in the tool or work	
Storage location	C9
Replaced by	
In connection with	
SI-Number	01 02 94 (777)

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2 357 904 Gauge

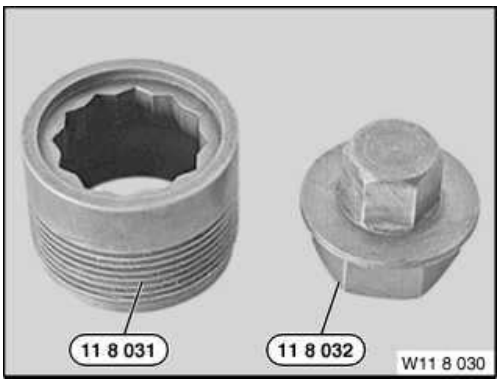


Common

Used in step 32 33

Usage	For positioning the high pressure pump to the crankshaft . Replaced by gauge 2420824
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 725 (11 8 030) Extractor



Common

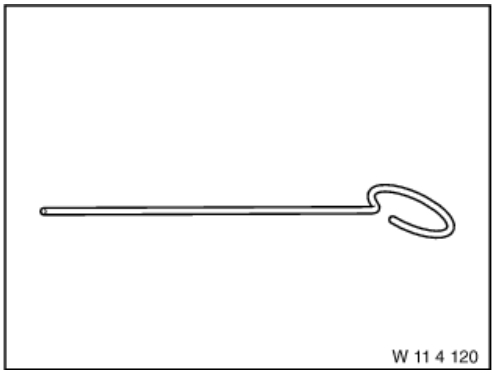
Used in step 32

Usage	for the disassembly of the high pressure pump (replaces SWZ 11 8 740 as of 08/2009) 11 8 740 will be replaced by 83 30 2 448 914.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 757 (11 8 031)	2 448 914	**Holding sleeve** Replaces SWZ11 8 741 from 08/2009, 09/2011 no longer available individually. From 10/2016, can only be ordered as a new set of special tools 2 448 914.	
2	0 496 758 (11 8 032)	2 448 914	**Adapter** Replaces special tool 11 8 742 from 08/2009, 09/2011 remaining inventories will be sold off - no longer available individually. From 10/2016, can only be ordered as a new set of special tools 2 448 914.	

0 491 012 (11 4 120) Pin



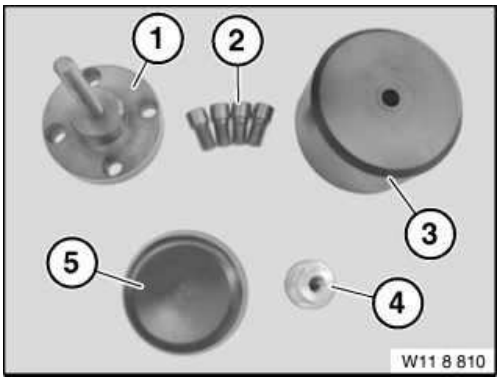
Common

Used in step 32 33

Usage	(lock pin) For chain tensioners, for locking the chain tensioner piston (e.g. during cylinder head removal and fitting)
Included in the tool or work	
Storage location	B1
Replaced by	
In connection with	
SI-Number	01 12 93 (701)

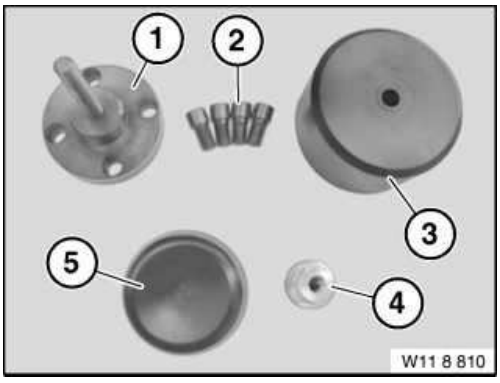
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0 496 137 (11 8 815) Holding sleeve



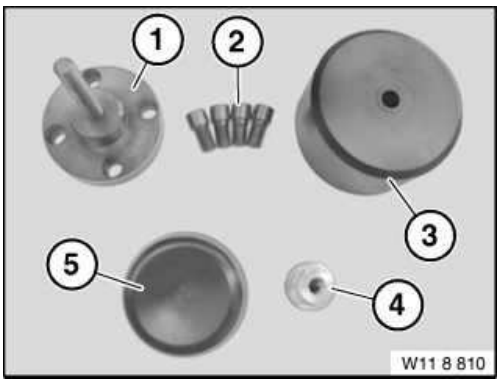
Common	Used in step 35
Usage	(Slip sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 133 (11 8 811) Basic body



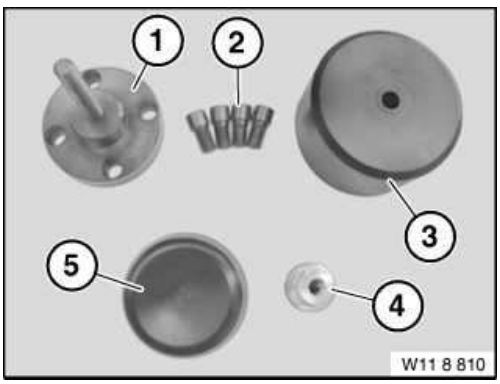
Common	Used in step 35
Usage	Liquidation of existing inventory and then available only as a complete tool set 11 8 810 = 83 30 0 496 132 - as of 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 134 (11 8 812) Screw



Common	Used in step 35
Usage	(Screw set) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

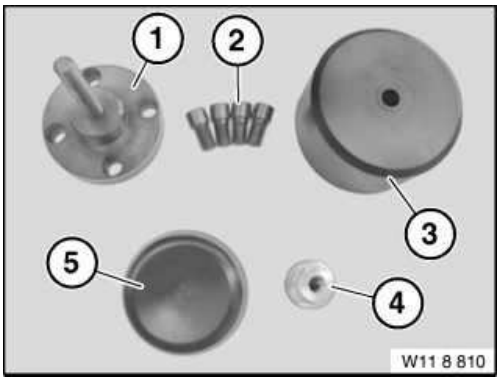
0 496 135 (11 8 813) Holding sleeve



Common	Used in step 35
Usage	(Thrust sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

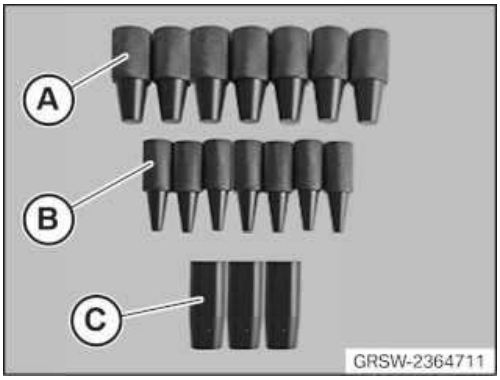
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0 496 136 (11 8 814) Nut



Common	Used in step 35
Usage	(Nut with bearing) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

2 364 711 Plug



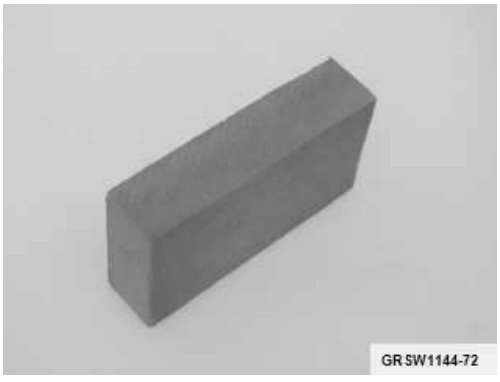
Common	Used in step 35
Usage	For closing the pressure oil holes for cleaning the cylinder head sealing surfaces.
Included in the tool or work	
Storage location	C20
Replaced by	
In connection with	
SI-Number	01 50 14 (203)

0 495 103 (11 4 471) Scraper



Common	Used in step 35
Usage	
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

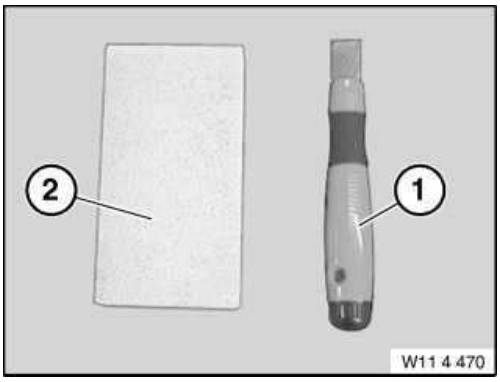
0 495 104 (11 4 472) Extractor



Common	Used in step 35
Usage	(grindstone)
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

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0 495 102 (11 4 470) Tool



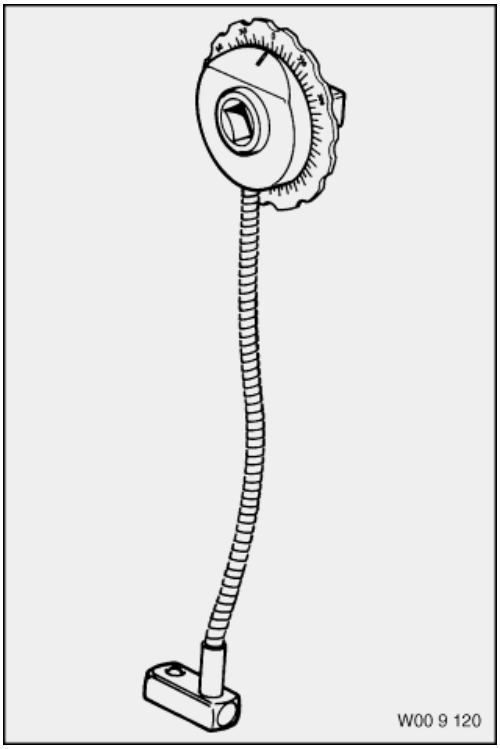
Common Used in step 35 56

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

0 490 504 (00 9 120) Torque angle measuring dial

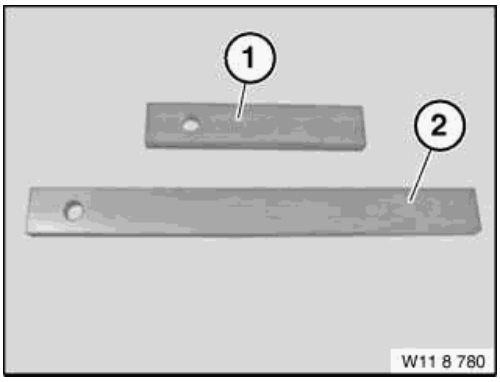


Common Used in step 35

Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

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0 496 120 (11 8 780) Plate



Common

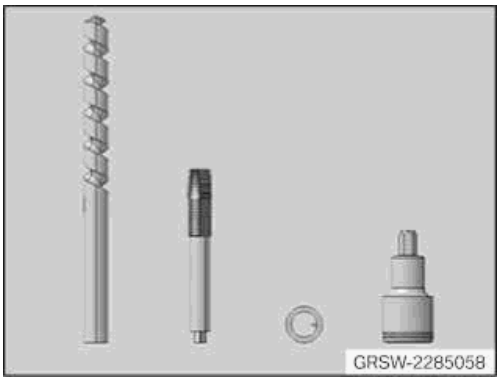
Used in step 35

Usage	(Mounting plates) For securing transmission oil sump when gearbox is removed.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 121 (11 8 781)		**Plate** (Mounting plate, short)Discontinued; only available via set 11 8 780 = 0496120.	
2	0 496 122 (11 8 782)		**Plate** (Mounting plate, long) Discontinued; only available via set 11 8 780 = 0496120.	

2 285 058 Tool set



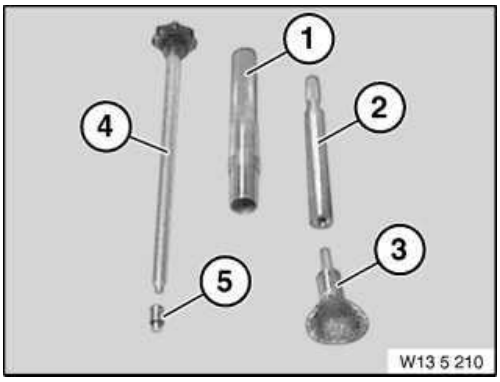
Common

Used in step 36

Usage	
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 02 14 (069)

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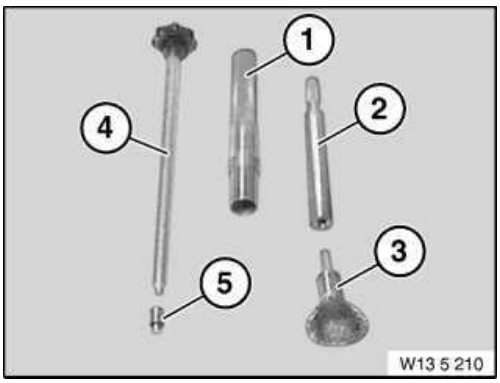
0 493 763 (13 5 215) Plug



Common Used in step 47

Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 762 (13 5 214) Rod

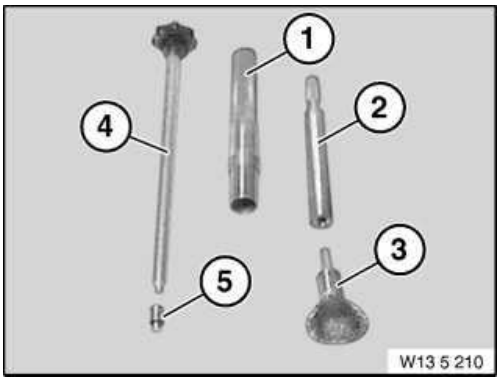


Common Used in step 47

Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 493 758 (13 5 210) Tool



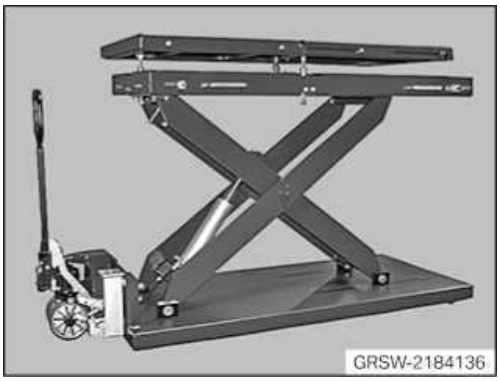
Common Used in step 47

Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

2 184 136 Mobile equipment table lift



Common Used in step 53

Usage	Table lift MHT 1200
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	06 01 10 (649)

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2 409 025 Puller



Common	Used in step 54
Usage	For disassembly of the outer radial shaft seal of the transmission output shaft, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A76
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 411 739 Puller



Common	Used in step 54
Usage	For disassembly of the inner radial shaft seal of the output, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C78
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 408 152 Striking element



Common	Used in step 54
Usage	For installation of the right radial shaft seal transmission output shaft (inner). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

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2 413 037 Handle



Common	Used in step 54
Usage	Universal drift handle. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C77
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

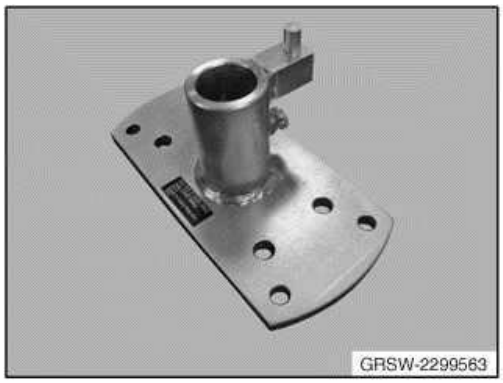
2 408 150 Striking element



Common	Used in step 54
Usage	For installing the right radial shaft seal transmission output shaft (outer). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

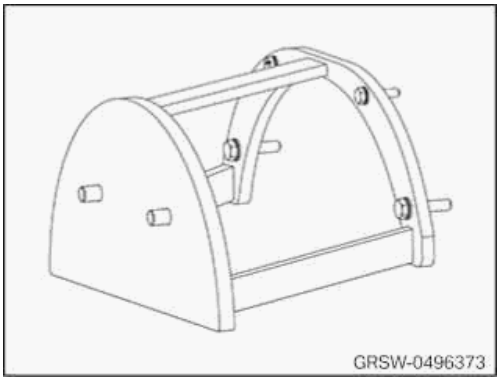
Replacement tools:

2 299 563 Adapter



Common	Used in step 13
Usage	New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.
Included in the tool or work	0 495 187
Storage location	
Replaced by	
In connection with	
SI-Number	

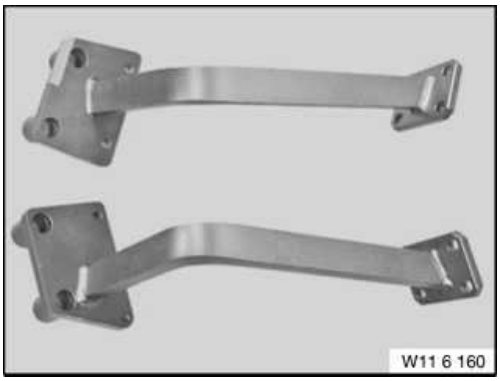
0 496 373 (11 5 420) Plate



Common	Used in step 13
Usage	(Fixture) Engine S62
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	

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0 496 680 (11 6 160) Support



Common	Used in step 13
Usage	For mounting N74 engine on the assembly stand. In combination with 00 2 300, 00 2 320
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	00 2 300; 00 2 320 = 0495196
SI-Number	01 31 09 (604)

2 448 914 Extractor



Common	Used in step 32
Usage	For removing and installing high pressure pump. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A49
Replaced by	
In connection with	
SI-Number	01 15 16 (411)

Overview Technical Data

Screw-in depth of thread cutter	Used in step 36
Screw-in depth	18 mm

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	7 58
EGR controller	7 58

General repair instructions	Used in step
11 00 ... Overview of consumables (Electronic Parts Catalogue)	35

Repair instructions	Used in step
11 00 050 Removing and installing engine	1 64
11 00 050 Removing and installing engine	1 64
11 00 050 Removing and installing engine	1 64
11 00 050 Removing and installing engine	1 64
11 00 050 Removing and installing engine	1 64
11 00 050 Removing and installing engine	1 64
11 00 050 Removing and installing engine	1 64
11 00 050 Removing and installing engine	1 64
11 00 050 Removing and installing engine	1 64

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31 10 001 Completely removing and installing front axle with engine and transmission	1 64
11 00 050 Removing and installing engine	1 64
11 00 050 Removing and installing engine	1 64
11 00 050 Removing and installing engine	1 64
11 00 050 Removing and installing engine	1 64
11 00 050 Removing and installing engine	1 64
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11 00 050 Removing and installing engine	1 64
11 00 050 Remove and install engine	1 64
11 00 050 Remove and install engine	1 64
11 00 050 Remove and install engine	1 64
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG)	1 64
11 00 050 Remove and install engine	1 64
11 00 050 Remove and install engine	1 64
11 00 050 Remove and install engine	1 64
11 00 050 Remove and install engine	1 64
11 00 050 Removing and installing the engine (manual gearbox)	1 64
11 00 050 Remove and install engine (Automatic)	1 64
11 00 050 Remove and install engine	1 64
11 00 050 Remove and install engine	1 64
11 00 050 Remove and install engine	1 64
11 00 050 Remove and install engine	1 64
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11 00 050 Remove and install engine	1 64
11 00 050 Removing and installing engine	1 64
11 00 050 Removing and installing engine \PREMIUM	1 64
11 00 050 Removing and installing/replacing engine (N63)	1 64
11 00 050 Removing and installing engine	1 64
11 00 050 Removing and installing engine	1 64
11 00 050 Removing and installing engine	1 64
11 00 050 Remove and install engine	1 64

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11 00 050 Remove and install engine (Automatic)	1 64
11 00 050 Remove and install engine (Automatic)	1 64
11 00 050 Remove and install engine	1 64
11 00 050 Remove and install engine	1 64
11 00 050 Remove and install engine (Automatic)	1 64
11 00 050 Remove and install engine (Automatic)	1 64
11 00 050 Remove and install engine	1 64
11 00 050 Remove and install engine	1 64
11 00 050 Remove and install engine	1 64
11 00 050 Remove and install engine	1 64
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG)	1 64
11 00 050 Remove and install engine	1 64
61 35 ... Notes on ESD protection (Electro Static Discharge)	6 17 25 35
61 35 ... Notes on ESD protection (Electro Static Discharge)	35

Operating materials	Used in step

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	42
Exhaust-gas recirculation cooler seal on exhaust manifold	58
Exhaust-gas recirculation cooler seal on intake plenum	58

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11 31 052 Replacing both timing chains

PRELIMINARY WORK

1 – Removing engine



- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

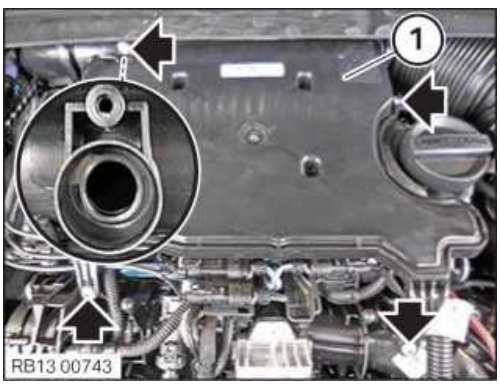
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

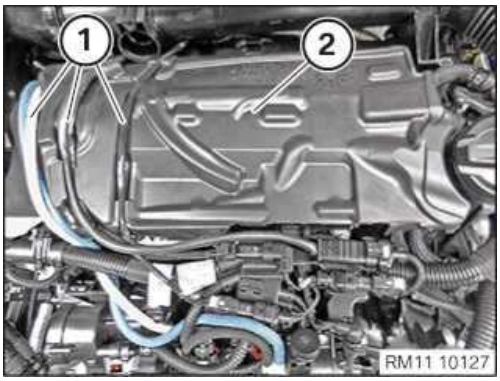
3 – Remove resonator



- Remove screws (arrows).
- Guide out and remove the resonator (1).

4 – Remove the acoustic cover for the injectors

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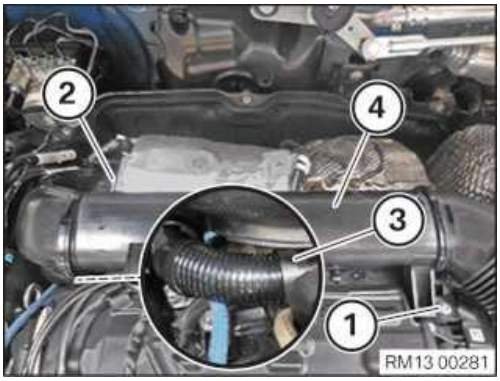


- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

5 – Removing clean air pipe



- Detach clamp (1) on the clean air pipe.
- Pull off the clean air pipe from the intake silencer housing.



- Loosen screw (1).
- Loosen clamp (2).
- Unlock the ventilation line (3) and pull it off the cylinder head cover.
- Feed out clean air pipe and remove.

6 – Remove differential pressure sensor

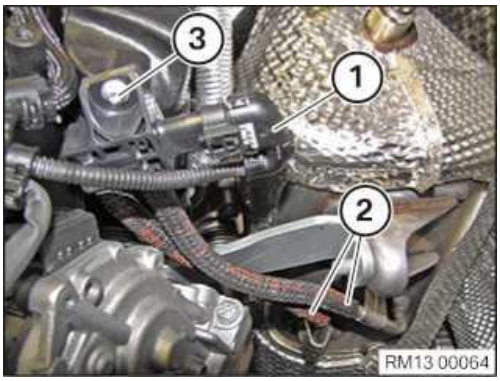
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

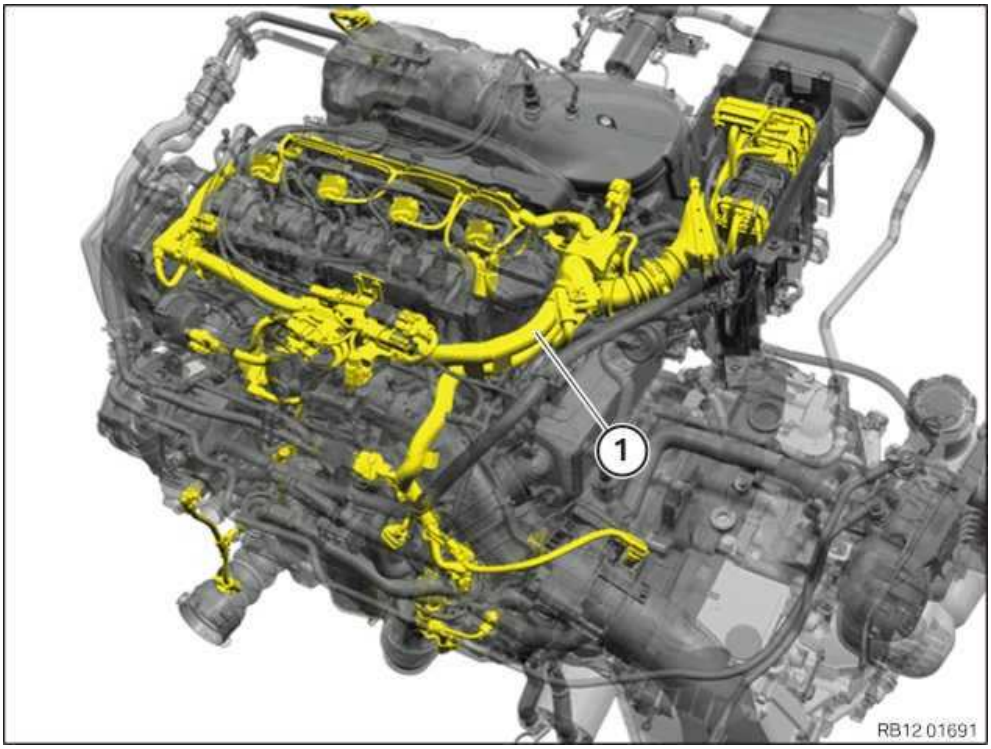
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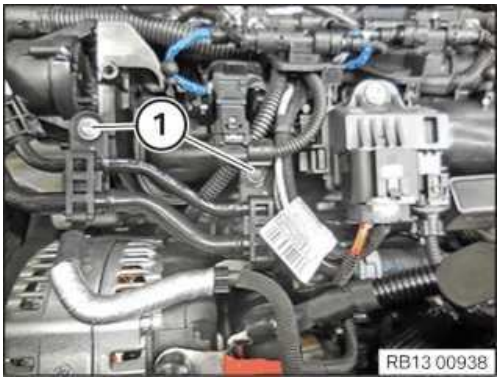
- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

7 – Removing assemblies (on lifting table)

Overview: Wiring harness section for the engine

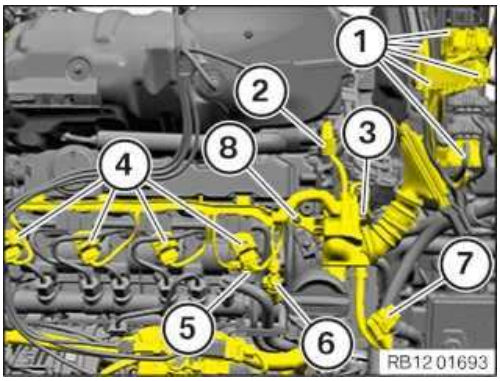


1 Wiring harness section for the engine

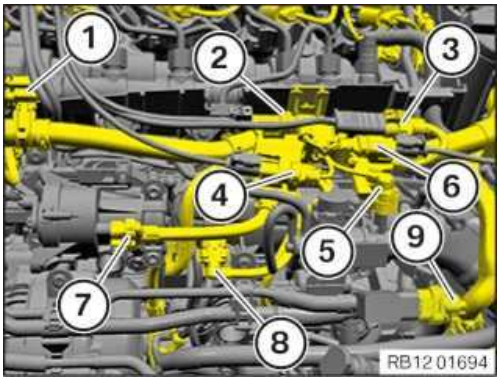


- Loosen screws (1).

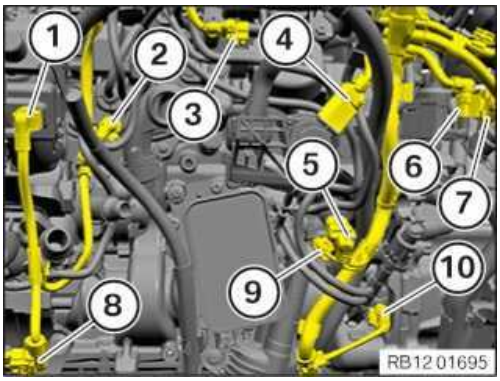
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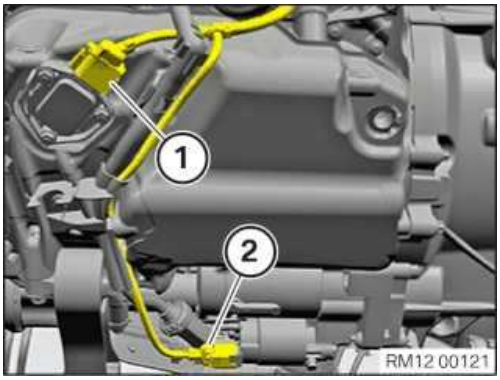
- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock the connector (2) and disconnect it from the differential pressure sensor.
- Unlock the connector (3) and disconnect it from the exhaust-gas recirculation valve.
- Unlock the connector (4) and pull off from the injectors.
- Unlock the connector (5) and disconnect it from the camshaft sensor.
- Unlock the connector (6) and disconnect it from the fuel pressure regulator.
- Unlock connector (7) and pull off from hot film air mass meter.
- Loosen screw (8).



- Unlock connector (1) and pull off from the rail pressure sensor.
- Unlock the connector (2) and disconnect it from the exhaust temperature sensor before the diesel particulate filter.
- Unlock connector (3) and pull it off from the front oxygen sensor.
- Unlock the connector (4) and disconnect it from the exhaust temperature sensor after the diesel particulate filter.
- Unlock and disconnect the connector (5) from the electric changeover valve.
- Unlock the connector (6) and disconnect it from the exhaust temperature sensor for the exhaust-gas recirculation cooler.
- Unlock the connector (7) and disconnect it from the servomotor for the swirl flaps.
- Unlock the connector (8) and pull it off the charging pressure sensor.
- Unlock the connector (9) and disconnect from the fuel pressure and temperature sensor.

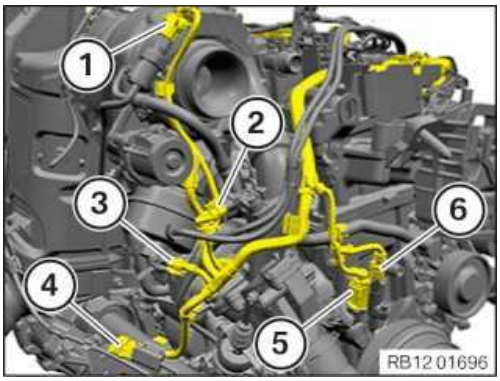


- Unlock and disconnect the connector (1) from the alternator.
- Unlock and disconnect the connector (2) from the electric changeover valve.
- Unlock and disconnect the connector (3) from the electric changeover valve.
- Unlock the connector (4) and pull it off the high pressure pump.
- Unlock the connector (5) and disconnect it from the oil pressure sensor.
- Unlock connector (6) and pull off from throttle body.
- Unlock the connector (7) and disconnect it from the intake air temperature sensor.
- Unlock the connector (8) and disconnect it from the air conditioning compressor.
- Unlock and disconnect the connector (9) from the solenoid valve.
- Unlock the connector (10) and pull it off the crankshaft sensor.



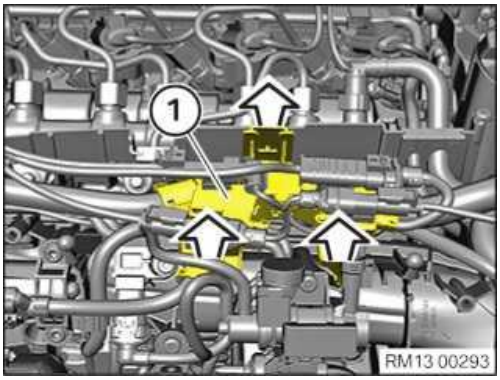
- Unlock the connector (1) and pull off of the oil-level sensor.
- Unlock connector (2) and remove from starter motor.

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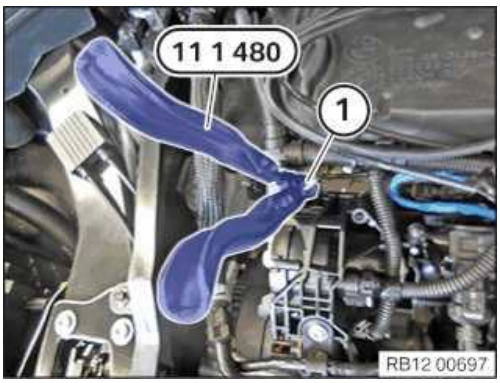


- Unlock the connector (1) and disconnect it from the exhaust gas pressure sensor.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock the connector (3) and pull it off the exhaust turbocharger.
- Unlock the connector (3) and disconnect it from the differential pressure sensor.
- Unlock connector (4) and pull it off from the monitoring oxygen sensor.
- Unlock the connector (5) and pull it off the oil pressure switch .
- Unlock connector (6) and disconnect from switching valve.
- Detach, feed out and remove the wiring harness from the clamps.

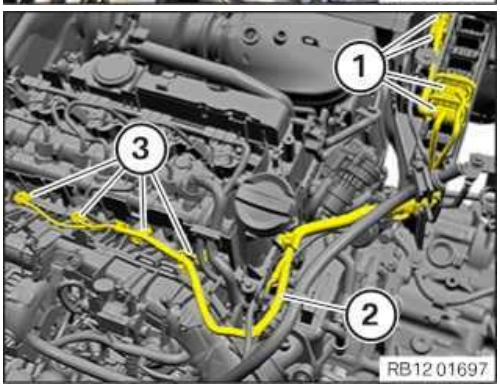
▶ **Removing the cable clips from the intake plenum**



- Detach the cable clip (1) in the direction of the arrow.
- Guide out the cable clip (1) in direction of arrow and set it aside.



- Unlock the connectors (1) of all glow elements with the special tool **0 490 796 (11 1 480)** and release them.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.



- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Pull off all connectors (3) from glow element using special tool **0 490 796 (11 1 480)**.
- Loosen screw (2) and remove the ground strap.
- Detach, feed out and remove the wiring harness from the clamps.

▶ **Removing the drive belt for alternator**

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

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CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

TECHNICAL INFORMATION

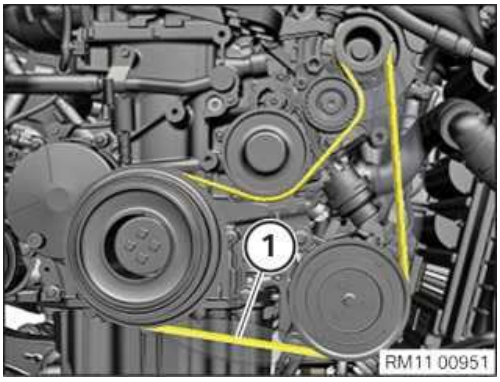
If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

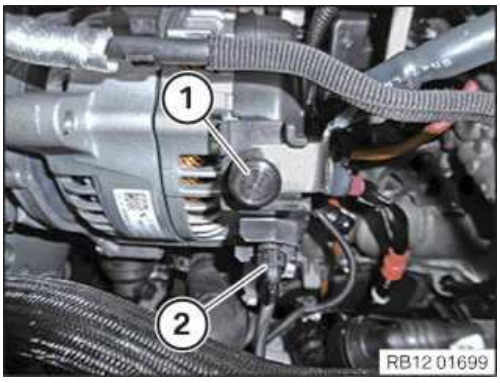
The drive belt must be replaced if contaminated with coolant- and oil residues.



- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool **0 496 268 (11 0 390)**.



- Guide out the drive belt for the alternator (1) and remove it.

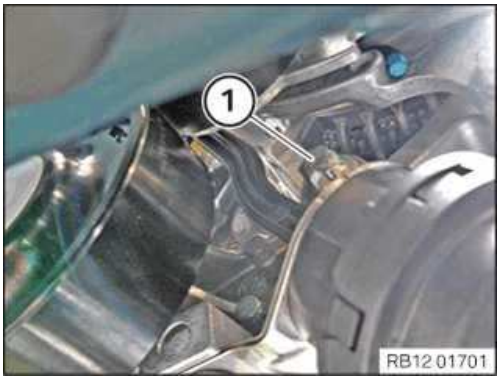


- Remove the cover (1) and loosen the nut below.
- Disconnect positive battery cable from alternator.
- Unlock and disconnect the connector (2) from the alternator.

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- Detach screw (1) on top on the alternator.



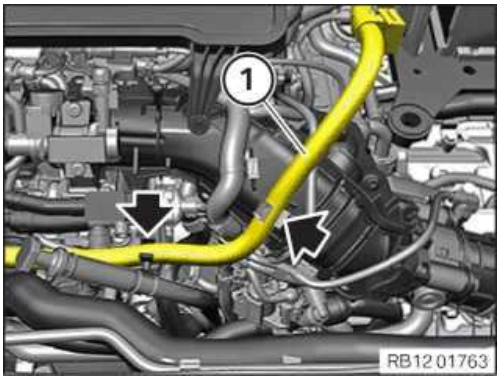
- Detach screw (1) below on the alternator.



- Feed out alternator (1) along with the screw (2) on the bottom of the alternator through the slot on the support and remove.

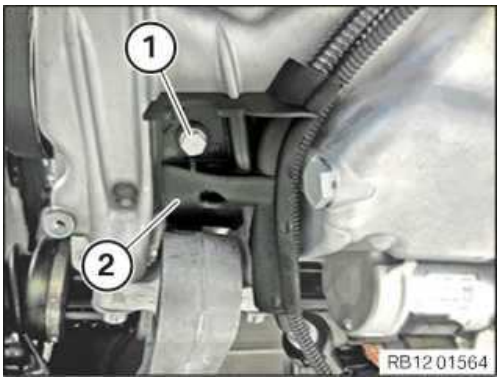


- Loosen screws (1).
- Feed out and remove the air conditioning compressor (2).



- Release the positive battery cable (1) from the clamps (arrows).

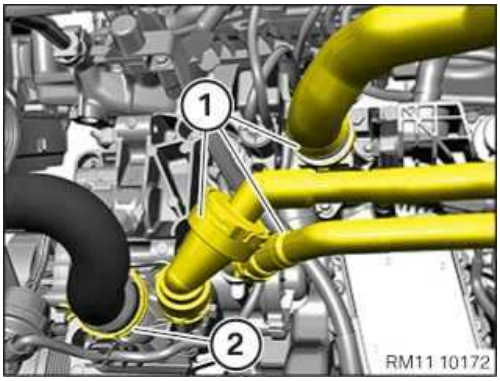
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- Loosen screw (1).
- Guide out and remove holder (2).



- Feed out positive battery cable from the clamps (1) and remove.



- Unlock and disconnect coolant lines (1).
- Guide out the coolant lines (1) and remove it.
- Detach the clamp (2).
- Guide the coolant hose out and remove.

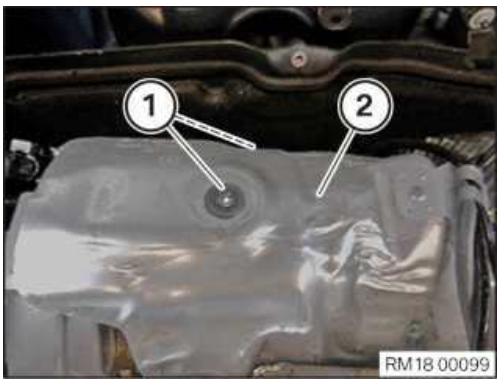
▶ **Removing heat shield from top exhaust turbocharger**

WARNING

Hot surfaces.

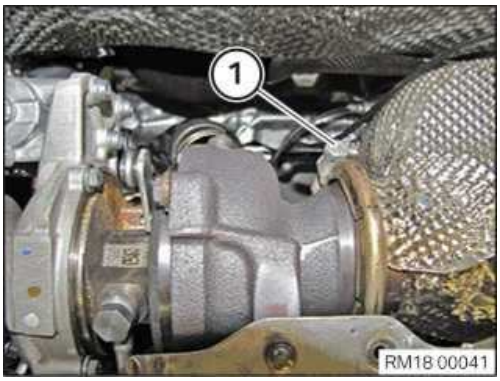
Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from holders.
- Release the screws (1) at the top and bottom of the heat shield.
- Feed out and remove the heat shield (2).

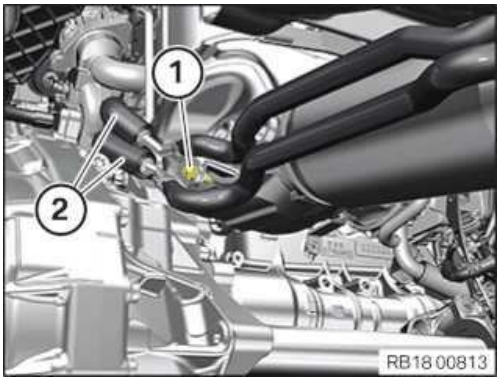
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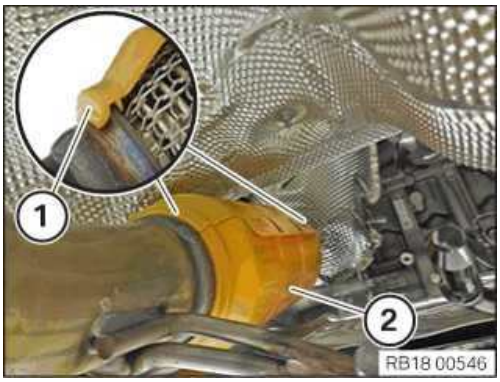
- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.



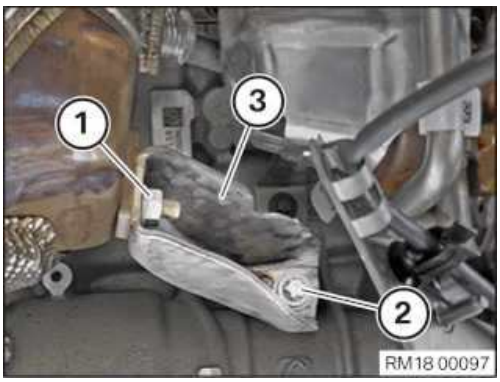
- Loosen nuts (1).



- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.

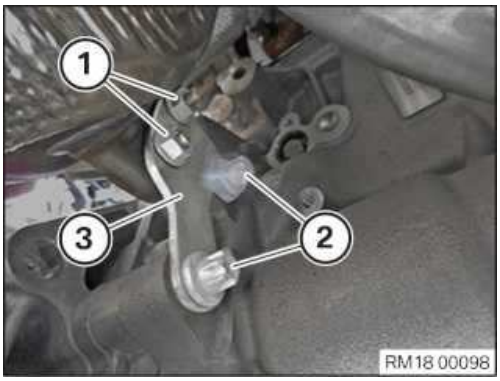


- Mount fitting aid (2).
- Make sure that the fitting aid is correctly position on the edges (1) of the flexible tube.



- Loosen nut (1).
- Loosen screw (2).
- Remove holder (3).

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- Loosen nuts (1).
- Loosen screws (2).
- Remove holder (3).
- Guide out and remove diesel particulate filter .

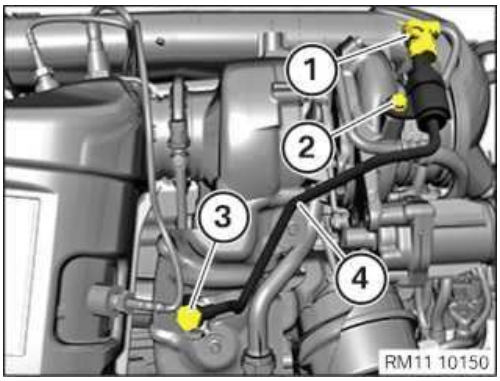
▶ **Remove the heat shield from the exhaust turbocharger at the bottom**

WARNING

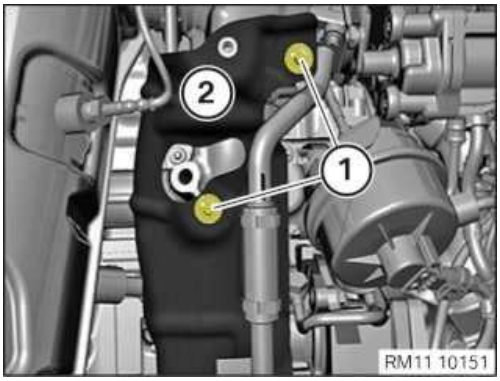
Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Unlock and disconnect connector (1).
- Unscrew the banjo bolt (3).
- The seals of the banjo bolt (3) must be renewed.
- Loosen screw (2).
- Remove the exhaust gas pressure pipe (4).



- Unscrew the bolts (1) on the heat shield .
- Feed out and remove the heat shield (2).

▶ **Removing the exhaust-gas recirculation cooler**

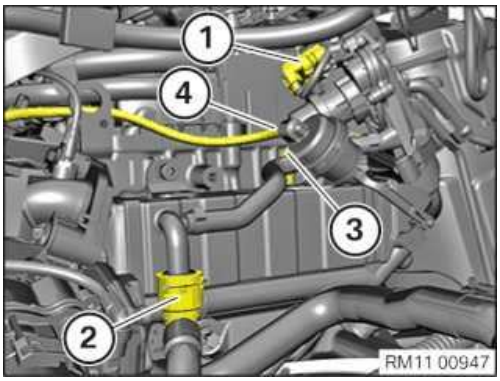
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

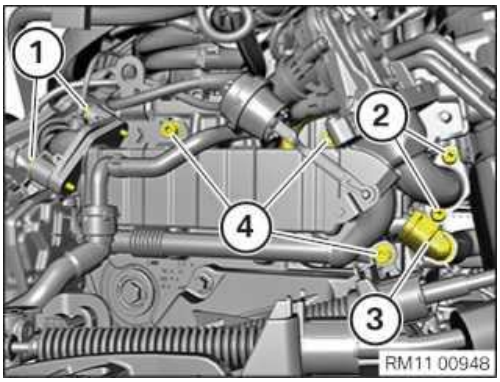
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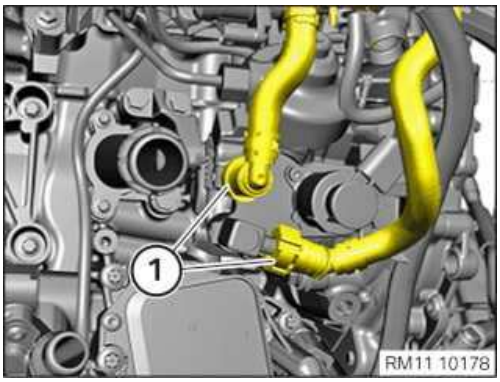
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

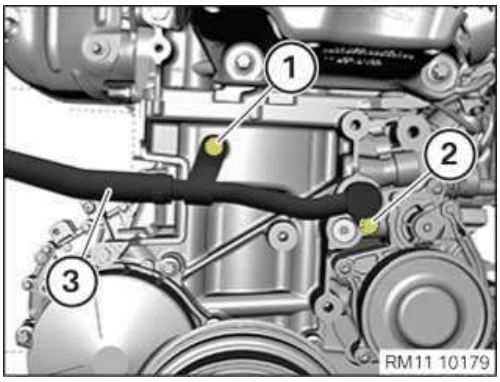
- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.



- Unlock the fuel lines (1) and disconnect from the high pressure pump.
- Remove the fuel lines.



- Loosen screws (1) and (2).
- Remove coolant line (3).

8 – Removing the low-pressure stage turbocharger

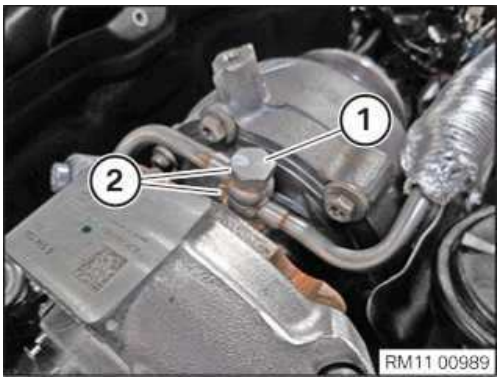
WARNING

Hot surfaces.

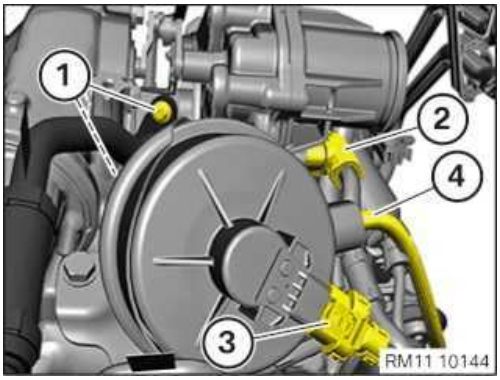
Risk of burning!

- Perform all work only on components that have cooled down.

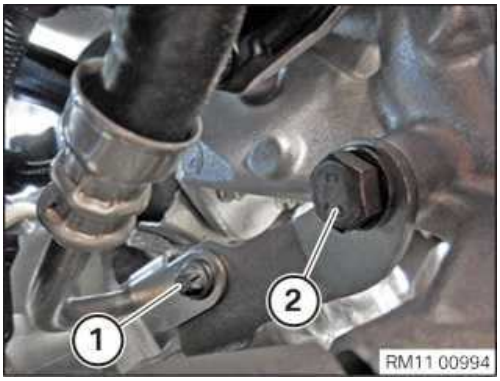
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- Release the banjo bolt (1) of the oil feed lines.
- Remove sealing rings (2).
- Place oil feed lines to one side.



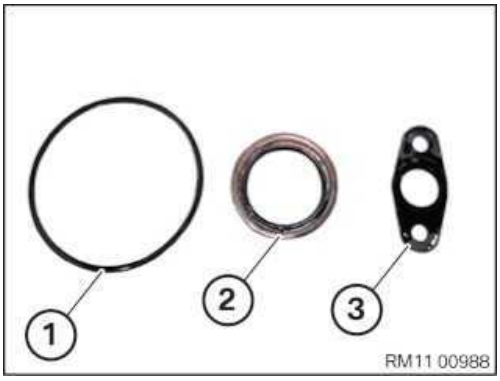
- Release the screws (1) of the oil return line.
- Unlock and disconnect the plug connections (2) and (3).
- Pull off the vacuum hose (4) carefully.



- Undo the bolt (1) of the oil feed line.
- Loosen screw (2).

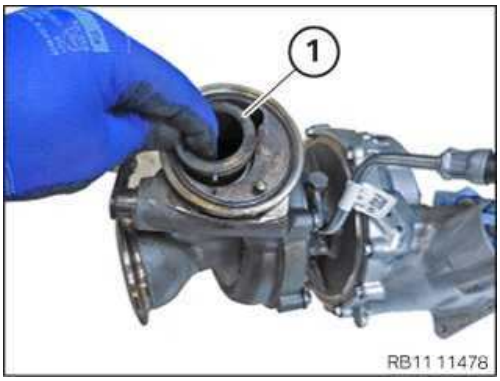


- Loosen screw (1).
- Remove the V hose clamp.
- Guide the low-pressure stage turbocharger out towards the top and remove.



- Remove seals (1), (2) and (3).

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- Remove the spacer ring (1).

9 – Removing the high-pressure stage exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

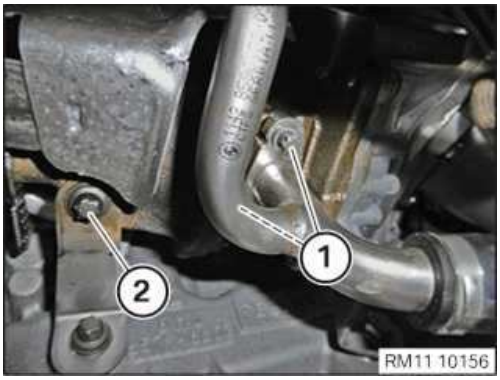
- Perform all work only on components that have cooled down.

CAUTION

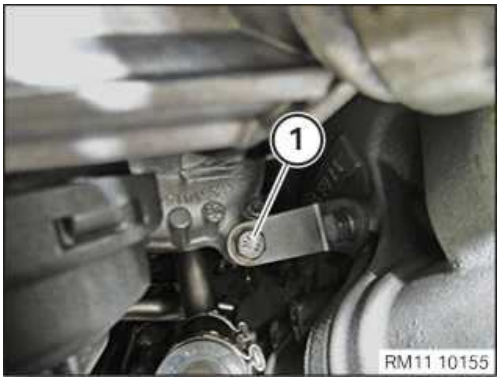
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

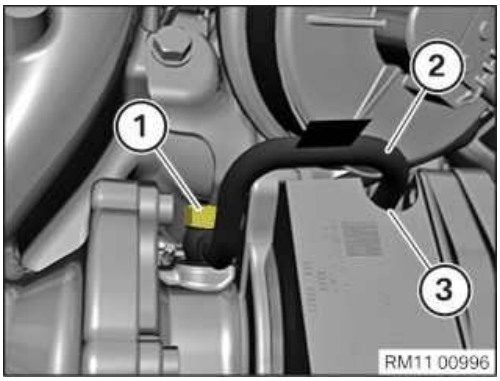


- Unscrew the bolts (1) on the oil return line .
- Loosen screw (2).

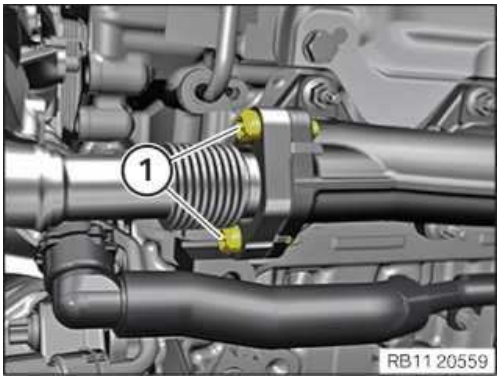


- Release screw (1) from the right wheel arch.

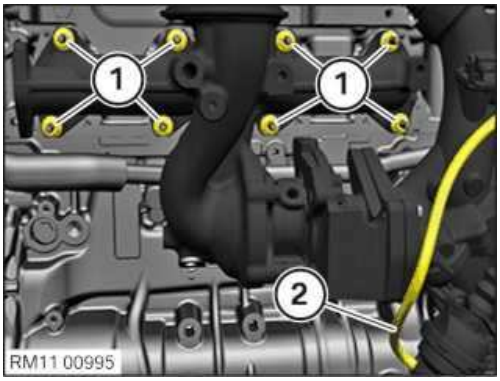
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- Unscrew the banjo bolt (1).
- Guide out oil feed line (2) from holder (3).

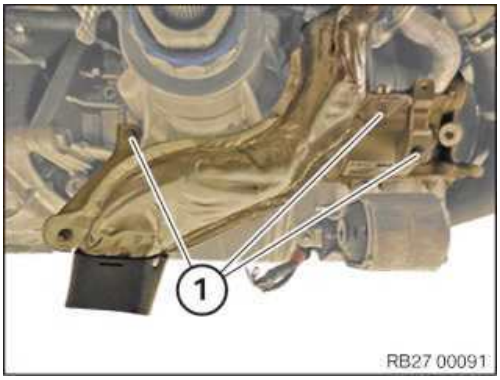


- Loosen screws (1).

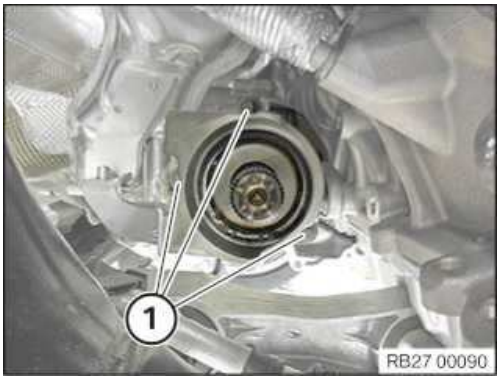


- Pull off the vacuum hose (2).
- Loosen nuts (1).
- Guide out the exhaust manifold and the high-pressure stage exhaust turbocharger to the top and remove them.

10 – Remove the intermediate shaft with the support tube

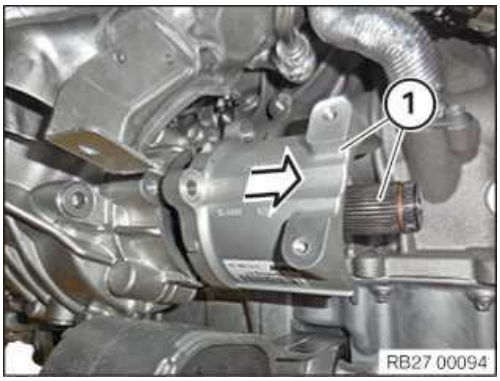


- With air duct installation: Loosen screws (1).
- Remove air duct



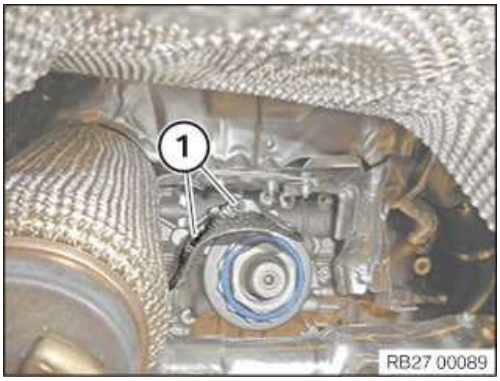
- Loosen screws (1).

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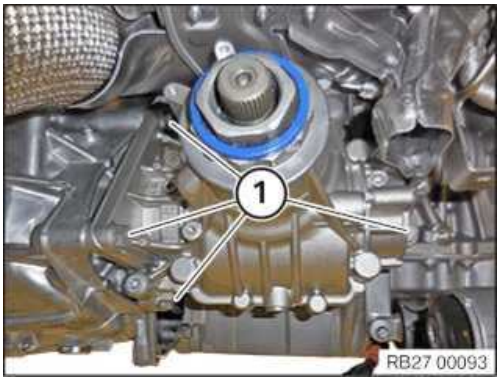


- Pull the intermediate shaft with the support tube (1) out of the transfer box.

11 – Remove transfer box (VTG)



- Loosen screws (1).
- Remove heat shield.



- Loosen screws (1).
- Remove the transfer box (VTG).

12 – Detach the engine from the automatic transmission

Prerequisite

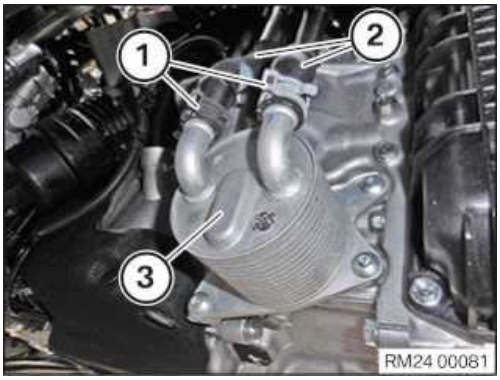
Engine has been removed.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Unfasten hose clamps (1).
- Disconnect coolant hoses (2) from transmission oil cooler (3).
- Catch the emerging coolant.

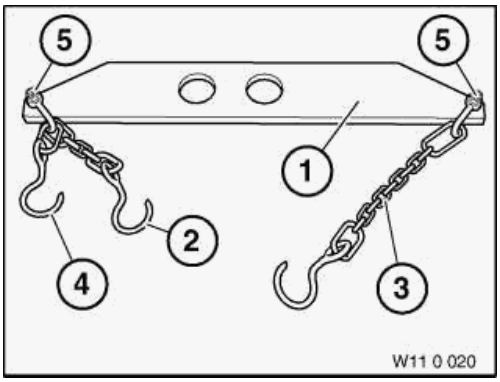
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- Crank engine with special tool **0 493 380 (11 6 480)** at vibration damper in direction of rotation.
- Unscrew the nut (1) of the torque converter.
- Crank engine further and release remaining 5 nuts.



- Stage the workshop crane **2 220 718**.



- Stage the lifting gear .



TECHNICAL INFORMATION

Conduct the following operation with the assistance of a second person.

- Secure the automatic transmission against dropping using a workshop crane **2 220 718** and lifting gear .
- Remove screws (arrows).
- Remove the automatic transmission with help from an auxiliary person and using the workshop crane **2 220 718** including lifting gear and put it to one side.

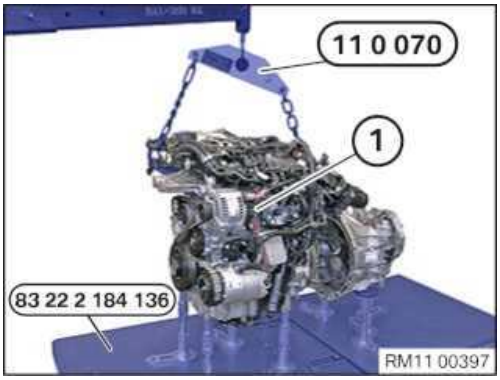
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- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

M8		Tightening torque	21,5 Nm



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Attach engine lifter to special tool and lift engine (1) off lifting table.

13 – Mount engine on assembly stand

CAUTION

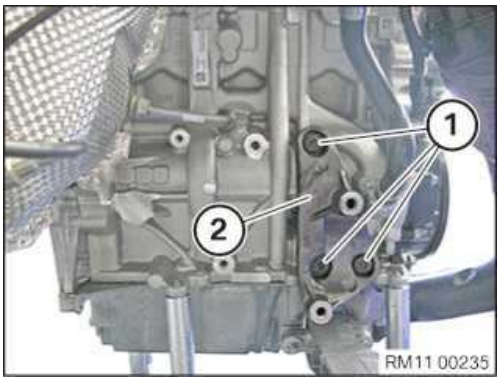
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Loosen screws (1).
- Guide out and remove holder (2).

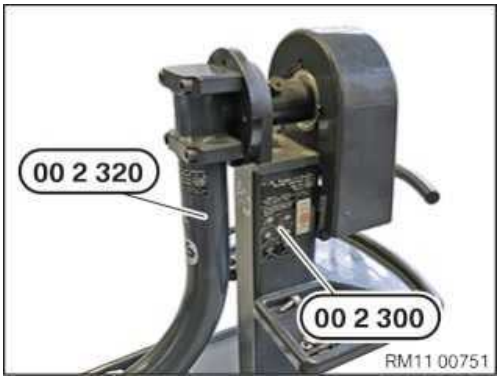
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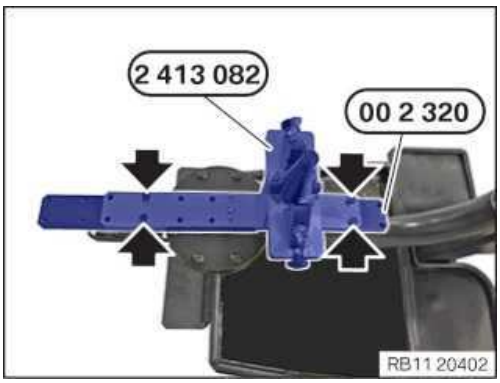
- Position the special tool **2 455 010** on the engine (1).
- Position the standard bolts **M10x30**.
- Tighten the standard bolts (arrows).
-

Special tool 2 455 010 to crankcase

M10x30		Tightening torque	38 Nm



- Prepare the assembly stand **0 495 187 (00 2 300)** with the special tool **0 495 196 (00 2 320)**.



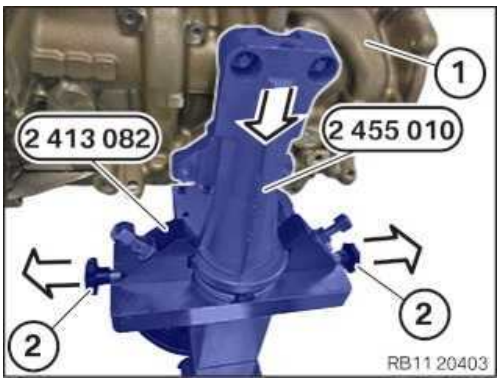
- Screw the special tool to the **0 495 196 (00 2 320)** special tool.
- Tighten screws (arrows).
-

Special tool 11 8 930 to special tool 00 2 320

M14x35		Tightening torque	160 Nm

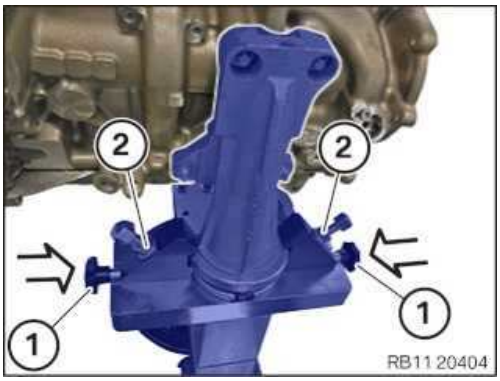


- Position the engine lifter with the special tool and the engine on the special tool **0 495 187 (00 2 300)**.



- Detach the holder (2) in the direction of the arrow.
- Position the engine (1) with the special tool **2 455 010** in the direction of the arrow on the special tool .

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- Lock the holder (1) in direction of arrow.
- Tighten nuts (2).

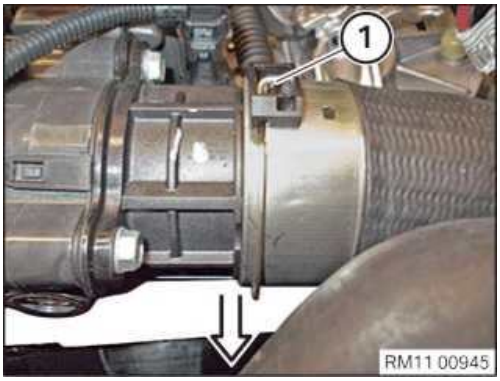
14 – Removing the intake plenum

TECHNICAL INFORMATION

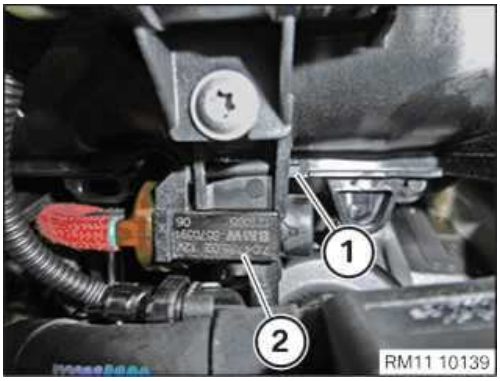
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Unlock the lock (1).

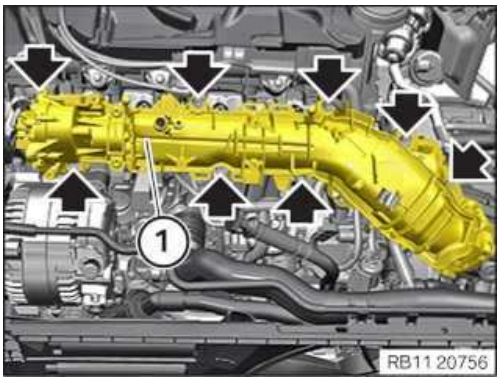


- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.

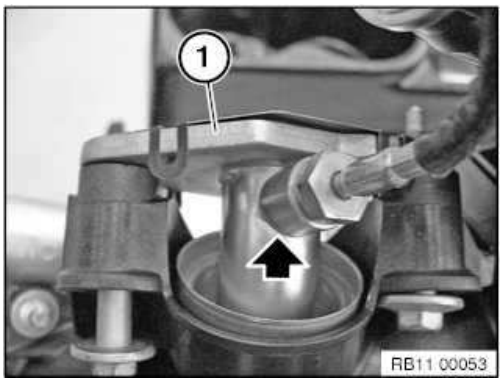


- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.

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- Release the screws (arrows) from the intake plenum (1).
- Guide the intake plenum (1) out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

15 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

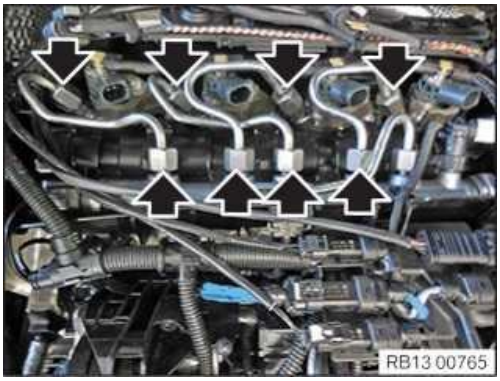
If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release the high pressure lines (arrows) with the special tool .
- Catch and dispose of escaping fuel.
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool .

16 – Detaching leakage oil line from injector

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

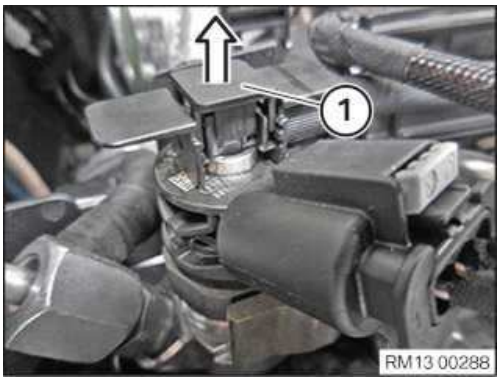
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

17 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

 **Electrostatic discharge.**

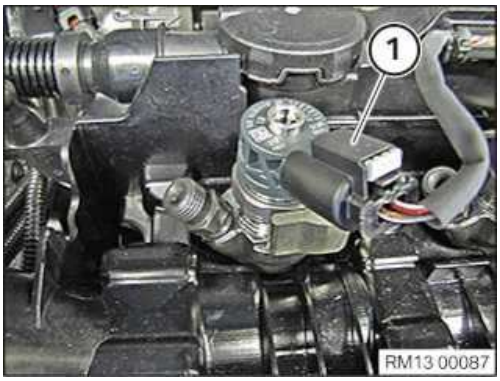
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

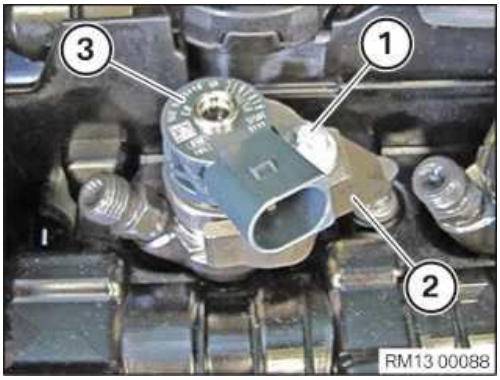
TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.

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- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

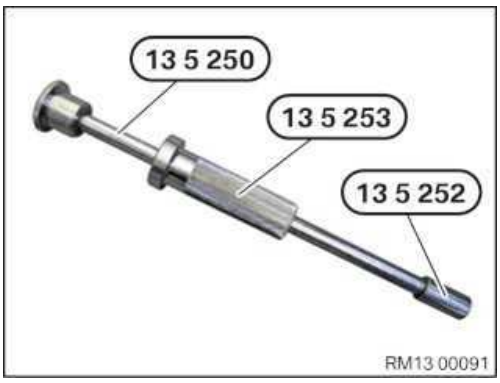
▶ **Loosen stuck injectors**

RISK OF DAMAGE

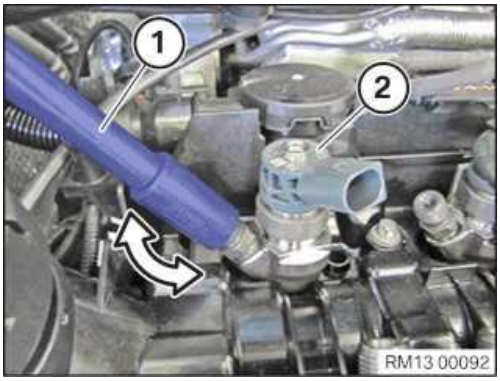
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)** back onto the special tool **0 493 321 (13 5 250)**.



- Screw the special tool (1) **0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1) **0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

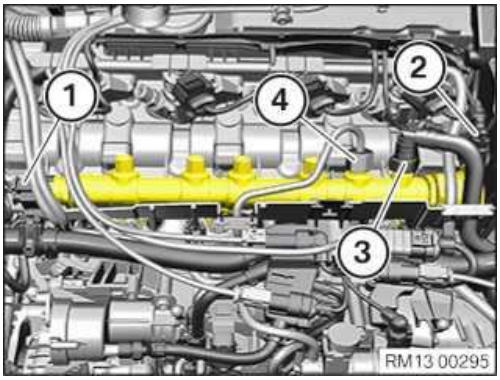
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

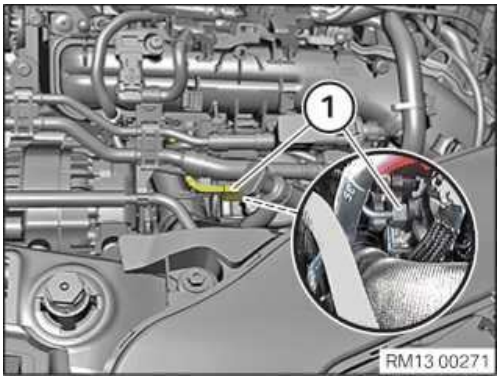
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

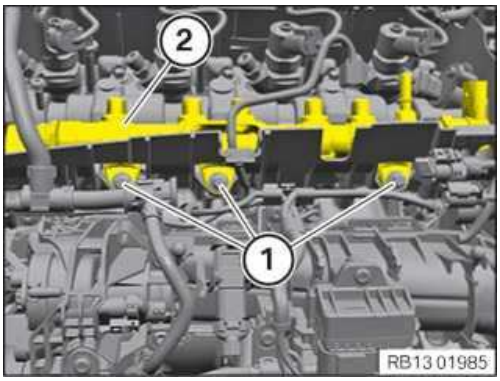


- Unlock and disconnect connector (1).
- Unlock and disconnect connector (2).
- Unlock and release fuel line (3).
- Loosen union nut (4) with special tool .
- Reset special tool early on to avoid bending pressure lines.



- Slacken the union nut (1) on the high pressure pump.

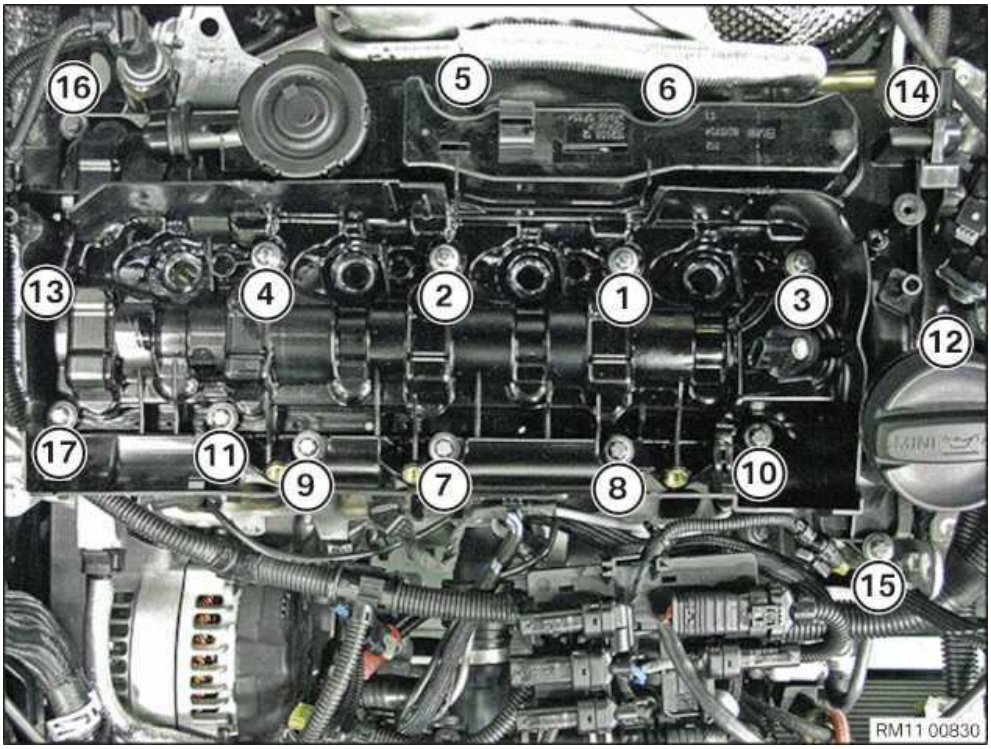
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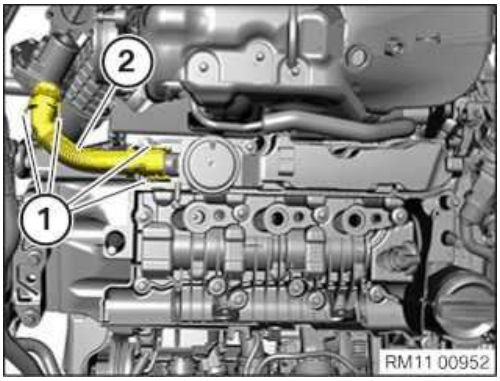
- Loosen screws (1).
- Carefully thread out and remove the rail (2).
- Make sure the pressure line of the high pressure pump is not bent.

19 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover

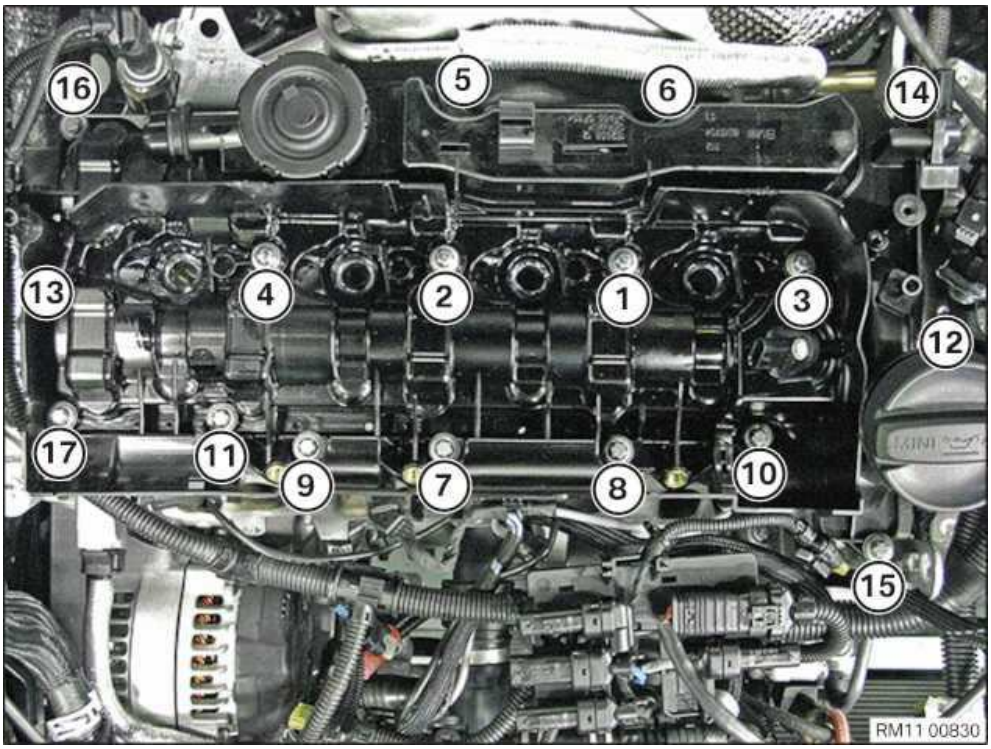


1 to 16 screws of the cylinder head cover.



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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- Loosen screws in the order (17) to (1).
- Remove cylinder head cover by lifting it out.

20 – Checking camshaft timing



- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

Damage to the engine.

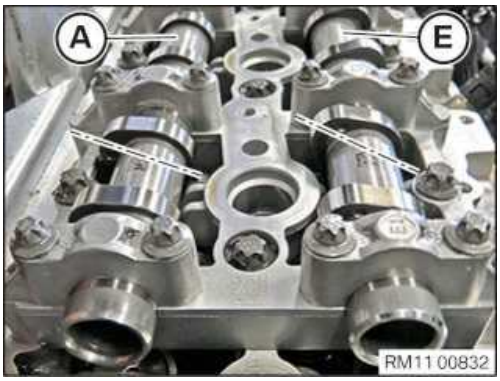
The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

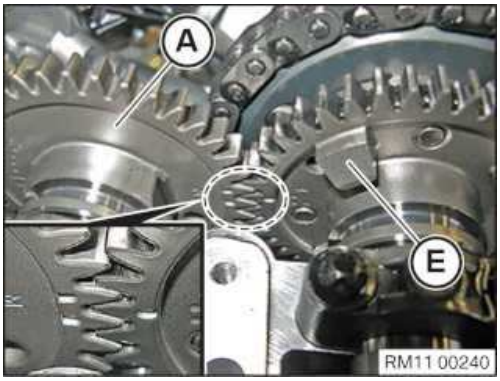
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- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.



- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

21 – Remove chain tensioner piston

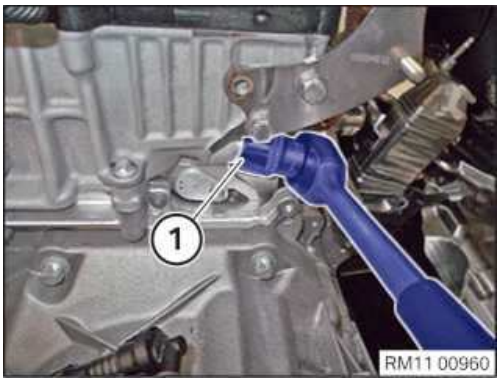
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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

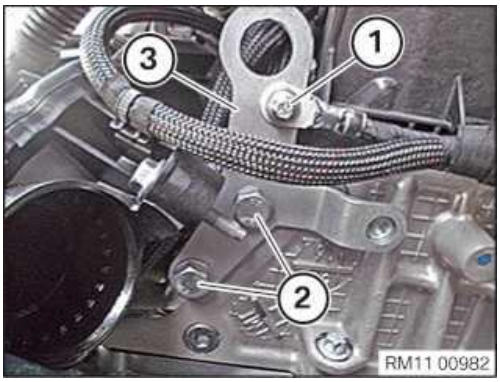


TECHNICAL INFORMATION

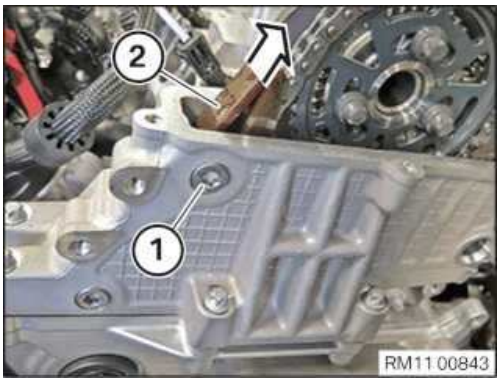
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

22 – Remove the timing chain guide rail

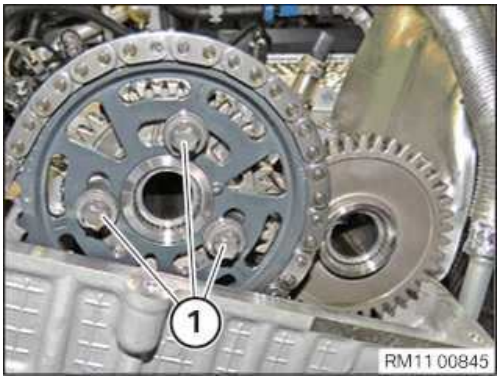


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

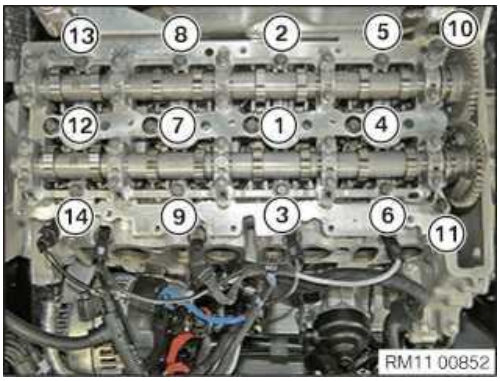
23 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

24 – Removing the camshaft support

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- Evenly loosen all screws in a sequence from (14) to (1).
- Loosen and remove all screws in a sequence from (14) to (1).
  Both camshafts can be removed with the camshaft carrier.
- Remove the camshaft support including camshafts towards the top.

25 – Removing glow elements

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Damage to the glow elements.

Excessive force may damage the glow elements and they may then have to be renewed.

- Handle glow elements with care and do not drop.
- Do not rest the cylinder head on glow elements. Glow elements protrude from the sealing surface of the cylinder head.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

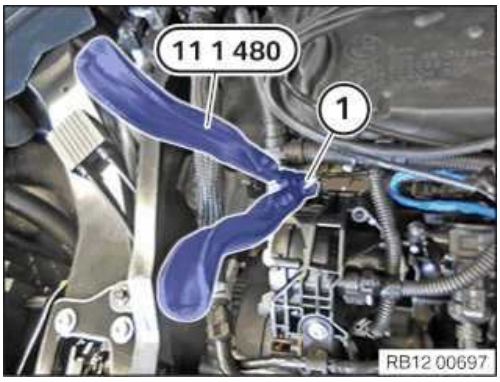
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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

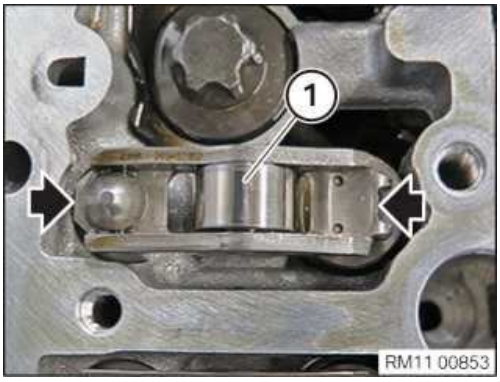


- Unlock and disconnect plug connection (1) using special tool **0 490 796 (11 1 480)**.



- Release the glow elements with the special tool or conventional tools.
- Feed out preheating elements and remove.

26 – Remove roller cam followers



- Guide out and remove all roller cam followers (1) (arrows).
- Place all roller cam followers (1) in order in special tool **0 495 105 (11 4 480)**.

  Roller cam followers that have already been used must be installed in same position again.

27 – Removing the hydraulic valve clearance compensating element

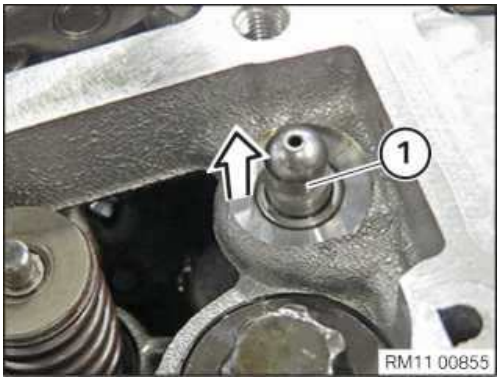
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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Remove the hydraulic valve clearance compensating element (1) in the direction of the arrow and place on the special tool **0 495 105 (11 4 480)**.
- Repeat the process on all hydraulic valve clearance compensating elements.

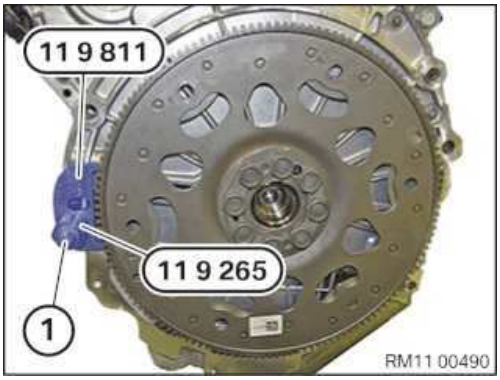
28 – Removing flywheel

CAUTION

Heavy component.

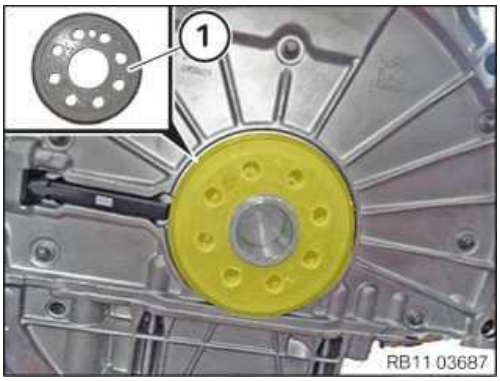
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Secure flywheel with a transmission bolt (1) and the special tools **0 496 171 (11 9 811)** and **0 494 793 (11 9 265)**.
- Unfasten flywheel bolts.
- Remove flywheel.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

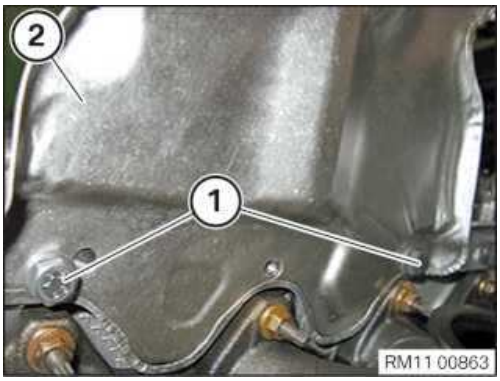
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Remove the increment wheel (1) from the crankshaft and set correctly.

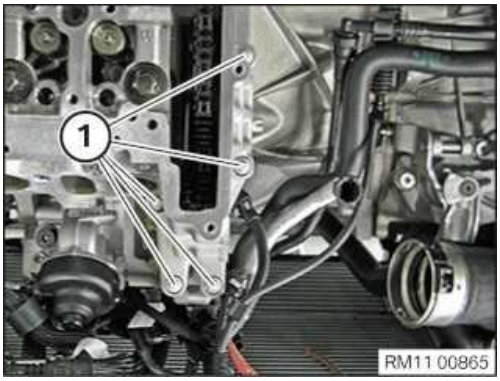
29 – Remove rear timing case cover

Prerequisite

Transmission is removed.



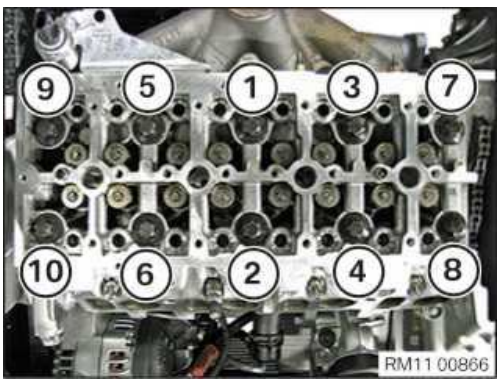
- Loosen screws (1).
- Feed out the heat shield (2) and place to one side.



TECHNICAL INFORMATION

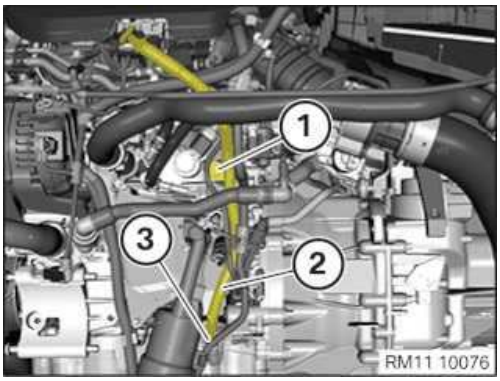
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screws (1).

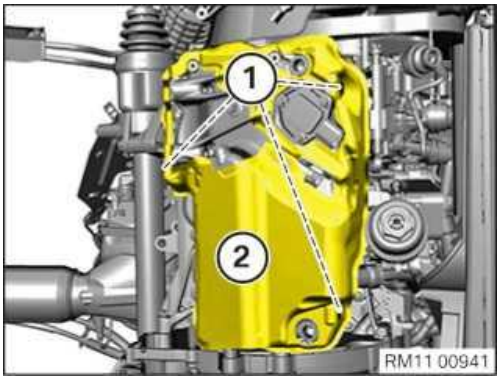


- Loosen the cylinder head bolts in the sequence from (10) to (1).
- Remove cylinder head bolts (1) to (10) with washers.
- Remove cylinder head.

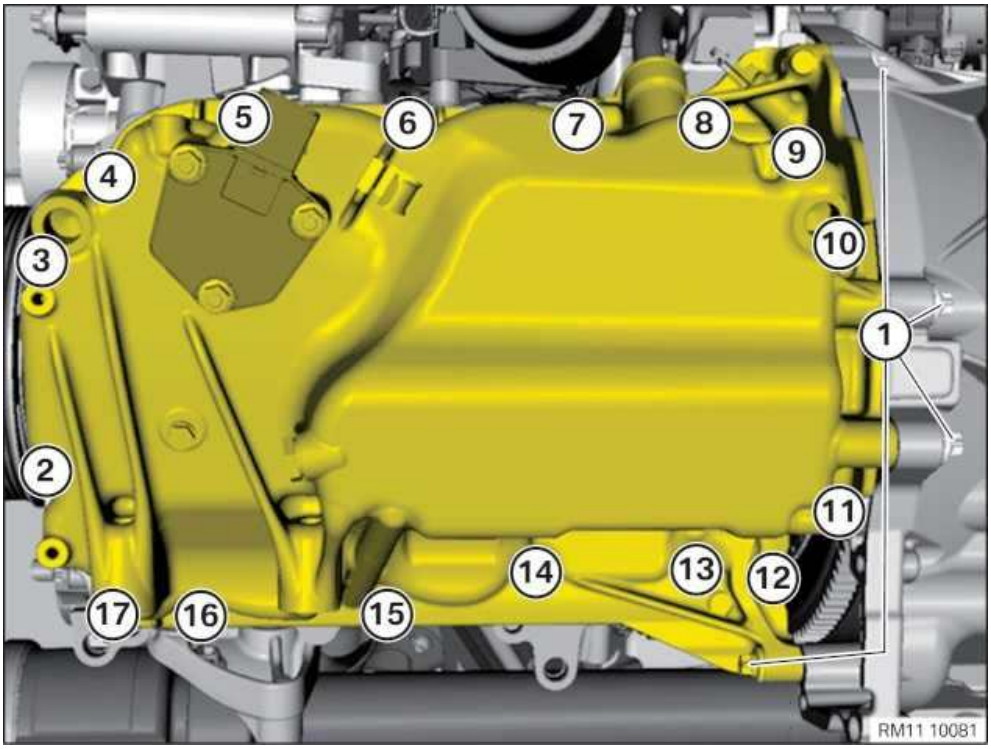
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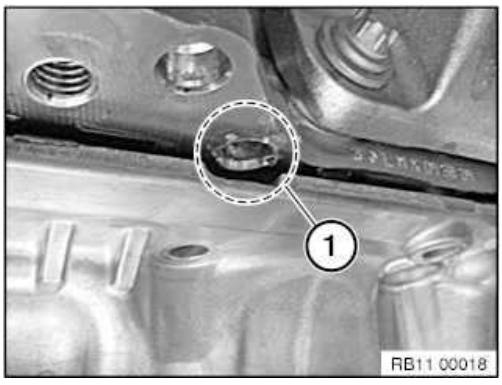
- Loosen screw (1).
- Disconnect the guide tube (2) for the oil dipstick toward the top from the oil sump and remove it.
- Remove sealing ring (3) from oil sump if necessary.



- Expanding rivets (1) on both sides of the acoustic cover (2).
- Feed out and remove the acoustic cover (2).

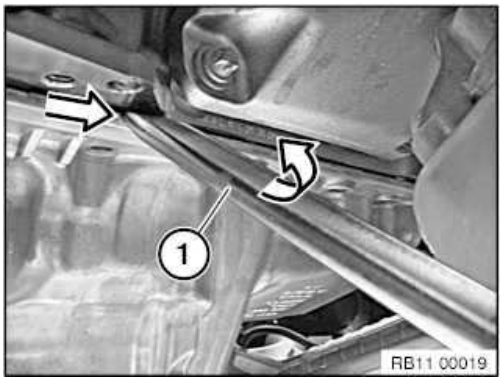


- Loosen the transmission bolts (1) on the oil sump.
- Loosen screws (2) to (17).



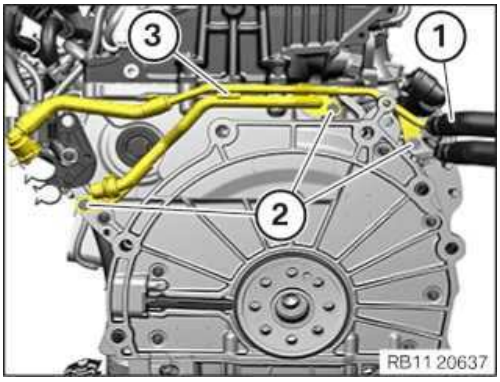
- Release oil sump only in area (1).

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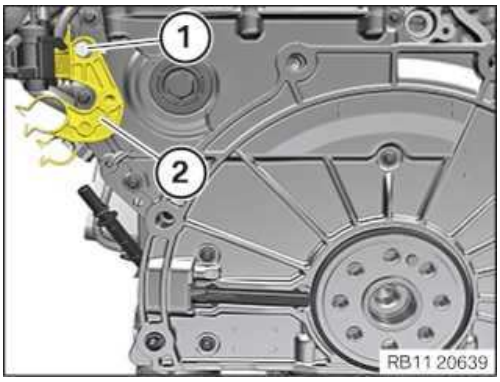


- Detach the oil sump with a suitable mounting lever (1) carefully at the point provided.
- Secure the oil sump against falling.

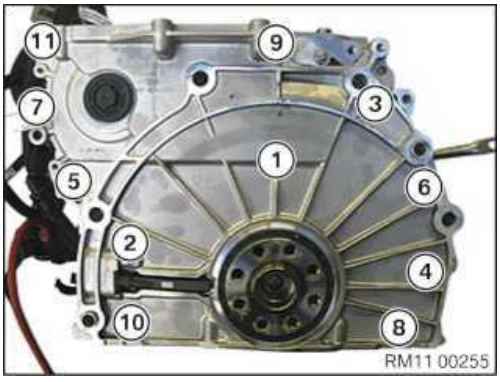
▶ **If installed: Remove coolant line of the SCR metering module**



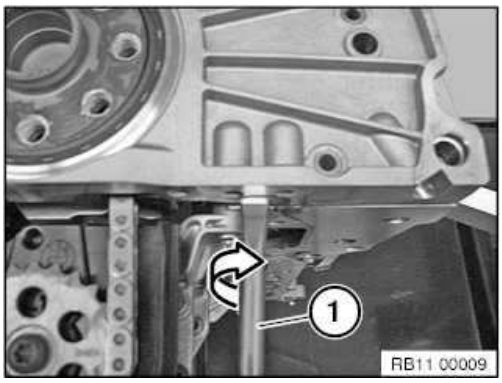
- Unlock and disconnect the coolant hose (1).
- Loosen screws (2).
- Remove the coolant line (3).



- Loosen screw (1).
- Guide out and remove holder (2).

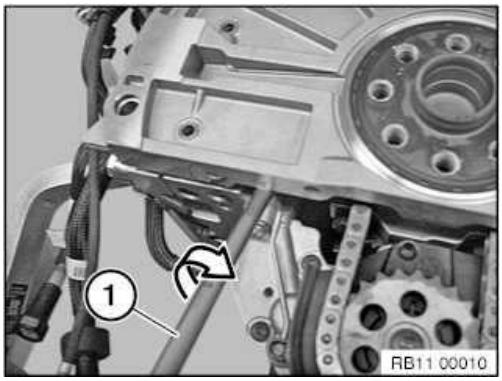


- Loosen screws in the order (11) to (1).



- Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.

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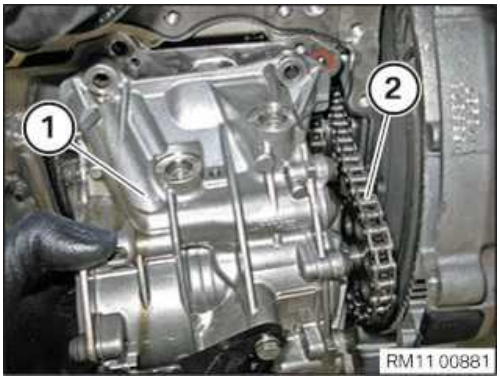


- Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.
- Remove the timing case cover.

30 – Remove the oil vacuum pump



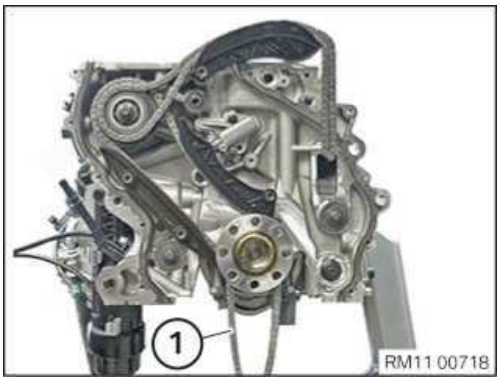
- Loosen screws (1) of the oil vacuum pump (2).



- Remove oil vacuum pump (1) and remove from the drive chain (2).

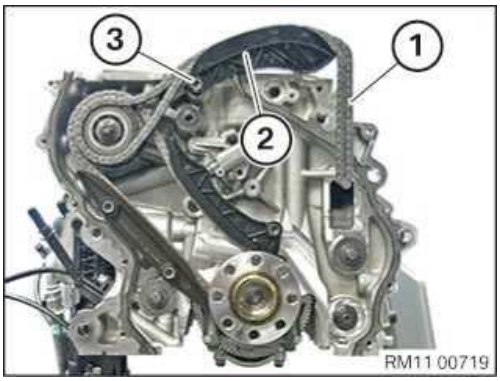
MAIN WORK

31 – Remove both timing chains



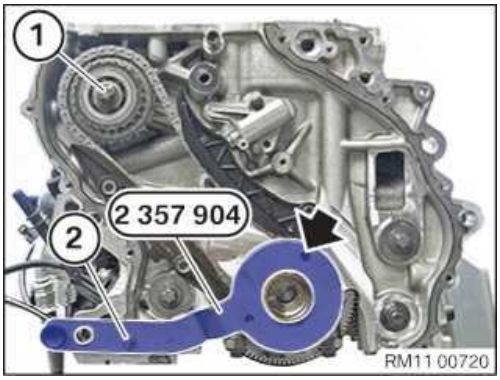
- Remove drive chain (1) for oil pump.

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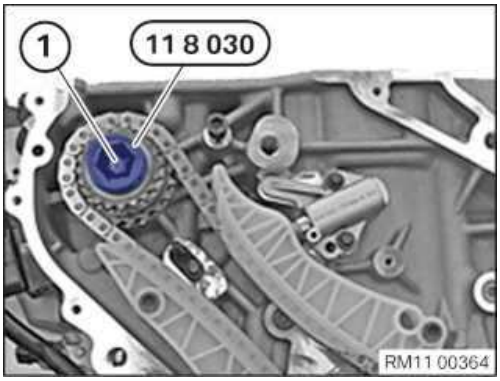


- Remove the timing chain (1) for the camshafts.
- Remove the tensioning rail (2) from the bearing journal (3).

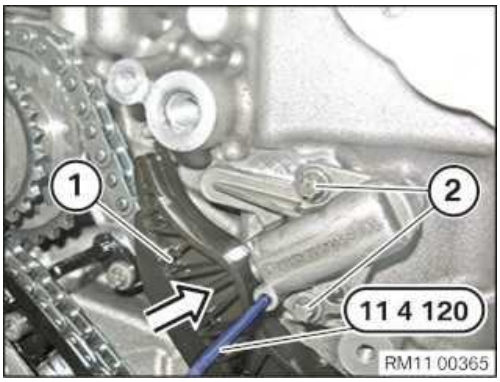
  Bearing journal (3) does not have to be disassembled.



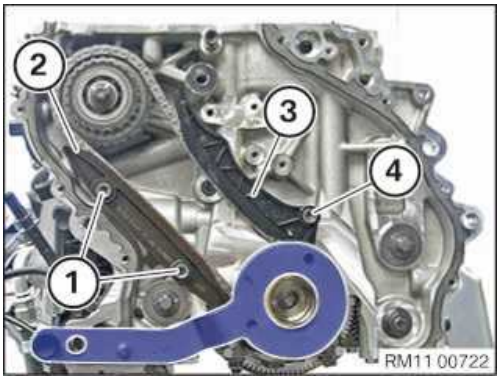
- Secure crankshaft to release central bolt (1) of high pressure pump.
- Position crankshaft with guide pin (arrow).
- Secure special tool **2 357 904** with bolt (2) on crankcase.
- Release central bolt (1) of high pressure pump; do not remove.



- Screw special tool **0 496 725 (11 8 030)** into sprocket of high pressure pump.
- Unscrew central bolt (1) of high pressure pump until central bolt can be supported on special tool **0 496 725 (11 8 030)**.
- Continue turning central bolt (1) until camshaft sprocket is released from high pressure pump shaft.



- Press chain tensioner in with tensioning rail (1) by hand in the direction of the arrow until the special tool **0 491 012 (11 4 120)** can be positioned.
- Loosen screws (2).
- Remove chain tensioner.

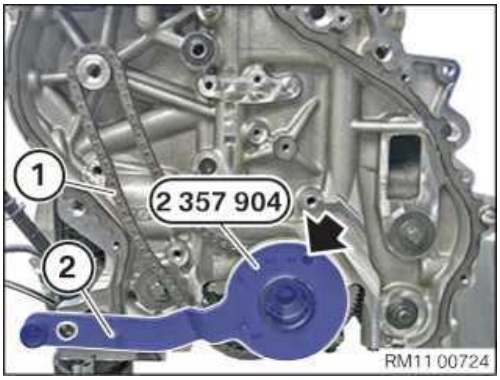


- Loosen both bearing journals (1).
- Remove the guide rail (2).
- Loosen the bearing journals (4).
- Remove the tensioning rail (3).

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- Remove bolt and camshaft sprocket (1) of high pressure pump.

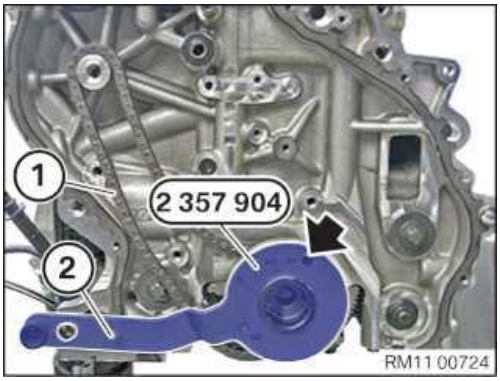


NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Unscrew the bolt (2) and remove the special tool **2 357 904**.
- Remove the timing chain (1).

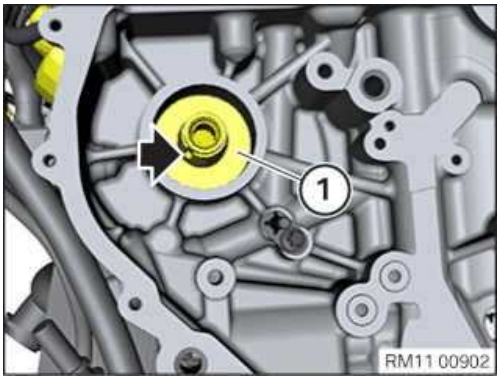
32 – Install both timing chains



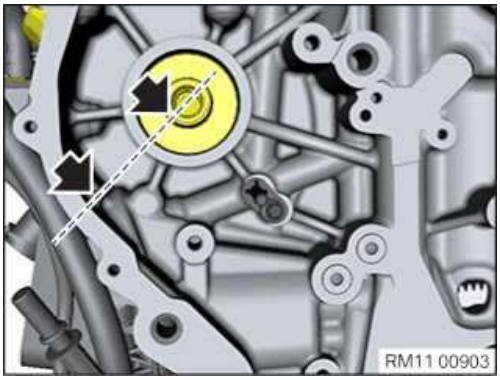
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Position the timing chain (1).
- Secure crankshaft with special tool **2 357 904**.
- Secure special tool **2 357 904** with bolt (2) on crankcase.

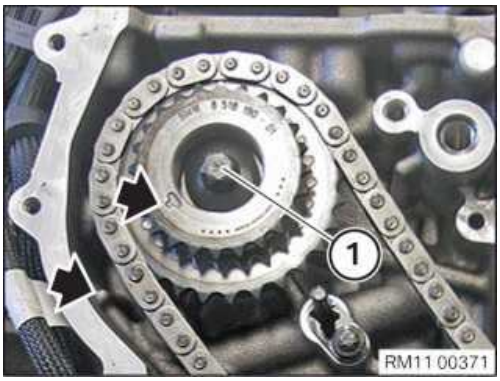


- Note spline groove on high pressure pump (1).

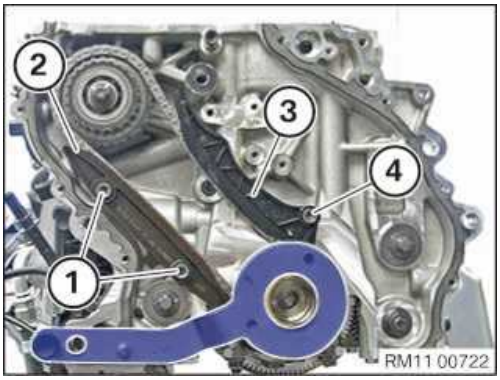


- Mark and groove (arrows) on high pressure pump and crankcase must align.

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- Position the impeller with timing chain on the high pressure pump.
- Screw in and fasten central bolt (1) of high pressure pump.
- Mark and cast lug (arrows) must align.



- Position tensioning rail (3).
- Replace bearing journal.

  Parts: Bearing journal
- Tighten the bearing journals (4).

Bearing journal of tensioning and guide rail

M8	*Replace bearing journal.*	Tightening torque	20 Nm

- Position the guide rail (2).
- Replace bearing journal.

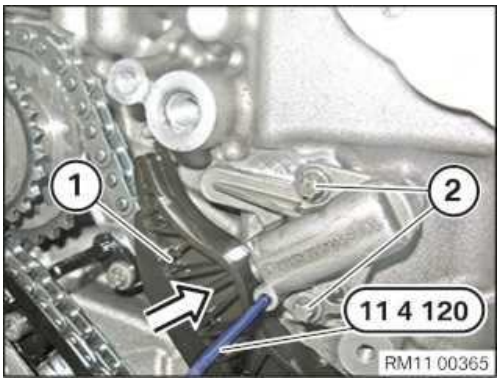
  Parts: Bearing journal
- Tighten both bearing journals (1).

Bearing journal of tensioning and guide rail

M8	*Replace bearing journal.*	Tightening torque	20 Nm



- Clean sealing surfaces (1) with compressed air.



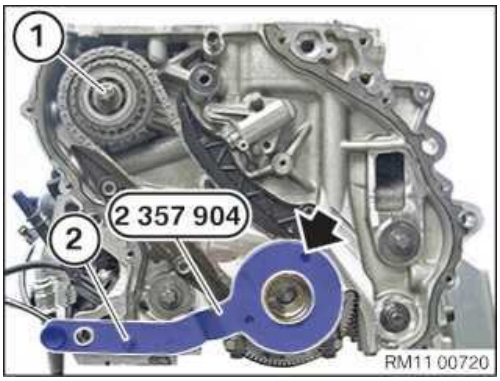
- Position hydraulic chain tensioner.
- Tighten down screws (2).

Chain tensioner to crankcase

M6x22		Tightening torque	10 Nm

- Press chain tensioner in by hand with tensioning rail (1) in direction of arrow until special tool **0 491 012 (11 4 120)** can be removed.

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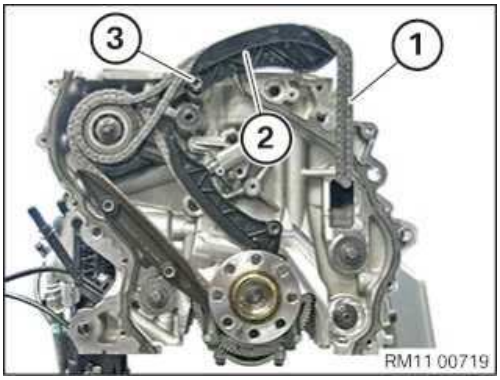


- To fasten central bolt (1) of high pressure pump, crankshaft must remain secured with special tool **2 357 904** and bolt (2).
- Renew central bolt (1).

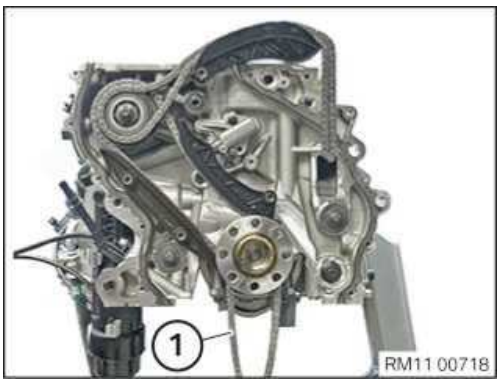
  Parts: Central bolt
- Tighten central bolt (1).

Camshaft sprocket on high pressure pump

M12		Tightening torque	65 Nm



- Position tensioning rail (2) on bearing journal (3).
- Position camshaft timing chain (1).



- Mount drive chain (1) for oil pump on crankshaft.

POSTPROCESSES

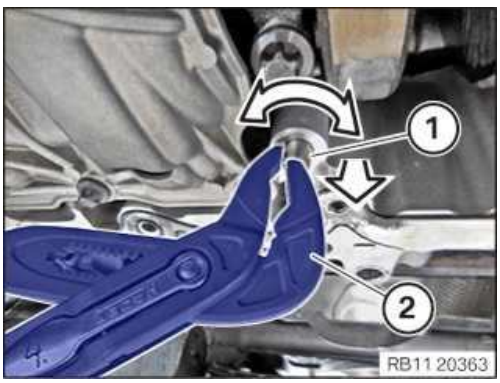
33 – Install the oil vacuum pump

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

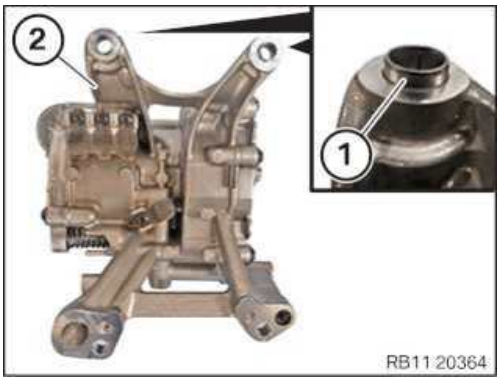
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Remove centering sleeves from the crankcase (1) using a standard tool (2).
- Renew the centring sleeves (1).

  Parts: Centring sleeves

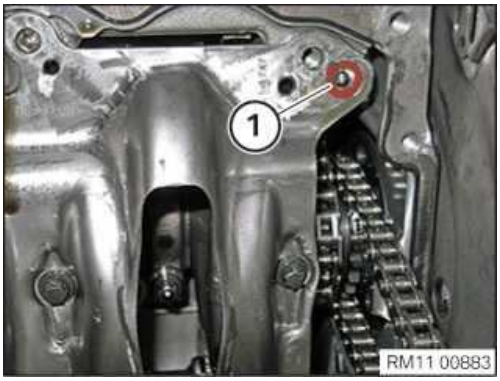
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- Install centering sleeves (1) in the oil vacuum pump (2).

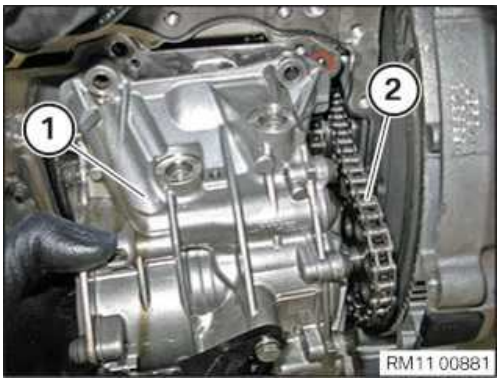


- Check the sealing ring (1) for damage and renew where required.
- Make sure the sealing ring (1) is installed correctly.



- Check sealing ring (1) for damage and replace oil deflector if necessary.

  Parts: Oil deflector



- Insert oil vacuum pump (1) into the drive chain (2).



- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1) of the oil vacuum pump (2).

Oil vacuum pump to crankcaseB47

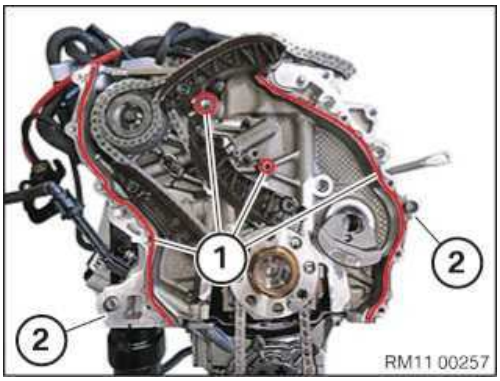
M8x35		Tightening torque	19 Nm

34 – Install the rear timing case cover

Prerequisite

Transmission is removed.

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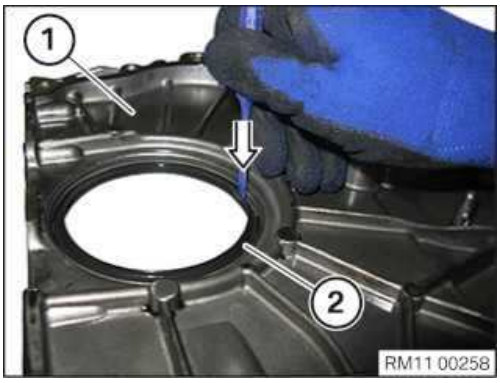
RISK OF DAMAGE

Damage to the surface.

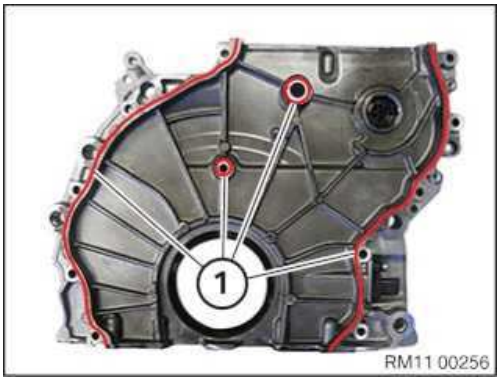
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

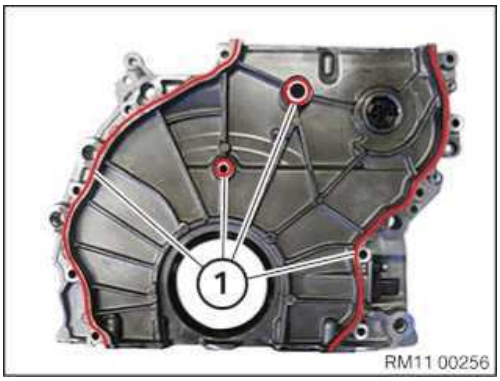
- Remove seal residue from the sealing surfaces (1) using special tool **0 495 102 (11 4 470)**.
- Check fitting sleeves (2) for damage and for tight fit; renew if necessary.



- Position the timing case cover (1) underneath.
- Position punch on inner side of crankshaft seal (2).
- Drive out crankshaft seal (2) outwards.



- Remove seal residue from the sealing surfaces (1) using special tool **0 495 102 (11 4 470)**.

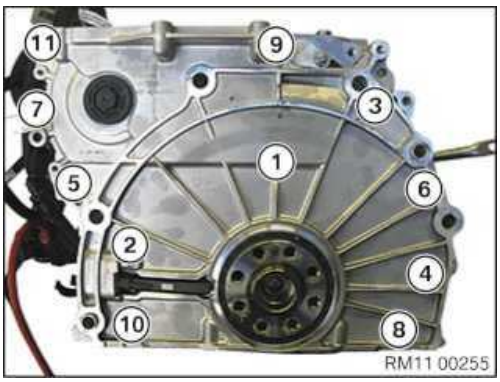


TECHNICAL INFORMATION

For more information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

- Apply sealing bead (1) with a height of approx. 1.5 mm to 2.0 mm on inner side of timing case cover in marked locations. Use liquid sealing compound for this.

  Application time of sealing bead (1) must not exceed 12 minutes.



- Mount the timing case cover without the crankshaft seal.
- Renew screws (1) to (11).

  Parts: Bolts
- Join the bolts in with the sequence (1) to (11).
- Tighten screws in the order (1) to (11).

Rear timing case cover to crankcase

M6	Renew screws.	Jointing torque	8 Nm
		Angle of rotation	90 °

▸ **Installing the rear crankshaft seal**

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RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) on the radial shaft seal with the sharp-edged connector gearing of the output shaft will result in destruction and/or leaks.

- When inserting the output shaft, make sure that the connector gearing of the output shaft does not touch the sealing lip (inner) of the radial shaft seal.

RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) and applying oil to the radial shaft seal will lead to its destruction.

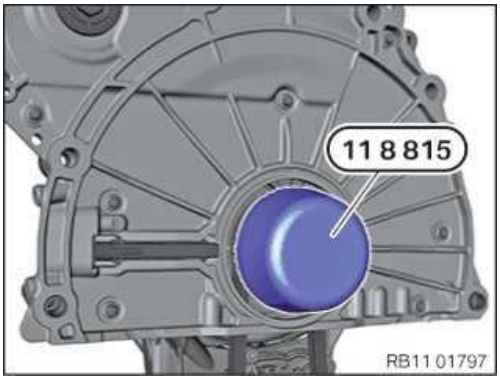
- Do not touch the sealing lip (inner) of the radial shaft seal.
- Do not apply oil to the radial shaft seal.
- Install the radial shaft seal dry.

RISK OF DAMAGE

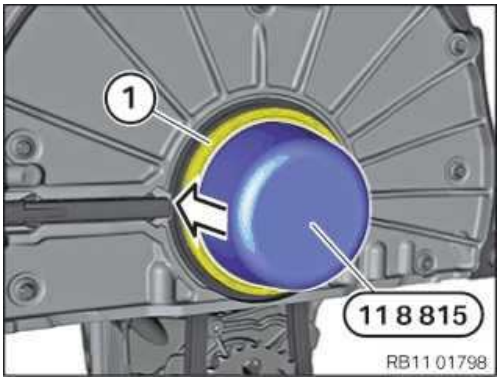
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Position special tool **0 496 137 (11 8 815)** on crankshaft. Make sure that the crankshaft sensor is not damaged.



- Fit the crankshaft seal (1) up to the timing case cover in the direction of the arrow using special tool **0 496 137 (11 8 815)** and position.
- Remove special tool **0 496 137 (11 8 815)**.

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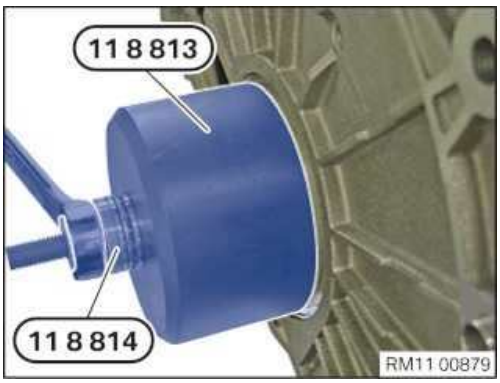


- Secure special tool **0 496 133 (11 8 811)** to the crankshaft using special tool **0 496 134 (11 8 812)**.

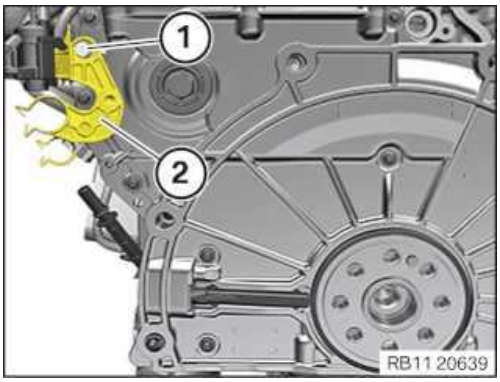


- Check the freedom of movement between the special tool **0 496 135 (11 8 813)** and the crankshaft sensor during installation.

  Otherwise there is a risk that the crankshaft sensor will be damaged.
- Slide on special tool **0 496 135 (11 8 813)**.
- Screw down special tool**0 496 136 (11 8 814)**.

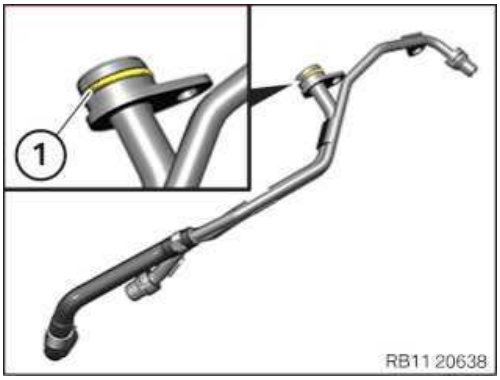


- Press in crankshaft seal with special tool **0 496 135 (11 8 813)**.
- Screw in special tool **0 496 135 (11 8 813)** up to timing case cover.



- Insert and install the holder (2).

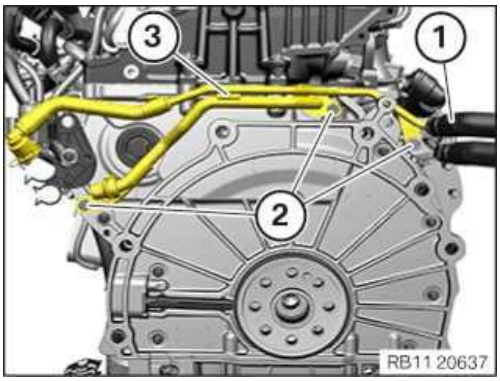
▶ **If installed: Installing the coolant line of the SCR metering module**



- Renew the O-ring 1.

  Parts: O-ring

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- Feed in and install coolant line (3).
- Tighten down screws (2).

SCR coolant lines to crankcase end cover

Hexagon screw M6x16		Tightening torque	8 Nm

- Connect and lock the coolant line (1).

  Coolant line (1) must audibly engage.

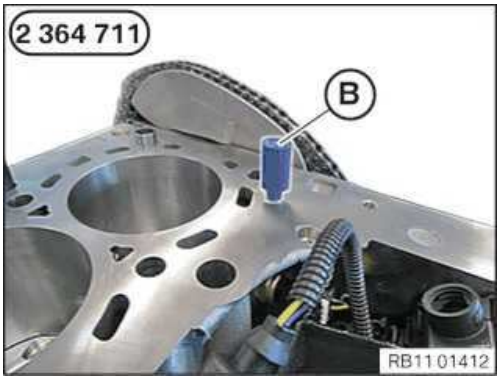
▸ **Cleaning the sealing surface**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Lock the front oil duct using special tool (B) from special tool **2 364 711**.



RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 103 (11 4 471)**.



RISK OF DAMAGE

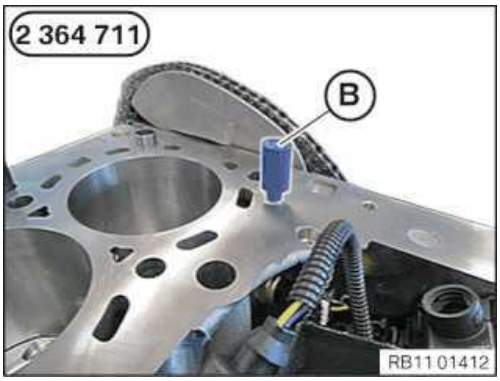
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

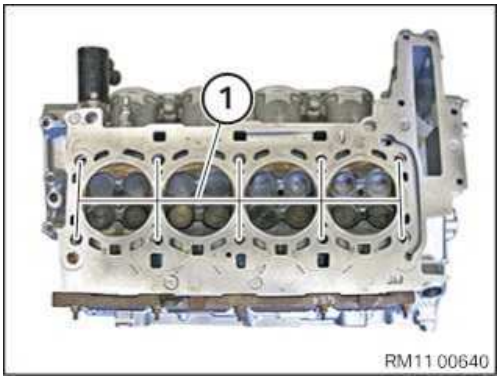
- Clean the sealing surface using special tool **0 495 104 (11 4 472)**.

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- Remove special tool (B).

▶ **Renewing the cylinder head gasket**



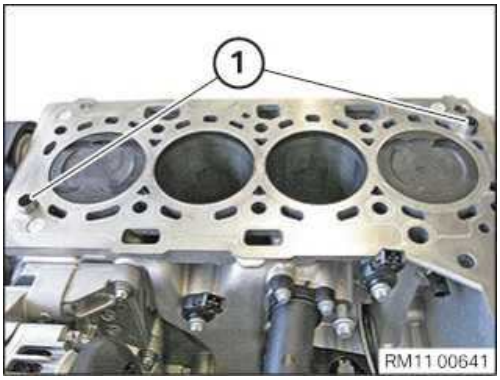
RISK OF DAMAGE

Damage to the surface.

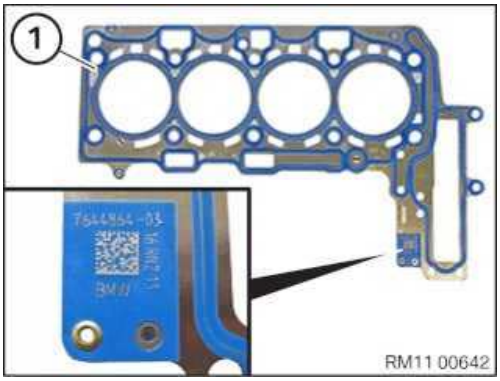
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Remove oil and dirt residue from the blind holes (1).

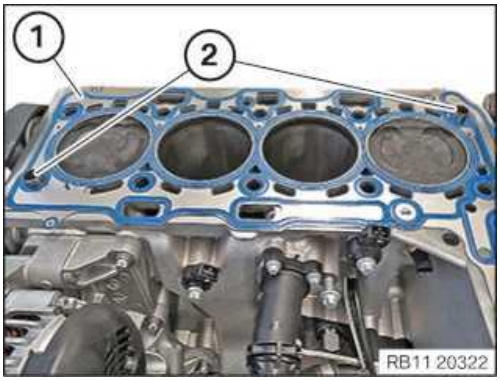


- Check the fitting sleeves (1) for secure fit and damage.



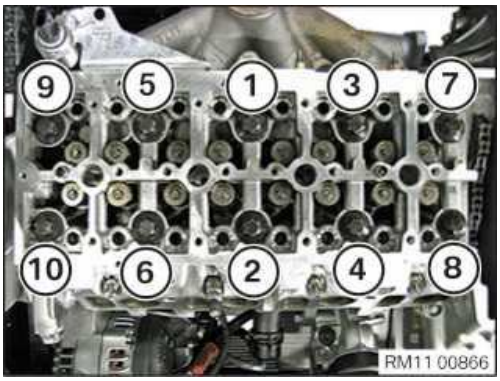
- Identify the cylinder head gasket (1) using the part number.

Note: If the cylinder head is reworked, an additional thicker gasket 0.3 mm is available for service personnel.



- Guide in the cylinder head gasket (1) and install.
- Ensure that the cylinder head gasket (1) is installed correctly in the fitting sleeves (2).

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CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Damage to threads.

Fluid in the threaded hole may damage the thread when screws are tightened in the threads.

- Dry threaded holes (e.g. using compressed air).

TECHNICAL INFORMATION

Do not remove bolt coating.

- Renew the cylinder head bolts (1).

  Parts: Cylinder head bolts
- Do **not** wash off coating of cylinder head bolts.
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

  No coolant, water or engine oil must be present in threaded holes of engine block.

TECHNICAL INFORMATION

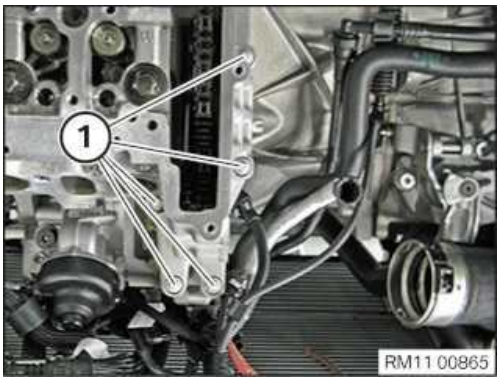
When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Feed in cylinder head bolts and install.
- Screw in cylinder head bolts in sequence (1) to (10).
- Tighten cylinder head bolts using special tools **0 490 504 (00 9 120)** and in sequence (1) to (10).

Cylinder head to crankcase

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

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- Tighten the cylinder head bolts (1).

Cylinder head bolt to timing case cover

M8x40		Tightening torque	19 Nm

-



TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

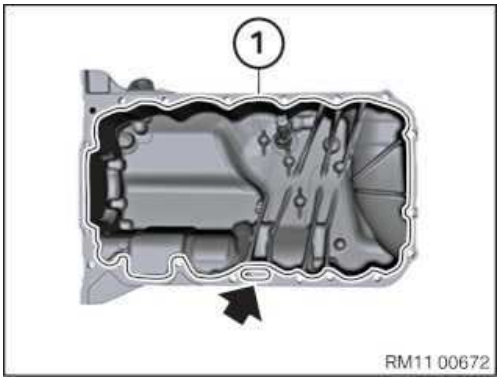
- Remove fine sealing remains on the sealing surface (1)and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.



TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove coarse sealing remains on the sealing surface (1)and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.



TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- Apply the sealing compound along the line (1) with a thickness of 2 mm to 2.5 mm.

  Apply the sealing compound along the inner edge.

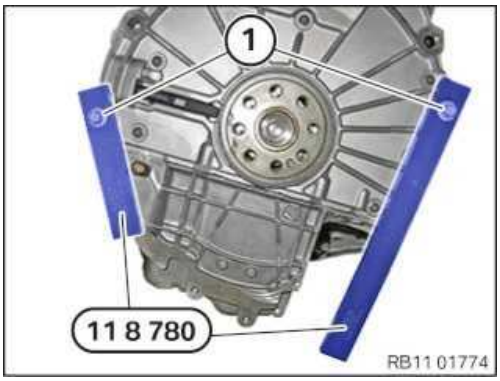
Sealing compound

Loctite 5970 liquid sealing compound	50 ml, Cartridge	83190404517

Overview of consumables (Electronic Parts Catalogue)

- Completely encircle the oil return orifice (arrow) with the sealing compound.

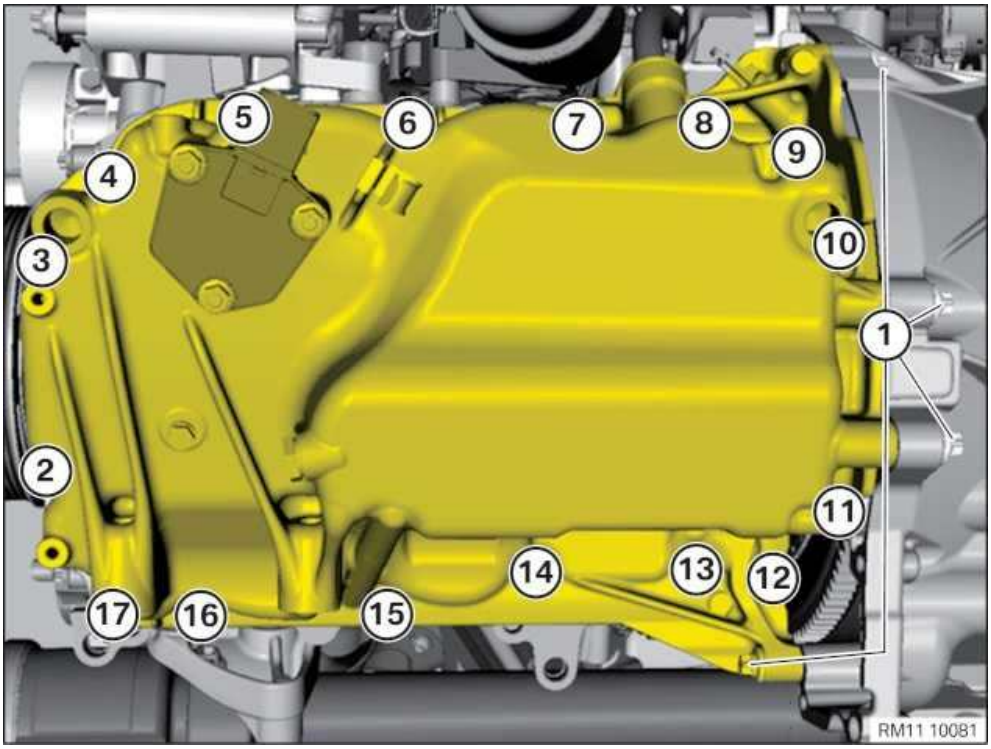
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TECHNICAL INFORMATION

The special tool 11 8 780 is only required when the transmission is removed.

- Position the special tool **0 496 120 (11 8 780)** with the transmission bolts (1) so that the oil sump is exactly flush with engine block.
- If necessary, renew fitting sleeves.



- Position and install oil sump.
- **Hand-tighten** oil sump screws (2) to (17) but do **not** tighten completely.
- Join transmission bolts (1) with 5 Nm.
- Tighten screws(2) to (17) of the oil sump.

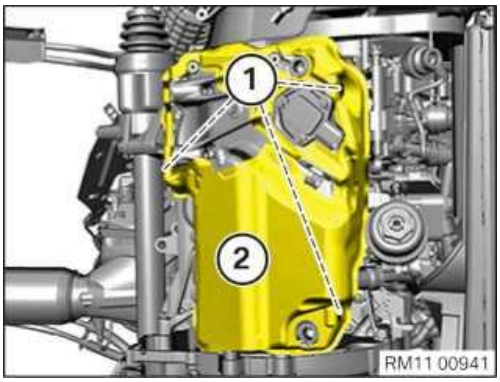
Oil sump to crankcase

M8x30		Tightening torque	2 Nr
M8x110		Tightening torque	2 Nr

- Tighten transmission bolts (1) on oil sump.

Transmission to oil sump

M8		Tightening torque	1 Nr



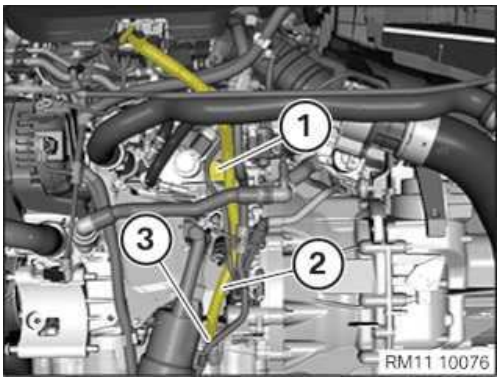
- Thread in and position the acoustic cover (2).
- Install the expanding rivet (1).



- Renew O-ring (1).

  Parts: O-ring

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- Guide in guide tube (2) for oil dipstick and insert it into oil sump.
- Make sure the sealing ring (3) is positioned correctly in the oil sump.
- Tighten down screw (1).

Guide tube for oil dipstick on engine

M8x16		Tightening torque	19 Nm

35 – Installing the flywheel

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

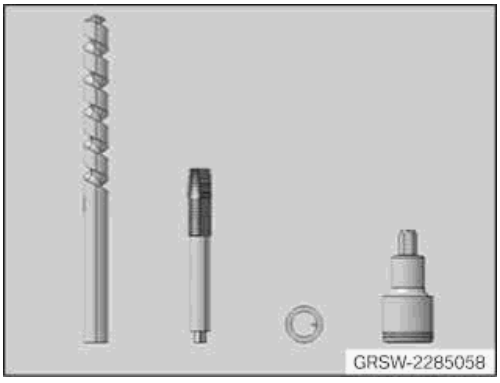


- Check fitting sleeve on the crankshaft for damage and replace if necessary.

TECHNICAL INFORMATION

Clean all threads with a screw tap.

- Clean all the screw threads (1).



- Use the set of special tools **2 285 058**.

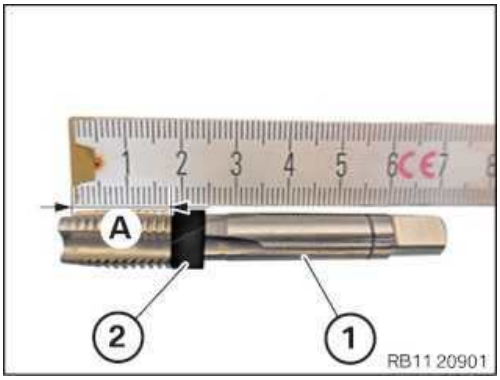
Description
Twist drill
Thread cutter M12x1.5
Depth
Insertion tool

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- Assemble tool set.

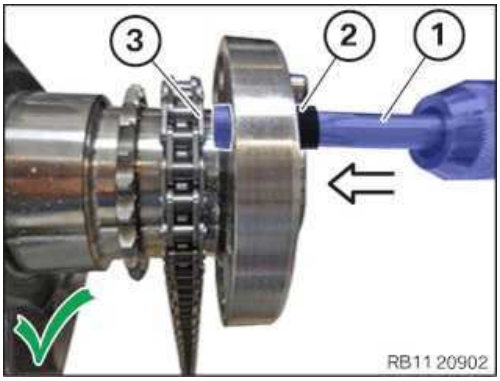
Number	Description
1	Tool holder
2	Thread cutter M12X1,5



- Mark the installation dimension (A) on thread cutter (1) from the set of special tools **2 285 058** using a commonly-available tool (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm



NOTICE

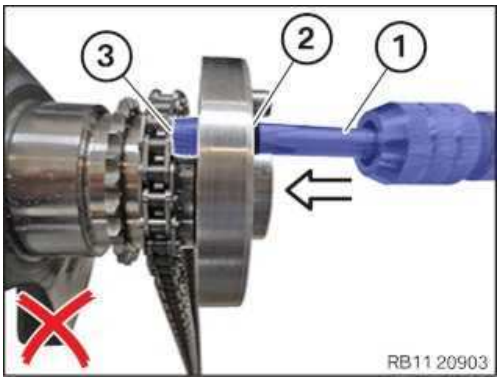
To provide a better overview: Shown with engine removed.

- Screw in the thread cutter (1) from the set of special tools **2 285 058** in direction of arrow up to the installation dimension (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm

- Make sure that the thread cutter does (1) **not** rest on the timing chain (3).

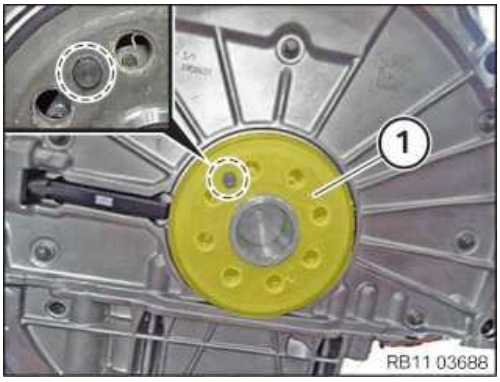


TECHNICAL INFORMATION

- **Carefully** handle the timing chain, to protect the timing chain and timing chain drive against damage.

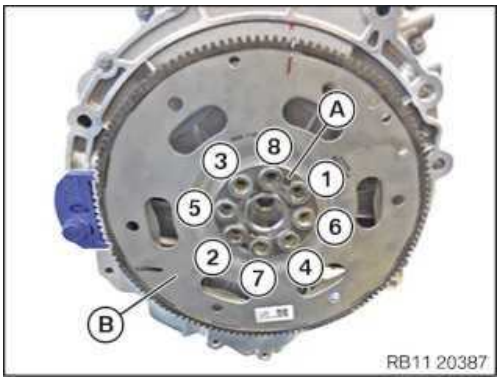
- Make sure the installation dimension (2) of the screw bore (1) is not exceeded.

  The thread cutter (1) may not rest on the timing chain (3).



- Important! Observe the marking shown during installation.
- Install special tool (1) on the crankshaft as shown.

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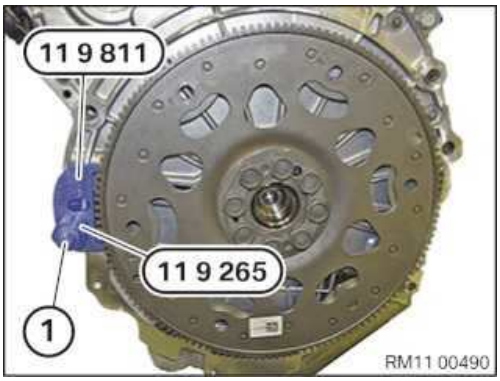


- Position flywheel (B) .
- Renew flywheel bolts (1) to (8).

  Parts: Flywheel bolts
- Screw in flywheel bolt (1) to (8) by hand.
- Observe tightening sequence. Begin at the dowel pin (A).
- Tighten flywheel bolts in sequence (1) to (8).

Flywheel to crankshaft

M12x1.5	Renew screws.	Tightening torque	120 Nm



- Loosen the transmission bolt (1).
- Guide out and remove the special tool **0 494 793 (11 9 265)** and **0 496 171 (11 9 811)** with the **standard** washer (5 mm).

36 – Installing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



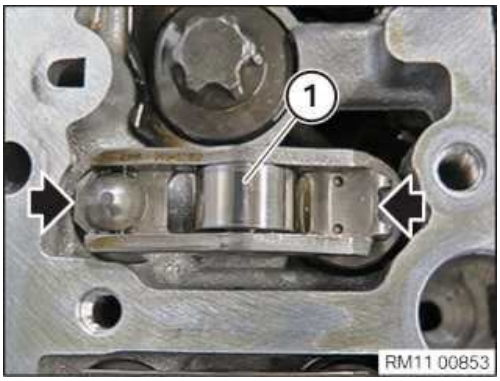
- Install the hydraulic valve clearance compensating element (1) in the direction of the arrow.
- Repeat the process on all hydraulic valve clearance compensating elements.

37 – Install the roller cam followers

TECHNICAL INFORMATION

- Note the installation position of the component. The component may be installed in various installation positions.

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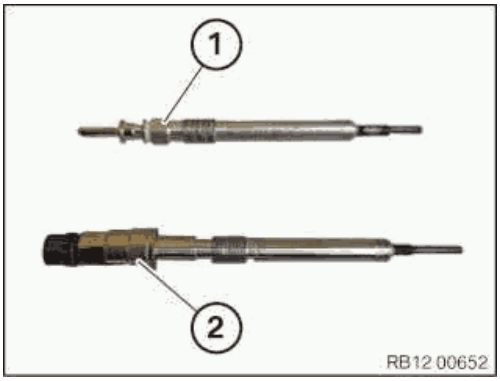


- Check all roller cam followers (1) for damage and replace if necessary.

  Parts: Roller cam followers
- Insert and install all roller cam followers (1).

  Roller cam followers (1) that have already been used must be installed in the same place.
- Note the mounting orientation of the roller cam followers (1).
- Oil all roller cam followers (1).

38 – Install glow elements



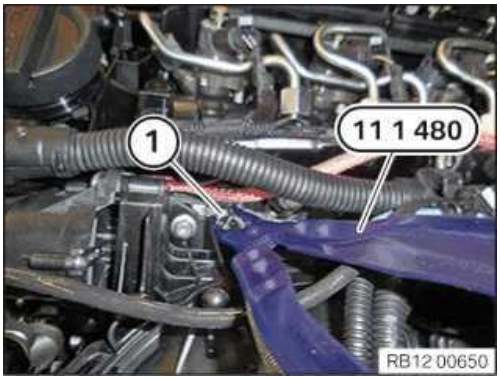
- Install glow elements (1) in cylinders 1, 2, 3 and 4.
- If fitted: Glow element (2) with the **combustion chamber pressure sensor** must be installed in cylinder **2**.



- Tighten the glow element with the special tool or conventional tools.

Glow elements to cylinder head

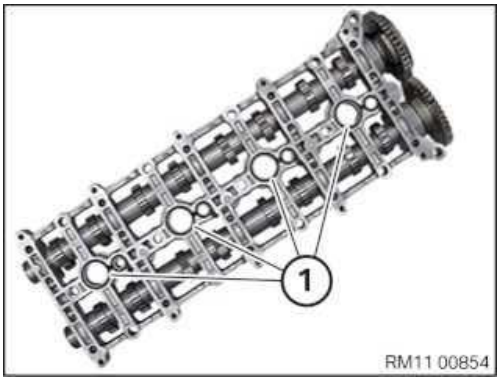
Glow element		Tightening torque	13 Nm



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

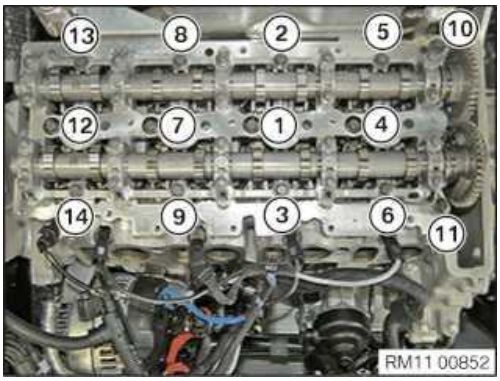
39 – Installing the camshaft support



- Renew gaskets (1).

  Parts: gaskets

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- Position the camshaft support including the camshafts.
- Tighten the screws in a sequence from (1) to (14) in several steps.

Camshaft carrier to cylinder head

M7x35		Tightening torque	13 Nm

40 – Adjusting the timing of the camshafts

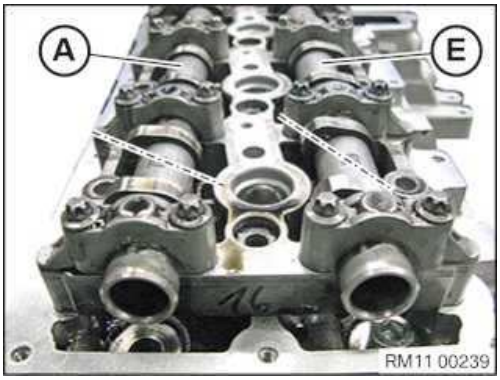


- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.



- Slide the special tool **2 288 380** completely into the bore hole of the oil sump.
- Use the special tool to block **2 288 380** the crankshaft in the TDC firing position at the first cylinder.



- The cam of the intake camshaft (E) at the first cylinder points up at an angle.
- The cam of the exhaust camshaft (A) at the first cylinder points outward at an angle.

▶ **Remove exhaust camshaft.**

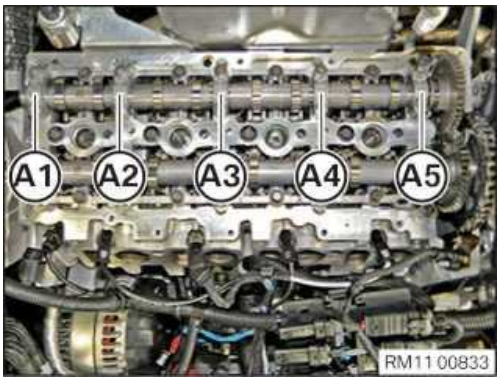
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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TECHNICAL INFORMATION

The camshaft is tensioned by the valve springs. Tighten or loosen each screw on the camshaft bearing caps one at a time in the specified sequence and by half a turn only. Repeat procedure.

- Loosen all screws of the exhaust camshaft bearing caps (A1) to (A5) from the outside to the inside, step by step in 1/2 turns.
- Remove exhaust camshaft in upward direction.
- Place all components on special tool **0 495 105 (11 4 480)** in a tidy and orderly fashion.

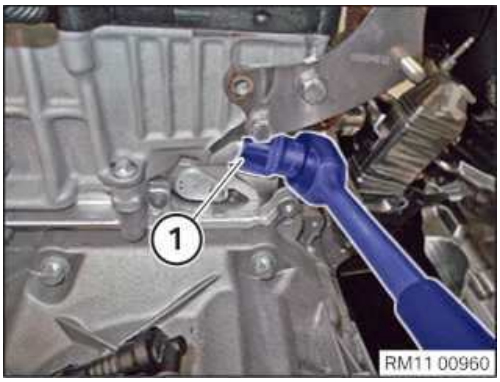
▸ **Remove chain tensioner piston**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

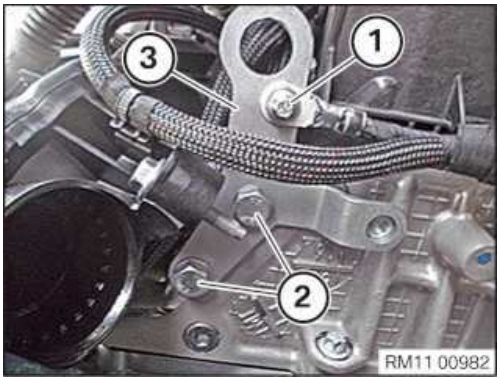


TECHNICAL INFORMATION

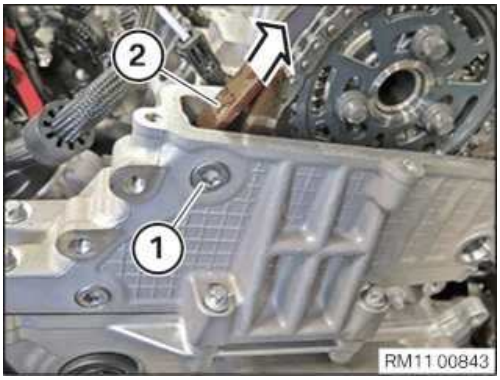
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

▸ **Remove the timing chain guide rail**



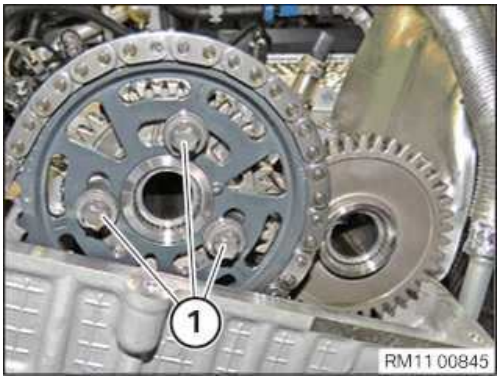
- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

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▶ **Removing the camshaft sprocket on the intake camshaft**



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

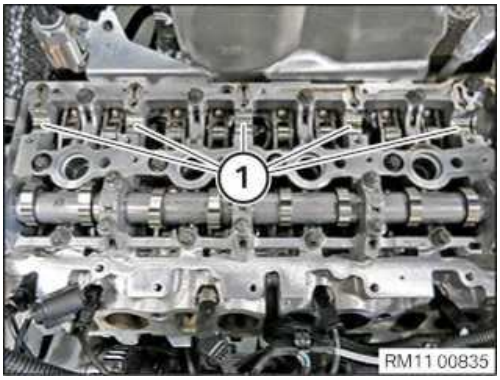
▶ **Install exhaust camshaft**

RISK OF DAMAGE

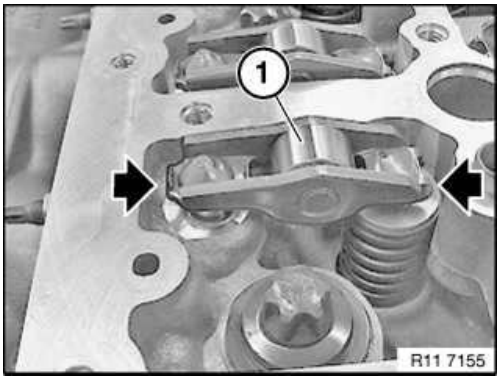
Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

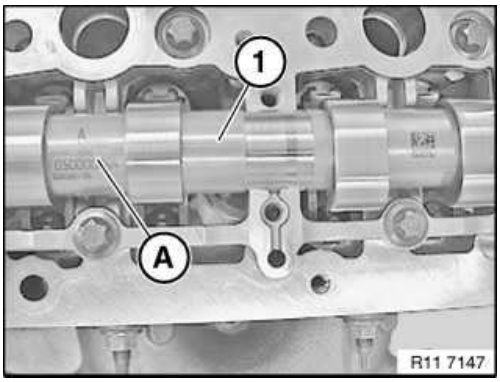
- Comply with the regulations for the installation and disassembly.
- Perform work with care.



- Oil all bearing positions (1).

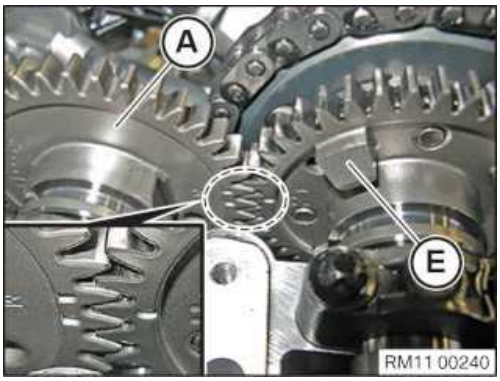


- Make sure the roller cam followers (1) have the correct mounting orientation.

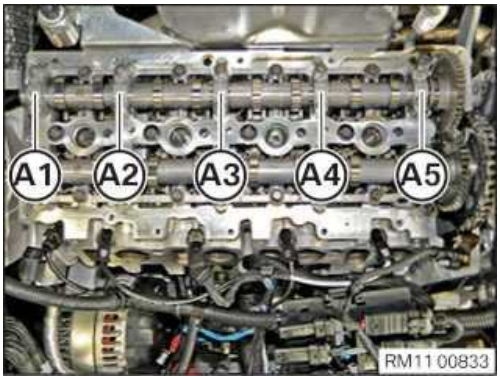


- Insert exhaust camshaft (1) so that the identification (A) points upwards.

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- Insert the exhaust camshaft (A) so that the marks on the camshafts (A) and (E) correspond in the highlighted area.
- Position the camshafts (A) and (E) accordingly.



- Tighten all exhaust camshaft bearing caps (A1) to (A5) from the inside to the outside by 1/2 a turn at a time.

Intake and exhaust camshaft in camshaft support

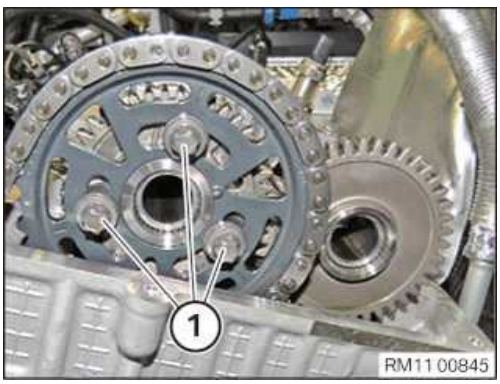
M6x31		Tightening torque	10 Nm



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

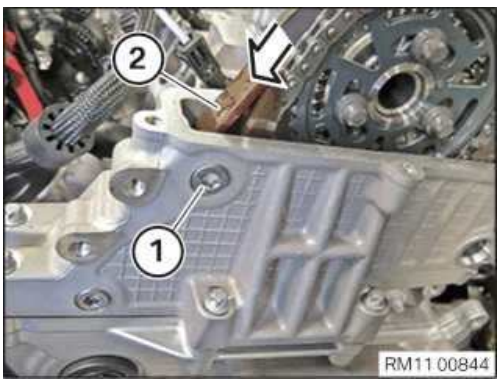
  Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

▶ **Installing the camshaft sprocket on the intake camshaft**



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

▶ **Install the timing chain guide rail**



- Position the guide rail (2) in the direction of the arrow.

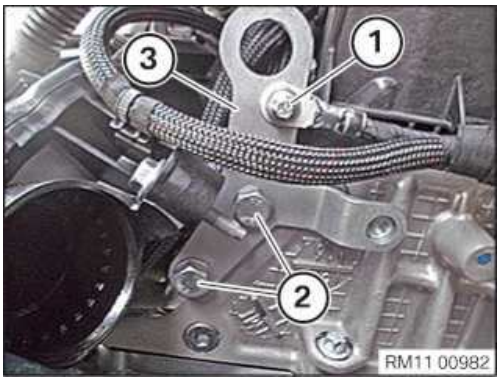
  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

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- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6		8 Nm

▸ **Installing the chain tensioner piston**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Renew sealing ring (1).

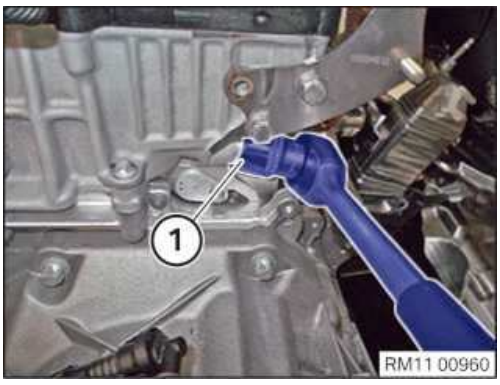
  Parts: Sealing ring



TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.



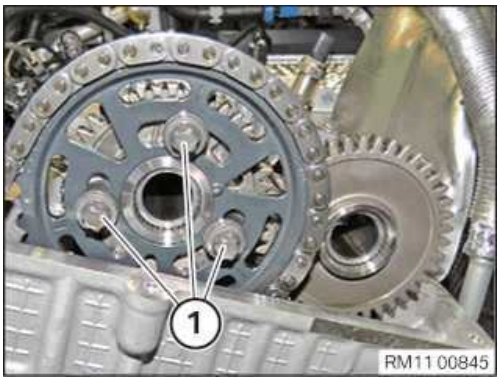
- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

▸ **Tightening the camshaft sprocket on the intake camshaft**

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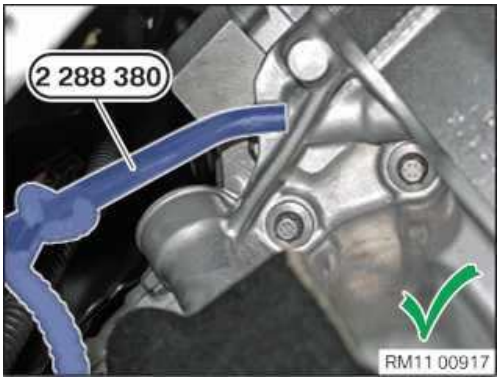


- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

41 – Removing the special tool to disconnect the crankshaft



- Remove special tool **2 288 380**.

42 – Removing the special tool to secure the exhaust camshaft



- Remove the special tool **0 496 112 (11 8 760)** to fix the exhaust camshaft.

43 – Checking camshaft timing



- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**

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RISK OF DAMAGE

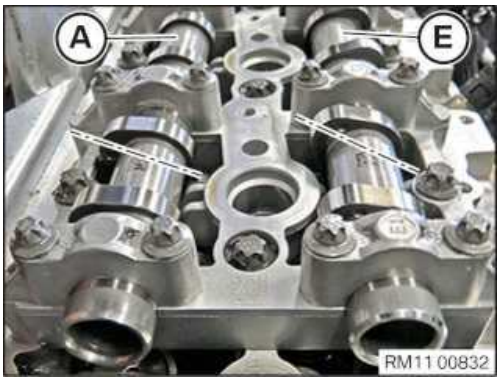
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

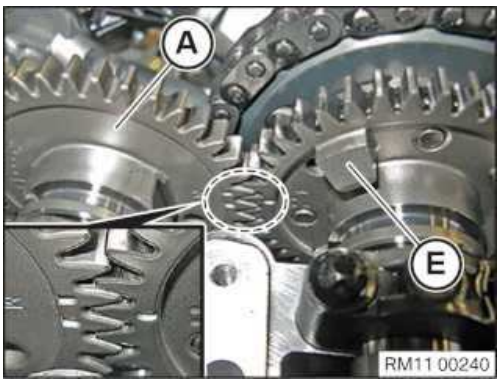
  Do **not** crank the engine in reverse.



- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

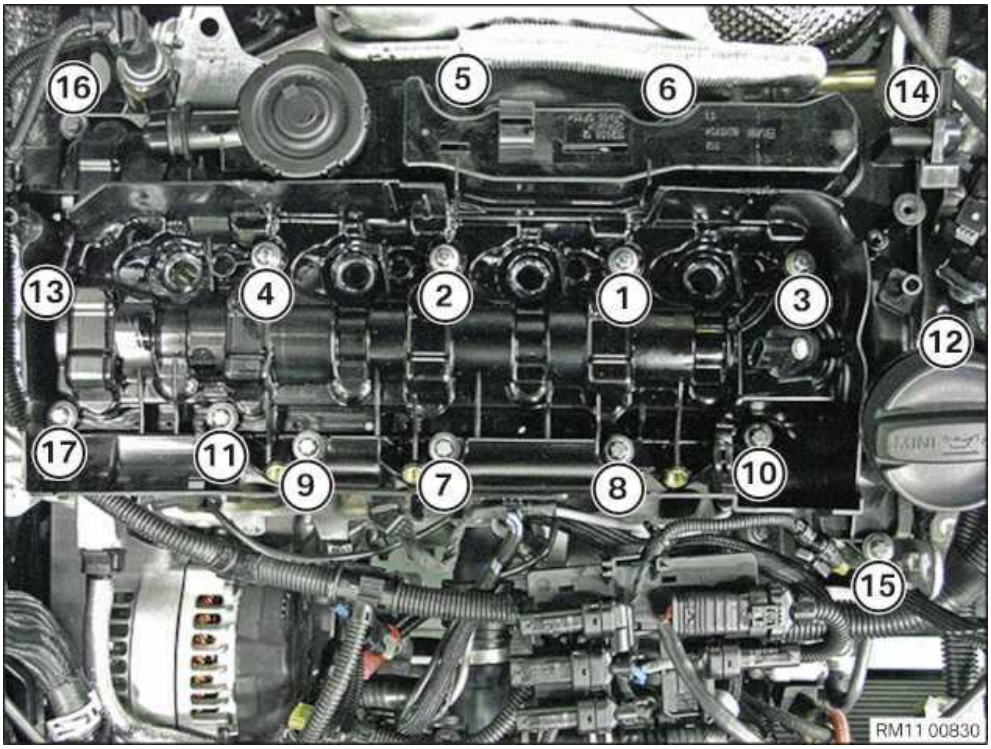
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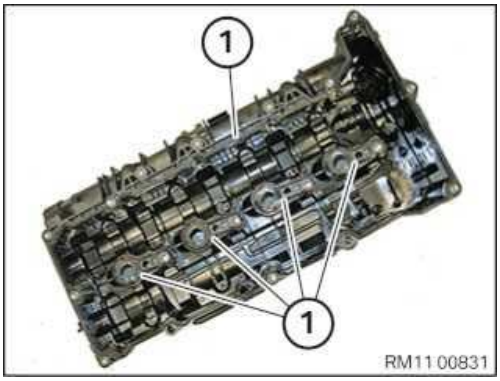
- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

44 – Installing cylinder head cover

Overview: Screw connection of the cylinder head cover



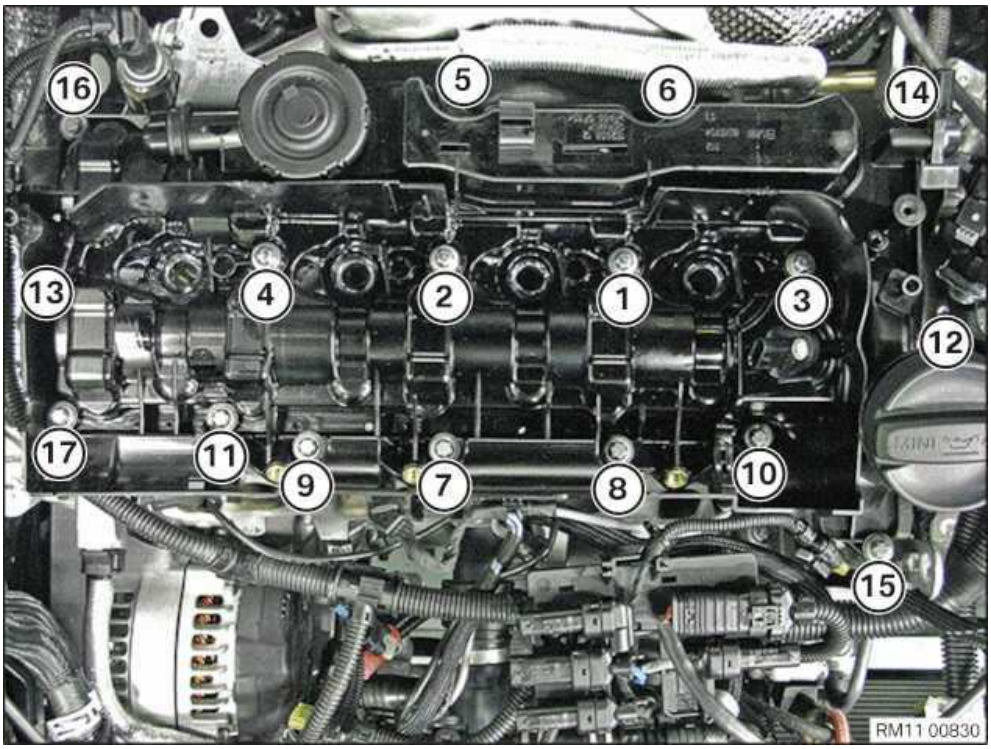
1 to 16 screws of the cylinder head cover.



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket

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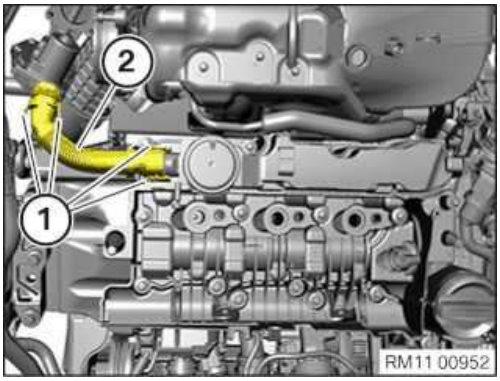


- Install cylinder head cover.
- Tighten screws in the order (1) to (17).

Cylinder head cover to cylinder head

M6		Tightening torque.	8, Nr

-



- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

45 – Installing injectors of injection system

▶ Cleaning the injector shafts

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

- Wear safety goggles.

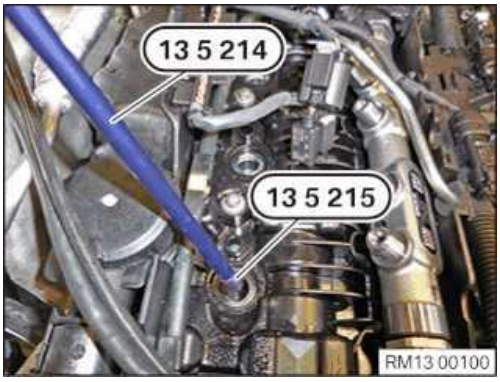
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RISK OF DAMAGE

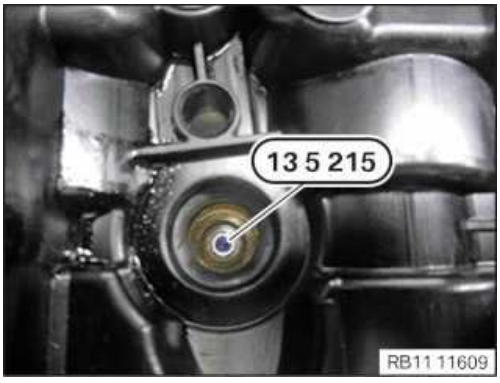
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.



- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.

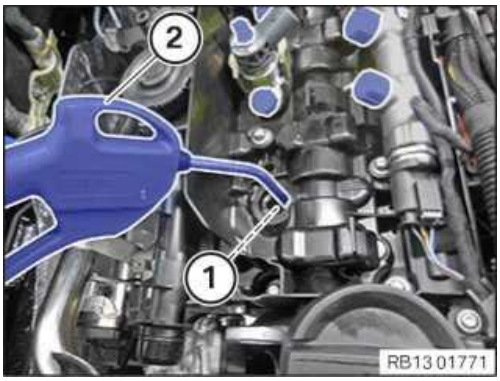


- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.

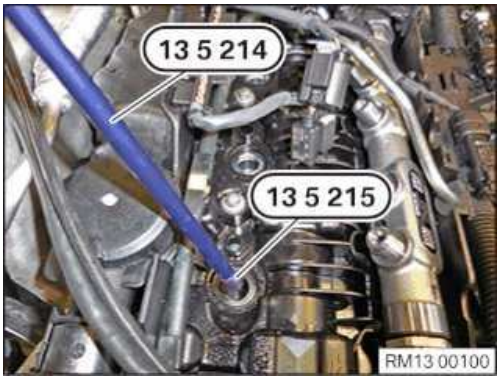


- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.

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- Blow out injector shaft (1) with air gun (2).



- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

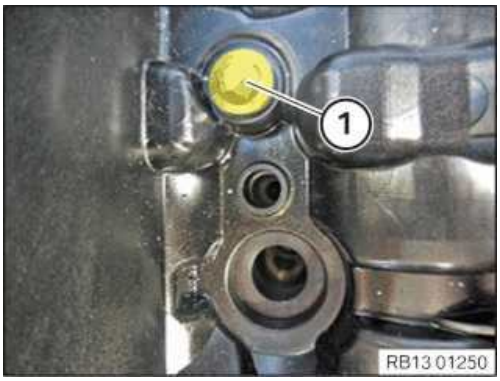
▸ **Check the placement of the clamping claw**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▸ **Prepare the injector for installation**

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

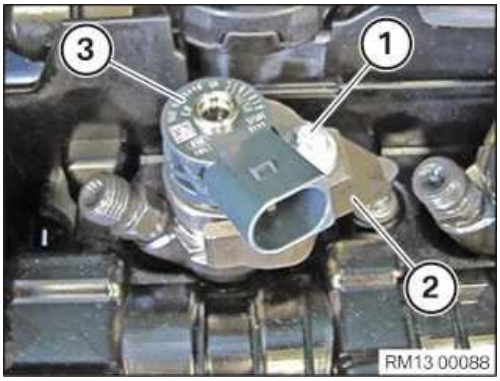


- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring
- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

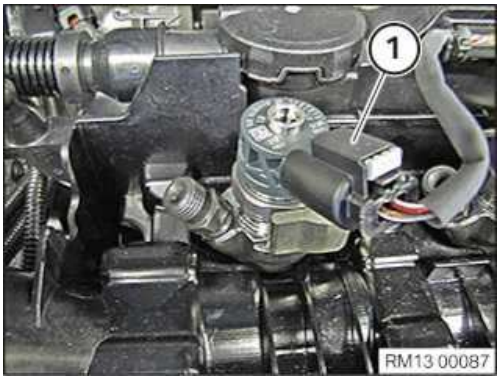
Injector lubricating grease	50 g, Can	83230441070



- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

▸ **Replacement: Perform injection quantity compensation**

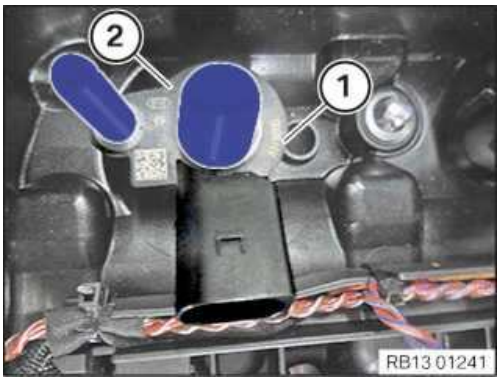
TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

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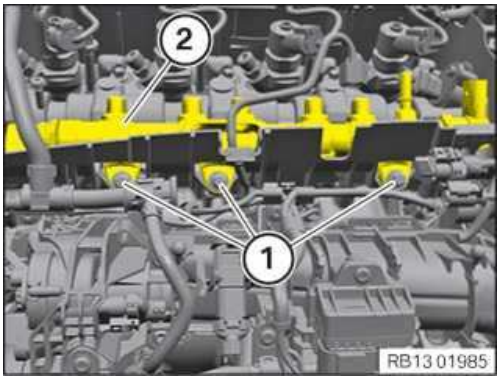


- Read off the adjustment value (1) on the new injector (2).



- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

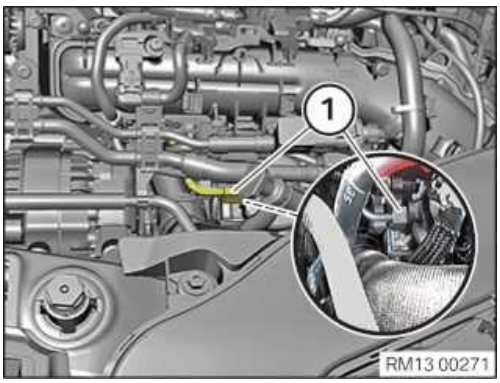
46 – Installing the rail



- Carefully insert and install the rail (2).
- Tighten the screws (1).

Rail on cylinder head cover

Torx screw M8x25		Tightening torque	19 Nm



TECHNICAL INFORMATION

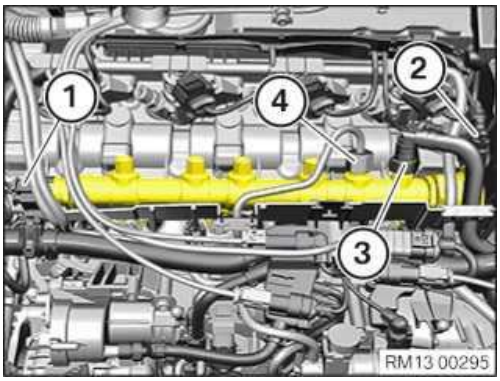
Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten union nut (1).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

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TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten union nut (4) with special tool .

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

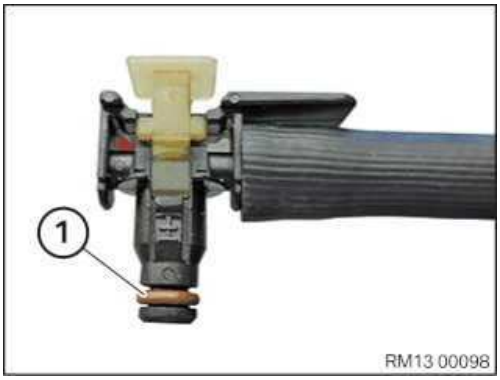
- Connect and lock the fuel line (3).

  Fuel line (3) must engage audibly.
- Connect connectors (2) and lock.

  The connector (2) must engage audibly.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

47 – Connect the leakage oil line on the injector



- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.



- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

48 – Installing high pressure lines between rail and injectors

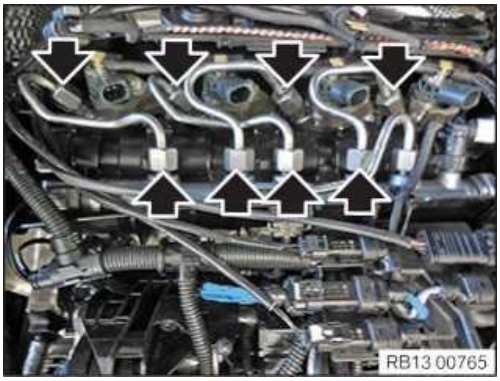
TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

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TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Remove special tool .
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

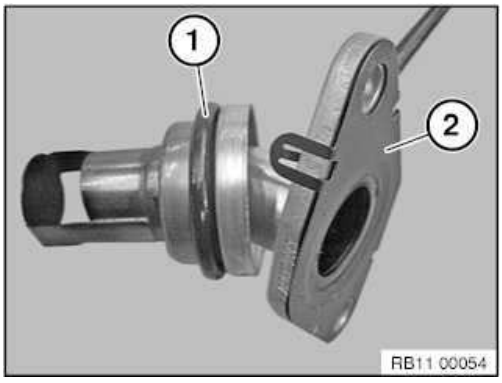
- Tighten the high pressure lines (arrows) with the special tool .

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

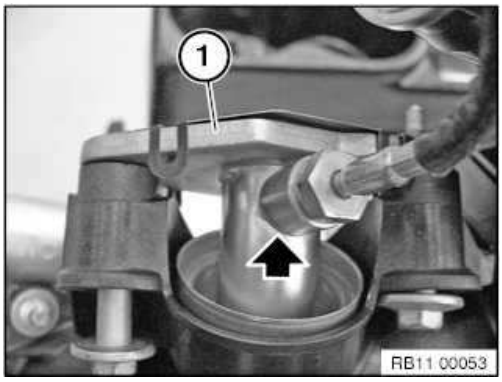
49 – Installing the intake plenum



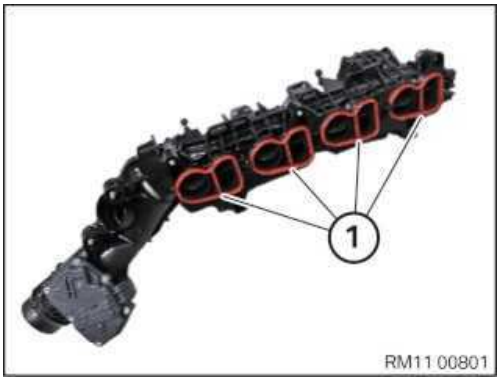
- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position the seal (2) and clip it in.



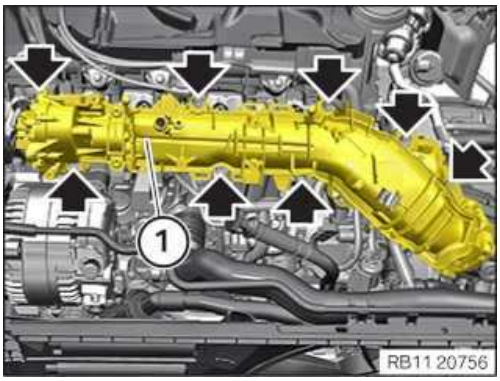
- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (1).

  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.

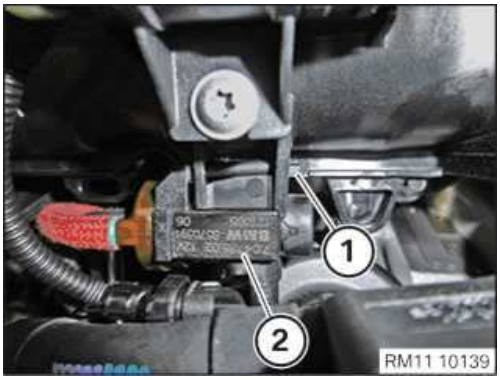
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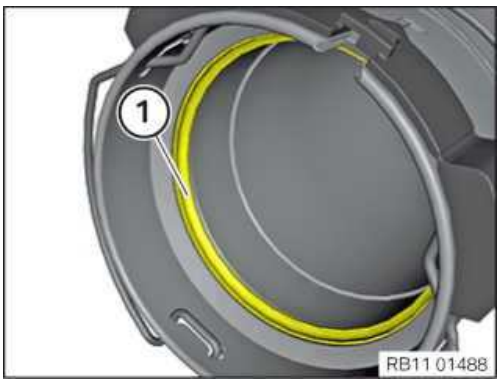
- Guide in and install intake (1) plenum.
- Tighten screws (arrows).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm

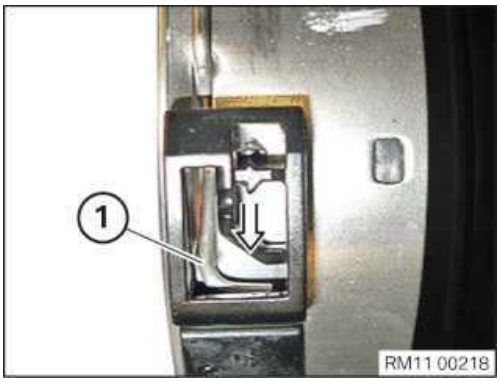


- Install the electric changeover valve (2) in the holder on the plenum from left to right.
- Lock (1) must engage audibly.

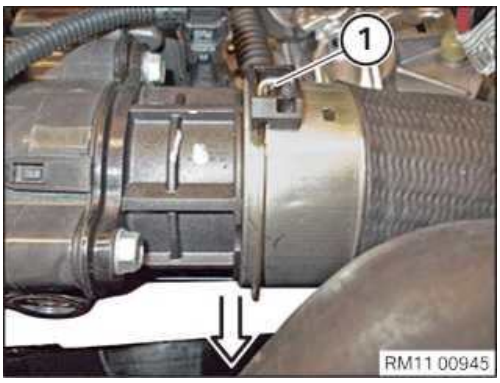


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring



- Engage the lock (1) on the bracket (arrow).



- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

50 – Remove the engine from the assembly stand

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CAUTION

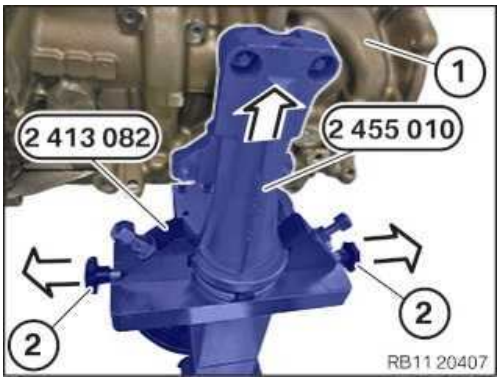
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



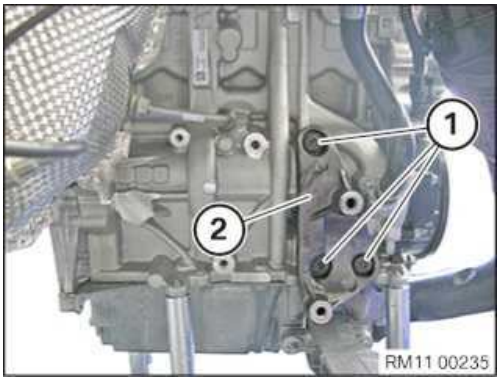
- Insert engine lifter with special tool and position engine (1).



- Unscrew the nuts on special tool .
- Detach the holder (2) in the direction of the arrow.
- Detach the engine (1) with special tool **2 455 010** out of the special tool in the direction of arrow.



- Remove conventional screws (arrows).
- Feed out the special tool **2 455 010** on the engine (1) and remove.



- Insert and install the holder (2).
- Tighten the screws (1).

Holder to crankcase

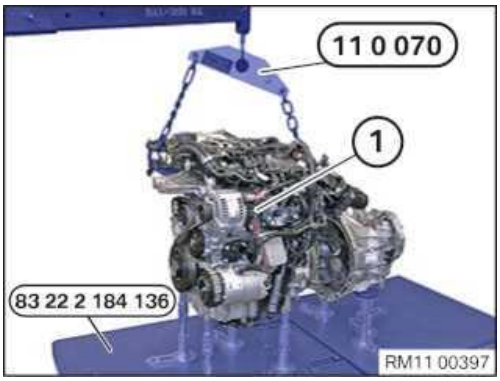
M10		Tightening torque	38 Nm

51 – Mount engine on the automatic transmission

Prerequisite

Engine has been removed.

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NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

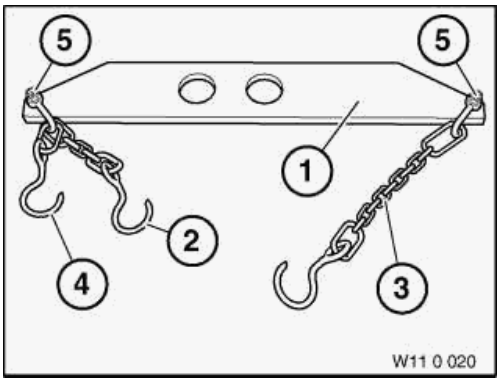
- Position the engine (1) on the lifting table **2 184 136** using the engine lifter and the special tool .
- Feed out engine lifter from engine (1) with special tool and push aside.



- Unscrew the bolts (1) of the special tool **2 459 012**.
- Feed out the special tool **2 459 012** at the cylinder head and remove.

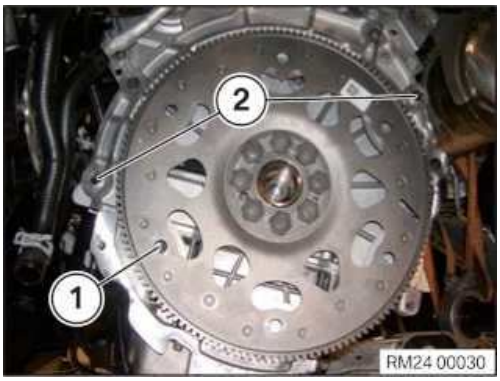


- Stage the workshop crane **2 220 718**.



- Stage the lifting gear .

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- The bore hole (1) of the flywheel must be accessible from the recess on the oil sump.
- Check for correct fit of fitting sleeves(2).



TECHNICAL INFORMATION

Conduct the following operation with the assistance of a second person.

- Twist torque converter until bore hole in torque converter is flush with bore hole of flywheel.
- Flange-mount and screw automatic transmission on the engine with an auxiliary person and the workshop crane **2 220 718** with the lifting gear .
- Tighten screws (arrows).

Transmission to engine

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

- Feed out workshop crane **2 220 718** with the lifting gear from the automatic transmission and push it aside.

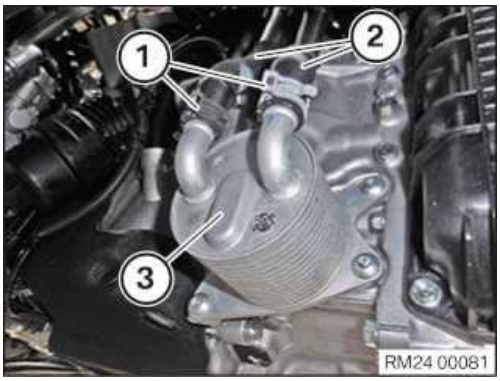


- Crank engine with special tool **0 493 380 (11 6 480)** at vibration damper in direction of rotation.
- Renew nuts (1).

  Parts: Nuts
- Tighten all 6 nuts (1) of the torque converter.

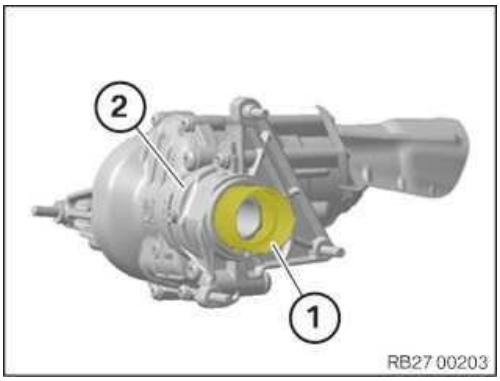
Torque converter to flywheel

M10	Replace nuts. Remove any adhesive residue from the threads.	Tightening torque	56 Nm



- Slide coolant hoses (1) onto transmission oil cooler (3).
- Secure hose clamps (1).

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- If intermediate shaft (1) gets caught on transfer box (VTG) (2), renew intermediate shaft (1) and the radial shaft seals in the automatic or manual transmission.



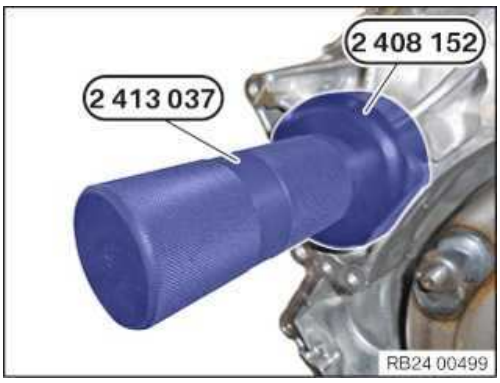
- Screw special tool **2 409 025** into the outer radial shaft seal.
- Turn the screw on the special tool **2 409 025** until the outer radial shaft seal has been pulled out.



- Insert special tool **2 411 739** into the inner radial shaft seal.

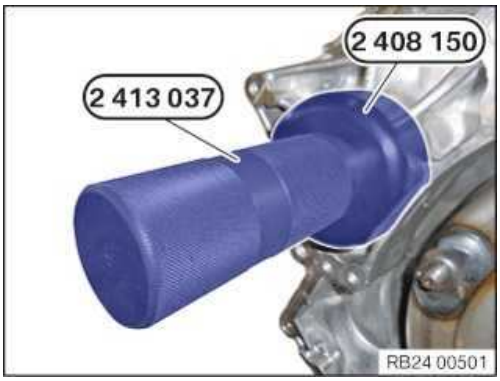


- Screw special tool **2 411 739** into the inner radial shaft seal.
- Turn the screw on the special tool **2 411 739** until the inner radial shaft seal has been pulled out.

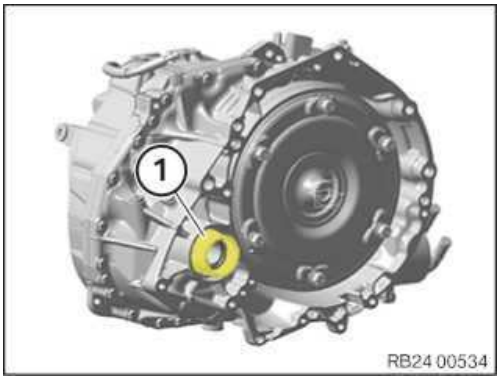


- Drive in the inner radial shaft seal using special tools **2 408 152** and **2 413 037** up to the limit position.

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- Drive in the outer radial shaft seal using special tools **2 413 037** and **2 408 150** up to the limit position.



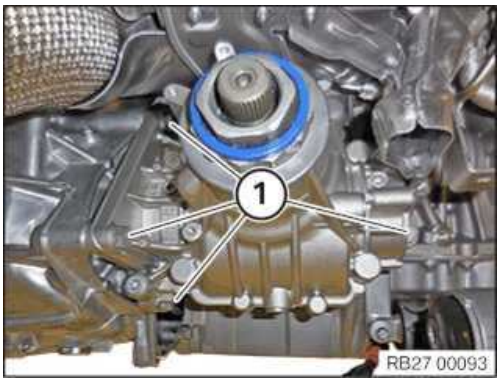
- If necessary, connect the new intermediate shaft (1) to the output flange of the automatic transmission or manual transmission.



- Coat the inside of the output flange (arrows) evenly with approx. 5 g of grease.

Expendable materials

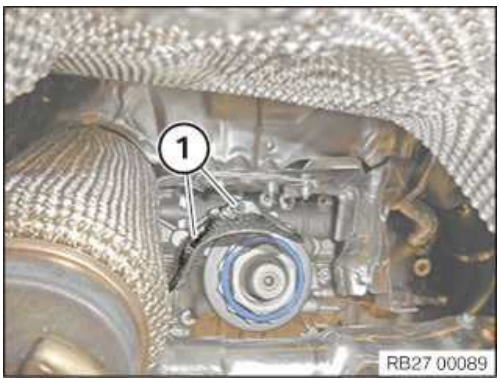
Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the transfer box (VTG).
- Tighten the screws (1).

Transfer box to transmission

M10		Tightening torque	56 Nm



- Install heat shield.
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Heat shield to transfer box

M6	Renew screws.	Tightening torque	6 Nm

▸ **Check the transfer box oil level**

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RISK OF DAMAGE

Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.



- Check transfer case oil level, correct:
- Open the oil filler plug (1).
- Check transfer box oil level.
- If necessary, top up transmission oil up to the lower edge of the oil filler plug opening (1).

Transmission oil

Technically suitable transfer box and electrical transmission oils	

Main group 27

- Tighten the oil filler plug (1).

Oil filler plug on transfer box (VTG)

M18x1.5		Tightening torque	35 Nm

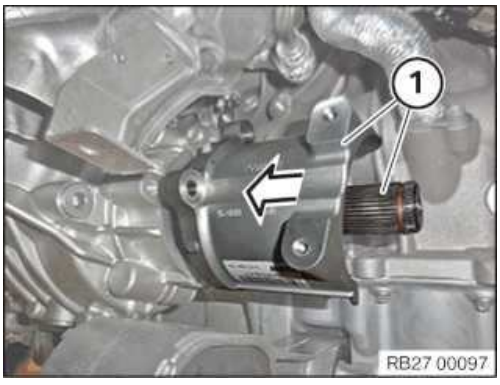
53 – Install the intermediate shaft with the support tube



- Coat gearing of the intermediate shaft uniformly with 5 g of grease.

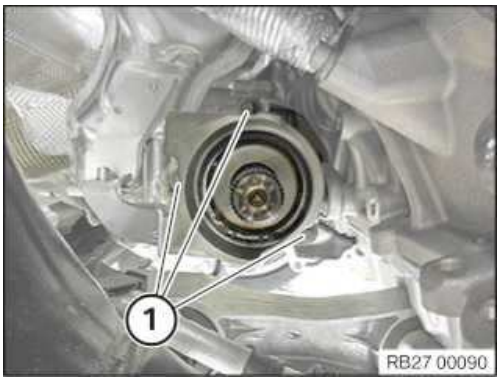
Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the intermediate shaft with support tube (1) in the transfer box.

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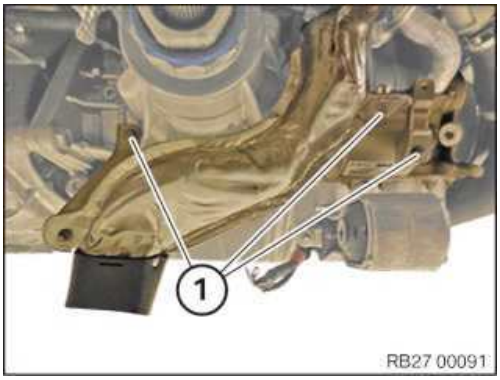
- Position screws (1).

Note: Check for correct screw length! Bolt M8x35 8.8

- Tighten the screws (1).

Intermediate shaft to transfer box

M8x35		Tightening torque	19 Nm



- If installed: Install air duct.
- Tighten the screws (1).

54 – Installing the high-pressure stage exhaust turbocharger

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to the surface.

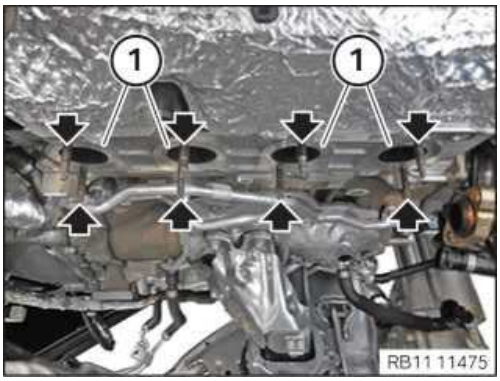
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

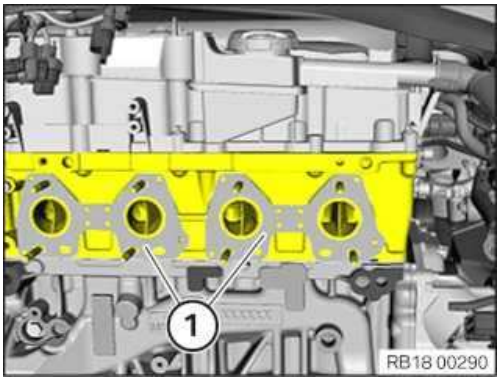
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- Clean the sealing surfaces (1) on the cylinder head using special tool **0 495 102 (11 4 470)**.
- Check the stud bolts (arrows) on the cylinder head for correct fit.

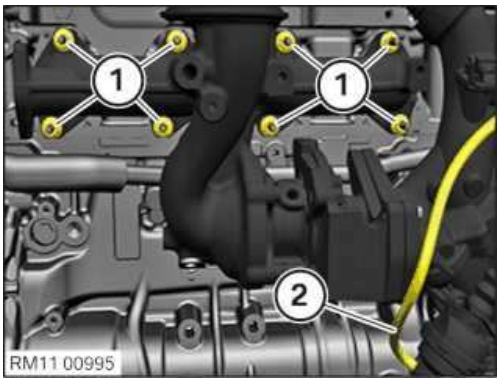


- Clean the sealing surfaces on the exhaust manifold using special tool **0 495 102 (11 4 470)**.



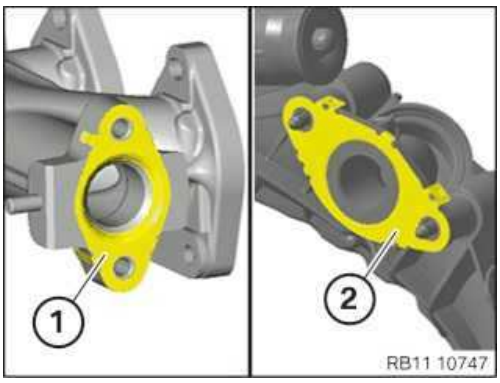
- Renew gasket (1).

  Parts: Gasket
- Install new gasket (1).



- Feed in and install the exhaust manifold and the high-pressure stage exhaust turbocharger.
- Tighten nuts (1).

  Parts: Nuts
- Connect vacuum hose(2).

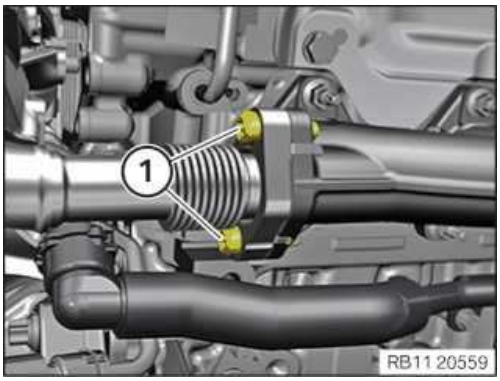


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket
- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket

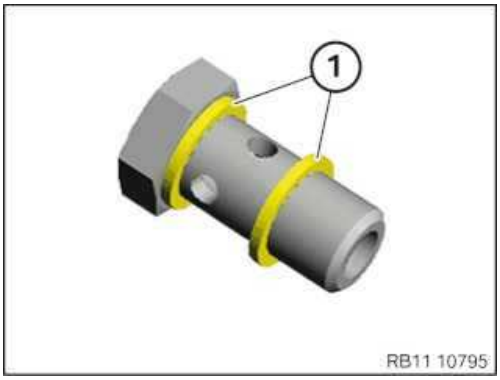
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- Tighten the screws (1).

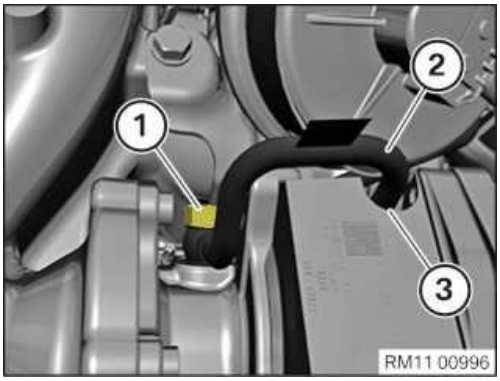
Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm



- Renew sealing rings (1) of banjo bolt.

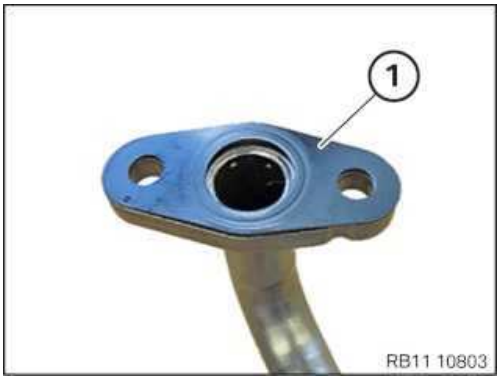
  Parts: Sealing ring



- Guide the oil feed line into the holder (3) and install it.
- Tighten down screw (1).



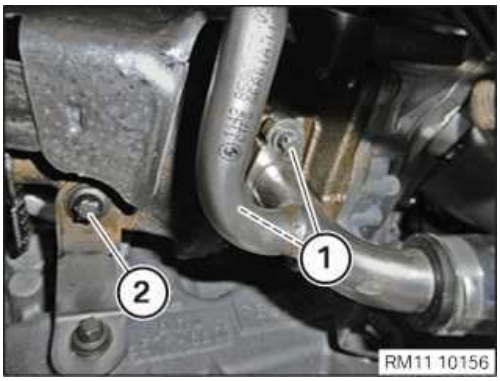
- Tighten bolt (1) from the right wheel arch.



- Renew seal (1) of oil return line.

  Parts: Gasket

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- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

55 – Installing the low-pressure stage turbocharger

RISK OF DAMAGE

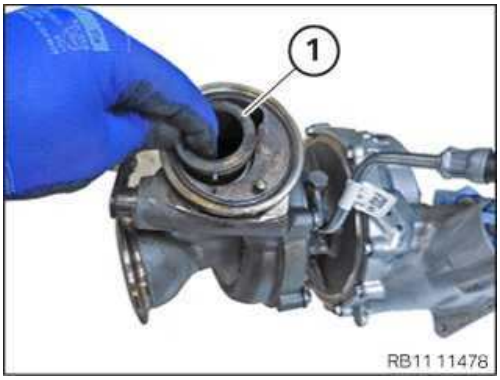
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.



- Check the spacer plug (1) for damage, renew if necessary.

  Parts: Spacer ring
- Insert and install the spacer ring (1).
- Position spacer ring (1) correctly.

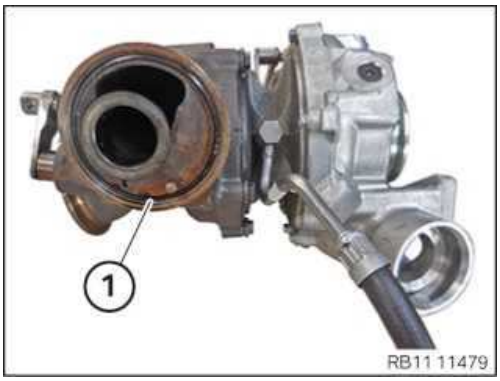


- Renew gasket (1).

  Parts: Gasket
- Position the seal (1).
- Renew the sleeve(2).

  Parts: Holding sleeve

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- Renew sealing ring (1).

  Parts: Sealing ring
- Affix the sealing rings on the exhaust turbocharger.

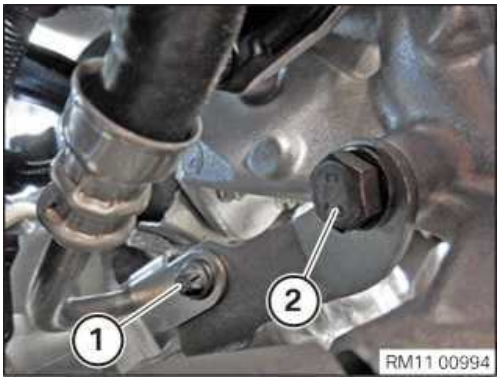


- Insert and install the low-pressure stage exhaust turbocharger on the exhaust manifold .
- Feed in and install V-band clamp .
- Tighten V-band clamp (2).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Screw in nut (1) with 2 **revolutions**.



- Tighten down screw (1).

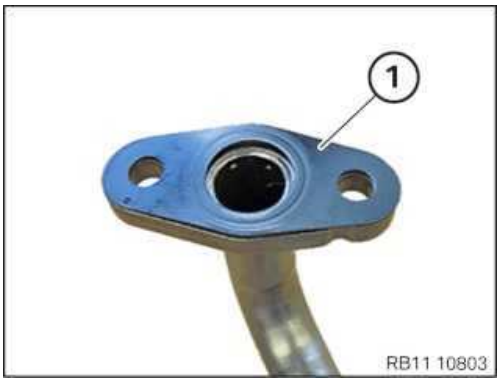
Oil feed line to bracket

Torx screw M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

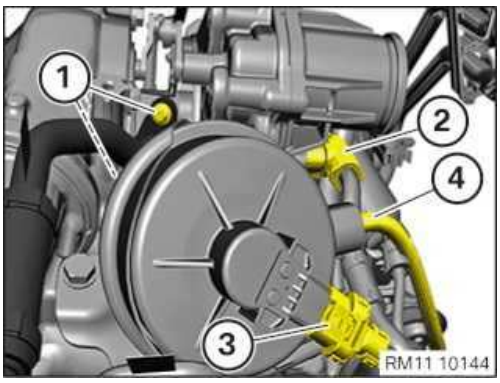
Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm



- Renew seal (1) on the oil return line.

  Parts: Gasket



- Position the oil return line with the seal.
- Tighten the screws (1).

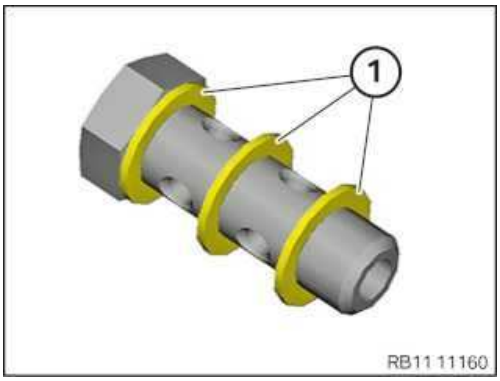
Oil return line to turbocharger

M6x12		Tightening torque	8 Nm

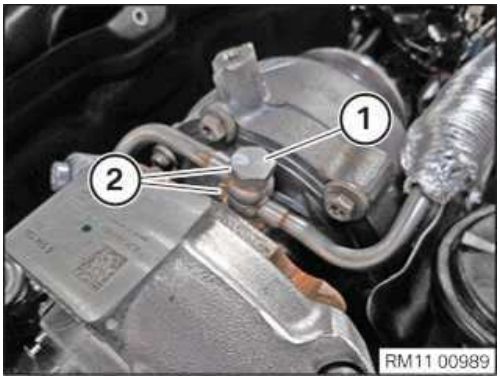
- Connect and lock connectors (2) and (3).

  The locks must engage audibly.
- Connect vacuum hose (4).

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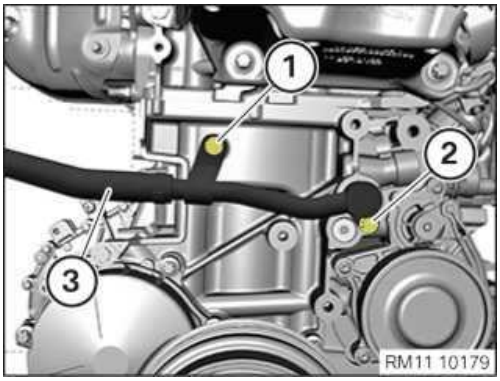


- Renew banjo bolt and sealing rings (1).
- **Parts:** Banjo bolt, sealing rings



- Install sealing rings (1).
- Tighten the banjo bolt (1).
- Ensure that the lines do not rest against the adjacent components.

56 – Attaching assemblies (on lifting table)

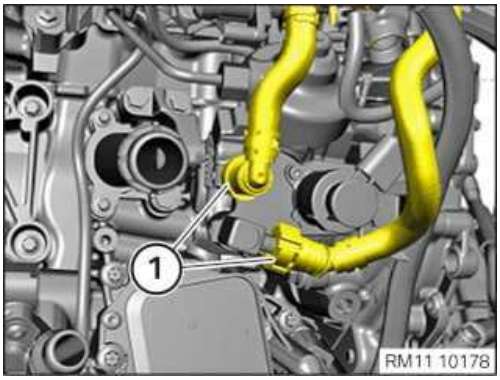


- Renew sealing ring of the coolant line (3).

  Parts: Sealing ring
- Coat the sealing ring and install the coolant line (3) .
- Tighten down screws (1) and (2).

Standard screw connection M6

M6		8 Nm



- Connect and lock fuel lines (1).

  The fuel lines (1) must audibly engage.

▸ **Installing the exhaust-gas recirculation cooler**

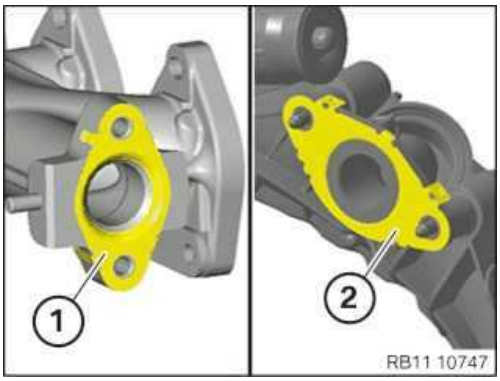
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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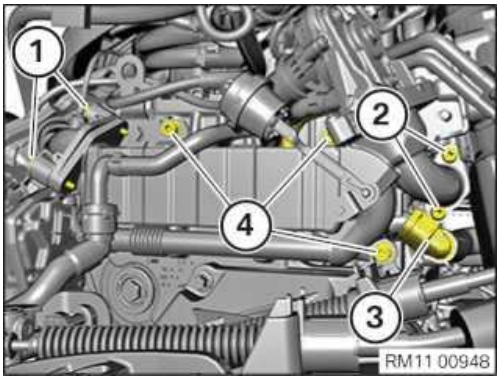


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket



- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts

- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

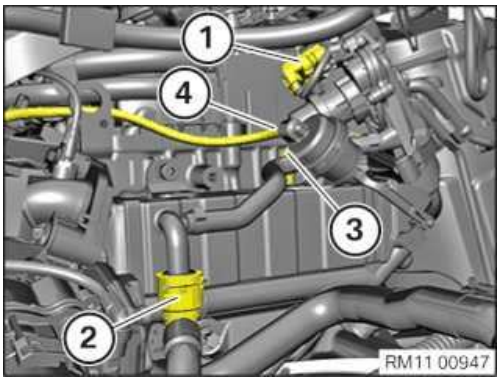
  The coolant hose (3) must audibly engage.

- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm

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TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

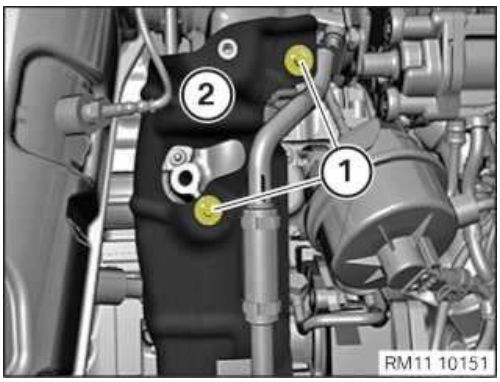
▶ **Installing heat shield on exhaust turbocharger at bottom**

WARNING

Hot surfaces.

Risk of burning!

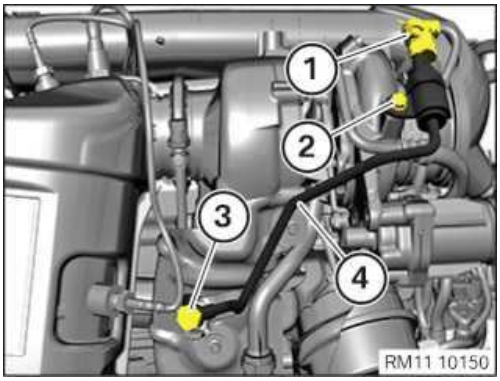
- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (2).
- Tighten the bolts (1) on the heat shield .

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm



- Position the exhaust gas pressure pipe (4).
- Hand-tighten the bolt (2).
- Renew sealing rings on the banjo bolt (3).

  Parts: Sealing ring
- Tighten the banjo bolt (3).

Banjo bolt for exhaust pressure pipe to exhaust manifold

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

- Tighten down screw (2).

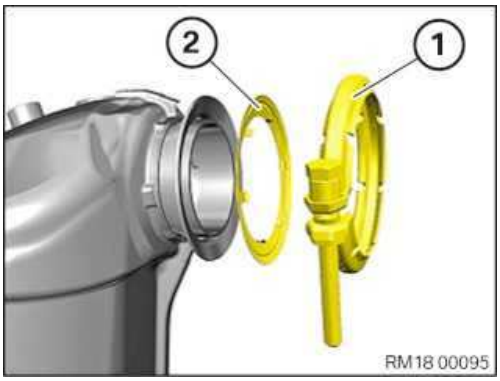
Standard screw connection M6

M6		8 Nm

- Connect connectors (1) and lock.

  Lock must audibly engage.

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CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

- Renew the V-clip (1).

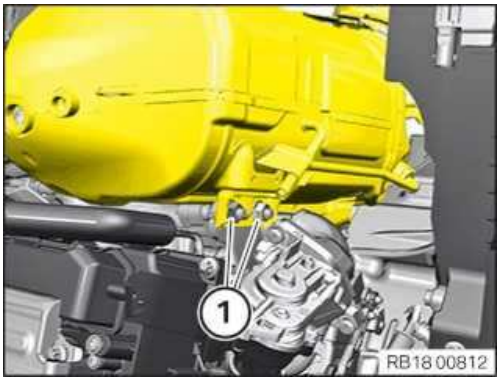
  Parts: V-band clamp

- Renew the gasket (2).

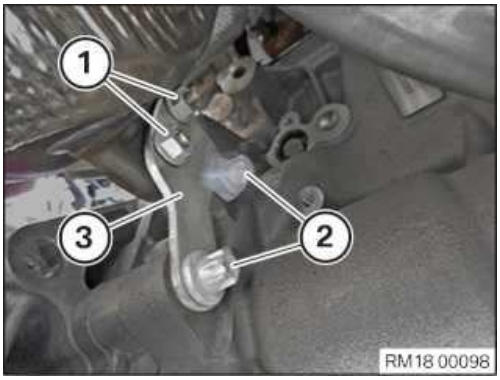
  Parts: Gasket



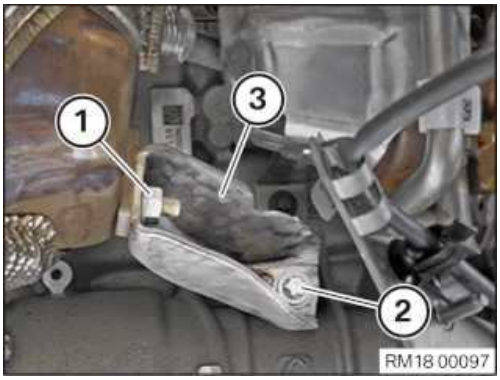
- Carefully insert and install the diesel particulate filter .
- Feed in and install V-band clamp (1).
- Make sure that the seal between the diesel particulate filter and the exhaust turbocharger is installed correctly.
- Align the diesel particulate filter on the exhaust turbocharger.
- Position V-clip (1).
- Hand-tighten the V-clip (1).



- Tighten nuts (1) by hand.

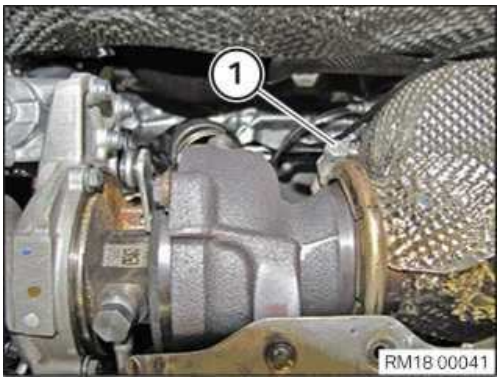


- Install holder (3).
- Hand-tighten the bolts (2).
- Tighten nuts (1) by hand.



- Install holder (3).
- Tighten the nut (1) hand-tight.
- Hand-tighten the bolt (2).

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- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

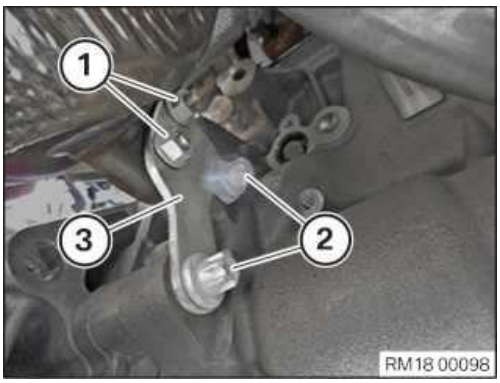
V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm



- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screws (2).

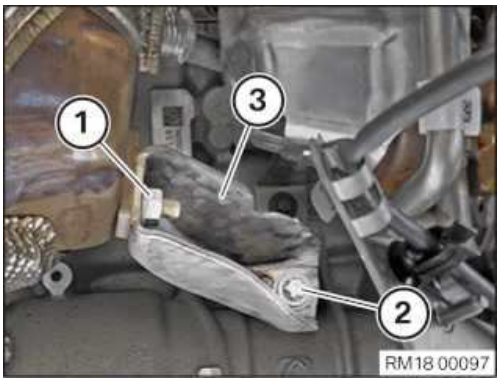
Diesel particulate filter holder to gearbox

M12x75		Tightening torque	66 Nm

- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screw (2).

Diesel particulate filter bracket to crankcase

M10x35		Tightening torque	38 Nm

- Tighten nut (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Remove fitting aid (1) for the flexible tube.

▸ **Install the heat shield on the exhaust turbocharger**

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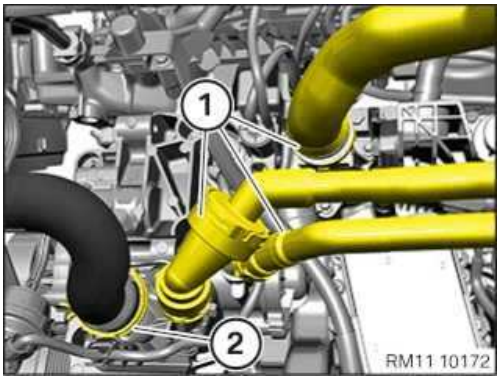


- Feed in and install the heat shield (2).
- Tighten the screws (1) at the top and bottom of the heat shield.

Heat shield for exhaust turbocharger

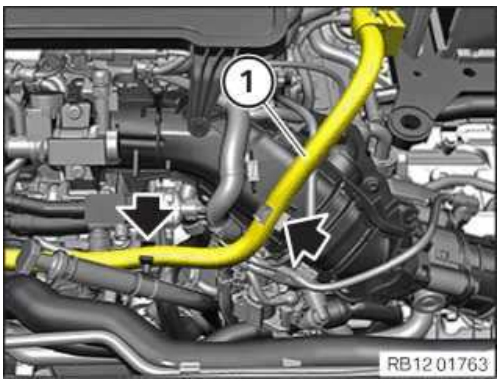
Torx screw BM 6x12		Tightening torque	10 Nm

- Fasten the cable at the clips .



- Install the coolant hose and secure with the clamp (2) .
- Connect and lock the coolant lines (1).

  The coolant lines (1) must engage audibly.



CAUTION

Improper routing of the positive battery cable.

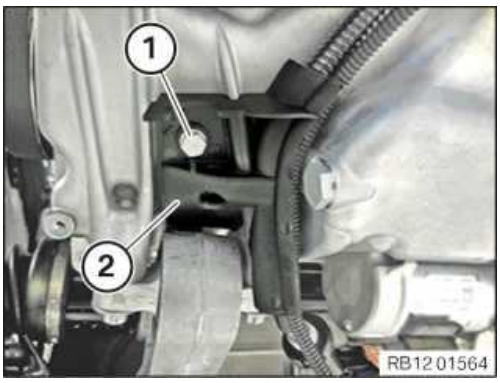
Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

- Insert the positive battery cable (1) into the clamps (arrows).



- Feed in and install positive battery cable at the clamps (1).



- Insert and install the holder (2).
- Tighten down screw (1).

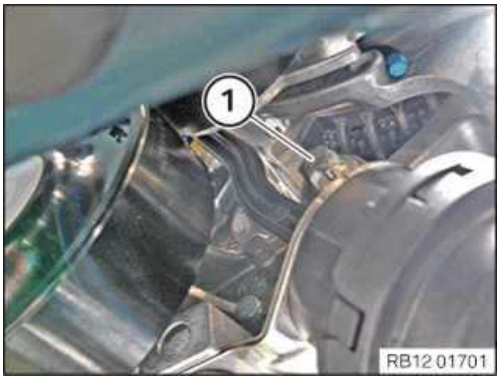
Bracket to oil sump

M6		Tightening torque	8 Nm

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- Insert and install alternator (1) along with the screw (2) on the bottom of the alternator through the slot on the support.



- Tighten the screw (1) below on the alternator.

Alternator to component carrier

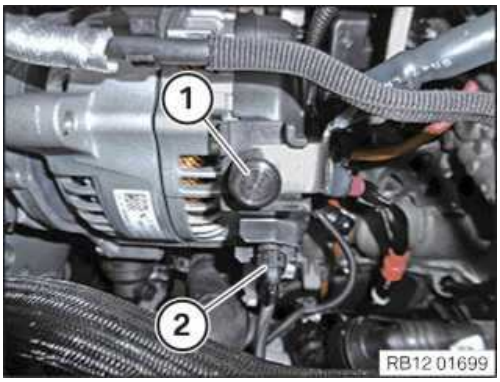
M10x75 / M10x125		Tightening torque	38 Nm



- Tighten the bolt (1) on top on the alternator.

Alternator to component carrier

M10x75 / M10x125		Tightening torque	38 Nm

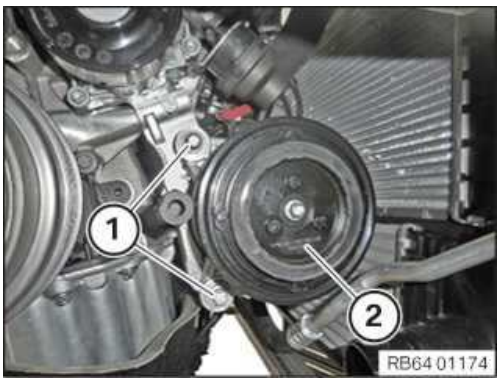


- Mount positive battery cable to the alternator.
- Tighten nut.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

- Mount the cover (1).
- Connect the connector (2) to the alternator and lock audibly.



- Install air conditioning compressor (2) and position it correctly.
- Tighten the screws (1).

Air conditioning compressor in component carrier

M10		Tightening torque	38 Nm

▸ **Installing the drive belt for alternator**

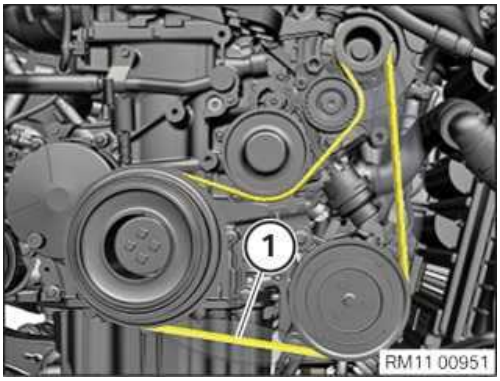
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TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

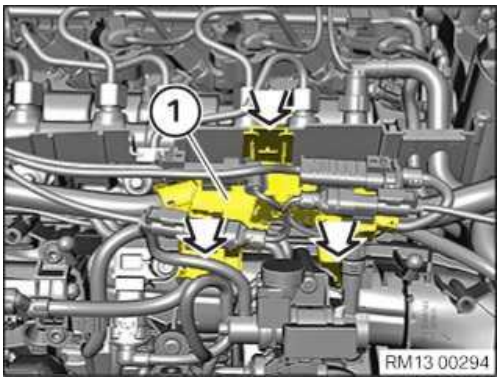


- Feed in the drive belt for the alternator (1) and install it.

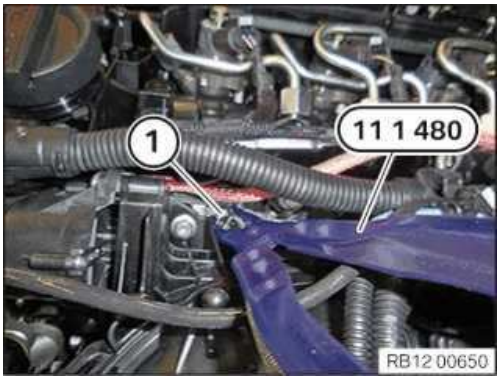


- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool **0 496 268 (11 0 390)** out of the belt tensioner and remove it.

▶ **Installing the cable clip for the intake plenum**



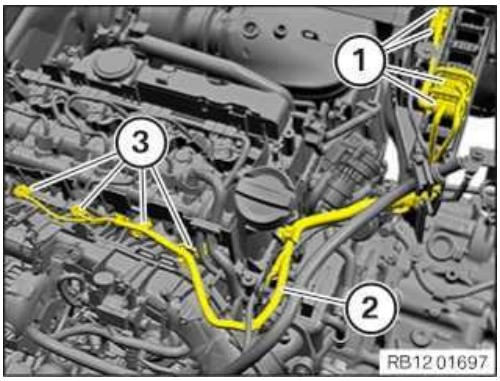
- Insert and install the cable clip (1) in the direction of the arrow.
- Make sure the cable clip (1) is fitted correctly.



- Connect and lock the connector (1) on the glow elements.

  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.

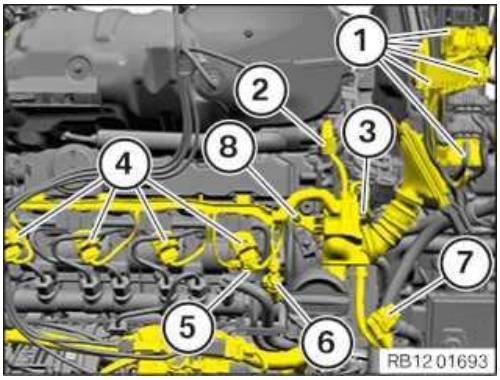
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- Lay vehicle wiring harness and fasten with clamps.
- Route all connectors (1) to the integrated supply module (PDM) and to the DME control unit.
- Connect all connectors (3) to the glow elements and engage them audibly.
- Mount ground strap and tighten screw (2).

Ground cable to cylinder head

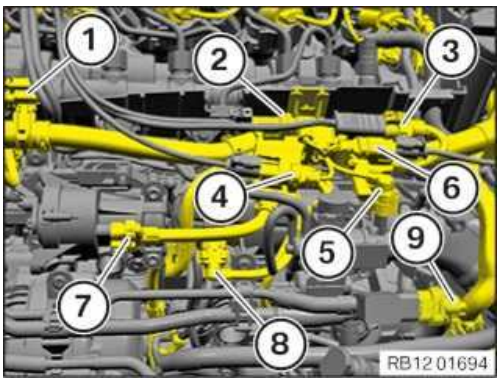
M6x12		Tightening torque	8 Nm



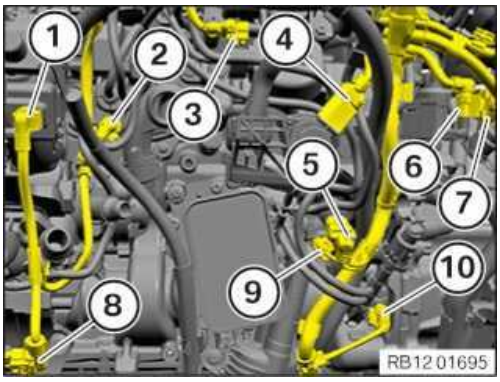
- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the integrated supply module (PDM) and to the DME control unit.
- Attach connector (2) to the differential pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust-gas recirculation valve and lock audibly.
- Attach connector (4) to the injectors and lock it audibly.
- Attach connector (5) to the camshaft sensor and lock it audibly.
- Attach connector (6) to the fuel pressure regulator and lock it audibly.
- Connect and audibly lock the connector (7) to the hot film air mass meter.
- Tighten down screw (8).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

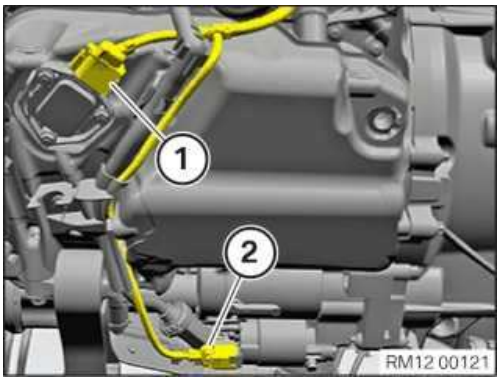


- Connect the connector (1) to the rail pressure sensor and lock it audibly.
- Attach connector (2) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (3) to the front oxygen sensor and lock audibly.
- Attach connector (4) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Connect the connector (5) to the electric changeover valve and lock audibly.
- Attach connector (6) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (7) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (8) to the charging pressure sensor and lock it audibly.
- Attach connector (9) to the fuel pressure and temperature sensor and lock it audibly.

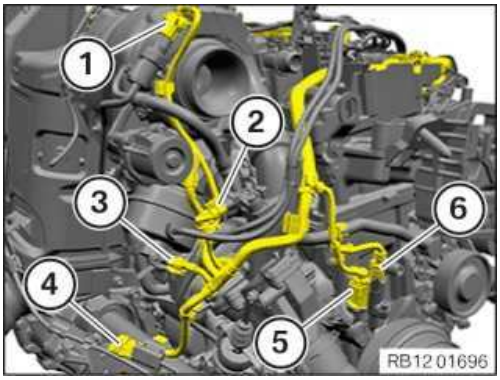


- Connect the connector (1) to the alternator and lock audibly.
- Connect the connector (2) to the electric changeover valve and lock audibly.
- Connect the connector (3) to the electric changeover valve and lock audibly.
- Connect the connector (4) to the high pressure pump and lock audibly.
- Connect the connector (5) to the oil pressure sensor and lock it audibly.
- Attach connector (6) to the throttle bodies and lock it audibly.
- Attach connector (7) to the intake air temperature sensor and lock it audibly.
- Connect the connector (8) to the air conditioning compressor and lock audibly.
- Connect the connector (9) to the solenoid valve and lock audibly.
- Connect the connector (10) to the crankshaft sensor and lock it audibly.

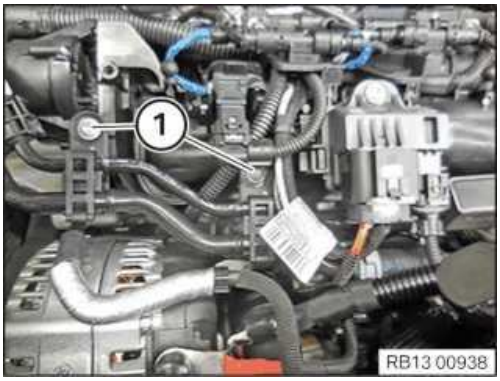
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- Connect the connector (1) to the oil-level sensor and lock it audibly.
- Connect connector (2) to the starter motor and lock audibly.



- Attach connector (1) to the exhaust turbocharger and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust gas pressure sensor and lock it audibly.
- Connect the connector (4) to the monitoring oxygen sensor and lock audibly.
- Attach connector (5) to the oil pressure switch and lock it audibly.
- Attach connector (6) to the switching valve and lock it audibly.

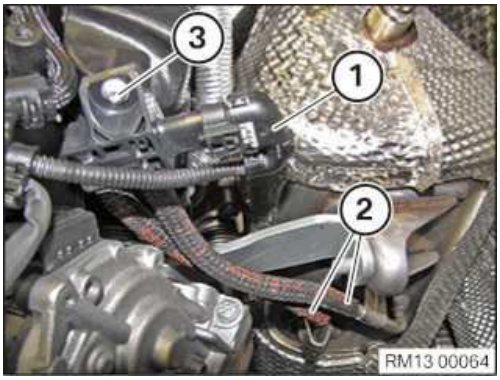


- Position the fuel line.
- Tighten the screws (1).

Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

57 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

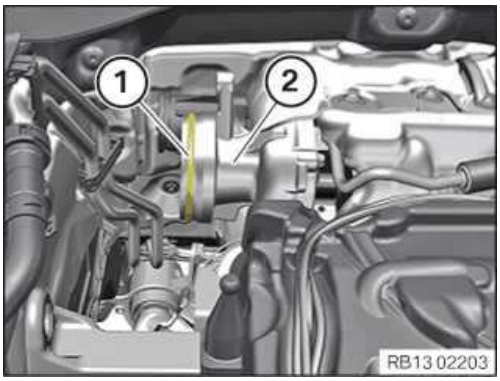
Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

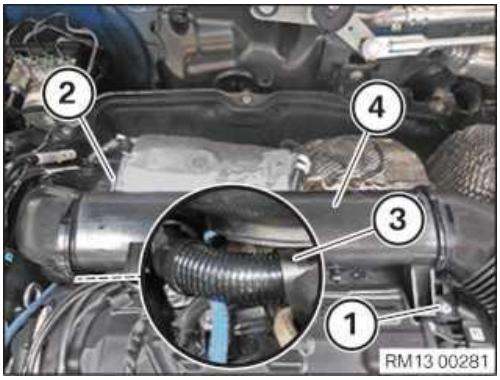
  The connector (1) must engage audibly.

58 – Installing clean air pipe

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- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.



- Feed in clean air pipe and install.
- Connect clean air pipe to the exhaust turbocharger and lock audibly in the clamps (2).
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Connect ventilation line (3) to the cylinder head cover and lock audibly.

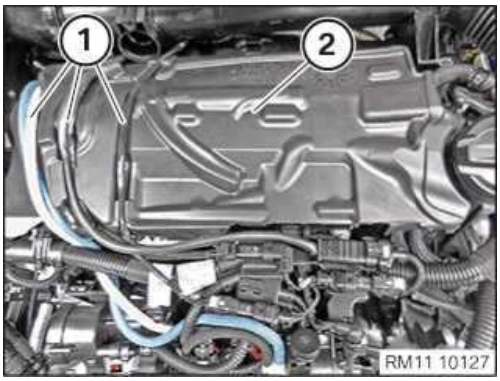


- Mount clean air pipe onto the intake filter housing.
- Tighten clamp (1) on the clean air pipe.

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

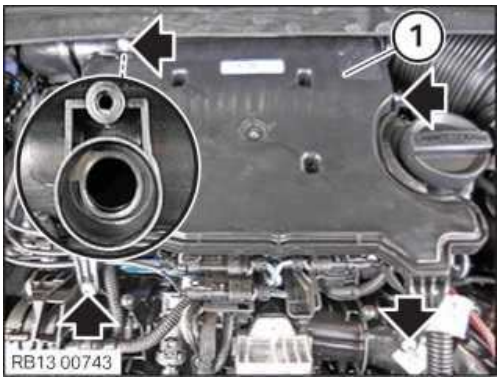
59 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the vehicle wiring harness (1) in the brackets.

60 – Install resonator

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- Insert and install the resonator (1).
- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

61 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Check for correct installation of all rubber mounts in the acoustic cover (1).



- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

62 – Install engine

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- See additional information.

Additional Information

Overview of Tightening Torques

Special tool to cylinder head — Used in step 12

M8		Tightening torque	21,5 Nm

Special tool 2 455 010 to crankcase — Used in step 13

M10x30		Tightening torque	38 Nm

Special tool 11 8 930 to special tool 00 2 320 — Used in step 13

M14x35		Tightening torque	160 Nm

Bearing journal of tensioning and guide rail — Used in step 32

M8	*Replace bearing journal.*	Tightening torque	20 Nm

Chain tensioner to crankcase — Used in step 32

M6x22		Tightening torque	10 Nm

Camshaft sprocket on high pressure pump — Used in step 32

M12		Tightening torque	65 Nm

Oil vacuum pump to crankcaseB47 — Used in step 33

M8x35		Tightening torque	19 Nm

Rear timing case cover to crankcase — Used in step 34

M6	Renew screws.	Jointing torque	8 Nm
		Angle of rotation	90 °

SCR coolant lines to crankcase end cover — Used in step 34

Hexagon screw M6x16		Tightening torque	8 Nm

Cylinder head to crankcase — Used in step 34

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

Cylinder head bolt to timing case cover — Used in step 34

M8x40		Tightening torque	19 Nm

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Oil sump to crankcase

Used in step 34

M8x30		Tightening torque	24 Nm
M8x110		Tightening torque	24 Nm

Transmission to oil sump

Used in step 34

M8		Tightening torque	19 Nm

Guide tube for oil dipstick on engine

Used in step 34

M8x16		Tightening torque	19 Nm

Flywheel to crankshaft

Used in step 35

M12x1.5	Renew screws.	Tightening torque	120 Nm

Glow elements to cylinder head

Used in step 38

Glow element		Tightening torque	13 Nm

Camshaft carrier to cylinder head

Used in step 39

M7x35		Tightening torque	13 Nm

Intake and exhaust camshaft in camshaft support

Used in step 40

M6x31		Tightening torque	10 Nm

Bearing journal to cylinder head

Used in step 40

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8

Used in step 40

M8		Tightening torque	19 Nm

Standard screw connection M6

Used in step 40 56

M6			8 Nm

Chain tensioner piston to cylinder head

Used in step 40

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft

Used in step 40

M7x17.			17 Nm

Cylinder head cover to cylinder head

Used in step 44

M6		Tightening torque.	8,5 Nm

Clamping claw facing to cylinder head cover

Used in step 45

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 45

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

Rail on cylinder head cover

Used in step 46

Torx screw M8x25		Tightening torque	19 Nm

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High pressure line between high pressure pump and rail

Used in step 46

High-pressure pipe		Tightening torque	28 Nm

High pressure lines between injector and rail

Used in step 48

High pressure lines		Tightening torque	28 Nm

Intake plenum to cylinder head

Used in step 49

M6		Tightening torque	11 Nm

Holder to crankcase

Used in step 50

M10		Tightening torque	38 Nm

Transmission to engine

Used in step 51

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

Torque converter to flywheel

Used in step 51

M10	Replace nuts. Remove any adhesive residue from the threads.	Tightening torque	56 Nm

Transfer box to transmission

Used in step 52

M10		Tightening torque	56 Nm

Heat shield to transfer box

Used in step 52

M6	Renew screws.	Tightening torque	6 Nm

Oil filler plug on transfer box (VTG)

Used in step 52

M18x1.5		Tightening torque	35 Nm

Intermediate shaft to transfer box

Used in step 53

M8x35		Tightening torque	19 Nm

Exhaust-gas recirculation cooler to exhaust manifold

Used in step 54 56

M8x28	Replace screws	Tightening torque	32 Nm

Oil return line to turbocharger

Used in step 54 55

M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase

Used in step 54

M8x16		Tightening torque	22 Nm

Exhaust turbocharger to exhaust manifold

Used in step 55

V-band clamp		Tightening torque	19 Nm

Oil feed line to bracket

Used in step 55

Torx screw M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase

Used in step 55

M8x16		Tightening torque	22 Nm

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Exhaust-gas recirculation cooler to cylinder head

Used in step 56

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler

Used in step 56

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 56

M8x20		Tightening torque	19 Nm

Heat shield for exhaust turbocharger

Used in step 56

Torx screw BM 6x12		Tightening torque	10 Nm

Banjo bolt for exhaust pressure pipe to exhaust manifold

Used in step 56

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

Diesel particulate filter V-clip to exhaust turbocharger

Used in step 56

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Diesel particle filter to holder

Used in step 56

M8 hexagon nut		Tightening torque	19 Nm

Diesel particulate filter holder to gearbox

Used in step 56

M12x75		Tightening torque	66 Nm

Diesel particulate filter bracket to crankcase

Used in step 56

M10x35		Tightening torque	38 Nm

Heat shield for exhaust turbocharger

Used in step 56

Torx screw BM 6x12		Tightening torque	10 Nm

Bracket to oil sump

Used in step 56

M6		Tightening torque	8 Nm

Alternator to component carrier

Used in step 56

M10x75 / M10x125		Tightening torque	38 Nm

Positive battery cable to alternator

Used in step 56

M8		Tightening torque	19 Nm

Air conditioning compressor in component carrier

Used in step 56

M10		Tightening torque	38 Nm

Ground cable to cylinder head

Used in step 56

M6x12		Tightening torque	8 Nm

Wiring harness to cylinder head cover

Used in step 56

TS5x20		Tightening torque	3,5 Nm

Fuel line to intake plenum

Used in step 56

TS6x20		Tightening torque	5 Nm

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Differential pressure sensor to holder — Used in step 57

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor — Used in step 57

Clamp 15–19mm		Tightening torque	3 Nm

Clean air pipe to cylinder head cover — Used in step 58

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 58

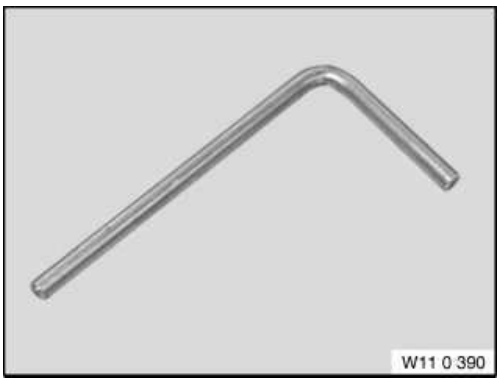
Clamp		Tightening torque	3 Nm

Resonator to manifold and clean air pipe — Used in step 60

Screw TS6	Renew screw.	Tightening torque	5 Nm

Overview of Special Tools

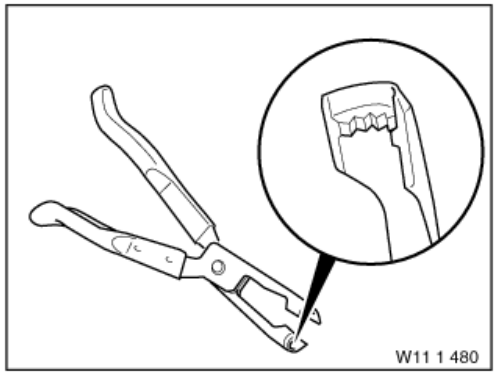
0 496 268 (11 0 390) Pin



Common — Used in step 7 56

Usage	(roll pin) For securing new tensioning pulley (poly-V belt)
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 15 07 (390)

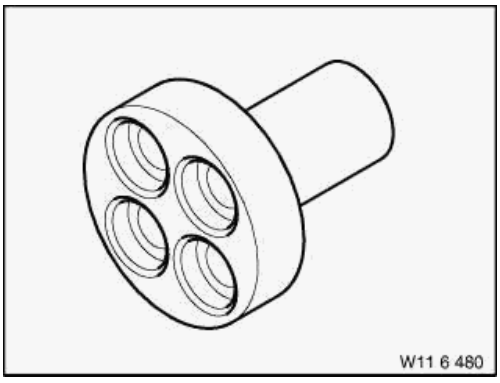
0 490 796 (11 1 480) Pliers



Common — Used in step 7 25

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

0 493 380 (11 6 480) Connector



Common — Used in step 12 20 40 43 51

Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

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2 220 718 Workshop crane



Common	Used in step 12 51
Usage	WSK 1000
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	06 01 11 (701)

2 459 012 Holder



Common	Used in step 12 51
Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

2 455 010 Engine support

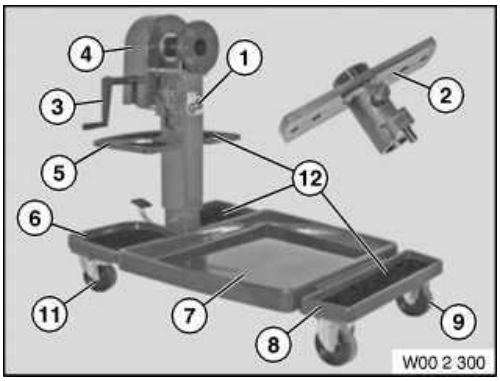


Common	Used in step 13 50
Usage	For accommodating engine on assembly stand. Engine: B3x, B4x, N47.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

0 495 187 (00 2 300) Assembly stand

Used in step 13

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Common

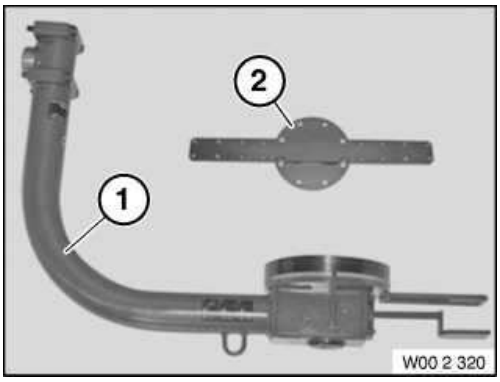
Usage	Assembly stand with universal flange for mounting engines from S85
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 188 (00 2 301)		**Assembly stand** available only as complete assembly stand 83 30 0 495 187.	
2	0 495 189 (00 2 302)	**2 299 563**	**Tool** (Universal flange). Do not use any more!!! Technically locked. Replaced with a new flange with material number 83 30 2 299 563. All flanges delivered until the end of 2011 will be replaced at no charge. From 2012, only the new flange will be supplied. Also applies to the complete engine mounting stand 00 2 300.	
3	0 495 200 (00 2 303)		**Crank**	
4	0 495 201 (00 2 304)		**Cover** (Protective hood)	
5	0 495 202 (00 2 305)		**oddments tray** (Oddments tray for small parts)	
6	0 495 203 (00 2 306)		**Shaped element** (Rear shaped pan)	
7	0 495 204 (00 2 307)		**Collection pan** (Oil collection pan)	
8	0 495 205 (00 2 308)		**Shaped element** (Front shaped pan)	
9	0 495 206 (00 2 309)		**Wheel** (Front wheel (without stop))	
10	0 495 207 (00 2 311)		**Wheel** (Rear wheel (with stop))	
11	0 495 208 (00 2 312)		**Mat** (Checker mat set)	
2	2 299 563		**Adapter** New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.	

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0 495 196 (00 2 320) Support arm



Common

Used in step 13

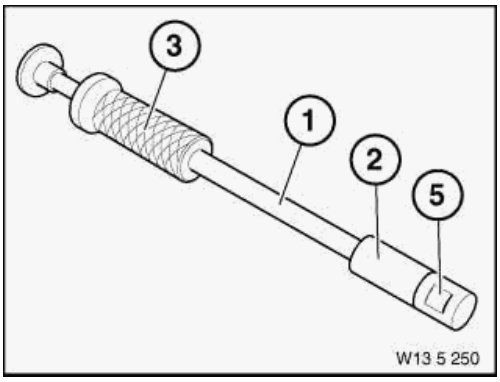
Usage	(Support arm with fixture) For mounting engines using the engine mounting bracket.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 197 (00 2 321)		**Support arm**	
2	0 495 198 (00 2 322)		**Panel** (take-up plate)	
3	0 495 380 (00 2 323)		**Panel** (fixture) Engine N73	
6	0 496 287 (00 2 326)		**Panel** (fixture) Engine: M73	
5	0 496 288 (00 2 327)	**0 496 373**	**Panel** (fixture) Engine: S62 Replaced by 11 5 420 (0 496 373)	
8	0 496 533 (00 2 328)		**Support** (Engine mount) Engine: N57, N57Top	
9	0 496 579 (00 2 329)	**0 496 680**	**Support** (Engine mount) Engine: N74 Replaced by 116160 (0 496 680)	
4	0 495 379 (00 2 324)		**Panel** (fixture) Engine M67TU	
5	0 495 381 (00 2 325)		**Panel** (fixture) Engine N62, N62TU	

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0 493 321 (13 5 250) Puller



Common

Used in step 17

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

0 493 339 (13 5 252) Bush



Common

Used in step 17

Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 493 340 (13 5 253) Weight



Common Used in step 17

Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

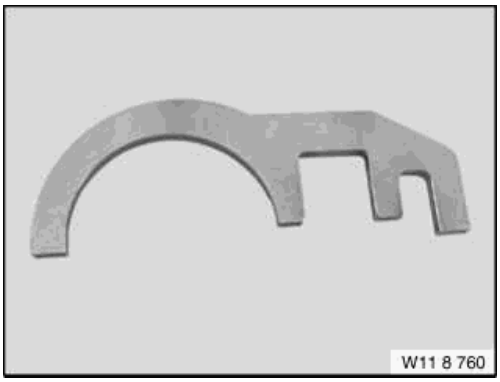
2 288 380 Locating stud



Common Used in step 20 40 41 43

Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 112 (11 8 760) Gauge



Common Used in step 20 40 42 43

Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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0 495 105 (11 4 480) oddments tray



Common

Used in step 26 27 40

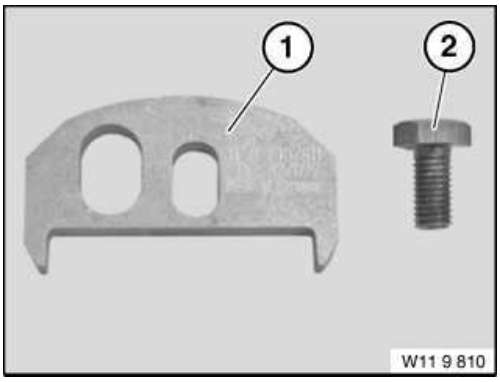
Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

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0 496 171 (11 9 811) Holder



Common	Used in step 28 35
Usage	Available only as a complete tool set 11 9 810 (83 30 0 496 170) - as of 13.01.12
Included in the tool or work	0 496 170
Storage location	C86
Replaced by	
In connection with	
SI-Number	01 07 07 (355)

0 494 793 (11 9 265) Bush



Common	Used in step 28 35
Usage	
Included in the tool or work	0 493 938
Storage location	A44
Replaced by	
In connection with	
SI-Number	

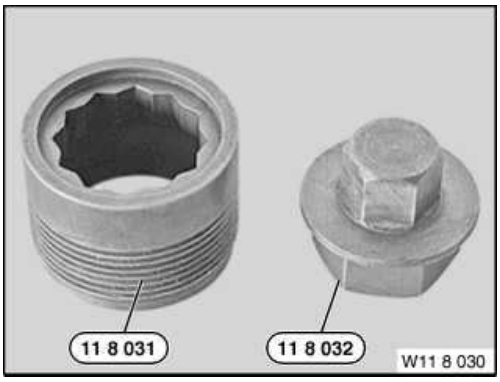
2 357 904 Gauge



Common	Used in step 31 32
Usage	For positioning the high pressure pump to the crankshaft . Replaced by gauge 2420824
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

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0 496 725 (11 8 030) Extractor



Common

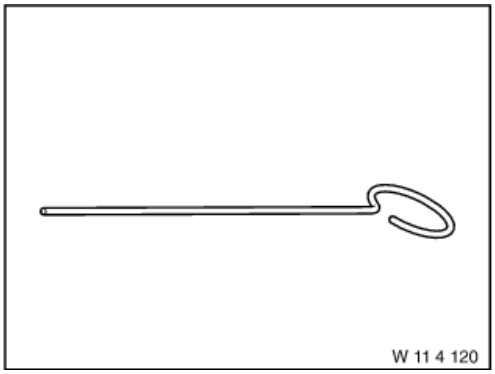
Used in step 31

Usage	for the disassembly of the high pressure pump (replaces SWZ 11 8 740 as of 08/2009) 11 8 740 will be replaced by 83 30 2 448 914.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 757 (11 8 031)	**2 448 914**	**Holding sleeve** Replaces SWZ11 8 741 from 08/2009, 09/2011 no longer available individually. From 10/2016, can only be ordered as a new set of special tools 2 448 914.	
2	0 496 758 (11 8 032)	**2 448 914**	**Adapter** Replaces special tool 11 8 742 from 08/2009, 09/2011 remaining inventories will be sold off - no longer available individually. From 10/2016, can only be ordered as a new set of special tools 2 448 914.	

0 491 012 (11 4 120) Pin



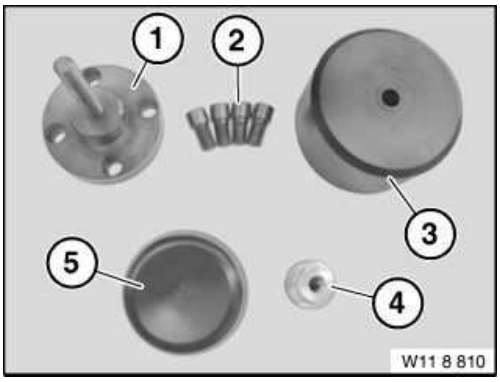
Common

Used in step 31 32

Usage	(lock pin) For chain tensioners, for locking the chain tensioner piston (e.g. during cylinder head removal and fitting)
Included in the tool or work	
Storage location	B1
Replaced by	
In connection with	
SI-Number	01 12 93 (701)

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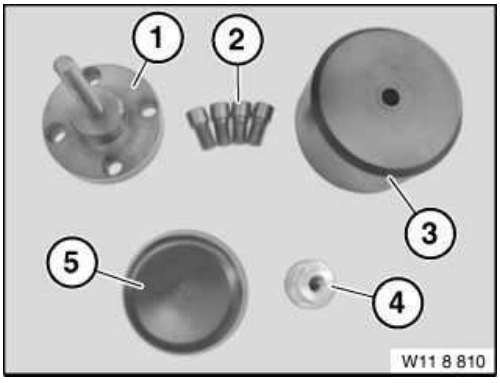
0 496 137 (11 8 815) Holding sleeve



Common Used in step 34

Usage	(Slip sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 133 (11 8 811) Basic body

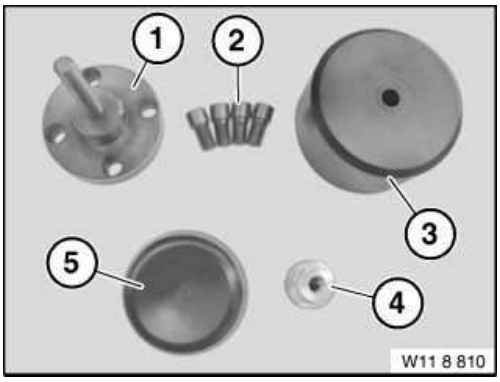


Common Used in step 34

Usage	Liquidation of existing inventory and then available only as a complete tool set 11 8 810 = 83 30 0 496 132 - as of 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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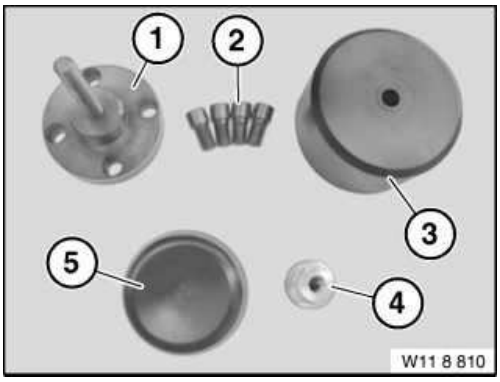
0 496 134 (11 8 812) Screw



Common Used in step 34

Usage	(Screw set) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

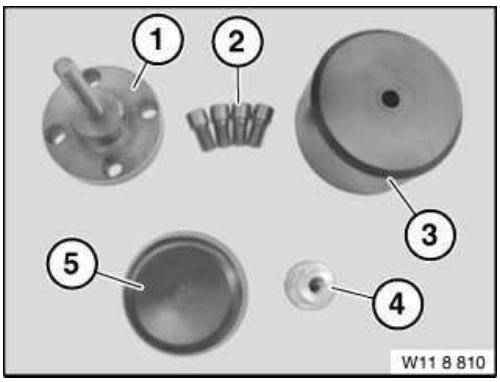
0 496 135 (11 8 813) Holding sleeve



Common Used in step 34

Usage	(Thrust sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 136 (11 8 814) Nut

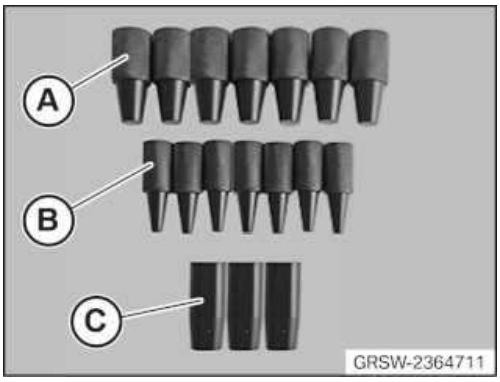


Common Used in step 34

Usage	(Nut with bearing) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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2 364 711 Plug



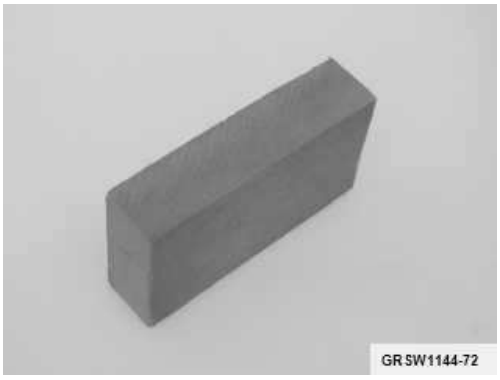
Common	Used in step 34
Usage	For closing the pressure oil holes for cleaning the cylinder head sealing surfaces.
Included in the tool or work	
Storage location	C20
Replaced by	
In connection with	
SI-Number	01 50 14 (203)

0 495 103 (11 4 471) Scraper



Common	Used in step 34
Usage	
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

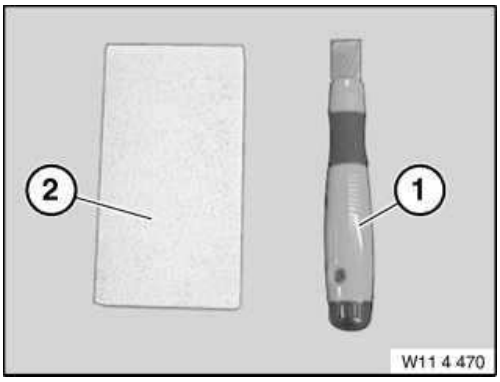
0 495 104 (11 4 472) Extractor



Common	Used in step 34
Usage	(grindstone)
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

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0 495 102 (11 4 470) Tool



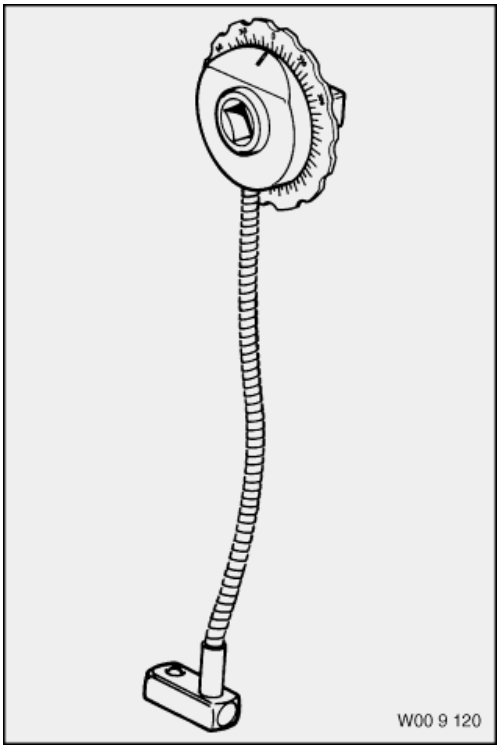
Common Used in step 34 54

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

0 490 504 (00 9 120) Torque angle measuring dial

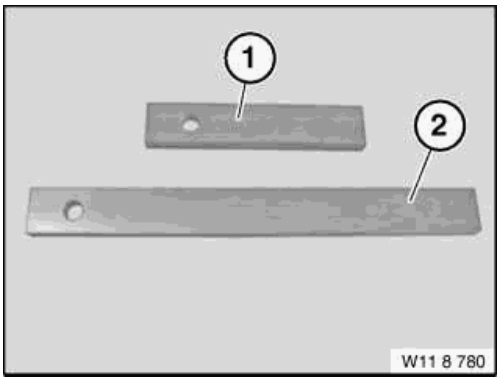


Common Used in step 34

Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

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0 496 120 (11 8 780) Plate



Common

Used in step 34

Usage	(Mounting plates) For securing transmission oil sump when gearbox is removed.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 121 (11 8 781)		**Plate** (Mounting plate, short)Discontinued; only available via set 11 8 780 = 0496120.	
2	0 496 122 (11 8 782)		**Plate** (Mounting plate, long) Discontinued; only available via set 11 8 780 = 0496120.	

2 285 058 Tool set



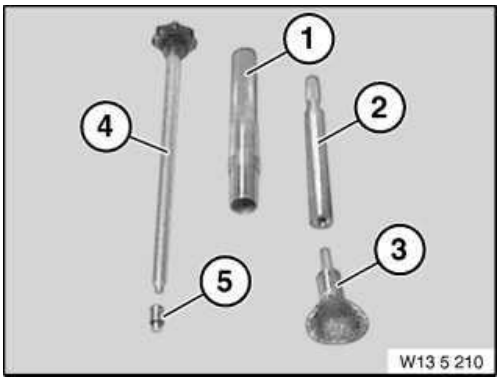
Common

Used in step 35

Usage	
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 02 14 (069)

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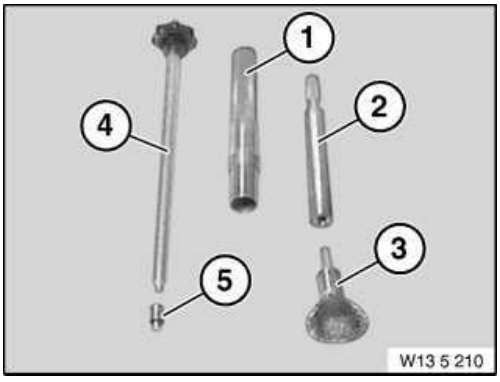
0 493 763 (13 5 215) Plug



Common Used in step 45

Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 762 (13 5 214) Rod

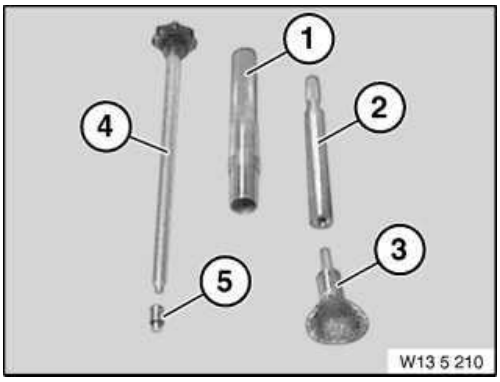


Common Used in step 45

Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 493 758 (13 5 210) Tool



Common

Used in step 45

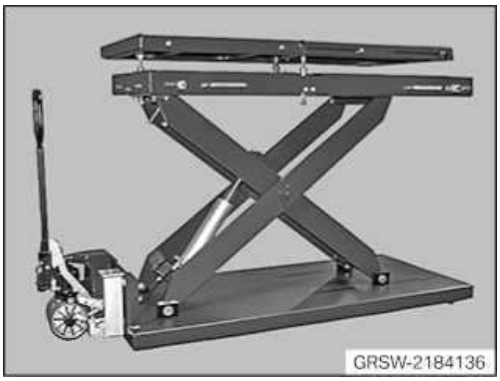
Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

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2 184 136 Mobile equipment table lift



Common	Used in step 51
Usage	Table lift MHT 1200
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	06 01 10 (649)

2 409 025 Puller



Common	Used in step 52
Usage	For disassembly of the outer radial shaft seal of the transmission output shaft, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A76
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 411 739 Puller



Common	Used in step 52
Usage	For disassembly of the inner radial shaft seal of the output, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C78
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 408 152 Striking element



Common	Used in step 52
Usage	For installation of the right radial shaft seal transmission output shaft (inner). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

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2 413 037 Handle



Common	Used in step 52
Usage	Universal drift handle. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C77
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

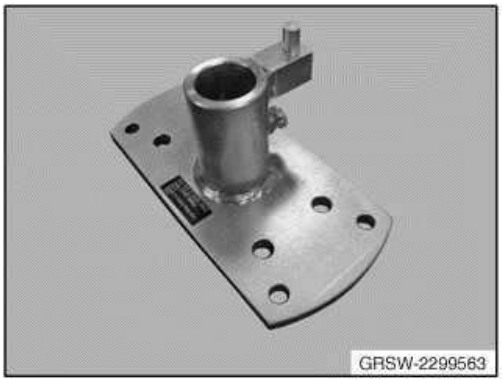
2 408 150 Striking element



Common	Used in step 52
Usage	For installing the right radial shaft seal transmission output shaft (outer). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

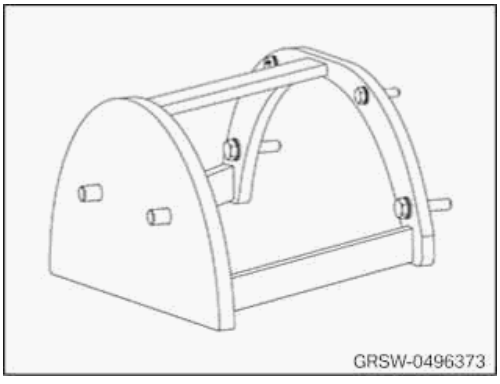
Replacement tools:

2 299 563 Adapter



Common	Used in step 13
Usage	New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.
Included in the tool or work	0 495 187
Storage location	
Replaced by	
In connection with	
SI-Number	

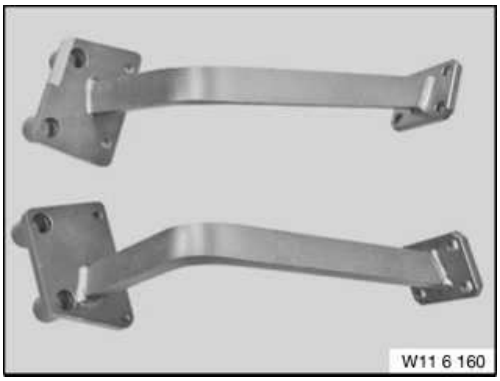
0 496 373 (11 5 420) Plate



Common	Used in step 13
Usage	(Fixture) Engine S62
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	

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0 496 680 (11 6 160) Support



Common	Used in step 13
Usage	For mounting N74 engine on the assembly stand. In combination with 00 2 300, 00 2 320
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	00 2 300; 00 2 320 = 0495196
SI-Number	01 31 09 (604)

2 448 914 Extractor



Common	Used in step 31
Usage	For removing and installing high pressure pump. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A49
Replaced by	
In connection with	
SI-Number	01 15 16 (411)

Overview Technical Data

Screw-in depth of thread cutter	Used in step 35
Screw-in depth	18 mm

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	7 56
EGR controller	7 56

General repair instructions	Used in step
11 00 ... Overview of consumables (Electronic Parts Catalogue)	34

Repair instructions	Used in step
11 00 050 Removing and installing engine	1 62
11 00 050 Removing and installing engine	1 62
11 00 050 Removing and installing engine	1 62
11 00 050 Removing and installing engine	1 62
11 00 050 Removing and installing engine	1 62
11 00 050 Removing and installing engine	1 62
11 00 050 Removing and installing engine	1 62
11 00 050 Removing and installing engine	1 62
11 00 050 Removing and installing engine	1 62
31 10 001 Completely removing and installing front axle with engine and transmission	1 62

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11 00 050 Removing and installing engine	1	62
11 00 050 Removing and installing engine	1	62
11 00 050 Removing and installing engine	1	62
11 00 050 Removing and installing engine	1	62
11 00 050 Removing and installing engine	1	62
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11 00 050 Removing and installing engine	1	62
11 00 050 Remove and install engine	1	62
11 00 050 Remove and install engine	1	62
11 00 050 Remove and install engine	1	62
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG)	1	62
11 00 050 Remove and install engine	1	62
11 00 050 Remove and install engine	1	62
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11 00 050 Remove and install engine	1	62
11 00 050 Removing and installing the engine (manual gearbox)	1	62
11 00 050 Remove and install engine (Automatic)	1	62
11 00 050 Remove and install engine	1	62
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11 00 050 Remove and install engine	1	62
11 00 050 Remove and install engine	1	62
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11 00 050 Remove and install engine	1	62
11 00 050 Removing and installing engine	1	62
11 00 050 Removing and installing engine \PREMIUM	1	62
11 00 050 Removing and installing/replacing engine (N63)	1	62
11 00 050 Removing and installing engine	1	62
11 00 050 Removing and installing engine	1	62
11 00 050 Removing and installing engine	1	62
11 00 050 Remove and install engine	1	62
11 00 050 Remove and install engine (Automatic)	1	62

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11 00 050 Remove and install engine (Automatic)	1 62
11 00 050 Remove and install engine	1 62
11 00 050 Remove and install engine	1 62
11 00 050 Remove and install engine (Automatic)	1 62
11 00 050 Remove and install engine (Automatic)	1 62
11 00 050 Remove and install engine	1 62
11 00 050 Remove and install engine	1 62
11 00 050 Remove and install engine	1 62
11 00 050 Remove and install engine	1 62
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG)	1 62
11 00 050 Remove and install engine	1 62
61 35 ... Notes on ESD protection (Electro Static Discharge)	6 17 25 34
61 35 ... Notes on ESD protection (Electro Static Discharge)	34

Operating materials	Used in step

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	40
Exhaust-gas recirculation cooler seal on exhaust manifold	56
Exhaust-gas recirculation cooler seal on intake plenum	56

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11 31 052 Replacing both timing chains (B47)

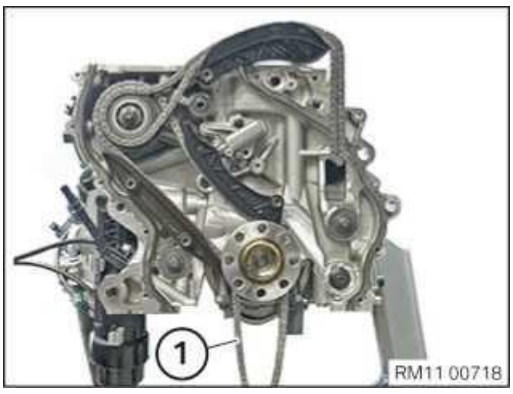
Special tools required:

- 2 357 904
- 11 8 030
- 11 4 120

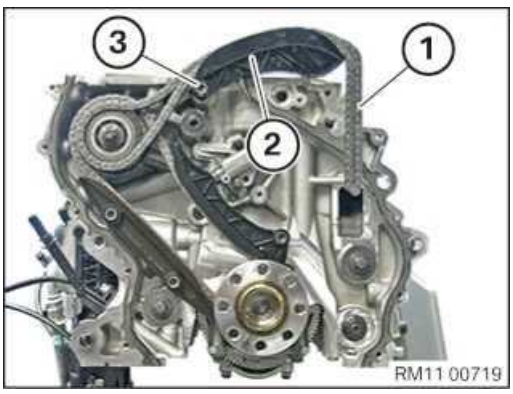
Necessary preliminary tasks:

- Remove engine with transmission
- Remove gearbox
- Mount engine on assembly stand
- Remove flywheel
- Remove cylinder head
- Remove oil pump
- Remove rear timing case cover

Removal:



Remove drive chain (1) for oil pump.

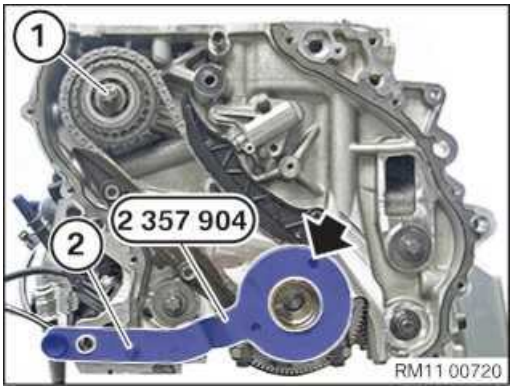


Remove camshaft timing chain (1).

Remove tensioning rail (2) from bearing journal (3).

Note:
Bearing journal (3) does not have to be removed.

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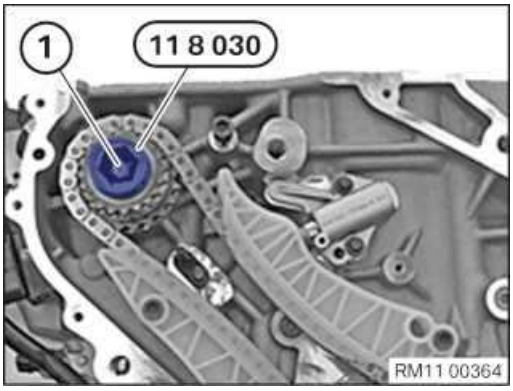
The crankshaft must be blocked in order to release central bolt (1) of the high pressure pump.

Position crankshaft with guide pin. Fix special tool 2 357 904 with screw (2) in position at the crankcase.

Release central bolt (1) of high pressure pump.

Important!

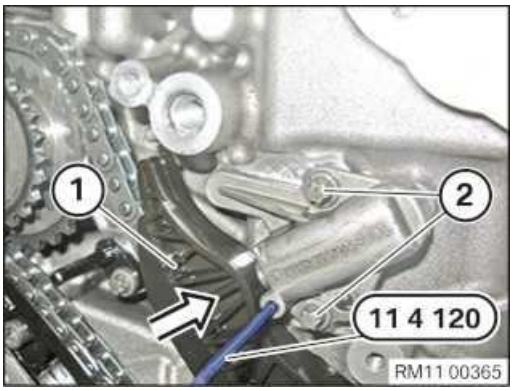
Merely loosen central bolt (1), do not remove.



Screw special tool11 8 030 into sprocket of high pressure pump.

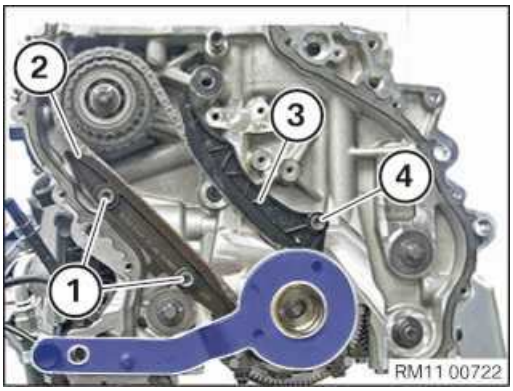
Unscrew central bolt (1) of high pressure pump so far that central bolt can rest on special tool 11 8 030 .

Keep turning the central bolt (1) until the sprocket has come loose from the high pressure pump shaft.



Press chain tensioner in with tensioning rail (1) by hand in the direction of the arrow until the special tool 11 4 120 can be positioned.

Unfasten screws (2). Remove chain tensioner.



Undo both bearing journals (1).

Remove guide rail (2).

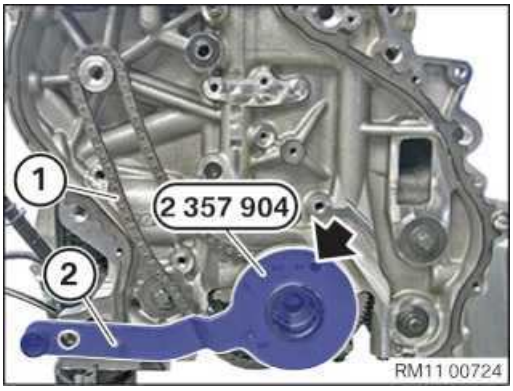
Release bearing journal (4).

Remove tensioning rail (3).

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Remove screw and camshaft sprocket (1) for high pressure pump.

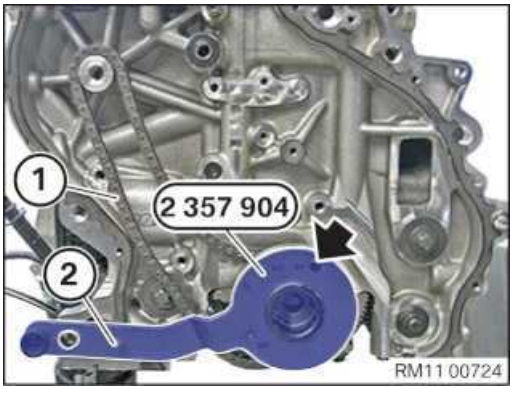


Release screw (2) and remove special tool 2 357 904 .

Remove timing chain (1).

Note:
Graphic B48.

Installation:

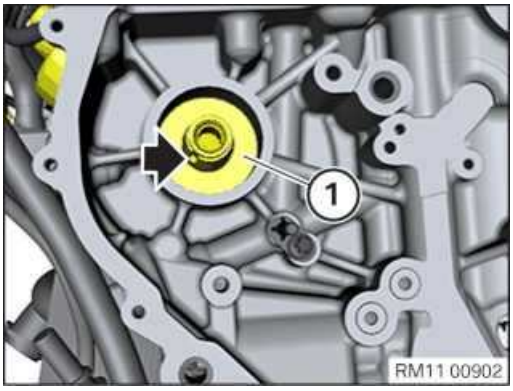


Fit timing chain (1).

Position crankshaft with special tool 2 357 904 .

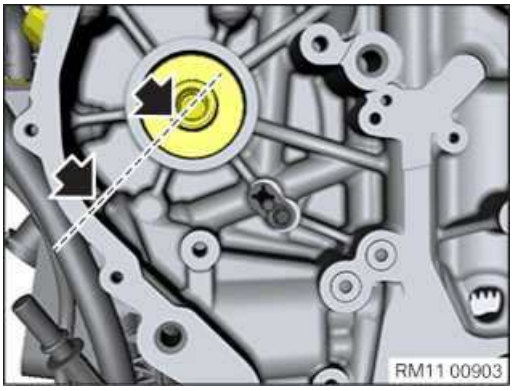
Fix special tool 2 357 904 with screw (2) in position at the crankcase.

Note:
Graphic B48.

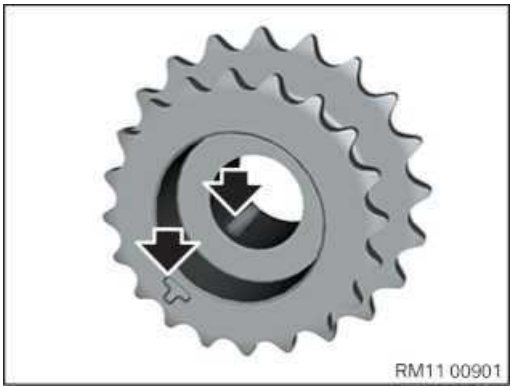


Note:
Pay attention to spline groove on high pressure pump (1).

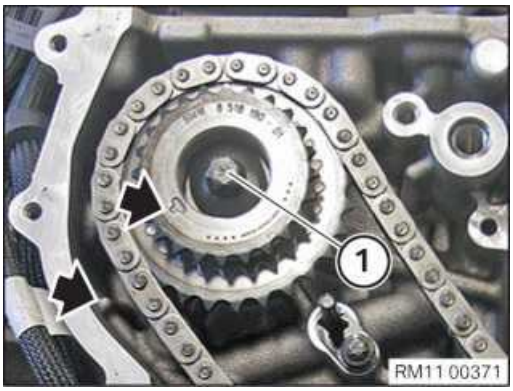
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Note:
Mark on crankcase and groove on high pressure pump must be in line.



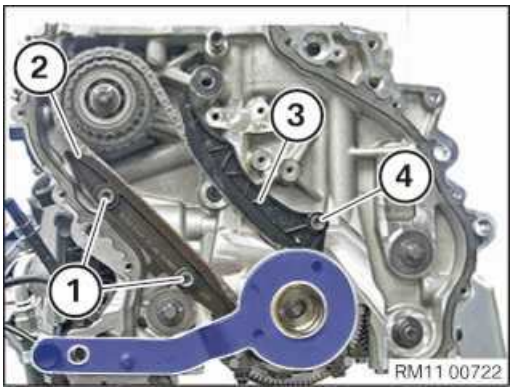
Note:
Spline and mark on pinion are on a single plane.



Position impeller with timing chain on the high-pressure pump.

Insert central bolt (1) of high pressure pump.

Mark and cast lug must be in line.



Important!

Clean all the threads of the bearing journals (if necessary with screw tap).

Parts: Replace bearing journals.

Position guide rail (2).

Screw in both bearing journals (1).

Tightening torque: 11 11 6AZ.

Position tensioning rail (3).

Screw in bearing journals (4).

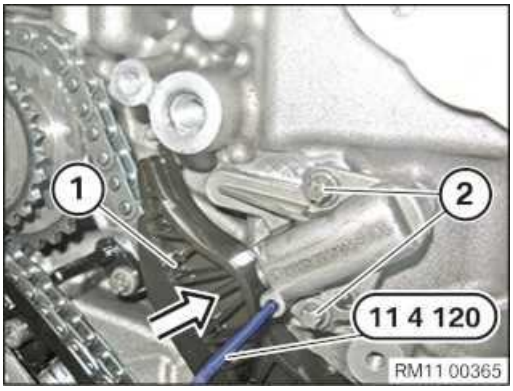
Tightening torque: 11 11 6AZ.

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Important!

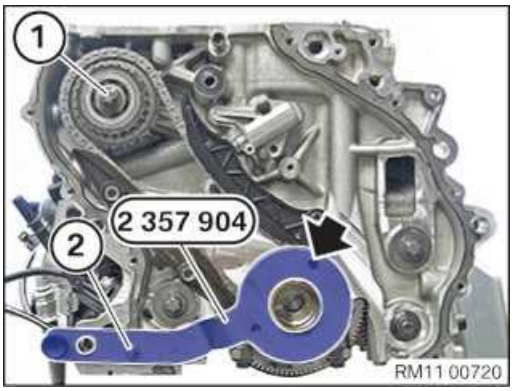
Clean sealing surfaces (1) with compressed air.



Install hydraulic chain tensioner. Tighten down screws (2).

Tightening torque: 13 52 1AZ.

Remove special tool 11 4 120 .

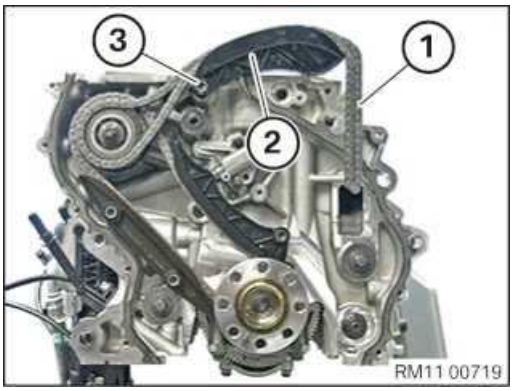


Note:
Crankshaft must remain blocked to fasten central bolt (1) of high pressure pump.

Parts: Replace central bolt (1).

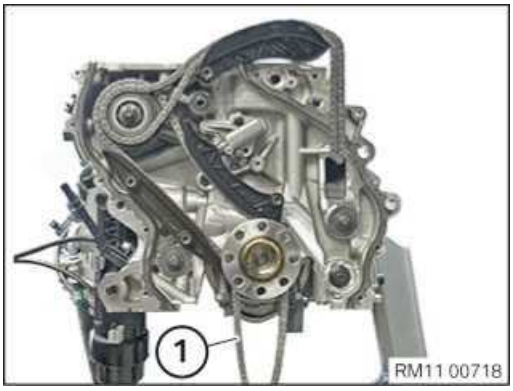
Tighten central bolt (1) of high pressure pump.

Tightening torque: 13 52 2AZ.



Install tensioning rail (2) with timing chain (1) for camshafts.

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Mount drive chain (1) for oil pump on crankshaft.

Required follow-up work:

- Install rear timing case cover
- Install oil pump
- Mounting the flywheel
- Mounting the cylinder head
- Remove engine from assembly stand
- Install gearbox
- Install engine with transmission

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11 31 028 Replacing exhaust camshaft (B47)

Special tools required:

- 11 6 480

Necessary preliminary tasks:

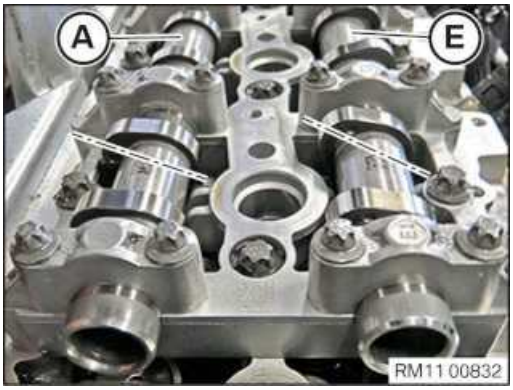
- Remove front right wheel arch panel
- Remove cylinder head cover

REMOVAL:



Crank engine with special tool11 6 480 to firing TDC position of cylinder no. 1.**Important!**

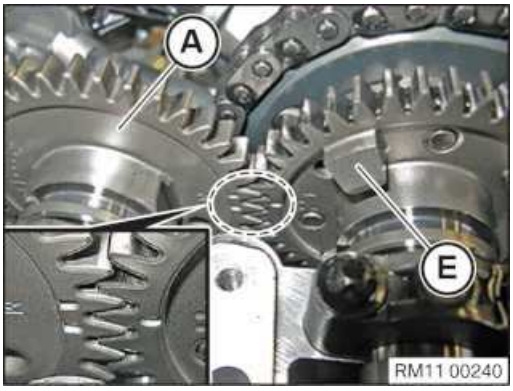
Do not crank engine in reverse direction!



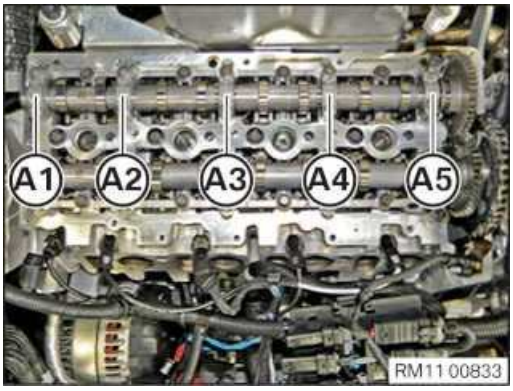
The cam on the intake camshaft (E) points obliquely upwards at cylinder No. 1.

The cam on the exhaust camshaft (A) points obliquely outward to the left at cylinder No. 1.

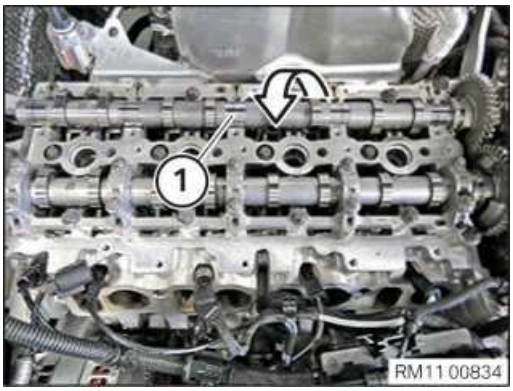
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Check position of exhaust and intake camshafts (see graphic).

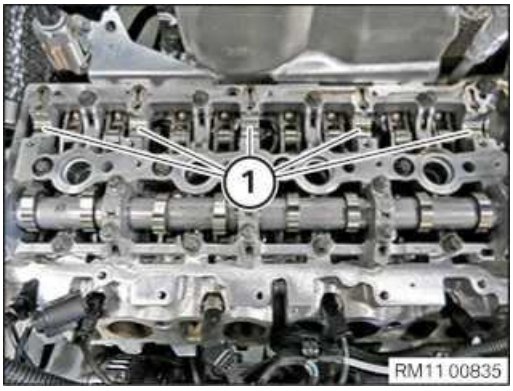


Release camshaft bearing caps **A1** to **A5** by 1/2 a turn at a time, working from the outside inwards, and remove.



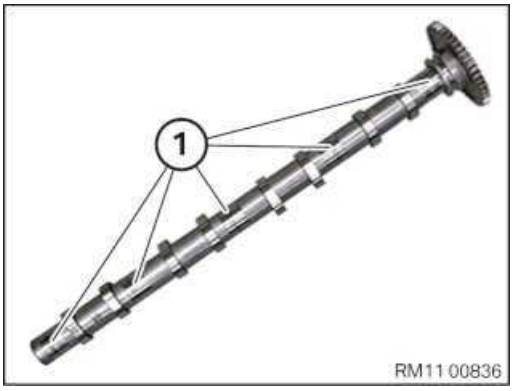
Feed exhaust camshaft upwards to remove.

INSTALLATION:

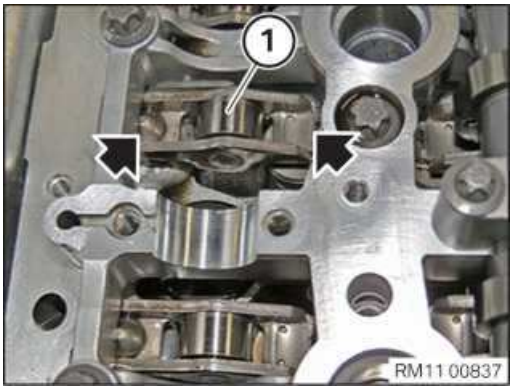


Oil all bearing positions (1).

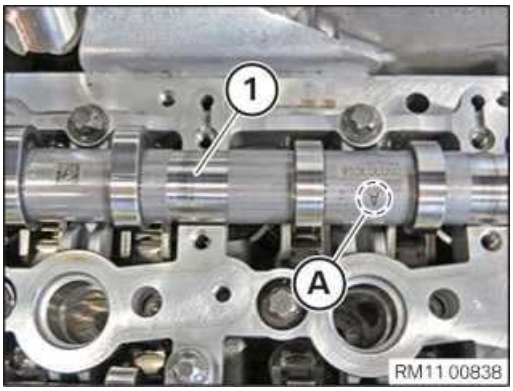
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Oil all bearing positions (1) of exhaust camshaft.

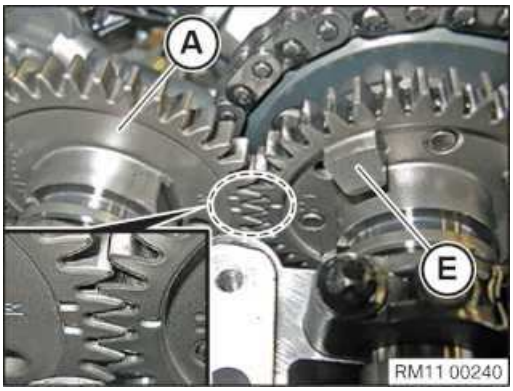


Check installation position of the roller cam followers **(risk of damage!)**.



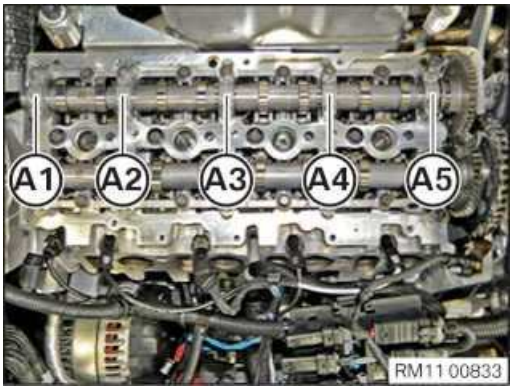
Note:
Identification (A) on exhaust camshaft (1) must point upwards.

Install exhaust camshaft (1).



When inserting the exhaust camshaft (A), the marks of both camshafts (A and E) must be aligned (see graphic).

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Tighten down camshaft bearing caps **A1** to **A5** on the camshaft carrier by 1/2 a turn at a time, working from the inside outwards.

Tightening torque: 11 31 2AZ.



Using special tool 11 6 480 , crank engine twice in direction of engine rotation until cylinder no.1 is back in firing TDC position.

Check camshaft adjustment .

Required follow-up work:

- Install cylinder head cover
- Install front right wheel arch panel

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11 31 025 Replacing intake camshaft (B47)

Special tools required:

- 11 6 480
- 2 288 380
- 11 8 760

Necessary preliminary tasks:

- Remove wheel arch panel
- Remove cylinder head cover
- Remove exhaust-gas recirculation cooler

REMOVAL:



Crank engine with special tool 11 6 480 to TDC firing position of cylinder no. 1.**Important!**
Do not crank engine in reverse direction!



Remove cover (1).

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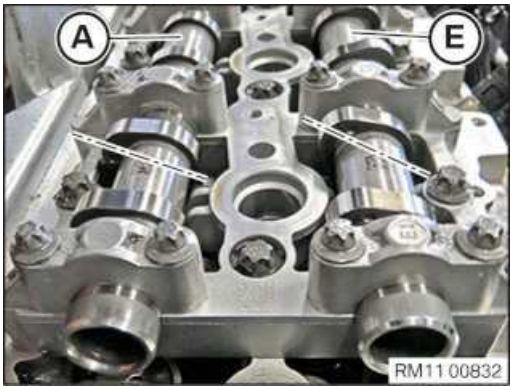
Turn engine with special tool 11 6 480 on vibration absorber.

Important!

Vehicles with manual gearboxes have an additional bore hole in front of the dowel hole that can be mistaken for the dowel hole.

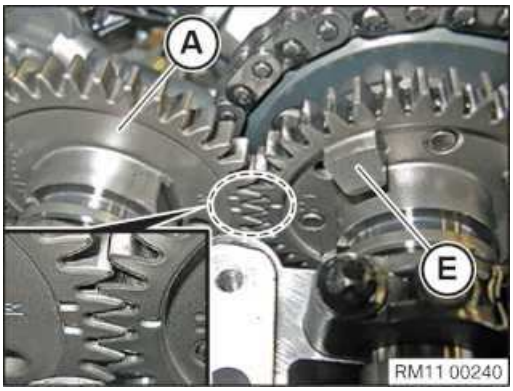
It must be possible to slide the special tool 2 288 380 into the oil sump to the offset.

Block crankshaft with cylinder no. 1 in TDC firing position with special tool2 288 380 .

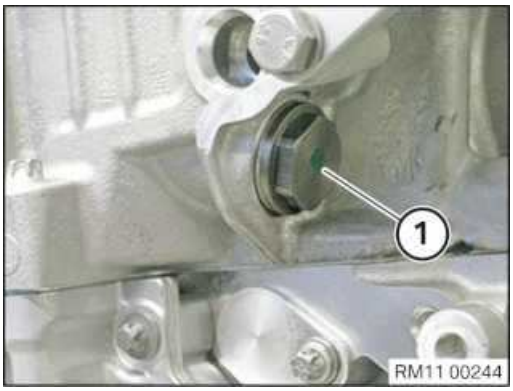


The cam on the intake camshaft (E) points obliquely upwards at cylinder No. 1.

The cam on the exhaust camshaft (A) points obliquely outward to the left at cylinder No. 1.

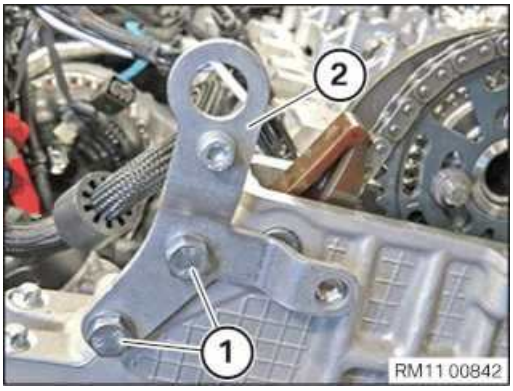


Marks on both camshafts (A and E) must match up (see graphic).



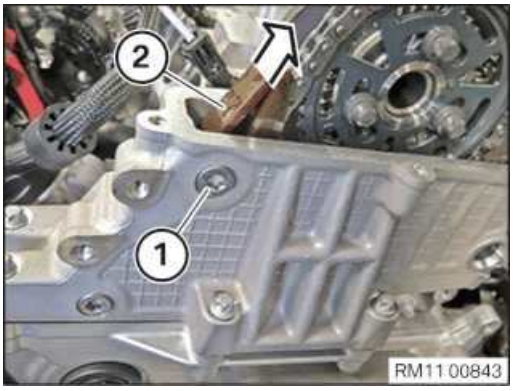
Release chain tensioner (1).

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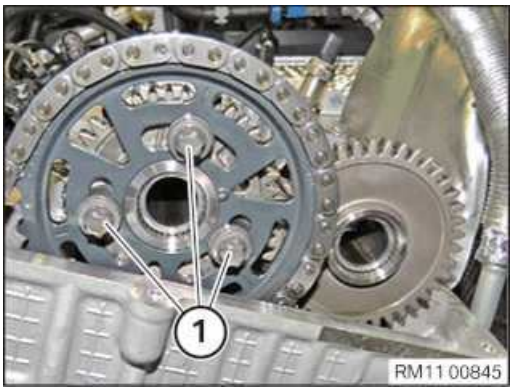
Release screws (1).

Remove suspension element (2).



Remove bearing journal (1).

Remove guide rail (2) in direction of arrow.



Important!

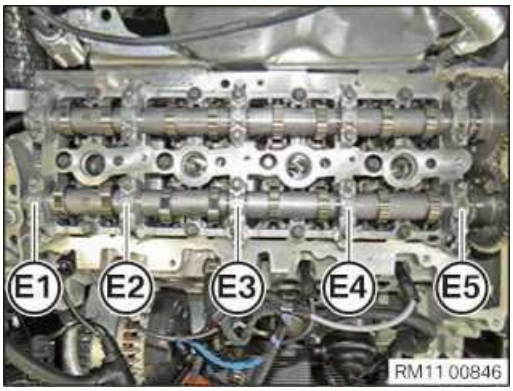
Secure timing chain against falling out.

Risk of damage to oil spray nozzle.

Release screws (1).

Remove camshaft sprocket from the intake camshaft and feed out of timing chain.

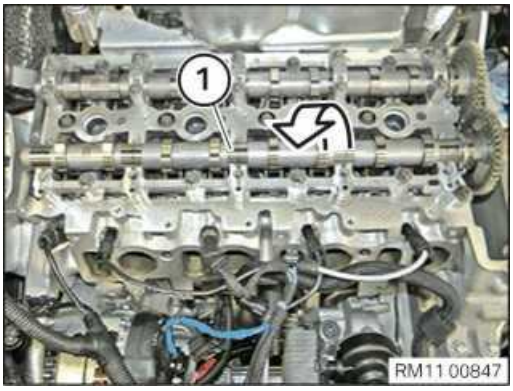
Place timing chain in cylinder head.



Note:
It is necessary to adjust the engine timing when removing the intake camshaft.

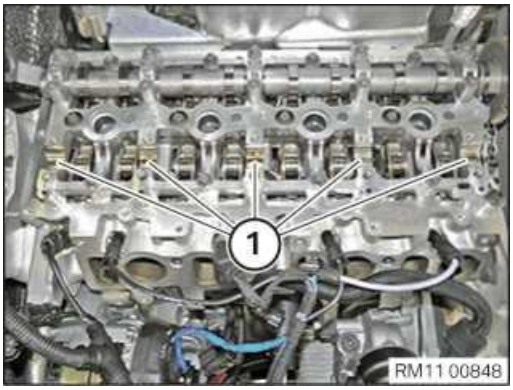
Release camshaft bearing caps **E1** to **E5** by 1/2 a turn at a time, working from the outside inwards.

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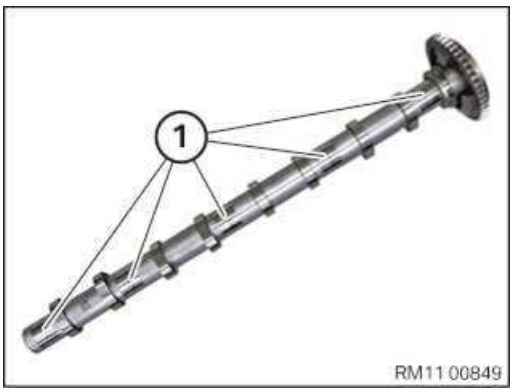


Feed out intake camshaft towards the top and put to one side.

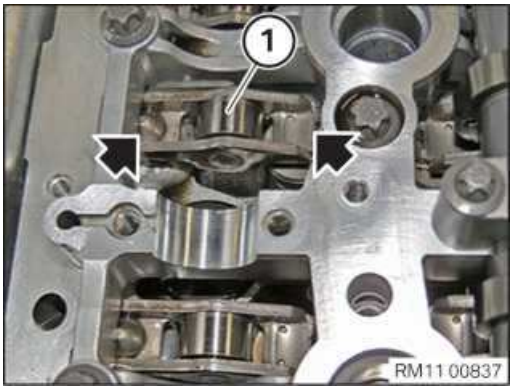
INSTALLATION:



Oil all bearing positions (1).

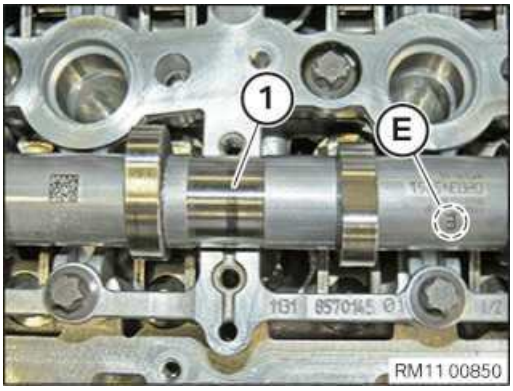


Grease all bearing positions (1) of the intake camshaft.



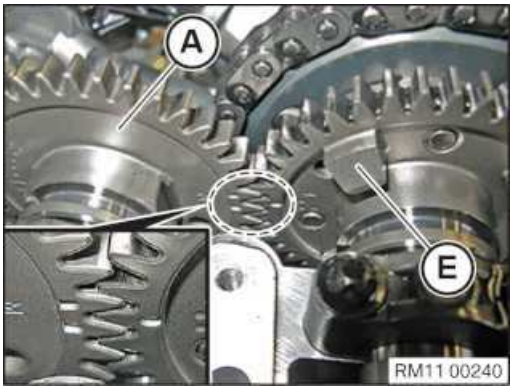
Check installation position of the roller cam followers **(risk of damage!)**.

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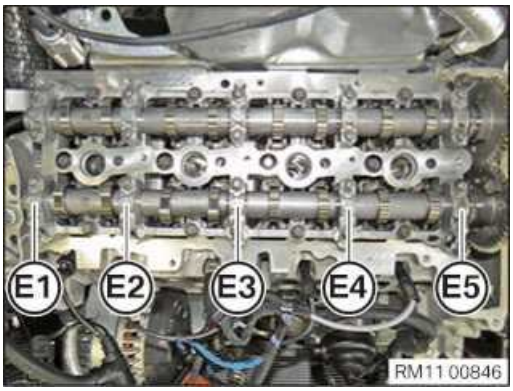


Note:
Identification (E) must point upwards.

Insert intake camshaft (1).

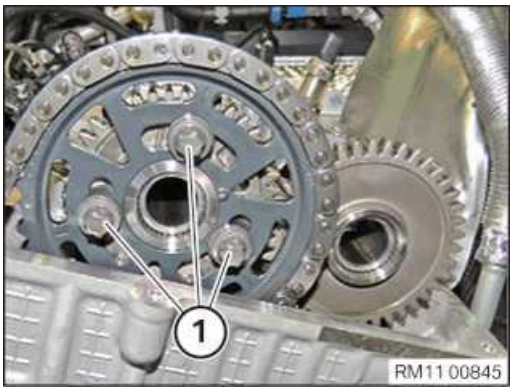


When inserting the intake camshaft (E), the marks of both camshafts (A and E) must be aligned (see graphic).



Tighten down camshaft bearing caps **E1** to **E5** on the camshaft carrier by 1/2 a turn at a time, working from the inside outwards.

Tightening torque: 11 31 2AZ.



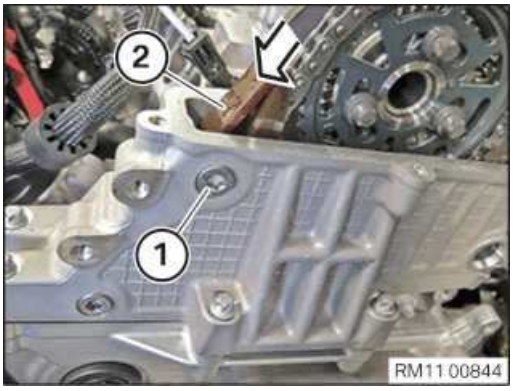
Place the camshaft sprocket with timing chain on the intake camshaft such that bolts (1) are located in the centre of the elongated holes.

Insert bolts (1).

Tighten bolts (1) to 10 Nm.

Release bolts (1) again by a 90° turn.

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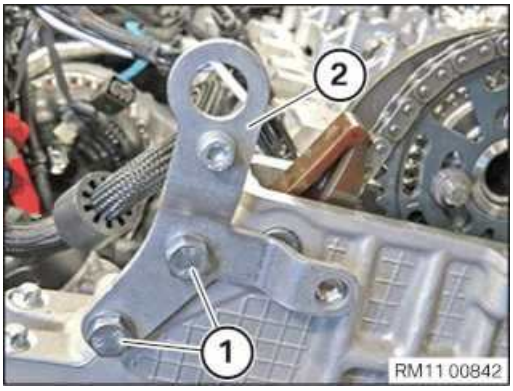
Parts: Replace bearing journals (1).

Install guide rail (2) in the direction of the arrow.

Note:
Make sure guide rail is correctly installed in the lower bearing journal.

Screw in bearing journals (1).

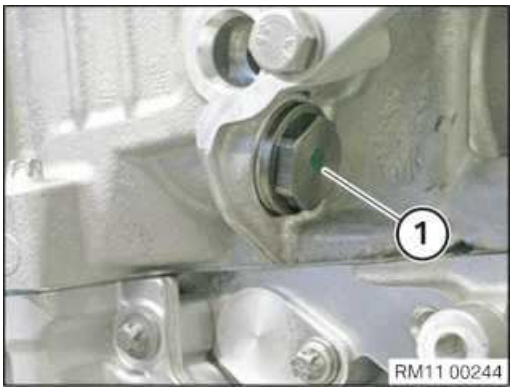
Tightening torque: 11 12 6AZ.



Install suspension element (2).

Tighten down screws (1).

Tightening torque: 11 00 4AZ.



Parts: Replace sealing ring.

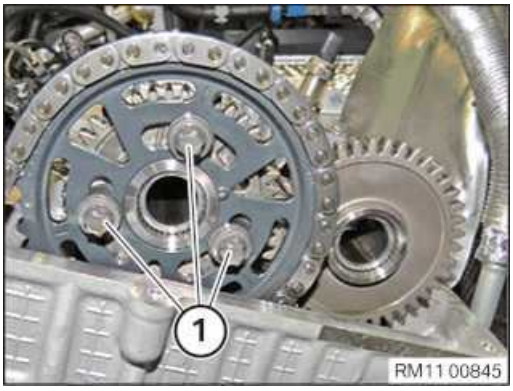
Install chain tensioner (1) and tighten down.

Tightening torque: 11 12 5AZ.



Place special tool 11 8 760 on exhaust camshaft.**Note:**
Special tool 11 8 760 must lie flush on cylinder head.

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Tighten camshaft bolts (1).

Tightening torque: 11 31 1AZ.



Crank engine twice in direction of engine rotation with special tool 11 6 480 up to TDC firing position of cylinder no. 1.

Check camshaft adjustment.

Important!

Do not crank engine in reverse direction!

Important!

2 288 380 Remove special tool before starting engine.

Required follow-up work:

- Install exhaust-gas recirculation cooler
- Install cylinder head cover
- Install wheel arch panel

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11 33 050 Removing and installing/replacing all rocker arms

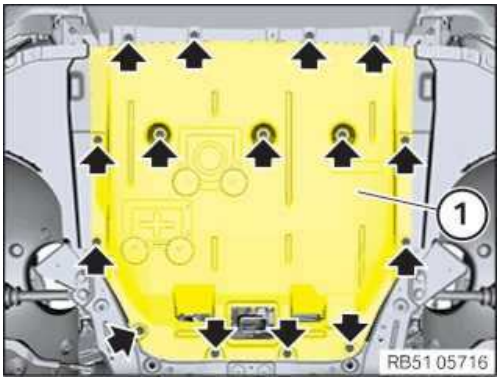
PRELIMINARY WORK

1 – Disconnecting all battery earth leads

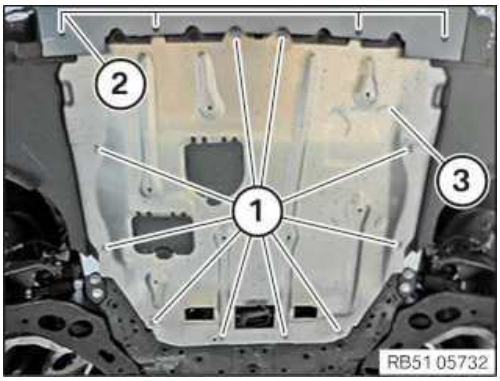


- See additional information.

2 – Removing the front underbody protection

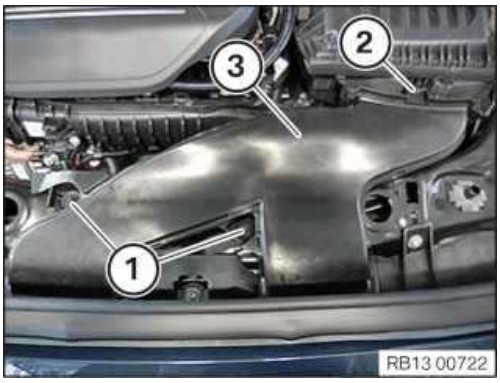


- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.



- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

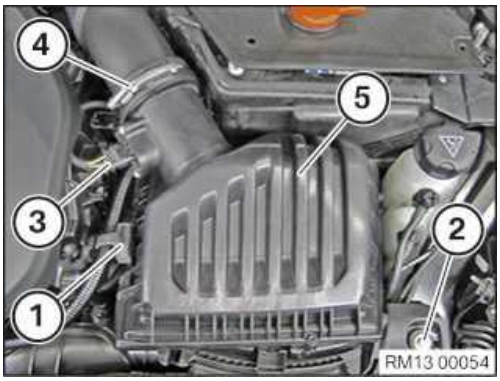
3 – Remove the intake neck for intake silencer housing



- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

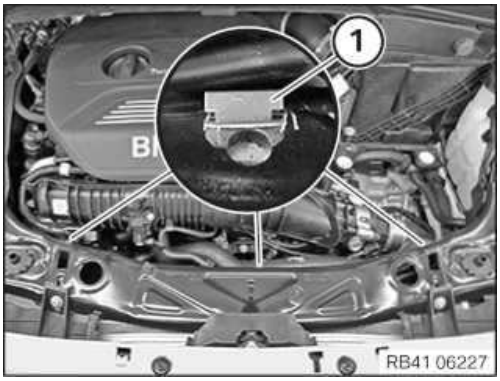
4 – Removing intake silencer housing

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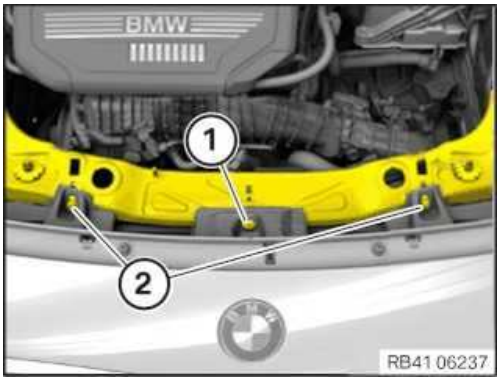


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

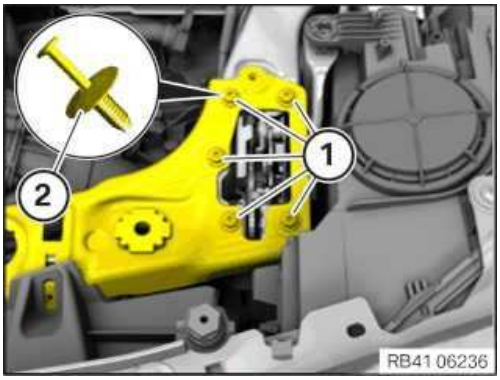
5 – Remove front cross connection



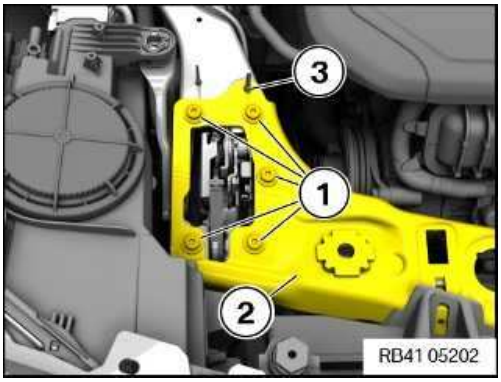
- Detach the clamps (1) for the Bowden cable of the bonnet locks from the cross connection.



- Loosen screw (1).
- Loosen screws (2).



- Loosen screws (1).
- Lever out expanding rivet (2).



- Loosen screws (1).
- Unclip the front cross connection (2) from the rubber retainer (3) and remove it upward.

6 – Draining coolant

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WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

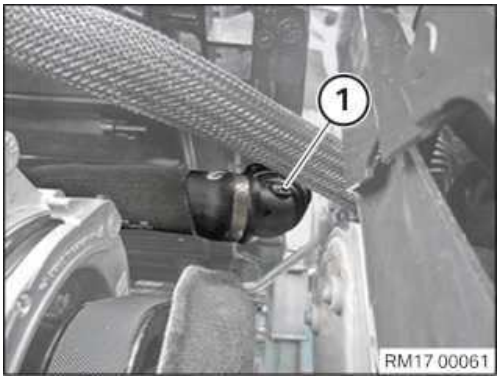
In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

TECHNICAL INFORMATION

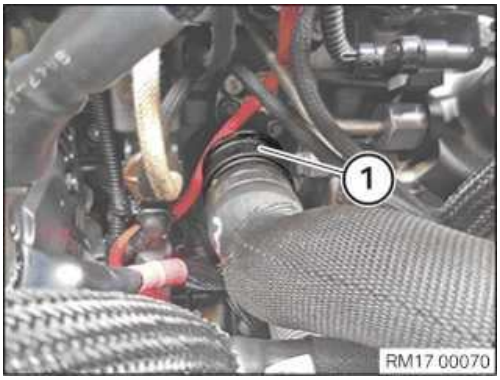
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Loosen sealing cap (1).



- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.



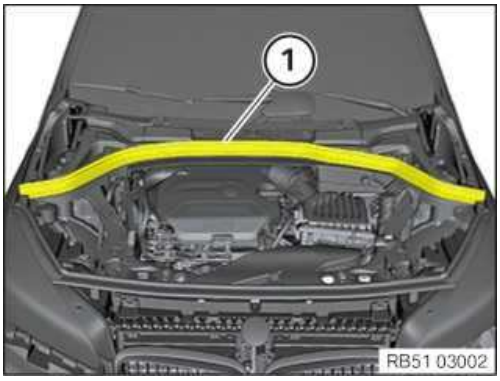
- Unlock the coolant line (1) and pull it off the connecting branch.
- Catch and dispose of escaping coolant.

7 – Remove the seal for the rear bonnet

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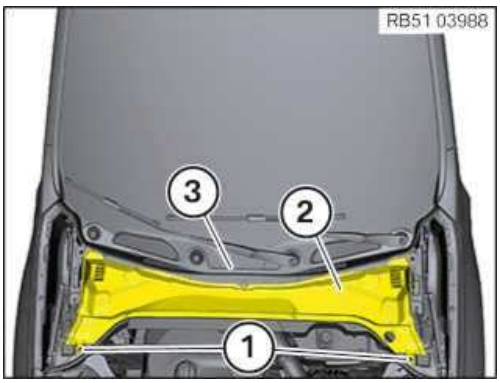
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



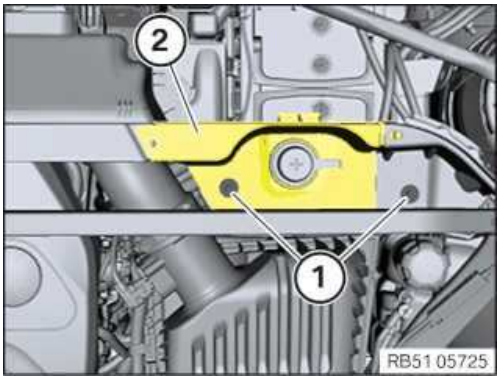
- Pull off rear bonnet seal (1) towards the top and remove.

8 – Removing front cowl panel cover

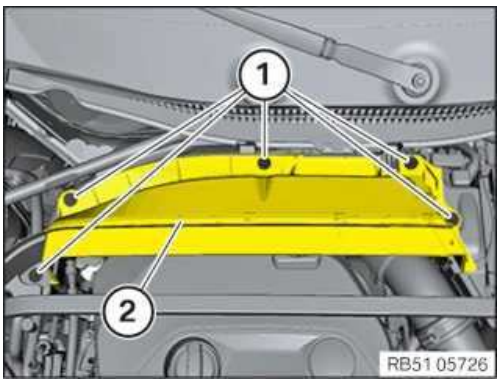


- Loosen the expanding rivet (1).
- Feed out and remove front cowl panel cover (2) from the rear cowl panel cover(3).

9 – Removing the upper bulkhead cover



- Loosen screws (1).
- Guide out and remove the cover (2).



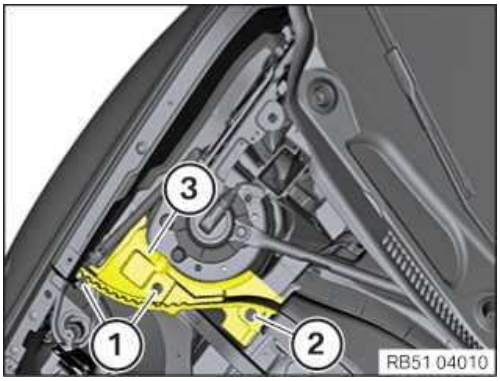
- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

10 – Remove suspension cross-brace

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TECHNICAL INFORMATION

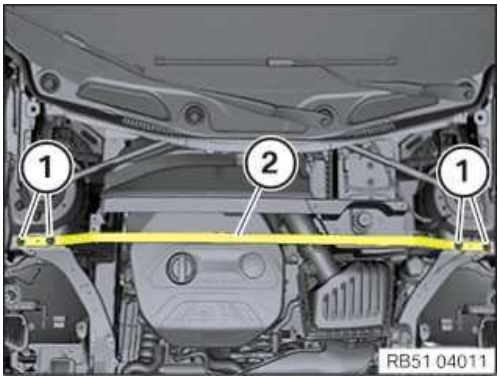
Driving without the strut brace/front end or tension strut is not permitted.



NOTICE

Description is for right component only. The procedure on the left side is identical.

- Loosen expanding rivet (1).
- Loosen screw (2).
- Remove the cover (3).



- Loosen screws (1).
- Remove strut brace (2).

11 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

Damage to the acoustic cover.

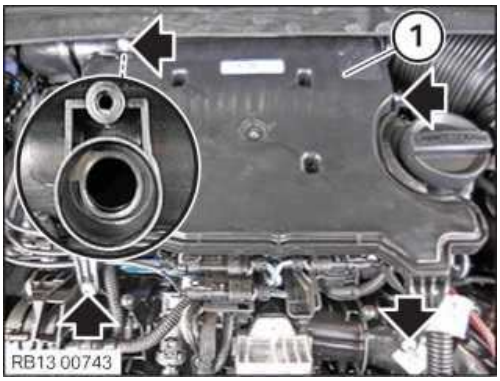
Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

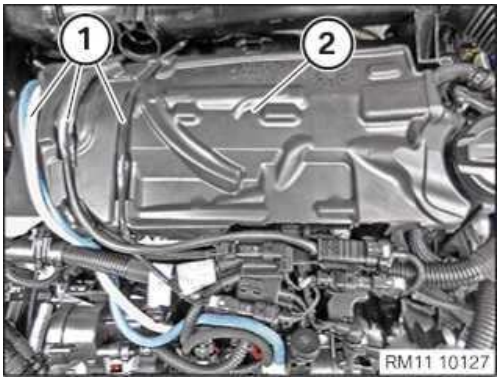
12 – Remove resonator

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- Remove screws (arrows).
- Guide out and remove the resonator (1).

13 – Remove the acoustic cover for the injectors

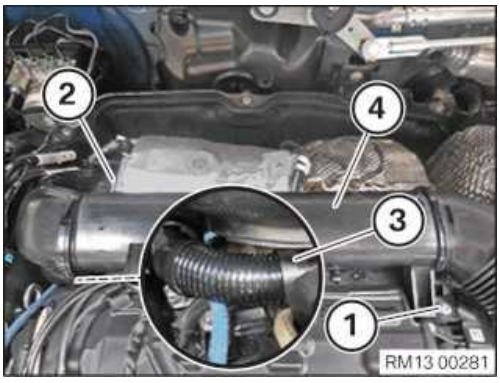


- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

14 – Removing clean air pipe



- Detach clamp (1) on the clean air pipe.
- Pull off the clean air pipe from the intake silencer housing.



- Loosen screw (1).
- Loosen clamp (2).
- Unlock the ventilation line (3) and pull it off the cylinder head cover.
- Feed out clean air pipe and remove.

15 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

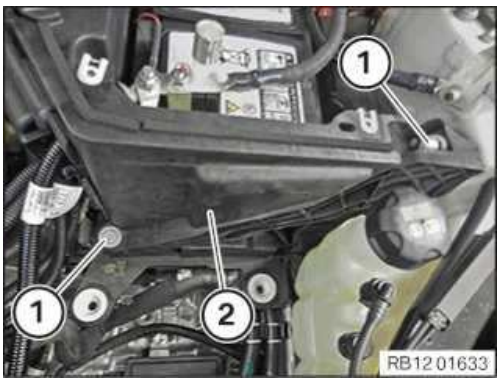
TECHNICAL INFORMATION

Follow instructions for removing and installing control units.

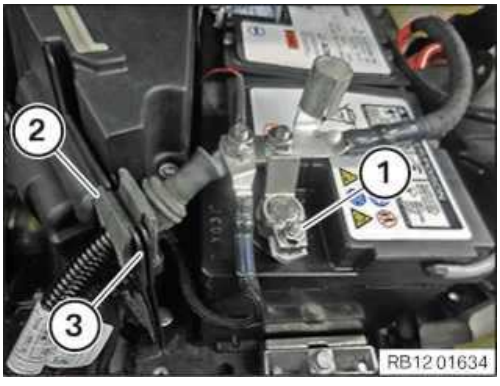
For additional information see: 12 00 ... Notes on removal and installation of control units

TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.

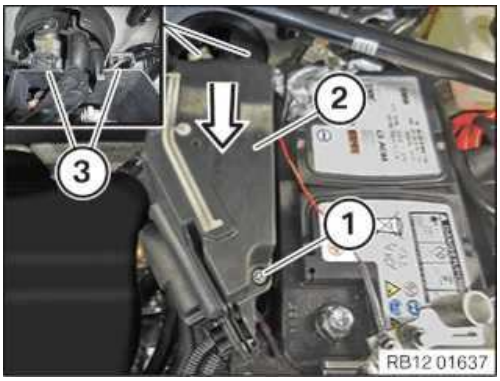


- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.

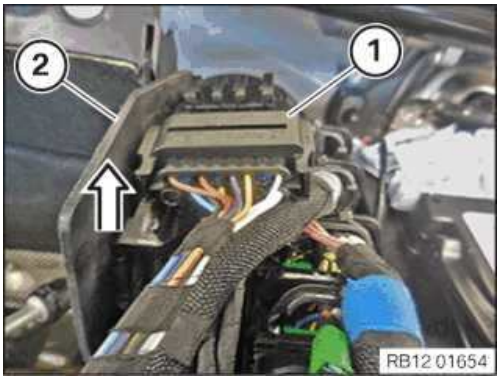


- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

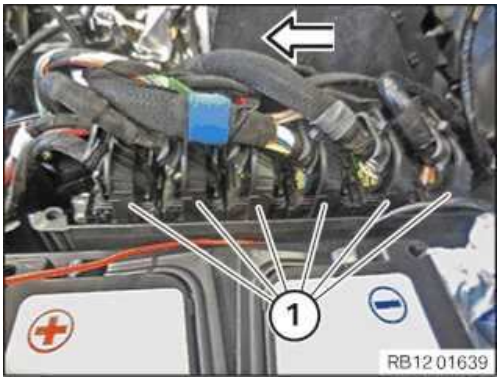
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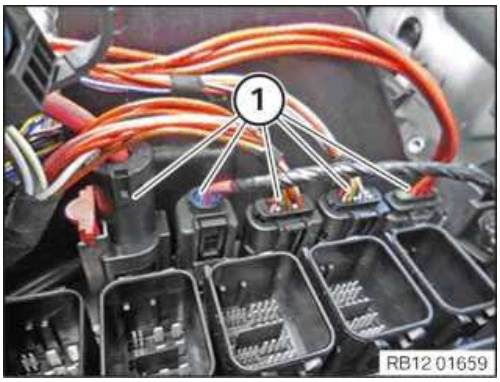
- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



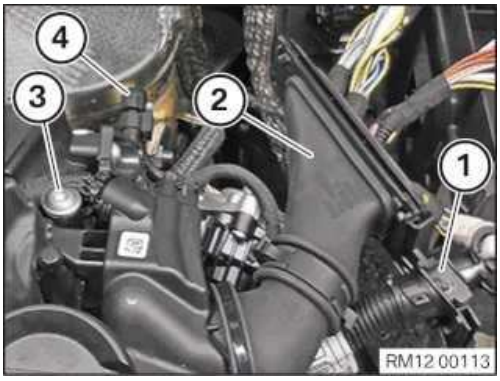
- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).



- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

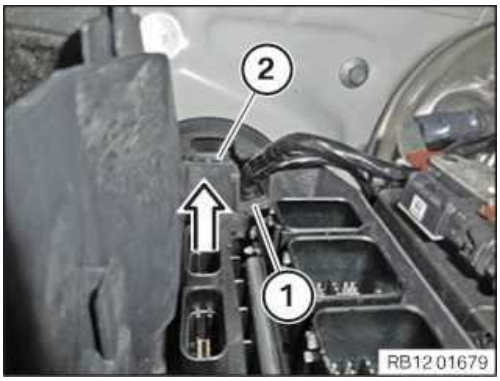


- Unlock and loosen connector (1).

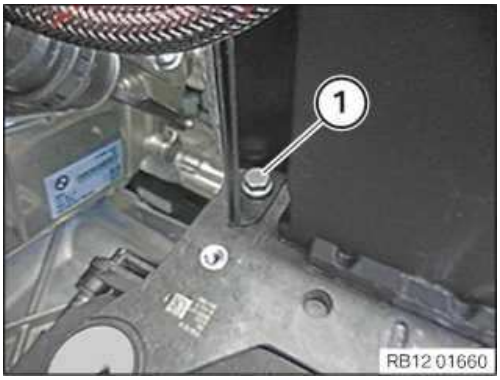


- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.

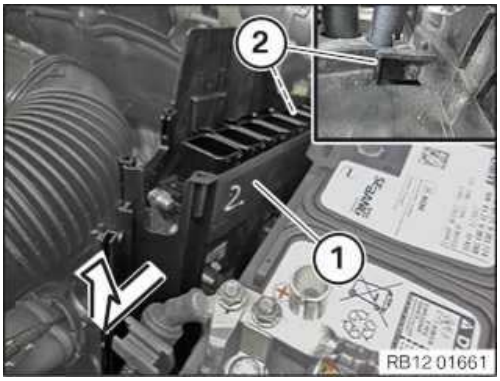
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- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.



- Loosen screw (1).



- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

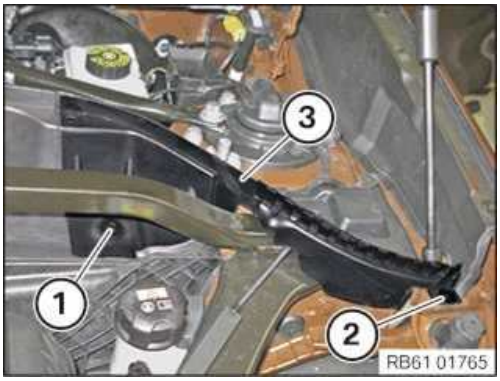
16 – Remove vehicle battery

WARNING

Working on 12 V vehicle electrical system.

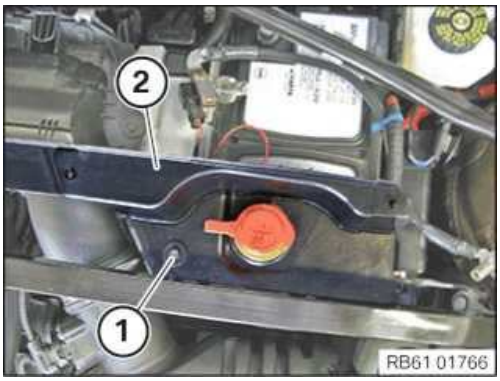
Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

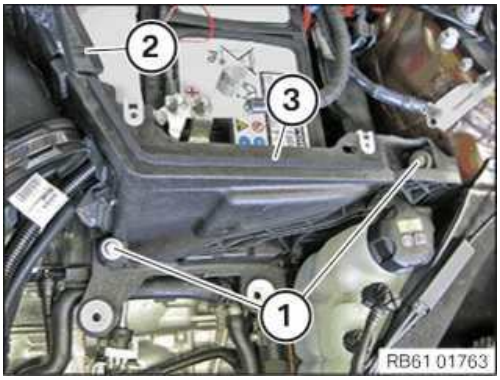


- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

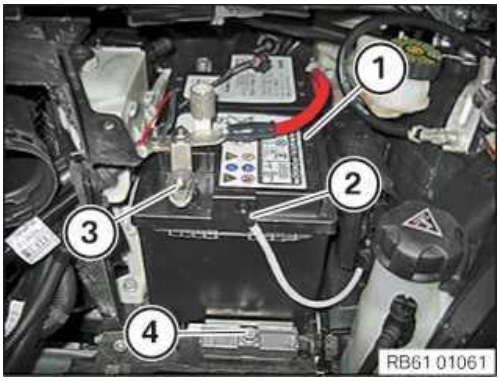
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- Loosen screw (1).
- Remove the cover (2).



- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.



- Pull off the vent hose (2).
- Slacken the nut (3) on the positive battery terminal and remove the positive battery terminal.

WARNING

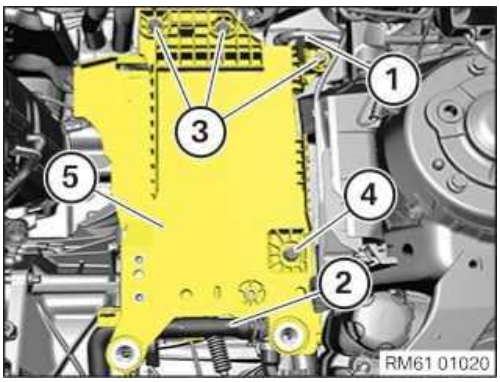
Unprotected battery terminals.

Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

17 – Remove battery holder

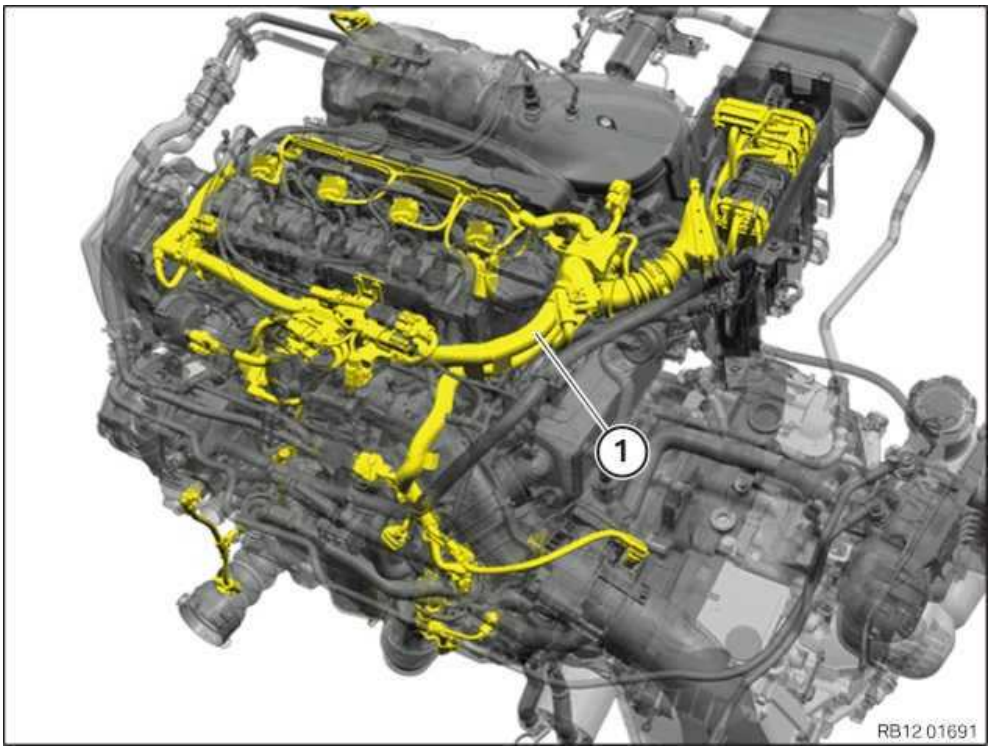


- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

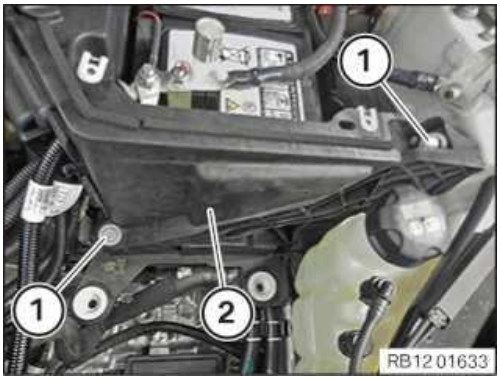
18 – Releasing the wiring harness section for the intake plenum

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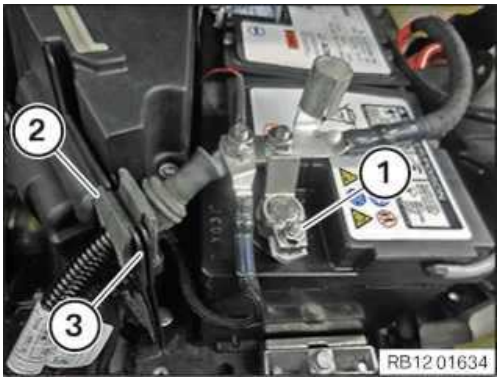
Overview: Wiring harness section for the engine



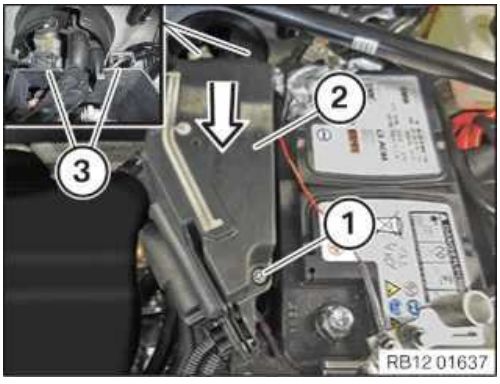
1 Wiring harness section for the engine



- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.

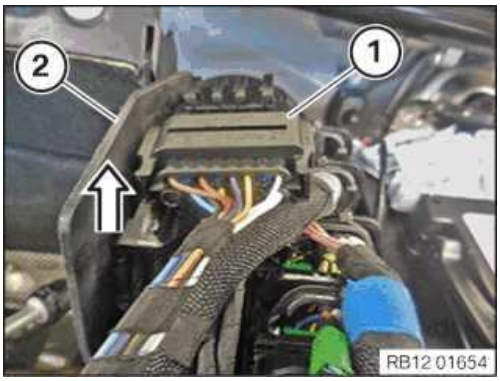


- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

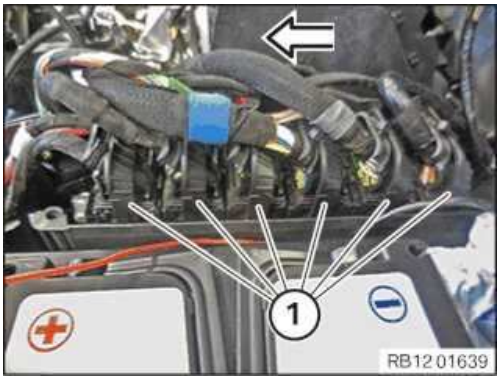


- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.

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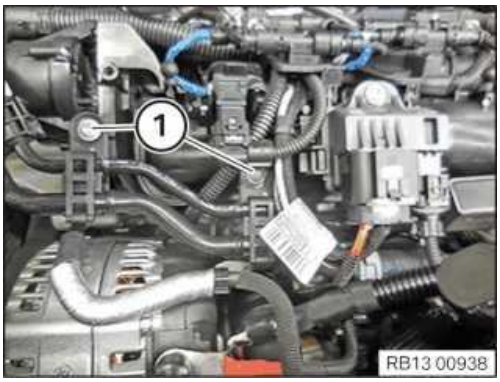
- Guide the connector (1)out of the electronics box (2) in the direction of arrow and remove it.
- Unlock and loosen connector (1).



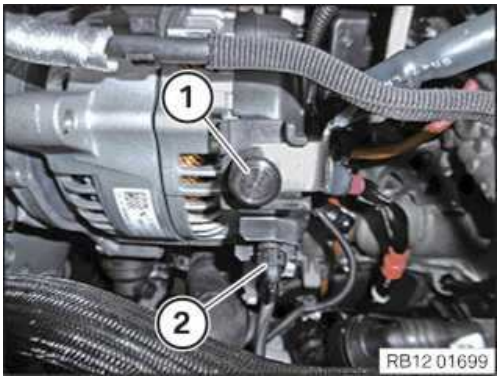
- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



- Unlock and loosen connector (1).

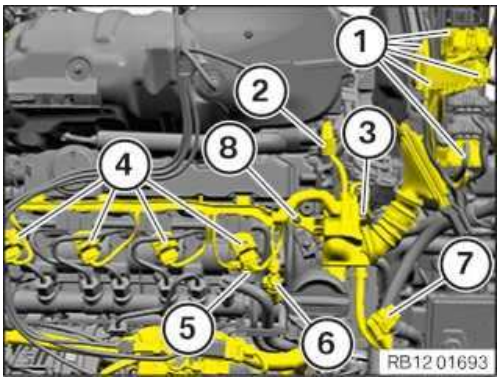


- Loosen screws (1).

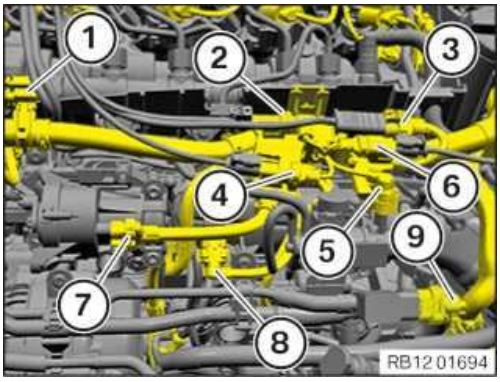


- Release the positive battery cable (1) on the alternator and place to one side.
- Unlock connector (2) and pull off.

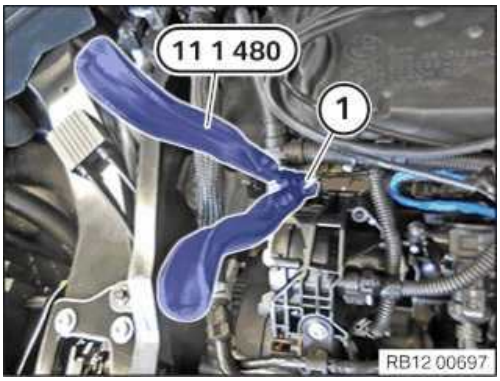
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- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock the connector (2) and disconnect it from the differential pressure sensor.
- Unlock the connector (3) and disconnect it from the exhaust-gas recirculation valve.
- Unlock the connector (4) and pull off from the injectors.
- Unlock the connector (5) and disconnect it from the camshaft sensor.
- Unlock the connector (6) and disconnect it from the fuel pressure regulator.
- Unlock connector (7) and pull off from hot film air mass meter.
- Loosen screw (8).

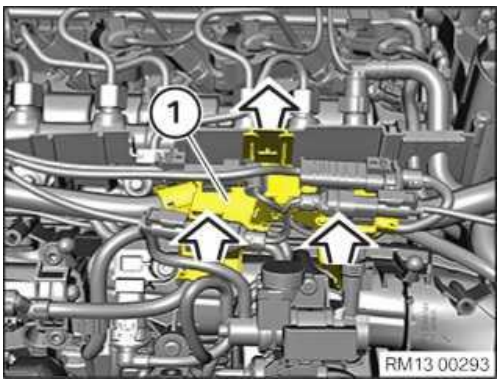


- Unlock connector (1) and pull off from the rail pressure sensor.
- Unlock the connector (2) and disconnect it from the exhaust temperature sensor before the diesel particulate filter.
- Unlock and disconnect the connector (3) from the front oxygen sensor.
- Unlock the connector (4) and disconnect it from the exhaust temperature sensor after the diesel particulate filter.
- Unlock and disconnect the connector (5) from the electric changeover valve.
- Unlock the connector (6) and disconnect it from the exhaust temperature sensor for the exhaust-gas recirculation cooler.
- Unlock the connector (7) and disconnect it from the servomotor for the swirl flaps.
- Unlock the connector (8) and pull it off the charging pressure sensor.
- Unlock the connector (9) and disconnect from the fuel pressure and temperature sensor.



- Unlock the connectors (1) of all glow elements with the special tool **0 490 796 (11 1 480)** and release them.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.

▶ **Removing the cable clips from the intake plenum**



- Detach the cable clip (1) in the direction of the arrow.
- Guide out the cable clip (1) in direction of arrow and set it aside.

19 – Removing the exhaust-gas recirculation cooler

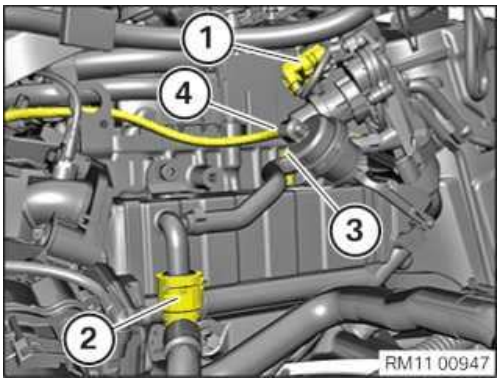
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WARNING

Hot surfaces.

Risk of burning!

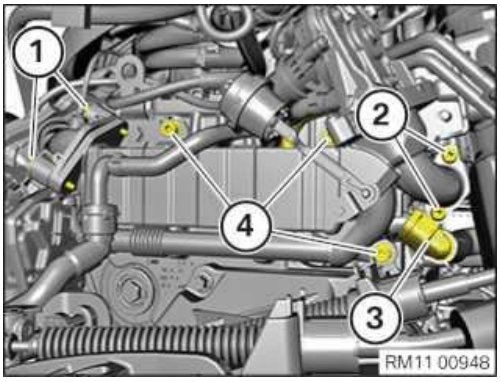
- Perform all work only on components that have cooled down.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.

20 – Removing the intake plenum

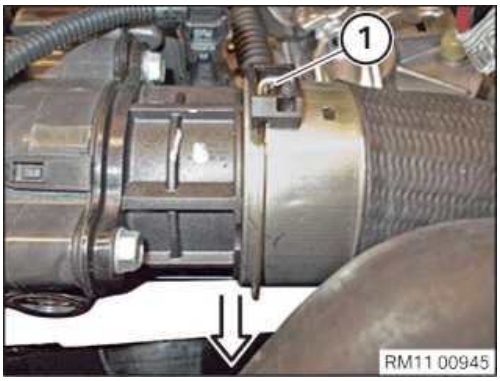
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

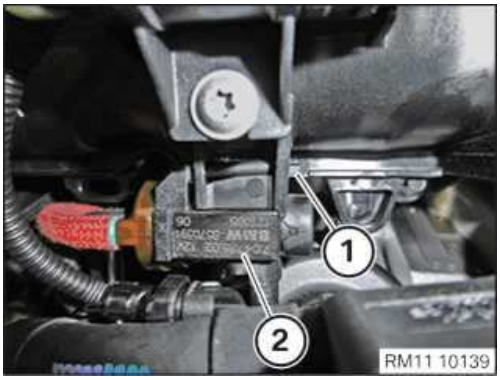


- Unlock the lock (1).

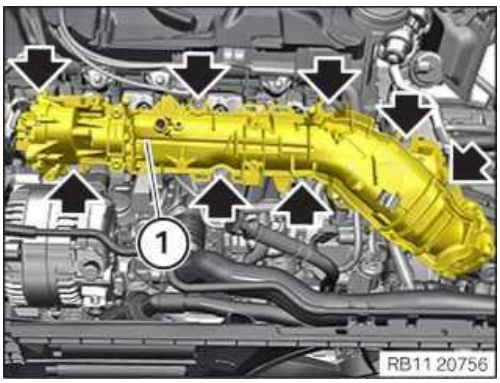
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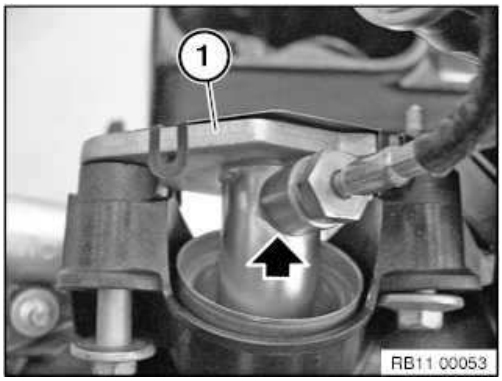
- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.



- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



- Release the screws (arrows) from the intake plenum (1).
- Guide the intake plenum (1) out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

21 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

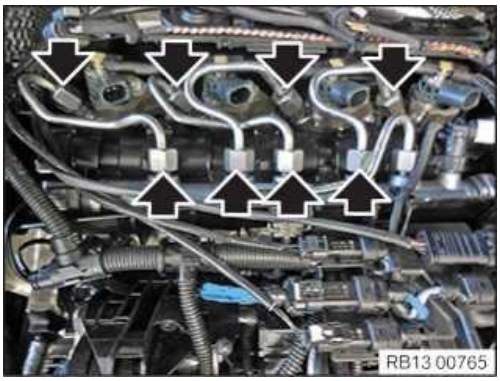
TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

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- Release the high pressure lines (arrows) with the special tool .
- Catch and dispose of escaping fuel.
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool .

22 – Detaching leakage oil line from injector

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Contaminant or foreign body.

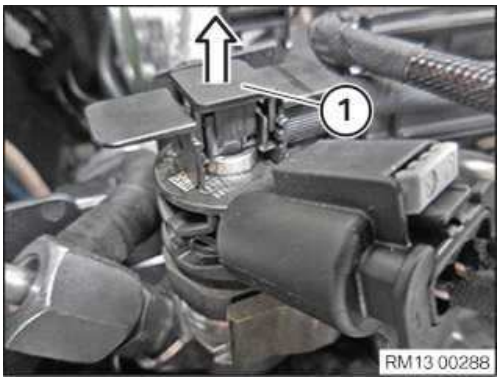
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

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- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

23 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

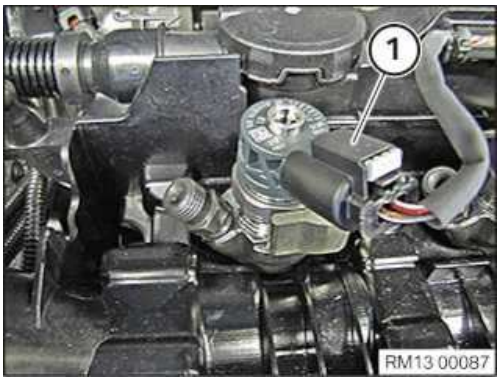
Electrostatic discharge.

Damage to or destruction of electrical components.

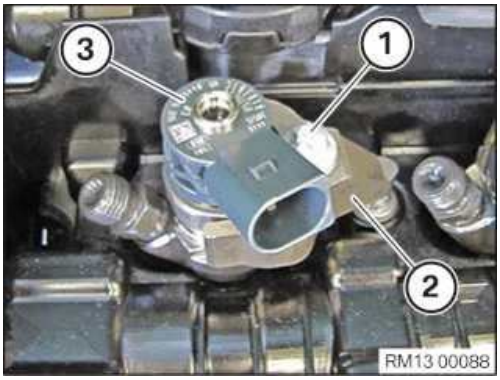
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.



- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

▶ **Loosen stuck injectors**

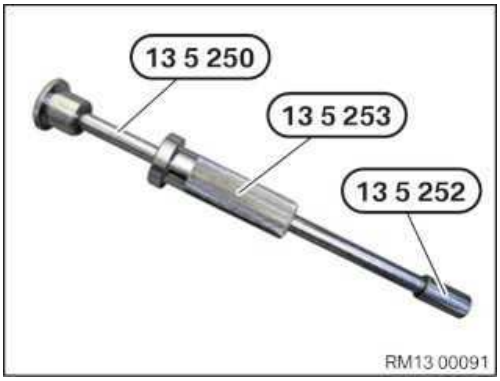
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RISK OF DAMAGE

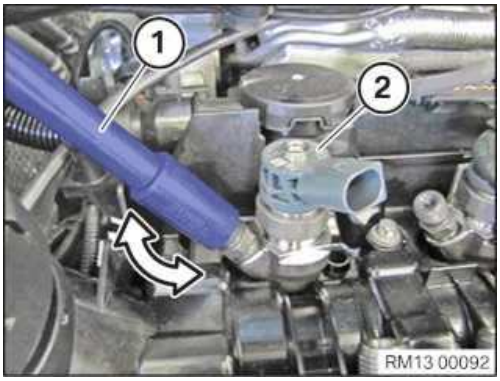
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)**back onto the special tool **0 493 321 (13 5 250)**.



- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

24 – Remove differential pressure sensor

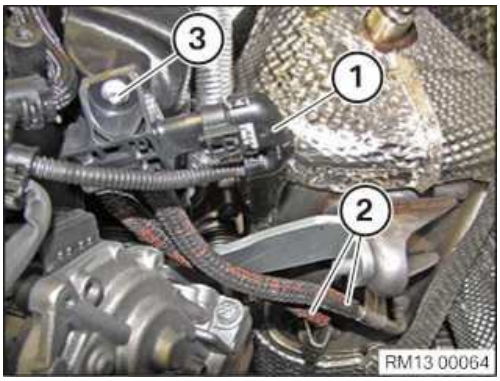
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

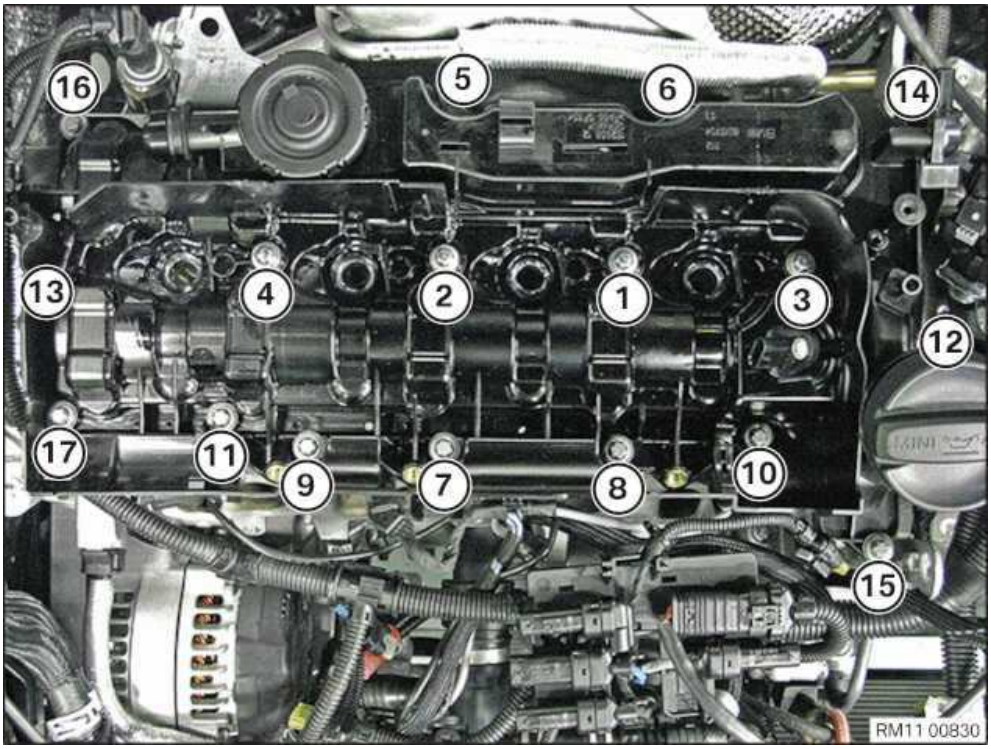
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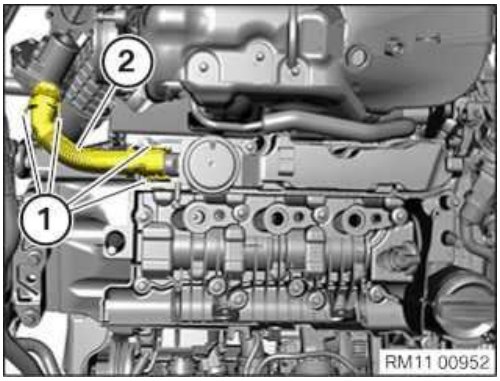
- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

25 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover

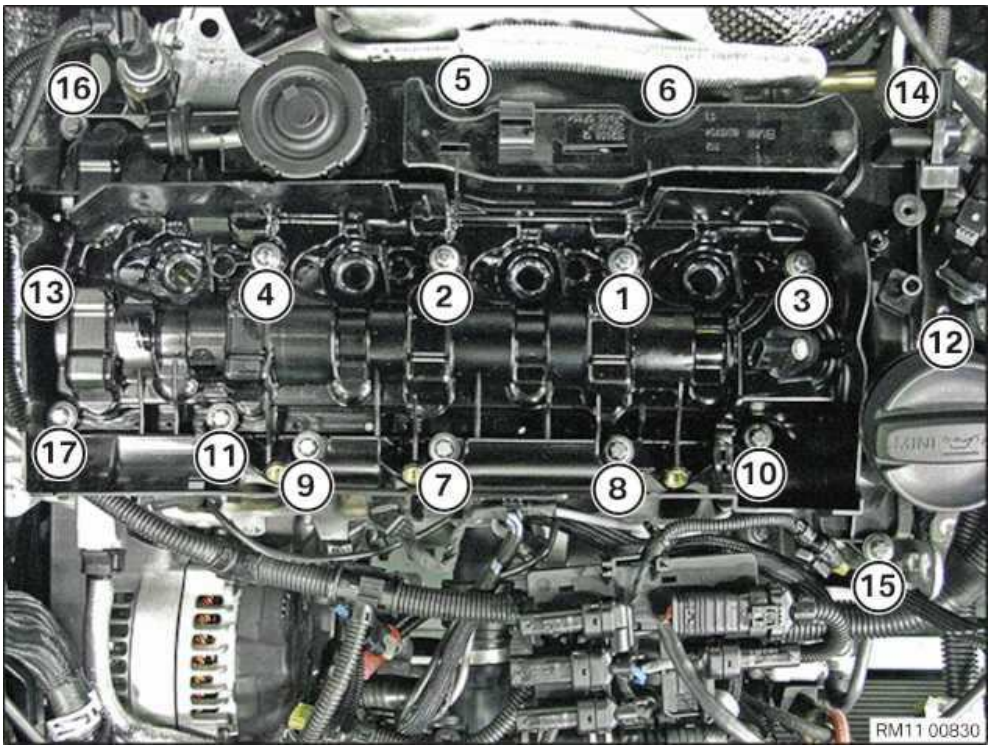


1 to 16 screws of the cylinder head cover.



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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- Loosen screws in the order (17) to (1).
- Remove cylinder head cover by lifting it out.

26 – Remove front right wheel

TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

TECHNICAL INFORMATION

Strictly observe the specified procedure to prevent clamping errors and imbalance.



- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

27 – Removing the front right wheel arch cover

▸ **Remove the front wheel arch trim**

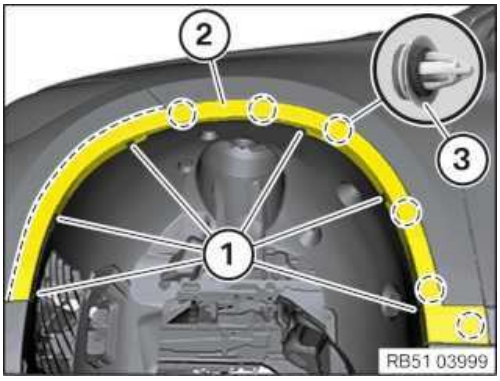
NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

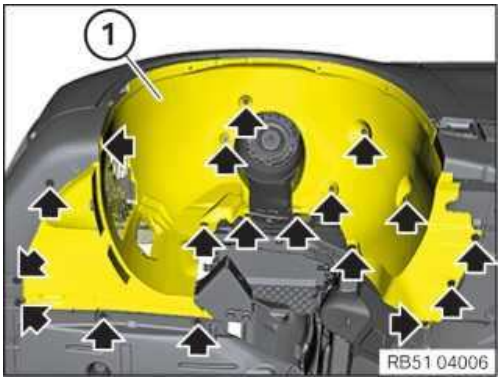
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NOTICE

Description is for left component only. Procedure on the right side is identical.



- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.



NOTICE

Description is for left component only. Procedure on the right side is identical.

- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

28 – Checking camshaft timing



- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

Damage to the engine.

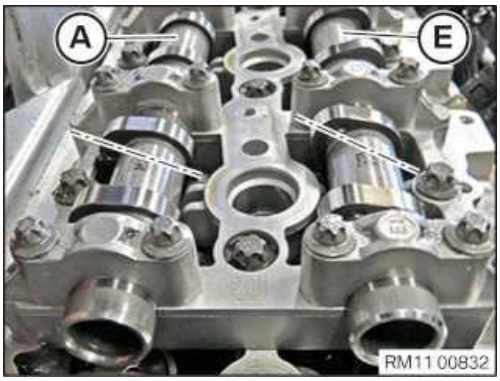
The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

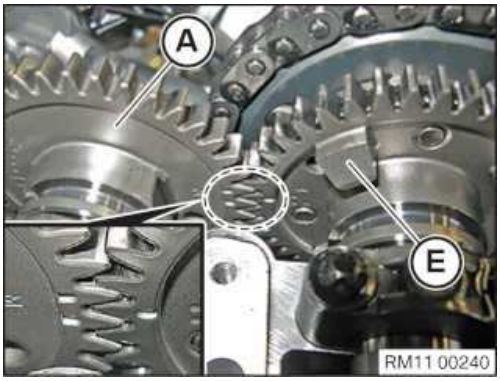
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- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.



- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

29 – Remove chain tensioner piston

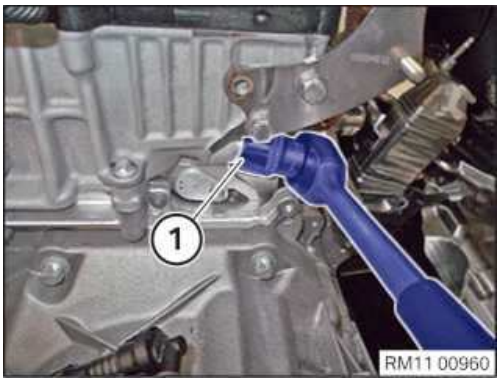
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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

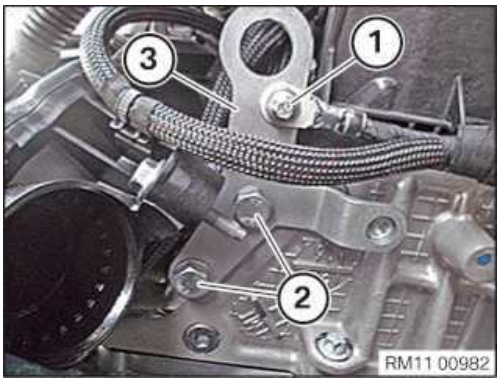


TECHNICAL INFORMATION

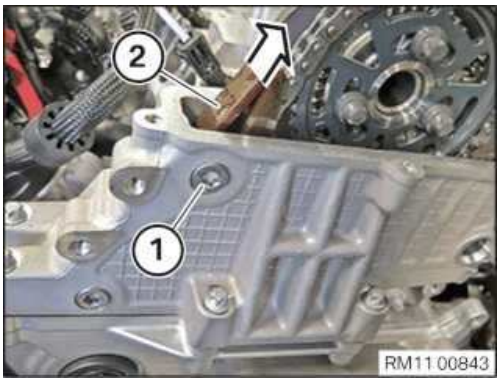
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

30 – Remove the timing chain guide rail

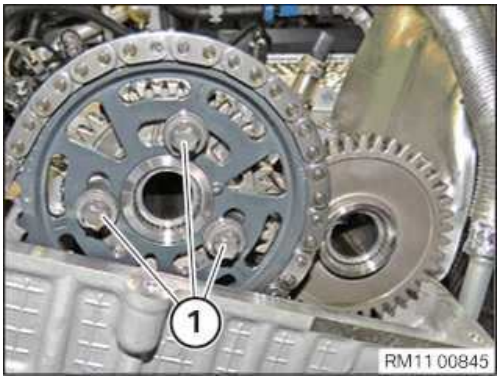


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

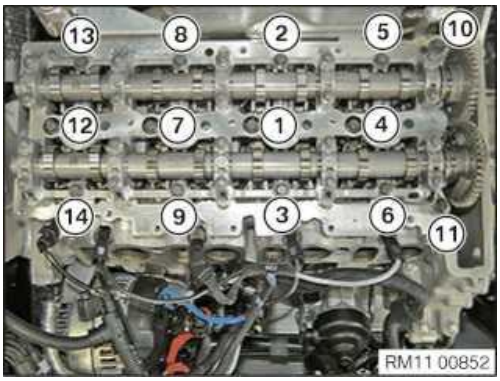
31 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

32 – Removing the camshaft support

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- Evenly loosen all screws in a sequence from (14) to (1).
- Loosen and remove all screws in a sequence from (14) to (1).

  Both camshafts can be removed with the camshaft carrier.
- Remove the camshaft support including camshafts towards the top.

MAIN WORK

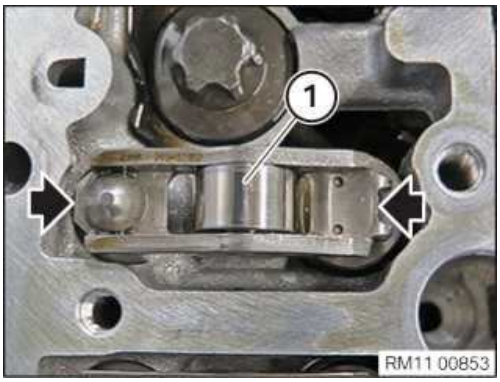
33 – Remove roller cam followers

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



RISK OF DAMAGE

Damage to the engine.

If the classification of the roller cam followers is ignored, this can lead to engine damage.

- Observe the classification of the roller cam followers.
- Always reuse used roller cam followers at the same position.

- Remove the roller cam follower (1) and place it onto the special tool **0 495 105 (11 4 480)**.
- Repeat the process for all roller cam followers.

34 – Install the roller cam followers

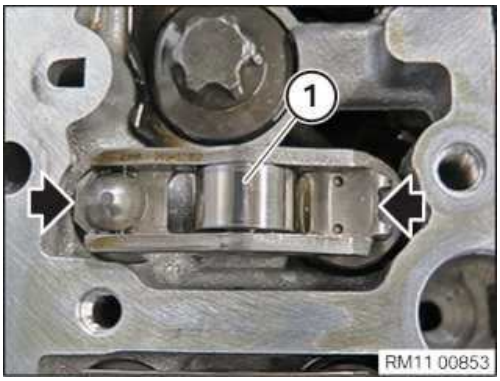
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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RISK OF DAMAGE

Damage to the engine.

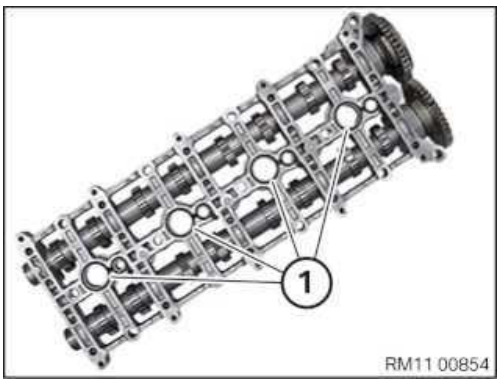
If the classification of the roller cam followers is ignored, this can lead to engine damage.

- Observe the classification of the roller cam followers.
- Always reuse used roller cam followers at the same position.

- Install the roller cam follower (1).
- Repeat the process for all roller cam followers.

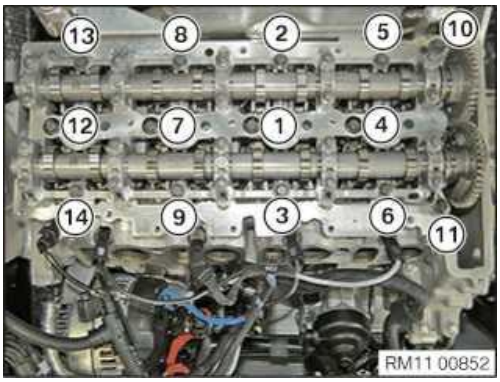
POSTPROCESSES

35 – Installing the camshaft support



- Renew gaskets (1).

  Parts: gaskets

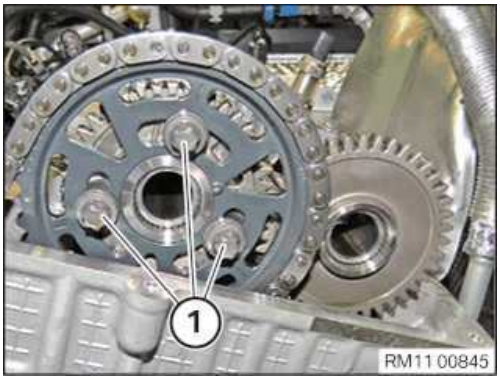


- Position the camshaft support including the camshafts.
- Tighten the screws in a sequence from (1) to (14) in several steps.

Camshaft carrier to cylinder head

M7x35		Tightening torque	13 Nm

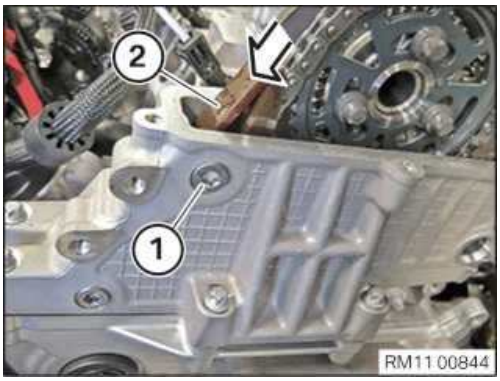
36 – Installing the camshaft sprocket on the intake camshaft



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

37 – Install the timing chain guide rail

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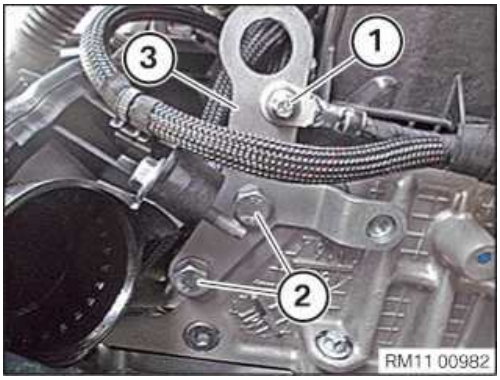
- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm



- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6		8 Nm

38 – Installing the chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Renew sealing ring (1).

  Parts: Sealing ring

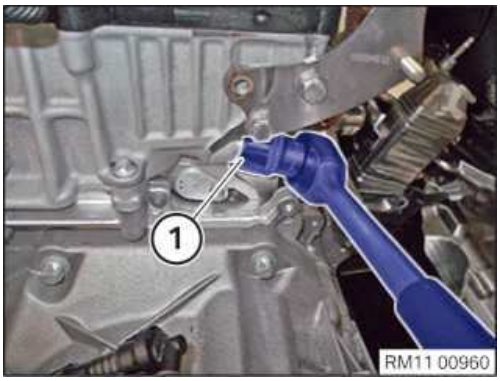


TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.

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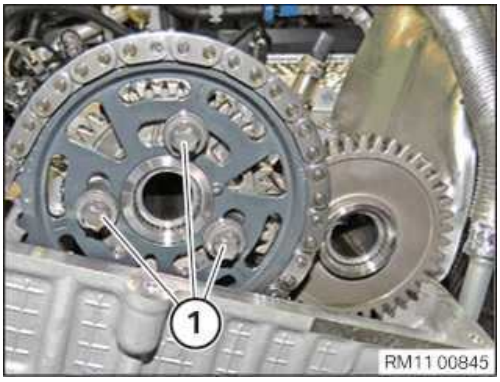


- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

39 – Tightening the camshaft sprocket on the intake camshaft



- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

40 – Checking camshaft timing



- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

Damage to the engine.

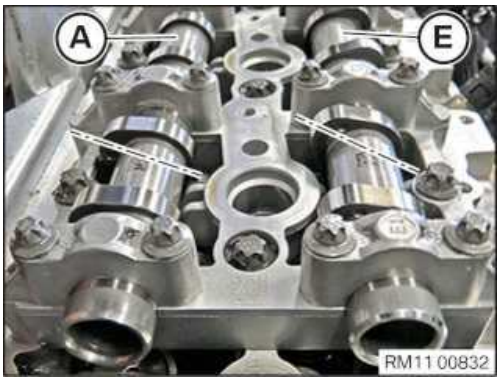
The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

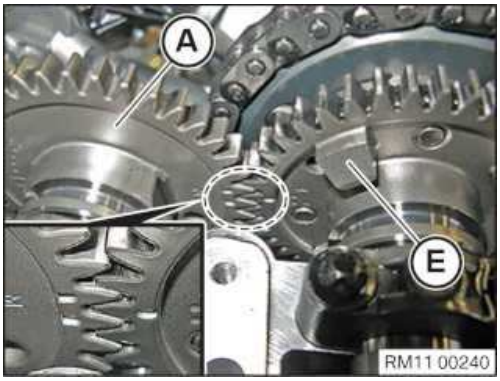
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- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.



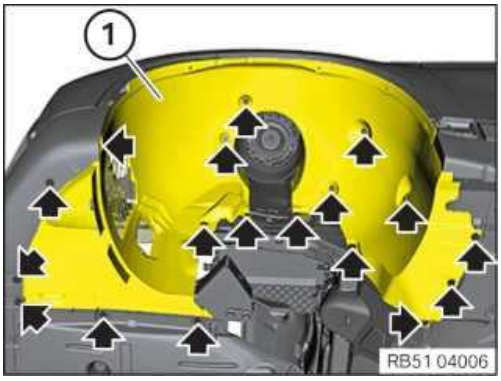
- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

41 – Installing the front right wheel arch cover

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NOTICE

Description is for left component only. Procedure on the right side is identical.



- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

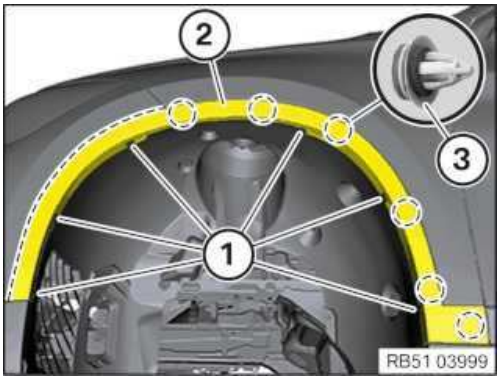
▸ **Installing front wheel arch trim**

NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Check the clips (3) for damage and renew where required.
  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

42 – Installing the front right wheel

▸ **Clean the contact surfaces between the brake disc and the wheel rim**

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TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

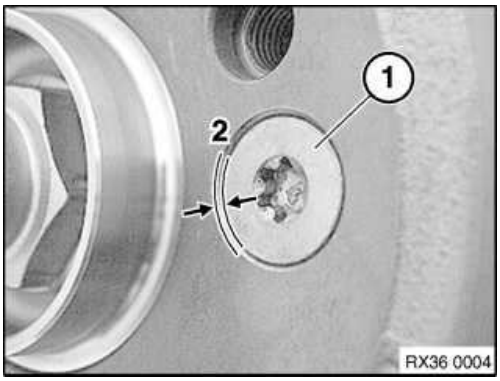
- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.



- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

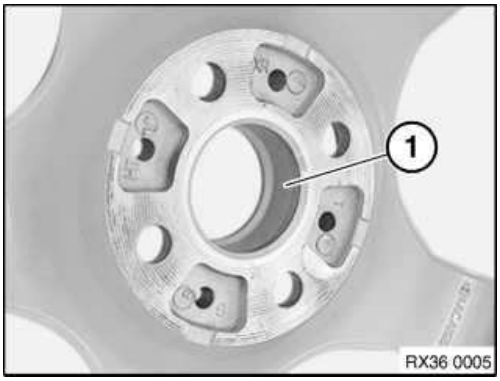


- Check the mounting bolt for the brake disc (1) for secure fit.

  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

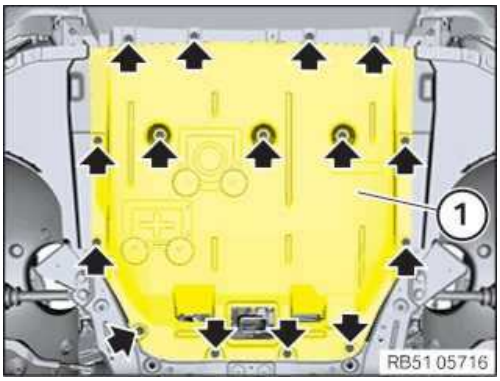
- Renew corroded wheel bolts.

  Parts: Wheel bolts
- Clean the wheel bolts and check the threads for damage. Renew the wheel bolts as needed.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

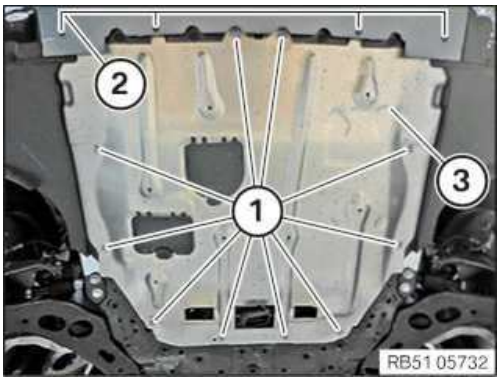
43 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm



- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

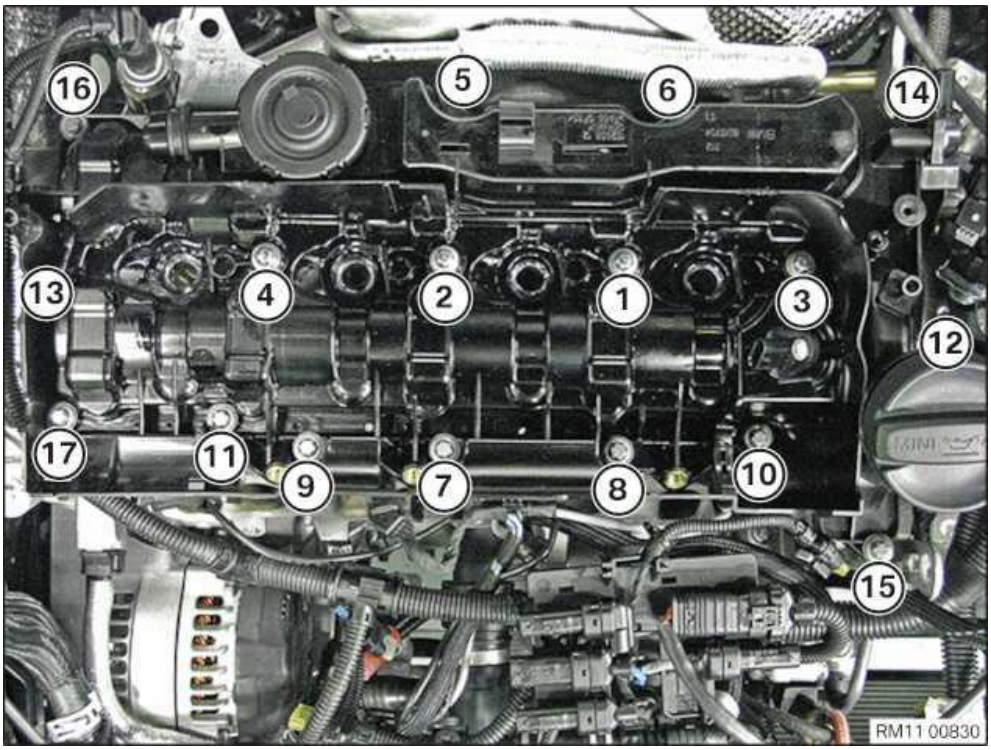
Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

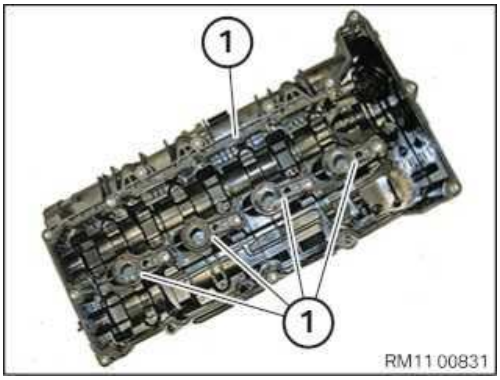
44 – Installing cylinder head cover

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Overview: Screw connection of the cylinder head cover

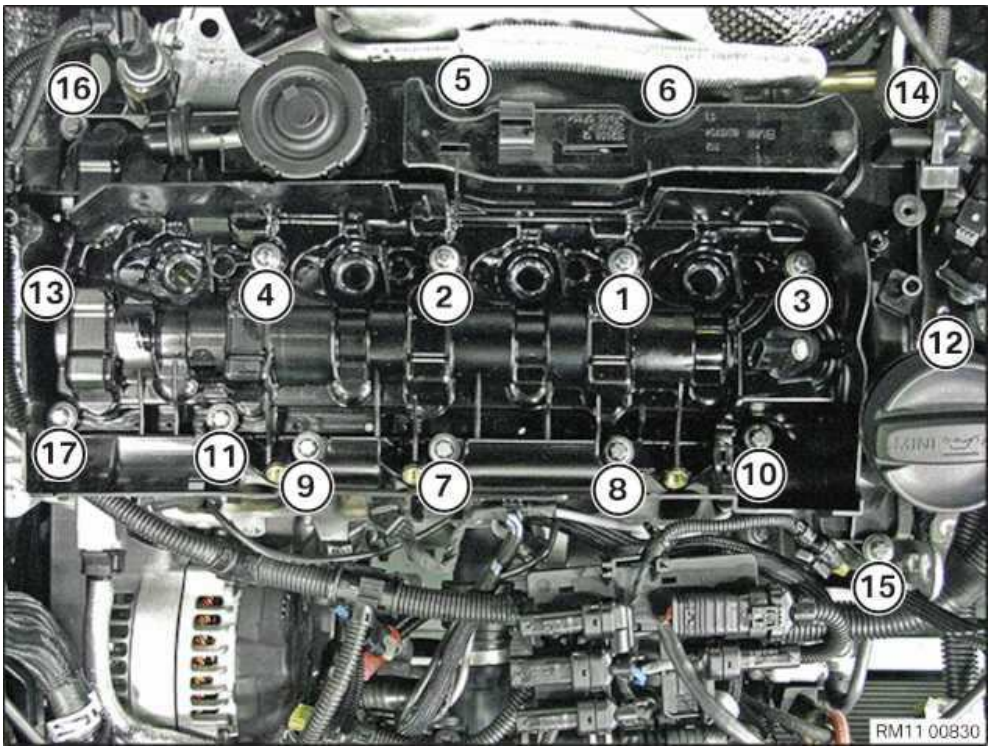


1 to 16 screws of the cylinder head cover.



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket



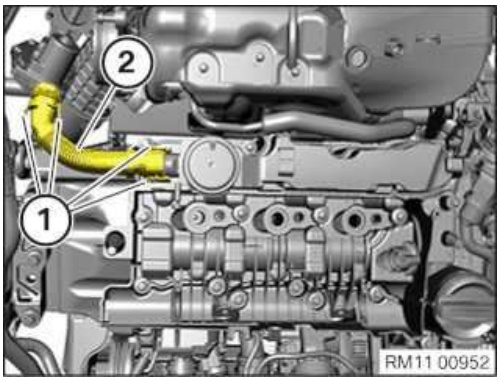
- Install cylinder head cover.
- Tighten screws in the order (1) to (17).

Cylinder head cover to cylinder head

M6		Tightening torque.	8, Nr

-

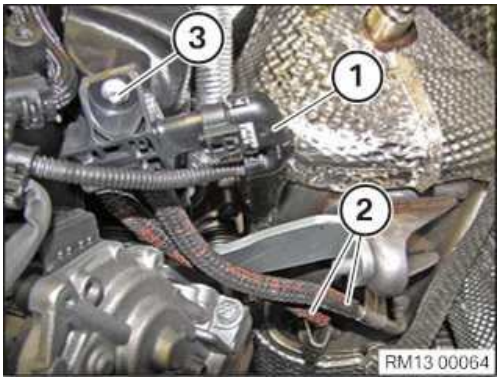
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- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

45 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

46 – Installing injectors of injection system

▶ **Cleaning the injector shafts**

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.



- Wear safety goggles.

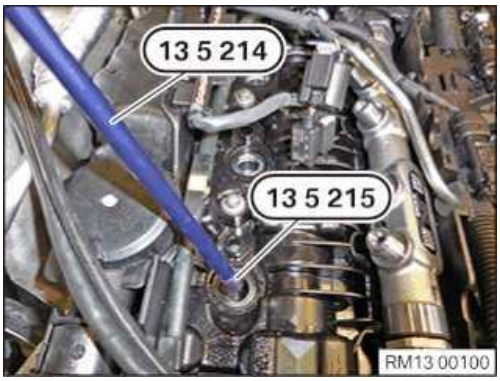
RISK OF DAMAGE

Contaminant or foreign body.

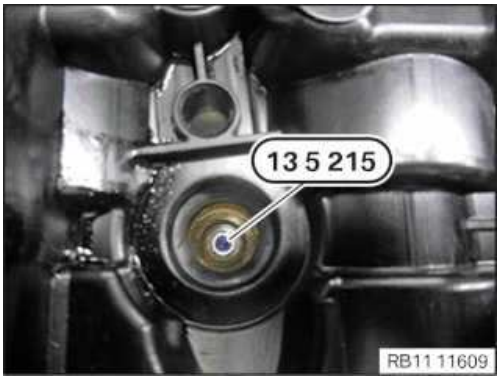
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.



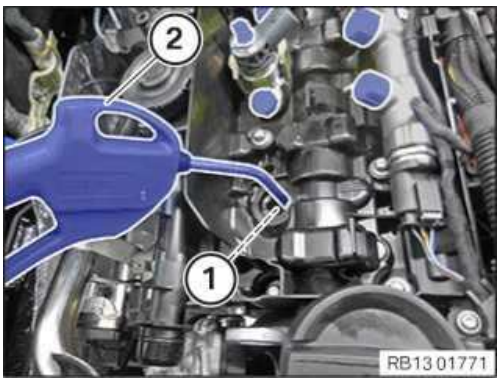
- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.



- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.

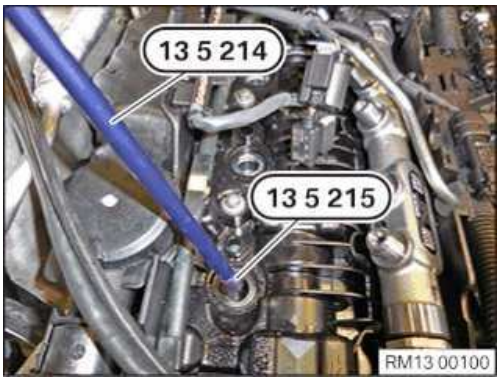


- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.



- Blow out injector shaft (1) with air gun (2).

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- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

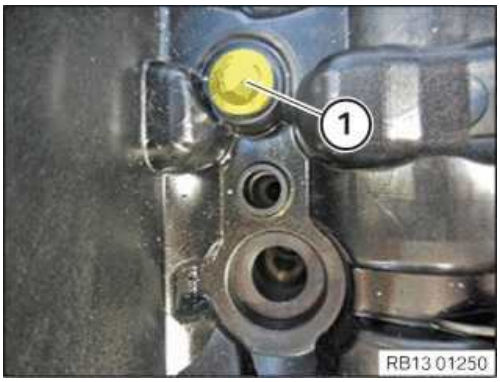
▸ **Check the placement of the clamping claw**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▸ **Prepare the injector for installation**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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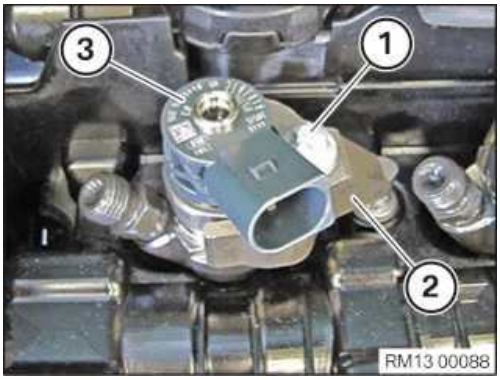
- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring

- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

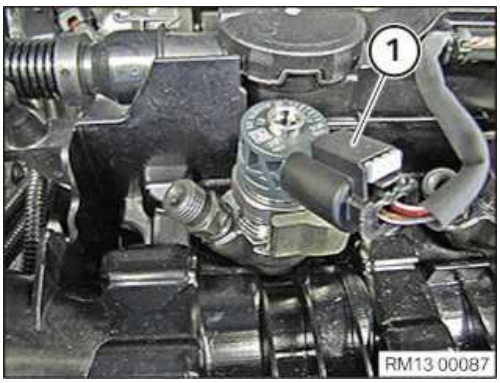
Injector lubricating grease	50 g, Can	83230441070



- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

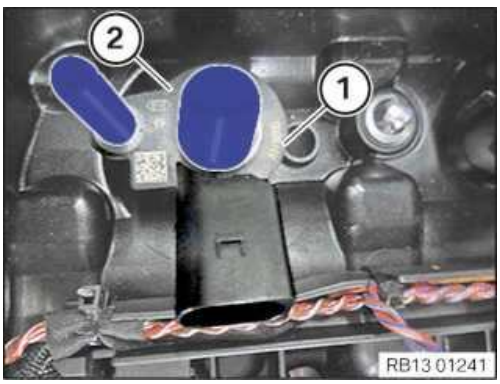
▸ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



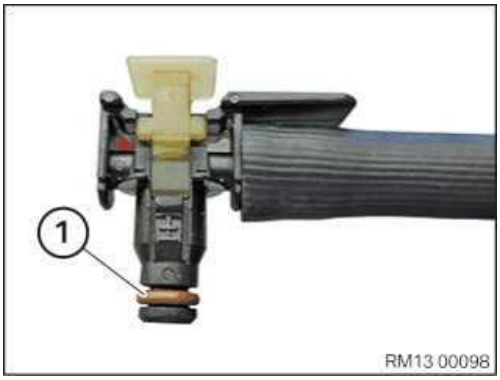
- Read off the adjustment value (1) on the new injector (2).

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- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

47 – Connect the leakage oil line on the injector



- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.



- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

48 – Installing high pressure lines between rail and injectors

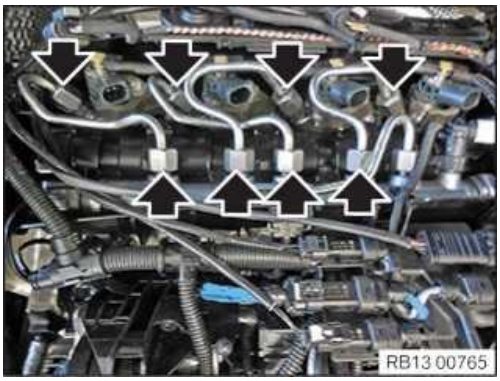
TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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- Remove special tool .
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

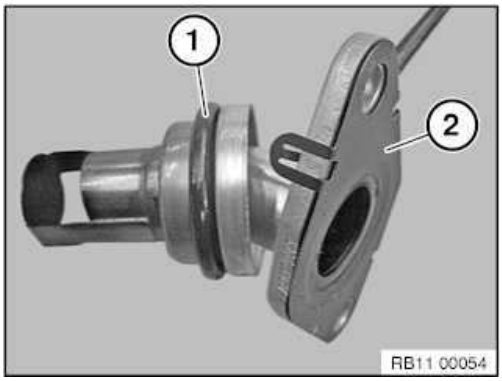
- Tighten the high pressure lines (arrows) with the special tool .

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

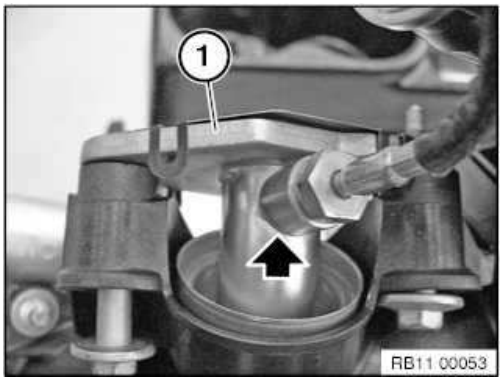
49 – Installing the intake plenum



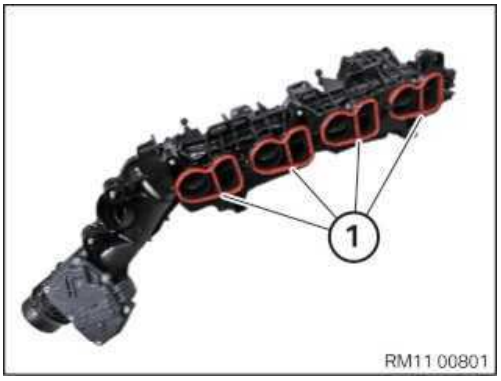
- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position the seal (2) and clip it in.



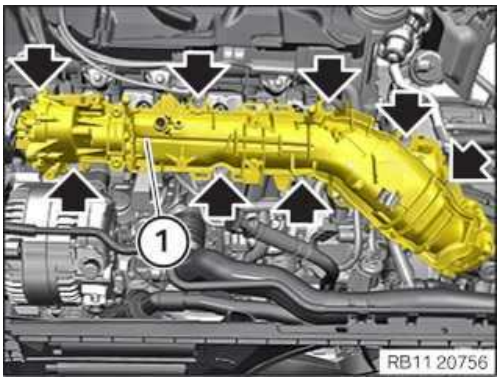
- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (1).

  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.

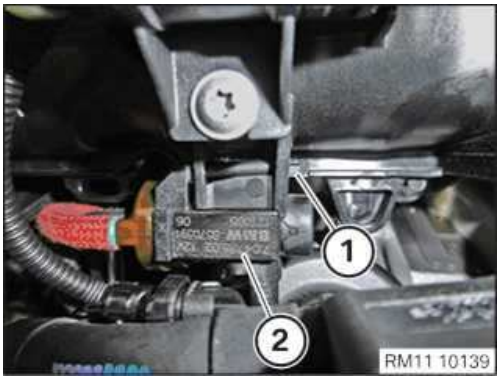
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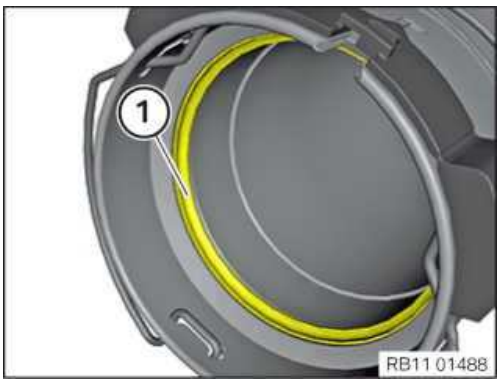
- Guide in and install intake (1) plenum.
- Tighten screws (arrows).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm

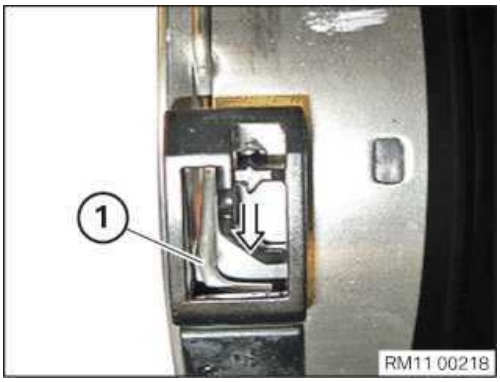


- Install the electric changeover valve (2) in the holder on the plenum from left to right.
- Lock (1) must engage audibly.

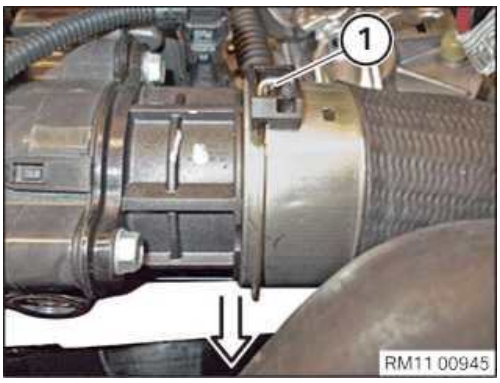


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring



- Engage the lock (1) on the bracket (arrow).



- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

50 – Installing the exhaust-gas recirculation cooler

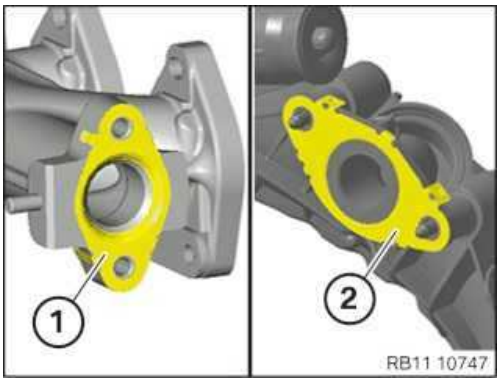
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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

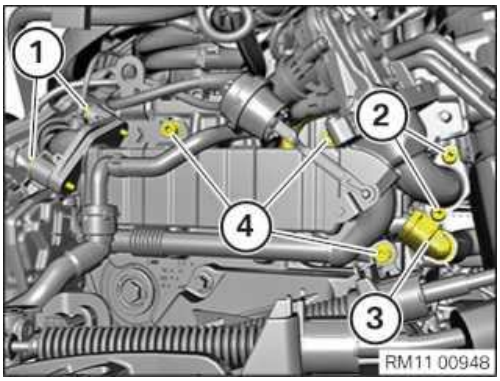


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket



- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts

- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

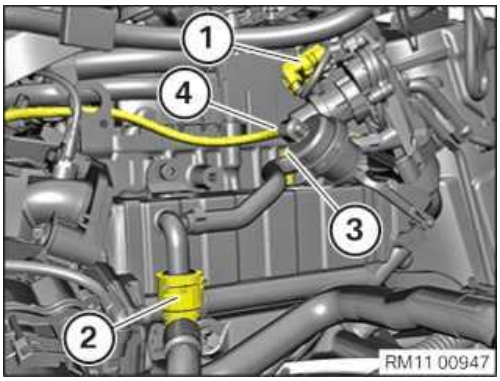
  The coolant hose (3) must audibly engage.

- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm

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TECHNICAL INFORMATION

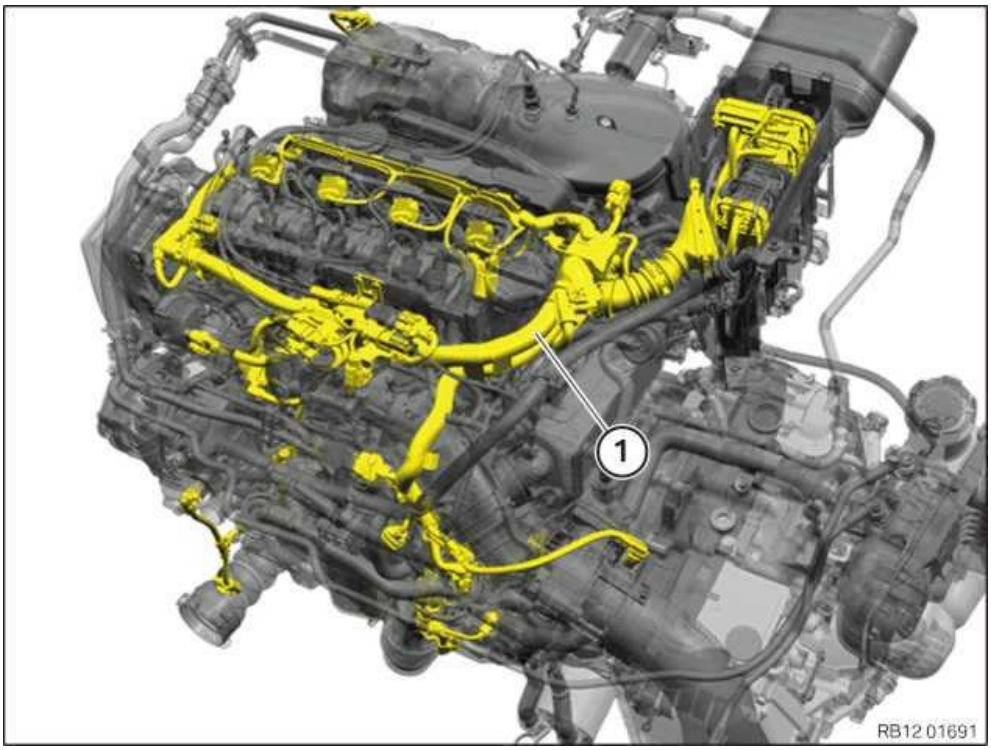
Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

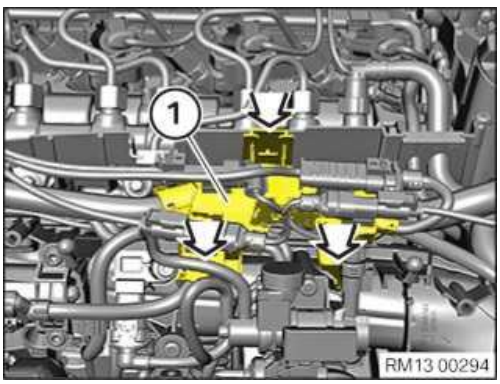
  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

51 – Fastening the wiring harness section for the intake plenum

Overview: Wiring harness section for the engine



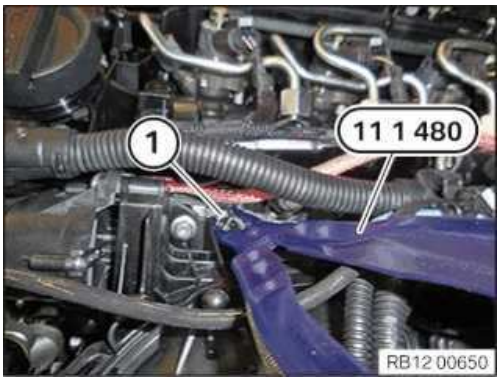
1 Wiring harness section for the engine



▸ **Installing the cable clip for the intake plenum**

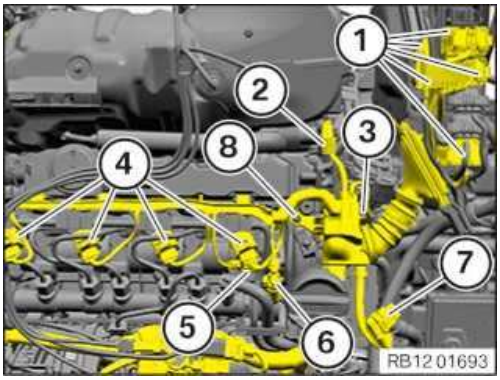
- Insert and install the cable clip (1) in the direction of the arrow.
- Make sure the cable clip (1) is fitted correctly.

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- Connect and lock the connector (1) on the glow elements.

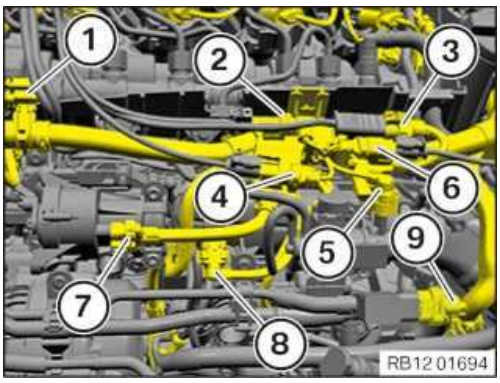
  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.



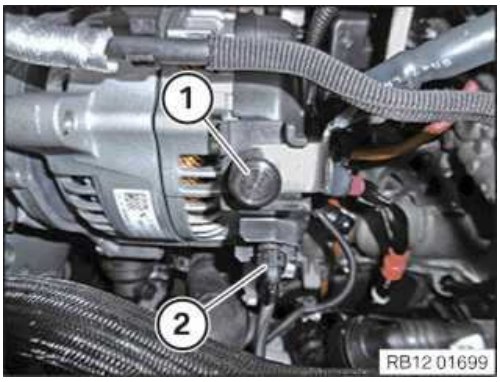
- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the DME control unit and remove the integrated supply module (PDM).
- Attach connector (2) to the differential pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust-gas recirculation valve and lock audibly.
- Attach connector (4) to the injectors and lock it audibly.
- Attach connector (5) to the camshaft sensor and lock it audibly.
- Attach connector (6) to the fuel pressure regulator and lock it audibly.
- Connect and audibly lock the connector (7) to the hot film air mass meter.
- Tighten down screw (8).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm



- Connect the connector (1) to the rail pressure sensor and lock it audibly.
- Attach connector (2) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (3) to the front oxygen sensor and lock audibly.
- Attach connector (4) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Connect the connector (5) to the electric changeover valve and lock audibly.
- Attach connector (6) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (7) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (8) to the charging pressure sensor and lock it audibly.
- Attach connector (9) to the fuel pressure and temperature sensor and lock it audibly.



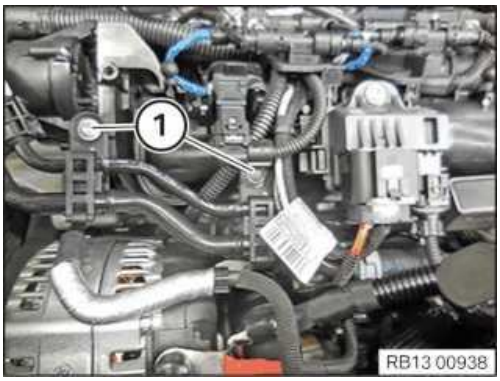
- Connect and lock the connector (2).

  Lock must snap audibly into place.
- Connect the positive battery cable (1) and tighten.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

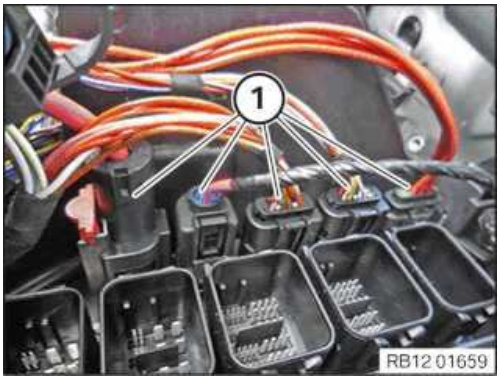
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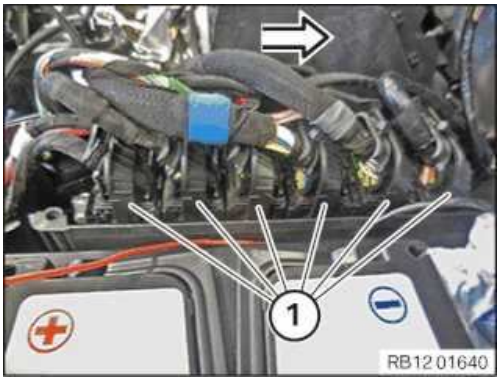
- Position the fuel line.
- Tighten the screws (1).

Fuel line to intake plenum

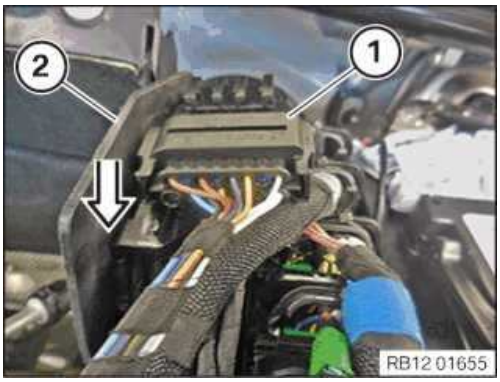
TS6x20		Tightening torque	5 Nm



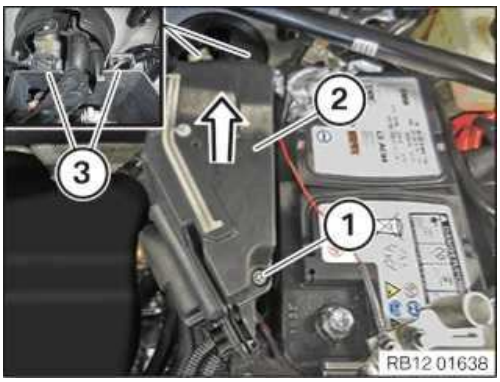
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.

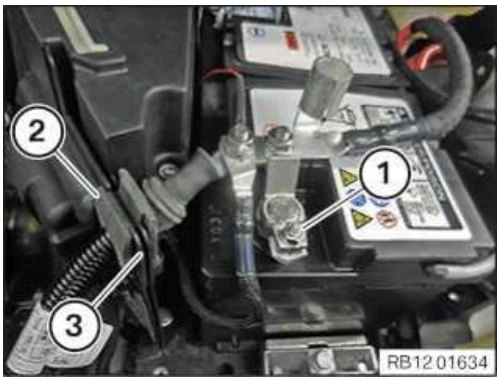


- Insert and install the cover (2) into the guides (3) in the direction of the arrow.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

RF5x26.5		Tightening torque	2,5 Nm

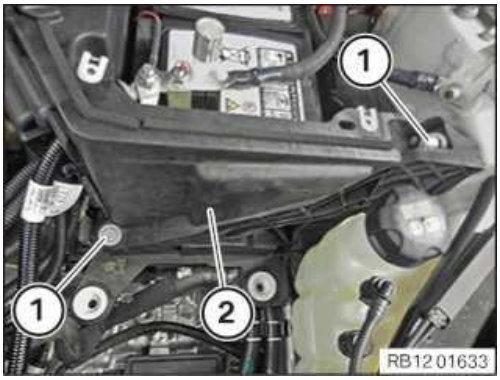
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- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

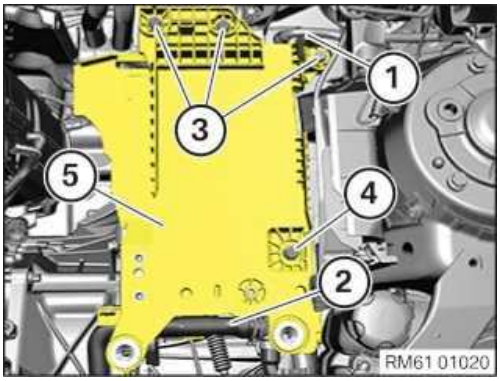


- Feed in and install tension strut (2).
- Tighten the screws (1).

Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

52 – Install the battery holder



- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

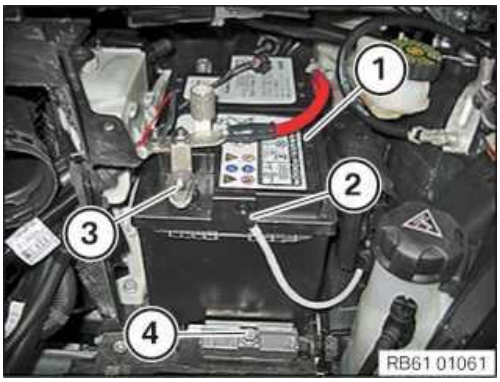
- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

53 – Install vehicle battery



- Install vehicle battery (1).
- Position the bracket and tighten with the screw (4) .

Battery terminal rail to battery tray

M8		19 Nm

- Position the vent hose (2) and clip it in.
- Position the positive battery terminal and tighten with the nut (3) .

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

▸ **Check the vent holes of the battery**

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WARNING

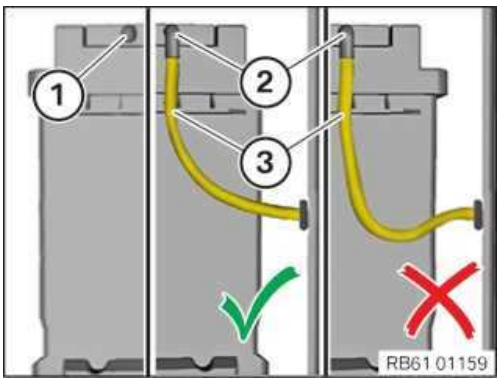
Gas emission.

Danger of injury! Danger of explosion!

- Assign the vent holes correctly.
- Route the vent hose correctly.

TECHNICAL INFORMATION

The battery has two vent holes, opposite:
One vent hole (1) must be closed correctly with a dummy plug.
The vent hose (3) must be correctly connected and routed at the other vent hole (2).



Check

- Check if the vent hole (1) is correctly closed with a dummy plug.

Result

» No dummy plug.

Measure

- Close the vent hole (1) correctly with a dummy plug.

Check

- Check if the vent hole (2) has a correctly connected vent hose (3).

Result

» The vent hose (3) is not correctly connected.

Measure

- At the vent hole (2), connect the vent hose (3) correctly.

Check

- Check if the vent hose (3) is routed to the outside with a downhill gradient (**no siphon formation!**).

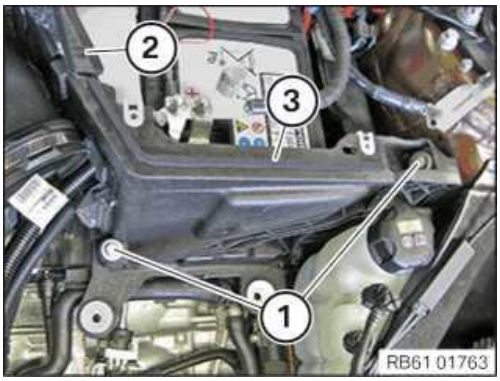
Result

» The vent hose (3) is not correctly routed as shown in the image on the right.

Measure

- Route the vent hose (3) correctly as shown in the centre image.

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- Insert tension strut (3) and tighten with screws (1).

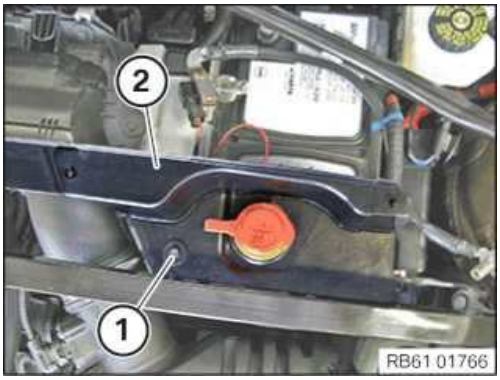
Trailing link

M8		Tightening torque	19 Nm

- Tighten down screw (2).

Battery cover

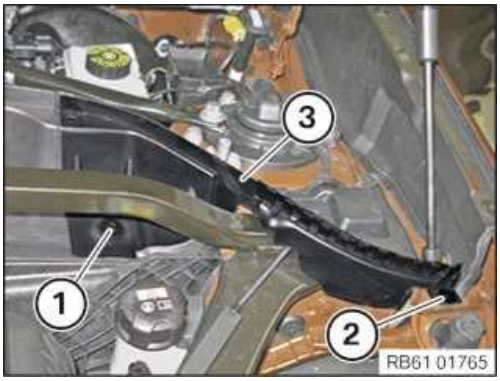
M8		2,8 Nm



- Position the cover (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm

54 – Install electronics box

Prerequisite

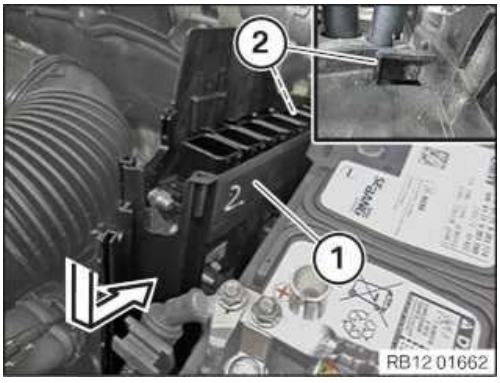
Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.

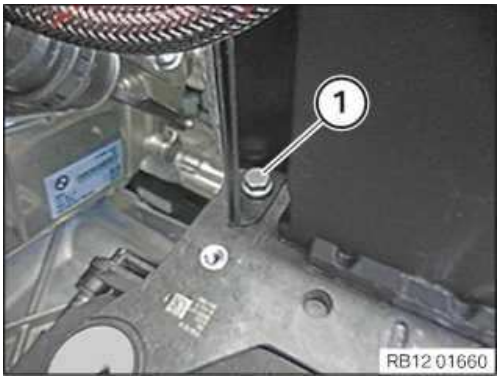


- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.

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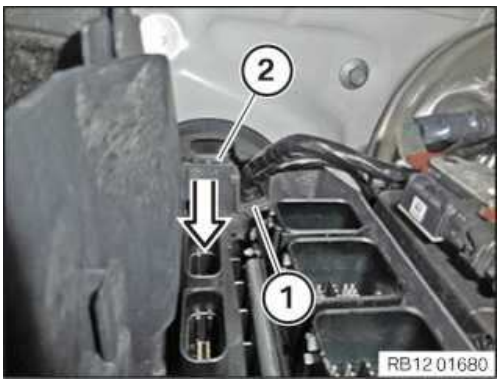
- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).



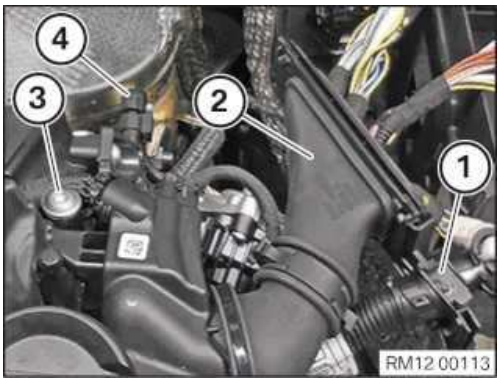
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.

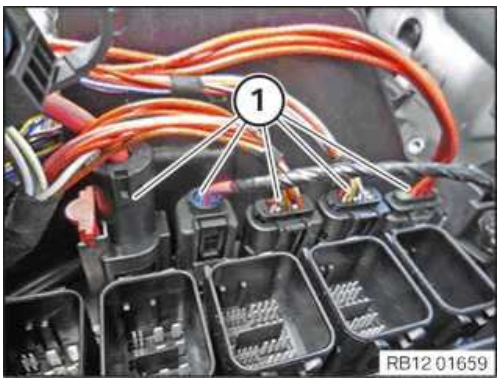


- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

Wiring harness to cylinder head cover

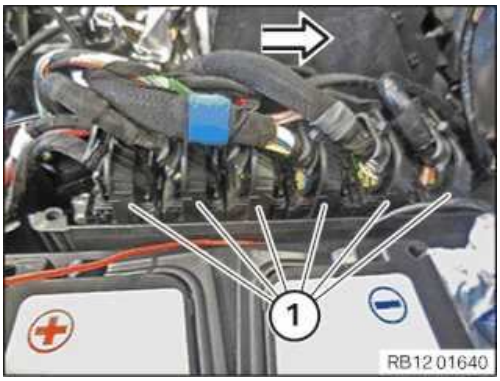
TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.

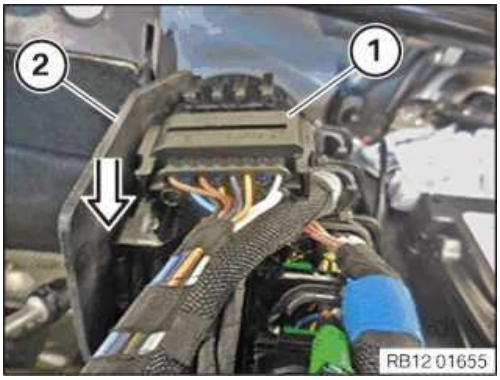


- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.

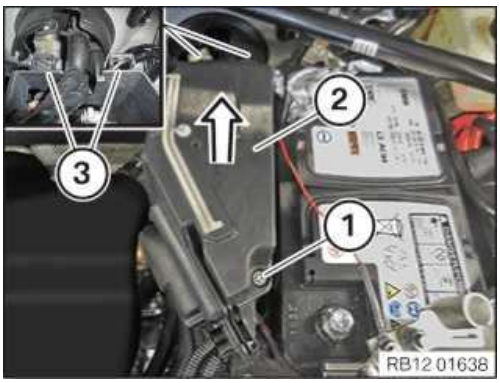
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- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



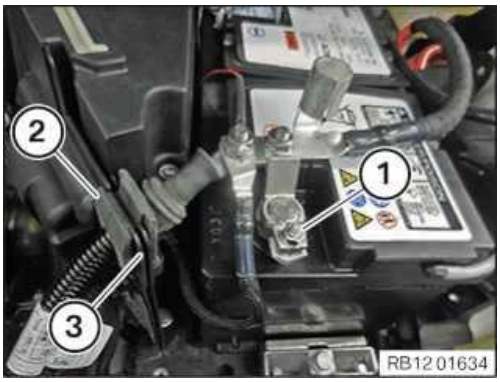
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

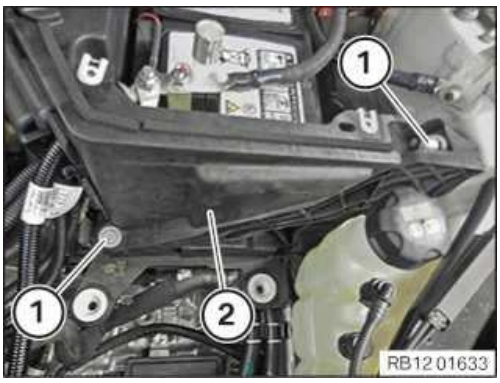
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

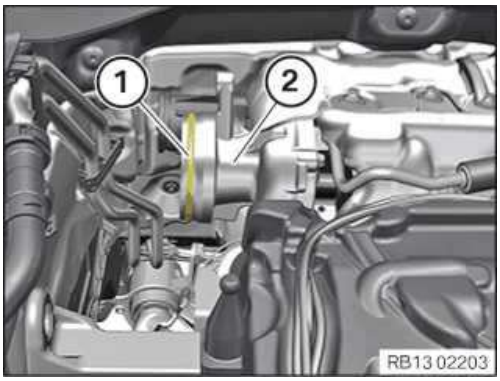


- Feed in and install tension strut (2).
- Tighten the screws (1).

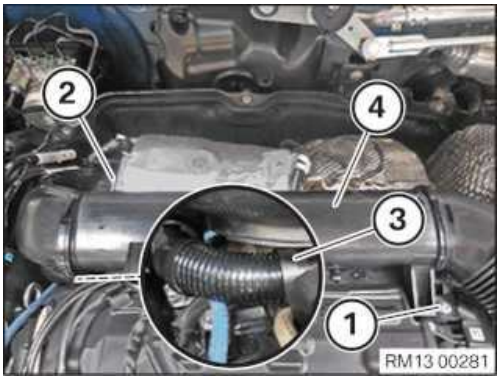
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

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- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.



- Feed in clean air pipe and install.
- Connect clean air pipe to the exhaust turbocharger and lock audibly in the clamps (2).
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Connect ventilation line (3) to the cylinder head cover and lock audibly.



- Mount clean air pipe onto the intake filter housing.
- Tighten clamp (1) on the clean air pipe.

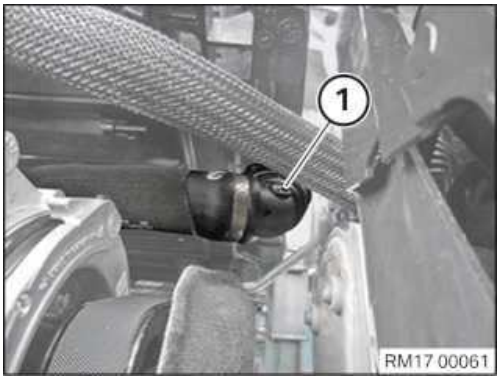
Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

56 – Connect the coolant line

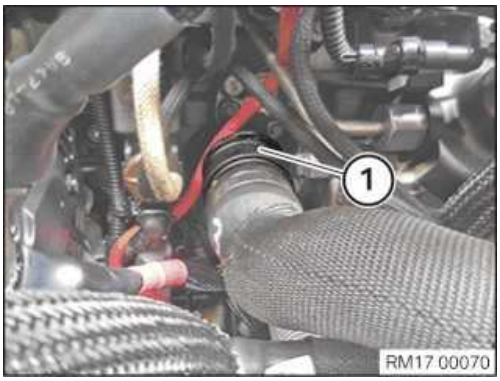
TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Connect the right coolant line (1) to the radiator and lock audibly.

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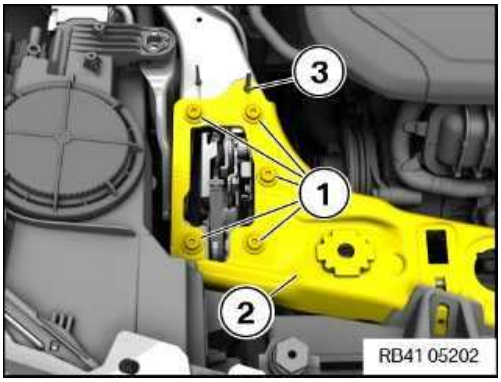


- Connect the coolant line (1) to the connecting branch and lock audibly.

57 – Install front cross connection



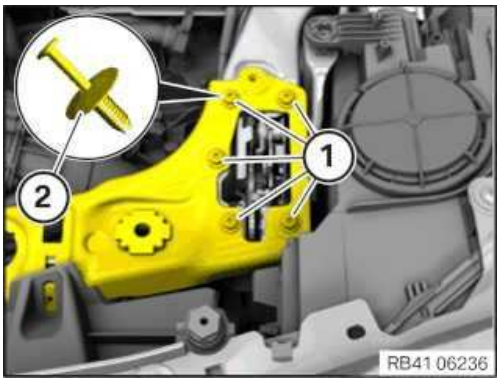
- Right side of vehicle only: Secure spray guard (1) on the cross connection (2) as pictured.



- Position front cross connection (2) and clip front cross connection (2) into the rubber retainer (3) at the same time.
- Tighten the screws (1).

Cross connection to carrier support

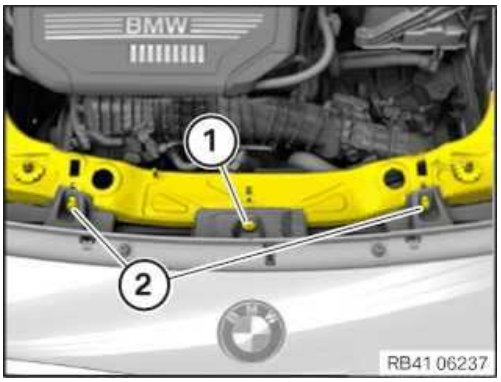
Screws M6x20		Tightening torque	11,8 Nm



- Tighten the screws (1).

Cross connection to carrier support

Screws M6x20		Tightening torque	11,8 Nm



- Position screws (3) on the rubber mounts for the radiator and tighten.

Screw connection for rubber mount of coolant radiator to coolant radiator

Bolt to rubber mount		Tightening torque	8 Nm

- Tighten down screws (2).

Air duct to upper connection

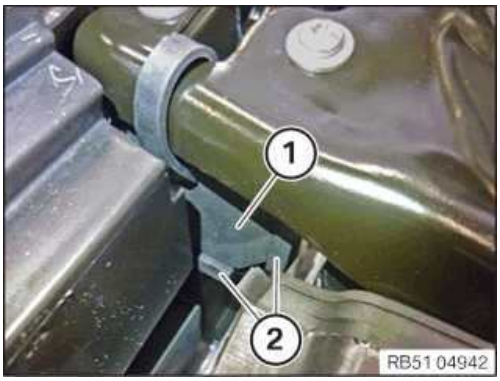
M6x20 screw		Tightening torque	11,8 Nm

- Tighten down screw (1).

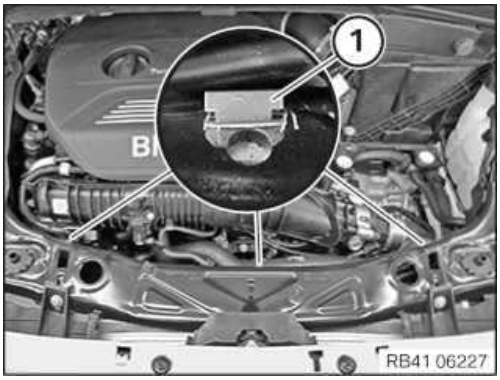
Bracing strut to upper connection

M8x20 screw		Tightening torque	28 Nm

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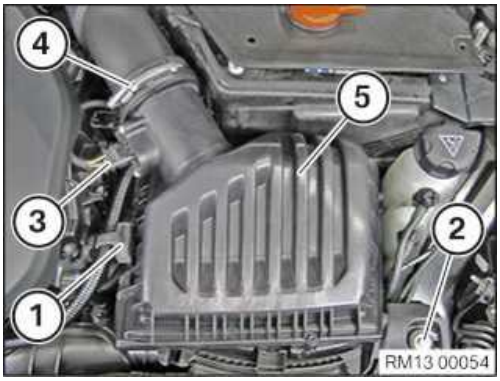


- Right side of vehicle only: Properly mount spray guard (1) to prevent corrosion.
- Secure spray guard (1) to the bridge with retaining tabs (2).



- Fasten the clamps (1) from the Bowden cable of the bonnet lock on the cross connection.

58 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.

  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

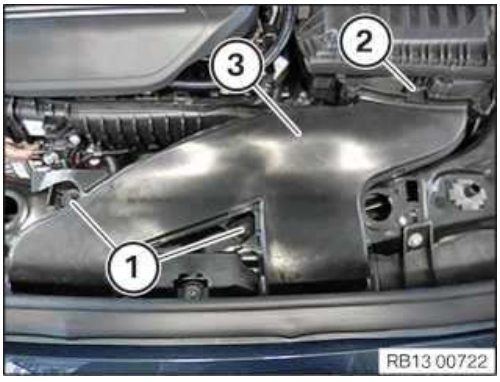
Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Insert and install the holder (1).

59 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).

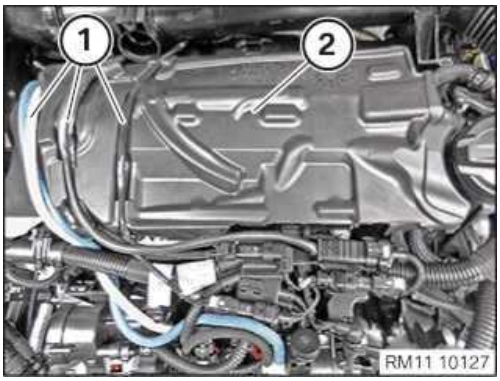
  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

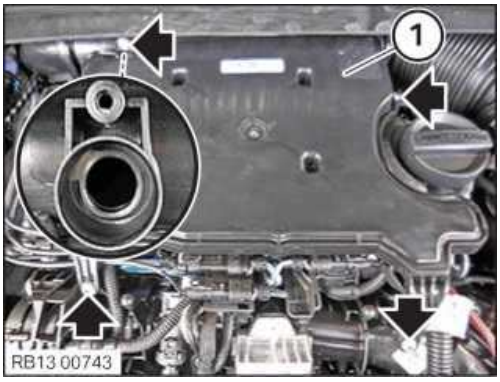
60 – Install the acoustic cover for the injectors

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- Feed the acoustic cover (2) in and install.
- Fasten the vehicle wiring harness (1) in the brackets.

61 – Install resonator



- Insert and install the resonator (1).
- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

62 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Check for correct installation of all rubber mounts in the acoustic cover (1).

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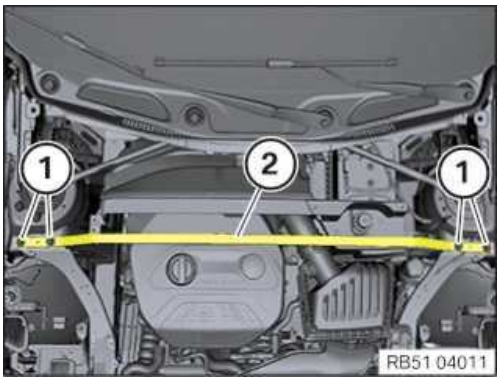


- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

63 – Install strut brace

TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.

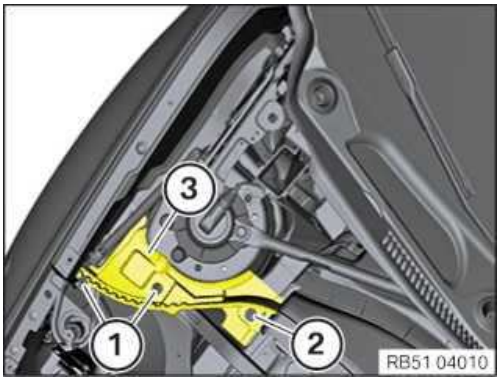


- Install the strut brace (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-brace to spring strut dome

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °



NOTICE

Description is for right component only. The procedure on the left side is identical.

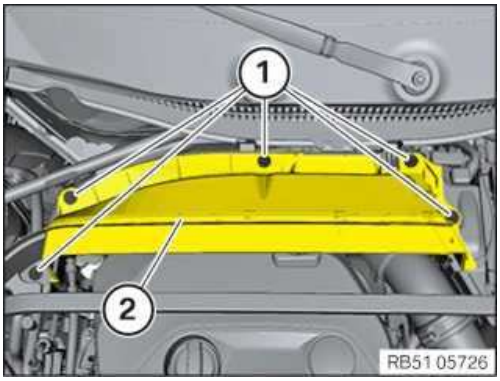
- Install the cover (3).
- Tighten down screw (2).

Cover on body

Hexagon screw		Tightening torque	3 Nm

- Install the expanding rivet (1).

64 – Installing the upper bulkhead cover

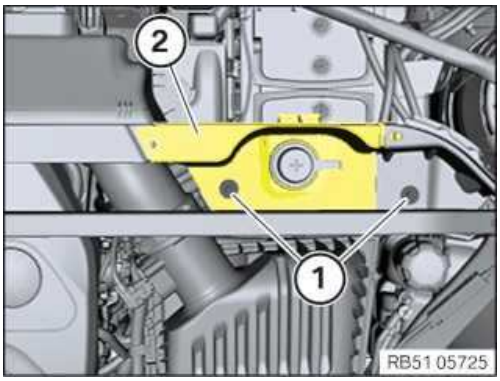


- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Cover of top bulkhead

Screw		Tightening torque	2,6 Nm

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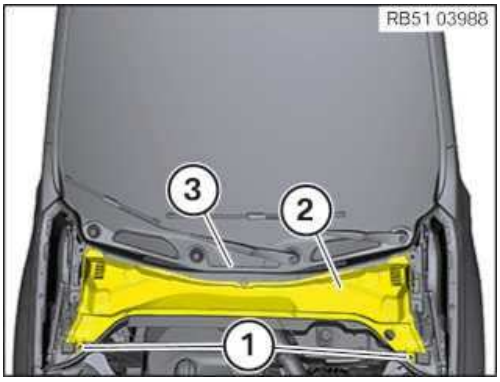


- Guide in and install cover (2).
- Tighten down screw (1).

Cover of remote positive terminal

Screw		Tightening torque	2,6 Nm

65 – Installing front cowl panel cover

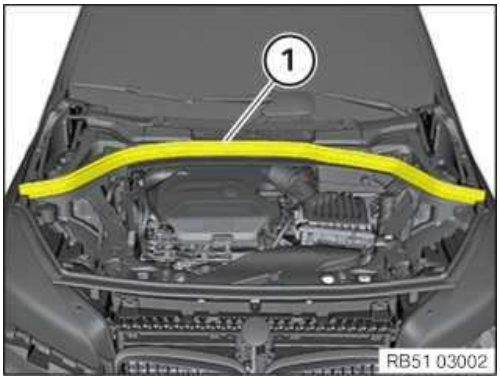


- Insert and install cowl panel cover at front (2) into cowl panel cover at rear (3).
- Check cowl panel cover at front is correctly seated (2).
- Secure expanding rivet (1).

66 – Install the seal for the bonnet

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

67 – Disconnecting all battery earth leads



- See additional information.

68 – Fill and bleed the coolant circuit

▸ **Filling and bleed the high-temperature coolant circuit**

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- See additional information.

Additional Information

Overview of Tightening Torques

Camshaft carrier to cylinder head — Used in step 35

M7x35		Tightening torque	13 Nm

Bearing journal to cylinder head — Used in step 37

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8 — Used in step 37

M8		Tightening torque	19 Nm

Standard screw connection M6 — Used in step 37

M6			8 Nm

Chain tensioner piston to cylinder head — Used in step 38

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft — Used in step 39

M7x17.			17 Nm

Wheel arch cover to body — Used in step 41

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body — Used in step 41

Plastic nut		Tightening torque	3 Nm

Brake disc to front wheel hub — Used in step 42

M8	Renew screw.		16 Nm

Wheel bolts — Used in step 42

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

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Underbody protection front

Used in step 43

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Cylinder head cover to cylinder head

Used in step 44

M6		Tightening torque.	8,5 Nm

Differential pressure sensor to holder

Used in step 45

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor

Used in step 45

Clamp 15–19mm		Tightening torque	3 Nm

Clamping claw facing to cylinder head cover

Used in step 46

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 46

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

High pressure lines between injector and rail

Used in step 48

High pressure lines		Tightening torque	28 Nm

Intake plenum to cylinder head

Used in step 49

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 50

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler

Used in step 50

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to exhaust manifold

Used in step 50

M8x28	Replace screws	Tightening torque	32 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 50

M8x20		Tightening torque	19 Nm

Wiring harness to cylinder head cover

Used in step 51 54

TS5x20		Tightening torque	3,5 Nm

Positive battery cable to alternator

Used in step 51

M8		Tightening torque	19 Nm

Fuel line to intake plenum

Used in step 51

TS6x20		Tightening torque	5 Nm

Cover to electronics box

Used in step 51 54

RF5x26.5		Tightening torque	2,5 Nm

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Positive battery terminal to battery

Used in step 51 54

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray

Used in step 51 54

M8		Tightening torque	19 Nm

Battery holder to engine support

Used in step 52

Hexagon screw M8x30		Tightening torque	19 Nm

Battery terminal rail to battery tray

Used in step 53

M8			19 Nm

Battery terminal with IBS positive battery terminal / negative battery terminal

Used in step 53

NutM6			5 Nm

Trailing link

Used in step 53

M8		Tightening torque	19 Nm

Battery cover

Used in step 53

M8			2,8 Nm

Electronics box to battery tray

Used in step 54

M8X16		Tightening torque	15 Nm

Clean air pipe to cylinder head cover

Used in step 55

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing

Used in step 55 58

Clamp		Tightening torque	3 Nm

Cross connection to carrier support

Used in step 57

Screws M6x20		Tightening torque	11,8 Nm

Screw connection for rubber mount of coolant radiator to coolant radiator

Used in step 57

Bolt to rubber mount		Tightening torque	8 Nm

Air duct to upper connection

Used in step 57

M6x20 screw		Tightening torque	11,8 Nm

Bracing strut to upper connection

Used in step 57

M8x20 screw		Tightening torque	28 Nm

Intake silencer housing to lock bridge

Used in step 58

M6X30		Tightening torque	8 Nm

Intake neck to cross connection

Used in step 59

M6		Tightening torque	8 Nm

Resonator to manifold and clean air pipe

Used in step 61

Screw TS6	Renew screw.	Tightening torque	5 Nm

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Cross-brace to spring strut dome

Used in step 63

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

Cover on body

Used in step 63

Hexagon screw		Tightening torque	3 Nm

Cover of top bulkhead

Used in step 64

Screw		Tightening torque	2,6 Nm

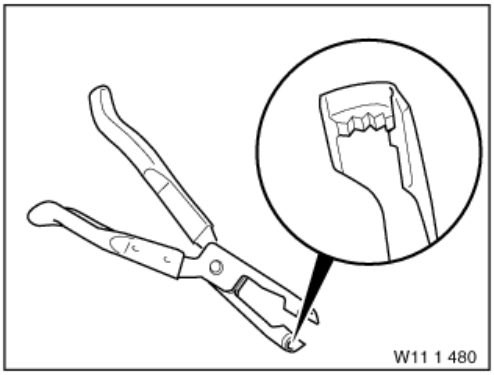
Cover of remote positive terminal

Used in step 64

Screw		Tightening torque	2,6 Nm

Overview of Special Tools

0 490 796 (11 1 480) Pliers



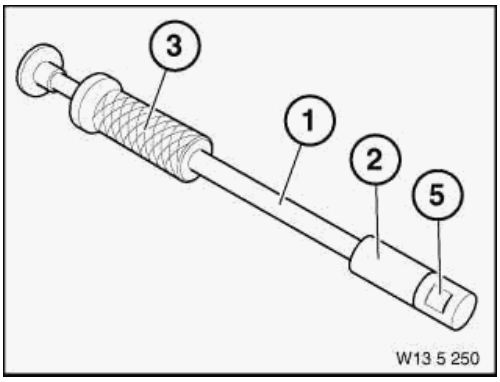
Common

Used in step 18

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

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0 493 321 (13 5 250) Puller



Common

Used in step 23

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

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0 493 339 (13 5 252) Bush



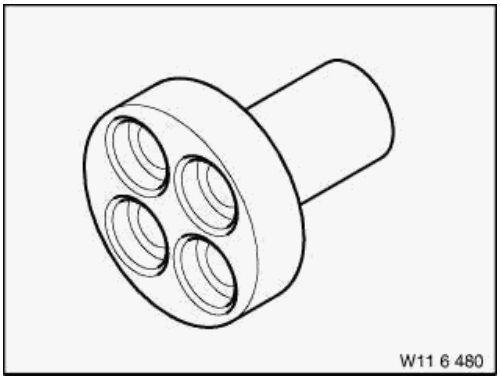
Common	Used in step 23
Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 340 (13 5 253) Weight



Common	Used in step 23
Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 380 (11 6 480) Connector



Common	Used in step 28 40
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

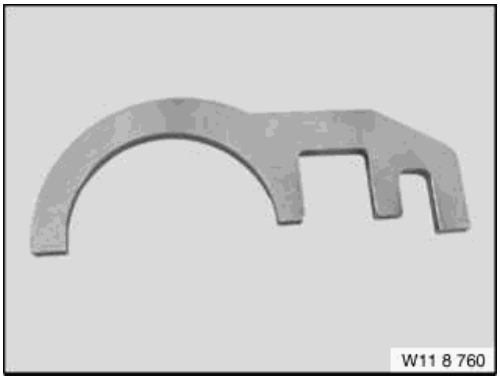
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2 288 380 Locating stud



Common	Used in step 28 40
Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 112 (11 8 760) Gauge



Common	Used in step 28 40
Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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0 495 105 (11 4 480) oddments tray



Common

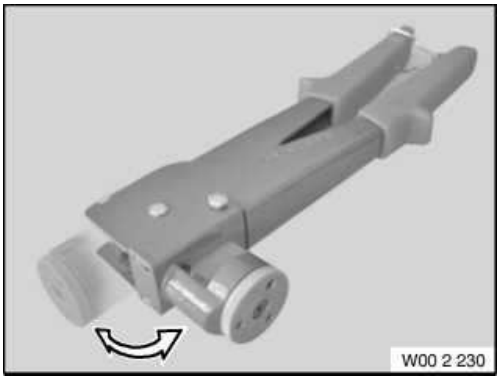
Used in step 33

Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

0 496 521 (00 2 230) Pliers



Common

Used in step 41

Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

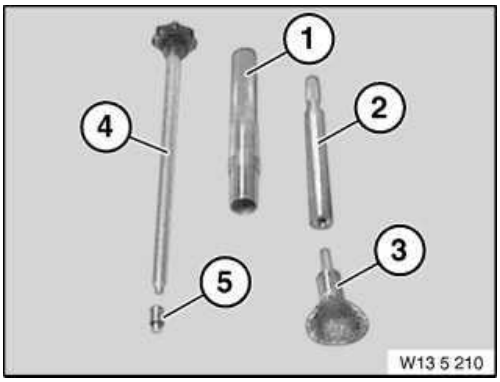
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2 344 011 Tool



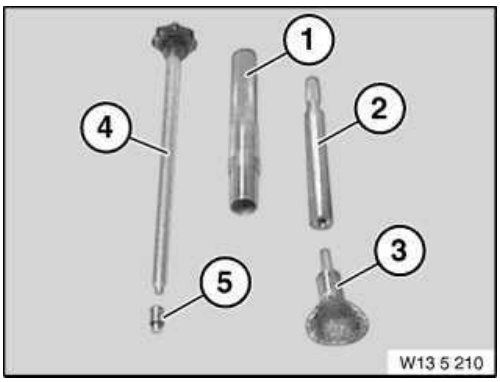
Common	Used in step 42
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

0 493 763 (13 5 215) Plug



Common	Used in step 46
Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

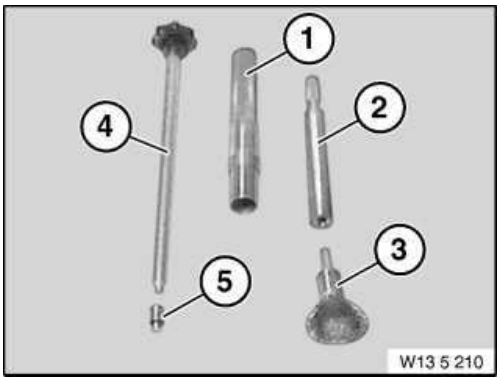
0 493 762 (13 5 214) Rod



Common	Used in step 46
Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 493 758 (13 5 210) Tool



Common

Used in step 46

Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

Replacement tools:

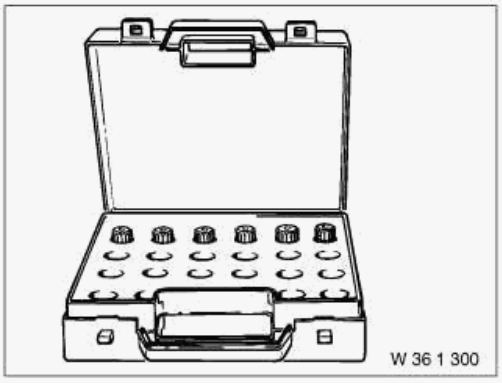
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0 495 221 (36 1 323) Wheel stud



Common	Used in step 26
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud



Common	Used in step 26
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud



Common	Used in step 26
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 226 (36 1 328) Wheel stud



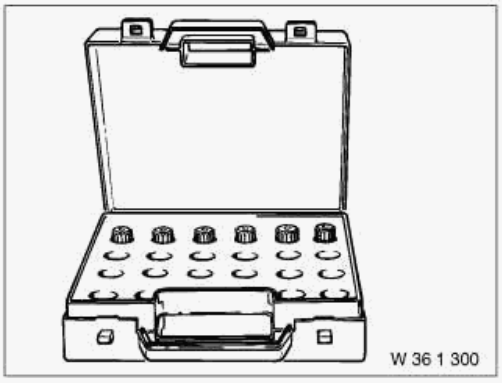
Common	Used in step 26
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud



Common	Used in step 26
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud



Common	Used in step 26
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 229 (36 1 332) Wheel stud



Common	Used in step 26
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud



Common	Used in step 26
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	19 50
EGR controller	19 50

Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	1 67
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61 20 900 Disconnecting and connecting battery earth lead 1 67
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17 00 039 Filling and bleeding the high-temperature cooling system vacuum filler device (B48)	68
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17 00 008 Draining and topping up the high-temperature coolant circuit	68
17 00 016 Draining and topping up coolant circuit for Range Extender \PREMIUM	68
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17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	68
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17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	68
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	68
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Operating materials	Used in step
2.0 Grease for wheel centring	42

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	38
Exhaust-gas recirculation cooler seal on exhaust manifold	50
Exhaust-gas recirculation cooler seal on intake plenum	50

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11 33 050 Removing and installing/replacing all rocker arms (B47)

Special tools required:

- 11 6 480
- 2 288 380
- 11 4 480

Important!

Risk of damage to engine.

Adherence to notes on checking and adjusting timing is mandatory!

Necessary preliminary tasks:

- Remove front right wheel arch cover
- Remove cylinder head cover
- Remove exhaust-gas recirculation cooler

Removal:



Use special tool11 6 480 to turn engine to TDC firing position of cylinder 1.**Important!**

Do not crank engine in reverse direction!



Remove protective cap on oil sump.

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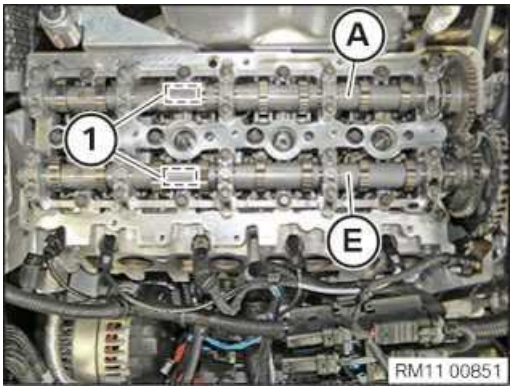


Important!

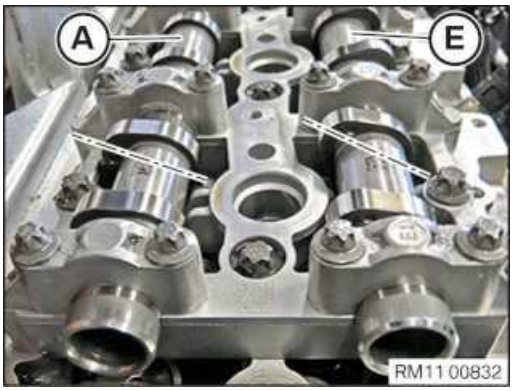
On vehicles with manual gearbox, an additional bore hole that can be confused with dowel hole is located in front of dowel hole.

It must be possible to push special tool 2 288 380 into oil sump up to throw.

Block crankshaft with cylinder no. 1 in TDC firing position with special tool2 288 380 .

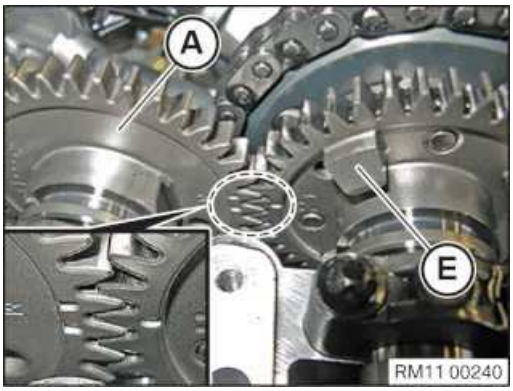


It must be possible to read the part number (1) on the exhaust and intake camshafts (A and E) from above.



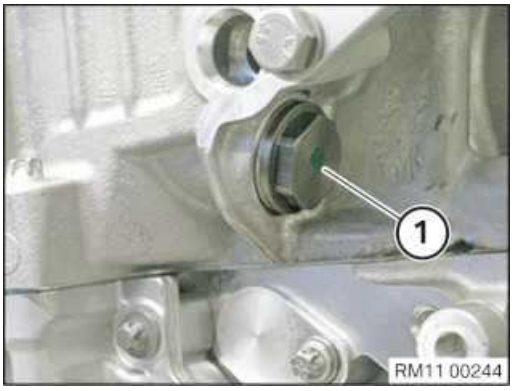
The cam on the intake camshaft (E) points obliquely upwards at cylinder No. 1.

The cam on the exhaust camshaft (A) at the first cylinder points obliquely outwards to the left.

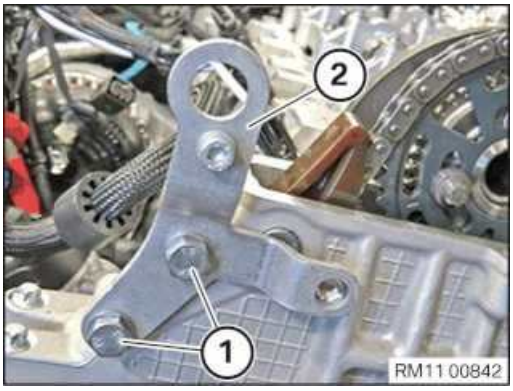


The marks on both camshafts (A and E) must match up (see graphic).

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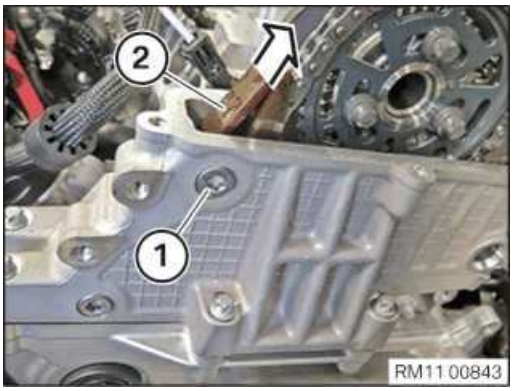


Release chain tensioner (1).



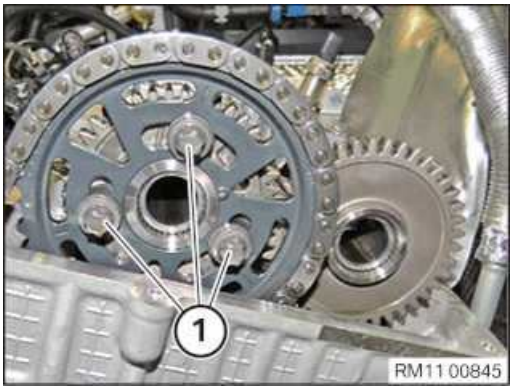
Release screws (1).

Remove suspension element (2).



Remove bearing journal (1).

Remove guide rail (2) in direction of arrow.



Important!

Protect timing chain to prevent it from falling.

Risk of damage to oil spray nozzle.

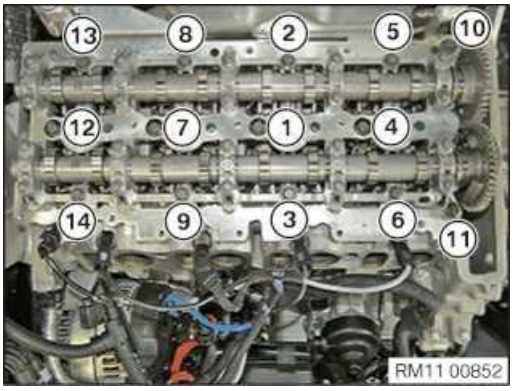
Release screws (1) on camshaft sprocket.

Remove camshaft sprocket from intake camshaft.

Pull camshaft sprocket out of timing chain and place it neatly on the special tool 11 4 480 .

Place timing chain at the cylinder head.

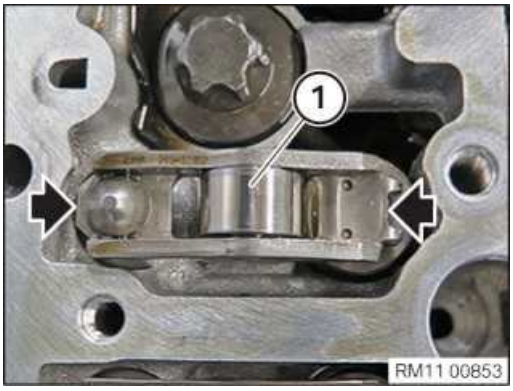
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Note:
Both camshafts can be removed with the camshaft carrier.

Release all screws (see graphic) in the sequence **14 - 1** in multiple steps.

Remove camshaft carrier with camshafts towards top.

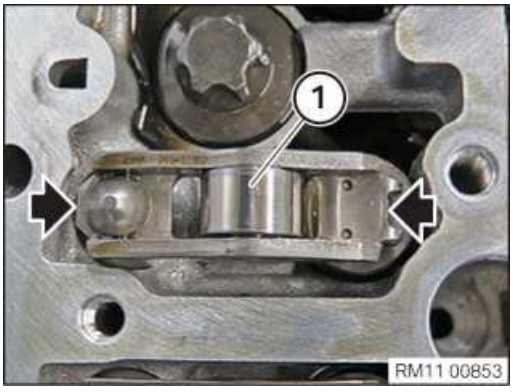


Note:
Already used rocker arms may be refitted only in the same position.

Set down all rocker arms (1) on special tool 11 4 480 in neat order.

Lift off rocker arm (1).

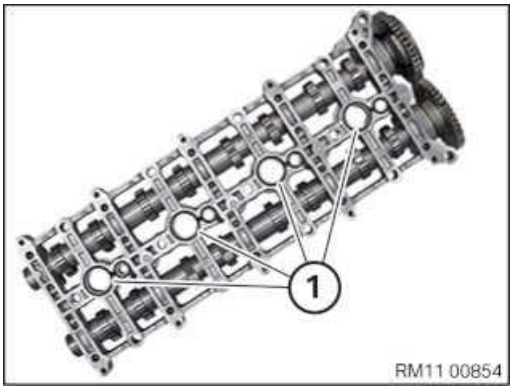
Installation:



Note:
Already used rocker arms may be refitted only in the same position.

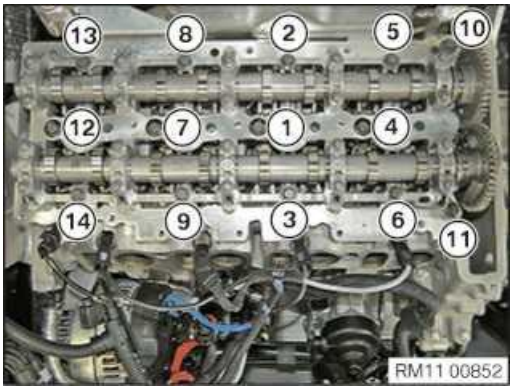
Make sure roller cam followers are in correct installation positions.

Install rocker arm (1).



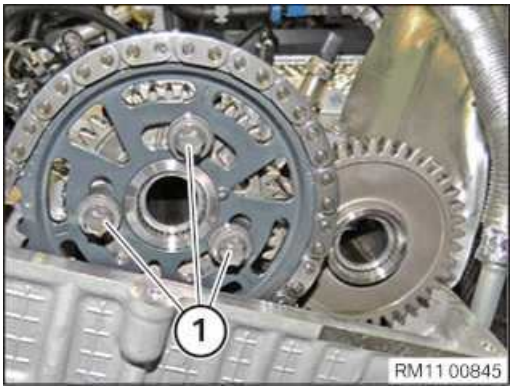
Parts: Replace gaskets (1).

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Tighten screws in the sequence **1** to **14** in multiple steps.

Tightening torque: 11 31 3AZ.

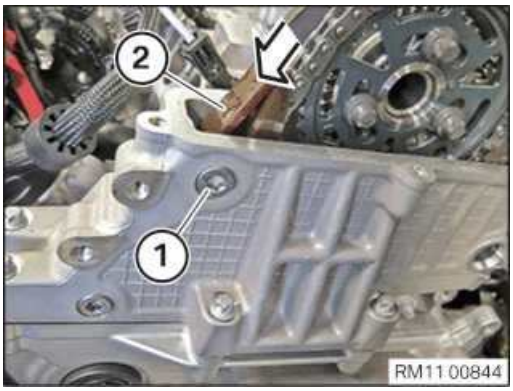


Place the camshaft sprocket with timing chain on the intake camshaft such that bolts (1) are located in the centre of the elongated holes.

Insert bolts (1).

Tighten bolts (1) to 10 Nm.

Release bolts (1) again by a 90° turn.



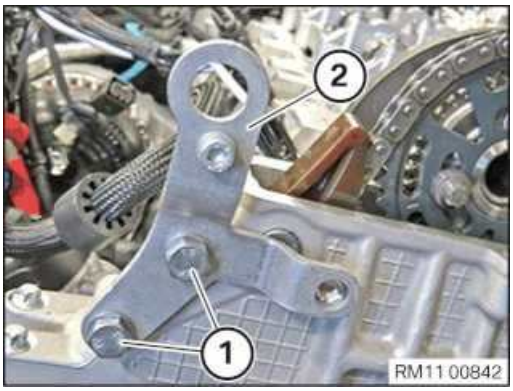
Parts: Replace bearing journals (1).

Install guide rail (2) in the direction of the arrow.

Note:
Ensure correct installation of guide rail (1) at bottom bearing journal.

Screw in bearing journals (1).

Tightening torque: 11 12 6AZ.

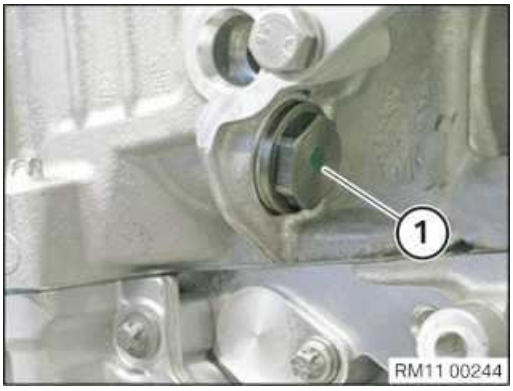


Install suspension element (2).

Tighten down screws (1).

Tightening torque: 11 00 4AZ.

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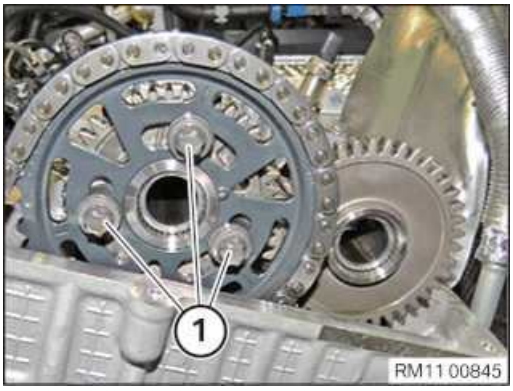


Install chain tensioner (1) and tighten down.

Parts:

Replace the sealing ring.

Tightening torque: 11 12 5AZ.



Tighten down screws (1).

Tightening torque: 11 31 1AZ.



Remove special tool 2 288 380 .



Crank engine with special tool 11 6 480 twice in direction of rotation.

Check timing.

Important!

Do not crank engine in reverse direction.



Important!

2 288 380 Remove special tool before starting engine.

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Required follow-up work:

- Install exhaust-gas recirculation cooler.
- Install cylinder head cover.
- Install front right wheel arch cover.

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11 33 062 Replacing all hydraulic valve clearance compensating elements

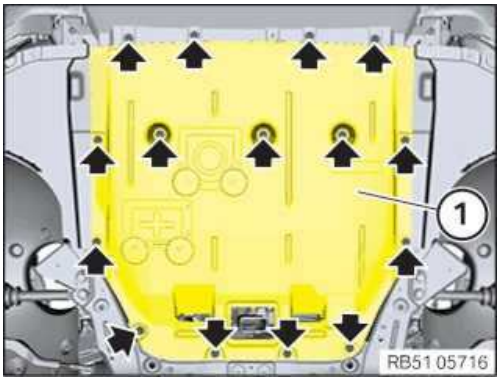
PRELIMINARY WORK

1 – Disconnecting all battery earth leads

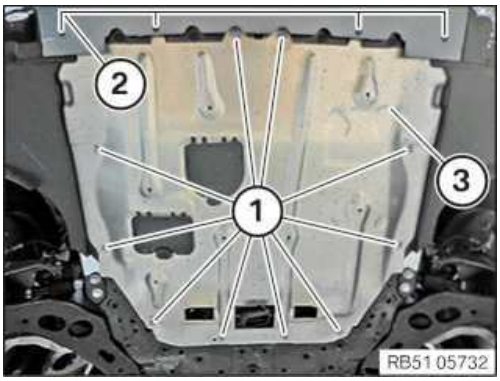


- See additional information.

2 – Removing the front underbody protection

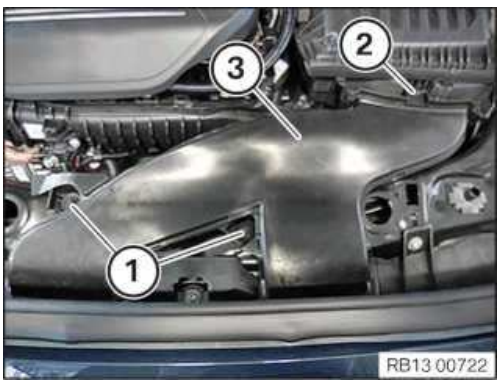


- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.



- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

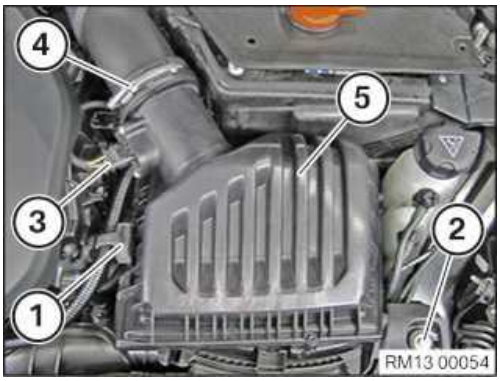
3 – Remove the intake neck for intake silencer housing



- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

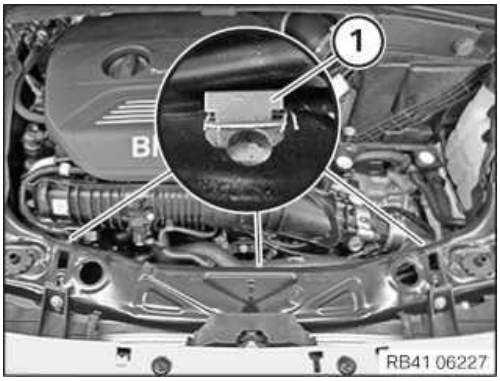
4 – Removing intake silencer housing

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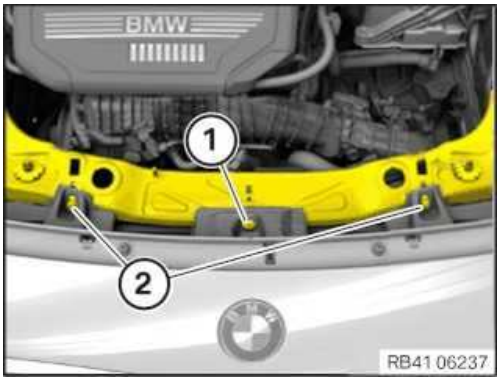


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

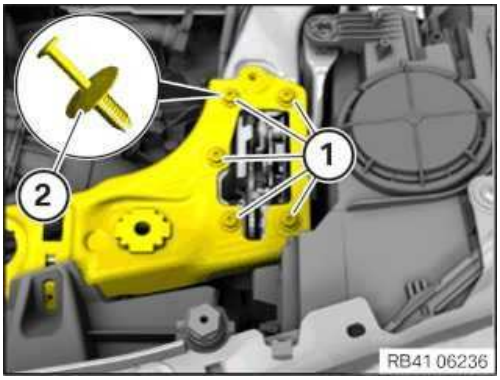
5 – Remove front cross connection



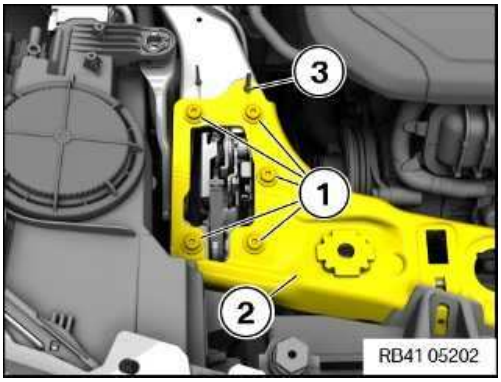
- Detach the clamps (1) for the Bowden cable of the bonnet locks from the cross connection.



- Loosen screw (1).
- Loosen screws (2).



- Loosen screws (1).
- Lever out expanding rivet (2).



- Loosen screws (1).
- Unclip the front cross connection (2) from the rubber retainer (3) and remove it upward.

6 – Draining coolant

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WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

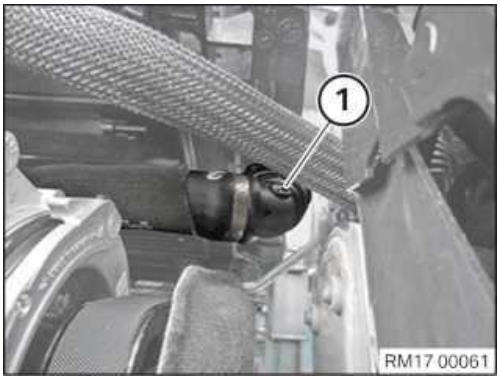
In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

TECHNICAL INFORMATION

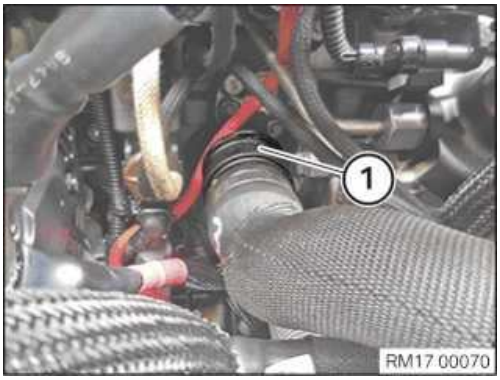
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Loosen sealing cap (1).



- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.



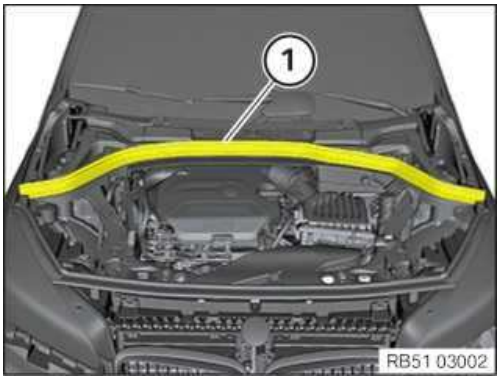
- Unlock the coolant line (1) and pull it off the connecting branch.
- Catch and dispose of escaping coolant.

7 – Remove the seal for the rear bonnet

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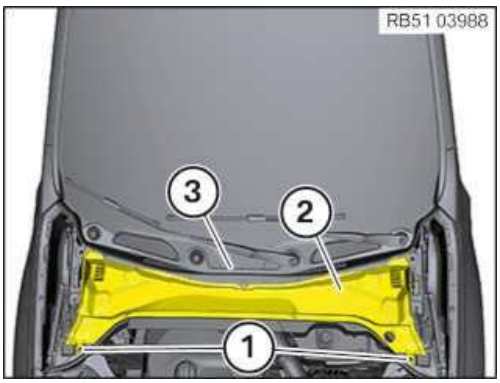
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



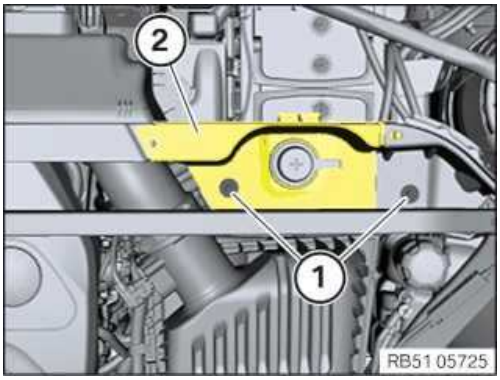
- Pull off rear bonnet seal (1) towards the top and remove.

8 – Removing front cowl panel cover

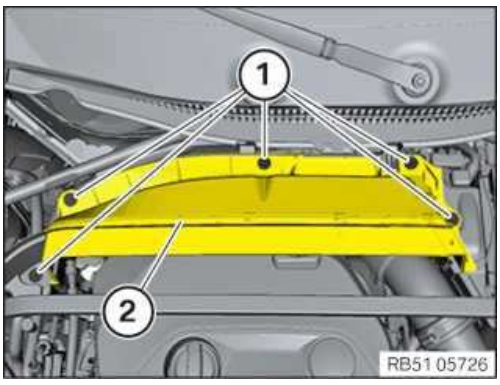


- Loosen the expanding rivet (1).
- Feed out and remove front cowl panel cover (2) from the rear cowl panel cover(3).

9 – Removing the upper bulkhead cover



- Loosen screws (1).
- Guide out and remove the cover (2).



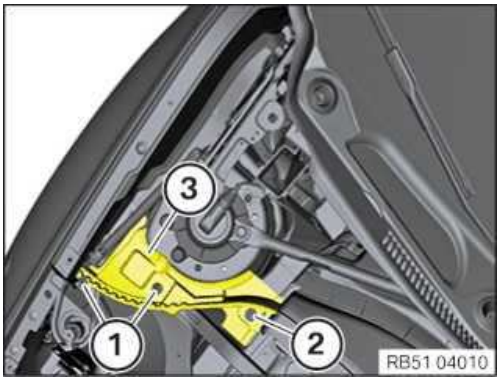
- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

10 – Remove suspension cross-brace

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TECHNICAL INFORMATION

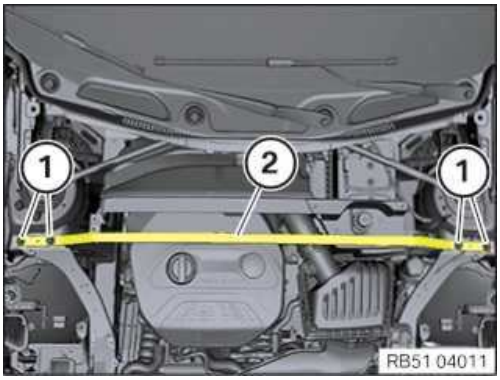
Driving without the strut brace/front end or tension strut is not permitted.



NOTICE

Description is for right component only. The procedure on the left side is identical.

- Loosen expanding rivet (1).
- Loosen screw (2).
- Remove the cover (3).



- Loosen screws (1).
- Remove strut brace (2).

11 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

Damage to the acoustic cover.

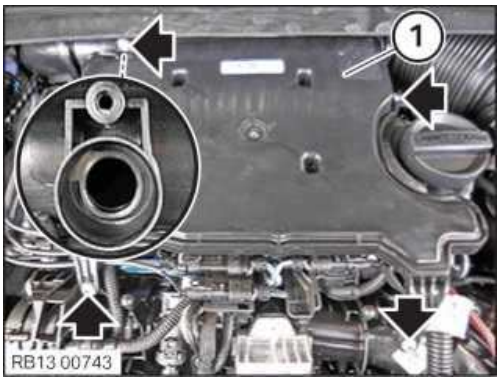
Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

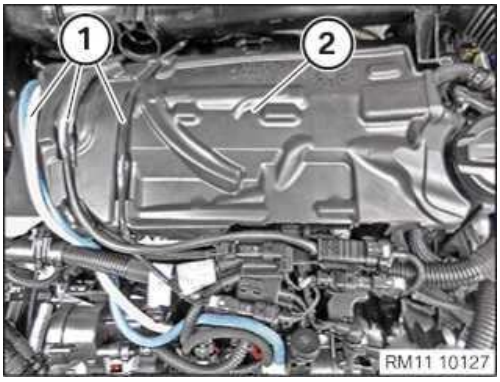
12 – Remove resonator

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- Remove screws (arrows).
- Guide out and remove the resonator (1).

13 – Remove the acoustic cover for the injectors

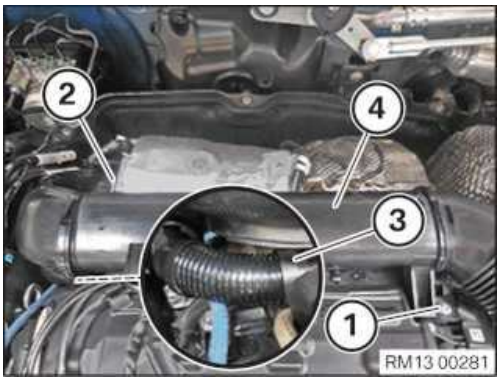


- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

14 – Removing clean air pipe



- Detach clamp (1) on the clean air pipe.
- Pull off the clean air pipe from the intake silencer housing.



- Loosen screw (1).
- Loosen clamp (2).
- Unlock the ventilation line (3) and pull it off the cylinder head cover.
- Feed out clean air pipe and remove.

15 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

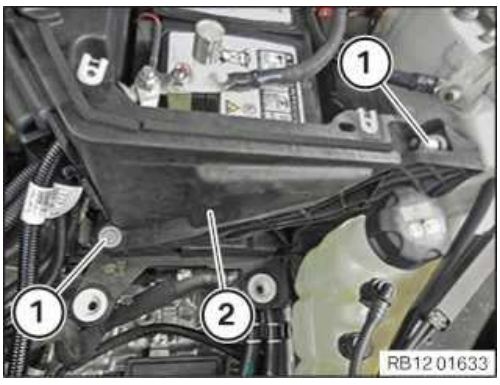
TECHNICAL INFORMATION

Follow instructions for removing and installing control units.

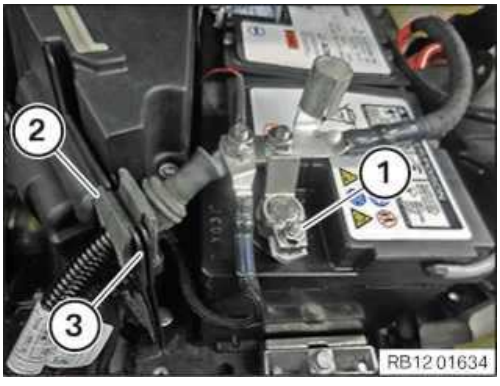
For additional information see: 12 00 ... Notes on removal and installation of control units

TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.

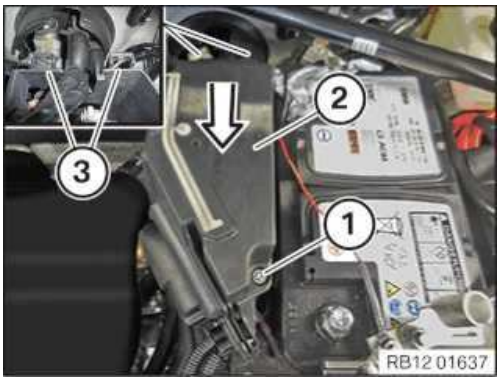


- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.

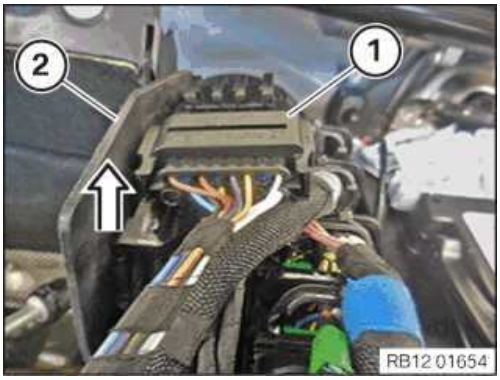


- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

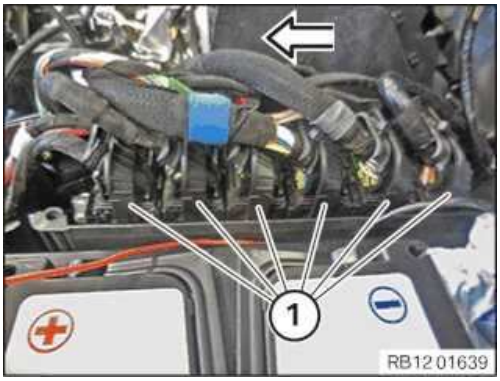
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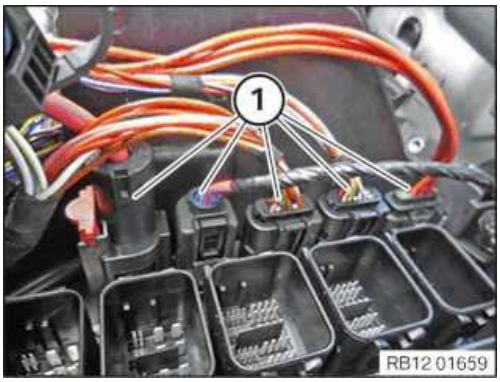
- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



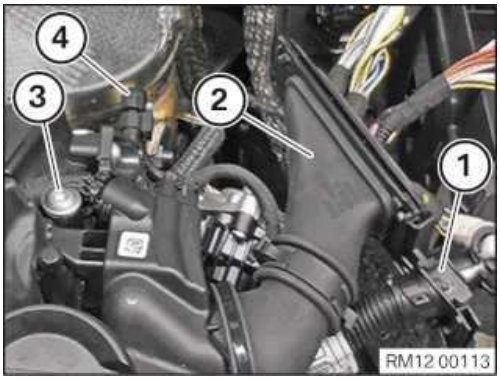
- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).



- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

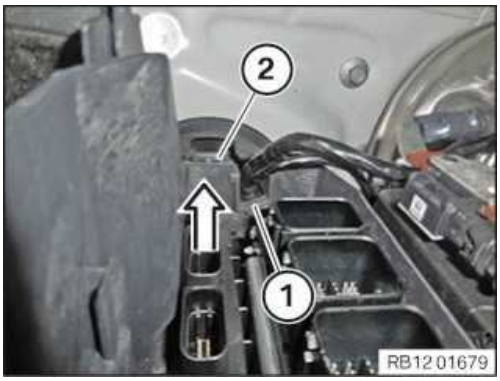


- Unlock and loosen connector (1).

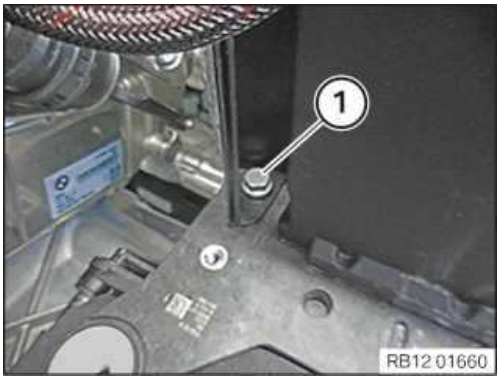


- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.

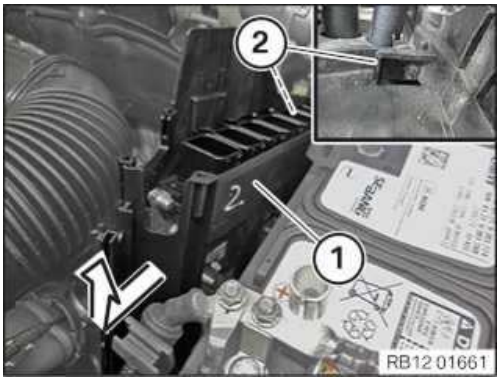
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- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.



- Loosen screw (1).



- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

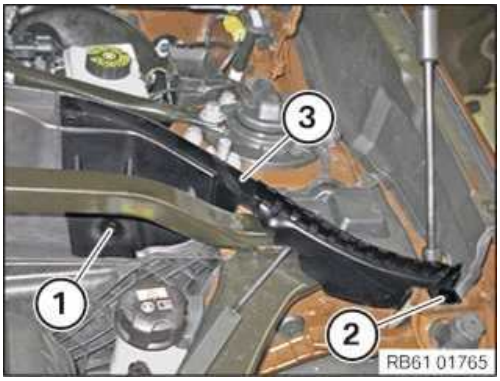
16 – Remove vehicle battery

WARNING

Working on 12 V vehicle electrical system.

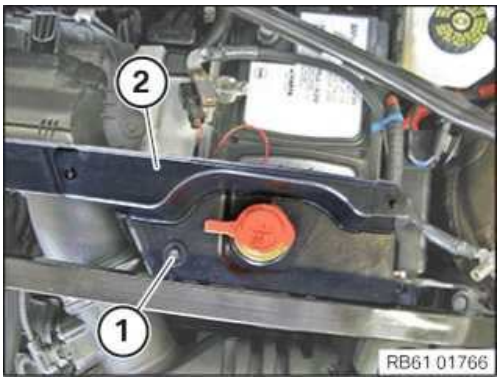
Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

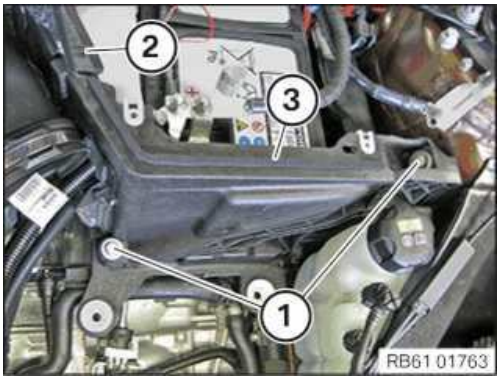


- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

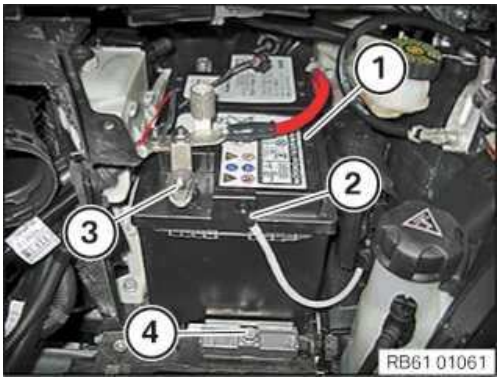
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- Loosen screw (1).
- Remove the cover (2).



- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.



- Pull off the vent hose (2).
- Slacken the nut (3) on the positive battery terminal and remove the positive battery terminal.

WARNING

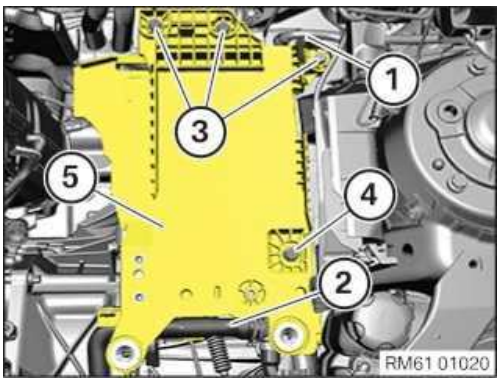
Unprotected battery terminals.

Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

17 – Remove battery holder

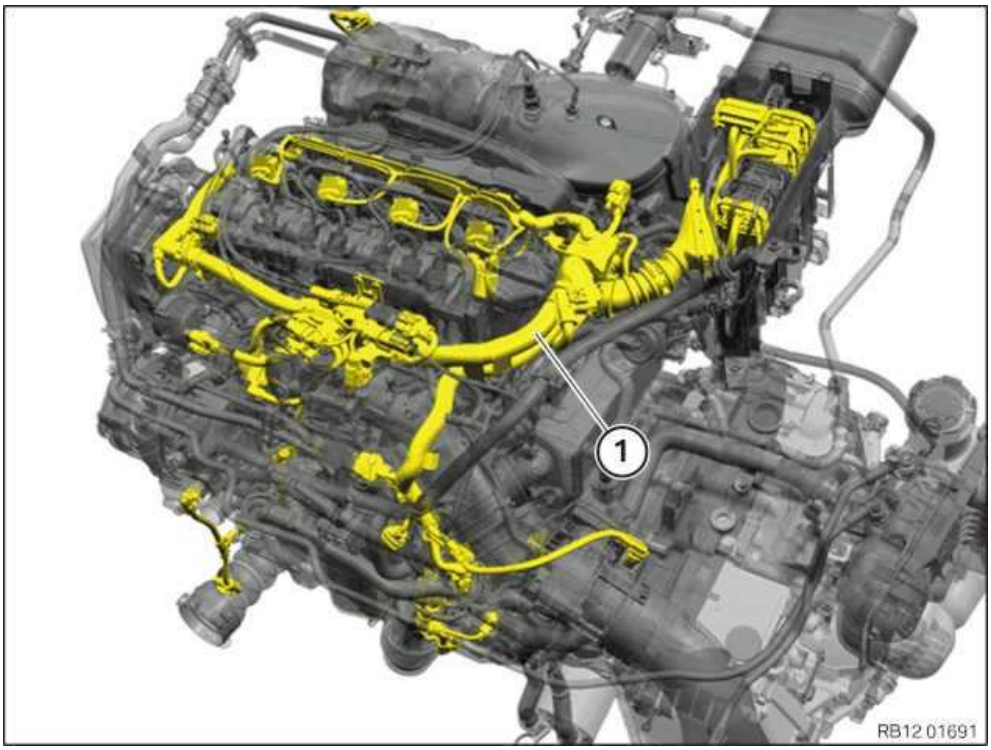


- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

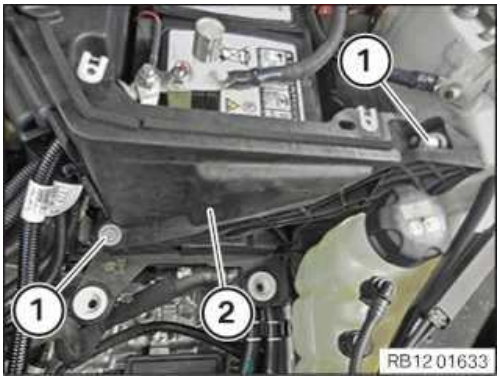
18 – Releasing the wiring harness section for the intake plenum

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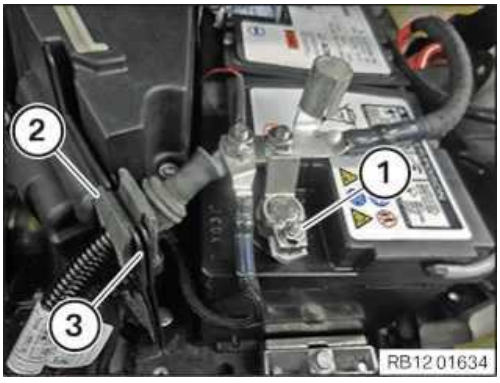
Overview: Wiring harness section for the engine



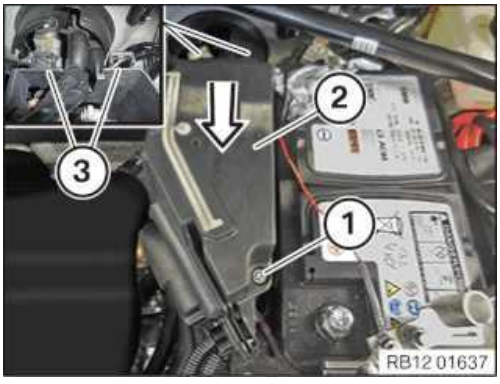
1 Wiring harness section for the engine



- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.

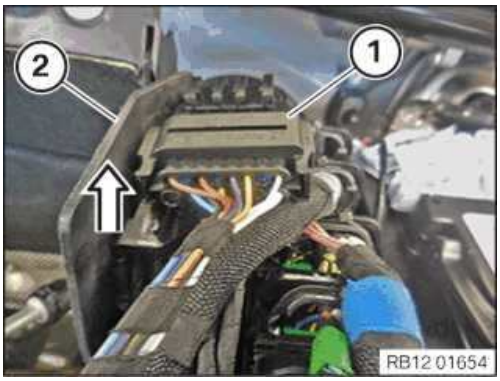


- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

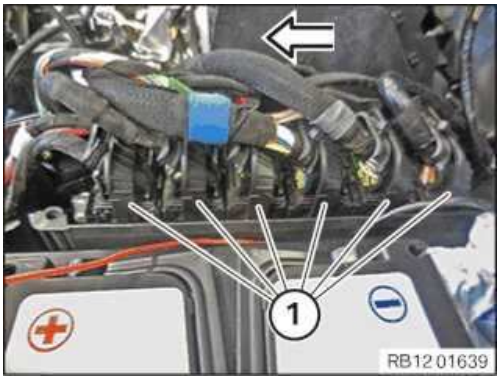


- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.

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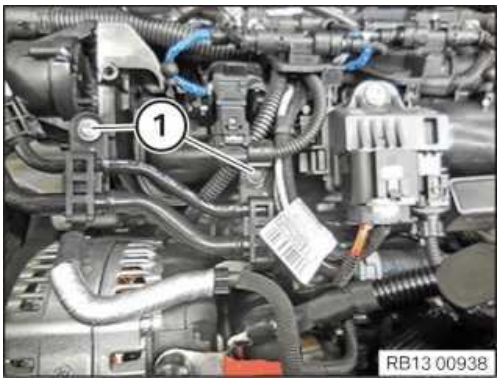
- Guide the connector (1)out of the electronics box (2) in the direction of arrow and remove it.
- Unlock and loosen connector (1).



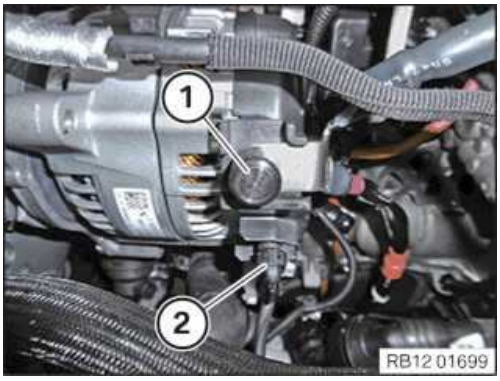
- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



- Unlock and loosen connector (1).

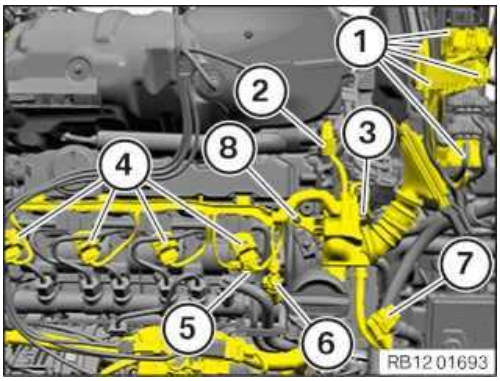


- Loosen screws (1).

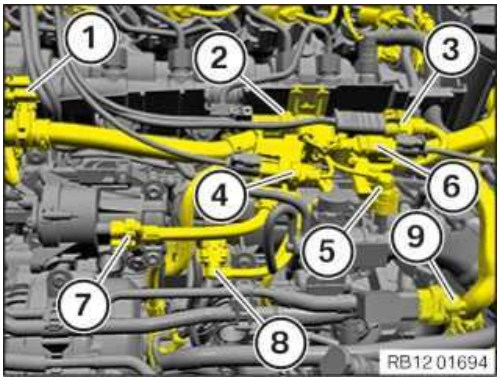


- Release the positive battery cable (1) on the alternator and place to one side.
- Unlock connector (2) and pull off.

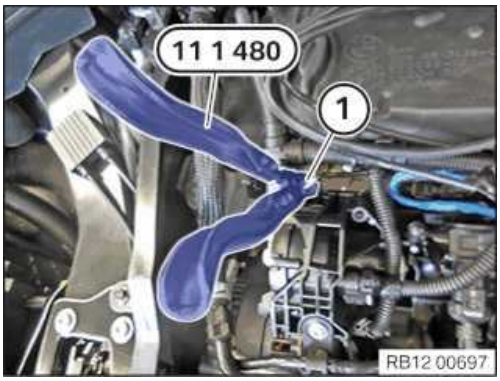
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- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock the connector (2) and disconnect it from the differential pressure sensor.
- Unlock the connector (3) and disconnect it from the exhaust-gas recirculation valve.
- Unlock the connector (4) and pull off from the injectors.
- Unlock the connector (5) and disconnect it from the camshaft sensor.
- Unlock the connector (6) and disconnect it from the fuel pressure regulator.
- Unlock connector (7) and pull off from hot film air mass meter.
- Loosen screw (8).

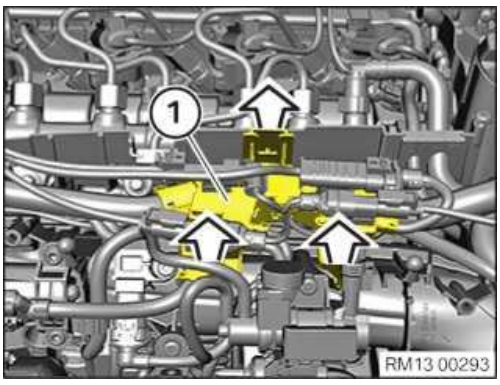


- Unlock connector (1) and pull off from the rail pressure sensor.
- Unlock the connector (2) and disconnect it from the exhaust temperature sensor before the diesel particulate filter.
- Unlock and disconnect the connector (3) from the front oxygen sensor.
- Unlock the connector (4) and disconnect it from the exhaust temperature sensor after the diesel particulate filter.
- Unlock and disconnect the connector (5) from the electric changeover valve.
- Unlock the connector (6) and disconnect it from the exhaust temperature sensor for the exhaust-gas recirculation cooler.
- Unlock the connector (7) and disconnect it from the servomotor for the swirl flaps.
- Unlock the connector (8) and pull it off the charging pressure sensor.
- Unlock the connector (9) and disconnect from the fuel pressure and temperature sensor.



- Unlock the connectors (1) of all glow elements with the special tool **0 490 796 (11 1 480)** and release them.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.

▶ **Removing the cable clips from the intake plenum**



- Detach the cable clip (1) in the direction of the arrow.
- Guide out the cable clip (1) in direction of arrow and set it aside.

19 – Removing the exhaust-gas recirculation cooler

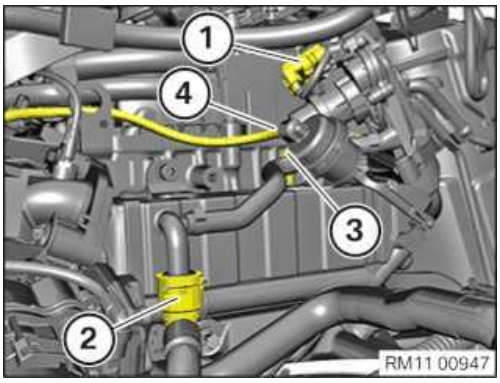
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WARNING

Hot surfaces.

Risk of burning!

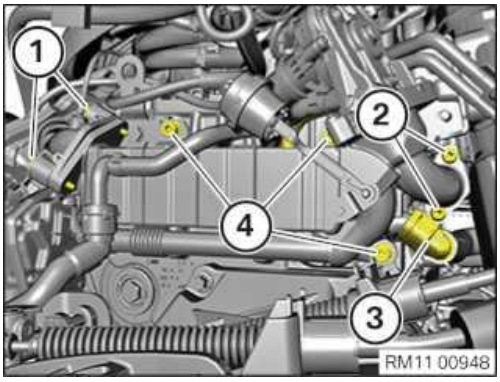
- Perform all work only on components that have cooled down.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.

20 – Removing the intake plenum

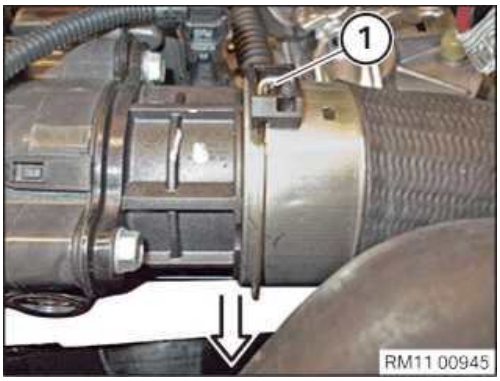
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

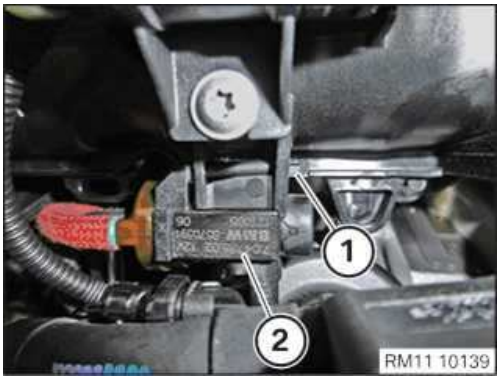


- Unlock the lock (1).

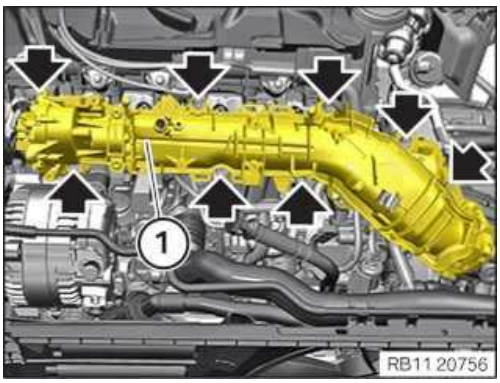
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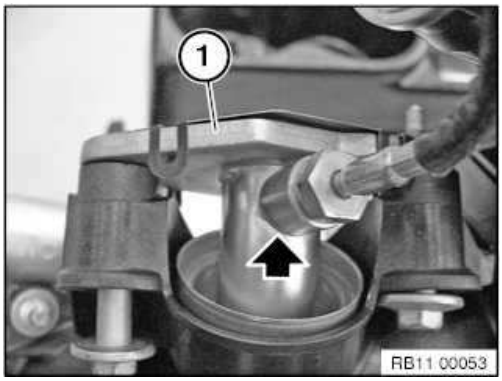
- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.



- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



- Release the screws (arrows) from the intake plenum (1).
- Guide the intake plenum (1) out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

21 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

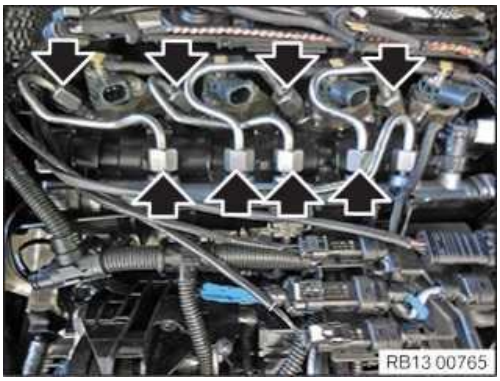
TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

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- Release the high pressure lines (arrows) with the special tool .
- Catch and dispose of escaping fuel.
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool .

22 – Detaching leakage oil line from injector

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Contaminant or foreign body.

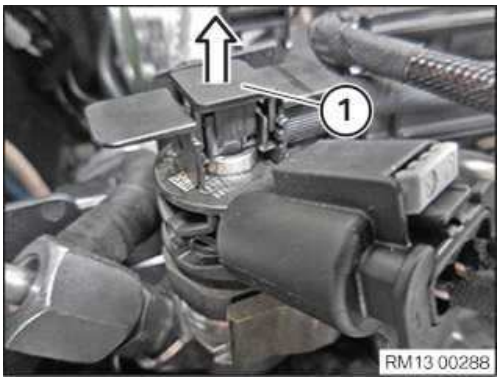
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

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- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

23 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

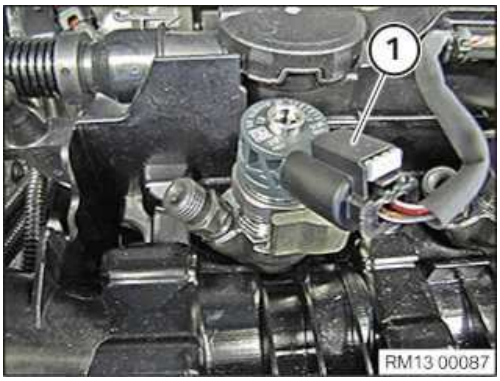
Electrostatic discharge.

Damage to or destruction of electrical components.

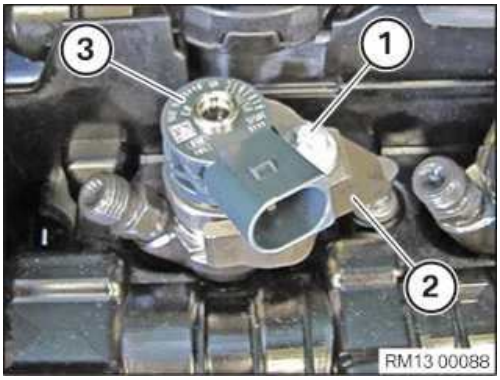
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.



- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

▶ **Loosen stuck injectors**

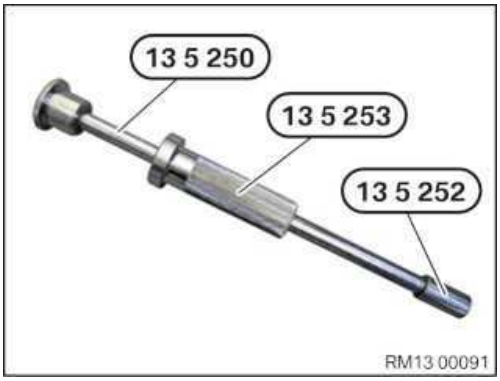
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RISK OF DAMAGE

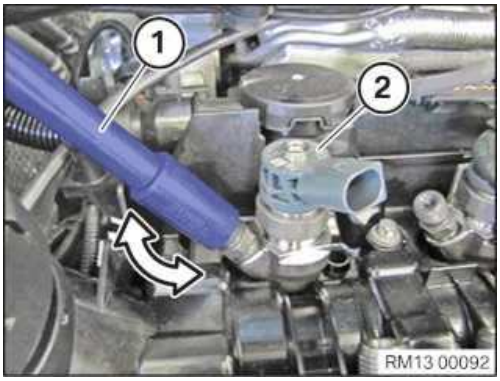
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)**back onto the special tool **0 493 321 (13 5 250)**.



- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

24 – Remove differential pressure sensor

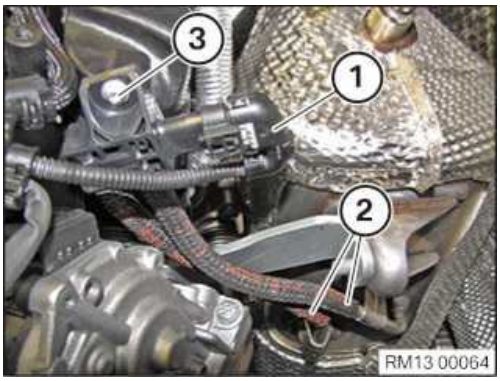
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

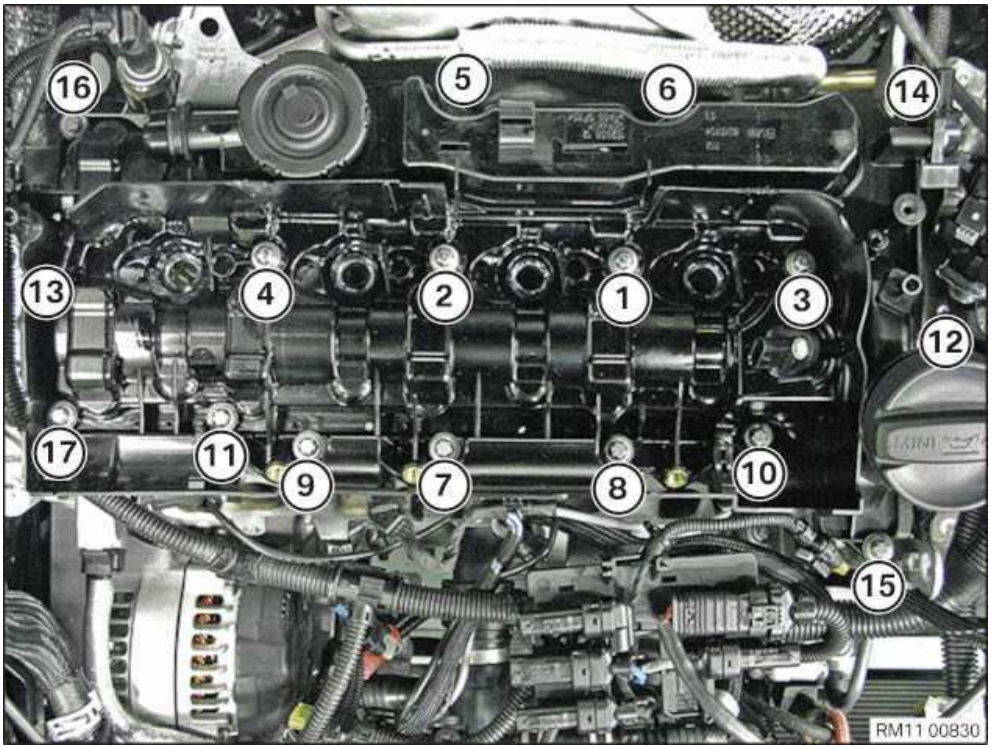
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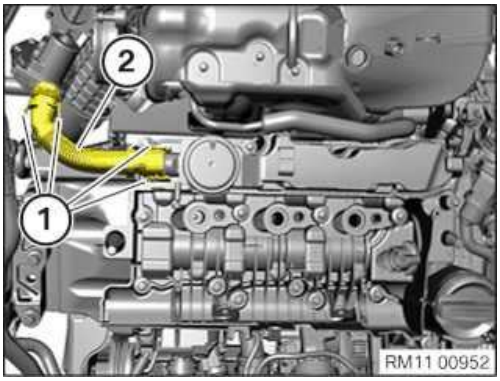
- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

25 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover

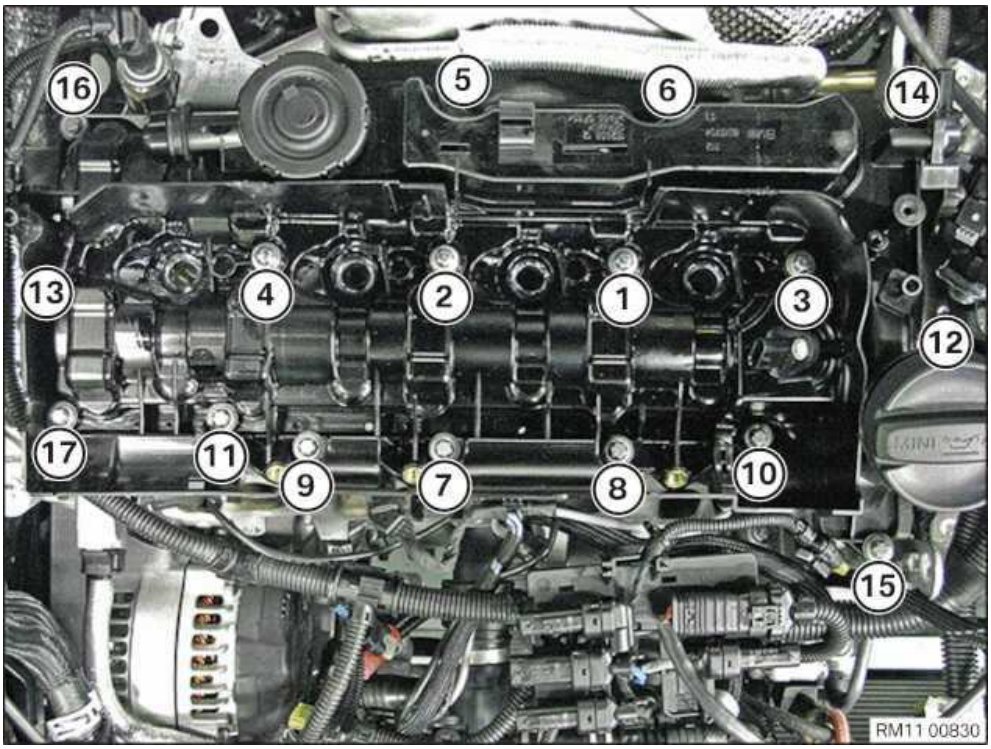


1 to 16 screws of the cylinder head cover.



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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- Loosen screws in the order (17) to (1).
- Remove cylinder head cover by lifting it out.

26 – Remove front right wheel

TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

TECHNICAL INFORMATION

Strictly observe the specified procedure to prevent clamping errors and imbalance.



- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

27 – Removing the front right wheel arch cover

▸ **Remove the front wheel arch trim**

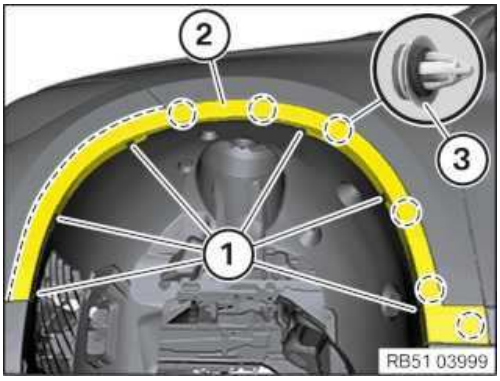
NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

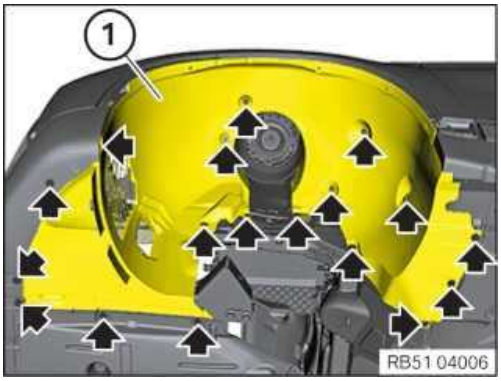
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NOTICE

Description is for left component only. Procedure on the right side is identical.



- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.



NOTICE

Description is for left component only. Procedure on the right side is identical.

- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

28 – Checking camshaft timing



- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

Damage to the engine.

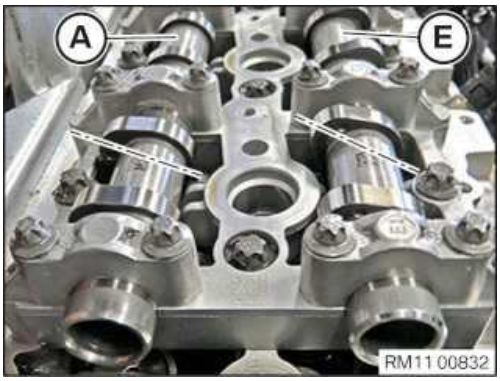
The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

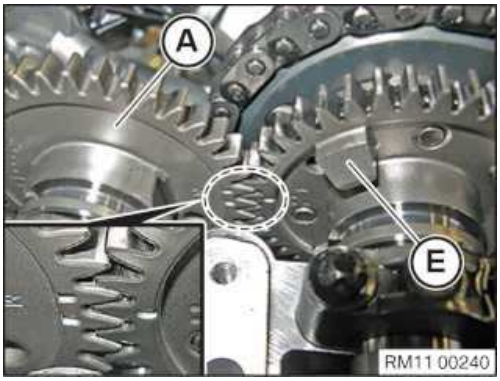
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- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.



- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

29 – Remove chain tensioner piston

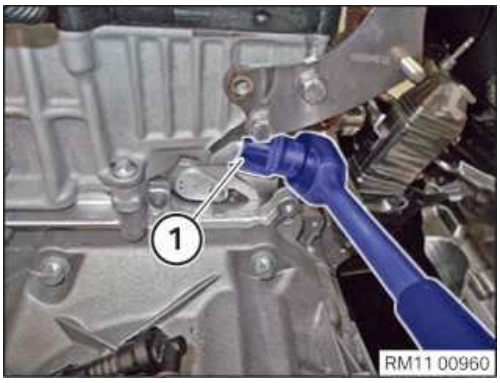
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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

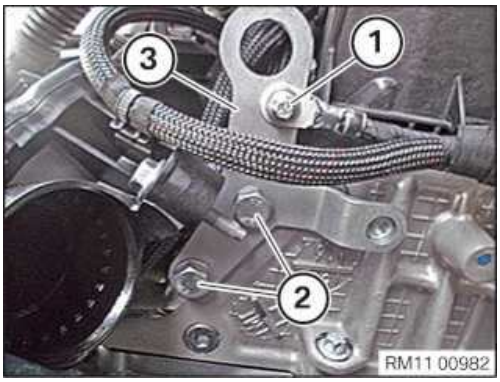


TECHNICAL INFORMATION

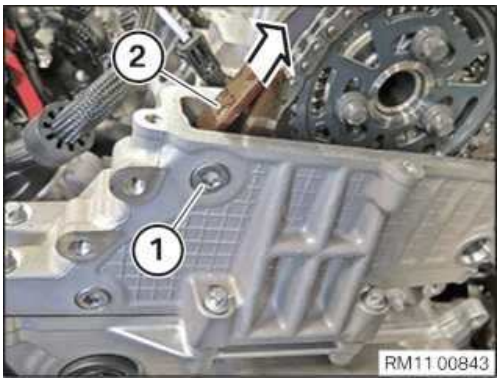
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

30 – Remove the timing chain guide rail

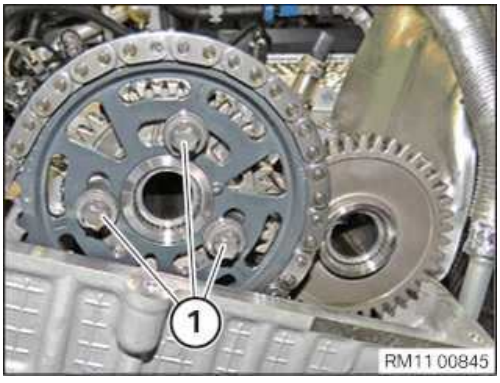


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

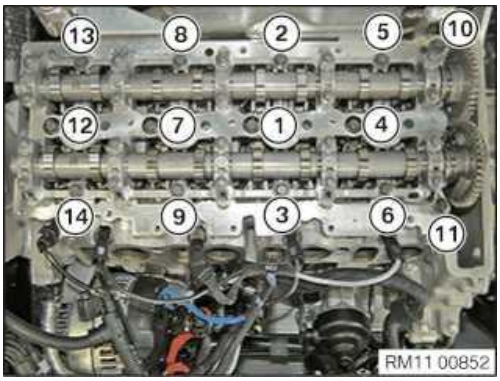
31 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

32 – Removing the camshaft support

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- Evenly loosen all screws in a sequence from (14) to (1).
- Loosen and remove all screws in a sequence from (14) to (1).

  Both camshafts can be removed with the camshaft carrier.
- Remove the camshaft support including camshafts towards the top.

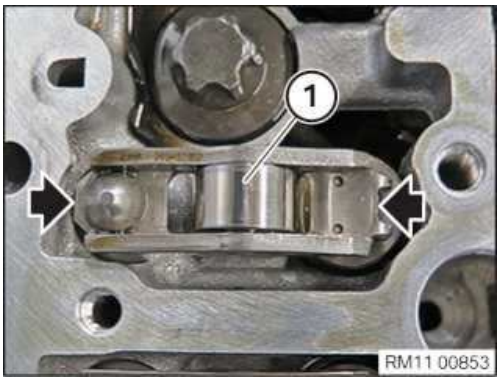
33 – Remove roller cam followers

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



RISK OF DAMAGE

Damage to the engine.

If the classification of the roller cam followers is ignored, this can lead to engine damage.

- Observe the classification of the roller cam followers.
- Always reuse used roller cam followers at the same position.

- Remove the roller cam follower (1) and place it onto the special tool **0 495 105 (11 4 480)**.
- Repeat the process for all roller cam followers.

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MAIN WORK

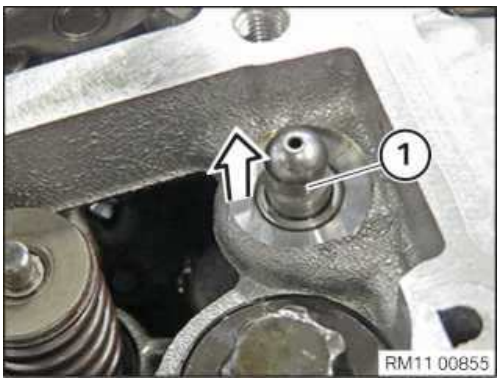
34 – Removing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Remove the hydraulic valve clearance compensating element (1) in the direction of the arrow and place on the special tool **0 495 105 (11 4 480)**.
- Repeat the process on all hydraulic valve clearance compensating elements.

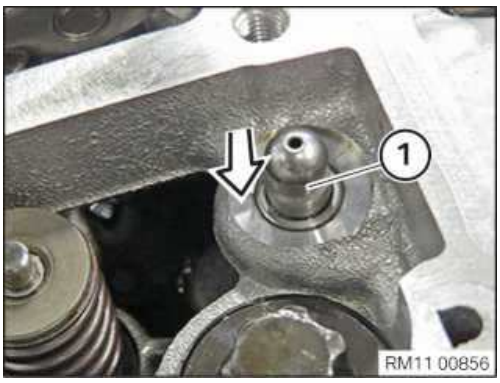
35 – Installing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Install the hydraulic valve clearance compensating element (1) in the direction of the arrow.
- Repeat the process on all hydraulic valve clearance compensating elements.

POSTPROCESSES

36 – Install the roller cam followers

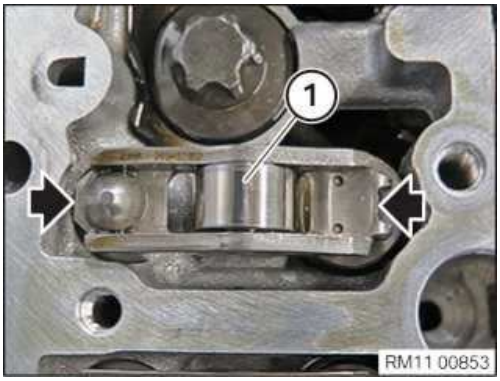
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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



RISK OF DAMAGE

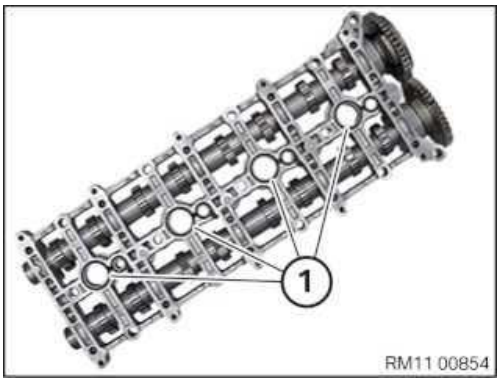
Damage to the engine.

If the classification of the roller cam followers is ignored, this can lead to engine damage.

- Observe the classification of the roller cam followers.
- Always reuse used roller cam followers at the same position.

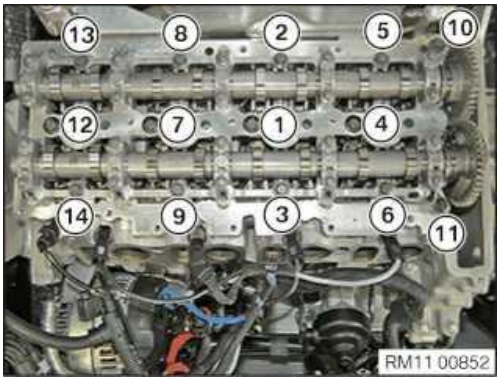
- Install the roller cam follower (1).
- Repeat the process for all roller cam followers.

37 – Installing the camshaft support



- Renew gaskets (1).

  Parts: gaskets



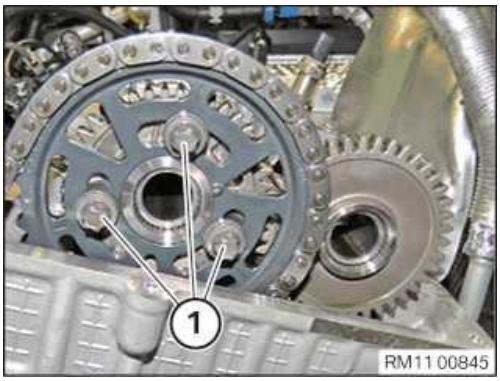
- Position the camshaft support including the camshafts.
- Tighten the screws in a sequence from (1) to (14) in several steps.

Camshaft carrier to cylinder head

M7x35		Tightening torque	13 Nm

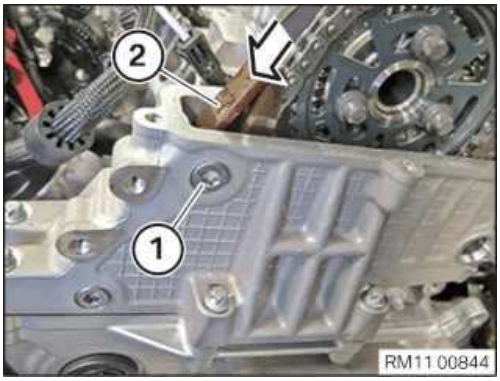
38 – Installing the camshaft sprocket on the intake camshaft

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- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

39 – Install the timing chain guide rail



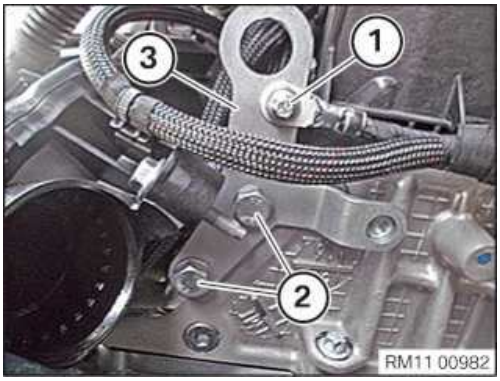
- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm



- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6		8 Nm

40 – Installing the chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Renew sealing ring (1).

  Parts: Sealing ring

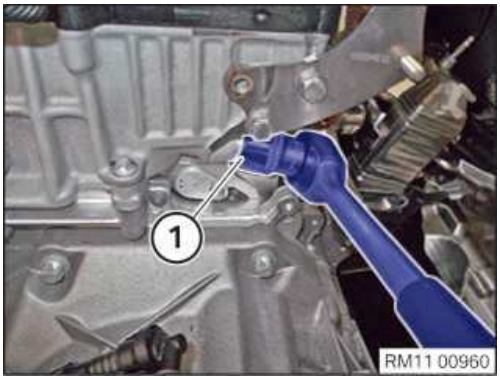
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TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.

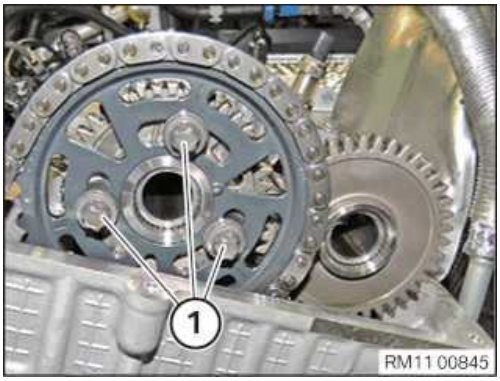


- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

41 – Tightening the camshaft sprocket on the intake camshaft



- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

42 – Checking camshaft timing



- Remove protective cap (1) from oil sump.

- **Spin the engine twice in the direction of rotation.**

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RISK OF DAMAGE

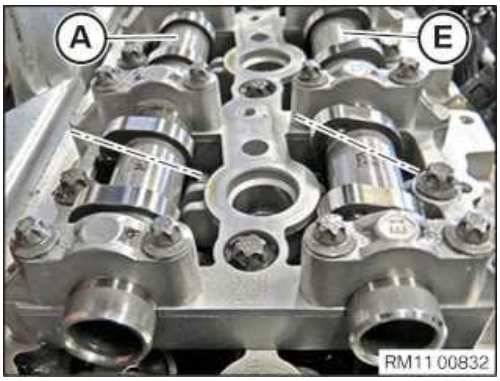
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

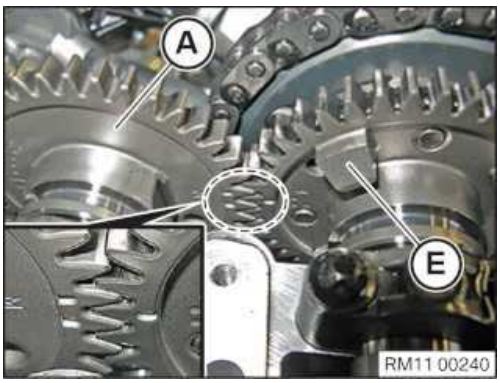
  Do **not** crank the engine in reverse.



- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

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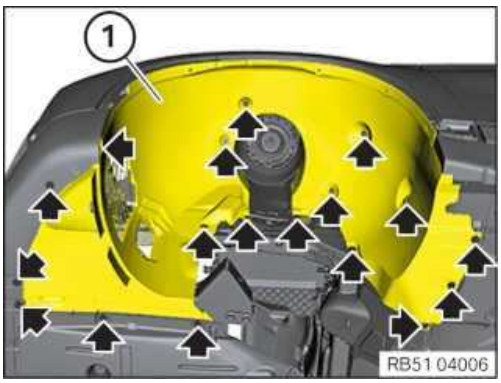


- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

43 – Installing the front right wheel arch cover

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

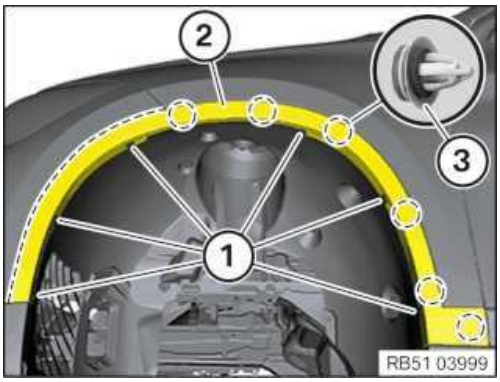
▸ **Installing front wheel arch trim**

NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Check the clips (3) for damage and renew where required.

  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

44 – Installing the front right wheel

▸ **Clean the contact surfaces between the brake disc and the wheel rim**

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TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

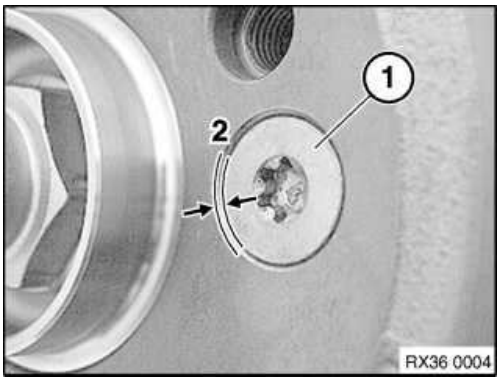
- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.



- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

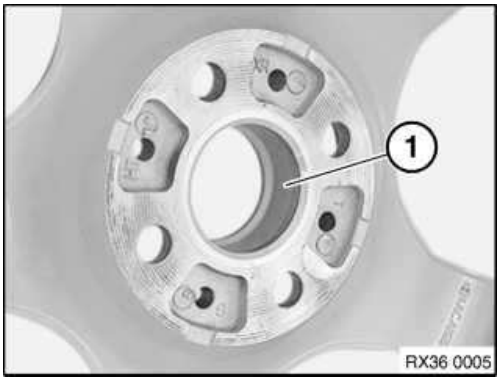


- Check the mounting bolt for the brake disc (1) for secure fit.

  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

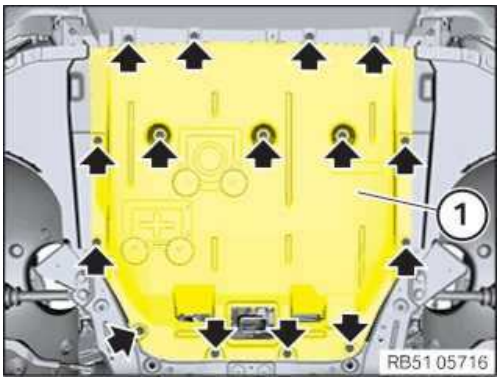
- Renew corroded wheel bolts.

  Parts: Wheel bolts
- Clean the wheel bolts and check the threads for damage. Renew the wheel bolts as needed.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

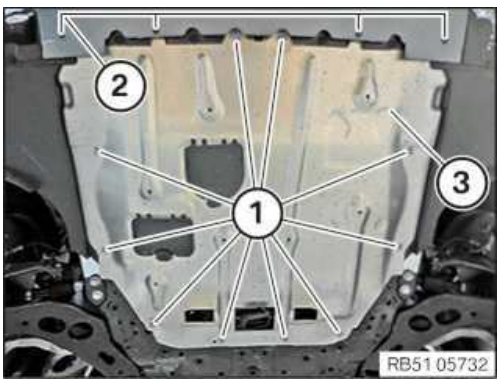
45 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm



- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

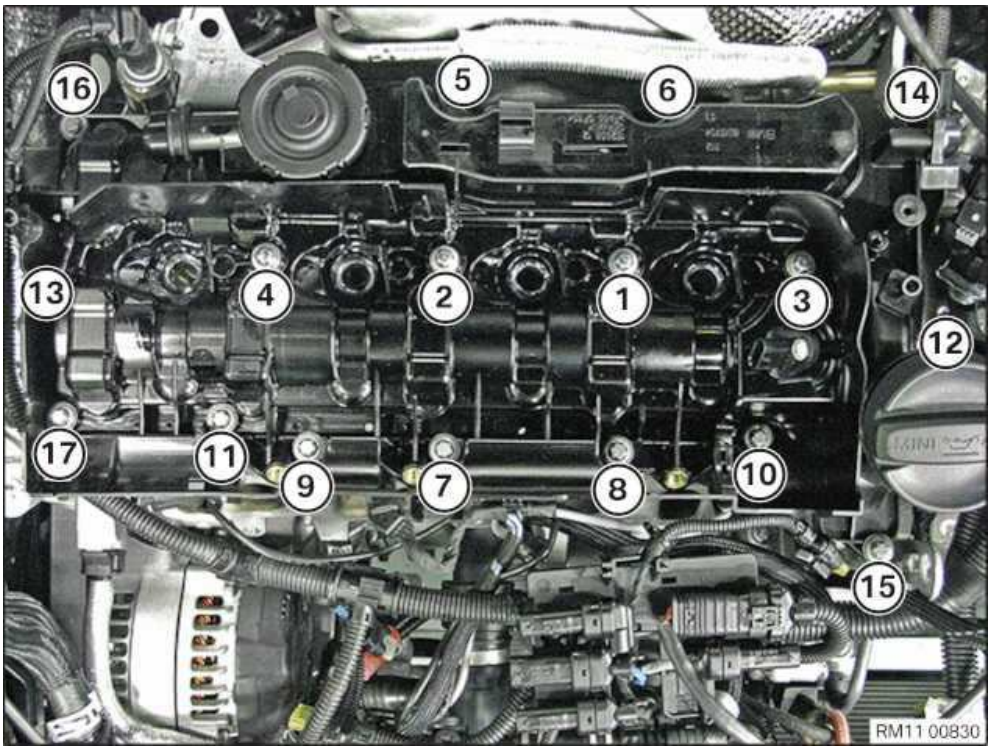
Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

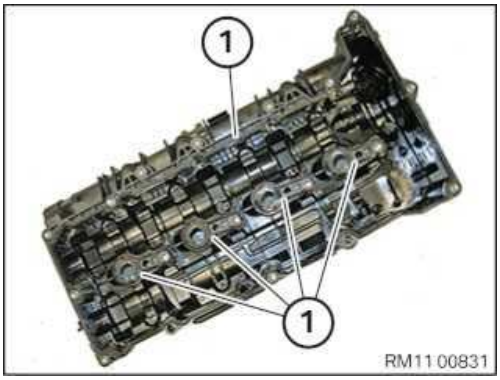
46 – Installing cylinder head cover

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Overview: Screw connection of the cylinder head cover

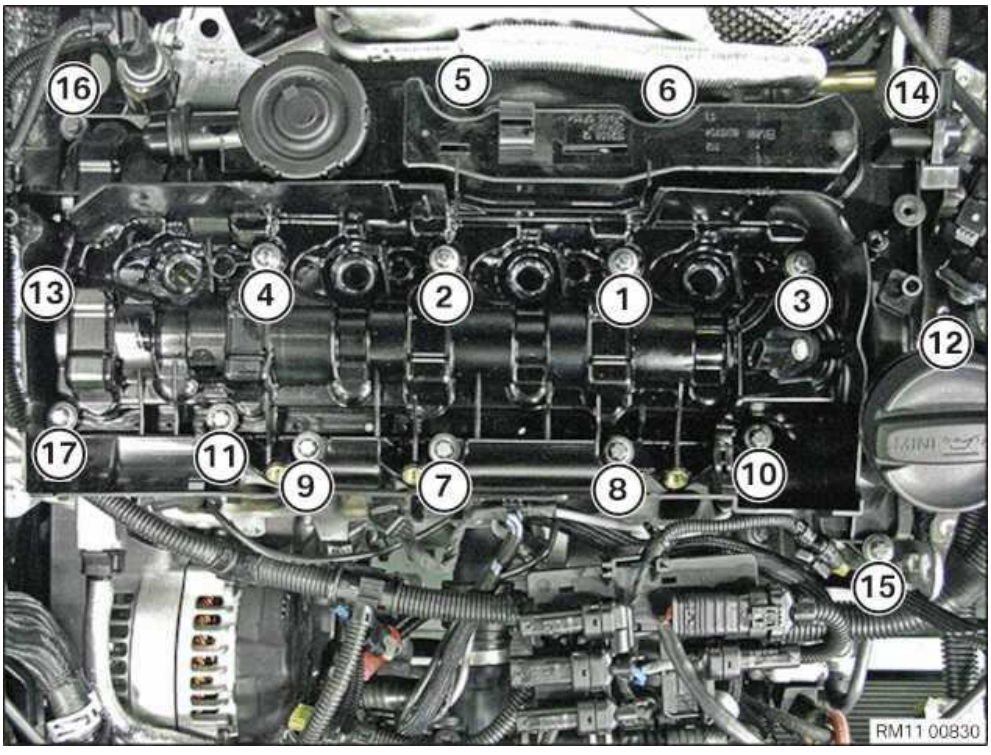


1 to 16 screws of the cylinder head cover.



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket



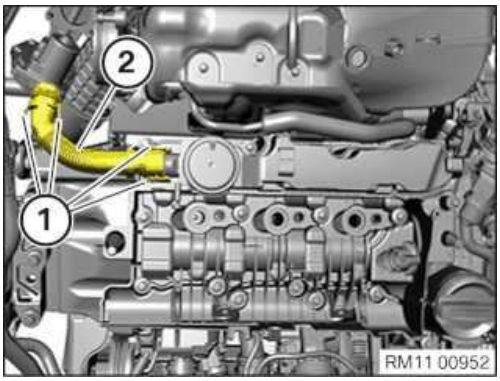
- Install cylinder head cover.
- Tighten screws in the order (1) to (17).

Cylinder head cover to cylinder head

M6		Tightening torque.	8, Nr

-

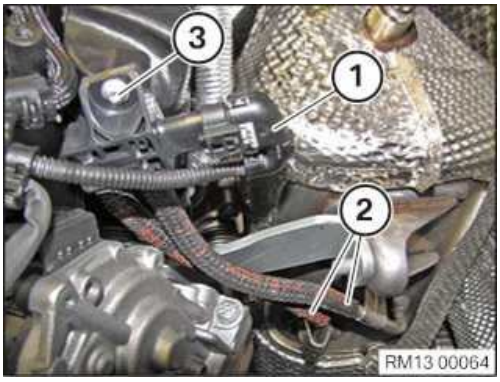
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- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

47 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

48 – Installing injectors of injection system

▶ **Cleaning the injector shafts**

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.



- Wear safety goggles.

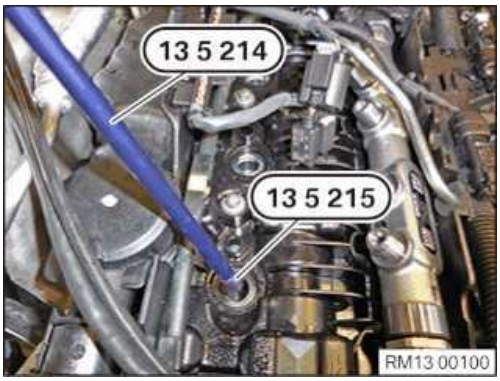
RISK OF DAMAGE

Contaminant or foreign body.

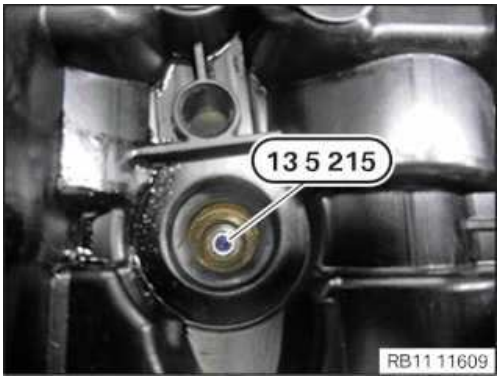
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.



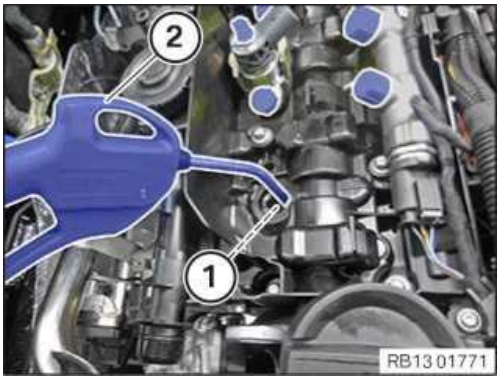
- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.



- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.

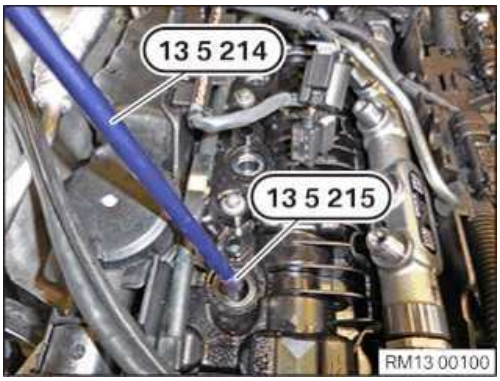


- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.



- Blow out injector shaft (1) with air gun (2).

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- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

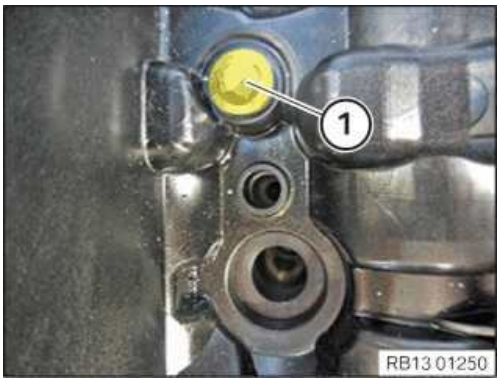
▶ **Check the placement of the clamping claw**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▶ **Prepare the injector for installation**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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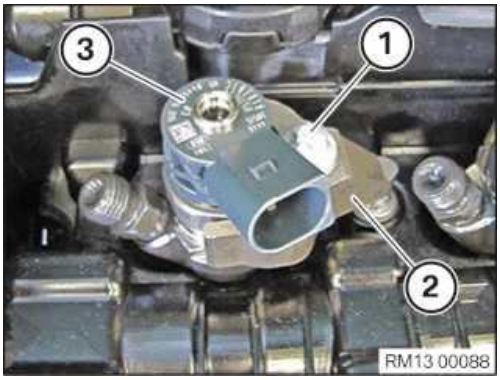
- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring

- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

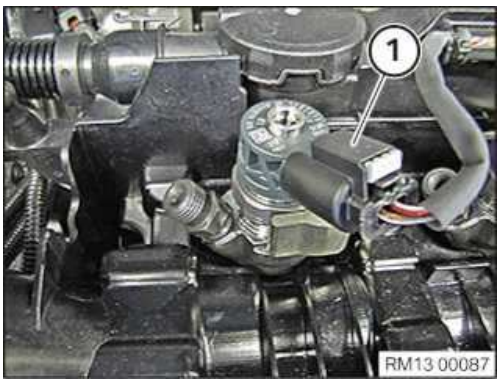
Injector lubricating grease	50 g, Can	83230441070



- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

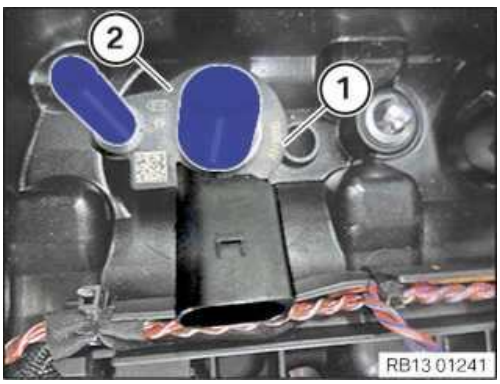
▸ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



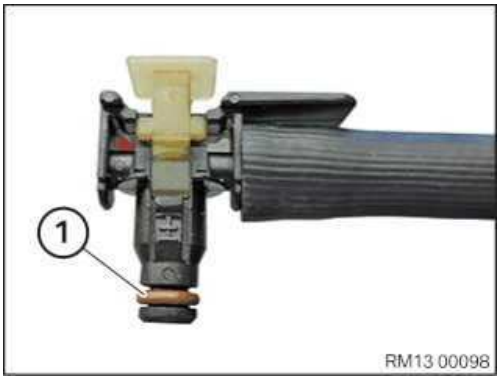
- Read off the adjustment value (1) on the new injector (2).

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- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

49 – Connect the leakage oil line on the injector



- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.



- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

50 – Installing high pressure lines between rail and injectors

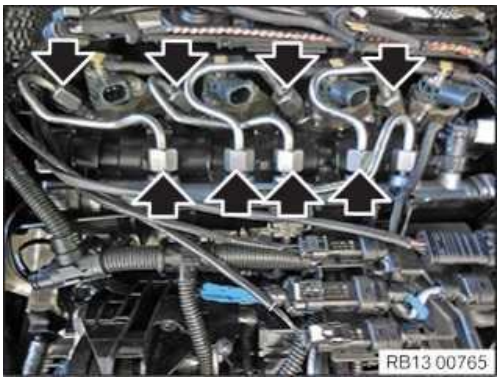
TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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- Remove special tool .
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

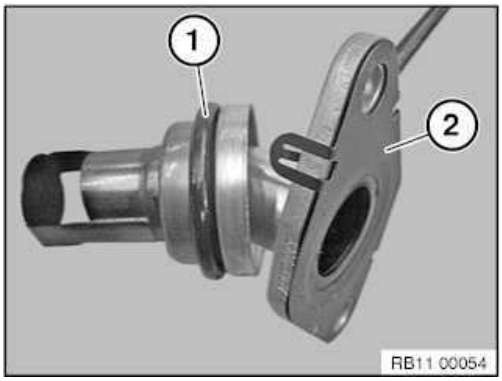
- Tighten the high pressure lines (arrows) with the special tool .

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

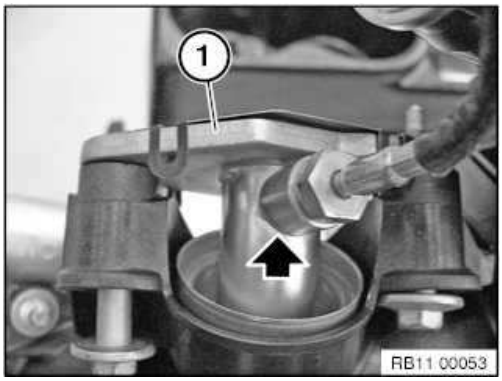
51 – Installing the intake plenum



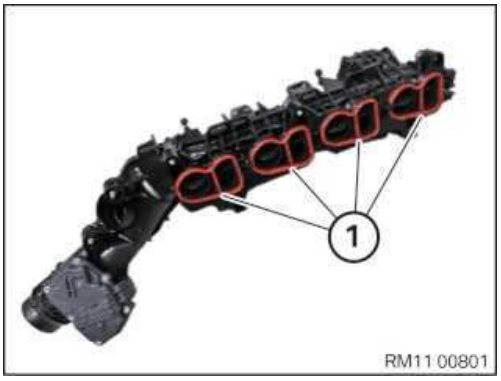
- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position the seal (2) and clip it in.



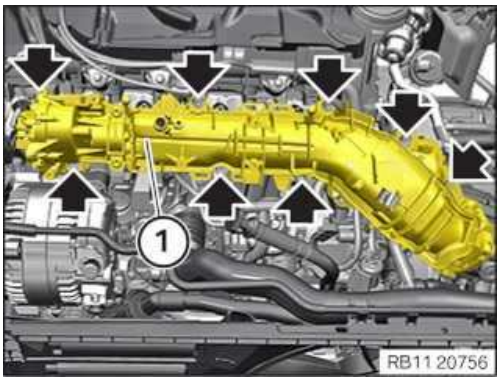
- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (1).

  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.

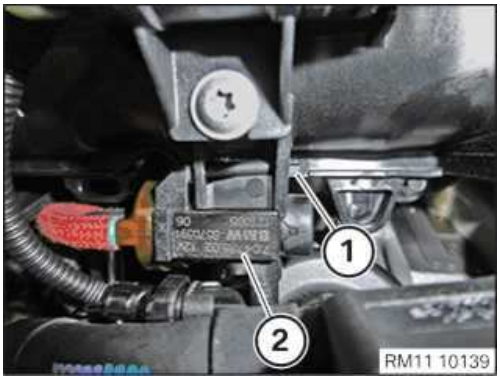
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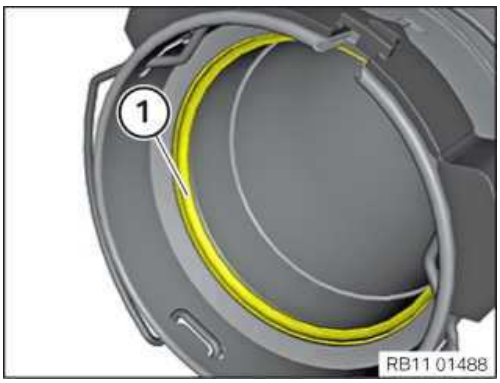
- Guide in and install intake (1) plenum.
- Tighten screws (arrows).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm

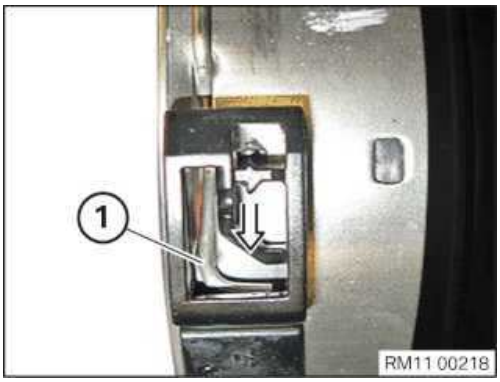


- Install the electric changeover valve (2) in the holder on the plenum from left to right.
- Lock (1) must engage audibly.

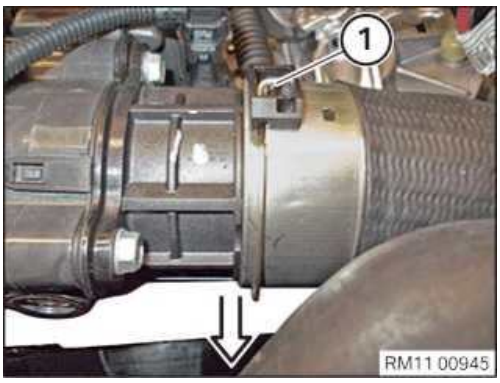


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring



- Engage the lock (1) on the bracket (arrow).



- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

52 – Installing the exhaust-gas recirculation cooler

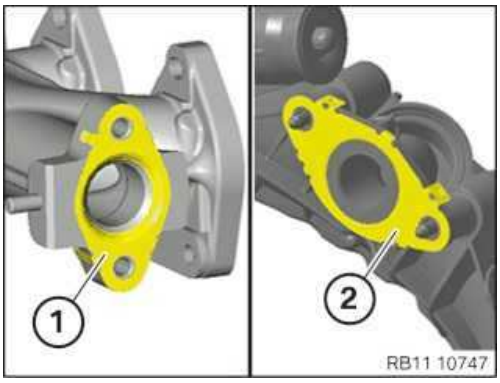
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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

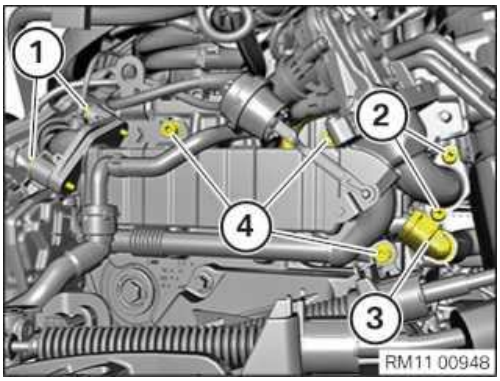


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket



- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts

- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

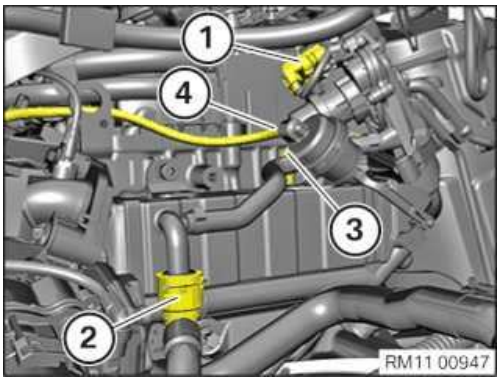
  The coolant hose (3) must audibly engage.

- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm

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TECHNICAL INFORMATION

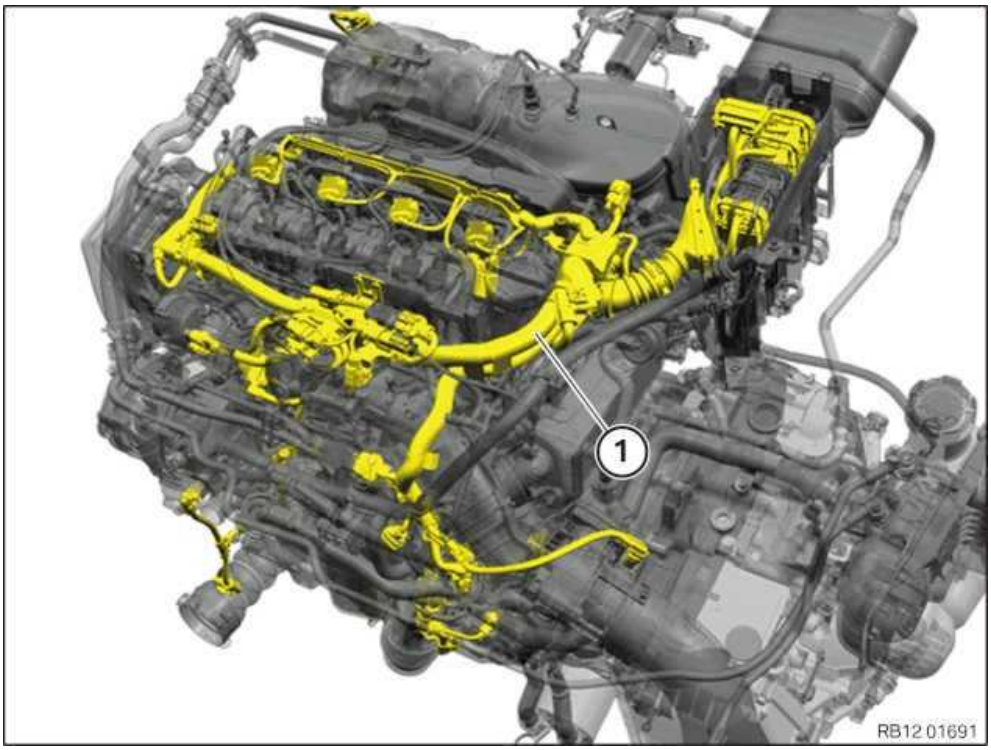
Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

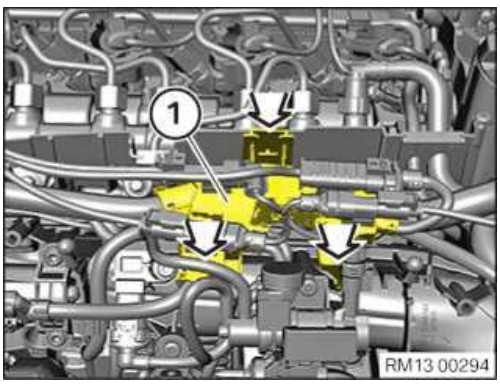
  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

53 – Fastening the wiring harness section for the intake plenum

Overview: Wiring harness section for the engine



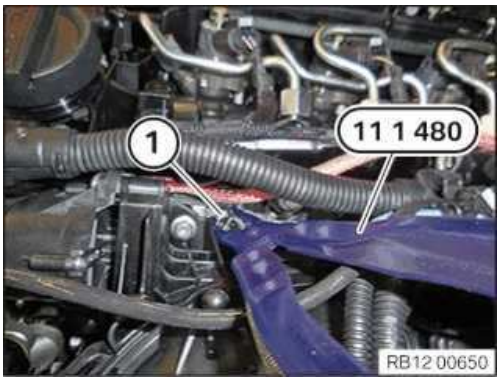
1 Wiring harness section for the engine



▸ **Installing the cable clip for the intake plenum**

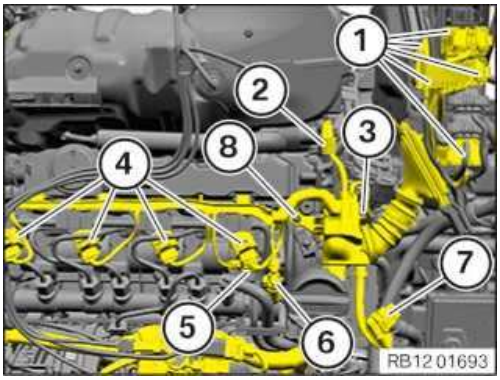
- Insert and install the cable clip (1) in the direction of the arrow.
- Make sure the cable clip (1) is fitted correctly.

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- Connect and lock the connector (1) on the glow elements.

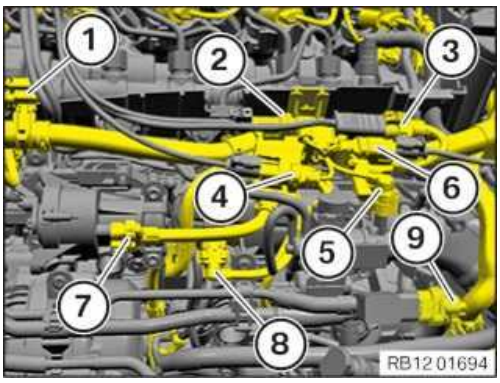
  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.



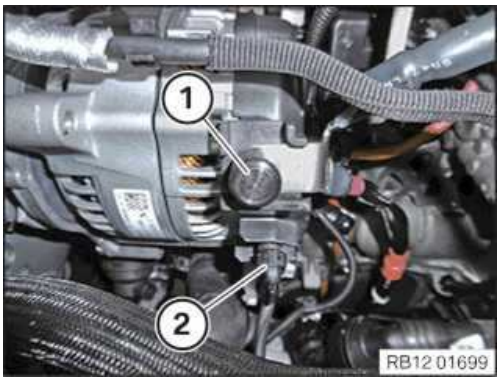
- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the DME control unit and remove the integrated supply module (PDM).
- Attach connector (2) to the differential pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust-gas recirculation valve and lock audibly.
- Attach connector (4) to the injectors and lock it audibly.
- Attach connector (5) to the camshaft sensor and lock it audibly.
- Attach connector (6) to the fuel pressure regulator and lock it audibly.
- Connect and audibly lock the connector (7) to the hot film air mass meter.
- Tighten down screw (8).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm



- Connect the connector (1) to the rail pressure sensor and lock it audibly.
- Attach connector (2) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (3) to the front oxygen sensor and lock audibly.
- Attach connector (4) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Connect the connector (5) to the electric changeover valve and lock audibly.
- Attach connector (6) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (7) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (8) to the charging pressure sensor and lock it audibly.
- Attach connector (9) to the fuel pressure and temperature sensor and lock it audibly.



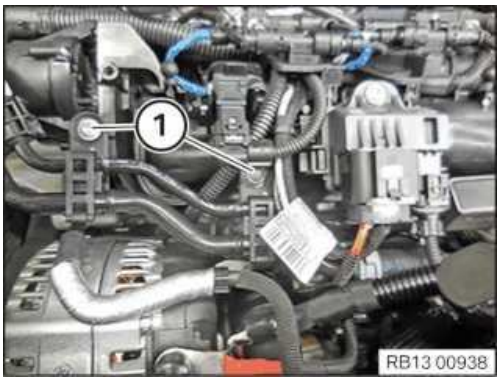
- Connect and lock the connector (2).

  Lock must snap audibly into place.
- Connect the positive battery cable (1) and tighten.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

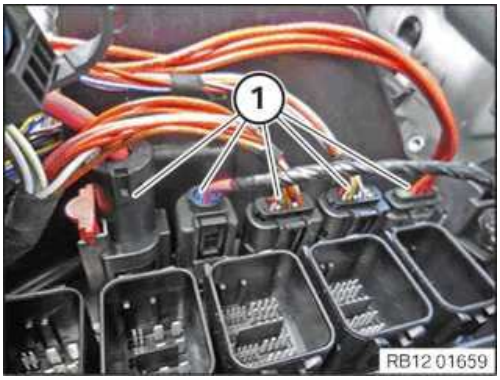
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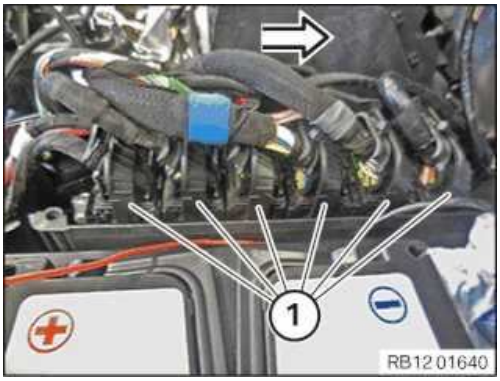
- Position the fuel line.
- Tighten the screws (1).

Fuel line to intake plenum

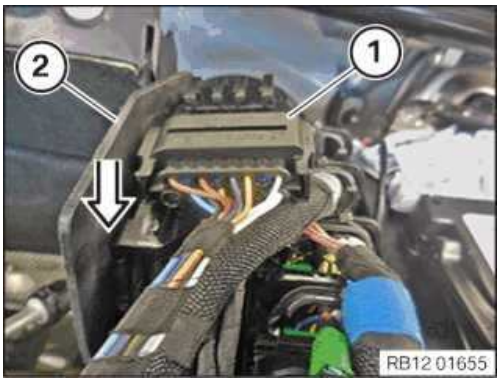
TS6x20		Tightening torque	5 Nm



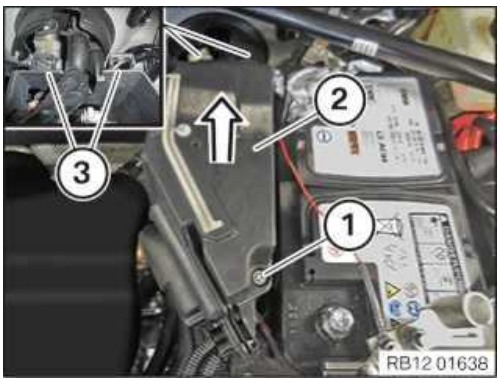
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.

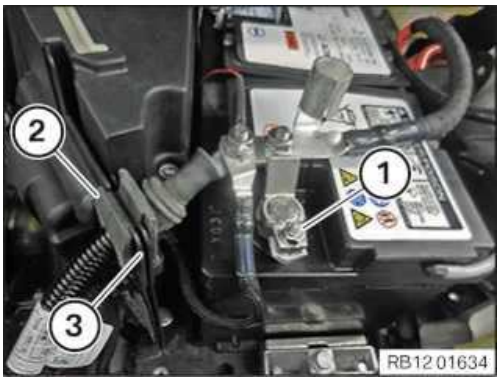


- Insert and install the cover (2) into the guides (3) in the direction of the arrow.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

RF5x26.5		Tightening torque	2,5 Nm

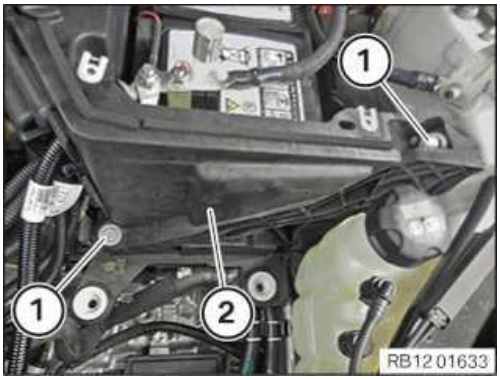
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- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

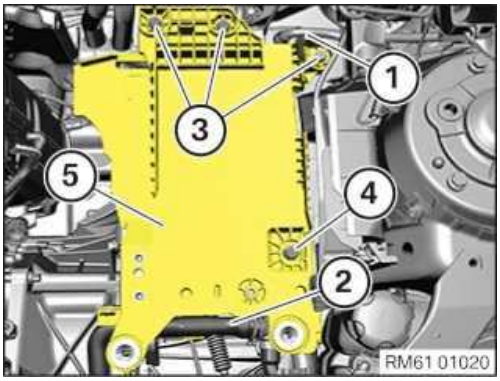


- Feed in and install tension strut (2).
- Tighten the screws (1).

Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

54 – Install the battery holder



- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

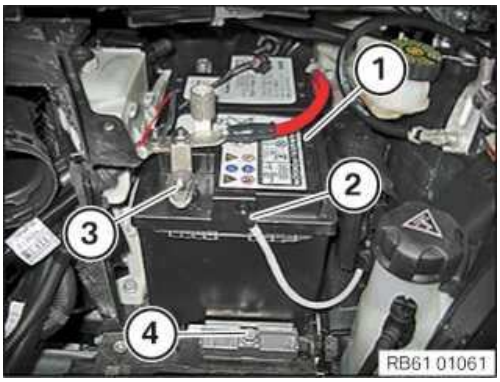
- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

55 – Install vehicle battery



- Install vehicle battery (1).
- Position the bracket and tighten with the screw (4) .

Battery terminal rail to battery tray

M8		19 Nm

- Position the vent hose (2) and clip it in.
- Position the positive battery terminal and tighten with the nut (3) .

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

▸ **Check the vent holes of the battery**

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WARNING

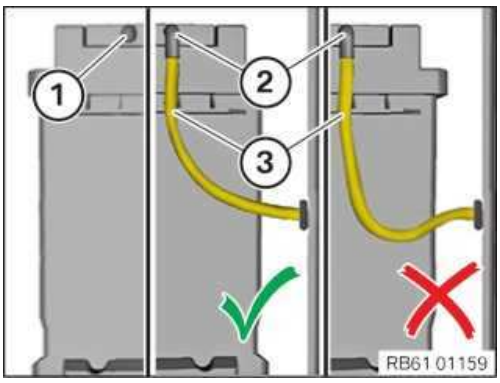
Gas emission.

Danger of injury! Danger of explosion!

- Assign the vent holes correctly.
- Route the vent hose correctly.

TECHNICAL INFORMATION

The battery has two vent holes, opposite:
One vent hole (1) must be closed correctly with a dummy plug.
The vent hose (3) must be correctly connected and routed at the other vent hole (2).



Check

- Check if the vent hole (1) is correctly closed with a dummy plug.

Result

» No dummy plug.

Measure

- Close the vent hole (1) correctly with a dummy plug.

Check

- Check if the vent hole (2) has a correctly connected vent hose (3).

Result

» The vent hose (3) is not correctly connected.

Measure

- At the vent hole (2), connect the vent hose (3) correctly.

Check

- Check if the vent hose (3) is routed to the outside with a downhill gradient (**no siphon formation!**).

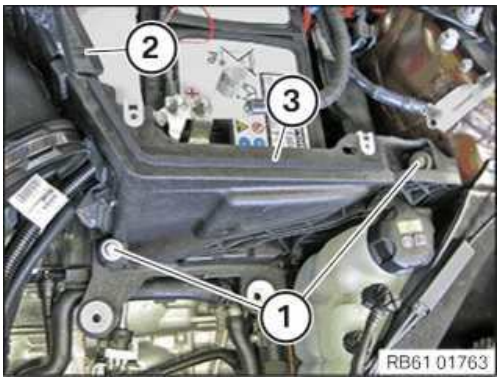
Result

» The vent hose (3) is not correctly routed as shown in the image on the right.

Measure

- Route the vent hose (3) correctly as shown in the centre image.

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- Insert tension strut (3) and tighten with screws (1).

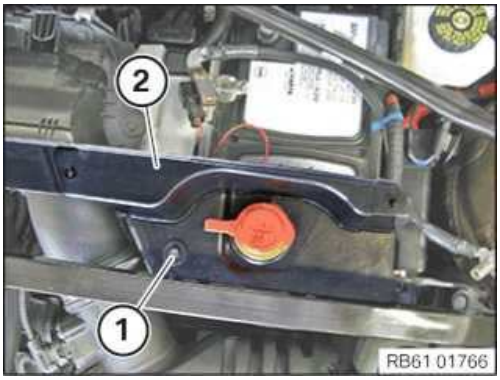
Trailing link

M8		Tightening torque	19 Nm

- Tighten down screw (2).

Battery cover

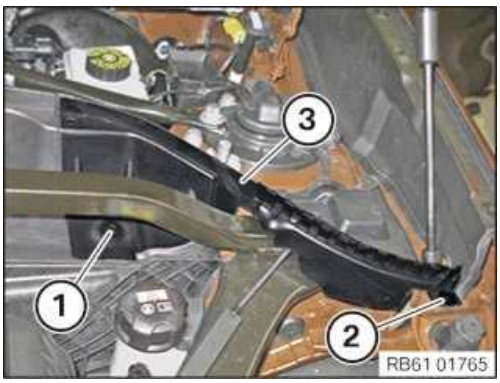
M8		2,8 Nm



- Position the cover (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm

56 – Install electronics box

Prerequisite

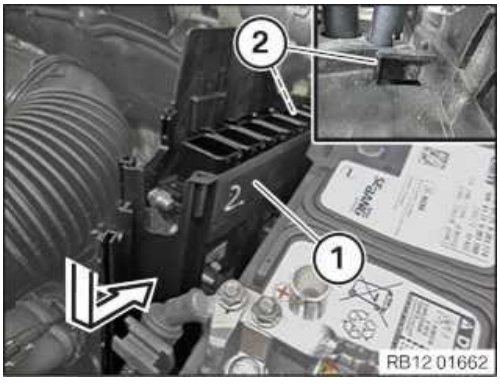
Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.

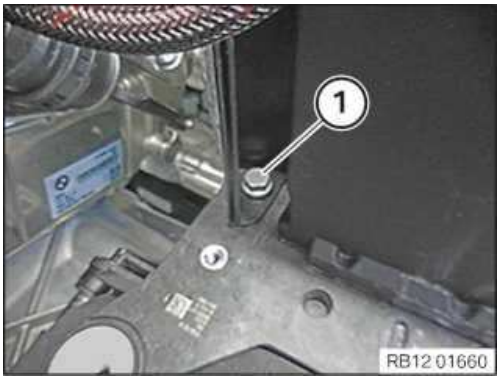


- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.

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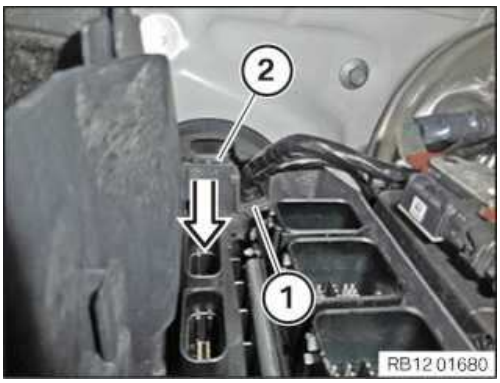
- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).



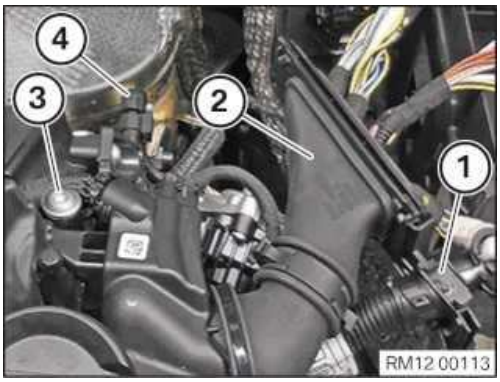
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.

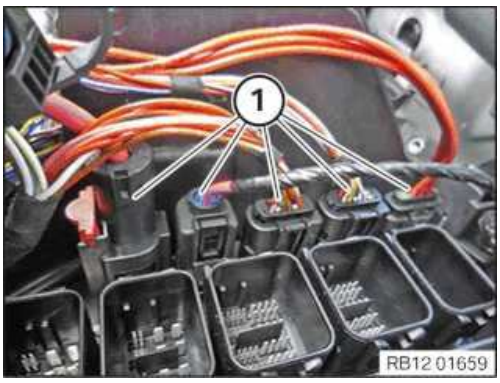


- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

Wiring harness to cylinder head cover

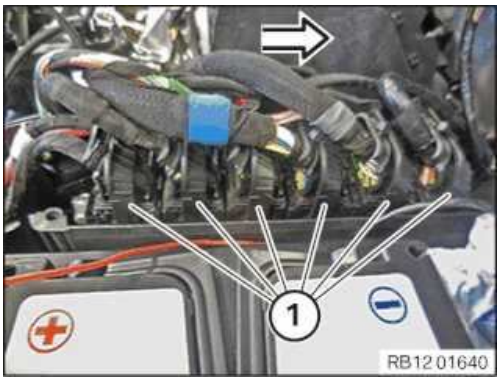
TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.

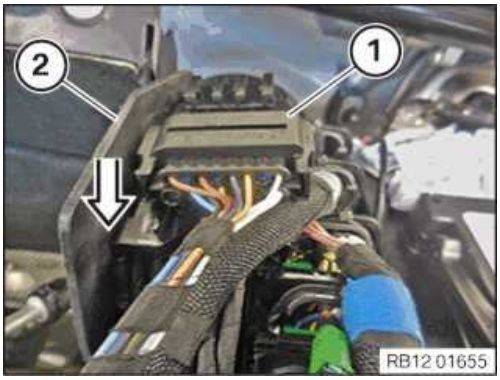


- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.

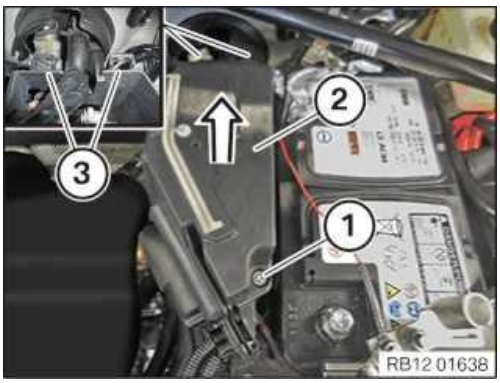
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- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



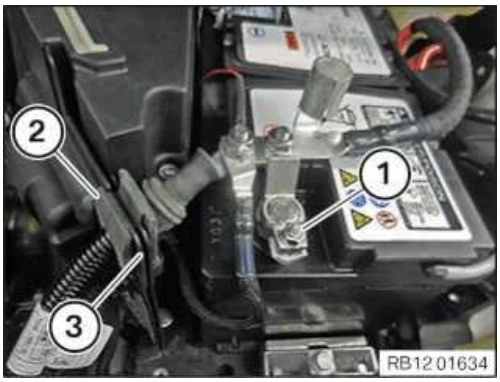
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

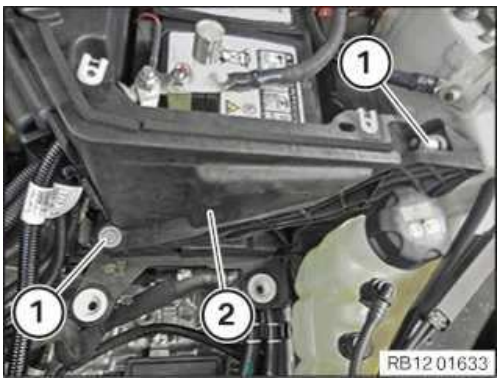
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

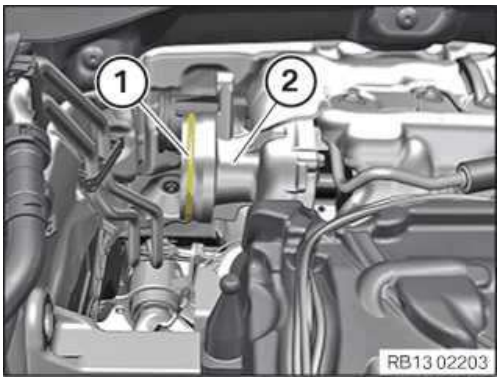


- Feed in and install tension strut (2).
- Tighten the screws (1).

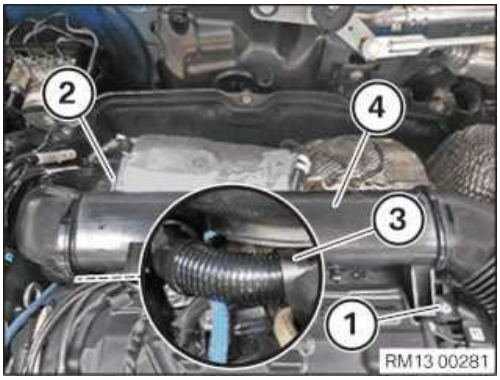
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

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- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.



- Feed in clean air pipe and install.
- Connect clean air pipe to the exhaust turbocharger and lock audibly in the clamps (2).
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Connect ventilation line (3) to the cylinder head cover and lock audibly.



- Mount clean air pipe onto the intake filter housing.
- Tighten clamp (1) on the clean air pipe.

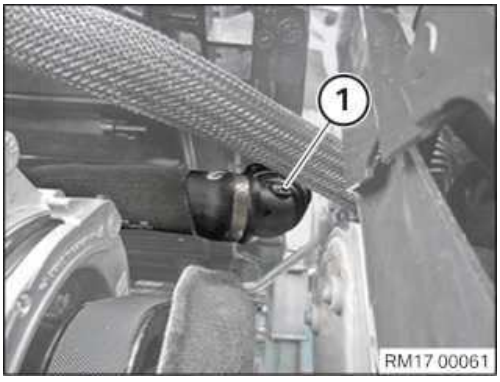
Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

58 – Connect the coolant line

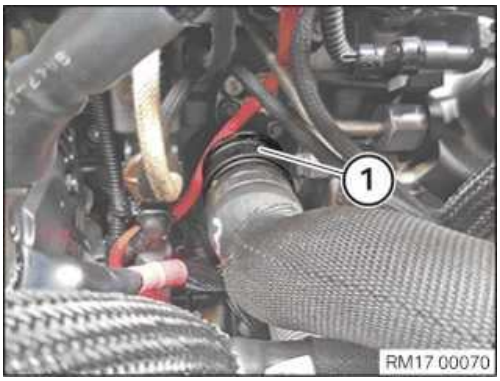
TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Connect the right coolant line (1) to the radiator and lock audibly.

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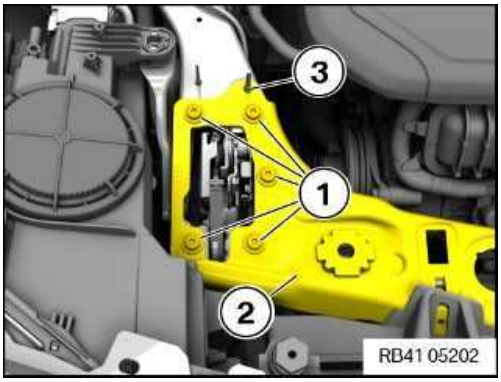


- Connect the coolant line (1) to the connecting branch and lock audibly.

59 – Install front cross connection



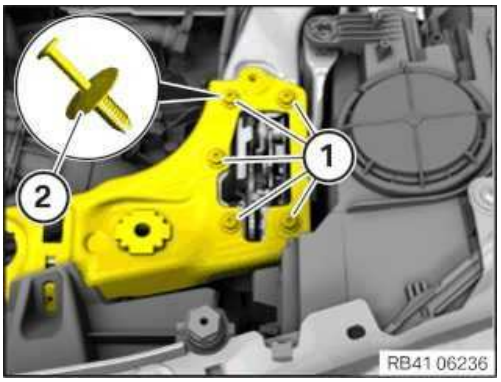
- Right side of vehicle only: Secure spray guard (1) on the cross connection (2) as pictured.



- Position front cross connection (2) and clip front cross connection (2) into the rubber retainer (3) at the same time.
- Tighten the screws (1).

Cross connection to carrier support

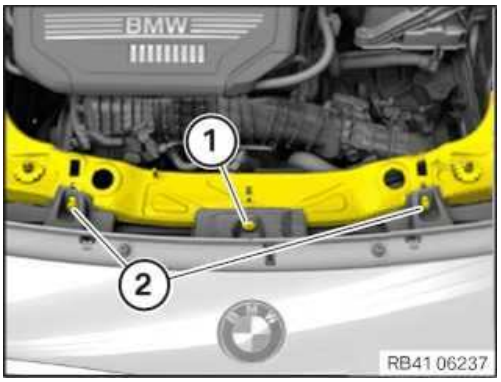
Screws M6x20		Tightening torque	11,8 Nm



- Tighten the screws (1).

Cross connection to carrier support

Screws M6x20		Tightening torque	11,8 Nm



- Position screws (3) on the rubber mounts for the radiator and tighten.

Screw connection for rubber mount of coolant radiator to coolant radiator

Bolt to rubber mount		Tightening torque	8 Nm

- Tighten down screws (2).

Air duct to upper connection

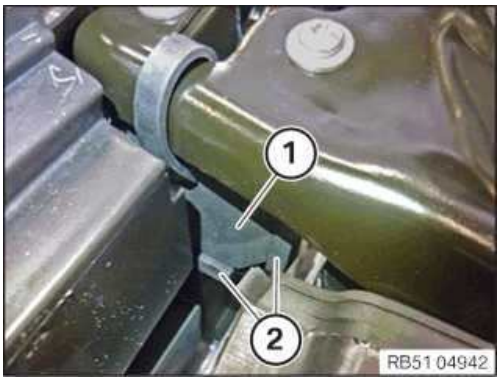
M6x20 screw		Tightening torque	11,8 Nm

- Tighten down screw (1).

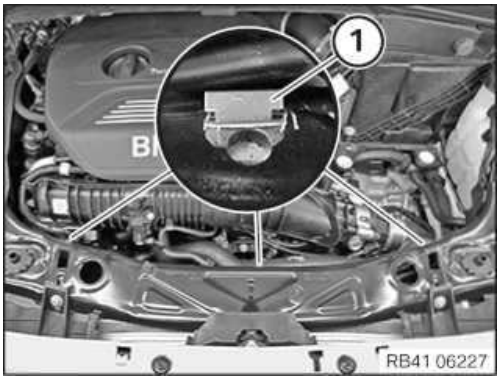
Bracing strut to upper connection

M8x20 screw		Tightening torque	28 Nm

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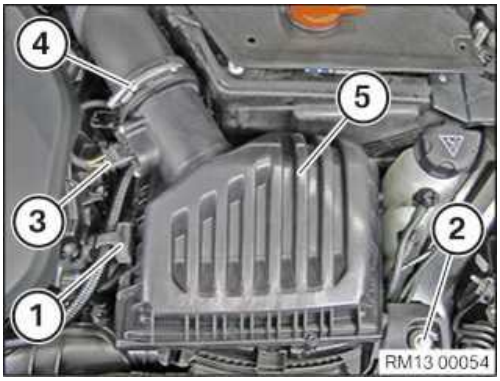


- Right side of vehicle only: Properly mount spray guard (1) to prevent corrosion.
- Secure spray guard (1) to the bridge with retaining tabs (2).



- Fasten the clamps (1) from the Bowden cable of the bonnet lock on the cross connection.

60 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.

  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

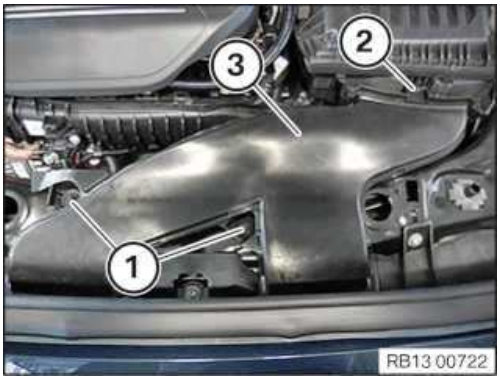
Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Insert and install the holder (1).

61 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).

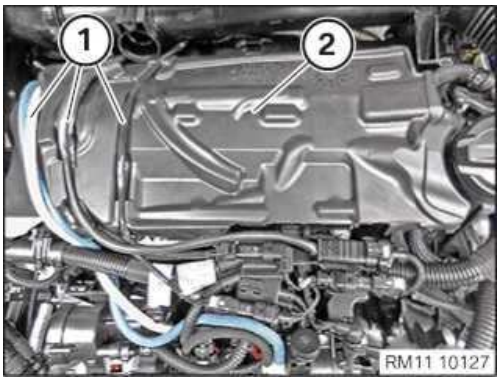
  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

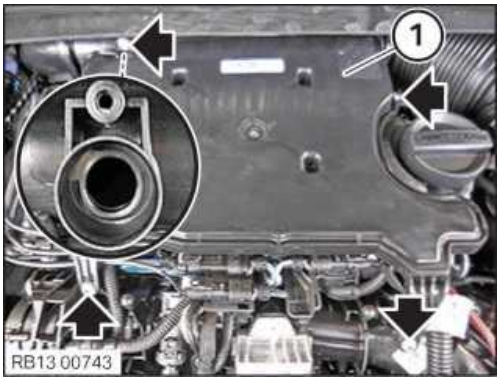
62 – Install the acoustic cover for the injectors

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- Feed the acoustic cover (2) in and install.
- Fasten the vehicle wiring harness (1) in the brackets.

63 – Install resonator



- Insert and install the resonator (1).
- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

64 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Check for correct installation of all rubber mounts in the acoustic cover (1).

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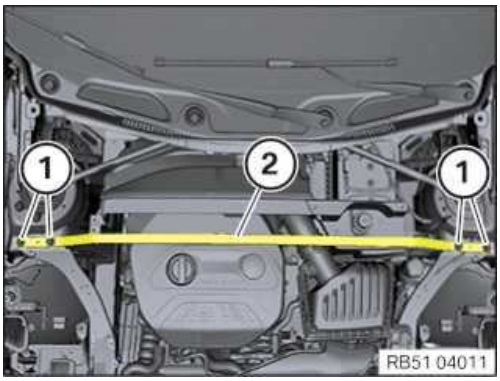


- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

65 – Install strut brace

TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.

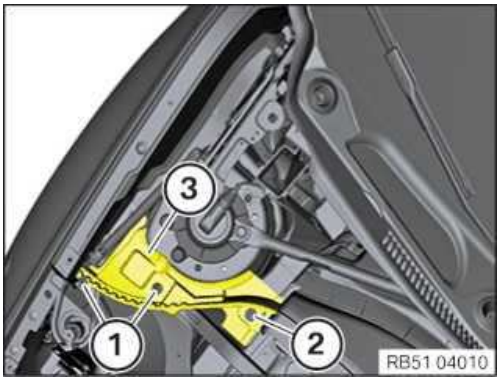


- Install the strut brace (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-brace to spring strut dome

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °



NOTICE

Description is for right component only. The procedure on the left side is identical.

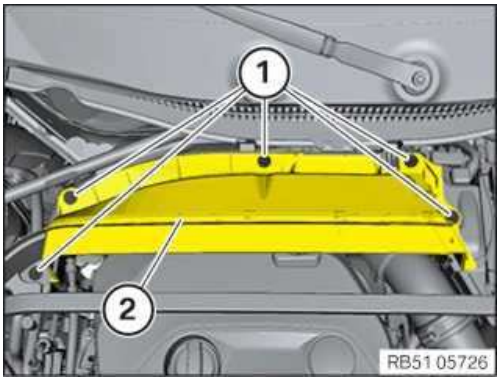
- Install the cover (3).
- Tighten down screw (2).

Cover on body

Hexagon screw		Tightening torque	3 Nm

- Install the expanding rivet (1).

66 – Installing the upper bulkhead cover

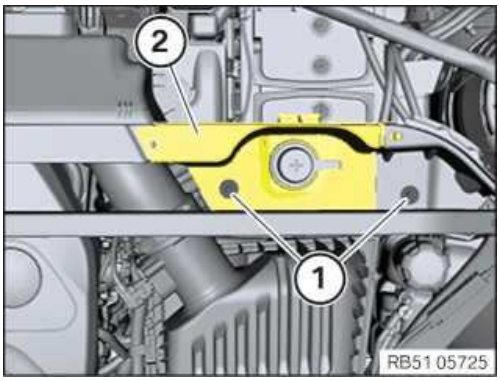


- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Cover of top bulkhead

Screw		Tightening torque	2,6 Nm

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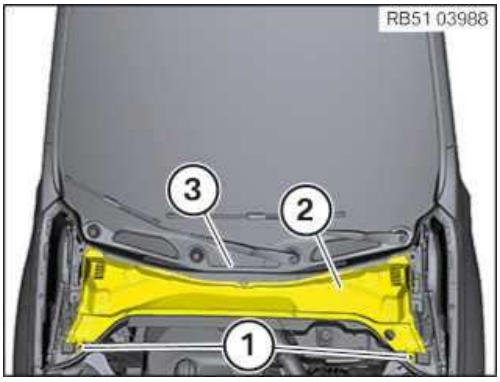


- Guide in and install cover (2).
- Tighten down screw (1).

Cover of remote positive terminal

Screw		Tightening torque	2,6 Nm

67 – Installing front cowl panel cover

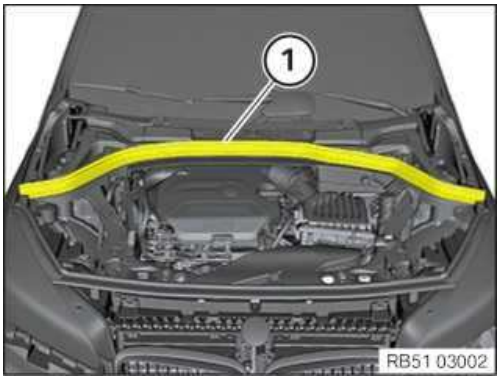


- Insert and install cowl panel cover at front (2) into cowl panel cover at rear (3).
- Check cowl panel cover at front is correctly seated (2).
- Secure expanding rivet (1).

68 – Install the seal for the bonnet

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

69 – Disconnecting all battery earth leads



- See additional information.

70 – Fill and bleed the coolant circuit

▸ **Filling and bleed the high-temperature coolant circuit**

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- See additional information.

Additional Information

Overview of Tightening Torques

Camshaft carrier to cylinder head — Used in step 37

M7x35		Tightening torque	13 Nm

Bearing journal to cylinder head — Used in step 39

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8 — Used in step 39

M8		Tightening torque	19 Nm

Standard screw connection M6 — Used in step 39

M6			8 Nm

Chain tensioner piston to cylinder head — Used in step 40

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft — Used in step 41

M7x17.			17 Nm

Wheel arch cover to body — Used in step 43

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body — Used in step 43

Plastic nut		Tightening torque	3 Nm

Brake disc to front wheel hub — Used in step 44

M8	Renew screw.		16 Nm

Wheel bolts — Used in step 44

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

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Underbody protection front

Used in step 45

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Cylinder head cover to cylinder head

Used in step 46

M6		Tightening torque.	8,5 Nm

Differential pressure sensor to holder

Used in step 47

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor

Used in step 47

Clamp 15–19mm		Tightening torque	3 Nm

Clamping claw facing to cylinder head cover

Used in step 48

Screw M6		Tightening torque	8 Nm

Injector to cylinder head

Used in step 48

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

High pressure lines between injector and rail

Used in step 50

High pressure lines		Tightening torque	28 Nm

Intake plenum to cylinder head

Used in step 51

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 52

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler

Used in step 52

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to exhaust manifold

Used in step 52

M8x28	Replace screws	Tightening torque	32 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 52

M8x20		Tightening torque	19 Nm

Wiring harness to cylinder head cover

Used in step 53 56

TS5x20		Tightening torque	3,5 Nm

Positive battery cable to alternator

Used in step 53

M8		Tightening torque	19 Nm

Fuel line to intake plenum

Used in step 53

TS6x20		Tightening torque	5 Nm

Cover to electronics box

Used in step 53 56

RF5x26.5		Tightening torque	2,5 Nm

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Positive battery terminal to battery

Used in step 53 56

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray

Used in step 53 56

M8		Tightening torque	19 Nm

Battery holder to engine support

Used in step 54

Hexagon screw M8x30		Tightening torque	19 Nm

Battery terminal rail to battery tray

Used in step 55

M8			19 Nm

Battery terminal with IBS positive battery terminal / negative battery terminal

Used in step 55

NutM6			5 Nm

Trailing link

Used in step 55

M8		Tightening torque	19 Nm

Battery cover

Used in step 55

M8			2,8 Nm

Electronics box to battery tray

Used in step 56

M8X16		Tightening torque	15 Nm

Clean air pipe to cylinder head cover

Used in step 57

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing

Used in step 57 60

Clamp		Tightening torque	3 Nm

Cross connection to carrier support

Used in step 59

Screws M6x20		Tightening torque	11,8 Nm

Screw connection for rubber mount of coolant radiator to coolant radiator

Used in step 59

Bolt to rubber mount		Tightening torque	8 Nm

Air duct to upper connection

Used in step 59

M6x20 screw		Tightening torque	11,8 Nm

Bracing strut to upper connection

Used in step 59

M8x20 screw		Tightening torque	28 Nm

Intake silencer housing to lock bridge

Used in step 60

M6X30		Tightening torque	8 Nm

Intake neck to cross connection

Used in step 61

M6		Tightening torque	8 Nm

Resonator to manifold and clean air pipe

Used in step 63

Screw TS6	Renew screw.	Tightening torque	5 Nm

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Cross-brace to spring strut dome

Used in step 65

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

Cover on body

Used in step 65

Hexagon screw		Tightening torque	3 Nm

Cover of top bulkhead

Used in step 66

Screw		Tightening torque	2,6 Nm

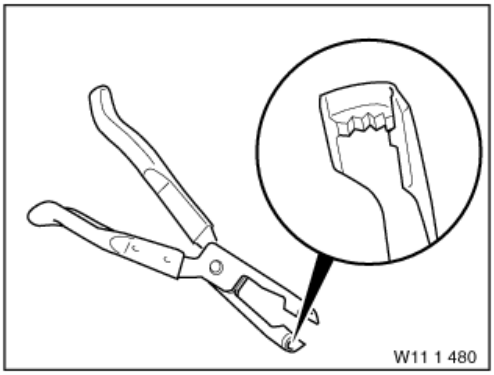
Cover of remote positive terminal

Used in step 66

Screw		Tightening torque	2,6 Nm

Overview of Special Tools

0 490 796 (11 1 480) Pliers



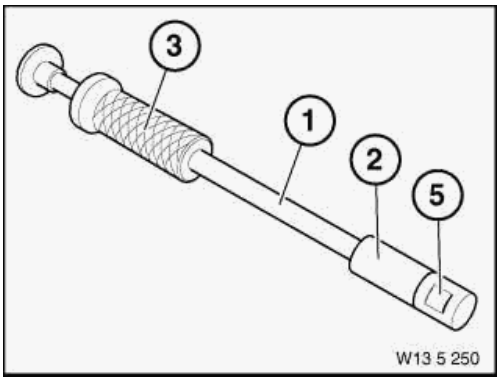
Common

Used in step 18

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

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0 493 321 (13 5 250) Puller



Common

Used in step 23

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

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0 493 339 (13 5 252) Bush



Common Used in step 23

Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

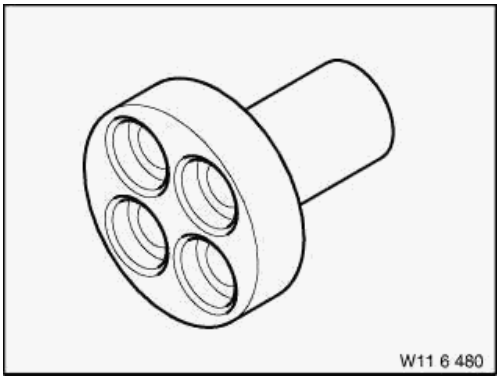
0 493 340 (13 5 253) Weight



Common Used in step 23

Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 380 (11 6 480) Connector



Common Used in step 28 42

Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

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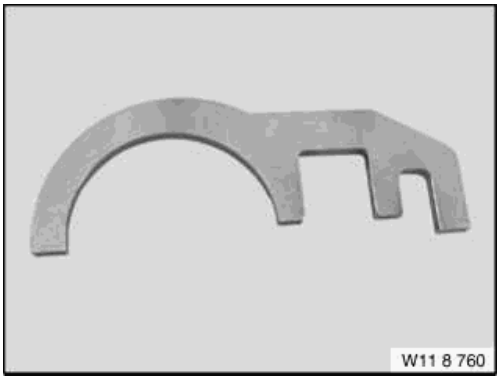
2 288 380 Locating stud



Common Used in step 28 42

Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 112 (11 8 760) Gauge



Common Used in step 28 42

Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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0 495 105 (11 4 480) oddments tray



Common

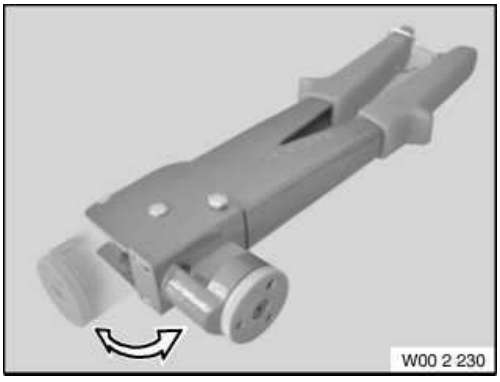
Used in step 33 34

Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

0 496 521 (00 2 230) Pliers



Common

Used in step 43

Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

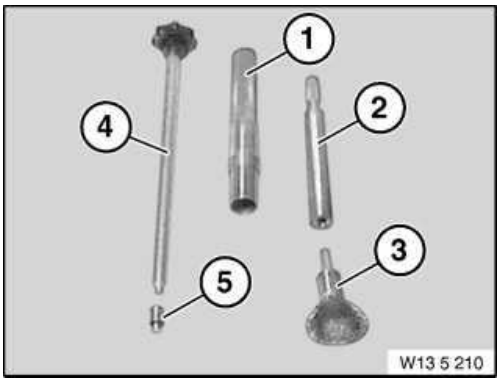
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2 344 011 Tool



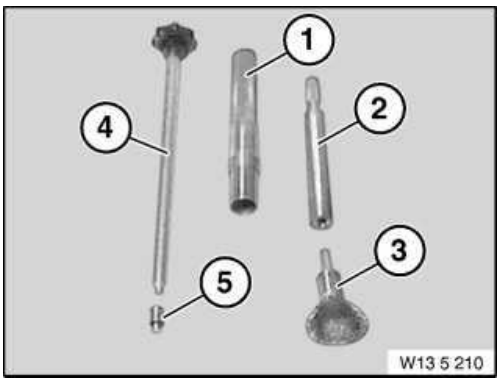
Common	Used in step 44
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

0 493 763 (13 5 215) Plug



Common	Used in step 48
Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

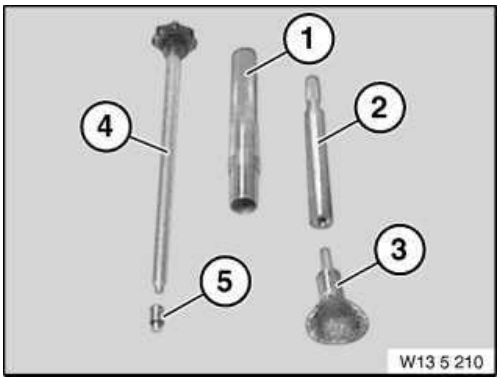
0 493 762 (13 5 214) Rod



Common	Used in step 48
Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 493 758 (13 5 210) Tool



Common

Used in step 48

Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

Replacement tools:

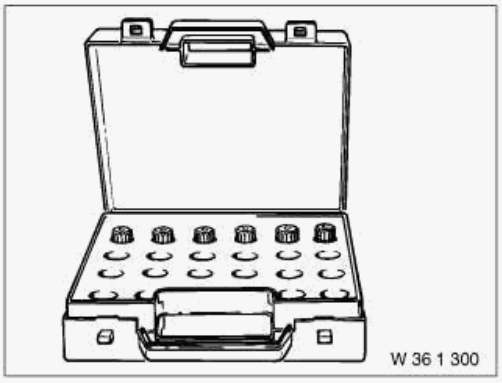
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0 495 221 (36 1 323) Wheel stud



Common	Used in step 26
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud



Common	Used in step 26
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud



Common	Used in step 26
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 226 (36 1 328) Wheel stud



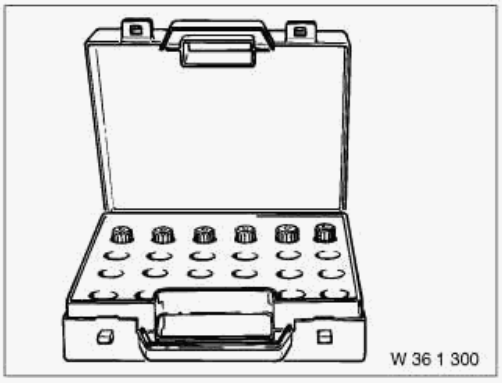
Common	Used in step 26
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud



Common	Used in step 26
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud



Common	Used in step 26
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 229 (36 1 332) Wheel stud



Common	Used in step 26
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud



Common	Used in step 26
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	19 52
EGR controller	19 52

Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	1 69
61 20 900 Disconnecting and connecting battery earth lead	1 69
61 20 900 Disconnecting and connecting battery earth lead	1 69
61 20 900 Disconnecting and connecting battery earth lead	1 69
61 20 900 Disconnecting and connecting battery earth lead	1 69

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61 20 900 Disconnecting and connecting battery earth lead 1 69
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads) 1 69
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads) 1 69
61 20 900 Disconnecting and connecting battery earth lead 1 69
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads) 1 69
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle) 1 69
61 20 900 Disconnecting and connecting battery earth lead 1 69
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61 20 900 Disconnecting and connecting battery earth lead 1 69
61 20 900 Disconnecting and connecting battery earth lead 1 69
61 20 900 Disconnecting and connecting battery earth lead 1 69
61 35 ... Notes on ESD protection (Electro Static Discharge) 15 23 24
17 00 008 Draining and topping up coolant for high-temperature circuit 70
17 00 008 Draining and topping up coolant for high-temperature circuit 70
17 00 008 Draining and topping up coolant for high-temperature circuit 70
17 00 039 Bleed the cooling system and check it for watertightness with the special tool 70
17 00 039 Bleed the cooling system and check it for watertightness with the special tool 70
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17 00 039 Bleed the cooling system and check it for watertightness with the special tool	70
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	70
17 00 039 Bleed the cooling system and check for watertightness with the special tool (coolant circuit for low temperature)	70
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	70
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	70
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	70
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	70
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	70
17 00 039 Bleeding the cooling system (B36, B38, B46, B48)	70
17 00 039 Bleeding cooling system (B37, B47)	70
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	70
17 00 039 Filling and bleeding the high-temperature cooling system vacuum filler device (B48)	70
17 00 008 Draining and topping up the high-temperature coolant circuit	70
17 00 008 Draining and topping up the high-temperature coolant circuit	70
17 00 016 Draining and topping up coolant circuit for Range Extender \PREMIUM	70
17 00 008 Draining and topping up the high-temperature coolant circuit	70
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	70
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	70
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	70
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	70
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	70

Operating materials	Used in step
2.0 Grease for wheel centring	44

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	40
Exhaust-gas recirculation cooler seal on exhaust manifold	52
Exhaust-gas recirculation cooler seal on intake plenum	52

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11 33 062 Replacing all hydraulic valve clearance compensating elements (B47)

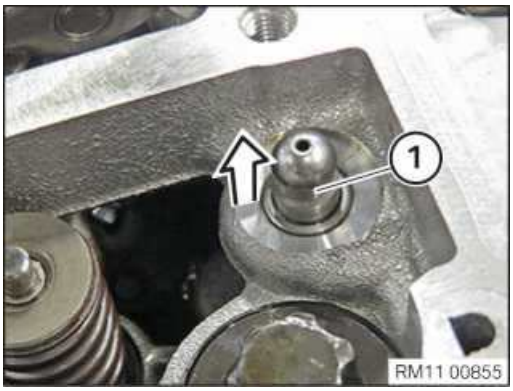
Special tools required:

- 11 4 480

When reused, the hydraulic valve clearance compensating elements must be fitted at the same position.

Necessary preliminary tasks:

- Remove all rocker arms



Remove all hydraulic valve clearance compensating elements (1) in direction of arrow.*Note:*
If hydraulic valve clearance compensating elements (1) are reused, they must be placed together with rocker arms in neat order in special tool 11 4 480 .

Installation:



Install all hydraulic valve clearance compensating elements (1).

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Required follow-up work:

- Install all rocker arms



Check function of DME.

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11 34 552 Removing and installing or replacing all valves - cylinder head removed (B47)

Special tools required:

- 11 9 000
- 11 9 005
- 11 9 006
- 11 9 008
- 11 4 480
- 11 9 007

Necessary preliminary tasks:

- Remove valve stem seals

Removal:

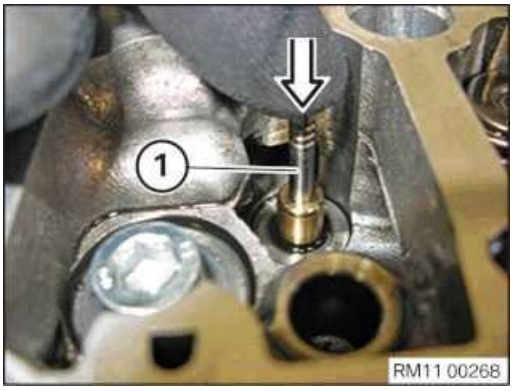


Turing the cylinder head with the special tool 11 9 000 .
Unlocking the special tool 11 9 005 .
Remove special tool 11 9 006 .

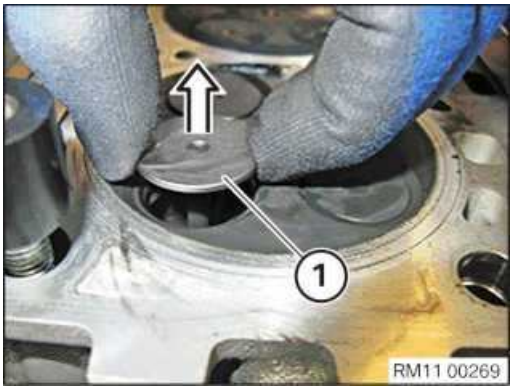


Remove special tool 11 9 008 if necessary.

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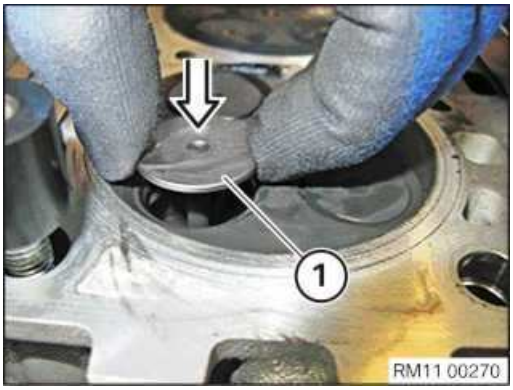


Push valve stem (1) into the cylinder head.

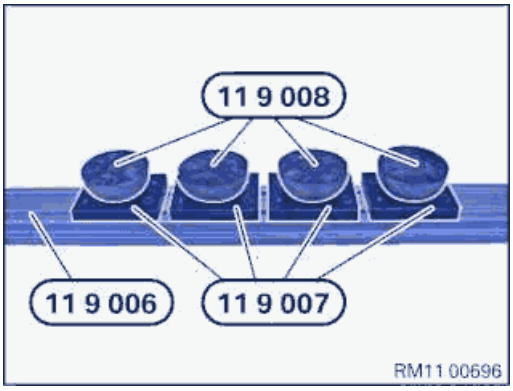


Removing the valve (1) and placing on the special tool 11 4 480 in an orderly fashion.

Installation:



Installing the valve (1).

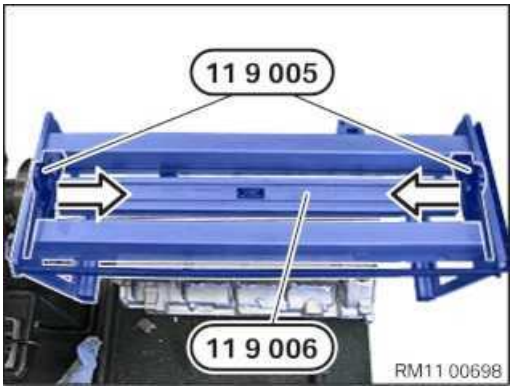


Prepare the special tools 11 9 006 , 11 9 007 and 11 9 008 as shown.

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Note:
The special tools 11 9 008 must be set up accordingly in the next operation.



Turn round special tool 11 9 006 and insert as shown.

Lock special tool 11 9 005 in direction of arrow.



Lock special tool 11 9 005 in direction of arrow.

Rotate cylinder head, using special tool 11 9 000 , 180° into installation position.

Required follow-up work:

- Installing and, if necessary, replacing the valve stem seals
- Assemble engine

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11 34 550 Removing and installing/replacing all valves

WARNING

Vehicle may slip off the vehicle hoist if the vehicle hoist is handled incorrectly.

Danger! Life-threatening injuries!

- Observe safety information on raising the vehicle using a vehicle hoist.
- For additional information see: 00 ... Raising the vehicle using a vehicle hoist.

WARNING

Motor vehicle may slip off the vehicle hoist where components are supported.

Danger! Life-threatening injuries!

- Secure the vehicle hoist against lowering and lifting.

WARNING

Motor vehicle may slip off the vehicle hoist if the weight is distributed unevenly.

Danger! Life-threatening injuries!

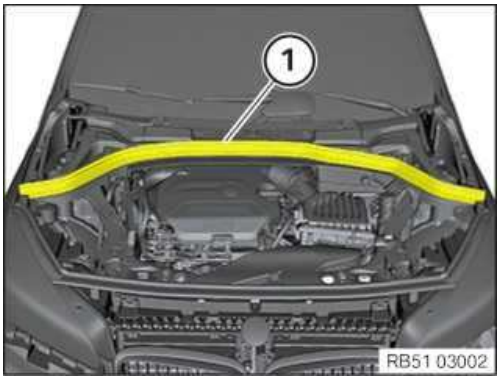
- Ensure there is a specific weight compensation on the motor vehicle.

PRELIMINARY WORK

1 – Remove the seal for the rear bonnet

NOTICE

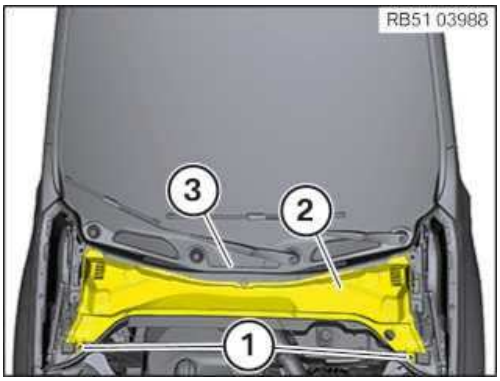
Schematic diagram is for example purposes. Some parts may differ in certain details.



- Pull off rear bonnet seal (1) towards the top and remove.

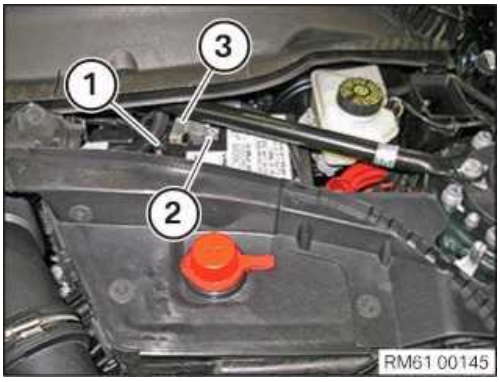
2 – Removing front cowl panel cover

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- Loosen the expanding rivet (1).
- Feed out and remove front cowl panel cover (2) from the rear cowl panel cover(3).

3 – Disconnecting the battery earth lead

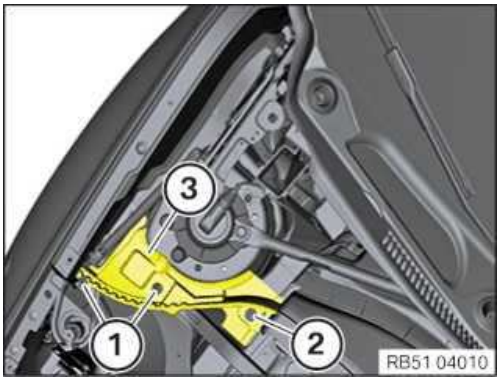


- Unlock plug connection (1) and disconnect.
- Unfasten nut (2).
- Remove the battery earth lead (3) and secure to one side.

4 – Remove suspension cross-brace

TECHNICAL INFORMATION

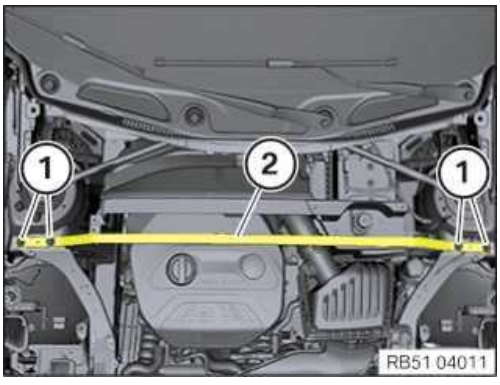
Driving without the strut brace/front end or tension strut is not permitted.



NOTICE

Description is for right component only. The procedure on the left side is identical.

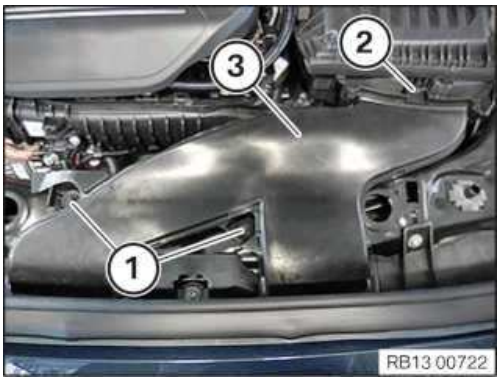
- Loosen expanding rivet (1).
- Loosen screw (2).
- Remove the cover (3).



- Loosen screws (1).
- Remove strut brace (2).

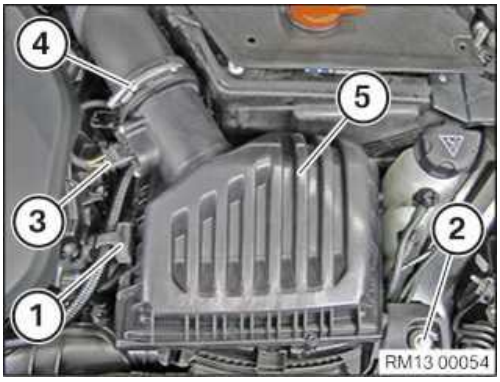
5 – Remove the intake neck for intake silencer housing

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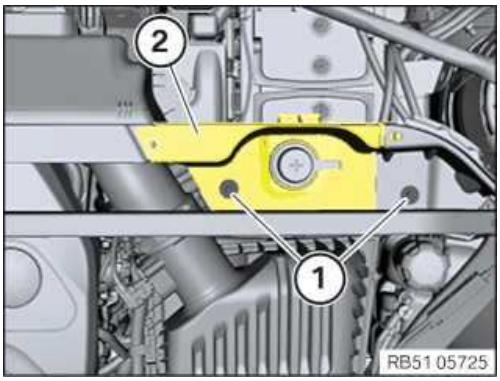
- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

6 – Removing intake silencer housing

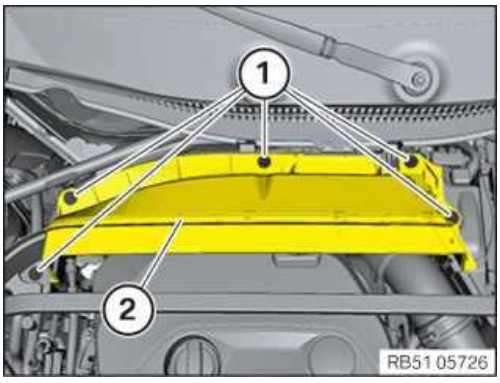


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

7 – Removing the upper bulkhead cover



- Loosen screws (1).
- Guide out and remove the cover (2).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

8 – Remove vehicle battery

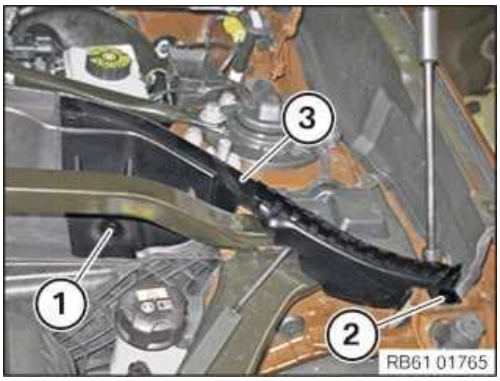
WARNING

Working on 12 V vehicle electrical system.

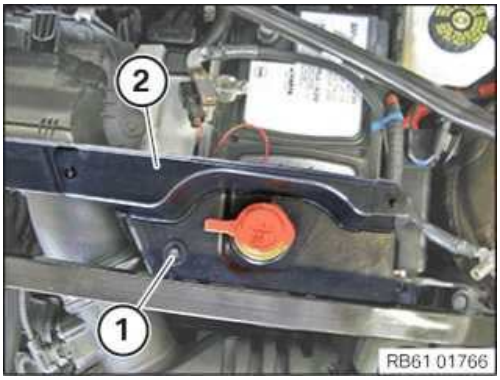
Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

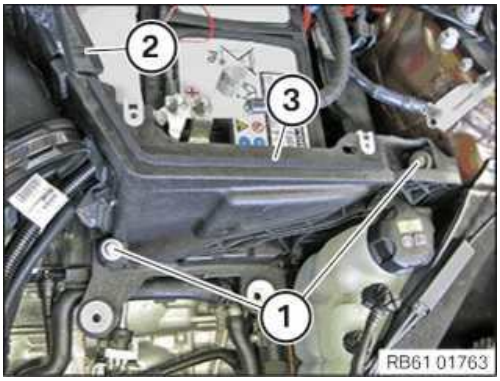
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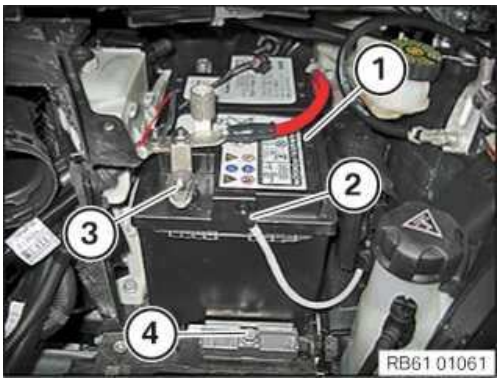
- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).



- Loosen screw (1).
- Remove the cover (2).



- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.



- Pull off the vent hose (2).
- Slacken the nut (3) on the positive battery terminal and remove the positive battery terminal.

WARNING

Unprotected battery terminals.

Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

9 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

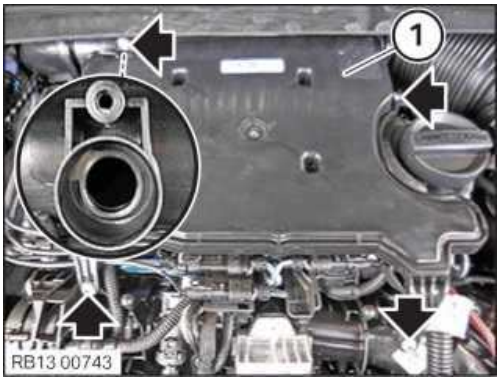
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

10 – Remove resonator

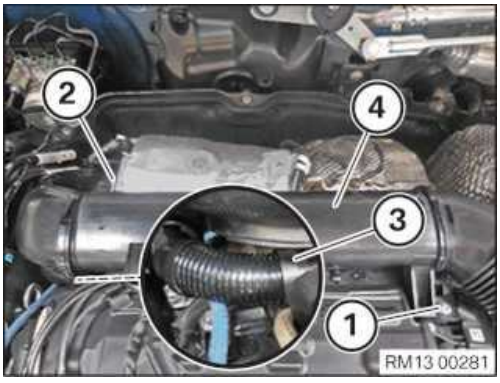


- Remove screws (arrows).
- Guide out and remove the resonator (1).

11 – Removing clean air pipe



- Detach clamp (1) on the clean air pipe.
- Pull off the clean air pipe from the intake silencer housing.



- Loosen screw (1).
- Loosen clamp (2).
- Unlock the ventilation line (3) and pull it off the cylinder head cover.
- Feed out clean air pipe and remove.

12 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

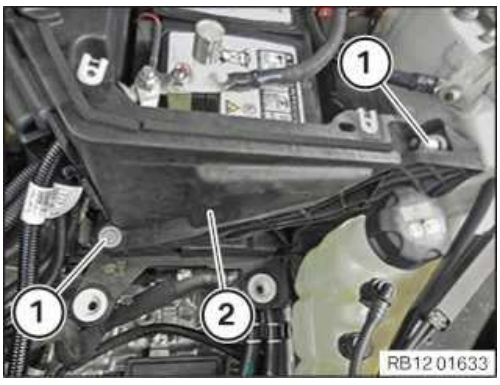
TECHNICAL INFORMATION

Follow instructions for removing and installing control units.

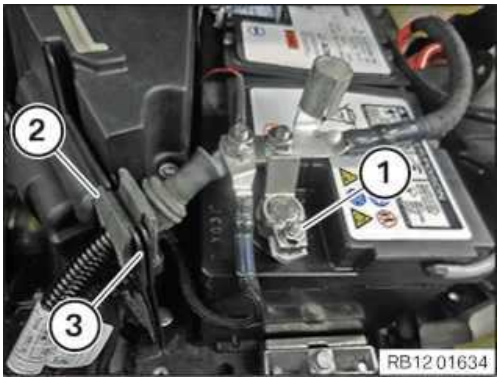
For additional information see: 12 00 ... Notes on removal and installation of control units

TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.

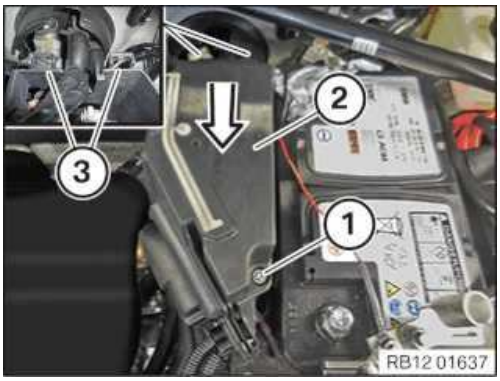


- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.

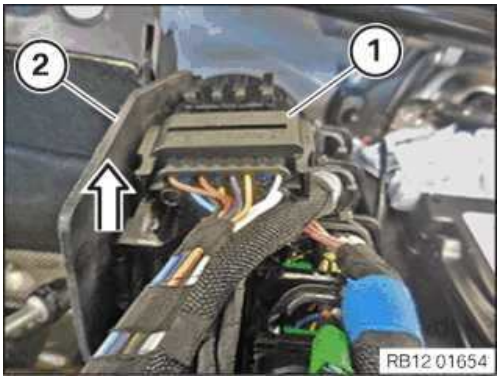


- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

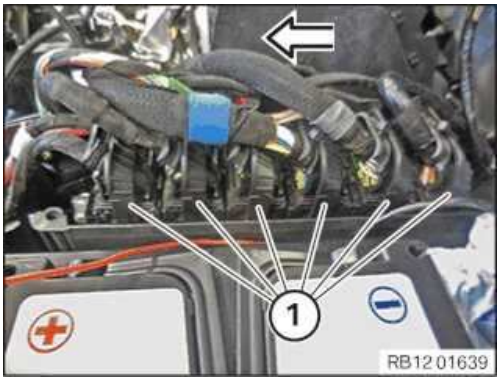
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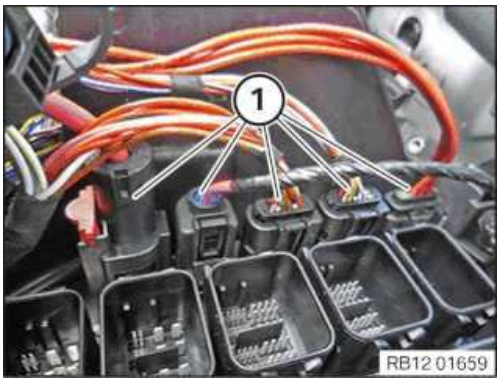
- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



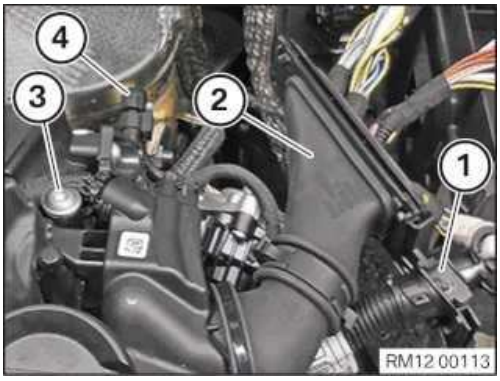
- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).



- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

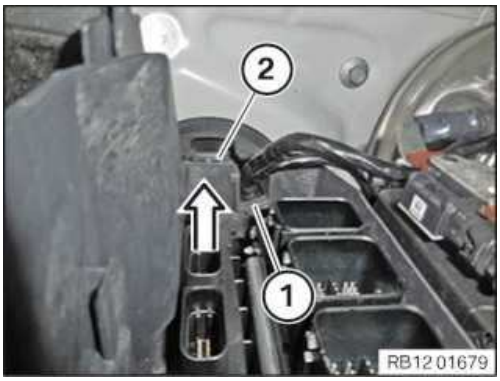


- Unlock and loosen connector (1).

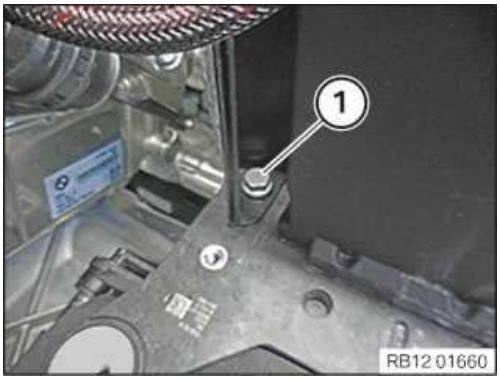


- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.

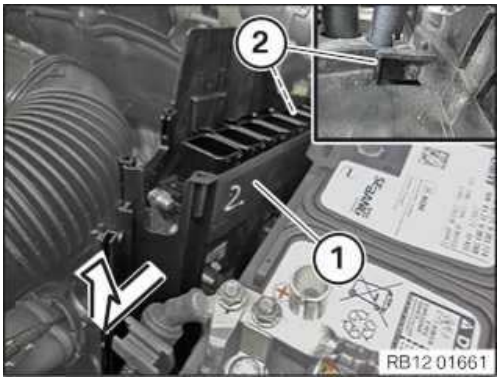
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- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.

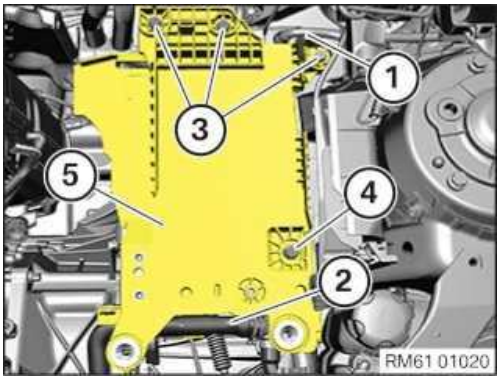


- Loosen screw (1).



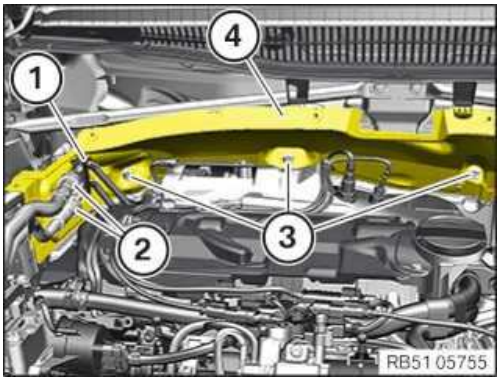
- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

13 – Remove battery holder



- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

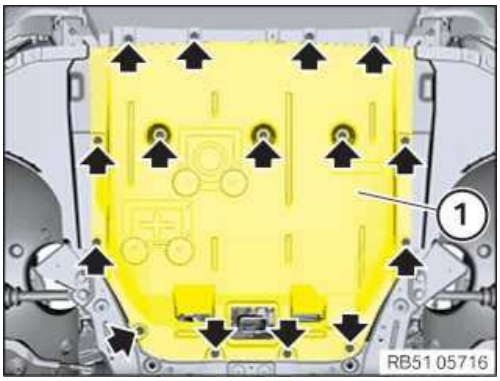
14 – Remove the rear bulkhead upper part



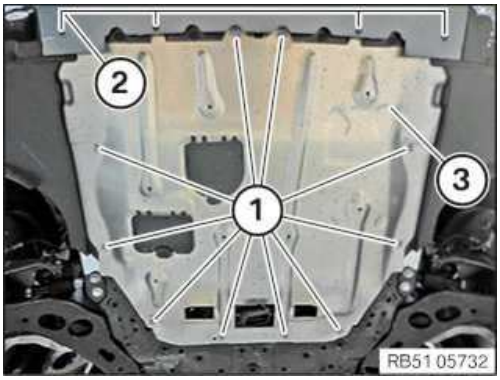
- Unlock the holder (1) and disconnect.
- Guide out and remove the fuel lines (2).
- Loosen screws (3).
- Guide out the rear bulkhead upper part (4) and remove.

15 – Removing the front underbody protection

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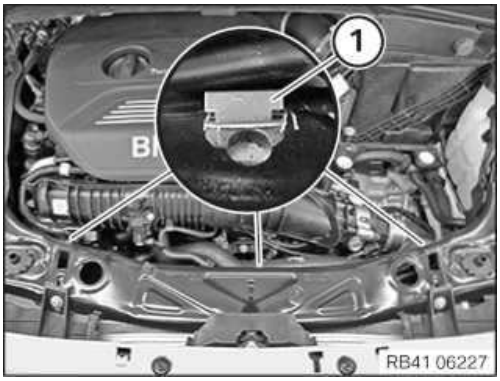


- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.

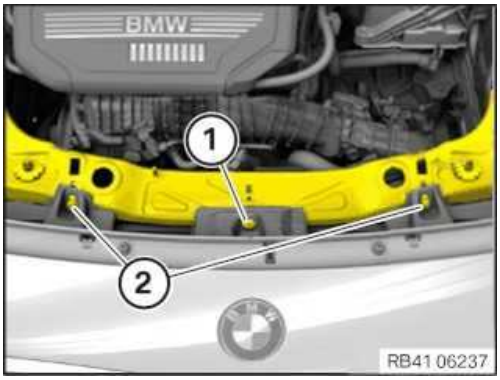


- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

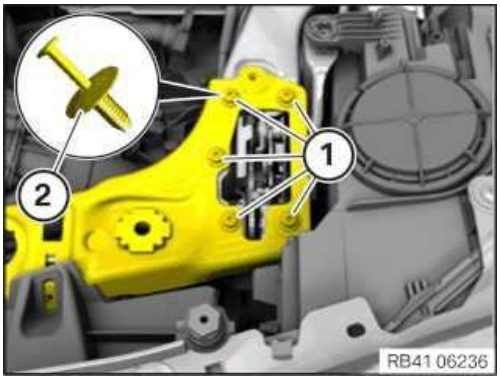
16 – Remove front cross connection



- Detach the clamps (1) for the Bowden cable of the bonnet locks from the cross connection.

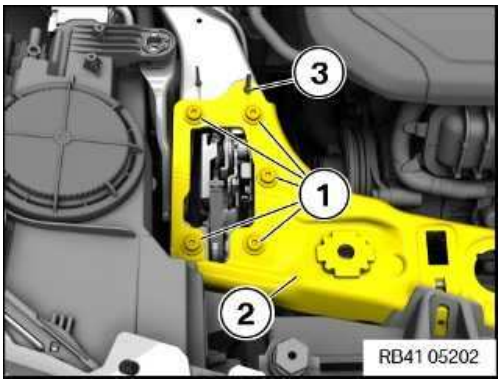


- Loosen screw (1).
- Loosen screws (2).



- Loosen screws (1).
- Lever out expanding rivet (2).

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- Loosen screws (1).
- Unclip the front cross connection (2) from the rubber retainer (3) and remove it upward.

17 – Draining coolant

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

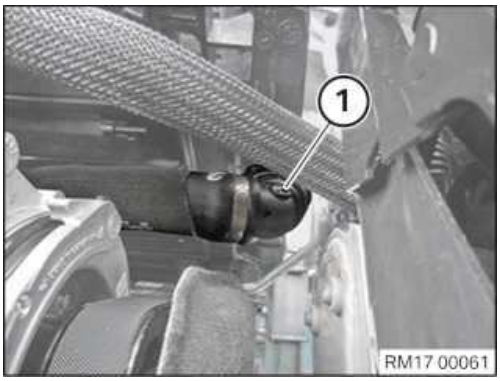
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

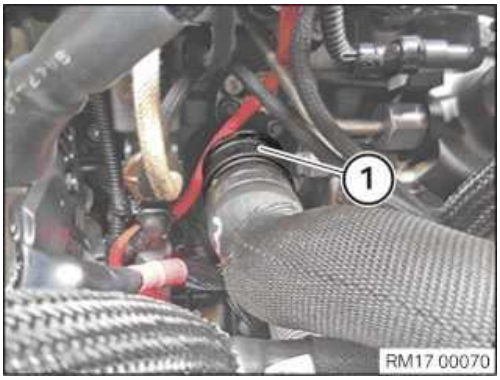


- Loosen sealing cap (1).

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- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.

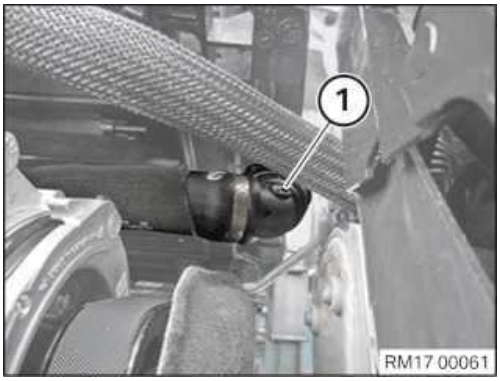


- Unlock the coolant line (1) and pull it off the connecting branch.
- Catch and dispose of escaping coolant.

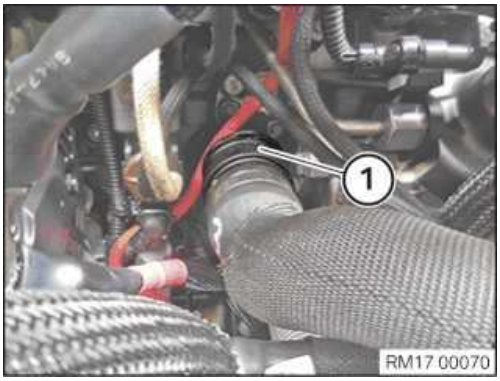
18 – Connect the coolant line

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Connect the right coolant line (1) to the radiator and lock audibly.



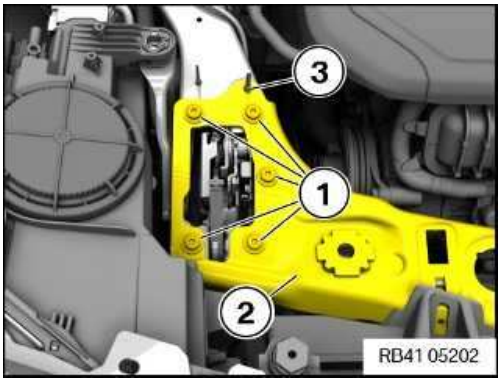
- Connect the coolant line (1) to the connecting branch and lock audibly.

19 – Install front cross connection

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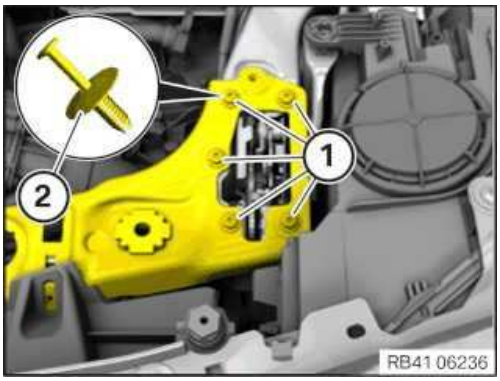
- Right side of vehicle only: Secure spray guard (1) on the cross connection (2) as pictured.



- Position front cross connection (2) and clip front cross connection (2) into the rubber retainer (3) at the same time.
- Tighten the screws (1).

Cross connection to carrier support

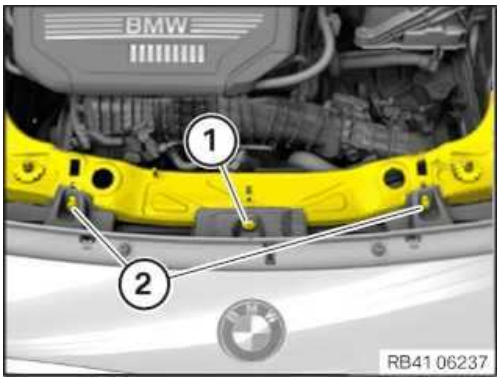
Screws M6x20		Tightening torque	11,8 Nm



- Tighten the screws (1).

Cross connection to carrier support

Screws M6x20		Tightening torque	11,8 Nm



- Position screws (3) on the rubber mounts for the radiator and tighten.

Screw connection for rubber mount of coolant radiator to coolant radiator

Bolt to rubber mount		Tightening torque	8 Nm

- Tighten down screws (2).

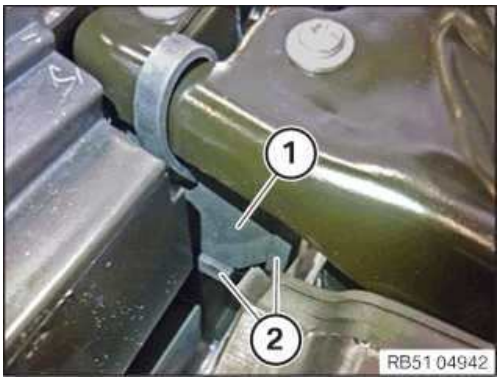
Air duct to upper connection

M6x20 screw		Tightening torque	11,8 Nm

- Tighten down screw (1).

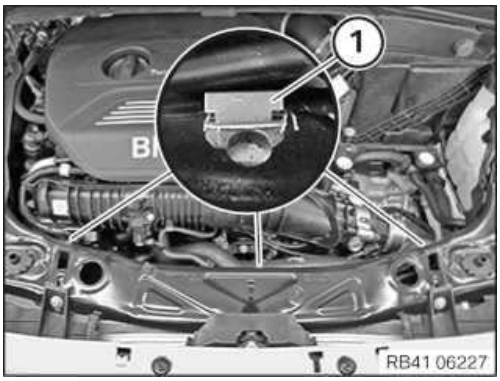
Bracing strut to upper connection

M8x20 screw		Tightening torque	28 Nm



- Right side of vehicle only: Properly mount spray guard (1) to prevent corrosion.
- Secure spray guard (1) to the bridge with retaining tabs (2).

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- Fasten the clamps (1) from the Bowden cable of the bonnet lock on the cross connection.

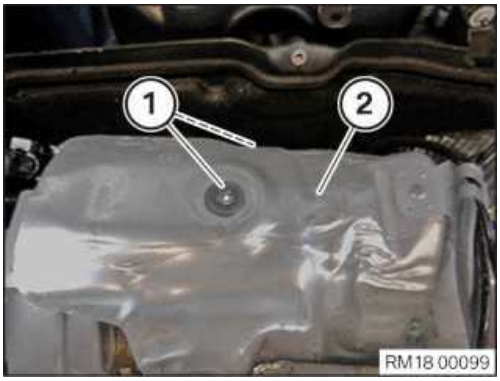
20 – Removing heat shield from top exhaust turbocharger

WARNING

Hot surfaces.

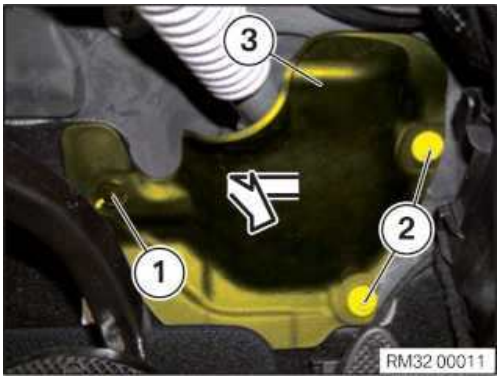
Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from holders.
- Release the screws (1) at the top and bottom of the heat shield.
- Feed out and remove the heat shield (2).

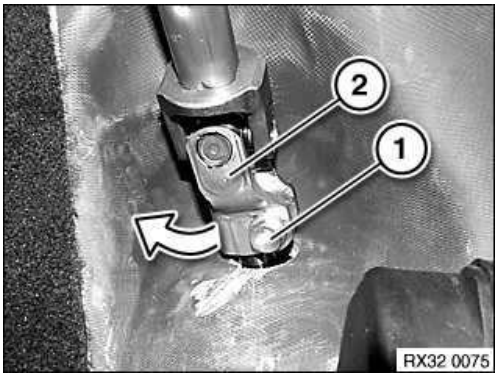
21 – Releasing lower steering shaft from steering gear



- **If installed:**
- Unfasten nut (1).
- Unscrew the nuts (2) by 1 rotation.

  Do not remove the nuts (2) !
- Remove the cover (3) on the steering column in the direction of the arrow.

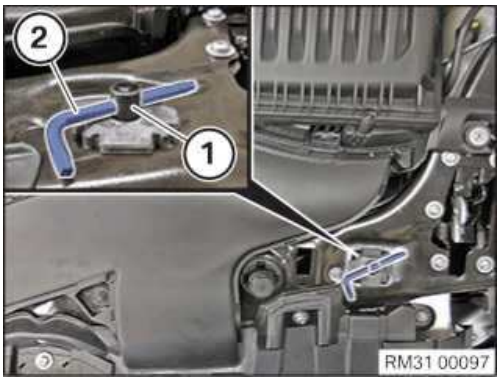
  The side footwell trim must not be disassembled!



- Loosen screw (1).
- Swivel out the universal joint (2) of the bottom steering shaft from the steering gear in the direction of the arrow.

22 – Securing radiator on left and right

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NOTICE

Perform the operations on the left and right side.

- Fasten radiator at centring pin (1) with suitable tool (2).

23 – Removing both front wheels

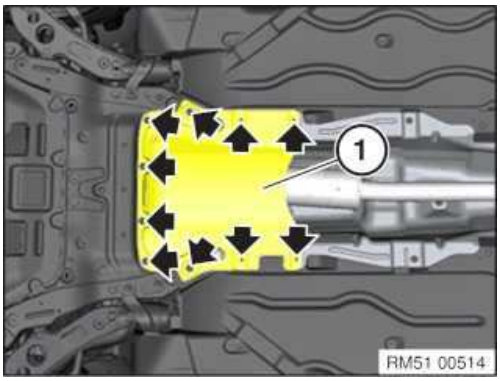
▶ **Removing the wheel**



- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Unscrew the wheel bolts (arrows) and remove the wheel.

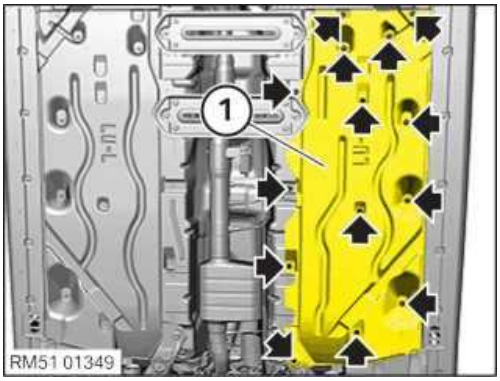
  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

24 – If installed: Removing rear underbody protection



- Remove screws (arrows).
- Remove the rear underbody protection (1).

25 – Removing right underbody panelling



- Unscrew all bolts and nuts (arrows).
- Remove the underbody panelling (1).

26 – Removing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

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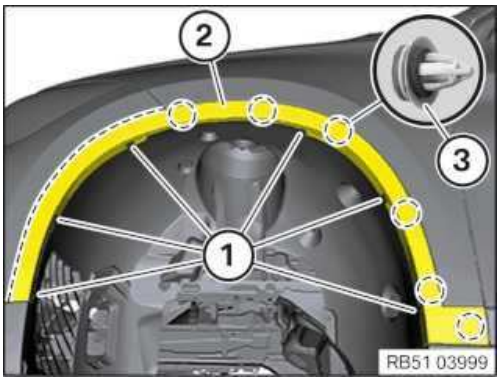
▶ **Remove the front wheel arch trim**

NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

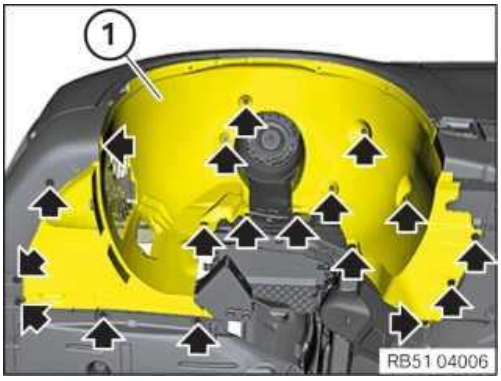
NOTICE

Description is for left component only. Procedure on the right side is identical.



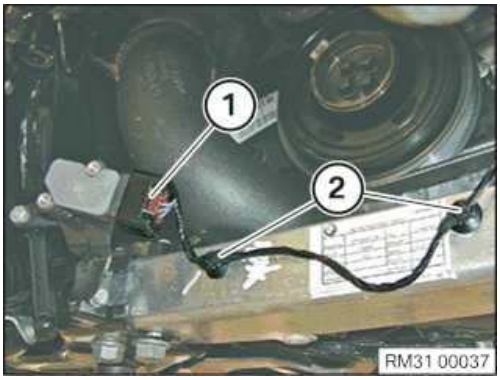
- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.

▶ **Remove front wheel arch cover**



- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

27 – With right installation: Detaching ride height sensor cable



- Unlock plug connection (1) and disconnect.
- Release cable clip (2) from deformation element adapter.

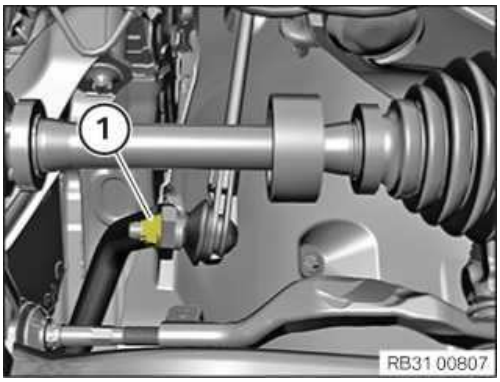
28 – Releasing anti-roll bar on left and right from anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▶ **Detach the anti-roll bar from the anti-roll bar link**

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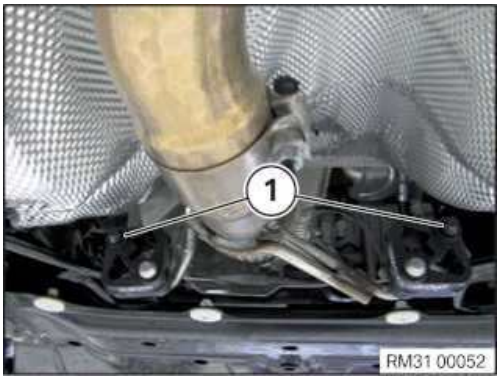


- Unfasten nut (1).

Note: Use the Torx socket for counter support.

- Loosen the anti-roll bar link from the anti-roll bar .

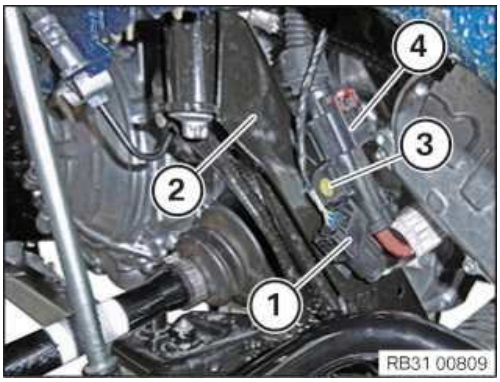
29 – Detaching rubber mount from front axle support



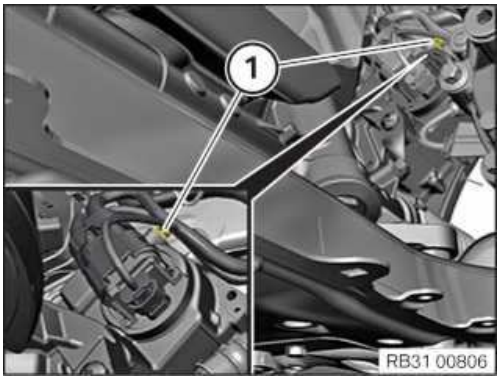
- Spray rubber mount (1) with lubricant and release from holder on front axle support.

30 – Disconnecting plug connections from steering gear

▶ **If installed: Detach connectors from the front axle carrier**

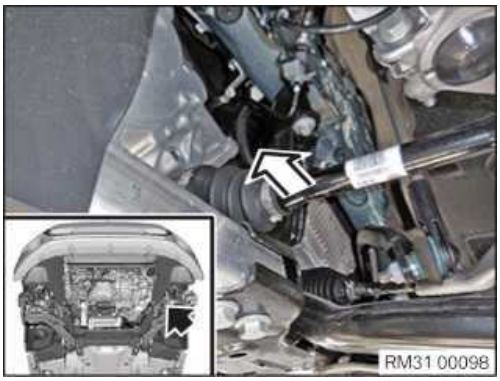


- Release the plug connection (1) from the front axle support (2).
- Loosen screw (3).
- Release the plug connection (4) from the front axle support (2).



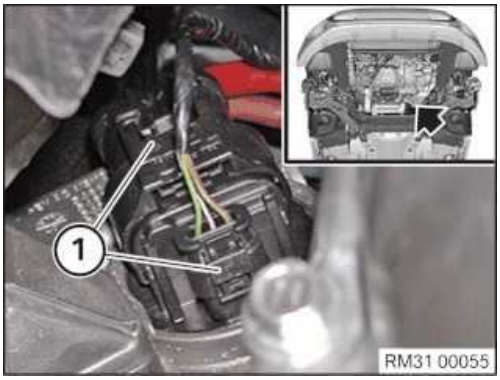
- Disconnect wiring harness (1) from steering gear.

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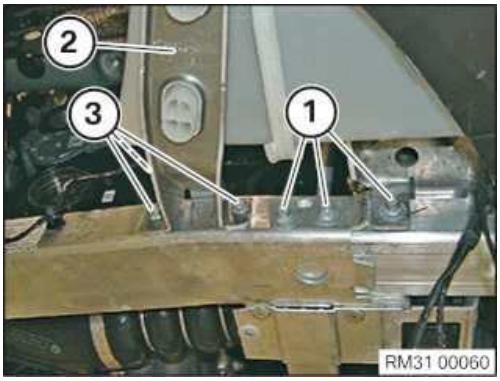
- To unlock the plug connections (see the following work step): unlock plug connections (arrow) with the right hand.

  The plug connections can be reached via the left-hand output shaft.



- Unlock plug connections (arrow) (1)and disconnect from the steering gear.
- Make sure when lowering the front axle that the cables are not damaged!

31 – Releasing the mounted part from the front axle support

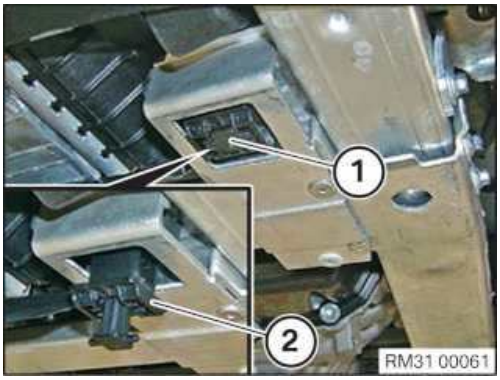


- **Only on right side:** Loosen screws (3) and remove holder for washer fluid reservoir (2).

NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).



NOTICE

Perform the operations on the left and right side.

- Unlock safety catch (1) of the lock (2) from the holder for the charge air cooler.
- Completely remove locks (2).



- Loosen screw (2) of the engine support (3) on the front axle (1).

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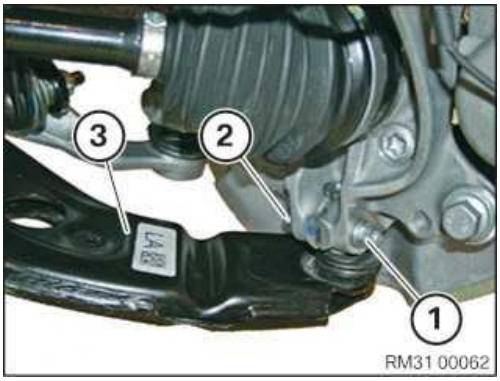


NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

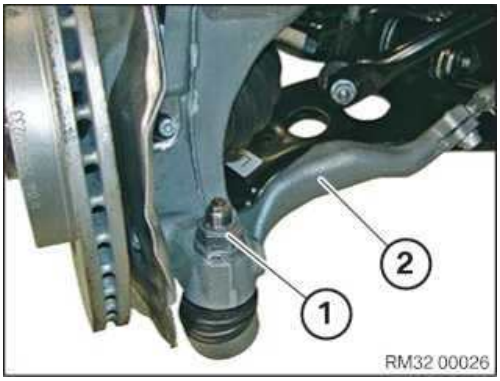
32 – Detaching and removing front axle completely



NOTICE

Perform the operations on the left and right side.

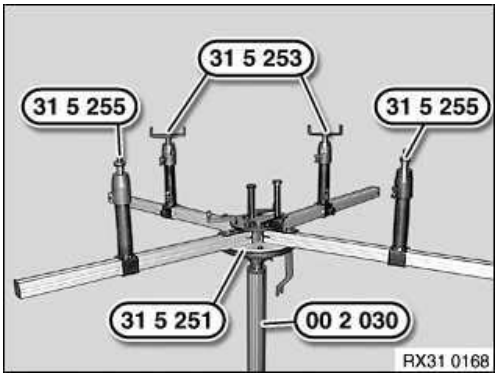
- Unfasten nut (1).
- (2)Pull out screw.
- Detach the wishbone (3) from the swivel bearing .



NOTICE

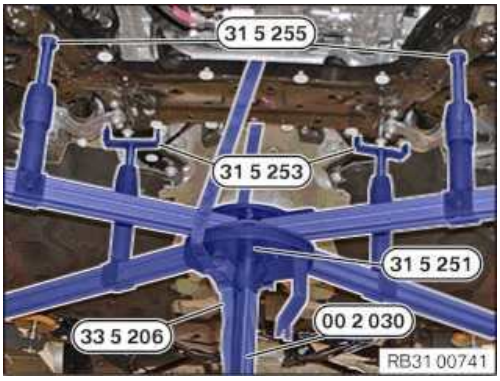
Perform the operations on the left and right side.

- Unfasten nut (1).
- Detach the track rod (2) from the swivel bearing.



- Fit the special tool completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools in telescopic supports of a profile rail pair.
- Insert special tools in telescopic supports of other profile rail pair.

Note: In a profile rail pair, two profile rails are connected to one another by gearing.

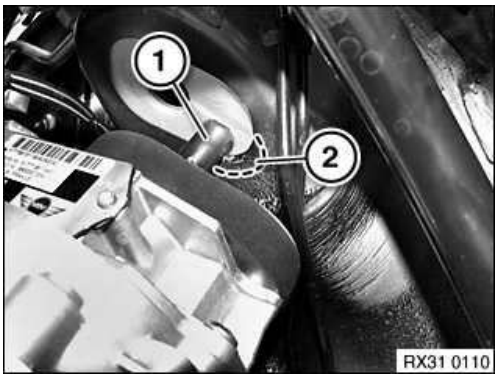


- Align special tools and to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool to special tool .

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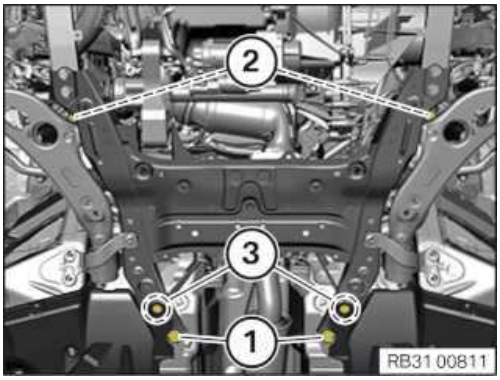


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



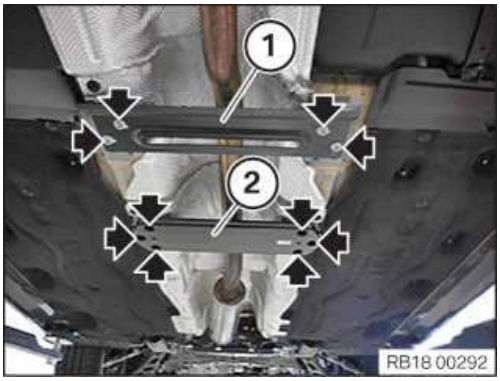
- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and remove the front axle.

TECHNICAL INFORMATION

Note the information on thread repairs using Helicoil thread inserts.
For more information see: 41 00 ... Notes on repairing threads

- Check threads for damage; if necessary, repair with Helicoil thread inserts.

33 – Removing the connecting support from the tunnel in front and back



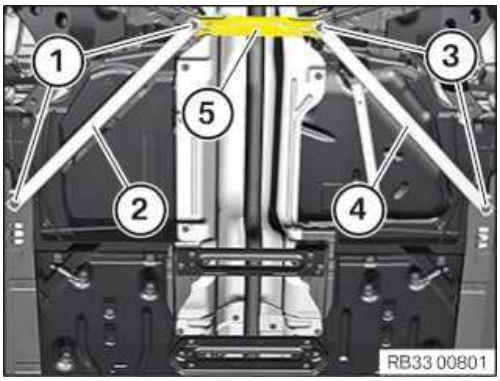
- Unscrew the bolts (arrows) from the connecting support (1).
- Feed out and remove the crossbeam (1).
- Unscrew the bolts (arrows) from the connecting support (2).
- Feed out and remove the crossbeam (2).

34 – Remove the cross strut with the torsion strut

TECHNICAL INFORMATION

Driving without a torsion strut is not permitted.

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- Loosen screws (1).
- Thread out torsion strut (2) at left and remove.
- Loosen screws (3).
- Thread out torsion strut (4) at right and remove.
- Feed out and remove the cross-member (5).

35 – Remove exhaust system

WARNING

Hot surfaces.

Risk of burning!

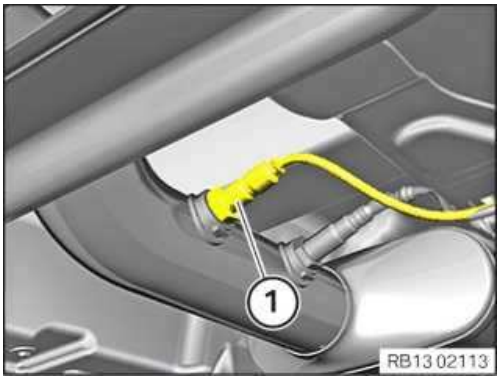
- Perform all work only on components that have cooled down.

CAUTION

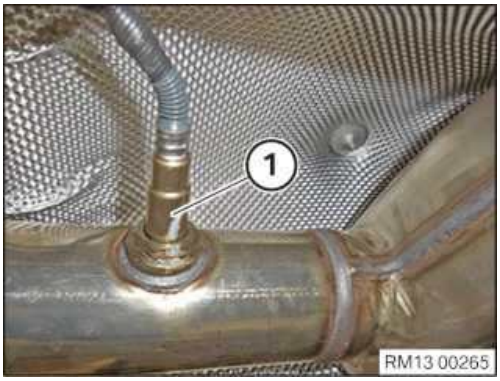
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

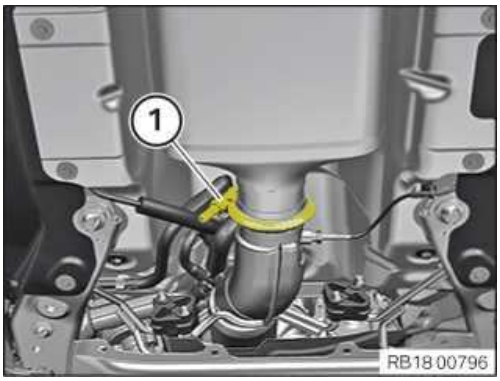


- Release the nitrogen oxide sensor (1) downstream of the SCR catalytic converter, guide it out and set it aside.

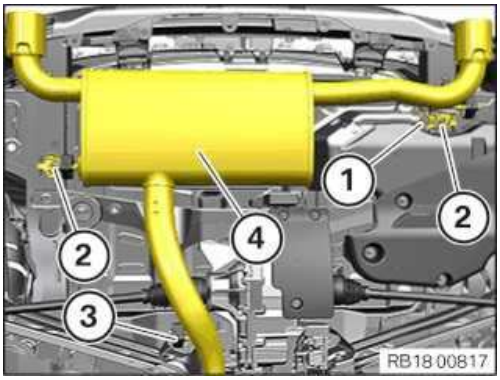


- Release the diesel particulate sensor (1), guide it out and set it aside.

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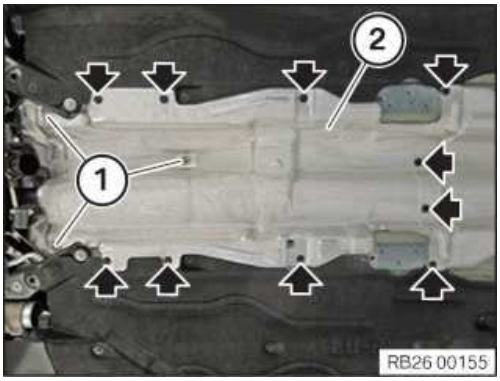


- Loosen V-band clamp (1).



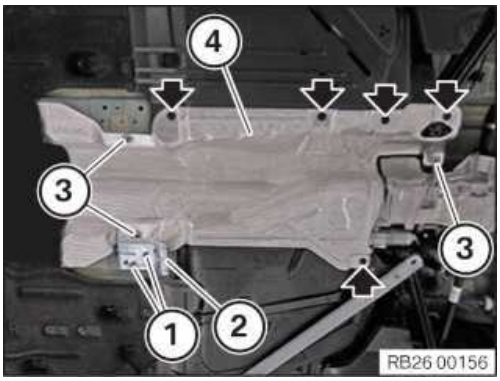
- Loosen screw (1).
- Loosen nuts (2).
- Release the rubber mount (3) of the exhaust system (4).
- Lower and guide out the exhaust system (4) with assistance of a second person and remove it.

36 – Remove front heat shield



- Remove screws (arrows).
- Loosen nuts (1).
- Guide the heat shield (2) out and remove it.

37 – Remove heat shield at rear.



- Loosen screws (1).
- Guide out and remove holder (2).
- Remove screws (arrows).
- Loosen nuts (3).
- Guide the heat shield (4) out and remove it.

38 – Remove propeller shaft

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CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

RISK OF DAMAGE

Damage to propeller shaft during removal.

Non-observance of the removal guidelines for the propeller shaft on the rear axle differential may cause severe damage.

- Do not disassemble the three-hole flange, flexible disc and propeller shaft. The three-hole flange to the rear axle differential is balanced with the flexible disc and propeller shaft.
- Loosen the recessed nut against the direction of travel in clockwise direction. The propeller shaft must be loosened on the recessed nut only and exclusively in the direction of rotation otherwise the anti-twist lock of the bi-hexagonal flange nut is damaged.
- In the event of a damaged anti-twist lock on the bi-hexagonal flange nut: Replace the rear axle differential.



- Install the special too l between the front and rear propeller shaft.
- Make sure that the arrows on the special tool point forward in the direction of travel.

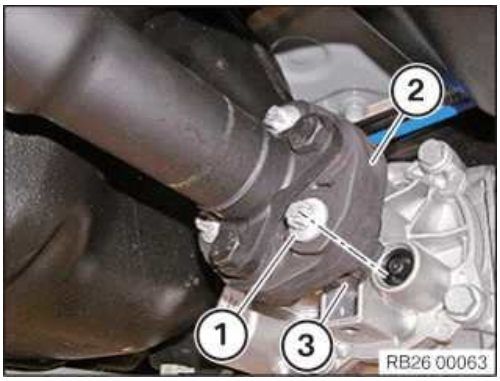


- Always support the propeller shaft (1) with a conventional jack.



- Protect the propeller shaft (1) with the special tools **0 495 554 (33 5 070)** and from twisting.

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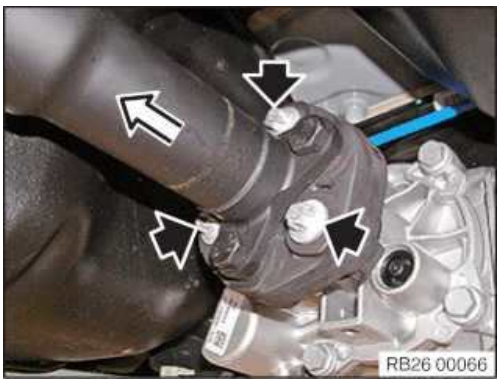
TECHNICAL INFORMATION

Compliance with the following instructions is required to avoid a humming noise from the propeller shaft after refitting the propeller shaft.

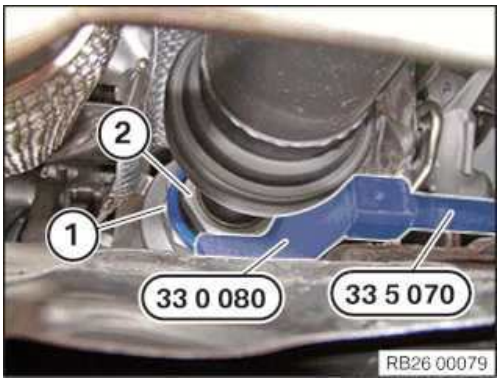
- Mark the installation position of the screw connection (1), the flexible disc (2) and the three-hole flange (3) on the same level.
- Loosen the screw connection (1).



- Loosen screws (1).



- Remove screws (arrows).
- Guide the propeller shaft out in the direction of the arrow and set it aside.



RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.

- Protect the recessed nut (2) on the transfer box from twisting with the special tools **0 495 554 (33 5 070)** and .

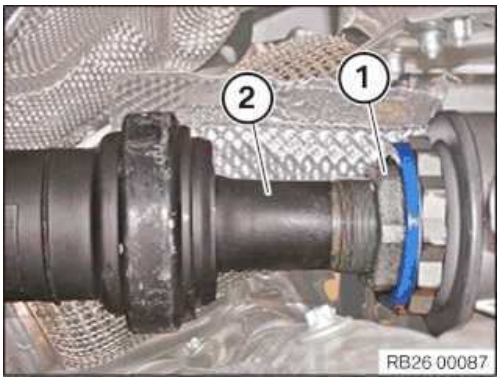
  The recessed nut (2) on the transfer box must **not** be used to detach the propeller shaft.

  The double hexagon flange nut (1) must **not** be used for counter support.

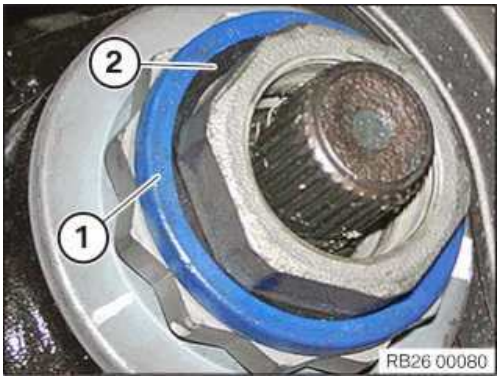


- Release the front propeller shaft with the special tools **0 495 554 (33 5 070)** and in the direction of the arrow.

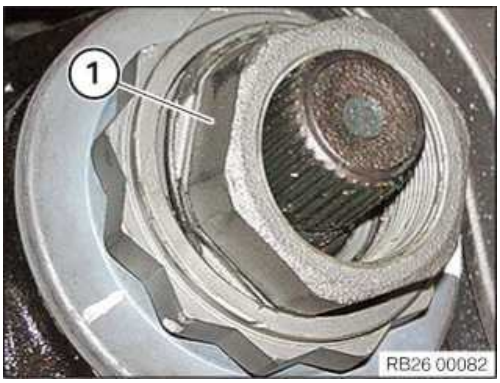
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- Thread the propeller shaft (2) out of the recessed nut (1) and remove.



- Thread the retaining clip (1) and the seal (2) out and remove.



- Thread out and remove the recessed nut (1).

39 – Removing starter motor

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and loosen connector (1).
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).



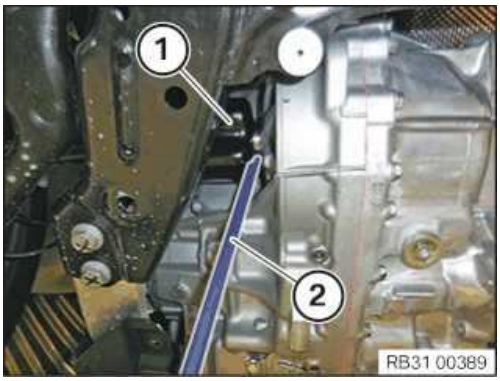
- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.



- Loosen screws (1).
- Feed out starter motor and remove.

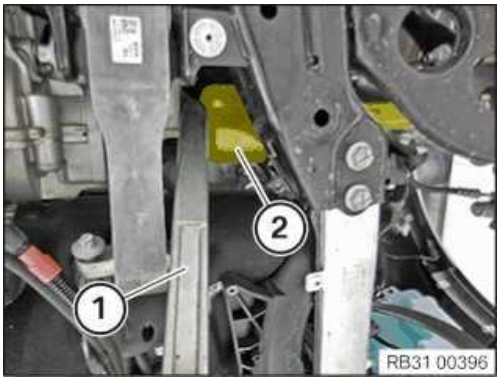
40 – Partially removing the left output shaft

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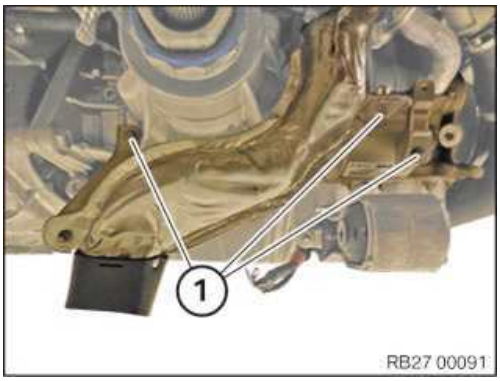
- Protect the output shaft (1) from falling.
- Lever out the output shaft (1) with a mounting lever (2) from the transmission.
- Tie up output shaft (1).

41 – Partially removing right output shaft

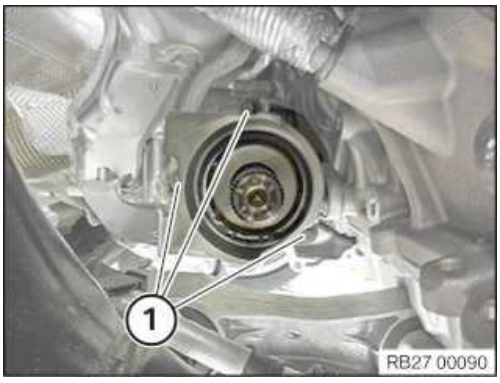


- Lever out the output shaft (2) with a mounting lever (1).
- Tie up output shaft (1).

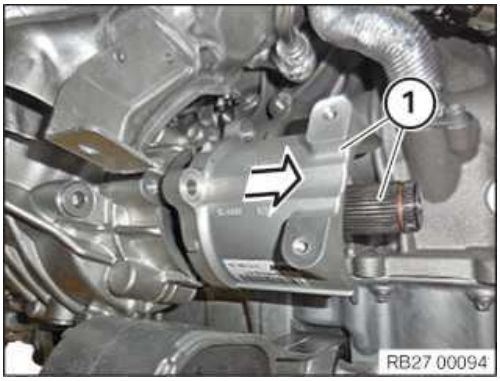
42 – Remove the intermediate shaft with the support tube



- With air duct installation: Loosen screws (1).
- Remove air duct



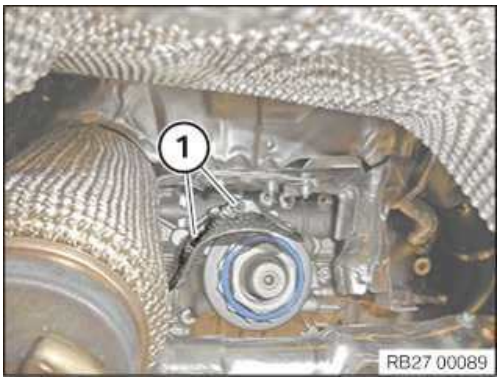
- Loosen screws (1).



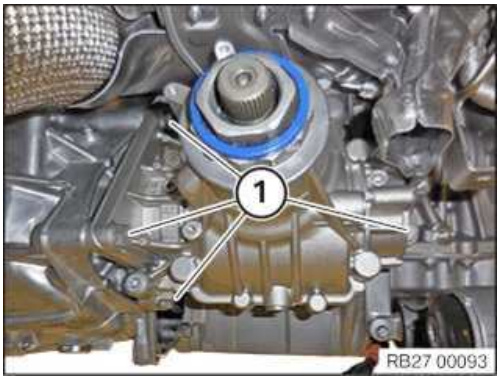
- Pull the intermediate shaft with the support tube (1) out of the transfer box.

43 – Remove transfer box (VTG)

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- Loosen screws (1).
- Remove heat shield.



- Loosen screws (1).
- Remove the transfer box (VTG).

44 – Remove the monitoring oxygen sensor

WARNING

Hot surfaces.

Risk of burning!

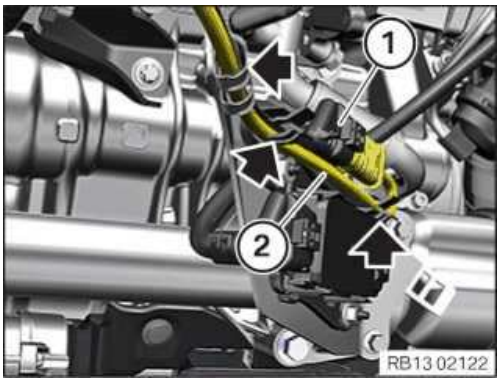
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

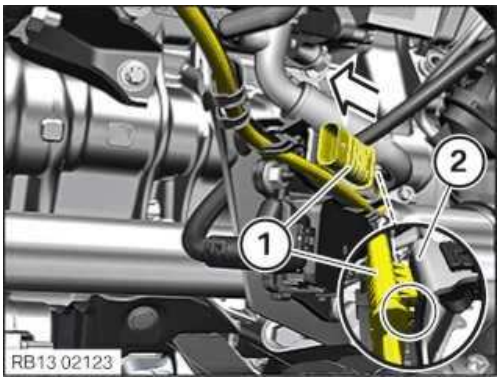
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

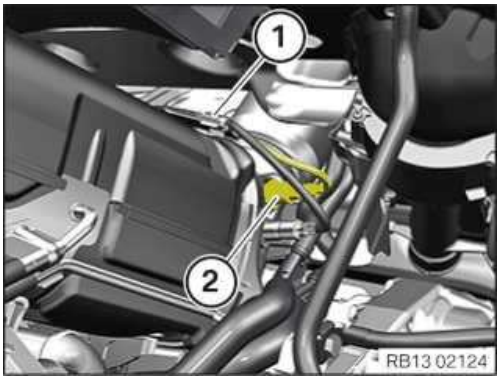


- Unlock plug connection (1) and disconnect.
- Feed oxygen monitor sensor cable (1) out of the clamps (arrows).

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- Unlock the connector (1) in the marked area and disconnect it from the holder (2) in the direction of arrow.



- Guide the cable of the monitoring oxygen sensor (2) out of the clamp (1).
- Release the monitoring oxygen sensor (2) using special tool **0 491 074 (11 7 020)**.
- Remove the monitoring oxygen sensor (2).

45 – Removing the nitrogen oxide sensor before SCR catalytic converter

WARNING

Hot surfaces.

Risk of burning!

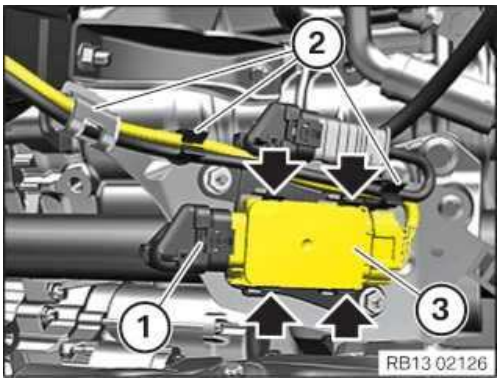
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

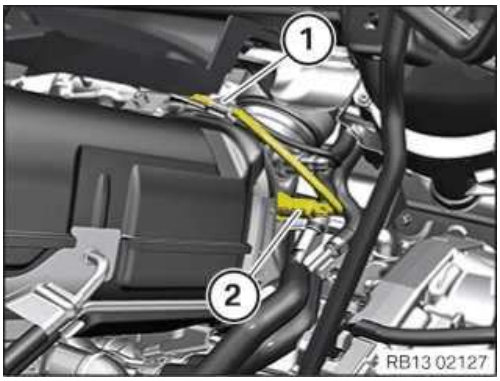
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



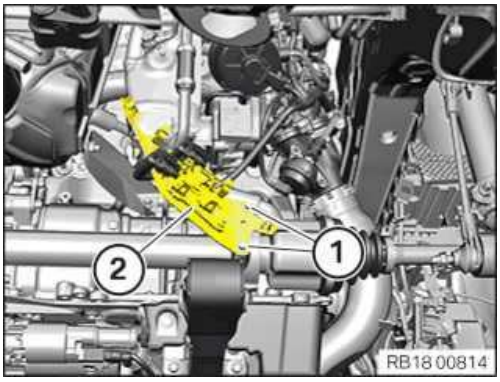
- Unlock plug connection (1) and disconnect.
- Slide the cable of the nitrogen oxide sensor evaluation electronics (3) out of the clamps (2) and remove.
- Unlock (arrows) and remove the evaluation electronics for the nitrogen oxide sensor (3).

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- Slide the cable of the nitrogen oxide sensor before the SCR catalytic converter (2) out of the clamps (1) and remove.
- Detach the nitrogen oxide sensor before the SCR catalytic converter (2) using the special tool **0 491 074 (11 7 020)**.
- Guide out and remove the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

46 – Remove holder for oxygen sensor



- Loosen screws (1).
- Thread out the holder (2) for the oxygen sensor and remove.

47 – Remove the exhaust temperature sensor on the catalytic converter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

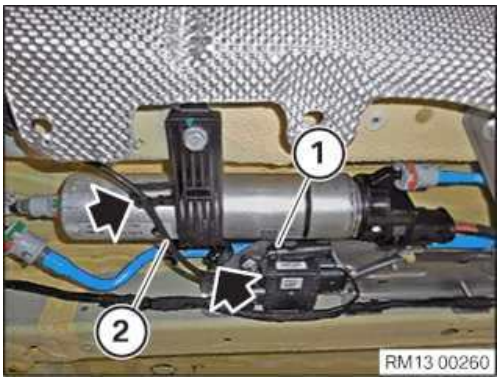
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

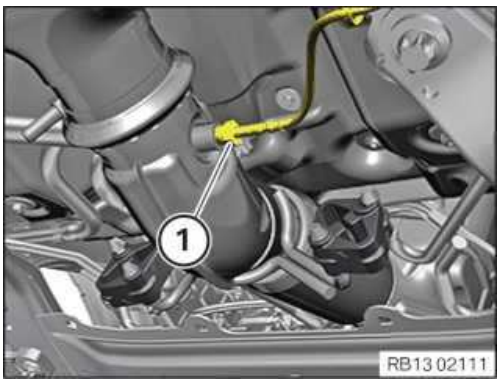
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- Unlock and loosen connector (1).
- Feed out the cable (2) of the exhaust temperature sensor from the clamps (arrows) and remove.



- Loosen the cable clip (1).



- Loosen exhaust temperature sensor (1).
- Feed out and remove exhaust temperature sensor (1).

48 – Removing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

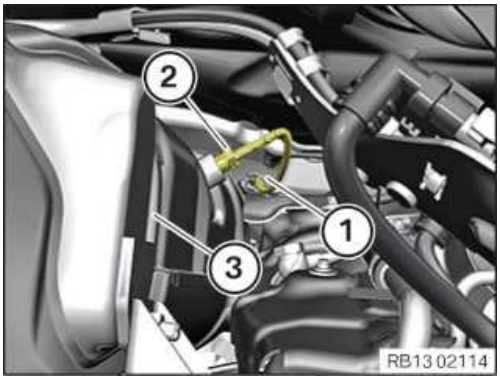
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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- Unlock and loosen connector (1).
- Uncover the exhaust temperature sensor cable.



- Guide the exhaust temperature sensor cable (2) out of the clamp (1) and place it to one side.
- Release the exhaust temperature sensor (2) with conventional tools .
- Feed out and remove the exhaust temperature sensor (2) from the diesel particulate filter (3).

49 – Remove the exhaust temperature sensor on the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

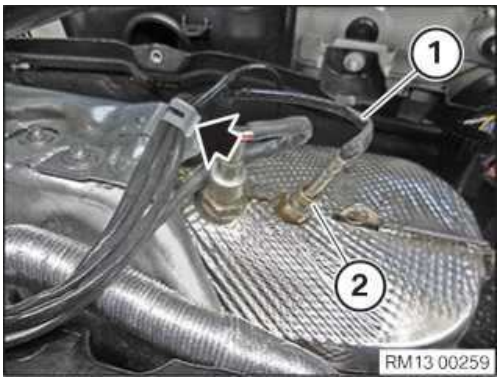
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect connector (1).
- Put the cable of the exhaust temperature sensor to one side.

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- Guide cable (1) of the exhaust temperature sensor out of the clamp (arrow) and remove it.
- Loosen exhaust temperature sensor (2).
- Feed out and remove exhaust temperature sensor (2).

50 – Remove the control sensor

WARNING

Hot surfaces.

Risk of burning!

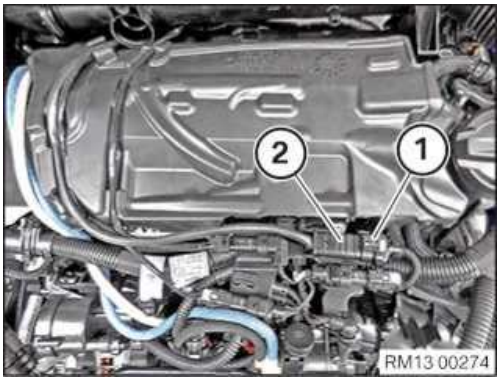
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock plug connection (1) and disconnect.
- Detach the connector (2) from the holder .
- Release the front oxygen sensor cable.



- Detach the control sensor (1) with the special tool .
- Feed out and remove the control sensor (1).

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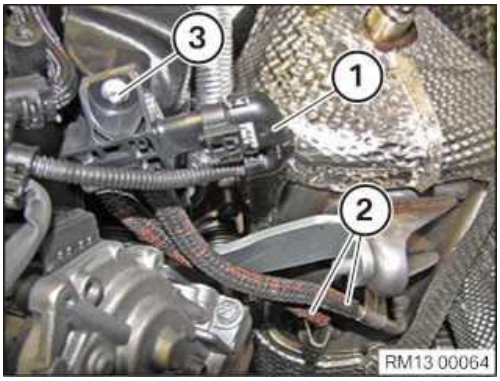
51 – Remove differential pressure sensor

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

52 – Removing the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

CAUTION

Heavy component.

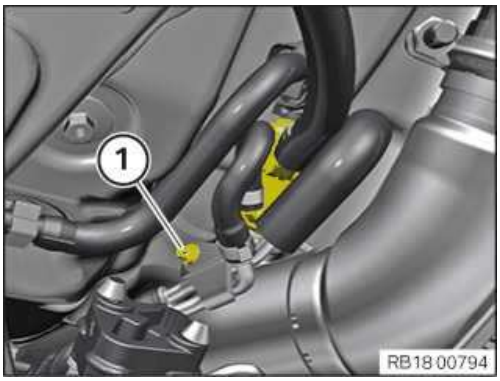
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

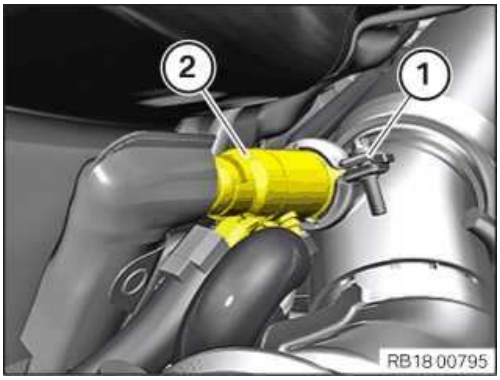


- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.

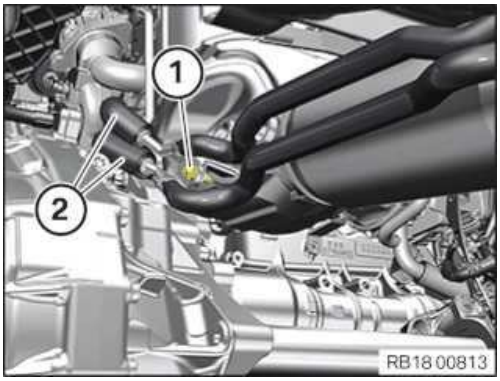
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- Loosen screw (1).



- Loosen V-band clamp (1).
- Remove the SCR metering module (2) and set it aside.



- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.

▶ **Remove differential pressure sensor**

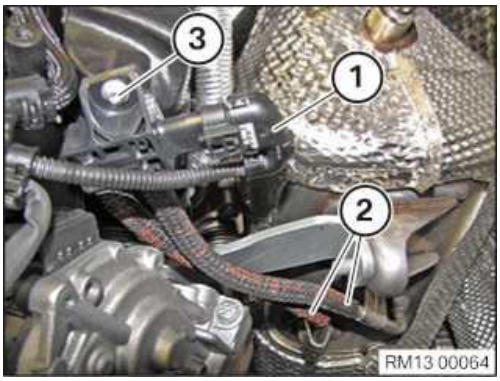
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

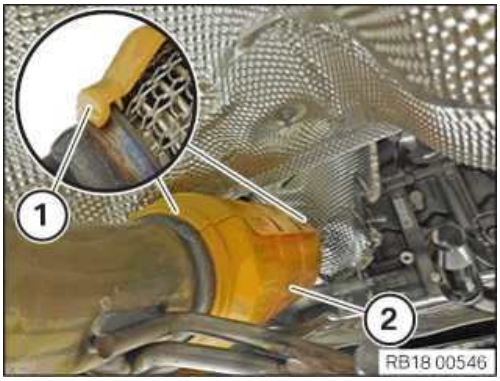
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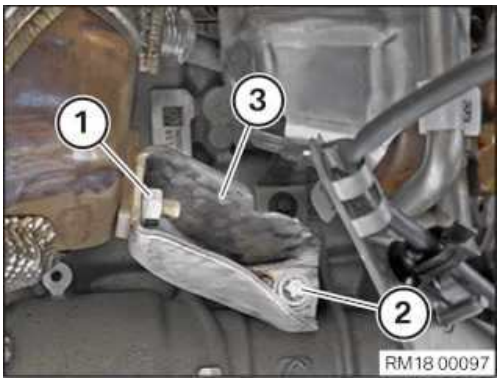
- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.



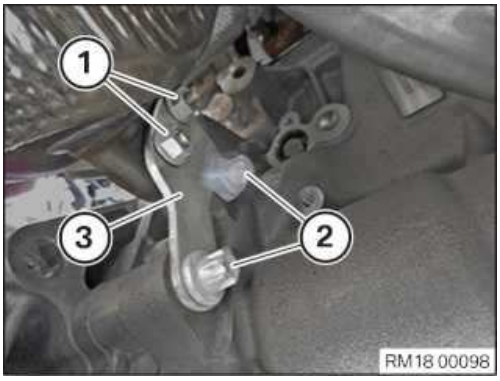
- Loosen nuts (1).



- Mount fitting aid (2).
- Make sure that the fitting aid is correctly position on the edges (1) of the flexible tube.

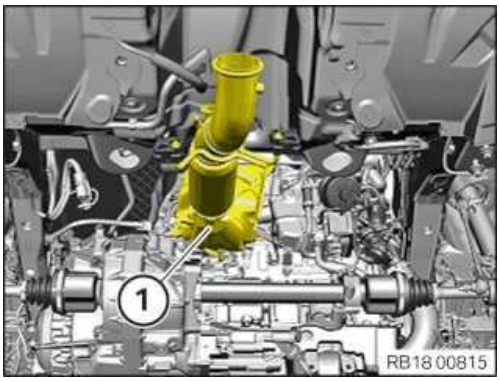


- Unfasten nut (1).
- Loosen screw (2).
- Remove holder (3).



- Loosen nuts (1).
- Loosen screws (2).
- Remove holder (3).

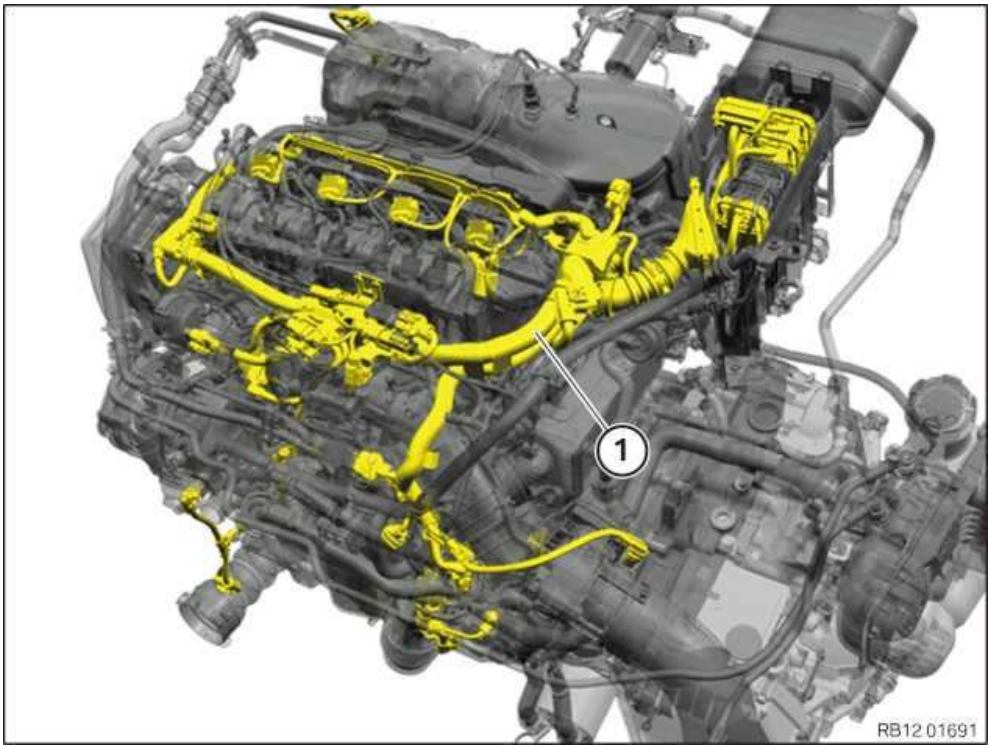
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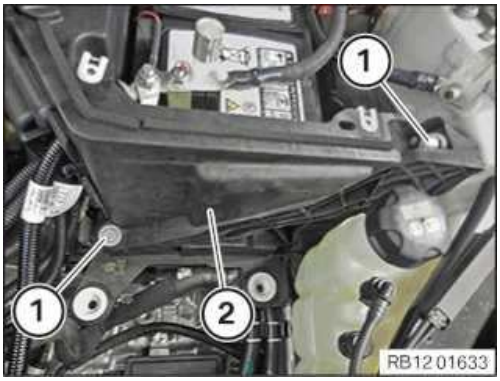
- Feed out diesel particulate filter (1) toward the bottom and remove.

53 – Releasing the wiring harness section for the intake plenum

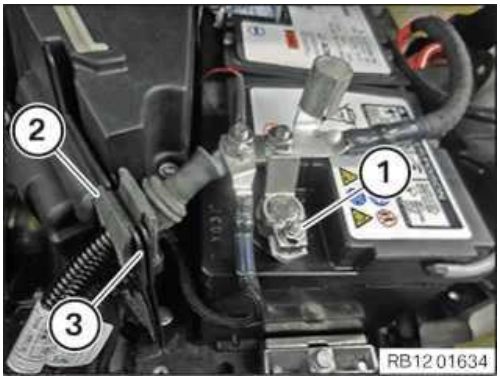
Overview: Wiring harness section for the engine



1 Wiring harness section for the engine

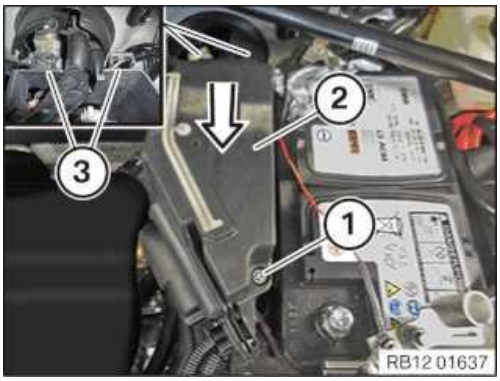


- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.

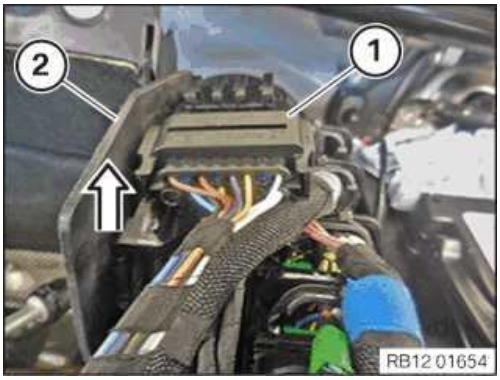


- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

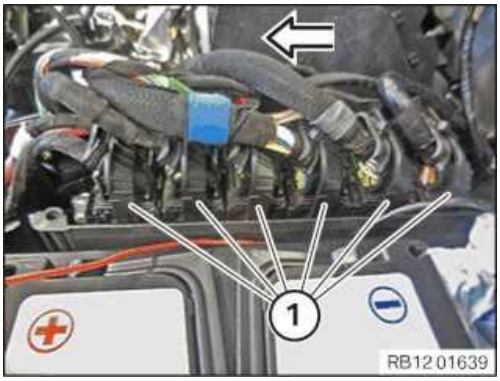
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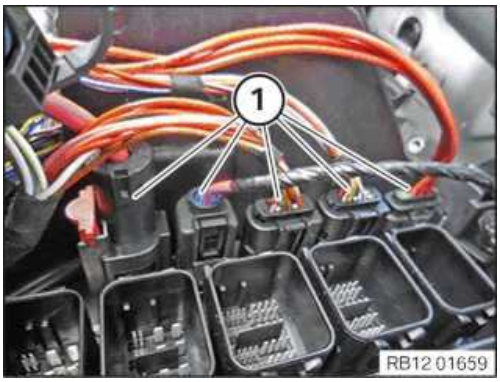
- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



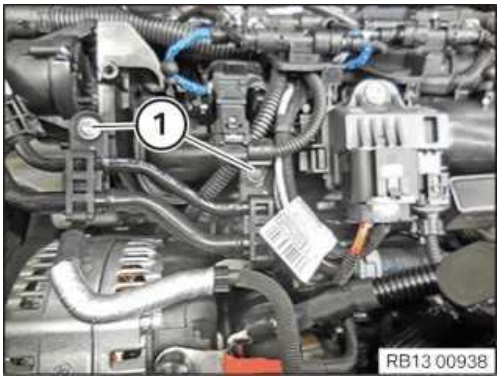
- Guide the connector (1)out of the electronics box (2) in the direction of arrow and remove it.
- Unlock and loosen connector (1).



- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

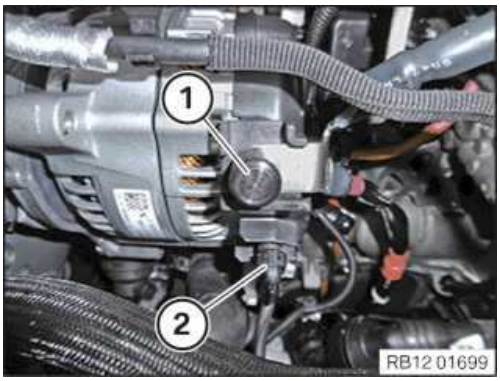


- Unlock and loosen connector (1).

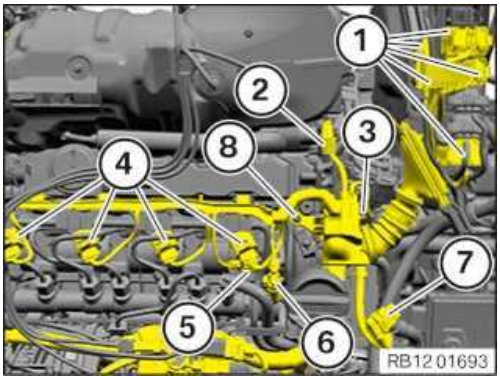


- Loosen screws (1).

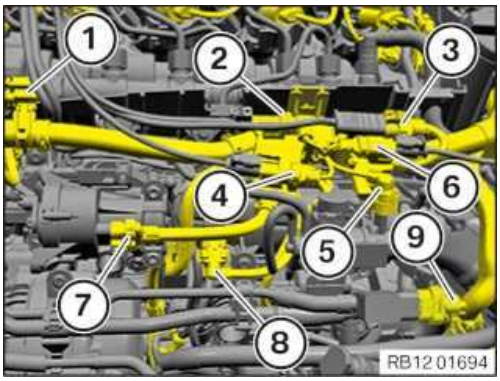
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- Release the positive battery cable (1) on the alternator and place to one side.
- Unlock connector (2) and pull off.



- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock the connector (2) and disconnect it from the differential pressure sensor.
- Unlock the connector (3) and disconnect it from the exhaust-gas recirculation valve.
- Unlock the connector (4) and pull off from the injectors.
- Unlock the connector (5) and disconnect it from the camshaft sensor.
- Unlock the connector (6) and disconnect it from the fuel pressure regulator.
- Unlock connector (7) and pull off from hot film air mass meter.
- Loosen screw (8).



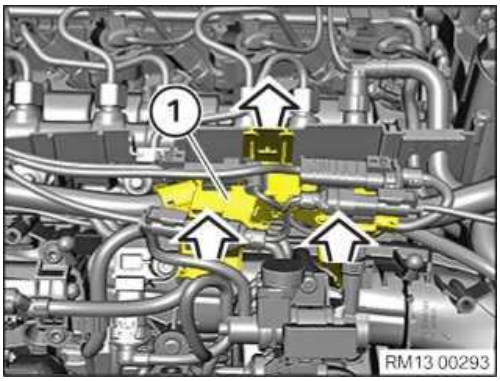
- Unlock connector (1) and pull off from the rail pressure sensor.
- Unlock the connector (2) and disconnect it from the exhaust temperature sensor before the diesel particulate filter.
- Unlock and disconnect the connector (3) from the front oxygen sensor.
- Unlock the connector (4) and disconnect it from the exhaust temperature sensor after the diesel particulate filter.
- Unlock and disconnect the connector (5) from the electric changeover valve.
- Unlock the connector (6) and disconnect it from the exhaust temperature sensor for the exhaust-gas recirculation cooler.
- Unlock the connector (7) and disconnect it from the servomotor for the swirl flaps.
- Unlock the connector (8) and pull it off the charging pressure sensor.
- Unlock the connector (9) and disconnect from the fuel pressure and temperature sensor.



- Unlock the connectors (1) of all glow elements with the special tool **0 490 796 (11 1 480)** and release them.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.

▶ **Removing the cable clips from the intake plenum**

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- Detach the cable clip (1) in the direction of the arrow.
- Guide out the cable clip (1) in direction of arrow and set it aside.

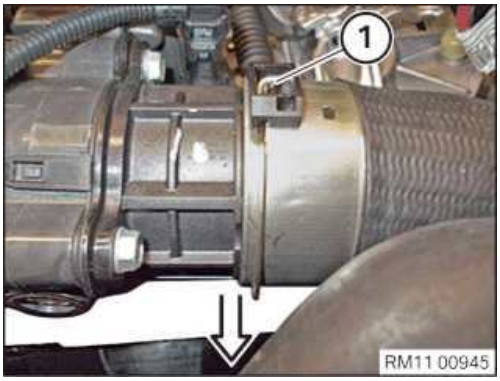
54 – Removing the intake plenum

TECHNICAL INFORMATION

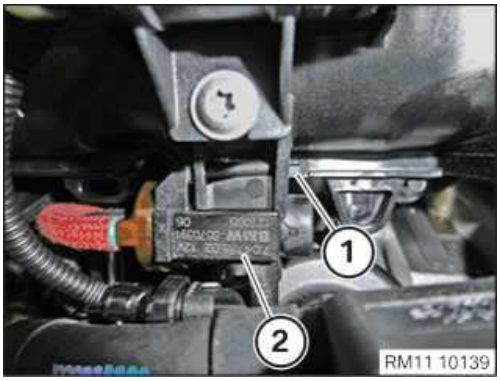
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Unlock the lock (1).

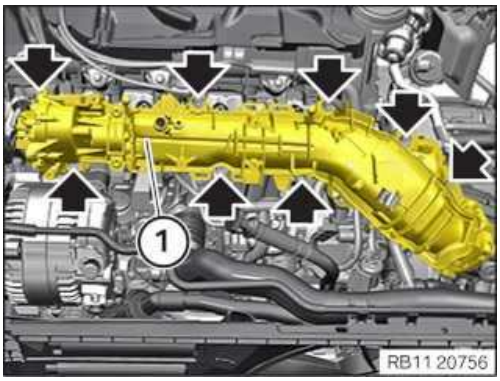


- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.

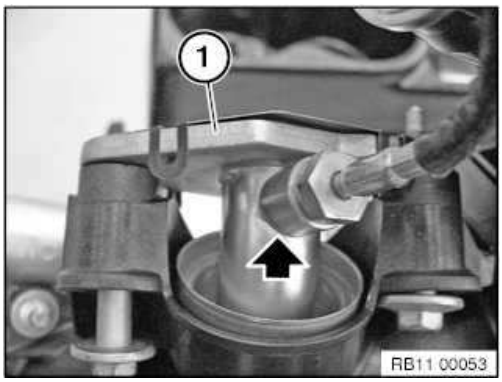


- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.

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- Release the screws (arrows) from the intake plenum (1).
- Guide the intake plenum (1) out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

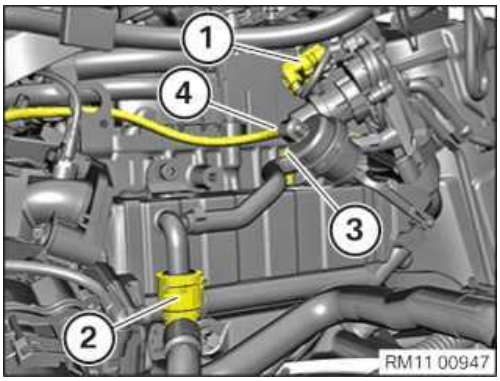
55 – Removing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

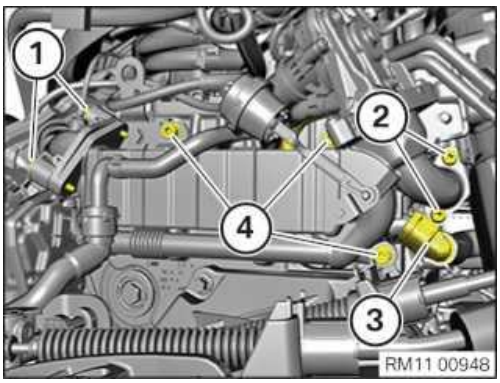
- Perform all work only on components that have cooled down.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

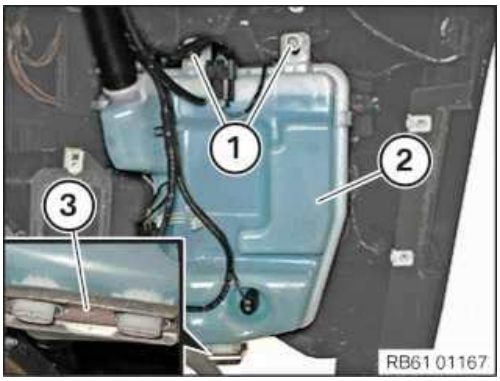
- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.

56 – Remove the washer fluid reservoir from the fixture

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- Loosen screws (1).
- Guide the washer fluid reservoir (2) up and out of the fixture (3) and set it aside.

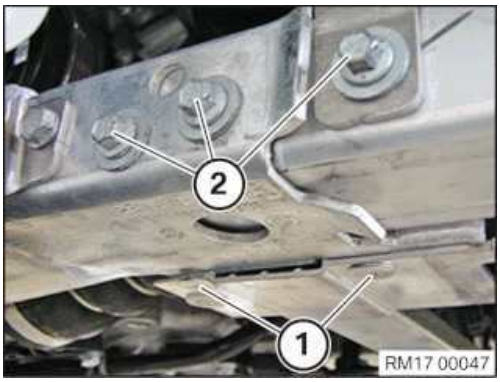
57 – Removing the right charge air duct between the exhaust turbocharger and the charge air cooler

WARNING

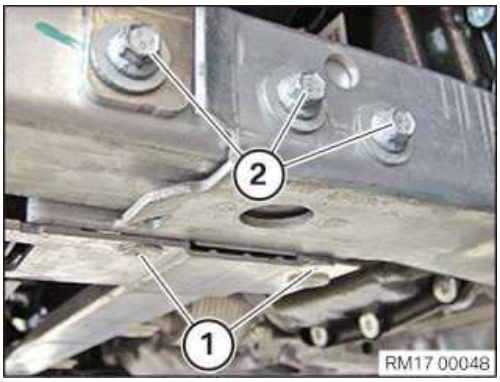
Hot surfaces.

Risk of burning!

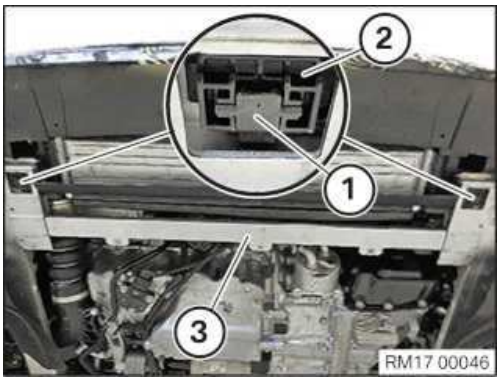
- Perform all work only on components that have cooled down.



- Undo screws (2) at front left.
- Drill out blind rivets (1) at front left.

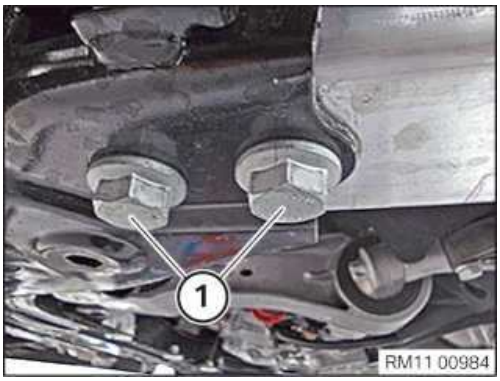


- Undo screws (2) at front right.
- Drill out blind rivets (1) at front right.

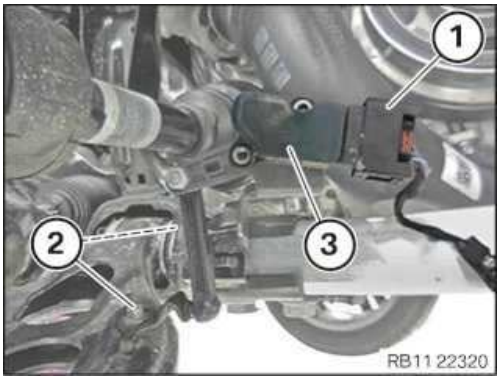


- Unlock locking pins (1).
- Thread out and remove locks (2).
- Thread out and remove cross connection (3).

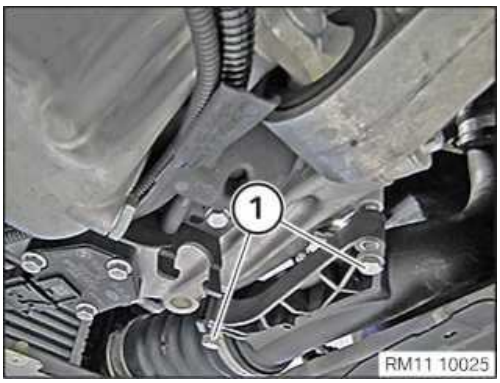
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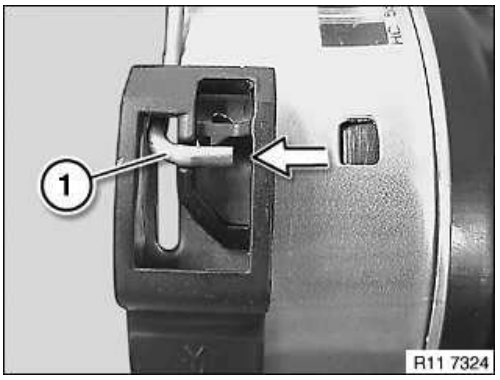
- Release the screws (1) on the right front axle support.



- **If installed:**
- Unlock and release plug connection (1).
- Loosen screws (2).
- Feed out the ride height sensor (3) and remove.

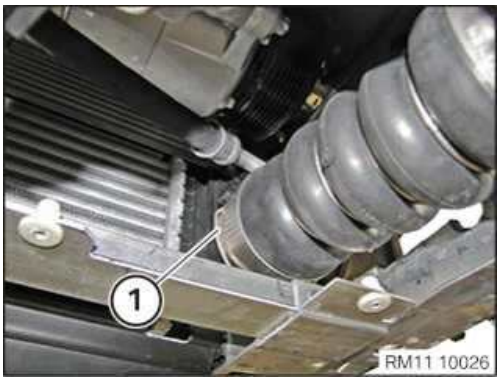


- Release screws (1) of charge air duct on right oil sump.



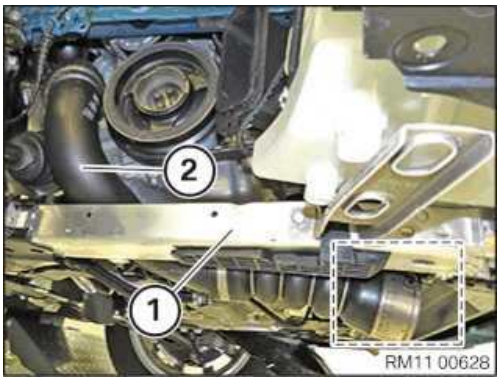
- Unlock lock (1).

  The lock (1) must engage in the bracket during unlocking (arrow).

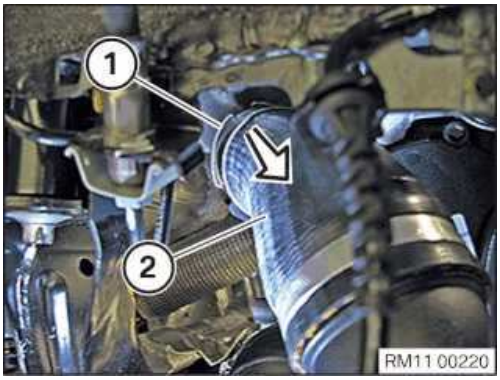


- Unlock and release the charge air duct (1) on the charge air cooler.

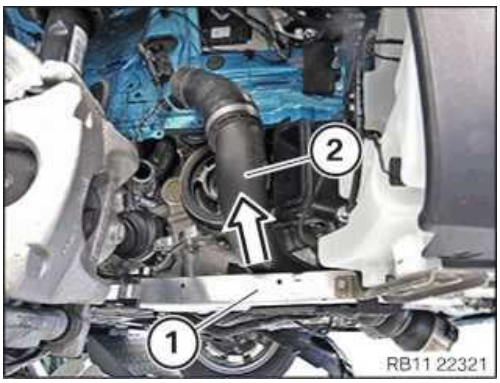
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- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed out the charge air duct (2) in the **marked** area towards the bottom and set it aside.



- Unlock and detach the locks (1) on both sides.
- Feed out the charge air duct (2) on the exhaust turbocharger in the direction of the arrow and set it aside.



- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed out the charge air duct (1) in the direction of arrow between the side member and the deformation element and remove.

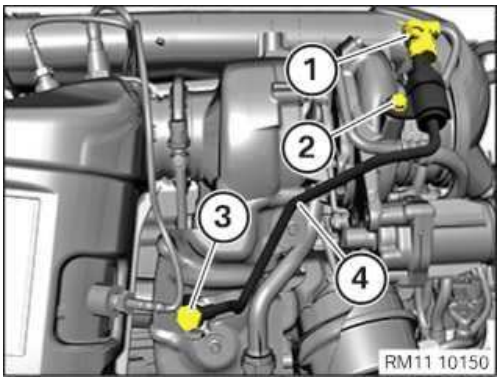
58 – Remove the heat shield from the exhaust turbocharger at the bottom

WARNING

Hot surfaces.

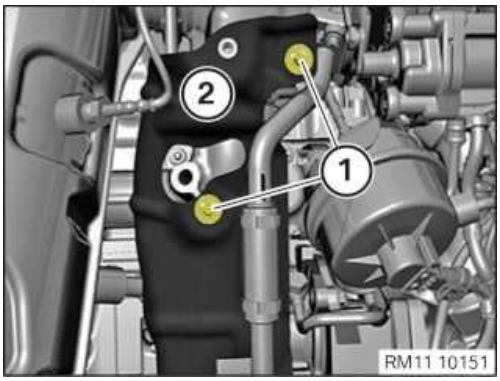
Risk of burning!

- Perform all work only on components that have cooled down.



- Unlock and disconnect connector (1).
- Unscrew the banjo bolt (3).
- The seals of the banjo bolt (3) must be renewed.
- Loosen screw (2).
- Remove the exhaust gas pressure pipe (4).

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- Unscrew the bolts (1) on the heat shield .
- Feed out and remove the heat shield (2).

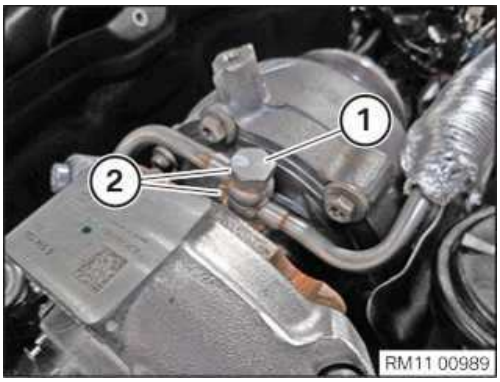
59 – Removing the low-pressure stage turbocharger

WARNING

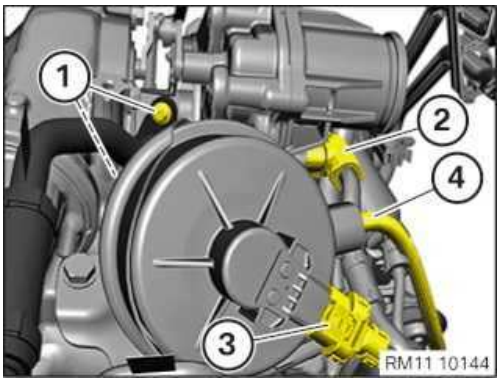
Hot surfaces.

Risk of burning!

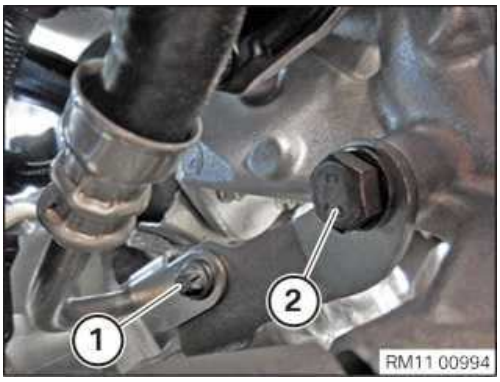
- Perform all work only on components that have cooled down.



- Release the banjo bolt (1) of the oil feed lines.
- Remove sealing rings (2).
- Place oil feed lines to one side.



- Release the screws (1) of the oil return line.
- Unlock and disconnect the plug connections (2) and (3).
- Pull off the vacuum hose (4) carefully.

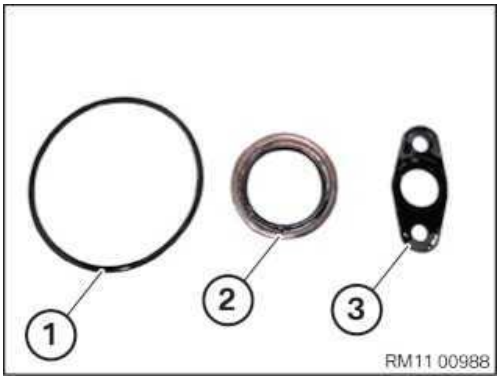


- Undo the bolt (1) of the oil feed line.
- Loosen screw (2).

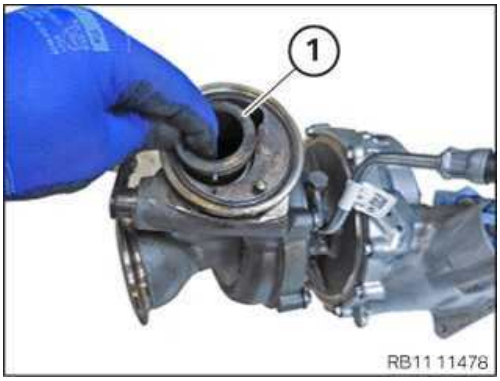
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- Loosen screw (1).
- Remove the V hose clamp.
- Guide the low-pressure stage turbocharger out towards the top and remove.



- Remove seals (1), (2) and (3).



- Remove the spacer ring (1).

60 – Removing the high-pressure stage exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

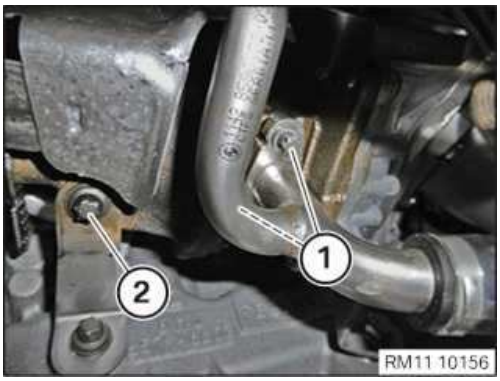
CAUTION

Heavy component.

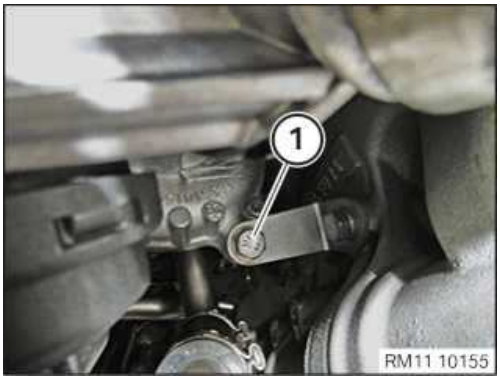
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

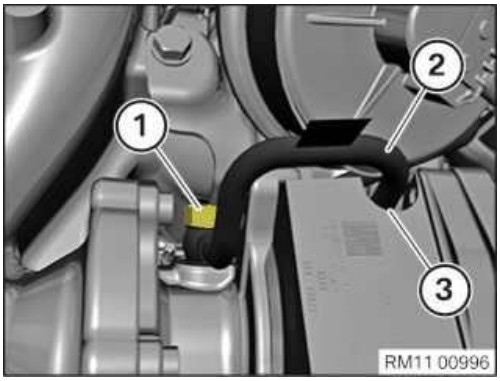
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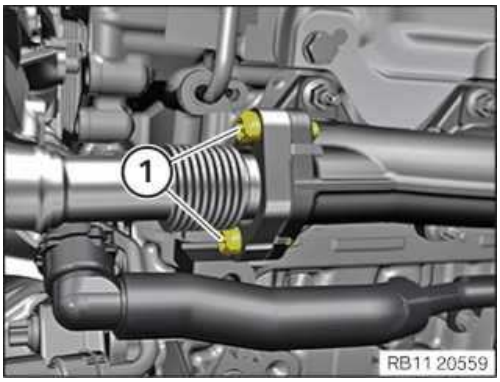
- Unscrew the bolts (1) on the oil return line .
- Loosen screw (2).



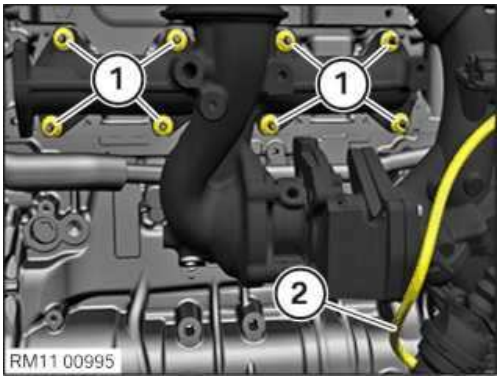
- Release screw (1) from the right wheel arch.



- Unscrew the banjo bolt (1).
- Guide out oil feed line (2) from holder (3).



- Loosen screws (1).



- Pull off the vacuum hose (2).
- Loosen nuts (1).
- Guide out the exhaust manifold and the high-pressure stage exhaust turbocharger to the top and remove them.

61 – Removing high pressure lines between rail and injectors

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

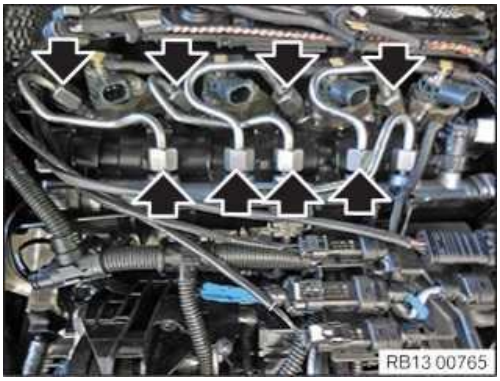
TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release the high pressure lines (arrows) with the special tool .
- Catch and dispose of escaping fuel.
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool .

62 – Remove leakage oil lines

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

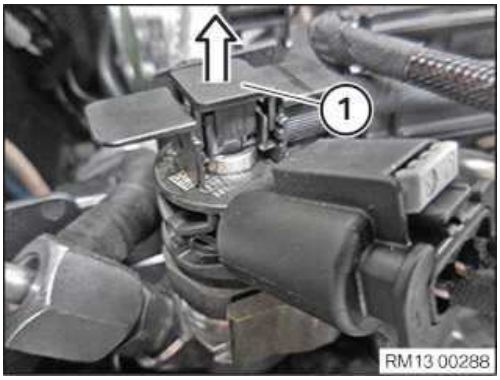
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

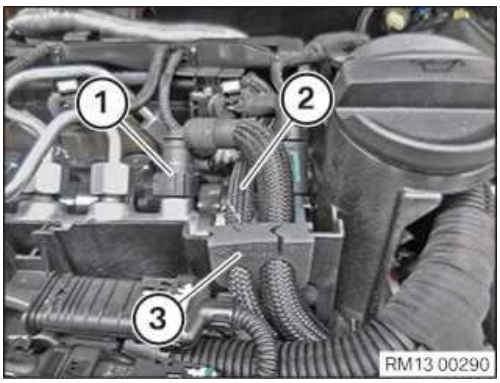
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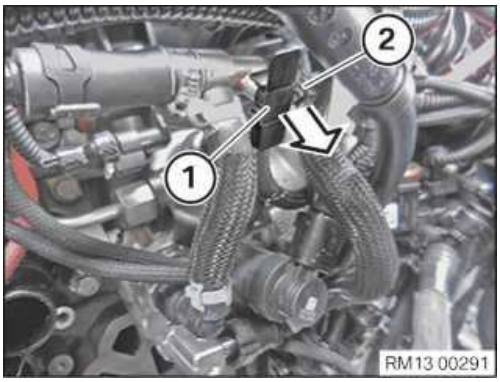
- Unlock the connectors (arrows) and disconnect.



- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.



- Unlock and loosen fuel line (1) and set it aside.
- Guide the leakage oil line (2) out of the rubber grommet (3) and set it aside.



- Release lock (1) in direction of arrow.
- Feed out leakage oil line (2) and remove.

63 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE



Electrostatic discharge.

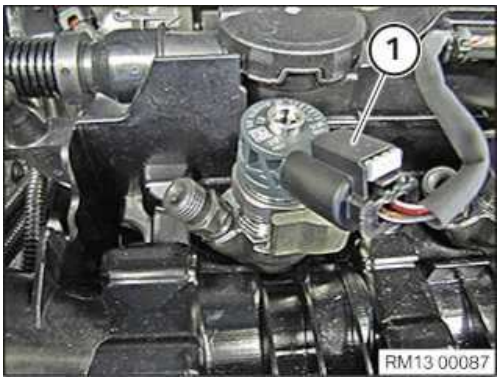
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

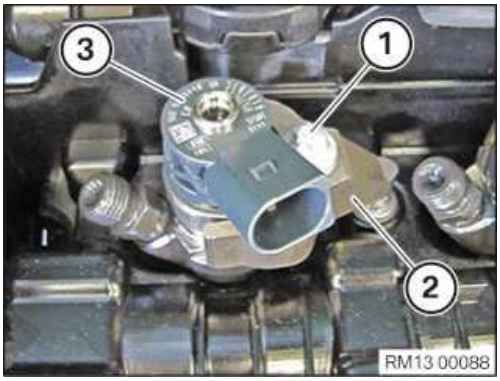
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TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.



- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

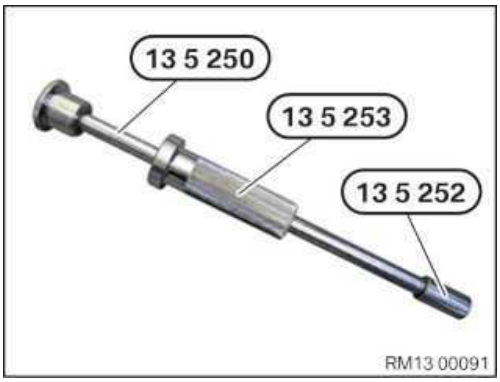
▶ **Loosen stuck injectors**

RISK OF DAMAGE

Contaminant or foreign body.

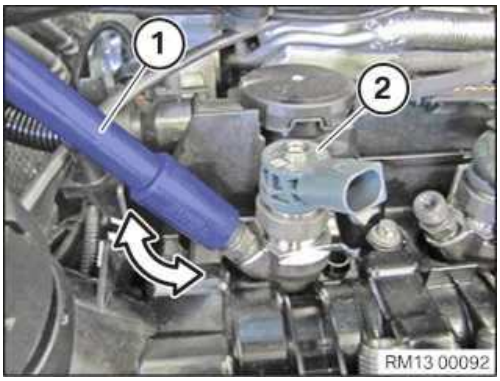
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)** back onto the special tool **0 493 321 (13 5 250)**.

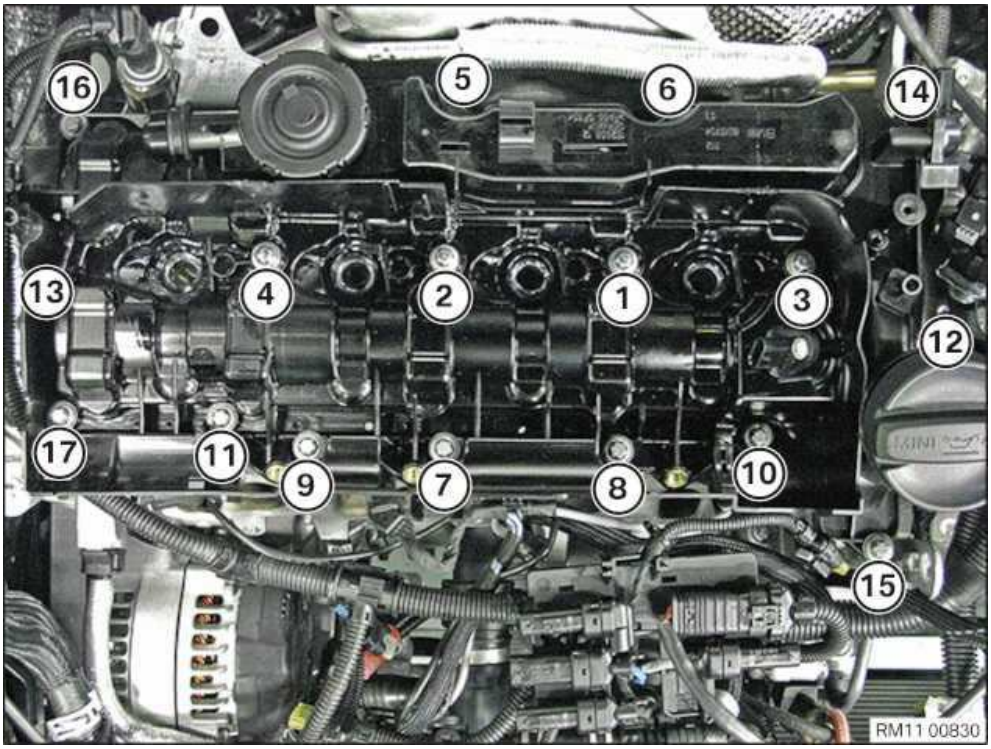
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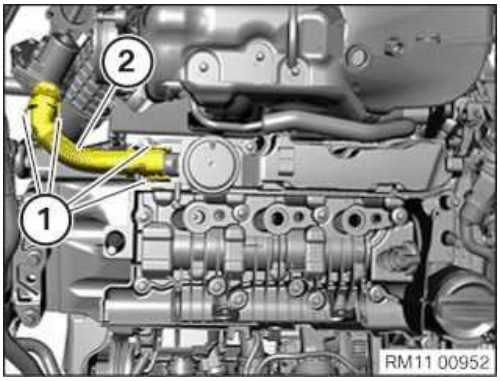
- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

64 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover

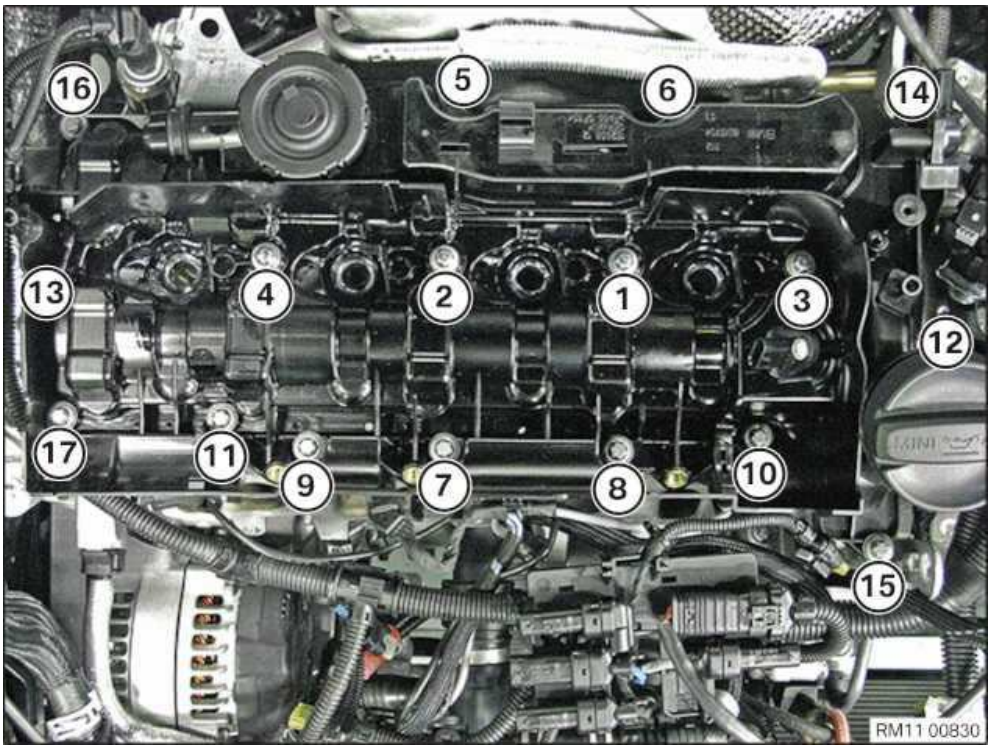


1 to 16 screws of the cylinder head cover.



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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- Loosen screws in the order (17) to (1).
- Remove cylinder head cover by lifting it out.

65 – Checking camshaft timing



- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

Damage to the engine.

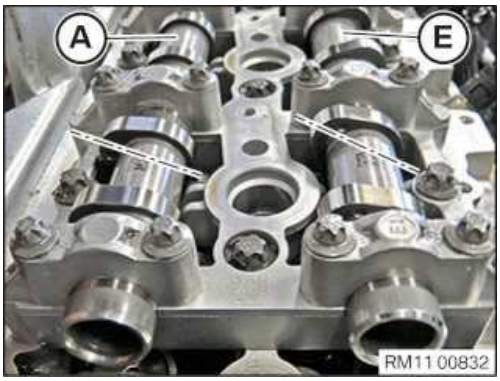
The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

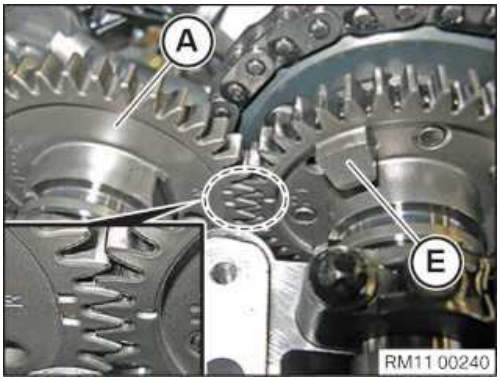
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- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.



- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

66 – Remove chain tensioner piston

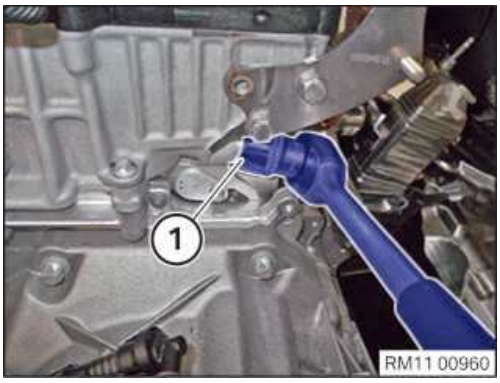
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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

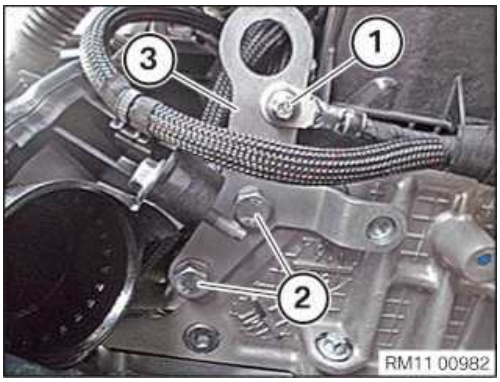


TECHNICAL INFORMATION

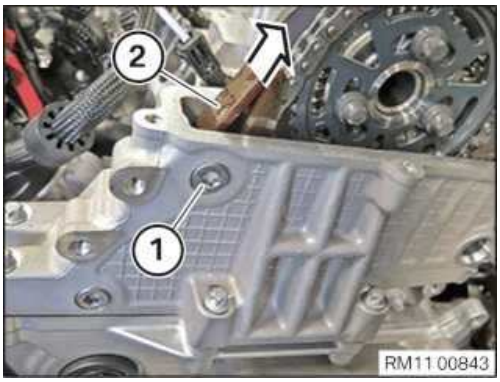
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

67 – Remove the timing chain guide rail

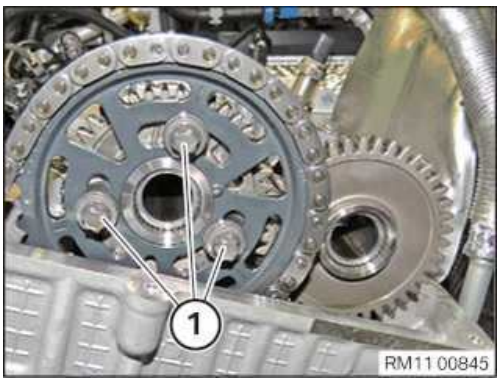


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

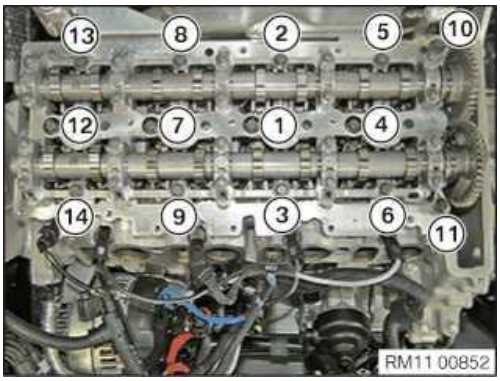
68 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

69 – Removing the camshaft support

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- Evenly loosen all screws in a sequence from (14) to (1).
- Loosen and remove all screws in a sequence from (14) to (1).

  Both camshafts can be removed with the camshaft carrier.
- Remove the camshaft support including camshafts towards the top.

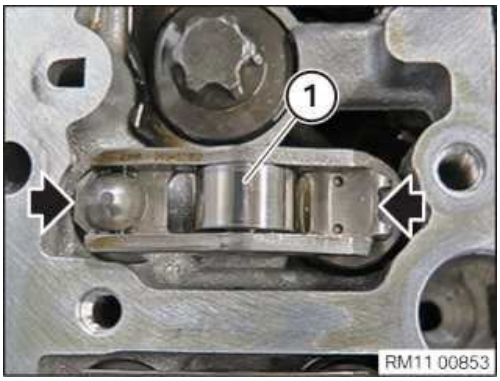
70 – Remove roller cam followers

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



RISK OF DAMAGE

Damage to the engine.

If the classification of the roller cam followers is ignored, this can lead to engine damage.

- Observe the classification of the roller cam followers.
- Always reuse used roller cam followers at the same position.

- Remove the roller cam follower (1) and place it onto the special tool **0 495 105 (11 4 480)**.
- Repeat the process for all roller cam followers.

71 – Removing the hydraulic valve clearance compensating element

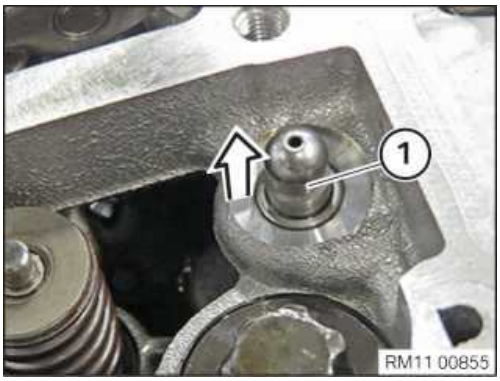
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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- Remove the hydraulic valve clearance compensating element (1) in the direction of the arrow and place on the special tool **0 495 105 (11 4 480)**.
- Repeat the process on all hydraulic valve clearance compensating elements.

72 – Removing glow elements

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Damage to the glow elements.

Excessive force may damage the glow elements and they may then have to be renewed.

- Handle glow elements with care and do not drop.
- Do not rest the cylinder head on glow elements. Glow elements protrude from the sealing surface of the cylinder head.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

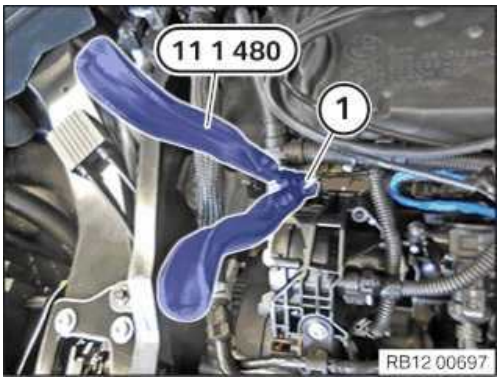
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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect plug connection (1) using special tool **0 490 796 (11 1 480)**.



- Release the glow elements with the special tool or conventional tools.
- Feed out preheating elements and remove.

73 – Remove cylinder head.

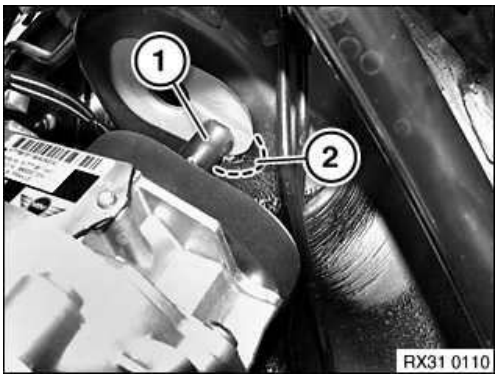
CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

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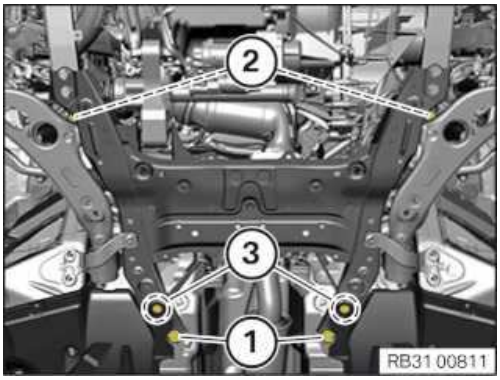


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- Position front axle support.
- Bend the underbody panelling to the side in area (3).
- Raise front axle support.
- When raising, insert the charge air cooler into its rubber mount on the transmission cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

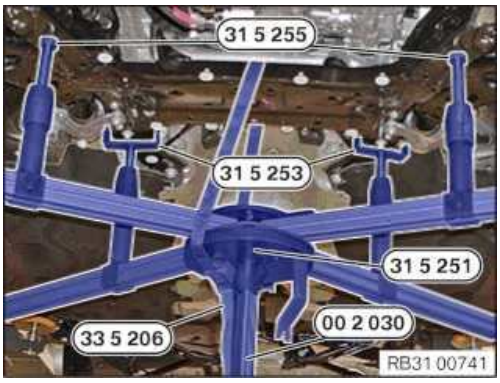
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

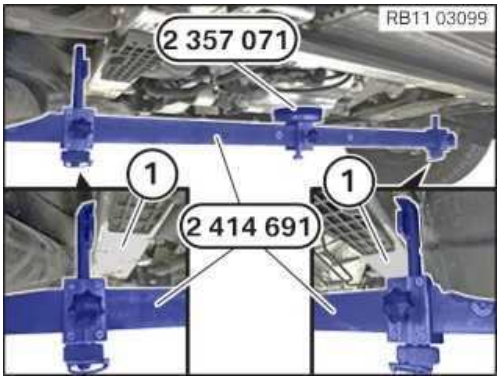
- If applicable, tighten the screws in area (3).

Underbody protection to body

Screw		Tightening torque	3 Nm

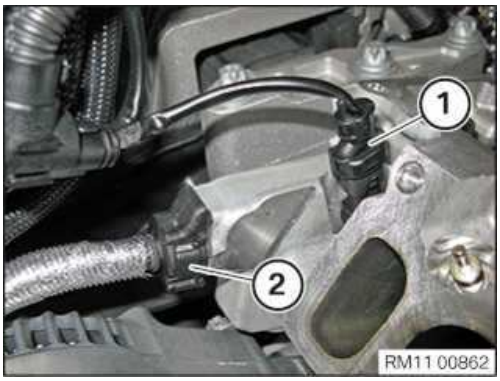


- Remove special tool from special tool .
- Lower the universal jack **0 490 133 (00 2 030)** with the special tool and set it aside.



- Prepare special tool together with the special tool **2 357 071**.
- Attach special tool to front axle support and align special tool **2 357 071** correctly under the oil sump and then tighten.
- Turn special tool at adjusting screw uniformly upwards, until the special tool **2 357 071** makes contact with the oil sump.
- Tighten all adjusting screws of special tools and **2 357 071**.

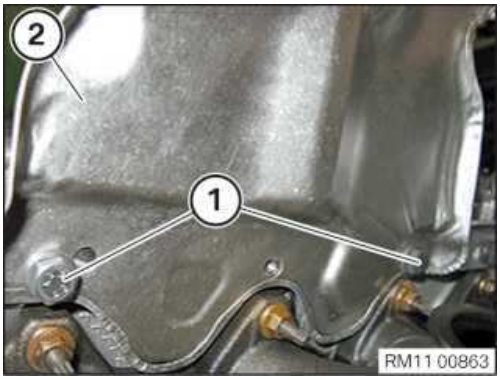
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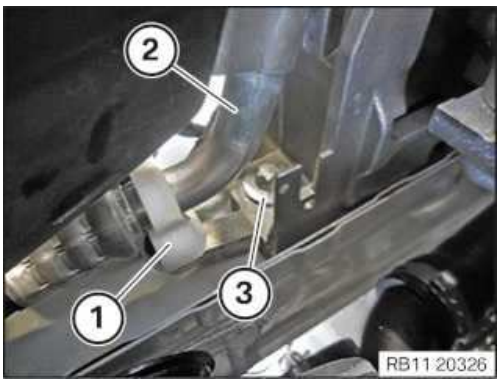
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Release the connector (1) from the coolant temperature sensor.
- Unlock and loosen coolant line (2).



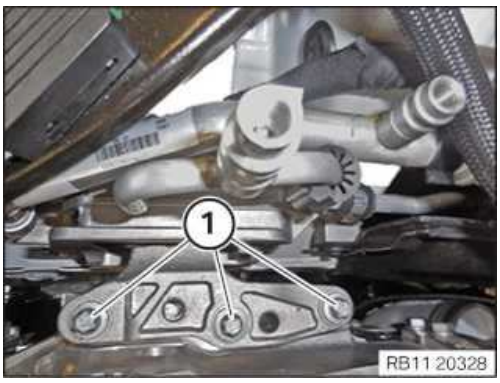
- Loosen screws (1).
- Feed out the heat shield (2) and set it aside.



- Unlock and loosen holder (1).
- Feed out the refrigerant line (2) and put to one side.
- Loosen screw (3).

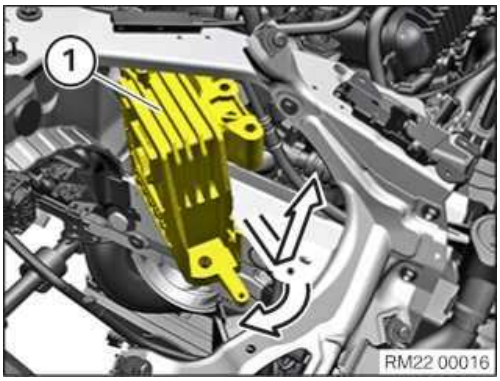


- Loosen screw (1).

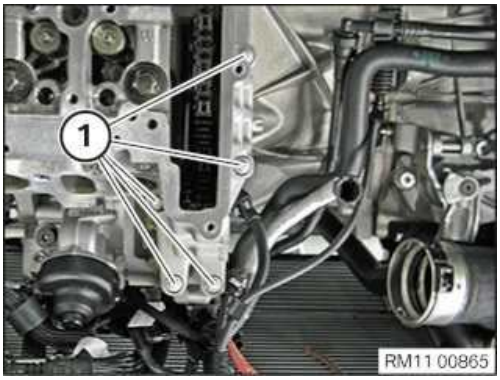


- Loosen screws (1).

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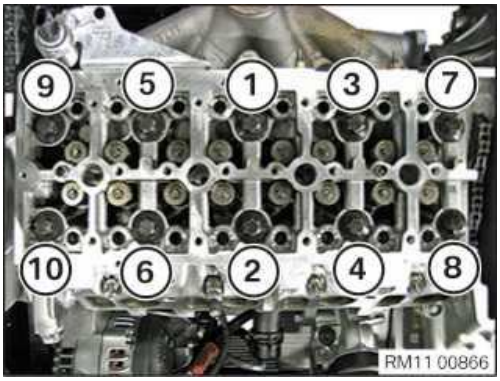
- Turn engine mount (1) in direction of arrow and remove upwards.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screws (1).



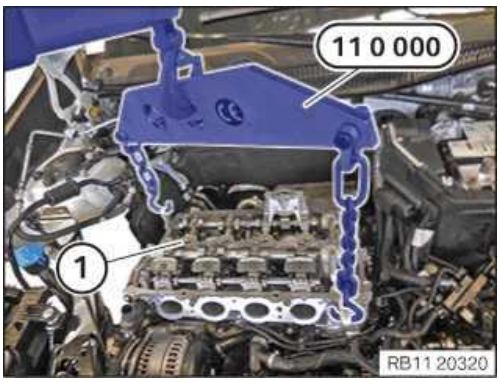
- Loosen the cylinder head bolts in the sequence from (10) to (1).
- Remove cylinder head bolts (1) to (10) with washers.



- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

M8		Tightening torque	21,5 Nm



RISK OF DAMAGE

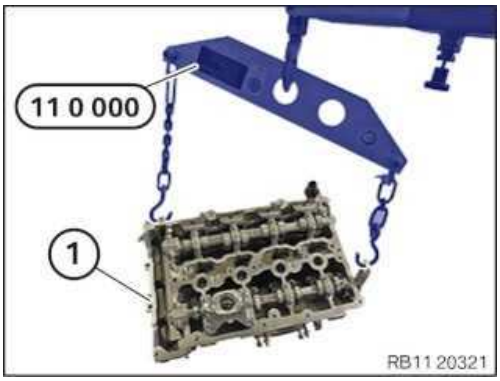
Damage to the guide rails.

Large amounts of force may damage the guide rails of the timing chain.

- Make sure not to damage the guide rail with the cylinder head when removing and installing the cylinder head.

- **Carefully** guide out the cylinder head (1) with the engine lifter and the special tool **0 490 561 (11 0 000)** and remove.

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- Mount the cylinder head (1) on the special tool **0 494 362 (11 9 000)**.

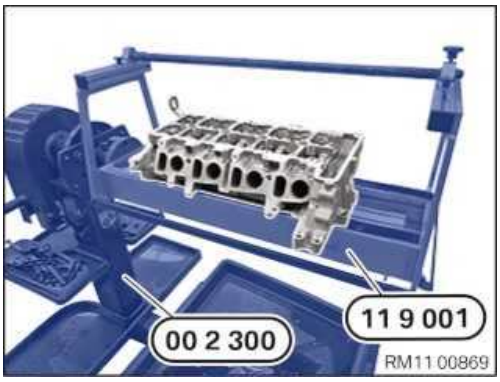
74 – Remove all valve springs

RISK OF DAMAGE

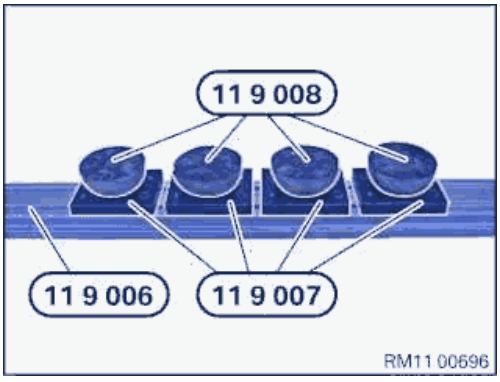
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Mount and screw the cylinder head onto the special tools **0 494 366 (11 9 001)** and **0 495 187 (00 2 300)**.

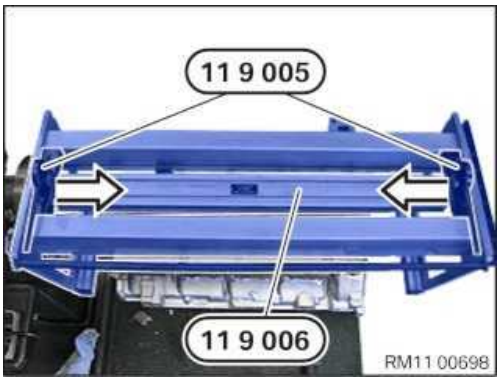


- Prepare the special tools **0 494 371 (11 9 006)**, **0 494 372 (11 9 007)** and **0 494 373 (11 9 008)** as shown.



- Position special tool **0 494 373 (11 9 008)** as illustrated.

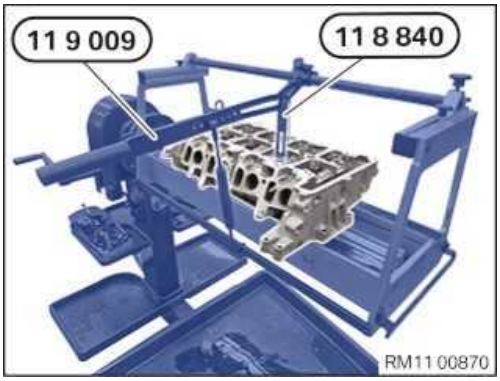
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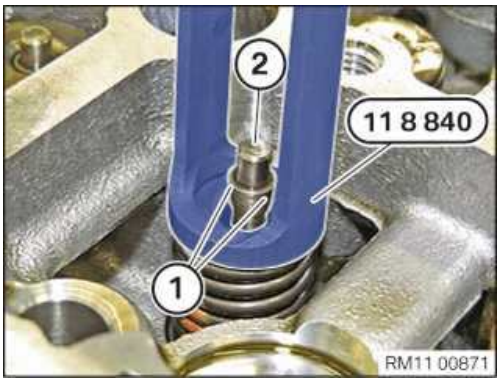
- Turn round special tool **0 494 371 (11 9 006)** and insert as shown.
- Lock special tool **0 494 370 (11 9 005)** in direction of arrow.



- Lock special tool **0 494 370 (11 9 005)** in direction of arrow.
- Use the special tool **0 494 362 (11 9 000)** to bring the cylinder head into the installation position by 180°.



- Align special tool **0 494 374 (11 9 009)** in direction of valve axis.
- Position the special tool **0 496 143 (11 8 840)** according to the nut.
- Press down the valve spring on the upper spring cup with the special tools **0 494 374 (11 9 009)** and **0 496 143 (11 8 840)**.
- The **hooks** from the set of special tools **0 494 362 (11 9 000)** can be used to **hold** the valve spring down.



- Keep the valve spring pressed down with the special tool **0 496 143 (11 8 840)**.
- Remove the valve shims (1) from the valve (2) using a magnet.
- Guide the valve spring and spring cup out and remove.
- Set down valve spring, spring cup and valve shims (2) in the special tool **0 495 105 (11 4 480)** in an orderly manner.

75 – Remove valve stem seals

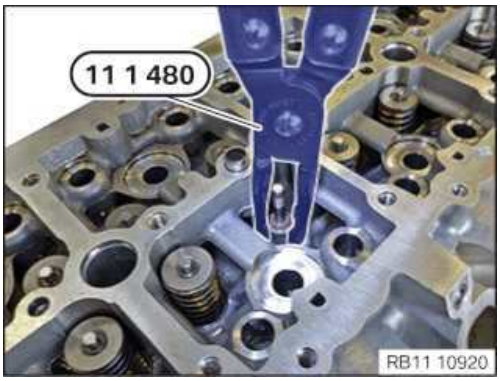
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

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- Disassemble the valve stem seal (1) using the special tool **0 490 796 (11 1 480)**.

MAIN WORK

76 – Remove all valves

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

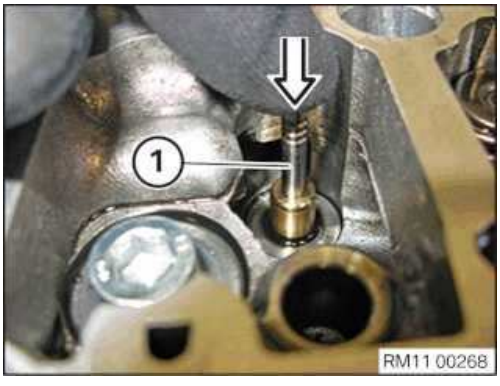
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Turn the cylinder head with the special tool **0 494 362 (11 9 000)**.
- Unlock the special tool **0 494 370 (11 9 005)** in the direction of the arrow.
- Remove special tool **0 494 371 (11 9 006)**.

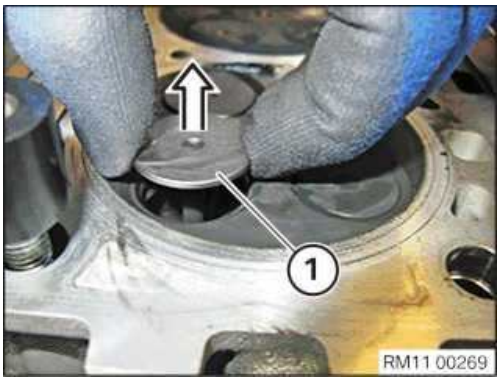


- Remove special tool **0 494 373 (11 9 008)** if necessary.



- Push the valve stem (1) into the cylinder head in the direction of the arrow.

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- Remove the valve (1) in the direction of arrow and store it properly in the special tool **0 495 105 (11 4 480)**.

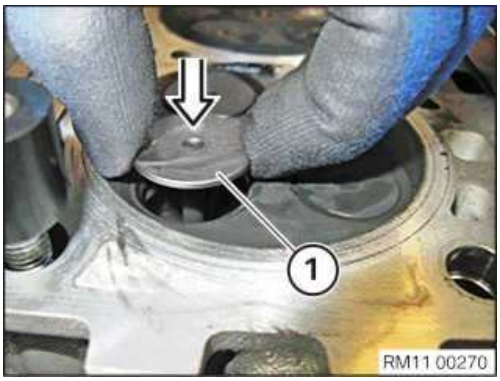
77 – Install all valves

RISK OF DAMAGE

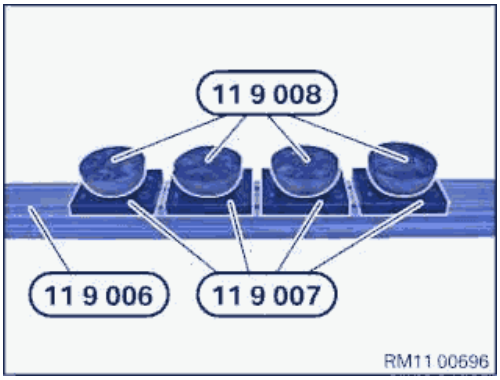
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Insert and install the valve (1) in the direction of the arrow.

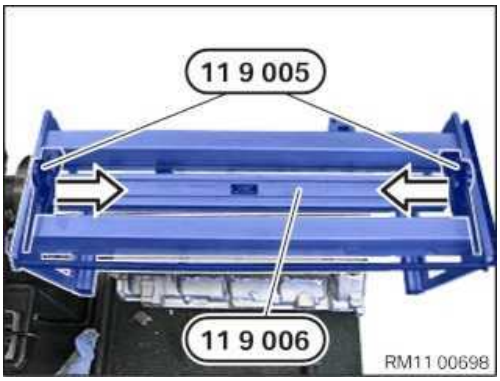


- Prepare the special tools **0 494 371 (11 9 006)**, **0 494 372 (11 9 007)** and **0 494 373 (11 9 008)** as shown.



- The special tools **0 494 373 (11 9 008)** must be set up accordingly in the next operation.

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- Turn round special tool **0 494 371 (11 9 006)** and insert as shown.
- Lock special tool **0 494 370 (11 9 005)** in direction of arrow.



- Lock special tool **0 494 370 (11 9 005)** in direction of arrow.
- Use the special tool **0 494 362 (11 9 000)** to bring the cylinder head into the installation position by 180°.

POSTPROCESSES

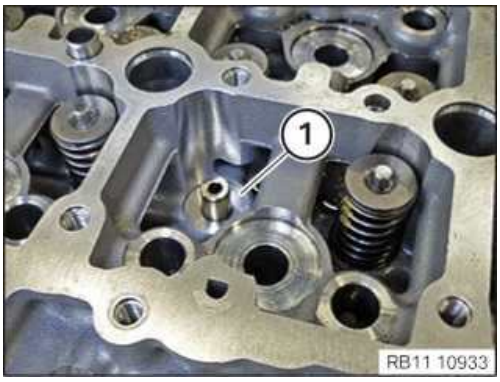
78 – Installing valve stem seals

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



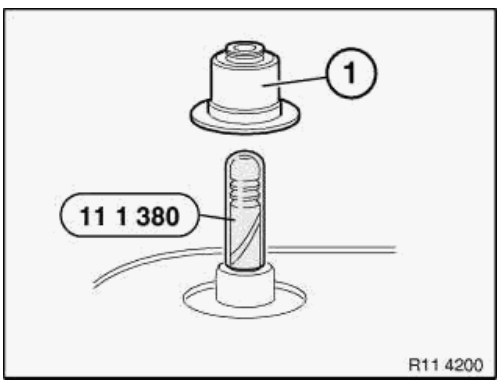
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

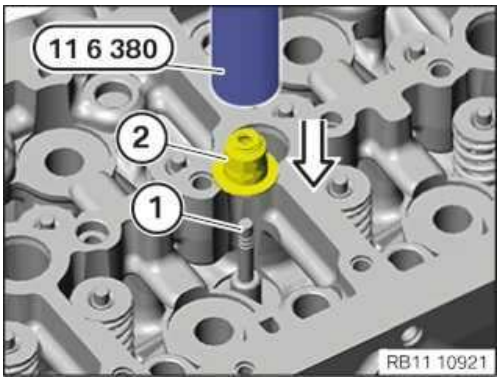
- Clean the contact surfaces (1).



- Fit special tool **0 490 746 (11 1 380)**.
- Oil the valve stem seal (1) and install it.

  Parts: Valve stem seal

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- Position the valve stem seals (2) on the valve (1).
- Use special tool **0 493 249 (11 6 380)** to press down the valve stem seal (2) until they are in contact with the cylinder head.

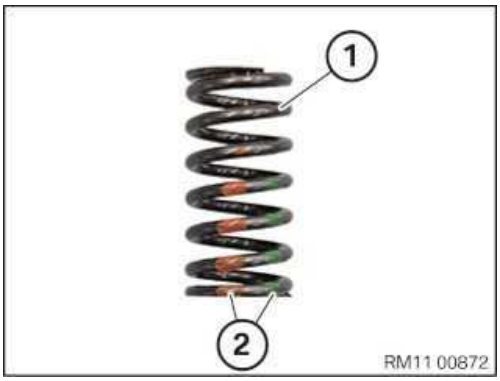
79 – Install all valve springs

RISK OF DAMAGE

Contaminant or foreign body.

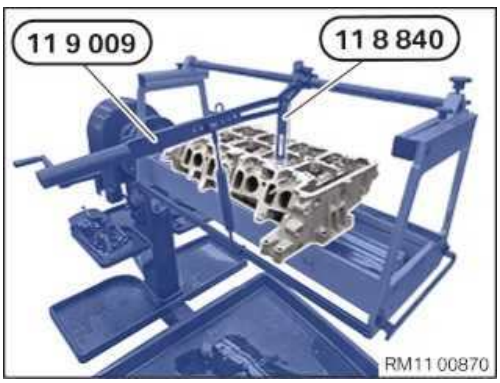
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

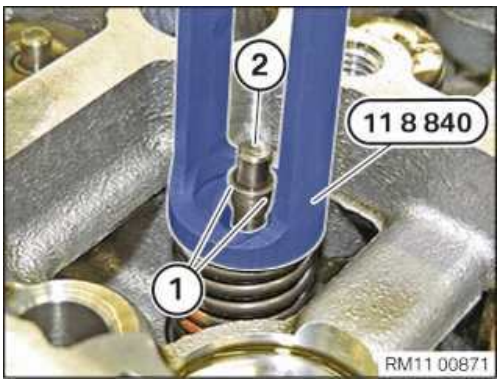


- The valve spring (1) is marked with a colour code (2).

  The mounting orientation of the valve spring (1) can be freely chosen.



- Align special tool **0 494 374 (11 9 009)** in direction of valve axis.
- Position the special tool **0 496 143 (11 8 840)** according to the nut.
- Press down the valve spring on the upper spring cup with the special tools **0 494 374 (11 9 009)** and **0 496 143 (11 8 840)**.
- The **hooks** from the set of special tools **0 494 362 (11 9 000)** can be used to **hold** the valve spring down.

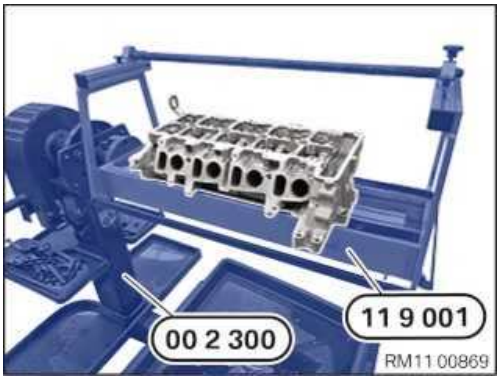


- Keep the valve spring pressed down with the special tool **0 496 143 (11 8 840)**.
- Insert the valve shims (1) at the valve (2) with the magnet and install.
- Relieve load on valve spring.
- Make sure that the valve shims (1) are installed correctly.

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- Unlock the special tool **0 494 370 (11 9 005)** in the direction of the arrow.
- Guide the special tool **0 494 371 (11 9 006)** out and remove.



- Unscrew and remove the cylinder head from the special tools **0 494 366 (11 9 001)** and **0 495 187 (00 2 300)**.

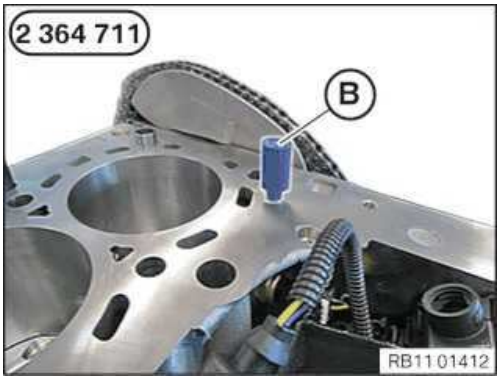
80 – Cleaning the sealing surface

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Lock the front oil duct using special tool (B) from special tool **2 364 711**.



RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 103 (11 4 471)**.

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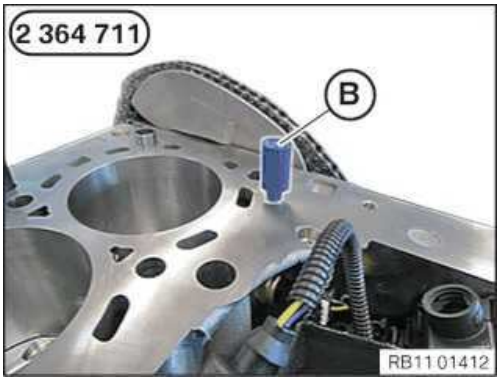
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

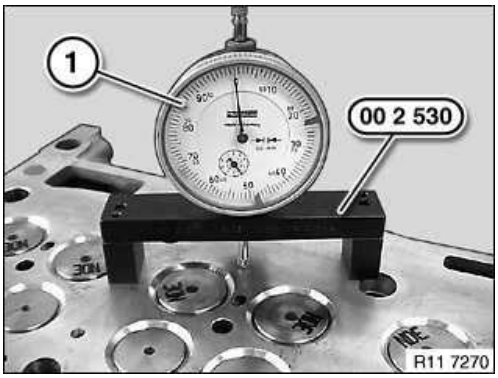
- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 104 (11 4 472)**.

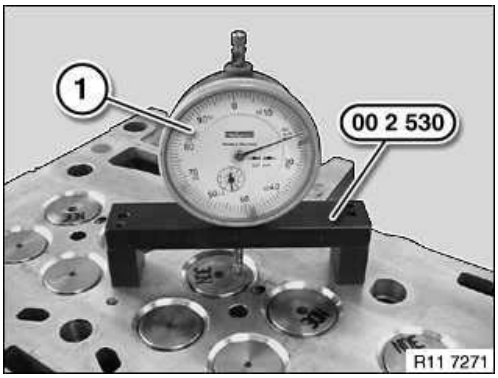


- Remove special tool (B).

81 – Checking the valve underprotrusion



- Set the dial gauge (1) onto the cleaned cylinder sealing surface with slight preload in special tool **0 490 185 (00 2 530)**.
- Set dial gauge in mildly preloaded state to "zero".



Check

- Position the dial gauge (1) on the valve with special tool **0 490 185 (00 2 530)**.
- Measure valve underprotrusion and compare with the setpoint value.

Valve underprotrusion

	0,8 (0,7 - 0,9) mm

Result

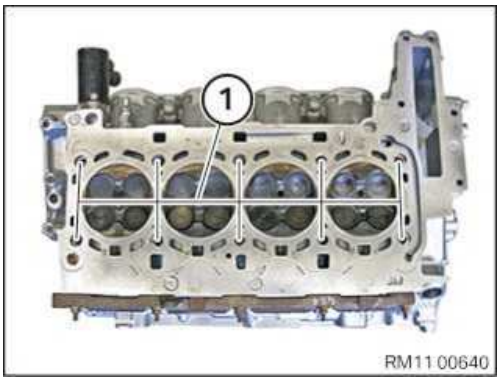
» Valve underprotrusion is outside tolerance.

Measure

- Replace cylinder head.

82 – Renewing the cylinder head gasket

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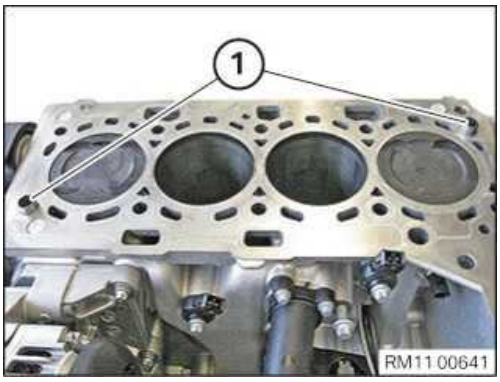
RISK OF DAMAGE

Damage to the surface.

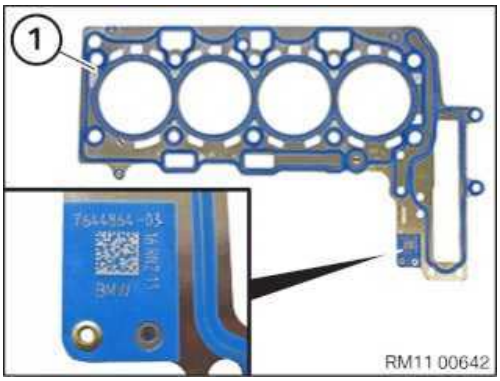
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Remove oil and dirt residue from the blind holes (1).

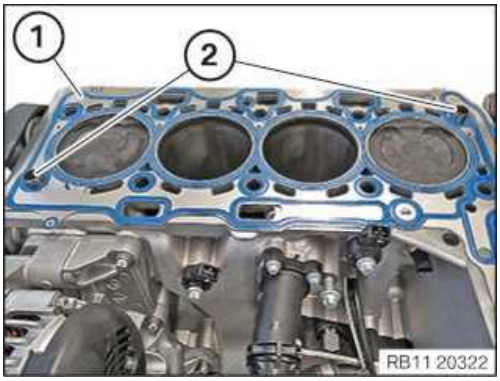


- Check the fitting sleeves (1) for secure fit and damage.



- Identify the cylinder head gasket (1) using the part number.

Note: If the cylinder head is reworked, an additional thicker gasket 0.3 mm is available for service personnel.



- Guide in the cylinder head gasket (1) and install.
- Ensure that the cylinder head gasket (1) is installed correctly in the fitting sleeves (2).

83 – Installing the cylinder head

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

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RISK OF DAMAGE

Damage to threads.

Fluid in the threaded hole may damage the thread when screws are tightened in the threads.

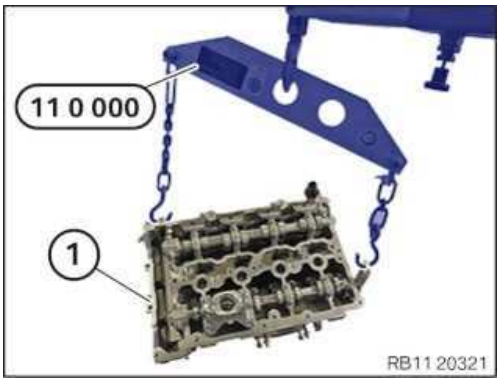
- Dry threaded holes (e.g. using compressed air).

TECHNICAL INFORMATION

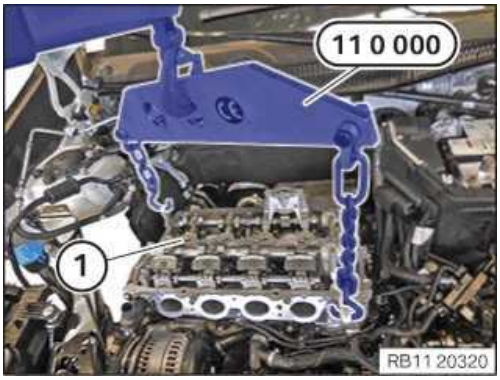
Do not remove bolt coating.

TECHNICAL INFORMATION

When replacing the cylinder head: The complete valve control and the Valvetronic servomotor are already pre-assembled for new cylinder heads.



- Position cylinder head (1) on special tool **0 490 561 (11 0 000)** and engine lifter.



RISK OF DAMAGE

Damage to the guide rails.

Large amounts of force may damage the guide rails of the timing chain.

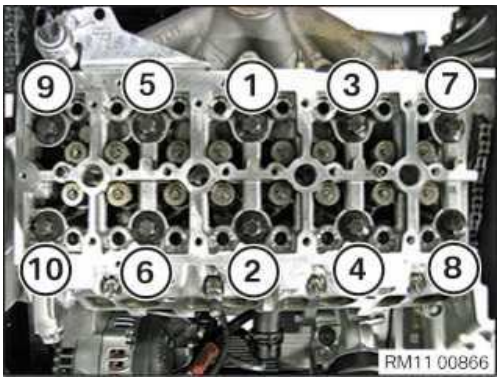
- Make sure not to damage the guide rail with the cylinder head when removing and installing the cylinder head.

- Feed in the cylinder head (1) **carefully** with the engine lifter and the special tool **0 490 561 (11 0 000)** and install.



- Unscrew the bolts (1) of the special tool **2 459 012**.
- Guide the special tool **2 459 012** out and remove.

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- Renew the cylinder head bolts (1).

  Parts: Cylinder head bolts
- Do **not** wash off coating of cylinder head bolts.
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

  No coolant, water or engine oil must be present in threaded holes of engine block.

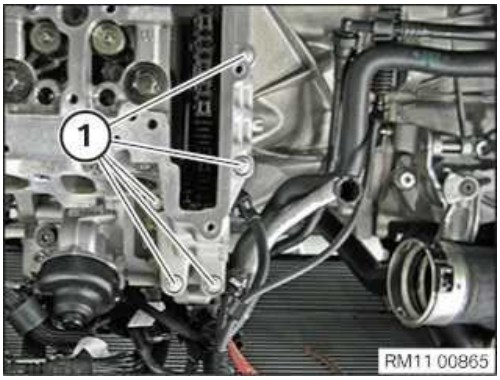
TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Feed in cylinder head bolts and install.
- Screw in cylinder head bolts in sequence (1) to (10).
- Tighten cylinder head bolts using special tools **0 490 504 (00 9 120)** and in sequence (1) to (10).

Cylinder head to crankcase

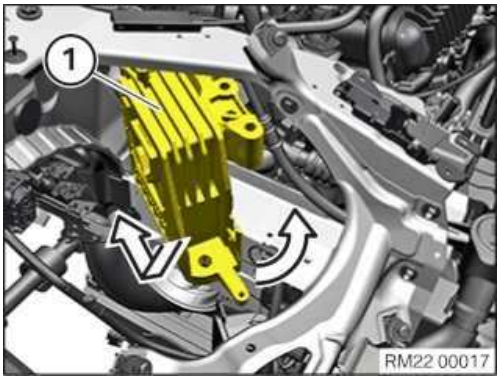
M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °



- Tighten the cylinder head bolts (1).

Cylinder head bolt to timing case cover

M8x40		Tightening torque	19 Nm



- Thread in engine mount (1) in direction of arrow then install.

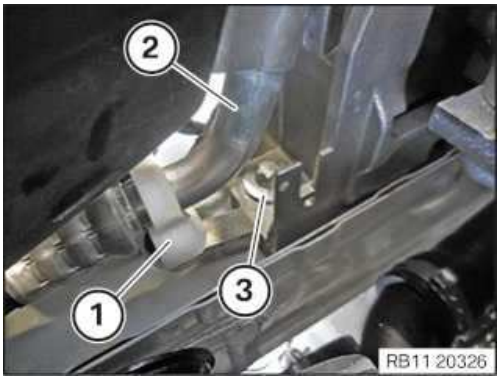
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- Tighten down screw (1).

Right engine mount to side member

M12		Tightening torque	100 Nm

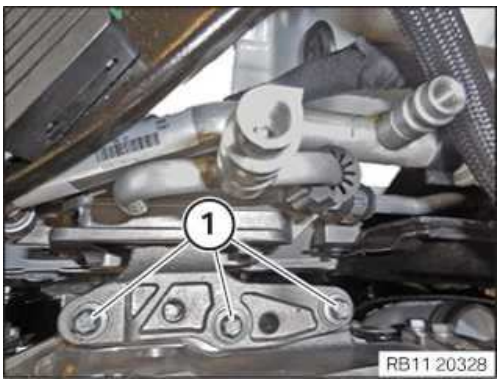


- Tighten down screw (3).

Right engine mount to side member

M12		Tightening torque	100 Nm

- Feed in and install the refrigerant line (2).
- Lock holder (1).
- Make sure the bracket (1) engages audibly.

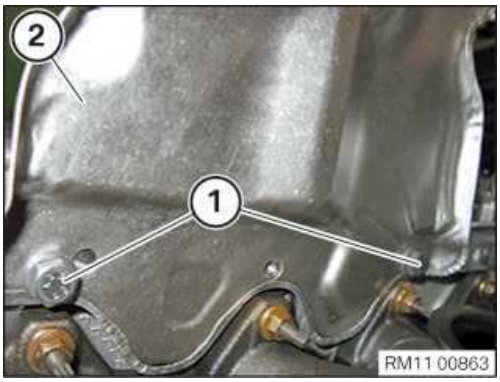


- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Right engine mount to cylinder head

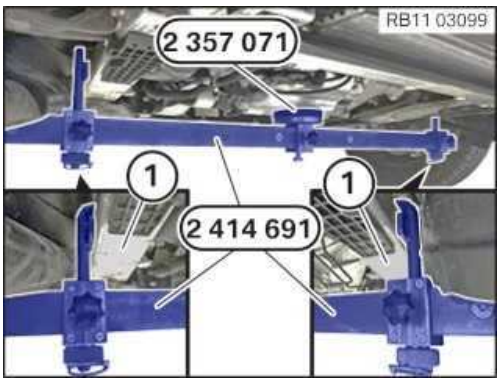
M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °



- Feed in and install the heat shield (2).
- Tighten the screws (1).

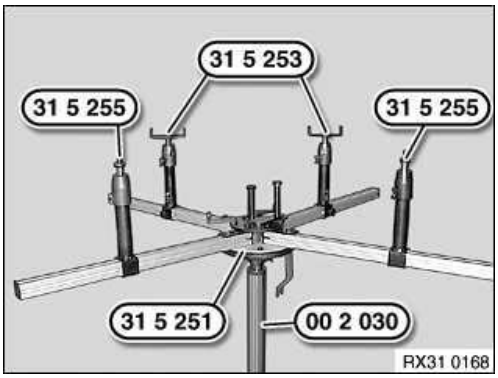
Heat shield to cylinder head

M8X16		Tightening torque	10 Nm



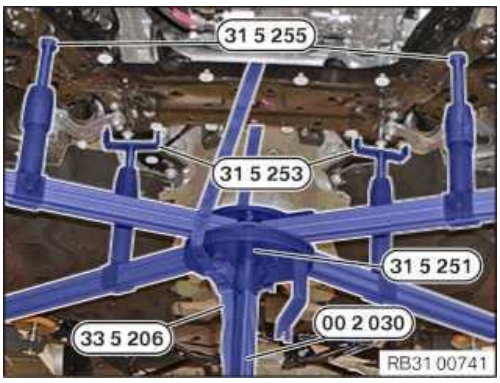
- Disassemble special tool using special tool **2 357 071**.

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- Fit the special tool completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools in telescopic supports of a profile rail pair.
- Insert special tools in telescopic supports of other profile rail pair.

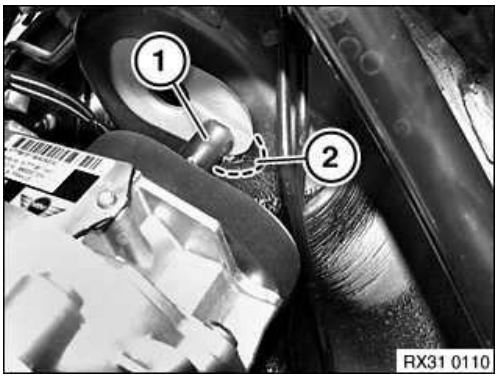
Note: In a profile rail pair, two profile rails are connected to one another by gearing.



- Align special tools and to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool to special tool .

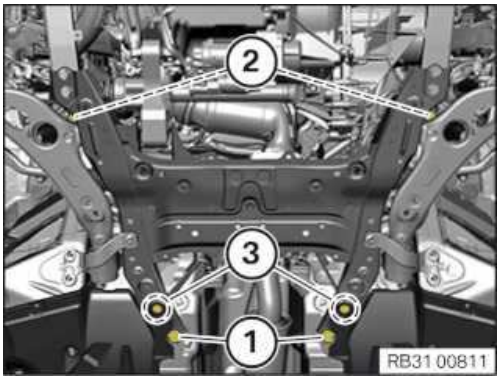


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

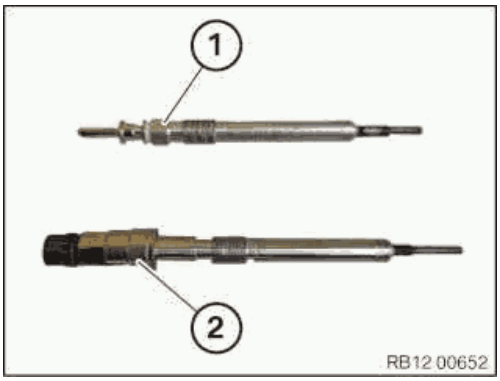
- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and the front axle remove.

84 – Install glow elements



- Install glow elements (1) in cylinders 1, 2, 3 and 4.
- If fitted: Glow element (2) with the **combustion chamber pressure sensor** must be installed in cylinder **2**.

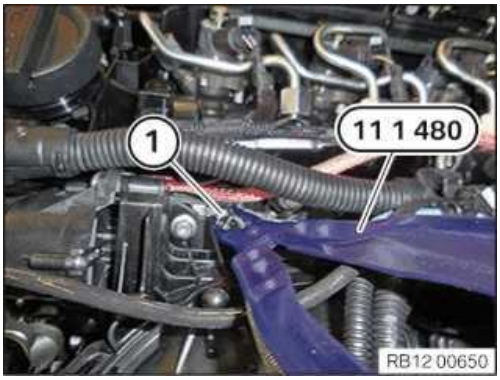
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- Tighten the glow element with the special tool or conventional tools.

Glow elements to cylinder head

Glow element		Tightening torque	13 Nm



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

85 – Installing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Install the hydraulic valve clearance compensating element (1) in the direction of the arrow.
- Repeat the process on all hydraulic valve clearance compensating elements.

86 – Install the roller cam followers

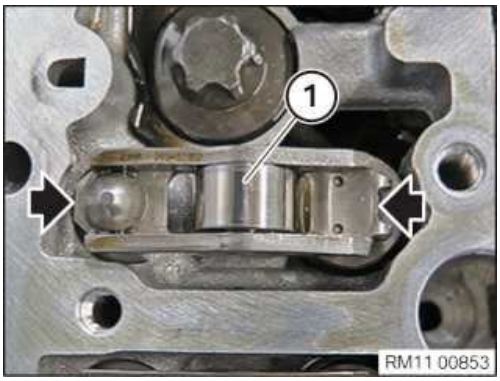
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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RISK OF DAMAGE

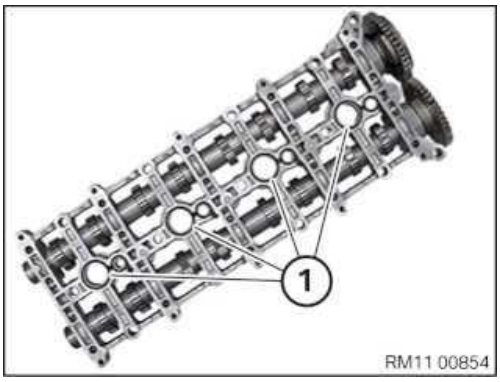
Damage to the engine.

If the classification of the roller cam followers is ignored, this can lead to engine damage.

- Observe the classification of the roller cam followers.
- Always reuse used roller cam followers at the same position.

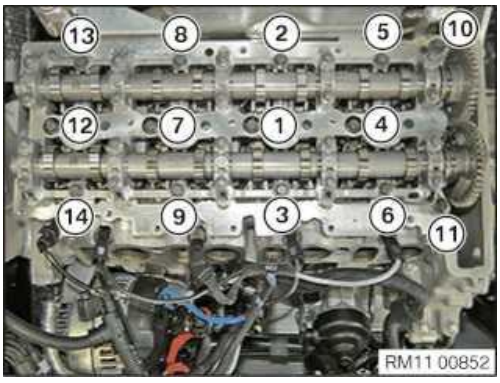
- Install the roller cam follower (1).
- Repeat the process for all roller cam followers.

87 – Installing the camshaft support



- Renew gaskets (1).

  Parts: gaskets

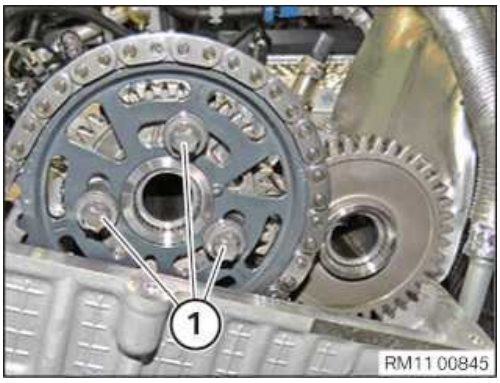


- Position the camshaft support including the camshafts.
- Tighten the screws in a sequence from (1) to (14) in several steps.

Camshaft carrier to cylinder head

M7x35		Tightening torque	13 Nm

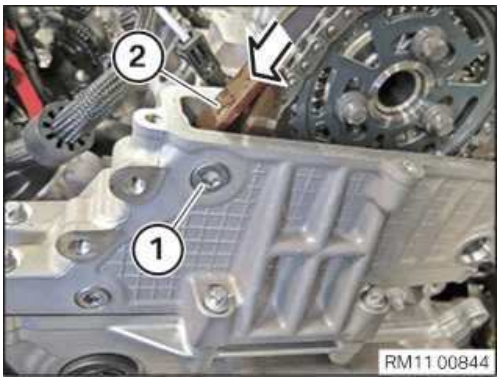
88 – Installing the camshaft sprocket on the intake camshaft



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

89 – Install the timing chain guide rail

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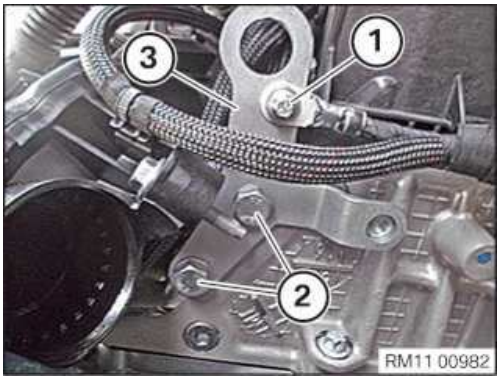
- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm



- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6		8 Nm

90 – Installing the chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Renew sealing ring (1).

  Parts: Sealing ring

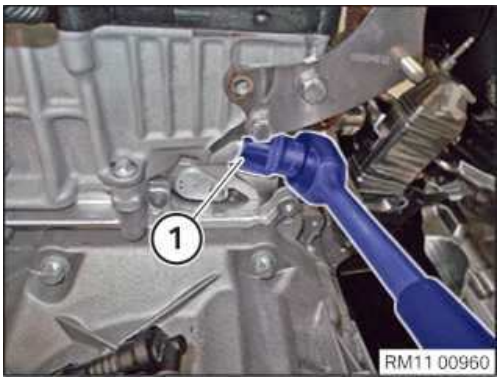


TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.

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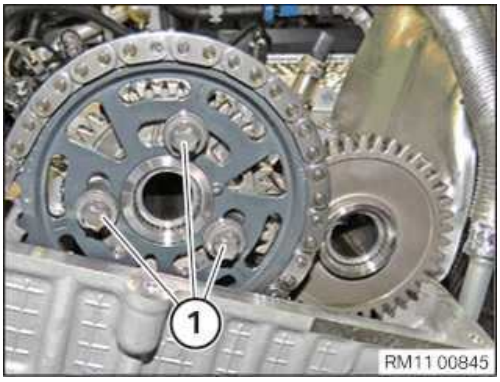


- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

91 – Tightening the camshaft sprocket on the intake camshaft



- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

92 – Checking camshaft timing



- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

Damage to the engine.

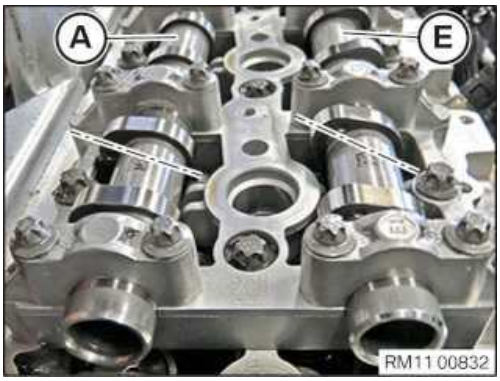
The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

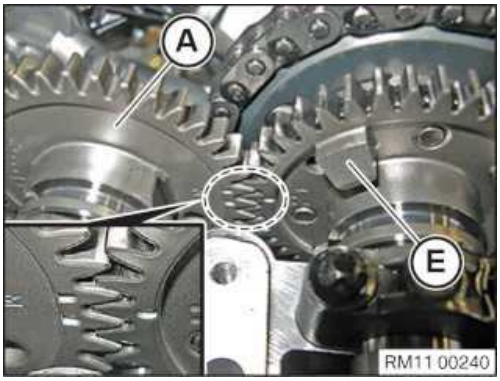
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- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

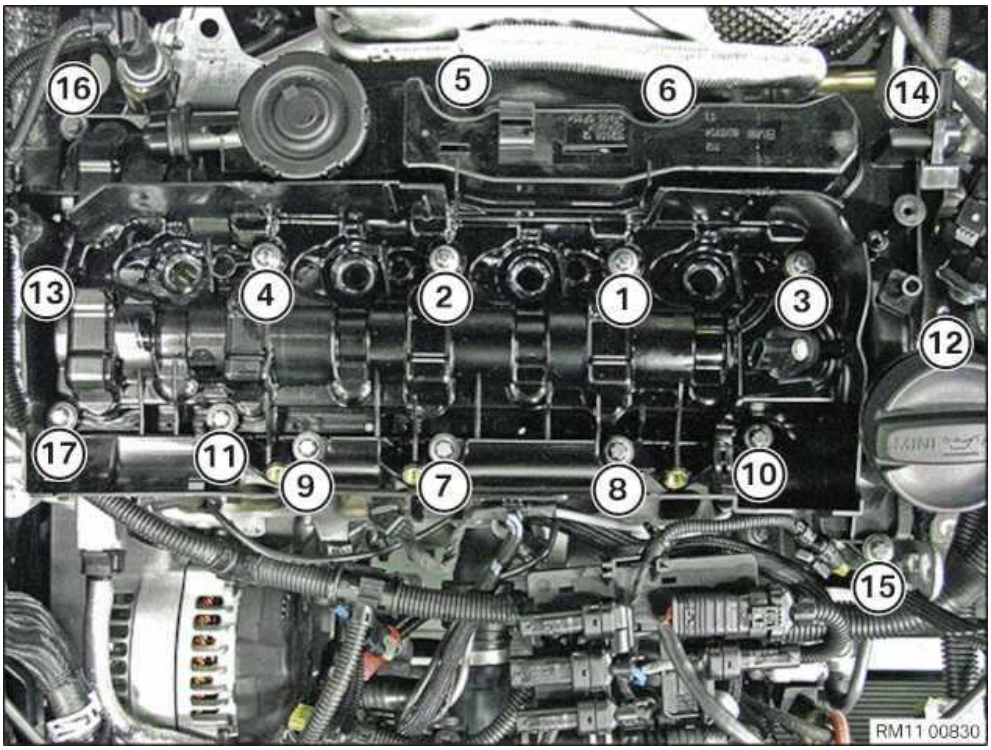


- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

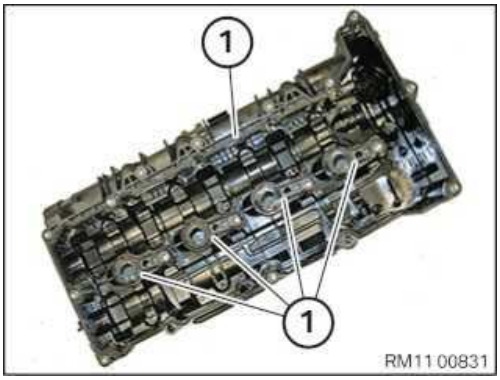
93 – Installing cylinder head cover

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Overview: Screw connection of the cylinder head cover

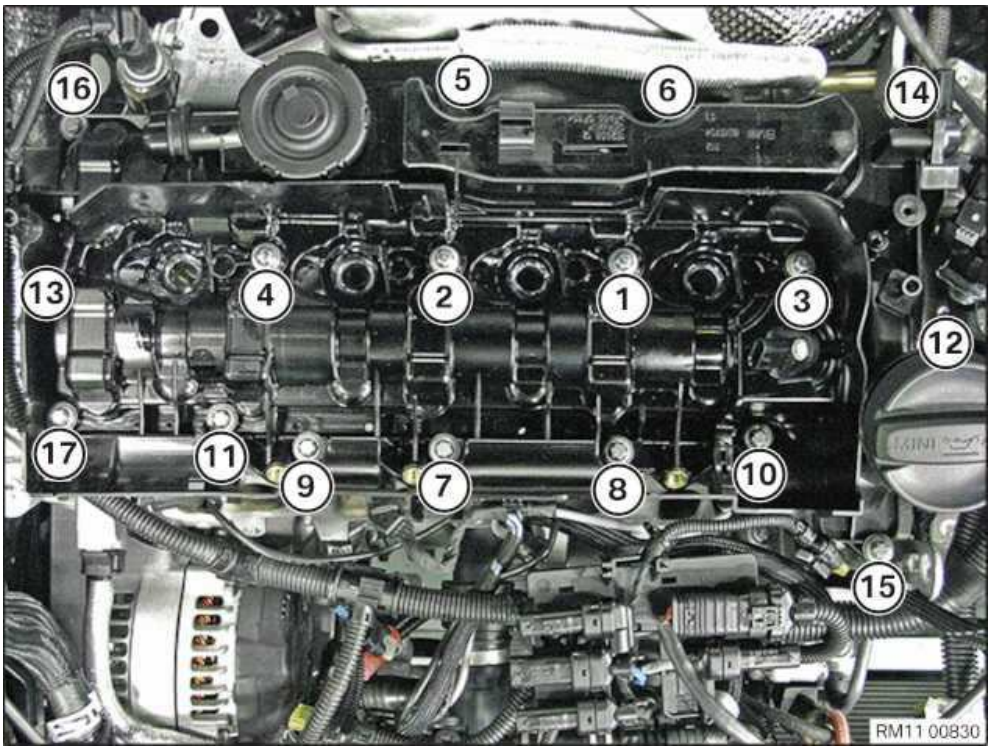


1 to 16 screws of the cylinder head cover.



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket



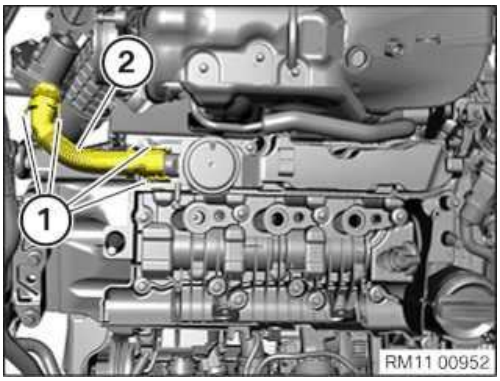
- Install cylinder head cover.
- Tighten screws in the order (1) to (17).

Cylinder head cover to cylinder head

M6		Tightening torque.	8, Nr

-

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- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

94 – Installing injectors of injection system

▸ **Cleaning the injector shafts**

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

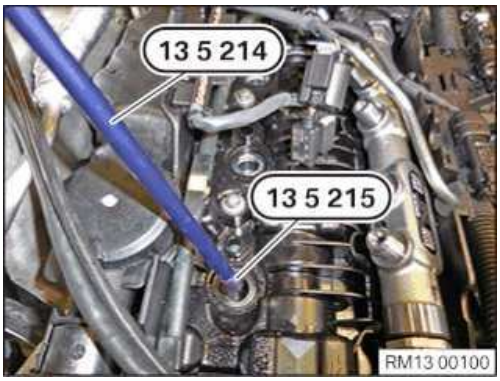
- Wear safety goggles.

RISK OF DAMAGE

Contaminant or foreign body.

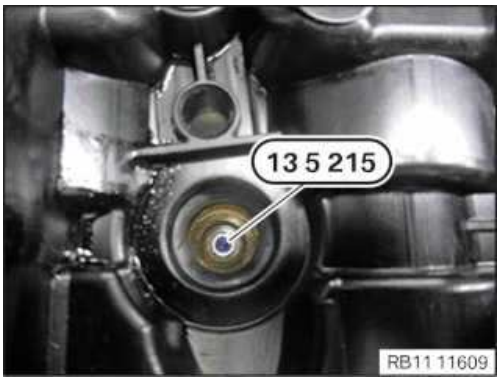
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.

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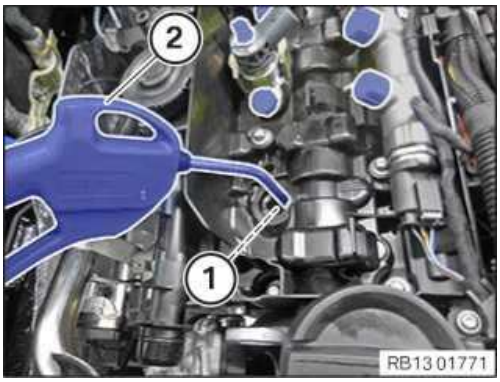
- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.



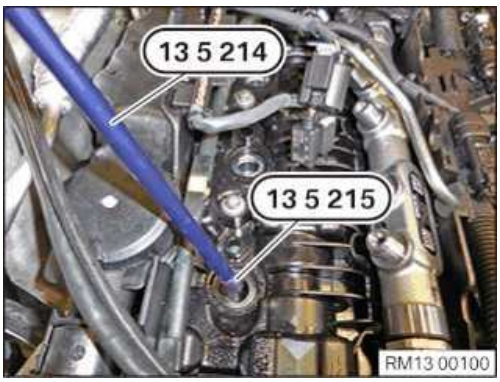
- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.



- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.



- Blow out injector shaft (1) with air gun (2).



- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

► **Check the placement of the clamping claw**

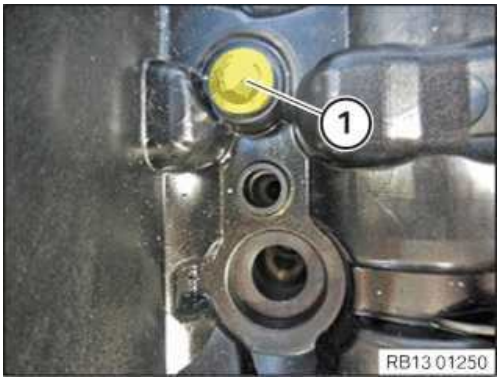
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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▸ **Prepare the injector for installation**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

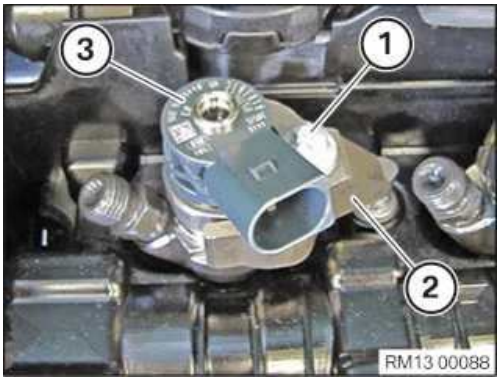


- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring
- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

Injector lubricating grease	50 g, Can	83230441070

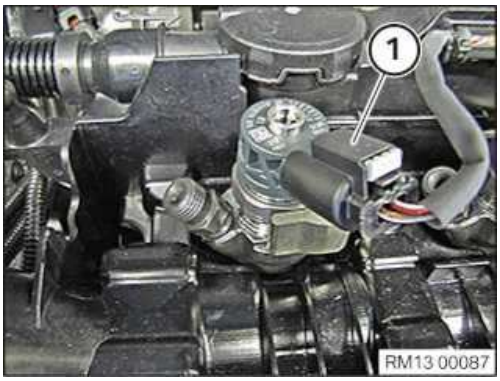


- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

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- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

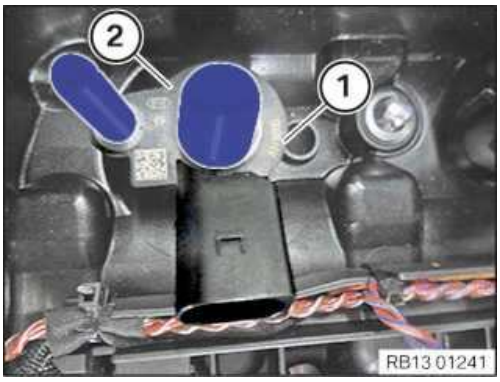
▶ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

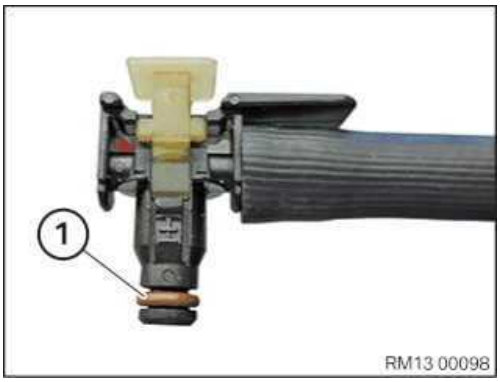


- Read off the adjustment value (1) on the new injector (2).



- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

95 – Connect the leakage oil line on the injector



- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.

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- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

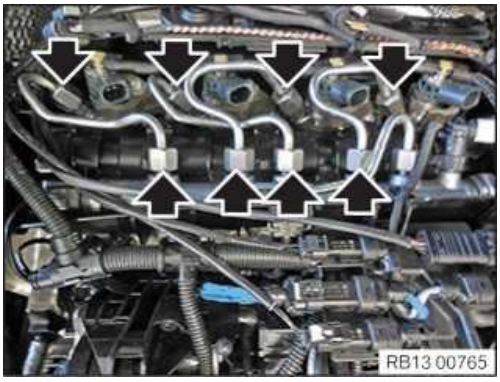
96 – Installing high pressure lines between rail and injectors

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Remove special tool .
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten the high pressure lines (arrows) with the special tool .

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

97 – Prepare for the installation of the exhaust turbocharger

- Check the oil feed lines and the oil return lines for contamination or obstruction, clean or renew if necessary.
- If the oil feed lines and/or oil return lines are heavily contaminated, we recommend changing the engine oil and the oil filter.
- If installed: Check the coolant feed lines and the coolant return lines for the exhaust turbocharger for contamination or obstruction, clean or renew if necessary.
- Check that the screw connections and the plug connections of all the lines are correct.
- Check air cleaner for contamination and clean or renew as needed.
- Check correct functioning of crankcase ventilation.
- Replace all gaskets.

  Parts: Seals

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98 – Installing the high-pressure stage exhaust turbocharger

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

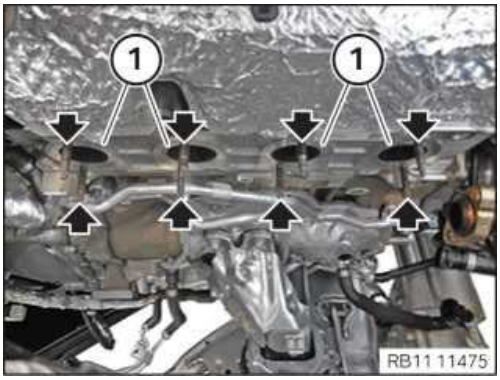
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

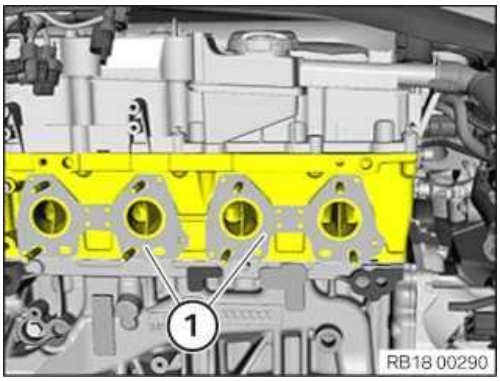


- Clean the sealing surfaces (1) on the cylinder head using special tool **0 495 102 (11 4 470)**.
- Check the stud bolts (arrows) on the cylinder head for correct fit.



- Clean the sealing surfaces on the exhaust manifold using special tool **0 495 102 (11 4 470)**.

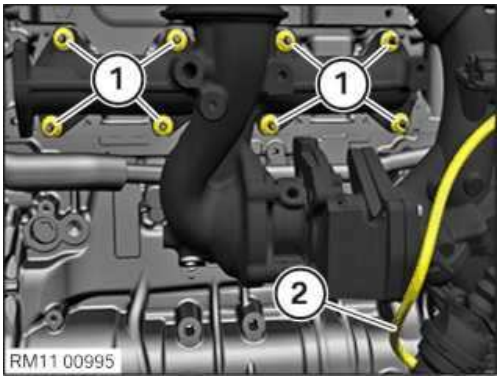
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- Renew gasket (1).

  Parts: Gasket

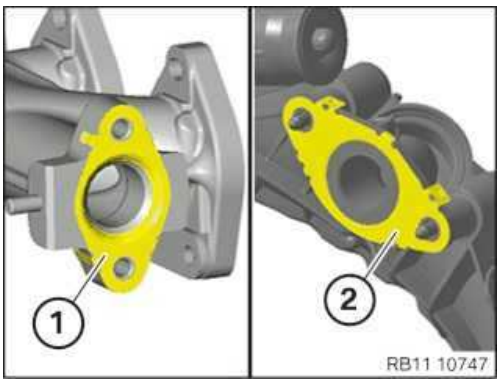
- Install new gasket (1).



- Feed in and install the exhaust manifold and the high-pressure stage exhaust turbocharger.
- Tighten nuts (1).

  Parts: Nuts

- Connect vacuum hose(2).

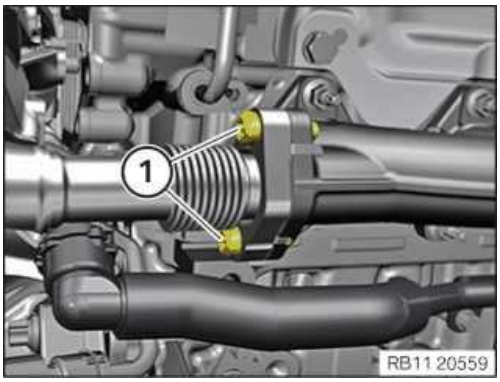


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

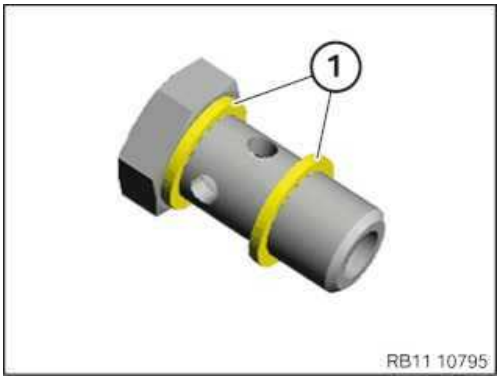
  Parts: Gasket



- Tighten the screws (1).

Exhaust-gas recirculation cooler to exhaust manifold

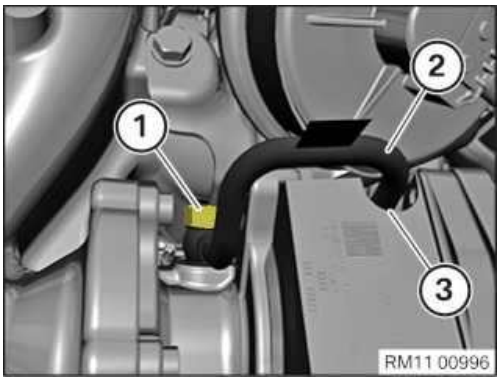
M8x28	Replace screws	Tightening torque	32 Nm



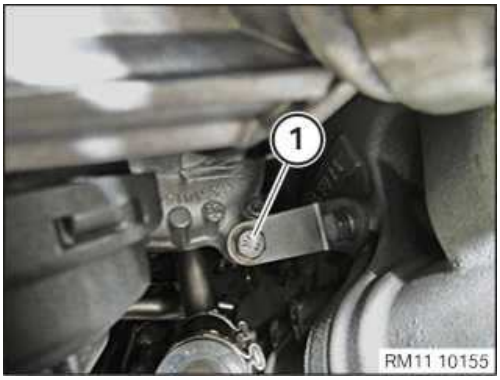
- Renew sealing rings (1) of banjo bolt.

  Parts: Sealing ring

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- Guide the oil feed line into the holder (3) and install it.
- Tighten down screw (1).

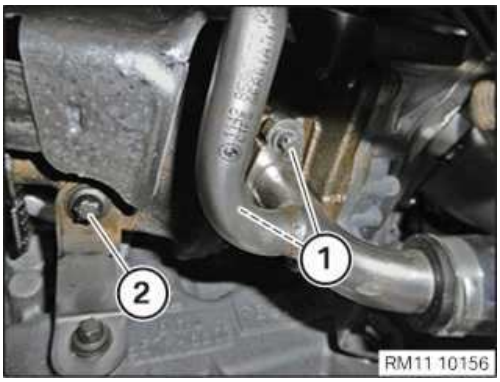


- Tighten bolt (1) from the right wheel arch.



- Renew seal (1) of oil return line.

  Parts: Gasket



- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

99 – Installing the low-pressure stage turbocharger

RISK OF DAMAGE

Damage to the surface.

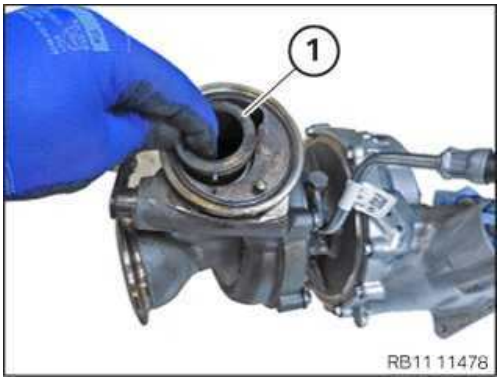
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

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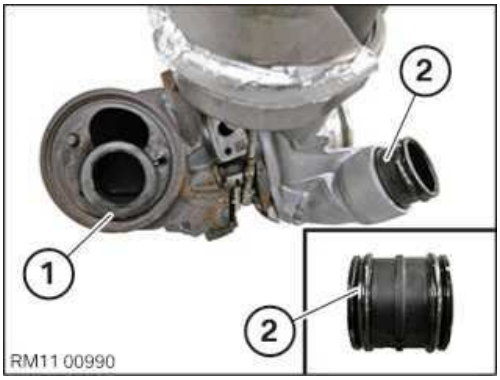
TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.



- Check the spacer plug (1) for damage, renew if necessary.

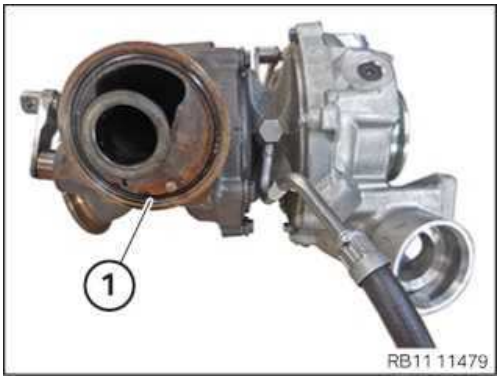
  Parts: Spacer ring
- Insert and install the spacer ring (1).
- Position spacer ring (1) correctly.



- Renew gasket (1).

  Parts: Gasket
- Position the seal (1).
- Renew the sleeve(2).

  Parts: Holding sleeve



- Renew sealing ring (1).

  Parts: Sealing ring
- Affix the sealing rings on the exhaust turbocharger.

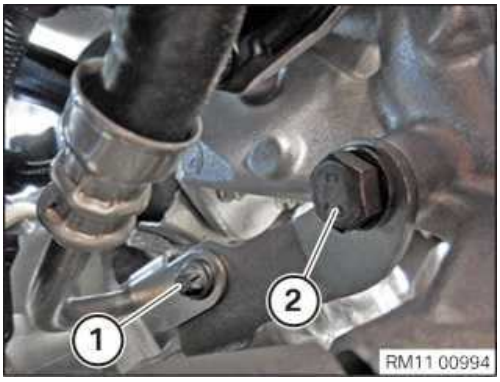


- Insert and install the low-pressure stage exhaust turbocharger on the exhaust manifold .
- Feed in and install V-band clamp .
- Tighten V-band clamp (2).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Screw in nut (1) with 2 **revolutions**.



- Tighten down screw (1).

Oil feed line to bracket

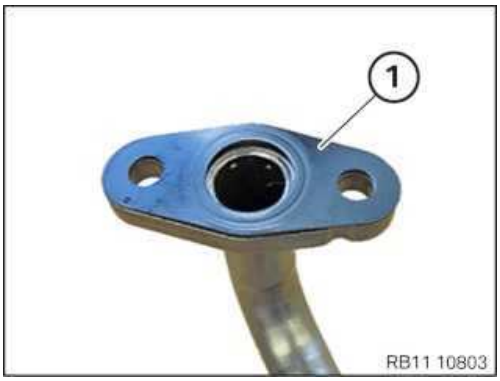
Torx screw M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

Holder to exhaust turbocharger and crankcase

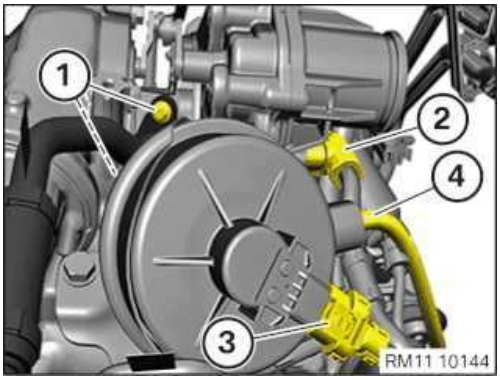
M8x16		Tightening torque	22 Nm

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- Renew seal (1) on the oil return line.

  Parts: Gasket



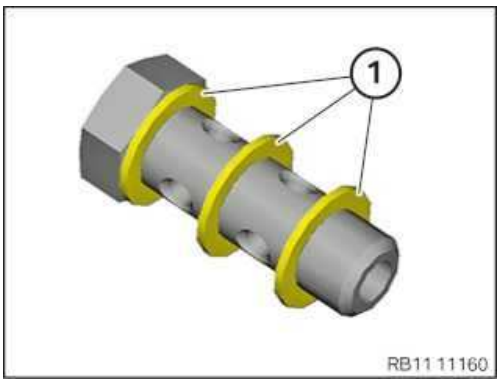
- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

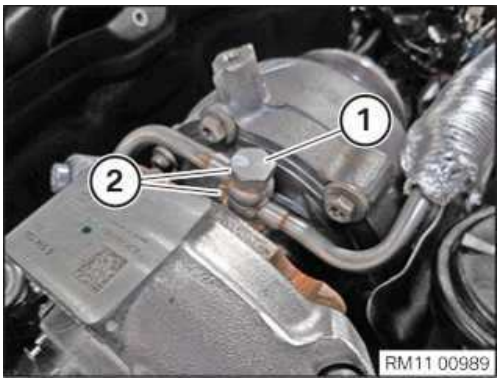
M6x12		Tightening torque	8 Nm

- Connect and lock connectors (2) and (3).

  The locks must engage audibly.
- Connect vacuum hose (4).



- Renew banjo bolt and sealing rings (1).
- **Parts:** Banjo bolt, sealing rings



- Install sealing rings (1).
- Tighten the banjo bolt (1).
- Ensure that the lines do not rest against the adjacent components.

100 – Installing heat shield on exhaust turbocharger at bottom

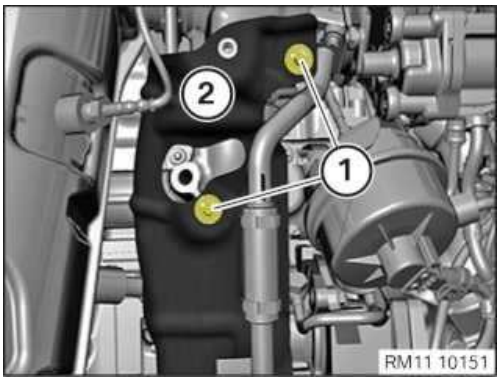
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

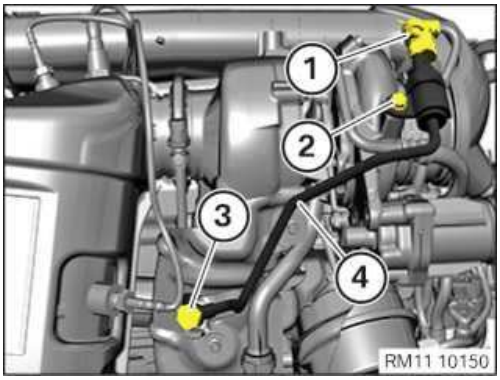
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- Feed in and install the heat shield (2).
- Tighten the bolts (1) on the heat shield .

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm



- Position the exhaust gas pressure pipe (4).
- Hand-tighten the bolt (2).
- Renew sealing rings on the banjo bolt (3).

  Parts: Sealing ring
- Tighten the banjo bolt (3).

Banjo bolt for exhaust pressure pipe to exhaust manifold

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

- Tighten down screw (2).

Standard screw connection M6

M6		8 Nm

- Connect connectors (1) and lock.

  Lock must audibly engage.

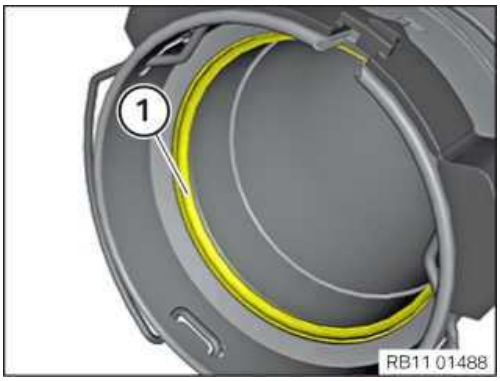
101 – Installing the right charge air duct between the exhaust turbocharger and the charge air cooler

RISK OF DAMAGE

Damage to the exhaust turbocharger.

A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.



- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

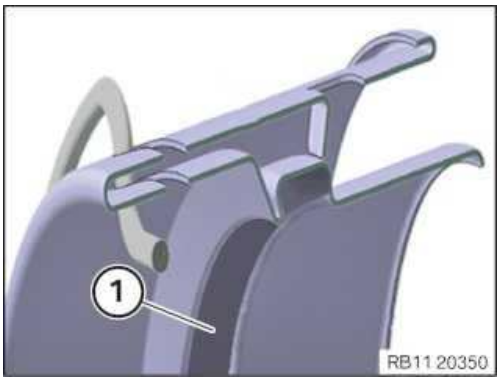
  Parts: Gasket

▸ **Replace damaged gasket**

TECHNICAL INFORMATION

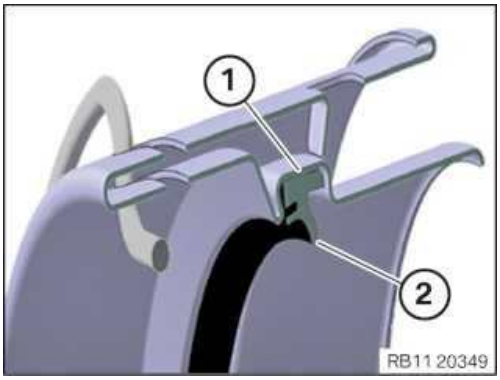
Do not use pointed or sharp-edged tools for the installation and/or removal.

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- Remove damaged seal.
- Clean gasket groove (1) with a dry towel.

  The gasket groove (1) must be clean.



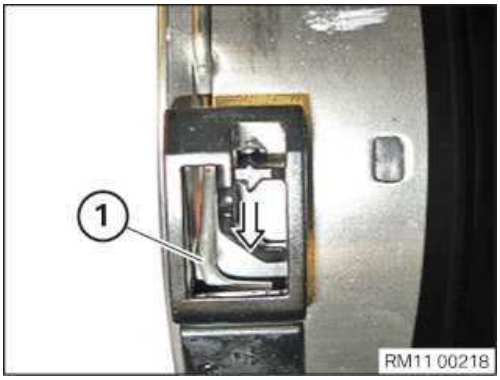
- Renew gasket.

  Parts: Gasket
- Install seal dry without lubricant or mounting agent.

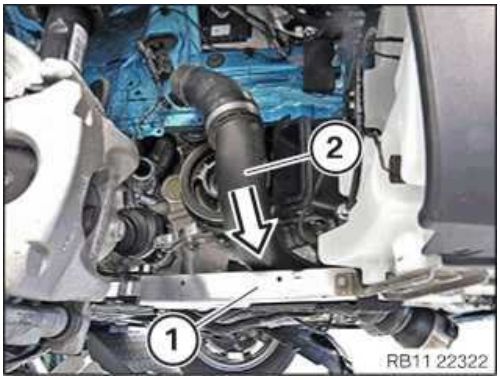
TECHNICAL INFORMATION

Incorrect assembly is possible. Ensure correct installation position.

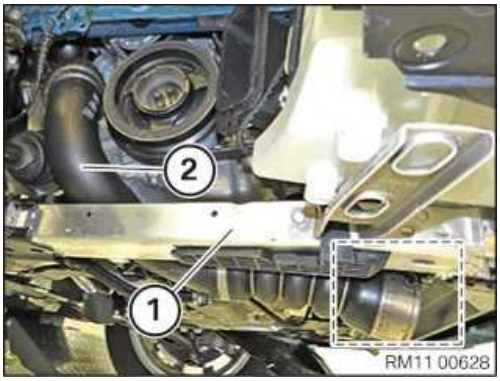
- Feed in and install the seal.
- Make sure the seal is correctly installed in the gasket groove (1).
- Make sure that the sealing lip (2) is pointing downwards (see figure).



- Detach the locks (1) in the direction of the arrow from the brackets.
- Ensure that the locks (1) engage audibly.

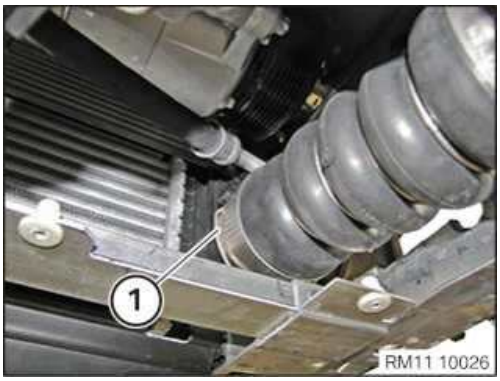


- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed in the charge air duct (1) in the **direction** of arrow between the side member and the deformation element and position.

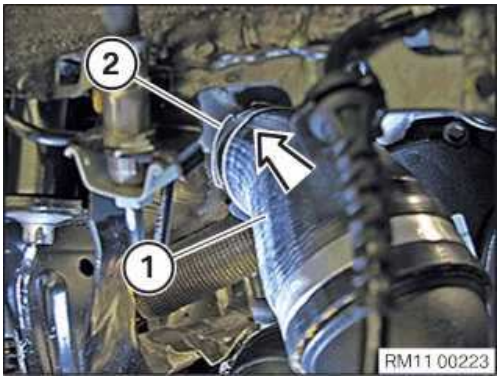


- Pull the adapter of the front axle support (1) downwards to the front right.
- Position the charge air duct (2) in **marked** area on the charge air cooler.

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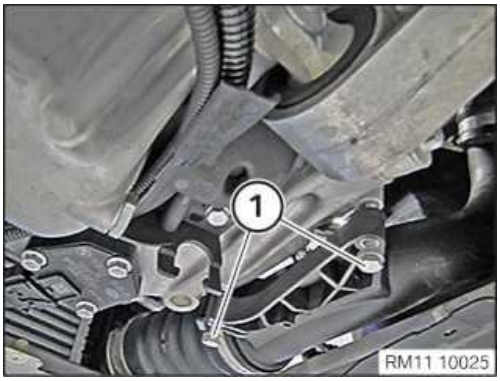


- Feed in and install the charge air duct (1) on the charge air cooler .
- Make sure the charge air duct (1) engages audibly on the charge air cooler.



- Feed in and install charge air duct (1) in the **direction** of the arrow on exhaust turbocharger.

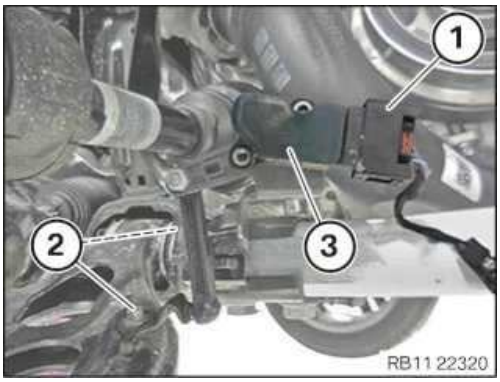
  The locks (2) must engage audibly.



- Tighten the screws (1).

Charge air duct to oil sump

M6		Tightening torque	8 Nm



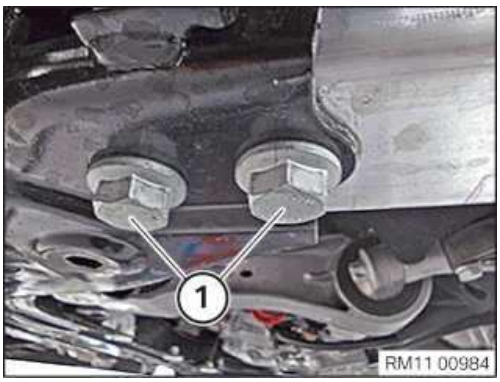
- **If installed:**
- Feed in and install the ride height sensor (3).
- Tighten the screws (2).

Ride height sensor holder to front axle support

M6		Tightening torque	8 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

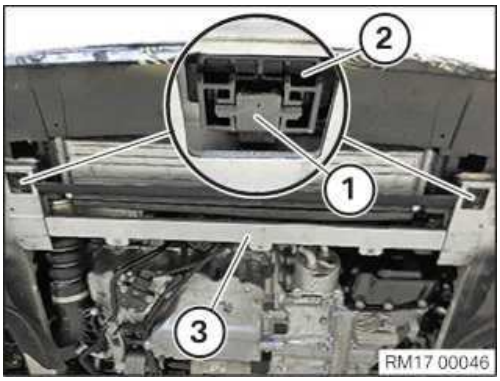


- Tighten the screws (1) on the adapter of the front axle support.

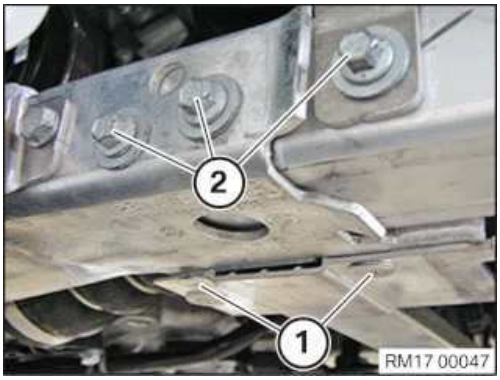
Adapter, front axle support to front axle support

		Tightening torque	100 Nm

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- Guide in cross connection (3) and install.
- Guide in locks (2) and install.
- Lock the locking pins (1).
- Ensure that the locking pins (1) audibly engage.



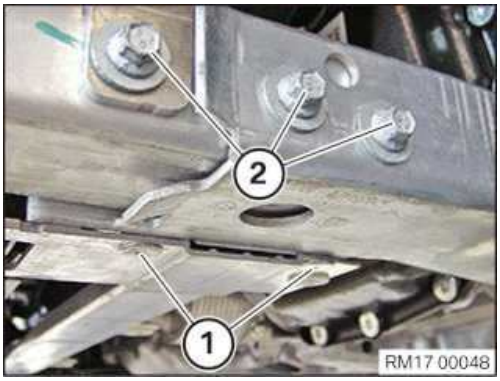
- Tighten the bolts (2) at the front left.

Cross connection to front axle support

M6		Tightening torque	12 Nm

- Renew the blind rivet (1).

  Parts: Blind rivet
- Mount the blind rivets (1) at the front left.



- Tighten the bolts (2) at the front right.

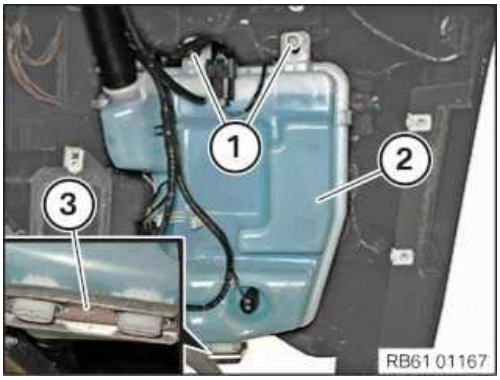
Cross connection to front axle support

M6		Tightening torque	12 Nm

- Renew the blind rivet (1).

  Parts: Blind rivet
- Mount the blind rivets (1) at the front right.

102 – Install the washer fluid reservoir in the fixture

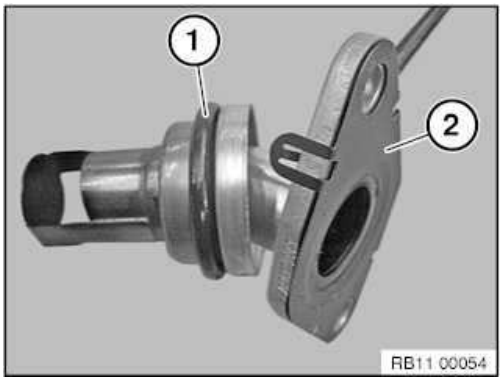


- Feed washer fluid reservoir (2) into the mounting (3) and install.
- Tighten the screws (1).

Washer fluid reservoir to body

M6x20		Tightening torque	8 Nm

103 – Installing the intake plenum

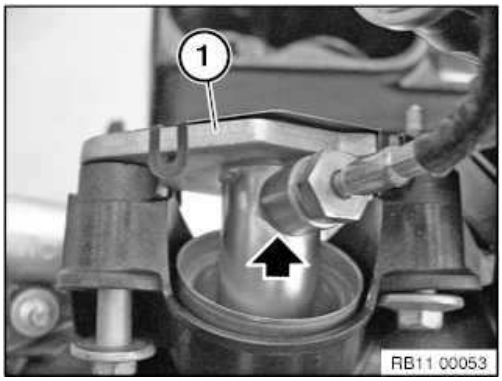


- Renew O-ring (1).

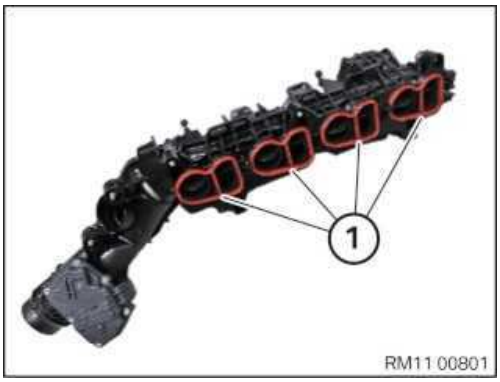
  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position the seal (2) and clip it in.

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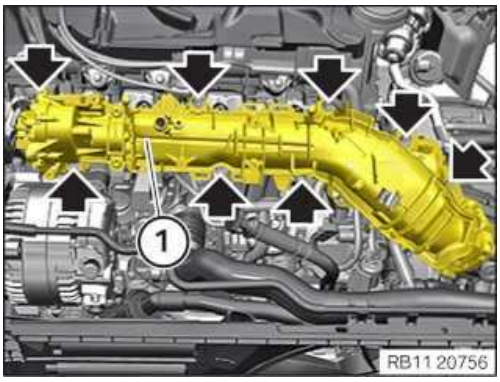


- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (1).

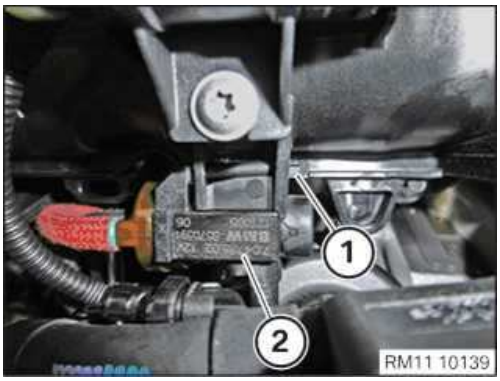
  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.



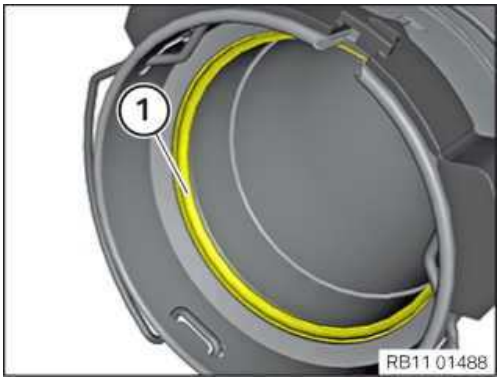
- Guide in and install intake (1) plenum.
- Tighten screws (arrows).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm



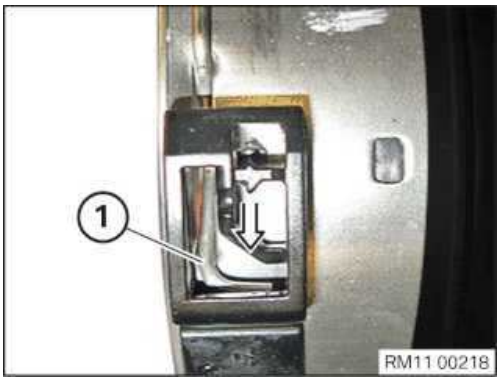
- Install the electric changeover valve (2) in the holder on the plenum from left to right.
- Lock (1) must engage audibly.



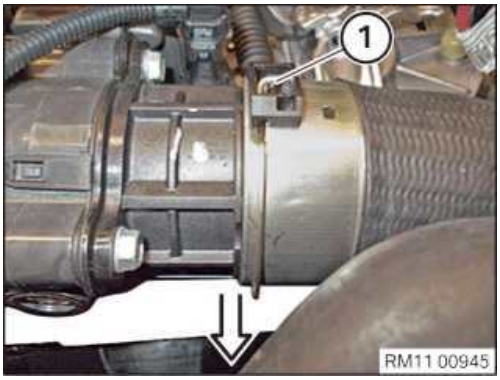
- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring

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- Engage the lock (1) on the bracket (arrow).



- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

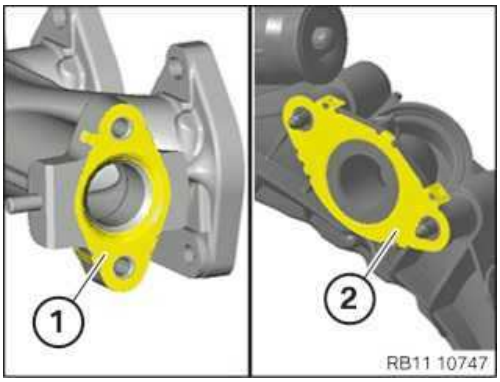
104 – Installing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

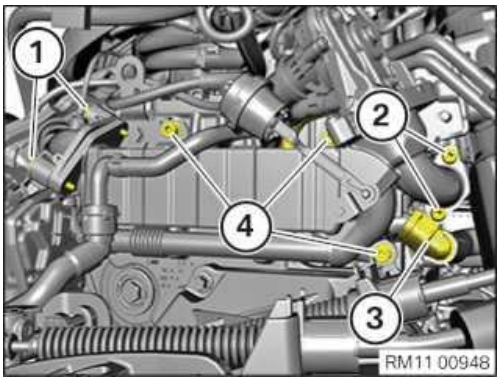


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket
- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket

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- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts
- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

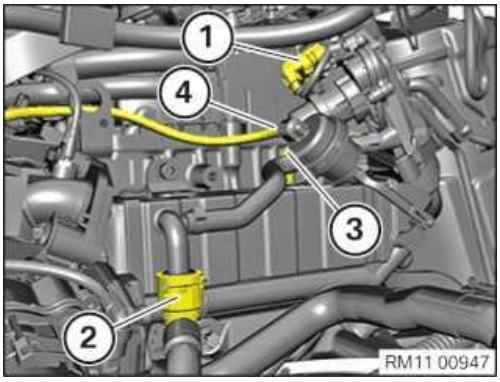
M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.
- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm



TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

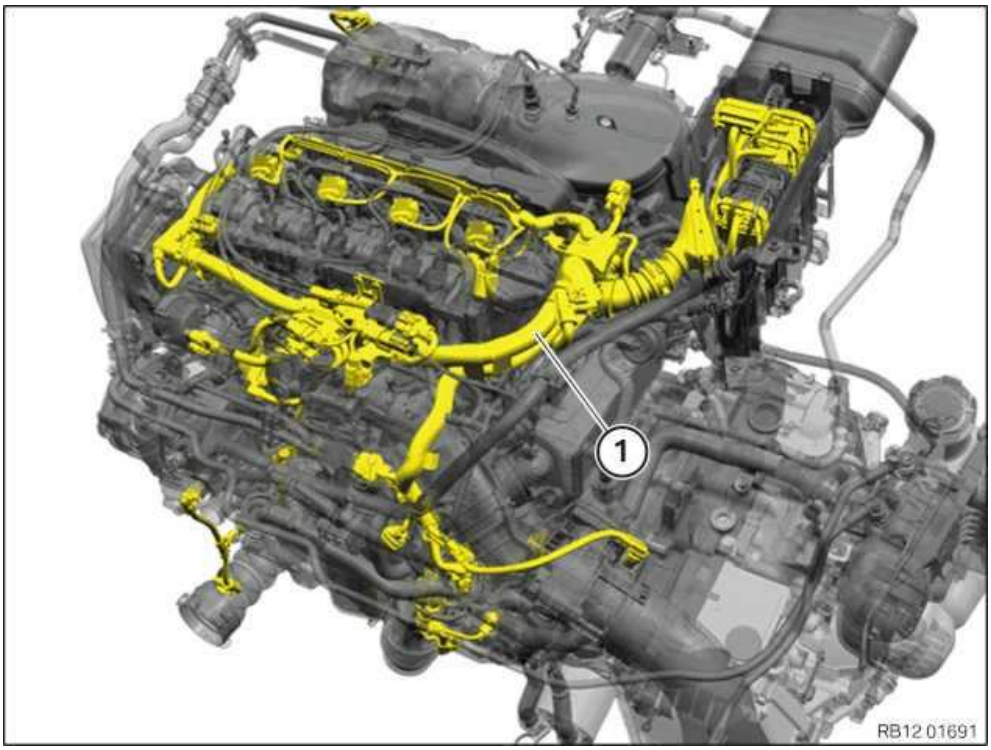
- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

105 – Fastening the wiring harness section for the intake plenum

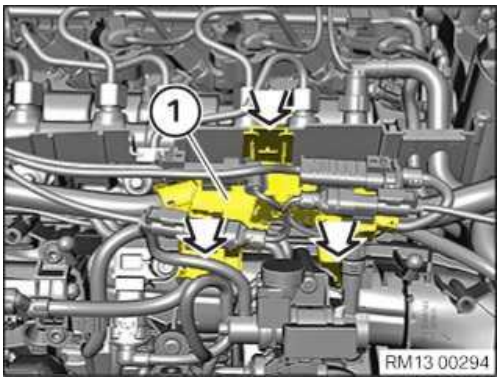
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Overview: Wiring harness section for the engine

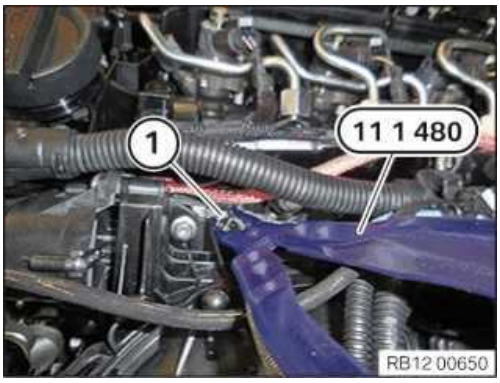


1 Wiring harness section for the engine

▶ **Installing the cable clip for the intake plenum**

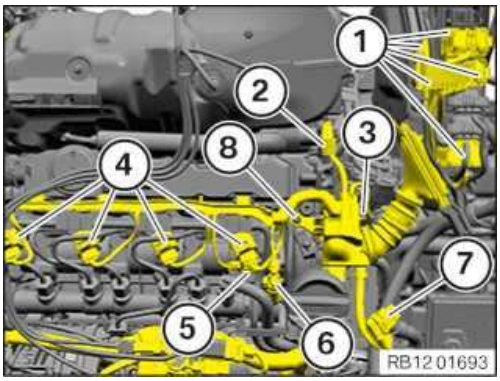


- Insert and install the cable clip (1) in the direction of the arrow.
- Make sure the cable clip (1) is fitted correctly.



- Connect and lock the connector (1) on the glow elements.
  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.

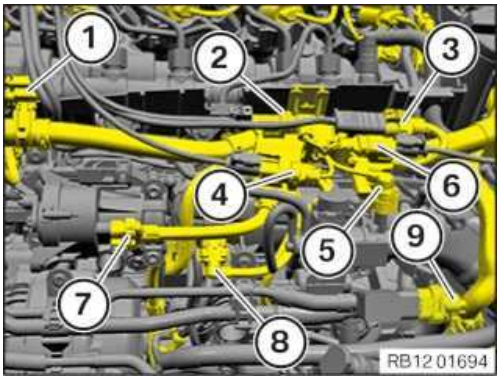
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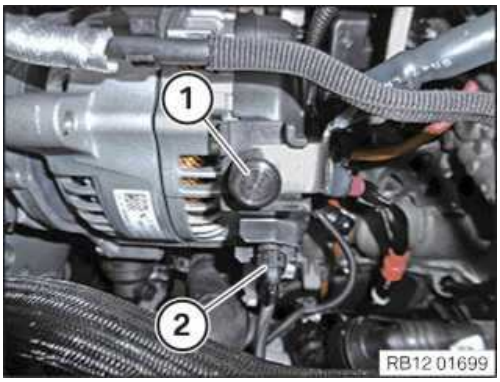
- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the DME control unit and remove the integrated supply module (PDM).
- Attach connector (2) to the differential pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust-gas recirculation valve and lock audibly.
- Attach connector (4) to the injectors and lock it audibly.
- Attach connector (5) to the camshaft sensor and lock it audibly.
- Attach connector (6) to the fuel pressure regulator and lock it audibly.
- Connect and audibly lock the connector (7) to the hot film air mass meter.
- Tighten down screw (8).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm



- Connect the connector (1) to the rail pressure sensor and lock it audibly.
- Attach connector (2) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (3) to the front oxygen sensor and lock audibly.
- Attach connector (4) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Connect the connector (5) to the electric changeover valve and lock audibly.
- Attach connector (6) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (7) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (8) to the charging pressure sensor and lock it audibly.
- Attach connector (9) to the fuel pressure and temperature sensor and lock it audibly.

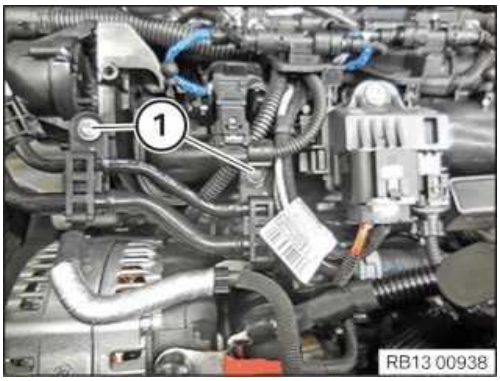


- Connect and lock the connector (2).

  Lock must snap audibly into place.
- Connect the positive battery cable (1) and tighten.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

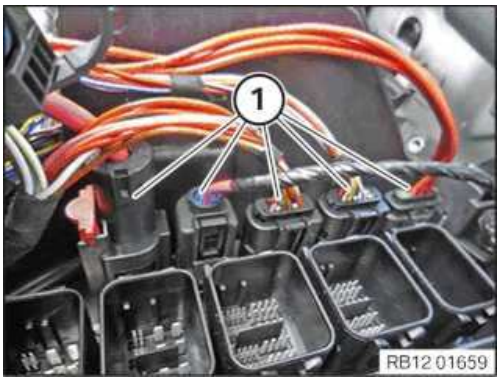


- Position the fuel line.
- Tighten the screws (1).

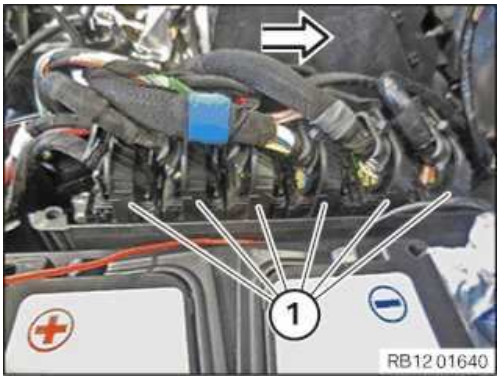
Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

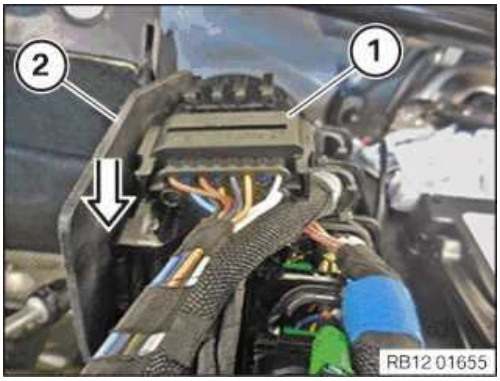
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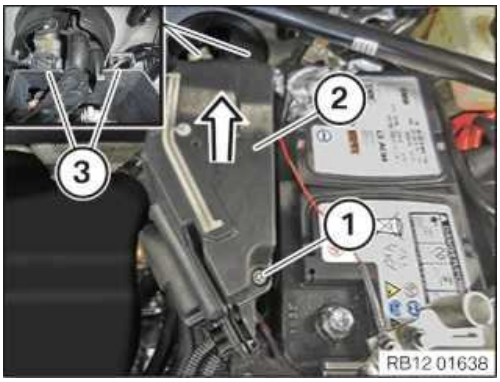
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



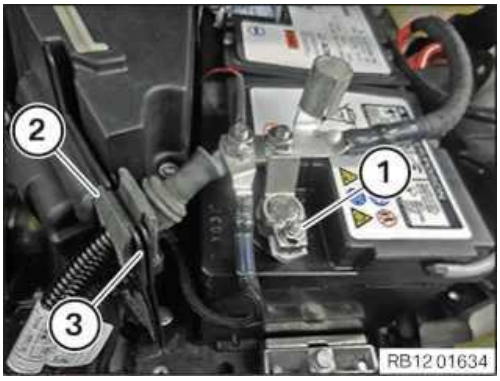
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert and install the cover (2) into the guides (3) in the direction of the arrow.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

RF5x26.5		Tightening torque	2,5 Nm

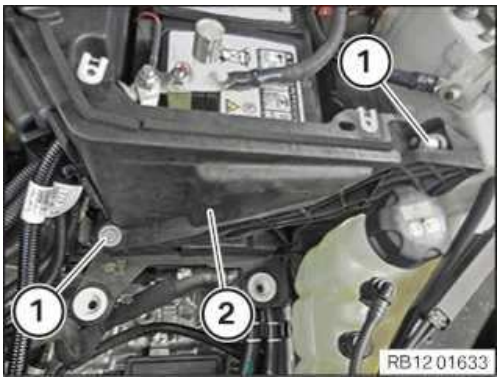


- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

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- Feed in and install tension strut (2).
- Tighten the screws (1).

Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

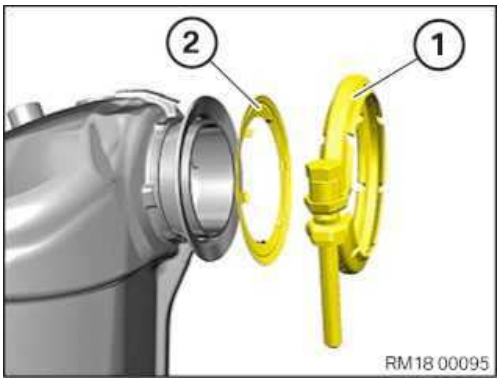
106 – Installing the diesel particulate filter

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



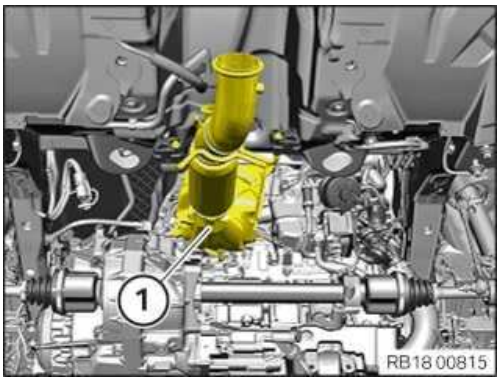
- Renew the V-clip (1).

  Parts: V-band clamp
- Renew the gasket (2).

  Parts: Gasket

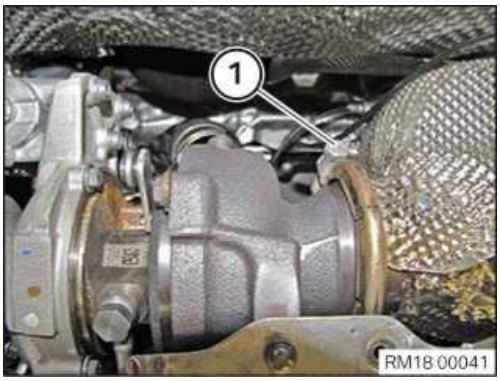


- Before installing the diesel particulate filter: Mount fitting aid (1) for the flexible tube.



- Carefully insert and install the diesel particulate filter (1).

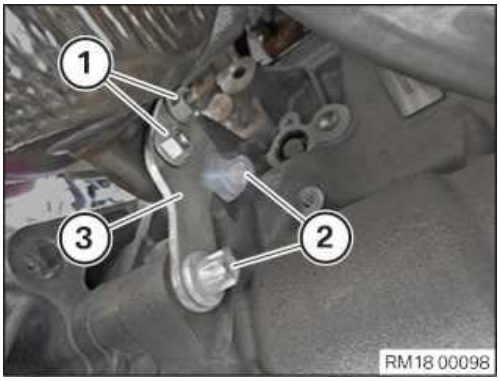
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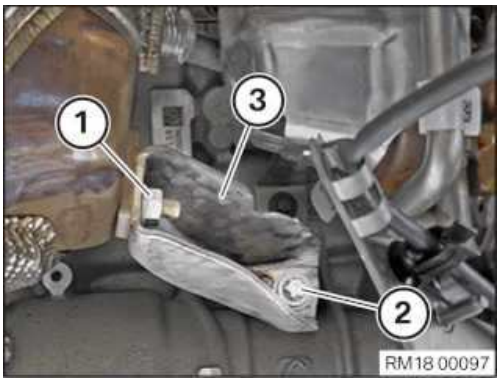
- Feed in and install V-band clamp (1).
- Make sure that the seal between the diesel particulate filter and the exhaust turbocharger is installed correctly.
- Align the diesel particulate filter on the exhaust turbocharger.
- Position V-clip (1).
- Hand-tighten the V-clip (1).



- Tighten nuts (1) by hand.



- Install holder (3).
- Hand-tighten the bolts (2).
- Tighten nuts (1) by hand.

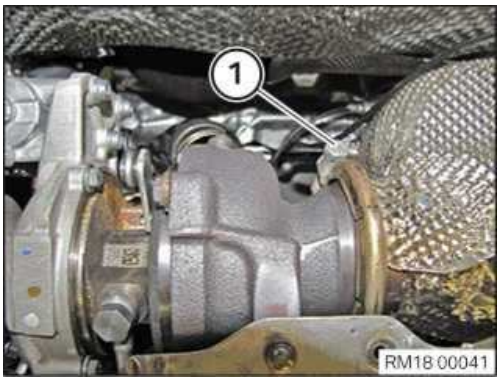


- Install holder (3).
- Tighten the nut (1) hand-tight.
- Hand-tighten the bolt (2).



- Remove fitting aid (1) for the flexible tube.

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- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

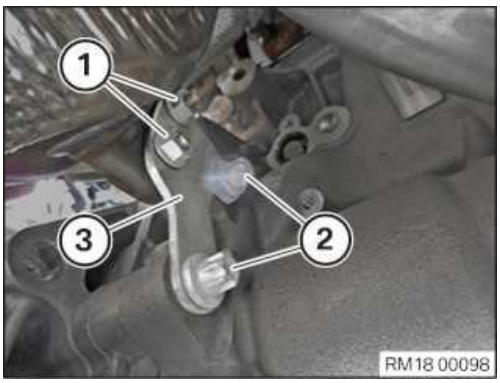
V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm



- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screws (2).

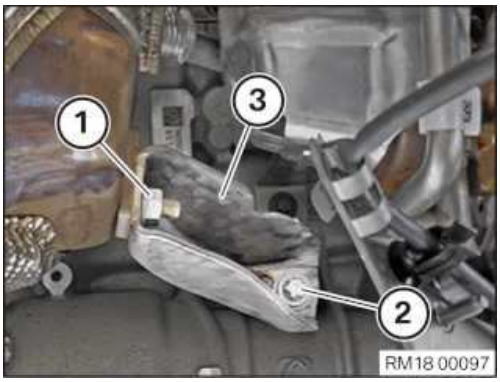
Diesel particulate filter holder to gearbox

M12x75		Tightening torque	66 Nm

- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screw (2).

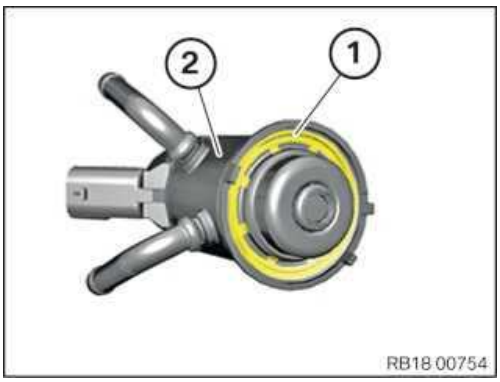
Diesel particulate filter bracket to crankcase

M10x35		Tightening torque	38 Nm

- Tighten nut (1).

Diesel particle filter to holder

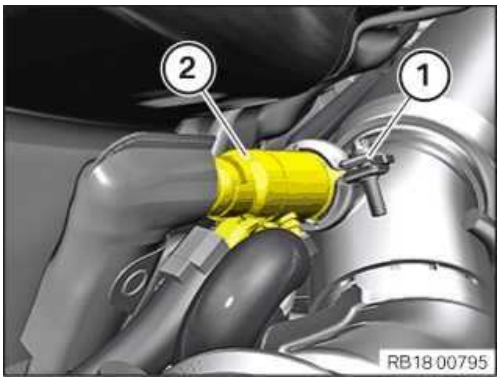
M8 hexagon nut		Tightening torque	19 Nm



- Renew sealing ring (1) of the SCR metering module (2).

  Parts: Sealing ring

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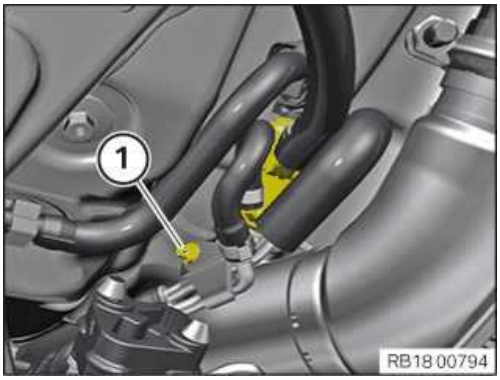


- Insert and install the SCR metering module (2).
- Renew the V-clip (1).

  Parts: V-band clamp
- Tighten V-band clamp (1).

SCR metering module V-clip to exhaust system

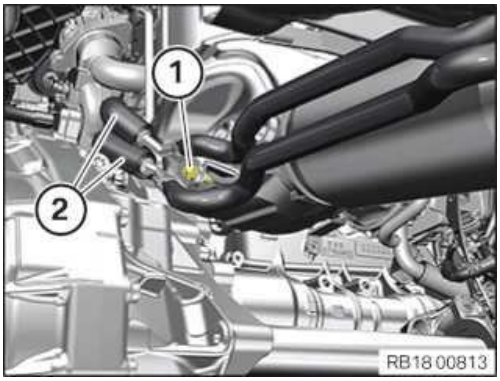
V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm



- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm

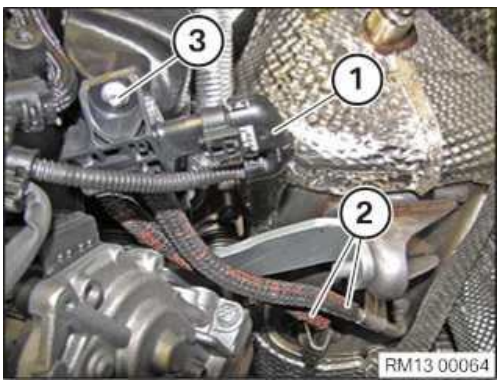


- Thread in and install coolant line (2) of the SCR metering module.
- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm

▶ **Installing differential pressure sensor**



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

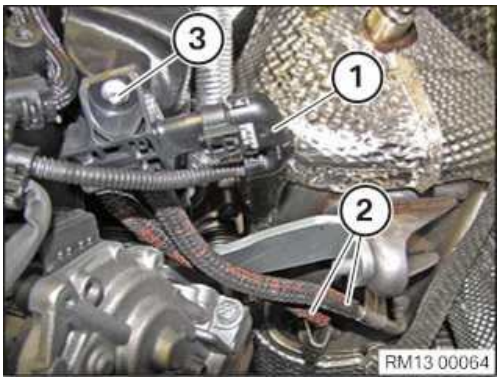
Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

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- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

108 – Install the control sensor

TECHNICAL INFORMATION

New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue



- Feed in front oxygen sensor (1) and install.
- Tighten front oxygen sensor (1) using special tool .

Control sensor

Control sensor		Tightening torque	50 Nm

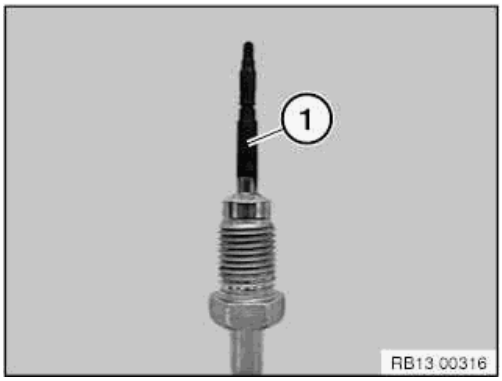


- Lay and secure cable of oxygen control sensor.
- Secure the connector (2) to the holder.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

109 – Install the exhaust-gas temperature sensor on the diesel particulate filter

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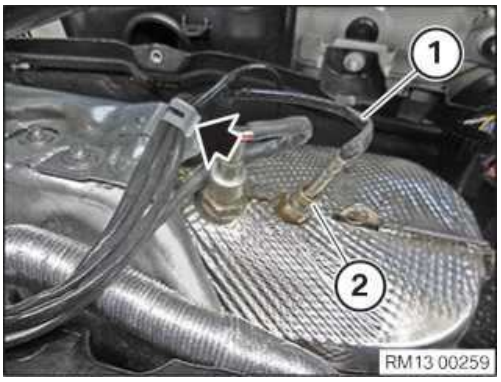
RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

- Check the gauge tip (1) for damage and renew the exhaust temperature sensor as needed.



- Feed in and install the exhaust temperature sensor (2).
- Tighten the exhaust temperature sensor (2).

Exhaust temperature sensor to diesel particulate filter

Exhaust-gas temperature sensor		Tightening torque	28 Nm



- Insert and install cable (1) of the exhaust temperature sensor in the clamp (arrow).
- Lay and fasten the cable of the exhaust gas temperature sensor.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

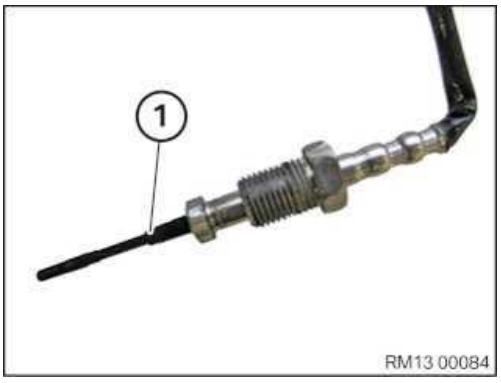
110 – Installing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

RISK OF DAMAGE

Damage of exhaust temperature sensor.

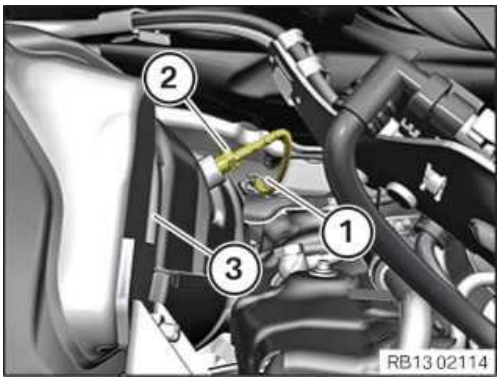
Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.



- Make sure the gauge tip (1) is not damaged during installation.

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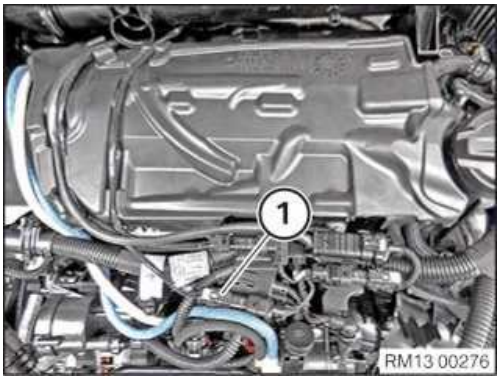


- Guide the exhaust temperature sensor (2) into diesel particulate filter (3) and install.
- Tighten the exhaust temperature sensor (2) with conventional tools .

Exhaust temperature sensor to diesel particulate filter

Exhaust-gas temperature sensor		Tightening torque	28 Nm

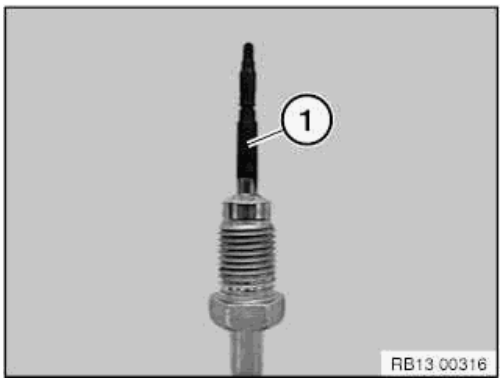
- Insert and install the cable of the exhaust temperature sensor (2) in the clamps (1).



- Lay and fasten the cable of the exhaust gas temperature sensor.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

111 – Installing exhaust temperature sensor on catalytic converter



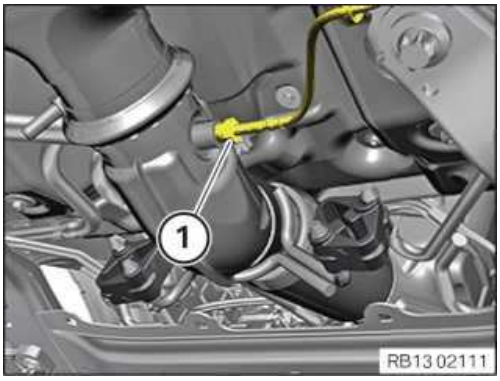
RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

- Check the gauge tip (1) for damage and replace the exhaust temperature sensor as needed.



- Feed in and install the exhaust temperature sensor (1).
- Tighten the exhaust temperature sensor (1).

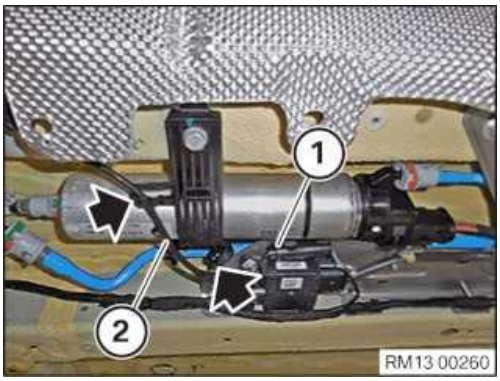
Exhaust-gas temperature sensor to exhaust system

Exhaust-gas temperature sensor		Tightening torque	28 Nm



- Secure the cable clips (1).

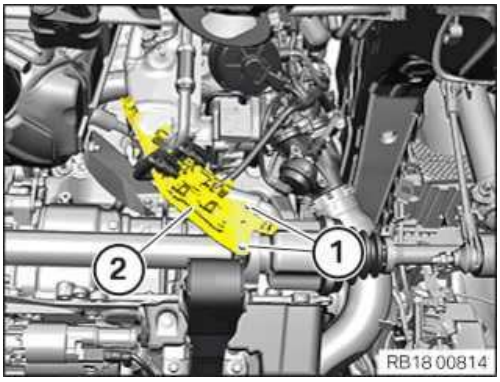
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- Feed cable (2) from exhaust temperature sensor into the clamps (arrows) and install.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

112 – Install holder for oxygen sensor

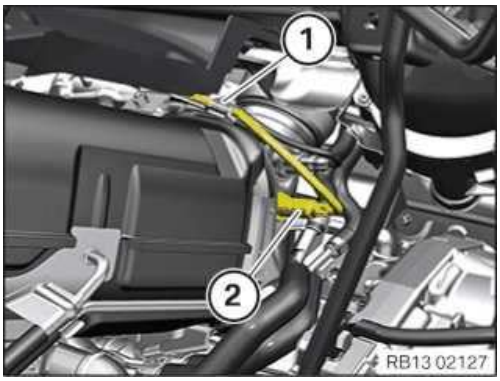


- Insert and install the holder (2).
- Tighten the screws (1).

Oxygen sensor holder to intermediate shaft

Hexagon screw M6x16		Tightening torque	8 Nm

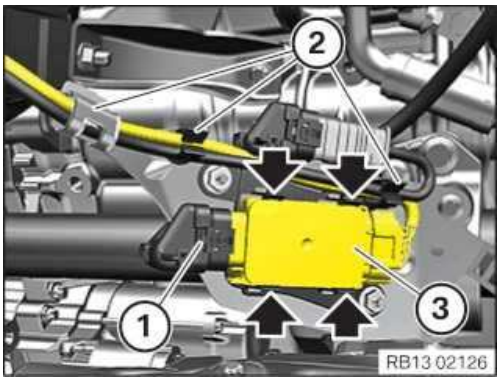
113 – Installing the nitrogen oxide sensor before SCR catalytic converter



- Insert nitrogen oxide sensor before the SCR catalytic converter (2) and install.
- Tighten the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

Nitrogen oxide sensor before SCR catalytic converter

Sensor		Tightening torque	50 Nm



- Install and lock the evaluation electronics for the nitrogen oxide sensor (3) (arrows).
- Insert the evaluation electronics cable for the nitrogen oxide sensor (3) into the clamps (2) and install.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

114 – Install the monitoring sensor

TECHNICAL INFORMATION

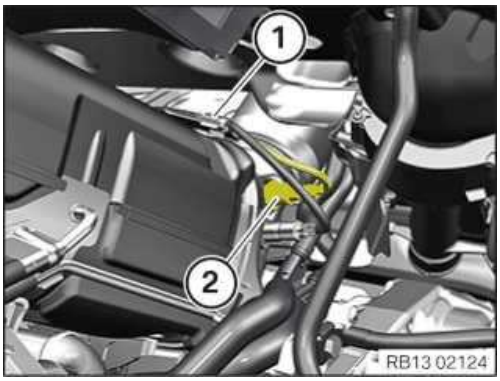
New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

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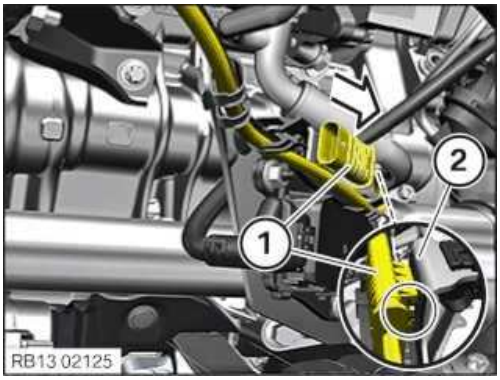


- Feed in the monitoring oxygen sensor (2) and install.
- Tighten the monitoring oxygen sensor (2) with special tool **0 491 074 (11 7 020)** .

Monitoring sensor

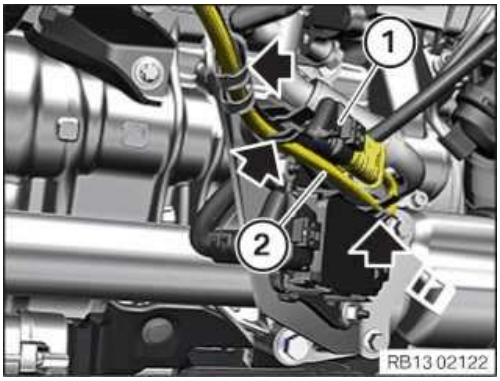
Sensor		Tightening torque	50 Nm

- Insert the cable of the monitoring oxygen sensor (2) into the clamp (1) and secure it.



- Connect the connector (1) with the bracket (2) in the direction of arrow.
- Make sure that the connector (1) is locked correctly in the marked area.

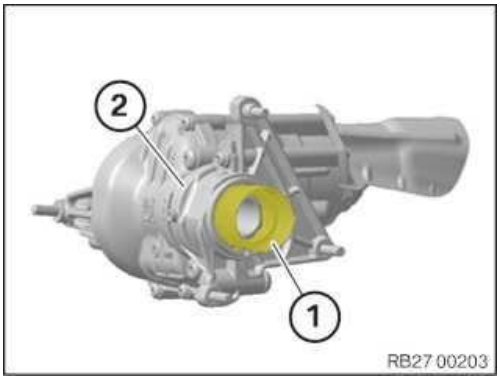
  The connector (1) must engage audibly.



- Insert and attach the cable of the monitoring oxygen sensor (2) to the clamps (arrows).
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

115 – Install the transfer box (VTG)



- If intermediate shaft (1) gets caught on transfer box (VTG) (2), renew intermediate shaft (1) and the radial shaft seals in the automatic or manual transmission.



- Screw special tool **2 409 025** into the outer radial shaft seal.
- Turn the screw on the special tool **2 409 025** until the outer radial shaft seal has been pulled out.

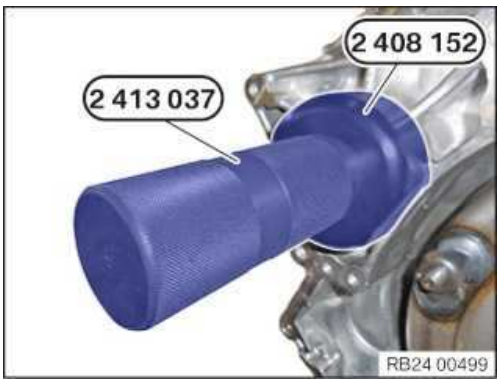
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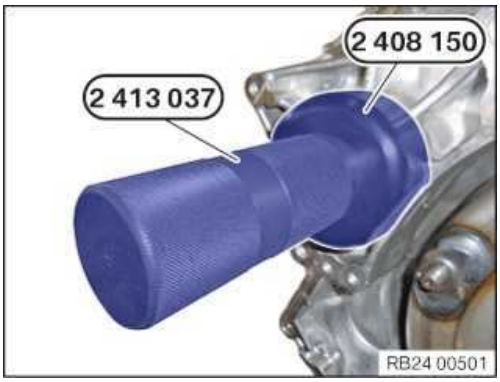
- Insert special tool **2 411 739** into the inner radial shaft seal.



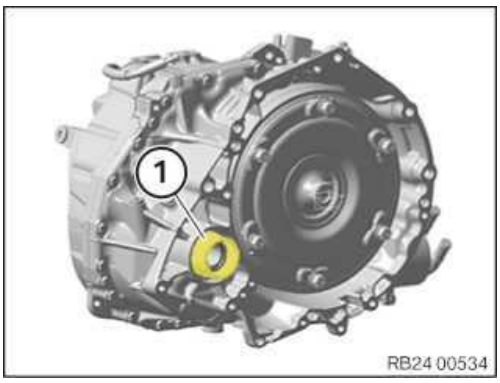
- Screw special tool **2 411 739** into the inner radial shaft seal.
- Turn the screw on the special tool **2 411 739** until the inner radial shaft seal has been pulled out.



- Drive in the inner radial shaft seal using special tools **2 408 152** and **2 413 037** up to the limit position.



- Drive in the outer radial shaft seal using special tools **2 413 037** and **2 408 150** up to the limit position.



- If necessary, connect the new intermediate shaft (1) to the output flange of the automatic transmission or manual transmission.

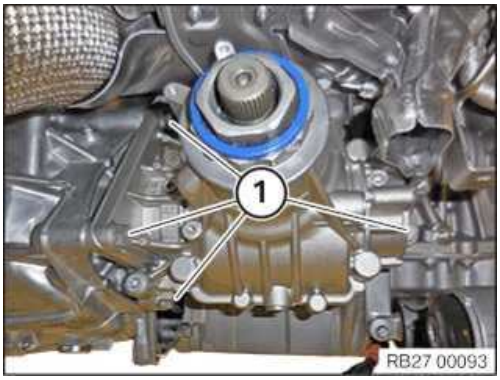
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- Coat the inside of the output flange (arrows) evenly with approx. 5 g of grease.

Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the transfer box (VTG).
- Tighten the screws (1).

Transfer box to transmission

M10		Tightening torque	56 Nm



- Install heat shield.
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Heat shield to transfer box

M6	Renew screws.	Tightening torque	6 Nm

▸ **Check the transfer box oil level**

RISK OF DAMAGE

Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.

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- Check transfer case oil level, correct:
- Open the oil filler plug (1).
- Check transfer box oil level.
- If necessary, top up transmission oil up to the lower edge of the oil filler plug opening (1).

Transmission oil

Technically suitable transfer box and electrical transmission oils	

Main group 27

- Tighten the oil filler plug (1).

Oil filler plug on transfer box (VTG)

M18x1.5		Tightening torque	35 Nm

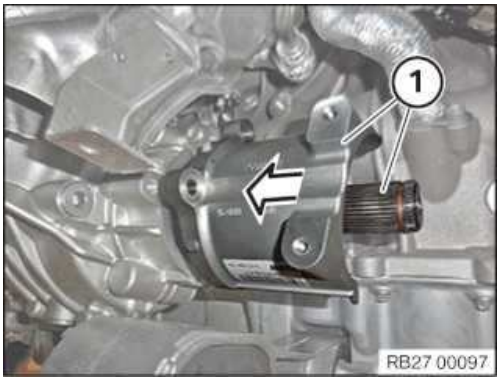
116 – Install the intermediate shaft with the support tube



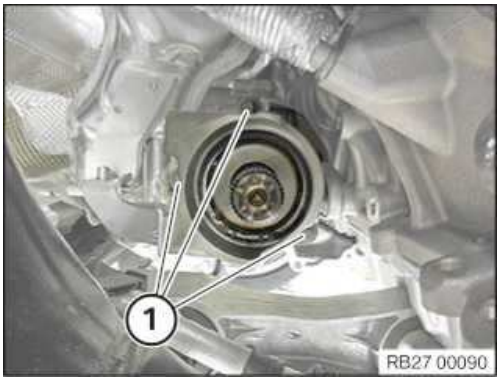
- Coat gearing of the intermediate shaft uniformly with 5 g of grease.

Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the intermediate shaft with support tube (1) in the transfer box.



- Position screws (1).

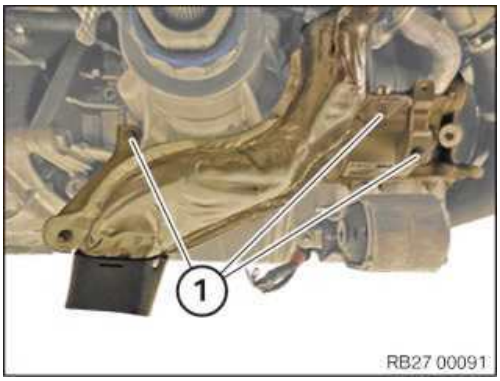
Note: Check for correct screw length! Bolt M8x35 8.8

- Tighten the screws (1).

Intermediate shaft to transfer box

M8x35		Tightening torque	19 Nm

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- If installed: Install air duct.
- Tighten the screws (1).

117 – Installing starter motor

CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.



- Insert and install the starter motor .
- Tighten the screws (1).

Starter motor to transmission

M8x45		Tightening torque	19 Nm



- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

Battery positive lead to starter

M8		Tightening torque	13,5 Nm



- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.

118 – Installing right output shaft partially

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- Renew the circlip (1).

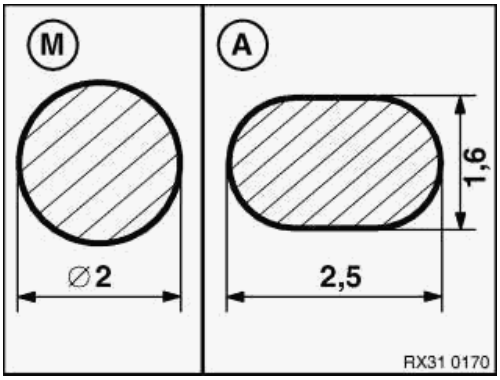
  Parts: Circlip
- Slide output shaft into the transmission as far as the limit position.
- Check for secure seat by levering.

119 – Partially installing the left output shaft



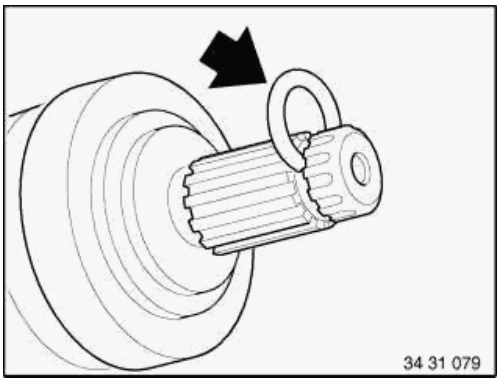
- **With automatic transmission only:**
- Lever out O-ring (1).
- Renew O-ring (1).

  Parts: O-ring
- Insert new O-ring (1).

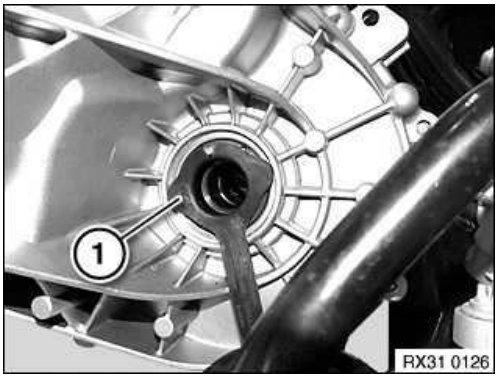


- Do not mix up circlips.

  Different types of output shafts fitted:
  - M: Manual transmission
  - A: Automatic transmission

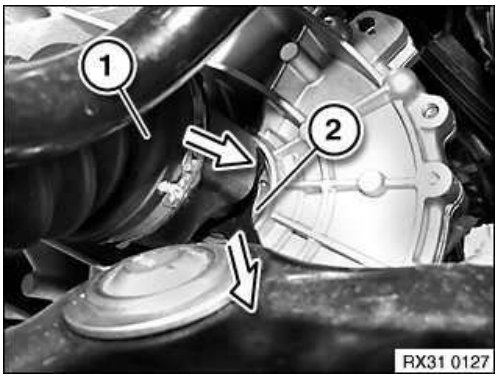


- Renew circlip (arrow).



- Insert installation protection ring (1) into the radial shaft seal.
- Make sure the tool fits over the lip of the radial shaft seal so there is no damage to sealing ring when the output shaft is inserted.

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- Insert output shaft (1) into transmission.
- **Manual gearbox only:** Pull on the handle to remove the installation protection ring (2) and dispose of it.
- Slide output shaft (1) into the transmission as far as the limit position.

  The output shaft (1) must engage audibly.
- Check for secure seat by levering.

120 – Install propeller shaft.

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

RISK OF DAMAGE

Damage to the propeller shaft during installation.

Non-observance of the installation guidelines for the propeller shaft on the rear axle differential may cause severe damage.

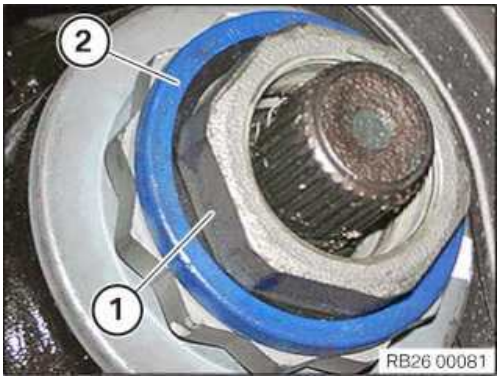
- Always renew the recessed nut on the rear axle differential. Screw locking must be available.
- Strictly observe a minimum hardening time of two hours after having screwed in the recessed nut. The hardening time may be longer at lower temperatures.

RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.



- Renew recessed nut (1).

  Parts: Insert nut
- Renew the retaining clip (2) and the seal.

  Parts: Retaining clip, seal
- Insert the seal with the recessed nut (1) and install.
- Insert the retaining clip (2) and install.
- Make sure that recessed nut (1) is screwed in within 5 min.
- Make sure that the hardening time of **minimum** 2 h for the recessed nut is observed.

  The hardening time must be extended at lower temperatures.

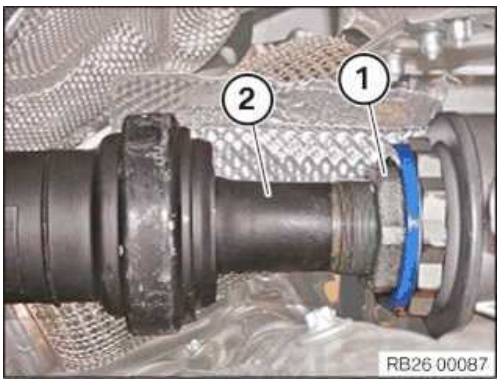
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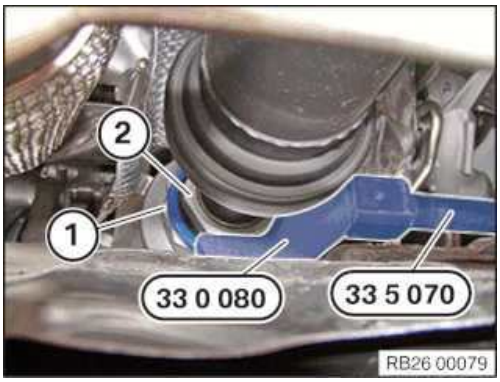
- Insert the propeller shaft (1) and install.
- Always support the propeller shaft (1) with a conventional jack.



- Hand-tighten the bolts (1).



- Push the propeller shaft (2) against the recessed nut (1) up to the limit position.
- Screw the propeller shaft (2) at least 2 thread starts onto the recessed nut (1) by hand.



RISK OF DAMAGE

Damage to the transfer box.

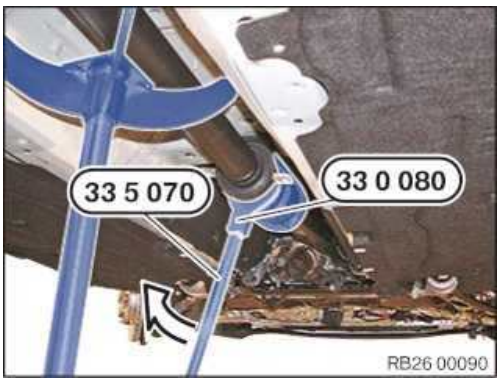
Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.

- Protect the recessed nut (2) on the transfer box from twisting with the special tools **0 495 554 (33 5 070)** and .

  The recessed nut (2) on the transfer box must **not** be used to tighten the propeller shaft.

  The double hexagon flange nut (1) must **not** be used for counter support.

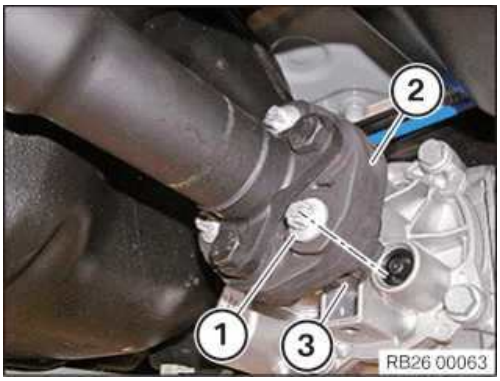


- Tighten the front propeller shaft with the special tools **0 495 554 (33 5 070)** and in the direction of the arrow.

Propeller shaft to transfer box

		Tightening torque	80 Nm

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TECHNICAL INFORMATION

Compliance with the following instructions is required to avoid a humming noise from the propeller shaft after refitting the propeller shaft.

- Assemble the screw connection (1) of the flexible disc (2) and the three-hole flange (3) according to the mark.
- Renew screws (1).

  Parts: Bolts
- Hand-tighten the bolts (1).



- Protect the propeller shaft (1) with the special tools **0 495 554 (33 5 070)** and from twisting.



- Tighten the bolts with the special tools **0 490 504 (00 9 120)** and .

Flexible disc to rear axle final drive

M12x1.5	Renew screws.	Tightening torque	55 Nm 90 °



- Tighten the screws (1).

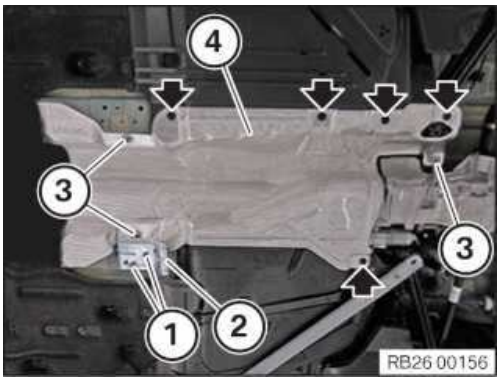
Centre mount to body

M8		Tightening torque	19 Nm



- Guide the special too l out between the front and rear propeller shaft and remove.

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- Insert and install the heat shield (4).
- Tighten screws (arrows).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

- Tighten nuts (3).

Heat shield to body

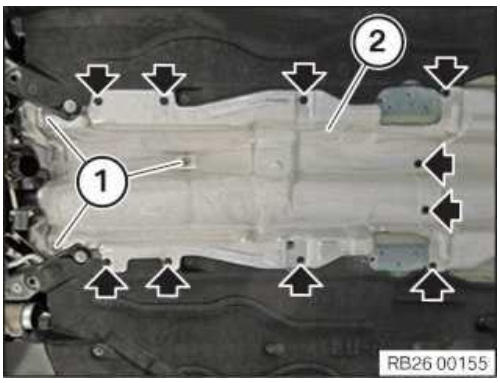
Bolts/nut		Tightening torque	3 Nm

- Insert and install the holder (2).
- Tighten the screws (1).

Bracket to body

M8		Tightening torque	21 Nm

122 – Install the front heat shield



- Insert and install the heat shield (2).
- Tighten screws (arrows).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

- Tighten nuts (1).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

123 – Install exhaust system

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

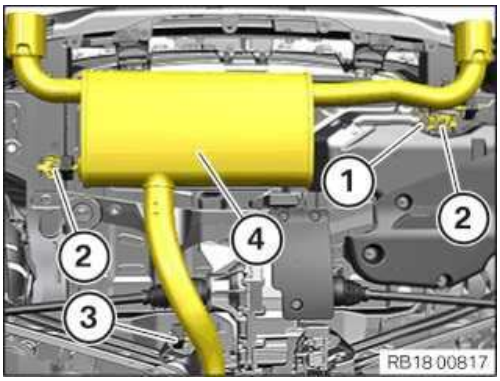
CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

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- Feed in and install the exhaust system (4) with a second person.
- Renew nuts (2).

  Parts: Nuts
- Tighten nuts (2).

Exhaust system to body

M8	Replace nuts.	Tightening torque	19 Nm

- Tighten down screw (1).

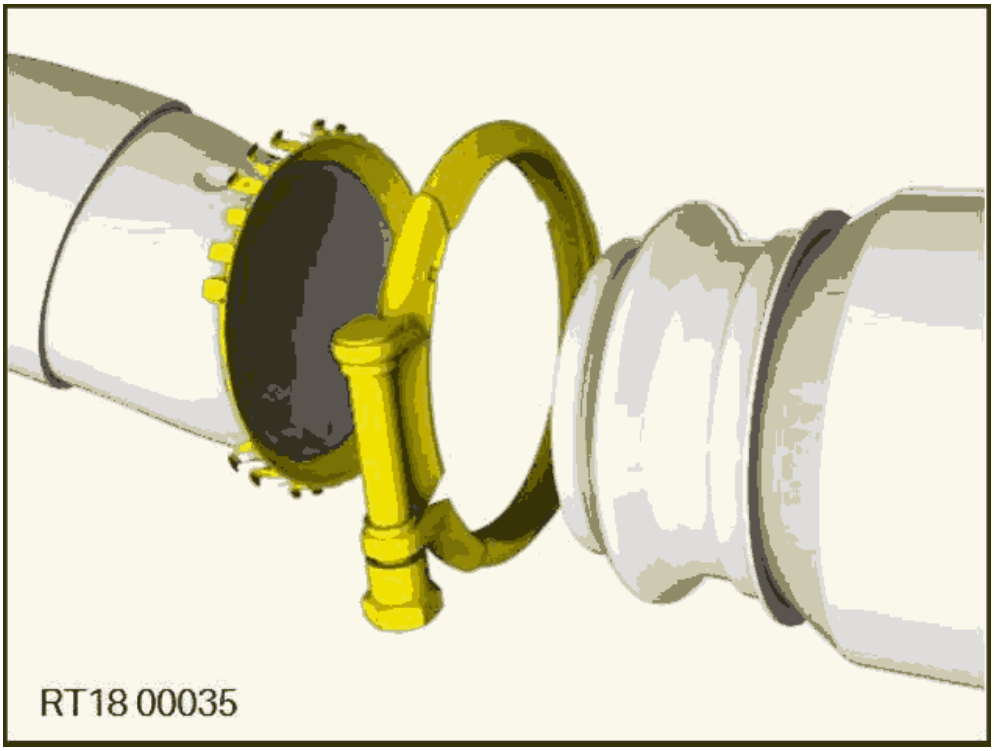
Exhaust bracket on body

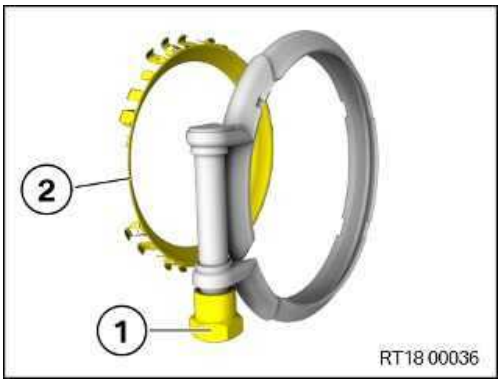
Hexagon screw M8x30		Tightening torque	19 Nm

- Check the rubber mount (3) for damage and renew as needed.
- Mount rubber mount (3) on the exhaust system (4).

▶ **Install the V-clip**

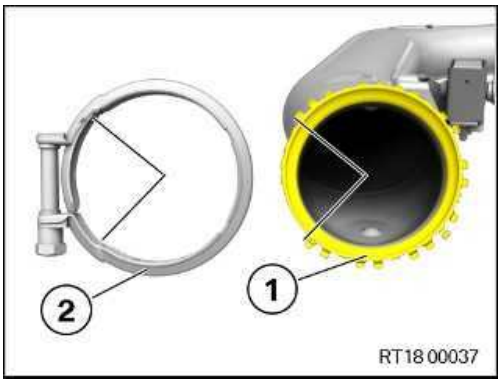
V-band clamp





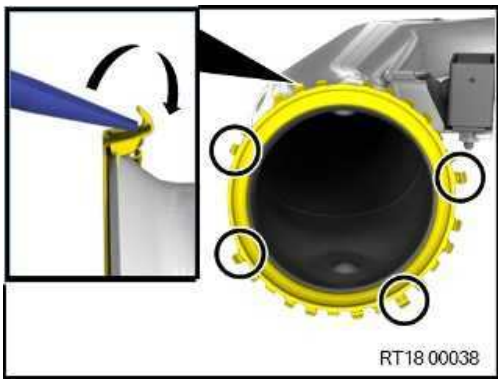
- Unscrew the nut (1) and remove the sealing ring (2).

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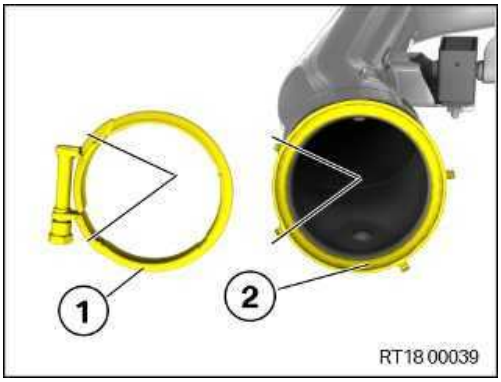


- Renew the V-clip (2).

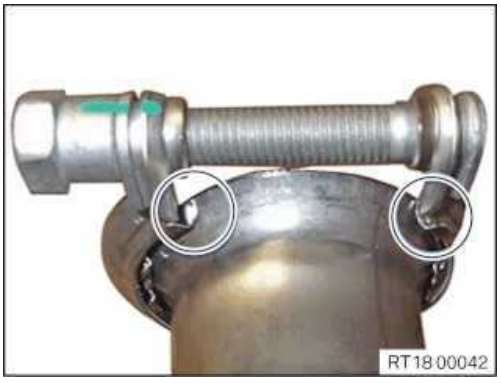
  Parts: V-band clamp
- Mount the sealing ring (1) on the exhaust system.
- Ensure that the sealing ring (1) for the V-clip (2) is positioned correctly.



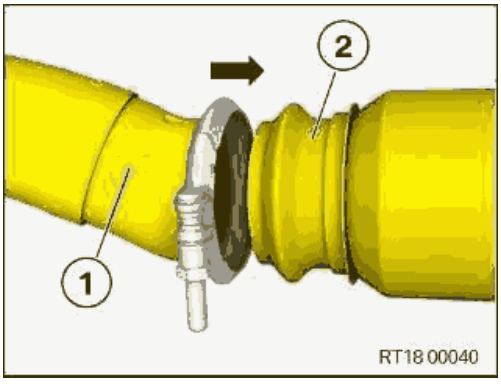
- Bend all sheet metal tabs over with a suitable tool, except those in the marked areas.



- Mount the V-clip (1) on the sealing ring (2).
- Make sure that the V-clip (1) is positioned correctly on the sealing ring (2).

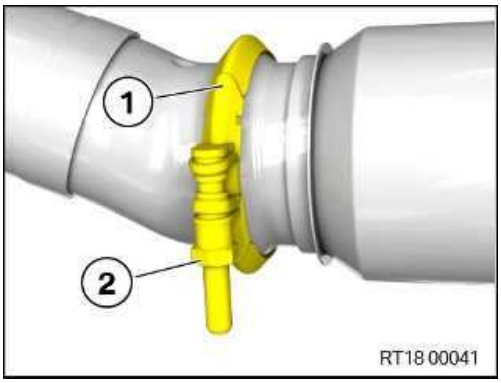


- Make sure that the V-clip rests against the sheet metal tabs after mounting (marks).



- Connect the exhaust system (1) with the catalytic converter (2) and position correctly.

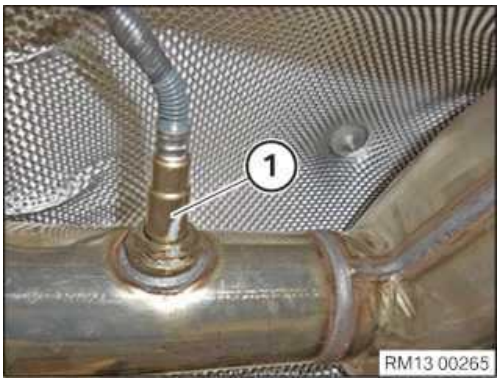
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- Make sure that V-clip (1) is fitted correctly.
- Tighten down screw (2).

V-clip to catalytic converter

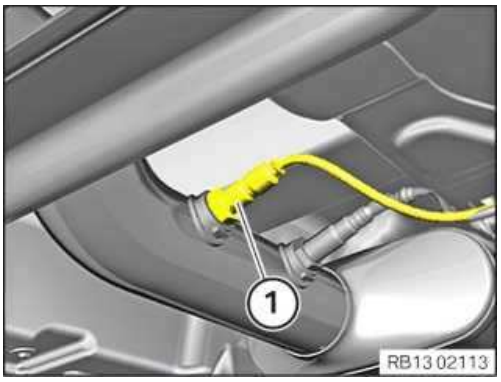
V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm



- Feed in, install and tighten diesel particulate sensor (1).

Diesel particulate sensor to exhaust system

Sensor		Tightening torque	50 Nm

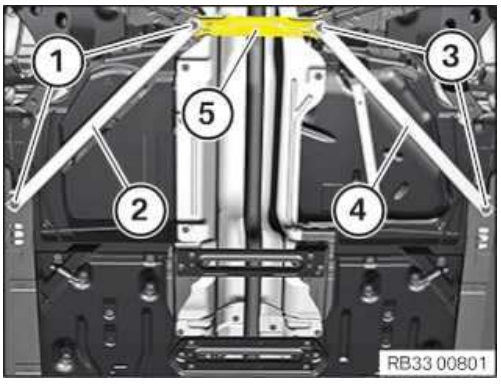


- Feed in, install and tighten nitrogen oxide sensor (1).

Nitrogen oxide sensor downstream of SCR catalytic converter

Sensor		Tightening torque	50 Nm

124 – Install the cross-member with torsion struts



- Insert and install the cross-member (5).
- Thread in torsion strut (4) at right and install.
- Renew screws (3).

  Parts: Bolts
- Tighten down screws (3).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

- Guide in and install the left torsion strut (2).
- Renew screws (1).

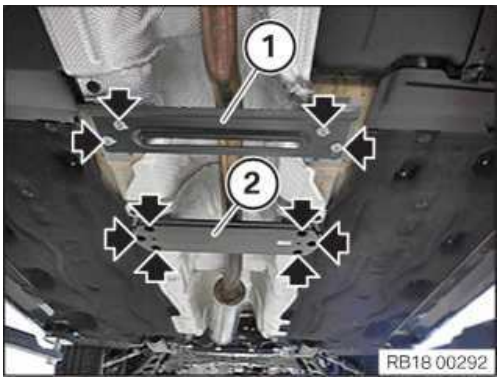
  Parts: Bolts
- Tighten the screws (1).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

125 – Install the connecting support on the tunnel in front and back

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- Insert and install connecting supports (2).
- Tighten the screws (arrows) from the connecting support (2).

Front connection carrier to body

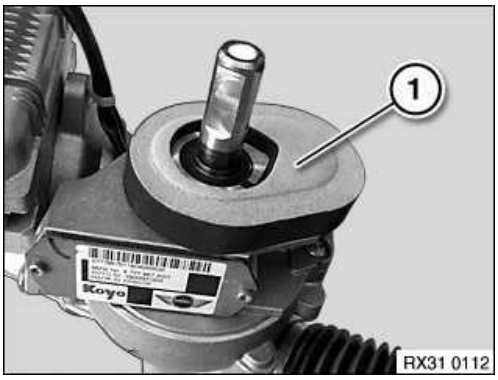
M10x18		Tightening torque	56 Nm

- Insert and install connecting supports (1).
- Tighten the screws (arrows) from the connecting support (1).

Rear connection carrier to body

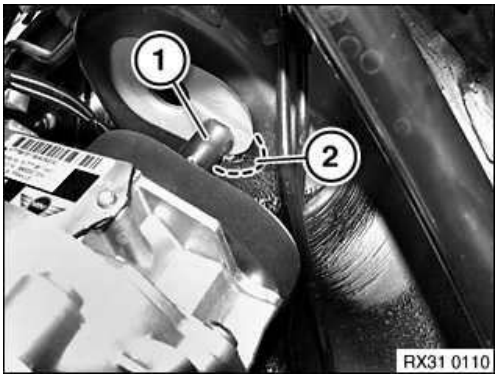
M8x18		Tightening torque	28 Nm

126 – Mount and secure the complete front axle



- Remove the seal (1).
- Clean surface on steering gear.
- Renew gasket (1).

  Parts: Gasket
- Position the seal (1) and glue it on.



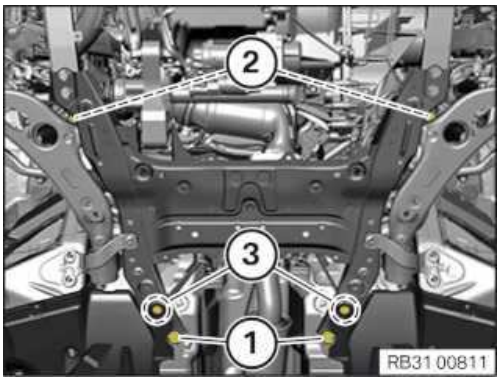
TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!

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- Position front axle support.
- Bend underbody panellings in the areas (3) to one side.
- Raise front axle support.
- When raising, insert charge air cooler into the rubber mount of the charge air cooler on cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

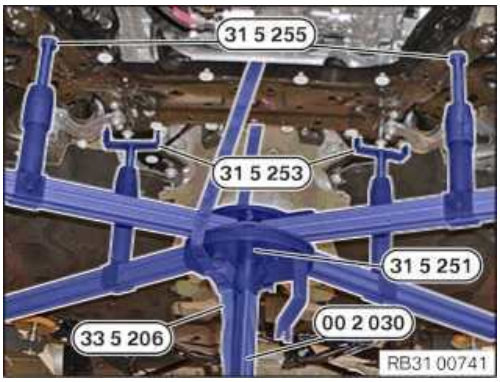
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

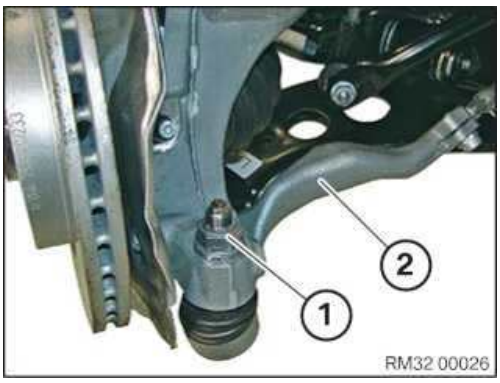
- If necessary, tighten the screws in the areas (3).

Underbody protection to body

Screw		Tightening torque	3 Nm



- Remove special tool from special tool .
- Lower universal jack **0 490 133 (00 2 030)** with the special tool and place it to the side.



NOTICE

Perform the operations on the left and right side.

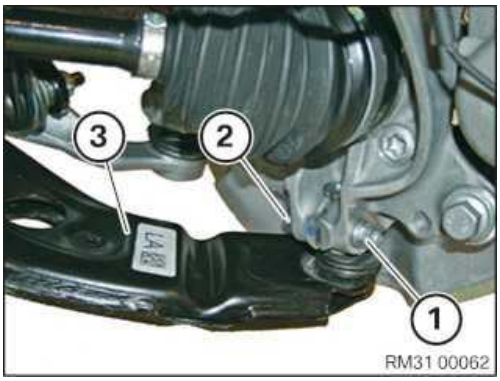
- Position the track rod (2) on the swivel bearing .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Track rod end to swivel bearing

M14	Renew nut.	Tightening torque	175 Nm

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NOTICE

Perform the operations on the left and right side.

- Position the wishbone (3) on the swivel bearing .
- Renew the bolt (2) and the nut (1).

  Parts: Bolt, nut
- Insert screw (2).
- Tighten nut (1).

Wishbone to swivel bearing

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

127 – Install the mounted parts on the front axle support



NOTICE

Perform the operations on the left and right side.

- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Holder, wishbone rubber mount, to body

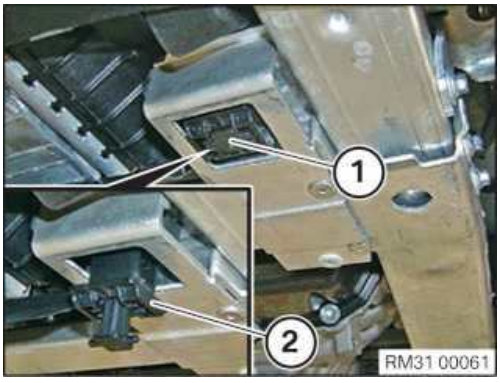
M10 screw	Renew screw.	Jointing torque	56 Nm
		Angle of rotation	90 °



- Position the engine support (3) on the front axle support (1).
- Tighten down screw (2).

Holder with rubber mount to front axle support

M12 screw		100 Nm

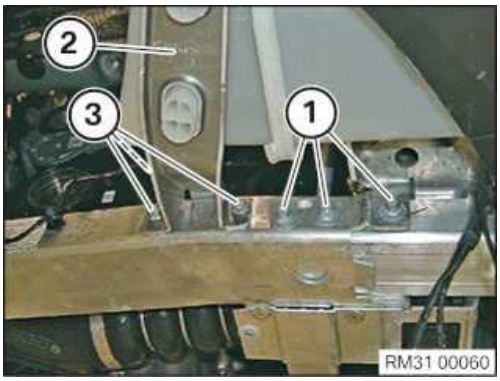


NOTICE

Perform the operations on the left and right side.

- Position the lock (2).
- Lock the bracket (1) of the lock (2) of the holder for the charge air cooler.

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- **Only on right side:** Position the holder for the washer fluid reservoir (2).
- Tighten down screws (3).

Washer fluid reservoir holder to front axle support adapter plate

		Tightening torque	10 Nm

NOTICE

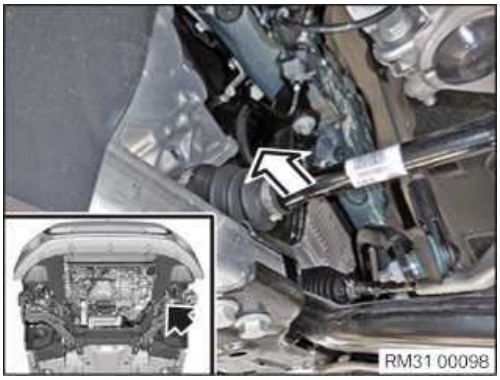
Perform the operations on the left and right side.

- Tighten the screws (1).

Deformation element, bottom, to adapter plate, front axle carrier

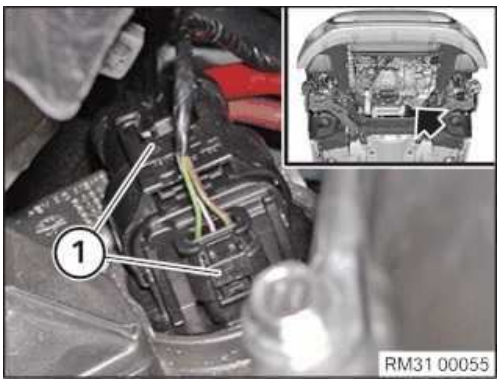
		Tightening torque	11,8 Nm

128 – Attaching connector at steering gear

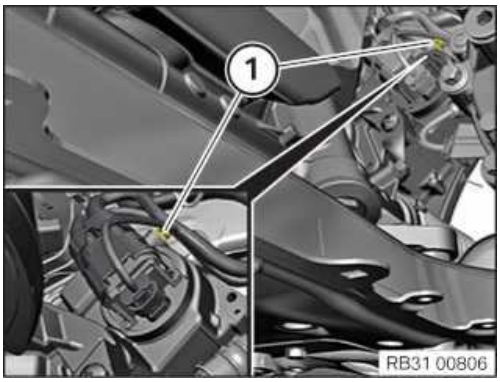


- To connect the connector (see the following step): Connect the connector with the right hand.

  The connectors can be accessed via the left output shaft.



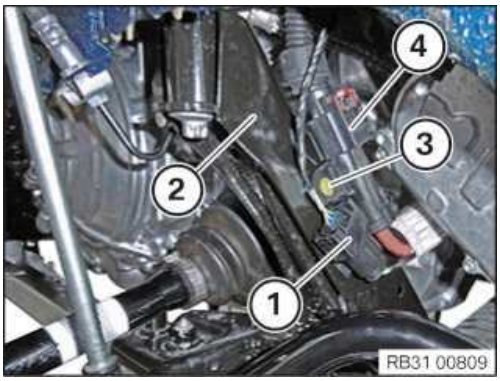
- Connect and lock connector (arrow) (1) with the steering gear.



- Fasten the wiring harness (1) on the steering gear.

▸ **If installed: Fasten the plug connections at the front axle support**

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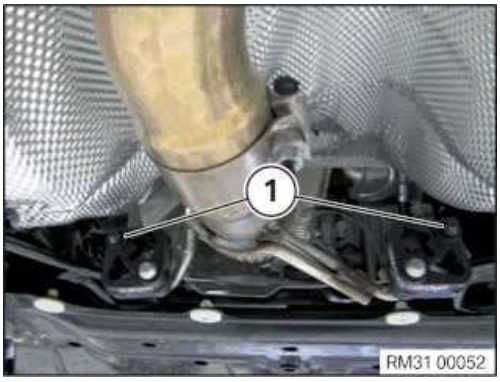
- Position the plug connection (4) at the front axle support (2).
- Tighten down screw (3).

Holder to front axle support

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

- Fasten the plug connection (1) at the front axle support (2).

129 – Securing rubber mount on front axle support



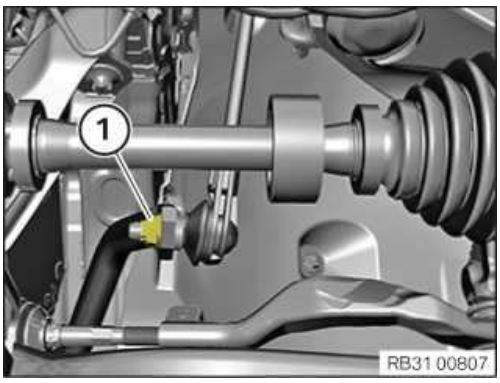
- Check rubber mount (1), replace if necessary.

  Parts: Rubber mount
- Spray rubber mount (1) with lubricant and slide onto holder on front axle support.

130 – Securing anti-roll bar on left and right on the anti-roll bar link

NOTICE

Perform the operations on the left and right side.



▶ **Fastening anti-roll bar on the anti-roll bar link**

- Position the anti-roll bar link on the anti-roll bar .
- Renew nut (1).

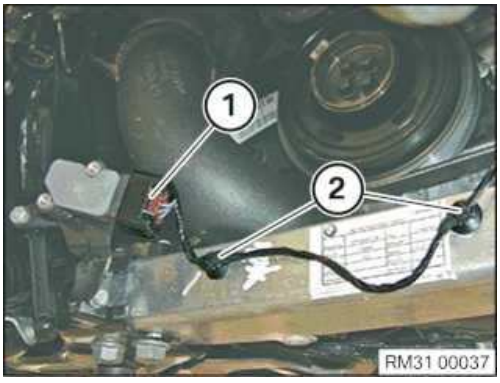
  Parts: Nut
- Tighten nut (1).

Note: Use the Torx socket for counter support.

Anti-roll bar link to anti-roll bar

M10	Renew nut.	Tightening torque	56 Nm

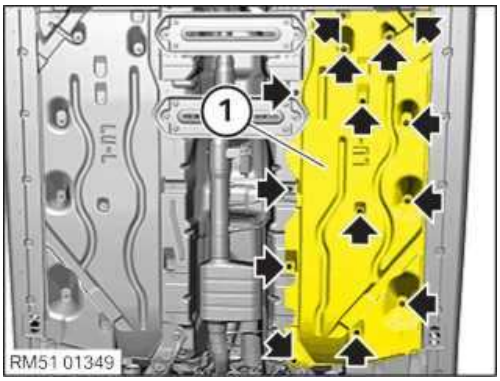
131 – With right installation: Securing the cable for the ride height sensor



- Secure the cable clip (2) on the adapter of the deformation element.
- Connect connectors (1) and lock.

132 – Installing underbody panelling , right

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- Correctly position the underbody panelling (1).
- Tighten all bolts and nuts (arrows).

Underbody panelling, side

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side

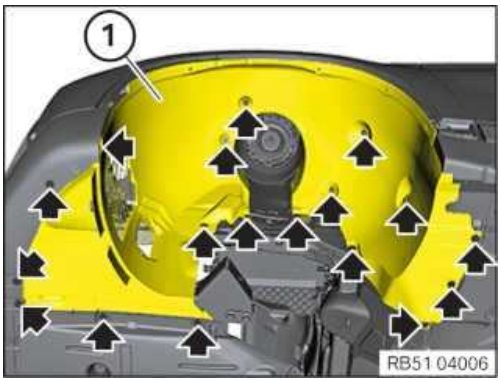
Plastic nut		Tightening torque	2,6 Nm

133 – Installing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

▸ **Installing the front wheel arch cover**



- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Plastic nut		Tightening torque	2,6 Nm
Screw		Tightening torque	2,6 Nm

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

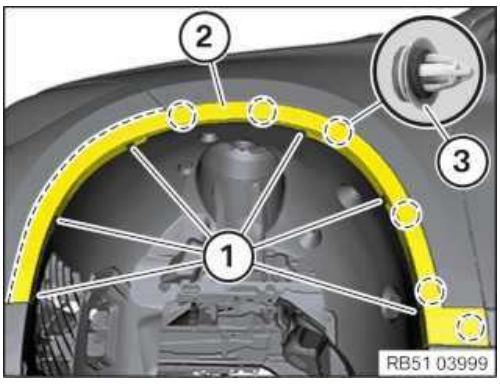
▸ **Installing front wheel arch trim**

NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Check the clips (3) for damage and renew where required.

  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

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▶ Mounting the wheel

▷ Clean the contact surfaces between the brake disc and the wheel rim



TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

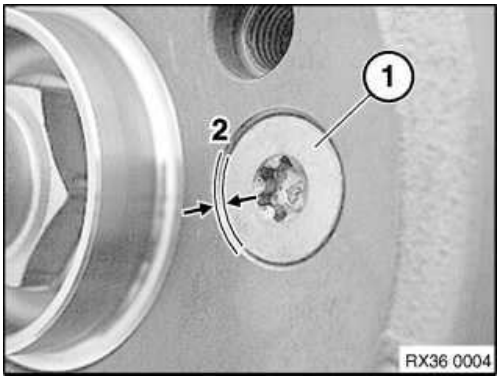
- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue in the area of the wheel bolt holes, remove and clean the brake disc.



- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).



- Renew mounting bolt (1).

  Parts: Mounting bolt
- Check that the mounting bolt (1) for the brake disc is securely seated.

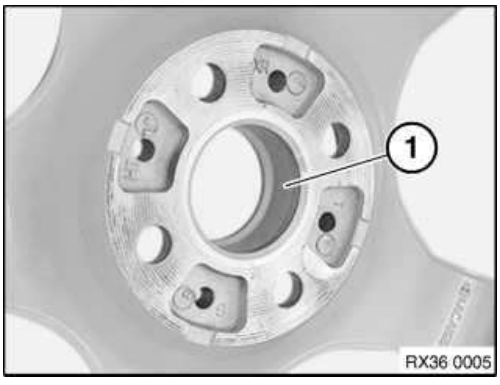
  The mounting bolt (1) for the brake disc may not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to rear wheel hub

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub

M8	Renew screw.	Tightening torque	16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring (1).

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

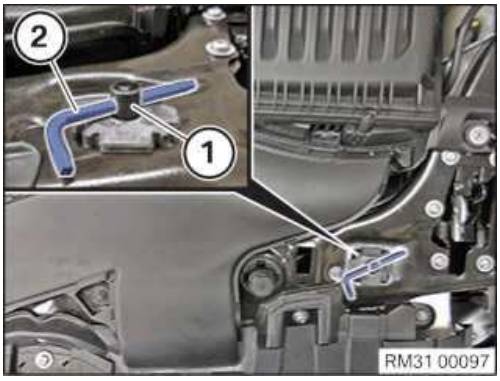
- Renew corroded wheel bolts.

  Parts: Wheel bolts
- Clean the wheel bolts.
- Check the wheel bolts and threads for damage, renew the wheel bolts if necessary.
- Join and tighten the wheel bolts (arrows).

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

135 – Removing fastener for left and right radiator



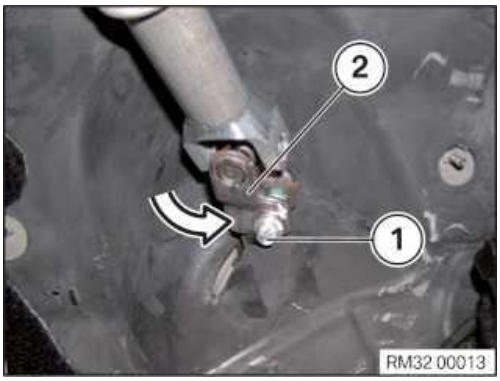
NOTICE

Perform the operations on the left and right side.

- Remove suitable tool (2) from the centering pin (1).

136 – Secure the steering shaft at the bottom on the steering gear

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- Clean the screw lock residue from the screw thread in the universal joint (2).
- Pivot the universal joint (2) in the direction of the arrow to the steering gear.
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Lower steering shaft to steering gear

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm



- **If installed:**
- Position the cover on the steering column (2).
- Tighten nuts (1).

Steering column cover to bulkhead

Plastic nut		Tightening torque	3 Nm

137 – Install the heat shield on the exhaust turbocharger



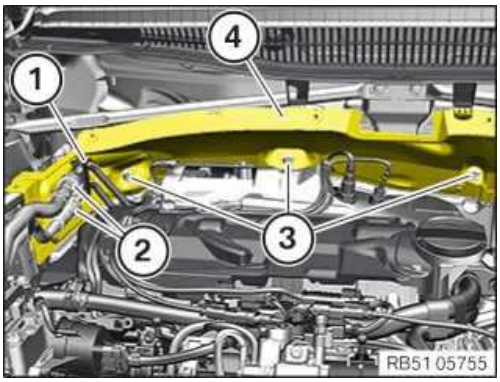
- Feed in and install the heat shield (2).
- Tighten the screws (1) at the top and bottom of the heat shield.

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Fasten the cable at the clips .

138 – Installing rear bulkhead upper part



- Feed in and install the rear bulkhead upper part (4).
- Tighten down screws (3).

Rear bulkhead upper part to lower section of bulkhead

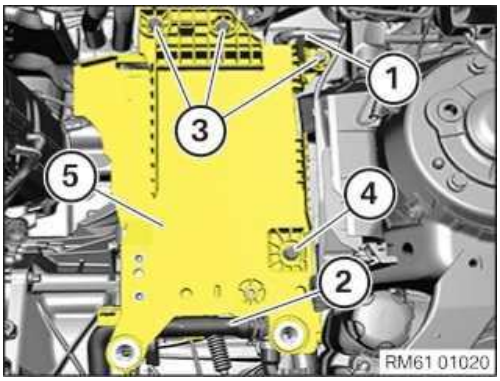
Oval-head screw		Tightening torque	5 Nm

- Feed the fuel line (2) into the holder (1) and install.
- Connect and lock the holder (1).

  The holder (1) must engage audibly.

139 – Install the battery holder

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- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

140 – Install electronics box

Prerequisite

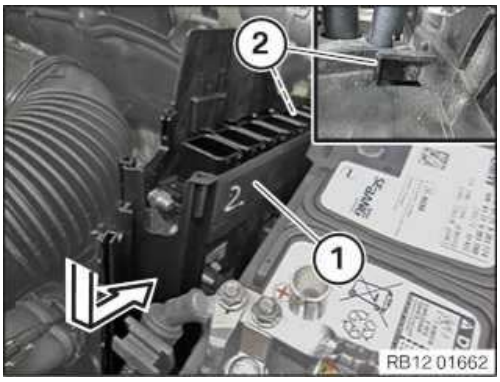
Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.

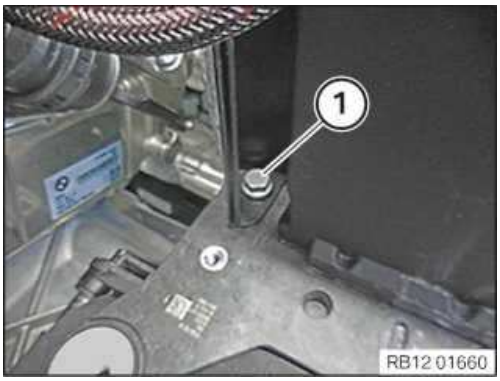


- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.



- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).

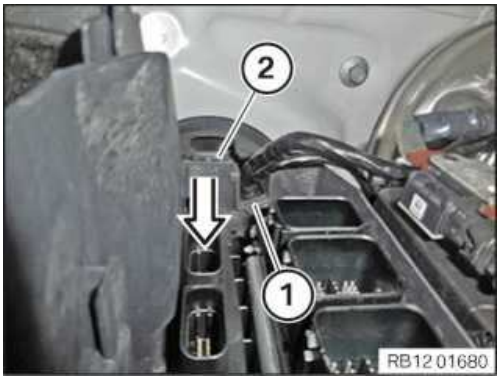
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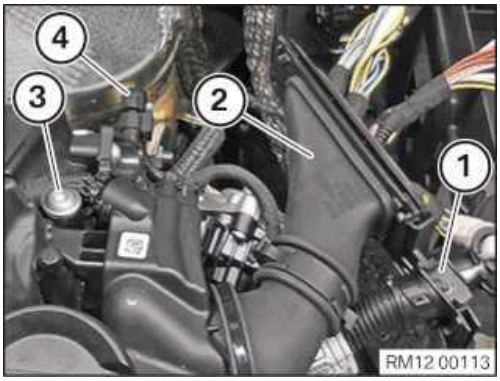
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.

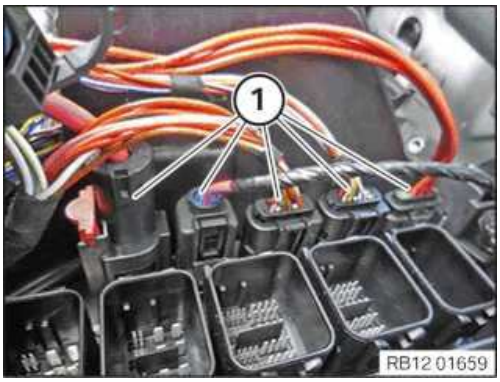


- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

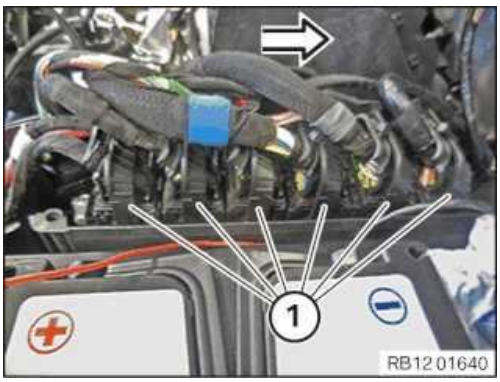
Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.

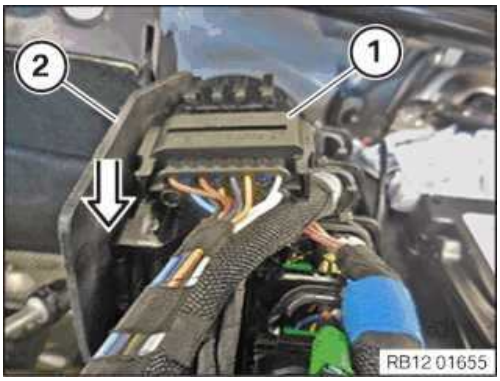


- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.

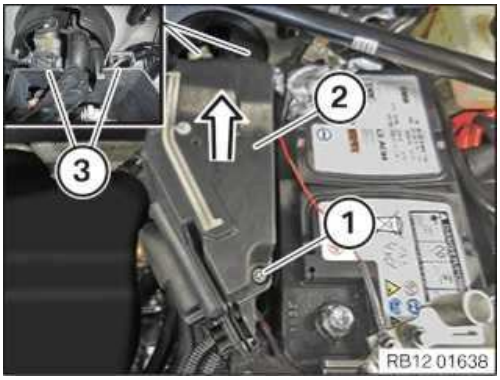


- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.

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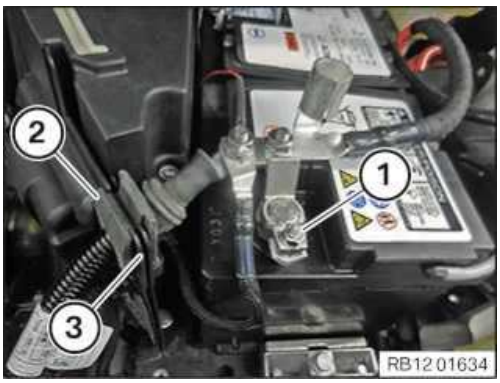
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

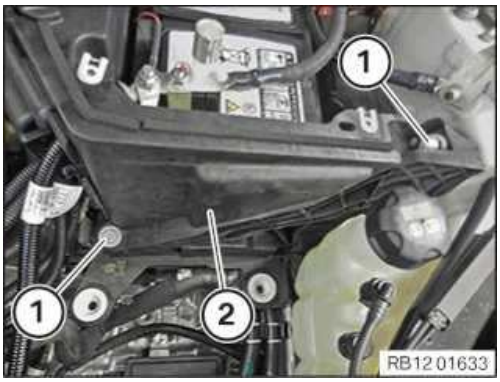
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

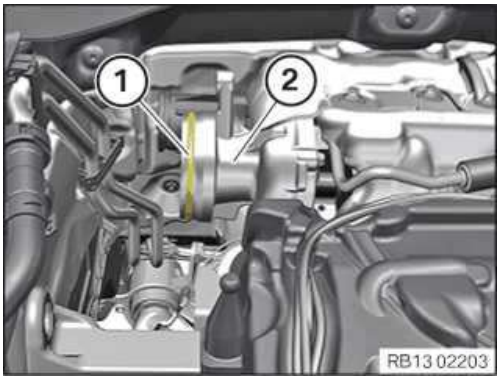


- Feed in and install tension strut (2).
- Tighten the screws (1).

Tension strut to spring strut dome/battery tray

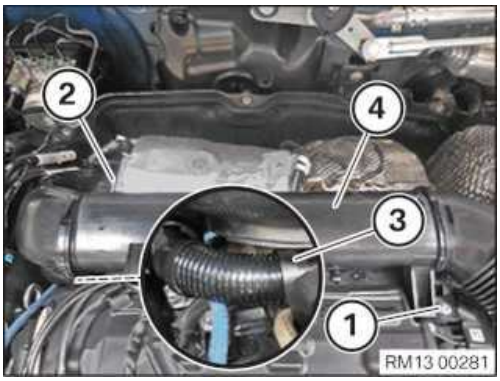
M8		Tightening torque	19 Nm

141 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.

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- Feed in clean air pipe and install.
- Connect clean air pipe to the exhaust turbocharger and lock audibly in the clamps (2).
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Connect ventilation line (3) to the cylinder head cover and lock audibly.

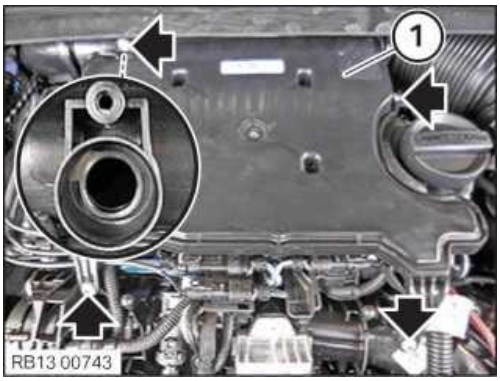


- Mount clean air pipe onto the intake filter housing.
- Tighten clamp (1) on the clean air pipe.

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

142 – Install resonator



- Insert and install the resonator (1).
- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

143 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

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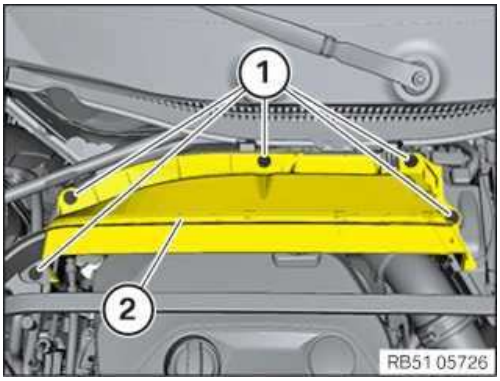


- Check for correct installation of all rubber mounts in the acoustic cover (1).



- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

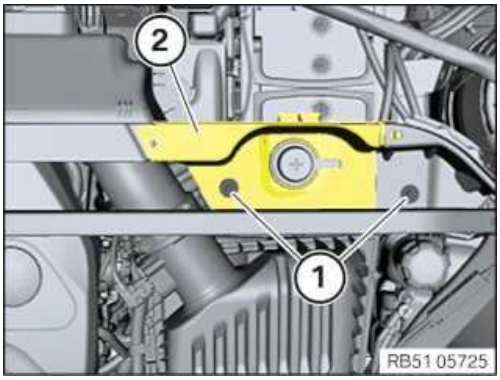
144 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Cover of top bulkhead

Screw		Tightening torque	2,6 Nm

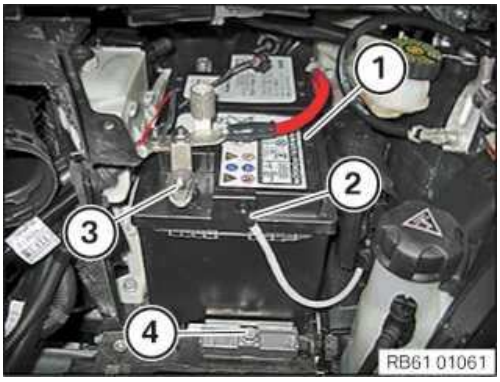


- Guide in and install cover (2).
- Tighten down screw (1).

Cover of remote positive terminal

Screw		Tightening torque	2,6 Nm

145 – Install vehicle battery



- Install vehicle battery (1).
- Position the bracket and tighten with the screw (4) .

Battery terminal rail to battery tray

M8		19 Nm

- Position the vent hose (2) and clip it in.
- Position the positive battery terminal and tighten with the nut (3) .

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

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▶ **Check the vent holes of the battery**

WARNING

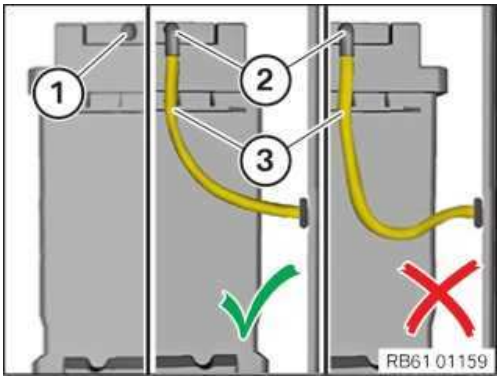
Gas emission.

Danger of injury! Danger of explosion!

- Assign the vent holes correctly.
- Route the vent hose correctly.

TECHNICAL INFORMATION

The battery has two vent holes, opposite:
One vent hole (1) must be closed correctly with a dummy plug.
The vent hose (3) must be correctly connected and routed at the other vent hole (2).



Check

- Check if the vent hole (1) is correctly closed with a dummy plug.

Result

» No dummy plug.

Measure

- Close the vent hole (1) correctly with a dummy plug.

Check

- Check if the vent hole (2) has a correctly connected vent hose (3).

Result

» The vent hose (3) is not correctly connected.

Measure

- At the vent hole (2), connect the vent hose (3) correctly.

Check

- Check if the vent hose (3) is routed to the outside with a downhill gradient (**no siphon formation!**).

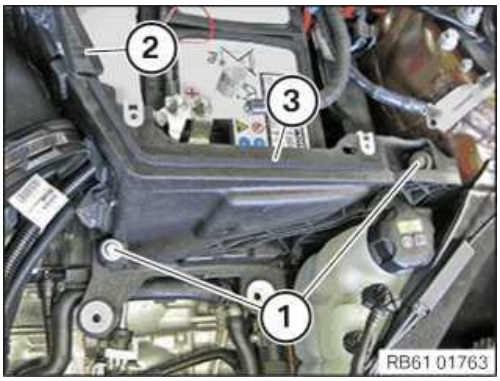
Result

» The vent hose (3) is not correctly routed as shown in the image on the right.

Measure

- Route the vent hose (3) correctly as shown in the centre image.

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- Insert tension strut (3) and tighten with screws (1).

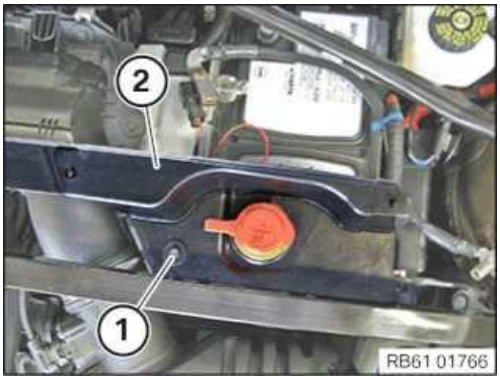
Trailing link

M8		Tightening torque	19 Nm

- Tighten down screw (2).

Battery cover

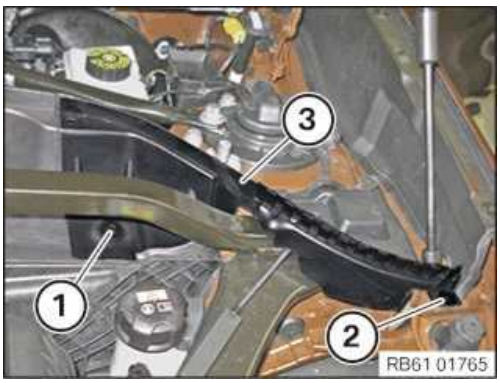
M8		2,8 Nm



- Position the cover (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

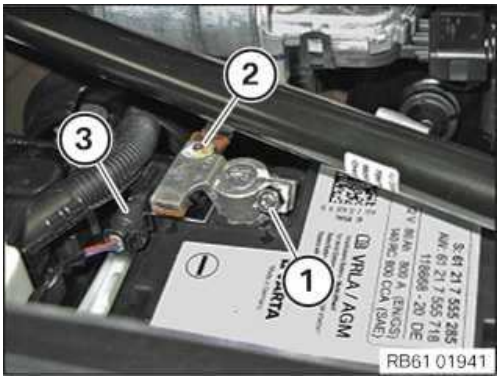
Battery cover

M8		2,8 Nm

146 – Connecting the battery earth lead

TECHNICAL INFORMATION

For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)



- Remove the protective cover of the positive battery terminal.
- Position the battery earth lead (2).
- Tighten nut (1).

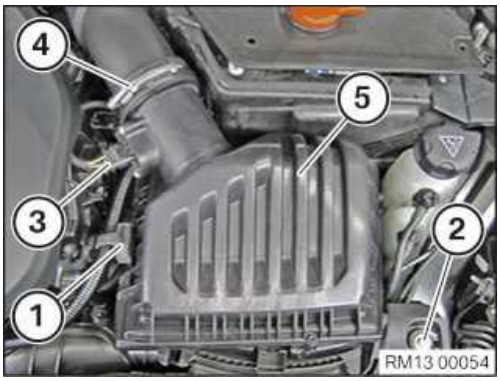
Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

- If required, connect the connector (3).

147 – Installing intake silencer housing

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- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

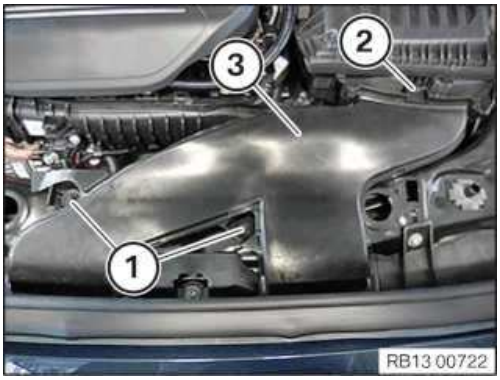
- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

148 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).
  The lock (2) must audibly engage.
- Tighten nuts (1).

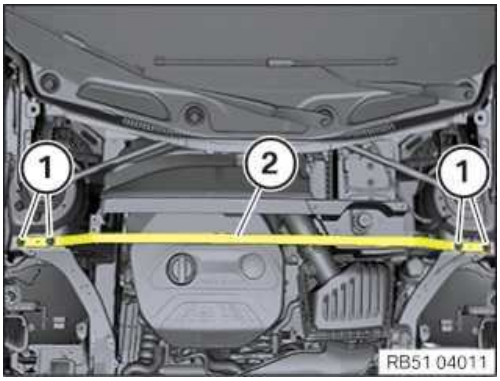
Intake neck to cross connection

M6		Tightening torque	8 Nm

149 – Install strut brace

TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.

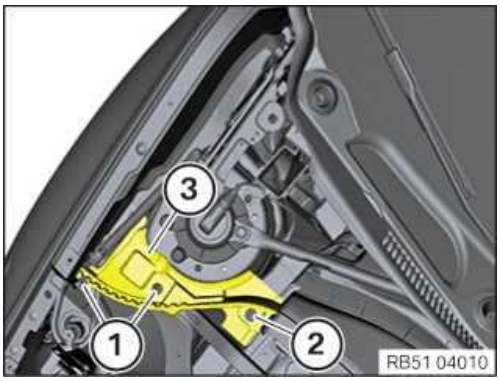


- Install the strut brace (2).
- Renew screws (1).
  Parts: Bolts
- Tighten the screws (1).

Cross-brace to spring strut dome

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

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NOTICE

Description is for right component only. The procedure on the left side is identical.

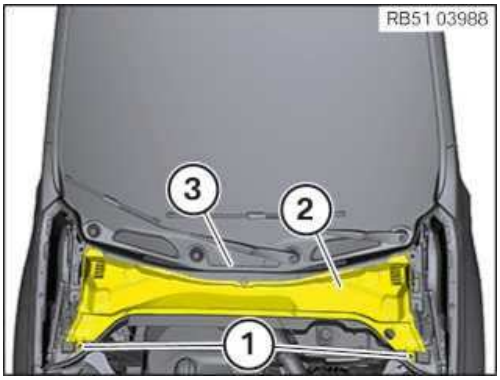
- Install the cover (3).
- Tighten down screw (2).

Cover on body

Hexagon screw		Tightening torque	3 Nm

- Install the expanding rivet (1).

150 – Installing front cowl panel cover

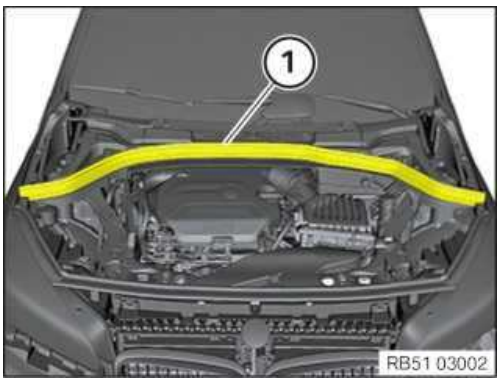


- Insert and install cowl panel cover at front (2) into cowl panel cover at rear (3).
- Check cowl panel cover at front is correctly seated (2).
- Secure expanding rivet (1).

151 – Install the seal for the bonnet

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

152 – Fill and bleed the coolant circuit

▸ **Filling and bleed the high-temperature coolant circuit**

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- See additional information.

153 – Checking/topping up oil level in automatic gearbox (AISIN GA8G45)

Prerequisite

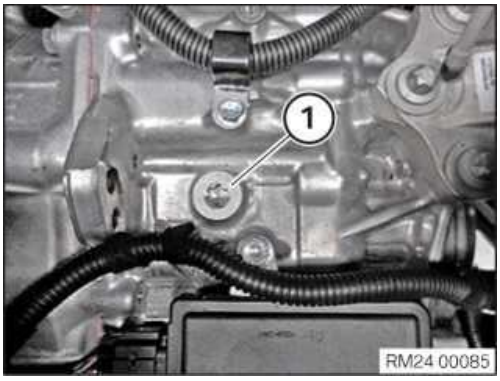
Vehicle in horizontal position.

CAUTION

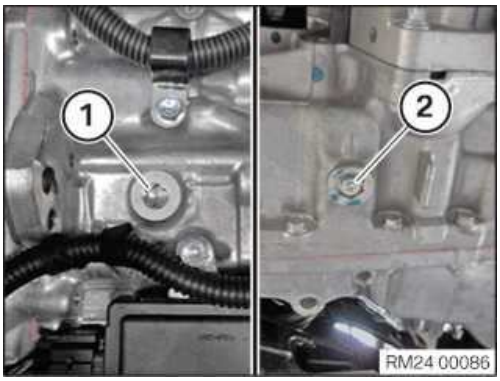
Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.



- Move the selector lever to the "P" position.
- Secure vehicle to prevent it rolling.
- Connect diagnosis system.
- Release the oil filler plug (1) using the Torx T55 .



- **Topping up the automatic transmission fluid (the automatic transmission fluid was drained):**
- Release oil filler plug (1) from engine compartment.
- Loosen the overflow plug (2) below at the transmission.
- Top up automatic transmission fluid at oil filler plug (1) until oil emerges at overflow plug (2).
- Start engine and run at idle speed.
- Check whether the automatic transmission fluid is leaking at the overflow plug (2) .
- If there is no automatic transmission fluid leaking at the overflow plug (2) , fill in the automatic transmission fluid to the oil filler plug (1) .
- Press the footbrake and, when idle, shift through all the gears from "P" to "D" 2 times for more than 2 seconds .
- Move the selector lever to the "P" position.
- Check again whether the automatic transmission fluid is leaking at the overflow plug(2) .
- Read the temperature of the automatic transmission fluid with the diagnosis system.
- Increase temperature of automatic transmission fluid to 35 °C to 45 °C.
- Top up automatic transmission fluid until it flows over.

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- Renew sealing rings.

  Parts: Sealing ring

- Screw in and fasten oil filler plug (1) and overflow plug (2).

Oil filler plug to transmission housing

M14	Renew the sealing ring.	Tightening torque	45 Nm

Overflow screw in oil drain plug

M6	Renew the sealing ring.		8 Nm

- **Check oil level (transmission oil temperature must be between** 35 °C **and** 45 °C **):**
- Open the oil filler plug (1).
- Slacken overflow plug (2).
- Start engine and run at idle speed.
- Unscrew and remove overflow plug (2).
- Check whether the automatic transmission fluid is leaking at the overflow plug (2) .
- If there is no automatic transmission fluid leaking at the overflow plug (2) , fill in the automatic transmission fluid to the oil filler plug (1) .
- Top up the automatic transmission fluid until it overflows at the overflow plug (2) .
- Press the footbrake and, when idle, shift through all the gears from "P" to "D" 2 times for more than 2 seconds .
- Move the selector lever to the "P" position.
- Check the oil level again.
- Renew sealing rings.

  Parts: Sealing ring

- If the oil escapes slightly from the overflow plug (2) , tighten the overflow plug (2) and the oil filler plug (1) .

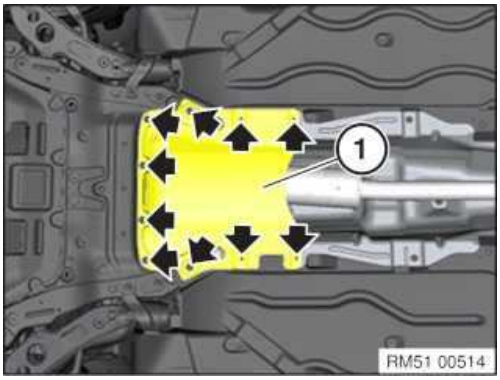
Overflow screw in oil drain plug

M6	Renew the sealing ring.		8 Nm

Oil filler plug to transmission housing

M14	Renew the sealing ring.	Tightening torque	45 Nm

154 – If installed: Installing underbody protection at rear



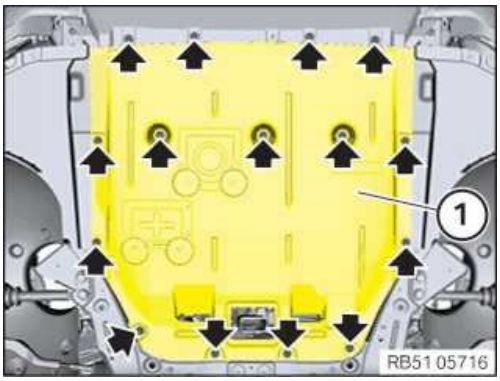
- Position rear underbody protection (1).
- Tighten screws (arrows).

Underbody protection to body

Screw		Tightening torque	3 Nm

155 – Installing the front underbody protection

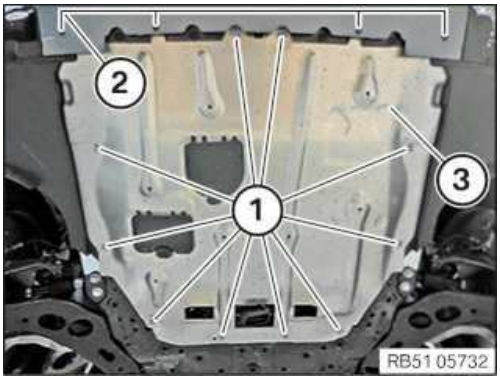
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- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm



- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Additional Information

Overview of Tightening Torques

Cross connection to carrier support — Used in step 19

Screws M6x20		Tightening torque	11,8 Nm

Screw connection for rubber mount of coolant radiator to coolant radiator — Used in step 19

Bolt to rubber mount		Tightening torque	8 Nm

Air duct to upper connection — Used in step 19

M6x20 screw		Tightening torque	11,8 Nm

Bracing strut to upper connection — Used in step 19

M8x20 screw		Tightening torque	28 Nm

Rear end of front axle support to body — Used in step 73 126

M14 screw	Renew screw.	Tightening torque	175 Nm

Front axle support, front to body — Used in step 73 126

M12 screw	Renew screw.	Tightening torque	108 Nm

Underbody protection to body — Used in step 73 126 154

Screw		Tightening torque	3 Nm

Special tool to cylinder head — Used in step 73

M8		Tightening torque	21,5 Nm

Cylinder head to crankcase — Used in step 83

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

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Cylinder head bolt to timing case cover

Used in step 83

M8x40		Tightening torque	19 Nm

Right engine mount to side member

Used in step 83

M12		Tightening torque	100 Nm

Right engine mount to cylinder head

Used in step 83

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

Heat shield to cylinder head

Used in step 83

M8X16		Tightening torque	10 Nm

Glow elements to cylinder head

Used in step 84

Glow element		Tightening torque	13 Nm

Camshaft carrier to cylinder head

Used in step 87

M7x35		Tightening torque	13 Nm

Bearing journal to cylinder head

Used in step 89

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8

Used in step 89

M8		Tightening torque	19 Nm

Standard screw connection M6

Used in step 89 100

M6			8 Nm

Chain tensioner piston to cylinder head

Used in step 90

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft

Used in step 91

M7x17.			17 Nm

Cylinder head cover to cylinder head

Used in step 93

M6		Tightening torque.	8,5 Nm

Clamping claw facing to cylinder head cover

Used in step 94

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 94

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

High pressure lines between injector and rail

Used in step 96

High pressure lines		Tightening torque	28 Nm

Exhaust-gas recirculation cooler to exhaust manifold

Used in step 98 104

M8x28	Replace screws	Tightening torque	32 Nm

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Oil return line to turbocharger

Used in step 98 99

M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase

Used in step 98

M8x16		Tightening torque	22 Nm

Exhaust turbocharger to exhaust manifold

Used in step 99

V-band clamp		Tightening torque	19 Nm

Oil feed line to bracket

Used in step 99

Torx screw M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase

Used in step 99

M8x16		Tightening torque	22 Nm

Heat shield for exhaust turbocharger

Used in step 100

Torx screw BM 6x12		Tightening torque	10 Nm

Banjo bolt for exhaust pressure pipe to exhaust manifold

Used in step 100

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

Charge air duct to oil sump

Used in step 101

M6		Tightening torque	8 Nm

Ride height sensor holder to front axle support

Used in step 101

M6		Tightening torque	8 Nm

Adapter, front axle support to front axle support

Used in step 101

		Tightening torque	100 Nm

Cross connection to front axle support

Used in step 101

M6		Tightening torque	12 Nm

Washer fluid reservoir to body

Used in step 102

M6x20		Tightening torque	8 Nm

Intake plenum to cylinder head

Used in step 103

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 104

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler

Used in step 104

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 104

M8x20		Tightening torque	19 Nm

Wiring harness to cylinder head cover

Used in step 105 140

TS5x20		Tightening torque	3,5 Nm

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Positive battery cable to alternator — Used in step 105

M8		Tightening torque	19 Nm

Fuel line to intake plenum — Used in step 105

TS6x20		Tightening torque	5 Nm

Cover to electronics box — Used in step 105 140

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery — Used in step 105 140

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray — Used in step 105 140

M8		Tightening torque	19 Nm

Diesel particulate filter V-clip to exhaust turbocharger — Used in step 106

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Diesel particle filter to holder — Used in step 106

M8 hexagon nut		Tightening torque	19 Nm

Diesel particulate filter holder to gearbox — Used in step 106

M12x75		Tightening torque	66 Nm

Diesel particulate filter bracket to crankcase — Used in step 106

M10x35		Tightening torque	38 Nm

SCR metering module V-clip to exhaust system — Used in step 106

V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm

Holder for coolant lines to diesel particulate filter — Used in step 106

Torx bolt BM6x16		Tightening torque	8 Nm

Differential pressure sensor to holder — Used in step 106 107

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor — Used in step 106 107

Clamp 15–19mm		Tightening torque	3 Nm

Control sensor — Used in step 108

Control sensor		Tightening torque	50 Nm

Exhaust temperature sensor to diesel particulate filter — Used in step 109 110

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Exhaust-gas temperature sensor to exhaust system — Used in step 111

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Oxygen sensor holder to intermediate shaft — Used in step 112

Hexagon screw M6x16		Tightening torque	8 Nm

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Nitrogen oxide sensor before SCR catalytic converter

Used in step 113

Sensor		Tightening torque	50 Nm

Monitoring sensor

Used in step 114

Sensor		Tightening torque	50 Nm

Transfer box to transmission

Used in step 115

M10		Tightening torque	56 Nm

Heat shield to transfer box

Used in step 115

M6	Renew screws.	Tightening torque	6 Nm

Oil filler plug on transfer box (VTG)

Used in step 115

M18x1.5		Tightening torque	35 Nm

Intermediate shaft to transfer box

Used in step 116

M8x35		Tightening torque	19 Nm

Starter motor to transmission

Used in step 117

M8x45		Tightening torque	19 Nm

Battery positive lead to starter

Used in step 117

M8		Tightening torque	13,5 Nm

Propeller shaft to transfer box

Used in step 120

		Tightening torque	80 Nm

Flexible disc to rear axle final drive

Used in step 120

M12x1.5	Renew screws.	Tightening torque	55 Nm 90 °

Centre mount to body

Used in step 120

M8		Tightening torque	19 Nm

Heat shield to body

Used in step 121 122

Bolts/nut		Tightening torque	3 Nm

Bracket to body

Used in step 121

M8		Tightening torque	21 Nm

Exhaust system to body

Used in step 123

M8	Replace nuts.	Tightening torque	19 Nm

Exhaust bracket on body

Used in step 123

Hexagon screw M8x30		Tightening torque	19 Nm

V-clip to catalytic converter

Used in step 123

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

Diesel particulate sensor to exhaust system

Used in step 123

Sensor		Tightening torque	50 Nm

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Nitrogen oxide sensor downstream of SCR catalytic converter

Used in step 123

Sensor		Tightening torque	50 Nm

Cross-member/torsion strut to axle support and mounting

Used in step 124

M12x48	Renew screws.	Jointing torque Angle of rotation	100 Nm 90 °

Front connection carrier to body

Used in step 125

M10x18		Tightening torque	56 Nm

Rear connection carrier to body

Used in step 125

M8x18		Tightening torque	28 Nm

Track rod end to swivel bearing

Used in step 126

M14	Renew nut.	Tightening torque	175 Nm

Wishbone to swivel bearing

Used in step 126

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

Holder, wishbone rubber mount, to body

Used in step 127

M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °

Holder with rubber mount to front axle support

Used in step 127

M12 screw			100 Nm

Washer fluid reservoir holder to front axle support adapter plate

Used in step 127

		Tightening torque	10 Nm

Deformation element, bottom, to adapter plate, front axle carrier

Used in step 127

		Tightening torque	11,8 Nm

Holder to front axle support

Used in step 128

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

Anti-roll bar link to anti-roll bar

Used in step 130

M10	Renew nut.	Tightening torque	56 Nm

Underbody panelling, side

Used in step 132

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side

Used in step 132

Plastic nut		Tightening torque	2,6 Nm

Wheel arch cover to body

Used in step 133

Plastic nut		Tightening torque	2,6 Nm
Screw		Tightening torque	2,6 Nm

Wheel arch cover to body

Used in step 133

Screw		Tightening torque	2,5 Nm

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Wheel arch cover to body

Used in step 133

Plastic nut		Tightening torque	3 Nm

Brake disc to rear wheel hub

Used in step 134

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub

Used in step 134

M8	Renew screw.	Tightening torque	16 Nm

Wheel bolts

Used in step 134

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Lower steering shaft to steering gear

Used in step 136

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

Steering column cover to bulkhead

Used in step 136

Plastic nut		Tightening torque	3 Nm

Heat shield for exhaust turbocharger

Used in step 137

Torx screw BM 6x12		Tightening torque	10 Nm

Rear bulkhead upper part to lower section of bulkhead

Used in step 138

Oval-head screw		Tightening torque	5 Nm

Battery holder to engine support

Used in step 139

Hexagon screw M8x30		Tightening torque	19 Nm

Electronics box to battery tray

Used in step 140

M8X16		Tightening torque	15 Nm

Clean air pipe to cylinder head cover

Used in step 141

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing

Used in step 141 147

Clamp		Tightening torque	3 Nm

Resonator to manifold and clean air pipe

Used in step 142

Screw TS6	Renew screw.	Tightening torque	5 Nm

Cover of top bulkhead

Used in step 144

Screw		Tightening torque	2,6 Nm

Cover of remote positive terminal

Used in step 144

Screw		Tightening torque	2,6 Nm

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Battery terminal rail to battery tray — Used in step 145

M8			19 Nm

Battery terminal with IBS positive battery terminal / negative battery terminal — Used in step 145 146

NutM6			5 Nm

Trailing link — Used in step 145

M8		Tightening torque	19 Nm

Battery cover — Used in step 145

M8			2,8 Nm

Intake silencer housing to lock bridge — Used in step 147

M6X30		Tightening torque	8 Nm

Intake neck to cross connection — Used in step 148

M6		Tightening torque	8 Nm

Cross-brace to spring strut dome — Used in step 149

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

Cover on body — Used in step 149

Hexagon screw		Tightening torque	3 Nm

Oil filler plug to transmission housing — Used in step 153

M14	Renew the sealing ring.	Tightening torque	45 Nm

Overflow screw in oil drain plug — Used in step 153

M6	Renew the sealing ring.		8 Nm

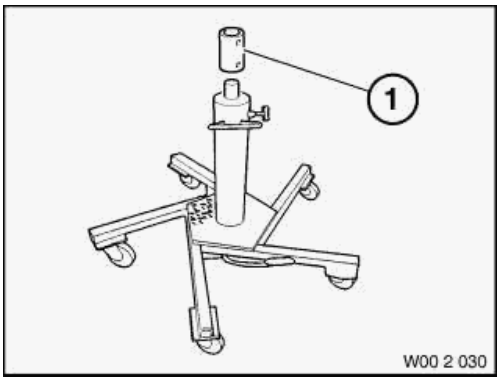
Underbody protection front — Used in step 155

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Overview of Special Tools

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0 490 133 (00 2 030) Device



Common

Used in step 32 73 83 126

Usage	(universal hydraulic lifter base unit) Chassis and hydraulic lifter - For removing and installing rear axle supports and gearboxes. Also for soft top mounts. Is replaced by 81 22 2 219 012
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 90 (207)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 490 134 (00 2 031)		**Adapter** (adapter for gearbox holder) Model series: E30, E31, E32, E34, E36	

0 495 554 (33 5 070) Extension



Common

Used in step 38 120

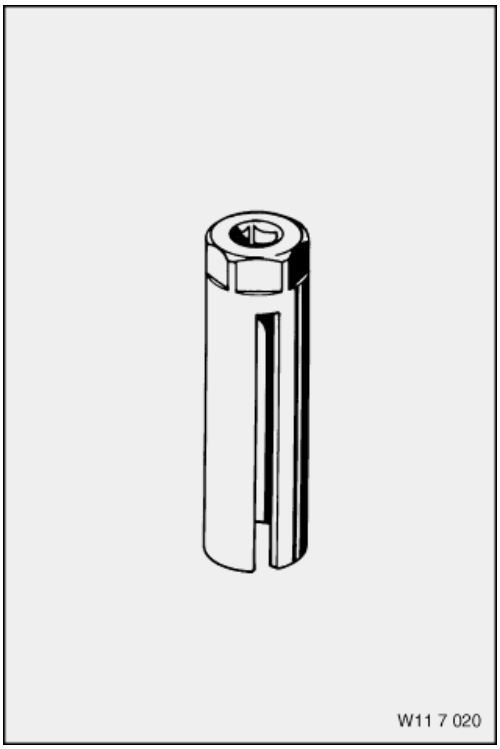
Usage	Pull-out extension for 33 5 040, 33 5 050, 33 5 060.
Included in the tool or work	
Storage location	A18
Replaced by	
In connection with	
SI-Number	01 21 06 (300)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 592 (33 5 071)		**Extension** (Extension (1 item)) discontinued, can only be ordered using complete tool	

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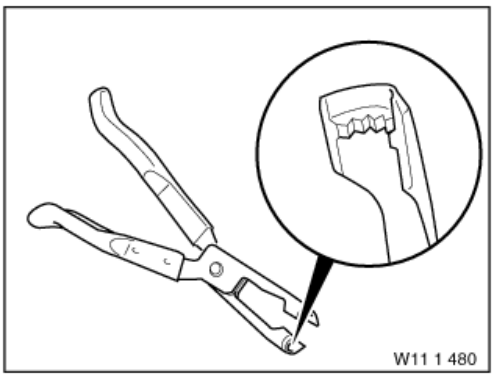
0 491 074 (11 7 020) Socket wrench insert



Common Used in step 44 45 114

Usage	(Socket wrench insert 22 mm) For loosening and tightening the oxygen sensor
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	

0 490 796 (11 1 480) Pliers

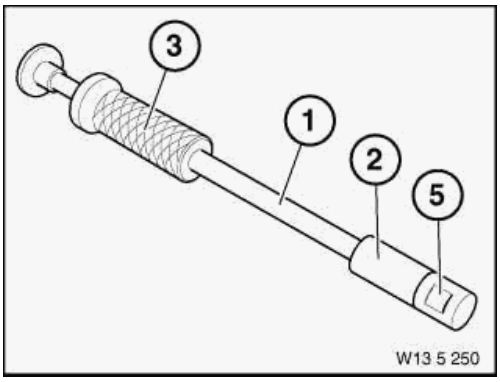


Common Used in step 53 72 75

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

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0 493 321 (13 5 250) Puller



Common

Used in step 63

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

0 493 339 (13 5 252) Bush



Common

Used in step 63

Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 340 (13 5 253) Weight



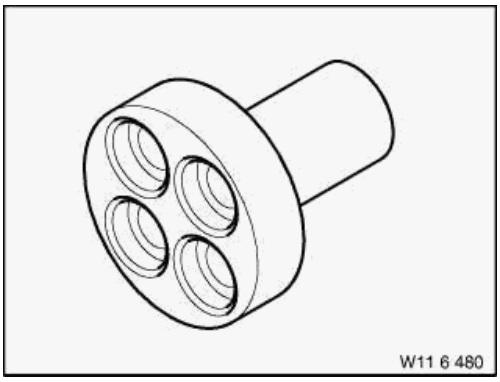
Common

Used in step 63

Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 493 380 (11 6 480) Connector



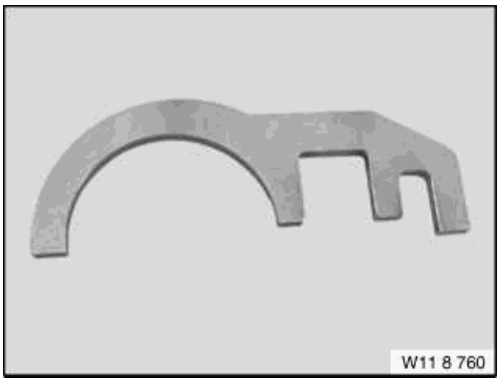
Common	Used in step 65 92
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

2 288 380 Locating stud



Common	Used in step 65 92
Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 112 (11 8 760) Gauge



Common	Used in step 65 92
Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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0 495 105 (11 4 480) oddments tray



Common Used in step 70 71 74 76

Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

2 357 071 Panel



Common Used in step 73 83

Usage	Additional mounting plate for lifting table MHT 1200. Delivery quantity: 1 piece. During the course of the changeover from BMWi to iPerformance, a tool changeover also takes place from campaign to warehouse.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	Table lift MHT 1200 81222184136
SI-Number	01 21 13 (987)

2 459 012 Holder

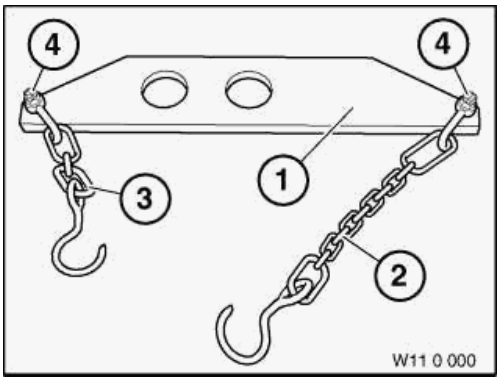


Common Used in step 73 83

Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

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0 490 561 (11 0 000) Lifting gear



Common

Used in step 73 83

Usage	(Hoisting gear) For removing and installing engines. As of 08/2011 only available as a complete set. Delivered with TÜV inspection certificate and operating instructions. No delivery of separate parts.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 13 94 (888)

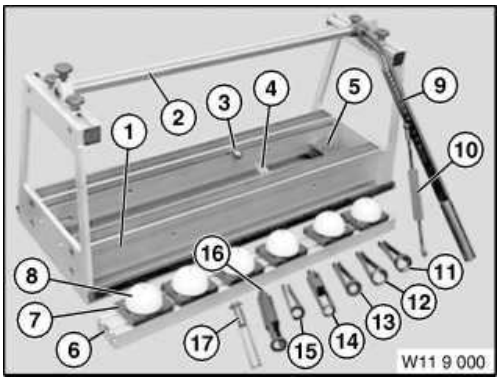
Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
4	0 490 565 (11 0 009)		**Shackle** (Shackle) 2 pieces. As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 562 (11 0 001)		**Lifting gear** (Cross member) As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
2	0 490 563 (11 0 002)		**Chain** (Chain) Version: long As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
3	0 490 564 (11 0 003)		**Chain** (Chain) Version: short As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	

0 494 362 (11 9 000) Device

Used in step 73 74 76 77 79

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Common

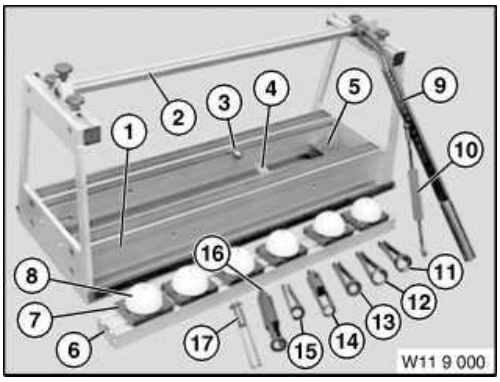
Usage	(Cylinder head expander tool)
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 03 02 (833)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 494 366 (11 9 001)		**Device**	
6	0 494 371 (11 9 006)		**Insert** (Aluminium strip)	
11	0 494 376 (11 9 012)		**Basket** (Valve spring cage) Engine M41, M51, S50	
17	0 495 028 (11 9 017)		**Basket** (Valve spring cage) Engine N52	
2	0 494 367 (11 9 002)		**Rod**	
3	0 494 368 (11 9 003)		**Adapter** (Sliding block)	
4	0 494 369 (11 9 004)		**Tab**	
5	0 494 370 (11 9 005)		**Quick fastener**	
7	0 494 372 (11 9 007)		**Shaped part** (shaped part)	
8	0 494 373 (11 9 008)		**Shaped part** (Shaped part) Shaped part made of plastic	
9	0 494 374 (11 9 009)		**Lever**	
10	0 494 375 (11 9 011)		**Hook**	
12	0 494 377 (11 9 013)		**Basket** (Valve spring cage) Engine M43, M73	
13	0 494 378 (11 9 014)		**Basket** (Valve spring cage) Engine M44, M52, M54, M56, M62, S52, S54, S62	
14	0 494 379 (11 9 015)		**Basket** (Valve spring cage) Engine M47, M47TU, M57, M57TU, N40, N42, N62, N73	
15	0 494 380 (11 9 016)		**Basket** (Valve spring cage) Engine M21, M40	

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0 494 366 (11 9 001) Device

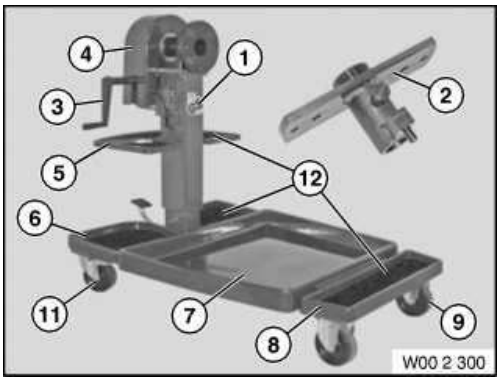


Common		Used in step 74 79
Usage		
Included in the tool or work	0 494 362	
Storage location		
Replaced by		
In connection with		
SI-Number		

0 495 187 (00 2 300) Assembly stand

Used in step 74 79

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Common

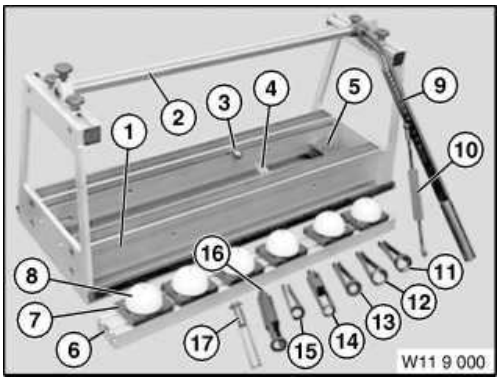
Usage	Assembly stand with universal flange for mounting engines from S85
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 188 (00 2 301)		**Assembly stand** available only as complete assembly stand 83 30 0 495 187.	
2	0 495 189 (00 2 302)	**2 299 563**	**Tool** (Universal flange). Do not use any more!!! Technically locked. Replaced with a new flange with material number 83 30 2 299 563. All flanges delivered until the end of 2011 will be replaced at no charge. From 2012, only the new flange will be supplied. Also applies to the complete engine mounting stand 00 2 300.	
3	0 495 200 (00 2 303)		**Crank**	
4	0 495 201 (00 2 304)		**Cover** (Protective hood)	
5	0 495 202 (00 2 305)		**oddments tray** (Oddments tray for small parts)	
6	0 495 203 (00 2 306)		**Shaped element** (Rear shaped pan)	
7	0 495 204 (00 2 307)		**Collection pan** (Oil collection pan)	
8	0 495 205 (00 2 308)		**Shaped element** (Front shaped pan)	
9	0 495 206 (00 2 309)		**Wheel** (Front wheel (without stop))	
10	0 495 207 (00 2 311)		**Wheel** (Rear wheel (with stop))	
11	0 495 208 (00 2 312)		**Mat** (Checker mat set)	
2	2 299 563		**Adapter** New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.	

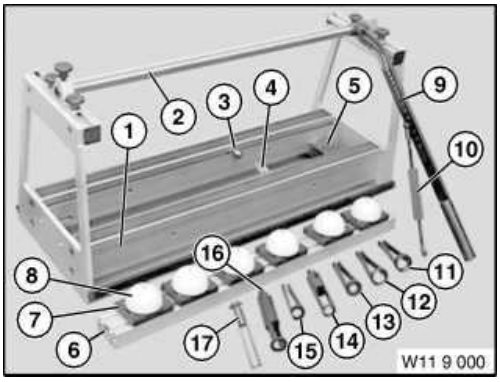
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0 494 371 (11 9 006) Insert



Common	Used in step 74 76 77 79
Usage	(Aluminium strip)
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 372 (11 9 007) Shaped part



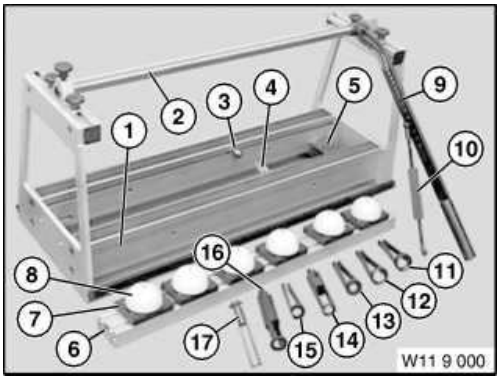
Common	Used in step 74 77
Usage	(Shaped part)
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 373 (11 9 008) Shaped part



Common	Used in step 74 76 77
Usage	(Shaped part) Shaped part made of plastic
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 370 (11 9 005) Quick fastener



Common	Used in step 74 76 77 79
Usage	
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 494 374 (11 9 009) Lever



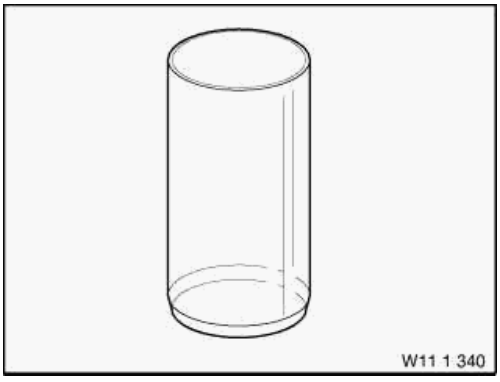
Common	Used in step 74 79
Usage	
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 496 143 (11 8 840) Basket



Common	Used in step 74 79
Usage	(Valve spring cage) For removing and fitting the valves.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

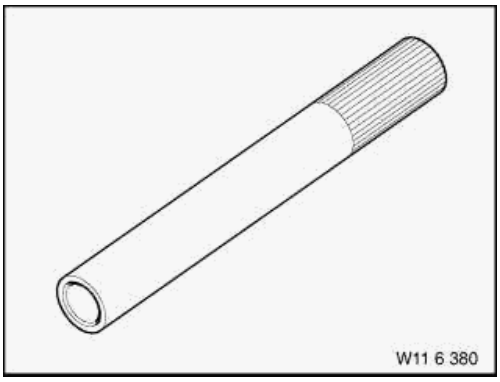
0 490 746 (11 1 380) Holding sleeve



Common	Used in step 78
Usage	(Assembly sleeve) For fitting the valve stem seal, diameter 7 mm
Included in the tool or work	
Storage location	individual
Replaced by	
In connection with	
SI-Number	

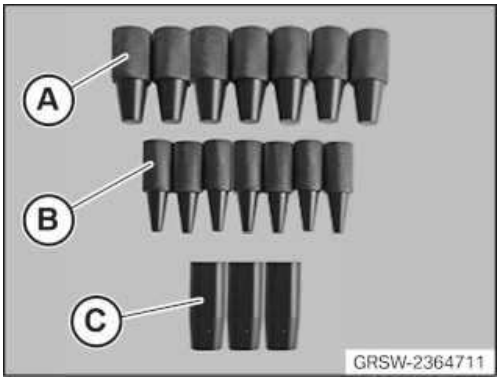
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0 493 249 (11 6 380) Bush



Common	Used in step 78
Usage	For fitting valve stem seal
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

2 364 711 Plug



Common	Used in step 80
Usage	For closing the pressure oil holes for cleaning the cylinder head sealing surfaces.
Included in the tool or work	
Storage location	C20
Replaced by	
In connection with	
SI-Number	01 50 14 (203)

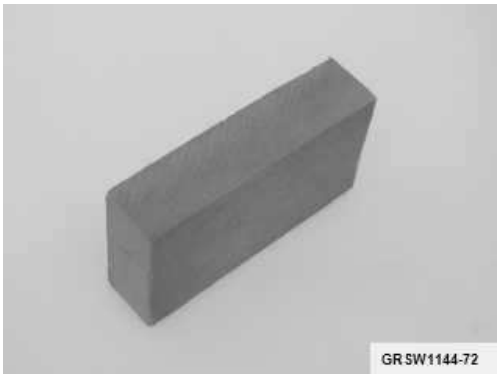
0 495 103 (11 4 471) Scraper



Common	Used in step 80
Usage	
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

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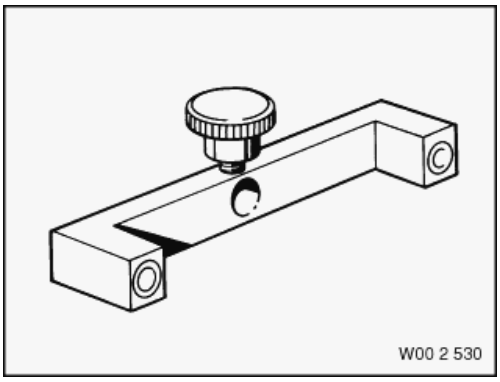
0 495 104 (11 4 472) Extractor



Common Used in step 80

Usage	(grindstone)
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

0 490 185 (00 2 530) Bridge



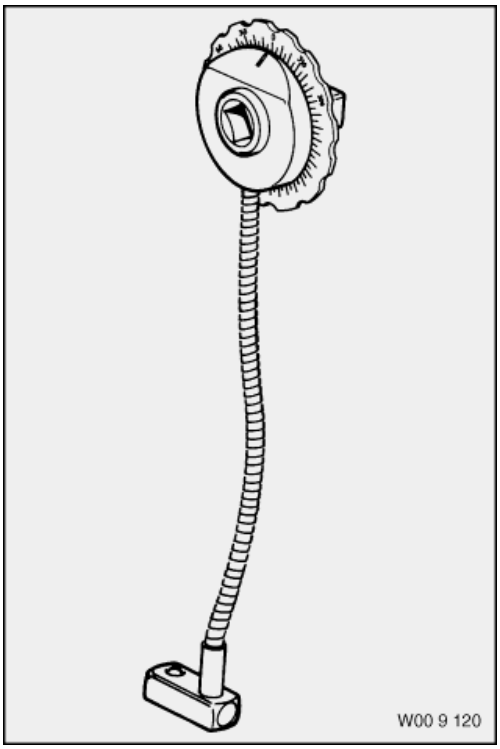
Common Used in step 81

Usage	(Measuring bridge) For determining the piston projection (Diesel)
Included in the tool or work	
Storage location	A3
Replaced by	
In connection with	
SI-Number	

0 490 504 (00 9 120) Torque angle measuring dial

Used in step 83 120

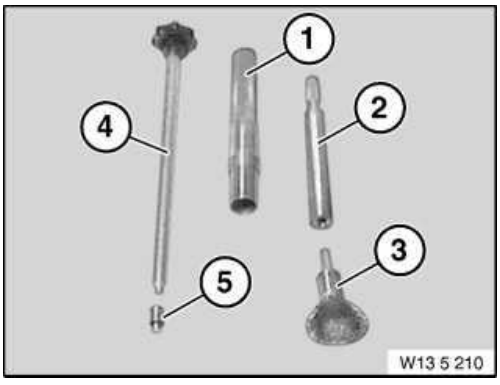
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Common

Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

0 493 763 (13 5 215) Plug

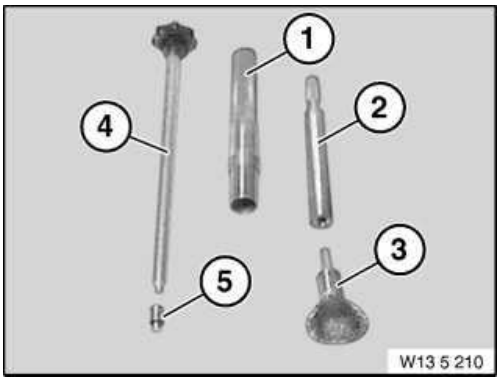


Common Used in step 94

Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

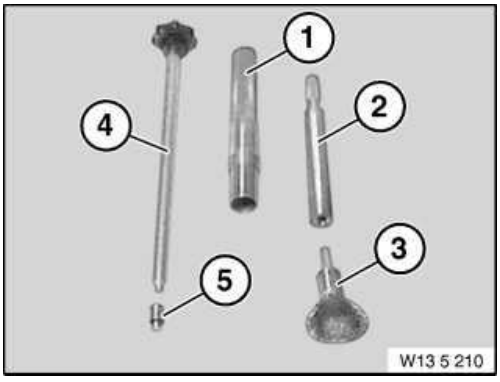
cardiagn.com

0 493 762 (13 5 214) Rod



Common	Used in step 94
Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 758 (13 5 210) Tool



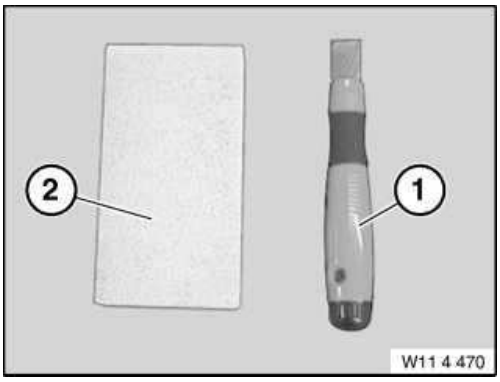
Common	Used in step 94
Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

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0 495 102 (11 4 470) Tool



Common Used in step 98

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

2 409 025 Puller



Common Used in step 115

Usage	For disassembly of the outer radial shaft seal of the transmission output shaft, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A76
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

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2 411 739 Puller



Common Used in step 115

Usage	For disassembly of the inner radial shaft seal of the output, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C78
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 408 152 Striking element



Common Used in step 115

Usage	For installation of the right radial shaft seal transmission output shaft (inner). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

2 413 037 Handle



Common Used in step 115

Usage	Universal drift handle. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C77
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

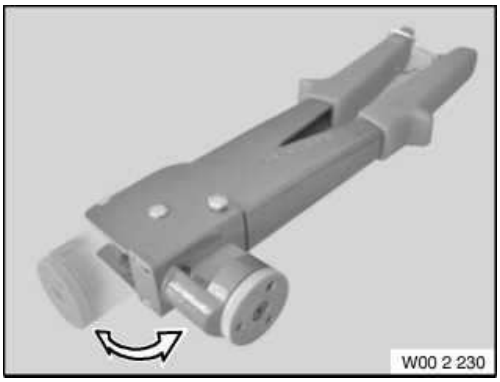
cardiagn.com

2 408 150 Striking element



Common	Used in step 115
Usage	For installing the right radial shaft seal transmission output shaft (outer). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

0 496 521 (00 2 230) Pliers



Common	Used in step 133
Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

2 344 011 Tool



Common	Used in step 134
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

0 495 221 (36 1 323) Wheel stud



Common	Used in step 23
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 224 (36 1 326) Wheel stud



Common	Used in step 23
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud



Common	Used in step 23
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud



Common	Used in step 23
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud



Common	Used in step 23
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 228 (36 1 331) Wheel stud



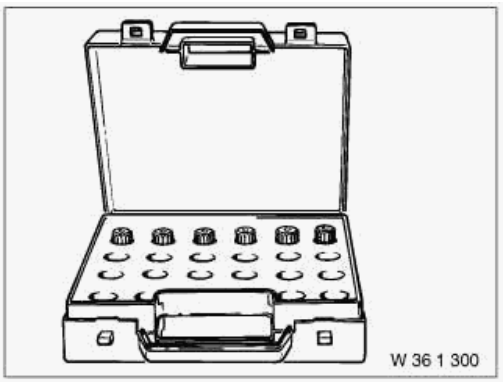
Common	Used in step 23
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 229 (36 1 332) Wheel stud



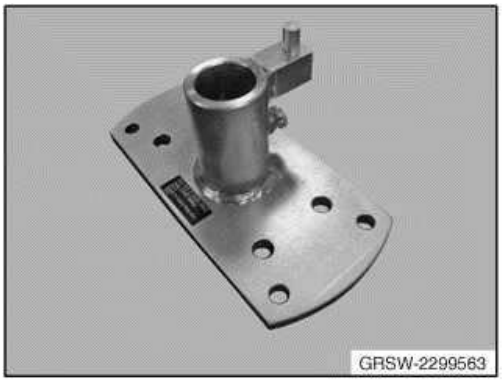
Common	Used in step 23
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud



Common	Used in step 23
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

2 299 563 Adapter



Common	Used in step 74 79
Usage	New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.
Included in the tool or work	0 495 187
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Valve underprotrusion

Used in step 81

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	0,8 (0,7 - 0,9) mm

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	55 104
EGR controller	55 104

General repair instructions	Used in step
61 20 ... Notes on AGM battery	146
61 12 ... Notes on intelligent battery sensor (IBS)	146
61 00 ... Notes for disconnecting and connecting battery	146
41 00 ... Notes on repairing threads	
61 00 ... Safety information for handling vehicle battery	

Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	12 44 45 47 48 49 50 51 52 63 72
17 00 008 Draining and topping up coolant for high-temperature circuit	152
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17 00 039 Bleed the cooling system and check it for watertightness with the special tool	152
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	152
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17 00 039 Bleed the cooling system and check it for watertightness with the special tool	152
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	152
17 00 039 Bleed the cooling system and check for watertightness with the special tool (coolant circuit for low temperature)	152
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	152
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	152
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	152
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	152
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	152
17 00 039 Bleeding the cooling system (B36, B38, B46, B48)	152
17 00 039 Bleeding cooling system (B37, B47)	152
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	152
17 00 039 Filling and bleeding the high-temperature cooling system vacuum filler device (B48)	152
17 00 008 Draining and topping up the high-temperature coolant circuit	152
17 00 008 Draining and topping up the high-temperature coolant circuit	152
17 00 016 Draining and topping up coolant circuit for Range Extender \PREMIUM	152
17 00 008 Draining and topping up the high-temperature coolant circuit	152
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	152
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	152
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	152
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	152
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	152
00 .. ... Raising the vehicle using a vehicle hoist	

Operating materials	Used in step
2.0 Grease for wheel centring	134
14.0 Automatic transmission fluid for ZF-transmission GA8HP45Z / GA8HP50Z / GA8HP70Z / GA8HP90Z / GA8P70H / GA8P75H / GA8HP75Z	153

Operating materials	Used in step

Parts

Parts required

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Designation	Used in step
Chain tensioner piston seal on cylinder head	90
Exhaust-gas recirculation cooler seal on exhaust manifold	104
Exhaust-gas recirculation cooler seal on intake plenum	104

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11 34 055 Replace all valve springs

WARNING

Vehicle may slip off the vehicle hoist if the vehicle hoist is handled incorrectly.

Danger! Life-threatening injuries!

- Observe safety information on raising the vehicle using a vehicle hoist.
- For additional information see: 00 ... Raising the vehicle using a vehicle hoist.

WARNING

Motor vehicle may slip off the vehicle hoist where components are supported.

Danger! Life-threatening injuries!

- Secure the vehicle hoist against lowering and lifting.

WARNING

Motor vehicle may slip off the vehicle hoist if the weight is distributed unevenly.

Danger! Life-threatening injuries!

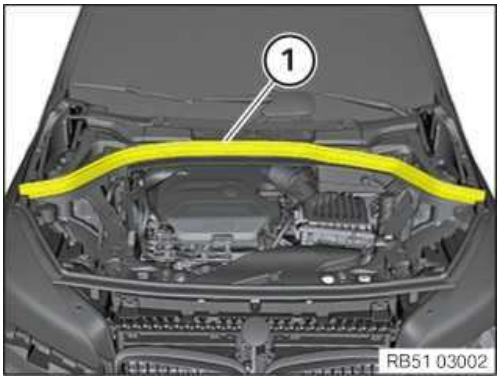
- Ensure there is a specific weight compensation on the motor vehicle.

PRELIMINARY WORK

1 – Remove the seal for the rear bonnet

NOTICE

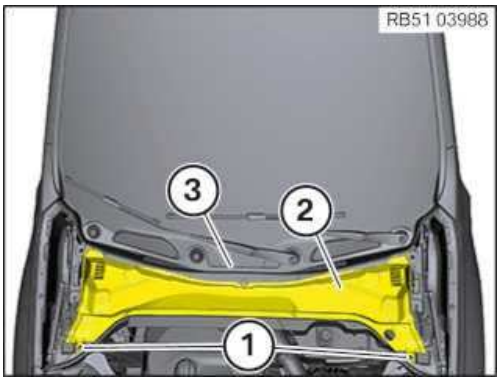
Schematic diagram is for example purposes. Some parts may differ in certain details.



- Pull off rear bonnet seal (1) towards the top and remove.

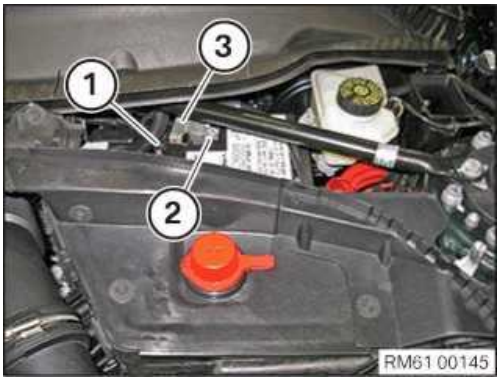
2 – Removing front cowl panel cover

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- Loosen the expanding rivet (1).
- Feed out and remove front cowl panel cover (2) from the rear cowl panel cover(3).

3 – Disconnecting the battery earth lead

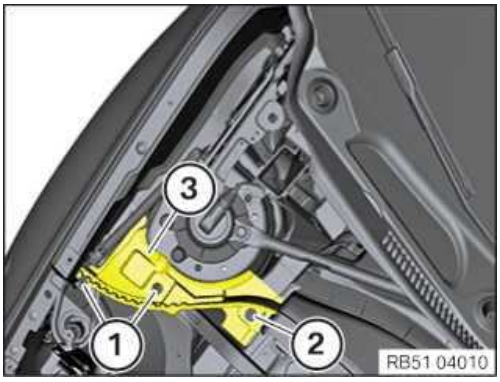


- Unlock plug connection (1) and disconnect.
- Unfasten nut (2).
- Remove the battery earth lead (3) and secure to one side.

4 – Remove suspension cross-brace

TECHNICAL INFORMATION

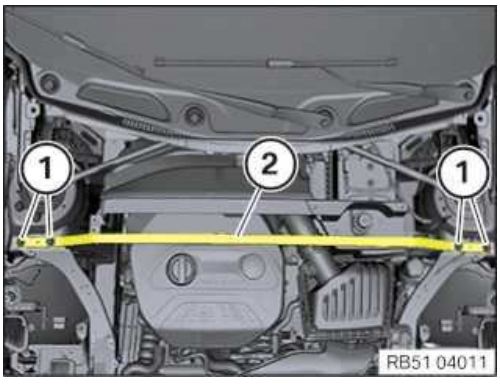
Driving without the strut brace/front end or tension strut is not permitted.



NOTICE

Description is for right component only. The procedure on the left side is identical.

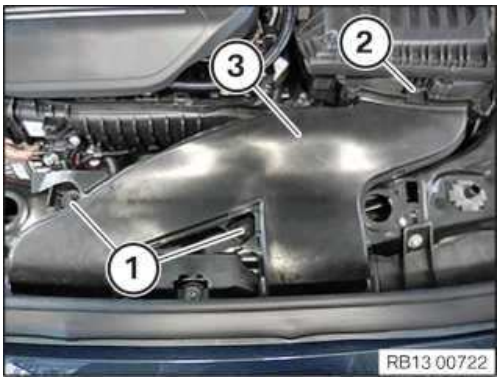
- Loosen expanding rivet (1).
- Loosen screw (2).
- Remove the cover (3).



- Loosen screws (1).
- Remove strut brace (2).

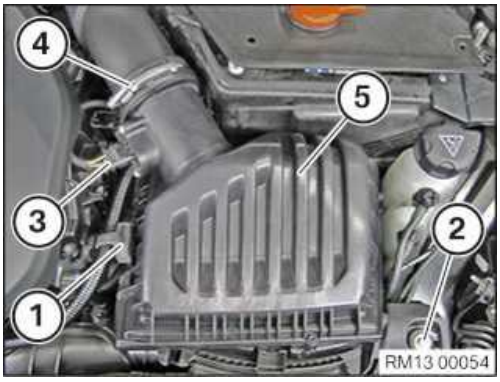
5 – Remove the intake neck for intake silencer housing

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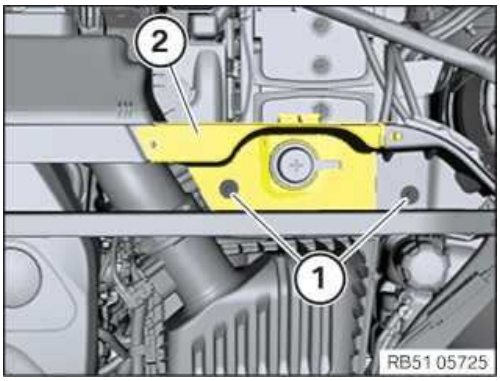
- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

6 – Removing intake silencer housing

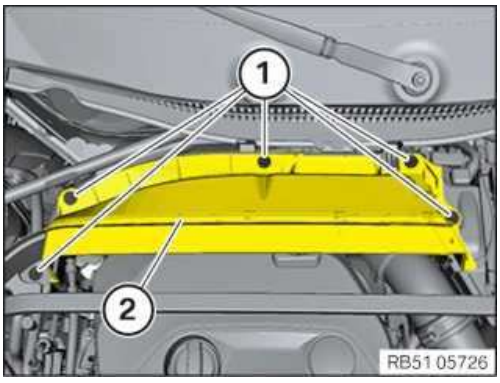


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

7 – Removing the upper bulkhead cover



- Loosen screws (1).
- Guide out and remove the cover (2).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

8 – Remove vehicle battery

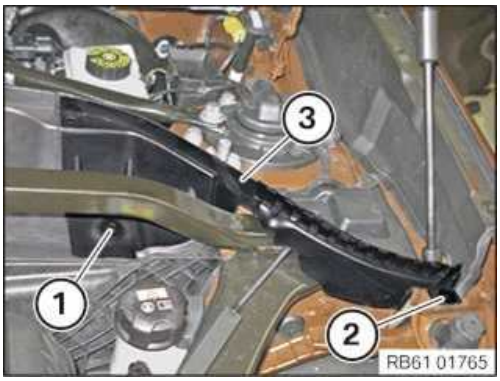
WARNING

Working on 12 V vehicle electrical system.

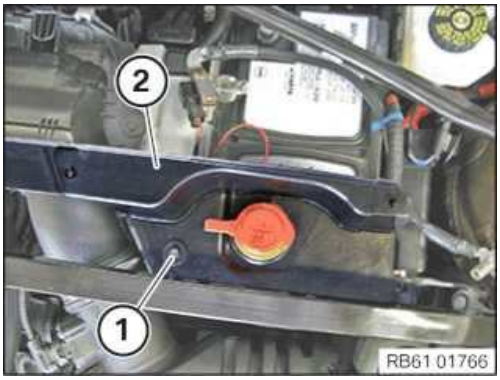
Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

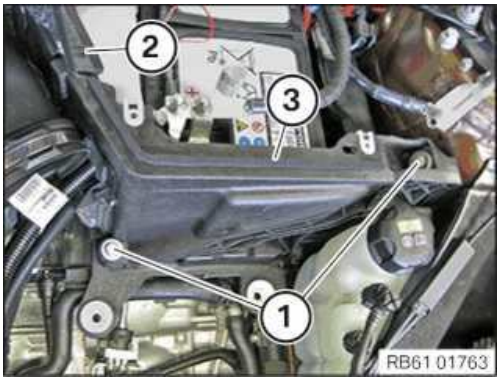
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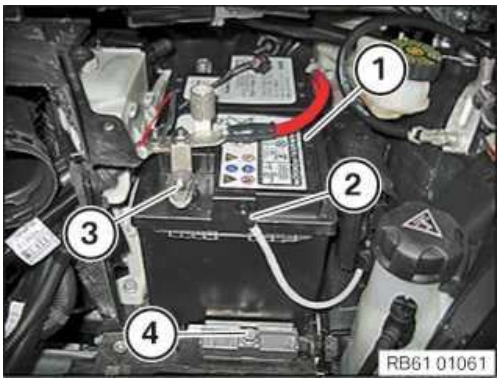
- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).



- Loosen screw (1).
- Remove the cover (2).



- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.



- Pull off the vent hose (2).
- Slacken the nut (3) on the positive battery terminal and remove the positive battery terminal.

WARNING

Unprotected battery terminals.

Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

9 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

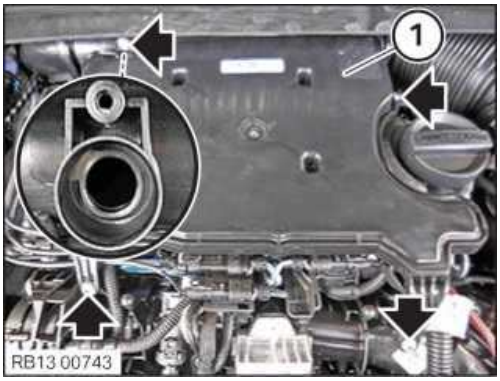
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

10 – Remove resonator

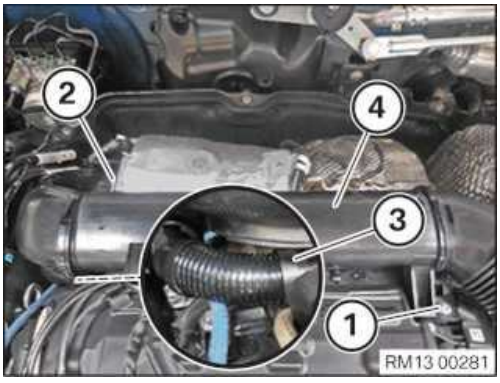


- Remove screws (arrows).
- Guide out and remove the resonator (1).

11 – Removing clean air pipe



- Detach clamp (1) on the clean air pipe.
- Pull off the clean air pipe from the intake silencer housing.



- Loosen screw (1).
- Loosen clamp (2).
- Unlock the ventilation line (3) and pull it off the cylinder head cover.
- Feed out clean air pipe and remove.

12 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

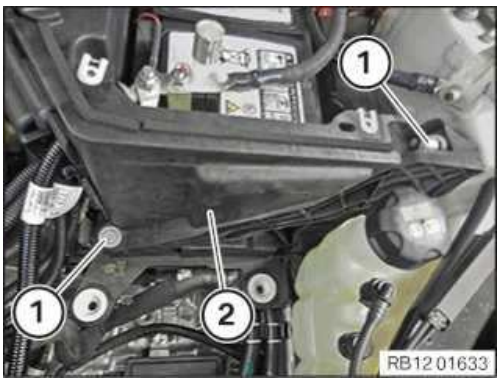
TECHNICAL INFORMATION

Follow instructions for removing and installing control units.

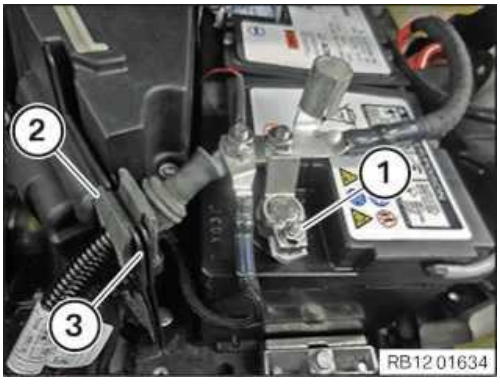
For additional information see: 12 00 ... Notes on removal and installation of control units

TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.

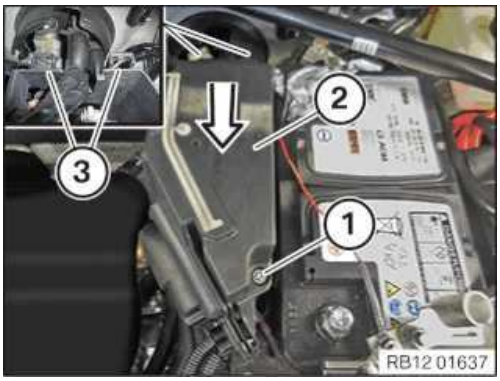


- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.

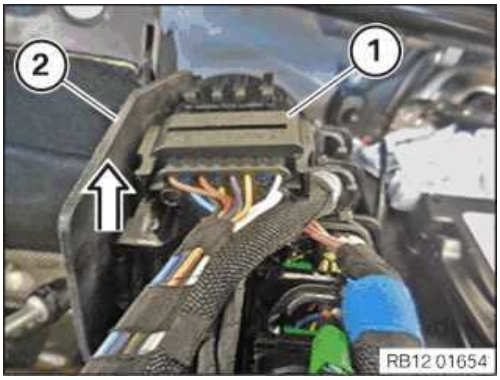


- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

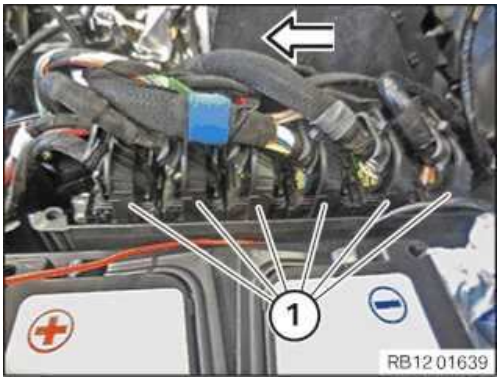
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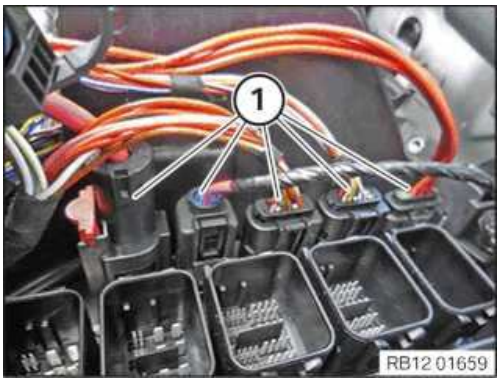
- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



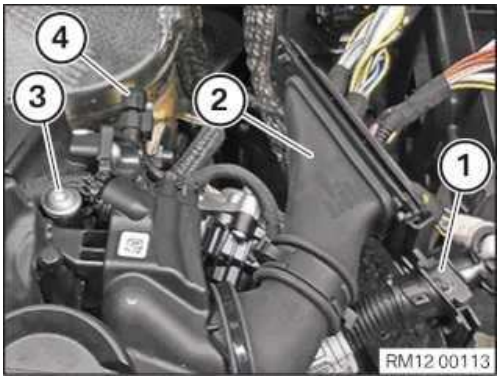
- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).



- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

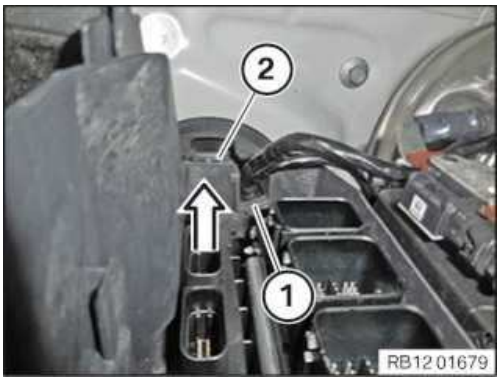


- Unlock and loosen connector (1).

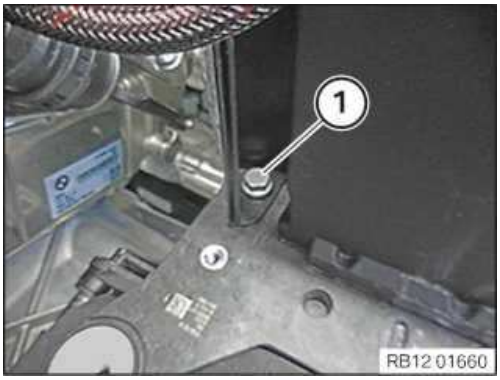


- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.

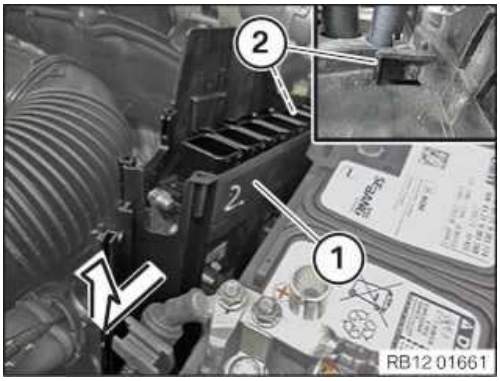
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- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.

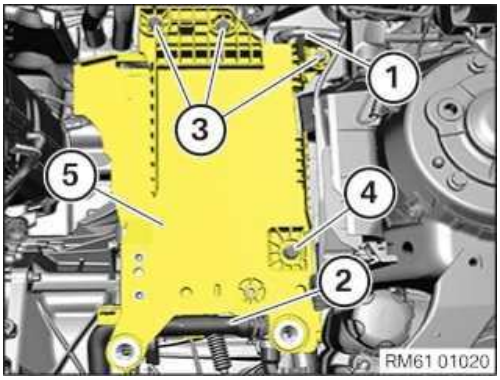


- Loosen screw (1).



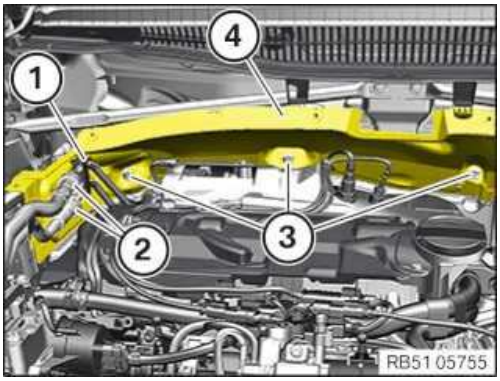
- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

13 – Remove battery holder



- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

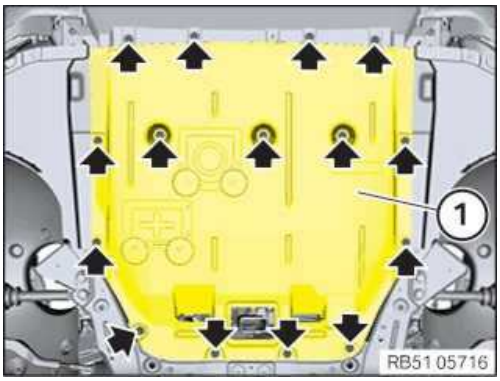
14 – Remove the rear bulkhead upper part



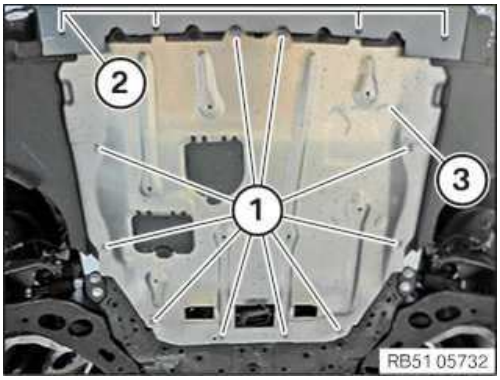
- Unlock the holder (1) and disconnect.
- Guide out and remove the fuel lines (2).
- Loosen screws (3).
- Guide out the rear bulkhead upper part (4) and remove.

15 – Removing the front underbody protection

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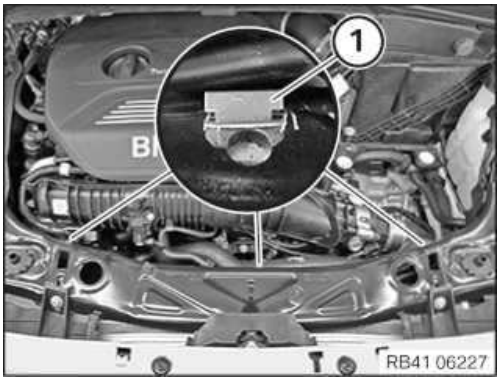


- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.

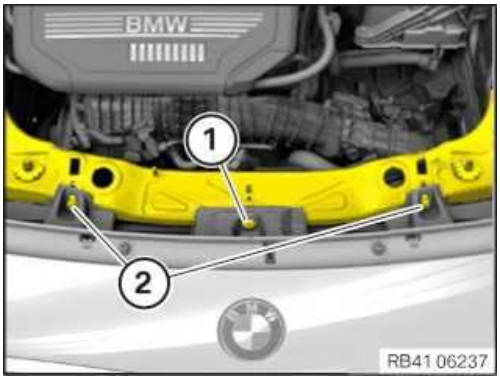


- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

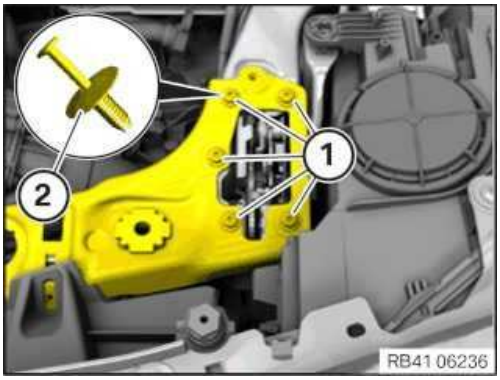
16 – Remove front cross connection



- Detach the clamps (1) for the Bowden cable of the bonnet locks from the cross connection.

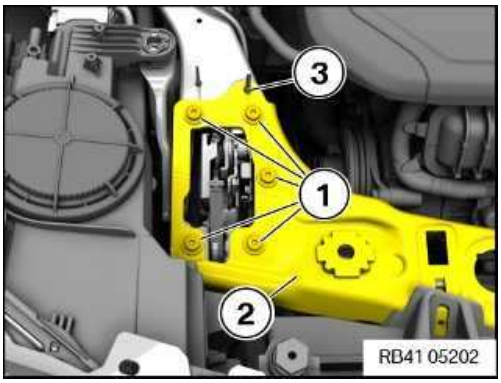


- Loosen screw (1).
- Loosen screws (2).



- Loosen screws (1).
- Lever out expanding rivet (2).

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- Loosen screws (1).
- Unclip the front cross connection (2) from the rubber retainer (3) and remove it upward.

17 – Draining coolant

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

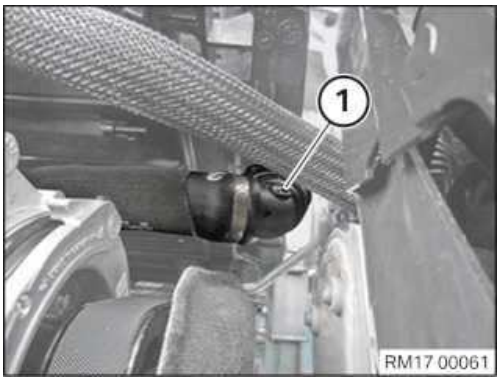
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

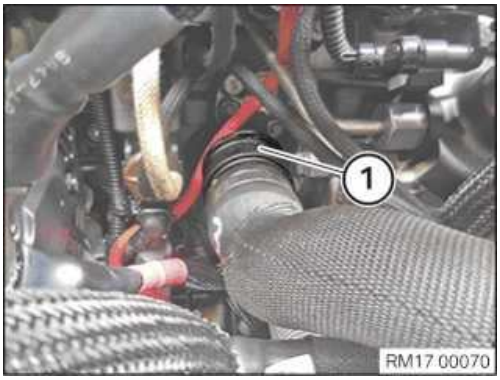


- Loosen sealing cap (1).

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- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.

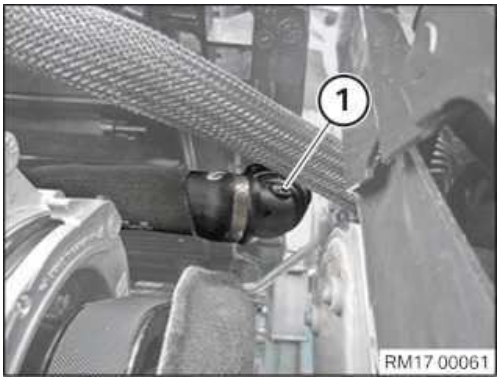


- Unlock the coolant line (1) and pull it off the connecting branch.
- Catch and dispose of escaping coolant.

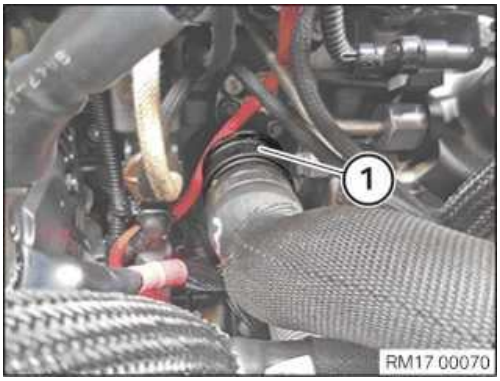
18 – Connect the coolant line

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Connect the right coolant line (1) to the radiator and lock audibly.



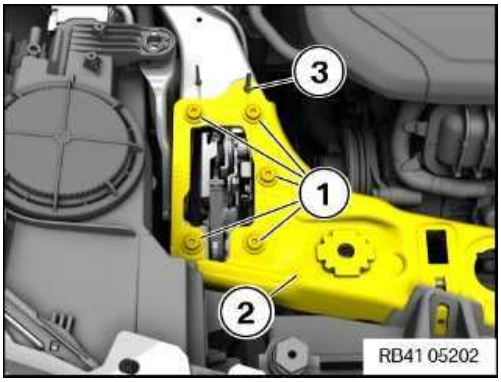
- Connect the coolant line (1) to the connecting branch and lock audibly.

19 – Install front cross connection

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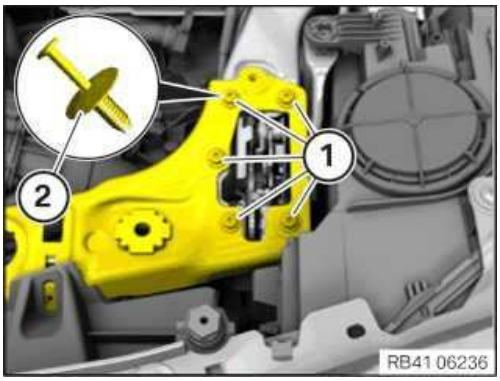
- Right side of vehicle only: Secure spray guard (1) on the cross connection (2) as pictured.



- Position front cross connection (2) and clip front cross connection (2) into the rubber retainer (3) at the same time.
- Tighten the screws (1).

Cross connection to carrier support

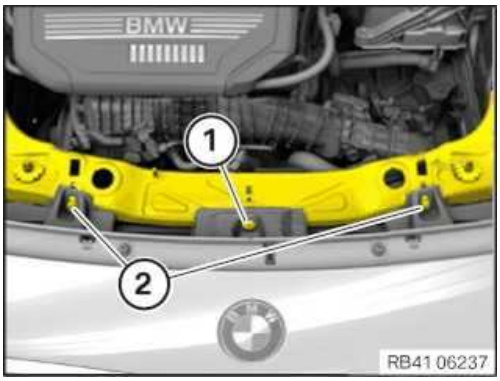
Screws M6x20		Tightening torque	11,8 Nm



- Tighten the screws (1).

Cross connection to carrier support

Screws M6x20		Tightening torque	11,8 Nm



- Position screws (3) on the rubber mounts for the radiator and tighten.

Screw connection for rubber mount of coolant radiator to coolant radiator

Bolt to rubber mount		Tightening torque	8 Nm

- Tighten down screws (2).

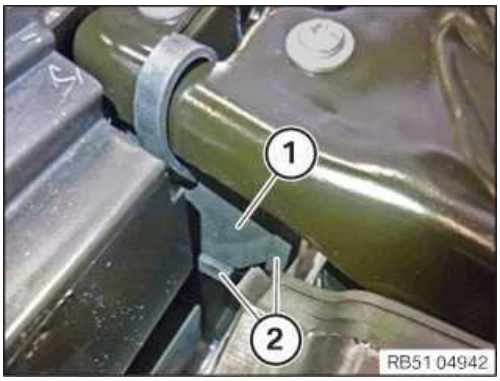
Air duct to upper connection

M6x20 screw		Tightening torque	11,8 Nm

- Tighten down screw (1).

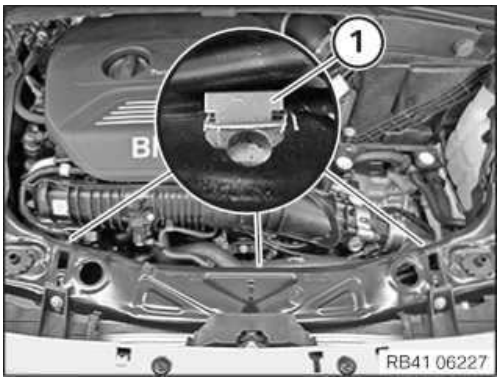
Bracing strut to upper connection

M8x20 screw		Tightening torque	28 Nm



- Right side of vehicle only: Properly mount spray guard (1) to prevent corrosion.
- Secure spray guard (1) to the bridge with retaining tabs (2).

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- Fasten the clamps (1) from the Bowden cable of the bonnet lock on the cross connection.

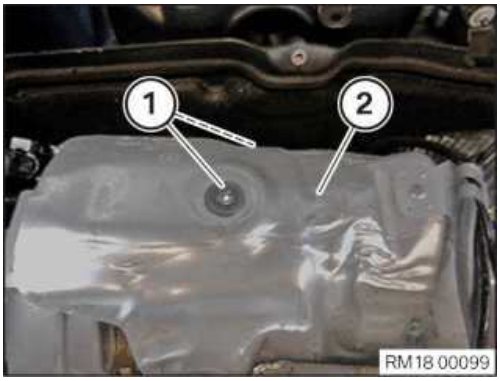
20 – Removing heat shield from top exhaust turbocharger

WARNING

Hot surfaces.

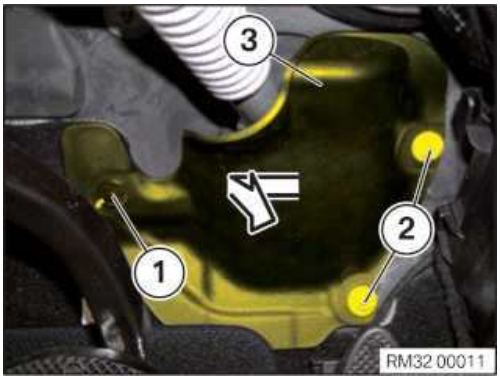
Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from holders.
- Release the screws (1) at the top and bottom of the heat shield.
- Feed out and remove the heat shield (2).

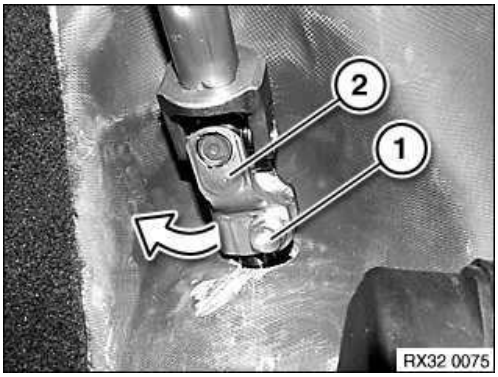
21 – Releasing lower steering shaft from steering gear



- **If installed:**
- Unfasten nut (1).
- Unscrew the nuts (2) by 1 rotation.

  Do not remove the nuts (2) !
- Remove the cover (3) on the steering column in the direction of the arrow.

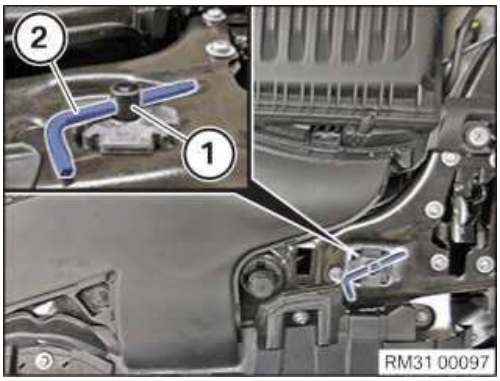
  The side footwell trim must not be disassembled!



- Loosen screw (1).
- Swivel out the universal joint (2) of the bottom steering shaft from the steering gear in the direction of the arrow.

22 – Securing radiator on left and right

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NOTICE

Perform the operations on the left and right side.

- Fasten radiator at centring pin (1) with suitable tool (2).

23 – Removing both front wheels

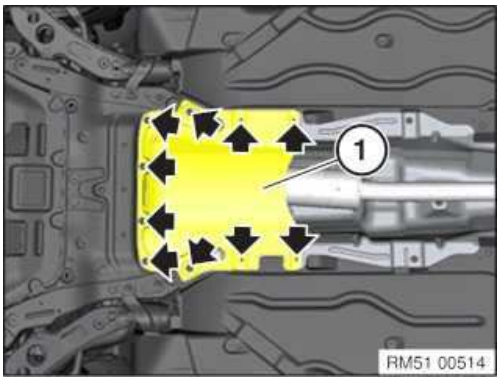
▶ **Removing the wheel**



- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Unscrew the wheel bolts (arrows) and remove the wheel.

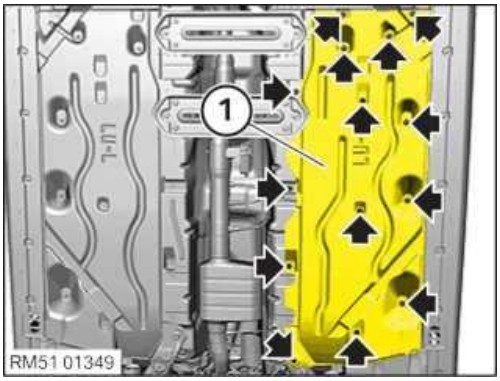
  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

24 – If installed: Removing rear underbody protection



- Remove screws (arrows).
- Remove the rear underbody protection (1).

25 – Removing right underbody panelling



- Unscrew all bolts and nuts (arrows).
- Remove the underbody panelling (1).

26 – Removing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

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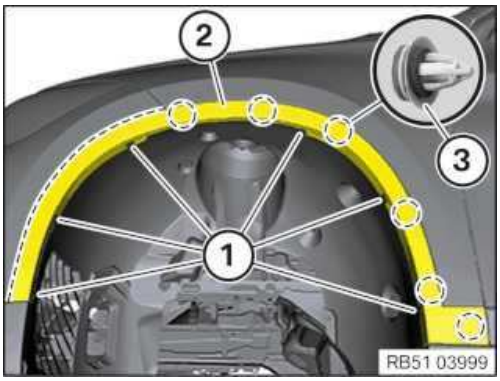
▶ **Remove the front wheel arch trim**

NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

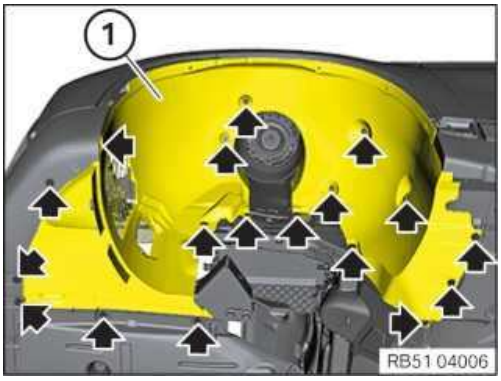
NOTICE

Description is for left component only. Procedure on the right side is identical.



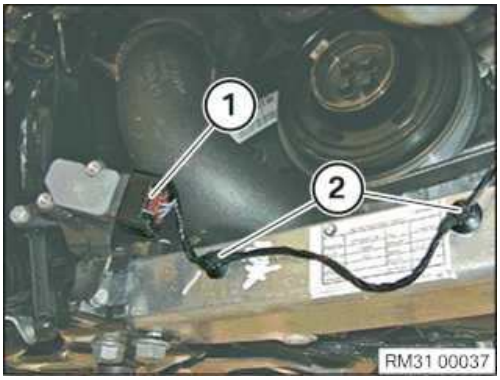
- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.

▶ **Remove front wheel arch cover**



- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

27 – With right installation: Detaching ride height sensor cable



- Unlock plug connection (1) and disconnect.
- Release cable clip (2) from deformation element adapter.

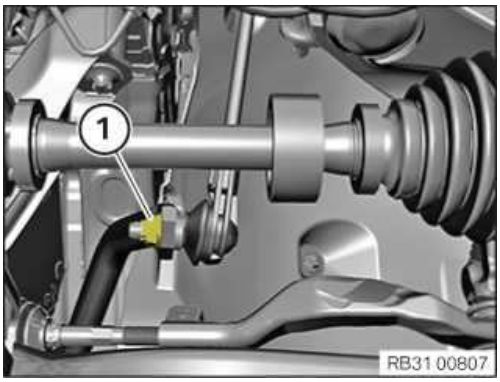
28 – Releasing anti-roll bar on left and right from anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▶ **Detach the anti-roll bar from the anti-roll bar link**

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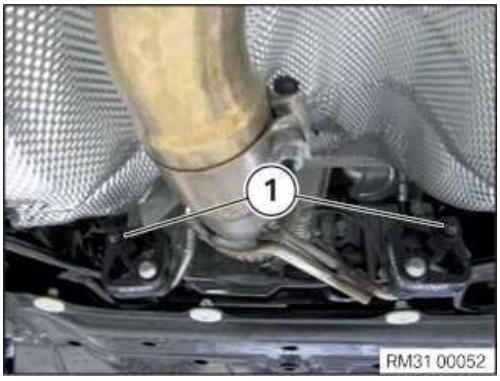


- Unfasten nut (1).

Note: Use the Torx socket for counter support.

- Loosen the anti-roll bar link from the anti-roll bar .

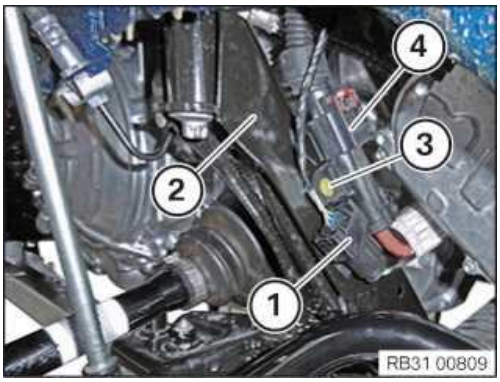
29 – Detaching rubber mount from front axle support



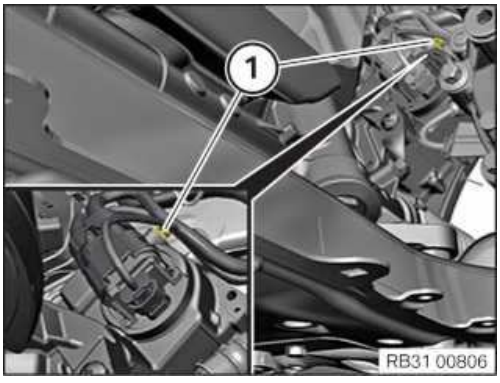
- Spray rubber mount (1) with lubricant and release from holder on front axle support.

30 – Disconnecting plug connections from steering gear

▶ **If installed: Detach connectors from the front axle carrier**

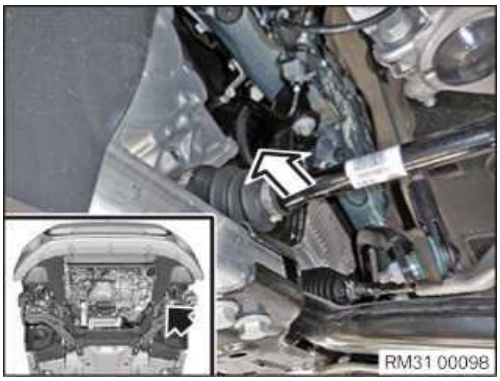


- Release the plug connection (1) from the front axle support (2).
- Loosen screw (3).
- Release the plug connection (4) from the front axle support (2).



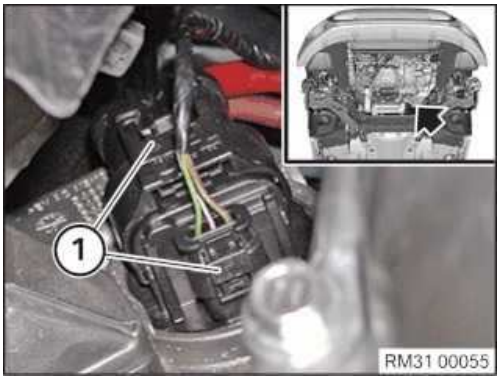
- Disconnect wiring harness (1) from steering gear.

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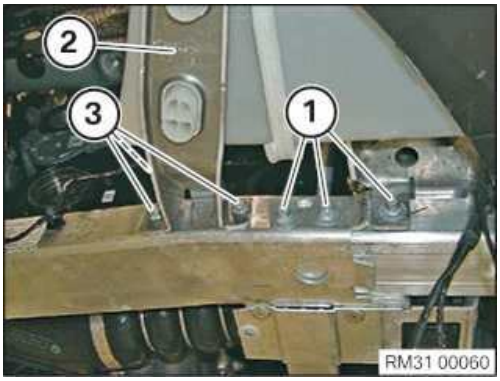
- To unlock the plug connections (see the following work step): unlock plug connections (arrow) with the right hand.

  The plug connections can be reached via the left-hand output shaft.



- Unlock plug connections (arrow) (1)and disconnect from the steering gear.
- Make sure when lowering the front axle that the cables are not damaged!

31 – Releasing the mounted part from the front axle support

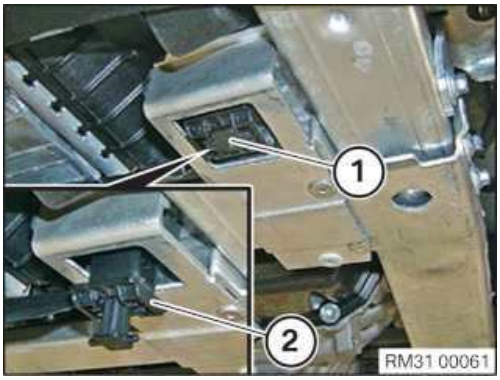


- **Only on right side:** Loosen screws (3) and remove holder for washer fluid reservoir (2).

NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).



NOTICE

Perform the operations on the left and right side.

- Unlock safety catch (1) of the lock (2) from the holder for the charge air cooler.
- Completely remove locks (2).



- Loosen screw (2) of the engine support (3) on the front axle (1).

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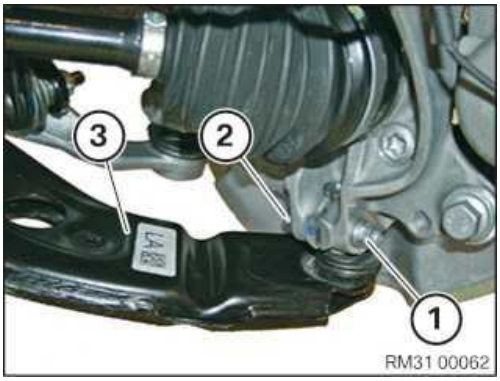


NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

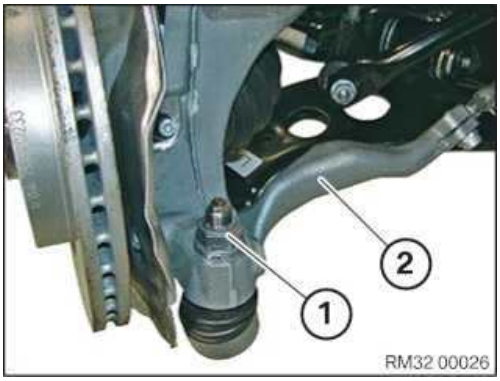
32 – Detaching and removing front axle completely



NOTICE

Perform the operations on the left and right side.

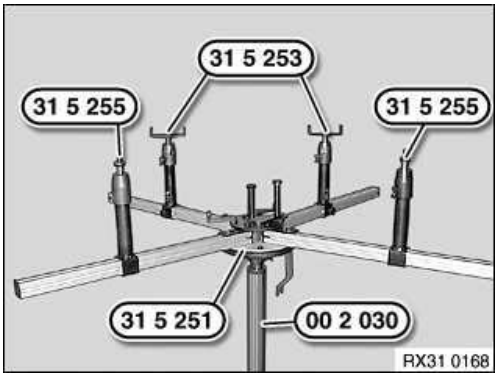
- Unfasten nut (1).
- (2)Pull out screw.
- Detach the wishbone (3) from the swivel bearing .



NOTICE

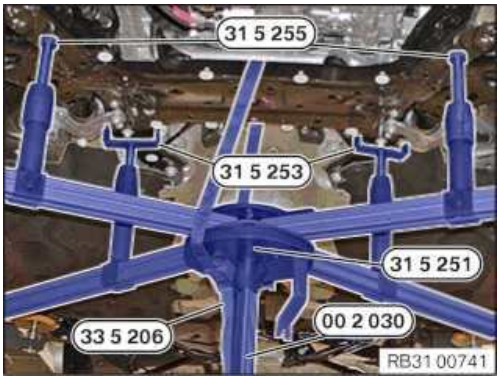
Perform the operations on the left and right side.

- Unfasten nut (1).
- Detach the track rod (2) from the swivel bearing.



- Fit the special tool completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools in telescopic supports of a profile rail pair.
- Insert special tools in telescopic supports of other profile rail pair.

Note: In a profile rail pair, two profile rails are connected to one another by gearing.

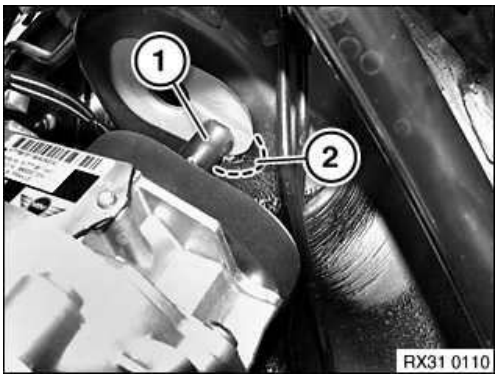


- Align special tools and to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool to special tool .

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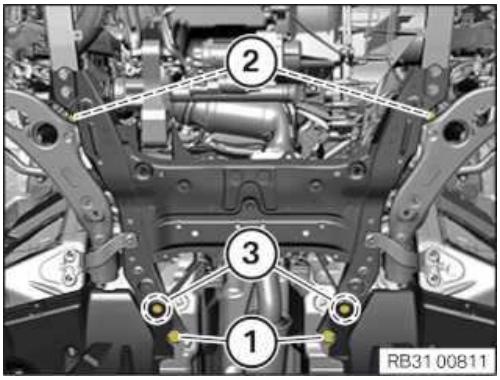


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



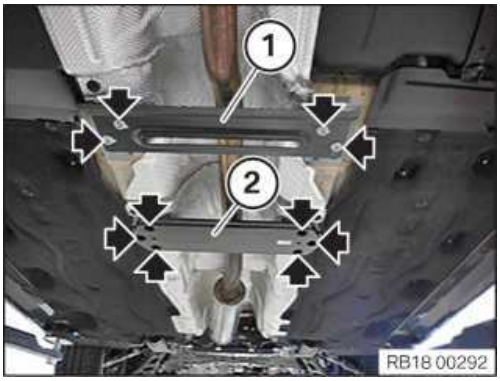
- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and remove the front axle.

TECHNICAL INFORMATION

Note the information on thread repairs using Helicoil thread inserts.
For more information see: 41 00 ... Notes on repairing threads

- Check threads for damage; if necessary, repair with Helicoil thread inserts.

33 – Removing the connecting support from the tunnel in front and back



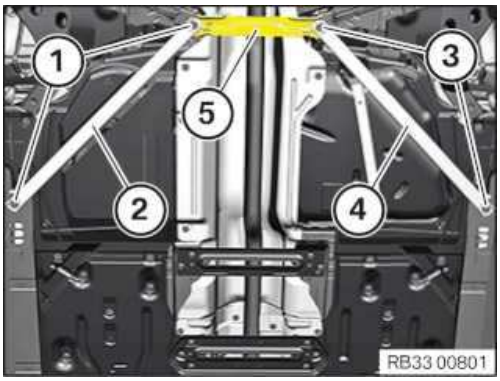
- Unscrew the bolts (arrows) from the connecting support (1).
- Feed out and remove the crossbeam (1).
- Unscrew the bolts (arrows) from the connecting support (2).
- Feed out and remove the crossbeam (2).

34 – Remove the cross strut with the torsion strut

TECHNICAL INFORMATION

Driving without a torsion strut is not permitted.

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- Loosen screws (1).
- Thread out torsion strut (2) at left and remove.
- Loosen screws (3).
- Thread out torsion strut (4) at right and remove.
- Feed out and remove the cross-member (5).

35 – Remove exhaust system

WARNING

Hot surfaces.

Risk of burning!

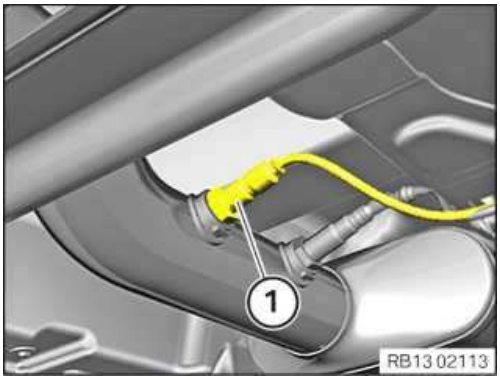
- Perform all work only on components that have cooled down.

CAUTION

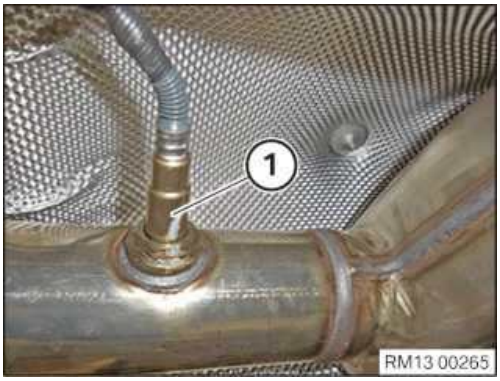
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

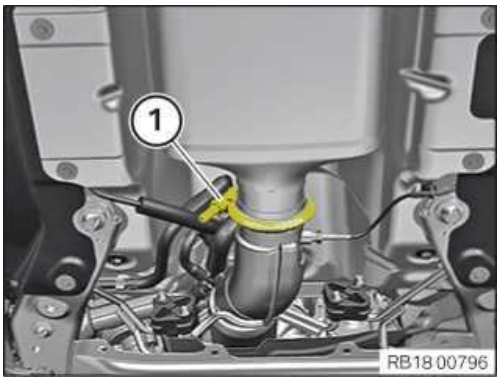


- Release the nitrogen oxide sensor (1) downstream of the SCR catalytic converter, guide it out and set it aside.

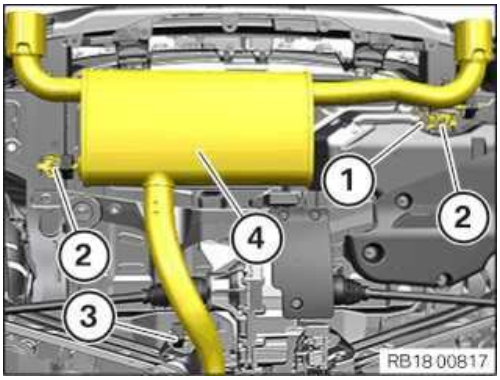


- Release the diesel particulate sensor (1), guide it out and set it aside.

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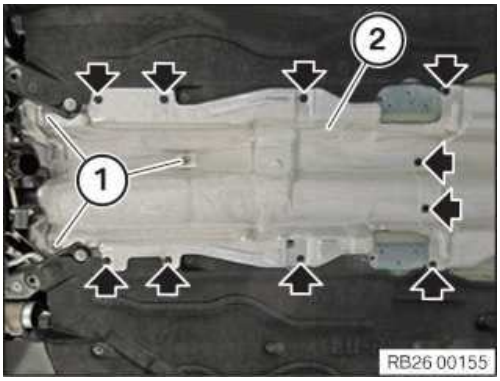


- Loosen V-band clamp (1).



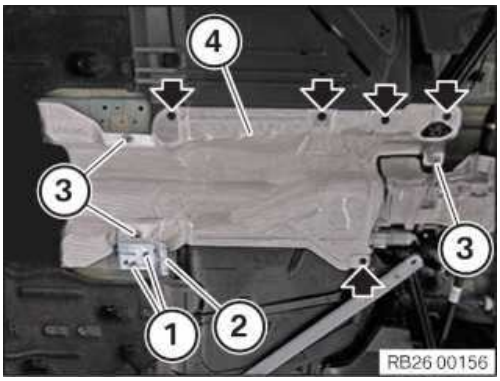
- Loosen screw (1).
- Loosen nuts (2).
- Release the rubber mount (3) of the exhaust system (4).
- Lower and guide out the exhaust system (4) with assistance of a second person and remove it.

36 – Remove front heat shield



- Remove screws (arrows).
- Loosen nuts (1).
- Guide the heat shield (2) out and remove it.

37 – Remove heat shield at rear.



- Loosen screws (1).
- Guide out and remove holder (2).
- Remove screws (arrows).
- Loosen nuts (3).
- Guide the heat shield (4) out and remove it.

38 – Remove propeller shaft

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CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

RISK OF DAMAGE

Damage to propeller shaft during removal.

Non-observance of the removal guidelines for the propeller shaft on the rear axle differential may cause severe damage.

- Do not disassemble the three-hole flange, flexible disc and propeller shaft. The three-hole flange to the rear axle differential is balanced with the flexible disc and propeller shaft.
- Loosen the recessed nut against the direction of travel in clockwise direction. The propeller shaft must be loosened on the recessed nut only and exclusively in the direction of rotation otherwise the anti-twist lock of the bi-hexagonal flange nut is damaged.
- In the event of a damaged anti-twist lock on the bi-hexagonal flange nut: Replace the rear axle differential.



- Install the special too l between the front and rear propeller shaft.
- Make sure that the arrows on the special tool point forward in the direction of travel.

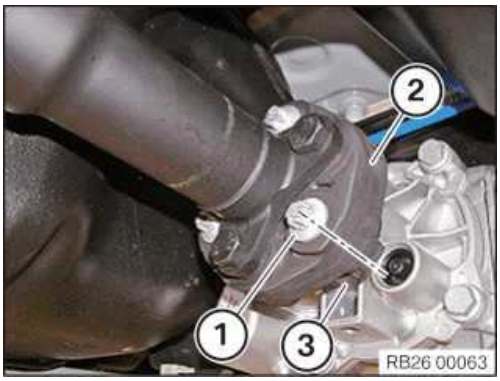


- Always support the propeller shaft (1) with a conventional jack.



- Protect the propeller shaft (1) with the special tools **0 495 554 (33 5 070)** and from twisting.

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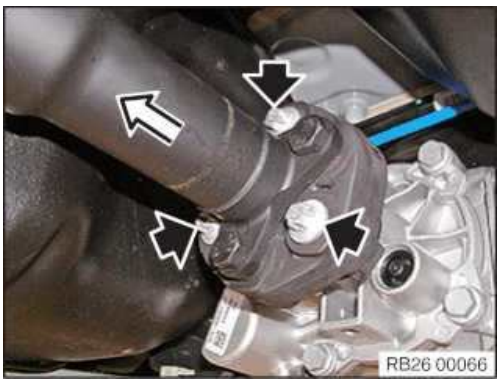
TECHNICAL INFORMATION

Compliance with the following instructions is required to avoid a humming noise from the propeller shaft after refitting the propeller shaft.

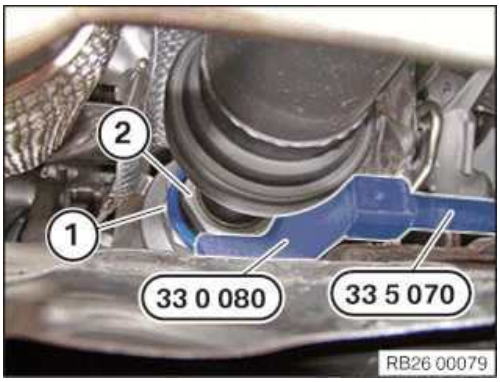
- Mark the installation position of the screw connection (1), the flexible disc (2) and the three-hole flange (3) on the same level.
- Loosen the screw connection (1).



- Loosen screws (1).



- Remove screws (arrows).
- Guide the propeller shaft out in the direction of the arrow and set it aside.



RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.

- Protect the recessed nut (2) on the transfer box from twisting with the special tools **0 495 554 (33 5 070)** and .

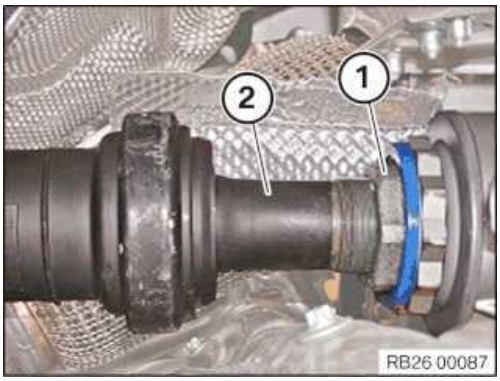
  The recessed nut (2) on the transfer box must **not** be used to detach the propeller shaft.

  The double hexagon flange nut (1) must **not** be used for counter support.

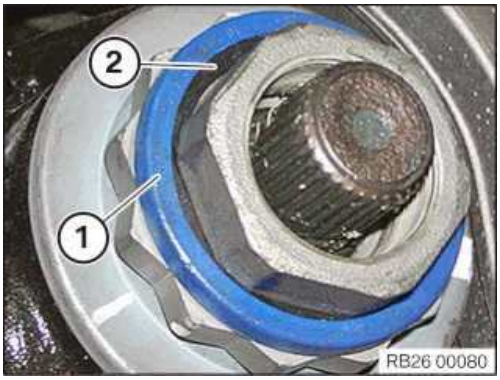


- Release the front propeller shaft with the special tools **0 495 554 (33 5 070)** and in the direction of the arrow.

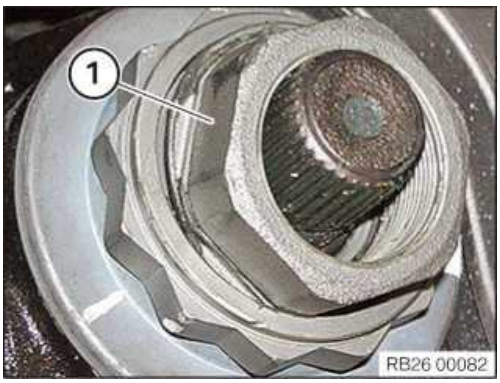
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- Thread the propeller shaft (2) out of the recessed nut (1) and remove.



- Thread the retaining clip (1) and the seal (2) out and remove.



- Thread out and remove the recessed nut (1).

39 – Removing starter motor

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and loosen connector (1).
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).



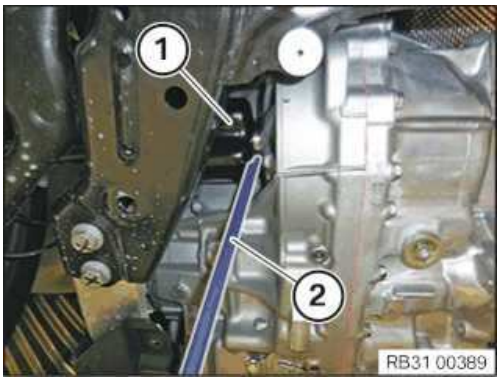
- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.



- Loosen screws (1).
- Feed out starter motor and remove.

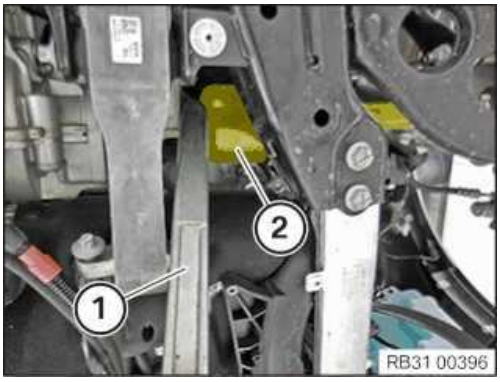
40 – Partially removing the left output shaft

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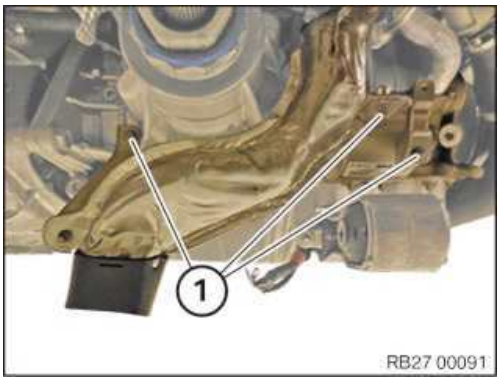
- Protect the output shaft (1) from falling.
- Lever out the output shaft (1) with a mounting lever (2) from the transmission.
- Tie up output shaft (1).

41 – Partially removing right output shaft

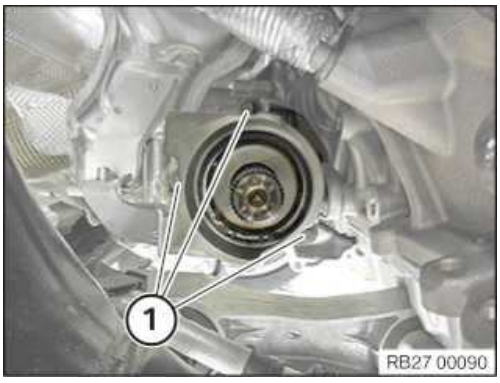


- Lever out the output shaft (2) with a mounting lever (1).
- Tie up output shaft (1).

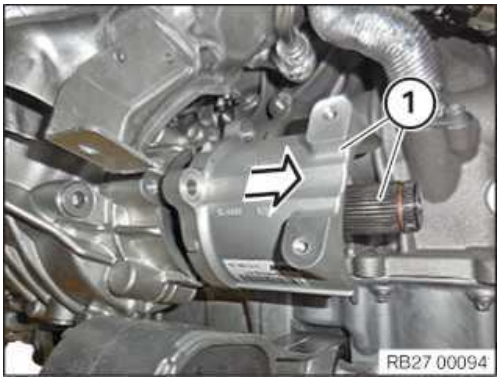
42 – Remove the intermediate shaft with the support tube



- With air duct installation: Loosen screws (1).
- Remove air duct



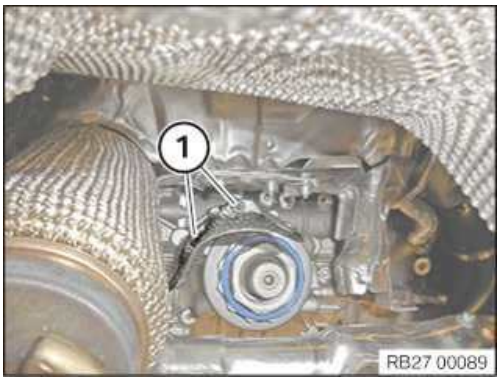
- Loosen screws (1).



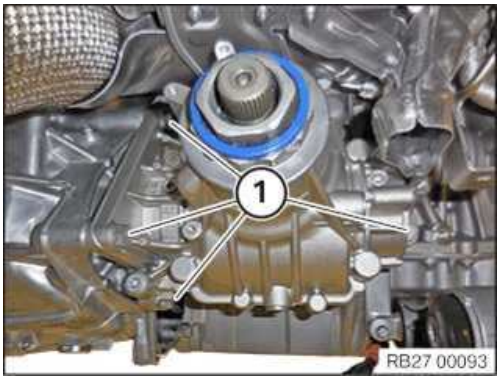
- Pull the intermediate shaft with the support tube (1) out of the transfer box.

43 – Remove transfer box (VTG)

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- Loosen screws (1).
- Remove heat shield.



- Loosen screws (1).
- Remove the transfer box (VTG).

44 – Remove the monitoring oxygen sensor

WARNING

Hot surfaces.

Risk of burning!

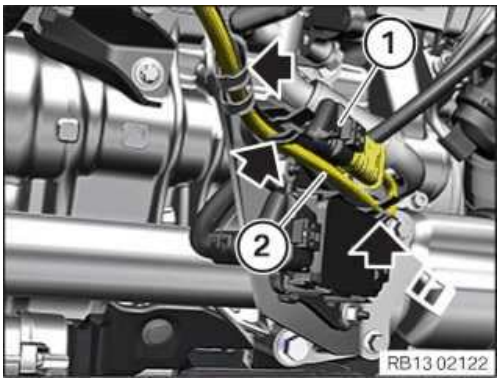
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

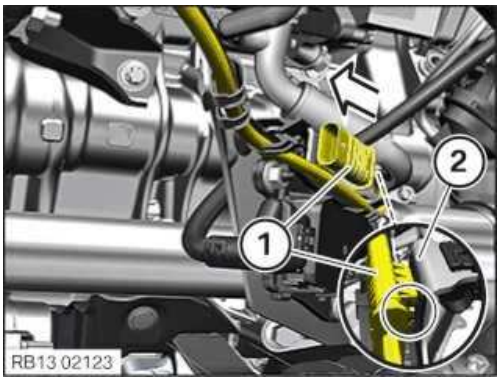
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

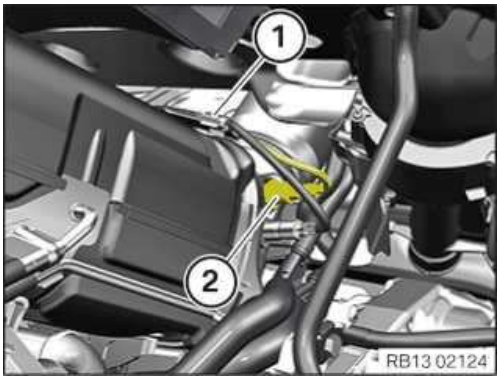


- Unlock plug connection (1) and disconnect.
- Feed oxygen monitor sensor cable (1) out of the clamps (arrows).

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- Unlock the connector (1) in the marked area and disconnect it from the holder (2) in the direction of arrow.



- Guide the cable of the monitoring oxygen sensor (2) out of the clamp (1).
- Release the monitoring oxygen sensor (2) using special tool **0 491 074 (11 7 020)**.
- Remove the monitoring oxygen sensor (2).

45 – Removing the nitrogen oxide sensor before SCR catalytic converter

WARNING

Hot surfaces.

Risk of burning!

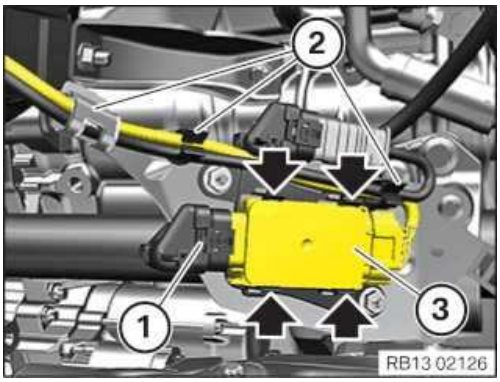
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

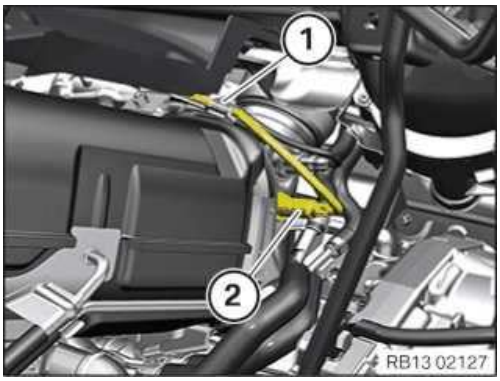
Damage to or destruction of electrical components.

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- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



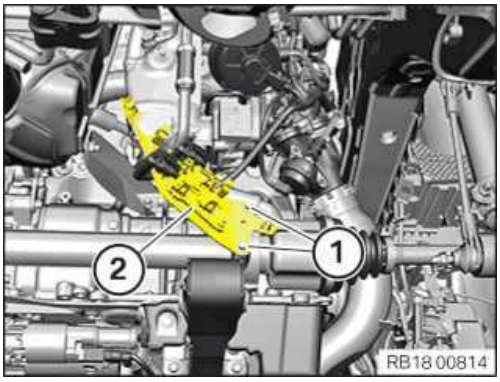
- Unlock plug connection (1) and disconnect.
- Slide the cable of the nitrogen oxide sensor evaluation electronics (3) out of the clamps (2) and remove.
- Unlock (arrows) and remove the evaluation electronics for the nitrogen oxide sensor (3).

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- Slide the cable of the nitrogen oxide sensor before the SCR catalytic converter (2) out of the clamps (1) and remove.
- Detach the nitrogen oxide sensor before the SCR catalytic converter (2) using the special tool **0 491 074 (11 7 020)**.
- Guide out and remove the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

46 – Remove holder for oxygen sensor



- Loosen screws (1).
- Thread out the holder (2) for the oxygen sensor and remove.

47 – Remove the exhaust temperature sensor on the catalytic converter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

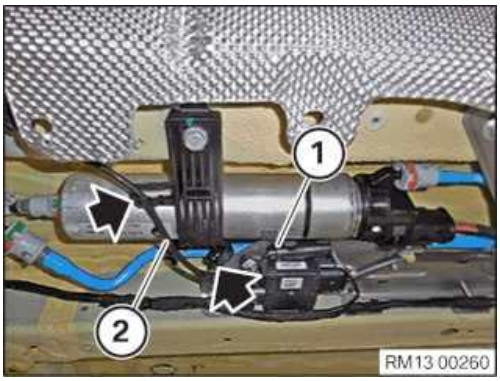
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

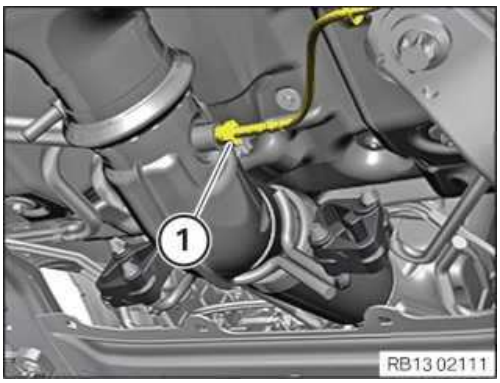
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- Unlock and loosen connector (1).
- Feed out the cable (2) of the exhaust temperature sensor from the clamps (arrows) and remove.



- Loosen the cable clip (1).



- Loosen exhaust temperature sensor (1).
- Feed out and remove exhaust temperature sensor (1).

48 – Removing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

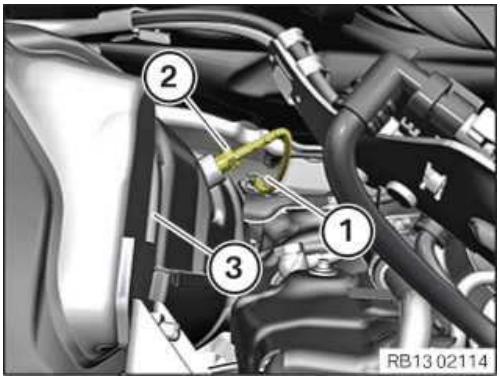
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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- Unlock and loosen connector (1).
- Uncover the exhaust temperature sensor cable.



- Guide the exhaust temperature sensor cable (2) out of the clamp (1) and place it to one side.
- Release the exhaust temperature sensor (2) with conventional tools .
- Feed out and remove the exhaust temperature sensor (2) from the diesel particulate filter (3).

49 – Remove the exhaust temperature sensor on the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

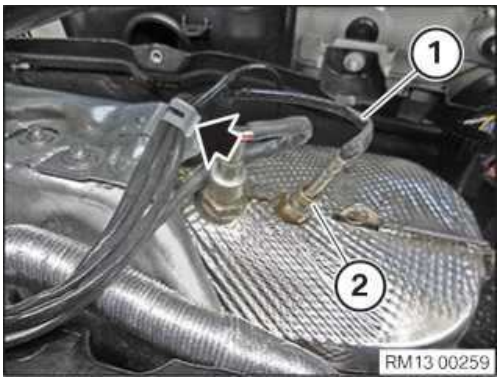
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect connector (1).
- Put the cable of the exhaust temperature sensor to one side.

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- Guide cable (1) of the exhaust temperature sensor out of the clamp (arrow) and remove it.
- Loosen exhaust temperature sensor (2).
- Feed out and remove exhaust temperature sensor (2).

50 – Remove the control sensor

WARNING

Hot surfaces.

Risk of burning!

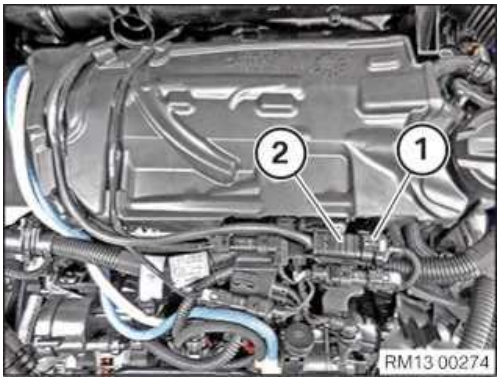
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock plug connection (1) and disconnect.
- Detach the connector (2) from the holder .
- Release the front oxygen sensor cable.



- Detach the control sensor (1) with the special tool .
- Feed out and remove the control sensor (1).

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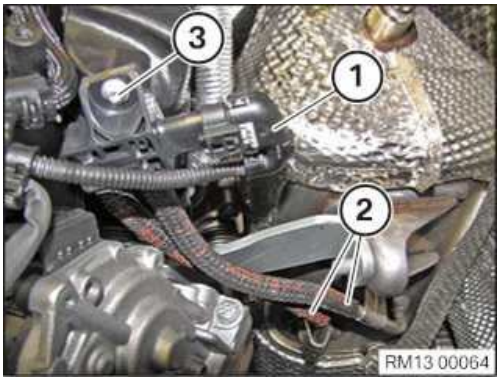
51 – Remove differential pressure sensor

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

52 – Removing the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

CAUTION

Heavy component.

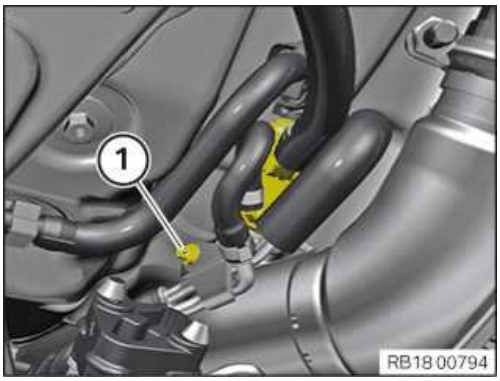
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

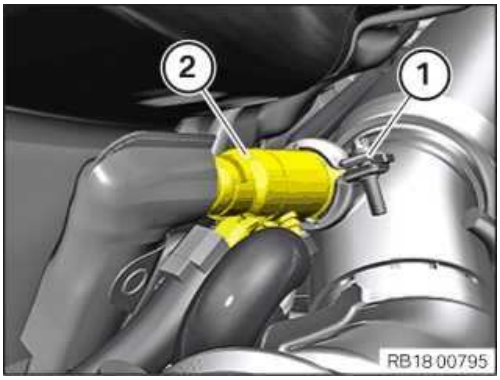


- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.

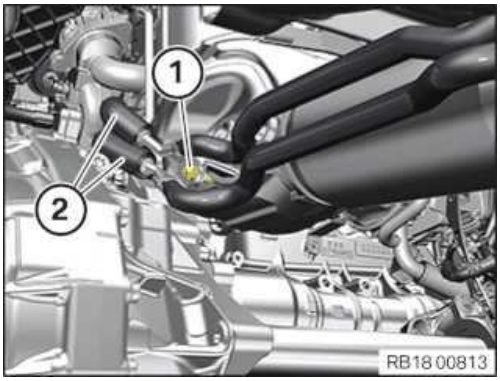
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- Loosen screw (1).



- Loosen V-band clamp (1).
- Remove the SCR metering module (2) and set it aside.



- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.

▶ **Remove differential pressure sensor**

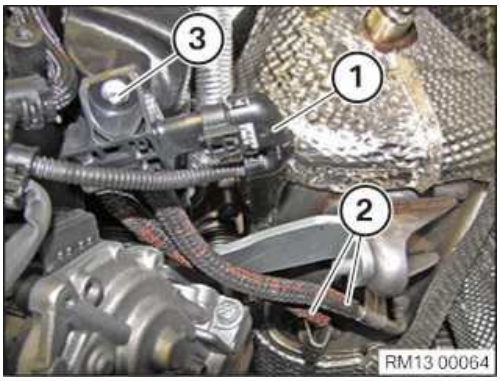
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

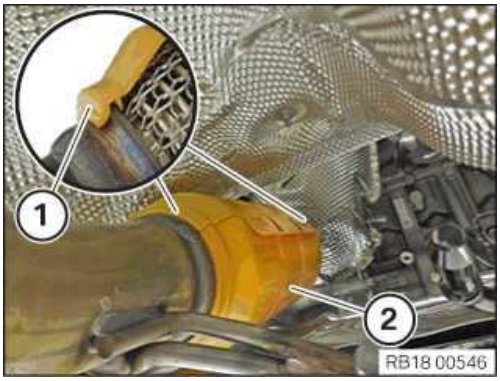
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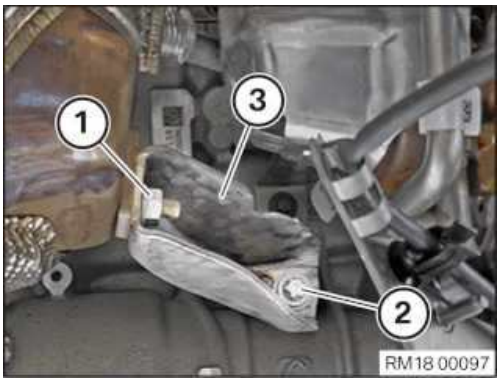
- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.



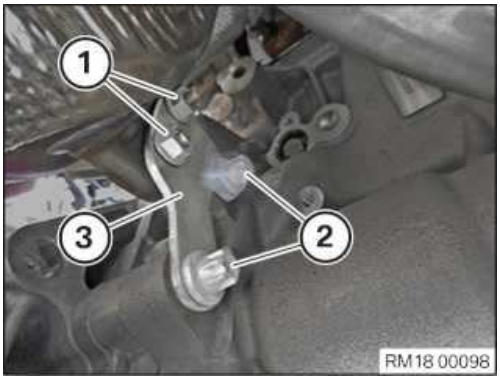
- Loosen nuts (1).



- Mount fitting aid (2).
- Make sure that the fitting aid is correctly position on the edges (1) of the flexible tube.

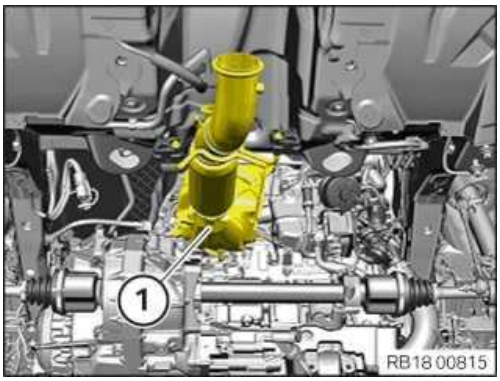


- Unfasten nut (1).
- Loosen screw (2).
- Remove holder (3).



- Loosen nuts (1).
- Loosen screws (2).
- Remove holder (3).

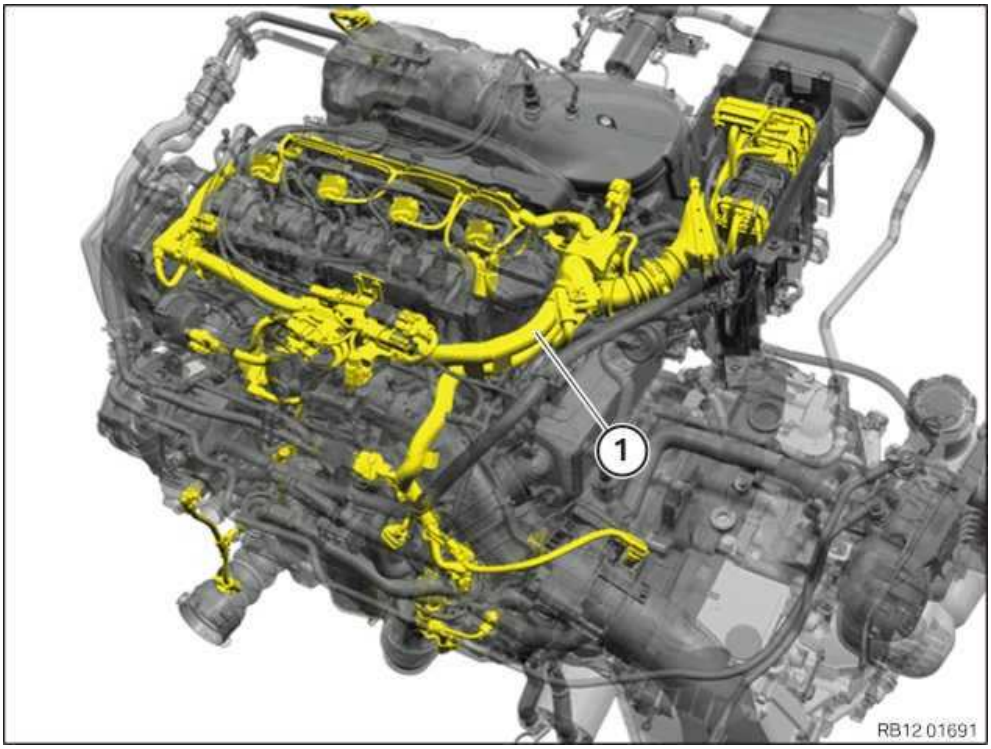
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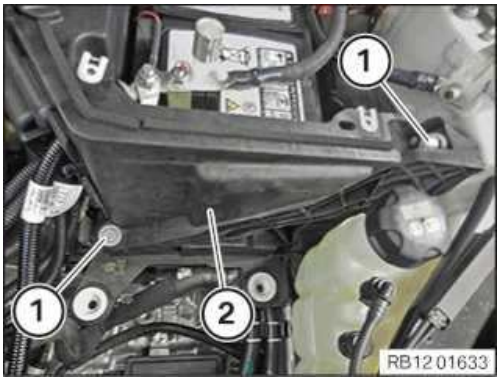
- Feed out diesel particulate filter (1) toward the bottom and remove.

53 – Releasing the wiring harness section for the intake plenum

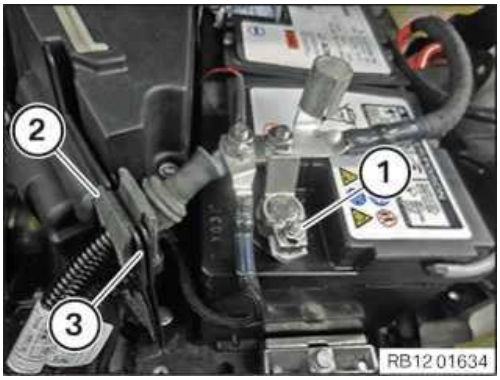
Overview: Wiring harness section for the engine



1 Wiring harness section for the engine

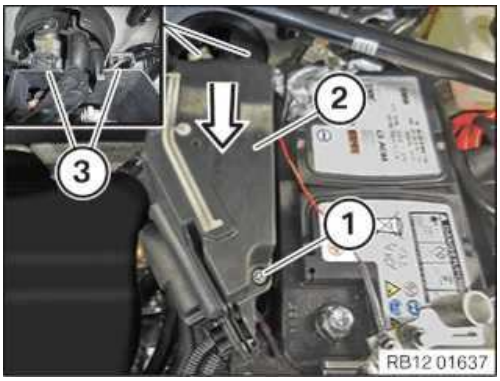


- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.

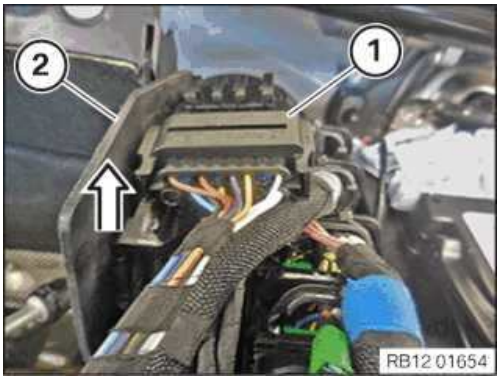


- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

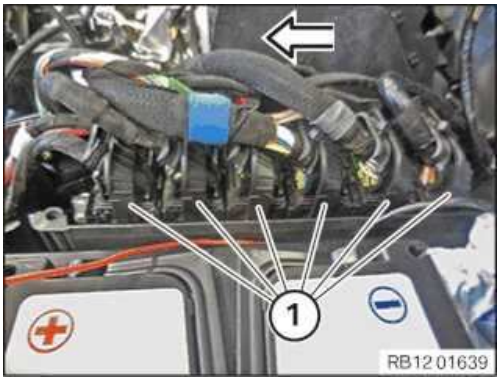
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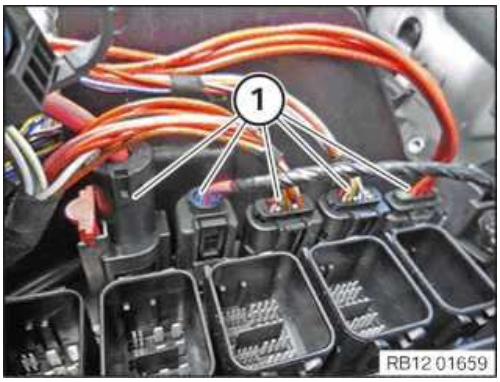
- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



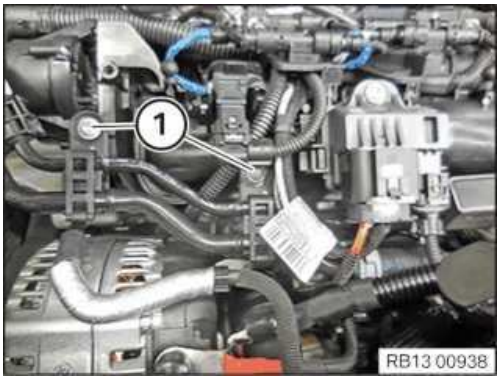
- Guide the connector (1)out of the electronics box (2) in the direction of arrow and remove it.
- Unlock and loosen connector (1).



- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

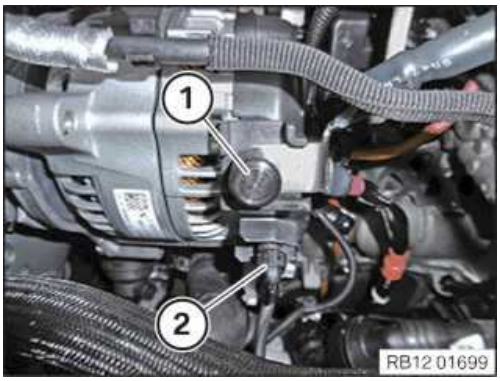


- Unlock and loosen connector (1).

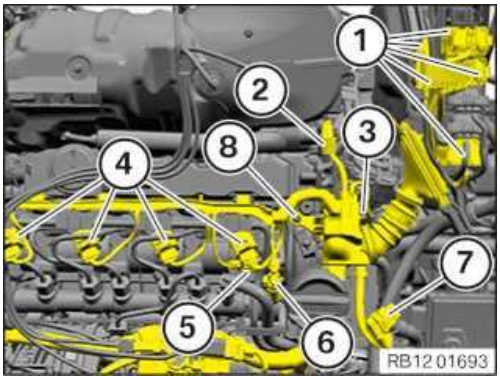


- Loosen screws (1).

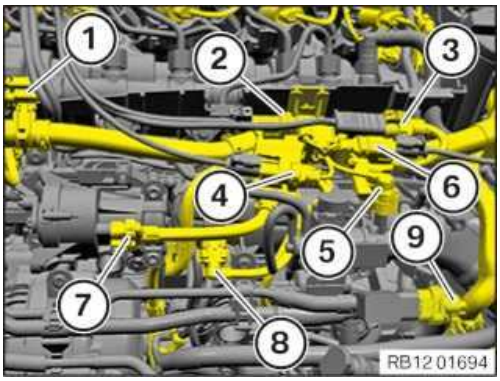
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- Release the positive battery cable (1) on the alternator and place to one side.
- Unlock connector (2) and pull off.



- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock the connector (2) and disconnect it from the differential pressure sensor.
- Unlock the connector (3) and disconnect it from the exhaust-gas recirculation valve.
- Unlock the connector (4) and pull off from the injectors.
- Unlock the connector (5) and disconnect it from the camshaft sensor.
- Unlock the connector (6) and disconnect it from the fuel pressure regulator.
- Unlock connector (7) and pull off from hot film air mass meter.
- Loosen screw (8).



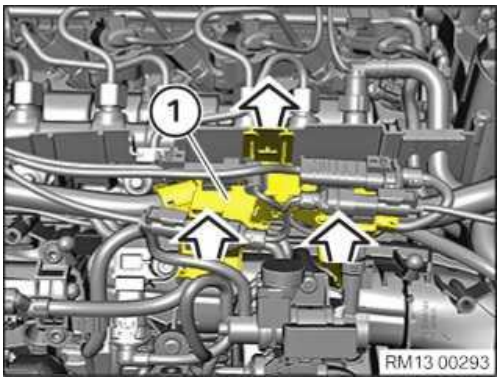
- Unlock connector (1) and pull off from the rail pressure sensor.
- Unlock the connector (2) and disconnect it from the exhaust temperature sensor before the diesel particulate filter.
- Unlock and disconnect the connector (3) from the front oxygen sensor.
- Unlock the connector (4) and disconnect it from the exhaust temperature sensor after the diesel particulate filter.
- Unlock and disconnect the connector (5) from the electric changeover valve.
- Unlock the connector (6) and disconnect it from the exhaust temperature sensor for the exhaust-gas recirculation cooler.
- Unlock the connector (7) and disconnect it from the servomotor for the swirl flaps.
- Unlock the connector (8) and pull it off the charging pressure sensor.
- Unlock the connector (9) and disconnect from the fuel pressure and temperature sensor.



- Unlock the connectors (1) of all glow elements with the special tool **0 490 796 (11 1 480)** and release them.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.

▶ **Removing the cable clips from the intake plenum**

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- Detach the cable clip (1) in the direction of the arrow.
- Guide out the cable clip (1) in direction of arrow and set it aside.

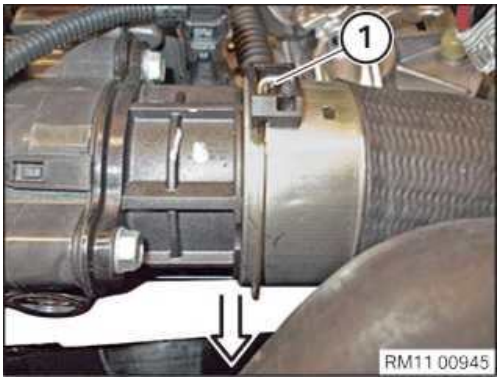
54 – Removing the intake plenum

TECHNICAL INFORMATION

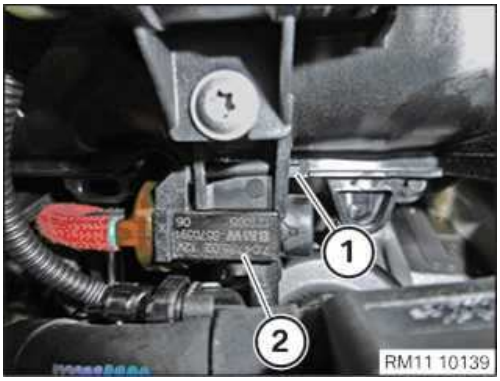
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Unlock the lock (1).

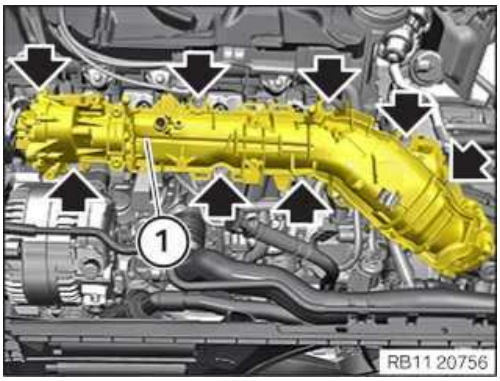


- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.

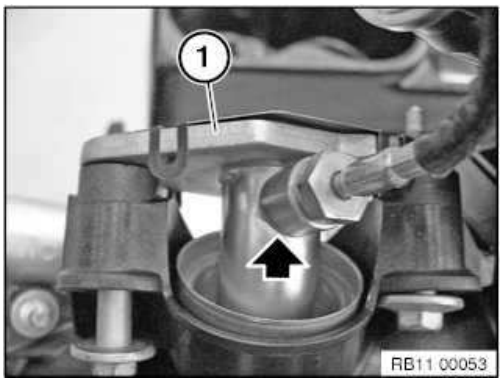


- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.

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- Release the screws (arrows) from the intake plenum (1).
- Guide the intake plenum (1) out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

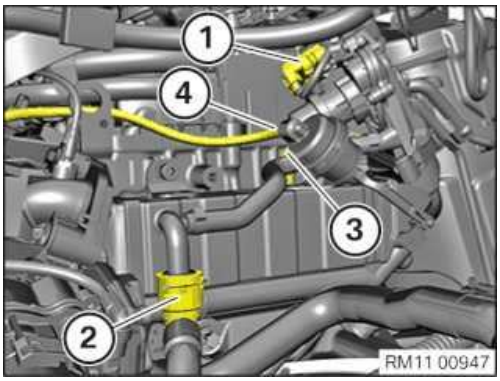
55 – Removing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

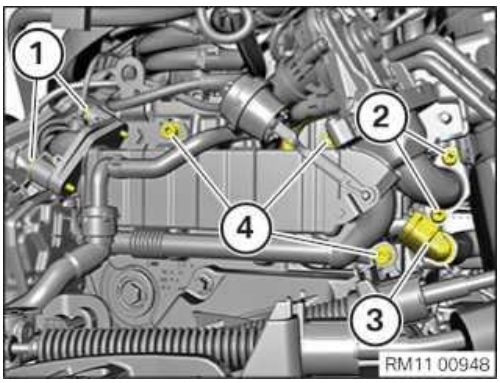
- Perform all work only on components that have cooled down.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

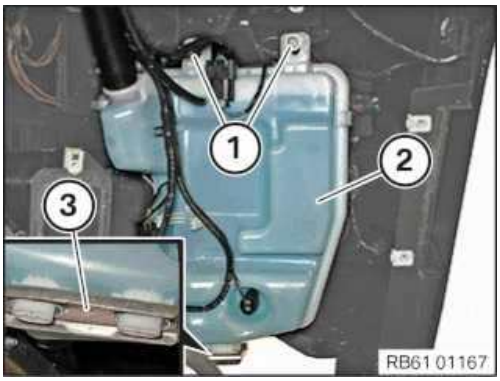
- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.

56 – Remove the washer fluid reservoir from the fixture

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- Loosen screws (1).
- Guide the washer fluid reservoir (2) up and out of the fixture (3) and set it aside.

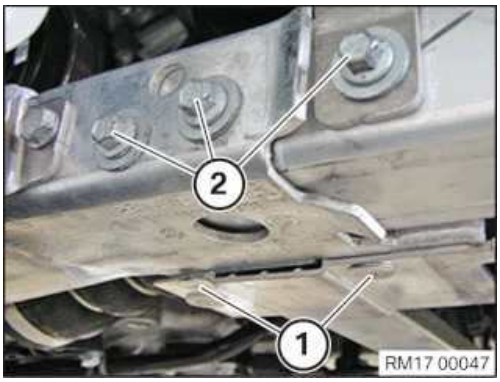
57 – Removing the right charge air duct between the exhaust turbocharger and the charge air cooler

WARNING

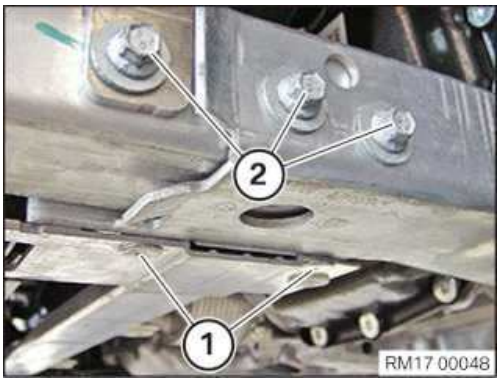
Hot surfaces.

Risk of burning!

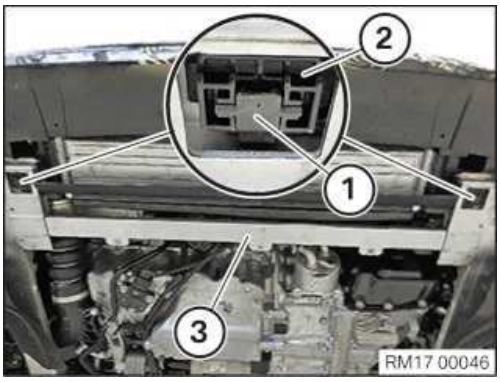
- Perform all work only on components that have cooled down.



- Undo screws (2) at front left.
- Drill out blind rivets (1) at front left.

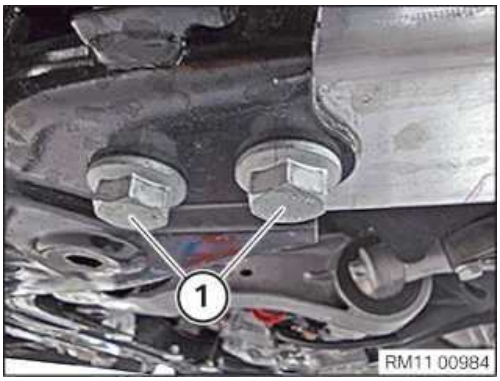


- Undo screws (2) at front right.
- Drill out blind rivets (1) at front right.

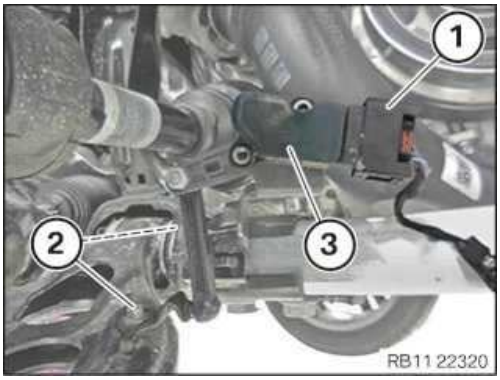


- Unlock locking pins (1).
- Thread out and remove locks (2).
- Thread out and remove cross connection (3).

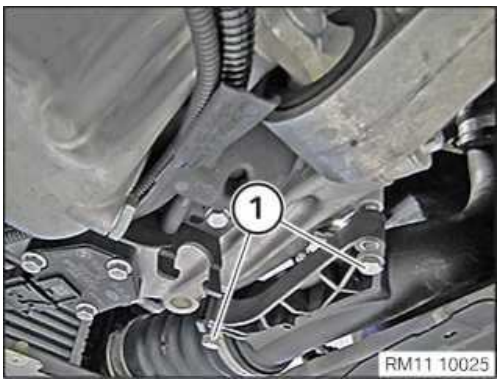
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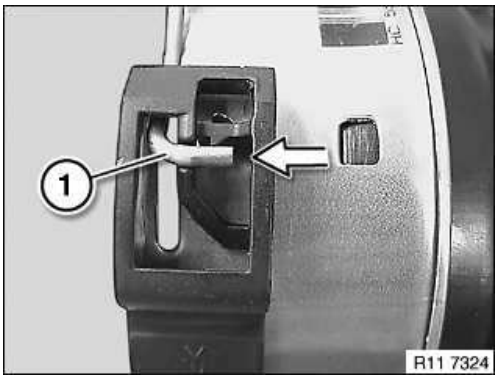
- Release the screws (1) on the right front axle support.



- **If installed:**
- Unlock and release plug connection (1).
- Loosen screws (2).
- Feed out the ride height sensor (3) and remove.

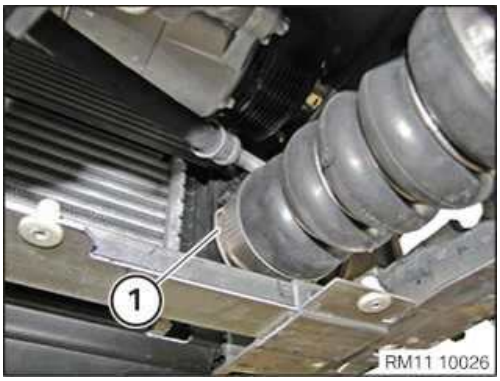


- Release screws (1) of charge air duct on right oil sump.



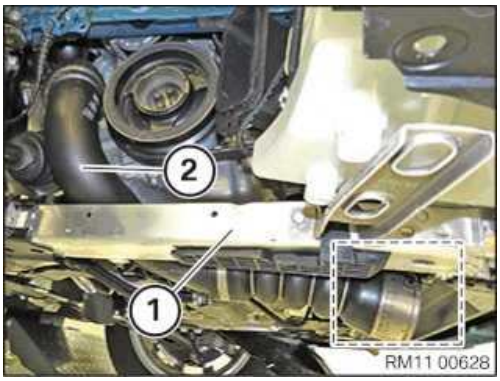
- Unlock lock (1).

  The lock (1) must engage in the bracket during unlocking (arrow).

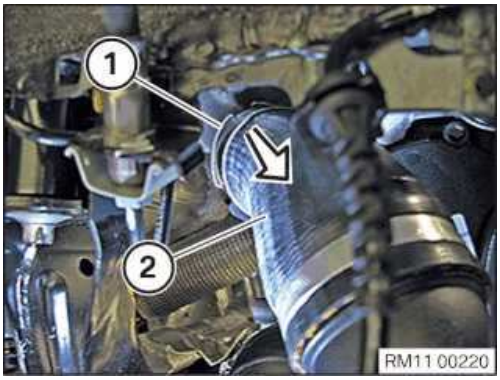


- Unlock and release the charge air duct (1) on the charge air cooler.

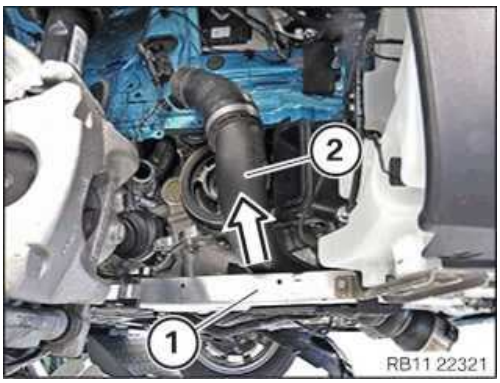
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- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed out the charge air duct (2) in the **marked** area towards the bottom and set it aside.



- Unlock and detach the locks (1) on both sides.
- Feed out the charge air duct (2) on the exhaust turbocharger in the direction of the arrow and set it aside.



- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed out the charge air duct (1) in the direction of arrow between the side member and the deformation element and remove.

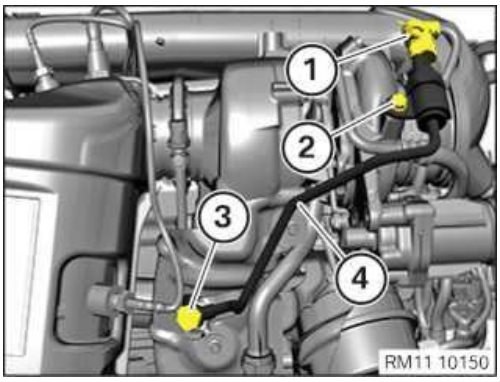
58 – Remove the heat shield from the exhaust turbocharger at the bottom

WARNING

Hot surfaces.

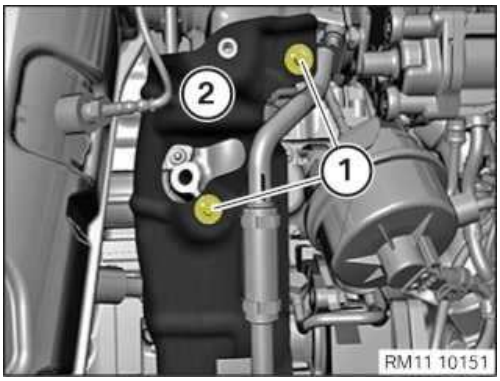
Risk of burning!

- Perform all work only on components that have cooled down.



- Unlock and disconnect connector (1).
- Unscrew the banjo bolt (3).
- The seals of the banjo bolt (3) must be renewed.
- Loosen screw (2).
- Remove the exhaust gas pressure pipe (4).

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- Unscrew the bolts (1) on the heat shield .
- Feed out and remove the heat shield (2).

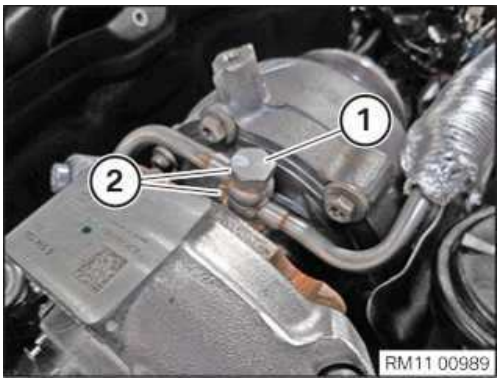
59 – Removing the low-pressure stage turbocharger

WARNING

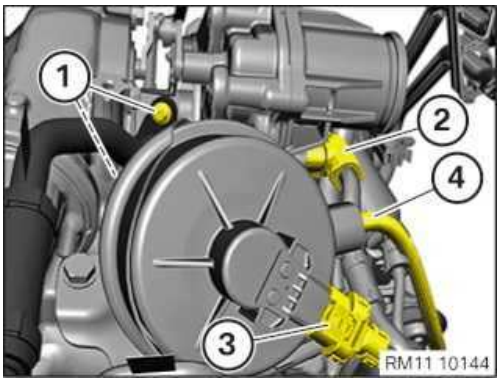
Hot surfaces.

Risk of burning!

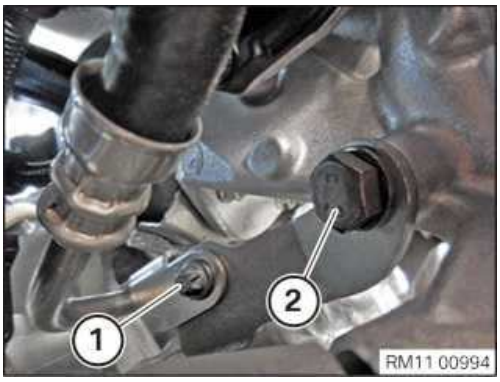
- Perform all work only on components that have cooled down.



- Release the banjo bolt (1) of the oil feed lines.
- Remove sealing rings (2).
- Place oil feed lines to one side.



- Release the screws (1) of the oil return line.
- Unlock and disconnect the plug connections (2) and (3).
- Pull off the vacuum hose (4) carefully.

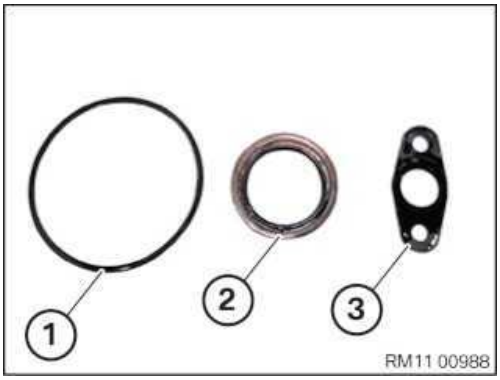


- Undo the bolt (1) of the oil feed line.
- Loosen screw (2).

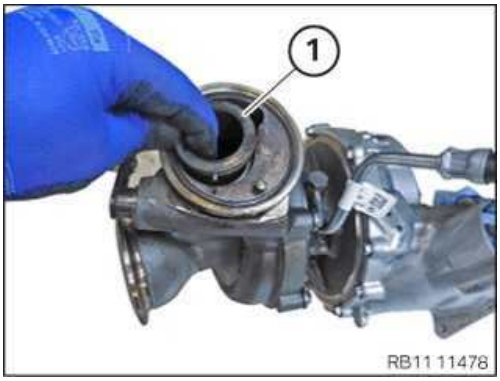
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- Loosen screw (1).
- Remove the V hose clamp.
- Guide the low-pressure stage turbocharger out towards the top and remove.



- Remove seals (1), (2) and (3).



- Remove the spacer ring (1).

60 – Removing the high-pressure stage exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

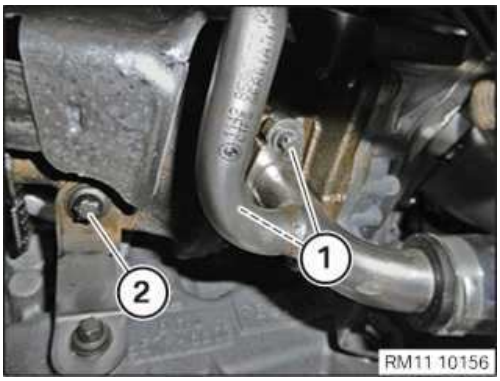
CAUTION

Heavy component.

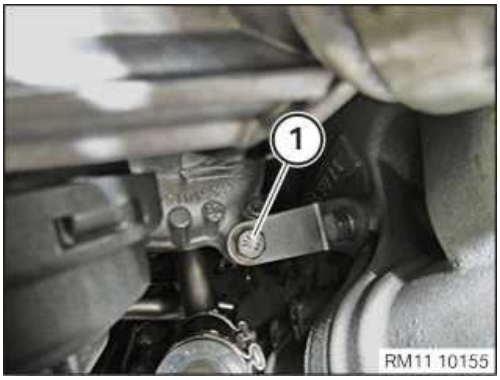
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

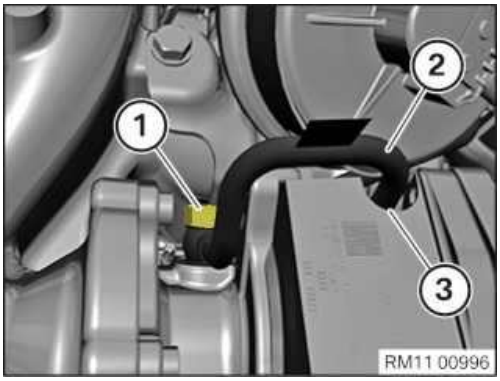
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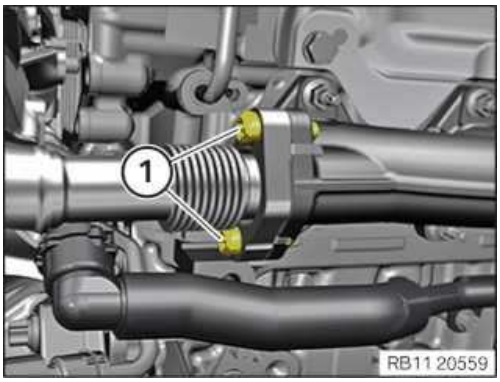
- Unscrew the bolts (1) on the oil return line .
- Loosen screw (2).



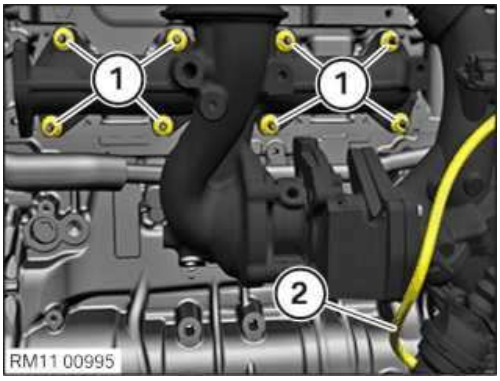
- Release screw (1) from the right wheel arch.



- Unscrew the banjo bolt (1).
- Guide out oil feed line (2) from holder (3).



- Loosen screws (1).



- Pull off the vacuum hose (2).
- Loosen nuts (1).
- Guide out the exhaust manifold and the high-pressure stage exhaust turbocharger to the top and remove them.

61 – Removing high pressure lines between rail and injectors

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

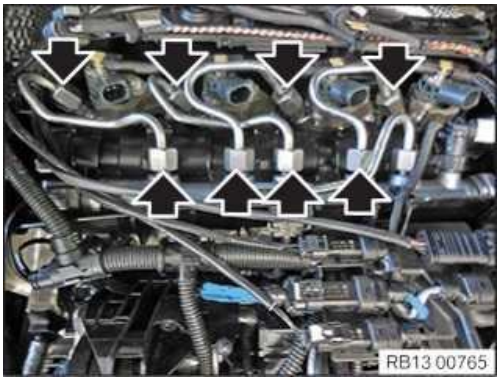
TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release the high pressure lines (arrows) with the special tool .
- Catch and dispose of escaping fuel.
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool .

62 – Remove leakage oil lines

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

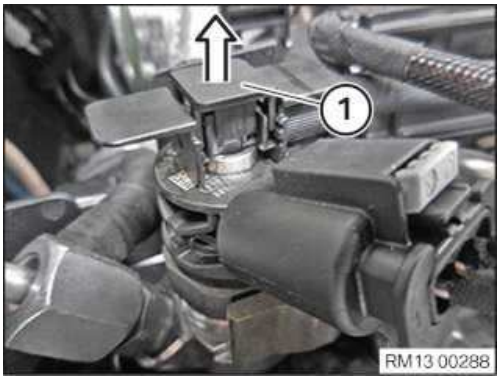
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

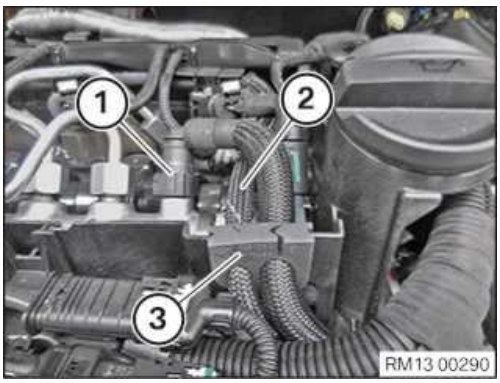
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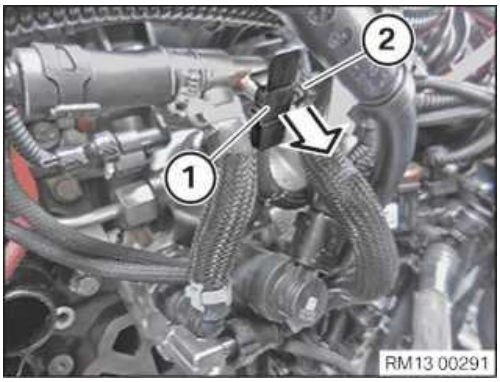
- Unlock the connectors (arrows) and disconnect.



- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.



- Unlock and loosen fuel line (1) and set it aside.
- Guide the leakage oil line (2) out of the rubber grommet (3) and set it aside.



- Release lock (1) in direction of arrow.
- Feed out leakage oil line (2) and remove.

63 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE



Electrostatic discharge.

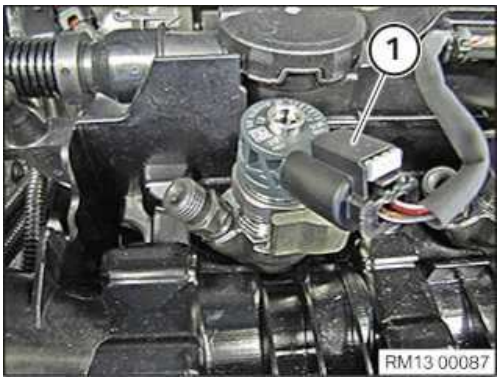
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

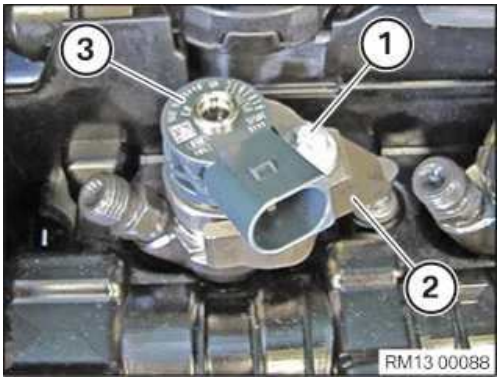
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TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.



- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

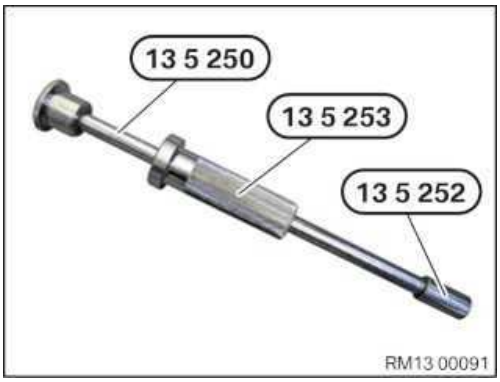
▶ **Loosen stuck injectors**

RISK OF DAMAGE

Contaminant or foreign body.

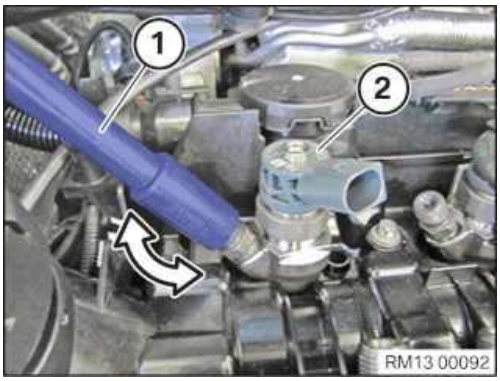
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)** back onto the special tool **0 493 321 (13 5 250)**.

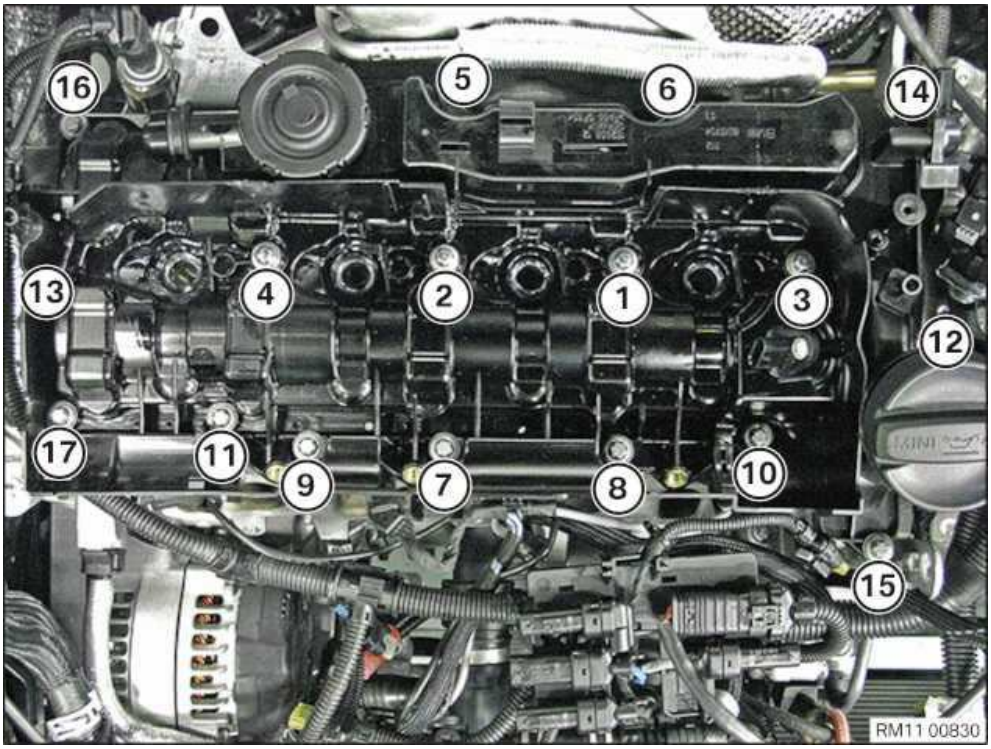
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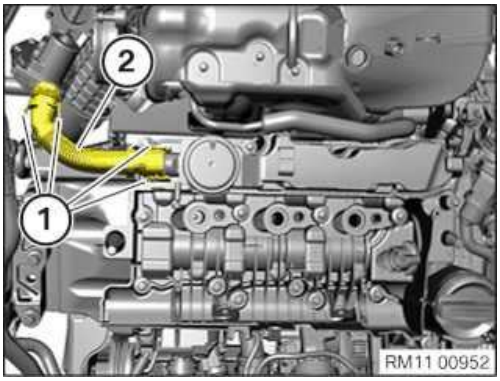
- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

64 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover

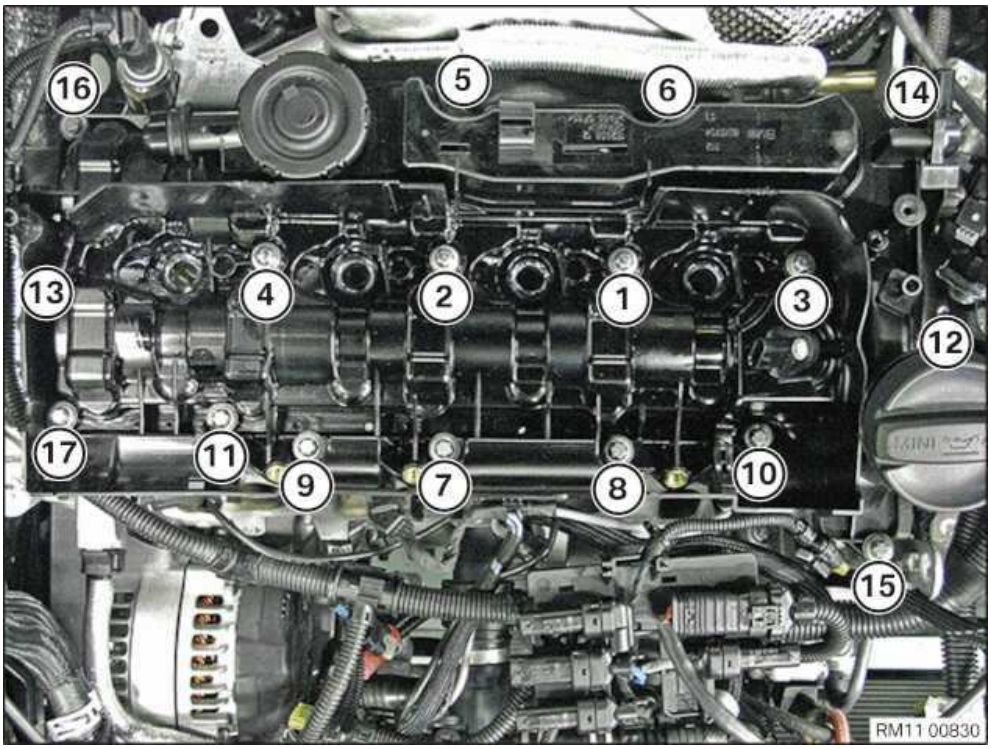


1 to 16 screws of the cylinder head cover.



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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- Loosen screws in the order (17) to (1).
- Remove cylinder head cover by lifting it out.

65 – Checking camshaft timing



- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

Damage to the engine.

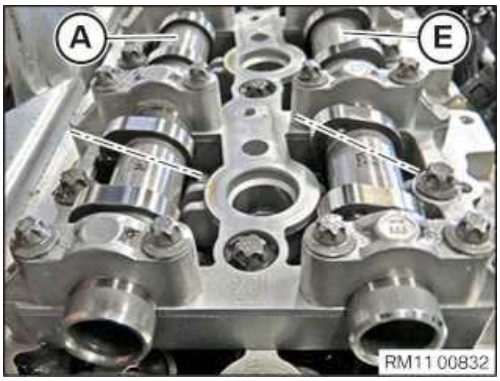
The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

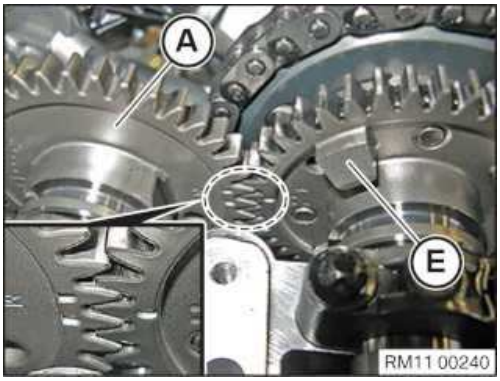
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- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.



- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

66 – Remove chain tensioner piston

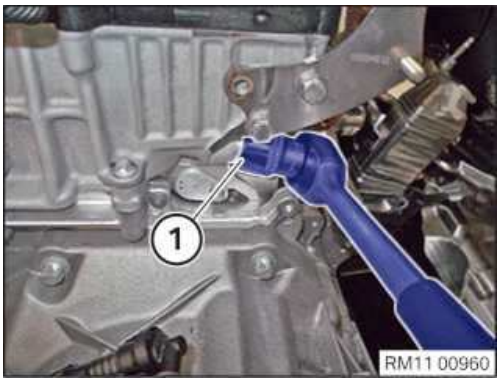
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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

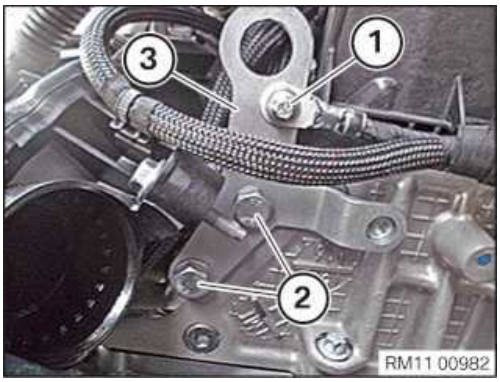


TECHNICAL INFORMATION

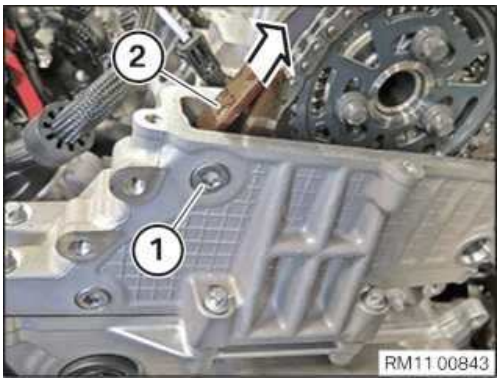
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

67 – Remove the timing chain guide rail

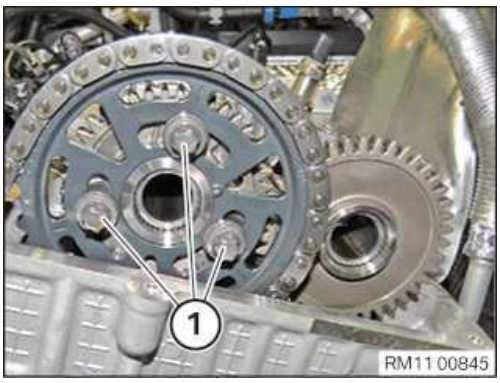


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

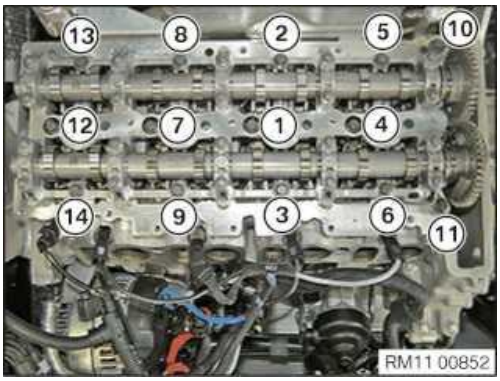
68 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

69 – Removing the camshaft support

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- Evenly loosen all screws in a sequence from (14) to (1).
- Loosen and remove all screws in a sequence from (14) to (1).

  Both camshafts can be removed with the camshaft carrier.
- Remove the camshaft support including camshafts towards the top.

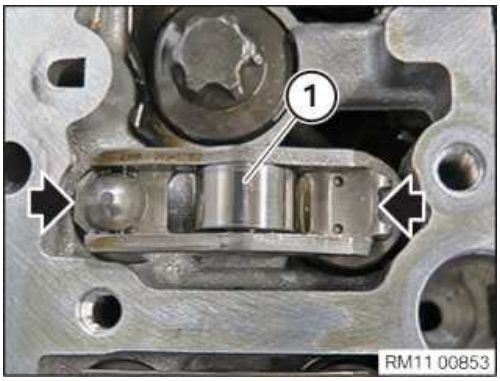
70 – Remove roller cam followers

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



RISK OF DAMAGE

Damage to the engine.

If the classification of the roller cam followers is ignored, this can lead to engine damage.

- Observe the classification of the roller cam followers.
- Always reuse used roller cam followers at the same position.

- Remove the roller cam follower (1) and place it onto the special tool **0 495 105 (11 4 480)**.
- Repeat the process for all roller cam followers.

71 – Removing the hydraulic valve clearance compensating element

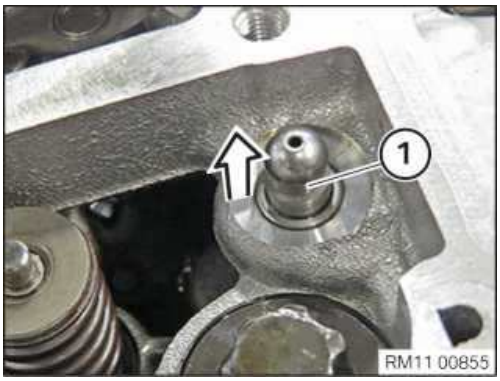
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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- Remove the hydraulic valve clearance compensating element (1) in the direction of the arrow and place on the special tool **0 495 105 (11 4 480)**.
- Repeat the process on all hydraulic valve clearance compensating elements.

72 – Removing glow elements

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Damage to the glow elements.

Excessive force may damage the glow elements and they may then have to be renewed.

- Handle glow elements with care and do not drop.
- Do not rest the cylinder head on glow elements. Glow elements protrude from the sealing surface of the cylinder head.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

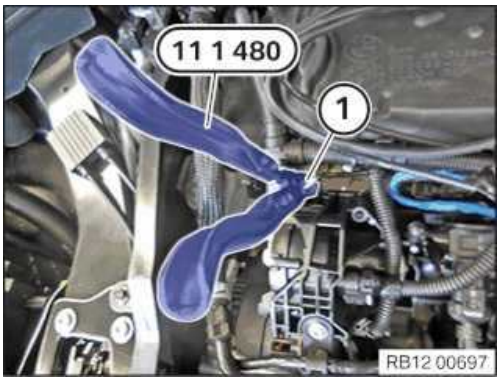
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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect plug connection (1) using special tool **0 490 796 (11 1 480)**.



- Release the glow elements with the special tool or conventional tools.
- Feed out preheating elements and remove.

73 – Remove cylinder head.

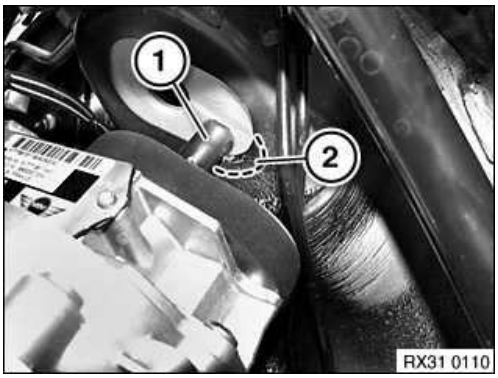
CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

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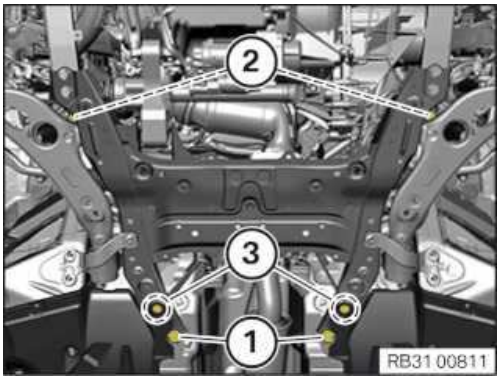


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- Position front axle support.
- Bend the underbody panelling to the side in area (3).
- Raise front axle support.
- When raising, insert the charge air cooler into its rubber mount on the transmission cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

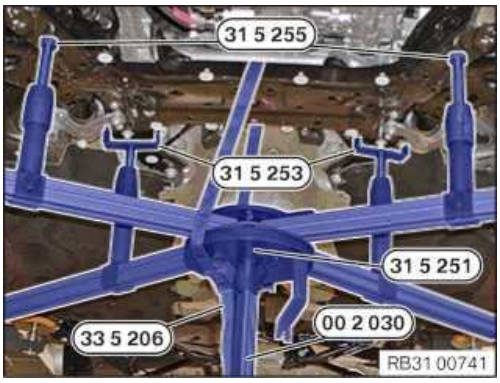
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

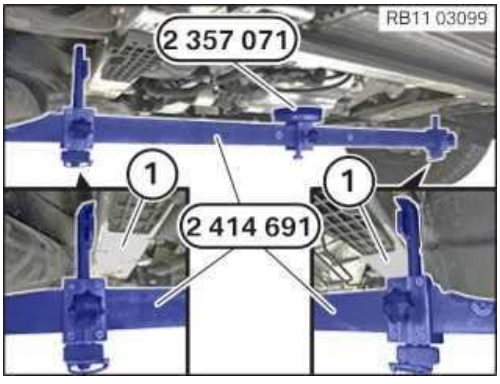
- If applicable, tighten the screws in area (3).

Underbody protection to body

Screw		Tightening torque	3 Nm

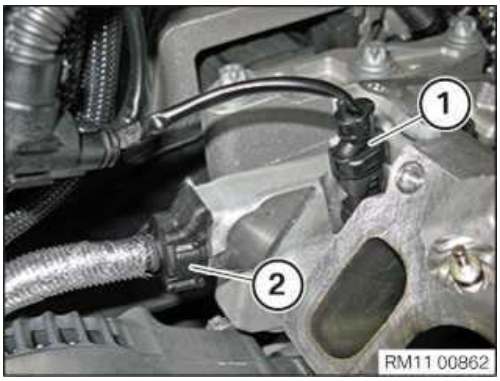


- Remove special tool from special tool .
- Lower the universal jack **0 490 133 (00 2 030)** with the special tool and set it aside.



- Prepare special tool together with the special tool **2 357 071**.
- Attach special tool to front axle support and align special tool **2 357 071** correctly under the oil sump and then tighten.
- Turn special tool at adjusting screw uniformly upwards, until the special tool **2 357 071** makes contact with the oil sump.
- Tighten all adjusting screws of special tools and **2 357 071**.

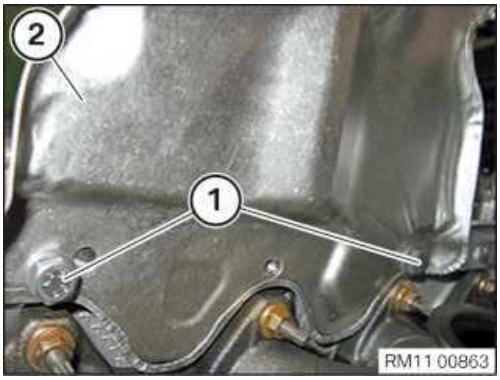
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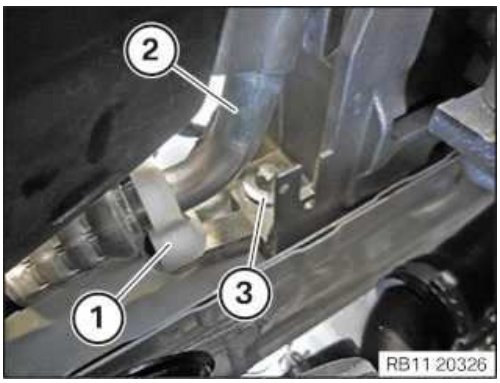
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Release the connector (1) from the coolant temperature sensor.
- Unlock and loosen coolant line (2).



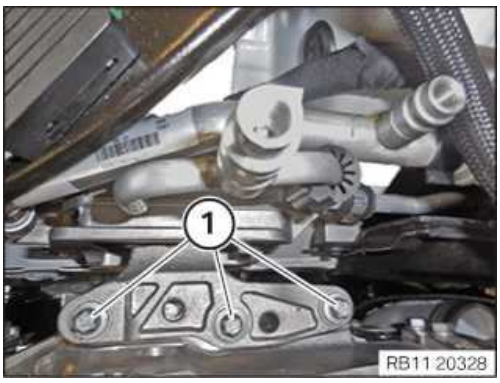
- Loosen screws (1).
- Feed out the heat shield (2) and set it aside.



- Unlock and loosen holder (1).
- Feed out the refrigerant line (2) and put to one side.
- Loosen screw (3).

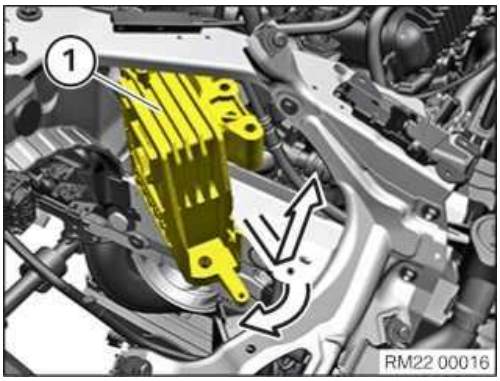


- Loosen screw (1).

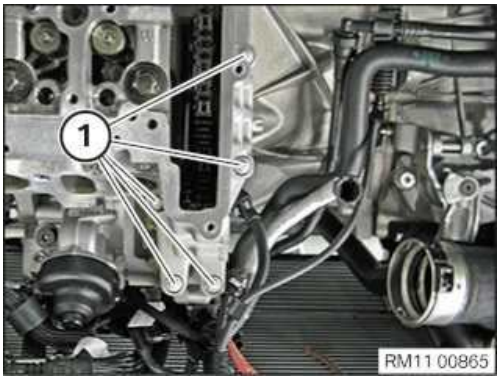


- Loosen screws (1).

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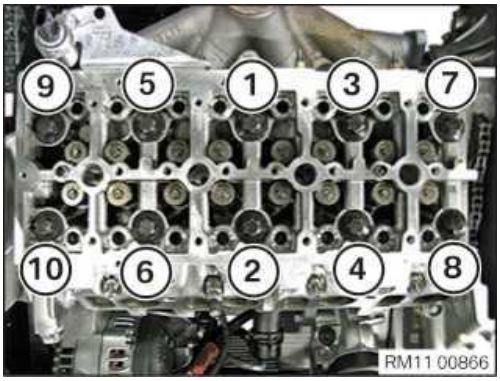
- Turn engine mount (1) in direction of arrow and remove upwards.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screws (1).



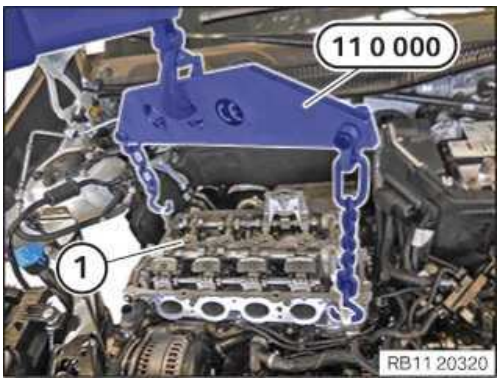
- Loosen the cylinder head bolts in the sequence from (10) to (1).
- Remove cylinder head bolts (1) to (10) with washers.



- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

M8		Tightening torque	21,5 Nm



RISK OF DAMAGE

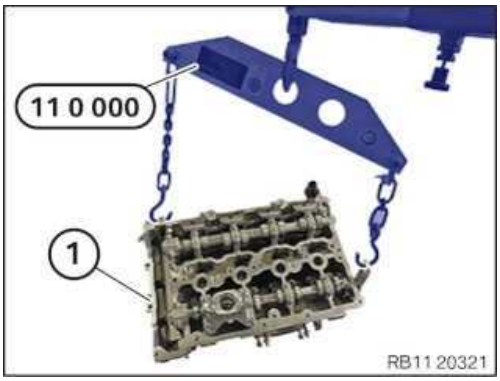
Damage to the guide rails.

Large amounts of force may damage the guide rails of the timing chain.

- Make sure not to damage the guide rail with the cylinder head when removing and installing the cylinder head.

- **Carefully** guide out the cylinder head (1) with the engine lifter and the special tool **0 490 561 (11 0 000)** and remove.

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- Mount the cylinder head (1) on the special tool **0 494 362 (11 9 000)**.

MAIN WORK

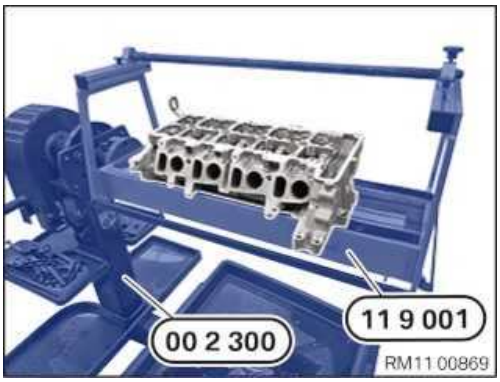
74 – Remove all valve springs

RISK OF DAMAGE

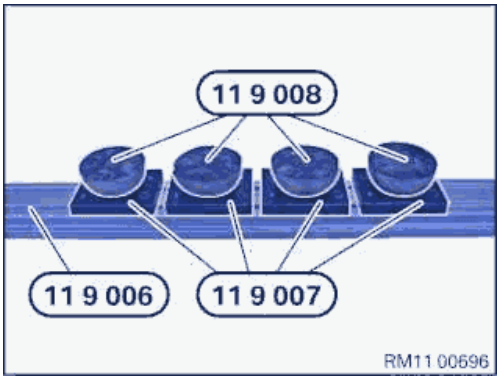
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Mount and screw the cylinder head onto the special tools **0 494 366 (11 9 001)** and **0 495 187 (00 2 300)**.

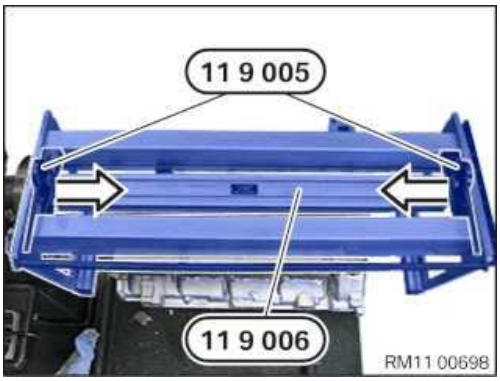


- Prepare the special tools **0 494 371 (11 9 006)**, **0 494 372 (11 9 007)** and **0 494 373 (11 9 008)** as shown.



- Position special tool **0 494 373 (11 9 008)** as illustrated.

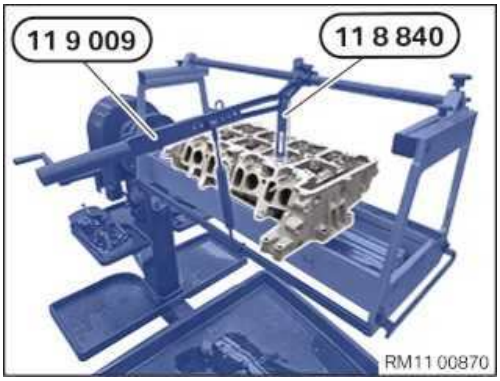
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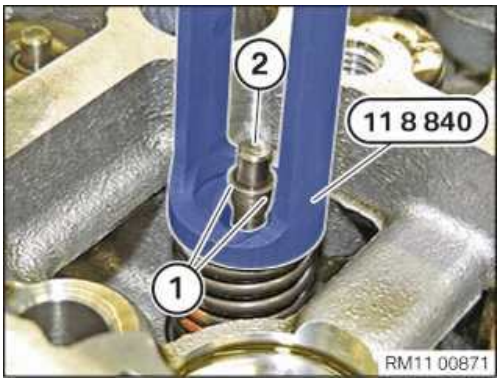
- Turn round special tool **0 494 371 (11 9 006)** and insert as shown.
- Lock special tool **0 494 370 (11 9 005)** in direction of arrow.



- Lock special tool **0 494 370 (11 9 005)** in direction of arrow.
- Use the special tool **0 494 362 (11 9 000)** to bring the cylinder head into the installation position by 180°.



- Align special tool **0 494 374 (11 9 009)** in direction of valve axis.
- Position the special tool **0 496 143 (11 8 840)** according to the nut.
- Press down the valve spring on the upper spring cup with the special tools **0 494 374 (11 9 009)** and **0 496 143 (11 8 840)**.
- The **hooks** from the set of special tools **0 494 362 (11 9 000)** can be used to **hold** the valve spring down.



- Keep the valve spring pressed down with the special tool **0 496 143 (11 8 840)**.
- Remove the valve shims (1) from the valve (2) using a magnet.
- Guide the valve spring and spring cup out and remove.
- Set down valve spring, spring cup and valve shims (2) in the special tool **0 495 105 (11 4 480)** in an orderly manner.

75 – Install all valve springs

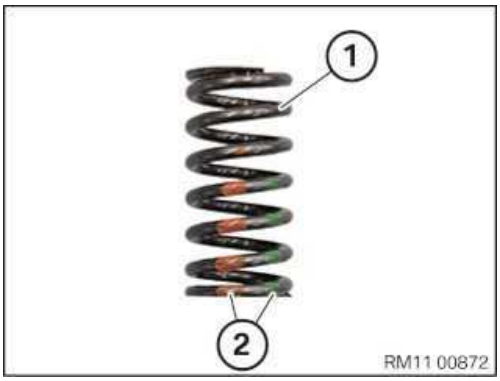
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

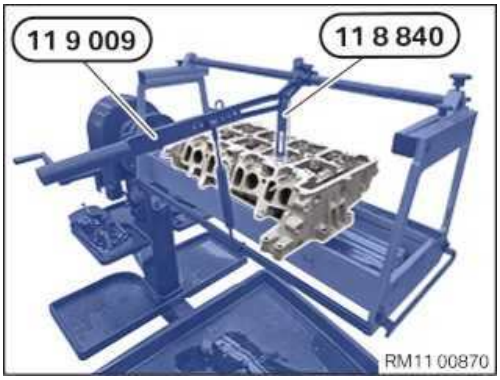
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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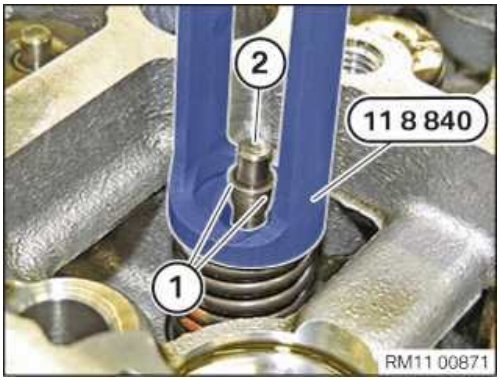


- The valve spring (1) is marked with a colour code (2).

  The mounting orientation of the valve spring (1) can be freely chosen.



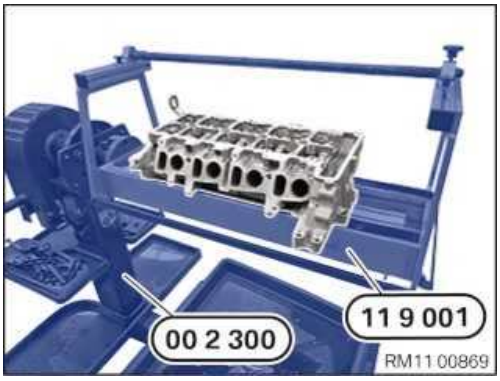
- Align special tool **0 494 374 (11 9 009)** in direction of valve axis.
- Position the special tool **0 496 143 (11 8 840)** according to the nut.
- Press down the valve spring on the upper spring cup with the special tools **0 494 374 (11 9 009)** and **0 496 143 (11 8 840)**.
- The **hooks** from the set of special tools **0 494 362 (11 9 000)** can be used to **hold** the valve spring down.



- Keep the valve spring pressed down with the special tool **0 496 143 (11 8 840)**.
- Insert the valve shims (1) at the valve (2) with the magnet and install.
- Relieve load on valve spring.
- Make sure that the valve shims (1) are installed correctly.



- Unlock the special tool **0 494 370 (11 9 005)** in the direction of the arrow.
- Guide the special tool **0 494 371 (11 9 006)** out and remove.



- Unscrew and remove the cylinder head from the special tools **0 494 366 (11 9 001)** and **0 495 187 (00 2 300)**.

POSTPROCESSES

76 – Cleaning the sealing surface

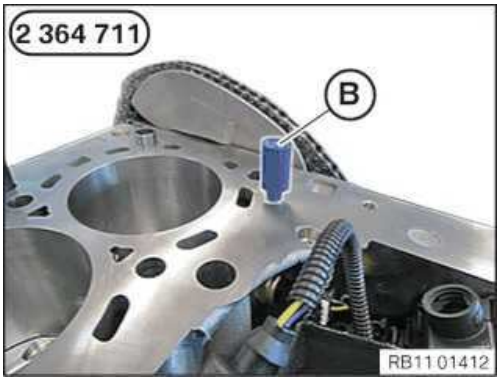
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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Lock the front oil duct using special tool (B) from special tool **2 364 711**.



RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 103 (11 4 471)**.



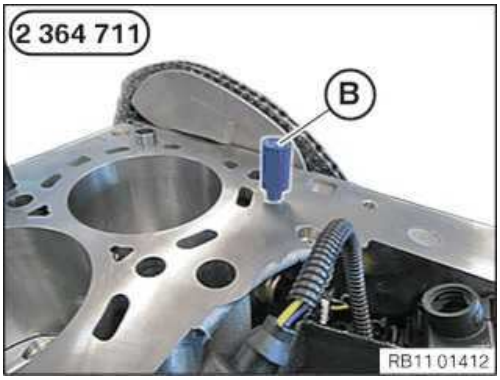
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

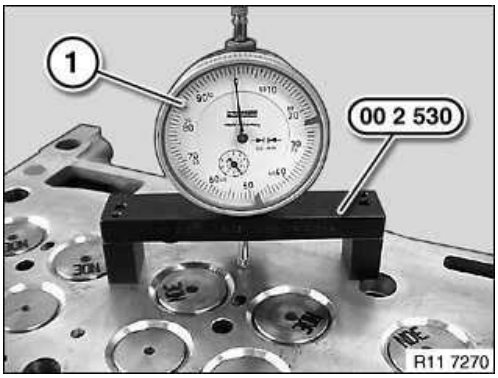
- Clean the sealing surface using special tool **0 495 104 (11 4 472)**.



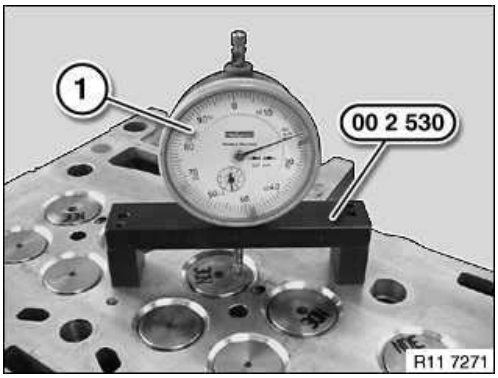
- Remove special tool (B).

77 – Checking the valve underprotrusion

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- Set the dial gauge (1) onto the cleaned cylinder sealing surface with slight preload in special tool **0 490 185 (00 2 530)**.
- Set dial gauge in mildly preloaded state to "zero".



Check

- Position the dial gauge (1) on the valve with special tool **0 490 185 (00 2 530)**.
- Measure valve underprotrusion and compare with the setpoint value.

Valve underprotrusion

	0,8 (0,7 - 0,9) mm

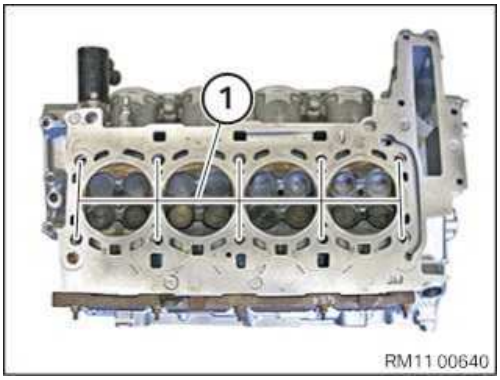
Result

» Valve underprotrusion is outside tolerance.

Measure

- Replace cylinder head.

78 – Renewing the cylinder head gasket



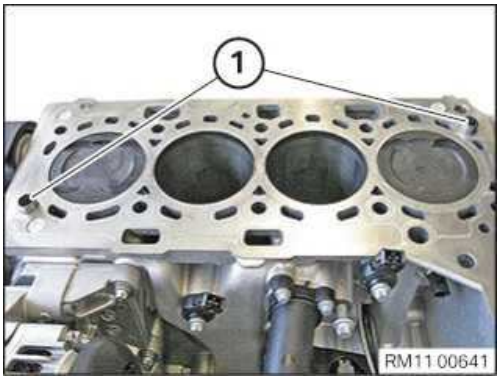
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

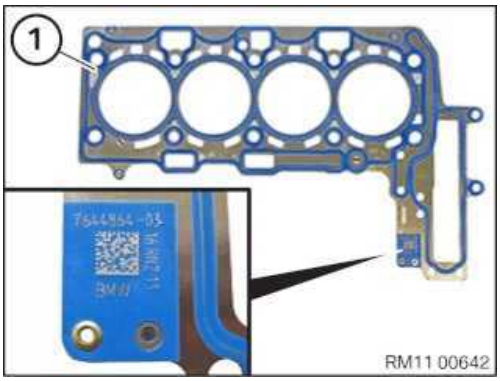
- Do not use any metal-cutting tools.

- Remove oil and dirt residue from the blind holes (1).



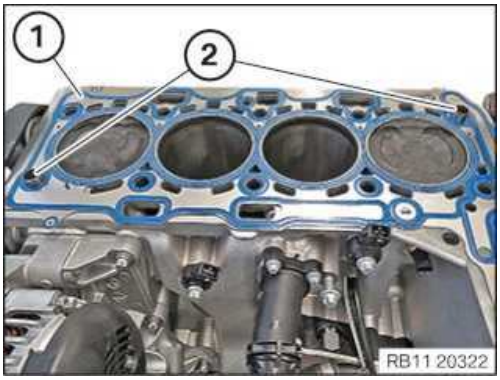
- Check the fitting sleeves (1) for secure fit and damage.

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- Identify the cylinder head gasket (1) using the part number.

Note: If the cylinder head is reworked, an additional thicker gasket 0.3 mm is available for service personnel.



- Guide in the cylinder head gasket (1) and install.
- Ensure that the cylinder head gasket (1) is installed correctly in the fitting sleeves (2).

79 – Installing the cylinder head

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Damage to threads.

Fluid in the threaded hole may damage the thread when screws are tightened in the threads.

- Dry threaded holes (e.g. using compressed air).

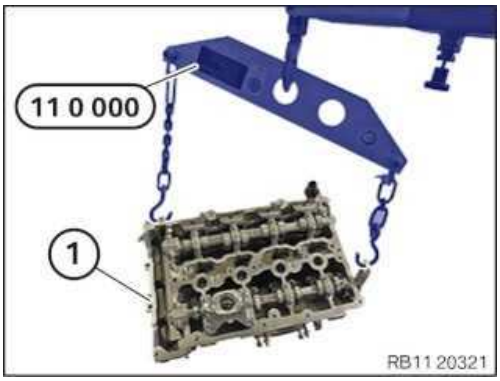
TECHNICAL INFORMATION

Do not remove bolt coating.

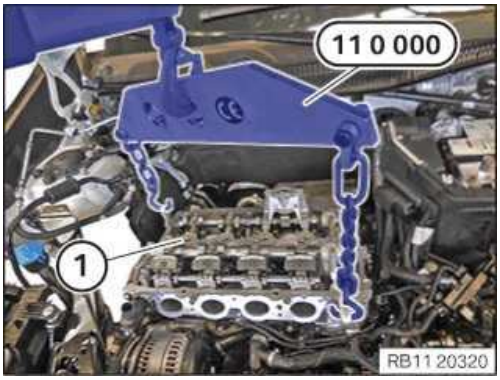
TECHNICAL INFORMATION

When replacing the cylinder head: The complete valve control and the Valvetronic servomotor are already pre-assembled for new cylinder heads.

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- Position cylinder head (1) on special tool **0 490 561 (11 0 000)** and engine lifter.



RISK OF DAMAGE

Damage to the guide rails.

Large amounts of force may damage the guide rails of the timing chain.

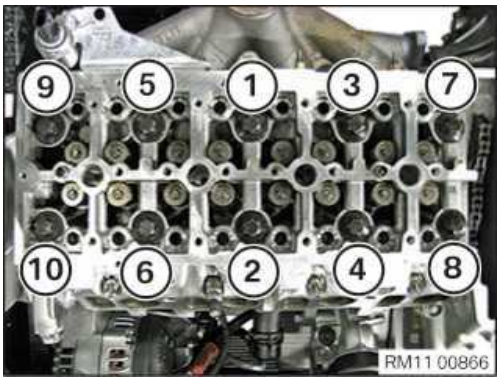
- Make sure not to damage the guide rail with the cylinder head when removing and installing the cylinder head.

- Feed in the cylinder head (1) **carefully** with the engine lifter and the special tool **0 490 561 (11 0 000)** and install.



- Unscrew the bolts (1) of the special tool **2 459 012**.
- Guide the special tool **2 459 012** out and remove.

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- Renew the cylinder head bolts (1).

  Parts: Cylinder head bolts
- Do **not** wash off coating of cylinder head bolts.
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

  No coolant, water or engine oil must be present in threaded holes of engine block.

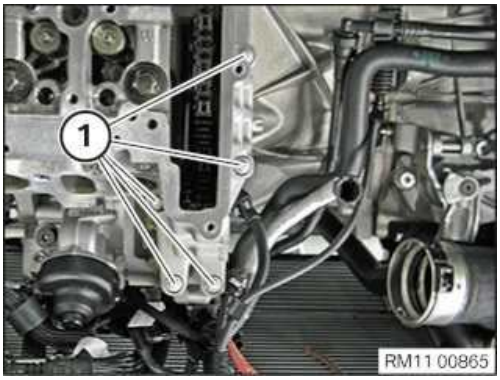
TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Feed in cylinder head bolts and install.
- Screw in cylinder head bolts in sequence (1) to (10).
- Tighten cylinder head bolts using special tools **0 490 504 (00 9 120)** and in sequence (1) to (10).

Cylinder head to crankcase

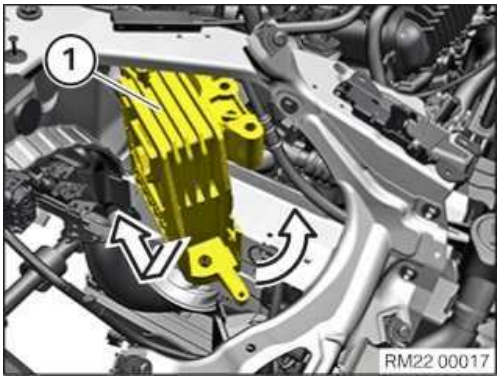
M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °



- Tighten the cylinder head bolts (1).

Cylinder head bolt to timing case cover

M8x40		Tightening torque	19 Nm



- Thread in engine mount (1) in direction of arrow then install.

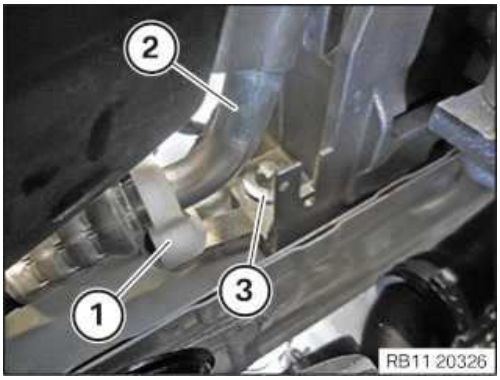
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- Tighten down screw (1).

Right engine mount to side member

M12		Tightening torque	100 Nm

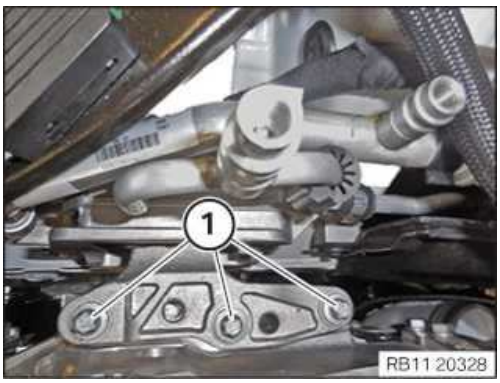


- Tighten down screw (3).

Right engine mount to side member

M12		Tightening torque	100 Nm

- Feed in and install the refrigerant line (2).
- Lock holder (1).
- Make sure the bracket (1) engages audibly.

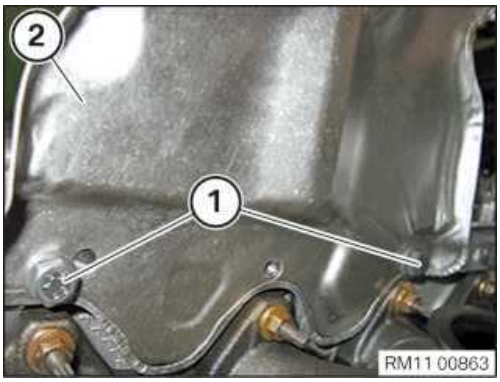


- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Right engine mount to cylinder head

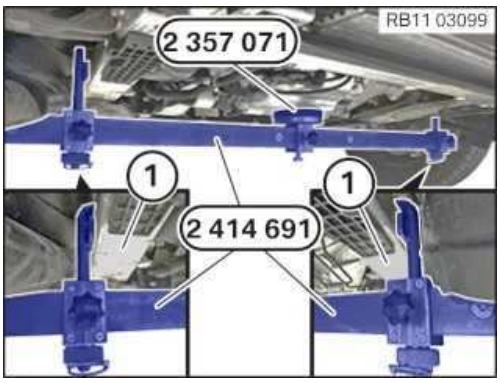
M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °



- Feed in and install the heat shield (2).
- Tighten the screws (1).

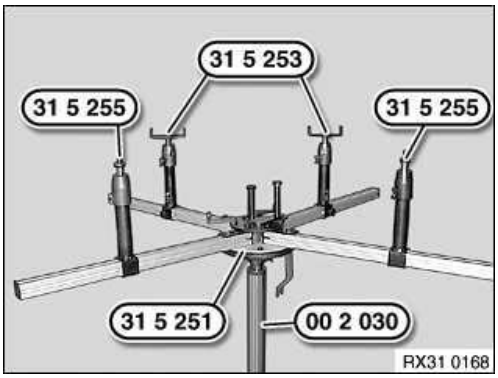
Heat shield to cylinder head

M8X16		Tightening torque	10 Nm



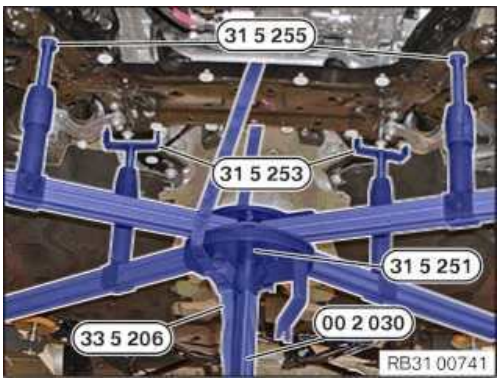
- Disassemble special tool using special tool **2 357 071**.

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- Fit the special tool completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools in telescopic supports of a profile rail pair.
- Insert special tools in telescopic supports of other profile rail pair.

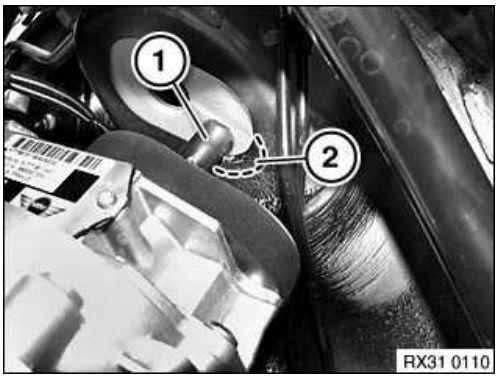
Note: In a profile rail pair, two profile rails are connected to one another by gearing.



- Align special tools and to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool to special tool .

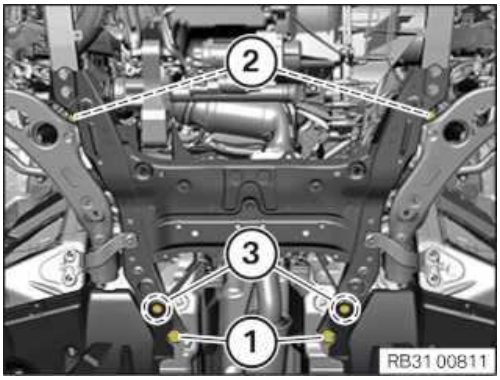


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

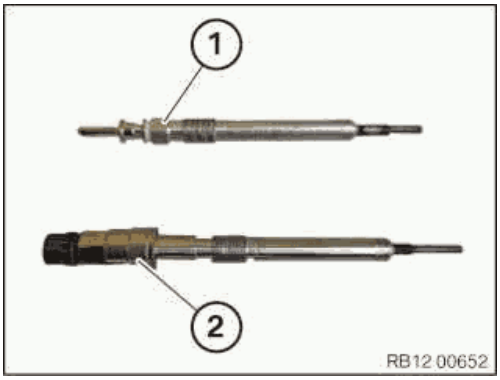
- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and the front axle remove.

80 – Install glow elements



- Install glow elements (1) in cylinders 1, 2, 3 and 4.
- If fitted: Glow element (2) with the **combustion chamber pressure sensor** must be installed in cylinder **2**.

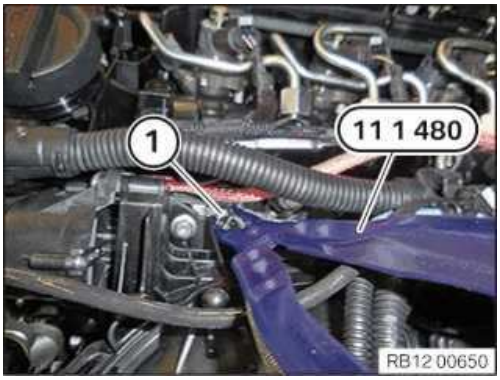
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- Tighten the glow element with the special tool or conventional tools.

Glow elements to cylinder head

Glow element		Tightening torque	13 Nm



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

81 – Installing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Install the hydraulic valve clearance compensating element (1) in the direction of the arrow.
- Repeat the process on all hydraulic valve clearance compensating elements.

82 – Install the roller cam followers

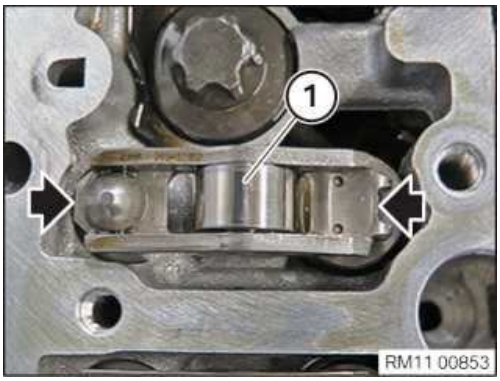
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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RISK OF DAMAGE

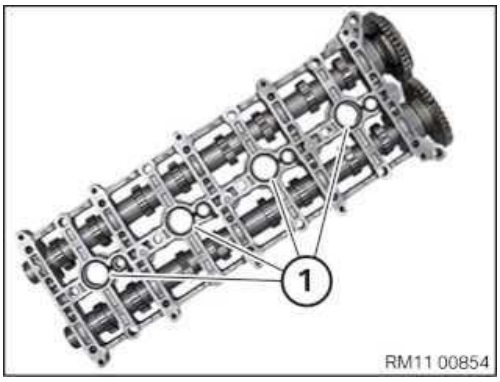
Damage to the engine.

If the classification of the roller cam followers is ignored, this can lead to engine damage.

- Observe the classification of the roller cam followers.
- Always reuse used roller cam followers at the same position.

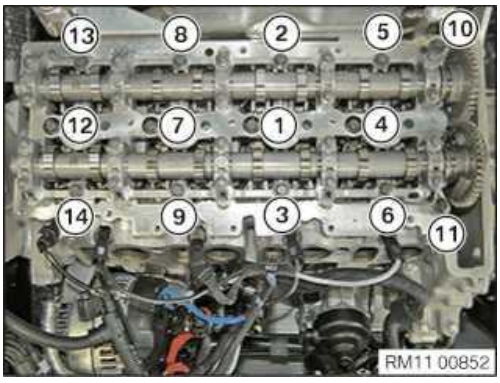
- Install the roller cam follower (1).
- Repeat the process for all roller cam followers.

83 – Installing the camshaft support



- Renew gaskets (1).

  Parts: gaskets

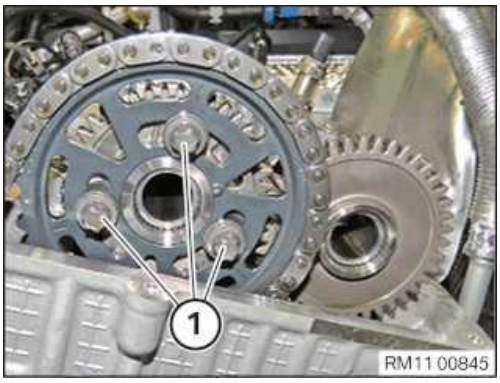


- Position the camshaft support including the camshafts.
- Tighten the screws in a sequence from (1) to (14) in several steps.

Camshaft carrier to cylinder head

M7x35		Tightening torque	13 Nm

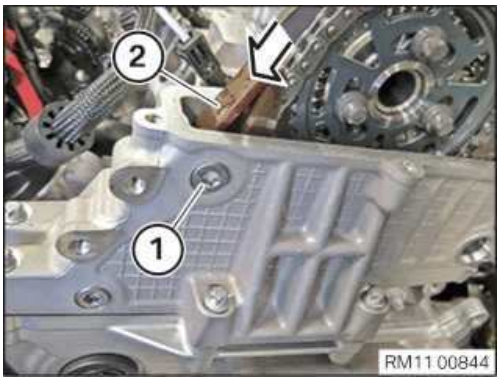
84 – Installing the camshaft sprocket on the intake camshaft



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

85 – Install the timing chain guide rail

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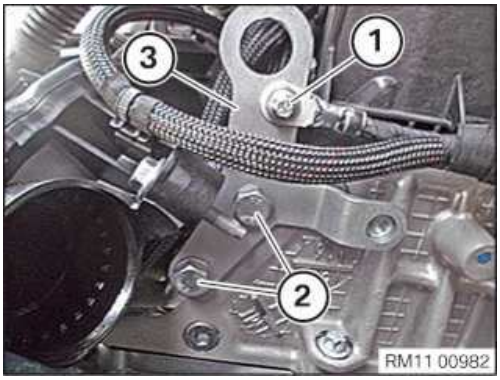
- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm



- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6		8 Nm

86 – Installing the chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Renew sealing ring (1).

  Parts: Sealing ring

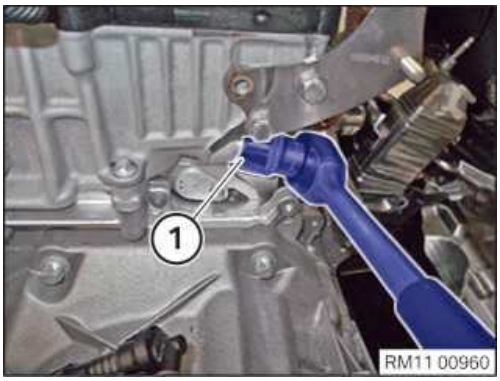


TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.

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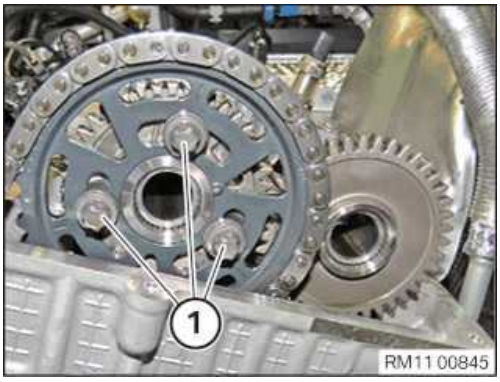


- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

87 – Tightening the camshaft sprocket on the intake camshaft



- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

88 – Checking camshaft timing



- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

Damage to the engine.

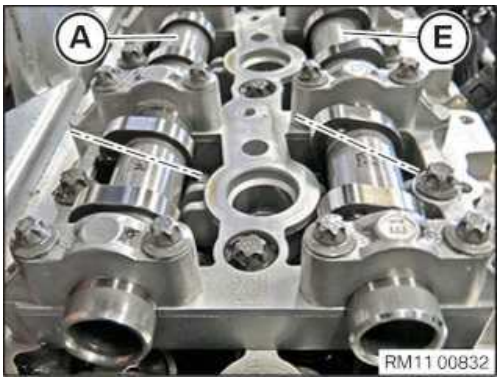
The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

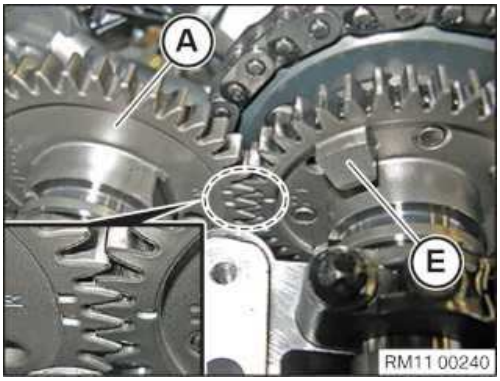
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- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

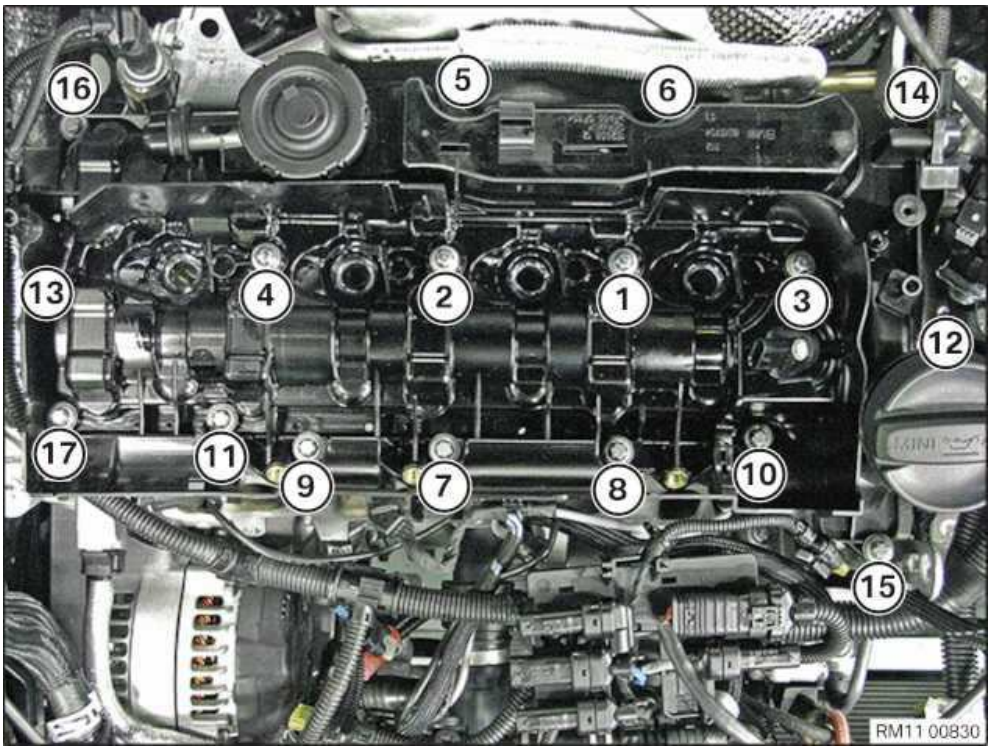


- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

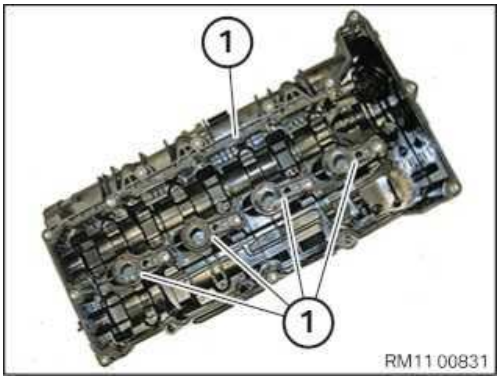
89 – Installing cylinder head cover

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Overview: Screw connection of the cylinder head cover

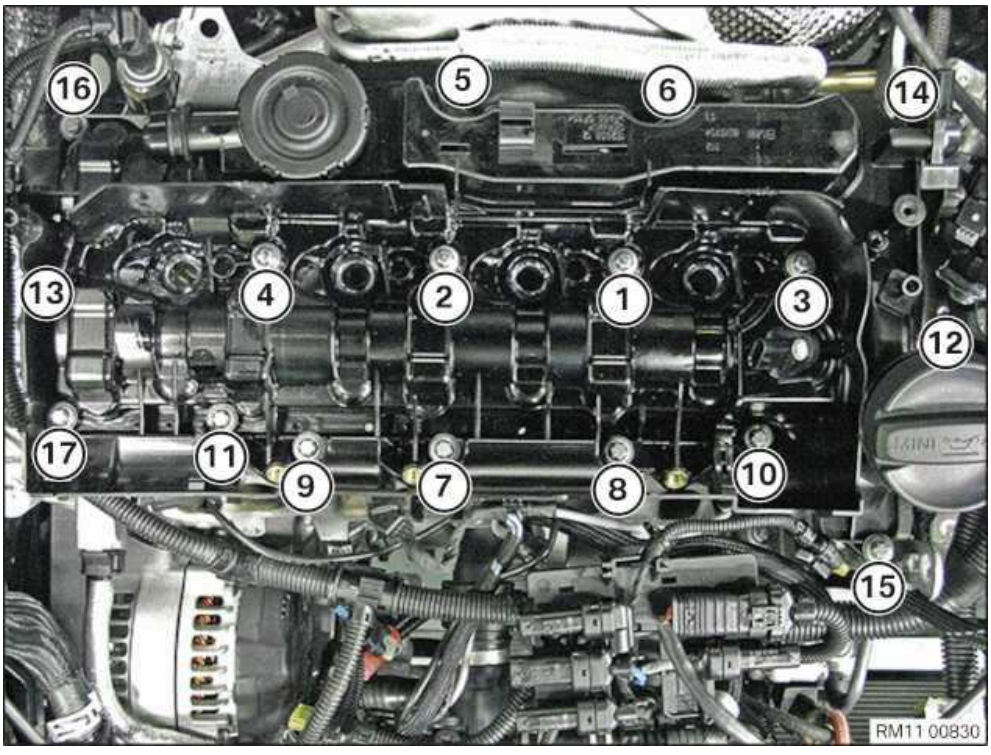


1 to 16 screws of the cylinder head cover.



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket



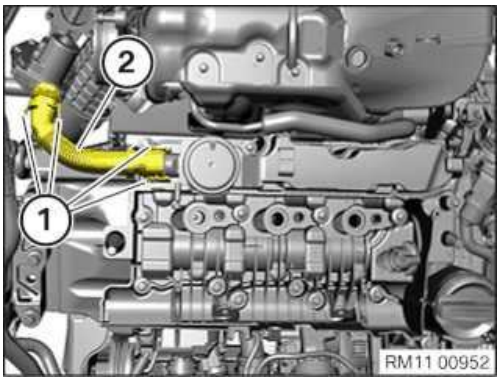
- Install cylinder head cover.
- Tighten screws in the order (1) to (17).

Cylinder head cover to cylinder head

M6		Tightening torque.	8, Nr

-

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- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

90 – Installing injectors of injection system

▸ **Cleaning the injector shafts**

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

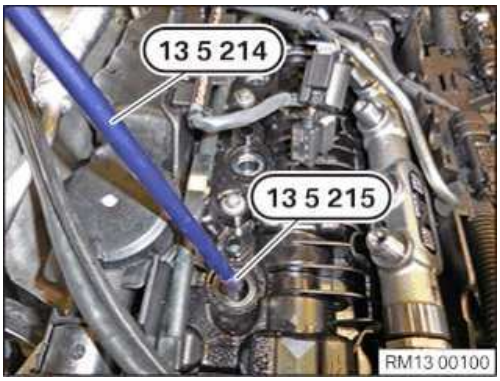
- Wear safety goggles.

RISK OF DAMAGE

Contaminant or foreign body.

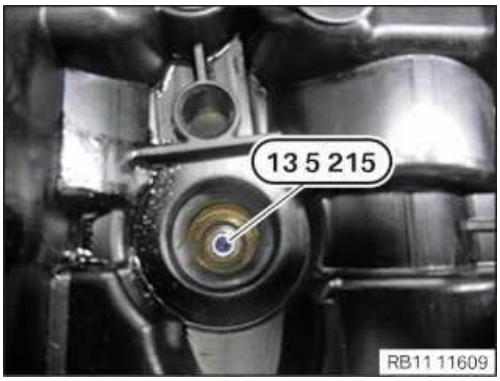
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.

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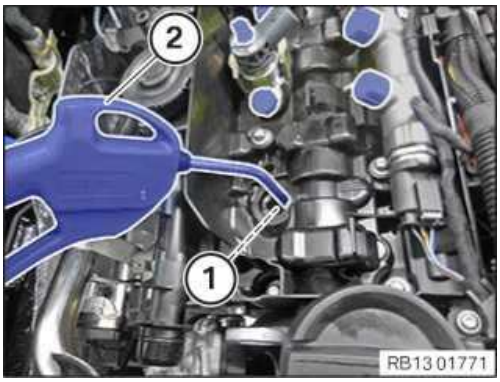
- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.



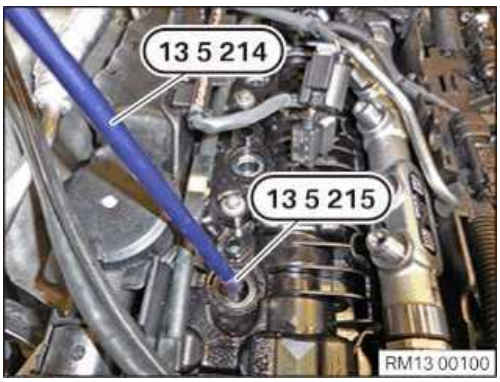
- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.



- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.



- Blow out injector shaft (1) with air gun (2).



- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

► **Check the placement of the clamping claw**

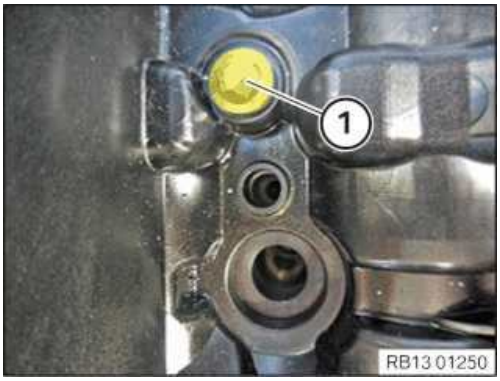
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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▸ **Prepare the injector for installation**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

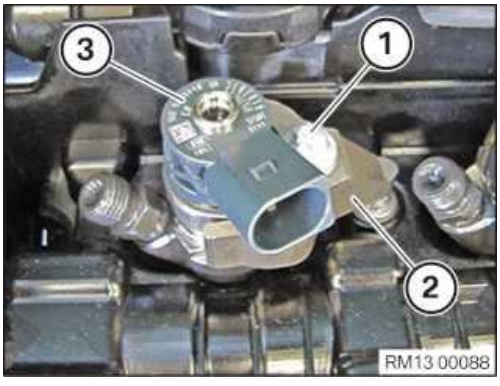


- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring
- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

Injector lubricating grease	50 g, Can	83230441070

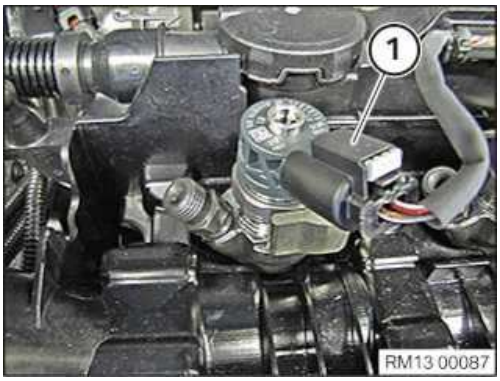


- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

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- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

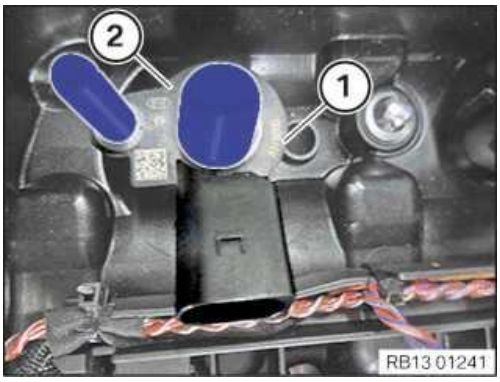
▶ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

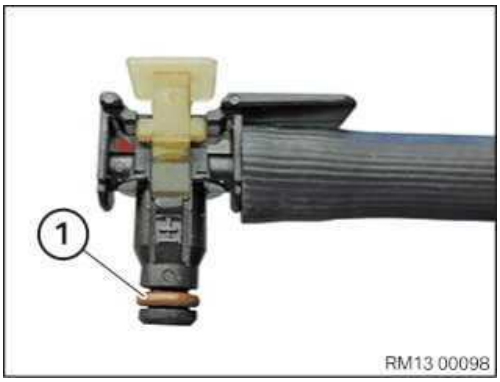


- Read off the adjustment value (1) on the new injector (2).



- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

91 – Connect the leakage oil line on the injector



- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.

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- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

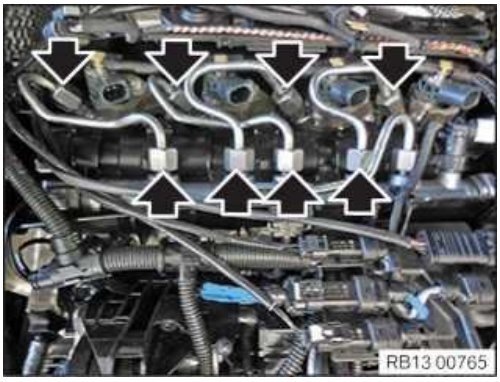
92 – Installing high pressure lines between rail and injectors

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Remove special tool .
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten the high pressure lines (arrows) with the special tool .

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

93 – Prepare for the installation of the exhaust turbocharger

- Check the oil feed lines and the oil return lines for contamination or obstruction, clean or renew if necessary.
- If the oil feed lines and/or oil return lines are heavily contaminated, we recommend changing the engine oil and the oil filter.
- If installed: Check the coolant feed lines and the coolant return lines for the exhaust turbocharger for contamination or obstruction, clean or renew if necessary.
- Check that the screw connections and the plug connections of all the lines are correct.
- Check air cleaner for contamination and clean or renew as needed.
- Check correct functioning of crankcase ventilation.
- Replace all gaskets.

  Parts: Seals

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94 – Installing the high-pressure stage exhaust turbocharger

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

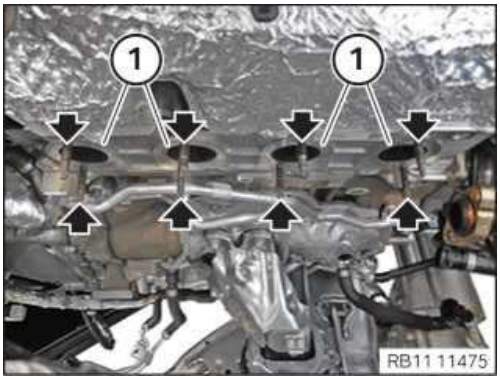
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

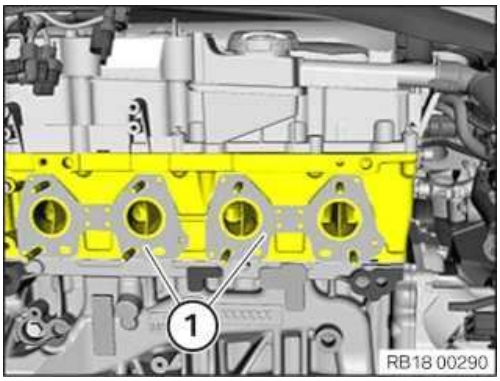


- Clean the sealing surfaces (1) on the cylinder head using special tool **0 495 102 (11 4 470)**.
- Check the stud bolts (arrows) on the cylinder head for correct fit.



- Clean the sealing surfaces on the exhaust manifold using special tool **0 495 102 (11 4 470)**.

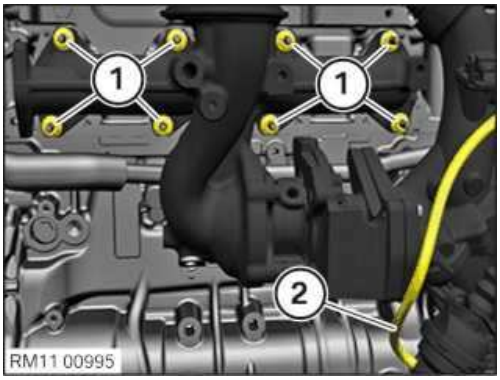
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- Renew gasket (1).

  Parts: Gasket

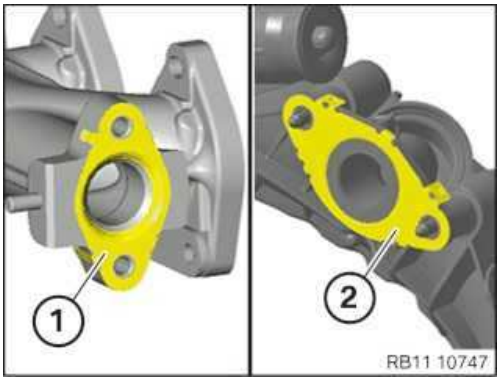
- Install new gasket (1).



- Feed in and install the exhaust manifold and the high-pressure stage exhaust turbocharger.
- Tighten nuts (1).

  Parts: Nuts

- Connect vacuum hose(2).

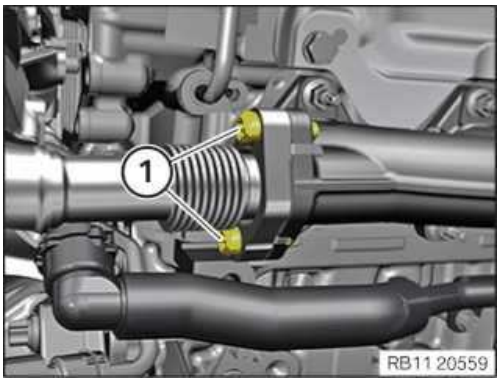


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

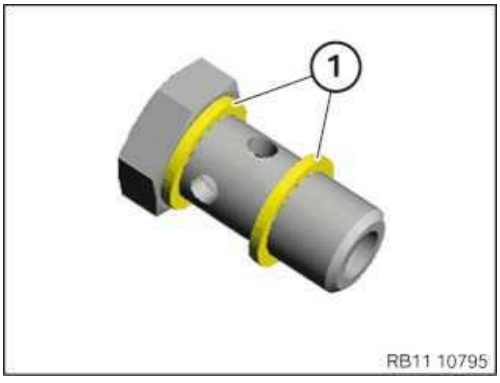
  Parts: Gasket



- Tighten the screws (1).

Exhaust-gas recirculation cooler to exhaust manifold

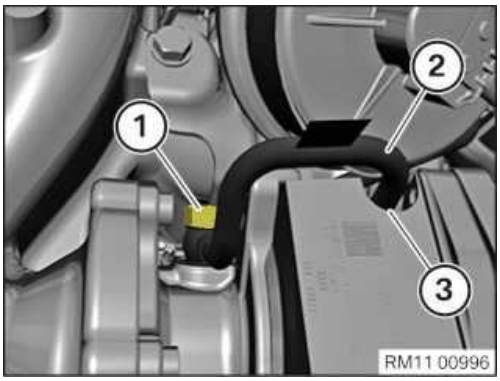
M8x28	Replace screws	Tightening torque	32 Nm



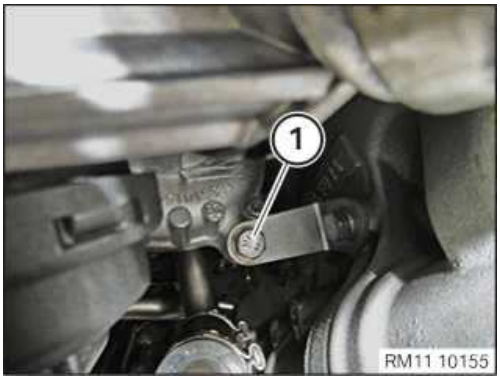
- Renew sealing rings (1) of banjo bolt.

  Parts: Sealing ring

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- Guide the oil feed line into the holder (3) and install it.
- Tighten down screw (1).

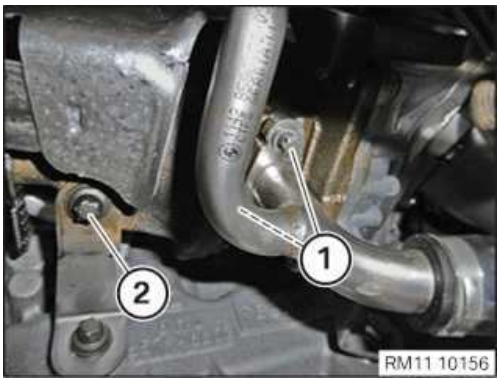


- Tighten bolt (1) from the right wheel arch.



- Renew seal (1) of oil return line.

  Parts: Gasket



- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

95 – Installing the low-pressure stage turbocharger

RISK OF DAMAGE

Damage to the surface.

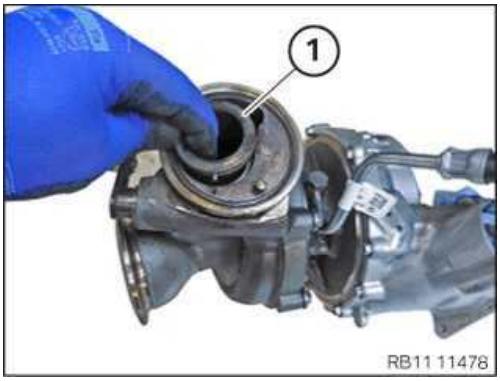
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

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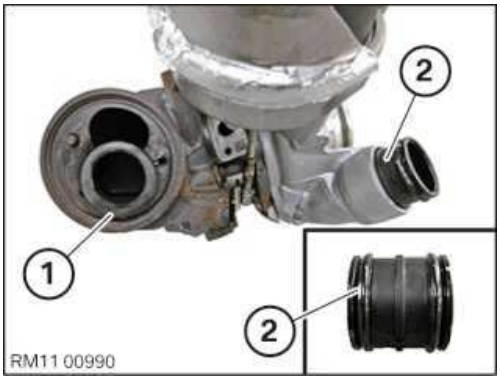
TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.



- Check the spacer plug (1) for damage, renew if necessary.

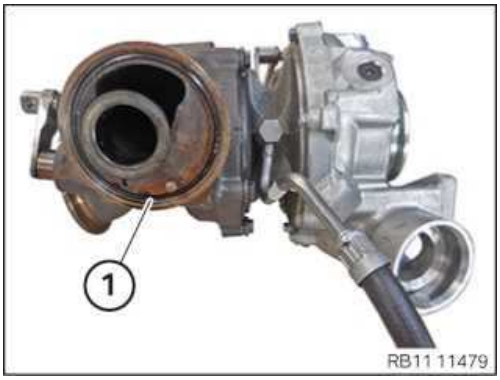
  Parts: Spacer ring
- Insert and install the spacer ring (1).
- Position spacer ring (1) correctly.



- Renew gasket (1).

  Parts: Gasket
- Position the seal (1).
- Renew the sleeve(2).

  Parts: Holding sleeve



- Renew sealing ring (1).

  Parts: Sealing ring
- Affix the sealing rings on the exhaust turbocharger.

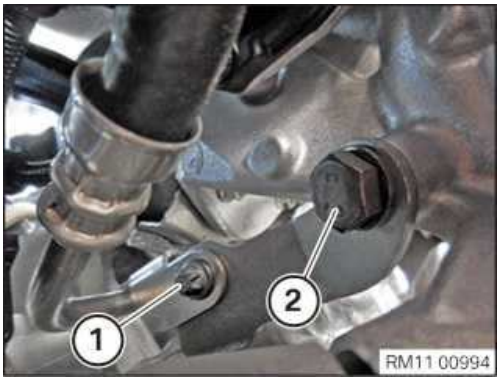


- Insert and install the low-pressure stage exhaust turbocharger on the exhaust manifold .
- Feed in and install V-band clamp .
- Tighten V-band clamp (2).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Screw in nut (1) with 2 **revolutions**.



- Tighten down screw (1).

Oil feed line to bracket

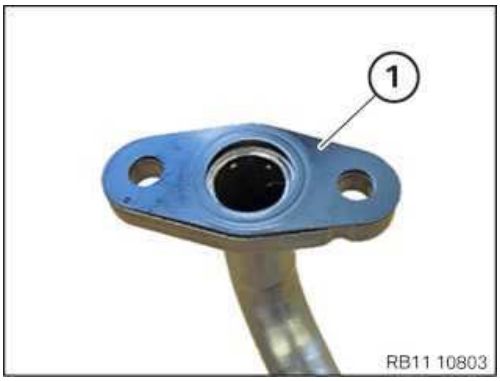
Torx screw M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

Holder to exhaust turbocharger and crankcase

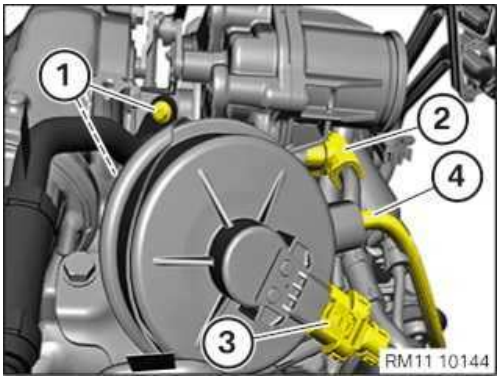
M8x16		Tightening torque	22 Nm

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- Renew seal (1) on the oil return line.

  Parts: Gasket



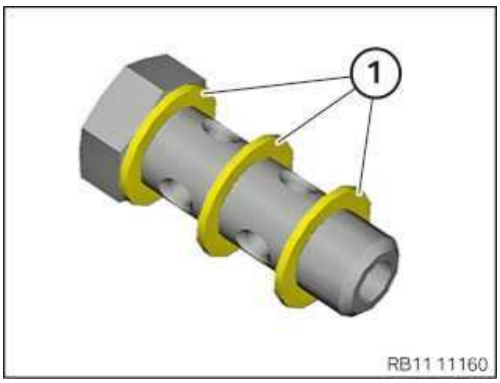
- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

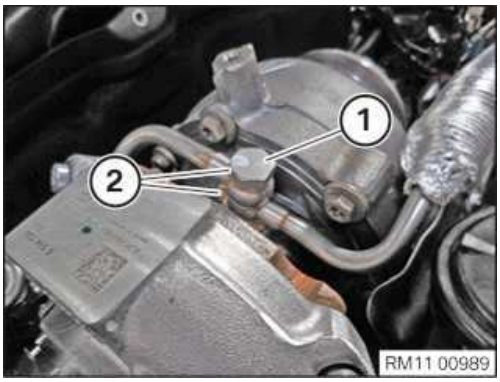
M6x12		Tightening torque	8 Nm

- Connect and lock connectors (2) and (3).

  The locks must engage audibly.
- Connect vacuum hose (4).



- Renew banjo bolt and sealing rings (1).
- **Parts:** Banjo bolt, sealing rings



- Install sealing rings (1).
- Tighten the banjo bolt (1).
- Ensure that the lines do not rest against the adjacent components.

96 – Installing heat shield on exhaust turbocharger at bottom

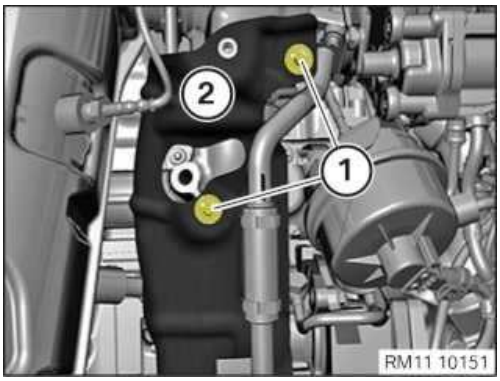
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

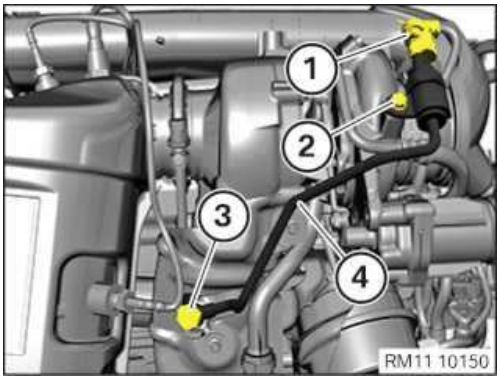
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- Feed in and install the heat shield (2).
- Tighten the bolts (1) on the heat shield .

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm



- Position the exhaust gas pressure pipe (4).
- Hand-tighten the bolt (2).
- Renew sealing rings on the banjo bolt (3).

  Parts: Sealing ring
- Tighten the banjo bolt (3).

Banjo bolt for exhaust pressure pipe to exhaust manifold

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

- Tighten down screw (2).

Standard screw connection M6

M6		8 Nm

- Connect connectors (1) and lock.

  Lock must audibly engage.

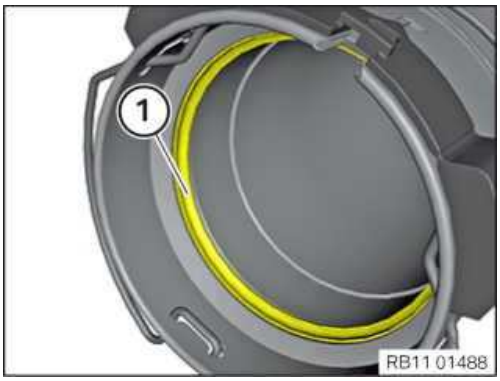
97 – Installing the right charge air duct between the exhaust turbocharger and the charge air cooler

RISK OF DAMAGE

Damage to the exhaust turbocharger.

A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.



- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

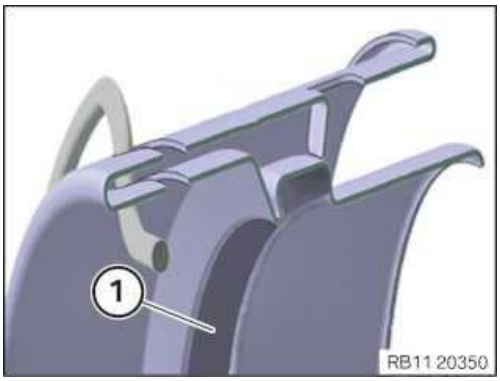
  Parts: Gasket

▸ **Replace damaged gasket**

TECHNICAL INFORMATION

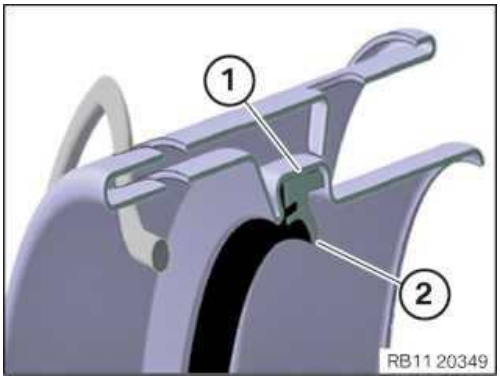
Do not use pointed or sharp-edged tools for the installation and/or removal.

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- Remove damaged seal.
- Clean gasket groove (1) with a dry towel.

  The gasket groove (1) must be clean.



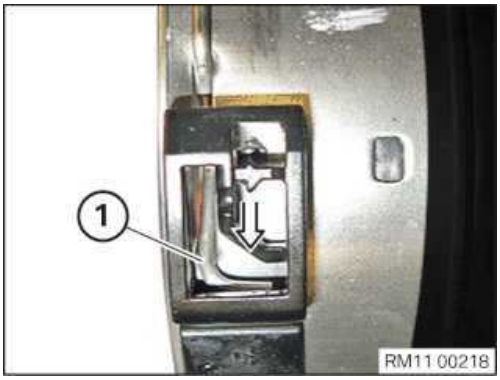
- Renew gasket.

  Parts: Gasket
- Install seal dry without lubricant or mounting agent.

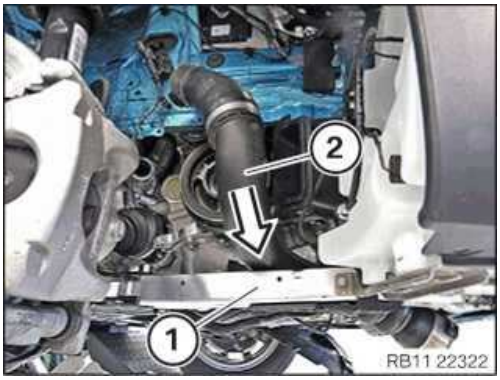
TECHNICAL INFORMATION

Incorrect assembly is possible. Ensure correct installation position.

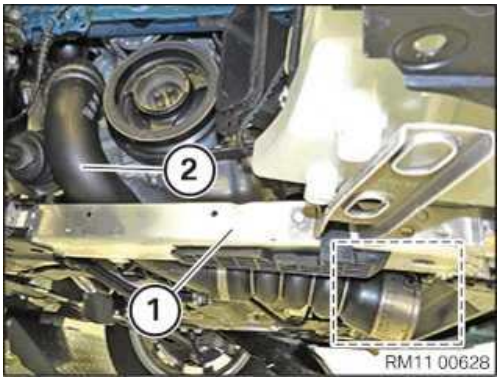
- Feed in and install the seal.
- Make sure the seal is correctly installed in the gasket groove (1).
- Make sure that the sealing lip (2) is pointing downwards (see figure).



- Detach the locks (1) in the direction of the arrow from the brackets.
- Ensure that the locks (1) engage audibly.

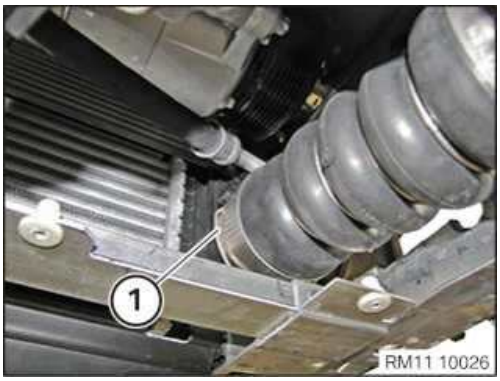


- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed in the charge air duct (1) in the **direction** of arrow between the side member and the deformation element and position.

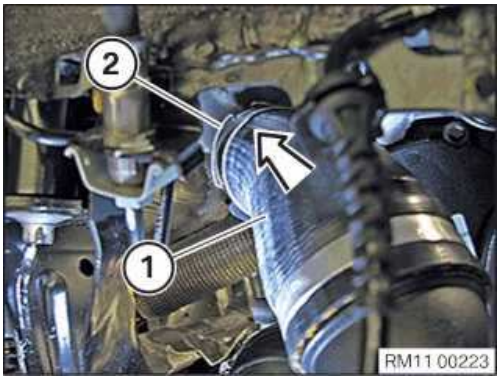


- Pull the adapter of the front axle support (1) downwards to the front right.
- Position the charge air duct (2) in **marked** area on the charge air cooler.

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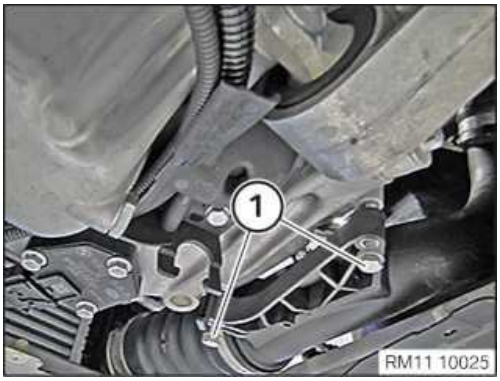


- Feed in and install the charge air duct (1) on the charge air cooler .
- Make sure the charge air duct (1) engages audibly on the charge air cooler.



- Feed in and install charge air duct (1) in the **direction** of the arrow on exhaust turbocharger.

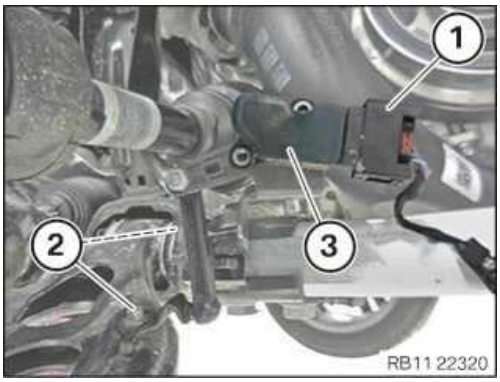
  The locks (2) must engage audibly.



- Tighten the screws (1).

Charge air duct to oil sump

M6		Tightening torque	8 Nm



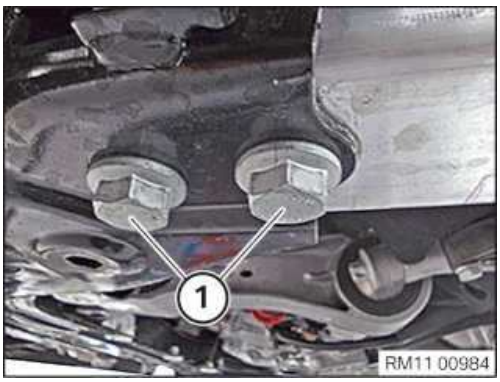
- **If installed:**
- Feed in and install the ride height sensor (3).
- Tighten the screws (2).

Ride height sensor holder to front axle support

M6		Tightening torque	8 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

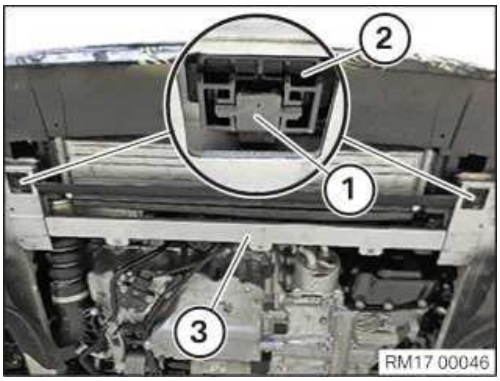


- Tighten the screws (1) on the adapter of the front axle support.

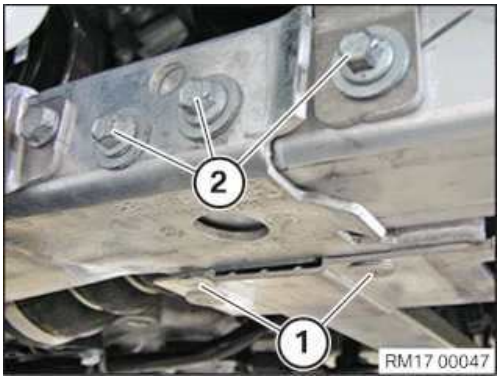
Adapter, front axle support to front axle support

		Tightening torque	100 Nm

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- Guide in cross connection (3) and install.
- Guide in locks (2) and install.
- Lock the locking pins (1).
- Ensure that the locking pins (1) audibly engage.



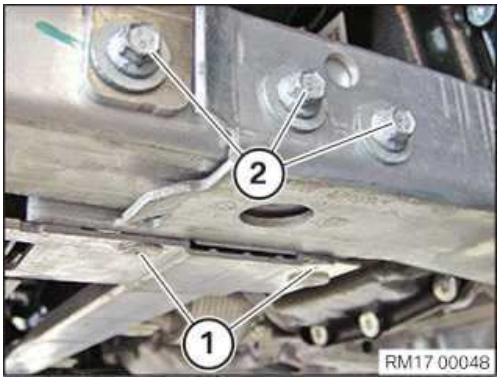
- Tighten the bolts (2) at the front left.

Cross connection to front axle support

M6		Tightening torque	12 Nm

- Renew the blind rivet (1).

  Parts: Blind rivet
- Mount the blind rivets (1) at the front left.



- Tighten the bolts (2) at the front right.

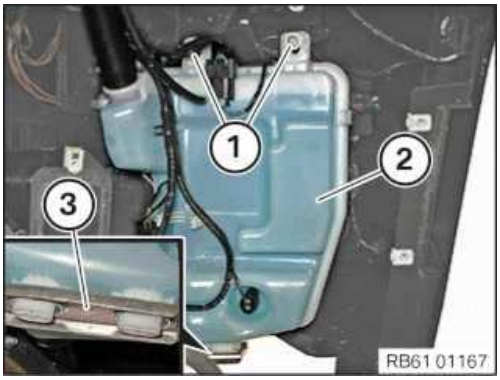
Cross connection to front axle support

M6		Tightening torque	12 Nm

- Renew the blind rivet (1).

  Parts: Blind rivet
- Mount the blind rivets (1) at the front right.

98 – Install the washer fluid reservoir in the fixture

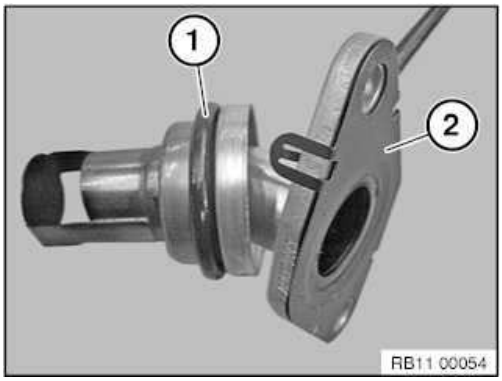


- Feed washer fluid reservoir (2) into the mounting (3) and install.
- Tighten the screws (1).

Washer fluid reservoir to body

M6x20		Tightening torque	8 Nm

99 – Installing the intake plenum

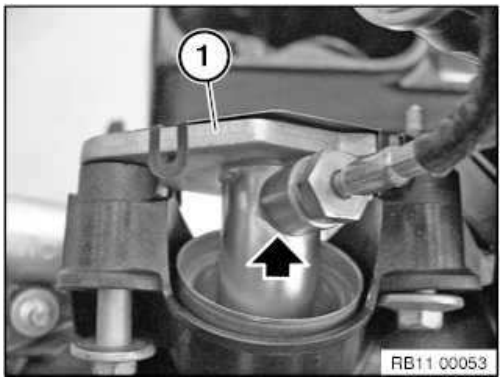


- Renew O-ring (1).

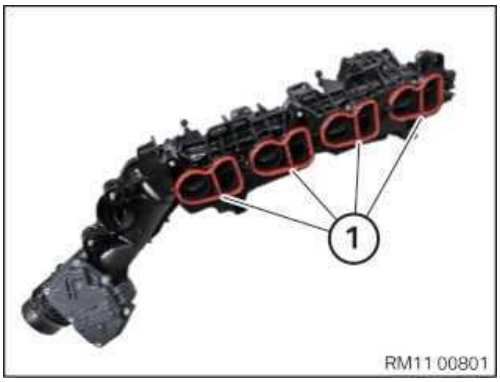
  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position the seal (2) and clip it in.

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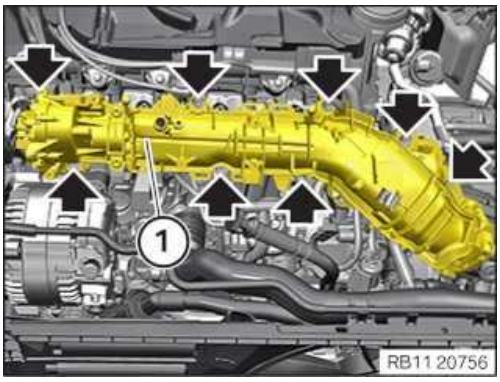


- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (1).

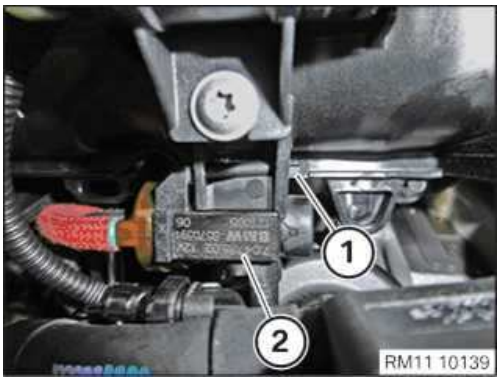
  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.



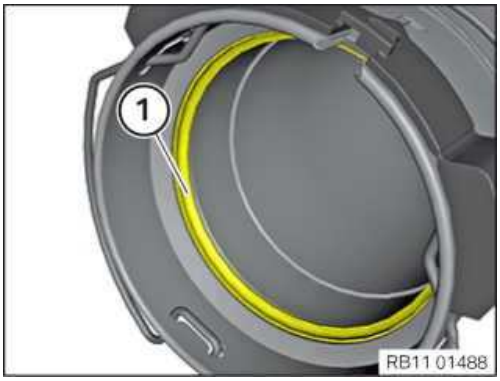
- Guide in and install intake (1) plenum.
- Tighten screws (arrows).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm



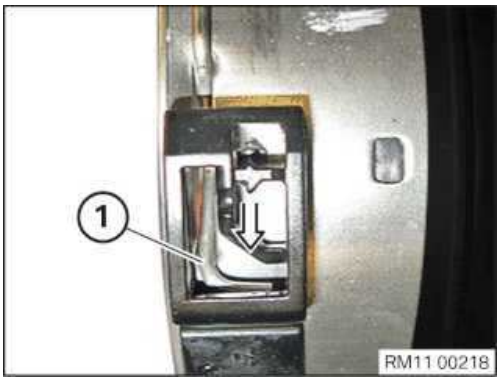
- Install the electric changeover valve (2) in the holder on the plenum from left to right.
- Lock (1) must engage audibly.



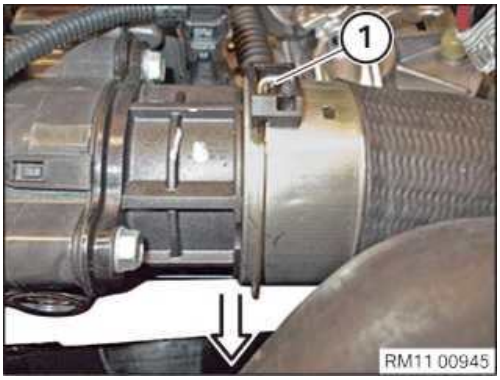
- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring

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- Engage the lock (1) on the bracket (arrow).



- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

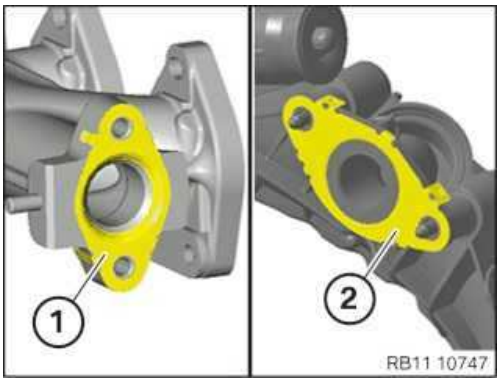
100 – Installing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

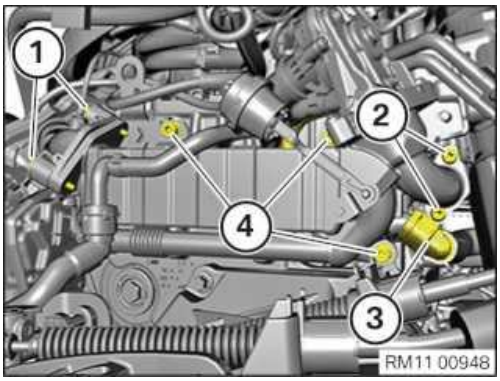


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket
- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket

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- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts
- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

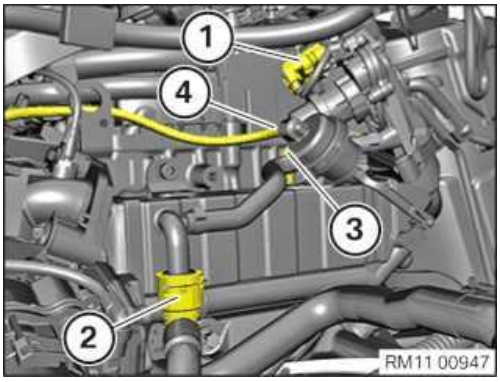
M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.
- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm



TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

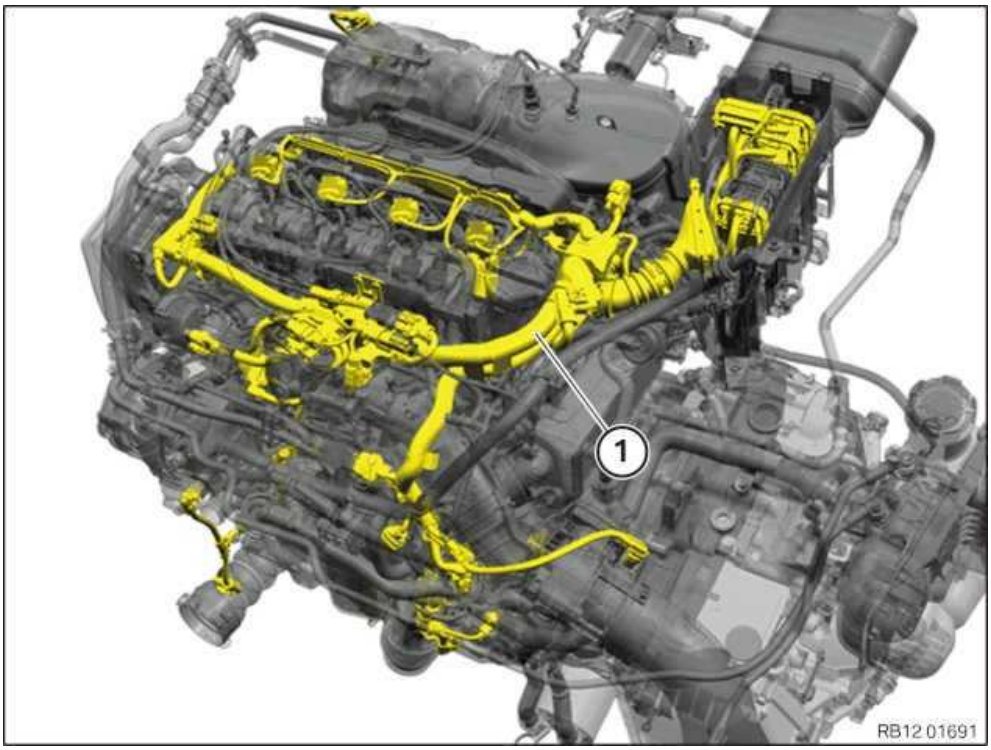
- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

101 – Fastening the wiring harness section for the intake plenum

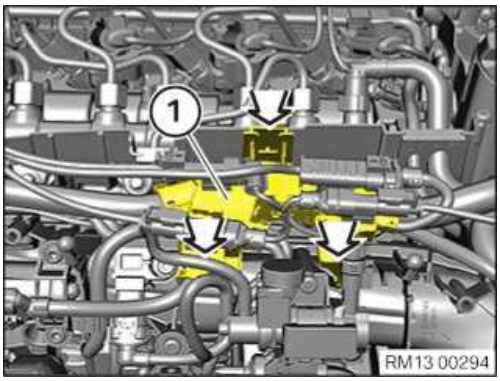
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Overview: Wiring harness section for the engine

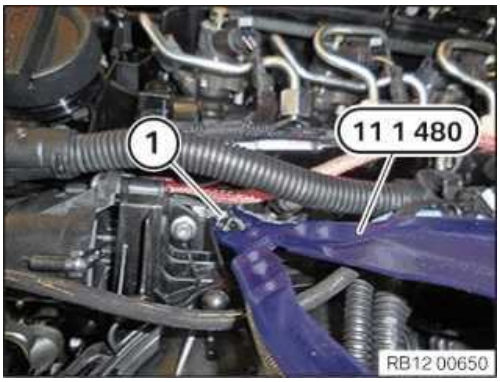


1 Wiring harness section for the engine

▶ **Installing the cable clip for the intake plenum**

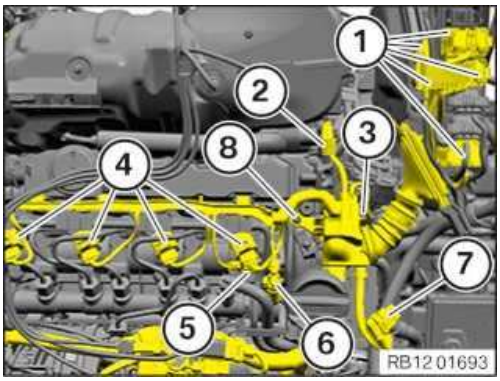


- Insert and install the cable clip (1) in the direction of the arrow.
- Make sure the cable clip (1) is fitted correctly.



- Connect and lock the connector (1) on the glow elements.
  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.

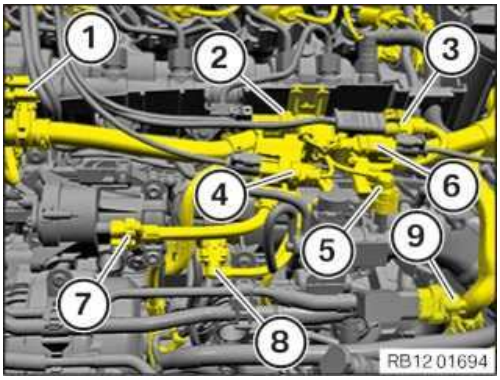
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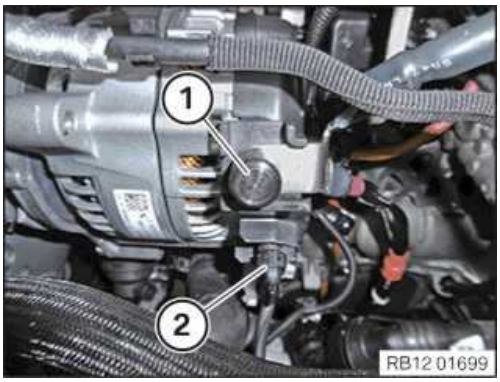
- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the DME control unit and remove the integrated supply module (PDM).
- Attach connector (2) to the differential pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust-gas recirculation valve and lock audibly.
- Attach connector (4) to the injectors and lock it audibly.
- Attach connector (5) to the camshaft sensor and lock it audibly.
- Attach connector (6) to the fuel pressure regulator and lock it audibly.
- Connect and audibly lock the connector (7) to the hot film air mass meter.
- Tighten down screw (8).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm



- Connect the connector (1) to the rail pressure sensor and lock it audibly.
- Attach connector (2) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (3) to the front oxygen sensor and lock audibly.
- Attach connector (4) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Connect the connector (5) to the electric changeover valve and lock audibly.
- Attach connector (6) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (7) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (8) to the charging pressure sensor and lock it audibly.
- Attach connector (9) to the fuel pressure and temperature sensor and lock it audibly.

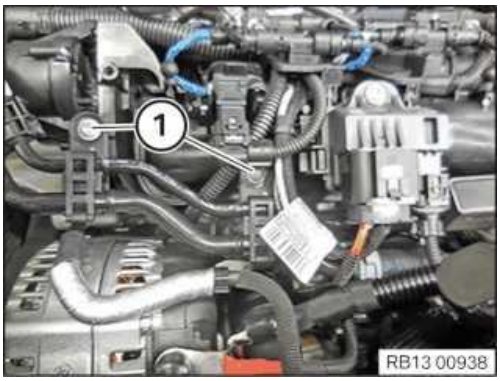


- Connect and lock the connector (2).

  Lock must snap audibly into place.
- Connect the positive battery cable (1) and tighten.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

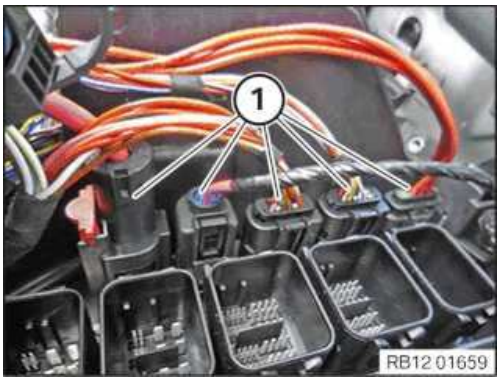


- Position the fuel line.
- Tighten the screws (1).

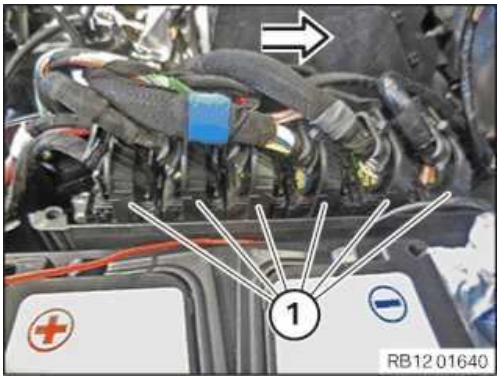
Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

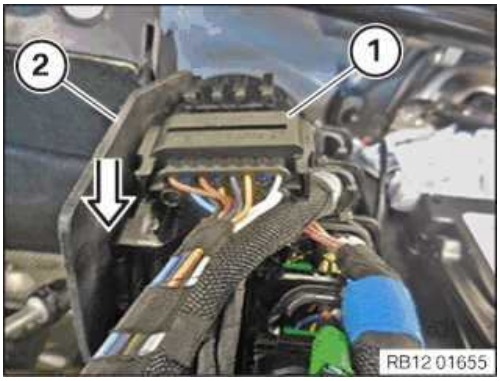
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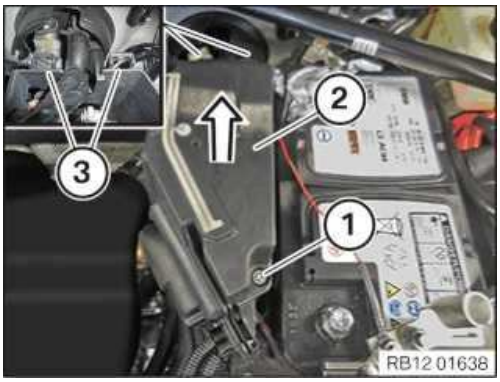
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



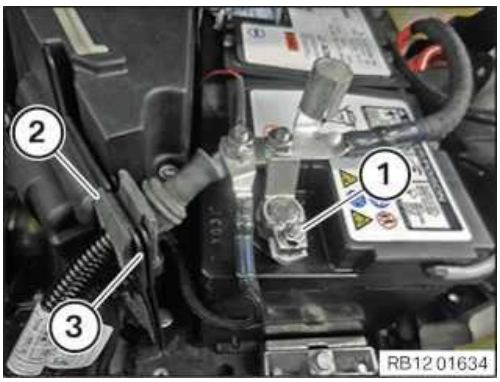
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert and install the cover (2) into the guides (3) in the direction of the arrow.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

RF5x26.5		Tightening torque	2,5 Nm

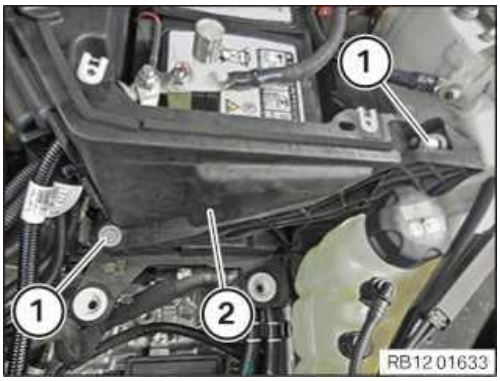


- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

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- Feed in and install tension strut (2).
- Tighten the screws (1).

Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

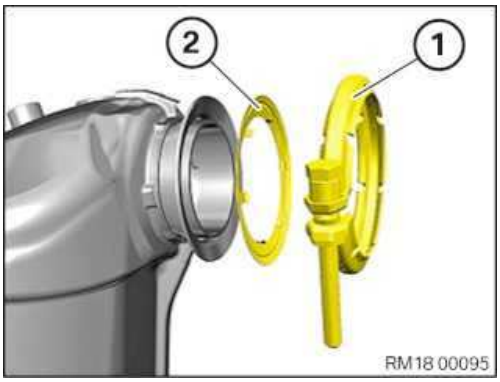
102 – Installing the diesel particulate filter

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



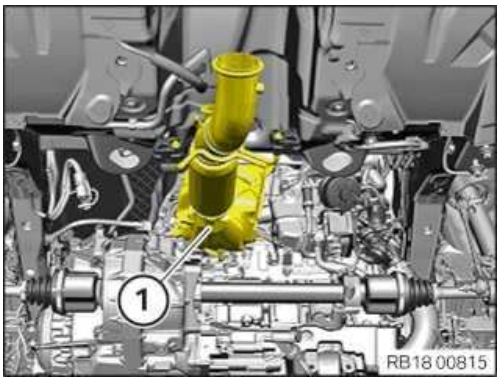
- Renew the V-clip (1).

  Parts: V-band clamp
- Renew the gasket (2).

  Parts: Gasket

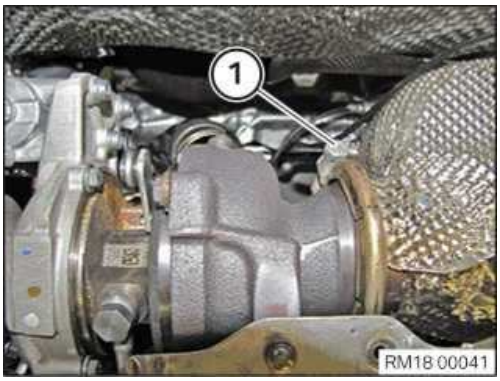


- Before installing the diesel particulate filter: Mount fitting aid (1) for the flexible tube.



- Carefully insert and install the diesel particulate filter (1).

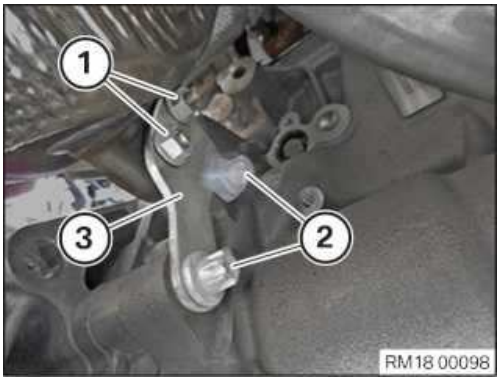
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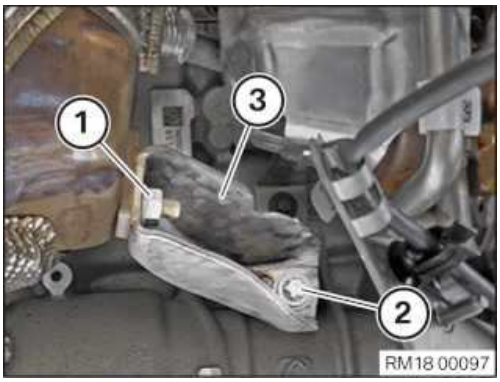
- Feed in and install V-band clamp (1).
- Make sure that the seal between the diesel particulate filter and the exhaust turbocharger is installed correctly.
- Align the diesel particulate filter on the exhaust turbocharger.
- Position V-clip (1).
- Hand-tighten the V-clip (1).



- Tighten nuts (1) by hand.



- Install holder (3).
- Hand-tighten the bolts (2).
- Tighten nuts (1) by hand.

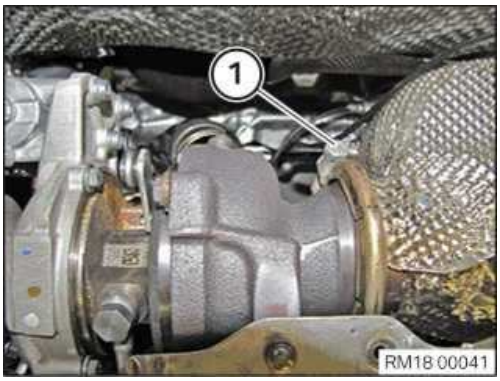


- Install holder (3).
- Tighten the nut (1) hand-tight.
- Hand-tighten the bolt (2).



- Remove fitting aid (1) for the flexible tube.

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- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

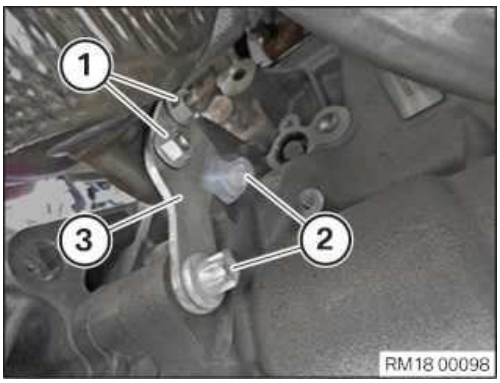
V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm



- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screws (2).

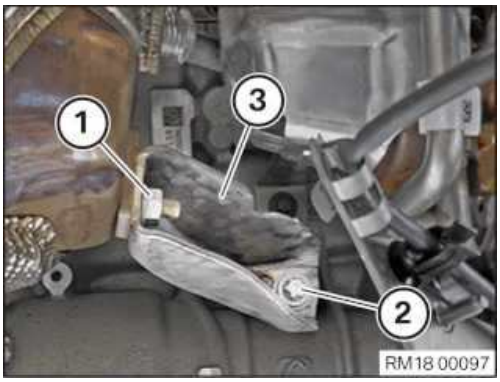
Diesel particulate filter holder to gearbox

M12x75		Tightening torque	66 Nm

- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screw (2).

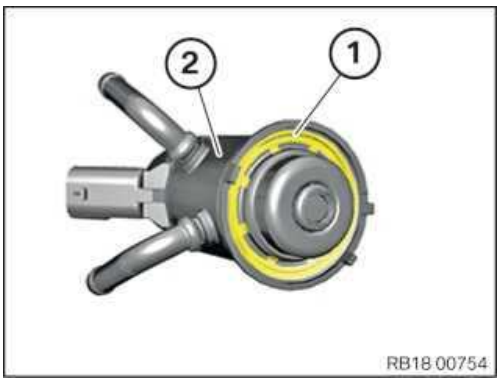
Diesel particulate filter bracket to crankcase

M10x35		Tightening torque	38 Nm

- Tighten nut (1).

Diesel particle filter to holder

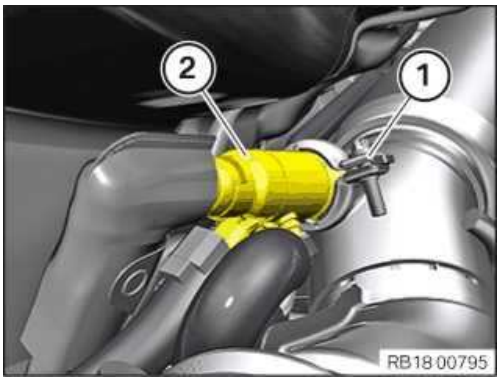
M8 hexagon nut		Tightening torque	19 Nm



- Renew sealing ring (1) of the SCR metering module (2).

  Parts: Sealing ring

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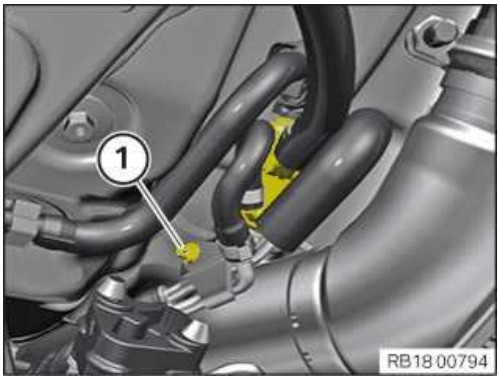


- Insert and install the SCR metering module (2).
- Renew the V-clip (1).

  Parts: V-band clamp
- Tighten V-band clamp (1).

SCR metering module V-clip to exhaust system

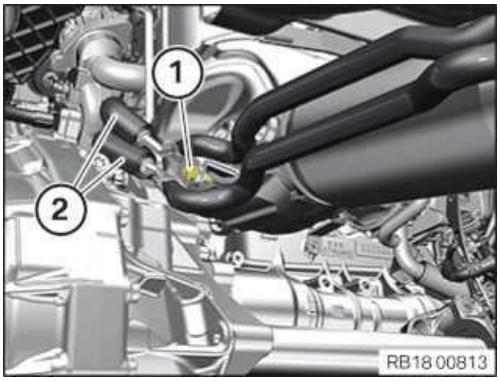
V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm



- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm

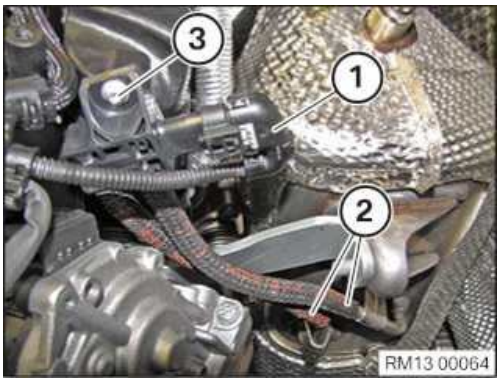


- Thread in and install coolant line (2) of the SCR metering module.
- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm

▶ **Installing differential pressure sensor**



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

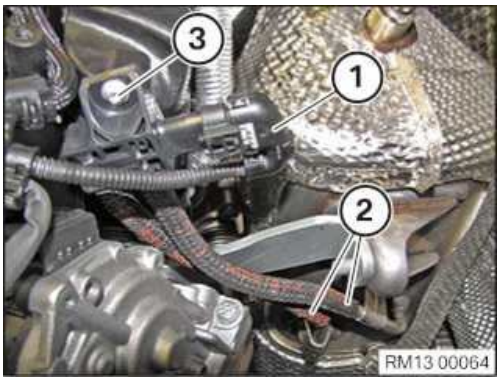
Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

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- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

104 – Install the control sensor

TECHNICAL INFORMATION

New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue



- Feed in front oxygen sensor (1) and install.
- Tighten front oxygen sensor (1) using special tool .

Control sensor

Control sensor		Tightening torque	50 Nm

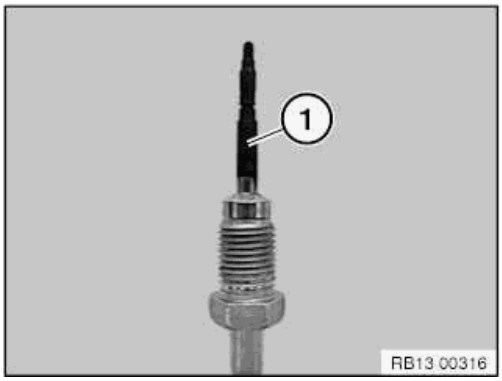


- Lay and secure cable of oxygen control sensor.
- Secure the connector (2) to the holder.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

105 – Install the exhaust-gas temperature sensor on the diesel particulate filter

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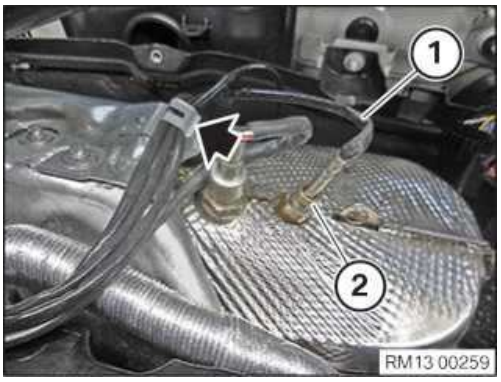
RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

- Check the gauge tip (1) for damage and renew the exhaust temperature sensor as needed.



- Feed in and install the exhaust temperature sensor (2).
- Tighten the exhaust temperature sensor (2).

Exhaust temperature sensor to diesel particulate filter

Exhaust-gas temperature sensor		Tightening torque	28 Nm



- Insert and install cable (1) of the exhaust temperature sensor in the clamp (arrow).
- Lay and fasten the cable of the exhaust gas temperature sensor.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

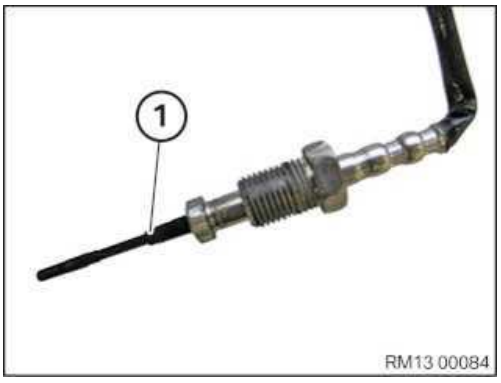
106 – Installing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

RISK OF DAMAGE

Damage of exhaust temperature sensor.

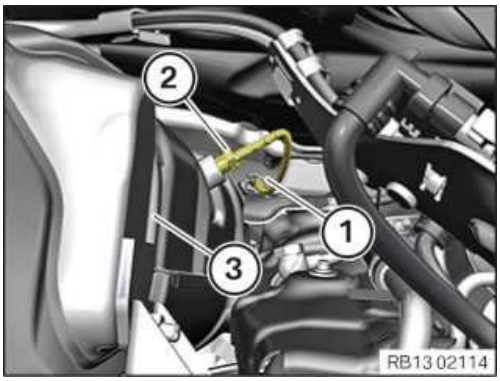
Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.



- Make sure the gauge tip (1) is not damaged during installation.

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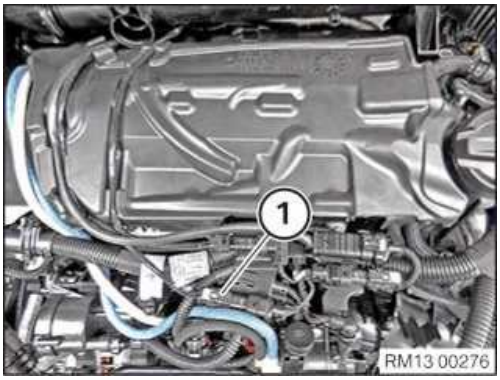


- Guide the exhaust temperature sensor (2) into diesel particulate filter (3) and install.
- Tighten the exhaust temperature sensor (2) with conventional tools .

Exhaust temperature sensor to diesel particulate filter

Exhaust-gas temperature sensor		Tightening torque	28 Nm

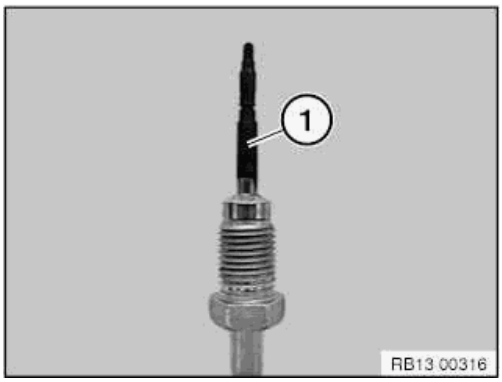
- Insert and install the cable of the exhaust temperature sensor (2) in the clamps (1).



- Lay and fasten the cable of the exhaust gas temperature sensor.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

107 – Installing exhaust temperature sensor on catalytic converter



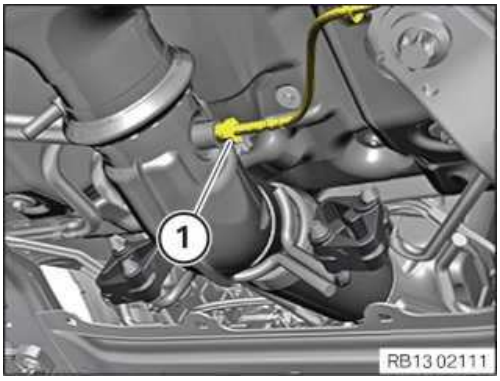
RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

- Check the gauge tip (1) for damage and replace the exhaust temperature sensor as needed.



- Feed in and install the exhaust temperature sensor (1).
- Tighten the exhaust temperature sensor (1).

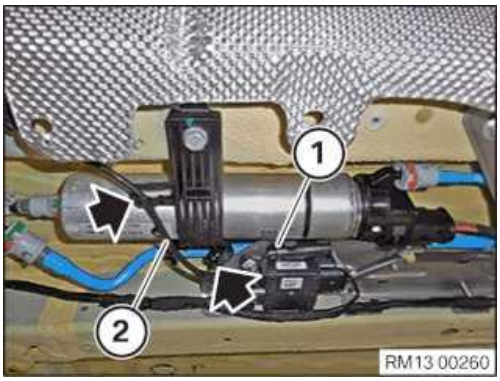
Exhaust-gas temperature sensor to exhaust system

Exhaust-gas temperature sensor		Tightening torque	28 Nm



- Secure the cable clips (1).

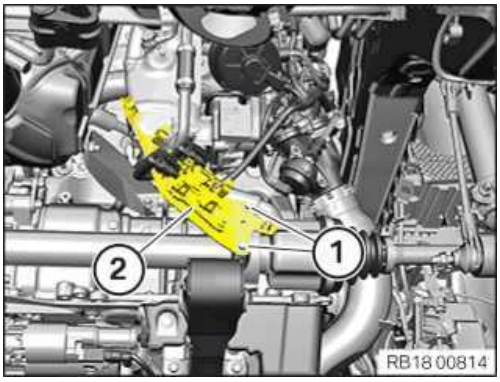
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- Feed cable (2) from exhaust temperature sensor into the clamps (arrows) and install.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

108 – Install holder for oxygen sensor

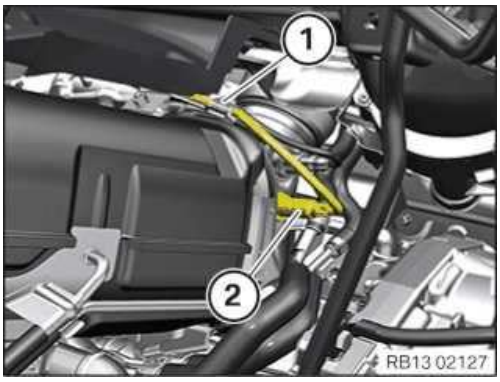


- Insert and install the holder (2).
- Tighten the screws (1).

Oxygen sensor holder to intermediate shaft

Hexagon screw M6x16		Tightening torque	8 Nm

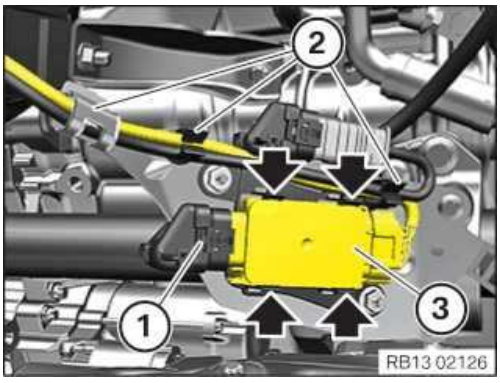
109 – Installing the nitrogen oxide sensor before SCR catalytic converter



- Insert nitrogen oxide sensor before the SCR catalytic converter (2) and install.
- Tighten the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

Nitrogen oxide sensor before SCR catalytic converter

Sensor		Tightening torque	50 Nm



- Install and lock the evaluation electronics for the nitrogen oxide sensor (3) (arrows).
- Insert the evaluation electronics cable for the nitrogen oxide sensor (3) into the clamps (2) and install.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

110 – Install the monitoring sensor

TECHNICAL INFORMATION

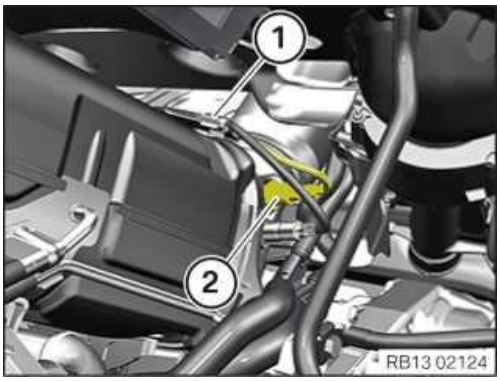
New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

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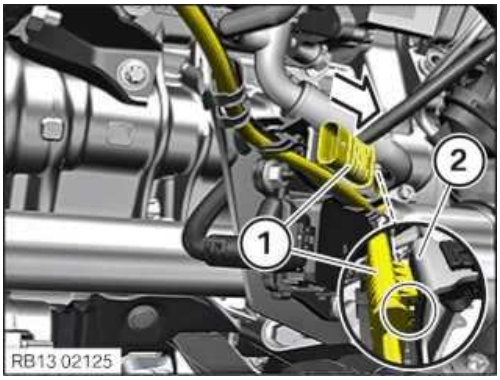


- Feed in the monitoring oxygen sensor (2) and install.
- Tighten the monitoring oxygen sensor (2) with special tool **0 491 074 (11 7 020)** .

Monitoring sensor

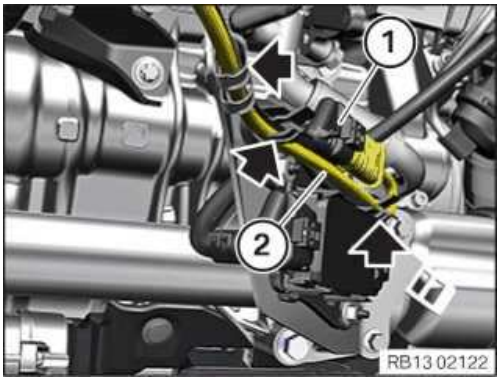
Sensor		Tightening torque	50 Nm

- Insert the cable of the monitoring oxygen sensor (2) into the clamp (1) and secure it.



- Connect the connector (1) with the bracket (2) in the direction of arrow.
- Make sure that the connector (1) is locked correctly in the marked area.

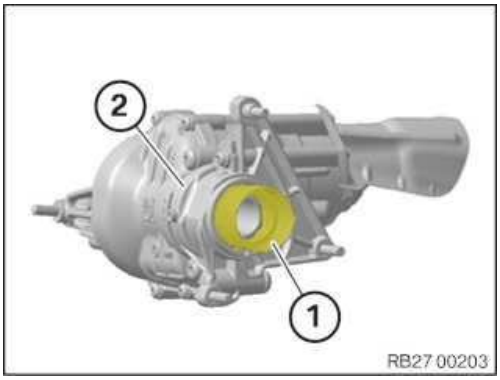
  The connector (1) must engage audibly.



- Insert and attach the cable of the monitoring oxygen sensor (2) to the clamps (arrows).
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

111 – Install the transfer box (VTG)



- If intermediate shaft (1) gets caught on transfer box (VTG) (2), renew intermediate shaft (1) and the radial shaft seals in the automatic or manual transmission.



- Screw special tool **2 409 025** into the outer radial shaft seal.
- Turn the screw on the special tool **2 409 025** until the outer radial shaft seal has been pulled out.

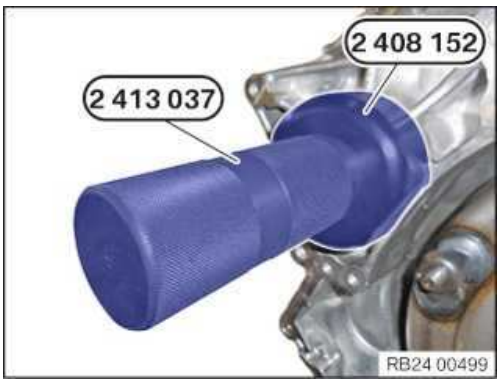
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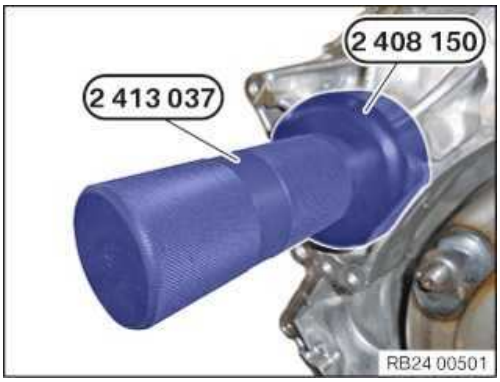
- Insert special tool **2 411 739** into the inner radial shaft seal.



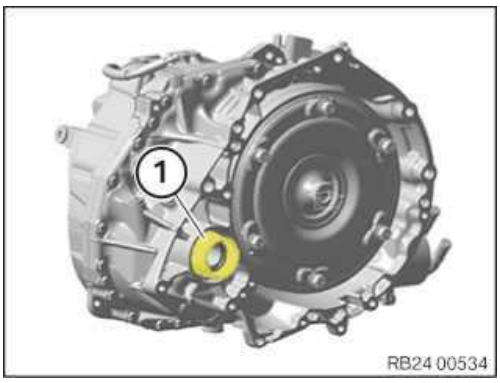
- Screw special tool **2 411 739** into the inner radial shaft seal.
- Turn the screw on the special tool **2 411 739** until the inner radial shaft seal has been pulled out.



- Drive in the inner radial shaft seal using special tools **2 408 152** and **2 413 037** up to the limit position.



- Drive in the outer radial shaft seal using special tools **2 413 037** and **2 408 150** up to the limit position.



- If necessary, connect the new intermediate shaft (1) to the output flange of the automatic transmission or manual transmission.

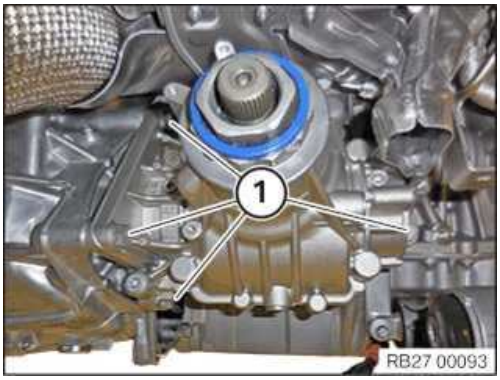
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- Coat the inside of the output flange (arrows) evenly with approx. 5 g of grease.

Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the transfer box (VTG).
- Tighten the screws (1).

Transfer box to transmission

M10		Tightening torque	56 Nm



- Install heat shield.
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Heat shield to transfer box

M6	Renew screws.	Tightening torque	6 Nm

▸ **Check the transfer box oil level**

RISK OF DAMAGE

Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.

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- Check transfer case oil level, correct:
- Open the oil filler plug (1).
- Check transfer box oil level.
- If necessary, top up transmission oil up to the lower edge of the oil filler plug opening (1).

Transmission oil

Technically suitable transfer box and electrical transmission oils	

Main group 27

- Tighten the oil filler plug (1).

Oil filler plug on transfer box (VTG)

M18x1.5		Tightening torque	35 Nm

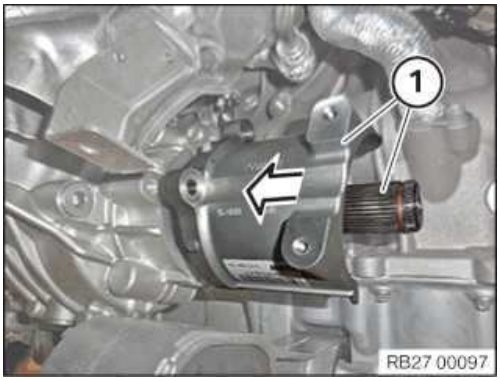
112 – Install the intermediate shaft with the support tube



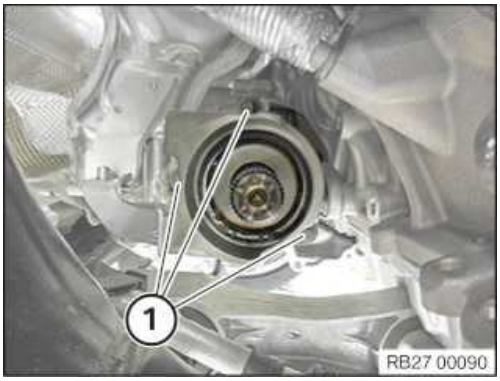
- Coat gearing of the intermediate shaft uniformly with 5 g of grease.

Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the intermediate shaft with support tube (1) in the transfer box.



- Position screws (1).

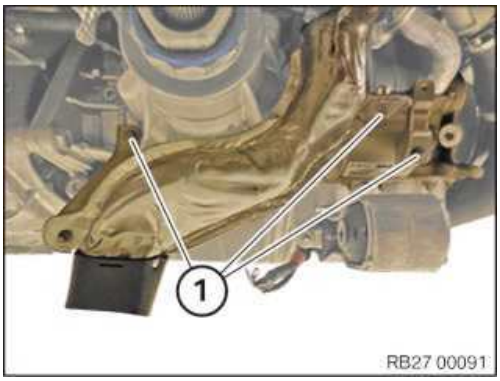
Note: Check for correct screw length! Bolt M8x35 8.8

- Tighten the screws (1).

Intermediate shaft to transfer box

M8x35		Tightening torque	19 Nm

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- If installed: Install air duct.
- Tighten the screws (1).

113 – Installing starter motor

CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.



- Insert and install the starter motor .
- Tighten the screws (1).

Starter motor to transmission

M8x45		Tightening torque	19 Nm



- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

Battery positive lead to starter

M8		Tightening torque	13,5 Nm



- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.

114 – Installing right output shaft partially

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- Renew the circlip (1).

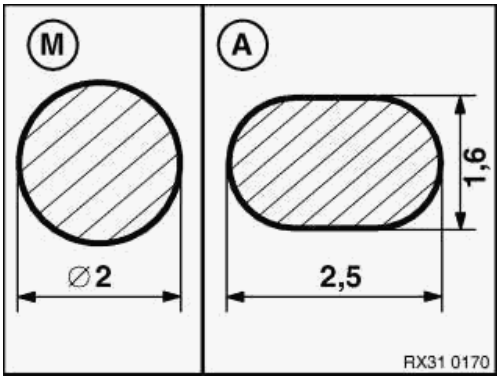
  Parts: Circlip
- Slide output shaft into the transmission as far as the limit position.
- Check for secure seat by levering.

115 – Partially installing the left output shaft



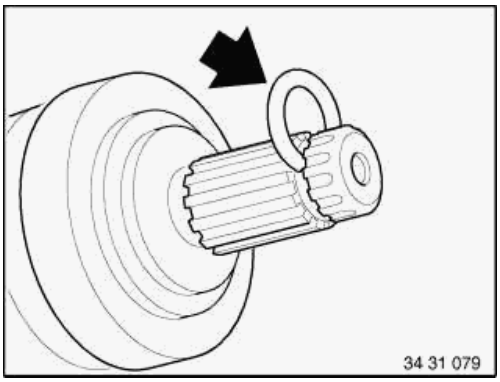
- **With automatic transmission only:**
- Lever out O-ring (1).
- Renew O-ring (1).

  Parts: O-ring
- Insert new O-ring (1).

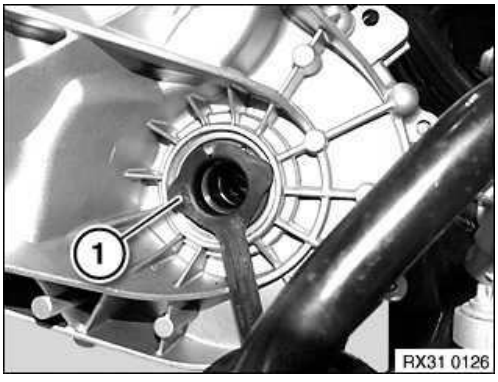


- Do not mix up circlips.

  Different types of output shafts fitted:
  - M: Manual transmission
  - A: Automatic transmission

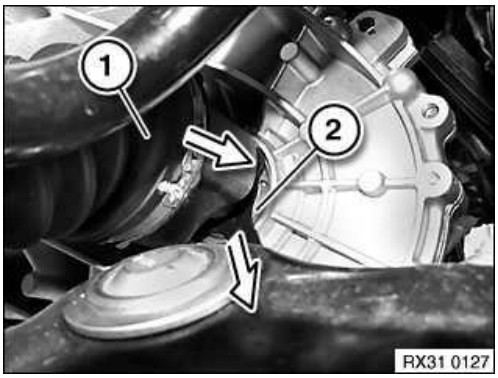


- Renew circlip (arrow).



- Insert installation protection ring (1) into the radial shaft seal.
- Make sure the tool fits over the lip of the radial shaft seal so there is no damage to sealing ring when the output shaft is inserted.

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- Insert output shaft (1) into transmission.
- **Manual gearbox only:** Pull on the handle to remove the installation protection ring (2) and dispose of it.
- Slide output shaft (1) into the transmission as far as the limit position.

  The output shaft (1) must engage audibly.
- Check for secure seat by levering.

116 – Install propeller shaft.

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

RISK OF DAMAGE

Damage to the propeller shaft during installation.

Non-observance of the installation guidelines for the propeller shaft on the rear axle differential may cause severe damage.

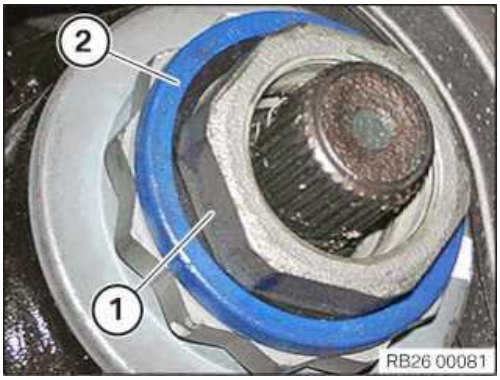
- Always renew the recessed nut on the rear axle differential. Screw locking must be available.
- Strictly observe a minimum hardening time of two hours after having screwed in the recessed nut. The hardening time may be longer at lower temperatures.

RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.



- Renew recessed nut (1).

  Parts: Insert nut
- Renew the retaining clip (2) and the seal.

  Parts: Retaining clip, seal
- Insert the seal with the recessed nut (1) and install.
- Insert the retaining clip (2) and install.
- Make sure that recessed nut (1) is screwed in within 5 min.
- Make sure that the hardening time of **minimum** 2 h for the recessed nut is observed.

  The hardening time must be extended at lower temperatures.

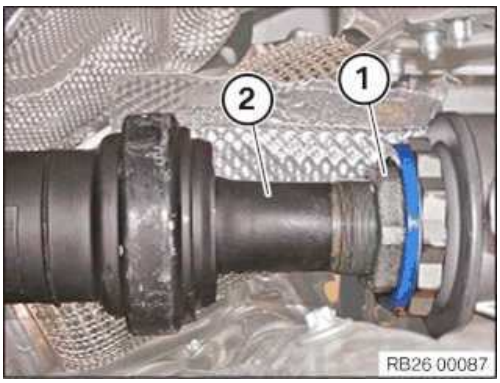
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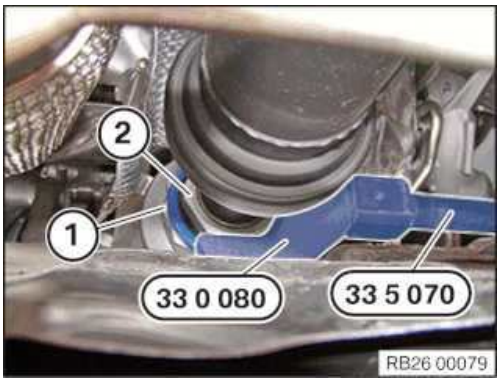
- Insert the propeller shaft (1) and install.
- Always support the propeller shaft (1) with a conventional jack.



- Hand-tighten the bolts (1).



- Push the propeller shaft (2) against the recessed nut (1) up to the limit position.
- Screw the propeller shaft (2) at least 2 thread starts onto the recessed nut (1) by hand.



RISK OF DAMAGE

Damage to the transfer box.

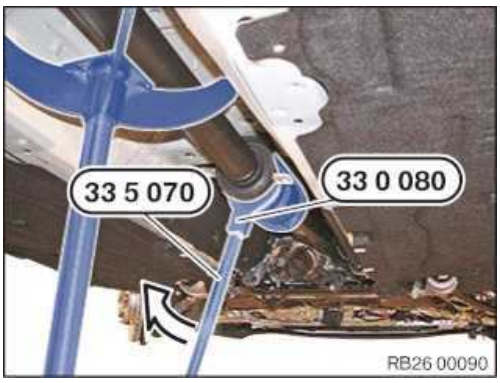
Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.

- Protect the recessed nut (2) on the transfer box from twisting with the special tools **0 495 554 (33 5 070)** and .

  The recessed nut (2) on the transfer box must **not** be used to tighten the propeller shaft.

  The double hexagon flange nut (1) must **not** be used for counter support.

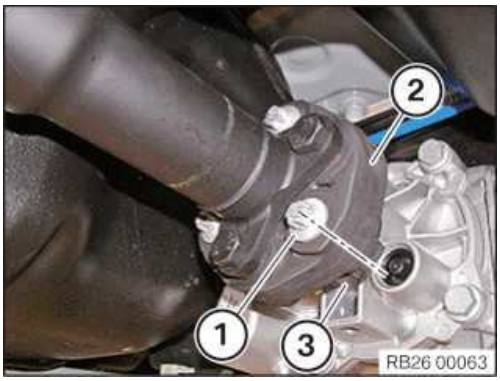


- Tighten the front propeller shaft with the special tools **0 495 554 (33 5 070)** and in the direction of the arrow.

Propeller shaft to transfer box

		Tightening torque	80 Nm

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TECHNICAL INFORMATION

Compliance with the following instructions is required to avoid a humming noise from the propeller shaft after refitting the propeller shaft.

- Assemble the screw connection (1) of the flexible disc (2) and the three-hole flange (3) according to the mark.
- Renew screws (1).

  Parts: Bolts
- Hand-tighten the bolts (1).



- Protect the propeller shaft (1) with the special tools **0 495 554 (33 5 070)** and from twisting.



- Tighten the bolts with the special tools **0 490 504 (00 9 120)** and .

Flexible disc to rear axle final drive

M12x1.5	Renew screws.	Tightening torque	55 Nm 90 °



- Tighten the screws (1).

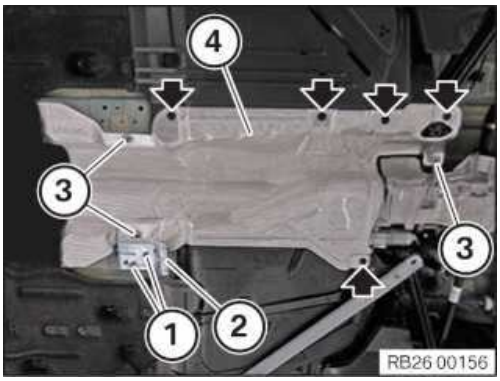
Centre mount to body

M8		Tightening torque	19 Nm



- Guide the special too l out between the front and rear propeller shaft and remove.

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- Insert and install the heat shield (4).
- Tighten screws (arrows).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

- Tighten nuts (3).

Heat shield to body

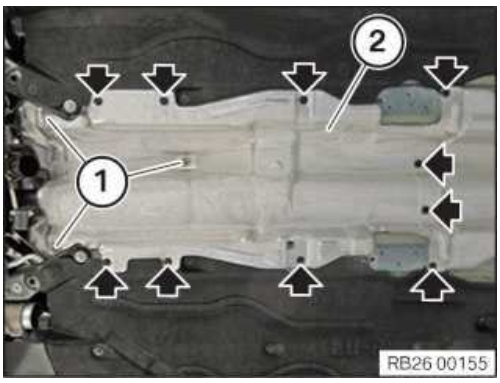
Bolts/nut		Tightening torque	3 Nm

- Insert and install the holder (2).
- Tighten the screws (1).

Bracket to body

M8		Tightening torque	21 Nm

118 – Install the front heat shield



- Insert and install the heat shield (2).
- Tighten screws (arrows).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

- Tighten nuts (1).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

119 – Install exhaust system

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

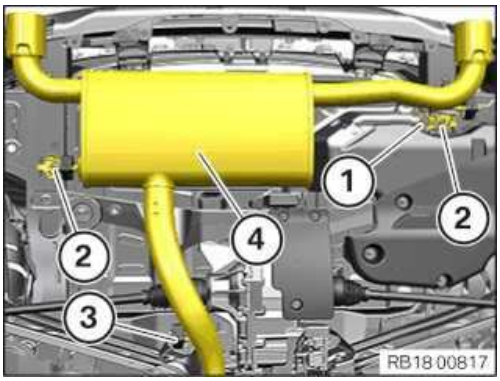
CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

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- Feed in and install the exhaust system (4) with a second person.
- Renew nuts (2).

  Parts: Nuts
- Tighten nuts (2).

Exhaust system to body

M8	Replace nuts.	Tightening torque	19 Nm

- Tighten down screw (1).

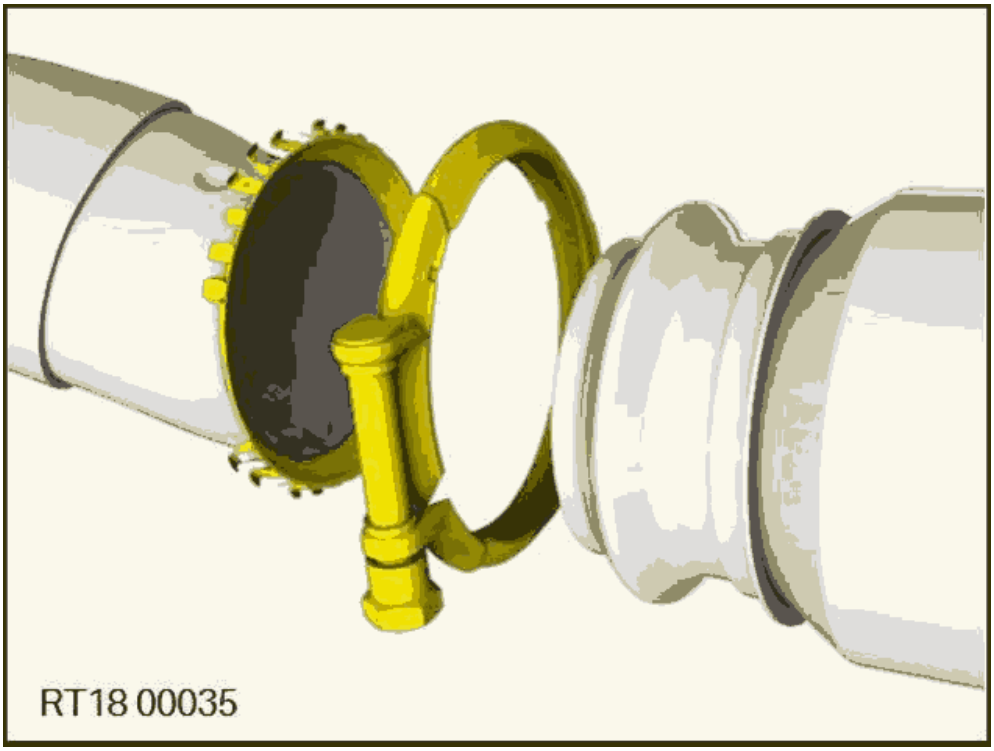
Exhaust bracket on body

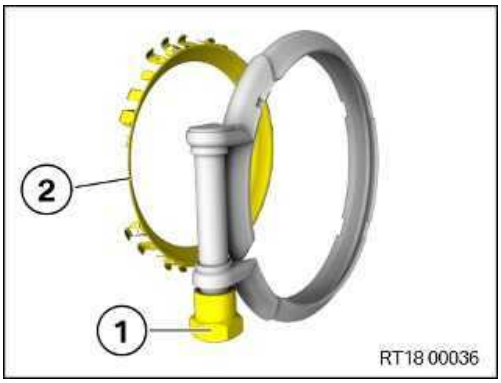
Hexagon screw M8x30		Tightening torque	19 Nm

- Check the rubber mount (3) for damage and renew as needed.
- Mount rubber mount (3) on the exhaust system (4).

▶ **Install the V-clip**

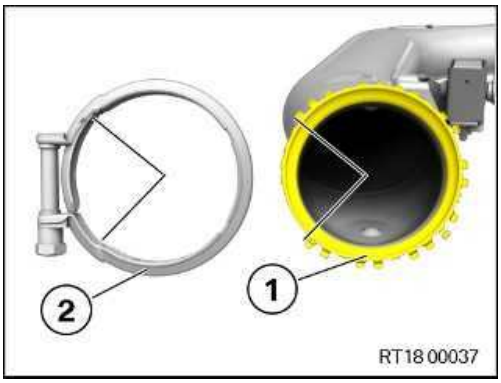
V-band clamp





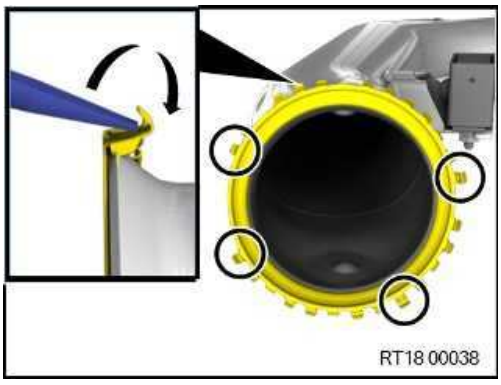
- Unscrew the nut (1) and remove the sealing ring (2).

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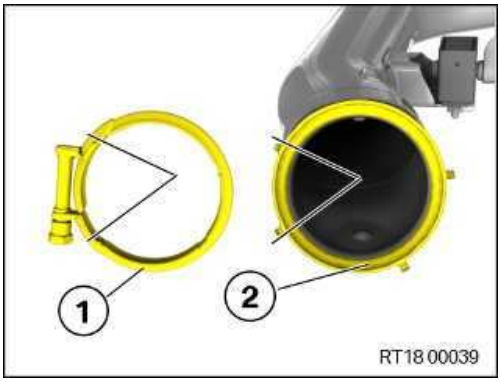


- Renew the V-clip (2).

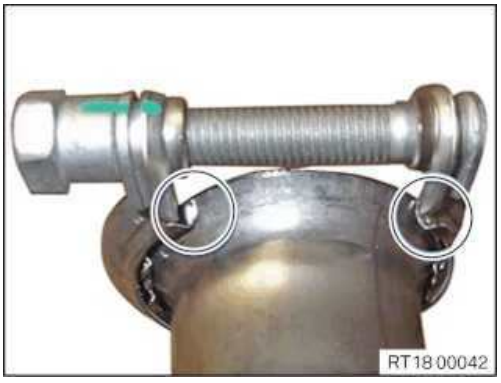
  Parts: V-band clamp
- Mount the sealing ring (1) on the exhaust system.
- Ensure that the sealing ring (1) for the V-clip (2) is positioned correctly.



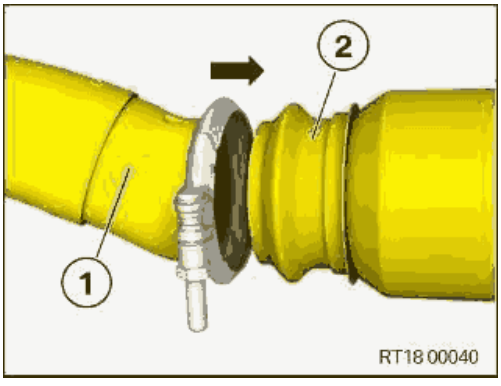
- Bend all sheet metal tabs over with a suitable tool, except those in the marked areas.



- Mount the V-clip (1) on the sealing ring (2).
- Make sure that the V-clip (1) is positioned correctly on the sealing ring (2).

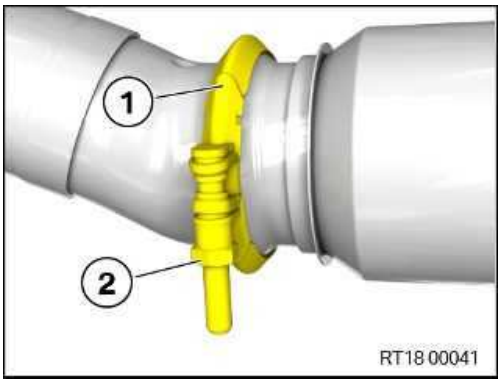


- Make sure that the V-clip rests against the sheet metal tabs after mounting (marks).



- Connect the exhaust system (1) with the catalytic converter (2) and position correctly.

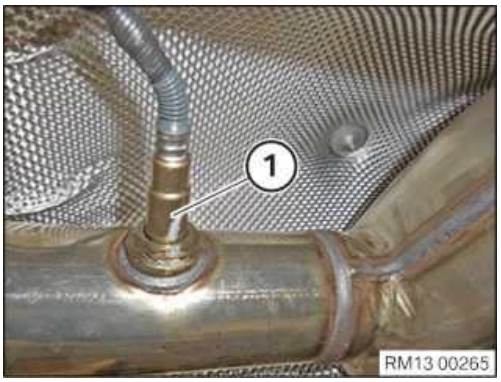
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- Make sure that V-clip (1) is fitted correctly.
- Tighten down screw (2).

V-clip to catalytic converter

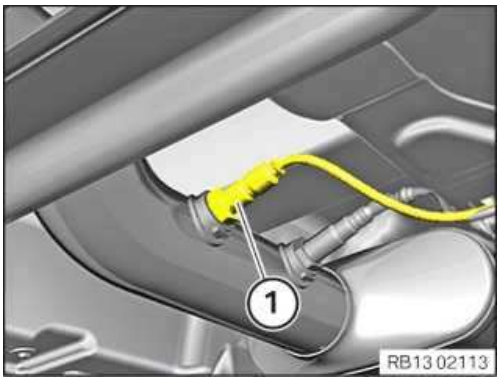
V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm



- Feed in, install and tighten diesel particulate sensor (1).

Diesel particulate sensor to exhaust system

Sensor		Tightening torque	50 Nm

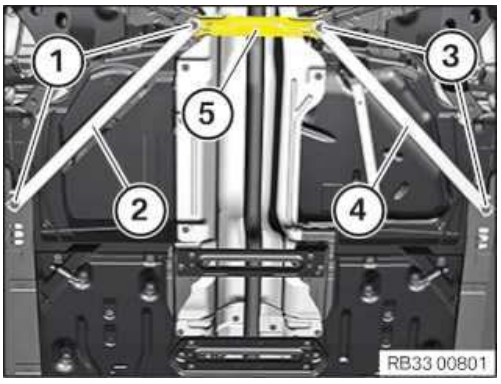


- Feed in, install and tighten nitrogen oxide sensor (1).

Nitrogen oxide sensor downstream of SCR catalytic converter

Sensor		Tightening torque	50 Nm

120 – Install the cross-member with torsion struts



- Insert and install the cross-member (5).
- Thread in torsion strut (4) at right and install.
- Renew screws (3).

  Parts: Bolts
- Tighten down screws (3).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

- Guide in and install the left torsion strut (2).
- Renew screws (1).

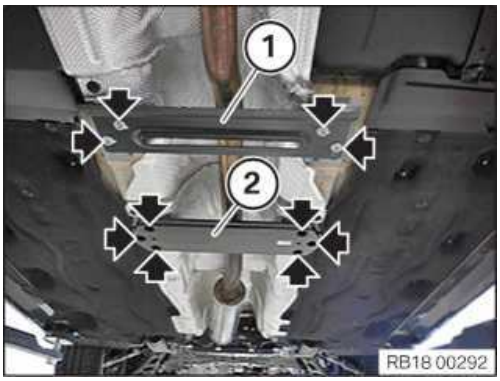
  Parts: Bolts
- Tighten the screws (1).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

121 – Install the connecting support on the tunnel in front and back

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- Insert and install connecting supports (2).
- Tighten the screws (arrows) from the connecting support (2).

Front connection carrier to body

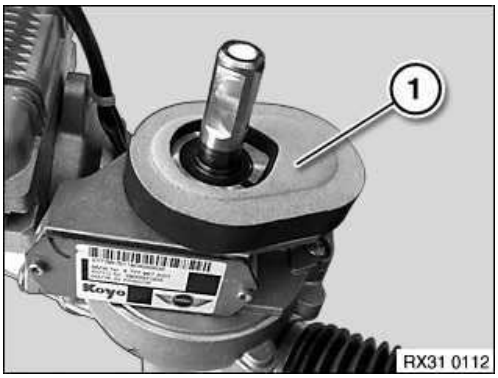
M10x18		Tightening torque	56 Nm

- Insert and install connecting supports (1).
- Tighten the screws (arrows) from the connecting support (1).

Rear connection carrier to body

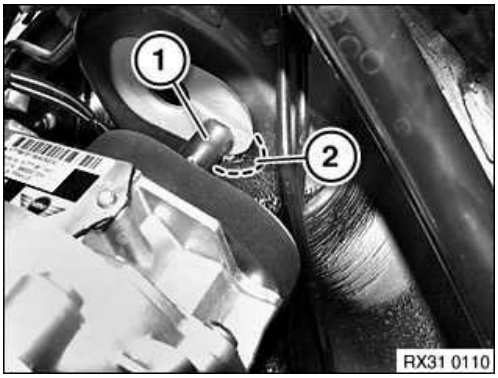
M8x18		Tightening torque	28 Nm

122 – Mount and secure the complete front axle



- Remove the seal (1).
- Clean surface on steering gear.
- Renew gasket (1).

  Parts: Gasket
- Position the seal (1) and glue it on.



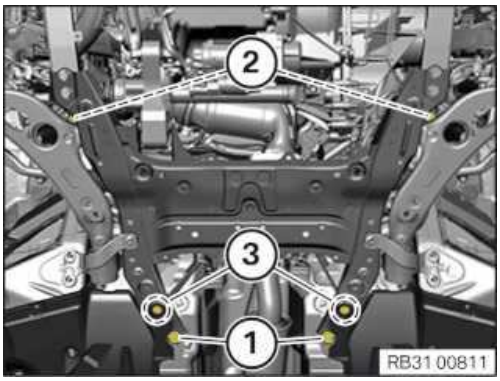
TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!

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- Position front axle support.
- Bend underbody panellings in the areas (3) to one side.
- Raise front axle support.
- When raising, insert charge air cooler into the rubber mount of the charge air cooler on cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

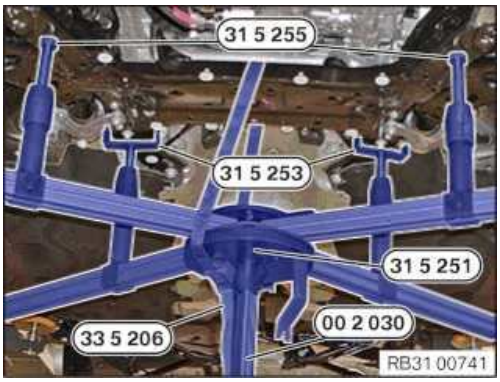
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

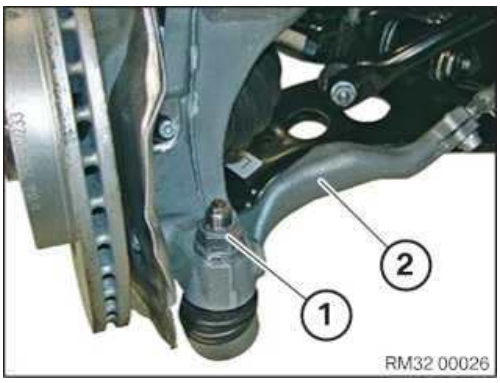
- If necessary, tighten the screws in the areas (3).

Underbody protection to body

Screw		Tightening torque	3 Nm



- Remove special tool from special tool .
- Lower universal jack **0 490 133 (00 2 030)** with the special tool and place it to the side.



NOTICE

Perform the operations on the left and right side.

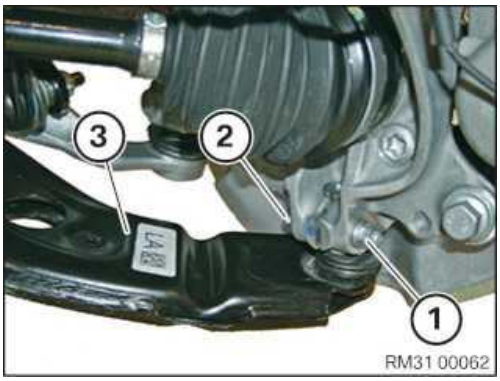
- Position the track rod (2) on the swivel bearing .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Track rod end to swivel bearing

M14	Renew nut.	Tightening torque	175 Nm

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NOTICE

Perform the operations on the left and right side.

- Position the wishbone (3) on the swivel bearing .
- Renew the bolt (2) and the nut (1).

  Parts: Bolt, nut
- Insert screw (2).
- Tighten nut (1).

Wishbone to swivel bearing

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

123 – Install the mounted parts on the front axle support



NOTICE

Perform the operations on the left and right side.

- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Holder, wishbone rubber mount, to body

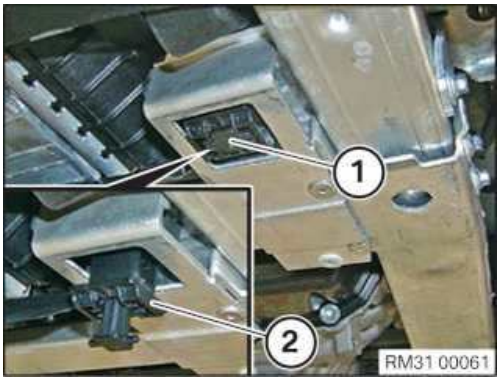
M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °



- Position the engine support (3) on the front axle support (1).
- Tighten down screw (2).

Holder with rubber mount to front axle support

M12 screw		100 Nm

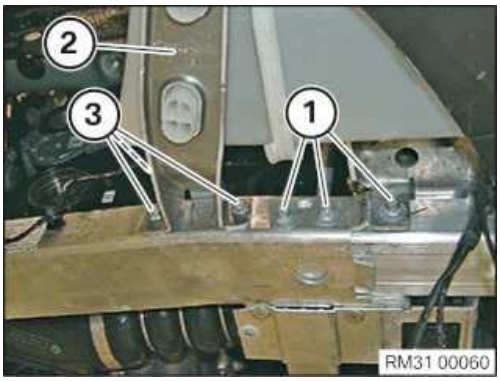


NOTICE

Perform the operations on the left and right side.

- Position the lock (2).
- Lock the bracket (1) of the lock (2) of the holder for the charge air cooler.

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- **Only on right side:** Position the holder for the washer fluid reservoir (2).
- Tighten down screws (3).

Washer fluid reservoir holder to front axle support adapter plate

		Tightening torque	10 Nm

NOTICE

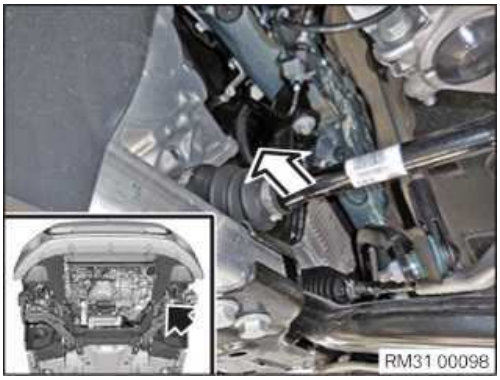
Perform the operations on the left and right side.

- Tighten the screws (1).

Deformation element, bottom, to adapter plate, front axle carrier

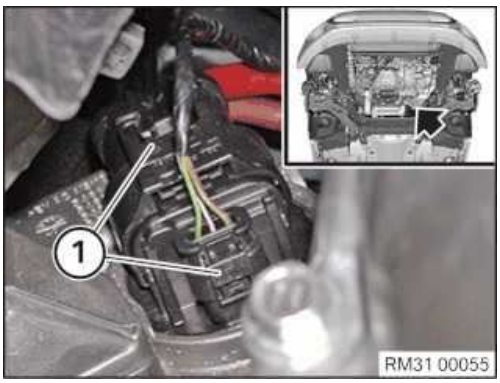
		Tightening torque	11,8 Nm

124 – Attaching connector at steering gear

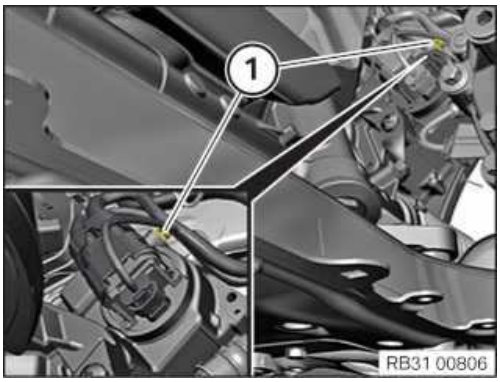


- To connect the connector (see the following step): Connect the connector with the right hand.

  The connectors can be accessed via the left output shaft.



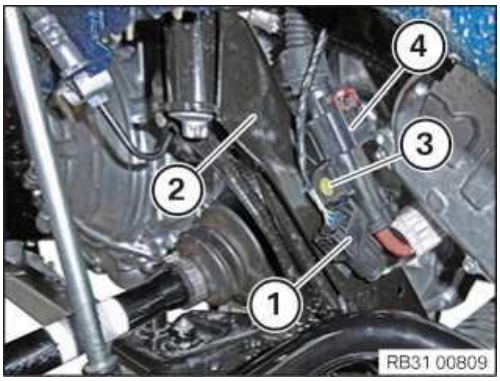
- Connect and lock connector (arrow) (1) with the steering gear.



- Fasten the wiring harness (1) on the steering gear.

▸ **If installed: Fasten the plug connections at the front axle support**

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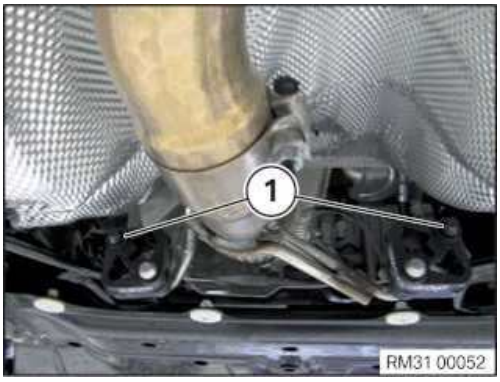
- Position the plug connection (4) at the front axle support (2).
- Tighten down screw (3).

Holder to front axle support

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

- Fasten the plug connection (1) at the front axle support (2).

125 – Securing rubber mount on front axle support



- Check rubber mount (1), replace if necessary.

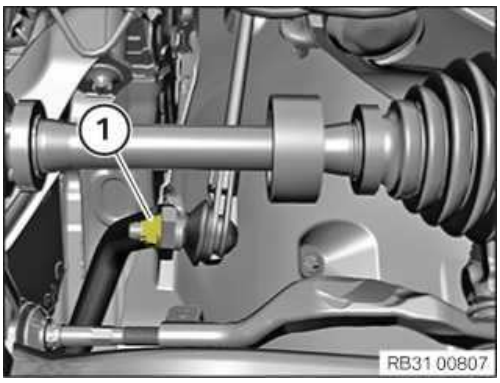
  Parts: Rubber mount
- Spray rubber mount (1) with lubricant and slide onto holder on front axle support.

126 – Securing anti-roll bar on left and right on the anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▶ **Fastening anti-roll bar on the anti-roll bar link**



- Position the anti-roll bar link on the anti-roll bar .
- Renew nut (1).

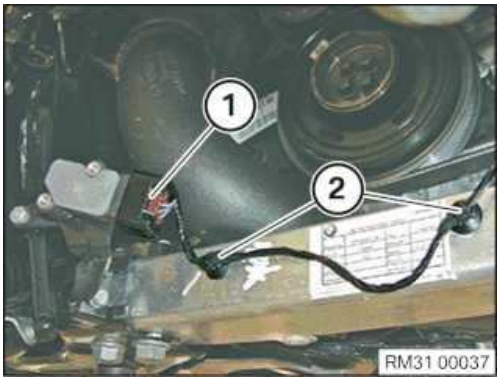
  Parts: Nut
- Tighten nut (1).

Note: Use the Torx socket for counter support.

Anti-roll bar link to anti-roll bar

M10	Renew nut.	Tightening torque	56 Nm

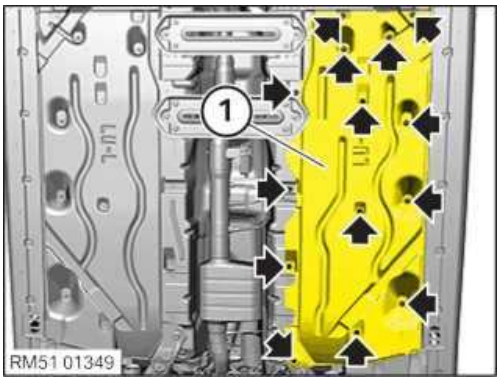
127 – With right installation: Securing the cable for the ride height sensor



- Secure the cable clip (2) on the adapter of the deformation element.
- Connect connectors (1) and lock.

128 – Installing underbody panelling , right

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- Correctly position the underbody panelling (1).
- Tighten all bolts and nuts (arrows).

Underbody panelling, side

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side

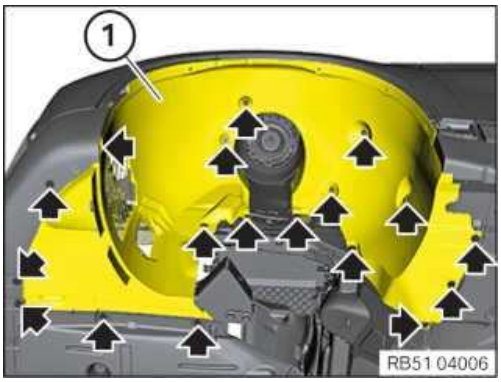
Plastic nut		Tightening torque	2,6 Nm

129 – Installing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

▸ **Installing the front wheel arch cover**



- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Plastic nut		Tightening torque	2,6 Nm
Screw		Tightening torque	2,6 Nm

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

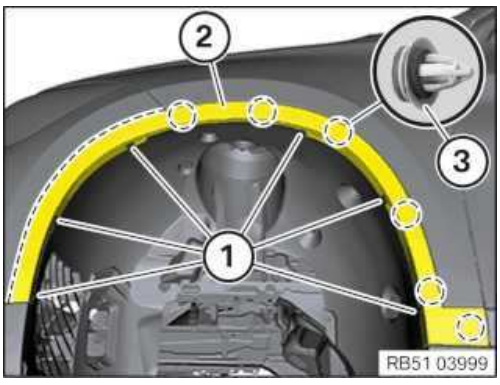
▸ **Installing front wheel arch trim**

NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Check the clips (3) for damage and renew where required.

  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

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▶ Mounting the wheel

▷ Clean the contact surfaces between the brake disc and the wheel rim



TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

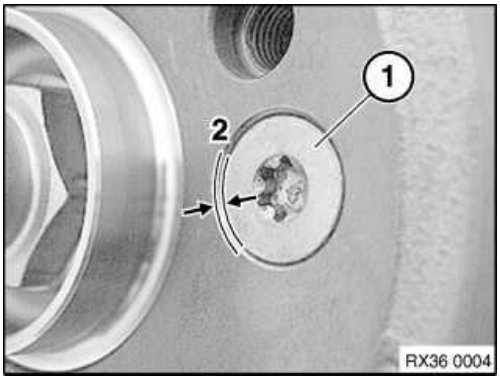
- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue in the area of the wheel bolt holes, remove and clean the brake disc.



- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).



- Renew mounting bolt (1).

  Parts: Mounting bolt
- Check that the mounting bolt (1) for the brake disc is securely seated.

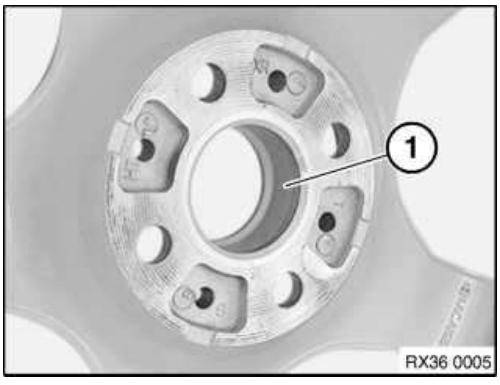
  The mounting bolt (1) for the brake disc may not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to rear wheel hub

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub

M8	Renew screw.	Tightening torque	16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring (1).

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

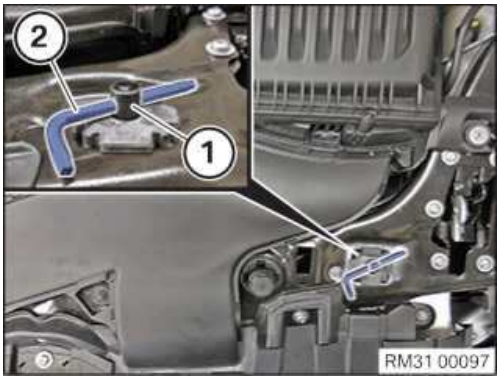
- Renew corroded wheel bolts.

  Parts: Wheel bolts
- Clean the wheel bolts.
- Check the wheel bolts and threads for damage, renew the wheel bolts if necessary.
- Join and tighten the wheel bolts (arrows).

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

131 – Removing fastener for left and right radiator



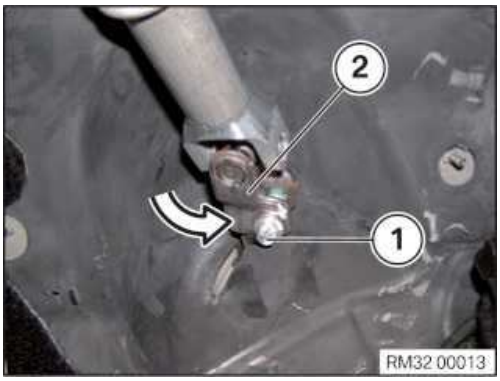
NOTICE

Perform the operations on the left and right side.

- Remove suitable tool (2) from the centering pin (1).

132 – Secure the steering shaft at the bottom on the steering gear

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- Clean the screw lock residue from the screw thread in the universal joint (2).
- Pivot the universal joint (2) in the direction of the arrow to the steering gear.
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Lower steering shaft to steering gear

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm



- **If installed:**
- Position the cover on the steering column (2).
- Tighten nuts (1).

Steering column cover to bulkhead

Plastic nut		Tightening torque	3 Nm

133 – Install the heat shield on the exhaust turbocharger



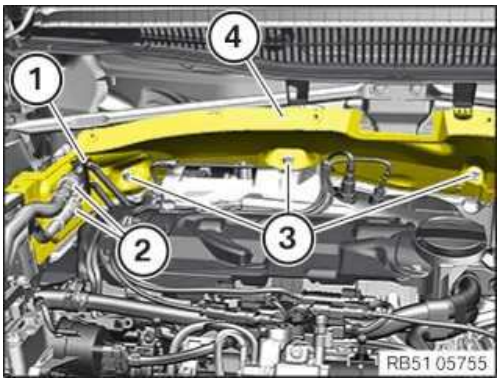
- Feed in and install the heat shield (2).
- Tighten the screws (1) at the top and bottom of the heat shield.

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Fasten the cable at the clips .

134 – Installing rear bulkhead upper part



- Feed in and install the rear bulkhead upper part (4).
- Tighten down screws (3).

Rear bulkhead upper part to lower section of bulkhead

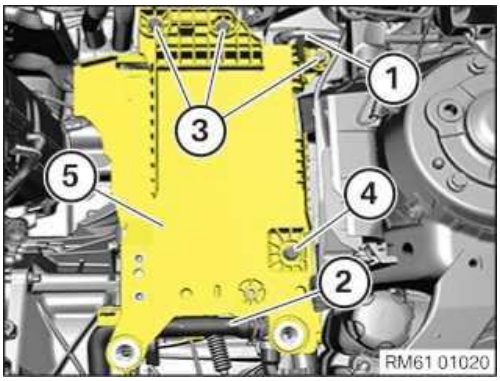
Oval-head screw		Tightening torque	5 Nm

- Feed the fuel line (2) into the holder (1) and install.
- Connect and lock the holder (1).

  The holder (1) must engage audibly.

135 – Install the battery holder

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- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

136 – Install electronics box

Prerequisite

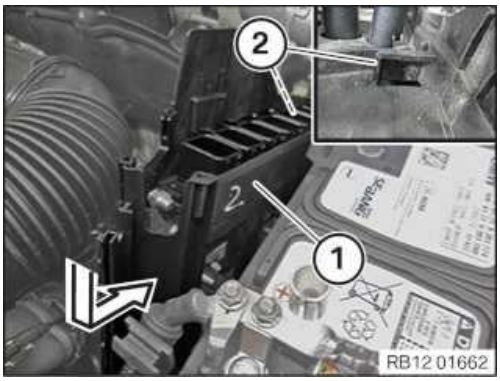
Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.

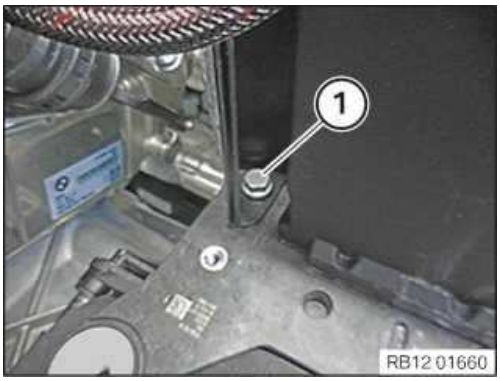


- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.



- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).

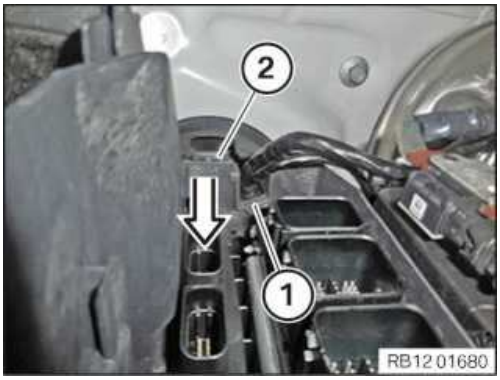
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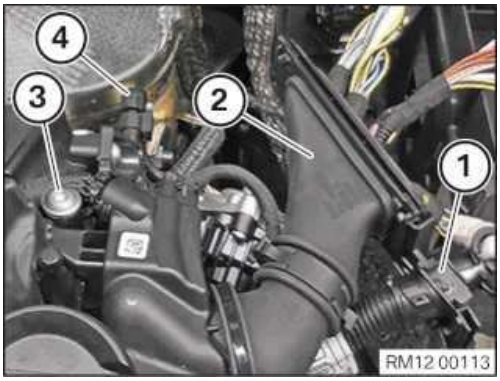
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.

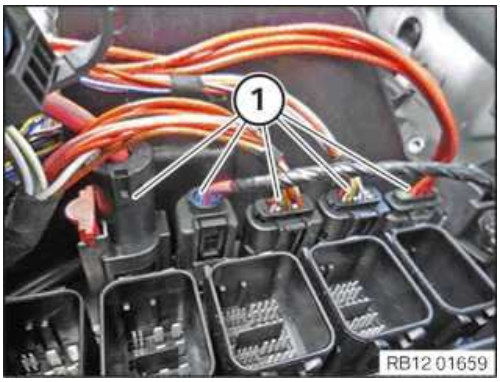


- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

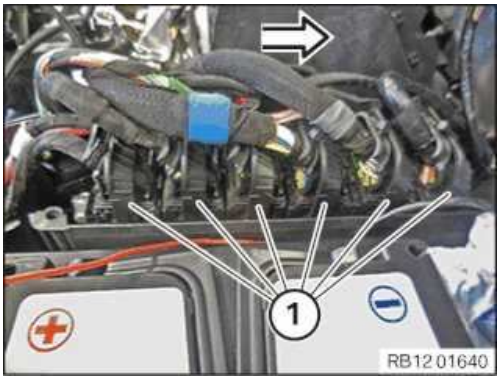
Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.

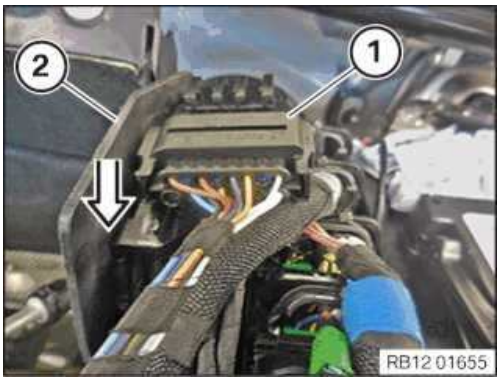


- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.

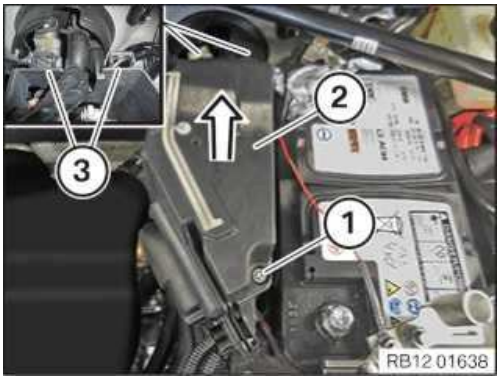


- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.

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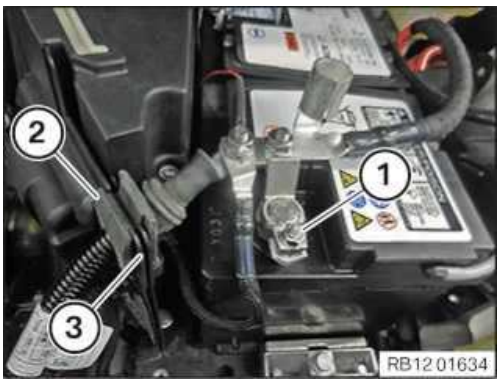
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

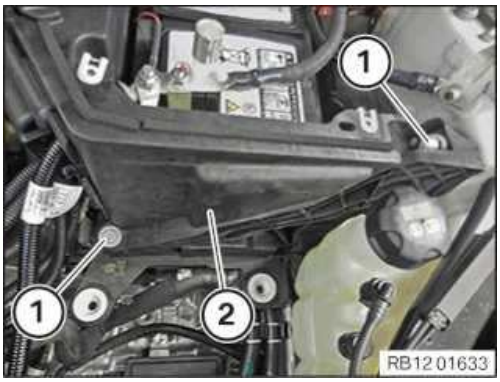
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

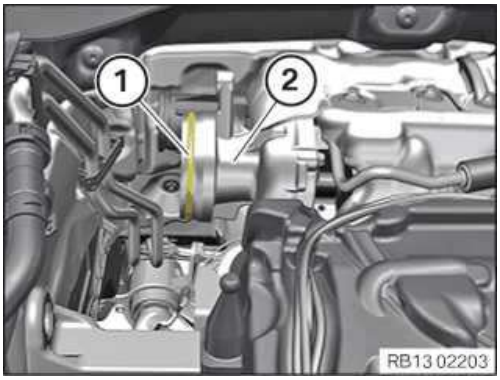


- Feed in and install tension strut (2).
- Tighten the screws (1).

Tension strut to spring strut dome/battery tray

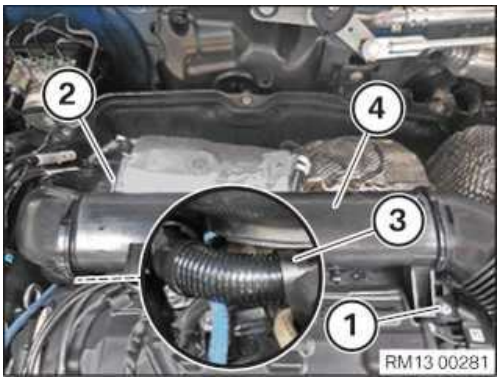
M8		Tightening torque	19 Nm

137 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.

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- Feed in clean air pipe and install.
- Connect clean air pipe to the exhaust turbocharger and lock audibly in the clamps (2).
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Connect ventilation line (3) to the cylinder head cover and lock audibly.

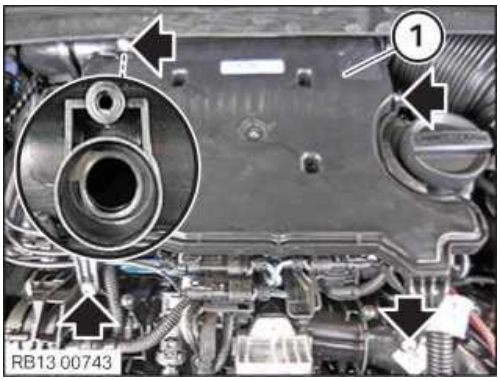


- Mount clean air pipe onto the intake filter housing.
- Tighten clamp (1) on the clean air pipe.

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

138 – Install resonator



- Insert and install the resonator (1).
- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

139 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

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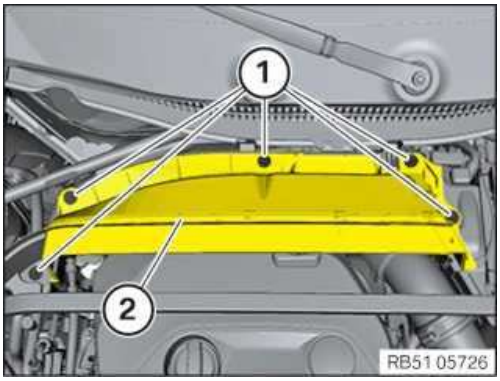


- Check for correct installation of all rubber mounts in the acoustic cover (1).



- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

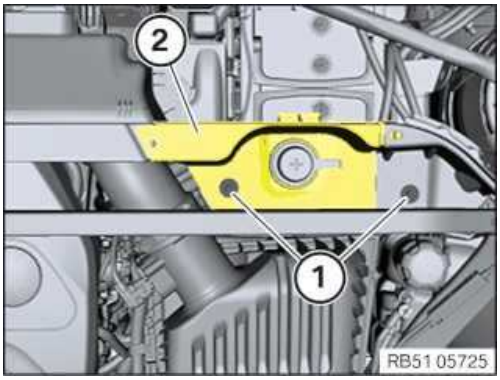
140 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Cover of top bulkhead

Screw		Tightening torque	2,6 Nm

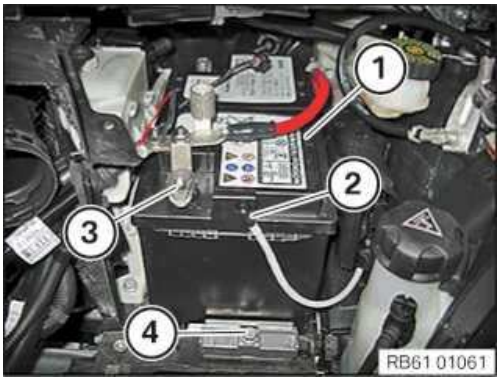


- Guide in and install cover (2).
- Tighten down screw (1).

Cover of remote positive terminal

Screw		Tightening torque	2,6 Nm

141 – Install vehicle battery



- Install vehicle battery (1).
- Position the bracket and tighten with the screw (4) .

Battery terminal rail to battery tray

M8		19 Nm

- Position the vent hose (2) and clip it in.
- Position the positive battery terminal and tighten with the nut (3) .

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

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▶ **Check the vent holes of the battery**

WARNING

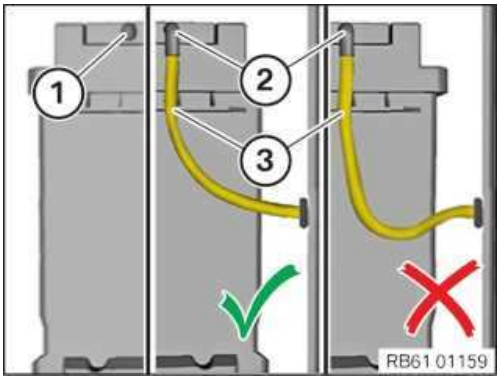
Gas emission.

Danger of injury! Danger of explosion!

- Assign the vent holes correctly.
- Route the vent hose correctly.

TECHNICAL INFORMATION

The battery has two vent holes, opposite:
One vent hole (1) must be closed correctly with a dummy plug.
The vent hose (3) must be correctly connected and routed at the other vent hole (2).



Check

- Check if the vent hole (1) is correctly closed with a dummy plug.

Result

» No dummy plug.

Measure

- Close the vent hole (1) correctly with a dummy plug.

Check

- Check if the vent hole (2) has a correctly connected vent hose (3).

Result

» The vent hose (3) is not correctly connected.

Measure

- At the vent hole (2), connect the vent hose (3) correctly.

Check

- Check if the vent hose (3) is routed to the outside with a downhill gradient (**no siphon formation!**).

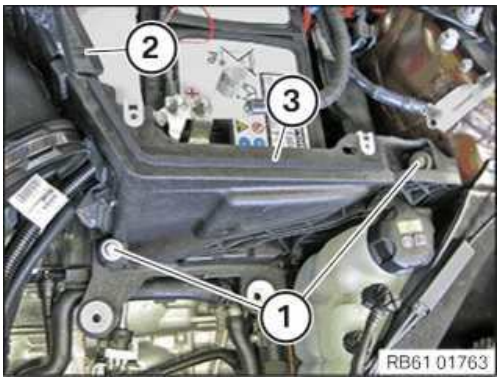
Result

» The vent hose (3) is not correctly routed as shown in the image on the right.

Measure

- Route the vent hose (3) correctly as shown in the centre image.

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- Insert tension strut (3) and tighten with screws (1).

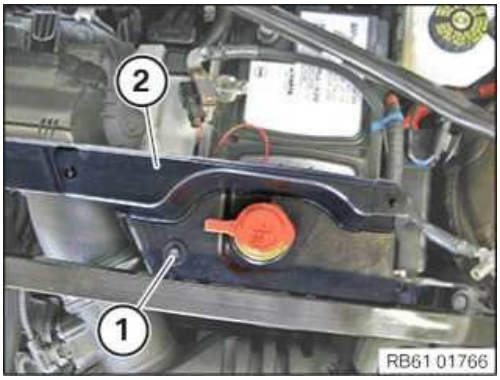
Trailing link

M8		Tightening torque	19 Nm

- Tighten down screw (2).

Battery cover

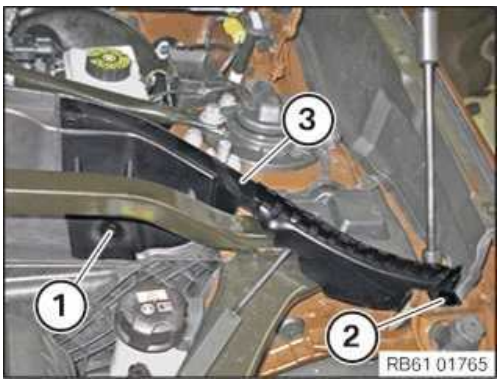
M8		2,8 Nm



- Position the cover (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

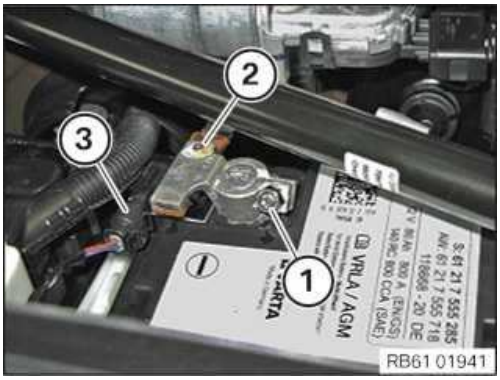
Battery cover

M8		2,8 Nm

142 – Connecting the battery earth lead

TECHNICAL INFORMATION

For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)



- Remove the protective cover of the positive battery terminal.
- Position the battery earth lead (2).
- Tighten nut (1).

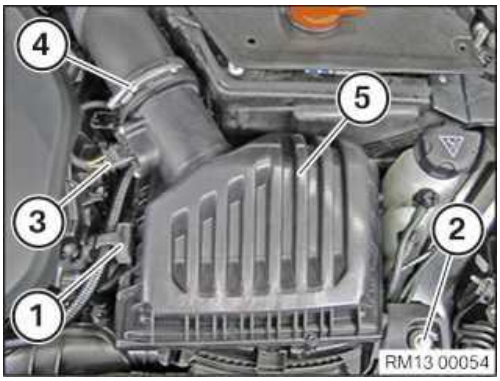
Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

- If required, connect the connector (3).

143 – Installing intake silencer housing

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- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

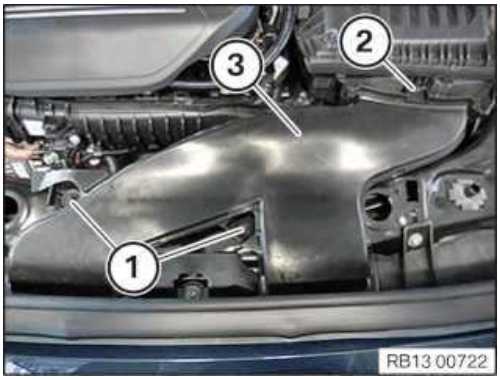
- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

144 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).
  The lock (2) must audibly engage.
- Tighten nuts (1).

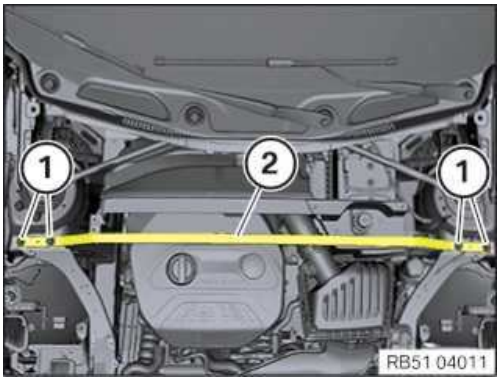
Intake neck to cross connection

M6		Tightening torque	8 Nm

145 – Install strut brace

TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.

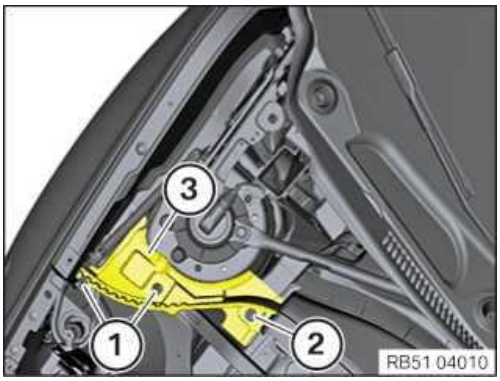


- Install the strut brace (2).
- Renew screws (1).
  Parts: Bolts
- Tighten the screws (1).

Cross-brace to spring strut dome

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

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NOTICE

Description is for right component only. The procedure on the left side is identical.

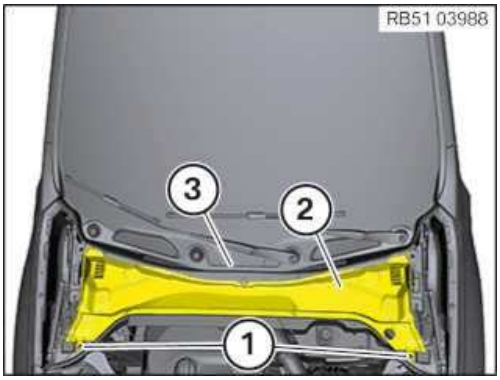
- Install the cover (3).
- Tighten down screw (2).

Cover on body

Hexagon screw		Tightening torque	3 Nm

- Install the expanding rivet (1).

146 – Installing front cowl panel cover

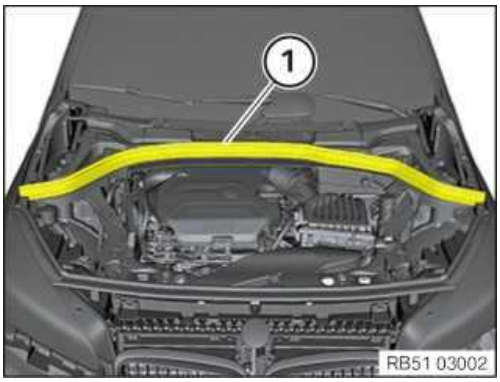


- Insert and install cowl panel cover at front (2) into cowl panel cover at rear (3).
- Check cowl panel cover at front is correctly seated (2).
- Secure expanding rivet (1).

147 – Install the seal for the bonnet

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

148 – Fill and bleed the coolant circuit

▸ **Filling and bleed the high-temperature coolant circuit**

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- See additional information.

149 – Checking/topping up oil level in automatic gearbox (AISIN GA8G45)

Prerequisite

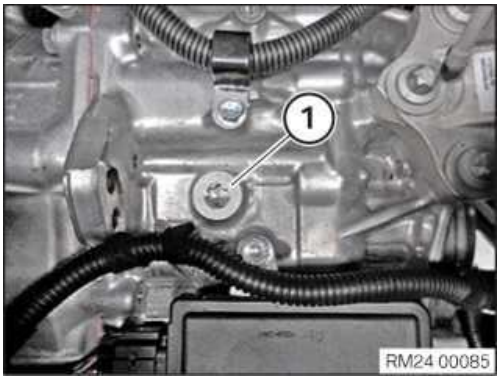
Vehicle in horizontal position.

CAUTION

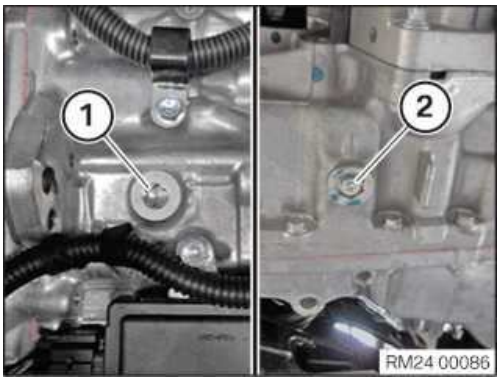
Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.



- Move the selector lever to the "P" position.
- Secure vehicle to prevent it rolling.
- Connect diagnosis system.
- Release the oil filler plug (1) using the Torx T55 .



- **Topping up the automatic transmission fluid (the automatic transmission fluid was drained):**
- Release oil filler plug (1) from engine compartment.
- Loosen the overflow plug (2) below at the transmission.
- Top up automatic transmission fluid at oil filler plug (1) until oil emerges at overflow plug (2).
- Start engine and run at idle speed.
- Check whether the automatic transmission fluid is leaking at the overflow plug (2) .
- If there is no automatic transmission fluid leaking at the overflow plug (2) , fill in the automatic transmission fluid to the oil filler plug (1) .
- Press the footbrake and, when idle, shift through all the gears from "P" to "D" 2 times for more than 2 seconds .
- Move the selector lever to the "P" position.
- Check again whether the automatic transmission fluid is leaking at the overflow plug(2) .
- Read the temperature of the automatic transmission fluid with the diagnosis system.
- Increase temperature of automatic transmission fluid to 35 °C to 45 °C.
- Top up automatic transmission fluid until it flows over.

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- Renew sealing rings.

  Parts: Sealing ring

- Screw in and fasten oil filler plug (1) and overflow plug (2).

Oil filler plug to transmission housing

M14	Renew the sealing ring.	Tightening torque	45 Nm

Overflow screw in oil drain plug

M6	Renew the sealing ring.		8 Nm

- **Check oil level (transmission oil temperature must be between** 35 °C **and** 45 °C **):**
- Open the oil filler plug (1).
- Slacken overflow plug (2).
- Start engine and run at idle speed.
- Unscrew and remove overflow plug (2).
- Check whether the automatic transmission fluid is leaking at the overflow plug (2) .
- If there is no automatic transmission fluid leaking at the overflow plug (2) , fill in the automatic transmission fluid to the oil filler plug (1) .
- Top up the automatic transmission fluid until it overflows at the overflow plug (2) .
- Press the footbrake and, when idle, shift through all the gears from "P" to "D" 2 times for more than 2 seconds .
- Move the selector lever to the "P" position.
- Check the oil level again.
- Renew sealing rings.

  Parts: Sealing ring

- If the oil escapes slightly from the overflow plug (2) , tighten the overflow plug (2) and the oil filler plug (1) .

Overflow screw in oil drain plug

M6	Renew the sealing ring.		8 Nm

Oil filler plug to transmission housing

M14	Renew the sealing ring.	Tightening torque	45 Nm

150 – Topping up oil level in the manual gearbox (GS6X60DA)

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

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TECHNICAL INFORMATION

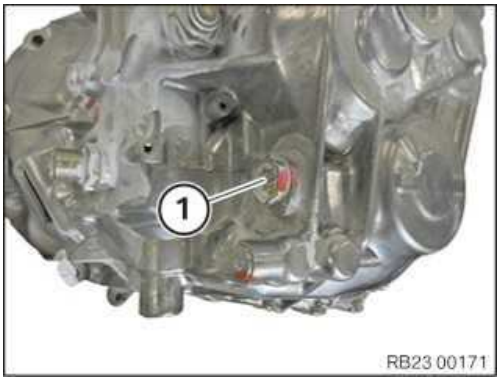
Make sure during removal of the filling/level control screw to note the installed filling/level control screw variant.

It is **mandatory** to use variant 1 in transmissions up to production date 08/2015.

It is **mandatory** to use variant 2 in transmissions from production date 08/2015.

Failure to observe will result in a leak on the transmission.

- Variant 1 **until** production date 08/2015.
- Variant 2 **from** production date 08/2015.



- Unscrew filling/level control screw (1) and fill the transmission until the oil overflows.

Transmission oil capacity

Transmission oil GS6-60DA, GS6X60DA/Owner's Handbook	2,2 l

Transmission oil: Technically suitable manual gearbox oil

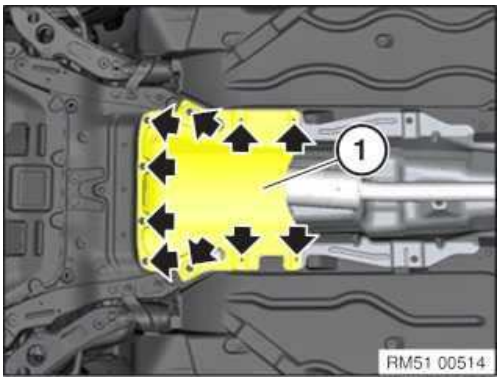
- Allow surplus oil to drain off.
- Renew the filling/level control screw (1).

  Parts: Filling/level control screw
- Tighten filling/level control screw (1).

Oil drain plug / oil filler plug

Hexagon socket		Tightening torque	43 Nm

151 – If installed: Installing underbody protection at rear

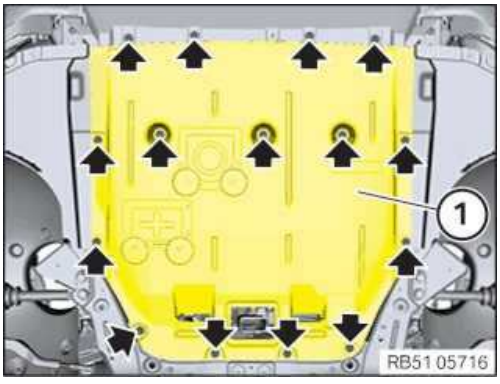


- Position rear underbody protection (1).
- Tighten screws (arrows).

Underbody protection to body

Screw		Tightening torque	3 Nm

152 – Installing the front underbody protection

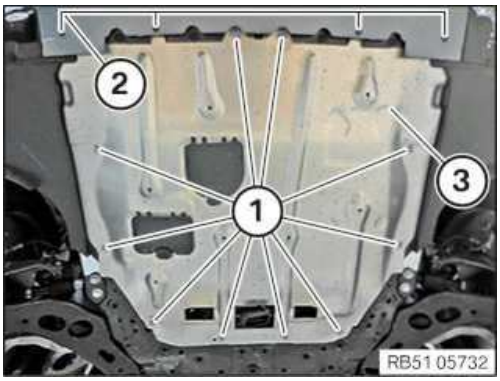


- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

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- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Additional Information

Overview of Tightening Torques

Cross connection to carrier support — Used in step 19

Screws M6x20		Tightening torque	11,8 Nm

Screw connection for rubber mount of coolant radiator to coolant radiator — Used in step 19

Bolt to rubber mount		Tightening torque	8 Nm

Air duct to upper connection — Used in step 19

M6x20 screw		Tightening torque	11,8 Nm

Bracing strut to upper connection — Used in step 19

M8x20 screw		Tightening torque	28 Nm

Rear end of front axle support to body — Used in step 73 122

M14 screw	Renew screw.	Tightening torque	175 Nm

Front axle support, front to body — Used in step 73 122

M12 screw	Renew screw.	Tightening torque	108 Nm

Underbody protection to body — Used in step 73 122 151

Screw		Tightening torque	3 Nm

Special tool to cylinder head — Used in step 73

M8		Tightening torque	21,5 Nm

Cylinder head to crankcase — Used in step 79

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

Cylinder head bolt to timing case cover — Used in step 79

M8x40		Tightening torque	19 Nm

Right engine mount to side member — Used in step 79

M12		Tightening torque	100 Nm

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Right engine mount to cylinder head

Used in step 79

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

Heat shield to cylinder head

Used in step 79

M8X16		Tightening torque	10 Nm

Glow elements to cylinder head

Used in step 80

Glow element		Tightening torque	13 Nm

Camshaft carrier to cylinder head

Used in step 83

M7x35		Tightening torque	13 Nm

Bearing journal to cylinder head

Used in step 85

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8

Used in step 85

M8		Tightening torque	19 Nm

Standard screw connection M6

Used in step 85 96

M6			8 Nm

Chain tensioner piston to cylinder head

Used in step 86

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft

Used in step 87

M7x17.			17 Nm

Cylinder head cover to cylinder head

Used in step 89

M6		Tightening torque.	8,5 Nm

Clamping claw facing to cylinder head cover

Used in step 90

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 90

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

High pressure lines between injector and rail

Used in step 92

High pressure lines		Tightening torque	28 Nm

Exhaust-gas recirculation cooler to exhaust manifold

Used in step 94 100

M8x28	Replace screws	Tightening torque	32 Nm

Oil return line to turbocharger

Used in step 94 95

M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase

Used in step 94

M8x16		Tightening torque	22 Nm

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Exhaust turbocharger to exhaust manifold

Used in step 95

V-band clamp		Tightening torque	19 Nm

Oil feed line to bracket

Used in step 95

Torx screw M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase

Used in step 95

M8x16		Tightening torque	22 Nm

Heat shield for exhaust turbocharger

Used in step 96

Torx screw BM 6x12		Tightening torque	10 Nm

Banjo bolt for exhaust pressure pipe to exhaust manifold

Used in step 96

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

Charge air duct to oil sump

Used in step 97

M6		Tightening torque	8 Nm

Ride height sensor holder to front axle support

Used in step 97

M6		Tightening torque	8 Nm

Adapter, front axle support to front axle support

Used in step 97

		Tightening torque	100 Nm

Cross connection to front axle support

Used in step 97

M6		Tightening torque	12 Nm

Washer fluid reservoir to body

Used in step 98

M6x20		Tightening torque	8 Nm

Intake plenum to cylinder head

Used in step 99

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 100

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler

Used in step 100

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 100

M8x20		Tightening torque	19 Nm

Wiring harness to cylinder head cover

Used in step 101 136

TS5x20		Tightening torque	3,5 Nm

Positive battery cable to alternator

Used in step 101

M8		Tightening torque	19 Nm

Fuel line to intake plenum

Used in step 101

TS6x20		Tightening torque	5 Nm

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Cover to electronics box — Used in step 101 136

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery — Used in step 101 136

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray — Used in step 101 136

M8		Tightening torque	19 Nm

Diesel particulate filter V-clip to exhaust turbocharger — Used in step 102

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Diesel particle filter to holder — Used in step 102

M8 hexagon nut		Tightening torque	19 Nm

Diesel particulate filter holder to gearbox — Used in step 102

M12x75		Tightening torque	66 Nm

Diesel particulate filter bracket to crankcase — Used in step 102

M10x35		Tightening torque	38 Nm

SCR metering module V-clip to exhaust system — Used in step 102

V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm

Holder for coolant lines to diesel particulate filter — Used in step 102

Torx bolt BM6x16		Tightening torque	8 Nm

Differential pressure sensor to holder — Used in step 102 103

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor — Used in step 102 103

Clamp 15–19mm		Tightening torque	3 Nm

Control sensor — Used in step 104

Control sensor		Tightening torque	50 Nm

Exhaust temperature sensor to diesel particulate filter — Used in step 105 106

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Exhaust-gas temperature sensor to exhaust system — Used in step 107

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Oxygen sensor holder to intermediate shaft — Used in step 108

Hexagon screw M6x16		Tightening torque	8 Nm

Nitrogen oxide sensor before SCR catalytic converter — Used in step 109

Sensor		Tightening torque	50 Nm

Monitoring sensor — Used in step 110

Sensor		Tightening torque	50 Nm

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Transfer box to transmission — Used in step 111

M10		Tightening torque	56 Nm

Heat shield to transfer box — Used in step 111

M6	Renew screws.	Tightening torque	6 Nm

Oil filler plug on transfer box (VTG) — Used in step 111

M18x1.5		Tightening torque	35 Nm

Intermediate shaft to transfer box — Used in step 112

M8x35		Tightening torque	19 Nm

Starter motor to transmission — Used in step 113

M8x45		Tightening torque	19 Nm

Battery positive lead to starter — Used in step 113

M8		Tightening torque	13,5 Nm

Propeller shaft to transfer box — Used in step 116

		Tightening torque	80 Nm

Flexible disc to rear axle final drive — Used in step 116

M12x1.5	Renew screws.	Tightening torque	55 Nm 90 °

Centre mount to body — Used in step 116

M8		Tightening torque	19 Nm

Heat shield to body — Used in step 117 118

Bolts/nut		Tightening torque	3 Nm

Bracket to body — Used in step 117

M8		Tightening torque	21 Nm

Exhaust system to body — Used in step 119

M8	Replace nuts.	Tightening torque	19 Nm

Exhaust bracket on body — Used in step 119

Hexagon screw M8x30		Tightening torque	19 Nm

V-clip to catalytic converter — Used in step 119

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

Diesel particulate sensor to exhaust system — Used in step 119

Sensor		Tightening torque	50 Nm

Nitrogen oxide sensor downstream of SCR catalytic converter — Used in step 119

Sensor		Tightening torque	50 Nm

Cross-member/torsion strut to axle support and mounting — Used in step 120

M12x48	Renew screws.	Jointing torque Angle of rotation	100 Nm 90 °

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Front connection carrier to body — Used in step 121

M10x18		Tightening torque	56 Nm

Rear connection carrier to body — Used in step 121

M8x18		Tightening torque	28 Nm

Track rod end to swivel bearing — Used in step 122

M14	Renew nut.	Tightening torque	175 Nm

Wishbone to swivel bearing — Used in step 122

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

Holder, wishbone rubber mount, to body — Used in step 123

M10 screw	Renew screw.	Jointing torque	56 Nm
		Angle of rotation	90 °

Holder with rubber mount to front axle support — Used in step 123

M12 screw			100 Nm

Washer fluid reservoir holder to front axle support adapter plate — Used in step 123

		Tightening torque	10 Nm

Deformation element, bottom, to adapter plate, front axle carrier — Used in step 123

		Tightening torque	11,8 Nm

Holder to front axle support — Used in step 124

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

Anti-roll bar link to anti-roll bar — Used in step 126

M10	Renew nut.	Tightening torque	56 Nm

Underbody panelling, side — Used in step 128

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side — Used in step 128

Plastic nut		Tightening torque	2,6 Nm

Wheel arch cover to body — Used in step 129

Plastic nut		Tightening torque	2,6 Nm
Screw		Tightening torque	2,6 Nm

Wheel arch cover to body — Used in step 129

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body — Used in step 129

Plastic nut		Tightening torque	3 Nm

Brake disc to rear wheel hub — Used in step 130

M8	Renew screw.	Tightening torque	16 Nm

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Brake disc to front wheel hub

Used in step 130

M8	Renew screw.	Tightening torque	16 Nm

Wheel bolts

Used in step 130

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Lower steering shaft to steering gear

Used in step 132

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

Steering column cover to bulkhead

Used in step 132

Plastic nut		Tightening torque	3 Nm

Heat shield for exhaust turbocharger

Used in step 133

Torx screw BM 6x12		Tightening torque	10 Nm

Rear bulkhead upper part to lower section of bulkhead

Used in step 134

Oval-head screw		Tightening torque	5 Nm

Battery holder to engine support

Used in step 135

Hexagon screw M8x30		Tightening torque	19 Nm

Electronics box to battery tray

Used in step 136

M8X16		Tightening torque	15 Nm

Clean air pipe to cylinder head cover

Used in step 137

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing

Used in step 137 143

Clamp		Tightening torque	3 Nm

Resonator to manifold and clean air pipe

Used in step 138

Screw TS6	Renew screw.	Tightening torque	5 Nm

Cover of top bulkhead

Used in step 140

Screw		Tightening torque	2,6 Nm

Cover of remote positive terminal

Used in step 140

Screw		Tightening torque	2,6 Nm

Battery terminal rail to battery tray

Used in step 141

M8			19 Nm

Battery terminal with IBS positive battery terminal / negative battery terminal

Used in step 141 142

NutM6			5 Nm

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Trailing link — Used in step 141

M8		Tightening torque	19 Nm

Battery cover — Used in step 141

M8			2,8 Nm

Intake silencer housing to lock bridge — Used in step 143

M6X30		Tightening torque	8 Nm

Intake neck to cross connection — Used in step 144

M6		Tightening torque	8 Nm

Cross-brace to spring strut dome — Used in step 145

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

Cover on body — Used in step 145

Hexagon screw		Tightening torque	3 Nm

Oil filler plug to transmission housing — Used in step 149

M14	Renew the sealing ring.	Tightening torque	45 Nm

Overflow screw in oil drain plug — Used in step 149

M6	Renew the sealing ring.		8 Nm

Oil drain plug / oil filler plug — Used in step 150

Hexagon socket		Tightening torque	43 Nm

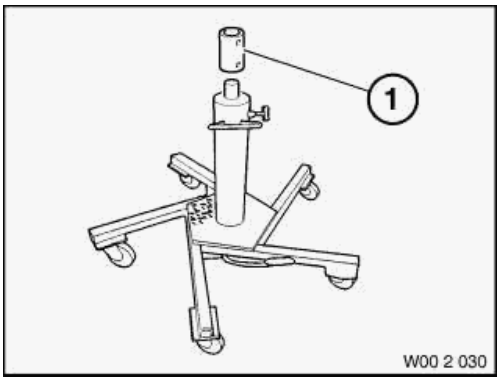
Underbody protection front — Used in step 152

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Overview of Special Tools

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0 490 133 (00 2 030) Device



Common

Used in step 32 73 79 122

Usage	(universal hydraulic lifter base unit) Chassis and hydraulic lifter - For removing and installing rear axle supports and gearboxes. Also for soft top mounts. Is replaced by 81 22 2 219 012
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 90 (207)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 490 134 (00 2 031)		**Adapter** (adapter for gearbox holder) Model series: E30, E31, E32, E34, E36	

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0 495 554 (33 5 070) Extension



Common

Used in step 38 116

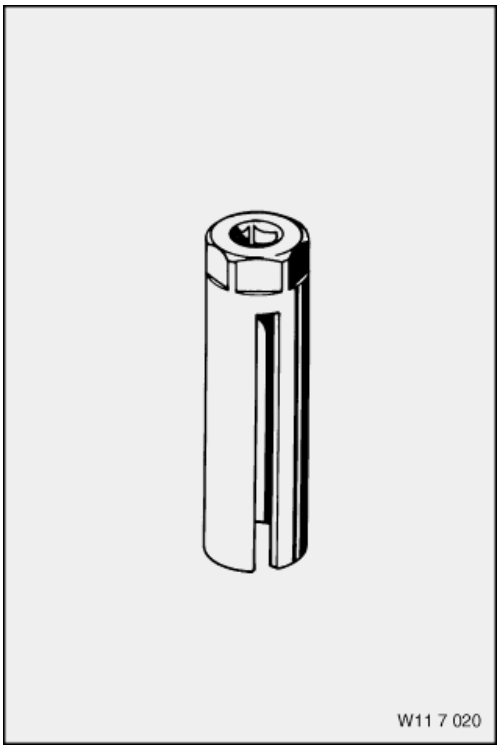
Usage	Pull-out extension for 33 5 040, 33 5 050, 33 5 060.
Included in the tool or work	
Storage location	A18
Replaced by	
In connection with	
SI-Number	01 21 06 (300)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 592 (33 5 071)		**Extension** (Extension (1 item)) discontinued, can only be ordered using complete tool	

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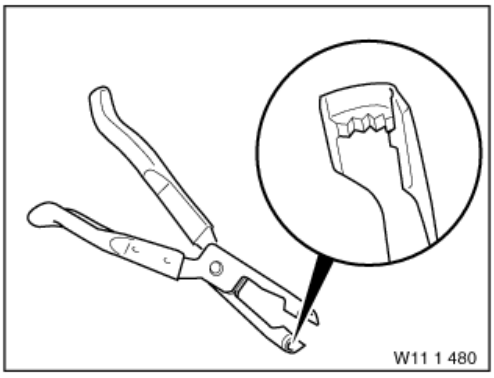
0 491 074 (11 7 020) Socket wrench insert



Common Used in step 44 45 110

Usage	(Socket wrench insert 22 mm) For loosening and tightening the oxygen sensor
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	

0 490 796 (11 1 480) Pliers

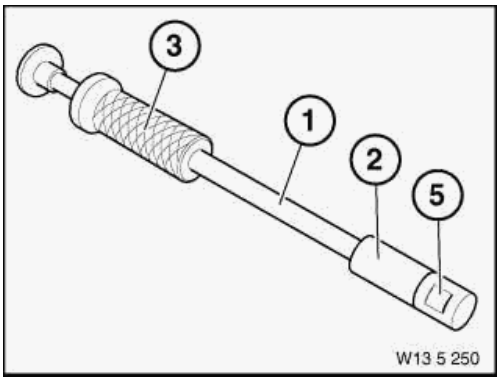


Common Used in step 53 72

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

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0 493 321 (13 5 250) Puller



Common Used in step 63

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

0 493 339 (13 5 252) Bush



Common Used in step 63

Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 340 (13 5 253) Weight

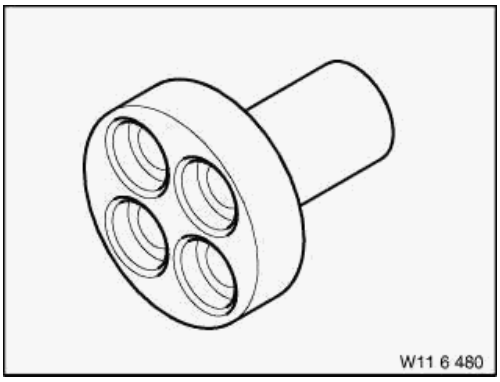


Common Used in step 63

Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 493 380 (11 6 480) Connector



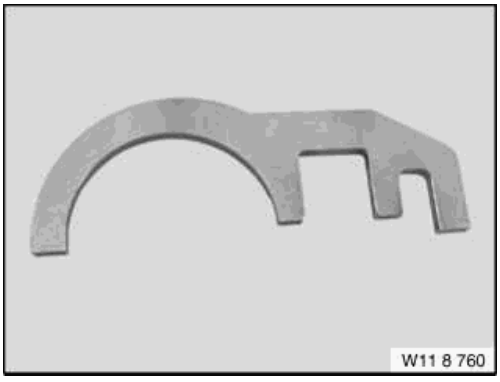
Common	Used in step 65 88
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

2 288 380 Locating stud



Common	Used in step 65 88
Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 112 (11 8 760) Gauge



Common	Used in step 65 88
Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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0 495 105 (11 4 480) oddments tray



Common Used in step 70 71 74

Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

2 357 071 Panel



Common Used in step 73 79

Usage	Additional mounting plate for lifting table MHT 1200. Delivery quantity: 1 piece. During the course of the changeover from BMWi to iPerformance, a tool changeover also takes place from campaign to warehouse.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	Table lift MHT 1200 81222184136
SI-Number	01 21 13 (987)

2 459 012 Holder

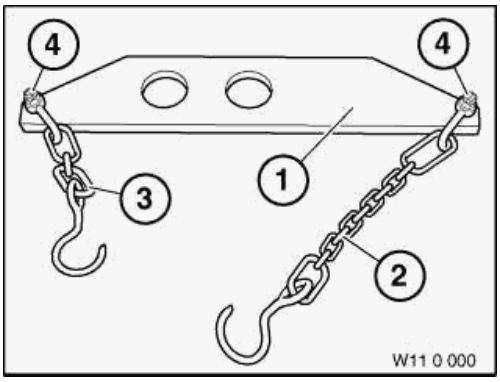


Common Used in step 73 79

Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

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0 490 561 (11 0 000) Lifting gear



Common

Used in step 73 79

Usage	(Hoisting gear) For removing and installing engines. As of 08/2011 only available as a complete set. Delivered with TÜV inspection certificate and operating instructions. No delivery of separate parts.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 13 94 (888)

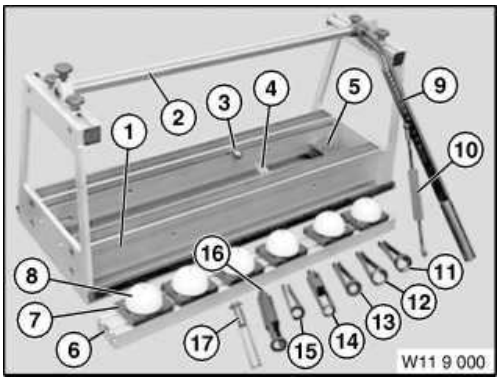
Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
4	0 490 565 (11 0 009)		**Shackle** (Shackle) 2 pieces. As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 562 (11 0 001)		**Lifting gear** (Cross member) As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
2	0 490 563 (11 0 002)		**Chain** (Chain) Version: long As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
3	0 490 564 (11 0 003)		**Chain** (Chain) Version: short As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	

0 494 362 (11 9 000) Device

Used in step 73 74 75

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Common

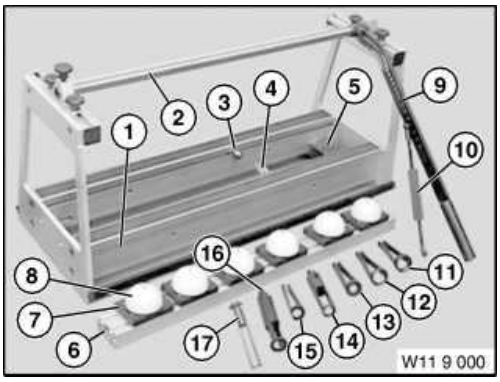
Usage	(Cylinder head expander tool)
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 03 02 (833)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 494 366 (11 9 001)		**Device**	
6	0 494 371 (11 9 006)		**Insert** (Aluminium strip)	
11	0 494 376 (11 9 012)		**Basket** (Valve spring cage) Engine M41, M51, S50	
17	0 495 028 (11 9 017)		**Basket** (Valve spring cage) Engine N52	
2	0 494 367 (11 9 002)		**Rod**	
3	0 494 368 (11 9 003)		**Adapter** (Sliding block)	
4	0 494 369 (11 9 004)		**Tab**	
5	0 494 370 (11 9 005)		**Quick fastener**	
7	0 494 372 (11 9 007)		**Shaped part** (shaped part)	
8	0 494 373 (11 9 008)		**Shaped part** (Shaped part) Shaped part made of plastic	
9	0 494 374 (11 9 009)		**Lever**	
10	0 494 375 (11 9 011)		**Hook**	
12	0 494 377 (11 9 013)		**Basket** (Valve spring cage) Engine M43, M73	
13	0 494 378 (11 9 014)		**Basket** (Valve spring cage) Engine M44, M52, M54, M56, M62, S52, S54, S62	
14	0 494 379 (11 9 015)		**Basket** (Valve spring cage) Engine M47, M47TU, M57, M57TU, N40, N42, N62, N73	
15	0 494 380 (11 9 016)		**Basket** (Valve spring cage) Engine M21, M40	

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0 494 366 (11 9 001) Device

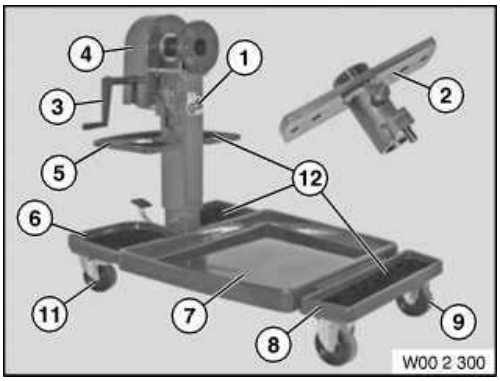


Common		Used in step 74 75
Usage		
Included in the tool or work	0 494 362	
Storage location		
Replaced by		
In connection with		
SI-Number		

0 495 187 (00 2 300) Assembly stand

Used in step 74 75

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Common

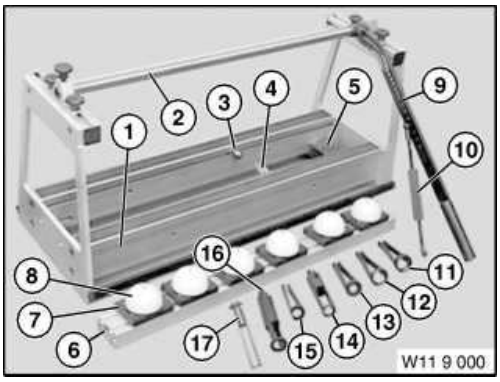
Usage	Assembly stand with universal flange for mounting engines from S85
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 188 (00 2 301)		**Assembly stand** available only as complete assembly stand 83 30 0 495 187.	
2	0 495 189 (00 2 302)	**2 299 563**	**Tool** (Universal flange). Do not use any more!!! Technically locked. Replaced with a new flange with material number 83 30 2 299 563. All flanges delivered until the end of 2011 will be replaced at no charge. From 2012, only the new flange will be supplied. Also applies to the complete engine mounting stand 00 2 300.	
3	0 495 200 (00 2 303)		**Crank**	
4	0 495 201 (00 2 304)		**Cover** (Protective hood)	
5	0 495 202 (00 2 305)		**oddments tray** (Oddments tray for small parts)	
6	0 495 203 (00 2 306)		**Shaped element** (Rear shaped pan)	
7	0 495 204 (00 2 307)		**Collection pan** (Oil collection pan)	
8	0 495 205 (00 2 308)		**Shaped element** (Front shaped pan)	
9	0 495 206 (00 2 309)		**Wheel** (Front wheel (without stop))	
10	0 495 207 (00 2 311)		**Wheel** (Rear wheel (with stop))	
11	0 495 208 (00 2 312)		**Mat** (Checker mat set)	
2	2 299 563		**Adapter** New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.	

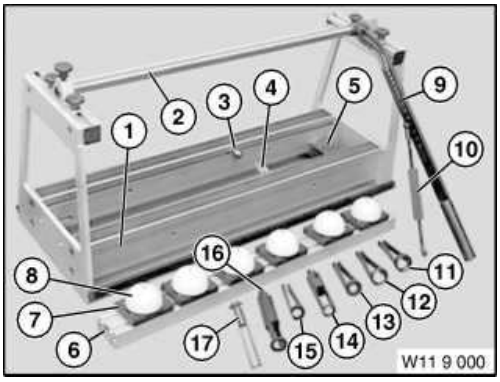
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0 494 371 (11 9 006) Insert



Common	Used in step 74 75
Usage	(Aluminium strip)
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 372 (11 9 007) Shaped part



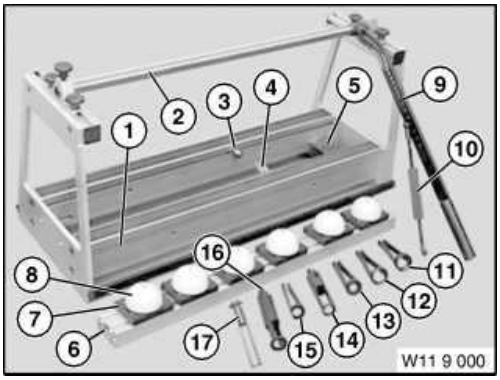
Common	Used in step 74
Usage	(Shaped part)
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 373 (11 9 008) Shaped part



Common	Used in step 74
Usage	(Shaped part) Shaped part made of plastic
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 370 (11 9 005) Quick fastener



Common	Used in step 74 75
Usage	
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 494 374 (11 9 009) Lever



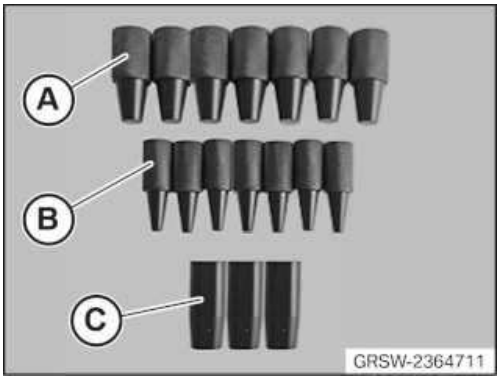
Common	Used in step 74 75
Usage	
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 496 143 (11 8 840) Basket



Common	Used in step 74 75
Usage	(Valve spring cage) For removing and fitting the valves.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

2 364 711 Plug



Common	Used in step 76
Usage	For closing the pressure oil holes for cleaning the cylinder head sealing surfaces.
Included in the tool or work	
Storage location	C20
Replaced by	
In connection with	
SI-Number	01 50 14 (203)

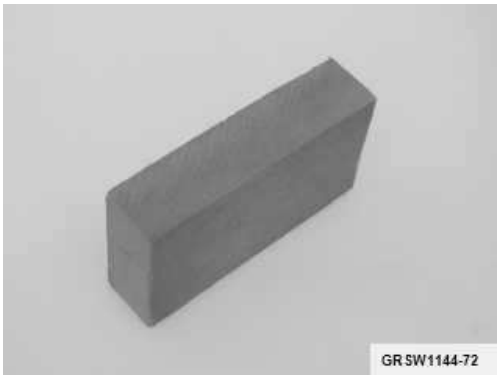
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0 495 103 (11 4 471) Scraper



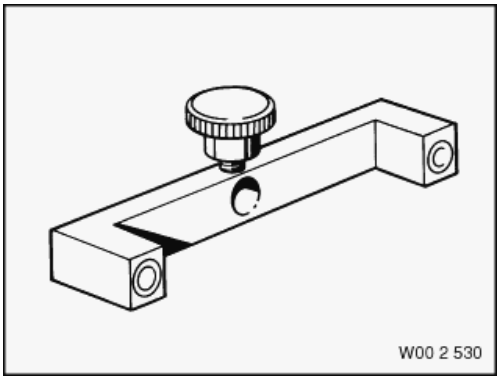
Common	Used in step 76
Usage	
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

0 495 104 (11 4 472) Extractor



Common	Used in step 76
Usage	(grindstone)
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

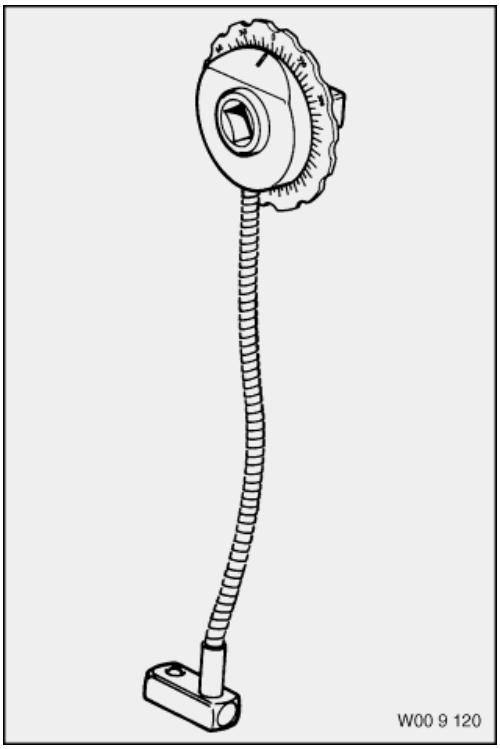
0 490 185 (00 2 530) Bridge



Common	Used in step 77
Usage	(Measuring bridge) For determining the piston projection (Diesel)
Included in the tool or work	
Storage location	A3
Replaced by	
In connection with	
SI-Number	

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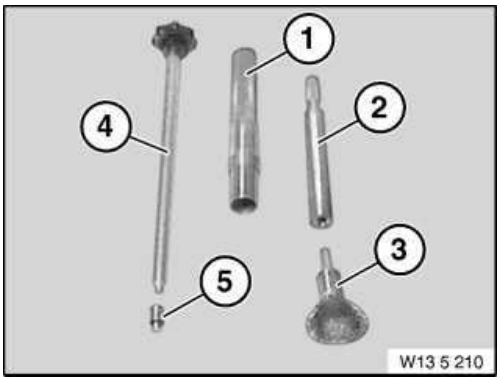
0 490 504 (00 9 120) Torque angle measuring dial



Common Used in step 79 116

Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

0 493 763 (13 5 215) Plug

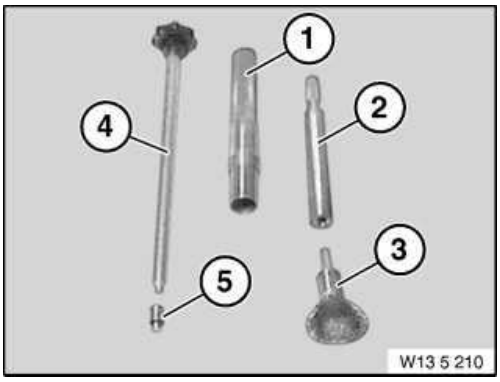


Common Used in step 90

Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

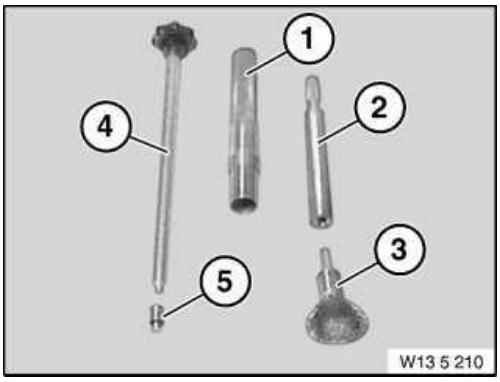
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0 493 762 (13 5 214) Rod



Common	Used in step 90
Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 758 (13 5 210) Tool



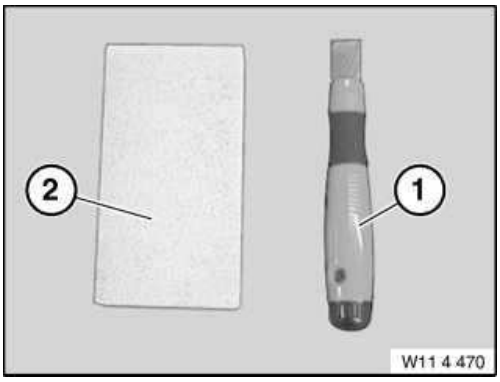
Common	Used in step 90
Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

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0 495 102 (11 4 470) Tool



Common Used in step 94

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

2 409 025 Puller



Common Used in step 111

Usage	For disassembly of the outer radial shaft seal of the transmission output shaft, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A76
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 411 739 Puller

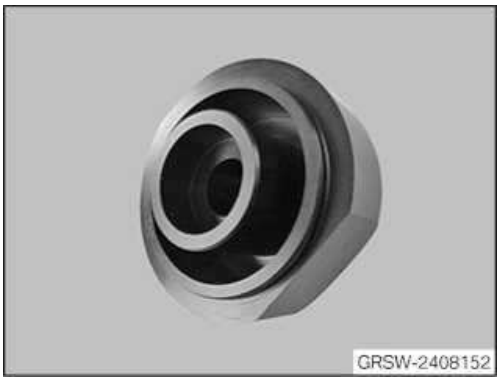


Common Used in step 111

Usage	For disassembly of the inner radial shaft seal of the output, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C78
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

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2 408 152 Striking element



Common Used in step 111

Usage	For installation of the right radial shaft seal transmission output shaft (inner). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

2 413 037 Handle



Common Used in step 111

Usage	Universal drift handle. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C77
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

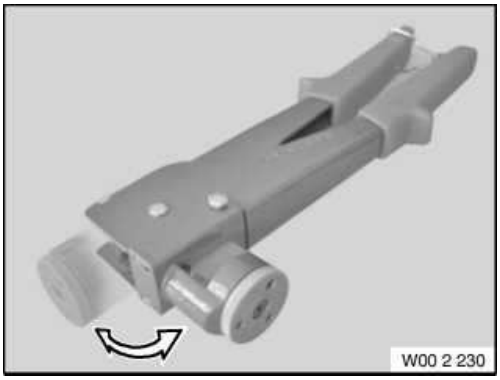
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2 408 150 Striking element



Common	Used in step 111
Usage	For installing the right radial shaft seal transmission output shaft (outer). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

0 496 521 (00 2 230) Pliers



Common	Used in step 129
Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

2 344 011 Tool



Common	Used in step 130
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

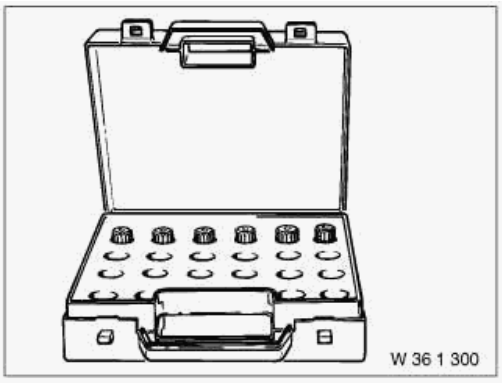
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0 495 221 (36 1 323) Wheel stud



Common	Used in step 23
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud



Common	Used in step 23
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud



Common	Used in step 23
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud



Common	Used in step 23
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 227 (36 1 329) Wheel stud



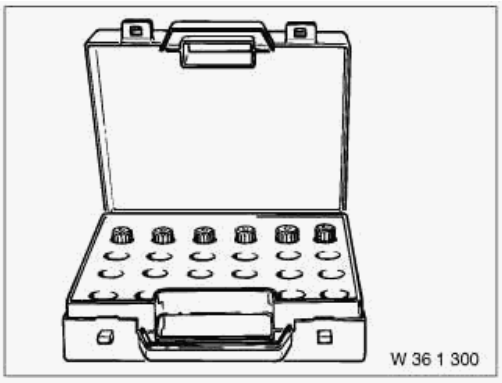
Common	Used in step 23
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud



Common	Used in step 23
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 229 (36 1 332) Wheel stud



Common	Used in step 23
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

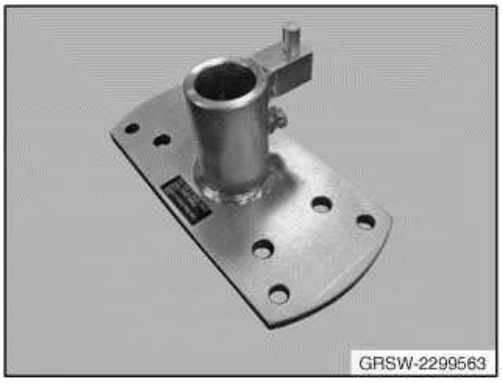
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0 495 230 (36 1 333) Wheel stud



Common	Used in step 23
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

2 299 563 Adapter



Common	Used in step 74 75
Usage	New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.
Included in the tool or work	0 495 187
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Valve underprotrusion	Used in step 77
	0,8 (0,7 - 0,9) mm

Transmission oil capacity	Used in step 150
Transmission oil GS6-60DA, GS6X60DA/Owner's Handbook	2,2 l

Transmission oil: Technically suitable manual gearbox oil

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	55 100
EGR controller	55 100

General repair instructions	Used in step

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61 20 ... Notes on AGM battery	142
61 12 ... Notes on intelligent battery sensor (IBS)	142
61 00 ... Notes for disconnecting and connecting battery	142
41 00 ... Notes on repairing threads	
61 00 ... Safety information for handling vehicle battery	

Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	12 44 45 47 48 49 50 51 52 63 72
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17 00 008 Draining and topping up coolant for high-temperature circuit	148
17 00 008 Draining and topping up coolant for high-temperature circuit	148
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	148
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	148
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	148
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	148
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17 00 039 Bleed the cooling system and check it for watertightness with the special tool	148

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17 00 039 Bleed the cooling system and check for watertightness with the special tool (coolant circuit for low temperature)	148
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	148
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	148
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	148
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	148
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	148
17 00 039 Bleeding the cooling system (B36, B38, B46, B48)	148
17 00 039 Bleeding cooling system (B37, B47)	148
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	148
17 00 039 Filling and bleeding the high-temperature cooling system vacuum filler device (B48)	148
17 00 008 Draining and topping up the high-temperature coolant circuit	148
17 00 008 Draining and topping up the high-temperature coolant circuit	148
17 00 016 Draining and topping up coolant circuit for Range Extender \PREMIUM	148
17 00 008 Draining and topping up the high-temperature coolant circuit	148
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	148
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	148
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	148
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	148
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	148
00 .. ... Raising the vehicle using a vehicle hoist	

Operating materials	Used in step
2.0 Grease for wheel centring	130
14.0 Automatic transmission fluid for ZF-transmission GA8HP45Z / GA8HP50Z / GA8HP70Z / GA8HP90Z / GA8P70H / GA8P75H / GA8HP75Z	149

Operating materials	Used in step

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	86
Exhaust-gas recirculation cooler seal on exhaust manifold	100
Exhaust-gas recirculation cooler seal on intake plenum	100

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11 34 055 Replacing all valve springs (B47)

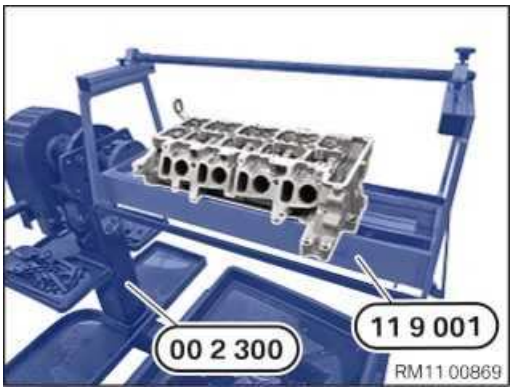
Special tools required:

- 11 9 001
- 00 2 300
- 11 9 006
- 11 9 007
- 11 9 008
- 11 9 005
- 11 9 000
- 11 9 009
- 11 8 840
- 11 9 010
- 11 4 480

Necessary preliminary tasks:

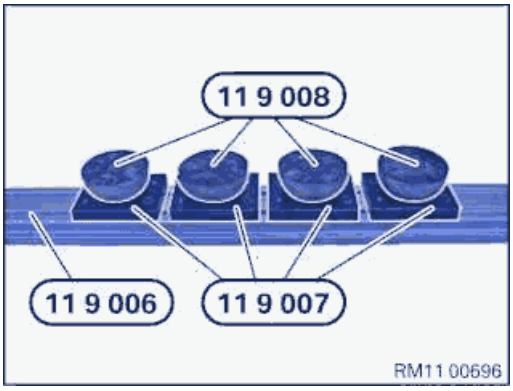
- Remove all hydraulic valve clearance compensating elements
- Remove all glow elements
- Remove cylinder head.
- Remove coolant temperature sensor
- Removing the exhaust gas manifold

Removal:



Mount and bolt cylinder head on special tools 11 9 001 and 00 2 300 .

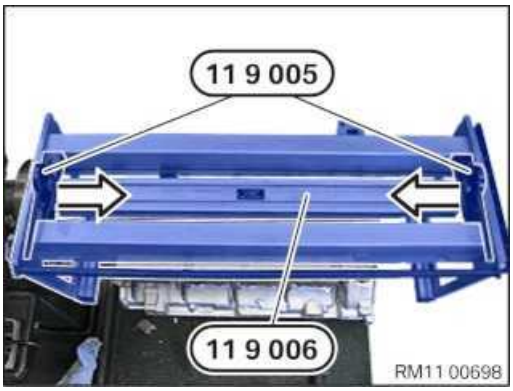
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Prepare special tools 11 9 006 , 11 9 007 and 11 9 008 as pictured.



Note:
Special tools 11 9 008 must be positioned accordingly in the next operation.



Turn special tool 11 9 006 over and insert as pictured.

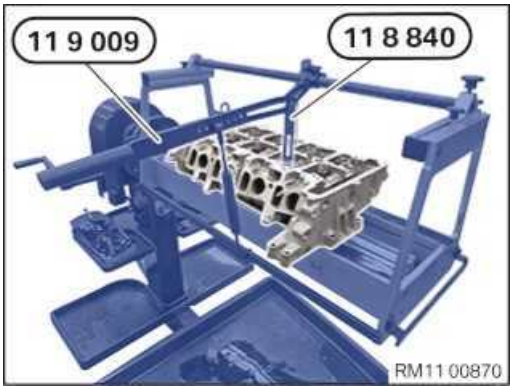
Lock special tool 11 9 005 in direction of arrow.



Lock special tool 11 9 005 in direction of arrow.

Rotate cylinder head, using special tool 11 9 000 , 180° into installation position.

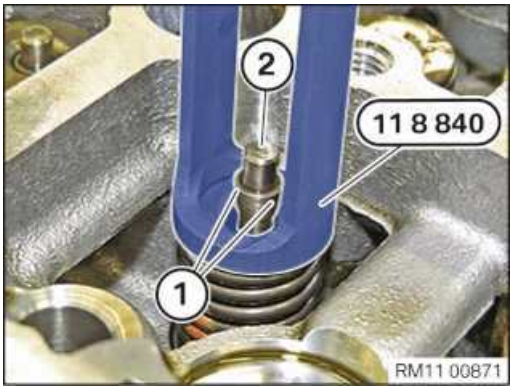
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Align special tool 11 9 009 in direction of valve axis. Select corresponding groove with special tool 11 8 840 .

Press down valve spring on upper spring cup with special tools 11 9 009 and 11 8 840 .

Valve spring can be held in pressed-down position with special tool 11 9 010 .



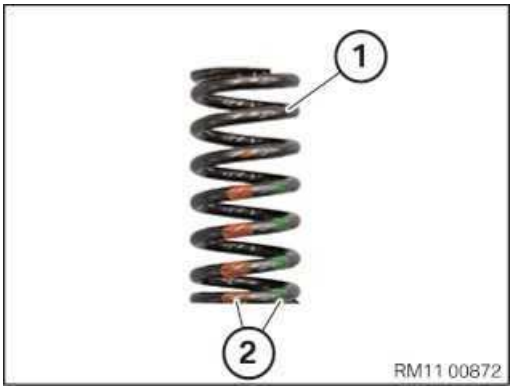
Keep valve spring pressed down with special tool 11 8 840 .

Use a magnet to remove valve keys (1) from valve (2).

Relieve load on valve spring. Remove valve spring and spring cup.

Set down valve spring, spring cup and valve keys in special tool 11 4 480 in an orderly manner.

Installation:

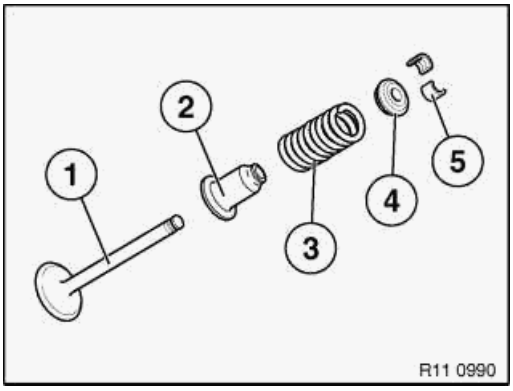


Colour code on valve spring (1).

Possible colour combinations (2):

- Yellow - orange
- Green - orange
- Blue - orange

The installation position of the valve spring can be freely selected.

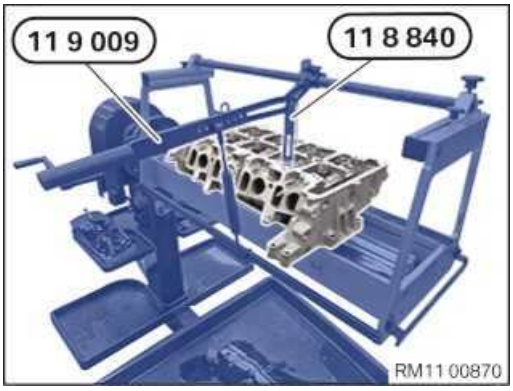


If necessary, replace valve stem seals.

Installation sequence:

1. Valve
2. Valve stem seal
3. Valve spring
4. Top spring cup
5. Valve keys

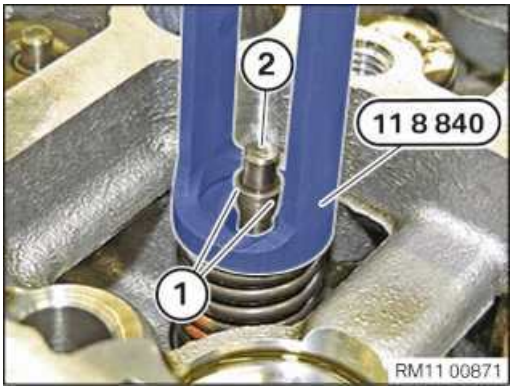
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Align special tool 11 9 009 in direction of valve axis. Select corresponding groove with special tool 11 8 840 .

Press down valve spring on upper spring cup with special tools 11 9 009 and 11 8 840 .

Valve spring can be held in pressed-down position with special tool 11 9 010 .



Keep valve spring pressed down with special tool 11 8 840 .

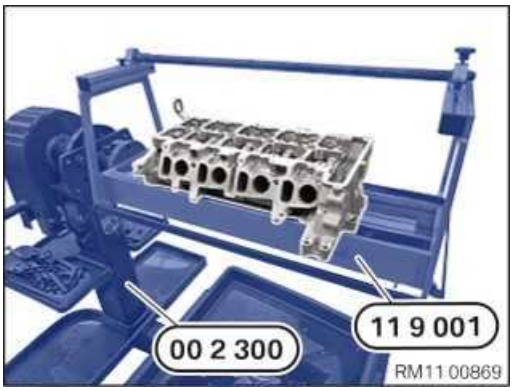
Use a magnet to install valve keys (1) on valve (2).

Relieve load on valve spring.



Unlock special tool 11 9 005 .

Remove special tool 11 9 006 .



Unscrew and remove cylinder head from special tools 11 9 001 and 00 2 300 .

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Required follow-up work:

- Mounting the exhaust manifold
- Install coolant temperature sensor
- Installing the cylinder head
- Install all glow elements
- Install all hydraulic valve clearance compensating elements
- Assemble engine

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11 34 190 Replacing all valve stem seals

WARNING

Vehicle may slip off the vehicle hoist if the vehicle hoist is handled incorrectly.

Danger! Life-threatening injuries!

- Observe safety information on raising the vehicle using a vehicle hoist.
- For additional information see: 00 ... Raising the vehicle using a vehicle hoist.

WARNING

Motor vehicle may slip off the vehicle hoist where components are supported.

Danger! Life-threatening injuries!

- Secure the vehicle hoist against lowering and lifting.

WARNING

Motor vehicle may slip off the vehicle hoist if the weight is distributed unevenly.

Danger! Life-threatening injuries!

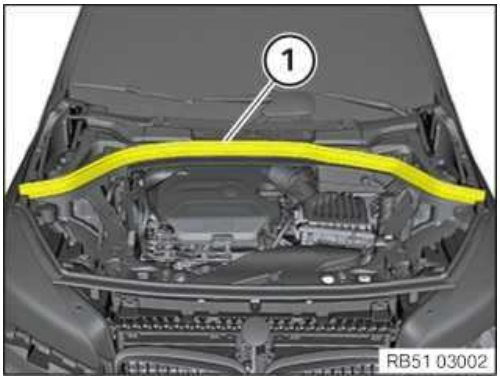
- Ensure there is a specific weight compensation on the motor vehicle.

PRELIMINARY WORK

1 – Remove the seal for the rear bonnet

NOTICE

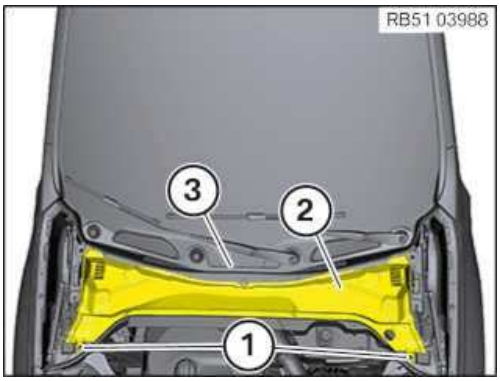
Schematic diagram is for example purposes. Some parts may differ in certain details.



- Pull off rear bonnet seal (1) towards the top and remove.

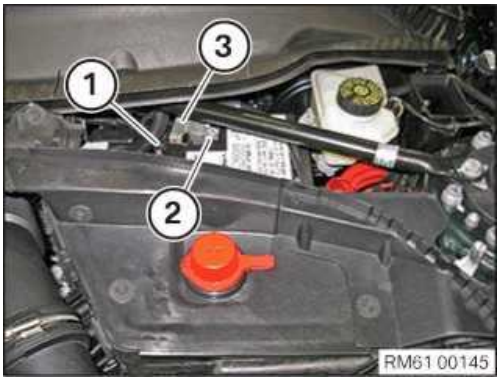
2 – Removing front cowl panel cover

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- Loosen the expanding rivet (1).
- Feed out and remove front cowl panel cover (2) from the rear cowl panel cover(3).

3 – Disconnecting the battery earth lead

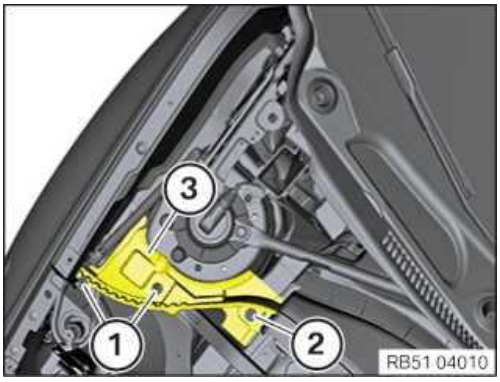


- Unlock plug connection (1) and disconnect.
- Unfasten nut (2).
- Remove the battery earth lead (3) and secure to one side.

4 – Remove suspension cross-brace

TECHNICAL INFORMATION

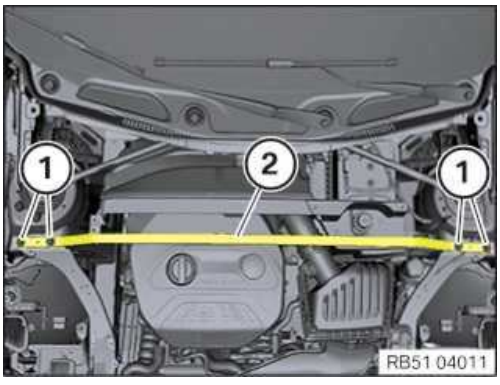
Driving without the strut brace/front end or tension strut is not permitted.



NOTICE

Description is for right component only. The procedure on the left side is identical.

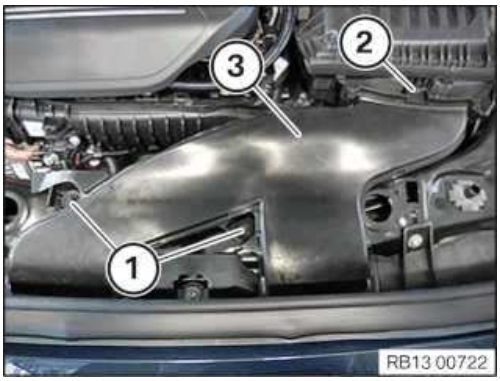
- Loosen expanding rivet (1).
- Loosen screw (2).
- Remove the cover (3).



- Loosen screws (1).
- Remove strut brace (2).

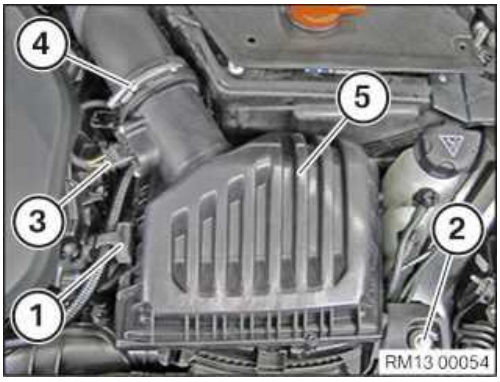
5 – Remove the intake neck for intake silencer housing

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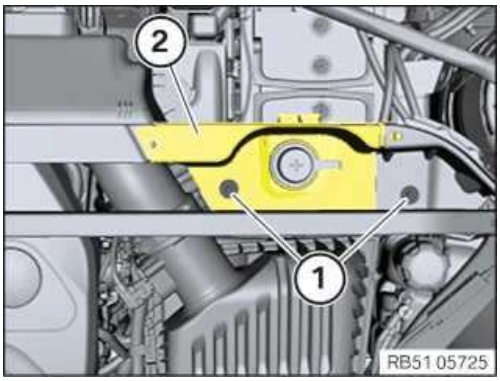
- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

6 – Removing intake silencer housing

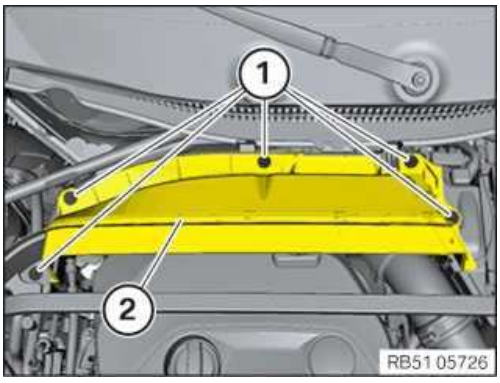


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

7 – Removing the upper bulkhead cover



- Loosen screws (1).
- Guide out and remove the cover (2).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

8 – Remove vehicle battery

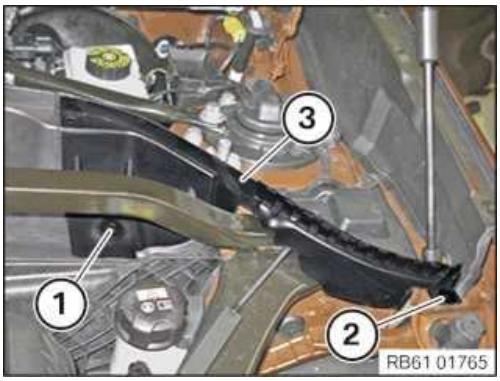
WARNING

Working on 12 V vehicle electrical system.

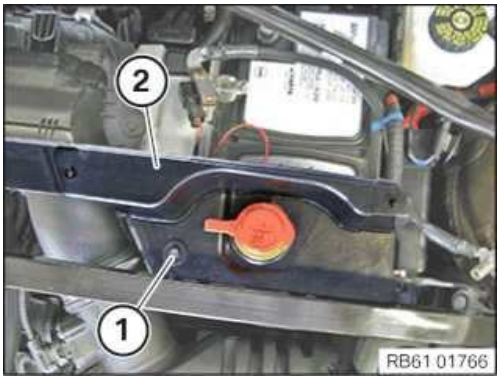
Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

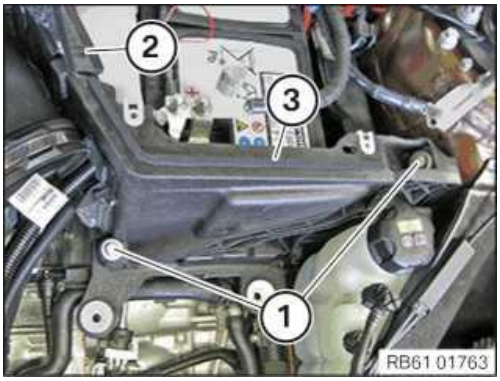
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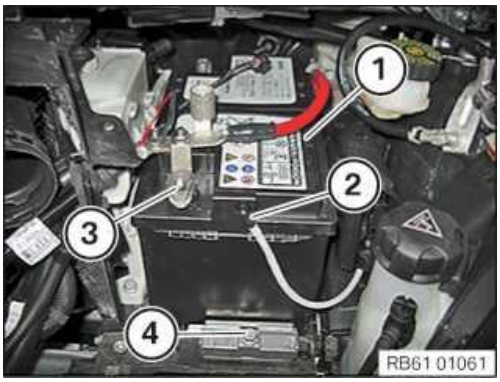
- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).



- Loosen screw (1).
- Remove the cover (2).



- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.



- Pull off the vent hose (2).
- Slacken the nut (3) on the positive battery terminal and remove the positive battery terminal.

WARNING

Unprotected battery terminals.

Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

9 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

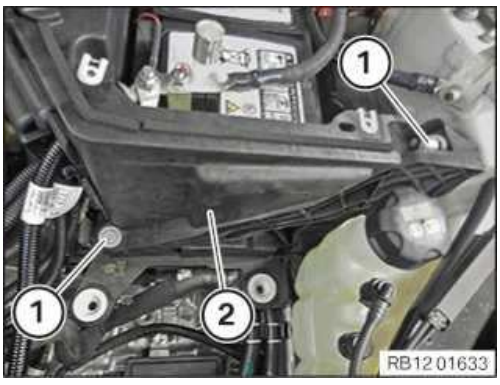
TECHNICAL INFORMATION

Follow instructions for removing and installing control units.

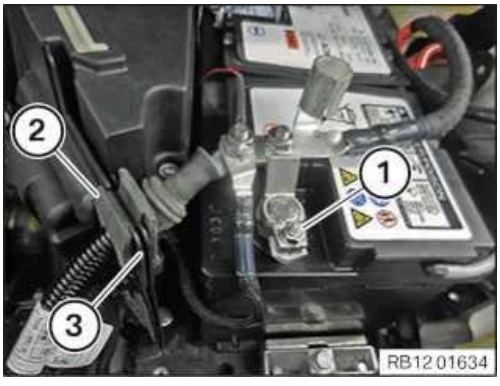
For additional information see: 12 00 ... Notes on removal and installation of control units

TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.

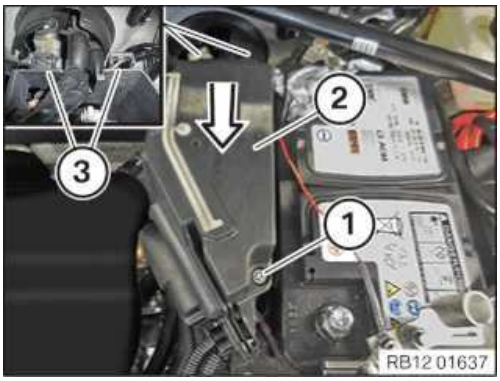


- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.

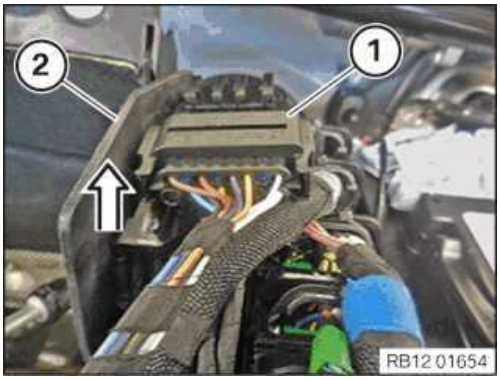


- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

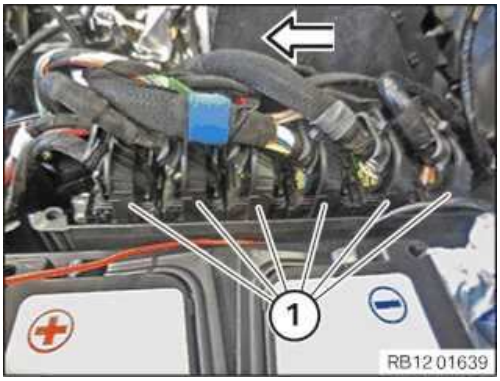
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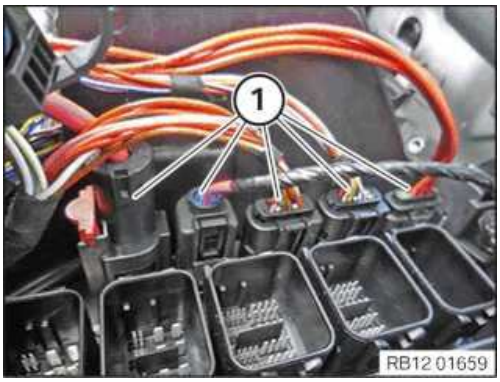
- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



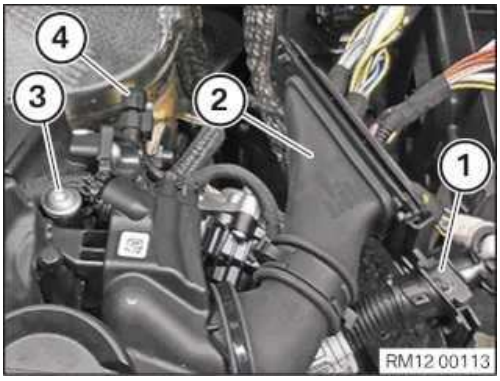
- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).



- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

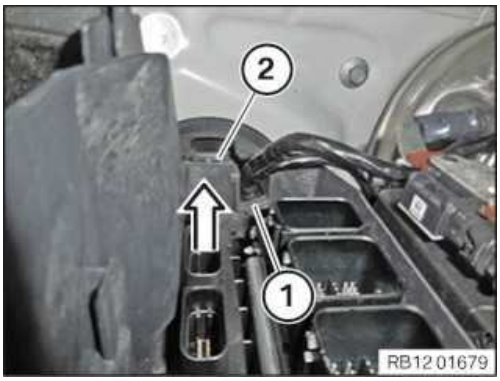


- Unlock and loosen connector (1).

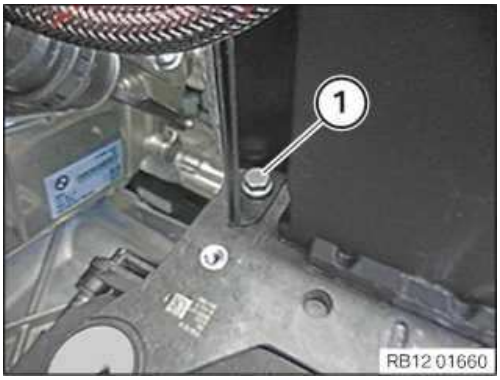


- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.

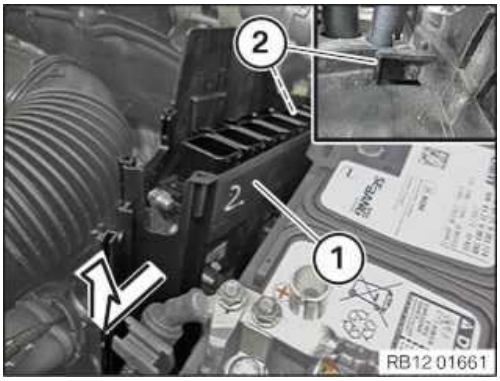
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- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.

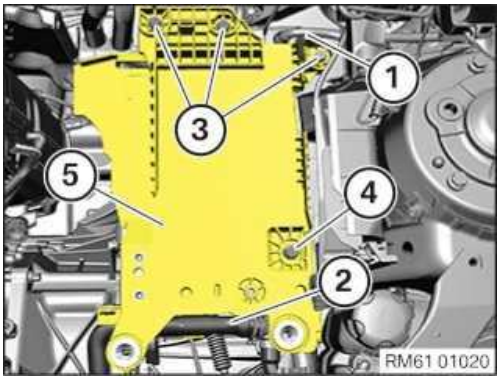


- Loosen screw (1).



- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

10 – Remove battery holder



- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

11 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

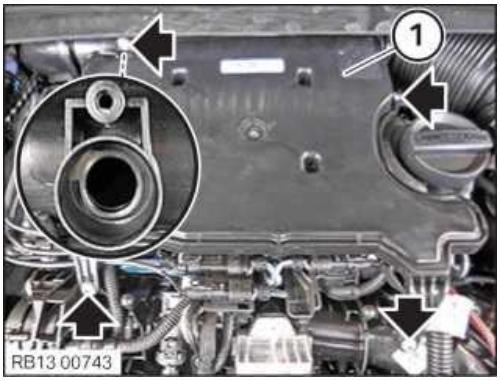
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

12 – Remove resonator

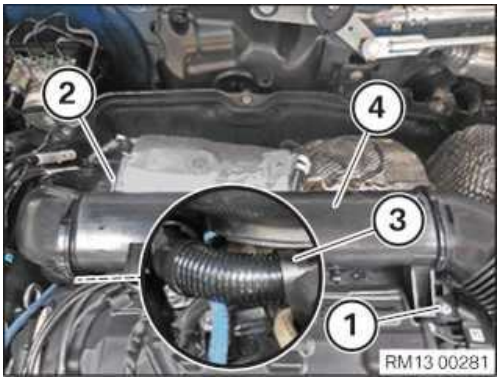


- Remove screws (arrows).
- Guide out and remove the resonator (1).

13 – Removing clean air pipe



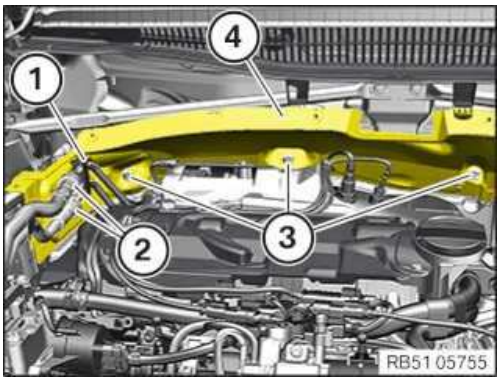
- Detach clamp (1) on the clean air pipe.
- Pull off the clean air pipe from the intake silencer housing.



- Loosen screw (1).
- Loosen clamp (2).
- Unlock the ventilation line (3) and pull it off the cylinder head cover.
- Feed out clean air pipe and remove.

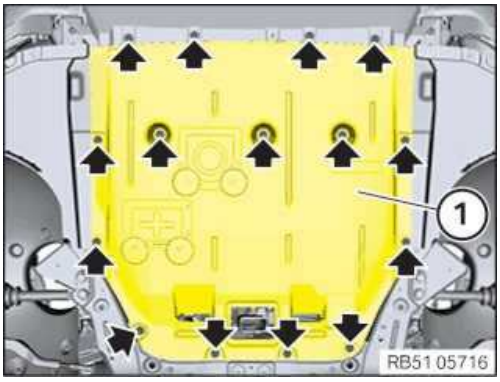
14 – Remove the rear bulkhead upper part

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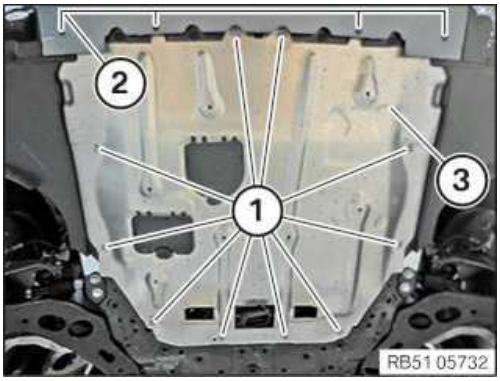


- Unlock the holder (1) and disconnect.
- Guide out and remove the fuel lines (2).
- Loosen screws (3).
- Guide out the rear bulkhead upper part (4) and remove.

15 – Removing the front underbody protection

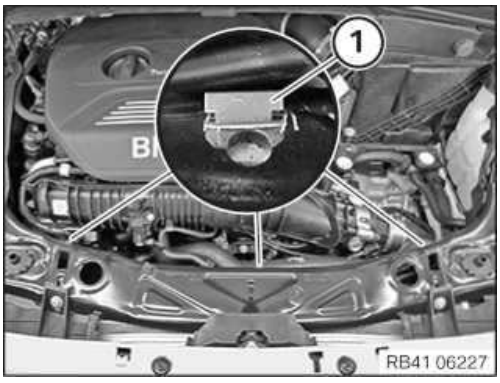


- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.

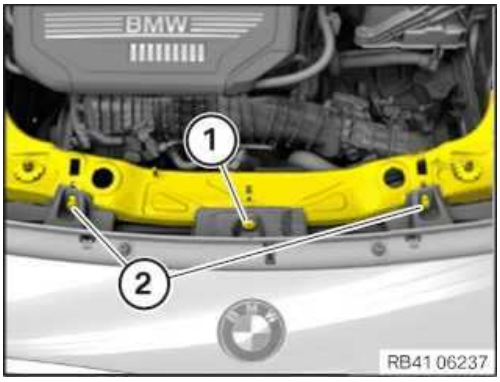


- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

16 – Remove front cross connection

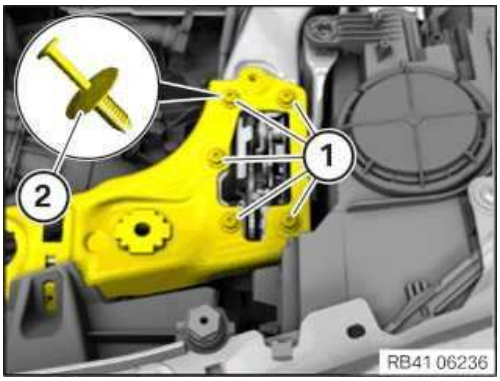


- Detach the clamps (1) for the Bowden cable of the bonnet locks from the cross connection.

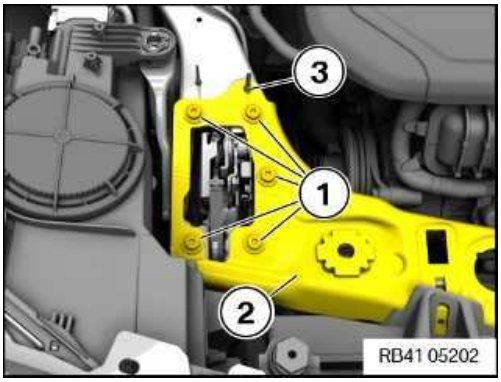


- Loosen screw (1).
- Loosen screws (2).

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- Loosen screws (1).
- Lever out expanding rivet (2).



- Loosen screws (1).
- Unclip the front cross connection (2) from the rubber retainer (3) and remove it upward.

17 – Draining coolant

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

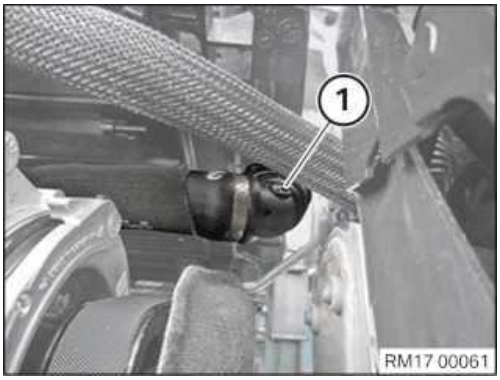
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

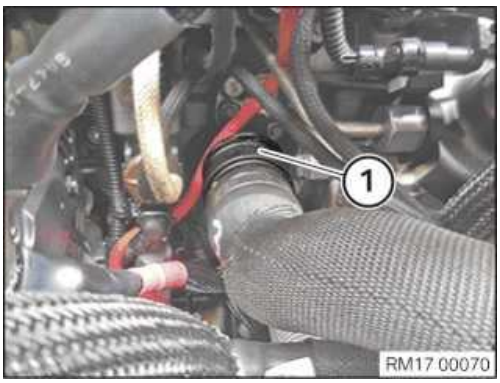
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- Loosen sealing cap (1).



- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.

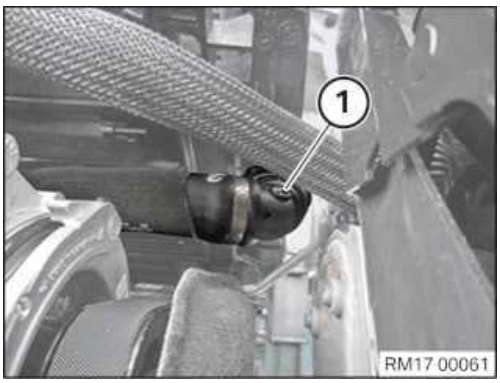


- Unlock the coolant line (1) and pull it off the connecting branch.
- Catch and dispose of escaping coolant.

18 – Connect the coolant line

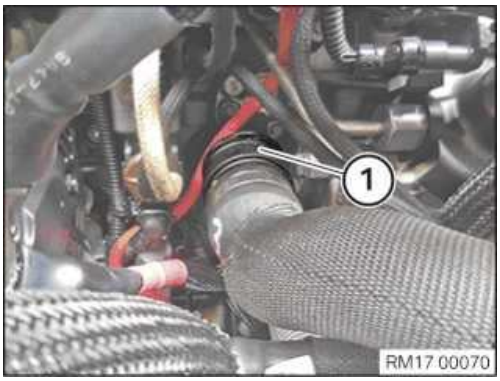
TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Connect the right coolant line (1) to the radiator and lock audibly.

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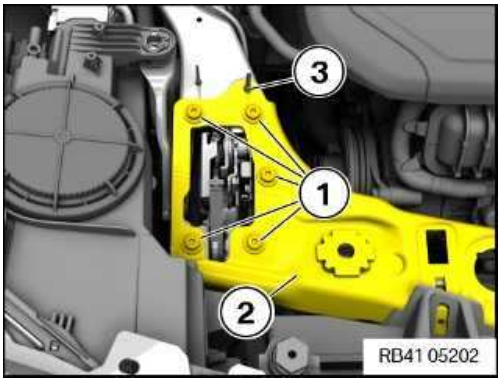


- Connect the coolant line (1) to the connecting branch and lock audibly.

19 – Install front cross connection



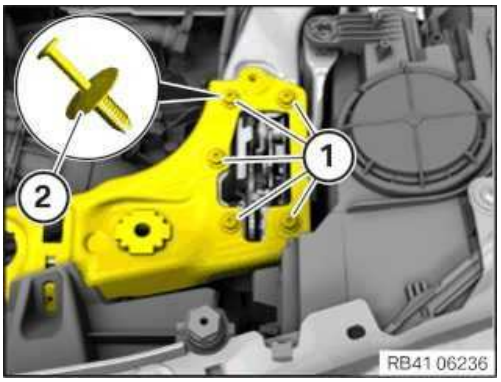
- Right side of vehicle only: Secure spray guard (1) on the cross connection (2) as pictured.



- Position front cross connection (2) and clip front cross connection (2) into the rubber retainer (3) at the same time.
- Tighten the screws (1).

Cross connection to carrier support

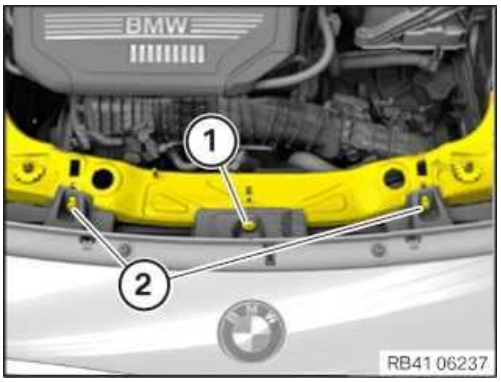
Screws M6x20		Tightening torque	11,8 Nm



- Tighten the screws (1).

Cross connection to carrier support

Screws M6x20		Tightening torque	11,8 Nm



- Position screws (3) on the rubber mounts for the radiator and tighten.

Screw connection for rubber mount of coolant radiator to coolant radiator

Bolt to rubber mount		Tightening torque	8 Nm

- Tighten down screws (2).

Air duct to upper connection

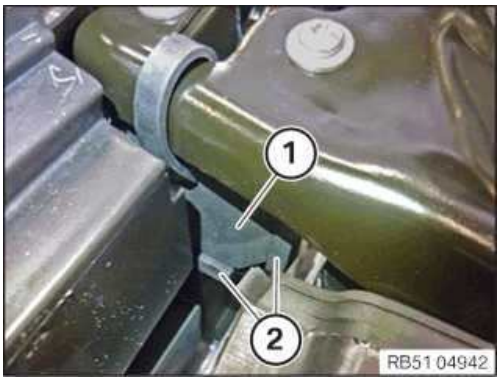
M6x20 screw		Tightening torque	11,8 Nm

- Tighten down screw (1).

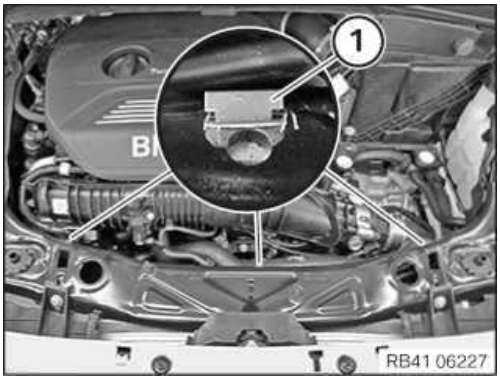
Bracing strut to upper connection

M8x20 screw		Tightening torque	28 Nm

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- Right side of vehicle only: Properly mount spray guard (1) to prevent corrosion.
- Secure spray guard (1) to the bridge with retaining tabs (2).



- Fasten the clamps (1) from the Bowden cable of the bonnet lock on the cross connection.

20 – Removing heat shield from top exhaust turbocharger

WARNING

Hot surfaces.

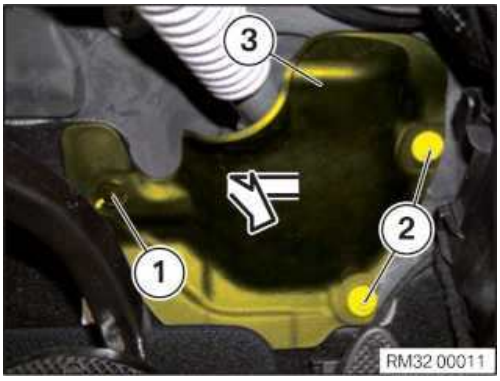
Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from holders.
- Release the screws (1) at the top and bottom of the heat shield.
- Feed out and remove the heat shield (2).

21 – Releasing lower steering shaft from steering gear

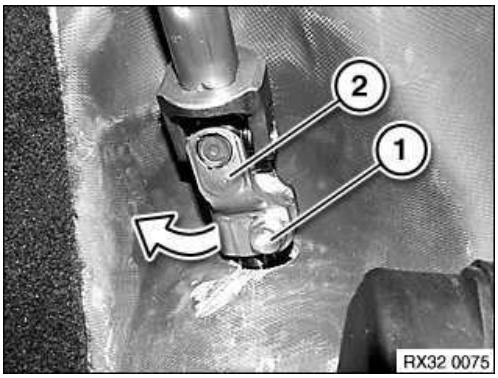


- **If installed:**
- Unfasten nut (1).
- Unscrew the nuts (2) by 1 rotation.

  Do not remove the nuts (2) !
- Remove the cover (3) on the steering column in the direction of the arrow.

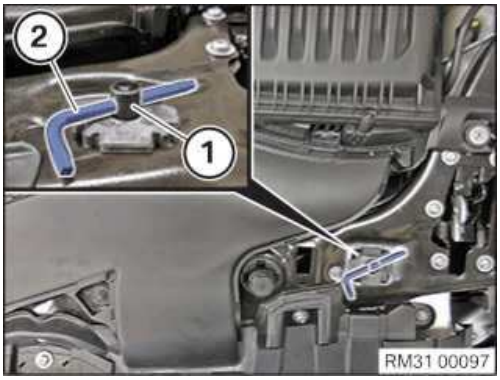
  The side footwell trim must not be disassembled!

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- Loosen screw (1).
- Swivel out the universal joint (2) of the bottom steering shaft from the steering gear in the direction of the arrow.

22 – Securing radiator on left and right



NOTICE

Perform the operations on the left and right side.

- Fasten radiator at centring pin (1) with suitable tool (2).

23 – Removing both front wheels

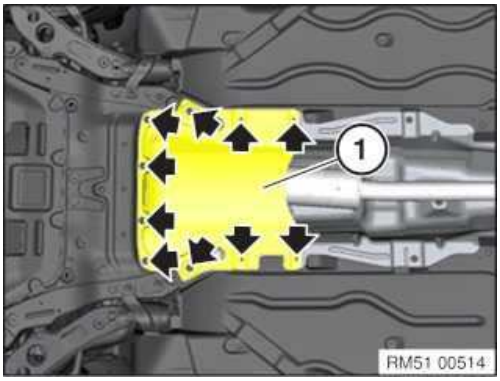
▶ **Removing the wheel**



- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Unscrew the wheel bolts (arrows) and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

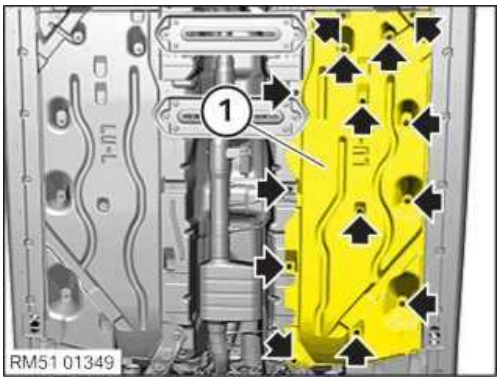
24 – If installed: Removing rear underbody protection



- Remove screws (arrows).
- Remove the rear underbody protection (1).

25 – Removing right underbody panelling

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- Unscrew all bolts and nuts (arrows).
- Remove the underbody panelling (1).

26 – Removing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

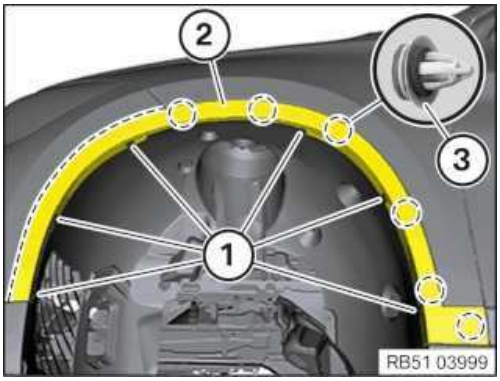
▶ **Remove the front wheel arch trim**

NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

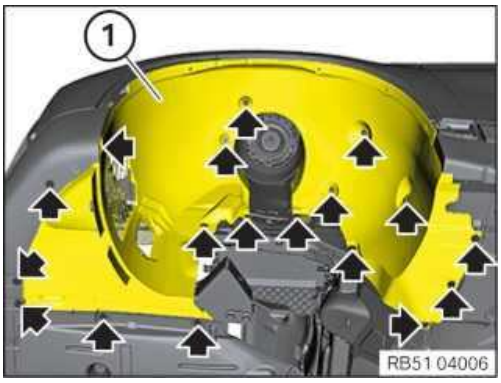
NOTICE

Description is for left component only. Procedure on the right side is identical.



- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.

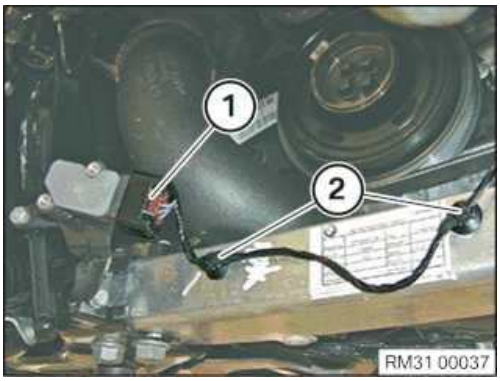
▶ **Remove front wheel arch cover**



- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

27 – With right installation: Detaching ride height sensor cable

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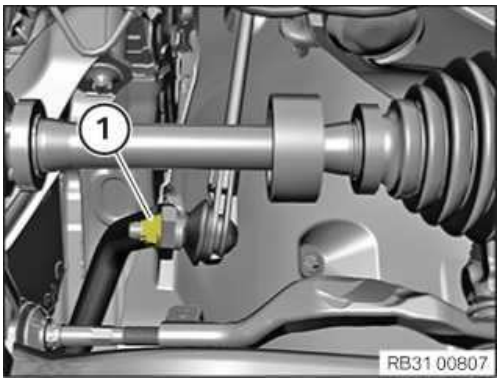
- Unlock plug connection (1) and disconnect.
- Release cable clip (2) from deformation element adapter.

28 – Releasing anti-roll bar on left and right from anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▶ Detach the anti-roll bar from the anti-roll bar link

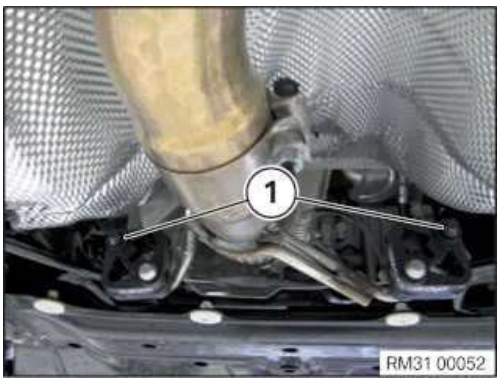


- Unfasten nut (1).

Note: Use the Torx socket for counter support.

- Loosen the anti-roll bar link from the anti-roll bar .

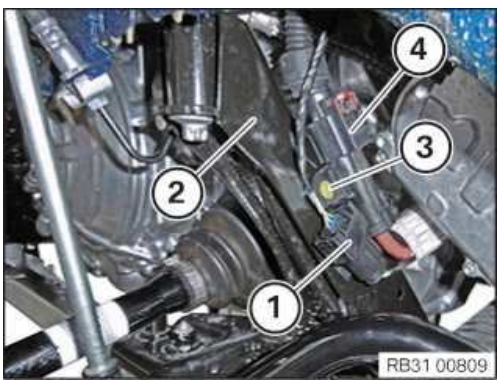
29 – Detaching rubber mount from front axle support



- Spray rubber mount (1) with lubricant and release from holder on front axle support.

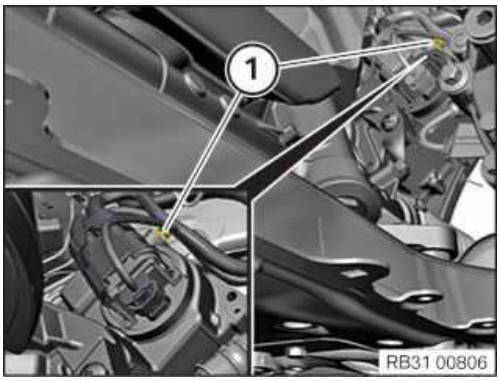
30 – Disconnecting plug connections from steering gear

▶ If installed: Detach connectors from the front axle carrier

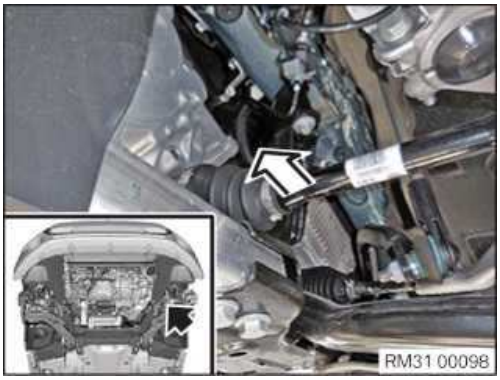


- Release the plug connection (1) from the front axle support (2).
- Loosen screw (3).
- Release the plug connection (4) from the front axle support (2).

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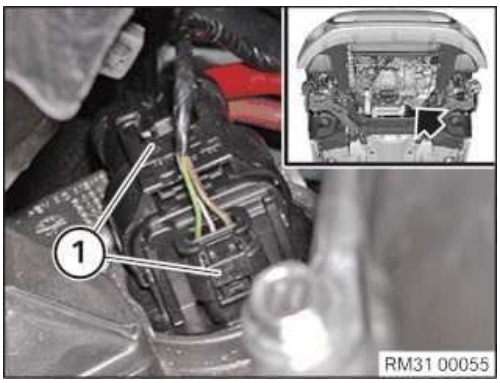


- Disconnect wiring harness (1) from steering gear.



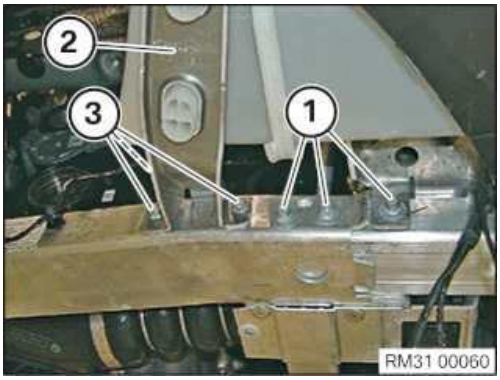
- To unlock the plug connections (see the following work step): unlock plug connections (arrow) with the right hand.

  The plug connections can be reached via the left-hand output shaft.



- Unlock plug connections (arrow) (1)and disconnect from the steering gear.
- Make sure when lowering the front axle that the cables are not damaged!

31 – Releasing the mounted part from the front axle support

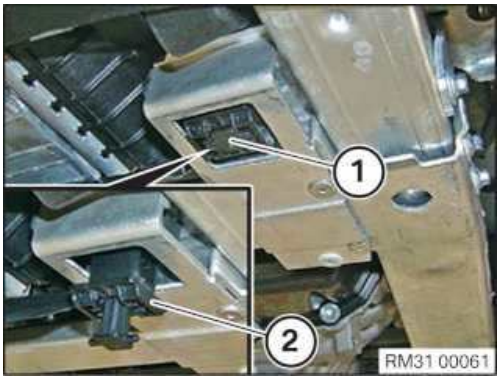


- **Only on right side:** Loosen screws (3) and remove holder for washer fluid reservoir (2).

NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).



NOTICE

Perform the operations on the left and right side.

- Unlock safety catch (1) of the lock (2) from the holder for the charge air cooler.
- Completely remove locks (2).

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- Loosen screw (2) of the engine support (3) on the front axle (1).

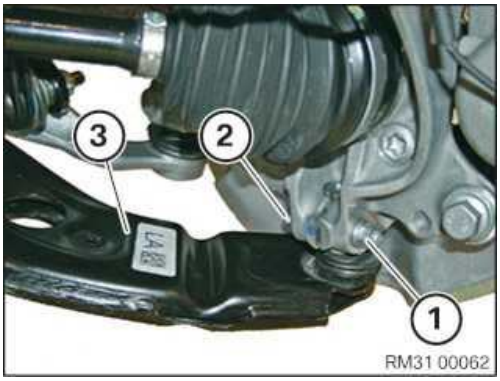


NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

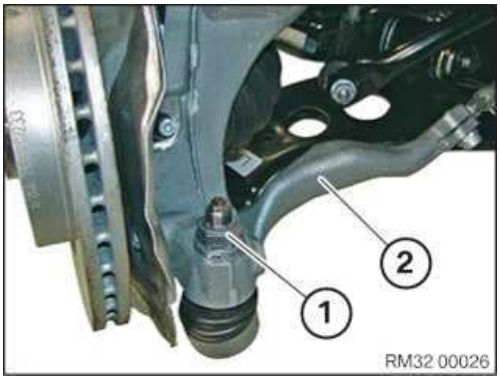
32 – Detaching and removing front axle completely



NOTICE

Perform the operations on the left and right side.

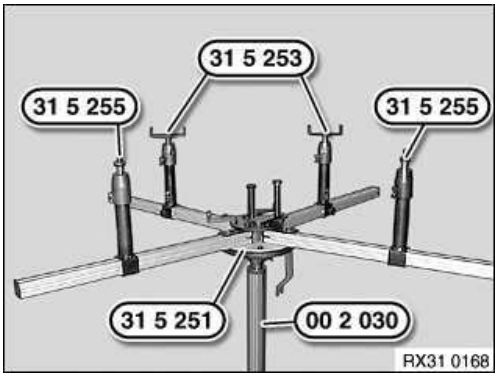
- Unfasten nut (1).
- (2)Pull out screw.
- Detach the wishbone (3) from the swivel bearing .



NOTICE

Perform the operations on the left and right side.

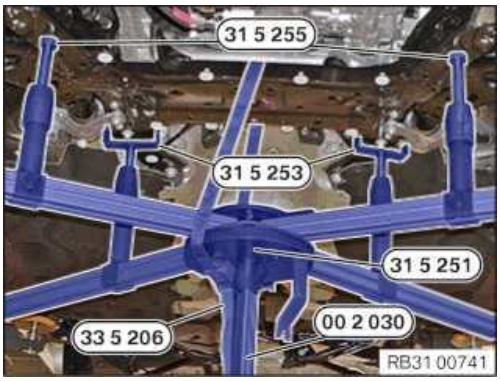
- Unfasten nut (1).
- Detach the track rod (2) from the swivel bearing.



- Fit the special tool completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools in telescopic supports of a profile rail pair.
- Insert special tools in telescopic supports of other profile rail pair.

Note: In a profile rail pair, two profile rails are connected to one another by gearing.

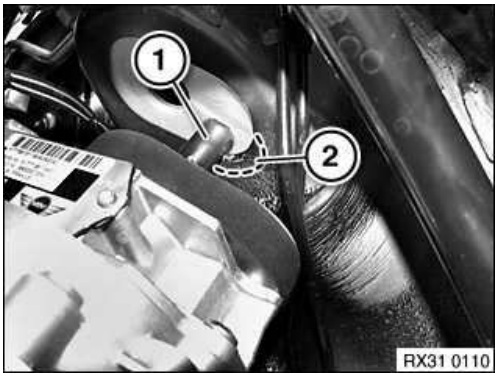
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- Align special tools and to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool to special tool .

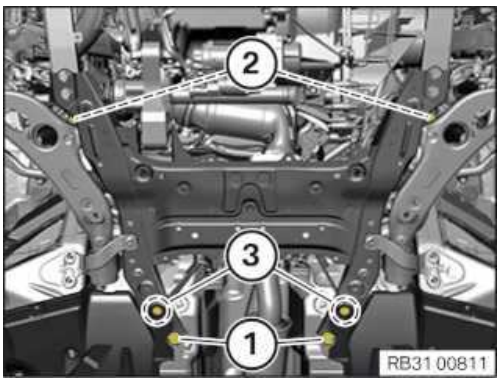


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



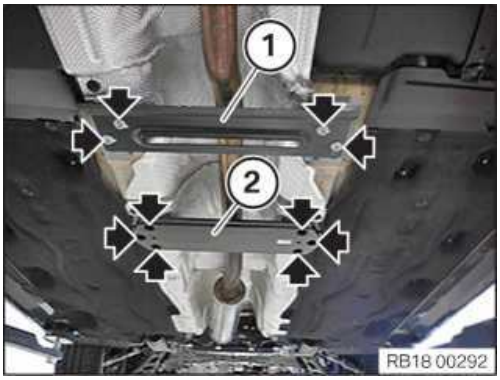
- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and remove the front axle.

TECHNICAL INFORMATION

Note the information on thread repairs using Helicoil thread inserts.
For more information see: 41 00 ... Notes on repairing threads

- Check threads for damage; if necessary, repair with Helicoil thread inserts.

33 – Removing the connecting support from the tunnel in front and back



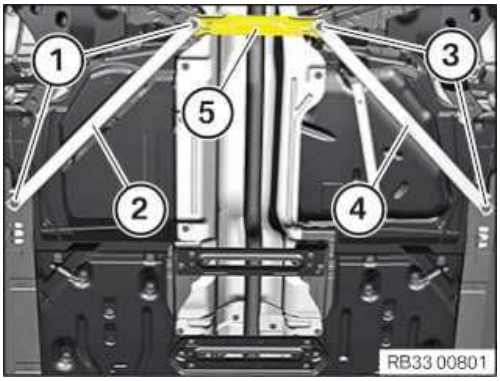
- Unscrew the bolts (arrows) from the connecting support (1).
- Feed out and remove the crossbeam (1).
- Unscrew the bolts (arrows) from the connecting support (2).
- Feed out and remove the crossbeam (2).

34 – Remove the cross strut with the torsion strut

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TECHNICAL INFORMATION

Driving without a torsion strut is not permitted.



- Loosen screws (1).
- Thread out torsion strut (2) at left and remove.
- Loosen screws (3).
- Thread out torsion strut (4) at right and remove.
- Feed out and remove the cross-member (5).

35 – Remove exhaust system

WARNING

Hot surfaces.

Risk of burning!

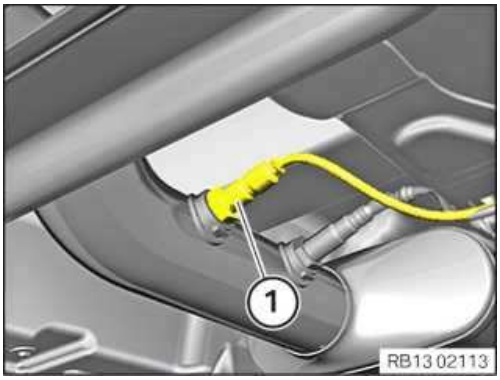
- Perform all work only on components that have cooled down.

CAUTION

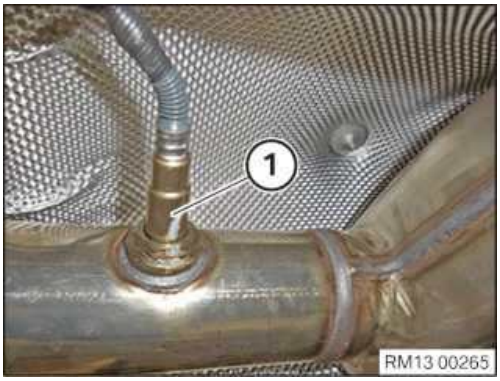
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

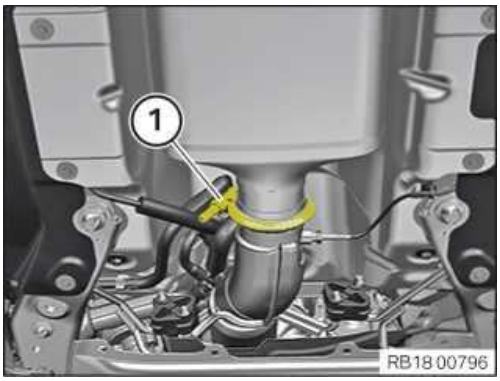


- Release the nitrogen oxide sensor (1) downstream of the SCR catalytic converter, guide it out and set it aside.

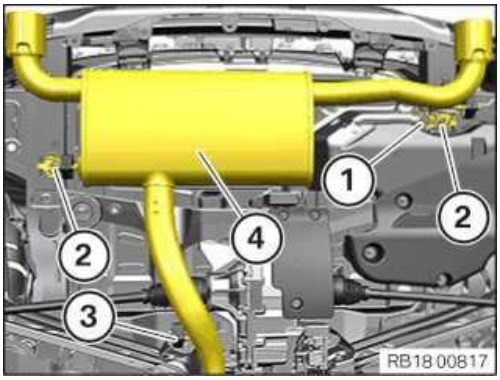


- Release the diesel particulate sensor (1), guide it out and set it aside.

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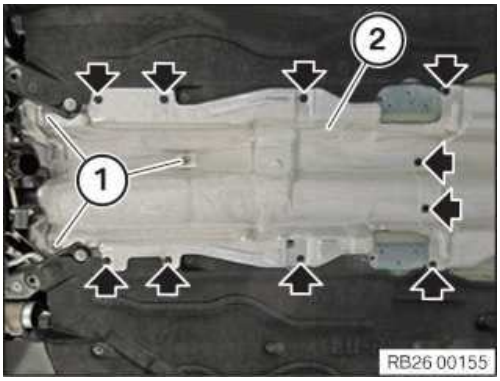


- Loosen V-band clamp (1).



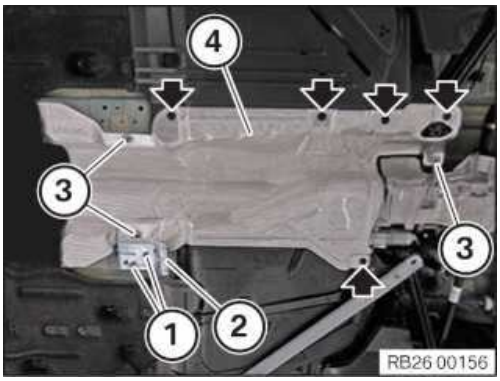
- Loosen screw (1).
- Loosen nuts (2).
- Release the rubber mount (3) of the exhaust system (4).
- Lower and guide out the exhaust system (4) with assistance of a second person and remove it.

36 – Remove front heat shield



- Remove screws (arrows).
- Loosen nuts (1).
- Guide the heat shield (2) out and remove it.

37 – Remove heat shield at rear.



- Loosen screws (1).
- Guide out and remove holder (2).
- Remove screws (arrows).
- Loosen nuts (3).
- Guide the heat shield (4) out and remove it.

38 – Remove propeller shaft

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CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

RISK OF DAMAGE

Damage to propeller shaft during removal.

Non-observance of the removal guidelines for the propeller shaft on the rear axle differential may cause severe damage.

- Do not disassemble the three-hole flange, flexible disc and propeller shaft. The three-hole flange to the rear axle differential is balanced with the flexible disc and propeller shaft.
- Loosen the recessed nut against the direction of travel in clockwise direction. The propeller shaft must be loosened on the recessed nut only and exclusively in the direction of rotation otherwise the anti-twist lock of the bi-hexagonal flange nut is damaged.
- In the event of a damaged anti-twist lock on the bi-hexagonal flange nut: Replace the rear axle differential.



- Install the special too l between the front and rear propeller shaft.
- Make sure that the arrows on the special tool point forward in the direction of travel.

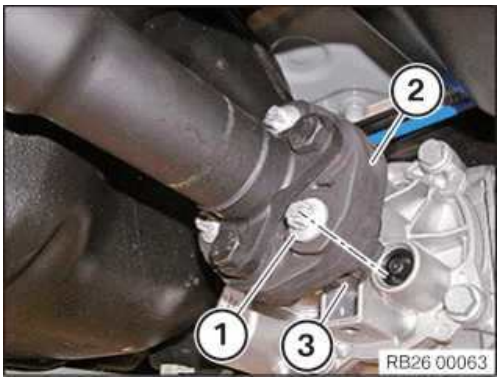


- Always support the propeller shaft (1) with a conventional jack.



- Protect the propeller shaft (1) with the special tools **0 495 554 (33 5 070)** and from twisting.

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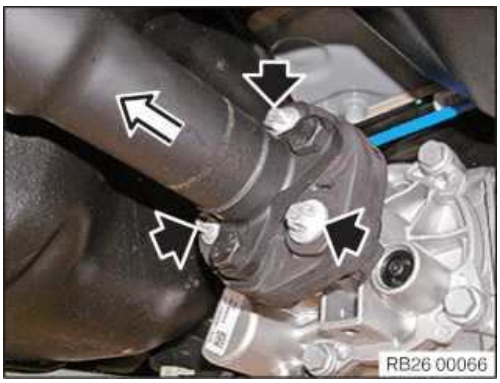
TECHNICAL INFORMATION

Compliance with the following instructions is required to avoid a humming noise from the propeller shaft after refitting the propeller shaft.

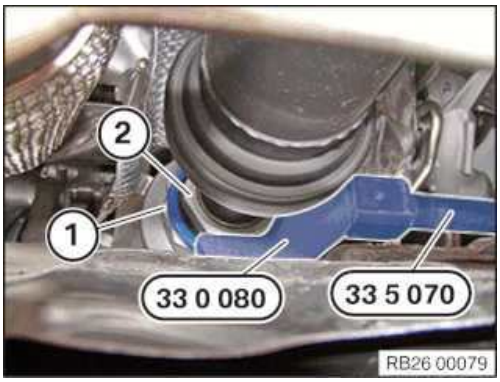
- Mark the installation position of the screw connection (1), the flexible disc (2) and the three-hole flange (3) on the same level.
- Loosen the screw connection (1).



- Loosen screws (1).



- Remove screws (arrows).
- Guide the propeller shaft out in the direction of the arrow and set it aside.



RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.

- Protect the recessed nut (2) on the transfer box from twisting with the special tools **0 495 554 (33 5 070)** and .

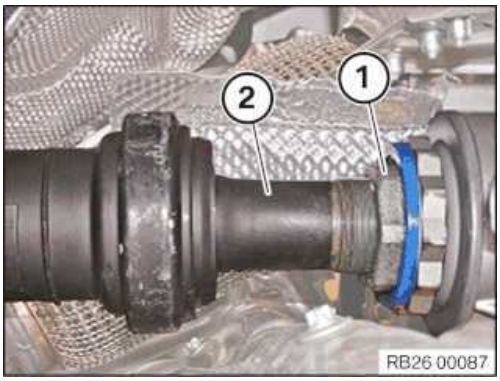
  The recessed nut (2) on the transfer box must **not** be used to detach the propeller shaft.

  The double hexagon flange nut (1) must **not** be used for counter support.

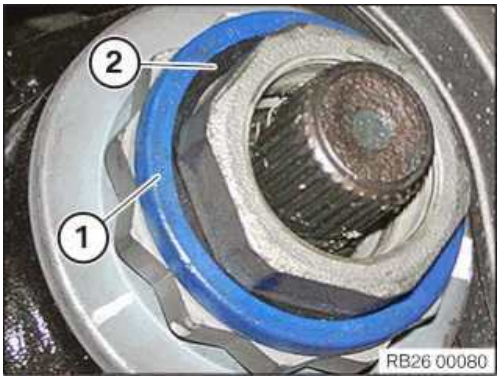


- Release the front propeller shaft with the special tools **0 495 554 (33 5 070)** and in the direction of the arrow.

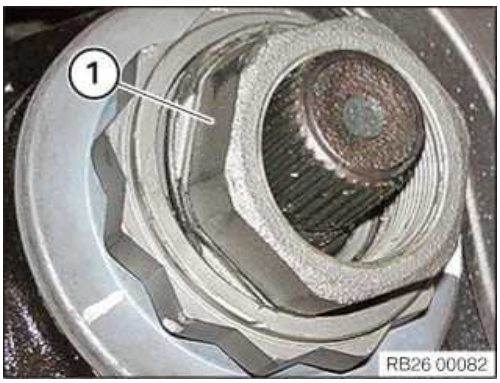
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- Thread the propeller shaft (2) out of the recessed nut (1) and remove.



- Thread the retaining clip (1) and the seal (2) out and remove.



- Thread out and remove the recessed nut (1).

39 – Removing starter motor

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and loosen connector (1).
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).



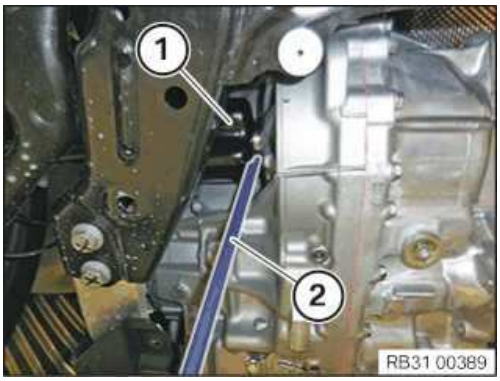
- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.



- Loosen screws (1).
- Feed out starter motor and remove.

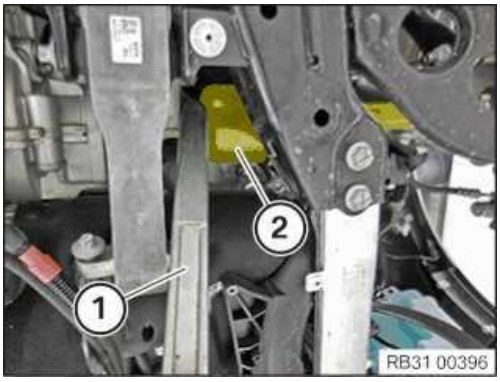
40 – Partially removing the left output shaft

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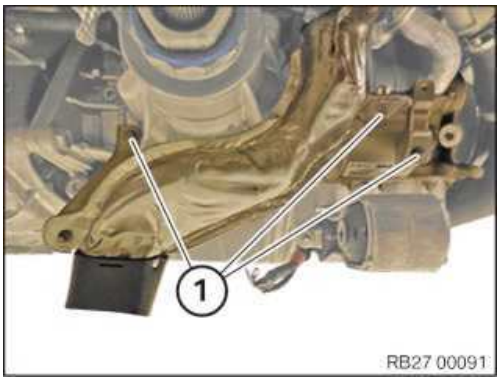
- Protect the output shaft (1) from falling.
- Lever out the output shaft (1) with a mounting lever (2) from the transmission.
- Tie up output shaft (1).

41 – Partially removing right output shaft

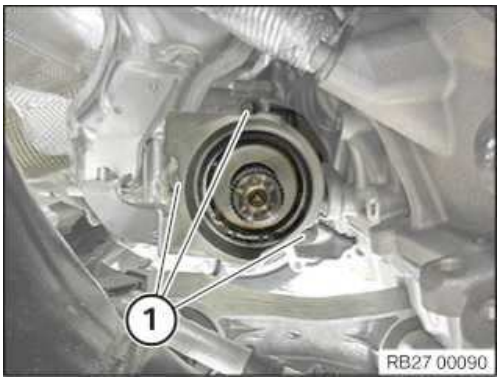


- Lever out the output shaft (2) with a mounting lever (1).
- Tie up output shaft (1).

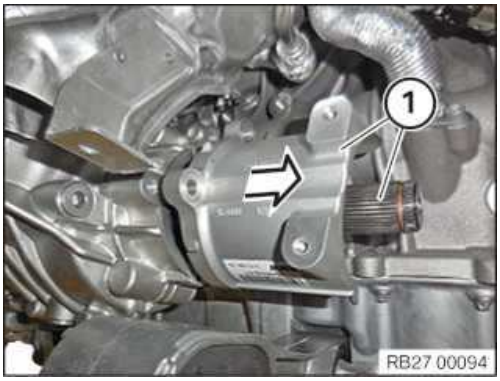
42 – Remove the intermediate shaft with the support tube



- With air duct installation: Loosen screws (1).
- Remove air duct



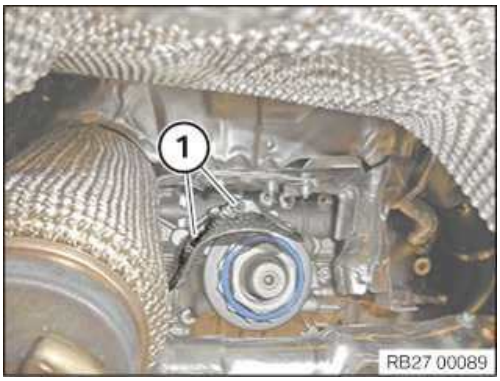
- Loosen screws (1).



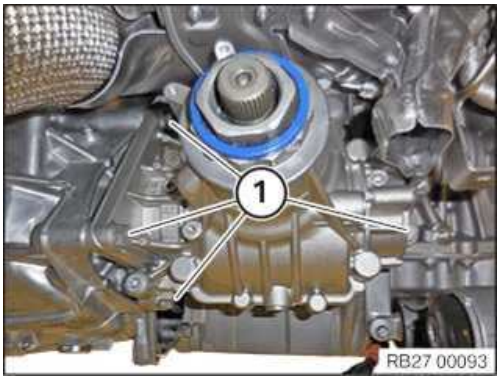
- Pull the intermediate shaft with the support tube (1) out of the transfer box.

43 – Remove transfer box (VTG)

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- Loosen screws (1).
- Remove heat shield.



- Loosen screws (1).
- Remove the transfer box (VTG).

44 – Remove the monitoring oxygen sensor

WARNING

Hot surfaces.

Risk of burning!

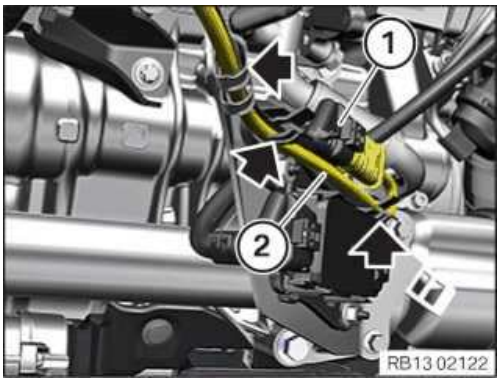
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

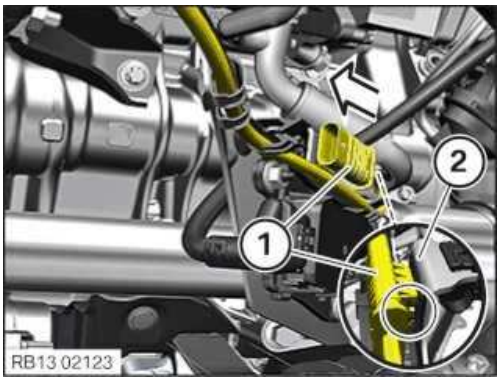
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

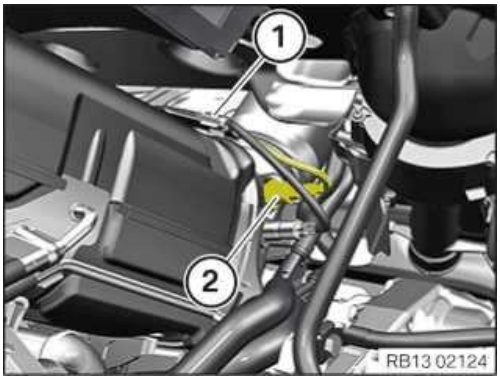


- Unlock plug connection (1) and disconnect.
- Feed oxygen monitor sensor cable (1) out of the clamps (arrows).

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- Unlock the connector (1) in the marked area and disconnect it from the holder (2) in the direction of arrow.



- Guide the cable of the monitoring oxygen sensor (2) out of the clamp (1).
- Release the monitoring oxygen sensor (2) using special tool **0 491 074 (11 7 020)**.
- Remove the monitoring oxygen sensor (2).

45 – Removing the nitrogen oxide sensor before SCR catalytic converter

WARNING

Hot surfaces.

Risk of burning!

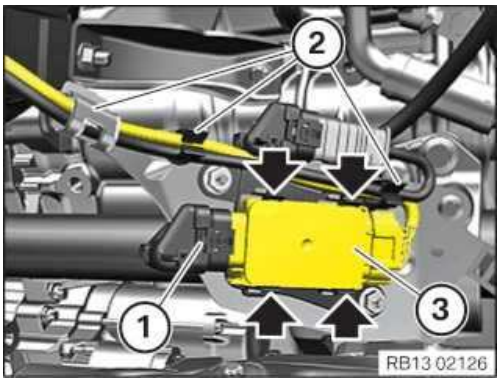
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

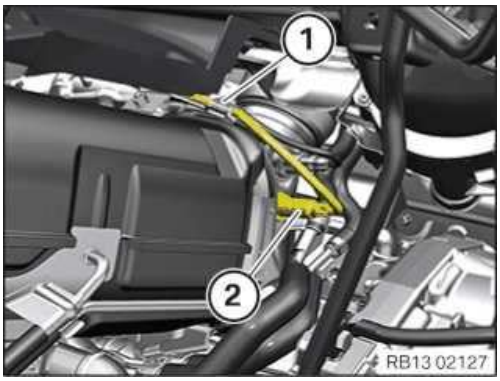
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



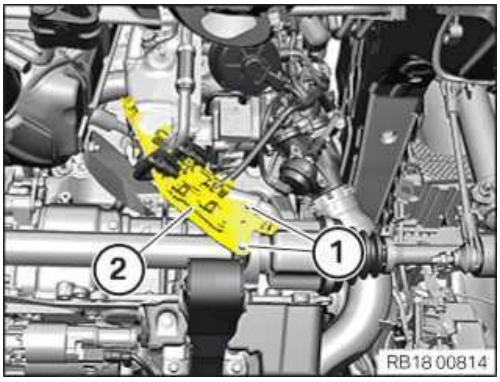
- Unlock plug connection (1) and disconnect.
- Slide the cable of the nitrogen oxide sensor evaluation electronics (3) out of the clamps (2) and remove.
- Unlock (arrows) and remove the evaluation electronics for the nitrogen oxide sensor (3).

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- Slide the cable of the nitrogen oxide sensor before the SCR catalytic converter (2) out of the clamps (1) and remove.
- Detach the nitrogen oxide sensor before the SCR catalytic converter (2) using the special tool **0 491 074 (11 7 020)**.
- Guide out and remove the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

46 – Remove holder for oxygen sensor



- Loosen screws (1).
- Thread out the holder (2) for the oxygen sensor and remove.

47 – Remove the exhaust temperature sensor on the catalytic converter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

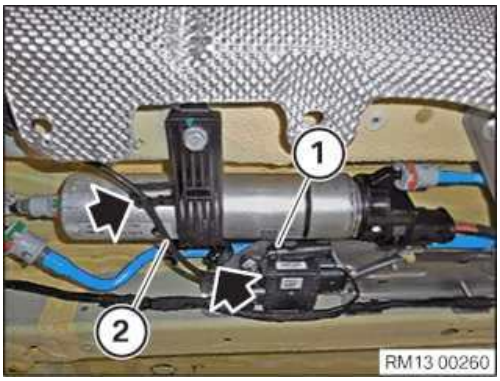
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

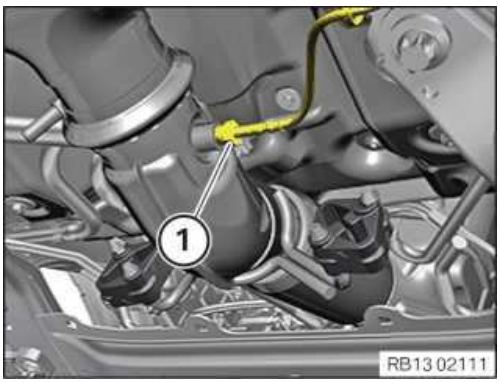
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- Unlock and loosen connector (1).
- Feed out the cable (2) of the exhaust temperature sensor from the clamps (arrows) and remove.



- Loosen the cable clip (1).



- Loosen exhaust temperature sensor (1).
- Feed out and remove exhaust temperature sensor (1).

48 – Removing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

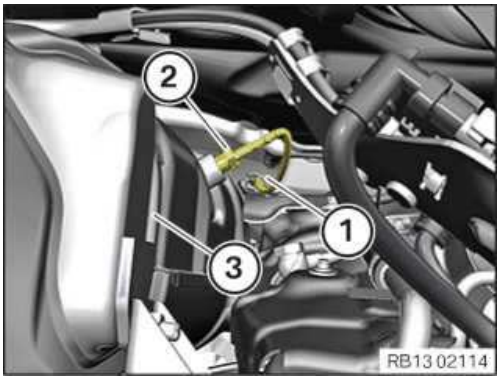
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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- Unlock and loosen connector (1).
- Uncover the exhaust temperature sensor cable.



- Guide the exhaust temperature sensor cable (2) out of the clamp (1) and place it to one side.
- Release the exhaust temperature sensor (2) with conventional tools .
- Feed out and remove the exhaust temperature sensor (2) from the diesel particulate filter (3).

49 – Remove the exhaust temperature sensor on the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

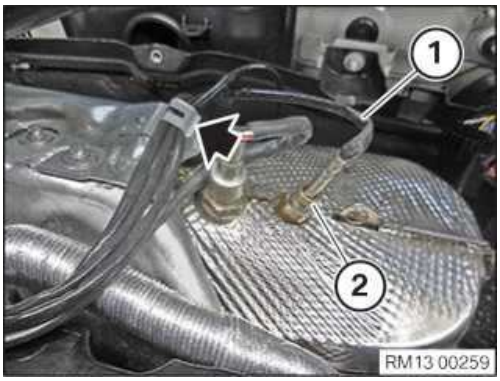
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect connector (1).
- Put the cable of the exhaust temperature sensor to one side.

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- Guide cable (1) of the exhaust temperature sensor out of the clamp (arrow) and remove it.
- Loosen exhaust temperature sensor (2).
- Feed out and remove exhaust temperature sensor (2).

50 – Remove the control sensor

WARNING

Hot surfaces.

Risk of burning!

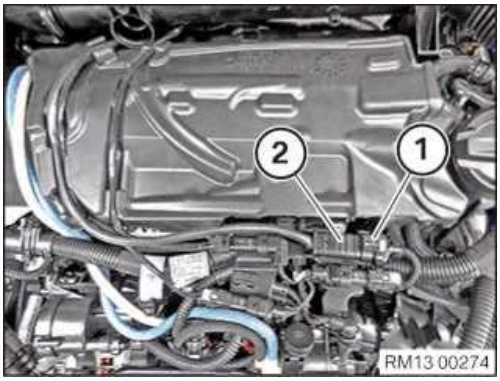
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock plug connection (1) and disconnect.
- Detach the connector (2) from the holder .
- Release the front oxygen sensor cable.



- Detach the control sensor (1) with the special tool .
- Feed out and remove the control sensor (1).

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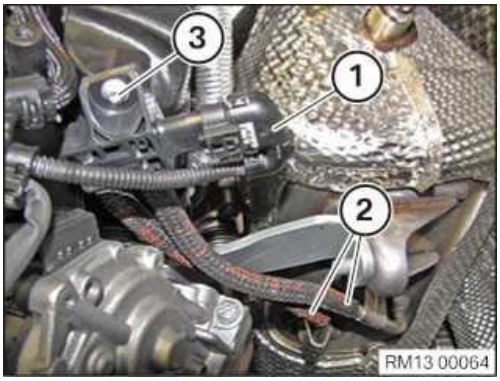
51 – Remove differential pressure sensor

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

52 – Removing the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

CAUTION

Heavy component.

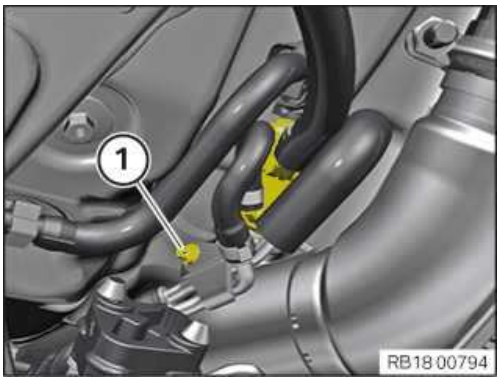
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

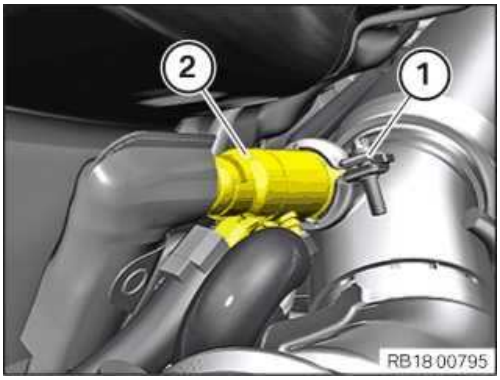


- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.

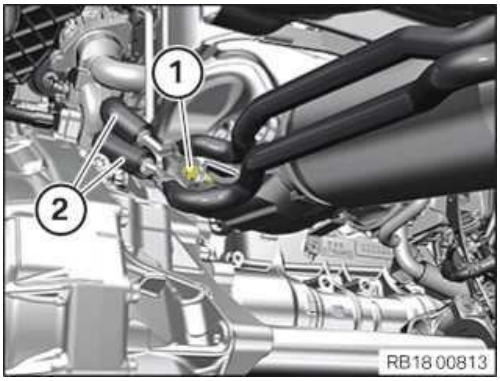
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- Loosen screw (1).



- Loosen V-band clamp (1).
- Remove the SCR metering module (2) and set it aside.



- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.

▶ **Remove differential pressure sensor**

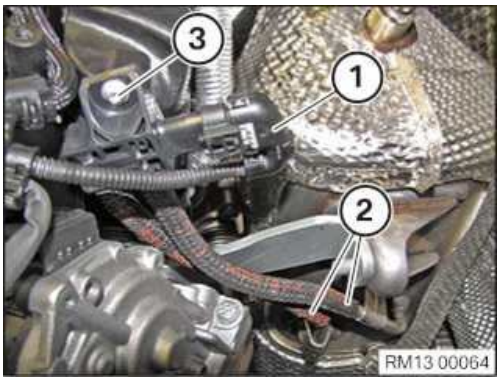
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

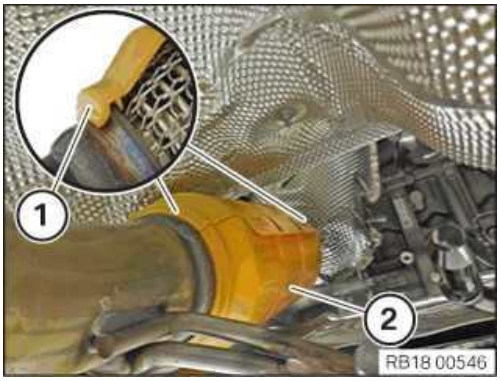
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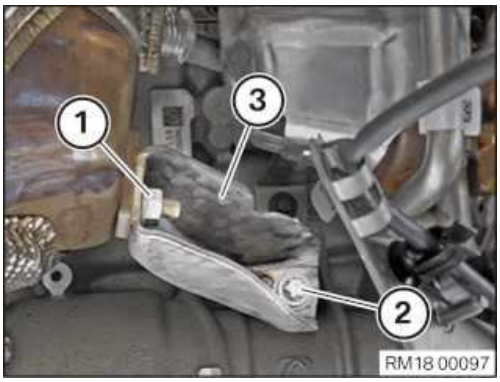
- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.



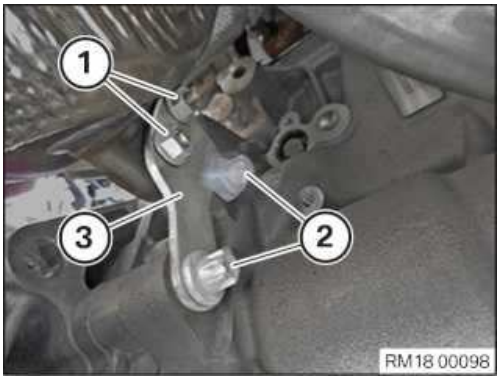
- Loosen nuts (1).



- Mount fitting aid (2).
- Make sure that the fitting aid is correctly position on the edges (1) of the flexible tube.

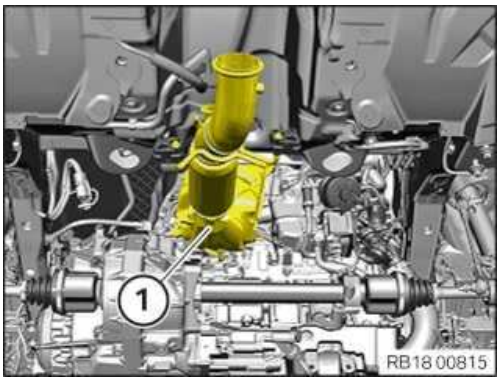


- Unfasten nut (1).
- Loosen screw (2).
- Remove holder (3).



- Loosen nuts (1).
- Loosen screws (2).
- Remove holder (3).

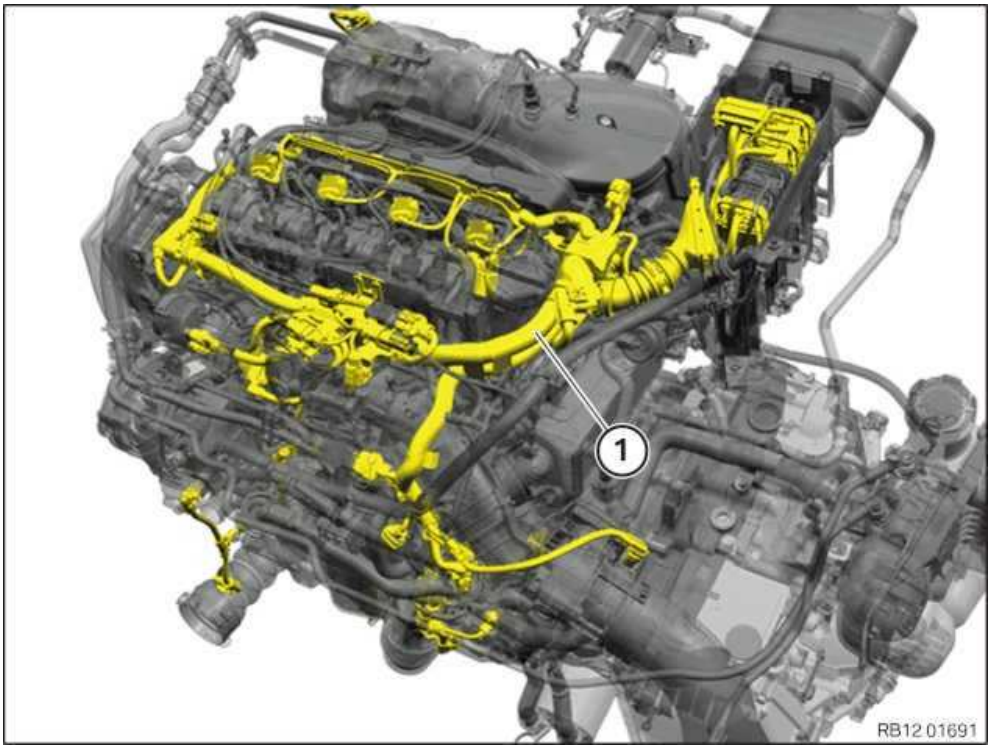
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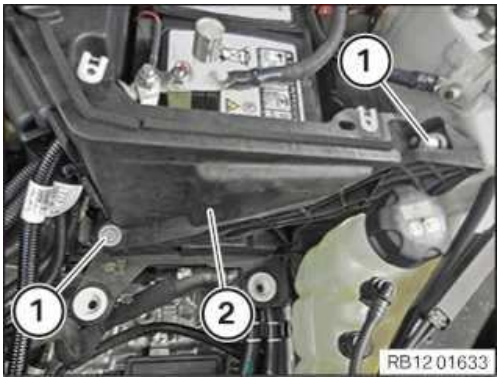
- Feed out diesel particulate filter (1) toward the bottom and remove.

53 – Releasing the wiring harness section for the intake plenum

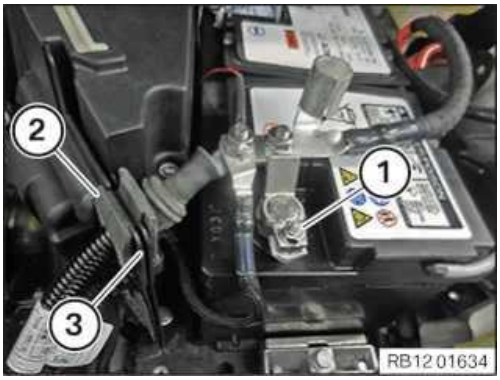
Overview: Wiring harness section for the engine



1 Wiring harness section for the engine

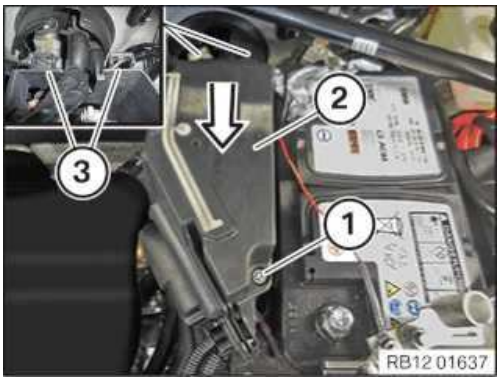


- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.

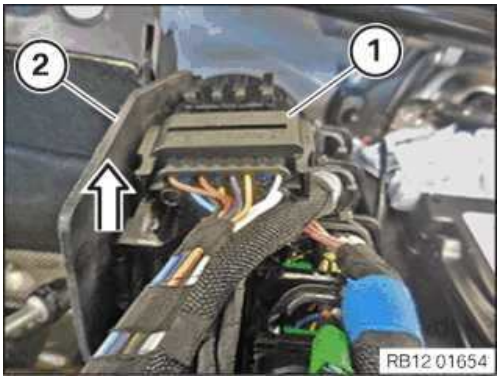


- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

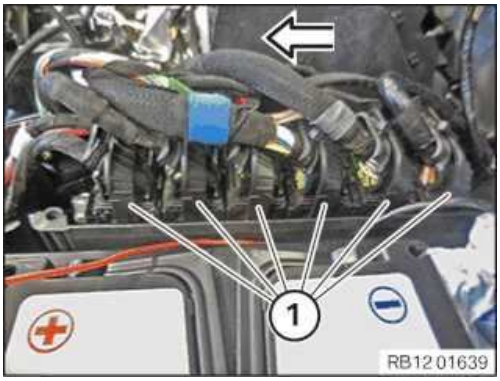
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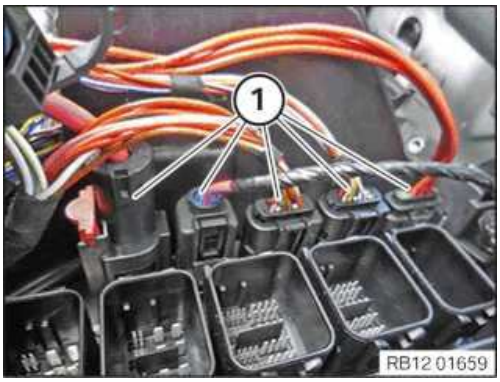
- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



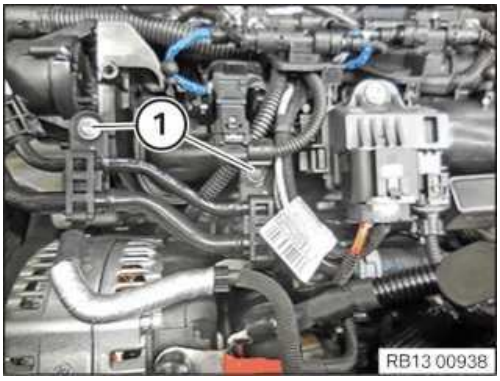
- Guide the connector (1)out of the electronics box (2) in the direction of arrow and remove it.
- Unlock and loosen connector (1).



- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

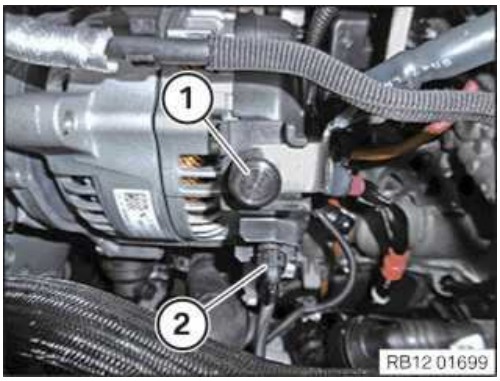


- Unlock and loosen connector (1).

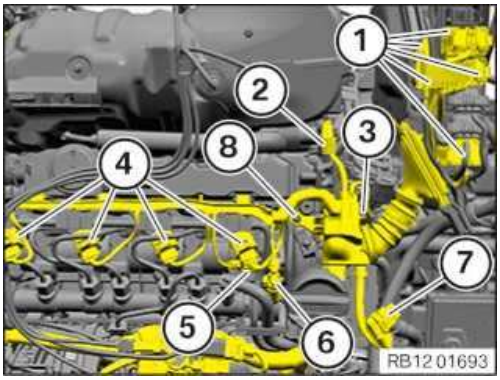


- Loosen screws (1).

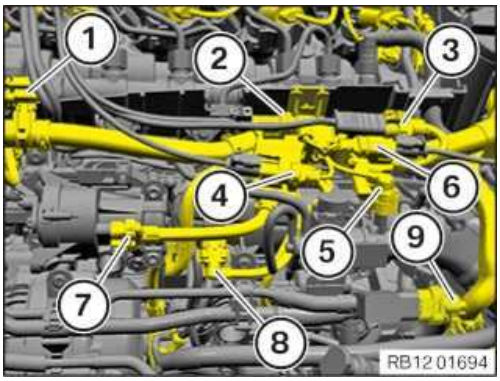
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- Release the positive battery cable (1) on the alternator and place to one side.
- Unlock connector (2) and pull off.



- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock the connector (2) and disconnect it from the differential pressure sensor.
- Unlock the connector (3) and disconnect it from the exhaust-gas recirculation valve.
- Unlock the connector (4) and pull off from the injectors.
- Unlock the connector (5) and disconnect it from the camshaft sensor.
- Unlock the connector (6) and disconnect it from the fuel pressure regulator.
- Unlock connector (7) and pull off from hot film air mass meter.
- Loosen screw (8).



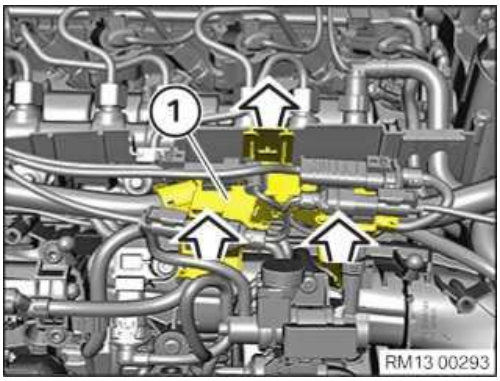
- Unlock connector (1) and pull off from the rail pressure sensor.
- Unlock the connector (2) and disconnect it from the exhaust temperature sensor before the diesel particulate filter.
- Unlock and disconnect the connector (3) from the front oxygen sensor.
- Unlock the connector (4) and disconnect it from the exhaust temperature sensor after the diesel particulate filter.
- Unlock and disconnect the connector (5) from the electric changeover valve.
- Unlock the connector (6) and disconnect it from the exhaust temperature sensor for the exhaust-gas recirculation cooler.
- Unlock the connector (7) and disconnect it from the servomotor for the swirl flaps.
- Unlock the connector (8) and pull it off the charging pressure sensor.
- Unlock the connector (9) and disconnect from the fuel pressure and temperature sensor.



- Unlock the connectors (1) of all glow elements with the special tool **0 490 796 (11 1 480)** and release them.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.

▶ **Removing the cable clips from the intake plenum**

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- Detach the cable clip (1) in the direction of the arrow.
- Guide out the cable clip (1) in direction of arrow and set it aside.

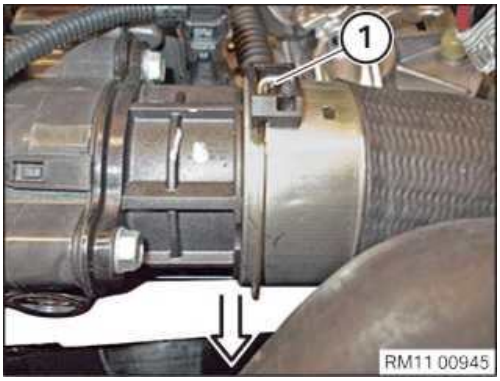
54 – Removing the intake plenum

TECHNICAL INFORMATION

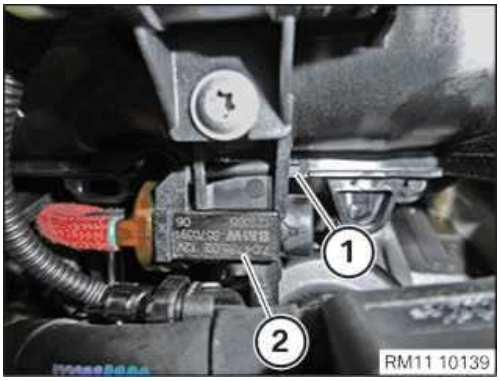
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Unlock the lock (1).

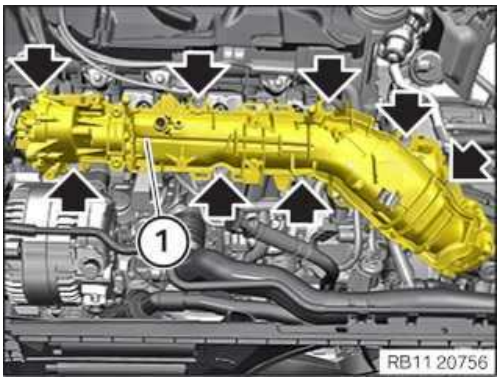


- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.

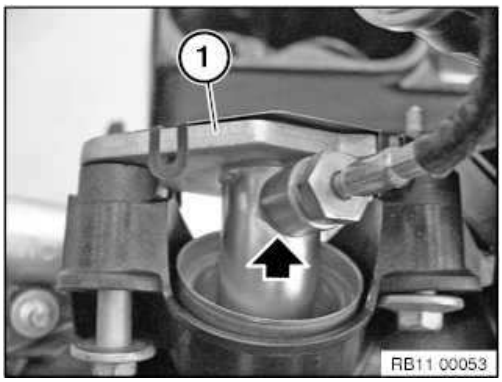


- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.

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- Release the screws (arrows) from the intake plenum (1).
- Guide the intake plenum (1) out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

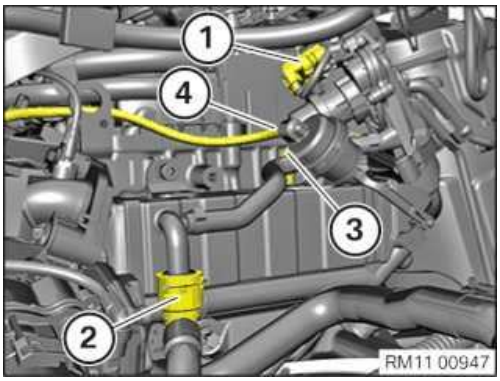
55 – Removing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

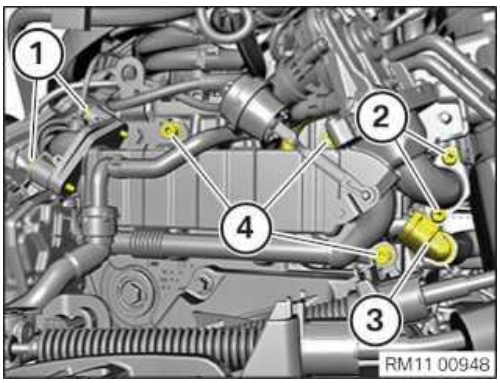
- Perform all work only on components that have cooled down.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

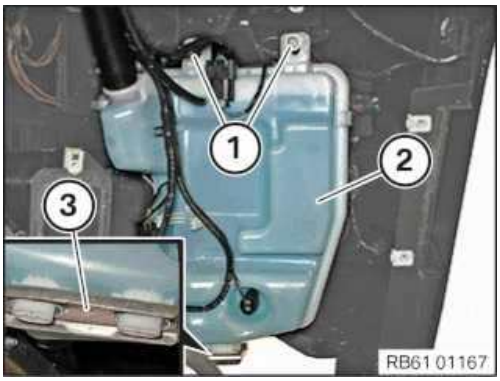
- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.

56 – Remove the washer fluid reservoir from the fixture

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- Loosen screws (1).
- Guide the washer fluid reservoir (2) up and out of the fixture (3) and set it aside.

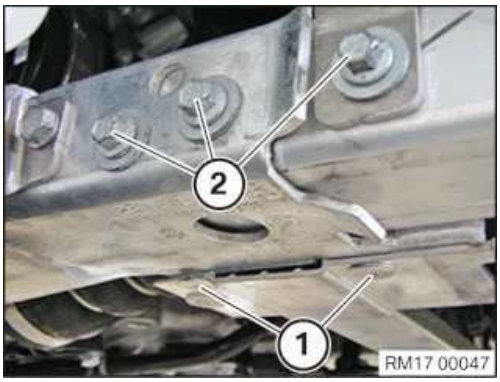
57 – Removing the right charge air duct between the exhaust turbocharger and the charge air cooler

WARNING

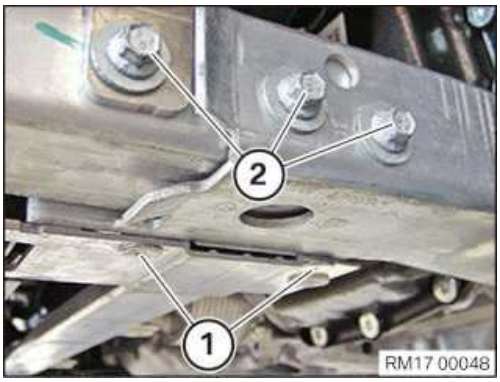
Hot surfaces.

Risk of burning!

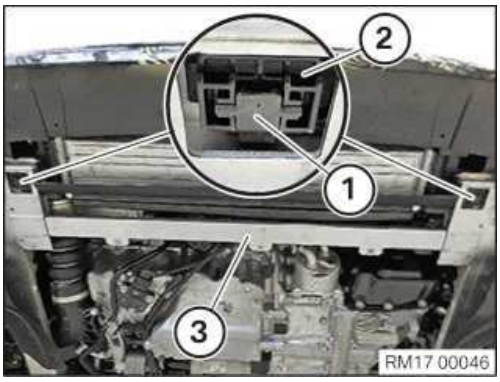
- Perform all work only on components that have cooled down.



- Undo screws (2) at front left.
- Drill out blind rivets (1) at front left.

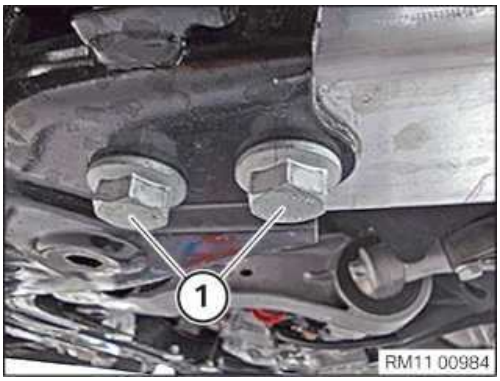


- Undo screws (2) at front right.
- Drill out blind rivets (1) at front right.

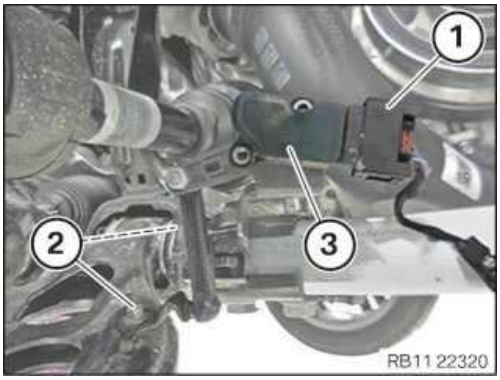


- Unlock locking pins (1).
- Thread out and remove locks (2).
- Thread out and remove cross connection (3).

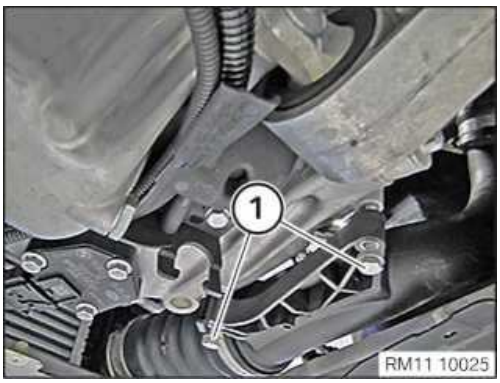
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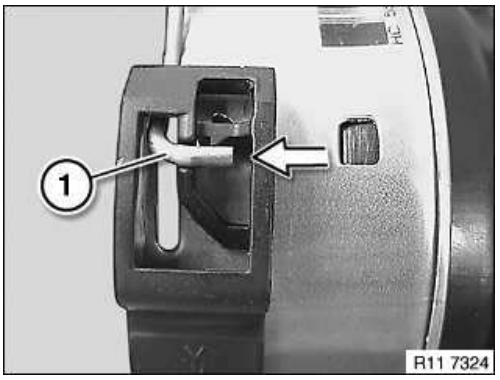
- Release the screws (1) on the right front axle support.



- **If installed:**
- Unlock and release plug connection (1).
- Loosen screws (2).
- Feed out the ride height sensor (3) and remove.

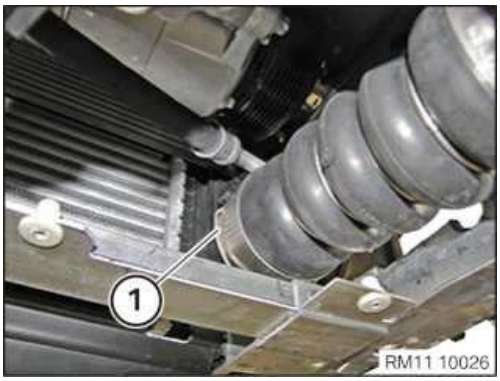


- Release screws (1) of charge air duct on right oil sump.



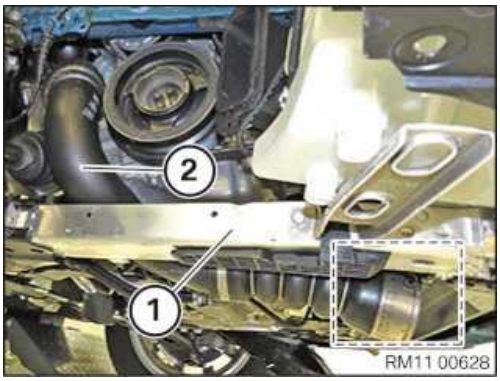
- Unlock lock (1).

  The lock (1) must engage in the bracket during unlocking (arrow).

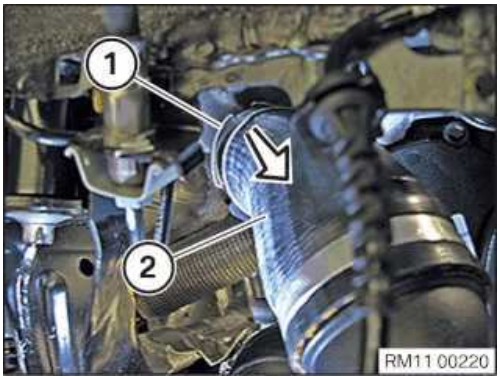


- Unlock and release the charge air duct (1) on the charge air cooler.

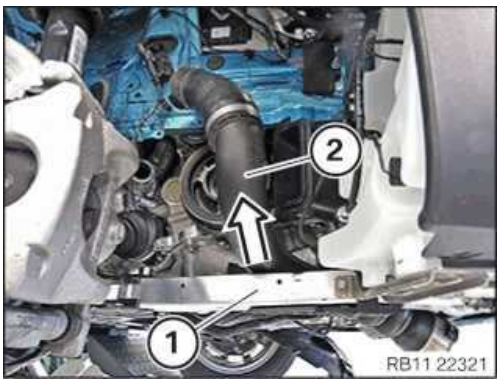
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- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed out the charge air duct (2) in the **marked** area towards the bottom and set it aside.



- Unlock and detach the locks (1) on both sides.
- Feed out the charge air duct (2) on the exhaust turbocharger in the direction of the arrow and set it aside.



- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed out the charge air duct (1) in the direction of arrow between the side member and the deformation element and remove.

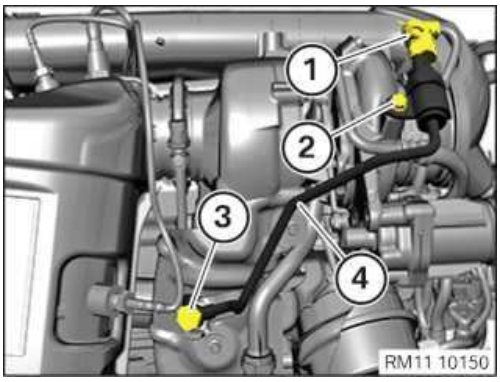
58 – Remove the heat shield from the exhaust turbocharger at the bottom

WARNING

Hot surfaces.

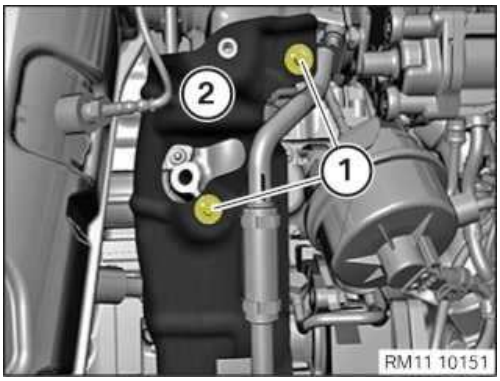
Risk of burning!

- Perform all work only on components that have cooled down.



- Unlock and disconnect connector (1).
- Unscrew the banjo bolt (3).
- The seals of the banjo bolt (3) must be renewed.
- Loosen screw (2).
- Remove the exhaust gas pressure pipe (4).

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- Unscrew the bolts (1) on the heat shield .
- Feed out and remove the heat shield (2).

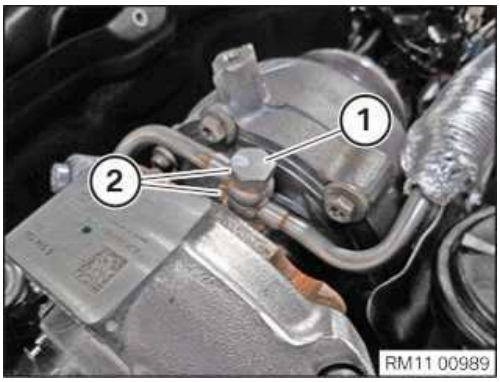
59 – Removing the low-pressure stage turbocharger

WARNING

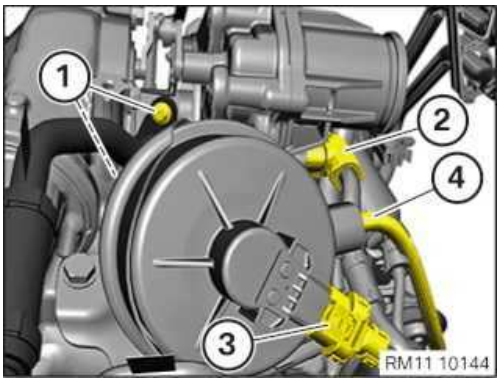
Hot surfaces.

Risk of burning!

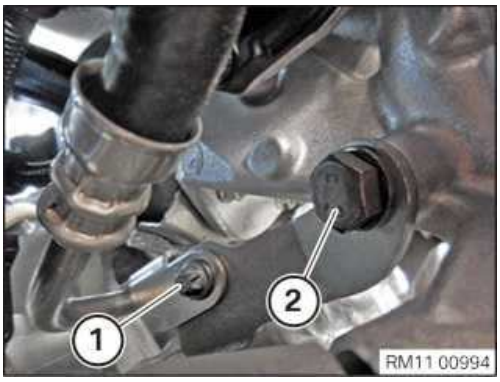
- Perform all work only on components that have cooled down.



- Release the banjo bolt (1) of the oil feed lines.
- Remove sealing rings (2).
- Place oil feed lines to one side.



- Release the screws (1) of the oil return line.
- Unlock and disconnect the plug connections (2) and (3).
- Pull off the vacuum hose (4) carefully.

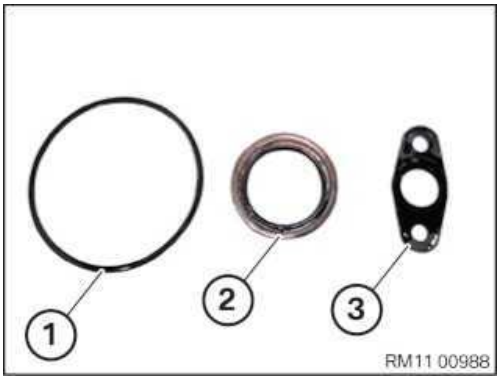


- Undo the bolt (1) of the oil feed line.
- Loosen screw (2).

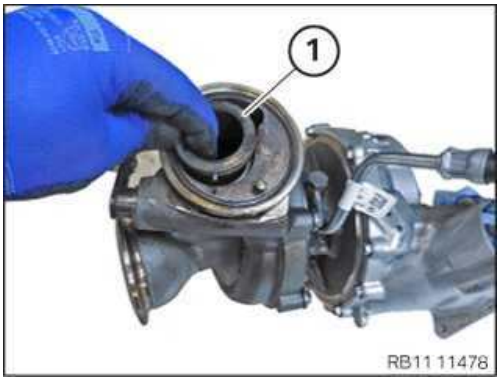
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- Loosen screw (1).
- Remove the V hose clamp.
- Guide the low-pressure stage turbocharger out towards the top and remove.



- Remove seals (1), (2) and (3).



- Remove the spacer ring (1).

60 – Removing the high-pressure stage exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

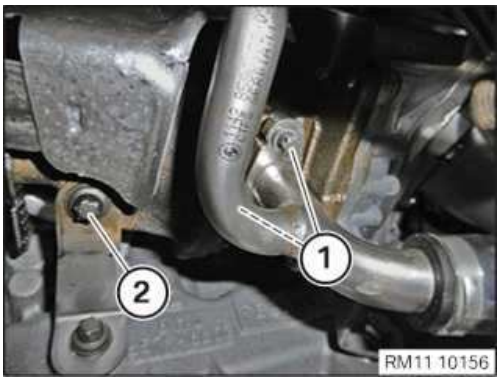
CAUTION

Heavy component.

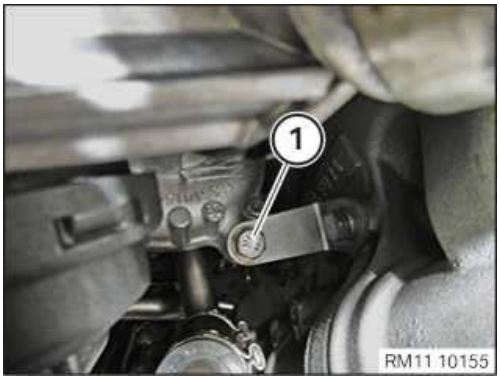
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

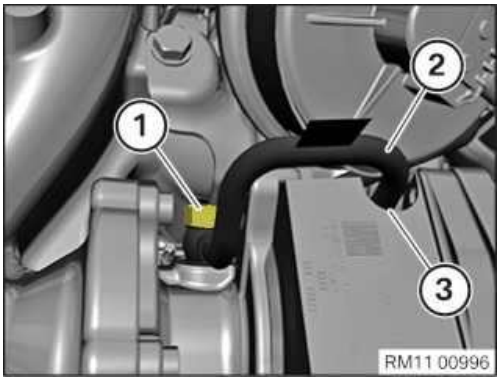
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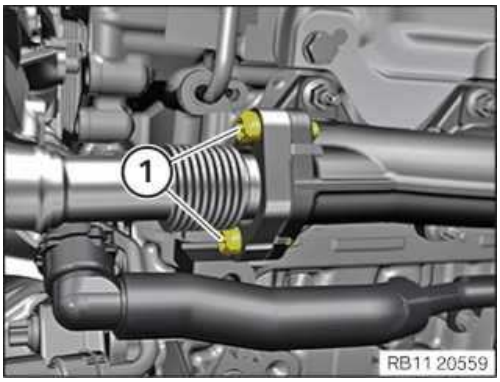
- Unscrew the bolts (1) on the oil return line .
- Loosen screw (2).



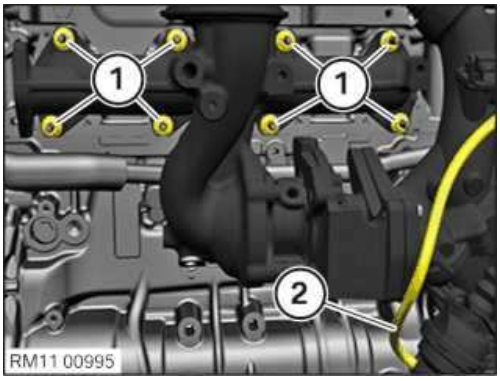
- Release screw (1) from the right wheel arch.



- Unscrew the banjo bolt (1).
- Guide out oil feed line (2) from holder (3).



- Loosen screws (1).



- Pull off the vacuum hose (2).
- Loosen nuts (1).
- Guide out the exhaust manifold and the high-pressure stage exhaust turbocharger to the top and remove them.

61 – Removing high pressure lines between rail and injectors

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

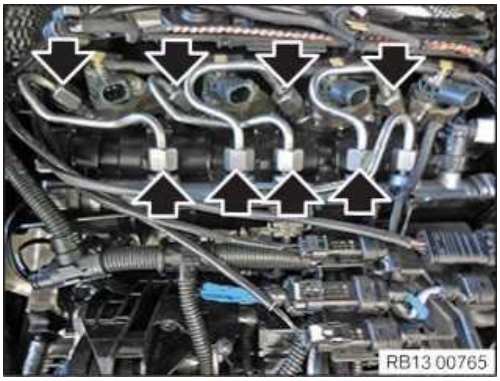
TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release the high pressure lines (arrows) with the special tool .
- Catch and dispose of escaping fuel.
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool .

62 – Remove leakage oil lines

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

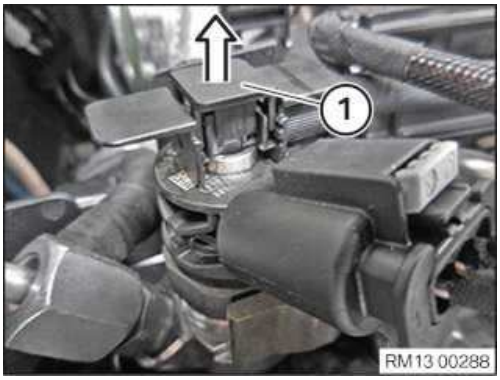
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

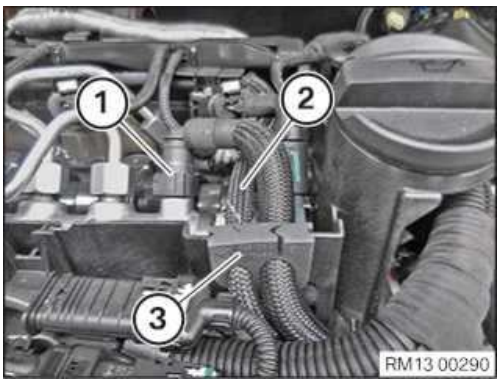
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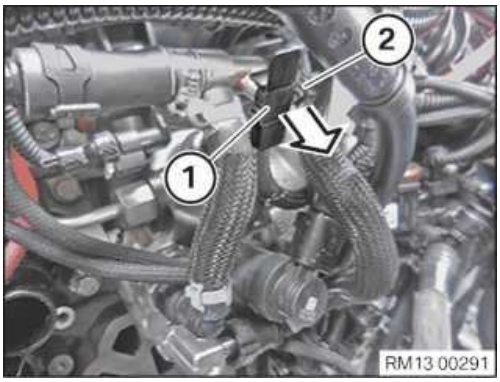
- Unlock the connectors (arrows) and disconnect.



- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.



- Unlock and loosen fuel line (1) and set it aside.
- Guide the leakage oil line (2) out of the rubber grommet (3) and set it aside.



- Release lock (1) in direction of arrow.
- Feed out leakage oil line (2) and remove.

63 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE



Electrostatic discharge.

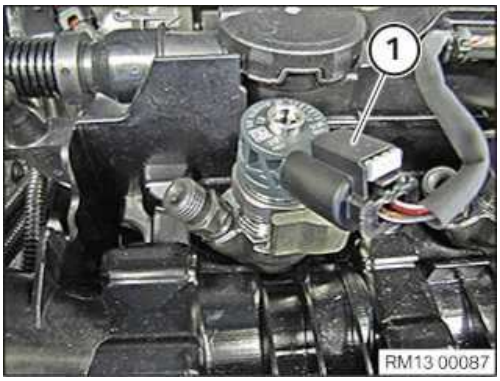
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

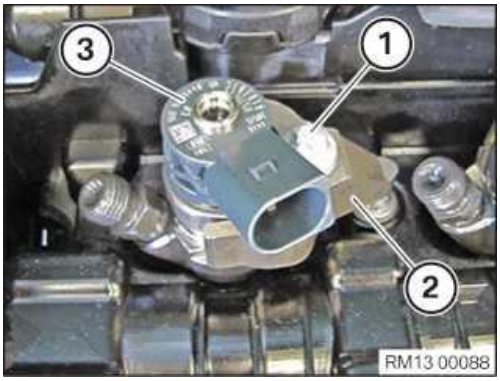
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TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.



- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

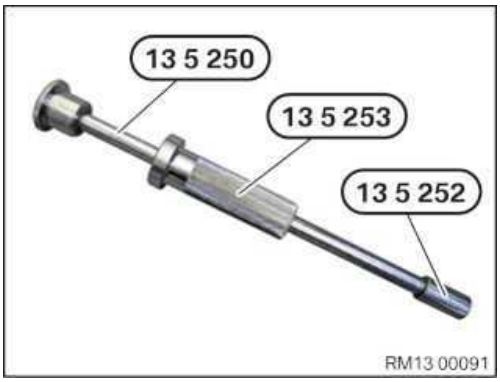
▶ **Loosen stuck injectors**

RISK OF DAMAGE

Contaminant or foreign body.

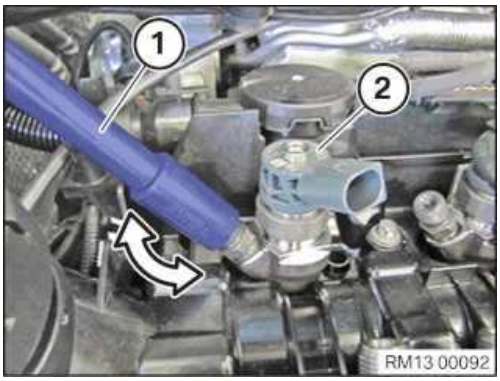
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)** back onto the special tool **0 493 321 (13 5 250)**.

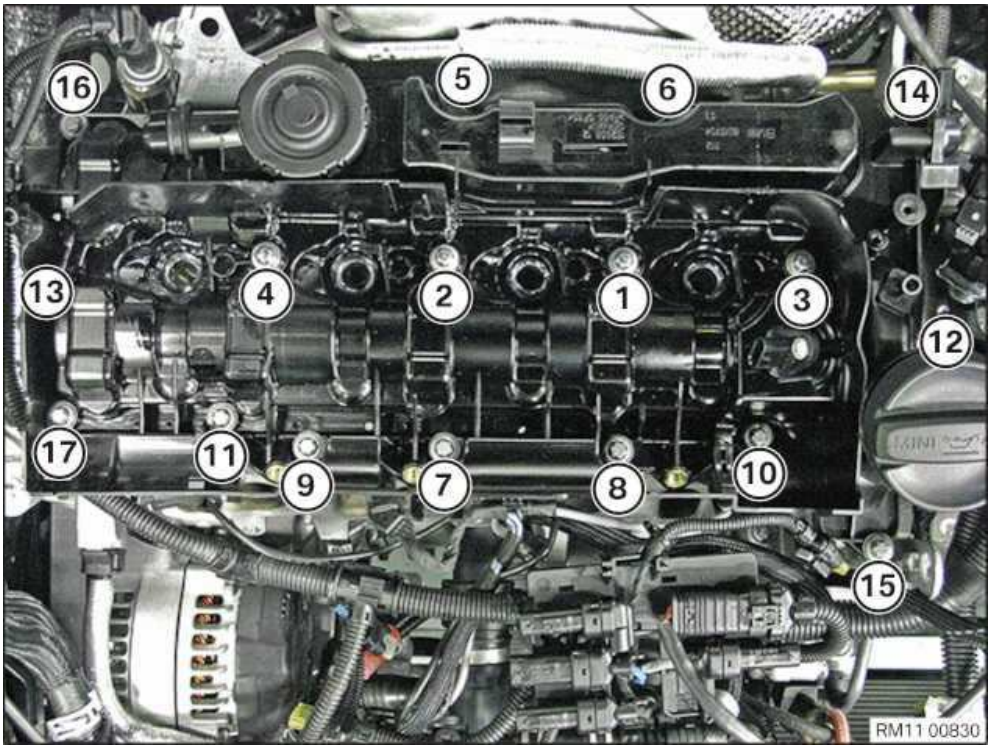
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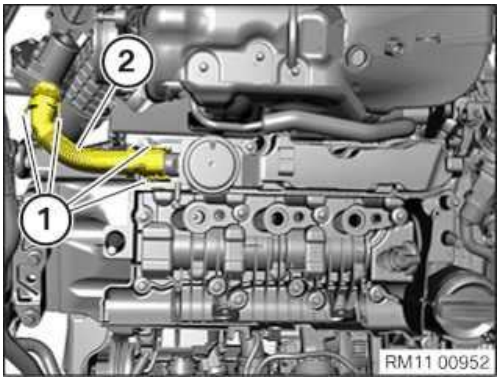
- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

64 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover

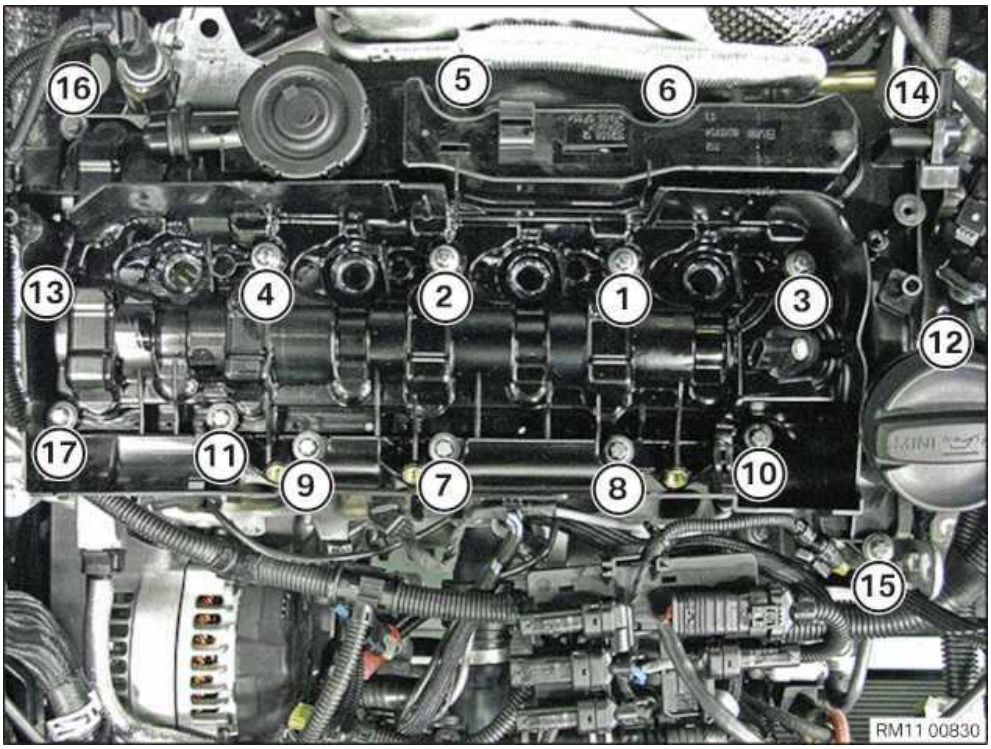


1 to 16 screws of the cylinder head cover.



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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- Loosen screws in the order (17) to (1).
- Remove cylinder head cover by lifting it out.

65 – Checking camshaft timing



- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

Damage to the engine.

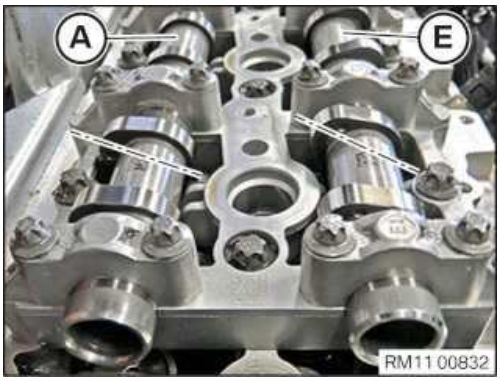
The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

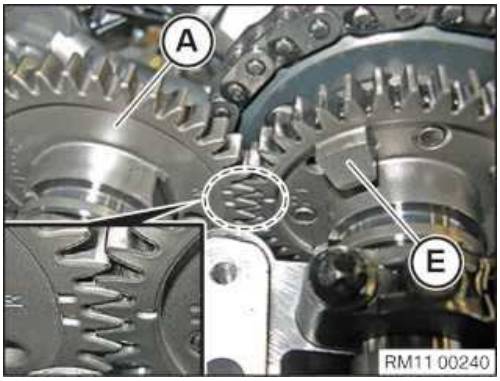
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- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.



- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

66 – Remove chain tensioner piston

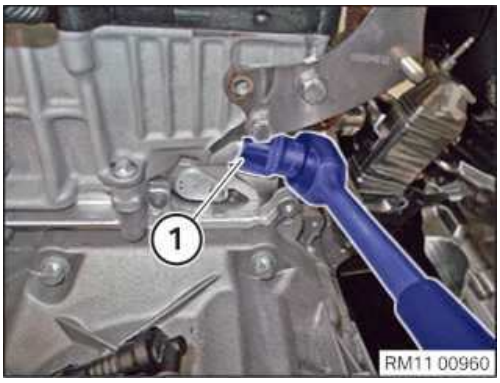
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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

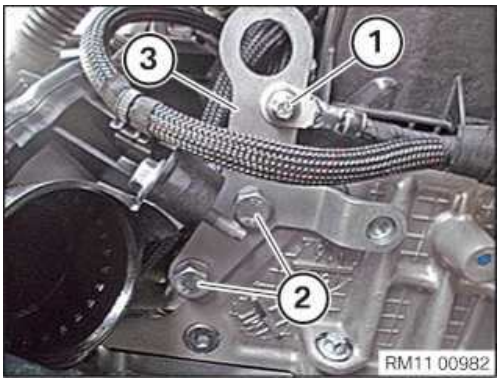


TECHNICAL INFORMATION

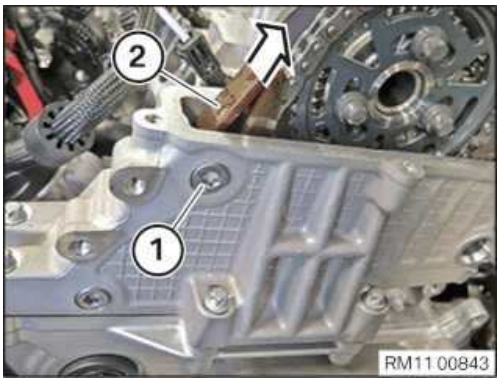
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

67 – Remove the timing chain guide rail

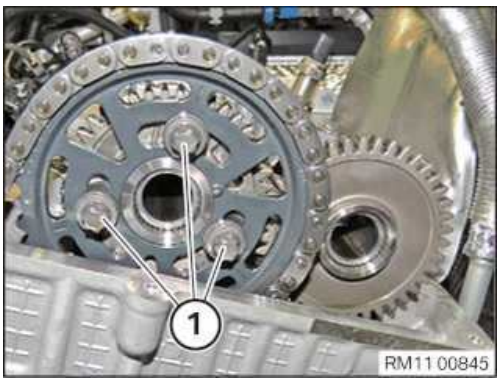


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

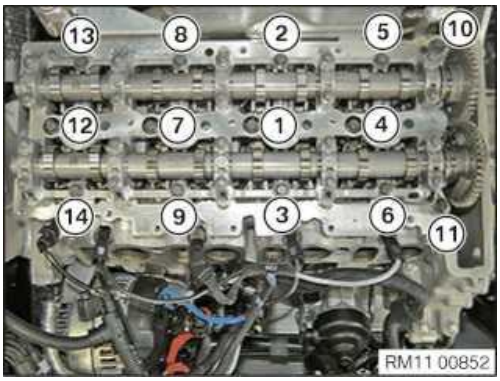
68 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

69 – Removing the camshaft support

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- Evenly loosen all screws in a sequence from (14) to (1).
- Loosen and remove all screws in a sequence from (14) to (1).

  Both camshafts can be removed with the camshaft carrier.
- Remove the camshaft support including camshafts towards the top.

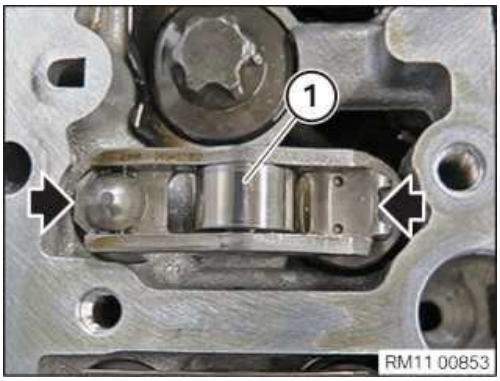
70 – Remove roller cam followers

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



RISK OF DAMAGE

Damage to the engine.

If the classification of the roller cam followers is ignored, this can lead to engine damage.

- Observe the classification of the roller cam followers.
- Always reuse used roller cam followers at the same position.

- Remove the roller cam follower (1) and place it onto the special tool **0 495 105 (11 4 480)**.
- Repeat the process for all roller cam followers.

71 – Removing the hydraulic valve clearance compensating element

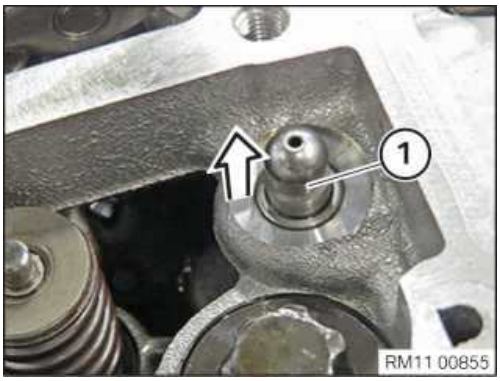
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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- Remove the hydraulic valve clearance compensating element (1) in the direction of the arrow and place on the special tool **0 495 105 (11 4 480)**.
- Repeat the process on all hydraulic valve clearance compensating elements.

72 – Removing glow elements

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Damage to the glow elements.

Excessive force may damage the glow elements and they may then have to be renewed.

- Handle glow elements with care and do not drop.
- Do not rest the cylinder head on glow elements. Glow elements protrude from the sealing surface of the cylinder head.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

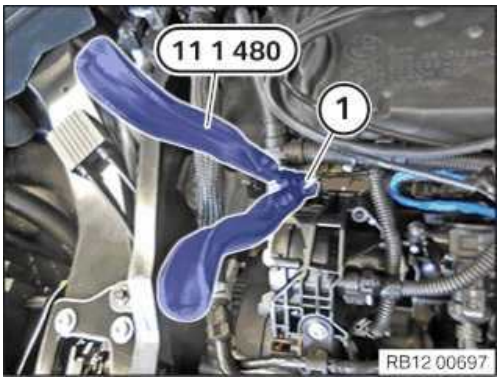
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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect plug connection (1) using special tool **0 490 796 (11 1 480)**.



- Release the glow elements with the special tool or conventional tools.
- Feed out preheating elements and remove.

73 – Remove cylinder head.

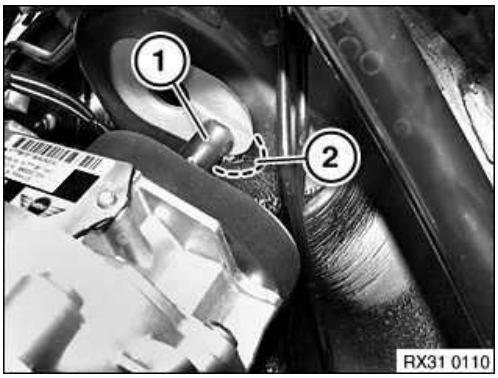
CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

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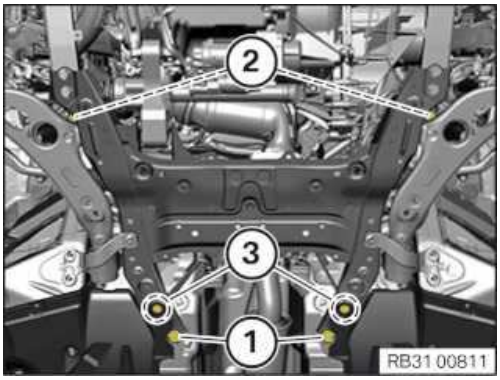


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- Position front axle support.
- Bend the underbody panelling to the side in area (3).
- Raise front axle support.
- When raising, insert the charge air cooler into its rubber mount on the transmission cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

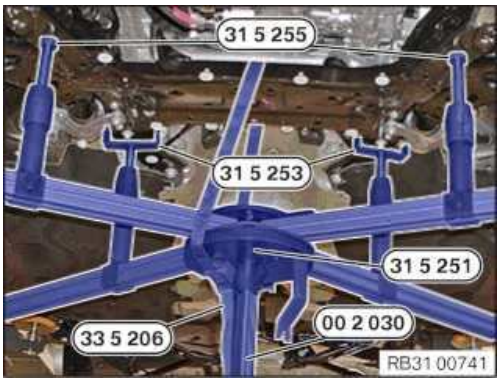
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

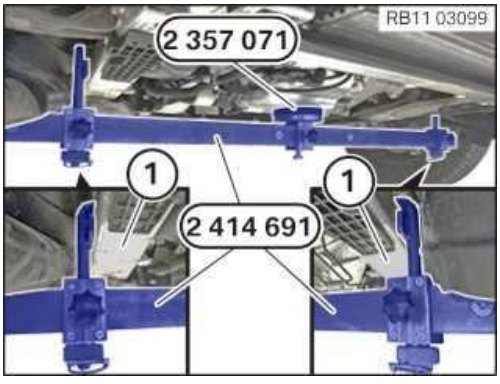
- If applicable, tighten the screws in area (3).

Underbody protection to body

Screw		Tightening torque	3 Nm

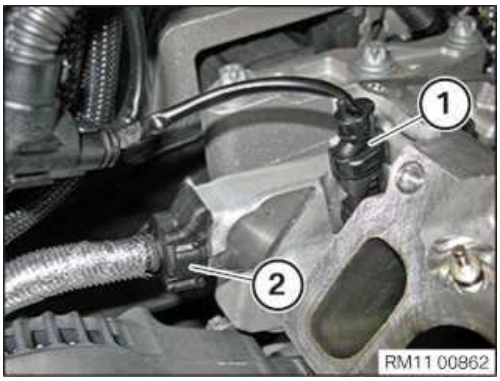


- Remove special tool from special tool .
- Lower the universal jack **0 490 133 (00 2 030)** with the special tool and set it aside.



- Prepare special tool together with the special tool **2 357 071**.
- Attach special tool to front axle support and align special tool **2 357 071** correctly under the oil sump and then tighten.
- Turn special tool at adjusting screw uniformly upwards, until the special tool **2 357 071** makes contact with the oil sump.
- Tighten all adjusting screws of special tools and **2 357 071**.

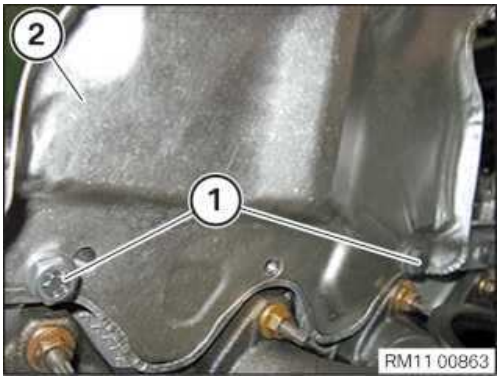
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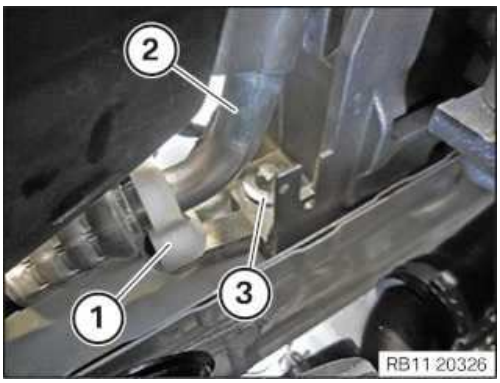
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Release the connector (1) from the coolant temperature sensor.
- Unlock and loosen coolant line (2).



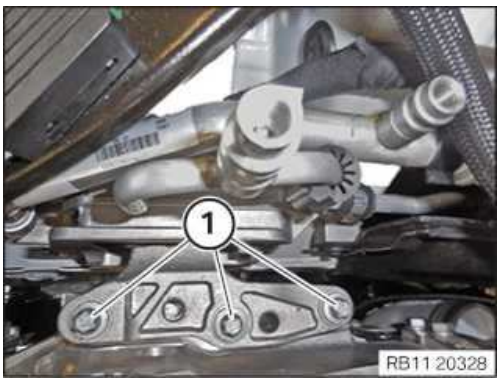
- Loosen screws (1).
- Feed out the heat shield (2) and set it aside.



- Unlock and loosen holder (1).
- Feed out the refrigerant line (2) and put to one side.
- Loosen screw (3).

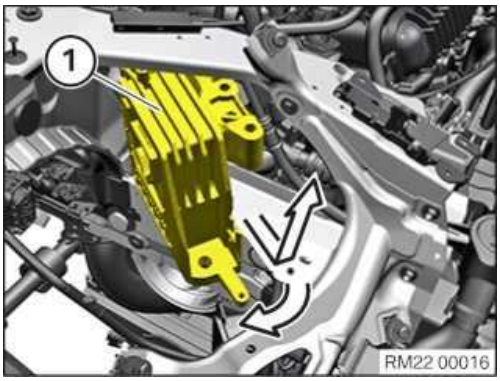


- Loosen screw (1).

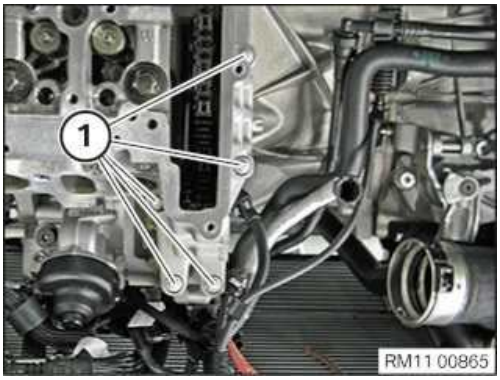


- Loosen screws (1).

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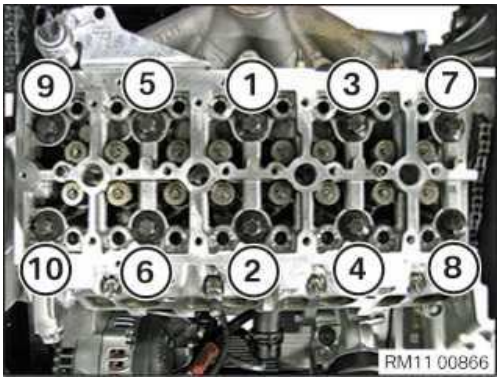
- Turn engine mount (1) in direction of arrow and remove upwards.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screws (1).



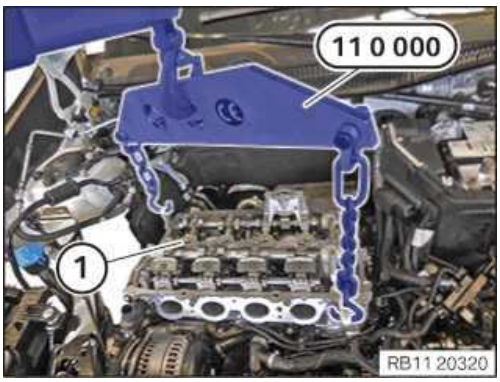
- Loosen the cylinder head bolts in the sequence from (10) to (1).
- Remove cylinder head bolts (1) to (10) with washers.



- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

M8		Tightening torque	21,5 Nm



RISK OF DAMAGE

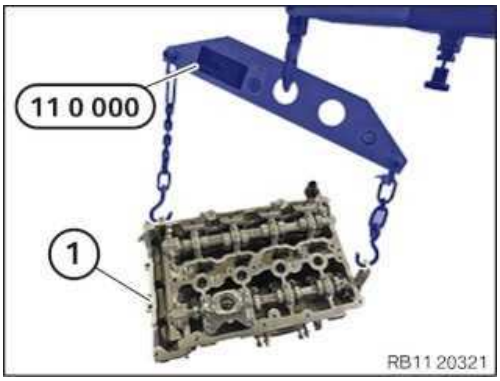
Damage to the guide rails.

Large amounts of force may damage the guide rails of the timing chain.

- Make sure not to damage the guide rail with the cylinder head when removing and installing the cylinder head.

- **Carefully** guide out the cylinder head (1) with the engine lifter and the special tool **0 490 561 (11 0 000)** and remove.

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- Mount the cylinder head (1) on the special tool **0 494 362 (11 9 000)**.

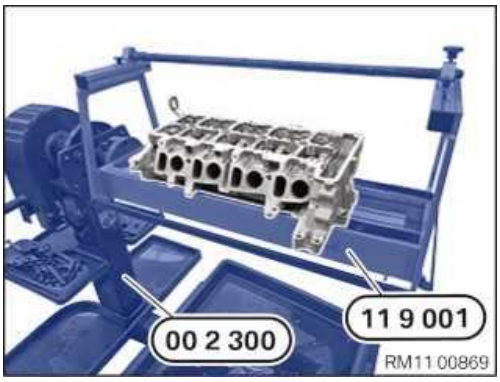
74 – Remove all valve springs

RISK OF DAMAGE

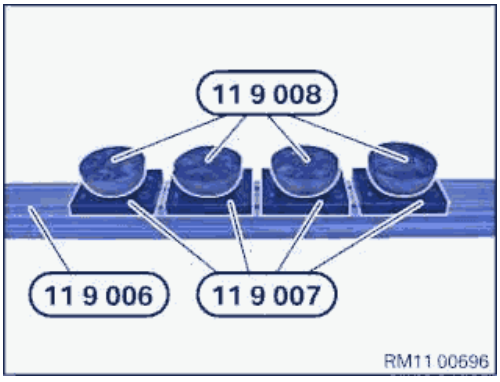
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Mount and screw the cylinder head onto the special tools **0 494 366 (11 9 001)** and **0 495 187 (00 2 300)**.

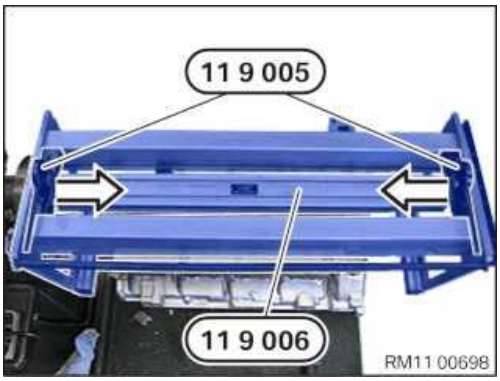


- Prepare the special tools **0 494 371 (11 9 006)**, **0 494 372 (11 9 007)** and **0 494 373 (11 9 008)** as shown.



- Position special tool **0 494 373 (11 9 008)** as illustrated.

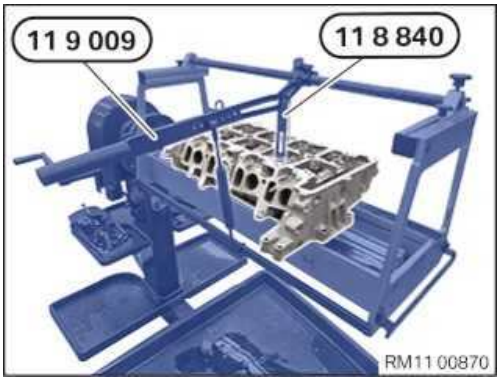
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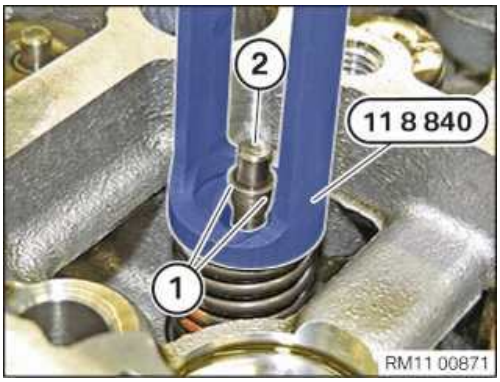
- Turn round special tool **0 494 371 (11 9 006)** and insert as shown.
- Lock special tool **0 494 370 (11 9 005)**in direction of arrow.



- Lock special tool **0 494 370 (11 9 005)**in direction of arrow.
- Use the special tool **0 494 362 (11 9 000)** to bring the cylinder head into the installation position by 180°.



- Align special tool **0 494 374 (11 9 009)** in direction of valve axis.
- Position the special tool **0 496 143 (11 8 840)** according to the nut.
- Press down the valve spring on the upper spring cup with the special tools **0 494 374 (11 9 009)** and **0 496 143 (11 8 840)**.
- The **hooks** from the set of special tools **0 494 362 (11 9 000)** can be used to **hold** the valve spring down.



- Keep the valve spring pressed down with the special tool **0 496 143 (11 8 840)**.
- Remove the valve shims (1) from the valve (2) using a magnet.
- Guide the valve spring and spring cup out and remove.
- Set down valve spring, spring cup and valve shims (2) in the special tool **0 495 105 (11 4 480)** in an orderly manner.

MAIN WORK

75 – Remove valve stem seals

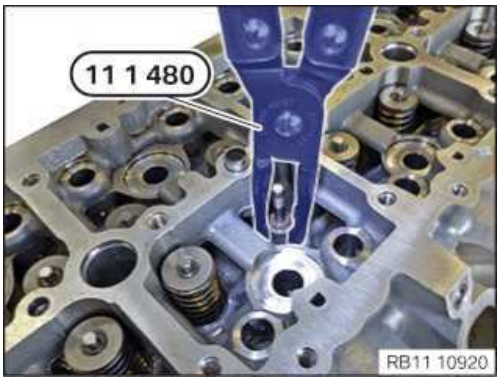
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

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- Disassemble the valve stem seal (1) using the special tool **0 490 796 (11 1 480)**.

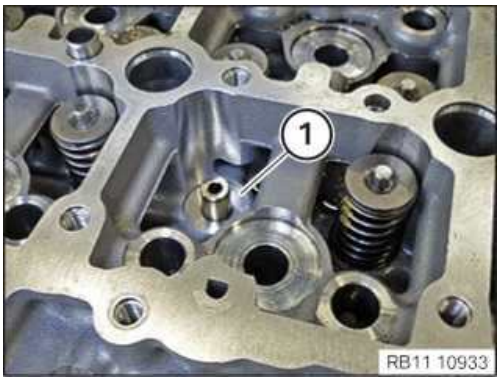
76 – Installing valve stem seals

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



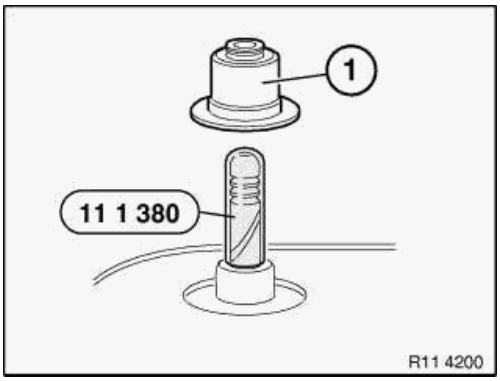
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

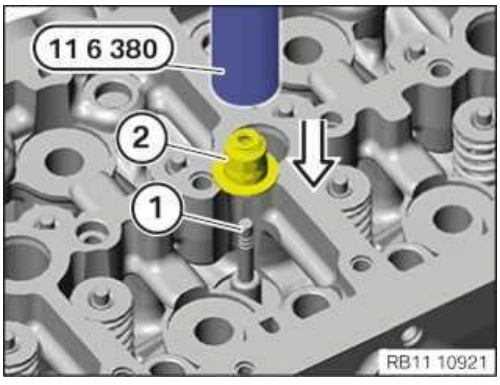
- Do not use any metal-cutting tools.

- Clean the contact surfaces (1).



- Fit special tool **0 490 746 (11 1 380)**.
- Oil the valve stem seal (1) and install it.

  Parts: Valve stem seal



- Position the valve stem seals (2) on the valve (1).
- Use special tool **0 493 249 (11 6 380)** to press down the valve stem seal (2) until they are in contact with the cylinder head.

POSTPROCESSES

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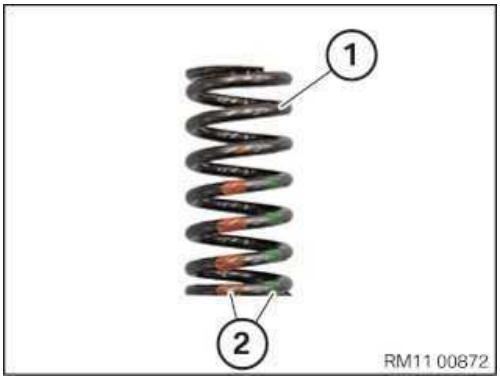
77 – Install all valve springs

RISK OF DAMAGE

Contaminant or foreign body.

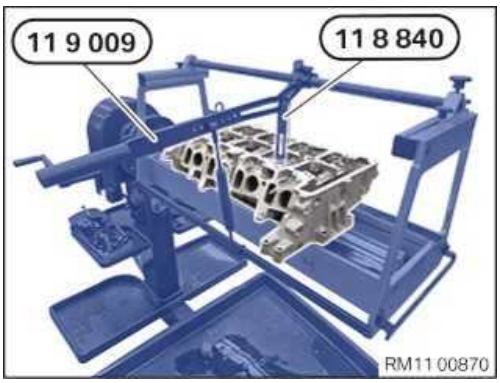
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

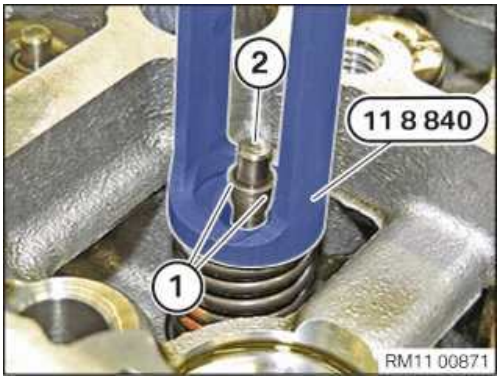


- The valve spring (1) is marked with a colour code (2).

  The mounting orientation of the valve spring (1) can be freely chosen.



- Align special tool **0 494 374 (11 9 009)** in direction of valve axis.
- Position the special tool **0 496 143 (11 8 840)** according to the nut.
- Press down the valve spring on the upper spring cup with the special tools **0 494 374 (11 9 009)** and **0 496 143 (11 8 840)**.
- The **hooks** from the set of special tools **0 494 362 (11 9 000)** can be used to **hold** the valve spring down.

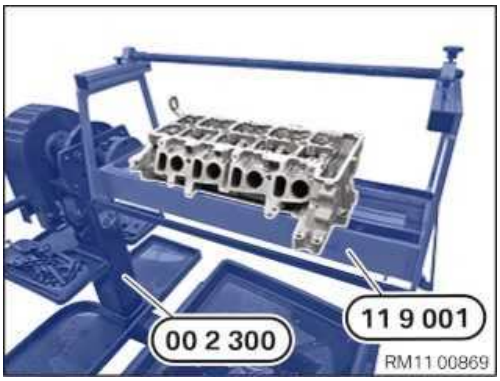


- Keep the valve spring pressed down with the special tool **0 496 143 (11 8 840)**.
- Insert the valve shims (1) at the valve (2) with the magnet and install.
- Relieve load on valve spring.
- Make sure that the valve shims (1) are installed correctly.



- Unlock the special tool **0 494 370 (11 9 005)** in the direction of the arrow.
- Guide the special tool **0 494 371 (11 9 006)** out and remove.

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- Unscrew and remove the cylinder head from the special tools **0 494 366 (11 9 001)** and **0 495 187 (00 2 300)**.

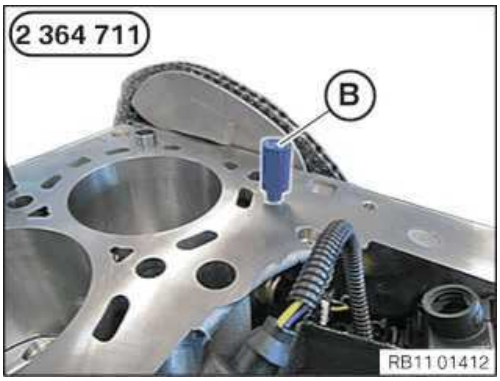
78 – Cleaning the sealing surface

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Lock the front oil duct using special tool (B) from special tool **2 364 711**.



RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 103 (11 4 471)**.



RISK OF DAMAGE

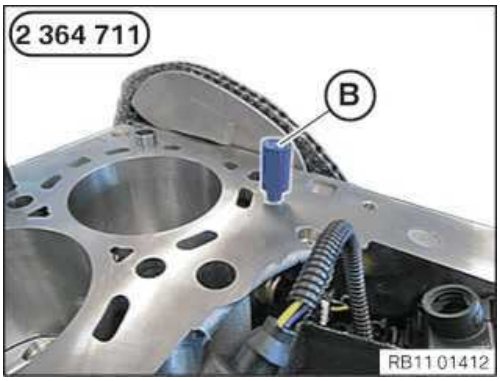
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

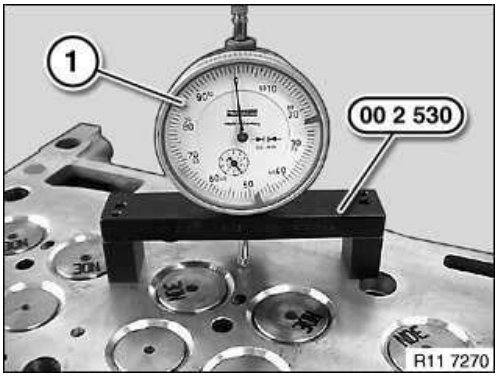
- Clean the sealing surface using special tool **0 495 104 (11 4 472)**.

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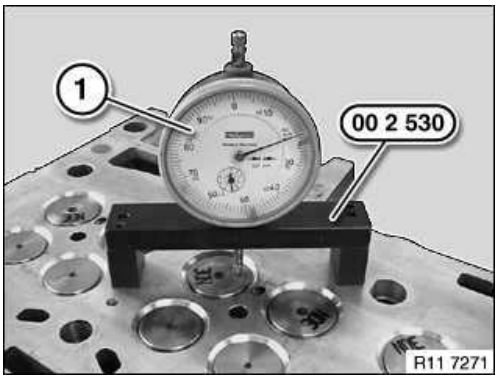


- Remove special tool (B).

79 – Checking the valve underprotrusion



- Set the dial gauge (1) onto the cleaned cylinder sealing surface with slight preload in special tool **0 490 185 (00 2 530)**.
- Set dial gauge in mildly preloaded state to "zero".



Check

- Position the dial gauge (1) on the valve with special tool **0 490 185 (00 2 530)**.
- Measure valve underprotrusion and compare with the setpoint value.

Valve underprotrusion

	0,8 (0,7 - 0,9) mm

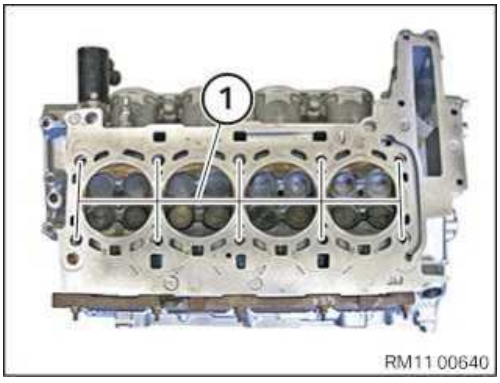
Result

» Valve underprotrusion is outside tolerance.

Measure

- Replace cylinder head.

80 – Renewing the cylinder head gasket



RISK OF DAMAGE

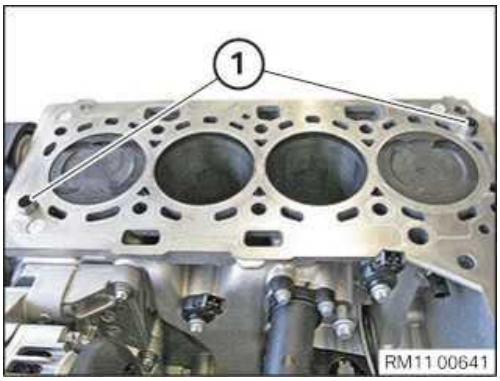
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

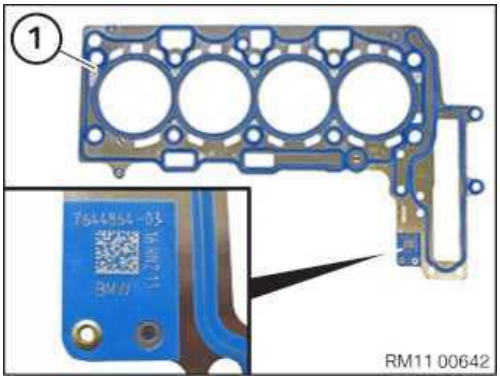
- Do not use any metal-cutting tools.

- Remove oil and dirt residue from the blind holes (1).

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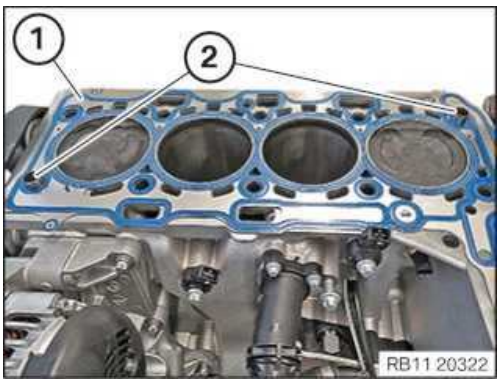


- Check the fitting sleeves (1) for secure fit and damage.



- Identify the cylinder head gasket (1) using the part number.

Note: If the cylinder head is reworked, an additional thicker gasket 0.3 mm is available for service personnel.



- Guide in the cylinder head gasket (1) and install.
- Ensure that the cylinder head gasket (1) is installed correctly in the fitting sleeves (2).

81 – Installing the cylinder head

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Damage to threads.

Fluid in the threaded hole may damage the thread when screws are tightened in the threads.

- Dry threaded holes (e.g. using compressed air).

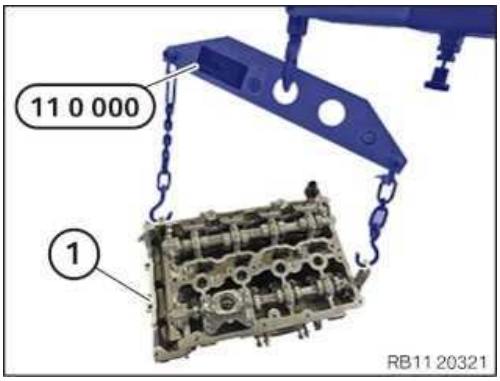
TECHNICAL INFORMATION

Do not remove bolt coating.

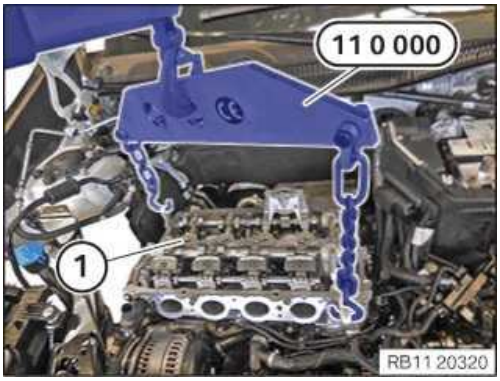
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TECHNICAL INFORMATION

When replacing the cylinder head: The complete valve control and the Valvetronic servomotor are already pre-assembled for new cylinder heads.



- Position cylinder head (1) on special tool **0 490 561 (11 0 000)** and engine lifter.



RISK OF DAMAGE

Damage to the guide rails.

Large amounts of force may damage the guide rails of the timing chain.

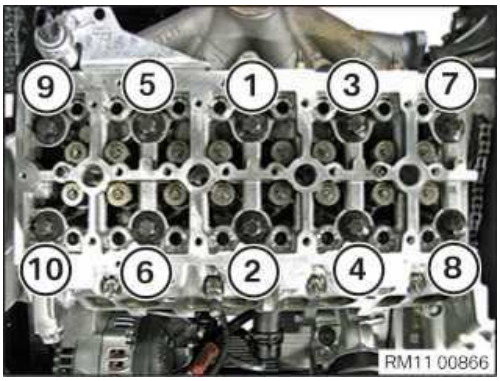
- Make sure not to damage the guide rail with the cylinder head when removing and installing the cylinder head.

- Feed in the cylinder head (1) **carefully** with the engine lifter and the special tool **0 490 561 (11 0 000)** and install.



- Unscrew the bolts (1) of the special tool **2 459 012**.
- Guide the special tool **2 459 012** out and remove.

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- Renew the cylinder head bolts (1).

  Parts: Cylinder head bolts
- Do **not** wash off coating of cylinder head bolts.
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

  No coolant, water or engine oil must be present in threaded holes of engine block.

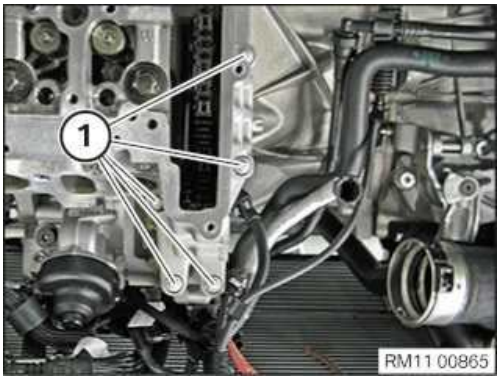
TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Feed in cylinder head bolts and install.
- Screw in cylinder head bolts in sequence (1) to (10).
- Tighten cylinder head bolts using special tools **0 490 504 (00 9 120)** and in sequence (1) to (10).

Cylinder head to crankcase

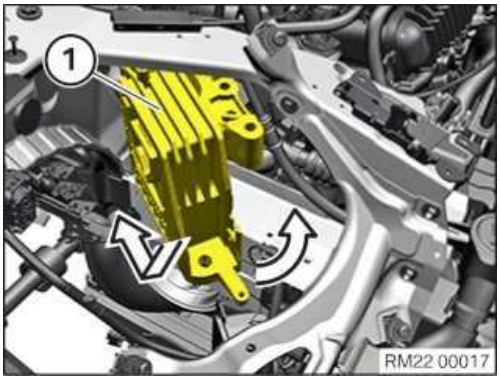
M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °



- Tighten the cylinder head bolts (1).

Cylinder head bolt to timing case cover

M8x40		Tightening torque	19 Nm



- Thread in engine mount (1) in direction of arrow then install.

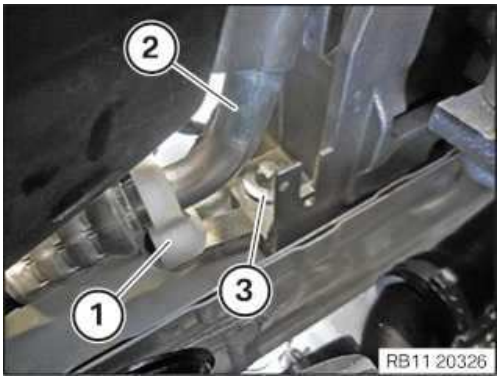
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- Tighten down screw (1).

Right engine mount to side member

M12		Tightening torque	100 Nm

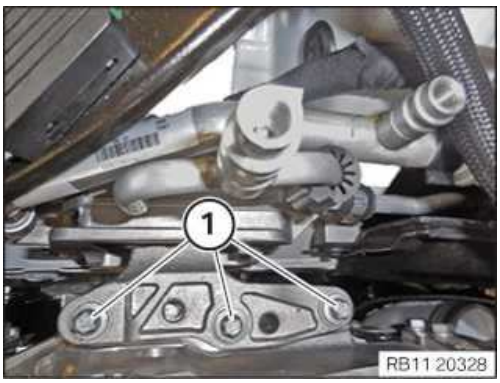


- Tighten down screw (3).

Right engine mount to side member

M12		Tightening torque	100 Nm

- Feed in and install the refrigerant line (2).
- Lock holder (1).
- Make sure the bracket (1) engages audibly.

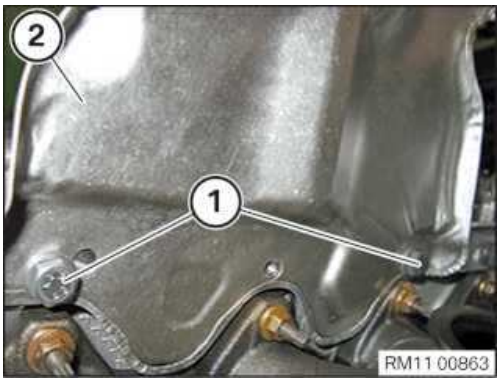


- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Right engine mount to cylinder head

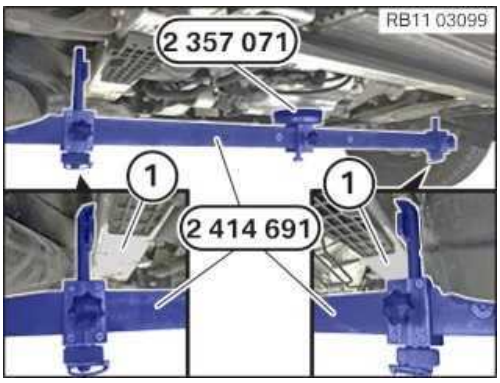
M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °



- Feed in and install the heat shield (2).
- Tighten the screws (1).

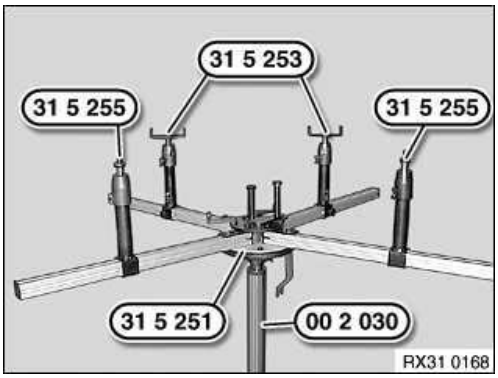
Heat shield to cylinder head

M8X16		Tightening torque	10 Nm



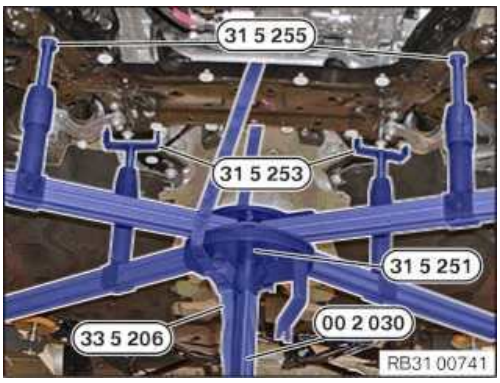
- Disassemble special tool using special tool **2 357 071**.

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- Fit the special tool completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools in telescopic supports of a profile rail pair.
- Insert special tools in telescopic supports of other profile rail pair.

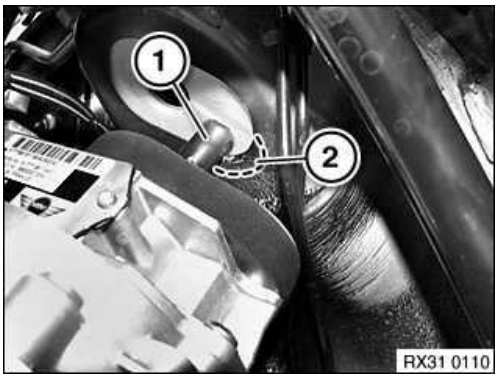
Note: In a profile rail pair, two profile rails are connected to one another by gearing.



- Align special tools and to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool to special tool .

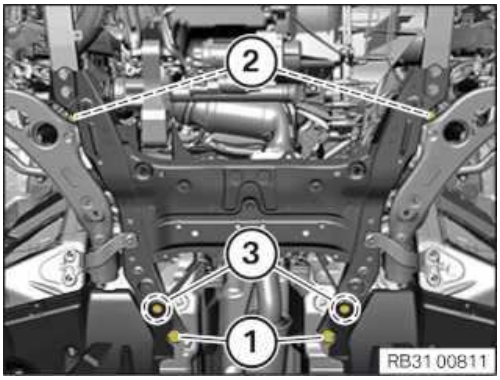


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

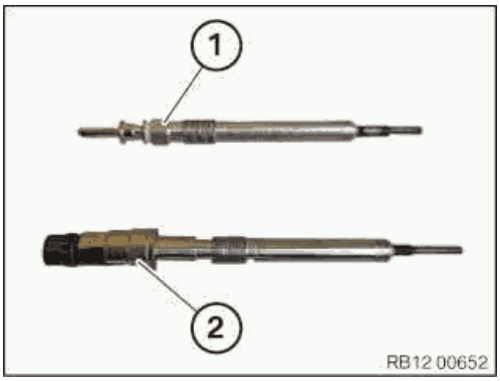
- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and the front axle remove.

82 – Install glow elements



- Install glow elements (1) in cylinders 1, 2, 3 and 4.
- If fitted: Glow element (2) with the **combustion chamber pressure sensor** must be installed in cylinder **2**.

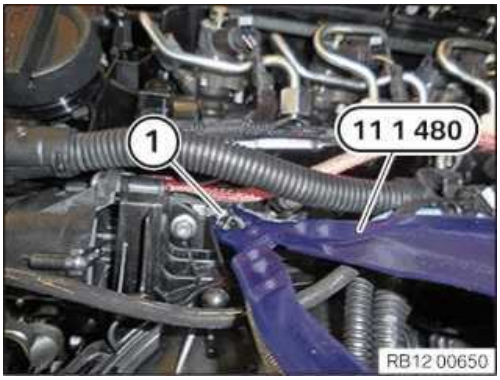
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- Tighten the glow element with the special tool or conventional tools.

Glow elements to cylinder head

Glow element		Tightening torque	13 Nm



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

83 – Installing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Install the hydraulic valve clearance compensating element (1) in the direction of the arrow.
- Repeat the process on all hydraulic valve clearance compensating elements.

84 – Install the roller cam followers

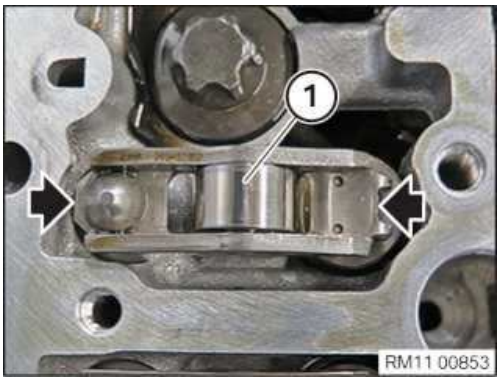
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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RISK OF DAMAGE

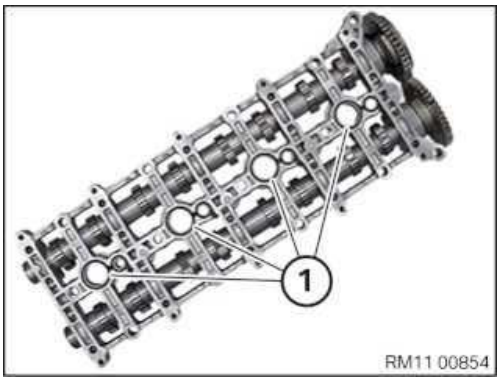
Damage to the engine.

If the classification of the roller cam followers is ignored, this can lead to engine damage.

- Observe the classification of the roller cam followers.
- Always reuse used roller cam followers at the same position.

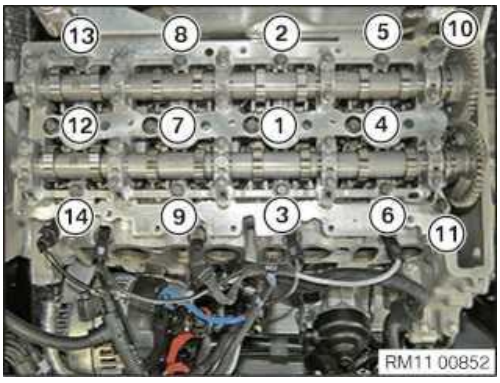
- Install the roller cam follower (1).
- Repeat the process for all roller cam followers.

85 – Installing the camshaft support



- Renew gaskets (1).

  Parts: gaskets

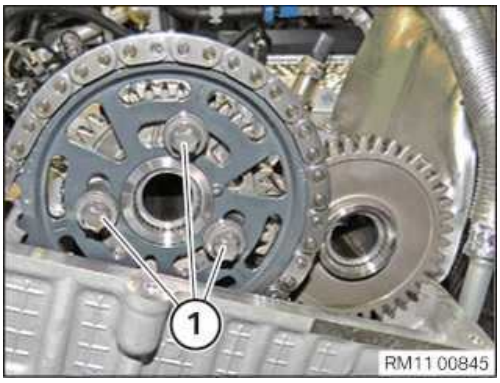


- Position the camshaft support including the camshafts.
- Tighten the screws in a sequence from (1) to (14) in several steps.

Camshaft carrier to cylinder head

M7x35		Tightening torque	13 Nm

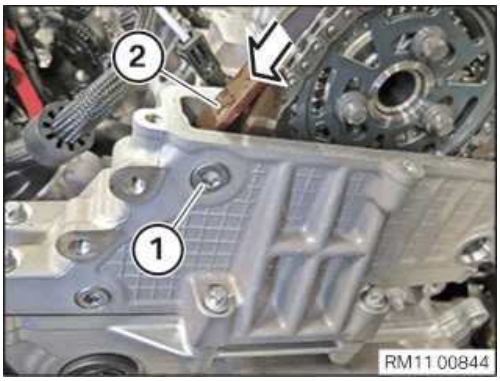
86 – Installing the camshaft sprocket on the intake camshaft



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

87 – Install the timing chain guide rail

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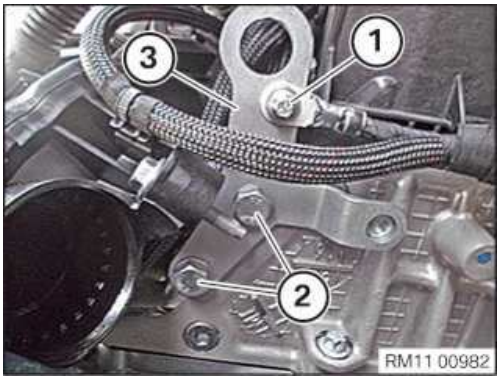
- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm



- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6		8 Nm

88 – Installing the chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Renew sealing ring (1).

  Parts: Sealing ring

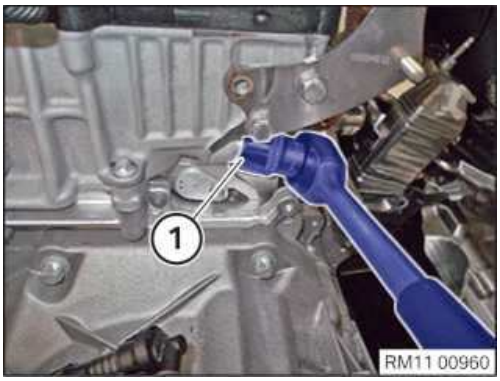


TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.

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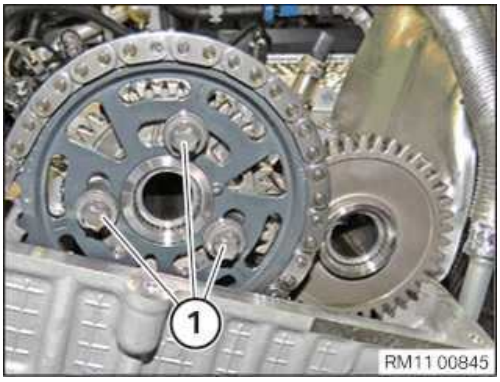


- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

89 – Tightening the camshaft sprocket on the intake camshaft



- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

90 – Checking camshaft timing



- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**



RISK OF DAMAGE

Damage to the engine.

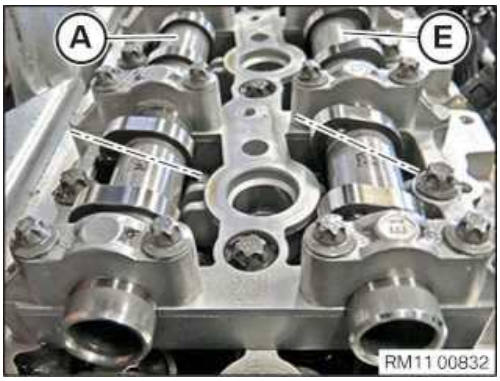
The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

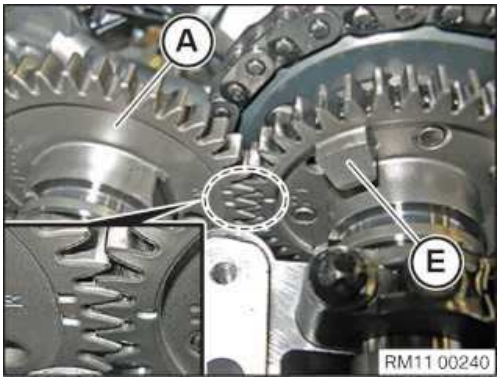
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- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.



- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.



- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

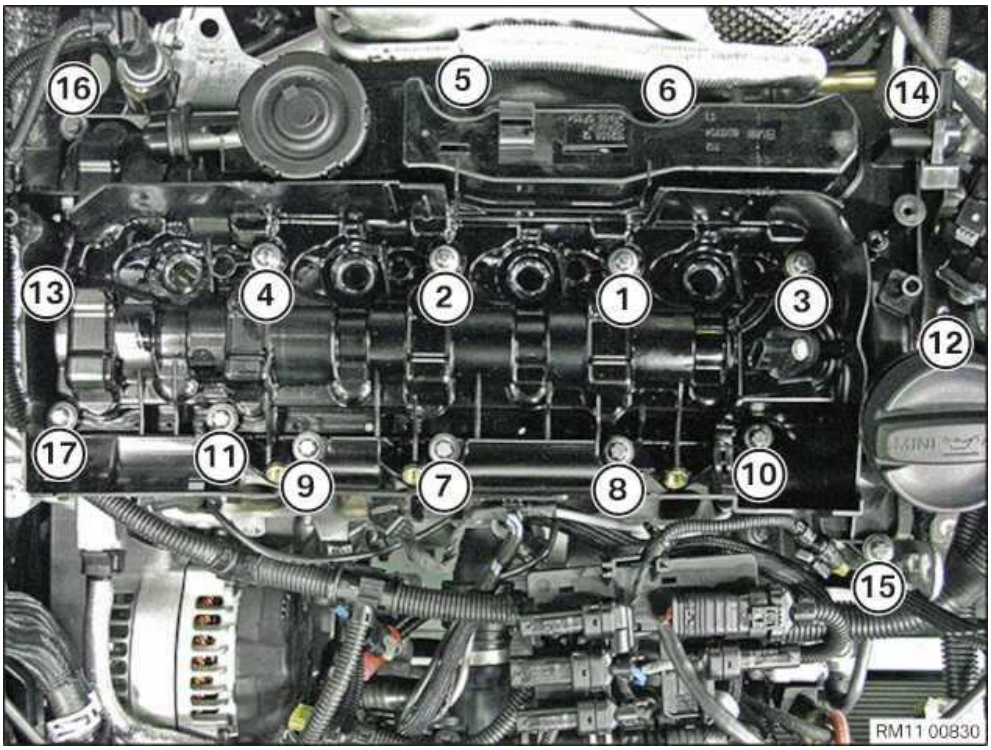


- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

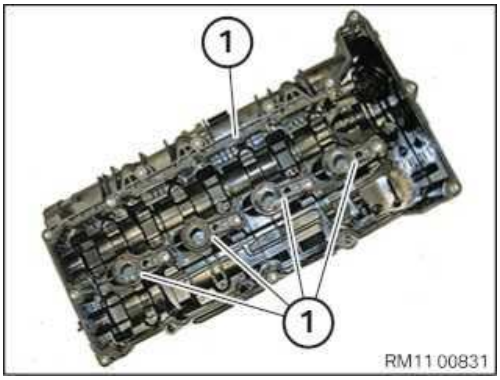
91 – Installing cylinder head cover

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Overview: Screw connection of the cylinder head cover

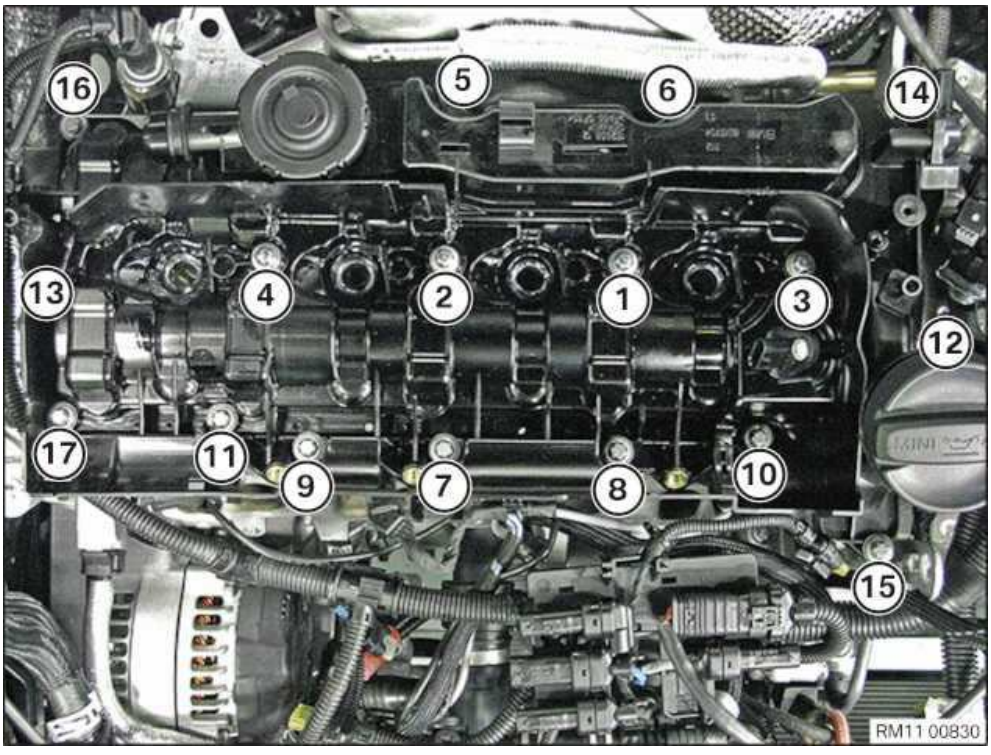


1 to 16 screws of the cylinder head cover.



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket



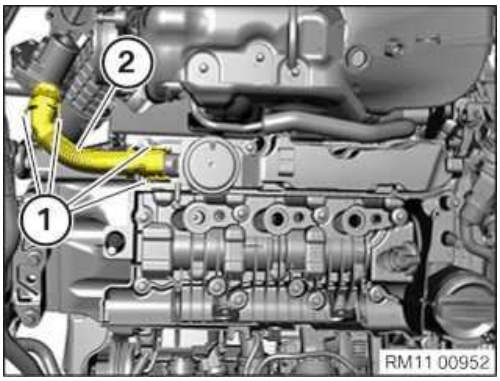
- Install cylinder head cover.
- Tighten screws in the order (1) to (17).

Cylinder head cover to cylinder head

M6		Tightening torque.	8, Nr

-

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- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

92 – Installing injectors of injection system

▸ **Cleaning the injector shafts**

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

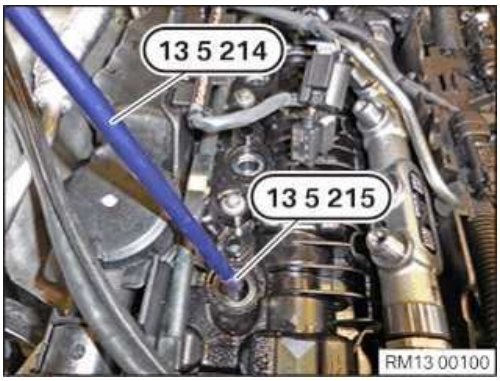
- Wear safety goggles.

RISK OF DAMAGE

Contaminant or foreign body.

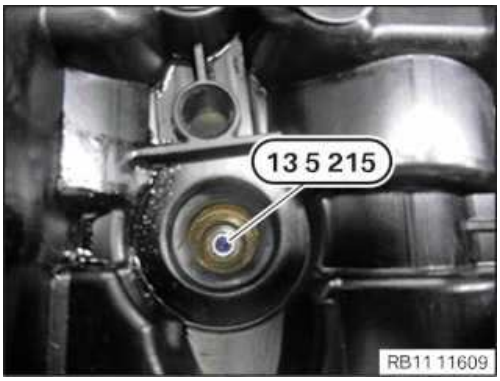
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.

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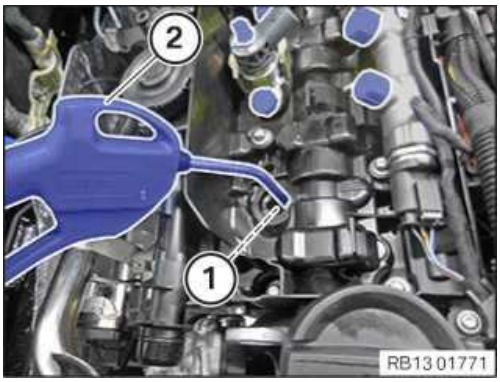
- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.



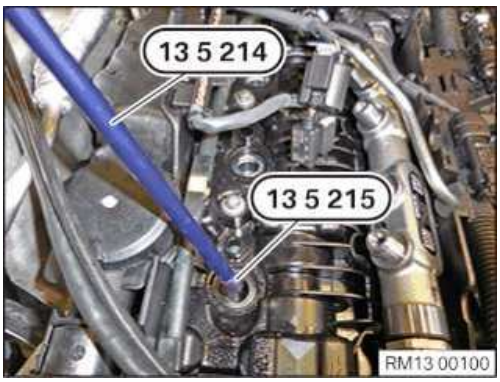
- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.



- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.



- Blow out injector shaft (1) with air gun (2).



- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

► **Check the placement of the clamping claw**

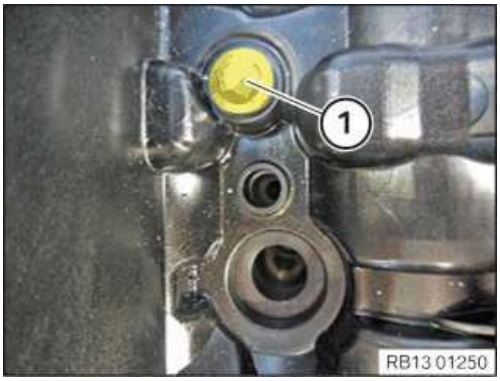
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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▸ **Prepare the injector for installation**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

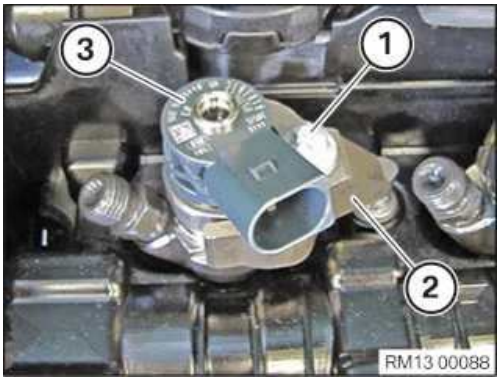


- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring
- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

Injector lubricating grease	50 g, Can	83230441070

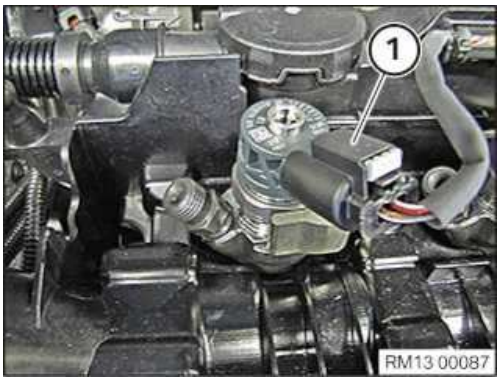


- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

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- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

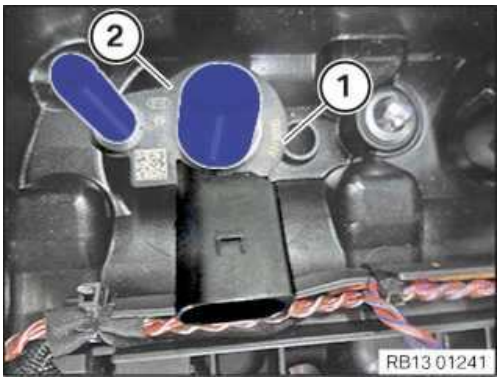
▶ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

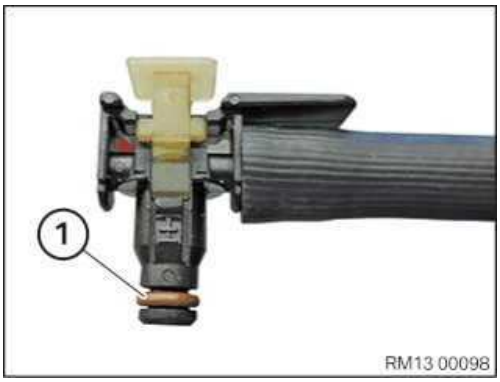


- Read off the adjustment value (1) on the new injector (2).



- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

93 – Connect the leakage oil line on the injector



- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.

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- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

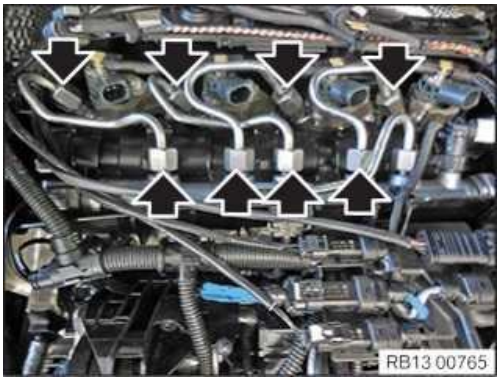
94 – Installing high pressure lines between rail and injectors

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Remove special tool .
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten the high pressure lines (arrows) with the special tool .

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

95 – Prepare for the installation of the exhaust turbocharger

- Check the oil feed lines and the oil return lines for contamination or obstruction, clean or renew if necessary.
- If the oil feed lines and/or oil return lines are heavily contaminated, we recommend changing the engine oil and the oil filter.
- If installed: Check the coolant feed lines and the coolant return lines for the exhaust turbocharger for contamination or obstruction, clean or renew if necessary.
- Check that the screw connections and the plug connections of all the lines are correct.
- Check air cleaner for contamination and clean or renew as needed.
- Check correct functioning of crankcase ventilation.
- Replace all gaskets.

  Parts: Seals

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96 – Installing the high-pressure stage exhaust turbocharger

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

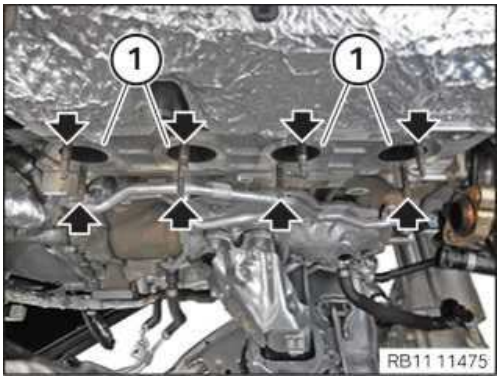
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

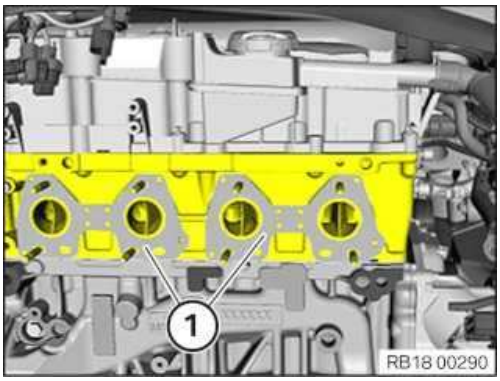


- Clean the sealing surfaces (1) on the cylinder head using special tool **0 495 102 (11 4 470)**.
- Check the stud bolts (arrows) on the cylinder head for correct fit.



- Clean the sealing surfaces on the exhaust manifold using special tool **0 495 102 (11 4 470)**.

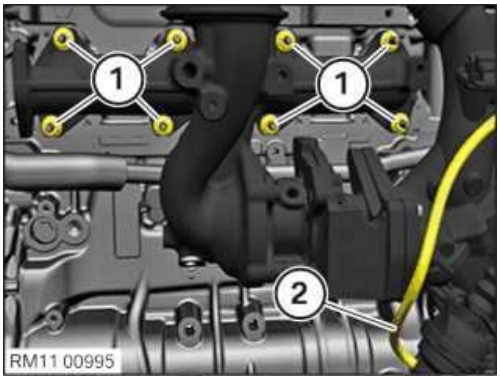
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- Renew gasket (1).

  Parts: Gasket

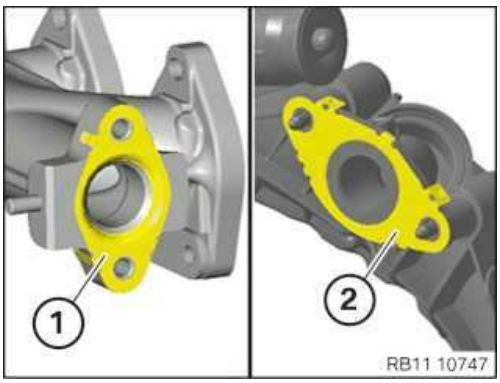
- Install new gasket (1).



- Feed in and install the exhaust manifold and the high-pressure stage exhaust turbocharger.
- Tighten nuts (1).

  Parts: Nuts

- Connect vacuum hose(2).

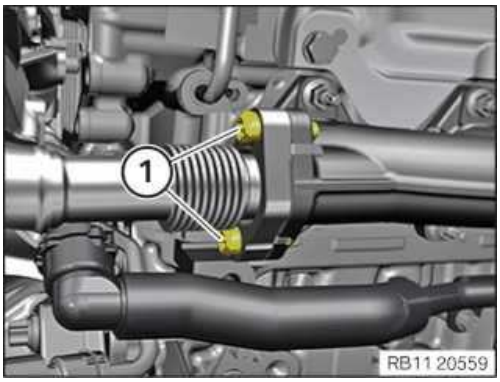


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

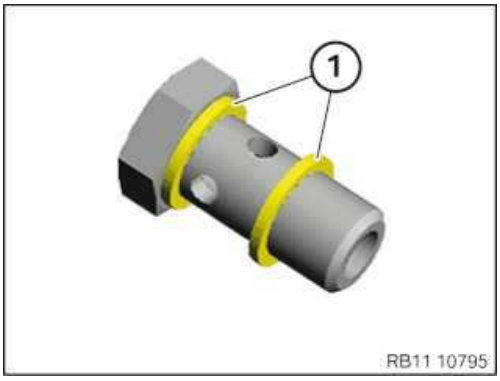
  Parts: Gasket



- Tighten the screws (1).

Exhaust-gas recirculation cooler to exhaust manifold

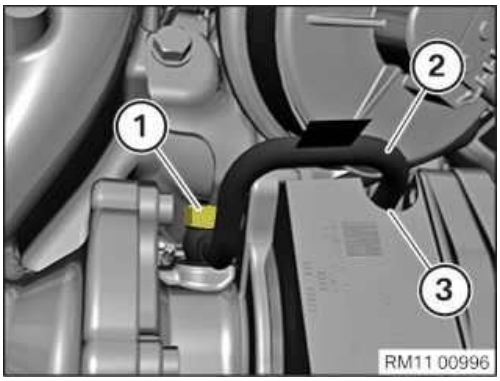
M8x28	Replace screws	Tightening torque	32 Nm



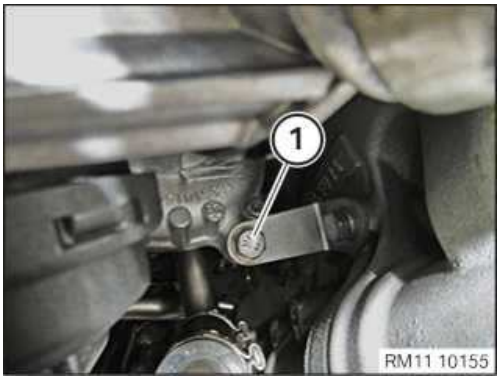
- Renew sealing rings (1) of banjo bolt.

  Parts: Sealing ring

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- Guide the oil feed line into the holder (3) and install it.
- Tighten down screw (1).

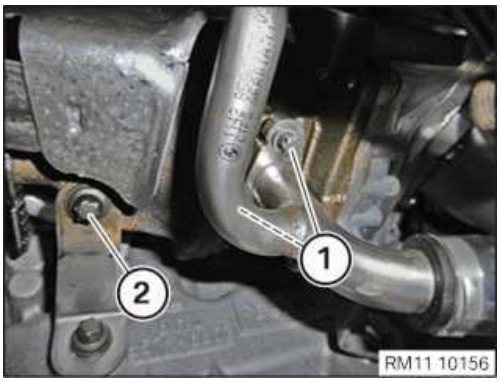


- Tighten bolt (1) from the right wheel arch.



- Renew seal (1) of oil return line.

  Parts: Gasket



- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

97 – Installing the low-pressure stage turbocharger

RISK OF DAMAGE

Damage to the surface.

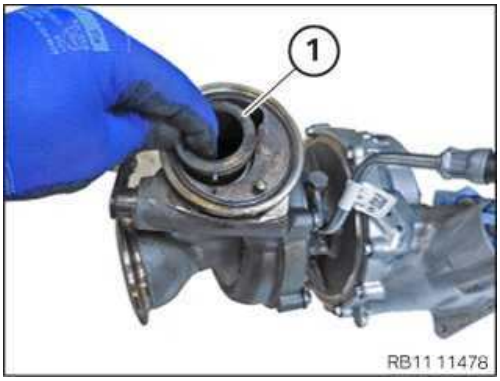
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

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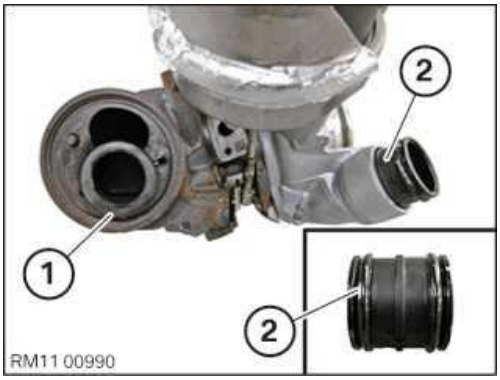
TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.



- Check the spacer plug (1) for damage, renew if necessary.

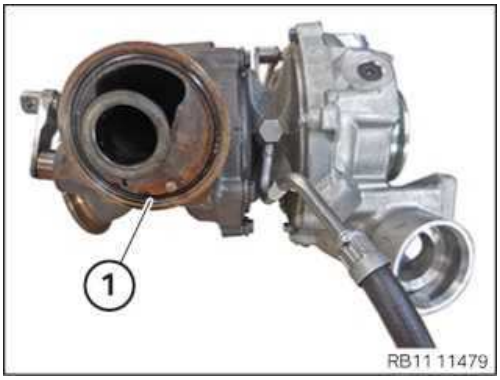
  Parts: Spacer ring
- Insert and install the spacer ring (1).
- Position spacer ring (1) correctly.



- Renew gasket (1).

  Parts: Gasket
- Position the seal (1).
- Renew the sleeve(2).

  Parts: Holding sleeve



- Renew sealing ring (1).

  Parts: Sealing ring
- Affix the sealing rings on the exhaust turbocharger.

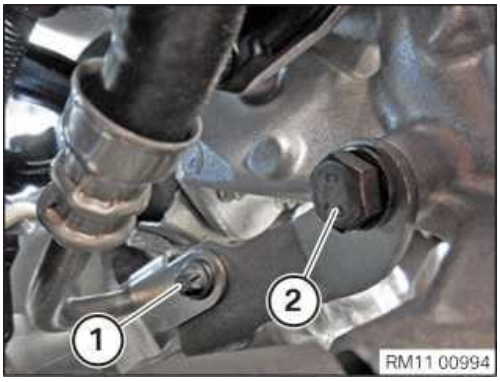


- Insert and install the low-pressure stage exhaust turbocharger on the exhaust manifold .
- Feed in and install V-band clamp .
- Tighten V-band clamp (2).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Screw in nut (1) with 2 **revolutions**.



- Tighten down screw (1).

Oil feed line to bracket

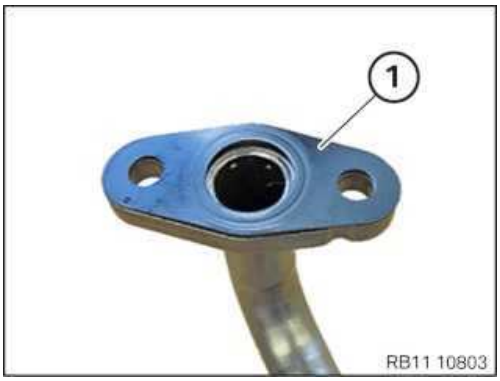
Torx screw M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

Holder to exhaust turbocharger and crankcase

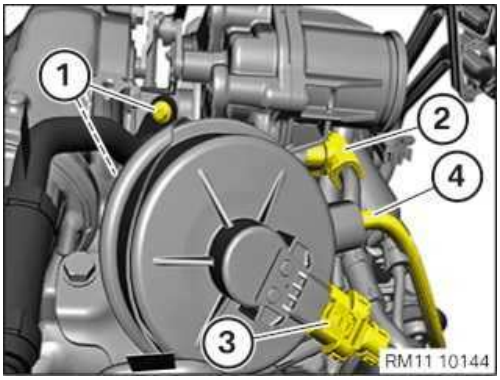
M8x16		Tightening torque	22 Nm

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- Renew seal (1) on the oil return line.

  Parts: Gasket



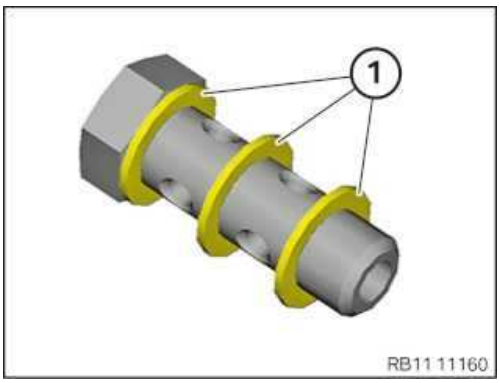
- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

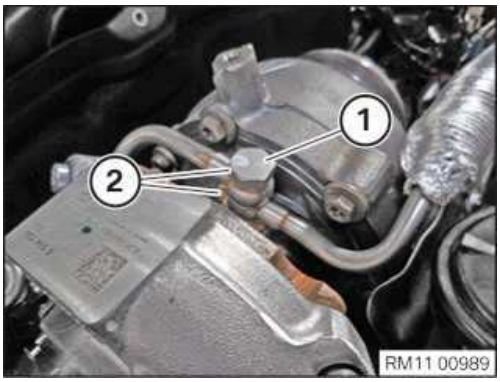
M6x12		Tightening torque	8 Nm

- Connect and lock connectors (2) and (3).

  The locks must engage audibly.
- Connect vacuum hose (4).



- Renew banjo bolt and sealing rings (1).
- **Parts:** Banjo bolt, sealing rings



- Install sealing rings (1).
- Tighten the banjo bolt (1).
- Ensure that the lines do not rest against the adjacent components.

98 – Installing heat shield on exhaust turbocharger at bottom

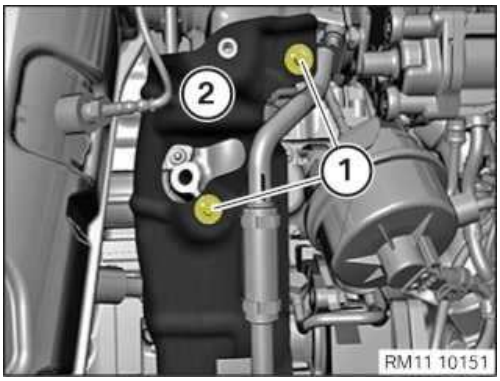
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

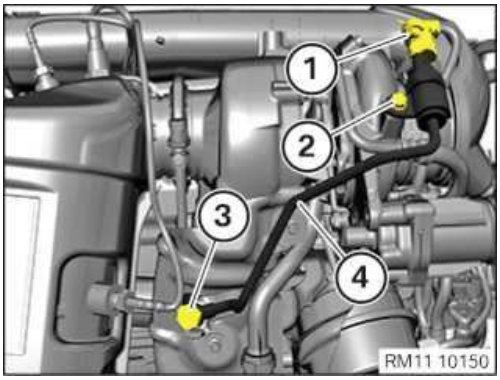
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- Feed in and install the heat shield (2).
- Tighten the bolts (1) on the heat shield .

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm



- Position the exhaust gas pressure pipe (4).
- Hand-tighten the bolt (2).
- Renew sealing rings on the banjo bolt (3).

  Parts: Sealing ring
- Tighten the banjo bolt (3).

Banjo bolt for exhaust pressure pipe to exhaust manifold

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

- Tighten down screw (2).

Standard screw connection M6

M6		8 Nm

- Connect connectors (1) and lock.

  Lock must audibly engage.

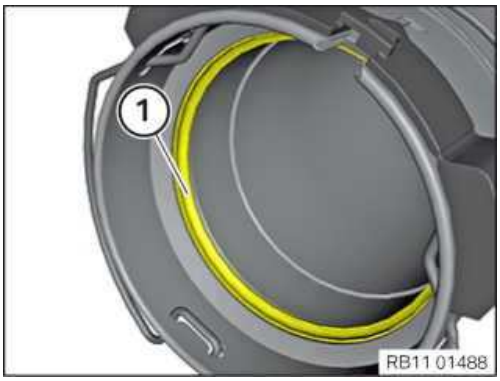
99 – Installing the right charge air duct between the exhaust turbocharger and the charge air cooler

RISK OF DAMAGE

Damage to the exhaust turbocharger.

A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.



- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

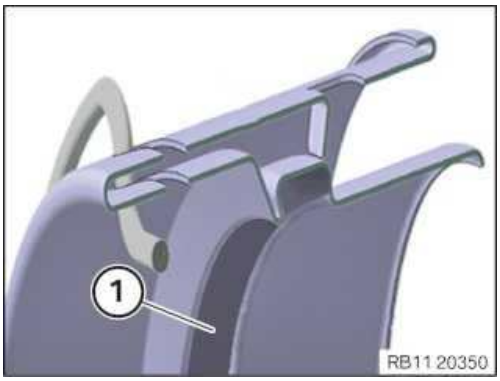
  Parts: Gasket

▸ **Replace damaged gasket**

TECHNICAL INFORMATION

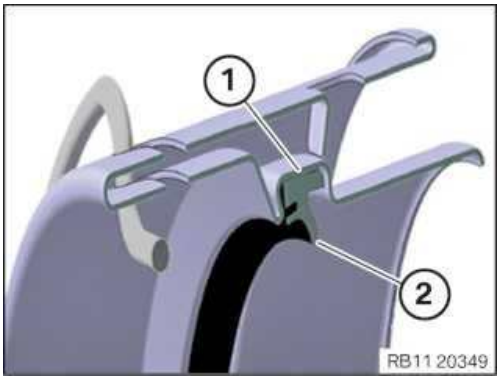
Do not use pointed or sharp-edged tools for the installation and/or removal.

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- Remove damaged seal.
- Clean gasket groove (1) with a dry towel.

  The gasket groove (1) must be clean.



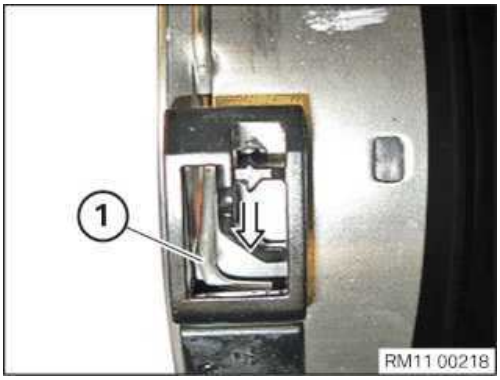
- Renew gasket.

  Parts: Gasket
- Install seal dry without lubricant or mounting agent.

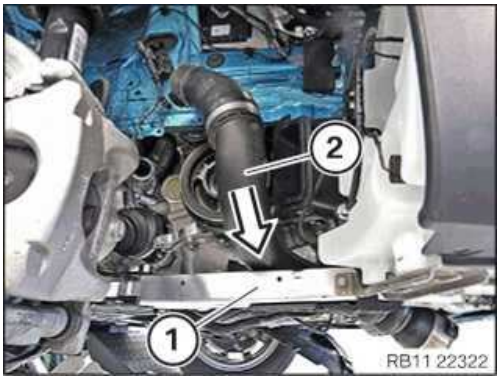
TECHNICAL INFORMATION

Incorrect assembly is possible. Ensure correct installation position.

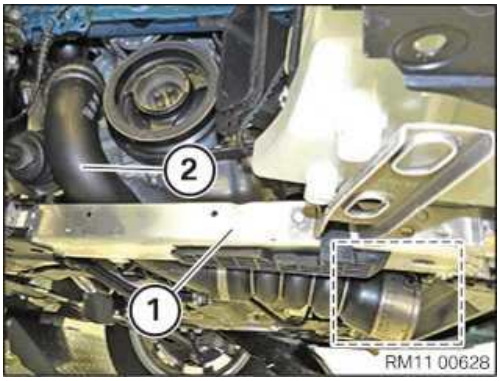
- Feed in and install the seal.
- Make sure the seal is correctly installed in the gasket groove (1).
- Make sure that the sealing lip (2) is pointing downwards (see figure).



- Detach the locks (1) in the direction of the arrow from the brackets.
- Ensure that the locks (1) engage audibly.

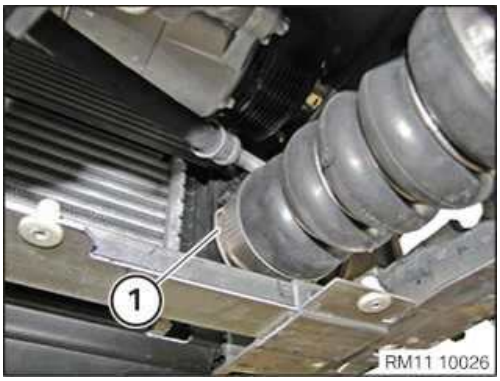


- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed in the charge air duct (1) in the **direction** of arrow between the side member and the deformation element and position.

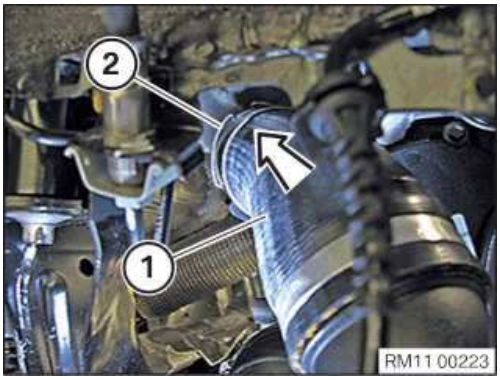


- Pull the adapter of the front axle support (1) downwards to the front right.
- Position the charge air duct (2) in **marked** area on the charge air cooler.

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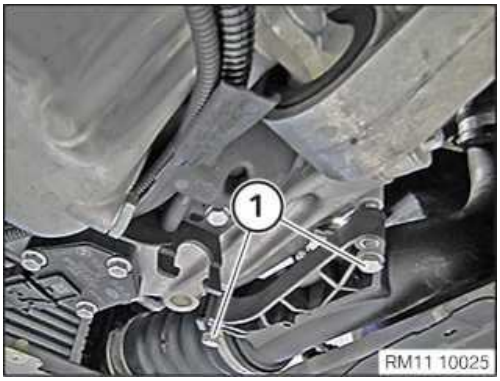


- Feed in and install the charge air duct (1) on the charge air cooler .
- Make sure the charge air duct (1) engages audibly on the charge air cooler.



- Feed in and install charge air duct (1) in the **direction** of the arrow on exhaust turbocharger.

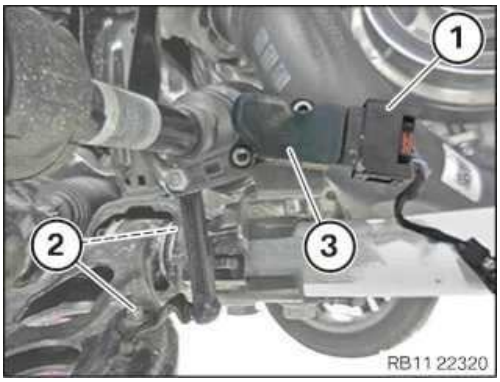
  The locks (2) must engage audibly.



- Tighten the screws (1).

Charge air duct to oil sump

M6		Tightening torque	8 Nm



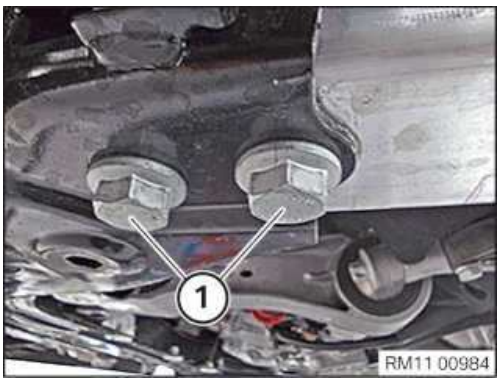
- **If installed:**
- Feed in and install the ride height sensor (3).
- Tighten the screws (2).

Ride height sensor holder to front axle support

M6		Tightening torque	8 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

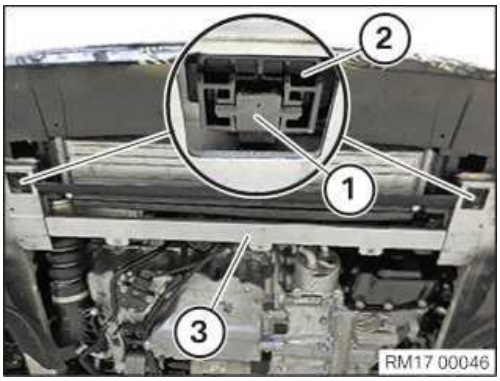


- Tighten the screws (1) on the adapter of the front axle support.

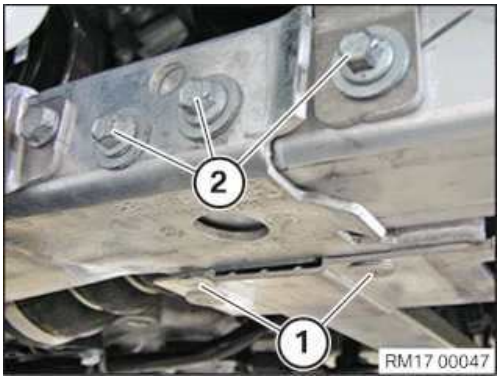
Adapter, front axle support to front axle support

		Tightening torque	100 Nm

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- Guide in cross connection (3) and install.
- Guide in locks (2) and install.
- Lock the locking pins (1).
- Ensure that the locking pins (1) audibly engage.



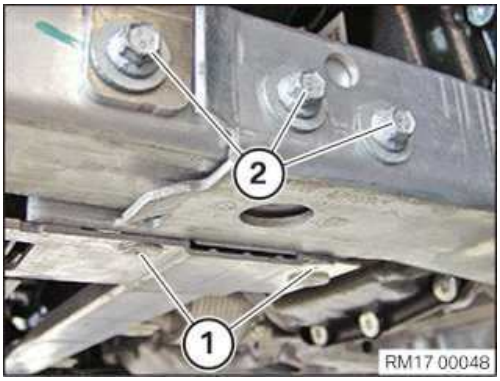
- Tighten the bolts (2) at the front left.

Cross connection to front axle support

M6		Tightening torque	12 Nm

- Renew the blind rivet (1).

  Parts: Blind rivet
- Mount the blind rivets (1) at the front left.



- Tighten the bolts (2) at the front right.

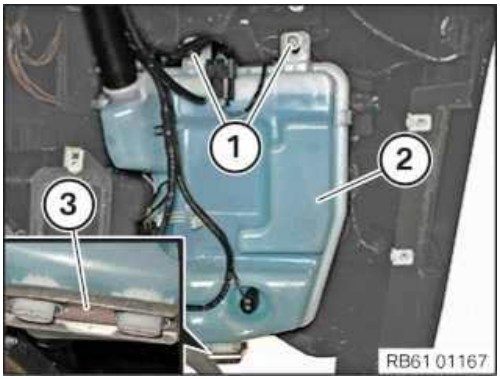
Cross connection to front axle support

M6		Tightening torque	12 Nm

- Renew the blind rivet (1).

  Parts: Blind rivet
- Mount the blind rivets (1) at the front right.

100 – Install the washer fluid reservoir in the fixture

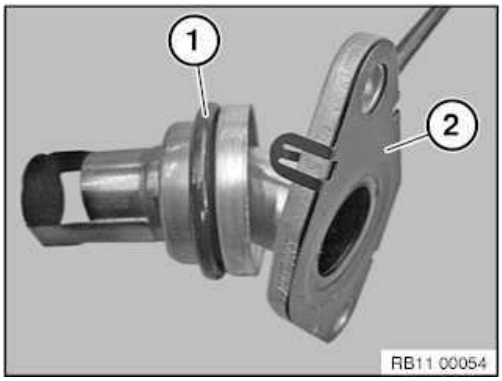


- Feed washer fluid reservoir (2) into the mounting (3) and install.
- Tighten the screws (1).

Washer fluid reservoir to body

M6x20		Tightening torque	8 Nm

101 – Installing the intake plenum

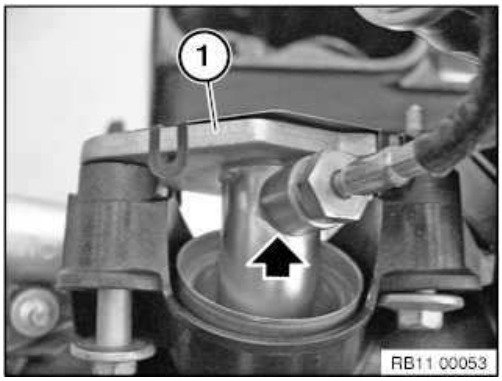


- Renew O-ring (1).

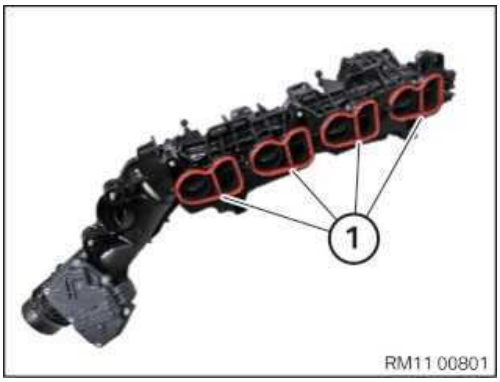
  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position the seal (2) and clip it in.

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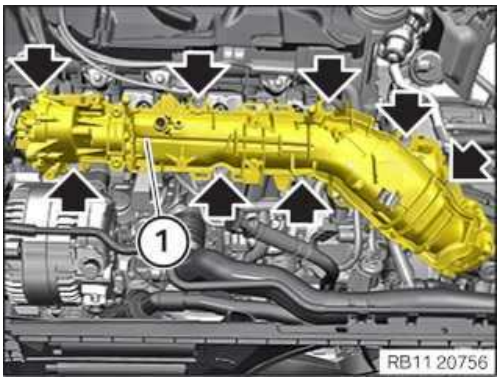


- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (1).

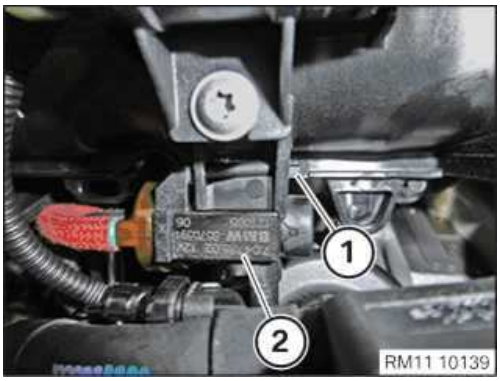
  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.



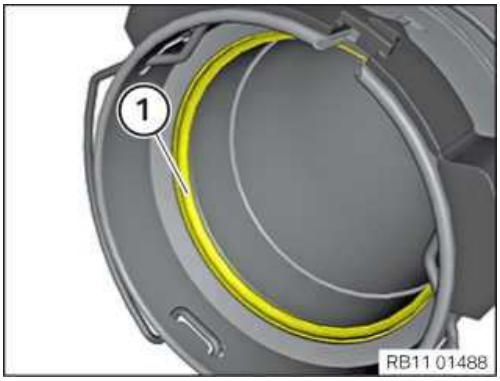
- Guide in and install intake (1) plenum.
- Tighten screws (arrows).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm



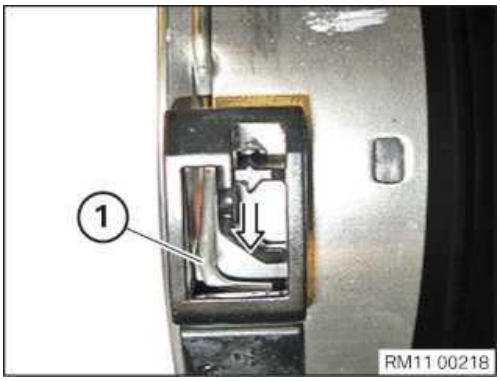
- Install the electric changeover valve (2) in the holder on the plenum from left to right.
- Lock (1) must engage audibly.



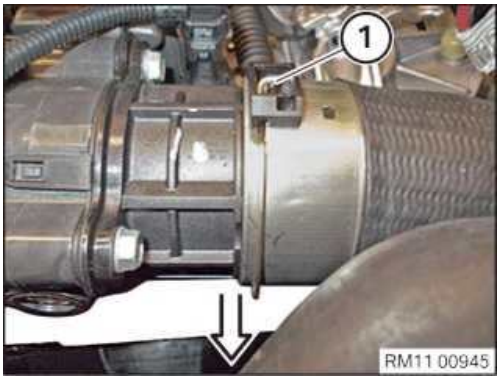
- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring

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- Engage the lock (1) on the bracket (arrow).



- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

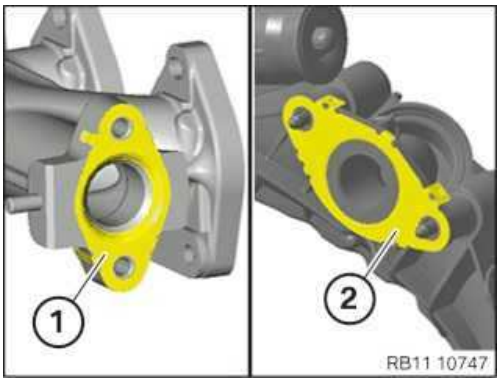
102 – Installing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

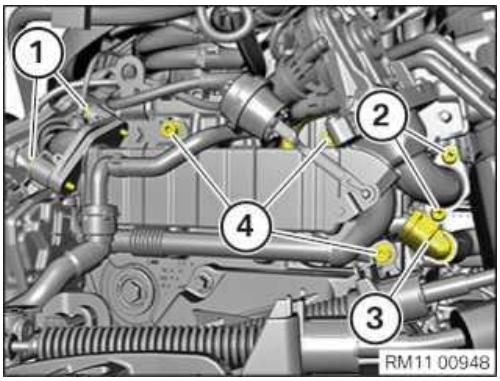


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket
- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket

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- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts
- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

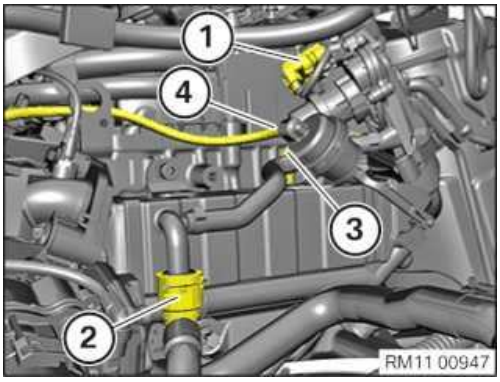
M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.
- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm



TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

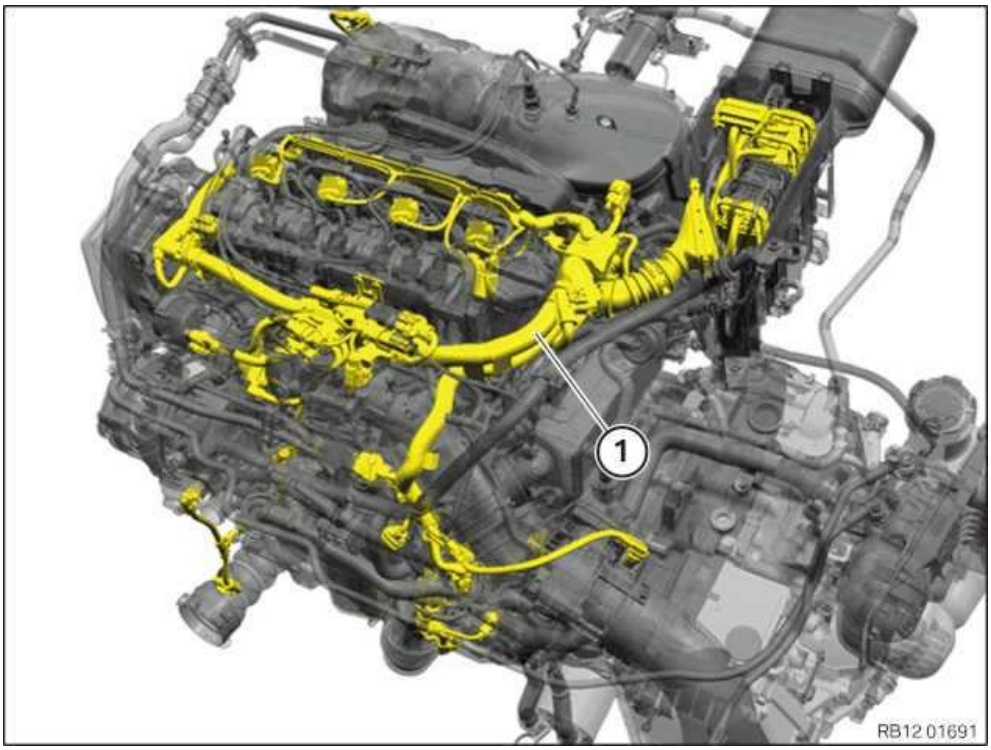
- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

103 – Fastening the wiring harness section for the intake plenum

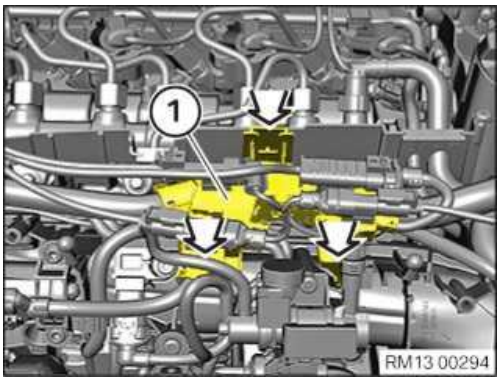
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Overview: Wiring harness section for the engine

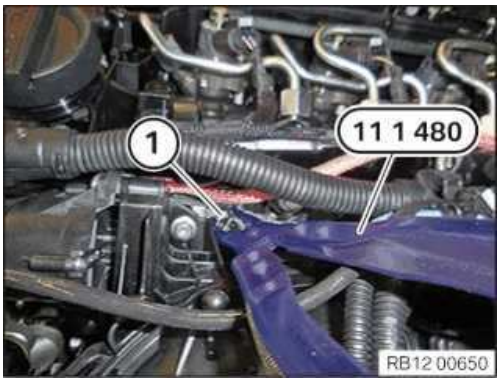


1 Wiring harness section for the engine

▶ **Installing the cable clip for the intake plenum**

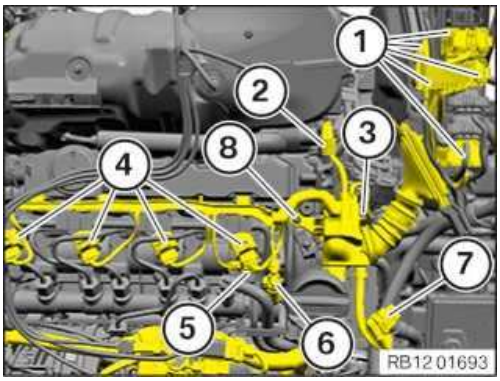


- Insert and install the cable clip (1) in the direction of the arrow.
- Make sure the cable clip (1) is fitted correctly.



- Connect and lock the connector (1) on the glow elements.
  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.

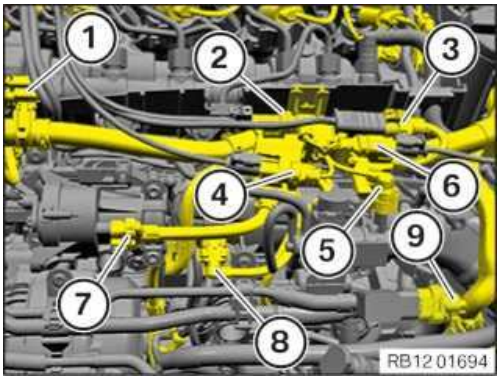
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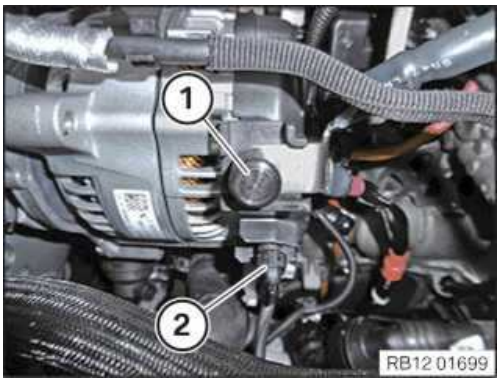
- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the DME control unit and remove the integrated supply module (PDM).
- Attach connector (2) to the differential pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust-gas recirculation valve and lock audibly.
- Attach connector (4) to the injectors and lock it audibly.
- Attach connector (5) to the camshaft sensor and lock it audibly.
- Attach connector (6) to the fuel pressure regulator and lock it audibly.
- Connect and audibly lock the connector (7) to the hot film air mass meter.
- Tighten down screw (8).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm



- Connect the connector (1) to the rail pressure sensor and lock it audibly.
- Attach connector (2) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (3) to the front oxygen sensor and lock audibly.
- Attach connector (4) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Connect the connector (5) to the electric changeover valve and lock audibly.
- Attach connector (6) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (7) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (8) to the charging pressure sensor and lock it audibly.
- Attach connector (9) to the fuel pressure and temperature sensor and lock it audibly.

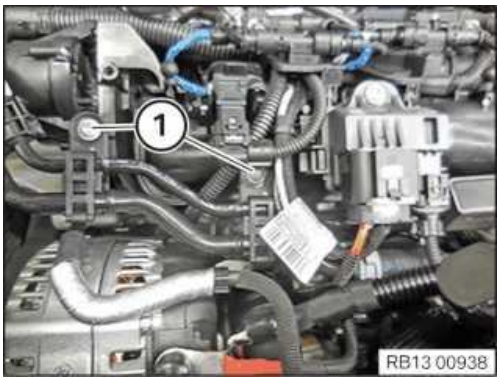


- Connect and lock the connector (2).

  Lock must snap audibly into place.
- Connect the positive battery cable (1) and tighten.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

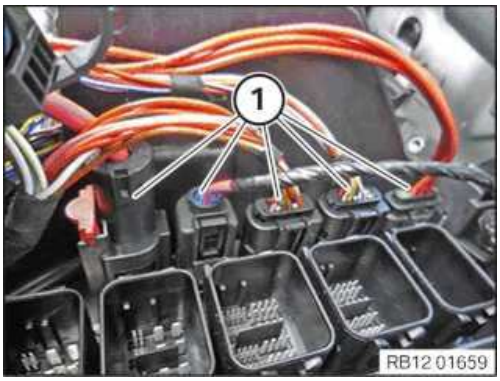


- Position the fuel line.
- Tighten the screws (1).

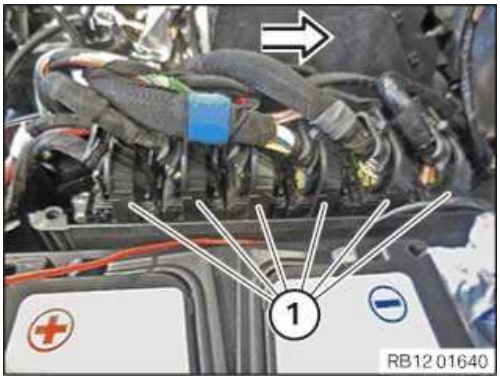
Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

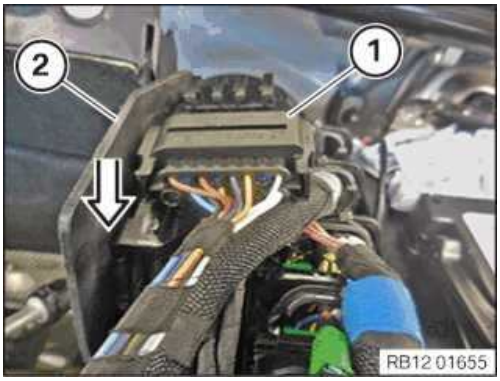
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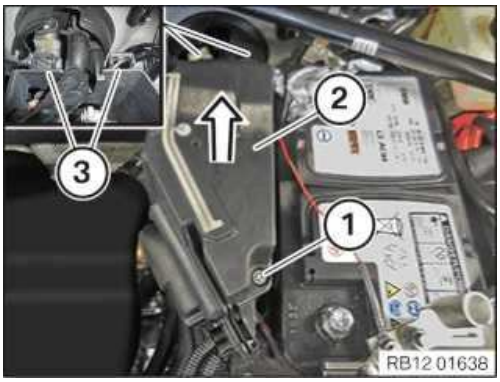
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



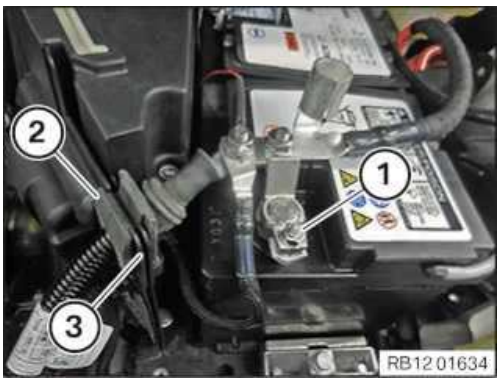
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert and install the cover (2) into the guides (3) in the direction of the arrow.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

RF5x26.5		Tightening torque	2,5 Nm

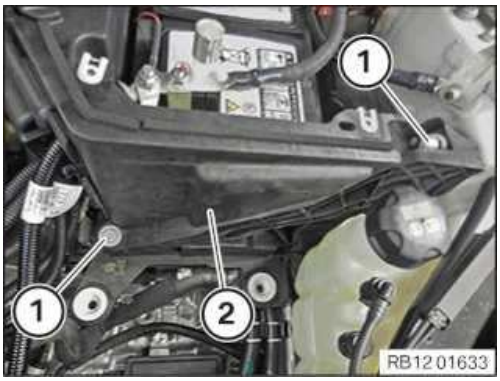


- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

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- Feed in and install tension strut (2).
- Tighten the screws (1).

Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

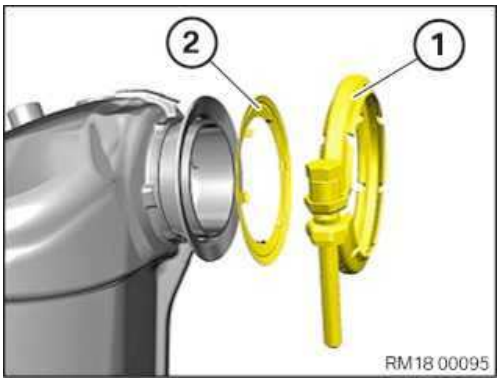
104 – Installing the diesel particulate filter

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



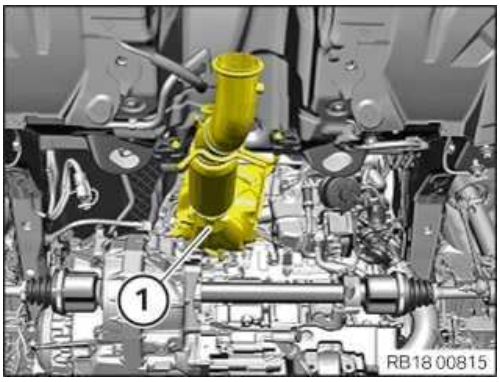
- Renew the V-clip (1).

  Parts: V-band clamp
- Renew the gasket (2).

  Parts: Gasket

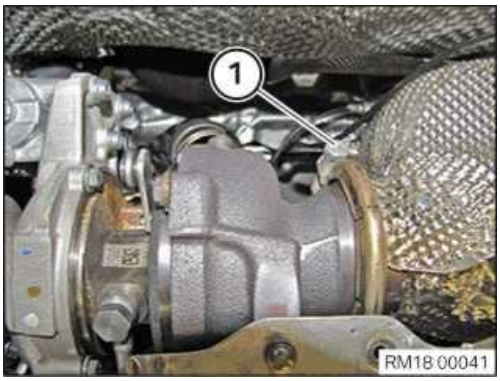


- Before installing the diesel particulate filter: Mount fitting aid (1) for the flexible tube.



- Carefully insert and install the diesel particulate filter (1).

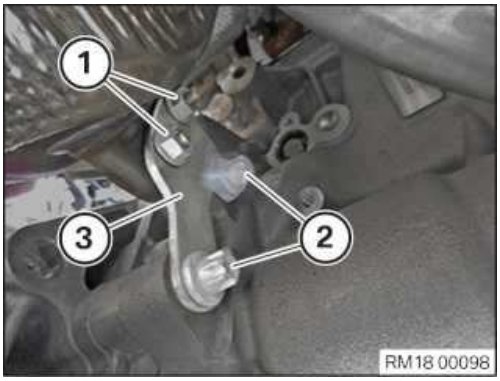
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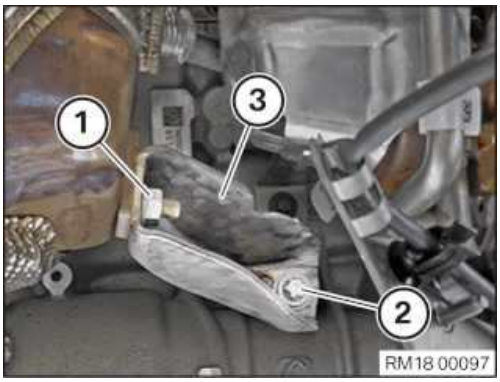
- Feed in and install V-band clamp (1).
- Make sure that the seal between the diesel particulate filter and the exhaust turbocharger is installed correctly.
- Align the diesel particulate filter on the exhaust turbocharger.
- Position V-clip (1).
- Hand-tighten the V-clip (1).



- Tighten nuts (1) by hand.



- Install holder (3).
- Hand-tighten the bolts (2).
- Tighten nuts (1) by hand.

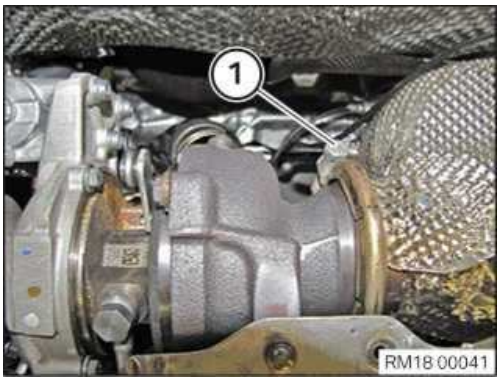


- Install holder (3).
- Tighten the nut (1) hand-tight.
- Hand-tighten the bolt (2).



- Remove fitting aid (1) for the flexible tube.

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- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

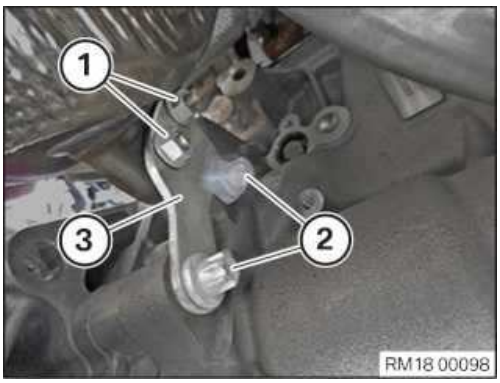
V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm



- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screws (2).

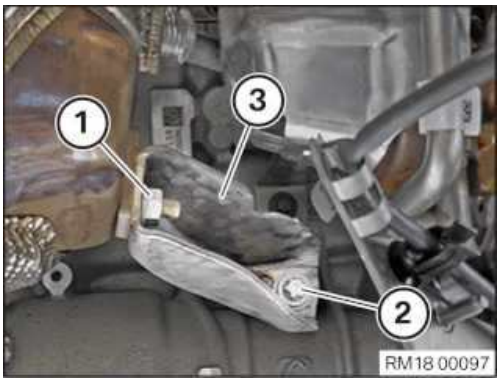
Diesel particulate filter holder to gearbox

M12x75		Tightening torque	66 Nm

- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screw (2).

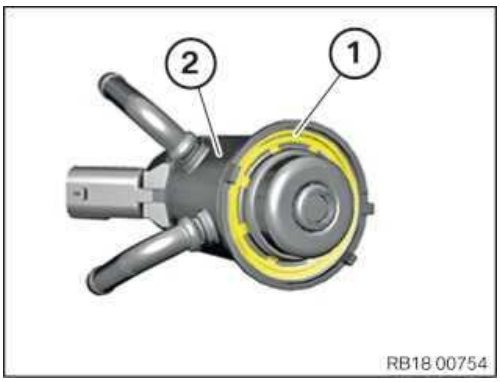
Diesel particulate filter bracket to crankcase

M10x35		Tightening torque	38 Nm

- Tighten nut (1).

Diesel particle filter to holder

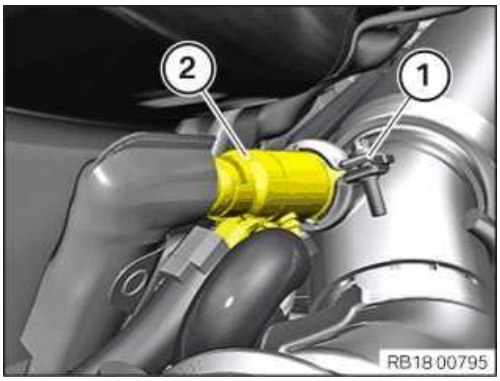
M8 hexagon nut		Tightening torque	19 Nm



- Renew sealing ring (1) of the SCR metering module (2).

  Parts: Sealing ring

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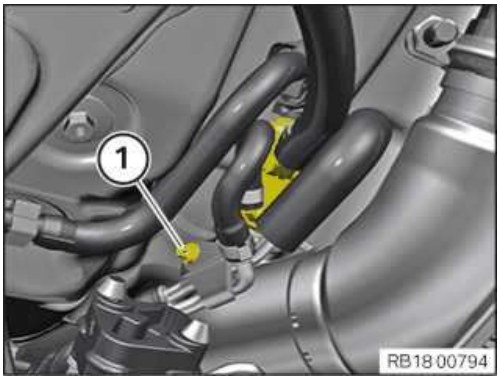


- Insert and install the SCR metering module (2).
- Renew the V-clip (1).

  Parts: V-band clamp
- Tighten V-band clamp (1).

SCR metering module V-clip to exhaust system

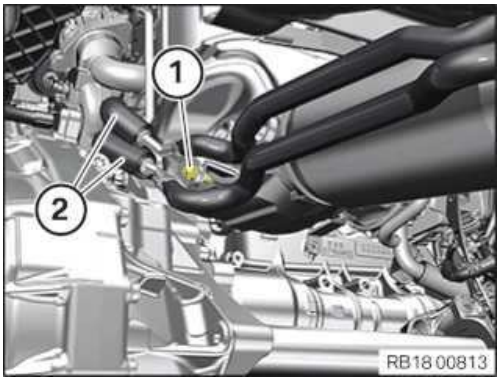
V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm



- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm

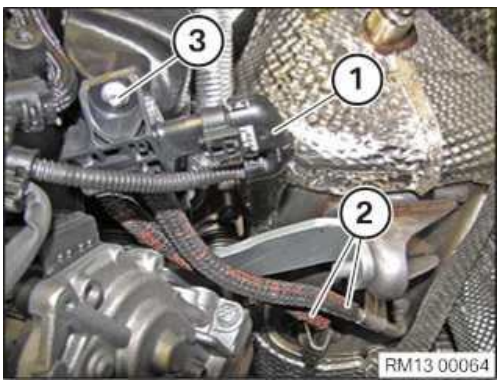


- Thread in and install coolant line (2) of the SCR metering module.
- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm

▶ **Installing differential pressure sensor**



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

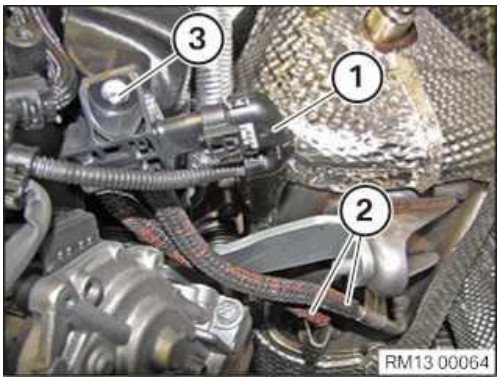
Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

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- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

106 – Install the control sensor

TECHNICAL INFORMATION

New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue



- Feed in front oxygen sensor (1) and install.
- Tighten front oxygen sensor (1) using special tool .

Control sensor

Control sensor		Tightening torque	50 Nm

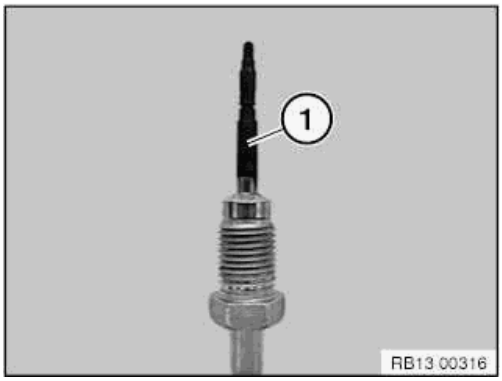


- Lay and secure cable of oxygen control sensor.
- Secure the connector (2) to the holder.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

107 – Install the exhaust-gas temperature sensor on the diesel particulate filter

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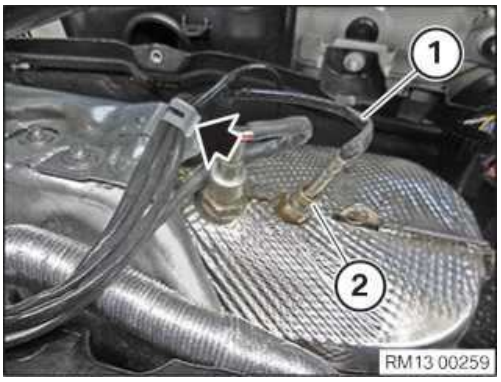
RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

- Check the gauge tip (1) for damage and renew the exhaust temperature sensor as needed.



- Feed in and install the exhaust temperature sensor (2).
- Tighten the exhaust temperature sensor (2).

Exhaust temperature sensor to diesel particulate filter

Exhaust-gas temperature sensor		Tightening torque	28 Nm



- Insert and install cable (1) of the exhaust temperature sensor in the clamp (arrow).
- Lay and fasten the cable of the exhaust gas temperature sensor.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

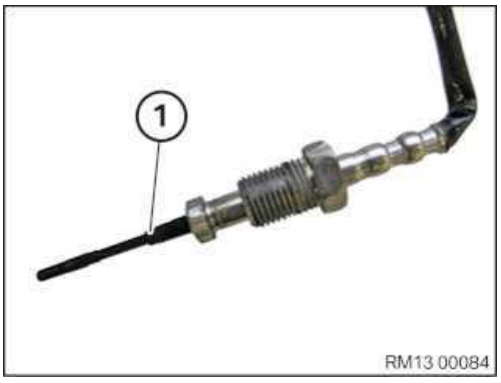
108 – Installing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

RISK OF DAMAGE

Damage of exhaust temperature sensor.

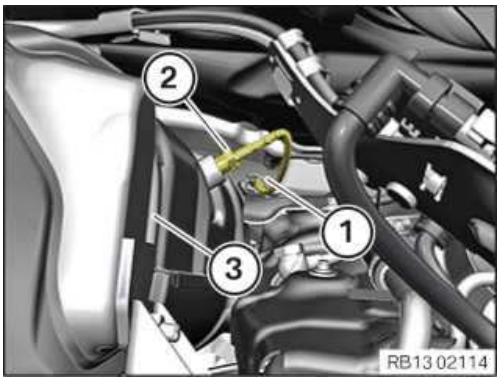
Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.



- Make sure the gauge tip (1) is not damaged during installation.

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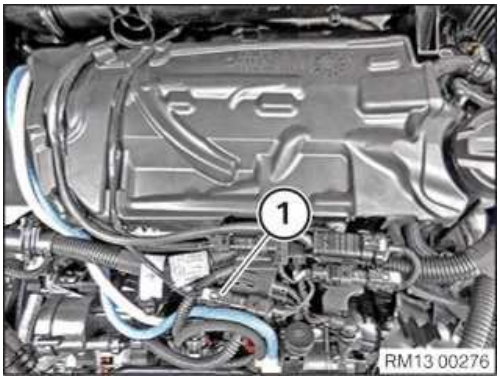


- Guide the exhaust temperature sensor (2) into diesel particulate filter (3) and install.
- Tighten the exhaust temperature sensor (2) with conventional tools .

Exhaust temperature sensor to diesel particulate filter

Exhaust-gas temperature sensor		Tightening torque	28 Nm

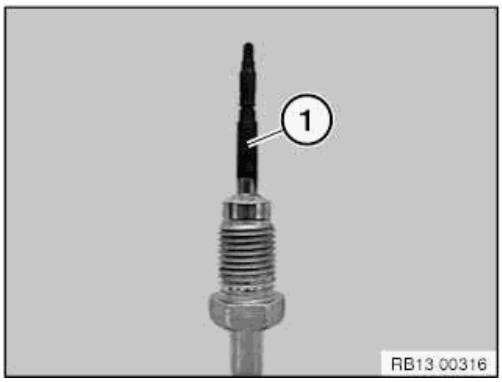
- Insert and install the cable of the exhaust temperature sensor (2) in the clamps (1).



- Lay and fasten the cable of the exhaust gas temperature sensor.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

109 – Installing exhaust temperature sensor on catalytic converter



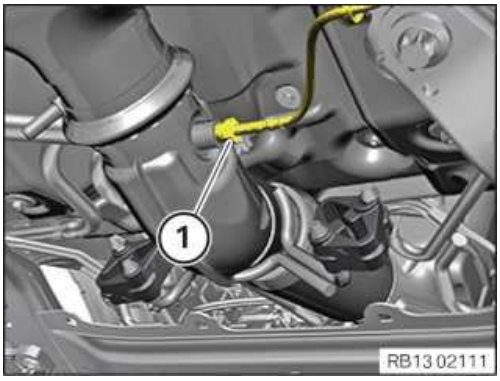
RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

- Check the gauge tip (1) for damage and replace the exhaust temperature sensor as needed.



- Feed in and install the exhaust temperature sensor (1).
- Tighten the exhaust temperature sensor (1).

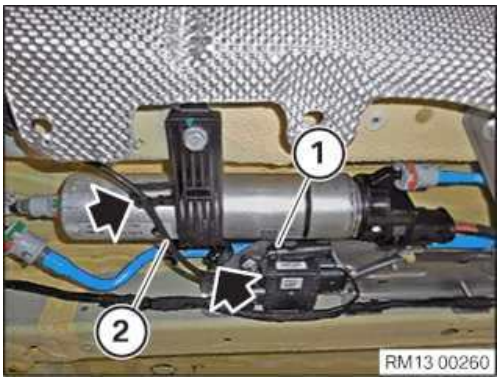
Exhaust-gas temperature sensor to exhaust system

Exhaust-gas temperature sensor		Tightening torque	28 Nm



- Secure the cable clips (1).

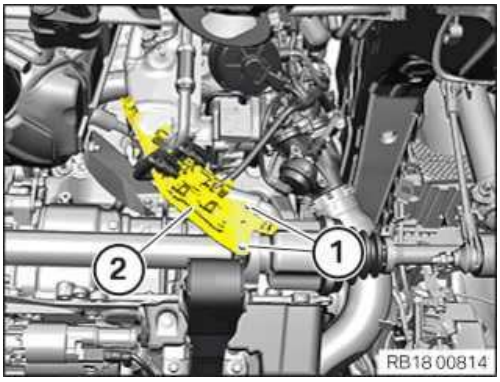
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- Feed cable (2) from exhaust temperature sensor into the clamps (arrows) and install.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

110 – Install holder for oxygen sensor

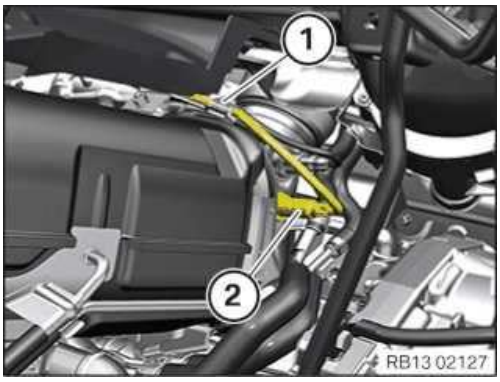


- Insert and install the holder (2).
- Tighten the screws (1).

Oxygen sensor holder to intermediate shaft

Hexagon screw M6x16		Tightening torque	8 Nm

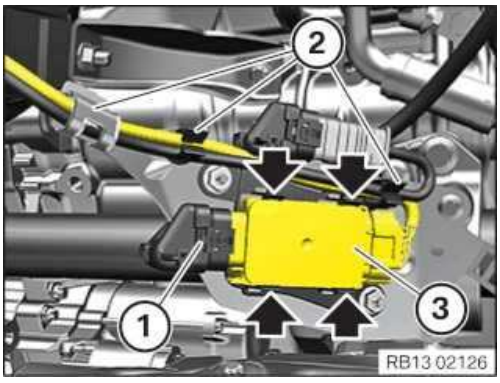
111 – Installing the nitrogen oxide sensor before SCR catalytic converter



- Insert nitrogen oxide sensor before the SCR catalytic converter (2) and install.
- Tighten the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

Nitrogen oxide sensor before SCR catalytic converter

Sensor		Tightening torque	50 Nm



- Install and lock the evaluation electronics for the nitrogen oxide sensor (3) (arrows).
- Insert the evaluation electronics cable for the nitrogen oxide sensor (3) into the clamps (2) and install.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

112 – Install the monitoring sensor

TECHNICAL INFORMATION

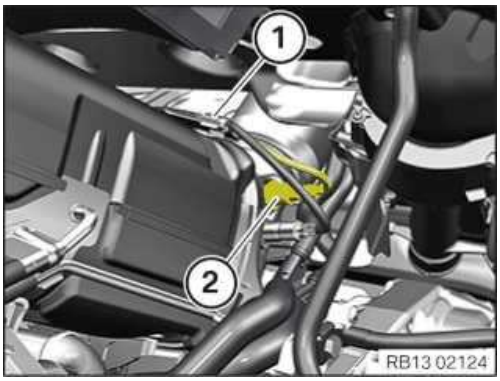
New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

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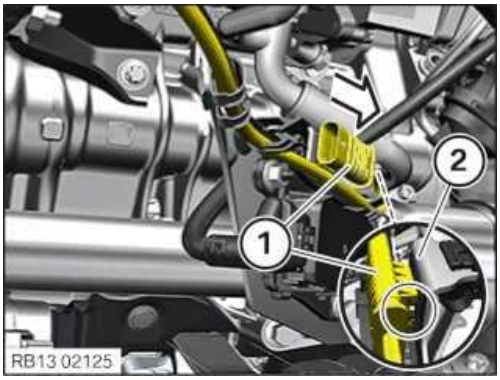


- Feed in the monitoring oxygen sensor (2) and install.
- Tighten the monitoring oxygen sensor (2) with special tool **0 491 074 (11 7 020)** .

Monitoring sensor

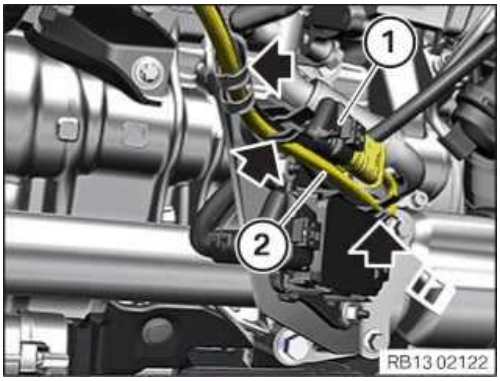
Sensor		Tightening torque	50 Nm

- Insert the cable of the monitoring oxygen sensor (2) into the clamp (1) and secure it.



- Connect the connector (1) with the bracket (2) in the direction of arrow.
- Make sure that the connector (1) is locked correctly in the marked area.

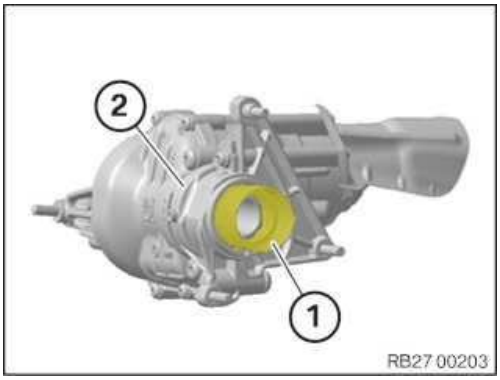
  The connector (1) must engage audibly.



- Insert and attach the cable of the monitoring oxygen sensor (2) to the clamps (arrows).
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

113 – Install the transfer box (VTG)



- If intermediate shaft (1) gets caught on transfer box (VTG) (2), renew intermediate shaft (1) and the radial shaft seals in the automatic or manual transmission.



- Screw special tool **2 409 025** into the outer radial shaft seal.
- Turn the screw on the special tool **2 409 025** until the outer radial shaft seal has been pulled out.

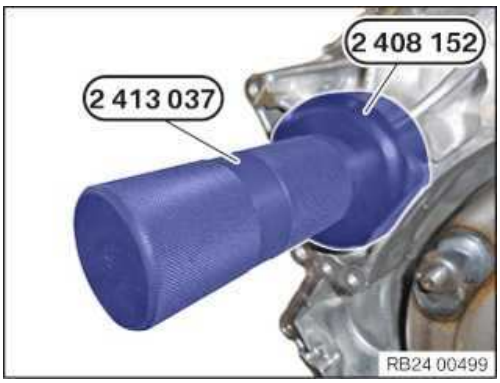
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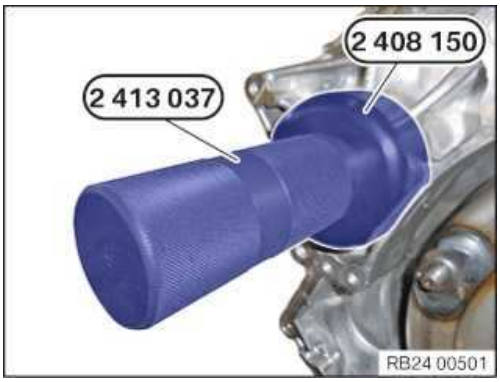
- Insert special tool **2 411 739** into the inner radial shaft seal.



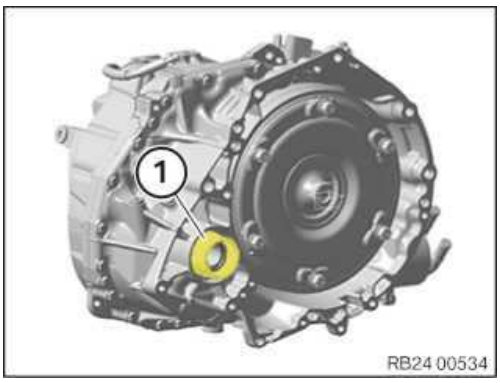
- Screw special tool **2 411 739** into the inner radial shaft seal.
- Turn the screw on the special tool **2 411 739** until the inner radial shaft seal has been pulled out.



- Drive in the inner radial shaft seal using special tools **2 408 152** and **2 413 037** up to the limit position.



- Drive in the outer radial shaft seal using special tools **2 413 037** and **2 408 150** up to the limit position.



- If necessary, connect the new intermediate shaft (1) to the output flange of the automatic transmission or manual transmission.

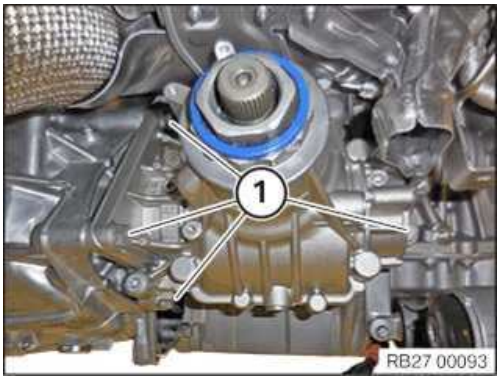
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- Coat the inside of the output flange (arrows) evenly with approx. 5 g of grease.

Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the transfer box (VTG).
- Tighten the screws (1).

Transfer box to transmission

M10		Tightening torque	56 Nm



- Install heat shield.
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Heat shield to transfer box

M6	Renew screws.	Tightening torque	6 Nm

▸ **Check the transfer box oil level**

RISK OF DAMAGE

Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.

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- Check transfer case oil level, correct:
- Open the oil filler plug (1).
- Check transfer box oil level.
- If necessary, top up transmission oil up to the lower edge of the oil filler plug opening (1).

Transmission oil

Technically suitable transfer box and electrical transmission oils	

Main group 27

- Tighten the oil filler plug (1).

Oil filler plug on transfer box (VTG)

M18x1.5		Tightening torque	35 Nm

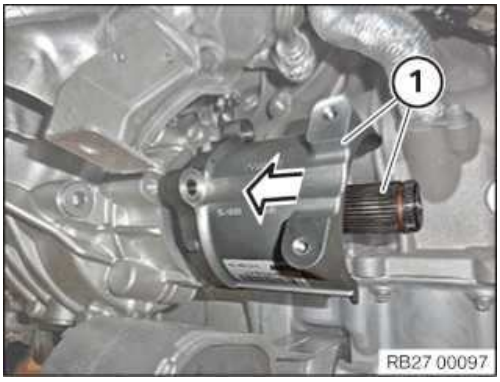
114 – Install the intermediate shaft with the support tube



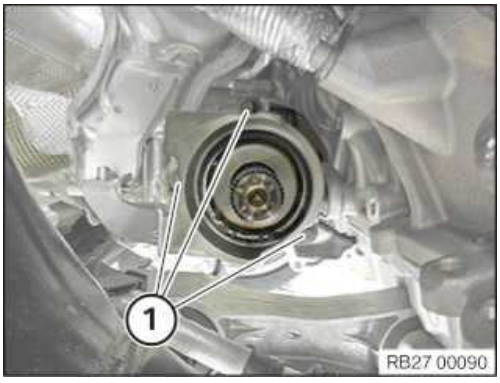
- Coat gearing of the intermediate shaft uniformly with 5 g of grease.

Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the intermediate shaft with support tube (1) in the transfer box.



- Position screws (1).

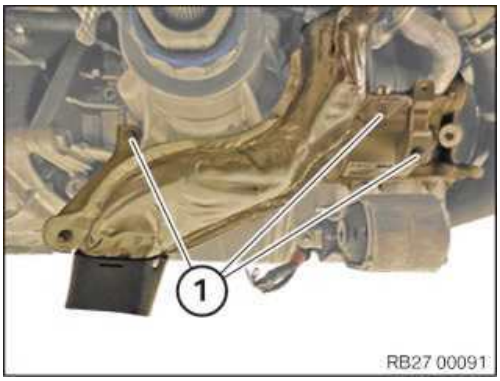
Note: Check for correct screw length! Bolt M8x35 8.8

- Tighten the screws (1).

Intermediate shaft to transfer box

M8x35		Tightening torque	19 Nm

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- If installed: Install air duct.
- Tighten the screws (1).

115 – Installing starter motor

CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.



- Insert and install the starter motor .
- Tighten the screws (1).

Starter motor to transmission

M8x45		Tightening torque	19 Nm



- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

Battery positive lead to starter

M8		Tightening torque	13,5 Nm



- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.

116 – Installing right output shaft partially

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- Renew the circlip (1).

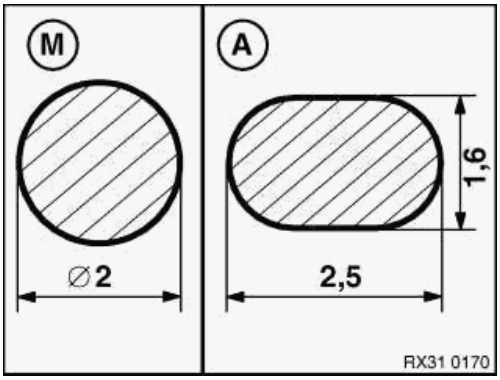
  Parts: Circlip
- Slide output shaft into the transmission as far as the limit position.
- Check for secure seat by levering.

117 – Partially installing the left output shaft



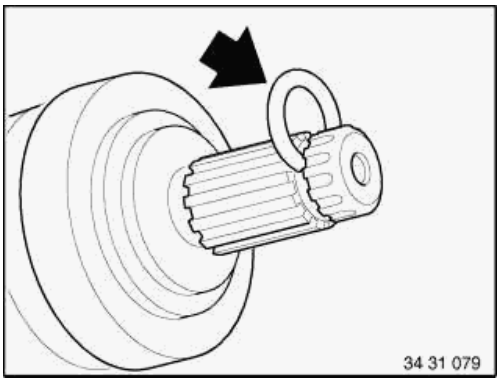
- **With automatic transmission only:**
- Lever out O-ring (1).
- Renew O-ring (1).

  Parts: O-ring
- Insert new O-ring (1).

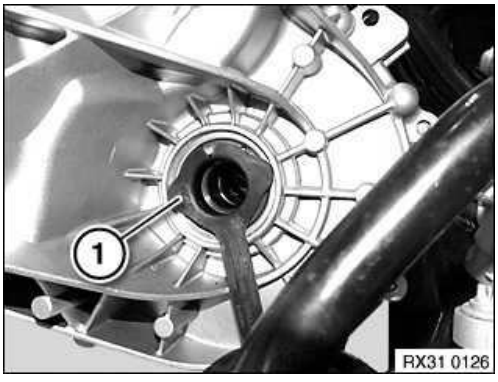


- Do not mix up circlips.

  Different types of output shafts fitted:
  - M: Manual transmission
  - A: Automatic transmission

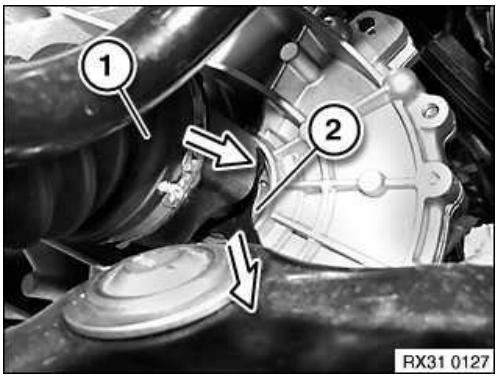


- Renew circlip (arrow).



- Insert installation protection ring (1) into the radial shaft seal.
- Make sure the tool fits over the lip of the radial shaft seal so there is no damage to sealing ring when the output shaft is inserted.

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- Insert output shaft (1) into transmission.
- **Manual gearbox only:** Pull on the handle to remove the installation protection ring (2) and dispose of it.
- Slide output shaft (1) into the transmission as far as the limit position.

  The output shaft (1) must engage audibly.
- Check for secure seat by levering.

118 – Install propeller shaft.

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

RISK OF DAMAGE

Damage to the propeller shaft during installation.

Non-observance of the installation guidelines for the propeller shaft on the rear axle differential may cause severe damage.

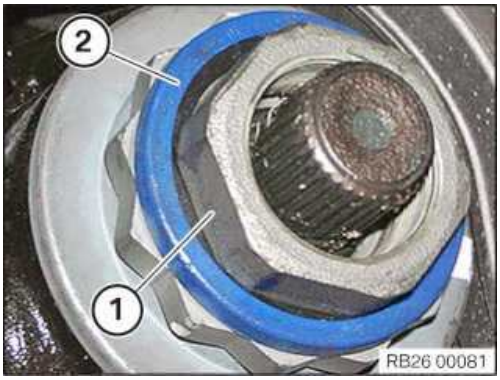
- Always renew the recessed nut on the rear axle differential. Screw locking must be available.
- Strictly observe a minimum hardening time of two hours after having screwed in the recessed nut. The hardening time may be longer at lower temperatures.

RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.



- Renew recessed nut (1).

  Parts: Insert nut
- Renew the retaining clip (2) and the seal.

  Parts: Retaining clip, seal
- Insert the seal with the recessed nut (1) and install.
- Insert the retaining clip (2) and install.
- Make sure that recessed nut (1) is screwed in within 5 min.
- Make sure that the hardening time of **minimum** 2 h for the recessed nut is observed.

  The hardening time must be extended at lower temperatures.

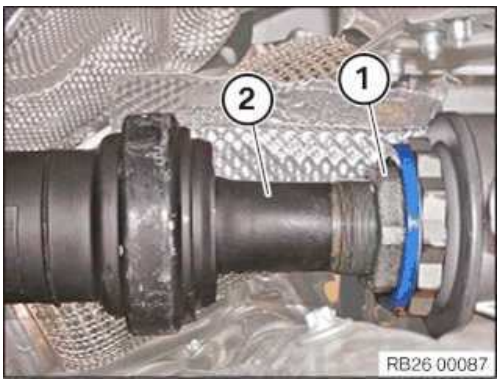
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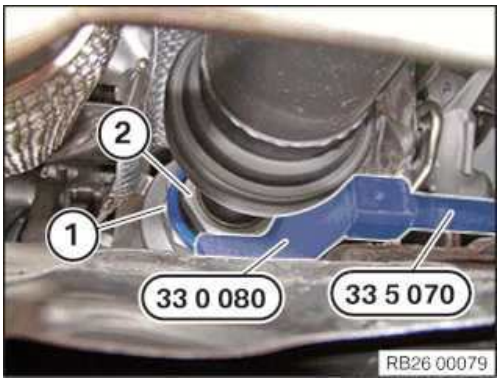
- Insert the propeller shaft (1) and install.
- Always support the propeller shaft (1) with a conventional jack.



- Hand-tighten the bolts (1).



- Push the propeller shaft (2) against the recessed nut (1) up to the limit position.
- Screw the propeller shaft (2) at least 2 thread starts onto the recessed nut (1) by hand.



RISK OF DAMAGE

Damage to the transfer box.

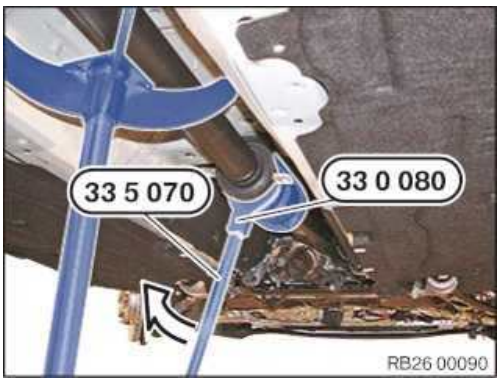
Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.

- Protect the recessed nut (2) on the transfer box from twisting with the special tools **0 495 554 (33 5 070)** and .

  The recessed nut (2) on the transfer box must **not** be used to tighten the propeller shaft.

  The double hexagon flange nut (1) must **not** be used for counter support.

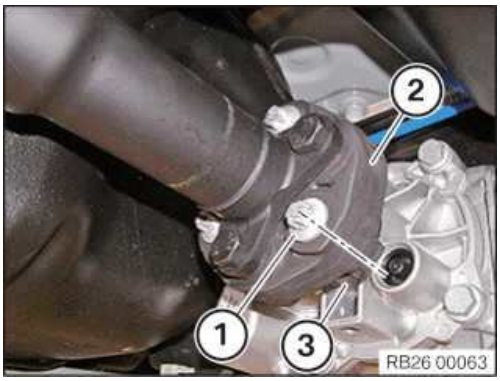


- Tighten the front propeller shaft with the special tools **0 495 554 (33 5 070)** and in the direction of the arrow.

Propeller shaft to transfer box

		Tightening torque	80 Nm

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TECHNICAL INFORMATION

Compliance with the following instructions is required to avoid a humming noise from the propeller shaft after refitting the propeller shaft.

- Assemble the screw connection (1) of the flexible disc (2) and the three-hole flange (3) according to the mark.
- Renew screws (1).

  Parts: Bolts
- Hand-tighten the bolts (1).



- Protect the propeller shaft (1) with the special tools **0 495 554 (33 5 070)** and from twisting.



- Tighten the bolts with the special tools **0 490 504 (00 9 120)** and .

Flexible disc to rear axle final drive

M12x1.5	Renew screws.	Tightening torque	55 Nm 90 °



- Tighten the screws (1).

Centre mount to body

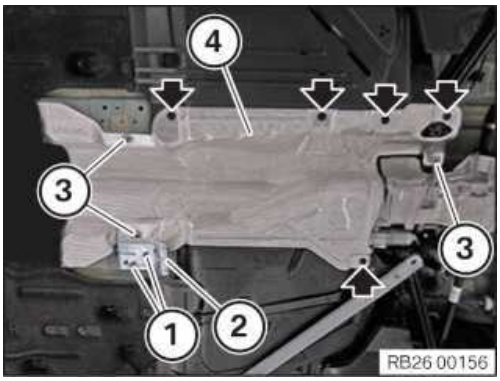
M8		Tightening torque	19 Nm



- Guide the special too l out between the front and rear propeller shaft and remove.

119 – Installing the rear heat shield

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- Insert and install the heat shield (4).
- Tighten screws (arrows).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

- Tighten nuts (3).

Heat shield to body

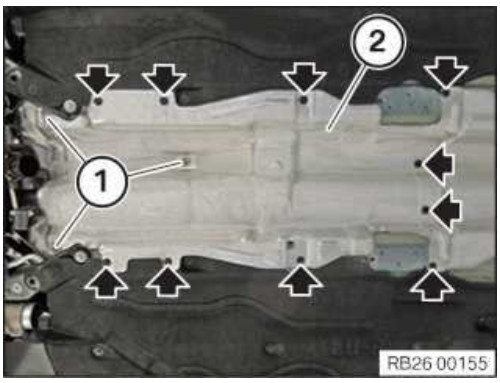
Bolts/nut		Tightening torque	3 Nm

- Insert and install the holder (2).
- Tighten the screws (1).

Bracket to body

M8		Tightening torque	21 Nm

120 – Install the front heat shield



- Insert and install the heat shield (2).
- Tighten screws (arrows).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

- Tighten nuts (1).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

121 – Install exhaust system

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

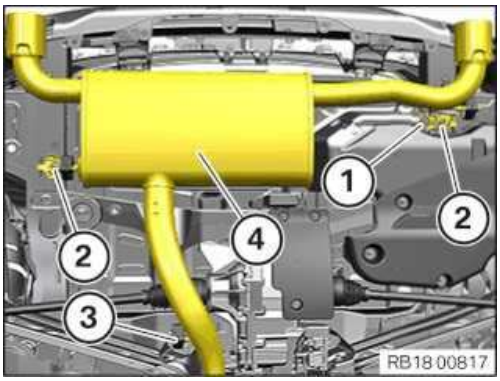
CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

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- Feed in and install the exhaust system (4) with a second person.
- Renew nuts (2).

  Parts: Nuts
- Tighten nuts (2).

Exhaust system to body

M8	Replace nuts.	Tightening torque	19 Nm

- Tighten down screw (1).

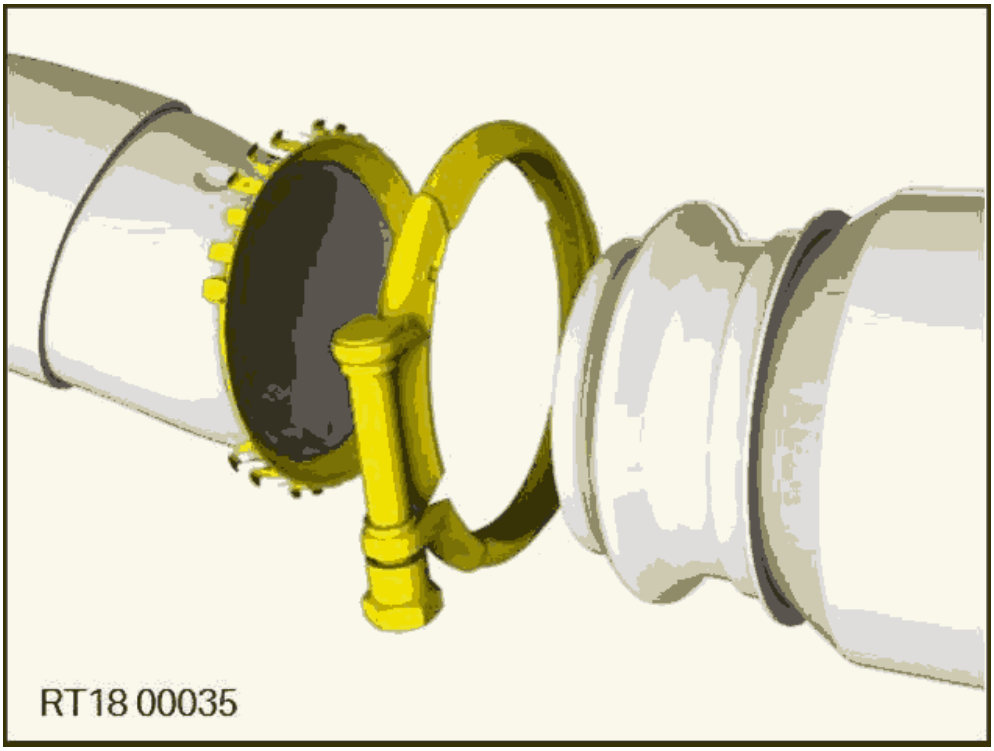
Exhaust bracket on body

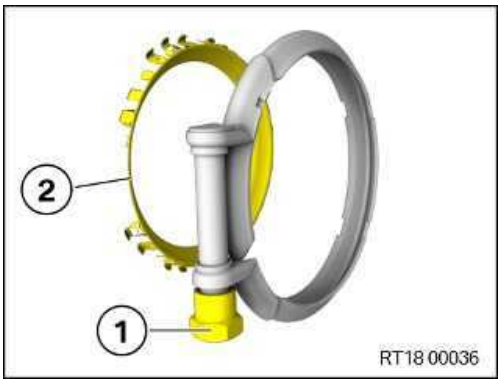
Hexagon screw M8x30		Tightening torque	19 Nm

- Check the rubber mount (3) for damage and renew as needed.
- Mount rubber mount (3) on the exhaust system (4).

▶ **Install the V-clip**

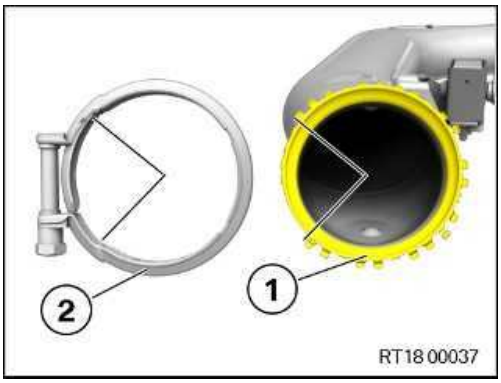
V-band clamp





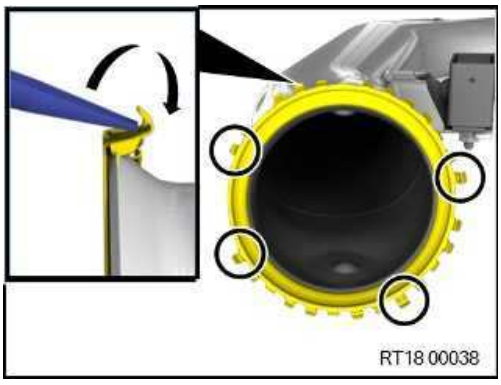
- Unscrew the nut (1) and remove the sealing ring (2).

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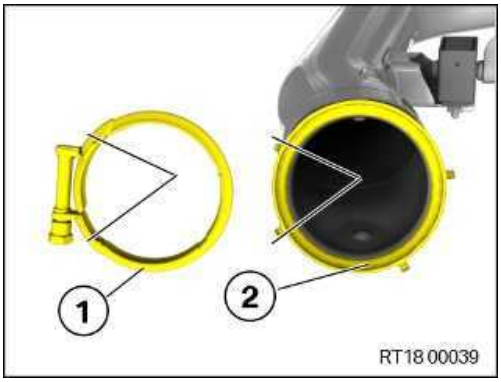


- Renew the V-clip (2).

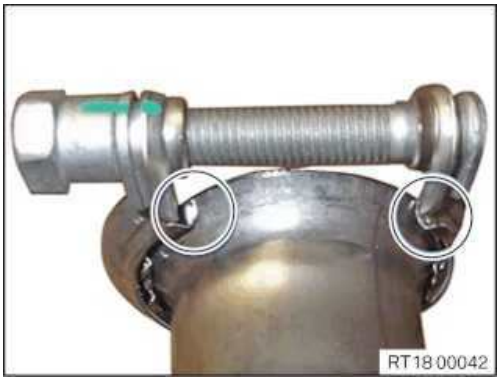
  Parts: V-band clamp
- Mount the sealing ring (1) on the exhaust system.
- Ensure that the sealing ring (1) for the V-clip (2) is positioned correctly.



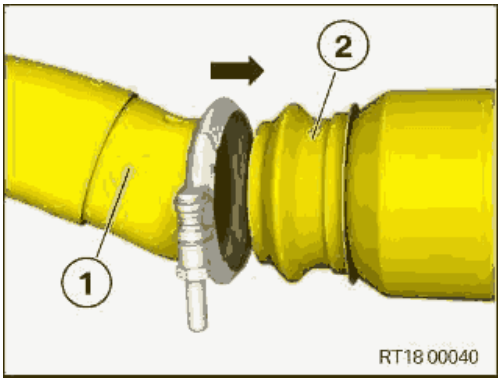
- Bend all sheet metal tabs over with a suitable tool, except those in the marked areas.



- Mount the V-clip (1) on the sealing ring (2).
- Make sure that the V-clip (1) is positioned correctly on the sealing ring (2).

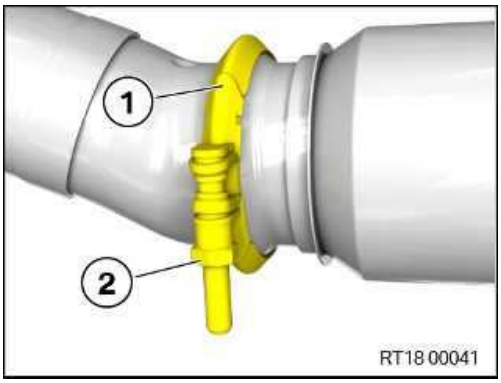


- Make sure that the V-clip rests against the sheet metal tabs after mounting (marks).



- Connect the exhaust system (1) with the catalytic converter (2) and position correctly.

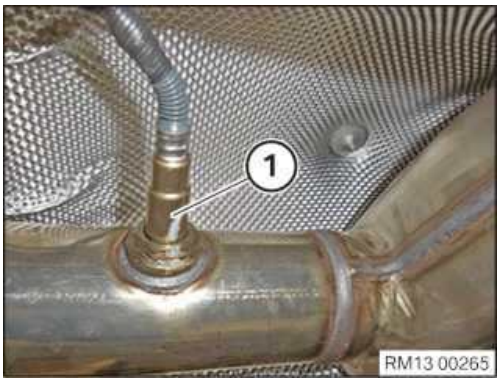
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- Make sure that V-clip (1) is fitted correctly.
- Tighten down screw (2).

V-clip to catalytic converter

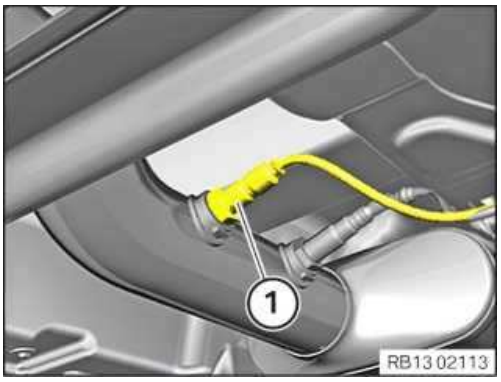
V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm



- Feed in, install and tighten diesel particulate sensor (1).

Diesel particulate sensor to exhaust system

Sensor		Tightening torque	50 Nm

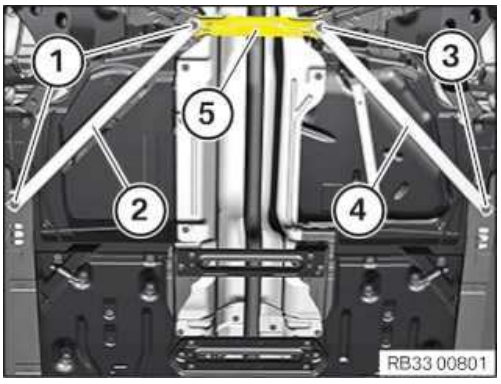


- Feed in, install and tighten nitrogen oxide sensor (1).

Nitrogen oxide sensor downstream of SCR catalytic converter

Sensor		Tightening torque	50 Nm

122 – Install the cross-member with torsion struts



- Insert and install the cross-member (5).
- Thread in torsion strut (4) at right and install.
- Renew screws (3).

  Parts: Bolts
- Tighten down screws (3).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

- Guide in and install the left torsion strut (2).
- Renew screws (1).

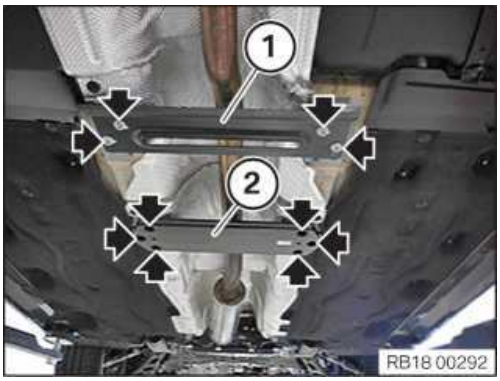
  Parts: Bolts
- Tighten the screws (1).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

123 – Install the connecting support on the tunnel in front and back

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- Insert and install connecting supports (2).
- Tighten the screws (arrows) from the connecting support (2).

Front connection carrier to body

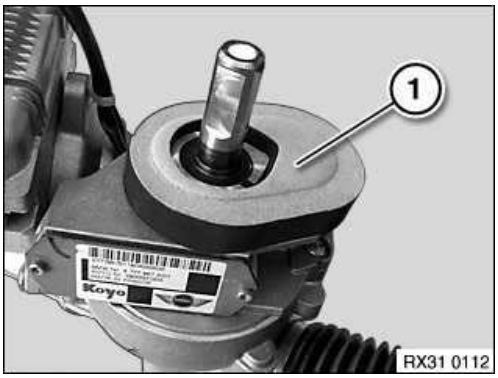
M10x18		Tightening torque	56 Nm

- Insert and install connecting supports (1).
- Tighten the screws (arrows) from the connecting support (1).

Rear connection carrier to body

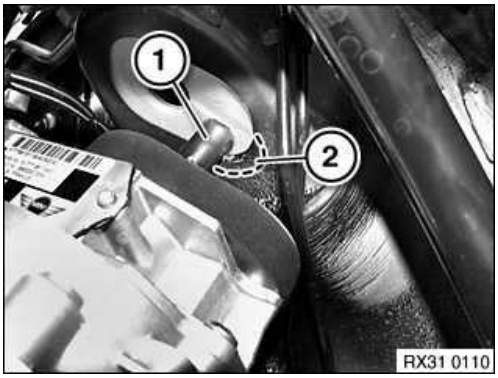
M8x18		Tightening torque	28 Nm

124 – Mount and secure the complete front axle



- Remove the seal (1).
- Clean surface on steering gear.
- Renew gasket (1).

  Parts: Gasket
- Position the seal (1) and glue it on.



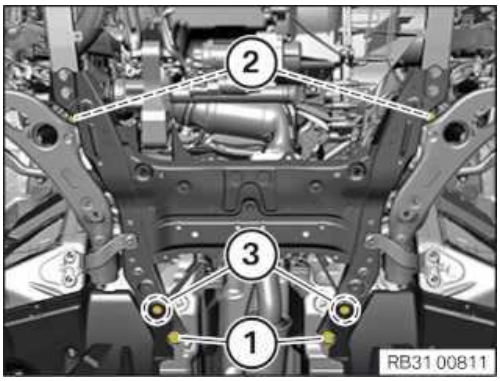
TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!

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- Position front axle support.
- Bend underbody panellings in the areas (3) to one side.
- Raise front axle support.
- When raising, insert charge air cooler into the rubber mount of the charge air cooler on cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

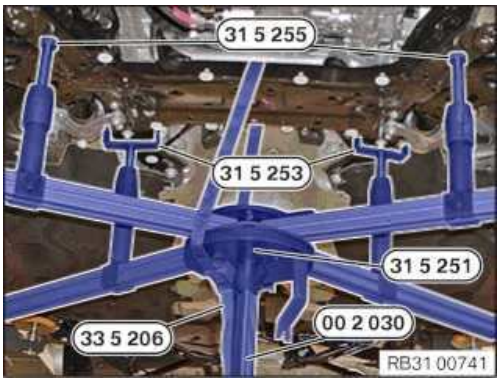
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

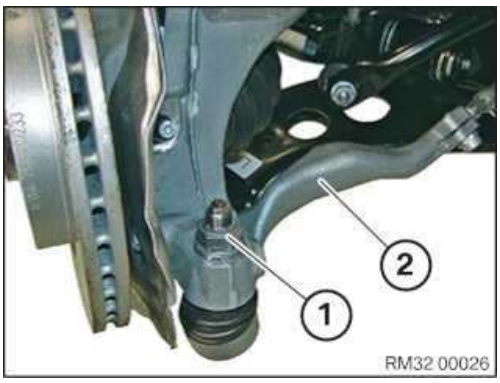
- If necessary, tighten the screws in the areas (3).

Underbody protection to body

Screw		Tightening torque	3 Nm



- Remove special tool from special tool .
- Lower universal jack **0 490 133 (00 2 030)** with the special tool and place it to the side.



NOTICE

Perform the operations on the left and right side.

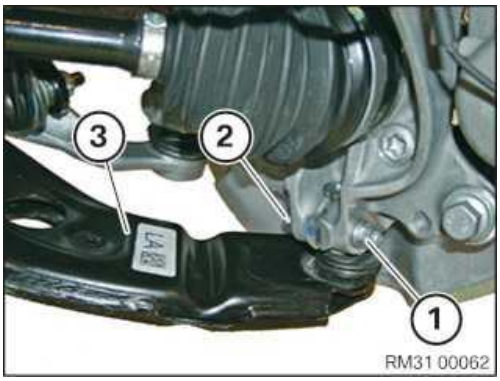
- Position the track rod (2) on the swivel bearing .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Track rod end to swivel bearing

M14	Renew nut.	Tightening torque	175 Nm

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NOTICE

Perform the operations on the left and right side.

- Position the wishbone (3) on the swivel bearing .
- Renew the bolt (2) and the nut (1).

  Parts: Bolt, nut
- Insert screw (2).
- Tighten nut (1).

Wishbone to swivel bearing

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

125 – Install the mounted parts on the front axle support



NOTICE

Perform the operations on the left and right side.

- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Holder, wishbone rubber mount, to body

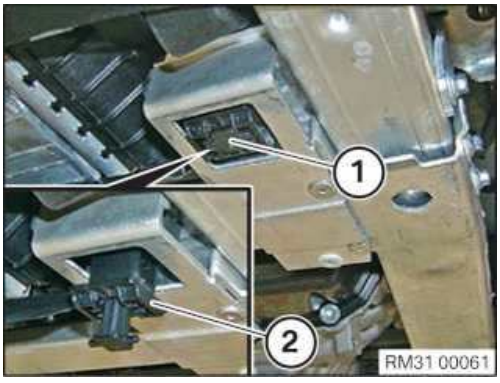
M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °



- Position the engine support (3) on the front axle support (1).
- Tighten down screw (2).

Holder with rubber mount to front axle support

M12 screw		100 Nm

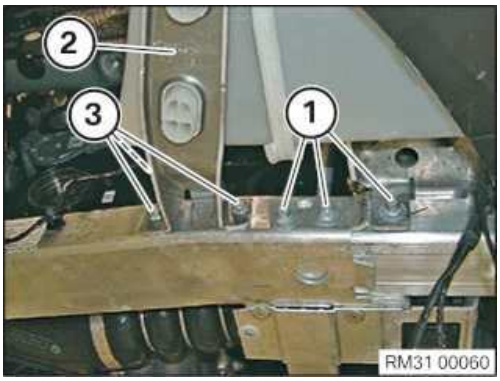


NOTICE

Perform the operations on the left and right side.

- Position the lock (2).
- Lock the bracket (1) of the lock (2) of the holder for the charge air cooler.

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- **Only on right side:** Position the holder for the washer fluid reservoir (2).
- Tighten down screws (3).

Washer fluid reservoir holder to front axle support adapter plate

		Tightening torque	10 Nm

NOTICE

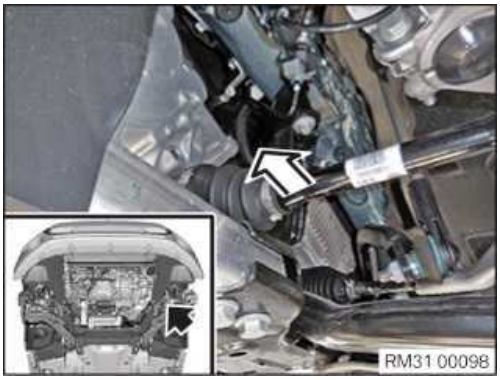
Perform the operations on the left and right side.

- Tighten the screws (1).

Deformation element, bottom, to adapter plate, front axle carrier

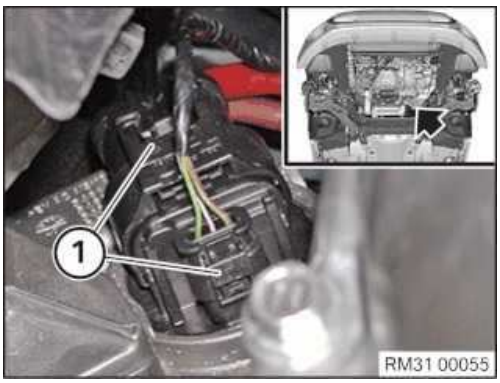
		Tightening torque	11,8 Nm

126 – Attaching connector at steering gear

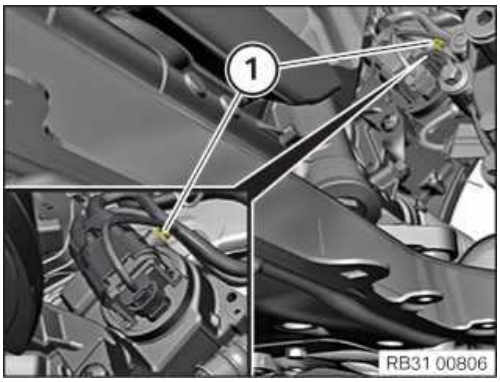


- To connect the connector (see the following step): Connect the connector with the right hand.

  The connectors can be accessed via the left output shaft.



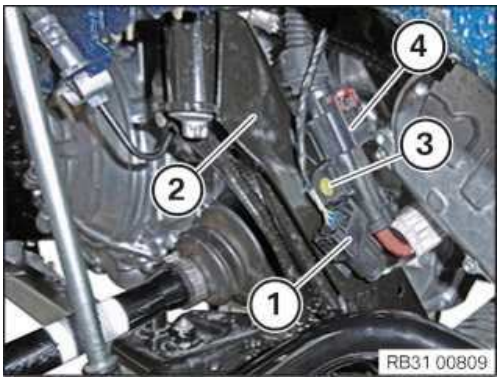
- Connect and lock connector (arrow) (1) with the steering gear.



- Fasten the wiring harness (1) on the steering gear.

▸ **If installed: Fasten the plug connections at the front axle support**

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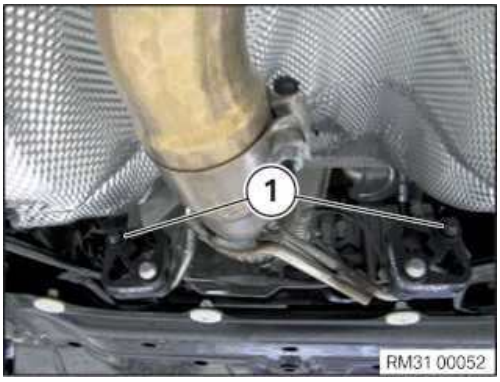
- Position the plug connection (4) at the front axle support (2).
- Tighten down screw (3).

Holder to front axle support

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

- Fasten the plug connection (1) at the front axle support (2).

127 – Securing rubber mount on front axle support



- Check rubber mount (1), replace if necessary.

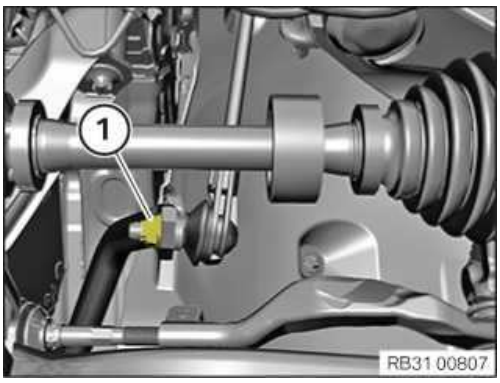
  Parts: Rubber mount
- Spray rubber mount (1) with lubricant and slide onto holder on front axle support.

128 – Securing anti-roll bar on left and right on the anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▶ **Fastening anti-roll bar on the anti-roll bar link**



- Position the anti-roll bar link on the anti-roll bar .
- Renew nut (1).

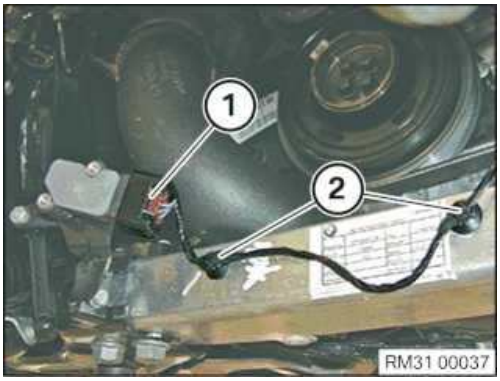
  Parts: Nut
- Tighten nut (1).

Note: Use the Torx socket for counter support.

Anti-roll bar link to anti-roll bar

M10	Renew nut.	Tightening torque	56 Nm

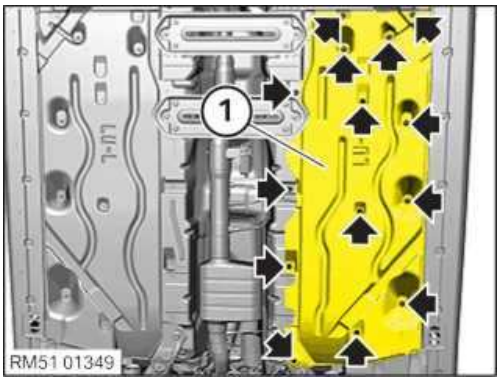
129 – With right installation: Securing the cable for the ride height sensor



- Secure the cable clip (2) on the adapter of the deformation element.
- Connect connectors (1) and lock.

130 – Installing underbody panelling , right

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- Correctly position the underbody panelling (1).
- Tighten all bolts and nuts (arrows).

Underbody panelling, side

Hexagon screw		Tightening torque	2,6 Nm

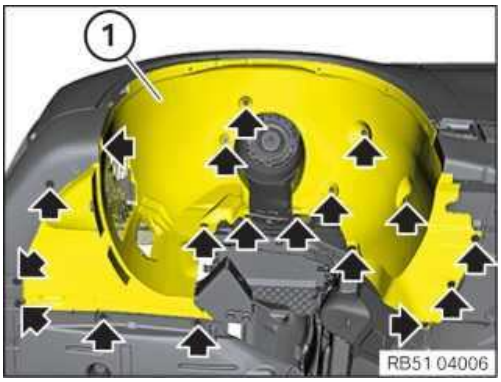
Underbody panelling, side

Plastic nut		Tightening torque	2,6 Nm

131 – Installing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.



▸ **Installing the front wheel arch cover**

- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Plastic nut		Tightening torque	2,6 Nm
Screw		Tightening torque	2,6 Nm

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

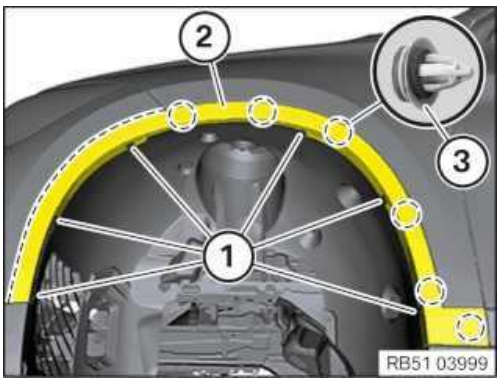
▸ **Installing front wheel arch trim**

NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Check the clips (3) for damage and renew where required.

  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

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▶ Mounting the wheel

▷ Clean the contact surfaces between the brake disc and the wheel rim



TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

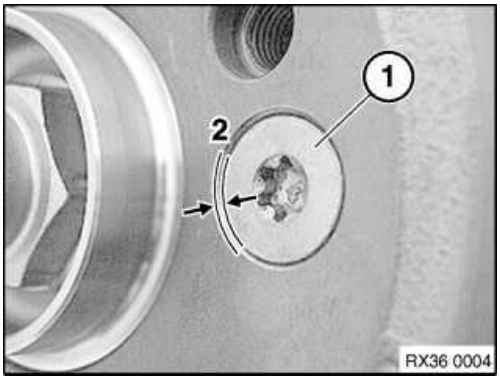
- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue in the area of the wheel bolt holes, remove and clean the brake disc.



- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).



- Renew mounting bolt (1).

  Parts: Mounting bolt
- Check that the mounting bolt (1) for the brake disc is securely seated.

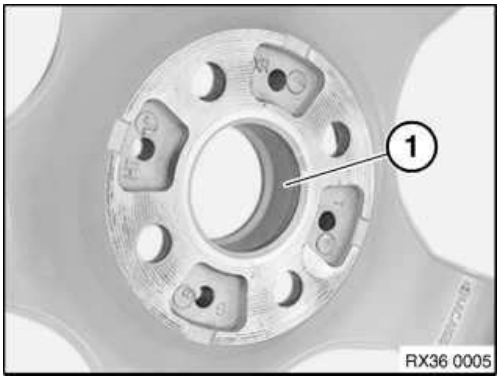
  The mounting bolt (1) for the brake disc may not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to rear wheel hub

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub

M8	Renew screw.	Tightening torque	16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring (1).

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

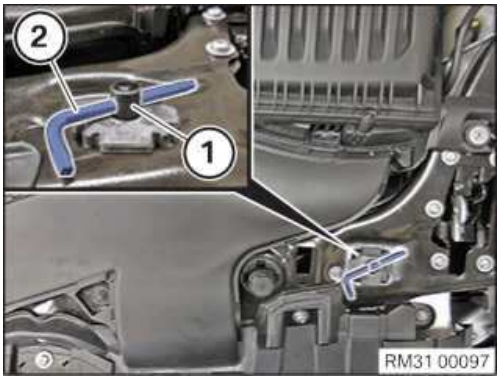
- Renew corroded wheel bolts.

  Parts: Wheel bolts
- Clean the wheel bolts.
- Check the wheel bolts and threads for damage, renew the wheel bolts if necessary.
- Join and tighten the wheel bolts (arrows).

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

133 – Removing fastener for left and right radiator



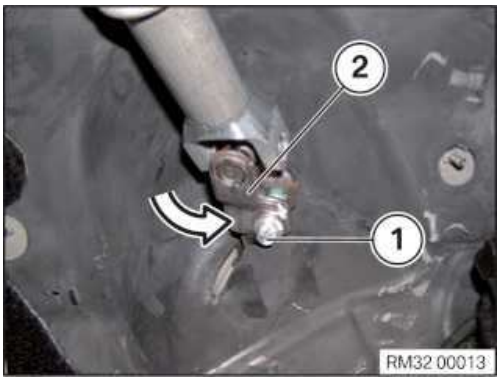
NOTICE

Perform the operations on the left and right side.

- Remove suitable tool (2) from the centering pin (1).

134 – Secure the steering shaft at the bottom on the steering gear

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- Clean the screw lock residue from the screw thread in the universal joint (2).
- Pivot the universal joint (2) in the direction of the arrow to the steering gear.
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Lower steering shaft to steering gear

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm



- **If installed:**
- Position the cover on the steering column (2).
- Tighten nuts (1).

Steering column cover to bulkhead

Plastic nut		Tightening torque	3 Nm

135 – Install the heat shield on the exhaust turbocharger



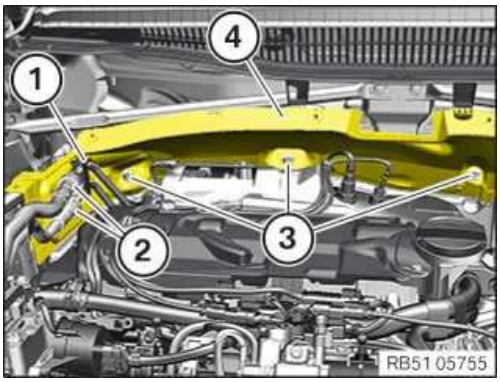
- Feed in and install the heat shield (2).
- Tighten the screws (1) at the top and bottom of the heat shield.

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Fasten the cable at the clips .

136 – Installing rear bulkhead upper part



- Feed in and install the rear bulkhead upper part (4).
- Tighten down screws (3).

Rear bulkhead upper part to lower section of bulkhead

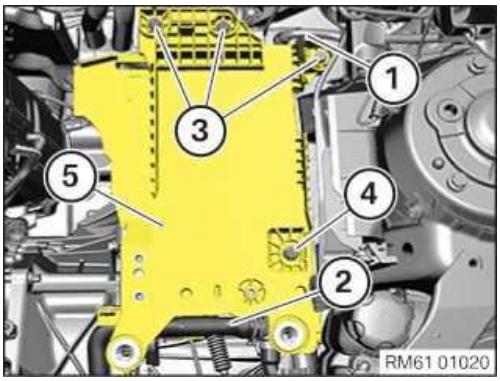
Oval-head screw		Tightening torque	5 Nm

- Feed the fuel line (2) into the holder (1) and install.
- Connect and lock the holder (1).

  The holder (1) must engage audibly.

137 – Install the battery holder

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- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

138 – Install electronics box

Prerequisite

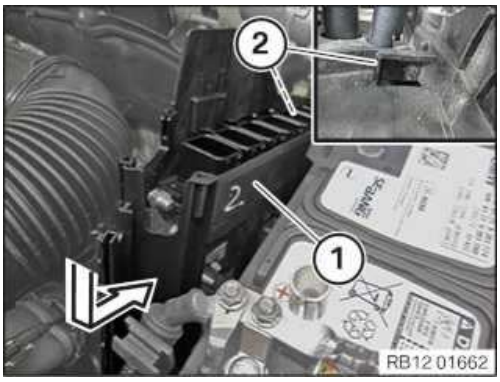
Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.

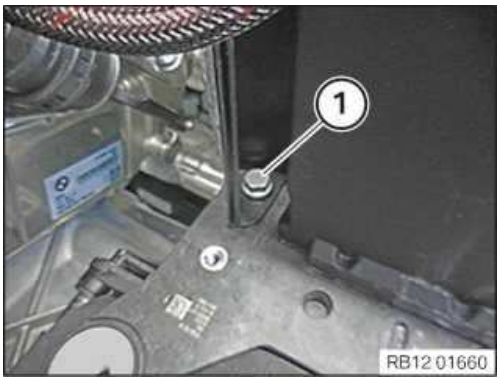


- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.



- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).

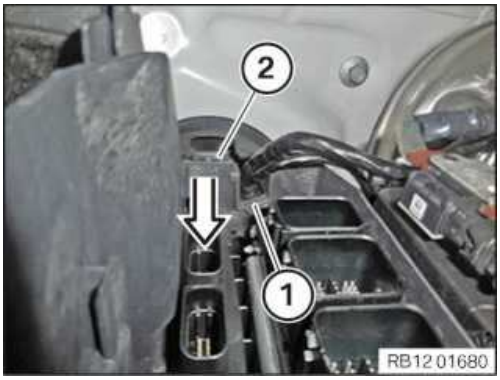
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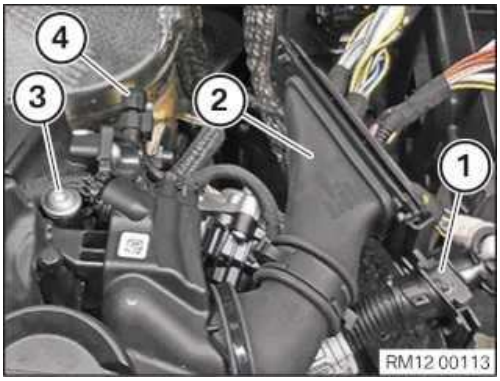
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.

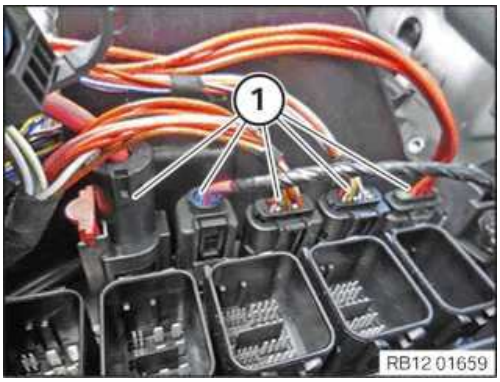


- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

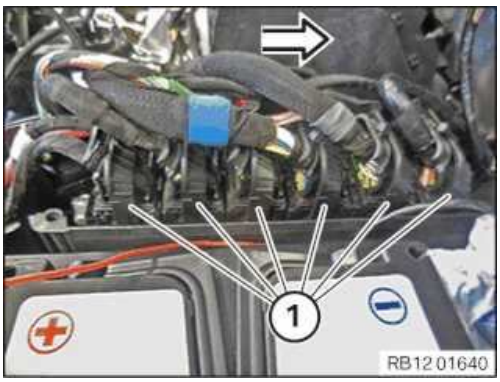
Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.

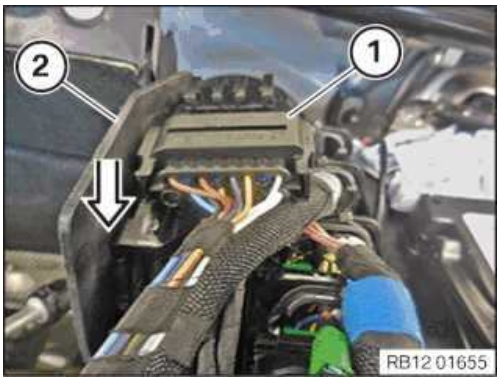


- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.

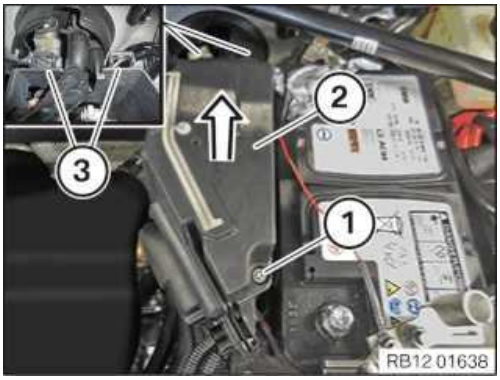


- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.

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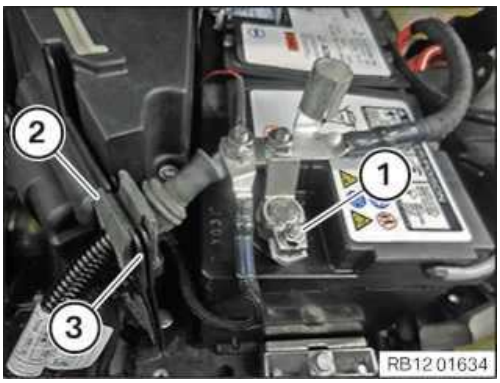
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

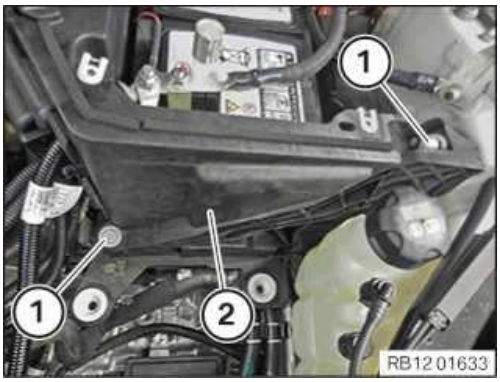
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

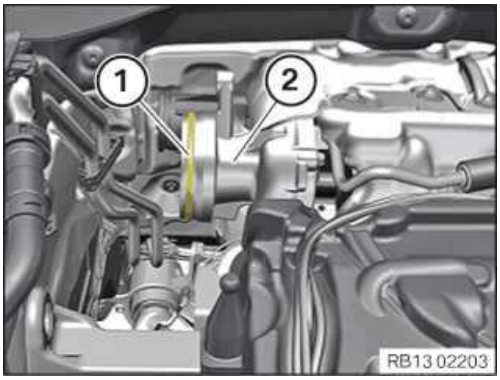


- Feed in and install tension strut (2).
- Tighten the screws (1).

Tension strut to spring strut dome/battery tray

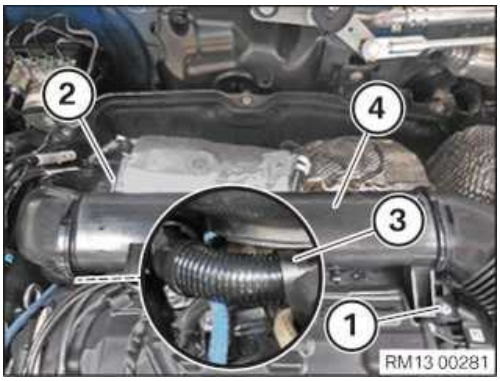
M8		Tightening torque	19 Nm

139 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.

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- Feed in clean air pipe and install.
- Connect clean air pipe to the exhaust turbocharger and lock audibly in the clamps (2).
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Connect ventilation line (3) to the cylinder head cover and lock audibly.

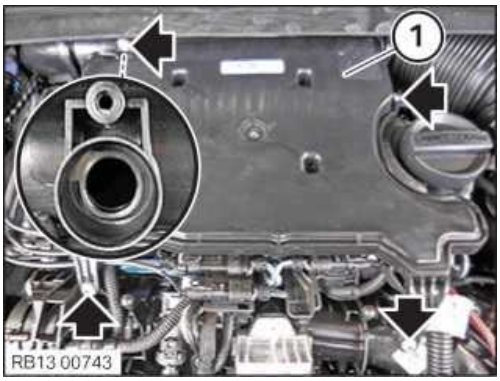


- Mount clean air pipe onto the intake filter housing.
- Tighten clamp (1) on the clean air pipe.

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

140 – Install resonator



- Insert and install the resonator (1).
- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

141 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

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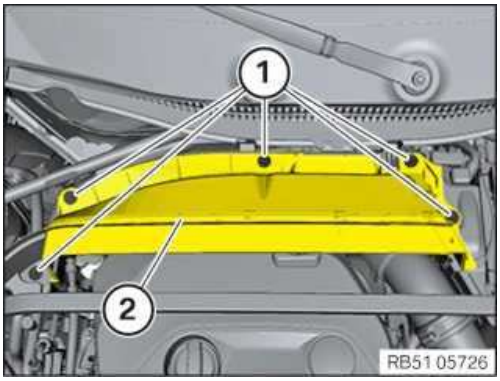


- Check for correct installation of all rubber mounts in the acoustic cover (1).



- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

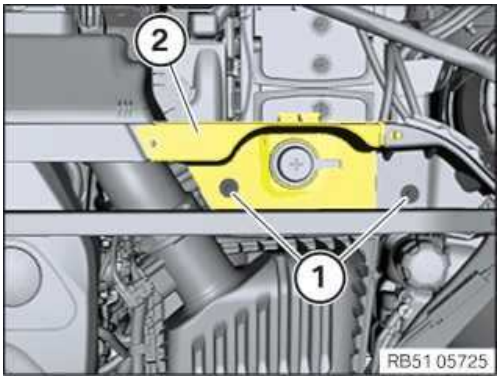
142 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Cover of top bulkhead

Screw		Tightening torque	2,6 Nm

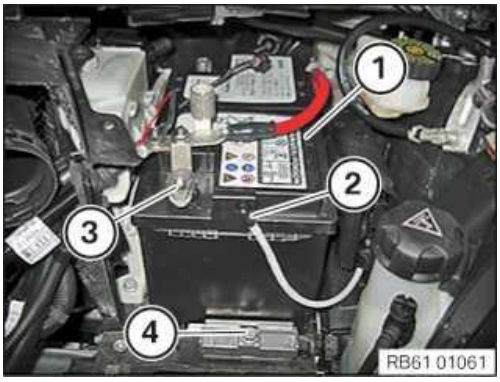


- Guide in and install cover (2).
- Tighten down screw (1).

Cover of remote positive terminal

Screw		Tightening torque	2,6 Nm

143 – Install vehicle battery



- Install vehicle battery (1).
- Position the bracket and tighten with the screw (4) .

Battery terminal rail to battery tray

M8		19 Nm

- Position the vent hose (2) and clip it in.
- Position the positive battery terminal and tighten with the nut (3) .

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

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▶ **Check the vent holes of the battery**

WARNING

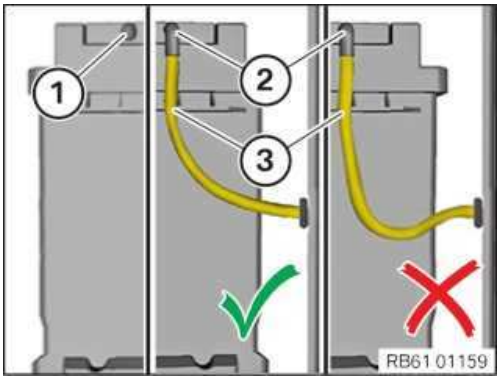
Gas emission.

Danger of injury! Danger of explosion!

- Assign the vent holes correctly.
- Route the vent hose correctly.

TECHNICAL INFORMATION

The battery has two vent holes, opposite:
One vent hole (1) must be closed correctly with a dummy plug.
The vent hose (3) must be correctly connected and routed at the other vent hole (2).



Check

- Check if the vent hole (1) is correctly closed with a dummy plug.

Result

» No dummy plug.

Measure

- Close the vent hole (1) correctly with a dummy plug.

Check

- Check if the vent hole (2) has a correctly connected vent hose (3).

Result

» The vent hose (3) is not correctly connected.

Measure

- At the vent hole (2), connect the vent hose (3) correctly.

Check

- Check if the vent hose (3) is routed to the outside with a downhill gradient (**no siphon formation!**).

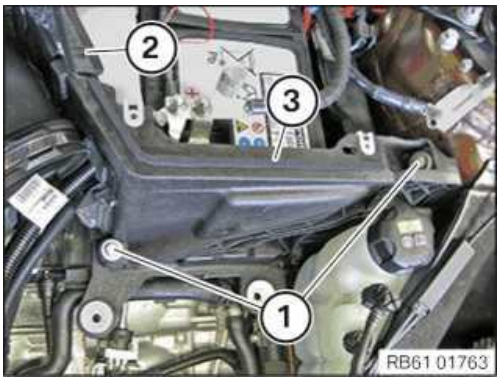
Result

» The vent hose (3) is not correctly routed as shown in the image on the right.

Measure

- Route the vent hose (3) correctly as shown in the centre image.

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- Insert tension strut (3) and tighten with screws (1).

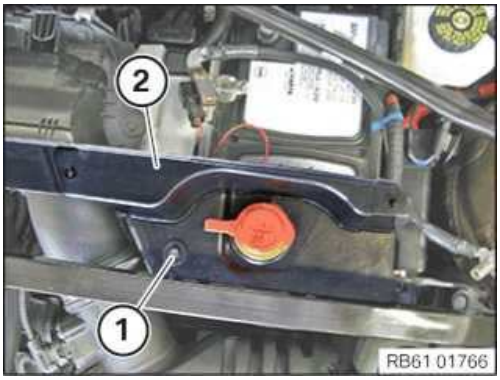
Trailing link

M8		Tightening torque	19 Nm

- Tighten down screw (2).

Battery cover

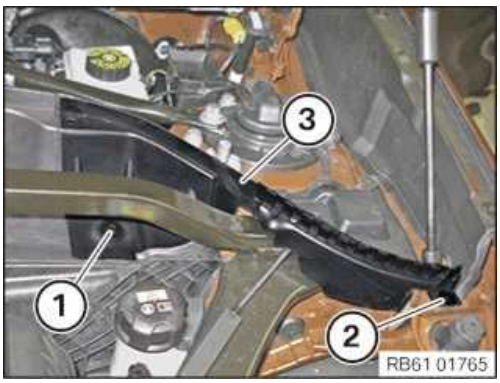
M8		2,8 Nm



- Position the cover (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

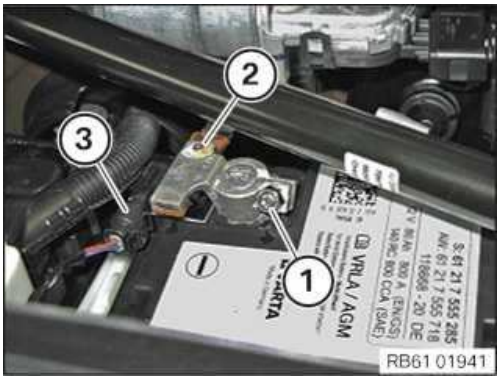
Battery cover

M8		2,8 Nm

144 – Connecting the battery earth lead

TECHNICAL INFORMATION

For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)



- Remove the protective cover of the positive battery terminal.
- Position the battery earth lead (2).
- Tighten nut (1).

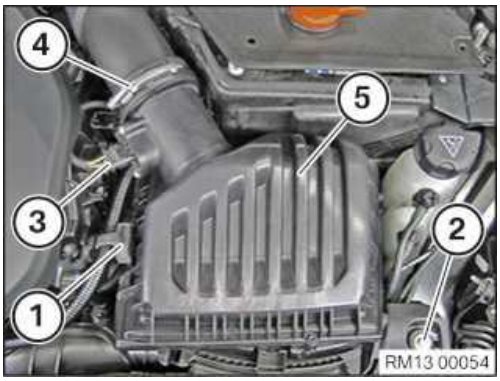
Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

- If required, connect the connector (3).

145 – Installing intake silencer housing

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- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

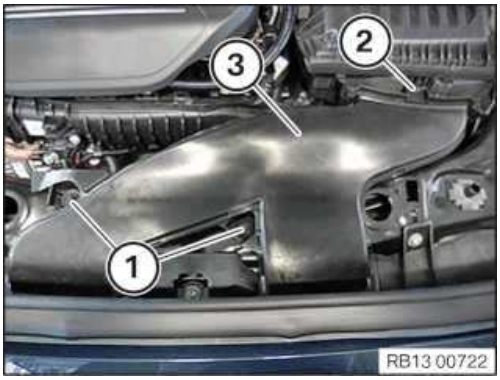
- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

146 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).
  The lock (2) must audibly engage.
- Tighten nuts (1).

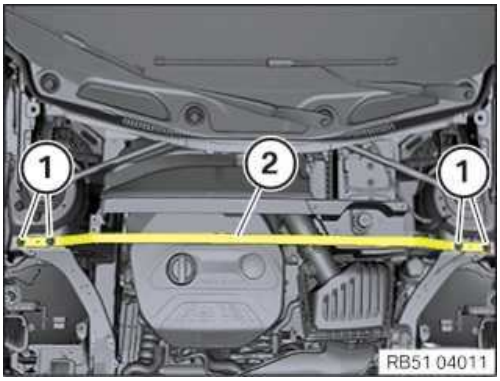
Intake neck to cross connection

M6		Tightening torque	8 Nm

147 – Install strut brace

TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.

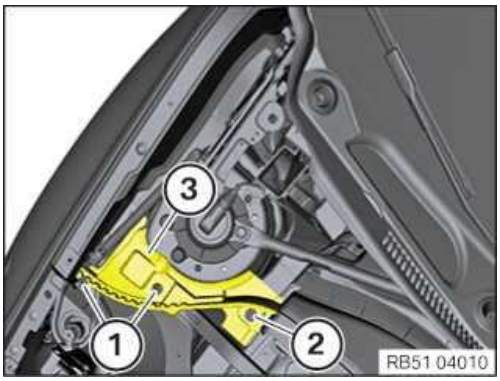


- Install the strut brace (2).
- Renew screws (1).
  Parts: Bolts
- Tighten the screws (1).

Cross-brace to spring strut dome

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

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NOTICE

Description is for right component only. The procedure on the left side is identical.

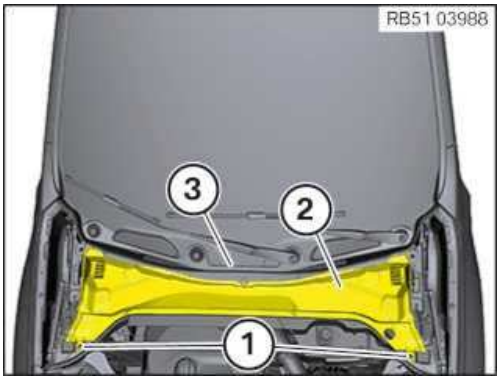
- Install the cover (3).
- Tighten down screw (2).

Cover on body

Hexagon screw		Tightening torque	3 Nm

- Install the expanding rivet (1).

148 – Installing front cowl panel cover

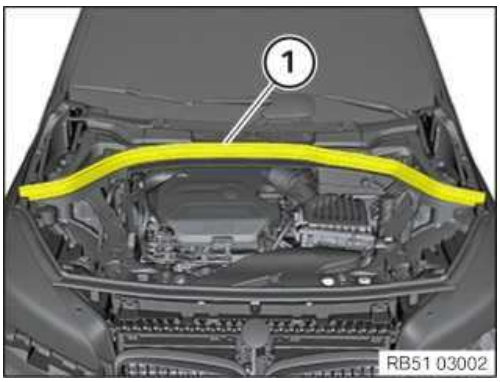


- Insert and install cowl panel cover at front (2) into cowl panel cover at rear (3).
- Check cowl panel cover at front is correctly seated (2).
- Secure expanding rivet (1).

149 – Install the seal for the bonnet

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

150 – Fill and bleed the coolant circuit

▸ **Filling and bleed the high-temperature coolant circuit**

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- See additional information.

151 – Checking/topping up oil level in automatic gearbox (AISIN GA8G45)

Prerequisite

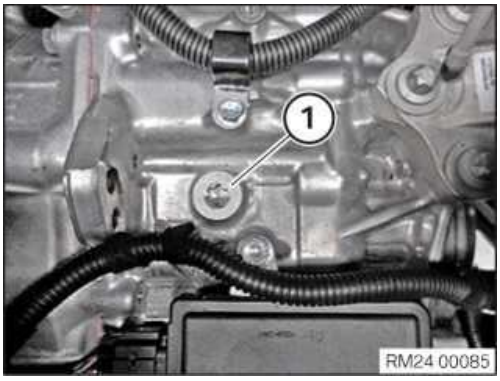
Vehicle in horizontal position.

CAUTION

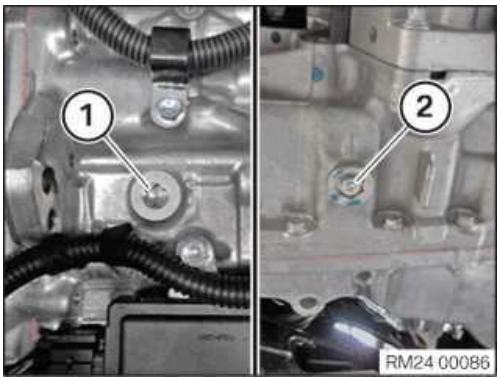
Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.



- Move the selector lever to the "P" position.
- Secure vehicle to prevent it rolling.
- Connect diagnosis system.
- Release the oil filler plug (1) using the Torx T55 .



- **Topping up the automatic transmission fluid (the automatic transmission fluid was drained):**
- Release oil filler plug (1) from engine compartment.
- Loosen the overflow plug (2) below at the transmission.
- Top up automatic transmission fluid at oil filler plug (1) until oil emerges at overflow plug (2).
- Start engine and run at idle speed.
- Check whether the automatic transmission fluid is leaking at the overflow plug (2) .
- If there is no automatic transmission fluid leaking at the overflow plug (2) , fill in the automatic transmission fluid to the oil filler plug (1) .
- Press the footbrake and, when idle, shift through all the gears from "P" to "D" 2 times for more than 2 seconds .
- Move the selector lever to the "P" position.
- Check again whether the automatic transmission fluid is leaking at the overflow plug(2) .
- Read the temperature of the automatic transmission fluid with the diagnosis system.
- Increase temperature of automatic transmission fluid to 35 °C to 45 °C.
- Top up automatic transmission fluid until it flows over.

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- Renew sealing rings.

  Parts: Sealing ring

- Screw in and fasten oil filler plug (1) and overflow plug (2).

Oil filler plug to transmission housing

M14	Renew the sealing ring.	Tightening torque	45 Nm

Overflow screw in oil drain plug

M6	Renew the sealing ring.		8 Nm

- **Check oil level (transmission oil temperature must be between** 35 °C **and** 45 °C **):**
- Open the oil filler plug (1).
- Slacken overflow plug (2).
- Start engine and run at idle speed.
- Unscrew and remove overflow plug (2).
- Check whether the automatic transmission fluid is leaking at the overflow plug (2) .
- If there is no automatic transmission fluid leaking at the overflow plug (2) , fill in the automatic transmission fluid to the oil filler plug (1) .
- Top up the automatic transmission fluid until it overflows at the overflow plug (2) .
- Press the footbrake and, when idle, shift through all the gears from "P" to "D" 2 times for more than 2 seconds .
- Move the selector lever to the "P" position.
- Check the oil level again.
- Renew sealing rings.

  Parts: Sealing ring

- If the oil escapes slightly from the overflow plug (2) , tighten the overflow plug (2) and the oil filler plug (1) .

Overflow screw in oil drain plug

M6	Renew the sealing ring.		8 Nm

Oil filler plug to transmission housing

M14	Renew the sealing ring.	Tightening torque	45 Nm

152 – Topping up oil level in the manual gearbox (GS6X60DA)

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

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TECHNICAL INFORMATION

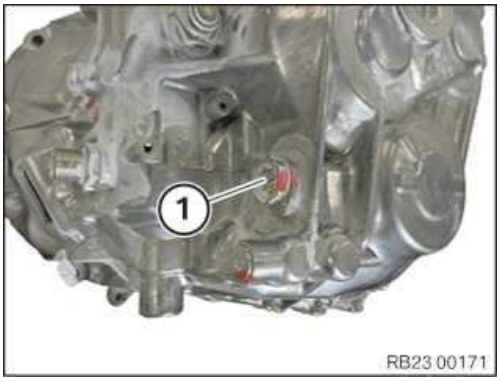
Make sure during removal of the filling/level control screw to note the installed filling/level control screw variant.

It is **mandatory** to use variant 1 in transmissions up to production date 08/2015.

It is **mandatory** to use variant 2 in transmissions from production date 08/2015.

Failure to observe will result in a leak on the transmission.

- Variant 1 **until** production date 08/2015.
- Variant 2 **from** production date 08/2015.



- Unscrew filling/level control screw (1) and fill the transmission until the oil overflows.

Transmission oil capacity

Transmission oil GS6-60DA, GS6X60DA/Owner's Handbook	2,2 l

Transmission oil: Technically suitable manual gearbox oil

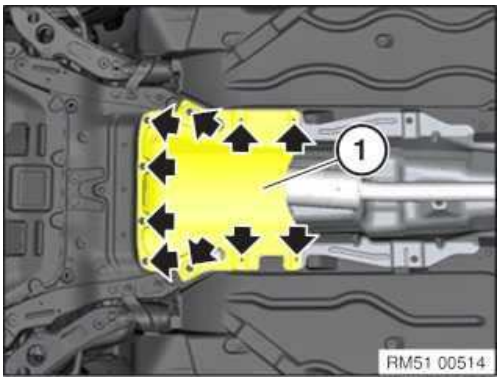
- Allow surplus oil to drain off.
- Renew the filling/level control screw (1).

  Parts: Filling/level control screw
- Tighten filling/level control screw (1).

Oil drain plug / oil filler plug

Hexagon socket		Tightening torque	43 Nm

153 – If installed: Installing underbody protection at rear

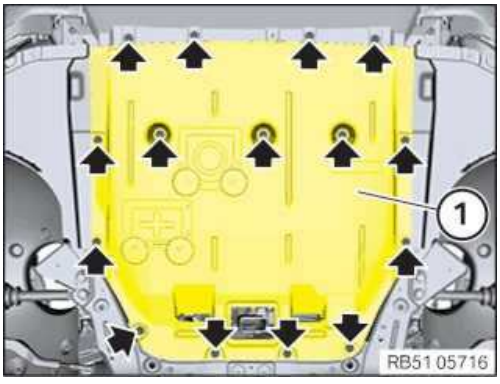


- Position rear underbody protection (1).
- Tighten screws (arrows).

Underbody protection to body

Screw		Tightening torque	3 Nm

154 – Installing the front underbody protection

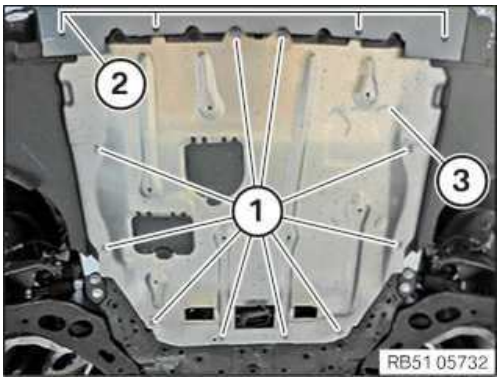


- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

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- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Additional Information

Overview of Tightening Torques

Cross connection to carrier support — Used in step 19

Screws M6x20		Tightening torque	11,8 Nm

Screw connection for rubber mount of coolant radiator to coolant radiator — Used in step 19

Bolt to rubber mount		Tightening torque	8 Nm

Air duct to upper connection — Used in step 19

M6x20 screw		Tightening torque	11,8 Nm

Bracing strut to upper connection — Used in step 19

M8x20 screw		Tightening torque	28 Nm

Rear end of front axle support to body — Used in step 73 124

M14 screw	Renew screw.	Tightening torque	175 Nm

Front axle support, front to body — Used in step 73 124

M12 screw	Renew screw.	Tightening torque	108 Nm

Underbody protection to body — Used in step 73 124 153

Screw		Tightening torque	3 Nm

Special tool to cylinder head — Used in step 73

M8		Tightening torque	21,5 Nm

Cylinder head to crankcase — Used in step 81

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

Cylinder head bolt to timing case cover — Used in step 81

M8x40		Tightening torque	19 Nm

Right engine mount to side member — Used in step 81

M12		Tightening torque	100 Nm

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Right engine mount to cylinder head

Used in step 81

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

Heat shield to cylinder head

Used in step 81

M8X16		Tightening torque	10 Nm

Glow elements to cylinder head

Used in step 82

Glow element		Tightening torque	13 Nm

Camshaft carrier to cylinder head

Used in step 85

M7x35		Tightening torque	13 Nm

Bearing journal to cylinder head

Used in step 87

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8

Used in step 87

M8		Tightening torque	19 Nm

Standard screw connection M6

Used in step 87 98

M6			8 Nm

Chain tensioner piston to cylinder head

Used in step 88

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft

Used in step 89

M7x17.			17 Nm

Cylinder head cover to cylinder head

Used in step 91

M6		Tightening torque.	8,5 Nm

Clamping claw facing to cylinder head cover

Used in step 92

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 92

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

High pressure lines between injector and rail

Used in step 94

High pressure lines		Tightening torque	28 Nm

Exhaust-gas recirculation cooler to exhaust manifold

Used in step 96 102

M8x28	Replace screws	Tightening torque	32 Nm

Oil return line to turbocharger

Used in step 96 97

M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase

Used in step 96

M8x16		Tightening torque	22 Nm

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Exhaust turbocharger to exhaust manifold

Used in step 97

V-band clamp		Tightening torque	19 Nm

Oil feed line to bracket

Used in step 97

Torx screw M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase

Used in step 97

M8x16		Tightening torque	22 Nm

Heat shield for exhaust turbocharger

Used in step 98

Torx screw BM 6x12		Tightening torque	10 Nm

Banjo bolt for exhaust pressure pipe to exhaust manifold

Used in step 98

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

Charge air duct to oil sump

Used in step 99

M6		Tightening torque	8 Nm

Ride height sensor holder to front axle support

Used in step 99

M6		Tightening torque	8 Nm

Adapter, front axle support to front axle support

Used in step 99

		Tightening torque	100 Nm

Cross connection to front axle support

Used in step 99

M6		Tightening torque	12 Nm

Washer fluid reservoir to body

Used in step 100

M6x20		Tightening torque	8 Nm

Intake plenum to cylinder head

Used in step 101

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 102

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler

Used in step 102

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 102

M8x20		Tightening torque	19 Nm

Wiring harness to cylinder head cover

Used in step 103 138

TS5x20		Tightening torque	3,5 Nm

Positive battery cable to alternator

Used in step 103

M8		Tightening torque	19 Nm

Fuel line to intake plenum

Used in step 103

TS6x20		Tightening torque	5 Nm

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Cover to electronics box

Used in step 103 138

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery

Used in step 103 138

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray

Used in step 103 138

M8		Tightening torque	19 Nm

Diesel particulate filter V-clip to exhaust turbocharger

Used in step 104

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Diesel particle filter to holder

Used in step 104

M8 hexagon nut		Tightening torque	19 Nm

Diesel particulate filter holder to gearbox

Used in step 104

M12x75		Tightening torque	66 Nm

Diesel particulate filter bracket to crankcase

Used in step 104

M10x35		Tightening torque	38 Nm

SCR metering module V-clip to exhaust system

Used in step 104

V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm

Holder for coolant lines to diesel particulate filter

Used in step 104

Torx bolt BM6x16		Tightening torque	8 Nm

Differential pressure sensor to holder

Used in step 104 105

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor

Used in step 104 105

Clamp 15–19mm		Tightening torque	3 Nm

Control sensor

Used in step 106

Control sensor		Tightening torque	50 Nm

Exhaust temperature sensor to diesel particulate filter

Used in step 107 108

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Exhaust-gas temperature sensor to exhaust system

Used in step 109

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Oxygen sensor holder to intermediate shaft

Used in step 110

Hexagon screw M6x16		Tightening torque	8 Nm

Nitrogen oxide sensor before SCR catalytic converter

Used in step 111

Sensor		Tightening torque	50 Nm

Monitoring sensor

Used in step 112

Sensor		Tightening torque	50 Nm

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Transfer box to transmission — Used in step 113

M10		Tightening torque	56 Nm

Heat shield to transfer box — Used in step 113

M6	Renew screws.	Tightening torque	6 Nm

Oil filler plug on transfer box (VTG) — Used in step 113

M18x1.5		Tightening torque	35 Nm

Intermediate shaft to transfer box — Used in step 114

M8x35		Tightening torque	19 Nm

Starter motor to transmission — Used in step 115

M8x45		Tightening torque	19 Nm

Battery positive lead to starter — Used in step 115

M8		Tightening torque	13,5 Nm

Propeller shaft to transfer box — Used in step 118

		Tightening torque	80 Nm

Flexible disc to rear axle final drive — Used in step 118

M12x1.5	Renew screws.	Tightening torque	55 Nm 90 °

Centre mount to body — Used in step 118

M8		Tightening torque	19 Nm

Heat shield to body — Used in step 119 120

Bolts/nut		Tightening torque	3 Nm

Bracket to body — Used in step 119

M8		Tightening torque	21 Nm

Exhaust system to body — Used in step 121

M8	Replace nuts.	Tightening torque	19 Nm

Exhaust bracket on body — Used in step 121

Hexagon screw M8x30		Tightening torque	19 Nm

V-clip to catalytic converter — Used in step 121

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

Diesel particulate sensor to exhaust system — Used in step 121

Sensor		Tightening torque	50 Nm

Nitrogen oxide sensor downstream of SCR catalytic converter — Used in step 121

Sensor		Tightening torque	50 Nm

Cross-member/torsion strut to axle support and mounting — Used in step 122

M12x48	Renew screws.	Jointing torque Angle of rotation	100 Nm 90 °

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Front connection carrier to body — Used in step 123

M10x18		Tightening torque	56 Nm

Rear connection carrier to body — Used in step 123

M8x18		Tightening torque	28 Nm

Track rod end to swivel bearing — Used in step 124

M14	Renew nut.	Tightening torque	175 Nm

Wishbone to swivel bearing — Used in step 124

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

Holder, wishbone rubber mount, to body — Used in step 125

M10 screw	Renew screw.	Jointing torque	56 Nm
		Angle of rotation	90 °

Holder with rubber mount to front axle support — Used in step 125

M12 screw			100 Nm

Washer fluid reservoir holder to front axle support adapter plate — Used in step 125

		Tightening torque	10 Nm

Deformation element, bottom, to adapter plate, front axle carrier — Used in step 125

		Tightening torque	11,8 Nm

Holder to front axle support — Used in step 126

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

Anti-roll bar link to anti-roll bar — Used in step 128

M10	Renew nut.	Tightening torque	56 Nm

Underbody panelling, side — Used in step 130

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side — Used in step 130

Plastic nut		Tightening torque	2,6 Nm

Wheel arch cover to body — Used in step 131

Plastic nut		Tightening torque	2,6 Nm
Screw		Tightening torque	2,6 Nm

Wheel arch cover to body — Used in step 131

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body — Used in step 131

Plastic nut		Tightening torque	3 Nm

Brake disc to rear wheel hub — Used in step 132

M8	Renew screw.	Tightening torque	16 Nm

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Brake disc to front wheel hub

Used in step 132

M8	Renew screw.	Tightening torque	16 Nm

Wheel bolts

Used in step 132

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Lower steering shaft to steering gear

Used in step 134

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

Steering column cover to bulkhead

Used in step 134

Plastic nut		Tightening torque	3 Nm

Heat shield for exhaust turbocharger

Used in step 135

Torx screw BM 6x12		Tightening torque	10 Nm

Rear bulkhead upper part to lower section of bulkhead

Used in step 136

Oval-head screw		Tightening torque	5 Nm

Battery holder to engine support

Used in step 137

Hexagon screw M8x30		Tightening torque	19 Nm

Electronics box to battery tray

Used in step 138

M8X16		Tightening torque	15 Nm

Clean air pipe to cylinder head cover

Used in step 139

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing

Used in step 139 145

Clamp		Tightening torque	3 Nm

Resonator to manifold and clean air pipe

Used in step 140

Screw TS6	Renew screw.	Tightening torque	5 Nm

Cover of top bulkhead

Used in step 142

Screw		Tightening torque	2,6 Nm

Cover of remote positive terminal

Used in step 142

Screw		Tightening torque	2,6 Nm

Battery terminal rail to battery tray

Used in step 143

M8			19 Nm

Battery terminal with IBS positive battery terminal / negative battery terminal

Used in step 143 144

NutM6			5 Nm

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Trailing link Used in step 143

M8		Tightening torque	19 Nm

Battery cover Used in step 143

M8			2,8 Nm

Intake silencer housing to lock bridge Used in step 145

M6X30		Tightening torque	8 Nm

Intake neck to cross connection Used in step 146

M6		Tightening torque	8 Nm

Cross-brace to spring strut dome Used in step 147

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

Cover on body Used in step 147

Hexagon screw		Tightening torque	3 Nm

Oil filler plug to transmission housing Used in step 151

M14	Renew the sealing ring.	Tightening torque	45 Nm

Overflow screw in oil drain plug Used in step 151

M6	Renew the sealing ring.		8 Nm

Oil drain plug / oil filler plug Used in step 152

Hexagon socket		Tightening torque	43 Nm

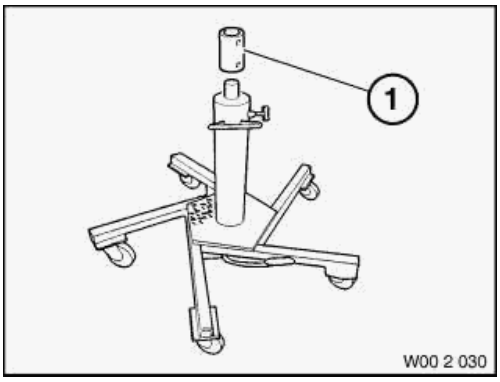
Underbody protection front Used in step 154

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Overview of Special Tools

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0 490 133 (00 2 030) Device



Common

Used in step 32 73 81 124

Usage	(universal hydraulic lifter base unit) Chassis and hydraulic lifter - For removing and installing rear axle supports and gearboxes. Also for soft top mounts. Is replaced by 81 22 2 219 012
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 90 (207)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 490 134 (00 2 031)		**Adapter** (adapter for gearbox holder) Model series: E30, E31, E32, E34, E36	

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0 495 554 (33 5 070) Extension



Common

Used in step 38 118

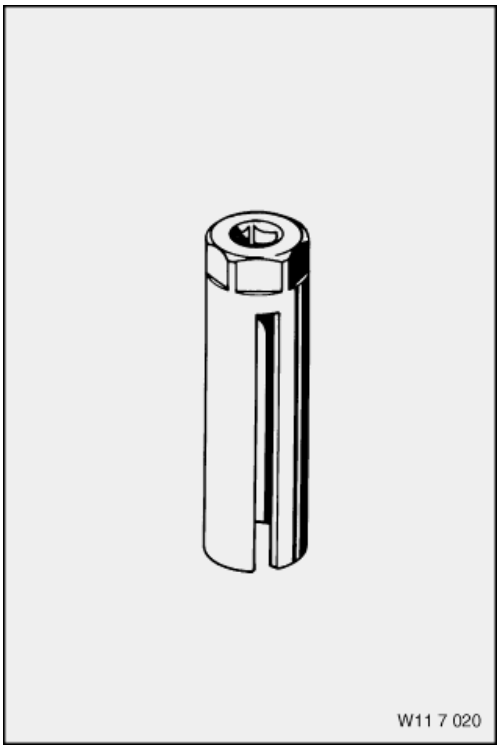
Usage	Pull-out extension for 33 5 040, 33 5 050, 33 5 060.
Included in the tool or work	
Storage location	A18
Replaced by	
In connection with	
SI-Number	01 21 06 (300)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 592 (33 5 071)		**Extension** (Extension (1 item)) discontinued, can only be ordered using complete tool	

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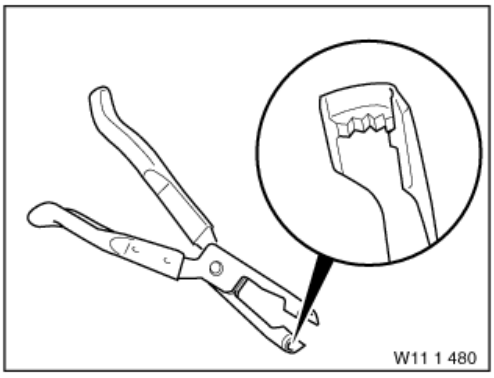
0 491 074 (11 7 020) Socket wrench insert



Common Used in step 44 45 112

Usage	(Socket wrench insert 22 mm) For loosening and tightening the oxygen sensor
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	

0 490 796 (11 1 480) Pliers

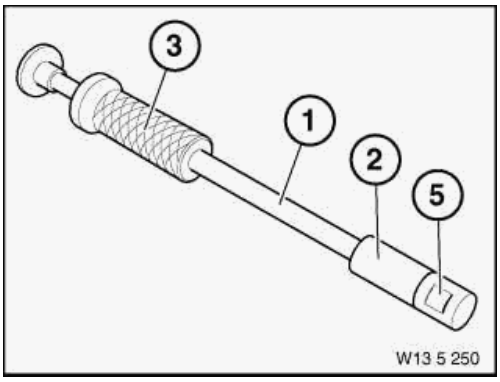


Common Used in step 53 72 75

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

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0 493 321 (13 5 250) Puller



Common Used in step 63

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

0 493 339 (13 5 252) Bush



Common Used in step 63

Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 340 (13 5 253) Weight

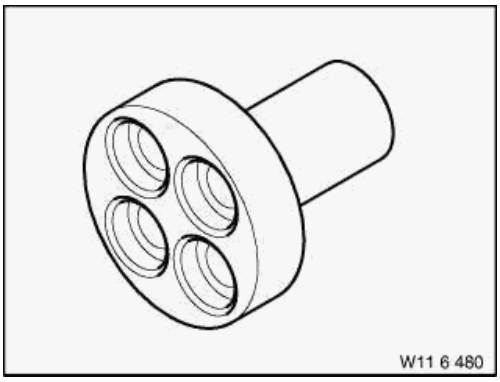


Common Used in step 63

Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 493 380 (11 6 480) Connector



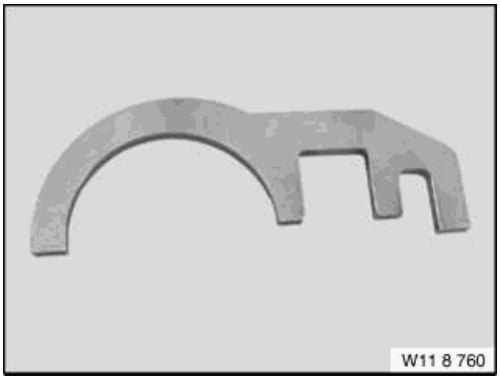
Common	Used in step 65 90
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

2 288 380 Locating stud



Common	Used in step 65 90
Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 112 (11 8 760) Gauge



Common	Used in step 65 90
Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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0 495 105 (11 4 480) oddments tray



Common Used in step 70 71 74

Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

2 357 071 Panel



Common Used in step 73 81

Usage	Additional mounting plate for lifting table MHT 1200. Delivery quantity: 1 piece. During the course of the changeover from BMWi to iPerformance, a tool changeover also takes place from campaign to warehouse.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	Table lift MHT 1200 81222184136
SI-Number	01 21 13 (987)

2 459 012 Holder

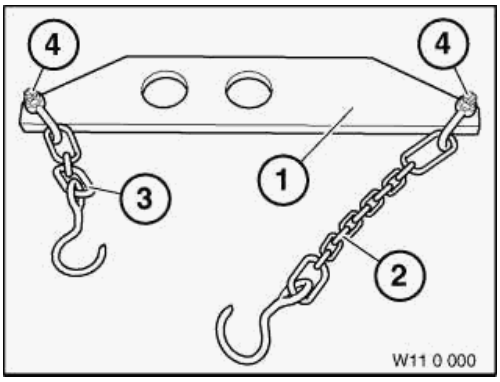


Common Used in step 73 81

Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

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0 490 561 (11 0 000) Lifting gear



Common

Used in step 73 81

Usage	(Hoisting gear) For removing and installing engines. As of 08/2011 only available as a complete set. Delivered with TÜV inspection certificate and operating instructions. No delivery of separate parts.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 13 94 (888)

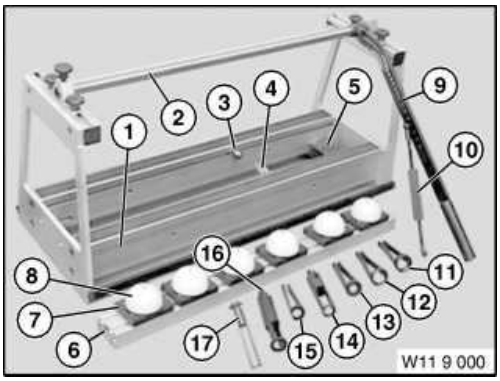
Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
4	0 490 565 (11 0 009)		**Shackle** (Shackle) 2 pieces. As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 562 (11 0 001)		**Lifting gear** (Cross member) As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
2	0 490 563 (11 0 002)		**Chain** (Chain) Version: long As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
3	0 490 564 (11 0 003)		**Chain** (Chain) Version: short As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	

0 494 362 (11 9 000) Device

Used in step 73 74 77

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Common

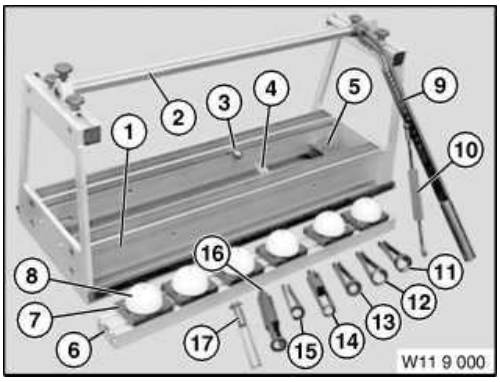
Usage	(Cylinder head expander tool)
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 03 02 (833)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 494 366 (11 9 001)		**Device**	
6	0 494 371 (11 9 006)		**Insert** (Aluminium strip)	
11	0 494 376 (11 9 012)		**Basket** (Valve spring cage) Engine M41, M51, S50	
17	0 495 028 (11 9 017)		**Basket** (Valve spring cage) Engine N52	
2	0 494 367 (11 9 002)		**Rod**	
3	0 494 368 (11 9 003)		**Adapter** (Sliding block)	
4	0 494 369 (11 9 004)		**Tab**	
5	0 494 370 (11 9 005)		**Quick fastener**	
7	0 494 372 (11 9 007)		**Shaped part** (shaped part)	
8	0 494 373 (11 9 008)		**Shaped part** (Shaped part) Shaped part made of plastic	
9	0 494 374 (11 9 009)		**Lever**	
10	0 494 375 (11 9 011)		**Hook**	
12	0 494 377 (11 9 013)		**Basket** (Valve spring cage) Engine M43, M73	
13	0 494 378 (11 9 014)		**Basket** (Valve spring cage) Engine M44, M52, M54, M56, M62, S52, S54, S62	
14	0 494 379 (11 9 015)		**Basket** (Valve spring cage) Engine M47, M47TU, M57, M57TU, N40, N42, N62, N73	
15	0 494 380 (11 9 016)		**Basket** (Valve spring cage) Engine M21, M40	

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0 494 366 (11 9 001) Device

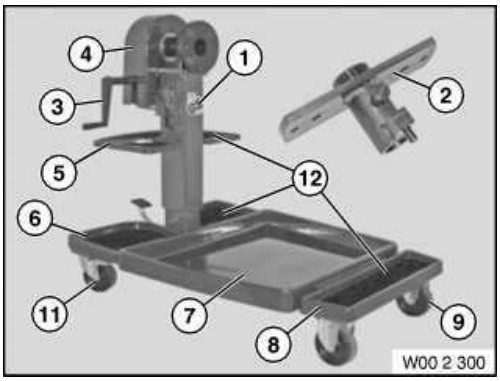


Common		Used in step 74 77
Usage		
Included in the tool or work	0 494 362	
Storage location		
Replaced by		
In connection with		
SI-Number		

0 495 187 (00 2 300) Assembly stand

Used in step 74 77

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Common

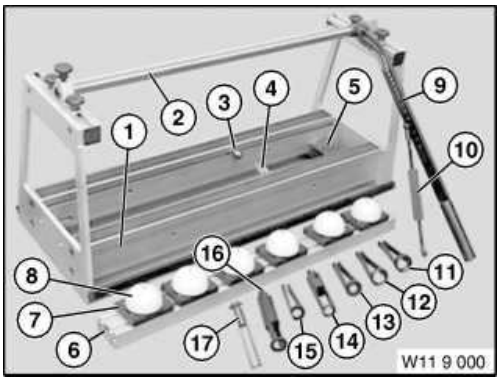
Usage	Assembly stand with universal flange for mounting engines from S85
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 188 (00 2 301)		**Assembly stand** available only as complete assembly stand 83 30 0 495 187.	
2	0 495 189 (00 2 302)	**2 299 563**	**Tool** (Universal flange). Do not use any more!!! Technically locked. Replaced with a new flange with material number 83 30 2 299 563. All flanges delivered until the end of 2011 will be replaced at no charge. From 2012, only the new flange will be supplied. Also applies to the complete engine mounting stand 00 2 300.	
3	0 495 200 (00 2 303)		**Crank**	
4	0 495 201 (00 2 304)		**Cover** (Protective hood)	
5	0 495 202 (00 2 305)		**oddments tray** (Oddments tray for small parts)	
6	0 495 203 (00 2 306)		**Shaped element** (Rear shaped pan)	
7	0 495 204 (00 2 307)		**Collection pan** (Oil collection pan)	
8	0 495 205 (00 2 308)		**Shaped element** (Front shaped pan)	
9	0 495 206 (00 2 309)		**Wheel** (Front wheel (without stop))	
10	0 495 207 (00 2 311)		**Wheel** (Rear wheel (with stop))	
11	0 495 208 (00 2 312)		**Mat** (Checker mat set)	
2	2 299 563		**Adapter** New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.	

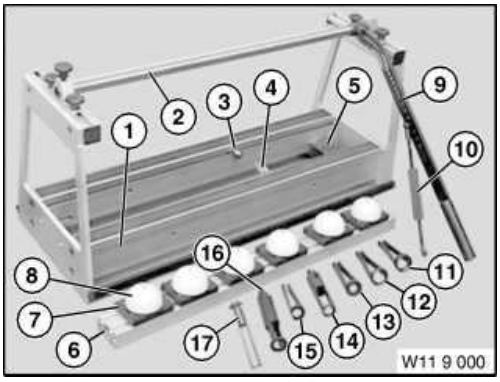
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0 494 371 (11 9 006) Insert



Common	Used in step 74 77
Usage	(Aluminium strip)
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 372 (11 9 007) Shaped part



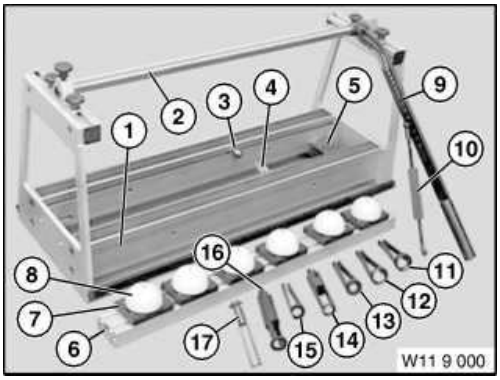
Common	Used in step 74
Usage	(Shaped part)
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 373 (11 9 008) Shaped part



Common	Used in step 74
Usage	(Shaped part) Shaped part made of plastic
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 370 (11 9 005) Quick fastener



Common	Used in step 74 77
Usage	
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 494 374 (11 9 009) Lever



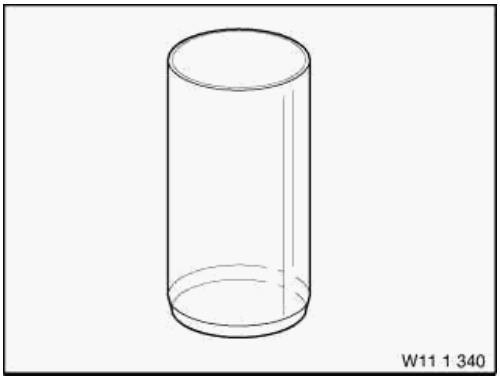
Common	Used in step 74 77
Usage	
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 496 143 (11 8 840) Basket



Common	Used in step 74 77
Usage	(Valve spring cage) For removing and fitting the valves.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

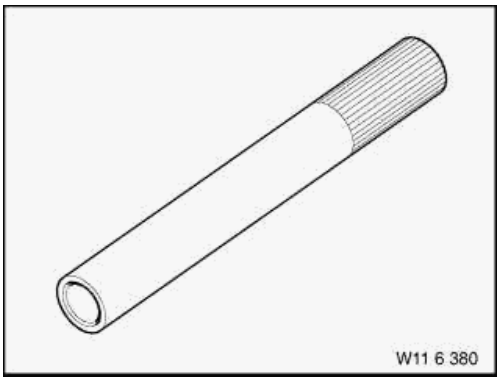
0 490 746 (11 1 380) Holding sleeve



Common	Used in step 76
Usage	(Assembly sleeve) For fitting the valve stem seal, diameter 7 mm
Included in the tool or work	
Storage location	individual
Replaced by	
In connection with	
SI-Number	

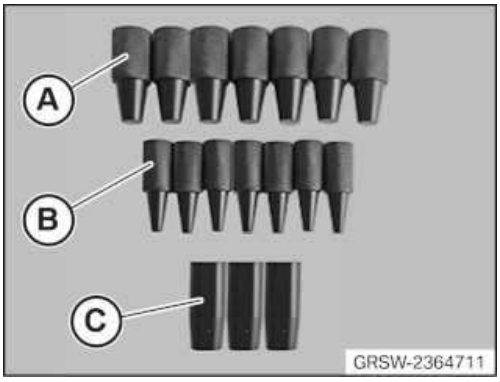
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0 493 249 (11 6 380) Bush



Common	Used in step 76
Usage	For fitting valve stem seal
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

2 364 711 Plug



Common	Used in step 78
Usage	For closing the pressure oil holes for cleaning the cylinder head sealing surfaces.
Included in the tool or work	
Storage location	C20
Replaced by	
In connection with	
SI-Number	01 50 14 (203)

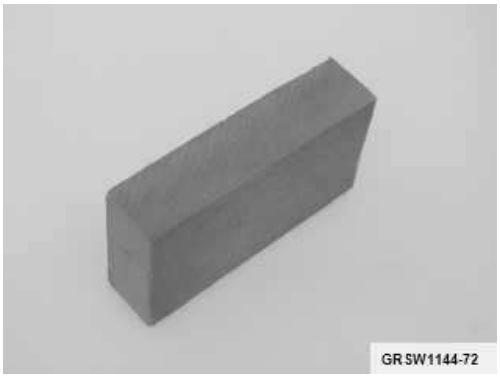
0 495 103 (11 4 471) Scraper



Common	Used in step 78
Usage	
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

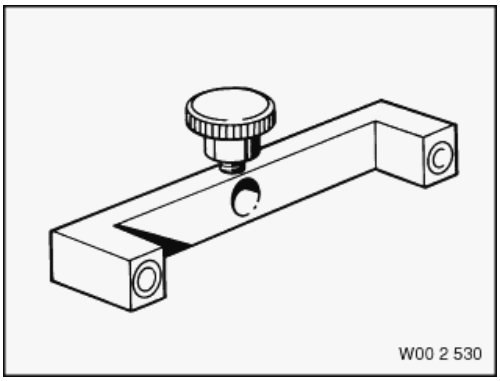
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0 495 104 (11 4 472) Extractor



Common	Used in step 78
Usage	(grindstone)
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

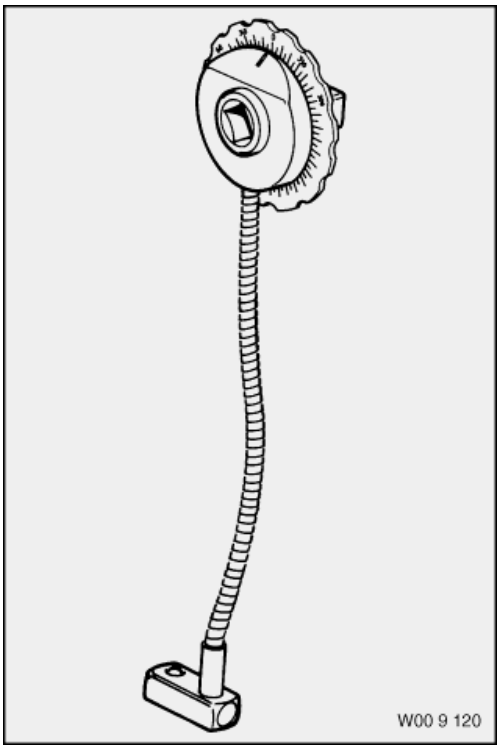
0 490 185 (00 2 530) Bridge



Common	Used in step 79
Usage	(Measuring bridge) For determining the piston projection (Diesel)
Included in the tool or work	
Storage location	A3
Replaced by	
In connection with	
SI-Number	

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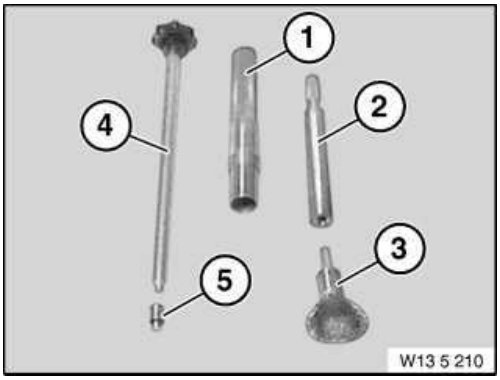
0 490 504 (00 9 120) Torque angle measuring dial



Common Used in step 81 118

Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

0 493 763 (13 5 215) Plug

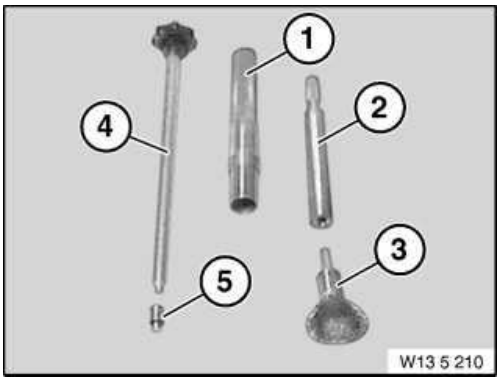


Common Used in step 92

Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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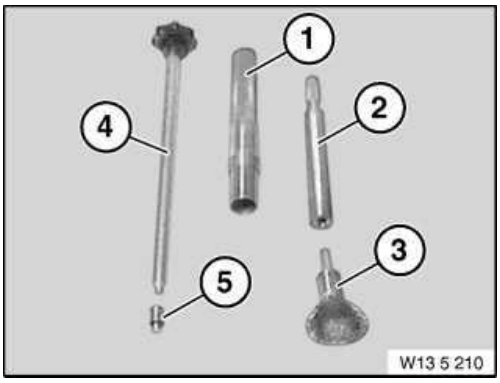
0 493 762 (13 5 214) Rod



Common Used in step 92

Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 758 (13 5 210) Tool



Common Used in step 92

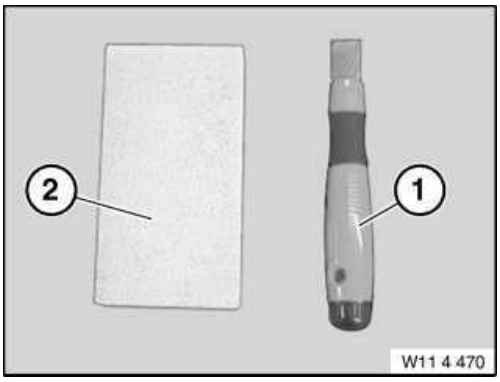
Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

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0 495 102 (11 4 470) Tool



Common Used in step 96

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

2 409 025 Puller



Common Used in step 113

Usage	For disassembly of the outer radial shaft seal of the transmission output shaft, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A76
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 411 739 Puller

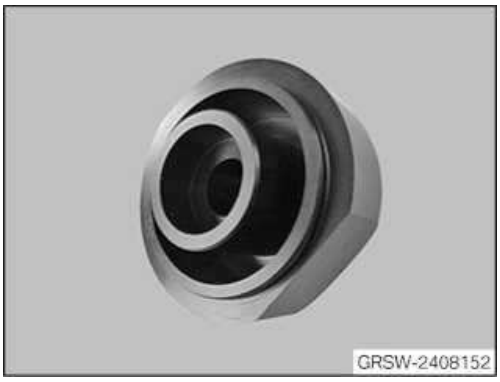


Common Used in step 113

Usage	For disassembly of the inner radial shaft seal of the output, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C78
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

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2 408 152 Striking element



Common Used in step 113

Usage	For installation of the right radial shaft seal transmission output shaft (inner). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

2 413 037 Handle



Common Used in step 113

Usage	Universal drift handle. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C77
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

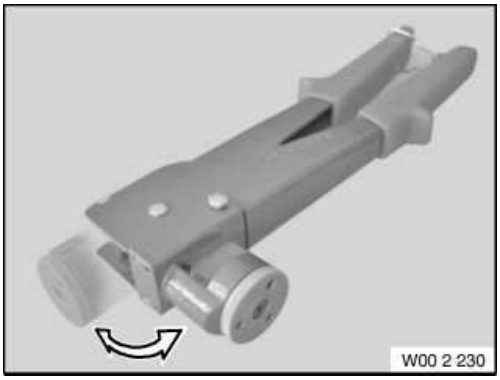
cardiagn.com

2 408 150 Striking element



Common	Used in step 113
Usage	For installing the right radial shaft seal transmission output shaft (outer). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

0 496 521 (00 2 230) Pliers



Common	Used in step 131
Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

2 344 011 Tool



Common	Used in step 132
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

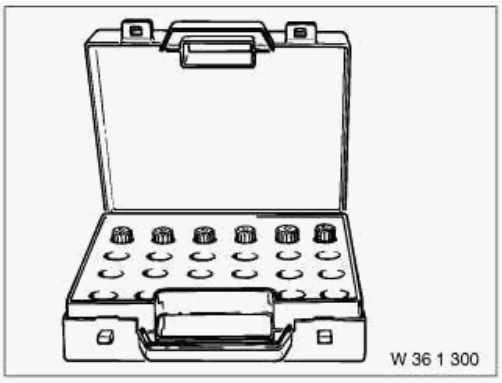
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0 495 221 (36 1 323) Wheel stud



Common	Used in step 23
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud



Common	Used in step 23
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud



Common	Used in step 23
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud



Common	Used in step 23
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 227 (36 1 329) Wheel stud



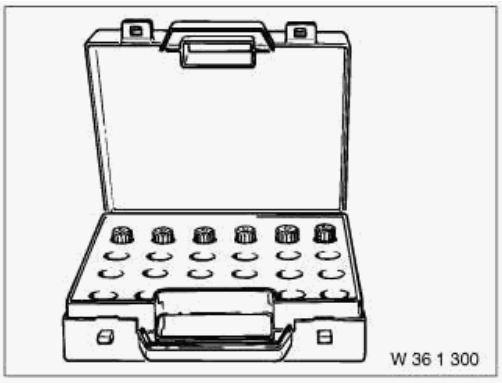
Common	Used in step 23
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud



Common	Used in step 23
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 229 (36 1 332) Wheel stud



Common	Used in step 23
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

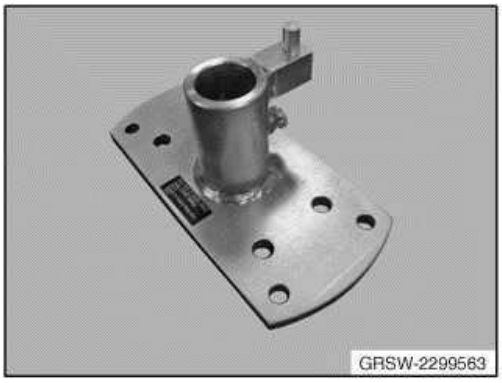
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0 495 230 (36 1 333) Wheel stud



Common	Used in step 23
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

2 299 563 Adapter



Common	Used in step 74 77
Usage	New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.
Included in the tool or work	0 495 187
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Valve underprotrusion	Used in step 79
	0,8 (0,7 - 0,9) mm

Transmission oil capacity	Used in step 152
Transmission oil GS6-60DA, GS6X60DA/Owner's Handbook	2,2 l

Transmission oil: Technically suitable manual gearbox oil

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	55 102
EGR controller	55 102

General repair instructions	Used in step

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61 20 ... Notes on AGM battery	144
61 12 ... Notes on intelligent battery sensor (IBS)	144
61 00 ... Notes for disconnecting and connecting battery	144
41 00 ... Notes on repairing threads	
61 00 ... Safety information for handling vehicle battery	

Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	9 44 45 47 48 49 50 51 52 63 72
17 00 008 Draining and topping up coolant for high-temperature circuit	150
17 00 008 Draining and topping up coolant for high-temperature circuit	150
17 00 008 Draining and topping up coolant for high-temperature circuit	150
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	150
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	150
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	150
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	150
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17 00 039 Bleed the cooling system and check it for watertightness with the special tool	150
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	150

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17 00 039 Bleed the cooling system and check for watertightness with the special tool (coolant circuit for low temperature)	150
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	150
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	150
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	150
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	150
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	150
17 00 039 Bleeding the cooling system (B36, B38, B46, B48)	150
17 00 039 Bleeding cooling system (B37, B47)	150
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	150
17 00 039 Filling and bleeding the high-temperature cooling system vacuum filler device (B48)	150
17 00 008 Draining and topping up the high-temperature coolant circuit	150
17 00 008 Draining and topping up the high-temperature coolant circuit	150
17 00 016 Draining and topping up coolant circuit for Range Extender \PREMIUM	150
17 00 008 Draining and topping up the high-temperature coolant circuit	150
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	150
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	150
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	150
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	150
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	150
00 .. ... Raising the vehicle using a vehicle hoist	

Operating materials	Used in step
2.0 Grease for wheel centring	132
14.0 Automatic transmission fluid for ZF-transmission GA8HP45Z / GA8HP50Z / GA8HP70Z / GA8HP90Z / GA8P70H / GA8P75H / GA8HP75Z	151

Operating materials	Used in step

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	88
Exhaust-gas recirculation cooler seal on exhaust manifold	102
Exhaust-gas recirculation cooler seal on intake plenum	102

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11 34 560 Replacing all valve stem seals (B47)

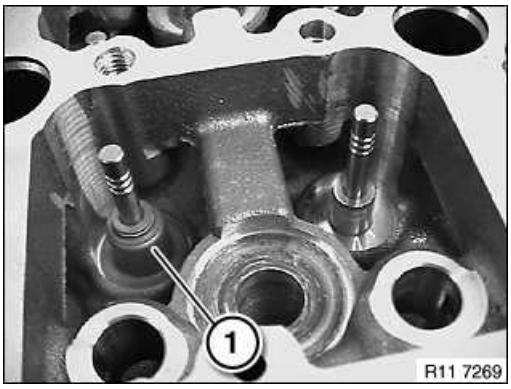
Special tools required:

- 11 1 480
- 11 6 380

Necessary preliminary tasks:

- Remove valve springs

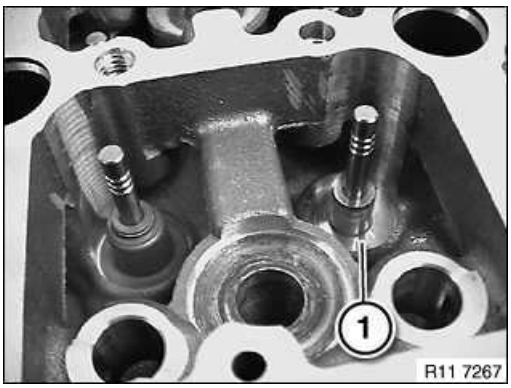
Removal:



Tap open valve stem seal (1) with special tool 11 1 480 or with a size 13 or 14 hexagon bit.

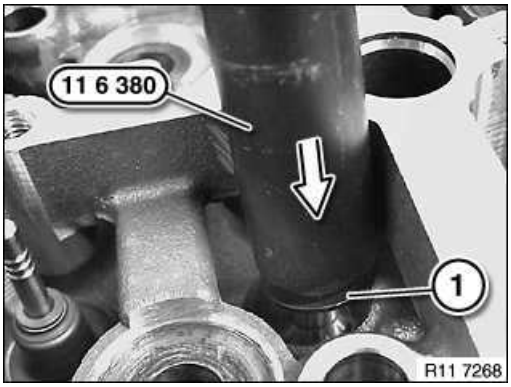
Remove valve stem seal (1) with turning and pulling motions.

Installation:



Installation note:
The contact surface (1) must be clean.

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Installation note:
Before installing the valve stem seals, the **assembly sleeve must** be fitted on the valve stem! **Risk of damage** to the sealing lip!

Press on valve stem seal (1) to stop using special tool 11 6 380 in direction of arrow.

Required follow-up work:

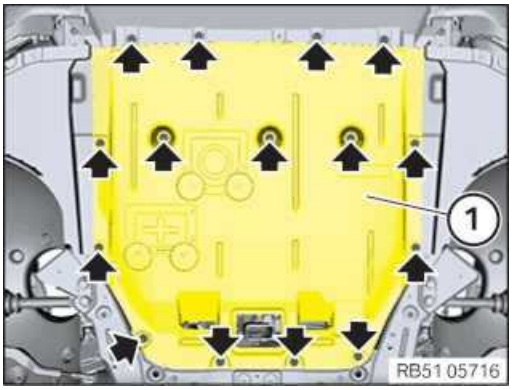
- Install valve springs
- Assemble engine

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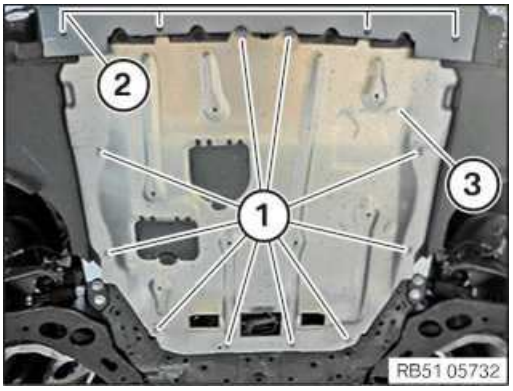
11 40 000 Checking engine oil pressure

PRELIMINARY WORK

1 – Removing the front underbody protection



- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.



- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

MAIN WORK

2 – Checking the oil pressure

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Undo the oil drain plug (1) on the oil filter cover (2).
- Feed out and remove oil drain plug (1).
- Catch and dispose of emerging engine oil.

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- Renew oil drain plug (1) with the sealing ring (2).

  Parts: Oil drain plug, sealing ring



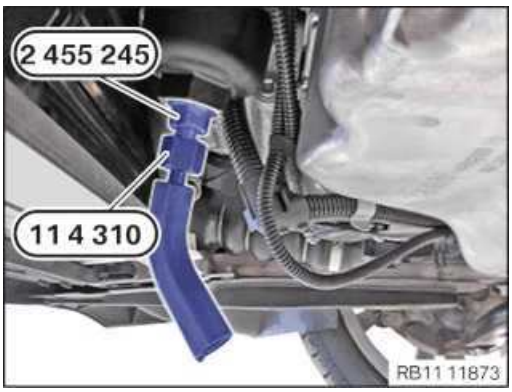
- Apply a thin coating of oil on the sealing rings on the special tool .



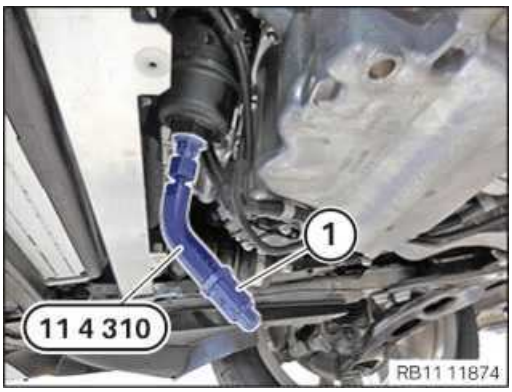
- Thread in the special tool at the oil filter cover (1) and install.
- Tighten the special tool on the oil filter cover (1).

Special tool to oil filter cover

Special tool		Tightening torque	6 Nm

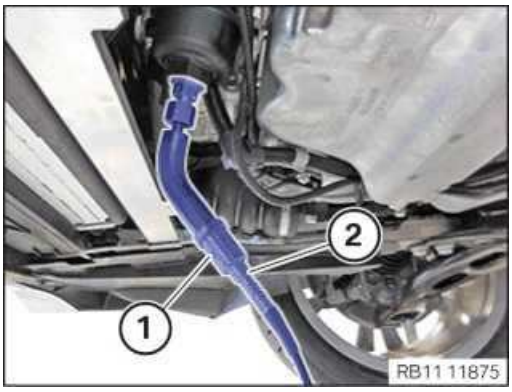


- Connect special tool **0 496 623 (11 4 310)** to special tool .



- Slightly grease gasket on the pressure sensor (1) **(part number: 81 31 2 357 801 and 81 38 0 431 592)**.
- Manually tighten the pressure sensor (1) **(part number: 81 31 2 357 801 and 81 38 0 431 592)** in the special tool **0 496 623 (11 4 310)**.

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- Connect and lock the connecting cable (2) on the pressure sensor (1).
- Connecting cable (2) and pressure sensor (1)**(part number: 81 31 2 357 801 or 81 38 0 431 592)** with the Integrated Measurement Interface Box (IMIB) (81 38 2 295 937).

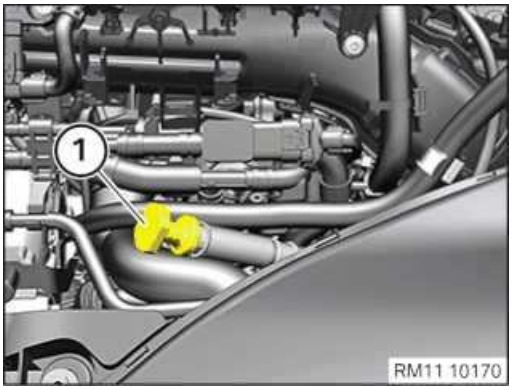
▶ **Check engine oil level**

- Park vehicle on a horizontal surface.
- In the case of automatic transmission, shift to selector lever position N or P.
- Accelerator pedal is not pressed.
- Engine is running and is at operating temperature.
- Read off the engine oil level in the instrument cluster (KOMBI) or on the control display.
- Top up engine oil if necessary.

▷ **Check engine oil level**

TECHNICAL INFORMATION

Always check the engine oil level when the engine is at operating temperature (engine oil temperature > 70°C).

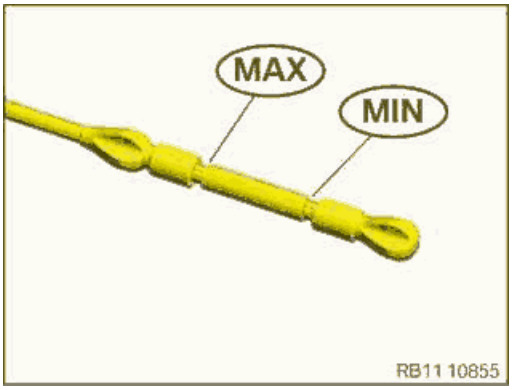


- Park vehicle on a horizontal surface.
- Stop the engine and wait for 5 minutes.
- Pull out the oil dipstick (1) and wipe off using a lint-free cloth.

TECHNICAL INFORMATION

Do not pull out or insert the oil dipstick into the guide tube too quickly or slowly.

- Push the oil dipstick (1) into the guide tube up to the limit position and pull it out again.



TECHNICAL INFORMATION

The engine oil level must be between the minimum mark and the maximum mark of the oil dipstick.

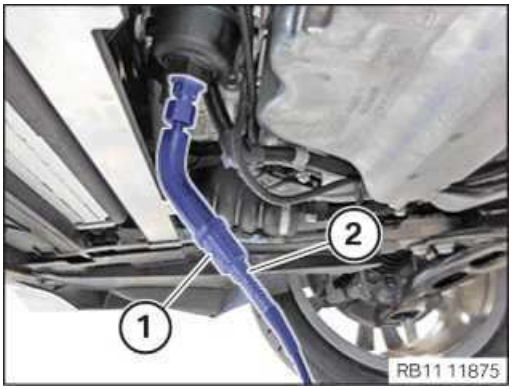
- Read the engine oil level on the oil dipstick.
- Top up engine oil if necessary.

◁

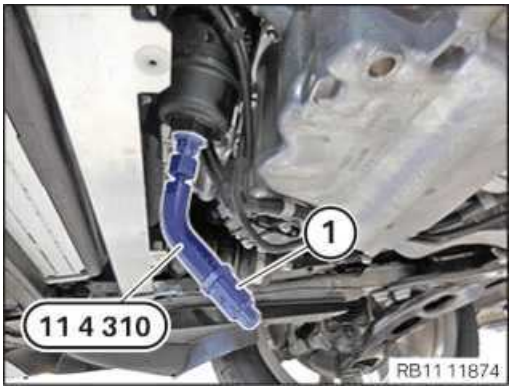
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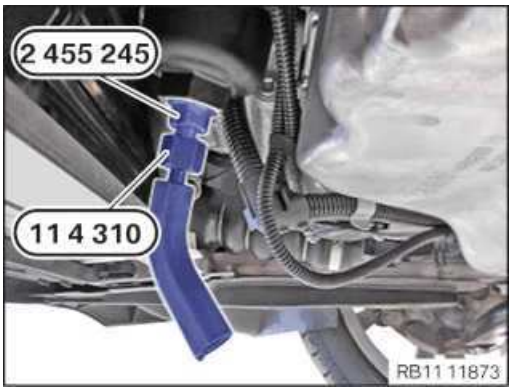
- Check oil pressure.
- Observe diagnosis instructions.



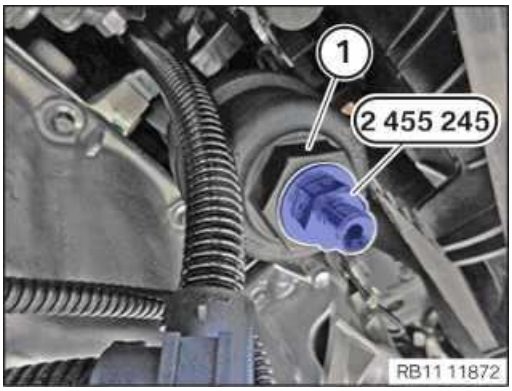
- Unlock and disconnect the connecting cable (2) from the pressure sensor (1).



- Thread out the pressure sensor (1) from the special tool **0 496 623 (11 4 310)** and remove.



- Thread out the special tool **0 496 623 (11 4 310)** from the special tool and remove.



- Thread out the special tool from the oil filter cover (1) and remove.



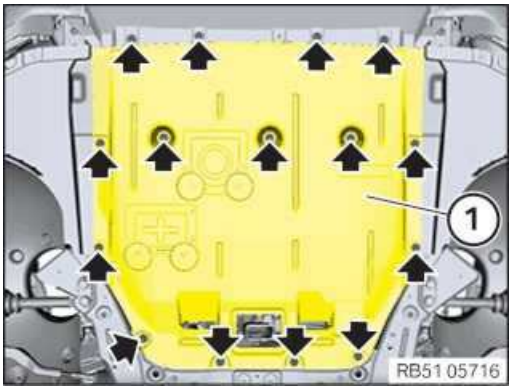
- Feed in and install new oil drain plug (1).
- Tighten new oil drain plug (1) on the oil filter cover (2).

Oil drain plug to oil filter cover

	Renewoil drain plug.	Tightening torque	6 Nm

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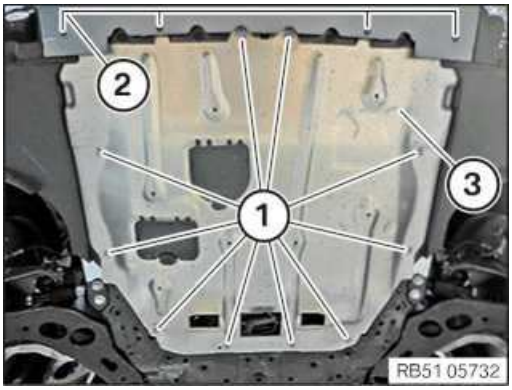
3 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm



- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

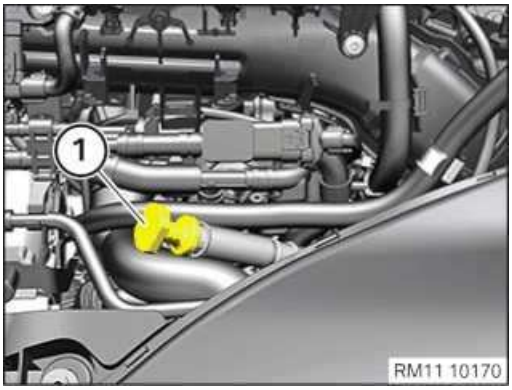
4 – Check engine oil level

- Park vehicle on a horizontal surface.
- In the case of automatic transmission, shift to selector lever position N or P.
- Accelerator pedal is not pressed.
- Engine is running and is at operating temperature.
- Read off the engine oil level in the instrument cluster (KOMBI) or on the control display.
- Top up engine oil if necessary.

▶ **Check engine oil level**

TECHNICAL INFORMATION

Always check the engine oil level when the engine is at operating temperature (engine oil temperature > 70°C).



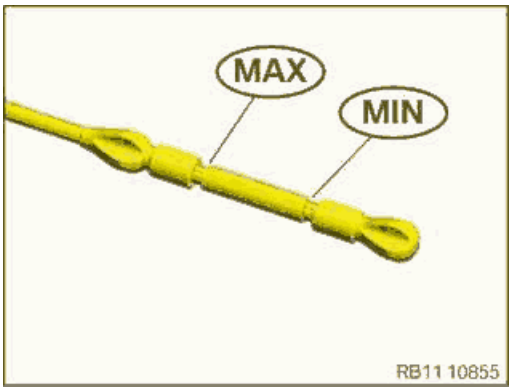
- Park vehicle on a horizontal surface.
- Stop the engine and wait for 5 minutes.
- Pull out the oil dipstick (1) and wipe off using a lint-free cloth.

TECHNICAL INFORMATION

Do not pull out or insert the oil dipstick into the guide tube too quickly or slowly.

- Push the oil dipstick (1) into the guide tube up to the limit position and pull it out again.

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TECHNICAL INFORMATION

The engine oil level must be between the minimum mark and the maximum mark of the oil dipstick.

- Read the engine oil level on the oil dipstick.
- Top up engine oil if necessary.

Additional Information

Overview of Tightening Torques

Special tool to oil filter cover — Used in step 2

Special tool		Tightening torque	6 Nm

Oil drain plug to oil filter cover — Used in step 2

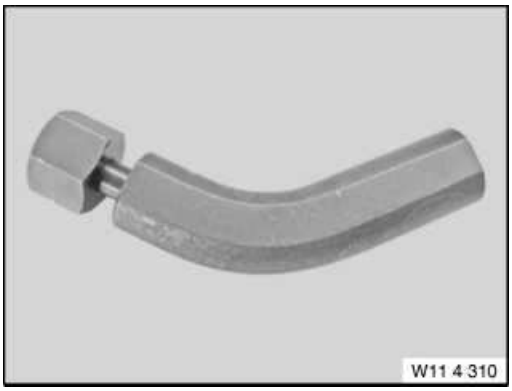
	Renewoil drain plug.	Tightening torque	6 Nm

Underbody protection front — Used in step 3

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Overview of Special Tools

0 496 623 (11 4 310) Adapter



Common — Used in step 2

Usage	For fuel pressure check. For variable camshaft timing control VANOS with Integrated Measurement Interface Box IMIB (100 bar sensor in delivery specification). In combination with 11 5 360.
Included in the tool or work	
Storage location	B26
Replaced by	
In connection with	11 5 360 = 0495130
SI-Number	01 27 09 (598)

Overview Technical Data

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11 41 000 Removing and installing or replacing oil/vacuum pump (B47)

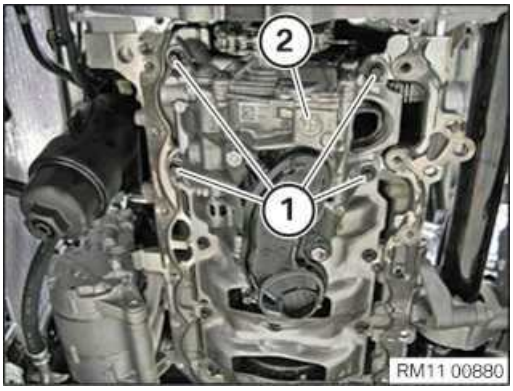
Important!

It is possible to remove and install the oil/vacuum pump **without** removing the gearbox.

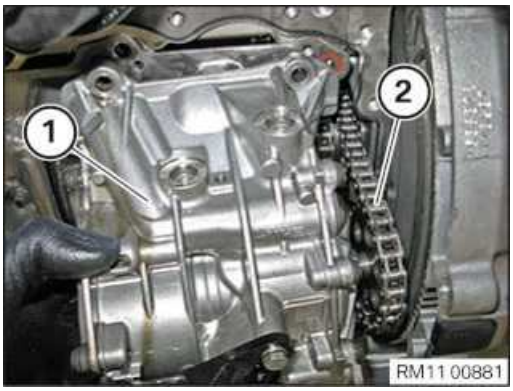
Necessary preliminary tasks:

- Remove oil sump

REMOVAL:

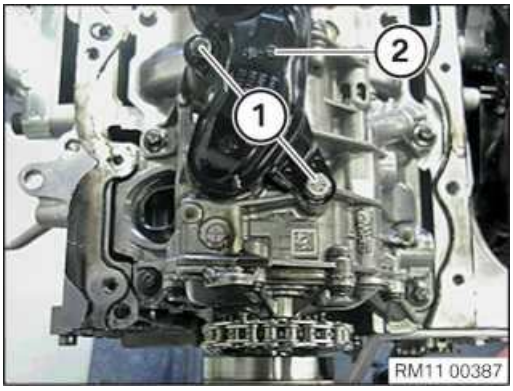


Release screws (1) of oil/vacuum pump (2).



Remove oil/vacuum pump (1) and feed out of drive chain (2).

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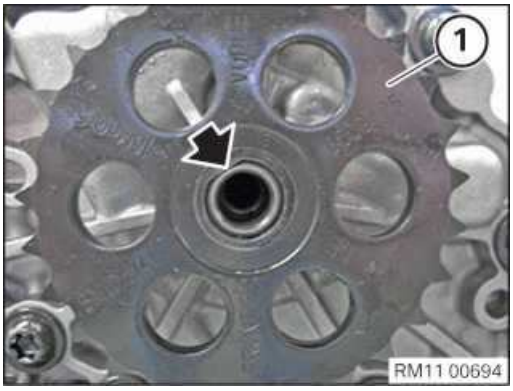


Replacement:

Release screws (1). Remount intake pipe (2).

Tighten down screws (1).

Tightening torque: 11 41 1AZ.



Replacement: Important!

Pay attention to mounting flats on oil pump (see arrow).

Labelling "Front" on the camshaft sprocket (1) needs to be visible.



Replacement:

Important!

Screw (1) has left-hand thread.

"Front" needs to be legible on the camshaft sprocket.

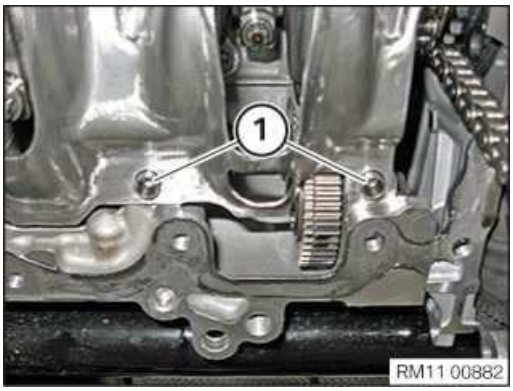
Hold down camshaft sprocket (2) with a suitable tool. Release screw (1). Remount camshaft sprocket.

Parts: Replace screw (1).

Mount camshaft sprocket (2) and hold down with a suitable tool. Tighten screw (1).

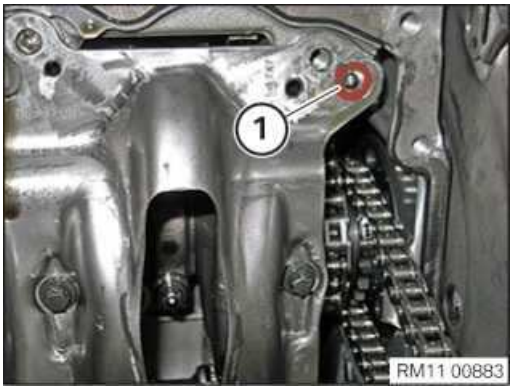
Tightening torque: 11 41 5AZ.

INSTALLATION:

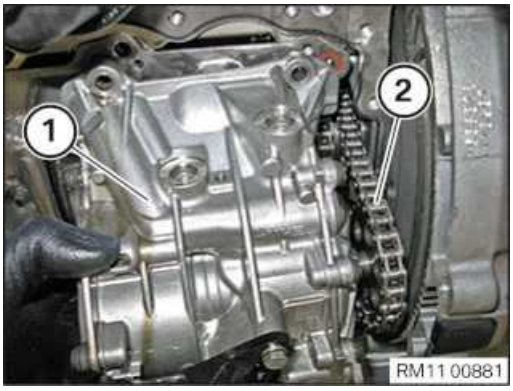


Check centring bushes (1) for damage, replace if necessary.

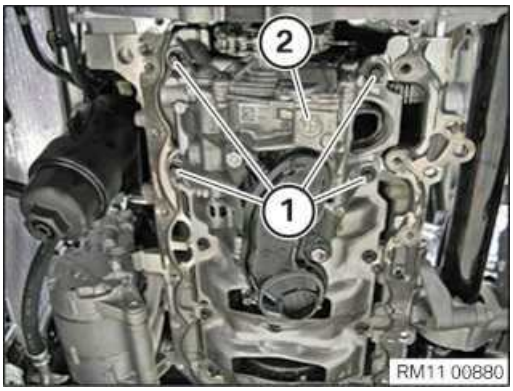
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Note:
Sealing ring (1) must not be damaged or missing.



Feed oil/vacuum pump (1) into drive chain (2).



Tighten down screws (1) of oil/vacuum pump (2).
Tightening torque: 11 41 2AZ.

Required follow-up work:

- Install oil sump
- Check engine for tightness

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11 66 000 Removing and installing or replacing oil/vacuum pump (B47)

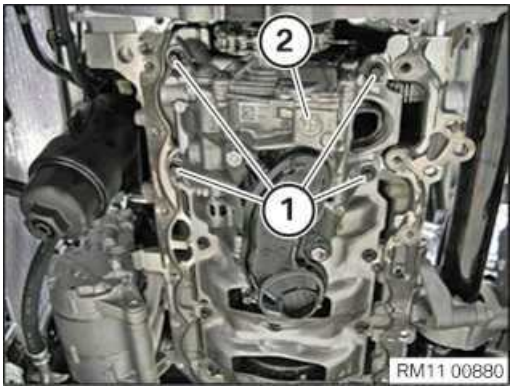
Important!

It is possible to remove and install the oil/vacuum pump **without** removing the gearbox.

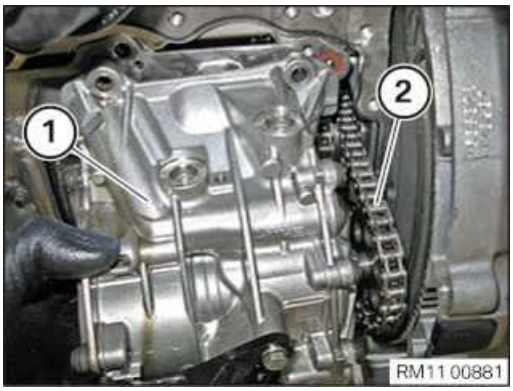
Necessary preliminary tasks:

- Remove oil sump

REMOVAL:

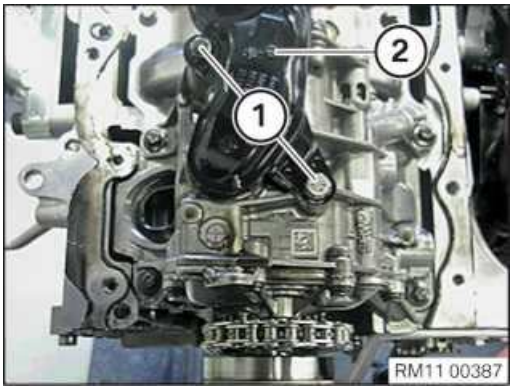


Release screws (1) of oil/vacuum pump (2).



Remove oil/vacuum pump (1) and feed out of drive chain (2).

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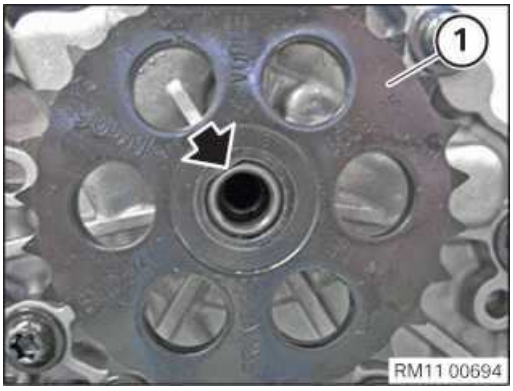


Replacement:

Release screws (1). Remount intake pipe (2).

Tighten down screws (1).

Tightening torque: 11 41 1AZ.



Replacement: Important!

Pay attention to mounting flats on oil pump (see arrow).

Labelling "Front" on the camshaft sprocket (1) needs to be visible.



Replacement:

Important!

Screw (1) has left-hand thread.

"Front" needs to be legible on the camshaft sprocket.

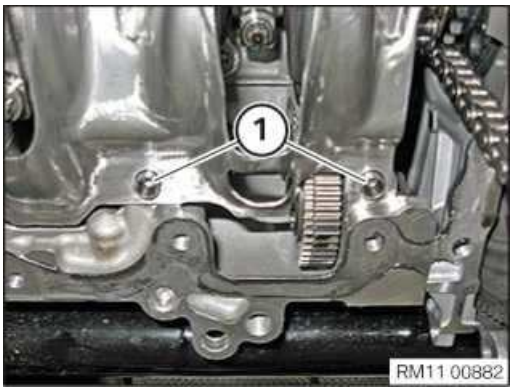
Hold down camshaft sprocket (2) with a suitable tool. Release screw (1). Remount camshaft sprocket.

Parts: Replace screw (1).

Mount camshaft sprocket (2) and hold down with a suitable tool. Tighten screw (1).

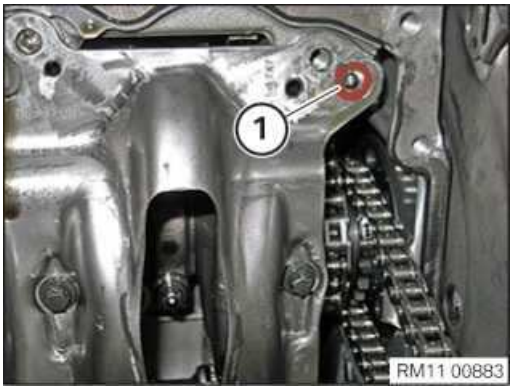
Tightening torque: 11 41 5AZ.

INSTALLATION:

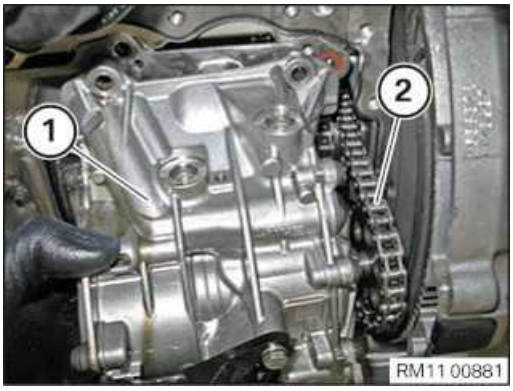


Check centring bushes (1) for damage, replace if necessary.

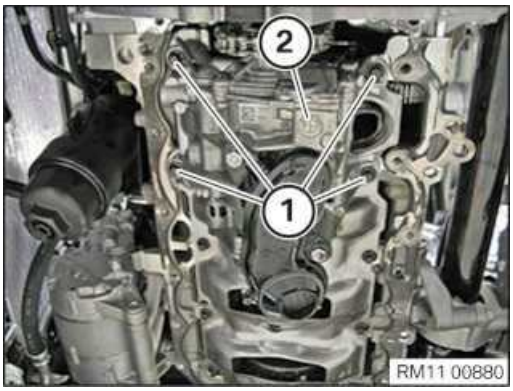
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Note:
Sealing ring (1) must not be damaged or missing.



Feed oil/vacuum pump (1) into drive chain (2).



Tighten down screws (1) of oil/vacuum pump (2).
Tightening torque: 11 41 2AZ.

Required follow-up work:

- Install oil sump
- Check engine for tightness

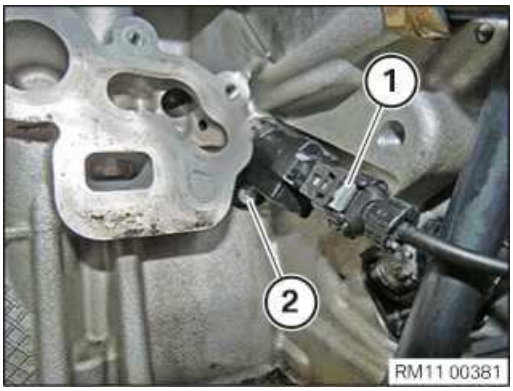
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11 41 115 Removing and installing/replacing hydraulic valve (B47)

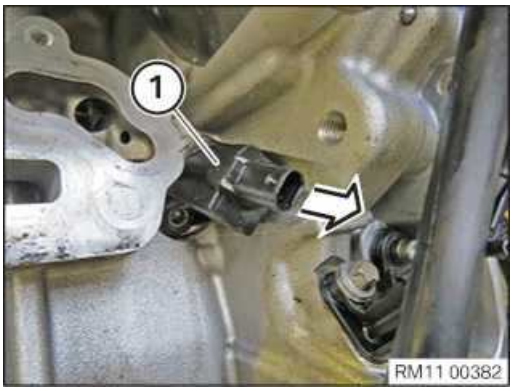
Necessary preliminary tasks:

- Remove full-flow oil filter.

Removal:

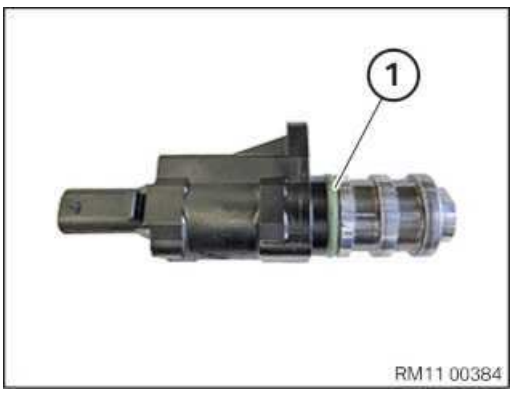


Unlock and disconnect the connector (1).
Release screw (2).



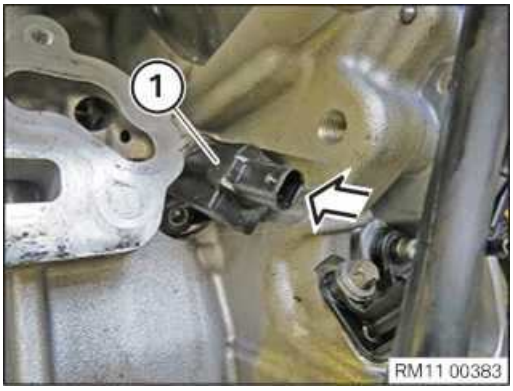
Remove hydraulic valve (1) in direction of arrow.

Installation:

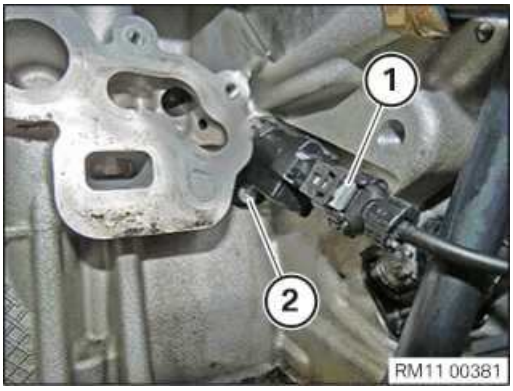


Parts: Replace O-ring (1).
Oil O-ring (1).

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Install hydraulic valve (1) in direction of arrow.



Tighten screw (2).
Tightening torque: 11 00 2AZ.
Connect the plug (1).

Required follow-up work:

- Install full-flow oil filter
- Assemble engine

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11 41 115 Removing and installing/replacing hydraulic valve for oil-pressure control

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

RISK OF DAMAGE

Engine damage caused by excessively filling the engine with engine oil.

Filling an excessive quantity of engine oil may cause engine damage.

- Observe the exact engine oil filling capacity.
- Drain the engine oil.

TECHNICAL INFORMATION

- When the engine is stopped after the end of the journey, it may be necessary to run the electric fan. In rare cases, operation of the electric fan can last up to 11 min. This protects the components. In this case, replacing the electric fan will not remedy the problem!

PRELIMINARY WORK

1 – Disconnecting all battery earth leads



- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

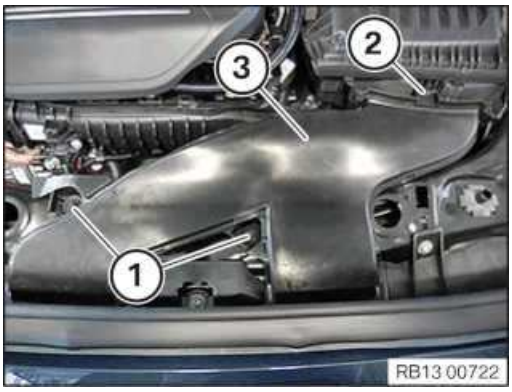
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

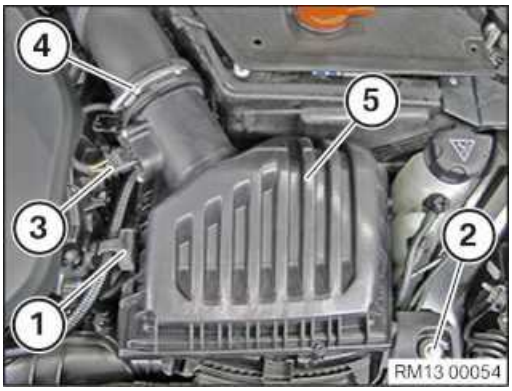
- Unclip the acoustic cover from the marked areas towards the top.

3 – Remove the intake neck for intake silencer housing



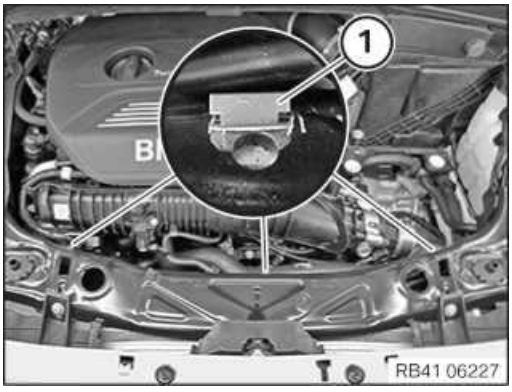
- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

4 – Removing intake silencer housing



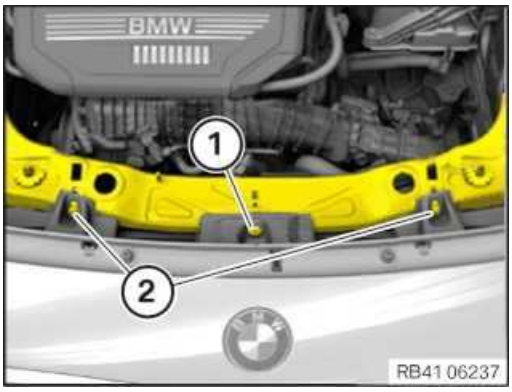
- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

5 – Remove front cross connection

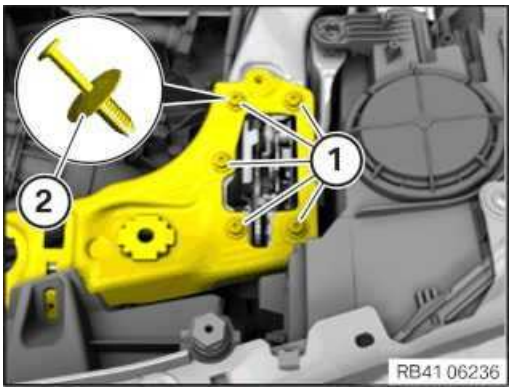


- Detach the clamps (1) for the Bowden cable of the bonnet locks from the cross connection.

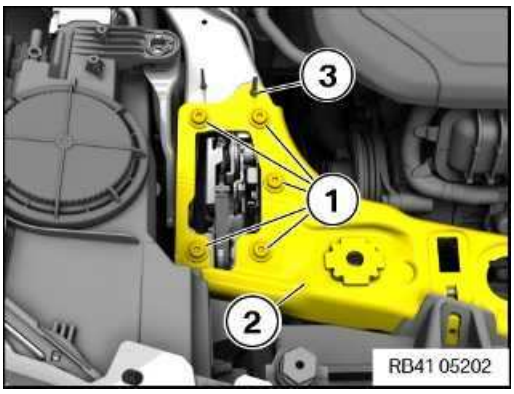
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- Loosen screw (1).
- Loosen screws (2).



- Loosen screws (1).
- Lever out expanding rivet (2).



- Loosen screws (1).
- Unclip the front cross connection (2) from the rubber retainer (3) and remove it upward.

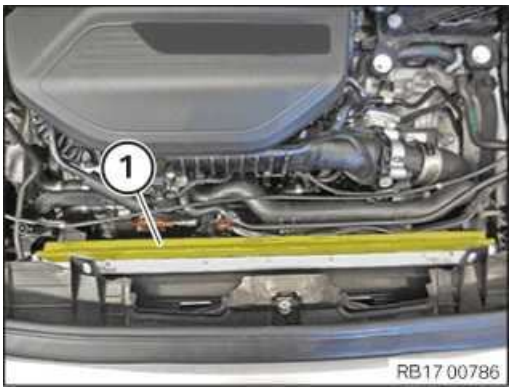
6 – Removing the fan cowl with electric fan

WARNING

Hot surfaces.

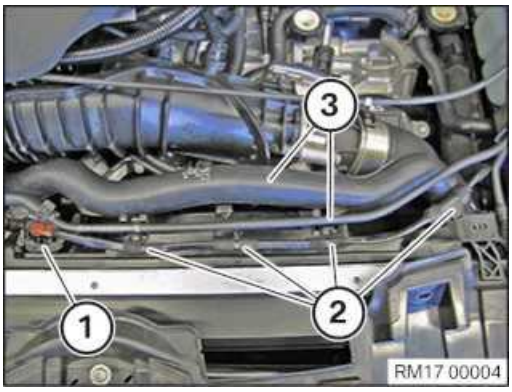
Risk of burning!

- Perform all work only on components that have cooled down.

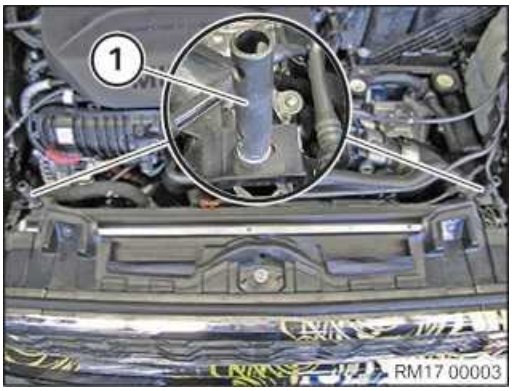


- Feed out and remove the sealing (1) from the radiator.

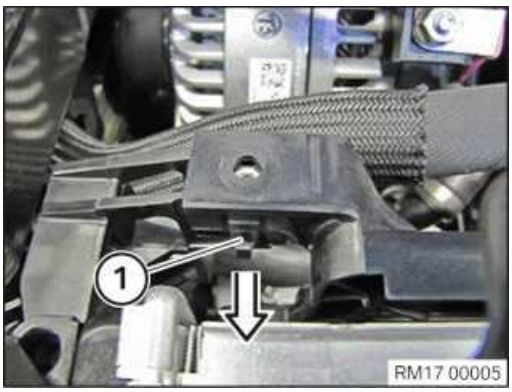
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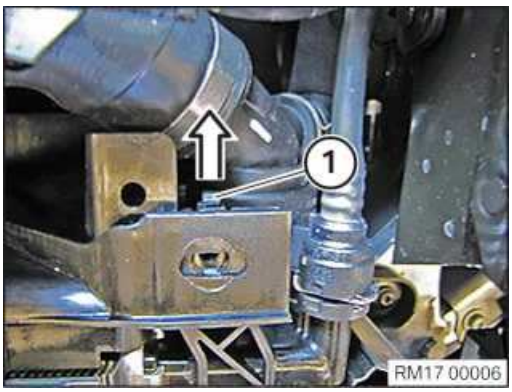
- Unlock plug connection (1) and disconnect.
- Unlock and loosen the clamps (2).
- Feed out connector (1) and place to one side.
- Thread off coolant line (3) and place to the side.



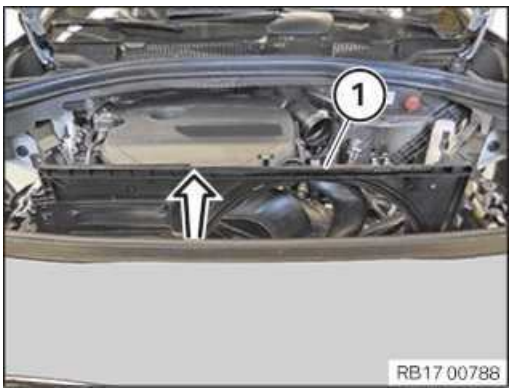
- Loosen screws (1).



- Unlock the right lock (1) on the fan cowl in the direction of the arrow.



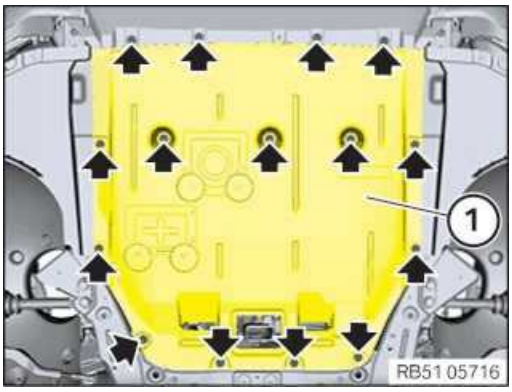
- Unlock the left lock (1) on the fan cowl in the direction of the arrow.



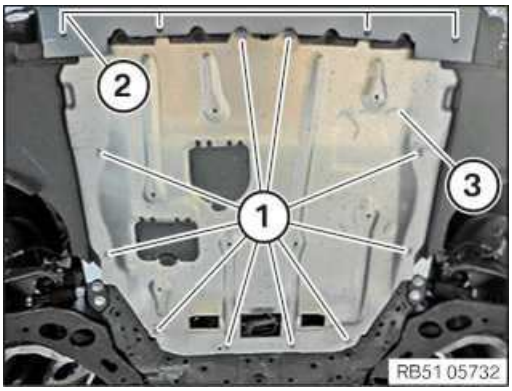
- Guide out fan cowl (1) in direction of arrow and remove.

7 – Removing the front underbody protection

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- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.



- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

8 – Draining coolant

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

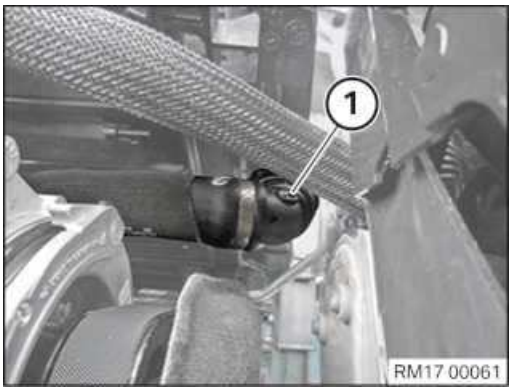
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

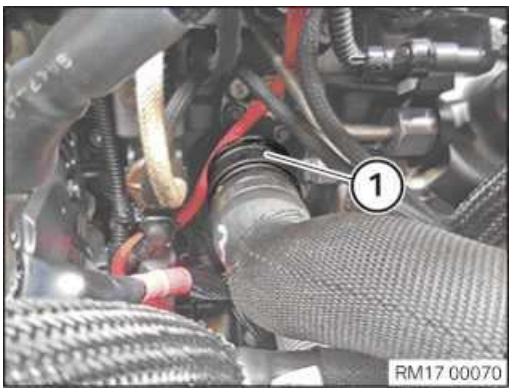
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- Loosen sealing cap (1).



- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.



- Unlock the coolant line (1) and pull it off the connecting branch.
- Catch and dispose of escaping coolant.

9 – Remove front right wheel

TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

TECHNICAL INFORMATION

Strictly observe the specified procedure to prevent clamping errors and imbalance.



- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

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10 – Removing the front right wheel arch cover

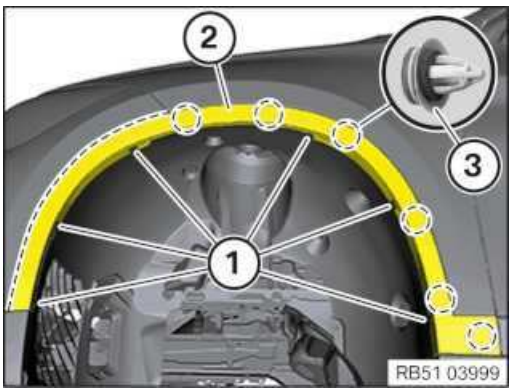
▶ **Remove the front wheel arch trim**

NOTICE

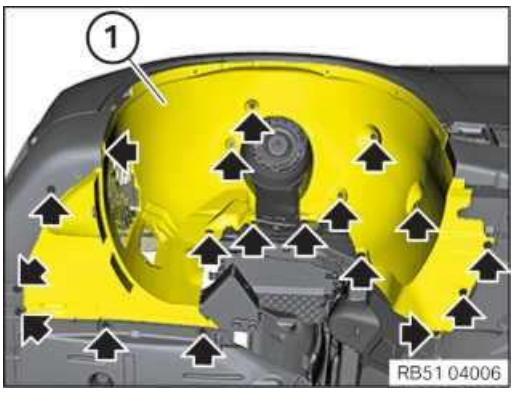
To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.



NOTICE

Description is for left component only. Procedure on the right side is identical.

- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

11 – Removing the oil filler cap



- Open oil filler cap (1).

12 – Releasing the oil drain plug

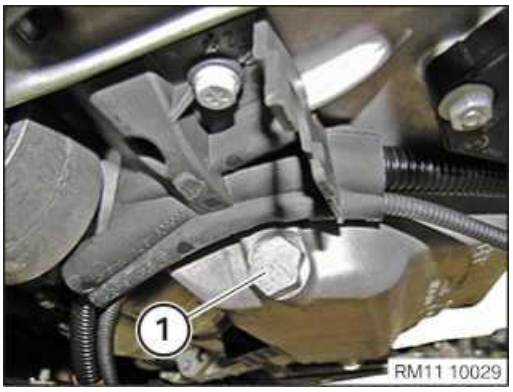
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WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

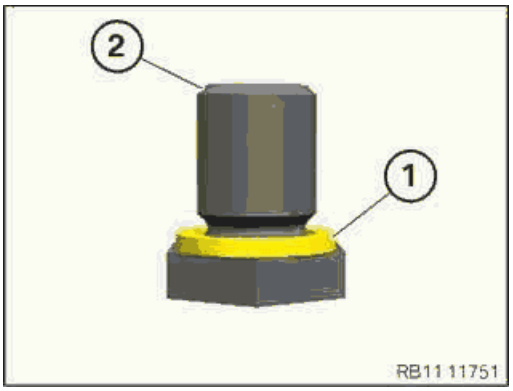


TECHNICAL INFORMATION

Catch and dispose of drained engine oil in a suitable collecting vessel. Observe country-specific waste disposal regulations.

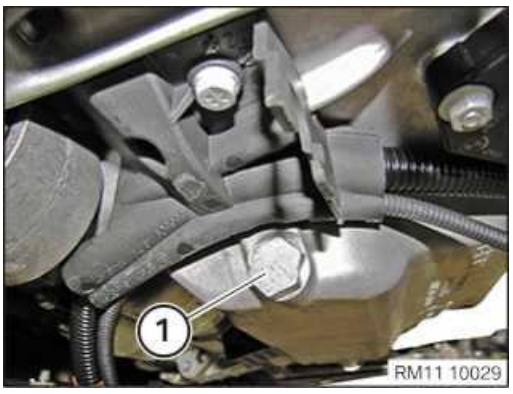
- Release oil drain plug (1).
- Drain engine oil.

13 – Tightening the oil drain plug



- Renew sealing ring (1) on the oil drain plug (2).

  Parts: Sealing ring
- Guide in the sealing ring (1) on the oil drain plug (2) and install.



- Renew the sealing ring.

  Parts: Sealing ring
- Position oil drain plug (1) on the oil sump and tighten.

Oil drain plug on oil sump

M12x1.5	Renew the sealing ring.	Tightening torque	25 Nm

14 – Undoing the oil drain plug on the oil filter cover

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

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TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Undo the oil drain plug (1) on the oil filter cover (2).
- Feed out and remove oil drain plug (1).
- Catch and dispose of emerging engine oil.

15 – Tightening the oil drain plug on the oil filter cover



- Renew oil drain plug (1) with the sealing ring (2).

  Parts: Oil drain plug, sealing ring



- Feed in and install the oil drain plug (1).
- Tighten the oil drain plug (1) on the oil filter cover (2).

Oil drain plug to oil filter cover

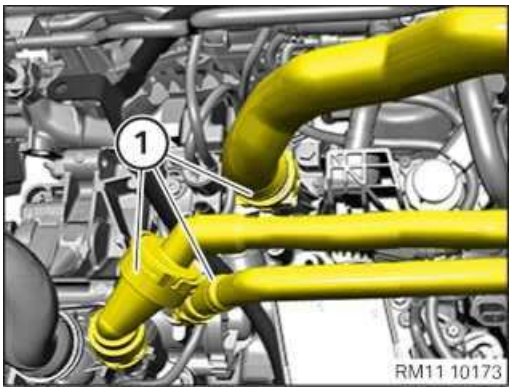
	Renewoil drain plug.	Tightening torque	6 Nm

16 – Remove full-flow oil filter

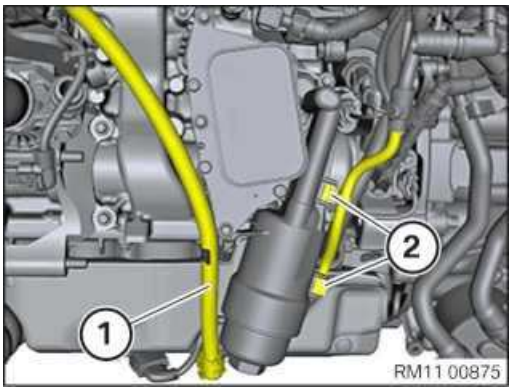
TECHNICAL INFORMATION

Make sure that there are no particles or impurities in the medium openings. Coolant or foreign substances in the oil can cause engine damage such as damage to the connecting rod bearing.

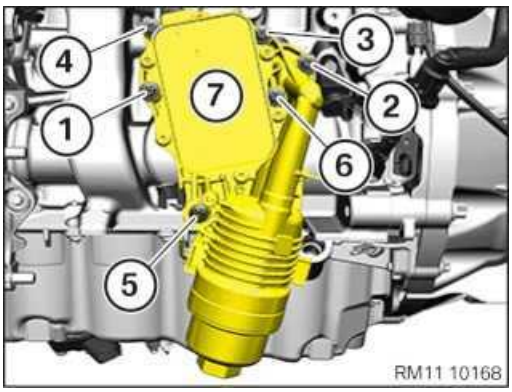
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- Unlock coolant lines (1).
- Pull off coolant lines (1) and place to one side.
- Catch and dispose of escaping coolant.



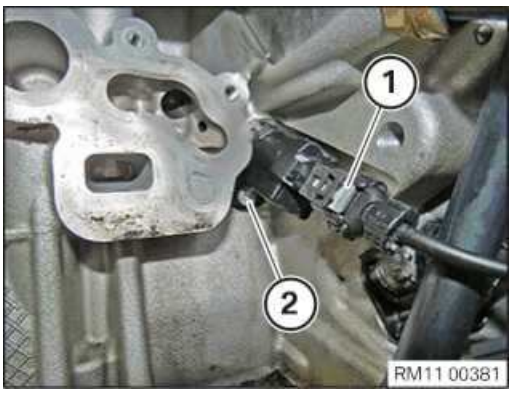
- Release positive battery cable (1) on full-flow oil filter from the clamp.
- Release the engine wiring harness (2) from the full-flow oil filter.



- Loosen screws in the order (6) to (1).
- Guide out the full-flow oil filter (7) upwards and remove.

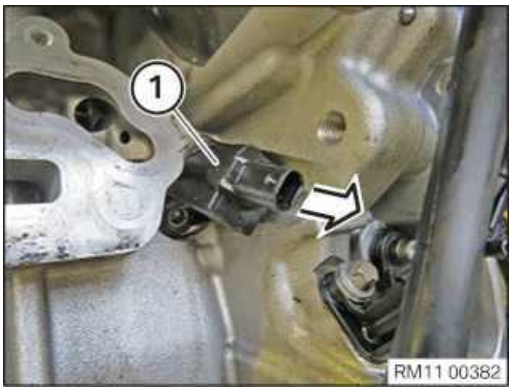
MAIN WORK

17 – Removing the hydraulic valve for the oil pressure control



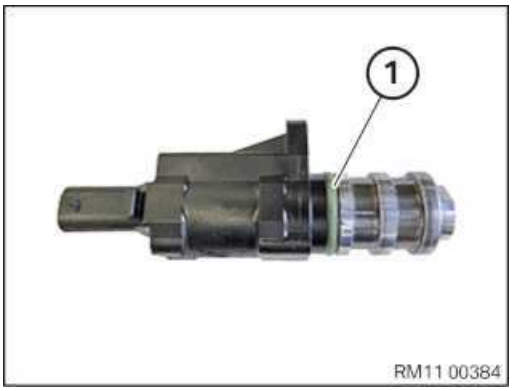
- Unlock and disconnect connector (1).
- Loosen screw (2).

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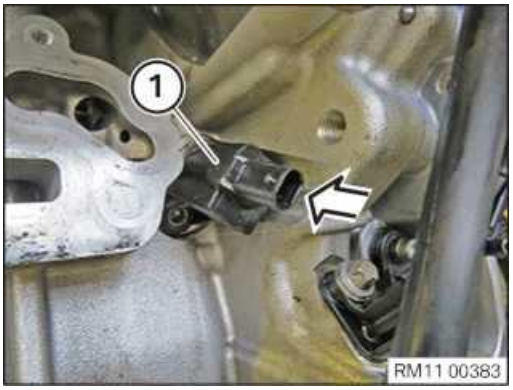
- Remove the hydraulic valve (1) in the direction of the arrow.

18 – Installing the hydraulic valve for the oil pressure control

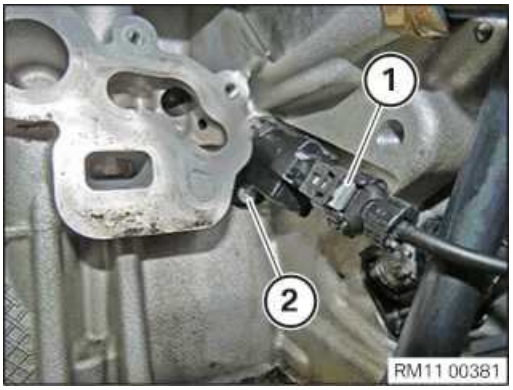


- Renew O-ring (1).

  Parts: O-ring
- Oil O-ring (1).



- Install the hydraulic valve (1) in the direction of the arrow.



- Tighten down screw (2).

Hydraulic valve to crankcase

M6 x 18		Tightening torque	8 Nm

- Connect connectors (1) and lock.

POSTPROCESSES

19 – Install full-flow oil filter

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RISK OF DAMAGE

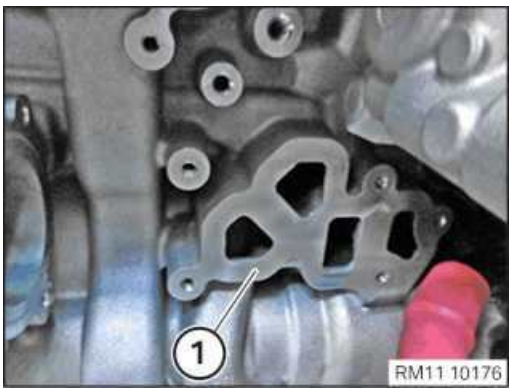
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.



- Clean any sealing residue on the sealing surface of the crankcase (1) with special tool **0 495 102 (11 4 470)**.



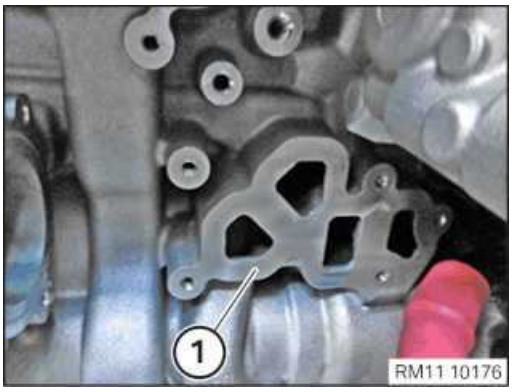
- Remove seals (1) using a suitable tool.
- Clean the sealing residue from the full-flow oil filter.
- Renew gaskets (1).

  Parts: Sealing kit
- Install seal (1).



- Crank the engine twice with the special tool **0 493 380 (11 6 480)** in the direction of rotation.

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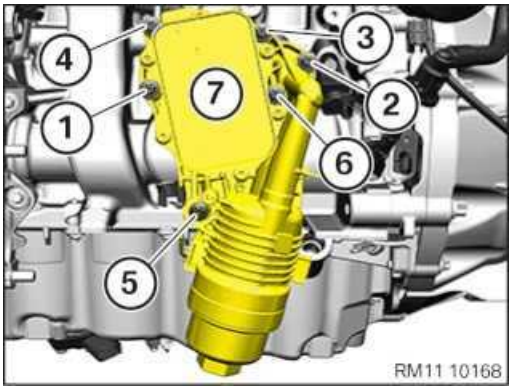


- Have a cleaning cloth ready.
- Catch any engine oil leaking from the oil duct of the crankcase (1) and dispose of this.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

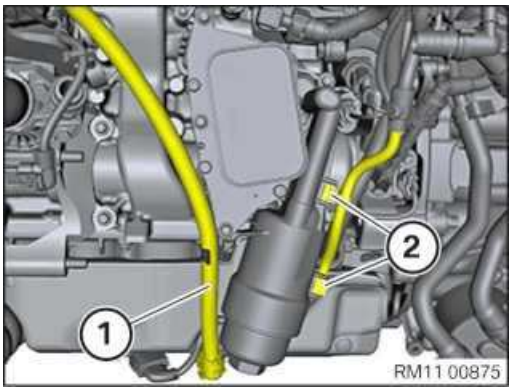
- Clean sealing surface (1).



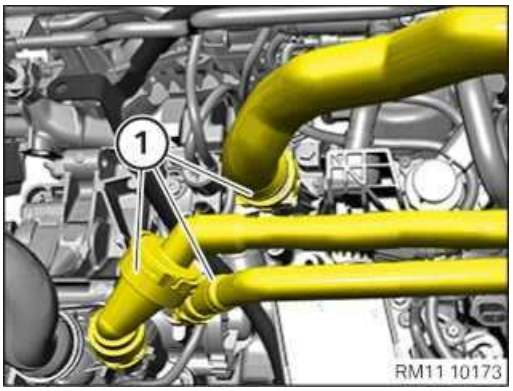
- Feed in and install the full-flow oil filter (7).
- Make sure seals are correctly seated.
- Tighten screws in the order (1) to (6).

Full-flow oil filter to crankcase

Screw M6	Observe tightening sequence.	Jointing torque	8 Nm
		Tighten down	8 Nm



- Secure the positive battery cable (1) on the full-flow oil filter in the clamp.
- Secure engine wiring harness (2) on full-flow oil filter.



- Connect and lock the coolant lines (1).

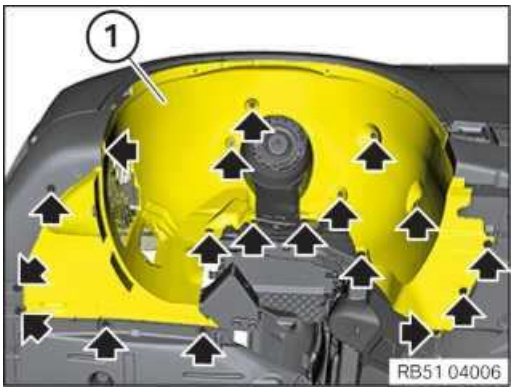
  The locks of the coolant lines (1) must audibly engage.

20 – Installing the front right wheel arch cover

NOTICE

Description is for left component only. Procedure on the right side is identical.

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- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

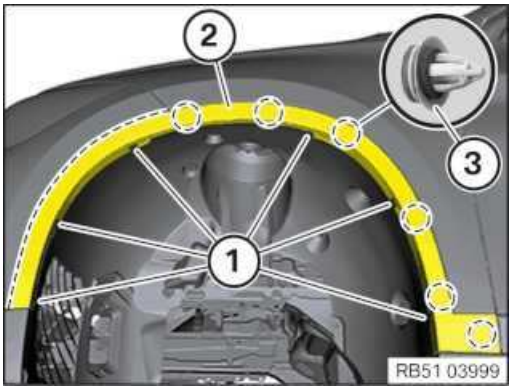
▸ **Installing front wheel arch trim**

NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Check the clips (3) for damage and renew where required.

  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

21 – Installing the front right wheel

▸ **Clean the contact surfaces between the brake disc and the wheel rim**



TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

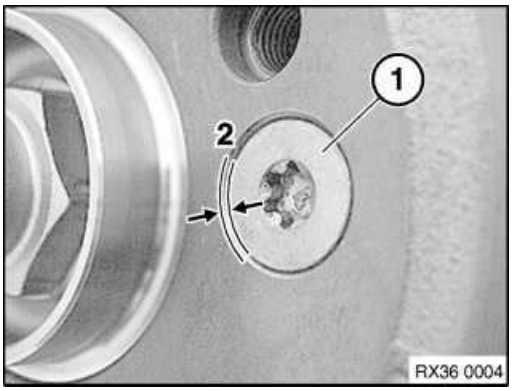
  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.

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- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

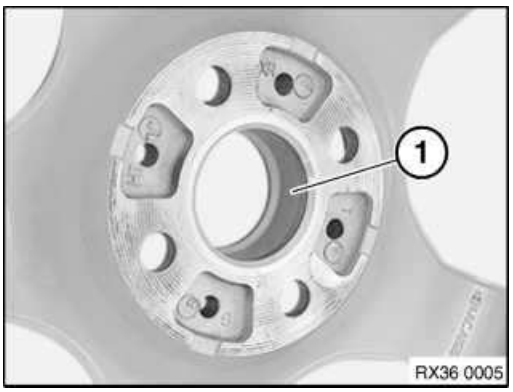


- Check the mounting bolt for the brake disc (1) for secure fit.

  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

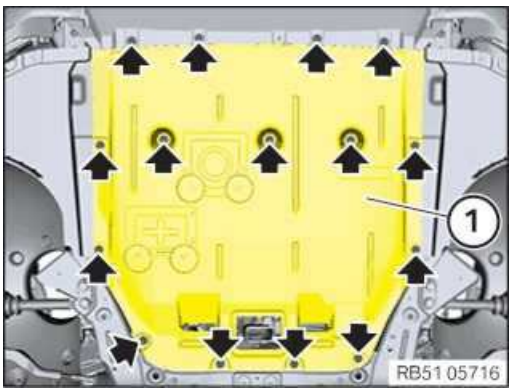
- Renew corroded wheel bolts.

  Parts: Wheel bolts
- Clean the wheel bolts and check the threads for damage. Renew the wheel bolts as needed.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

22 – Installing the front underbody protection

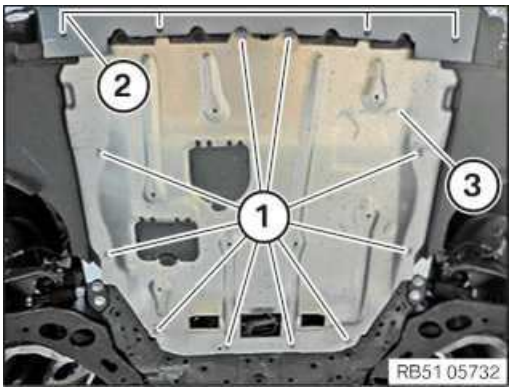


- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

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- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

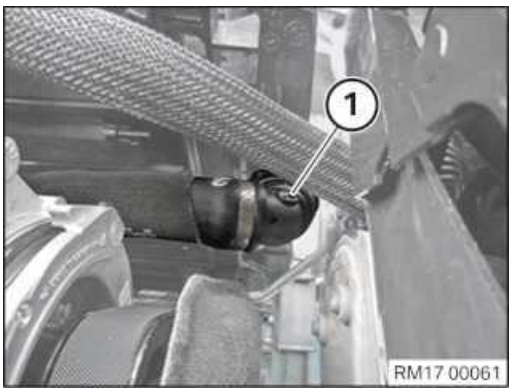
Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

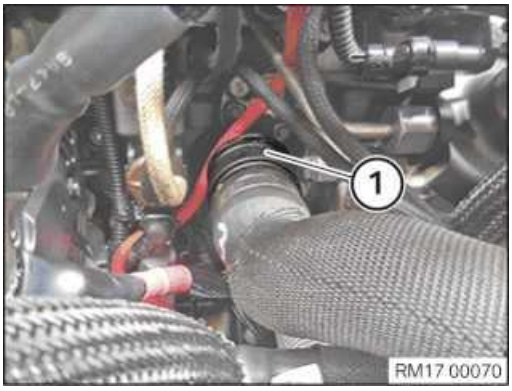
23 – Connect the coolant line

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Connect the right coolant line (1) to the radiator and lock audibly.



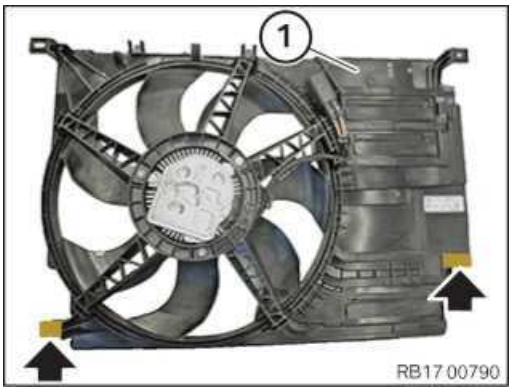
- Connect the coolant line (1) to the connecting branch and lock audibly.

24 – Installing fan cowl with electric fan

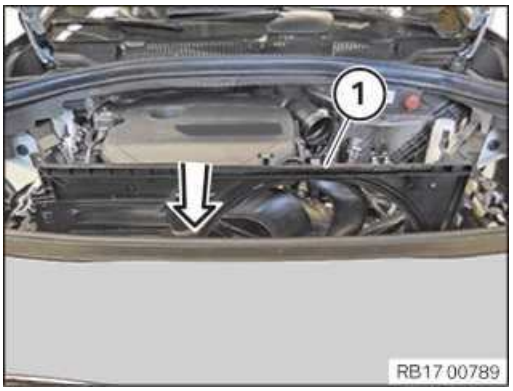
TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

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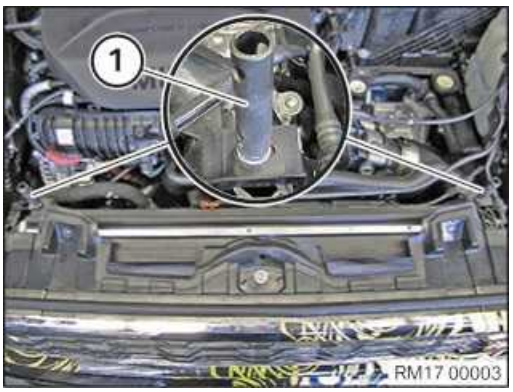
- Feed the guides (arrows) of the fan cowl (1) into the charge air cooler.



- Feed in and install the fan cowl (1) in the direction of the arrow.



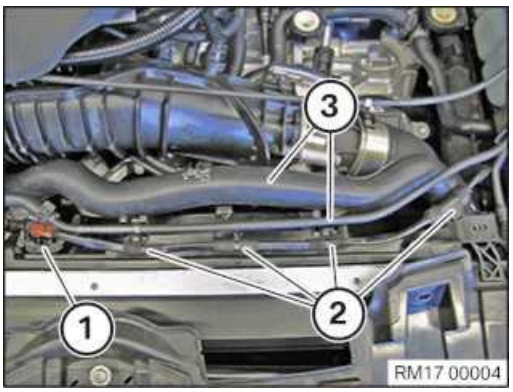
- Lock the left and right locks (arrows).



- Tighten the screws (1).

Fan cowl on radiator

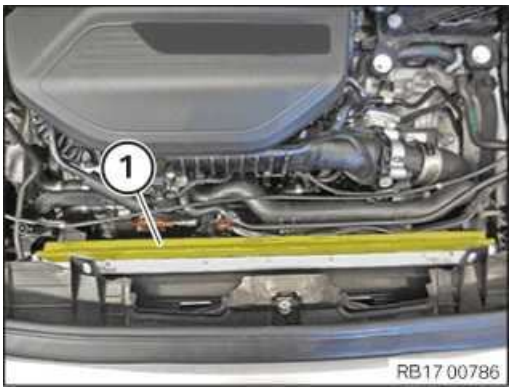
M6X12		Tightening torque	6 Nm



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.
- Secure clamps (2).
- Thread in and install coolant line (3).

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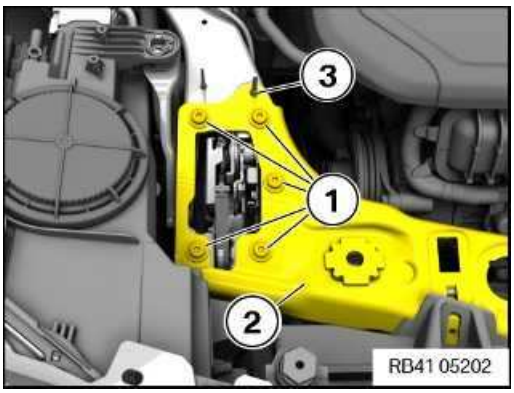


- Guide the sealing (1) on the radiator in and install it.

25 – Install front cross connection



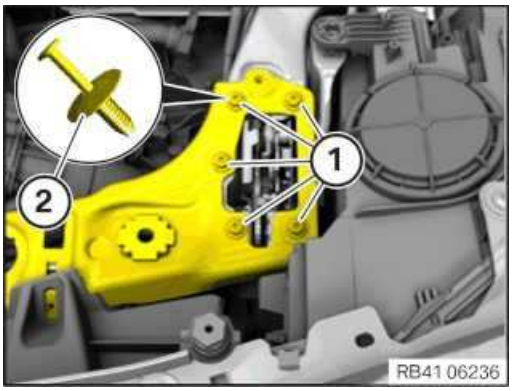
- Right side of vehicle only: Secure spray guard (1) on the cross connection (2) as pictured.



- Position front cross connection (2) and clip front cross connection (2) into the rubber retainer (3) at the same time.
- Tighten the screws (1).

Cross connection to carrier support

Screws M6x20		Tightening torque	11,8 Nm

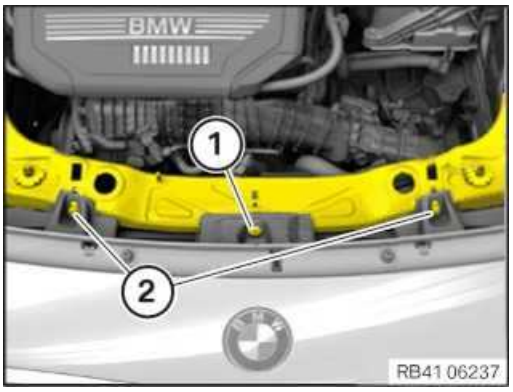


- Tighten the screws (1).

Cross connection to carrier support

Screws M6x20		Tightening torque	11,8 Nm

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- Position screws (3) on the rubber mounts for the radiator and tighten.

Screw connection for rubber mount of coolant radiator to coolant radiator

Bolt to rubber mount		Tightening torque	8 Nm

- Tighten down screws (2).

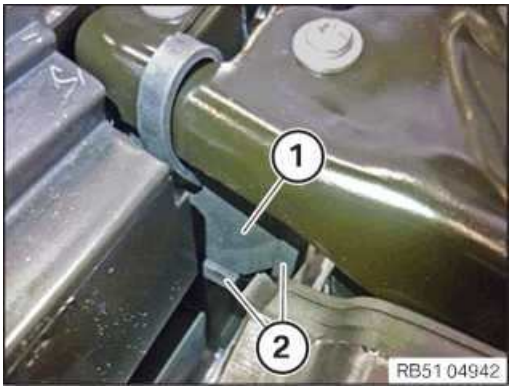
Air duct to upper connection

M6x20 screw		Tightening torque	11,8 Nm

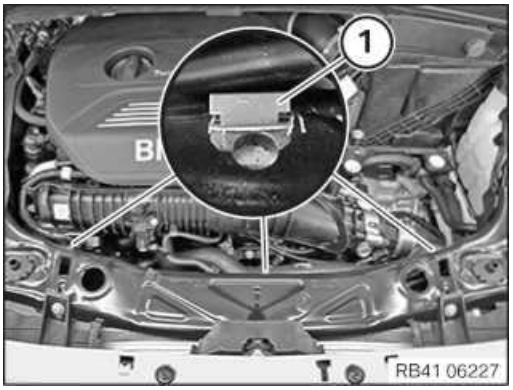
- Tighten down screw (1).

Bracing strut to upper connection

M8x20 screw		Tightening torque	28 Nm

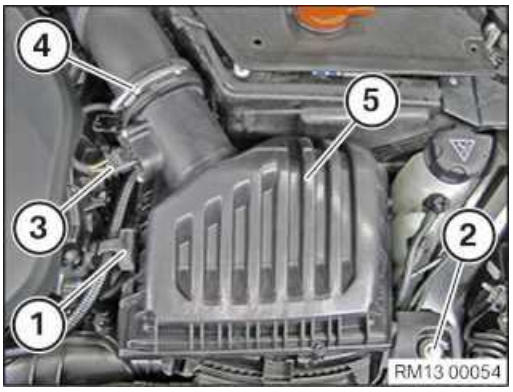


- Right side of vehicle only: Properly mount spray guard (1) to prevent corrosion.
- Secure spray guard (1) to the bridge with retaining tabs (2).



- Fasten the clamps (1) from the Bowden cable of the bonnet lock on the cross connection.

26 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.

  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

Clean air pipe to intake silencer housing

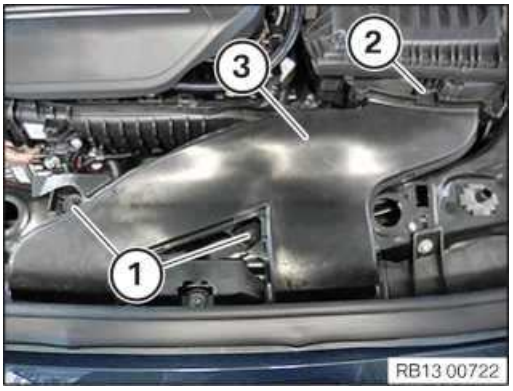
Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Insert and install the holder (1).

27 – Install the intake neck for the intake filter housing

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- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

28 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Check for correct installation of all rubber mounts in the acoustic cover (1).



- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

29 – Topping up the engine oil

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RISK OF DAMAGE

Damage to the petrol particulate filter.

Vehicles equipped with a petrol particulate filter must be operated with low-ash engine oil only.

- Use BMW Longlife-04 , BMW Longlife-12 FE or BMW Longlife-17 FE+ engine oils or engine oils approved by BMW matching the same specifications only.
- For additional information see: Overview of approved engine oils for BMW Group engines.

RISK OF DAMAGE

Engine damage caused by excessively filling the engine with engine oil.

Filling an excessive quantity of engine oil may cause engine damage.

- Observe the exact engine oil filling capacity.
- Drain the engine oil.

- Pour in engine oil.

Engine oilB47TÜ1

Capacity of engine oil	5,5 l

Engine oil: Technically suitable engine oils for BMW Group engines

30 – Installing the oil filler cap



- Close oil filler cap (1).

31 – Check engine oil level

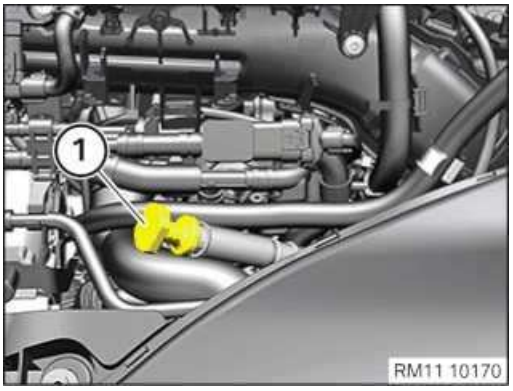
- Park vehicle on a horizontal surface.
- In the case of automatic transmission, shift to selector lever position N or P.
- Accelerator pedal is not pressed.
- Engine is running and is at operating temperature.
- Read off the engine oil level in the instrument cluster (KOMBI) or on the control display.
- Top up engine oil if necessary.

▸ **Check engine oil level**

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TECHNICAL INFORMATION

Always check the engine oil level when the engine is at operating temperature (engine oil temperature > 70°C).

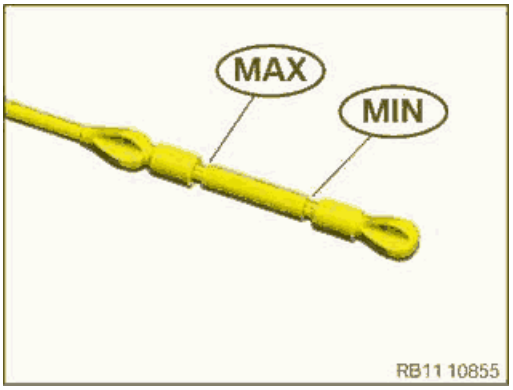


- Park vehicle on a horizontal surface.
- Stop the engine and wait for 5 minutes.
- Pull out the oil dipstick (1) and wipe off using a lint-free cloth.

TECHNICAL INFORMATION

Do not pull out or insert the oil dipstick into the guide tube too quickly or slowly.

- Push the oil dipstick (1) into the guide tube up to the limit position and pull it out again.



TECHNICAL INFORMATION

The engine oil level must be between the minimum mark and the maximum mark of the oil dipstick.

- Read the engine oil level on the oil dipstick.
- Top up engine oil if necessary.

32 – Disconnecting all battery earth leads



- See additional information.

33 – Fill and bleed the coolant circuit

▶ **Filling and bleed the high-temperature coolant circuit**



- See additional information.

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Additional Information

Overview of Tightening Torques

Oil drain plug on oil sump

Used in step 13

M12x1.5	Renew the sealing ring.	Tightening torque	25 Nm

Oil drain plug to oil filter cover

Used in step 15

	Renewoil drain plug.	Tightening torque	6 Nm

Hydraulic valve to crankcase

Used in step 18

M6 x 18		Tightening torque	8 Nm

Full-flow oil filter to crankcase

Used in step 19

Screw M6	Observe tightening sequence.	Jointing torque	8 Nm
		Tighten down	8 Nm

Wheel arch cover to body

Used in step 20

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Used in step 20

Plastic nut		Tightening torque	3 Nm

Brake disc to front wheel hub

Used in step 21

M8	Renew screw.		16 Nm

Wheel bolts

Used in step 21

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Underbody protection front

Used in step 22

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Fan cowl on radiator

Used in step 24

M6X12		Tightening torque	6 Nm

Cross connection to carrier support

Used in step 25

Screws M6x20		Tightening torque	11,8 Nm

Screw connection for rubber mount of coolant radiator to coolant radiator

Used in step 25

Bolt to rubber mount		Tightening torque	8 Nm

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Air duct to upper connection — Used in step 25

M6x20 screw		Tightening torque	11,8 Nm

Bracing strut to upper connection — Used in step 25

M8x20 screw		Tightening torque	28 Nm

Intake silencer housing to lock bridge — Used in step 26

M6X30		Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 26

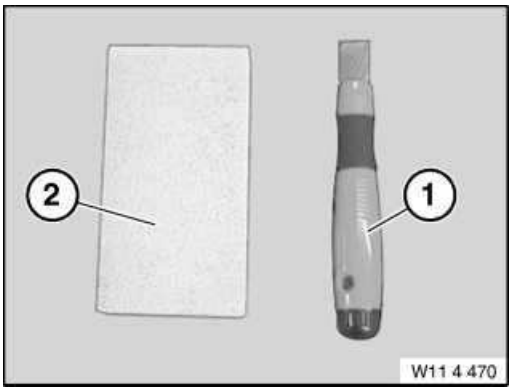
Clamp		Tightening torque	3 Nm

Intake neck to cross connection — Used in step 27

M6		Tightening torque	8 Nm

Overview of Special Tools

0 495 102 (11 4 470) Tool



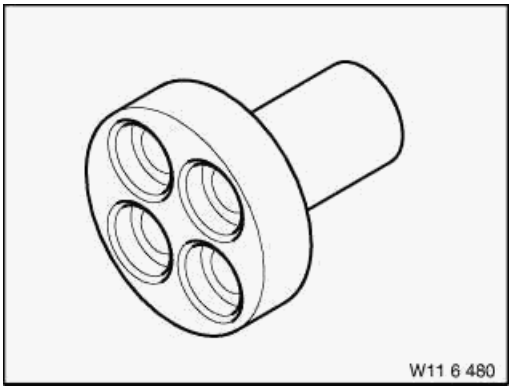
Common — Used in step 19

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

0 493 380 (11 6 480) Connector

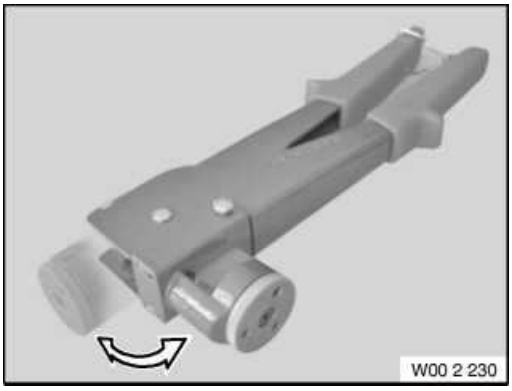


Common — Used in step 19

Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

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0 496 521 (00 2 230) Pliers



Common	Used in step 20
Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

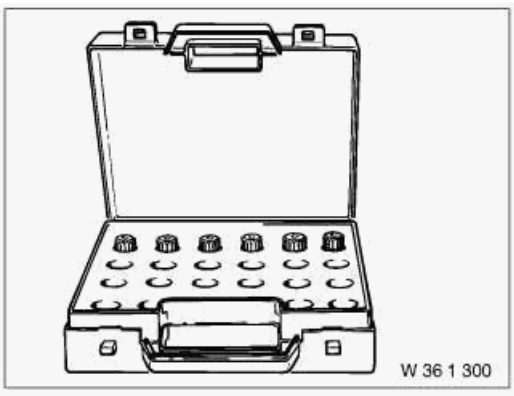
2 344 011 Tool



Common	Used in step 21
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

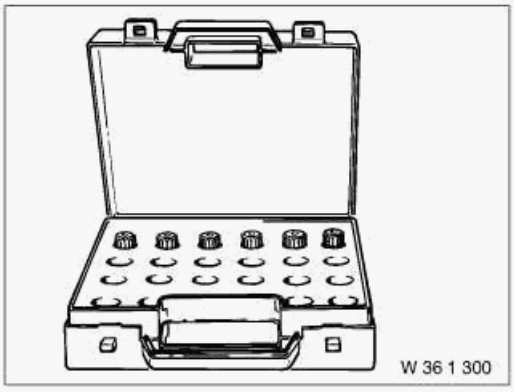
0 495 221 (36 1 323) Wheel stud



Common	Used in step 9
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 224 (36 1 326) Wheel stud



Common	Used in step 9
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud



Common	Used in step 9
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud



Common	Used in step 9
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

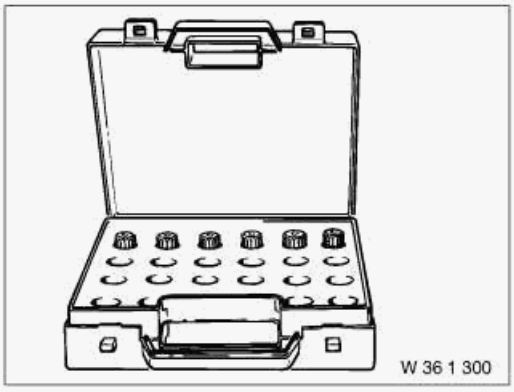
0 495 227 (36 1 329) Wheel stud



Common	Used in step 9
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 228 (36 1 331) Wheel stud



Common	Used in step 9
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 229 (36 1 332) Wheel stud



Common	Used in step 9
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud



Common	Used in step 9
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Engine oilB47TÜ1	Used in step 29
Capacity of engine oil	5,5 l

Engine oil: Technically suitable engine oils for BMW Group engines

Links

Repair instructions	Used in step
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61 20 900 Disconnecting and connecting battery earth lead	1 32
61 20 900 Disconnecting and connecting battery earth lead	1 32
61 20 900 Disconnecting and connecting battery earth lead	1 32
61 20 900 Disconnecting and connecting battery earth lead	1 32
61 20 900 Disconnecting and connecting battery earth lead	1 32

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61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1	32
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1	32
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61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1	32
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61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1	32
61 20 900 Disconnecting and connecting battery earth lead	1	32
61 20 900 Disconnecting and connecting battery earth lead	1	32
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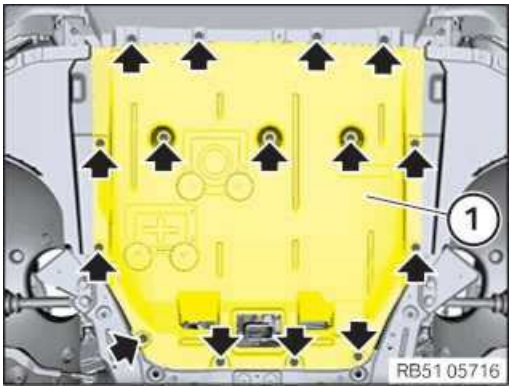
Operating materials	Used in step
2.0 Grease for wheel centring	21
3.0 Technically appropriate engine oils for BMW Group engines	29

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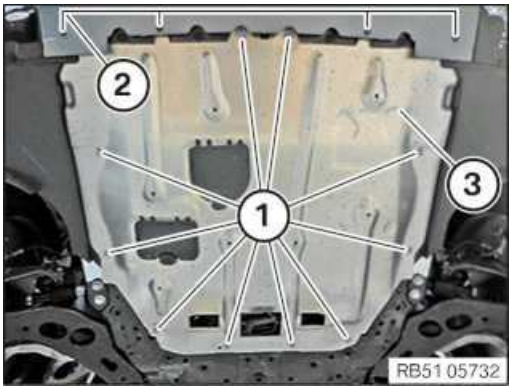
11 42 240 Attaching and detaching/sealing or replacing the oil return line for the high pressure exhaust turbocharger

PRELIMINARY WORK

1 – Removing the front underbody protection



- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.



- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

Damage to the acoustic cover.

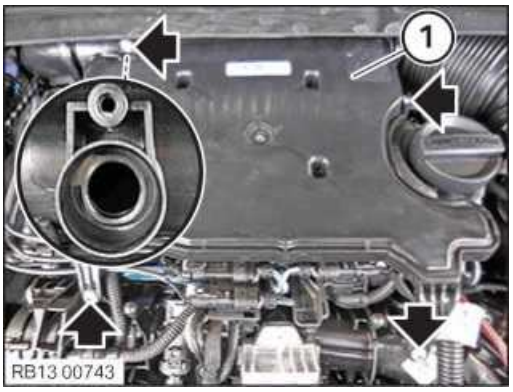
Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

3 – Remove resonator

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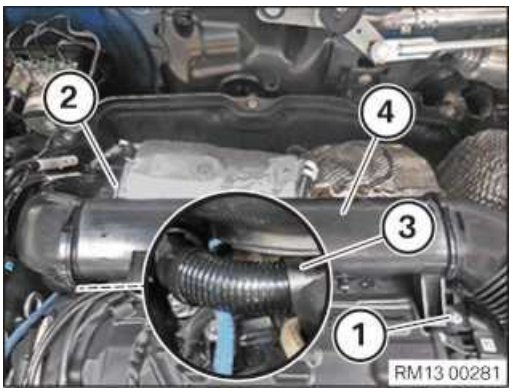


- Remove screws (arrows).
- Guide out and remove the resonator (1).

4 – Removing clean air pipe



- Detach clamp (1) on the clean air pipe.
- Pull off the clean air pipe from the intake silencer housing.



- Loosen screw (1).
- Loosen clamp (2).
- Unlock the ventilation line (3) and pull it off the cylinder head cover.
- Feed out clean air pipe and remove.

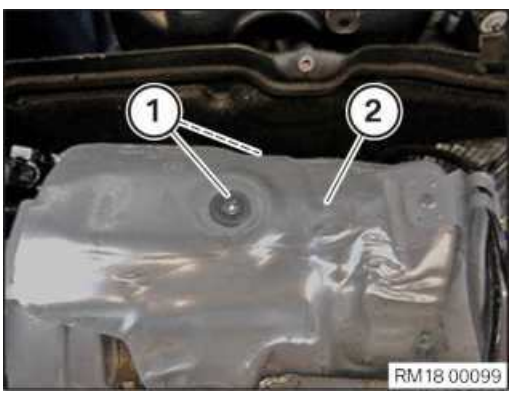
5 – Removing heat shield from top exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from holders.
- Release the screws (1) at the top and bottom of the heat shield.
- Feed out and remove the heat shield (2).

6 – Remove the heat shield from the exhaust turbocharger at the bottom

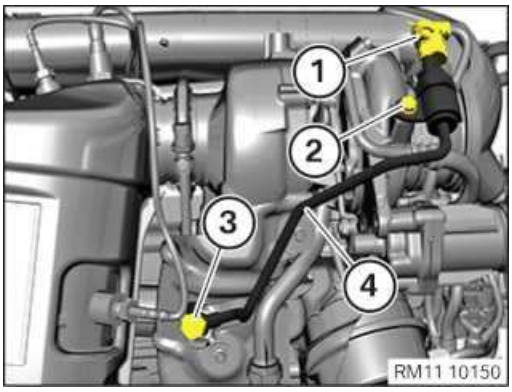
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WARNING

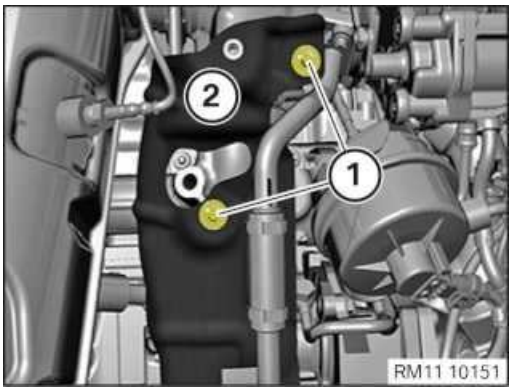
Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Unlock and disconnect connector (1).
- Unscrew the banjo bolt (3).
- The seals of the banjo bolt (3) must be renewed.
- Loosen screw (2).
- Remove the exhaust gas pressure pipe (4).



- Unscrew the bolts (1) on the heat shield .
- Feed out and remove the heat shield (2).

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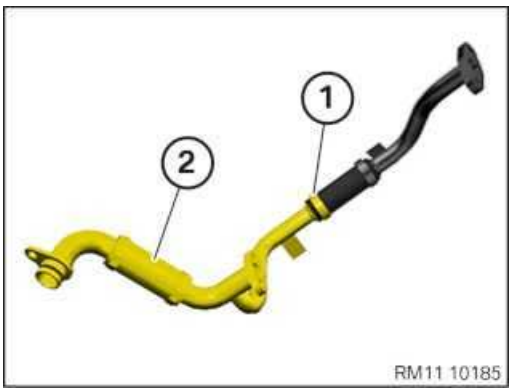
7 – Remove the oil return line for the high-pressure stage exhaust turbocharger

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.



- Detach the clamp (1).

TECHNICAL INFORMATION

- Note the installation position of the component. The component may be installed in various installation positions.

- Guide out and remove the oil return line (2).

  The oil return line (2) must be reinstalled in the same mounting orientation, set marks where required.

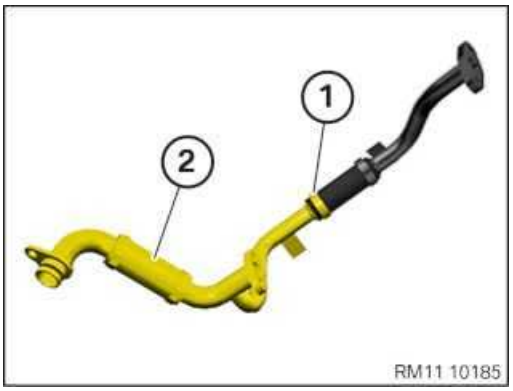
8 – Install the oil return line for the high-pressure stage exhaust turbocharger

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Renew the clamp (1).

  Parts: Clamp

- Insert and install the clamp (1).

TECHNICAL INFORMATION

Incorrect assembly is possible. Ensure correct installation position.

- Thread in the oil return line (2) in the correct mounting orientation and install. Observe any marks that may exist.
- Position and secure the clamp (1).

POSTPROCESSES

9 – Installing heat shield on exhaust turbocharger at bottom

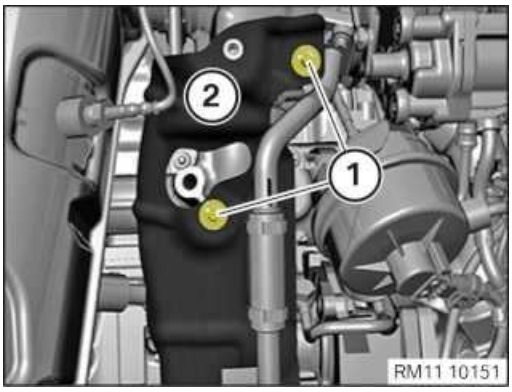
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WARNING

Hot surfaces.

Risk of burning!

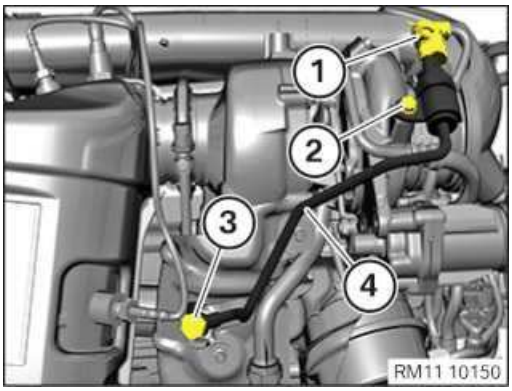
- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (2).
- Tighten the bolts (1) on the heat shield .

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm



- Position the exhaust gas pressure pipe (4).
- Hand-tighten the bolt (2).
- Renew sealing rings on the banjo bolt (3).

  Parts: Sealing ring
- Tighten the banjo bolt (3).

Banjo bolt for exhaust pressure pipe to exhaust manifold

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

- Tighten down screw (2).

Standard screw connection M6

M6		8 Nm

- Connect connectors (1) and lock.

  Lock must audibly engage.

10 – Install the heat shield on the exhaust turbocharger



- Feed in and install the heat shield (2).
- Tighten the screws (1) at the top and bottom of the heat shield.

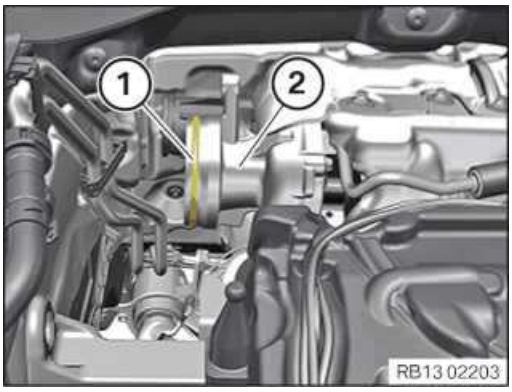
Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

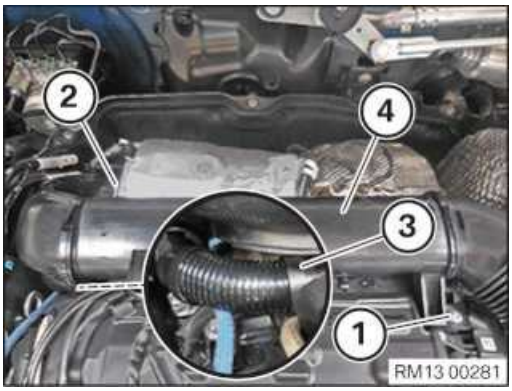
- Fasten the cable at the clips .

11 – Installing clean air pipe

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- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.



- Feed in clean air pipe and install.
- Connect clean air pipe to the exhaust turbocharger and lock audibly in the clamps (2).
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Connect ventilation line (3) to the cylinder head cover and lock audibly.

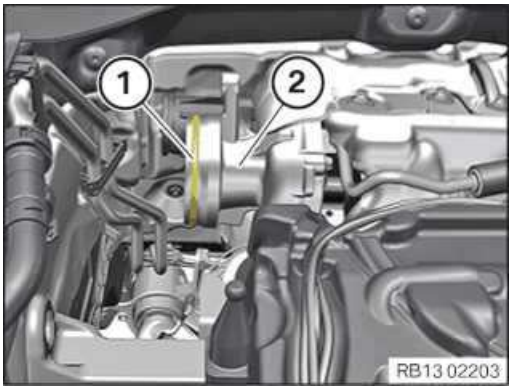


- Mount clean air pipe onto the intake filter housing.
- Tighten clamp (1) on the clean air pipe.

Clean air pipe to intake silencer housing

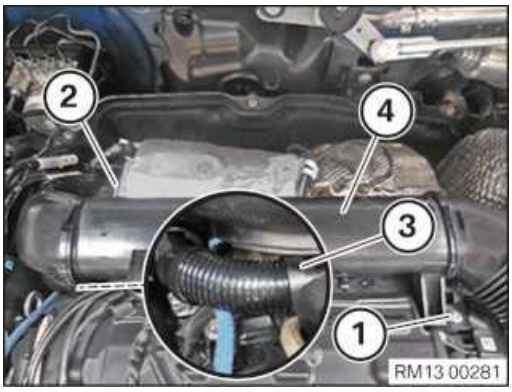
Clamp		Tightening torque	3 Nm

12 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.

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- Feed in clean air pipe and install.
- Connect clean air pipe to the exhaust turbocharger and lock audibly in the clamps (2).
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Connect ventilation line (3) to the cylinder head cover and lock audibly.



- Mount clean air pipe onto the intake filter housing.
- Tighten clamp (1) on the clean air pipe.

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

13 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



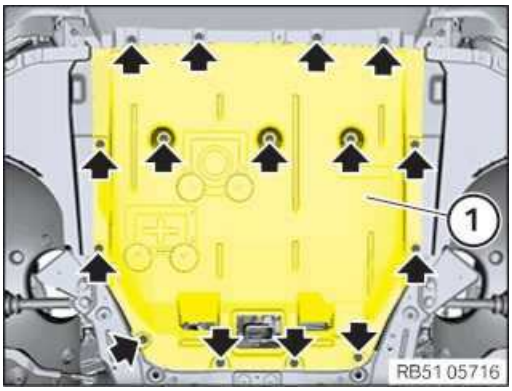
- Check for correct installation of all rubber mounts in the acoustic cover (1).

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- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

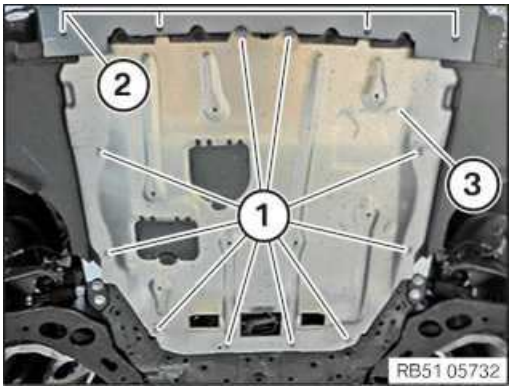
14 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm



- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

15 – Check engine oil level

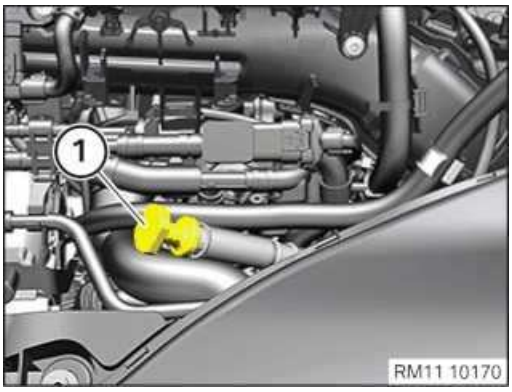
- Park vehicle on a horizontal surface.
- In the case of automatic transmission, shift to selector lever position N or P.
- Accelerator pedal is not pressed.
- Engine is running and is at operating temperature.
- Read off the engine oil level in the instrument cluster (KOMBI) or on the control display.
- Top up engine oil if necessary.

▸ **Check engine oil level**

TECHNICAL INFORMATION

Always check the engine oil level when the engine is at operating temperature (engine oil temperature > 70°C).

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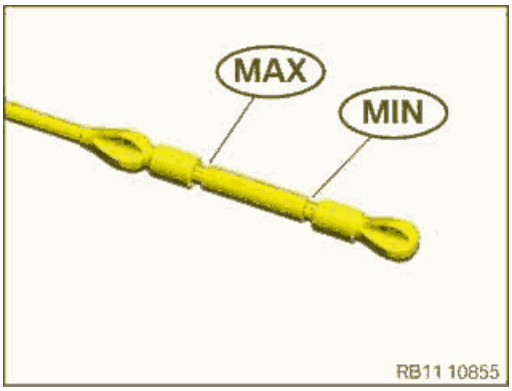


- Park vehicle on a horizontal surface.
- Stop the engine and wait for 5 minutes.
- Pull out the oil dipstick (1) and wipe off using a lint-free cloth.

TECHNICAL INFORMATION

Do not pull out or insert the oil dipstick into the guide tube too quickly or slowly.

- Push the oil dipstick (1) into the guide tube up to the limit position and pull it out again.



TECHNICAL INFORMATION

The engine oil level must be between the minimum mark and the maximum mark of the oil dipstick.

- Read the engine oil level on the oil dipstick.
- Top up engine oil if necessary.

Additional Information

Overview of Tightening Torques

Heat shield for exhaust turbocharger — Used in step 9

Torx screw BM 6x12		Tightening torque	10 Nm

Banjo bolt for exhaust pressure pipe to exhaust manifold — Used in step 9

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

Standard screw connection M6 — Used in step 9

M6			8 Nm

Heat shield for exhaust turbocharger — Used in step 10

Torx screw BM 6x12		Tightening torque	10 Nm

Clean air pipe to cylinder head cover — Used in step 11 12

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 11 12

Clamp		Tightening torque	3 Nm

Underbody protection front — Used in step 14

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Overview Technical Data

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Parts

Parts required

Designation	Used in step

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11 42 020 Removing and installing/replacing full-flow oil filter (B47)

Special tools required:

- 11 4 470
- 11 6 480

Risk of scalding!

Only perform this repair work after the engine has cooled down.

Recycling:

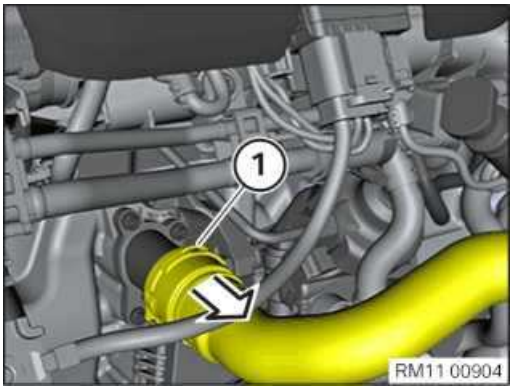
Catch and dispose of drained coolant.

Observe country-specific waste disposal regulations.

Necessary preliminary tasks:

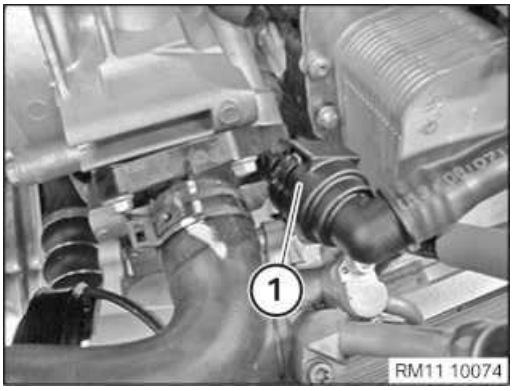
- Disconnect negative battery cable.
- Remove underbody protection
- Remove fan cowl.
- Drain coolant.

Removal:

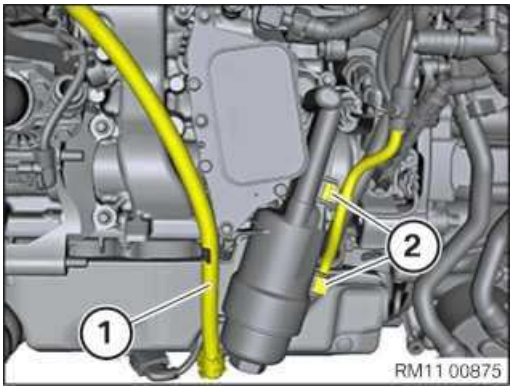


Unlock and detach coolant hose (1).

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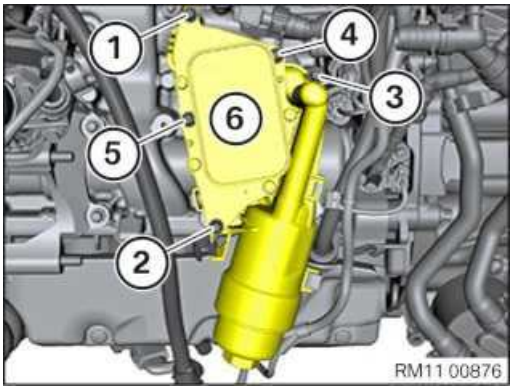
Unlock and detach coolant hose (1).



Unclip positive wire (1) from full-flow oil filter.
Unclip engine wiring harness (23) from full-flow oil filter.



Open screw plug (1).
Drain oil.



Release screws in the sequence 5 - 1.
Remove full-flow oil filter (6).

Installation:

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Attention!

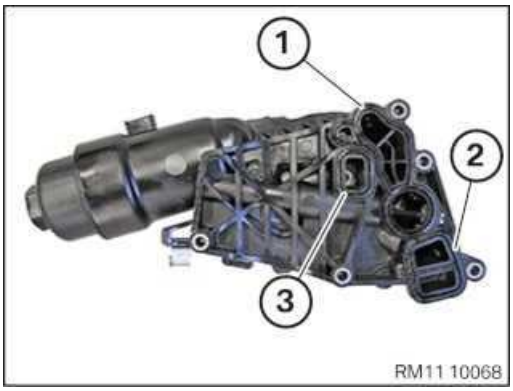
Remove gasket residues from crankcase and full-flow oil filter with special tool 11 4 470 .

Do not use any metal-cutting tools (e.g. emery cloth).

Make sure that there are no particles or impurities in the medium openings.

Coolant or foreign particles in the oil can cause engine damage e.g. damages in the connecting rod bearing.

Crank engine with special tool 11 6 480 until engine oil in the full-flow oil filter area flows out of the oil duct.



Installation note:
All sealing surfaces and gaskets must be cleaned and free of oil.

Parts: Replace gaskets (1 - 3).

Replacement:

Remount oil-to-water heat exchanger.

Check that gaskets (1 - 3) are correctly seated.



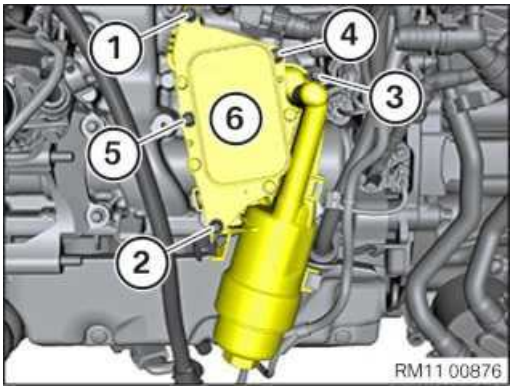
Parts: Replace screw (2) with O-ring (1).



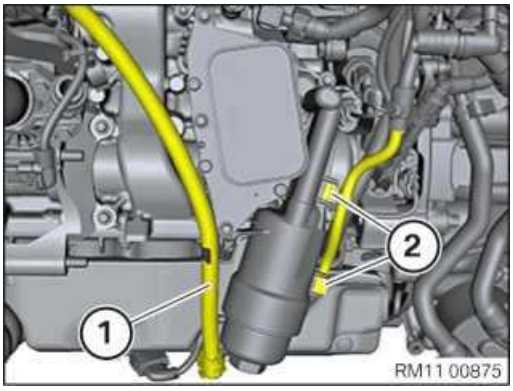
Install and tighten screw (1).

Tightening torque: 11 42 6AZ.

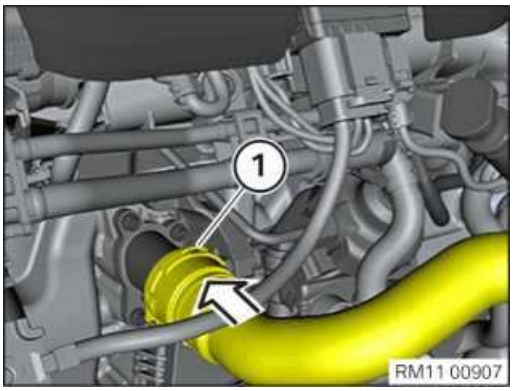
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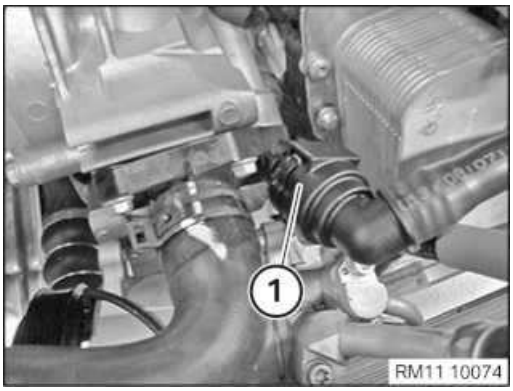
Position full-flow oil filter (6).
Tighten screws in the **sequence 1 - 5**.
Tightening torque: 11 42 9AZ.



Clip engine wiring harness (2) into full-flow oil filter.
Clip positive wire (1) into full-flow oil filter.



Connect coolant hose (1).
Lock must snap audibly into place.



Connect coolant hose (1).
Lock must snap audibly into place.

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Required follow-up work:

- Install underbody protection
- Add coolant
- Install fan cowl
- Connect battery earth lead

Note:
Start engine and run at idle until oil pressure indicator light goes out.

Switch off engine.

1.Check exhaust emission system oil filter cover for tightness.

Assemble engine.

Checking oil level:

- Park vehicle on a horizontal surface
- Using the oil dipstick, check the engine oil level after five minutes on the engine at operating temperature
- Top up engine oil if necessary

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11 42 020 Removing and installing/replacing full-flow oil filter completely

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

RISK OF DAMAGE

Engine damage caused by excessively filling the engine with engine oil.

Filling an excessive quantity of engine oil may cause engine damage.

- Observe the exact engine oil filling capacity.
- Drain the engine oil.

TECHNICAL INFORMATION

- When the engine is stopped after the end of the journey, it may be necessary to run the electric fan. In rare cases, operation of the electric fan can last up to 11 min. This protects the components. In this case, replacing the electric fan will not remedy the problem!

PRELIMINARY WORK

1 – Disconnecting all battery earth leads



- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

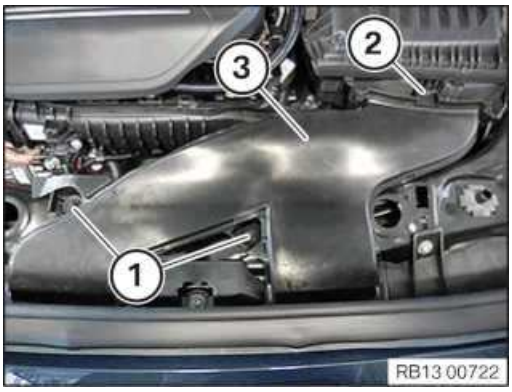
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

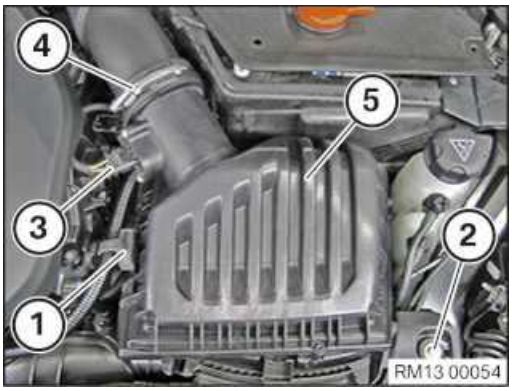
- Unclip the acoustic cover from the marked areas towards the top.

3 – Remove the intake neck for intake silencer housing



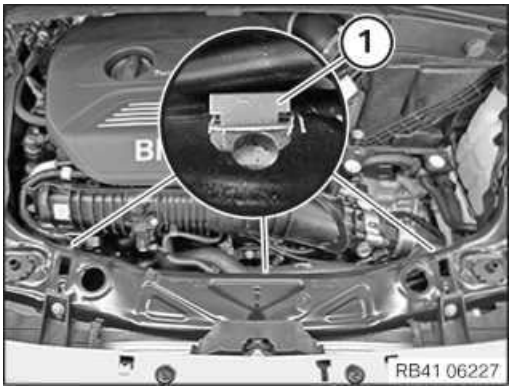
- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

4 – Removing intake silencer housing



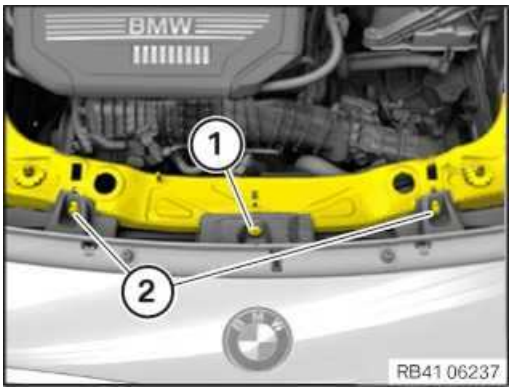
- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

5 – Remove front cross connection

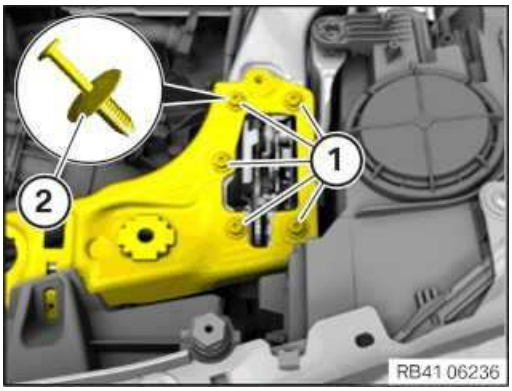


- Detach the clamps (1) for the Bowden cable of the bonnet locks from the cross connection.

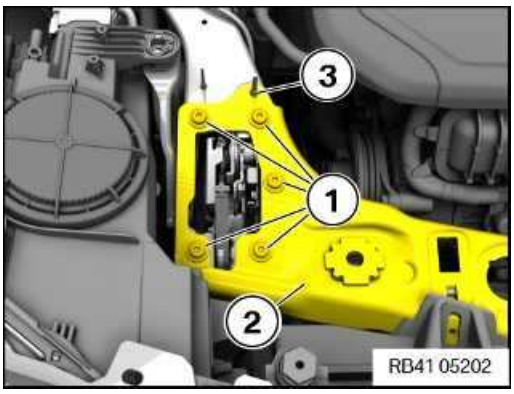
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- Loosen screw (1).
- Loosen screws (2).



- Loosen screws (1).
- Lever out expanding rivet (2).



- Loosen screws (1).
- Unclip the front cross connection (2) from the rubber retainer (3) and remove it upward.

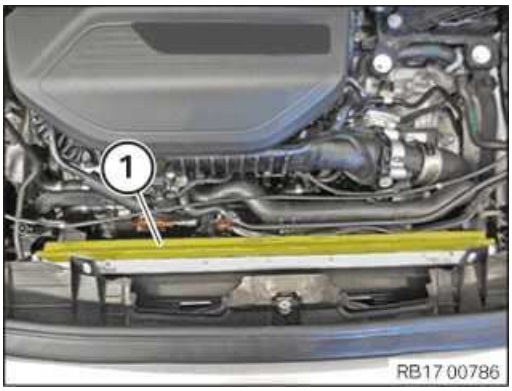
6 – Removing the fan cowl with electric fan

WARNING

Hot surfaces.

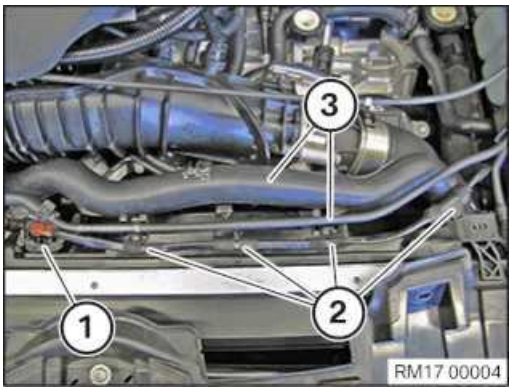
Risk of burning!

- Perform all work only on components that have cooled down.

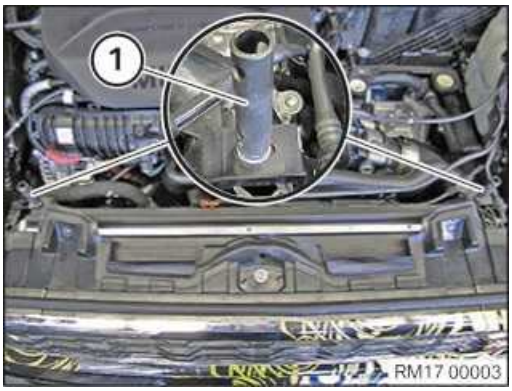


- Feed out and remove the sealing (1) from the radiator.

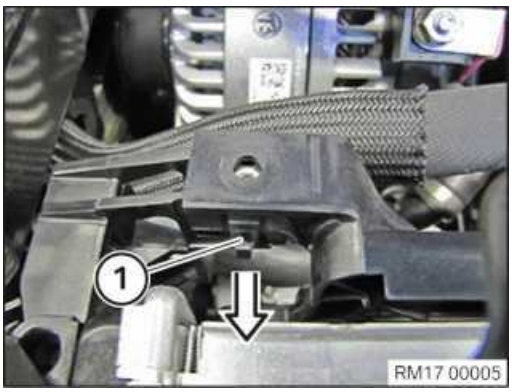
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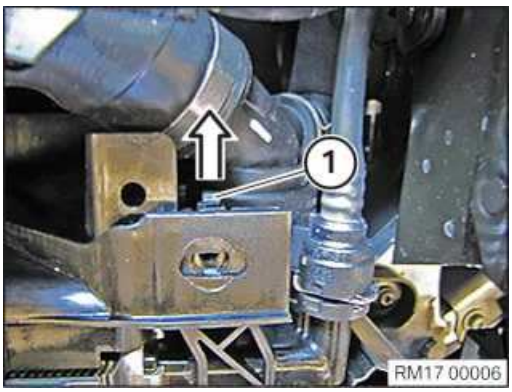
- Unlock plug connection (1) and disconnect.
- Unlock and loosen the clamps (2).
- Feed out connector (1) and place to one side.
- Thread off coolant line (3) and place to the side.



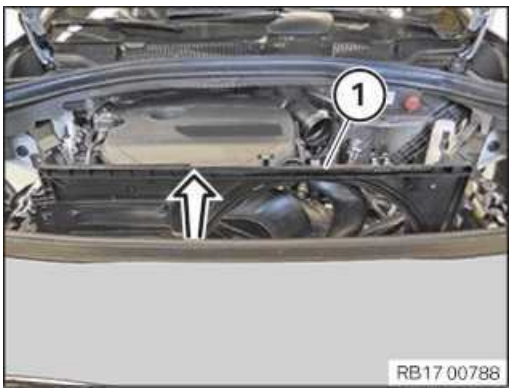
- Loosen screws (1).



- Unlock the right lock (1) on the fan cowl in the direction of the arrow.



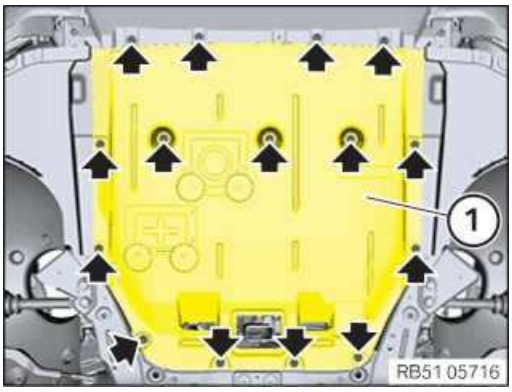
- Unlock the left lock (1) on the fan cowl in the direction of the arrow.



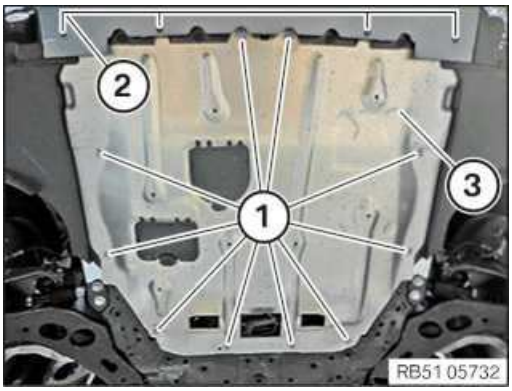
- Guide out fan cowl (1) in direction of arrow and remove.

7 – Removing the front underbody protection

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- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.



- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

8 – Draining coolant

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

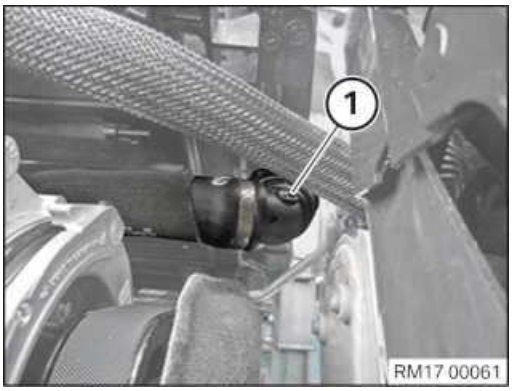
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

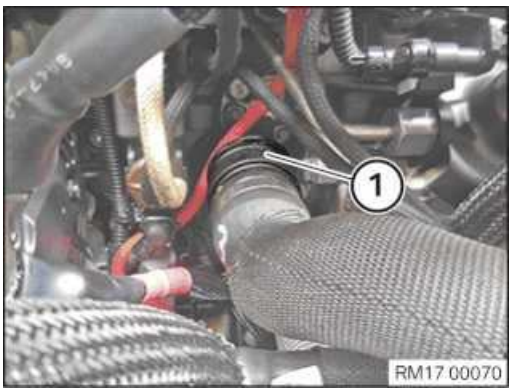
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- Loosen sealing cap (1).



- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.



- Unlock the coolant line (1) and pull it off the connecting branch.
- Catch and dispose of escaping coolant.

9 – Remove front right wheel

TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

TECHNICAL INFORMATION

Strictly observe the specified procedure to prevent clamping errors and imbalance.



- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

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10 – Removing the front right wheel arch cover

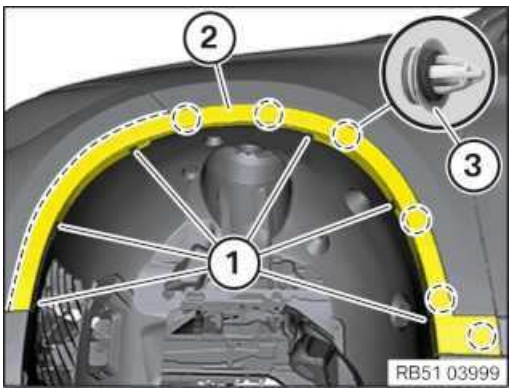
▶ **Remove the front wheel arch trim**

NOTICE

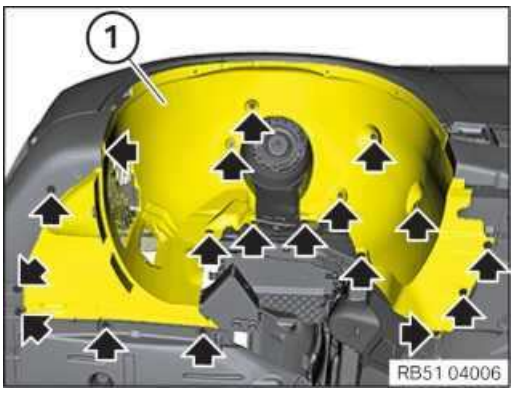
To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.



NOTICE

Description is for left component only. Procedure on the right side is identical.

- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

11 – Removing the oil filler cap



- Open oil filler cap (1).

12 – Releasing the oil drain plug

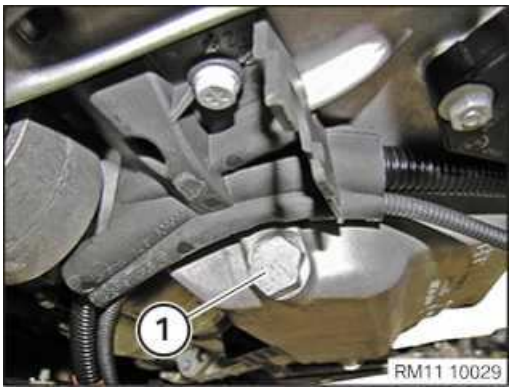
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WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

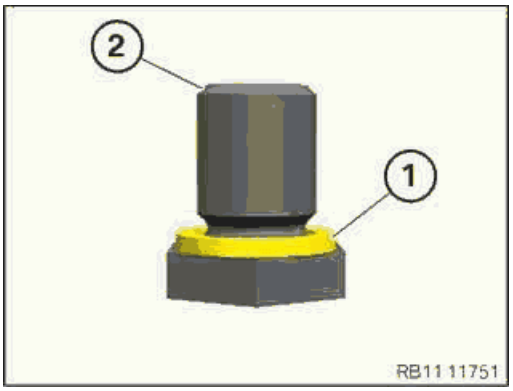


TECHNICAL INFORMATION

Catch and dispose of drained engine oil in a suitable collecting vessel. Observe country-specific waste disposal regulations.

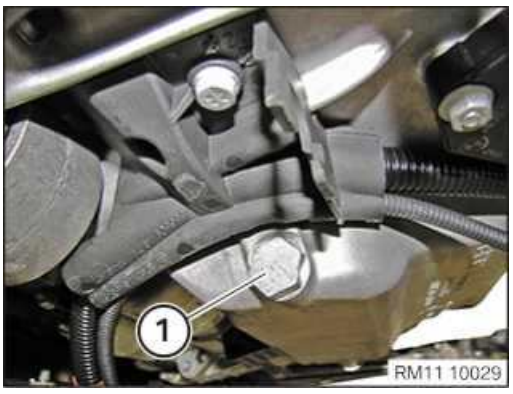
- Release oil drain plug (1).
- Drain engine oil.

13 – Tightening the oil drain plug



- Renew sealing ring (1) on the oil drain plug (2).

  Parts: Sealing ring
- Guide in the sealing ring (1) on the oil drain plug (2) and install.



- Renew the sealing ring.

  Parts: Sealing ring
- Position oil drain plug (1) on the oil sump and tighten.

Oil drain plug on oil sump

M12x1.5	Renew the sealing ring.	Tightening torque	25 Nm

14 – Undoing the oil drain plug on the oil filter cover

WARNING

Hot fluids.

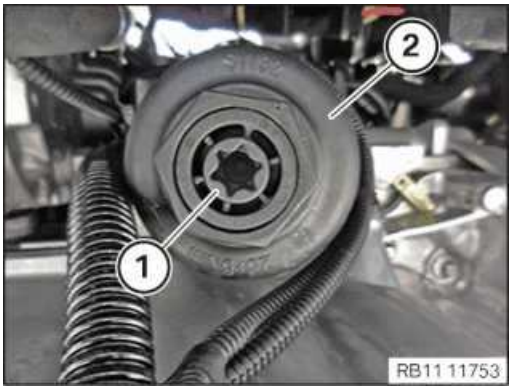
Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

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TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



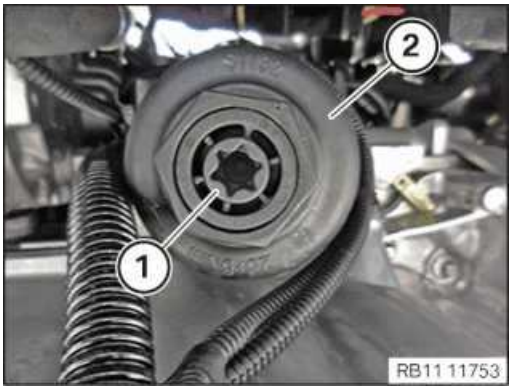
- Undo the oil drain plug (1) on the oil filter cover (2).
- Feed out and remove oil drain plug (1).
- Catch and dispose of emerging engine oil.

15 – Tightening the oil drain plug on the oil filter cover



- Renew oil drain plug (1) with the sealing ring (2).

  Parts: Oil drain plug, sealing ring



- Feed in and install the oil drain plug (1).
- Tighten the oil drain plug (1) on the oil filter cover (2).

Oil drain plug to oil filter cover

	Renewoil drain plug.	Tightening torque	6 Nm

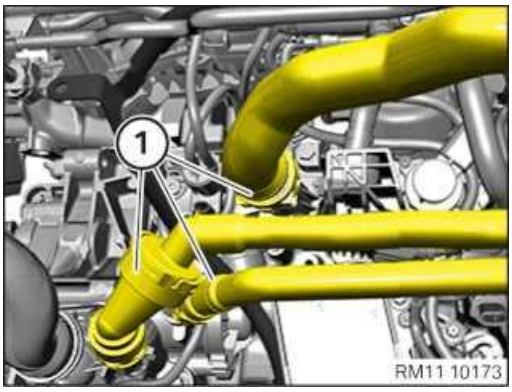
MAIN WORK

16 – Remove full-flow oil filter

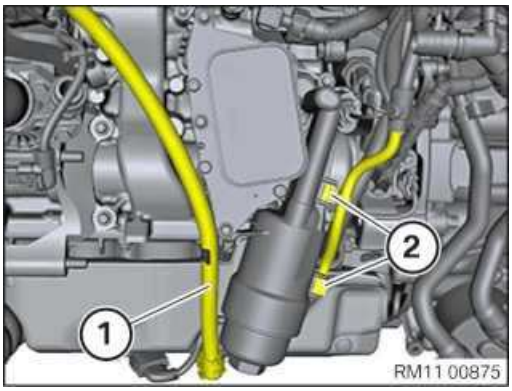
TECHNICAL INFORMATION

Make sure that there are no particles or impurities in the medium openings. Coolant or foreign substances in the oil can cause engine damage such as damage to the connecting rod bearing.

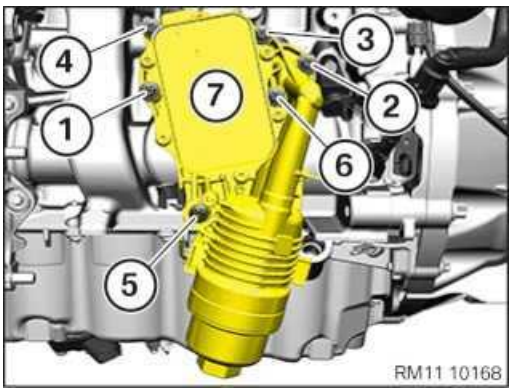
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- Unlock coolant lines (1).
- Pull off coolant lines (1) and place to one side.
- Catch and dispose of escaping coolant.



- Release positive battery cable (1) on full-flow oil filter from the clamp.
- Release the engine wiring harness (2) from the full-flow oil filter.



- Loosen screws in the order (6) to (1).
- Guide out the full-flow oil filter (7) upwards and remove.

17 – Install full-flow oil filter

RISK OF DAMAGE

Damage to the surface.

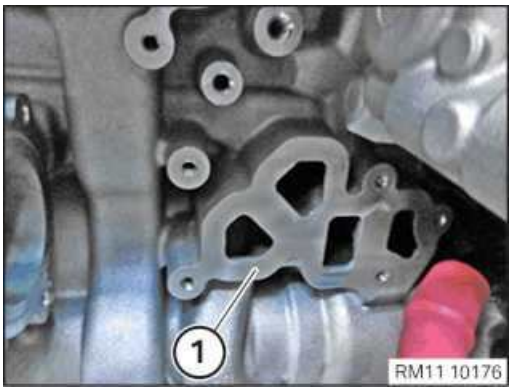
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

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- Clean any sealing residue on the sealing surface of the crankcase (1) with special tool **0 495 102 (11 4 470)**.

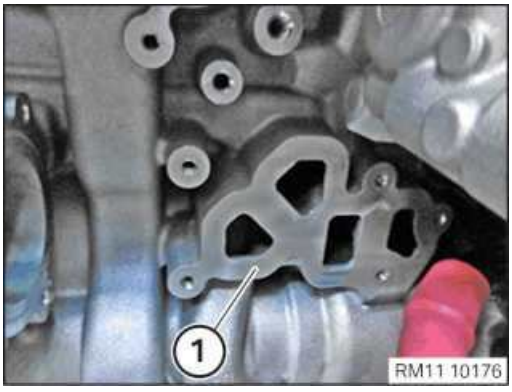


- Remove seals (1) using a suitable tool.
- Clean the sealing residue from the full-flow oil filter.
- Renew gaskets (1).

  Parts: Sealing kit
- Install seal (1).



- Crank the engine twice with the special tool **0 493 380 (11 6 480)** in the direction of rotation.

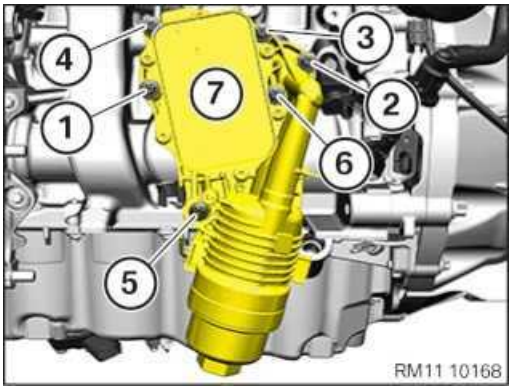


- Have a cleaning cloth ready.
- Catch any engine oil leaking from the oil duct of the crankcase (1) and dispose of this.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Clean sealing surface (1).

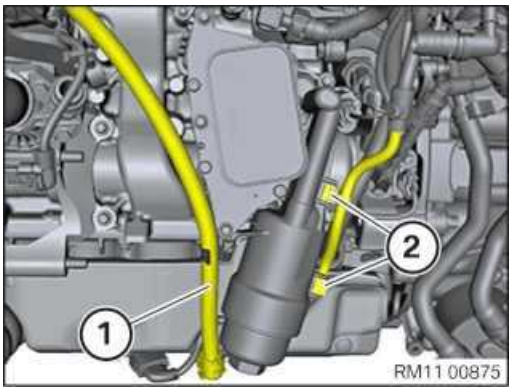


- Feed in and install the full-flow oil filter (7).
- Make sure seals are correctly seated.
- Tighten screws in the order (1) to (6).

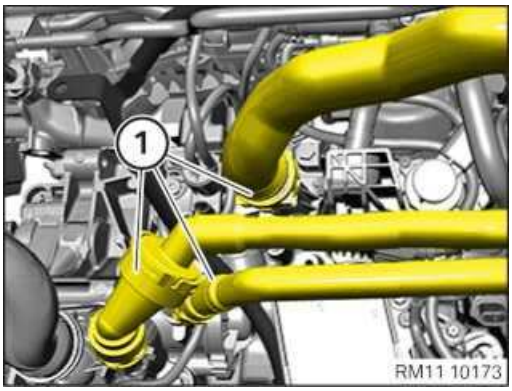
Full-flow oil filter to crankcase

Screw M6	Observe tightening sequence.	Jointing torque	8 Nm
		Tighten down	8 Nm

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- Secure the positive battery cable (1) on the full-flow oil filter in the clamp.
- Secure engine wiring harness (2) on full-flow oil filter.



- Connect and lock the coolant lines (1).

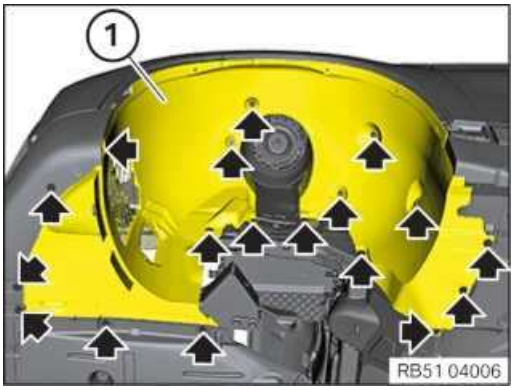
  The locks of the coolant lines (1) must audibly engage.

POSTPROCESSES

18 – Installing the front right wheel arch cover

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

▸ **Installing front wheel arch trim**

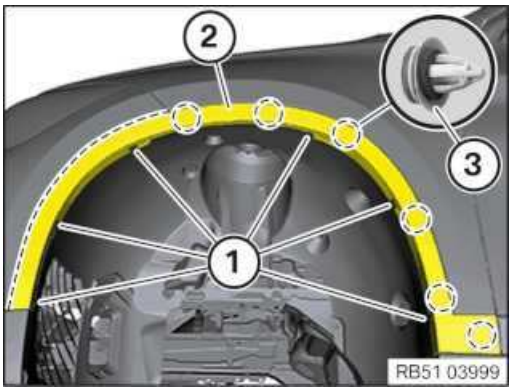
NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.

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- Check the clips (3) for damage and renew where required.

  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

19 – Installing the front right wheel

▸ **Clean the contact surfaces between the brake disc and the wheel rim**



TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

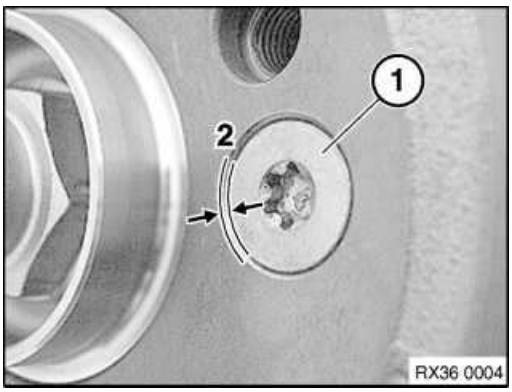
- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.



- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).



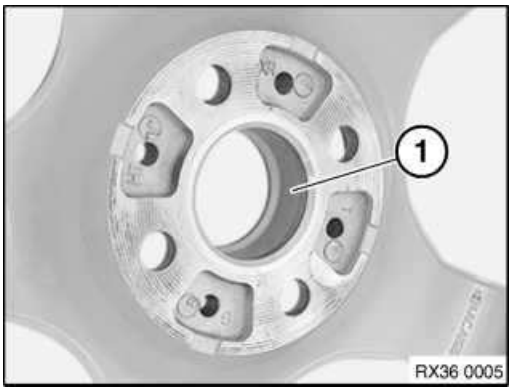
- Check the mounting bolt for the brake disc (1) for secure fit.

  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm

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- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.



TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

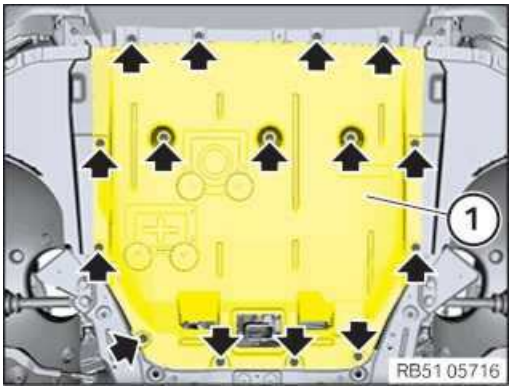
  Parts: Wheel bolts

- Clean the wheel bolts and check the threads for damage. Renew the wheel bolts as needed.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

20 – Installing the front underbody protection

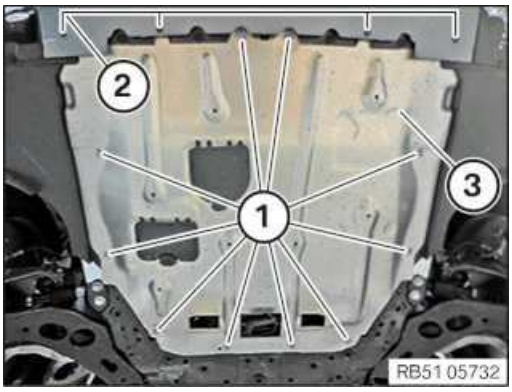


- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

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- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

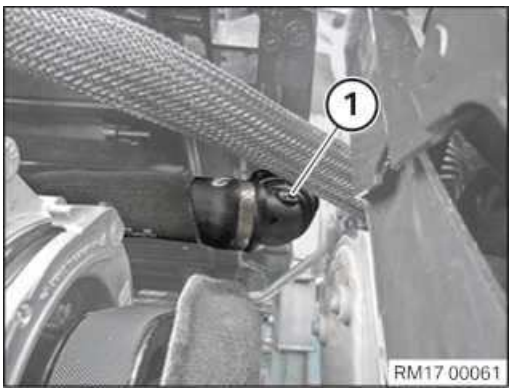
Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

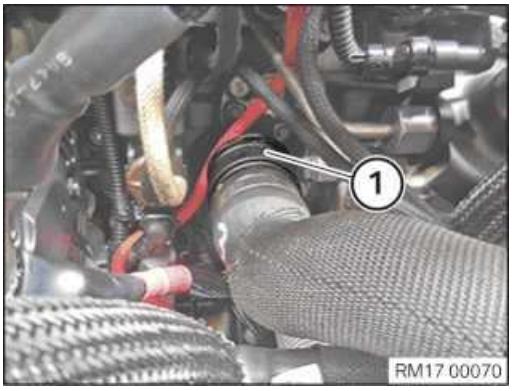
21 – Connect the coolant line

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Connect the right coolant line (1) to the radiator and lock audibly.



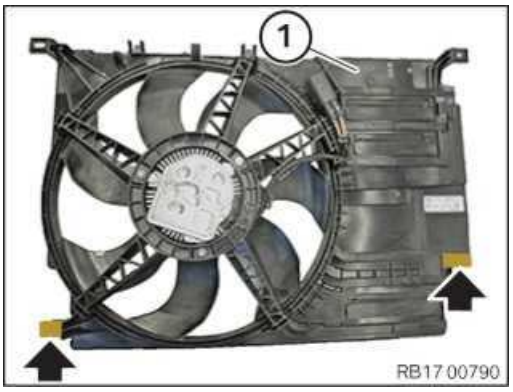
- Connect the coolant line (1) to the connecting branch and lock audibly.

22 – Installing fan cowl with electric fan

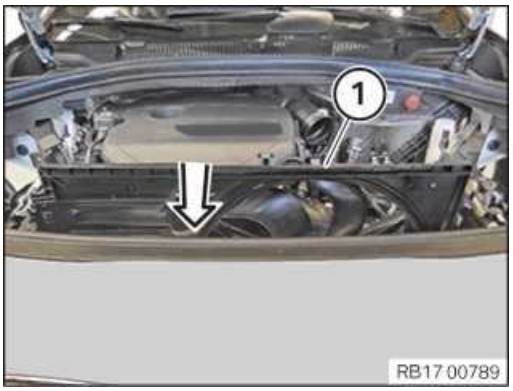
TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

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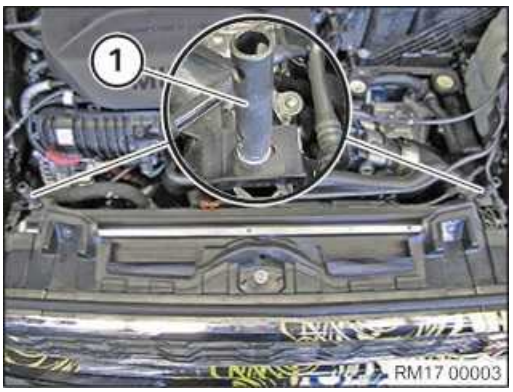
- Feed the guides (arrows) of the fan cowl (1) into the charge air cooler.



- Feed in and install the fan cowl (1) in the direction of the arrow.



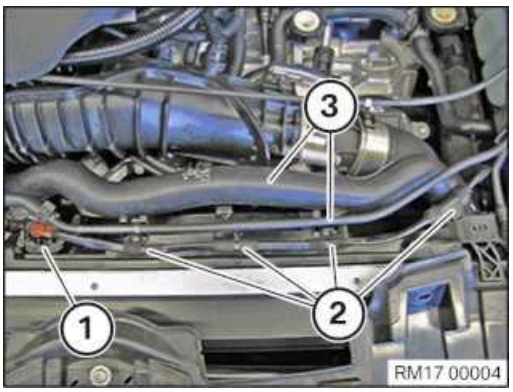
- Lock the left and right locks (arrows).



- Tighten the screws (1).

Fan cowl on radiator

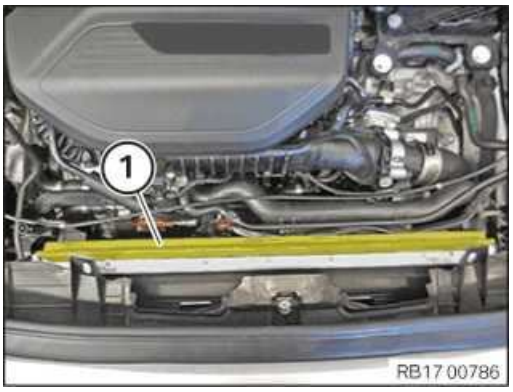
M6X12		Tightening torque	6 Nm



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.
- Secure clamps (2).
- Thread in and install coolant line (3).

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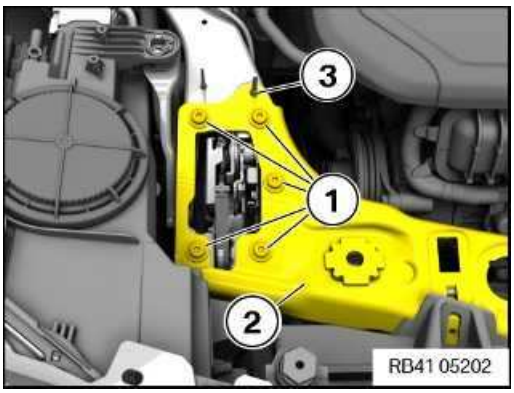


- Guide the sealing (1) on the radiator in and install it.

23 – Install front cross connection



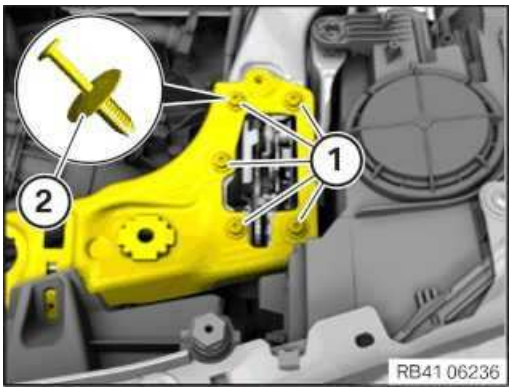
- Right side of vehicle only: Secure spray guard (1) on the cross connection (2) as pictured.



- Position front cross connection (2) and clip front cross connection (2) into the rubber retainer (3) at the same time.
- Tighten the screws (1).

Cross connection to carrier support

Screws M6x20		Tightening torque	11,8 Nm

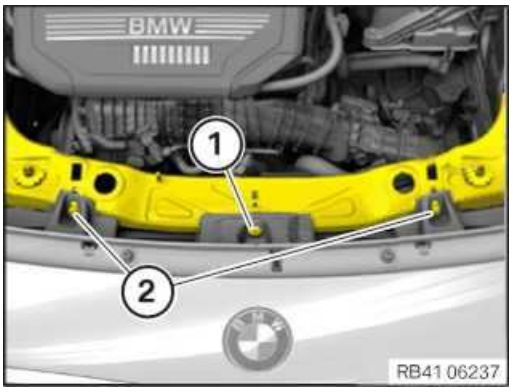


- Tighten the screws (1).

Cross connection to carrier support

Screws M6x20		Tightening torque	11,8 Nm

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- Position screws (3) on the rubber mounts for the radiator and tighten.

Screw connection for rubber mount of coolant radiator to coolant radiator

Bolt to rubber mount		Tightening torque	8 Nm

- Tighten down screws (2).

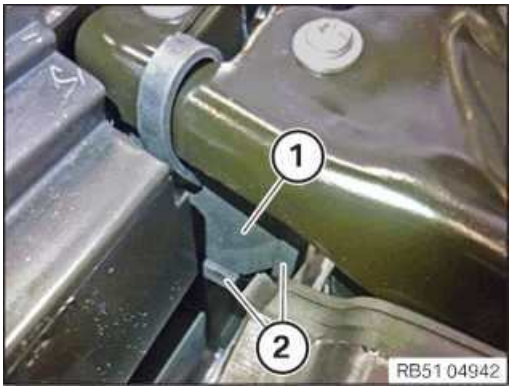
Air duct to upper connection

M6x20 screw		Tightening torque	11,8 Nm

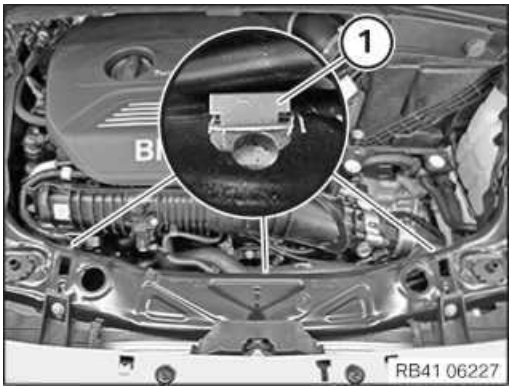
- Tighten down screw (1).

Bracing strut to upper connection

M8x20 screw		Tightening torque	28 Nm

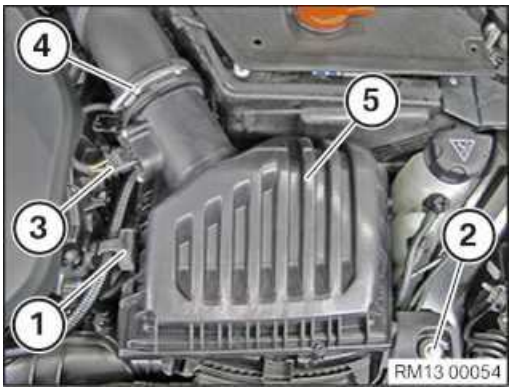


- Right side of vehicle only: Properly mount spray guard (1) to prevent corrosion.
- Secure spray guard (1) to the bridge with retaining tabs (2).



- Fasten the clamps (1) from the Bowden cable of the bonnet lock on the cross connection.

24 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.

  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

Clean air pipe to intake silencer housing

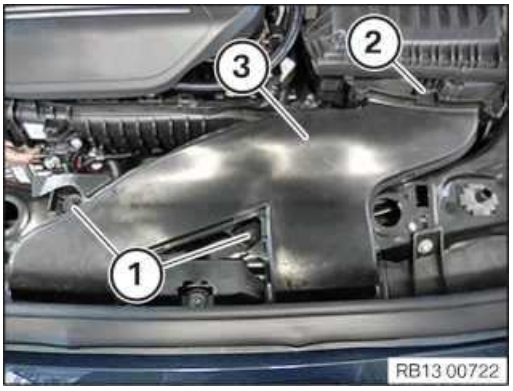
Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Insert and install the holder (1).

25 – Install the intake neck for the intake filter housing

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- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

26 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Check for correct installation of all rubber mounts in the acoustic cover (1).



- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

27 – Topping up the engine oil

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RISK OF DAMAGE

Damage to the petrol particulate filter.

Vehicles equipped with a petrol particulate filter must be operated with low-ash engine oil only.

- Use BMW Longlife-04 , BMW Longlife-12 FE or BMW Longlife-17 FE+ engine oils or engine oils approved by BMW matching the same specifications only.
- For additional information see: Overview of approved engine oils for BMW Group engines.

RISK OF DAMAGE

Engine damage caused by excessively filling the engine with engine oil.

Filling an excessive quantity of engine oil may cause engine damage.

- Observe the exact engine oil filling capacity.
- Drain the engine oil.

- Pour in engine oil.

Engine oilB47TÜ1

Capacity of engine oil	5,5 l

Engine oil: Technically suitable engine oils for BMW Group engines

28 – Installing the oil filler cap



- Close oil filler cap (1).

29 – Check engine oil level

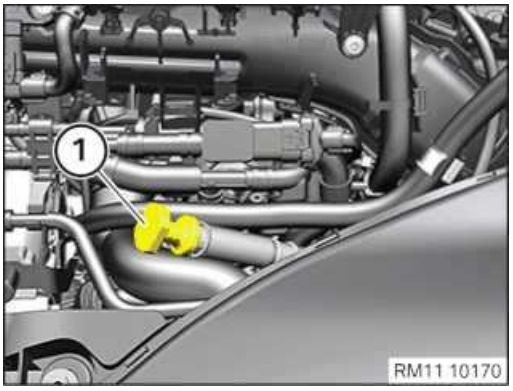
- Park vehicle on a horizontal surface.
- In the case of automatic transmission, shift to selector lever position N or P.
- Accelerator pedal is not pressed.
- Engine is running and is at operating temperature.
- Read off the engine oil level in the instrument cluster (KOMBI) or on the control display.
- Top up engine oil if necessary.

▸ **Check engine oil level**

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TECHNICAL INFORMATION

Always check the engine oil level when the engine is at operating temperature (engine oil temperature > 70°C).

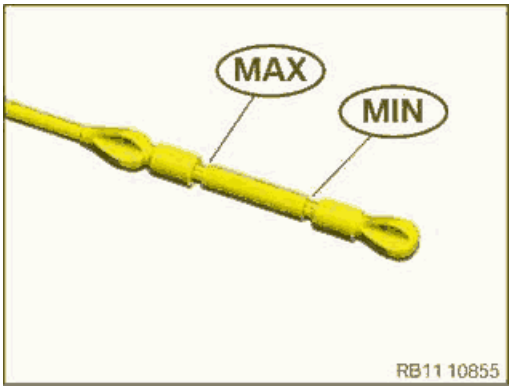


- Park vehicle on a horizontal surface.
- Stop the engine and wait for 5 minutes.
- Pull out the oil dipstick (1) and wipe off using a lint-free cloth.

TECHNICAL INFORMATION

Do not pull out or insert the oil dipstick into the guide tube too quickly or slowly.

- Push the oil dipstick (1) into the guide tube up to the limit position and pull it out again.



TECHNICAL INFORMATION

The engine oil level must be between the minimum mark and the maximum mark of the oil dipstick.

- Read the engine oil level on the oil dipstick.
- Top up engine oil if necessary.

30 – Disconnecting all battery earth leads



- See additional information.

31 – Fill and bleed the coolant circuit

▶ **Filling and bleed the high-temperature coolant circuit**



- See additional information.

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Additional Information

Overview of Tightening Torques

Oil drain plug on oil sump

Used in step 13

M12x1.5	Renew the sealing ring.	Tightening torque	25 Nm

Oil drain plug to oil filter cover

Used in step 15

	Renewoil drain plug.	Tightening torque	6 Nm

Full-flow oil filter to crankcase

Used in step 17

Screw M6	Observe tightening sequence.	Jointing torque	8 Nm
		Tighten down	8 Nm

Wheel arch cover to body

Used in step 18

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Used in step 18

Plastic nut		Tightening torque	3 Nm

Brake disc to front wheel hub

Used in step 19

M8	Renew screw.		16 Nm

Wheel bolts

Used in step 19

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Underbody protection front

Used in step 20

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Fan cowl on radiator

Used in step 22

M6X12		Tightening torque	6 Nm

Cross connection to carrier support

Used in step 23

Screws M6x20		Tightening torque	11,8 Nm

Screw connection for rubber mount of coolant radiator to coolant radiator

Used in step 23

Bolt to rubber mount		Tightening torque	8 Nm

Air duct to upper connection

Used in step 23

M6x20 screw		Tightening torque	11,8 Nm

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Bracing strut to upper connection Used in step 23

M8x20 screw		Tightening torque	28 Nm

Intake silencer housing to lock bridge Used in step 24

M6X30		Tightening torque	8 Nm

Clean air pipe to intake silencer housing Used in step 24

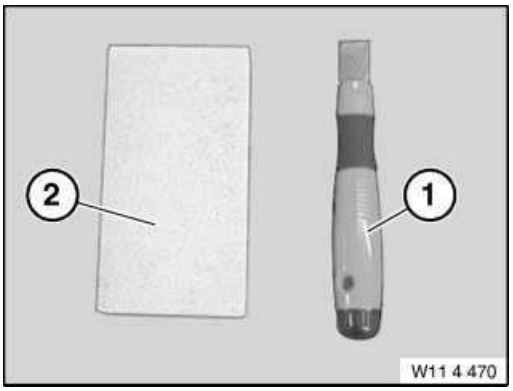
Clamp		Tightening torque	3 Nm

Intake neck to cross connection Used in step 25

M6		Tightening torque	8 Nm

Overview of Special Tools

0 495 102 (11 4 470) Tool



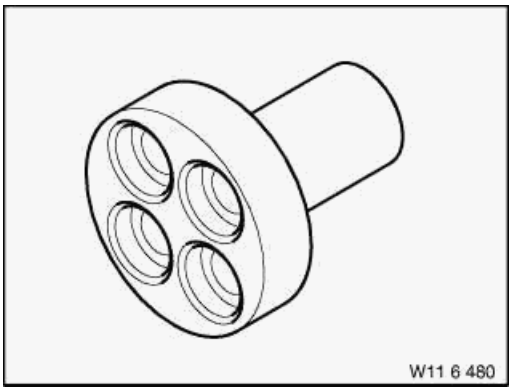
Common Used in step 17

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

0 493 380 (11 6 480) Connector

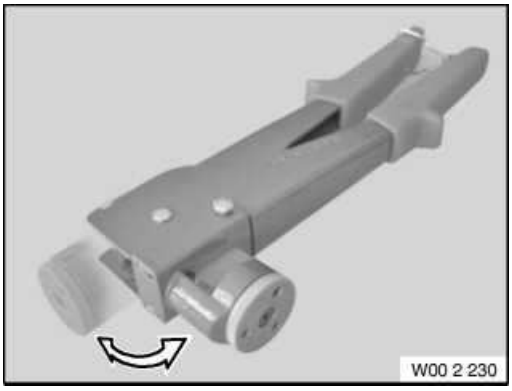


Common Used in step 17

Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

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0 496 521 (00 2 230) Pliers



Common	Used in step 18
Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

2 344 011 Tool

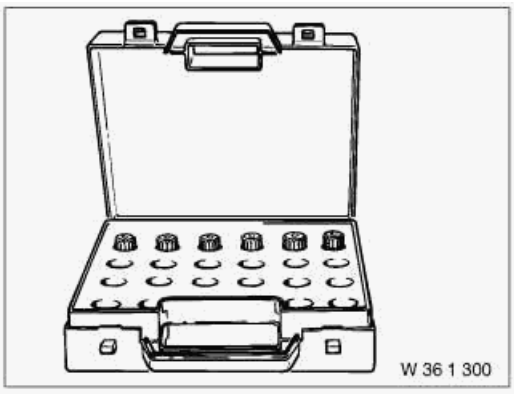


Common	Used in step 19
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

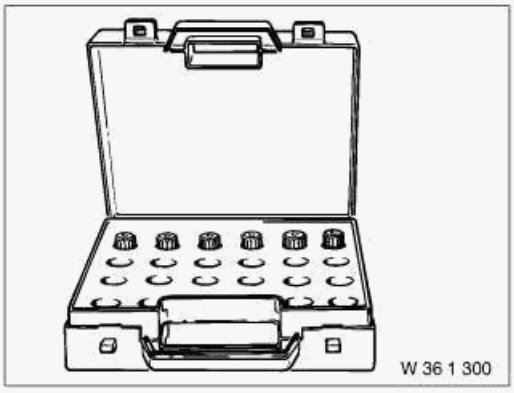
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0 495 221 (36 1 323) Wheel stud



Common	Used in step 9
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

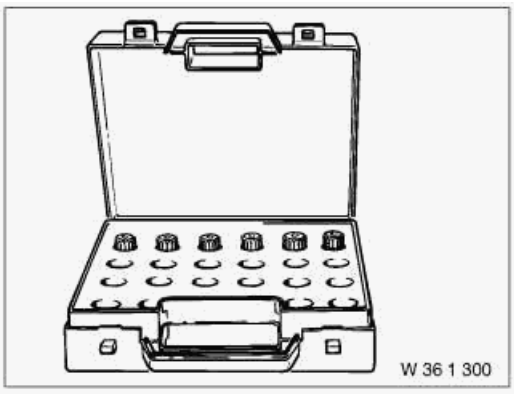
0 495 224 (36 1 326) Wheel stud



Common	Used in step 9
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 225 (36 1 327) Wheel stud



Common	Used in step 9
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

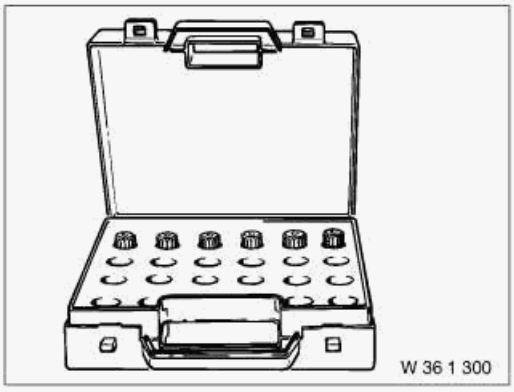
0 495 226 (36 1 328) Wheel stud



Common	Used in step 9
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 227 (36 1 329) Wheel stud



Common	Used in step 9
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud



Common	Used in step 9
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

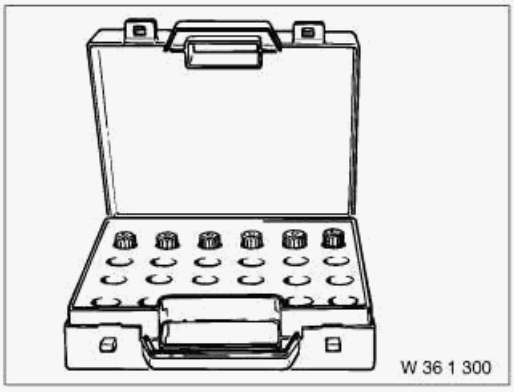
0 495 229 (36 1 332) Wheel stud



Common	Used in step 9
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 230 (36 1 333) Wheel stud



Common	Used in step 9
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Engine oilB47TÜ1	Used in step 27
Capacity of engine oil	5,5 l

Engine oil: Technically suitable engine oils for BMW Group engines

Links

Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	1 30
61 20 900 Disconnecting and connecting battery earth lead	1 30
61 20 900 Disconnecting and connecting battery earth lead	1 30
61 20 900 Disconnecting and connecting battery earth lead	1 30
61 20 900 Disconnecting and connecting battery earth lead	1 30
61 20 900 Disconnecting and connecting battery earth lead	1 30
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 30
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 30
61 20 900 Disconnecting and connecting battery earth lead	1 30
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 30
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	1 30
61 20 900 Disconnecting and connecting battery earth lead	1 30
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61 20 900 Disconnecting and connecting battery earth lead 1 30
61 20 900 Disconnecting and connecting battery earth lead 1 30
17 00 008 Draining and topping up coolant for high-temperature circuit 31
17 00 008 Draining and topping up coolant for high-temperature circuit 31
17 00 008 Draining and topping up coolant for high-temperature circuit 31
17 00 039 Bleed the cooling system and check it for watertightness with the special tool 31
17 00 039 Bleed the cooling system and check it for watertightness with the special tool 31
17 00 039 Bleed the cooling system and check it for watertightness with the special tool 31
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17 00 039 Bleed the cooling system and check it for watertightness with the special tool 31
17 00 039 Bleeding the cooling system (B36, B38, B46, B48) 31
17 00 039 Bleeding cooling system (B37, B47) 31
17 00 039 Bleed the cooling system and check it for watertightness with the special tool 31
17 00 039 Filling and bleeding the high-temperature cooling system vacuum filler device (B48) 31

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17 00 008 Draining and topping up the high-temperature coolant circuit	31
17 00 008 Draining and topping up the high-temperature coolant circuit	31
17 00 016 Draining and topping up coolant circuit for Range Extender \PREMIUM	31
17 00 008 Draining and topping up the high-temperature coolant circuit	31
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	31
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	31
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	31
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	31
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	31

Operating materials	Used in step
2.0 Grease for wheel centring	19
3.0 Technically appropriate engine oils for BMW Group engines	27

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11 42 200 Removing and installing/replacing oil feed line (B47AO0)

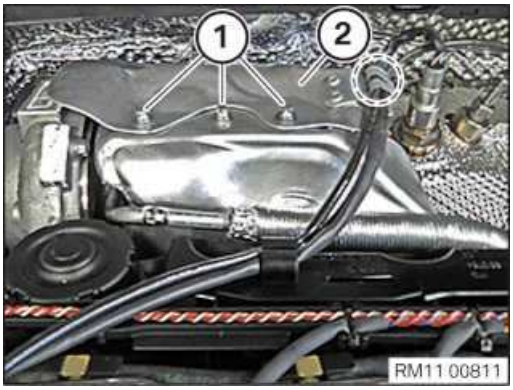
Necessary preliminary work:

- Remove clean air pipe.
- Remove exhaust-gas recirculation cooler

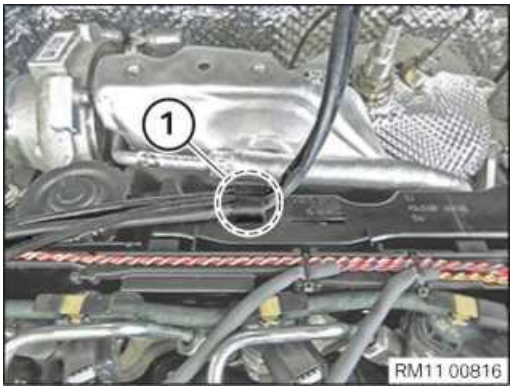
Removal:



Loosen screws (1) on heat shield.

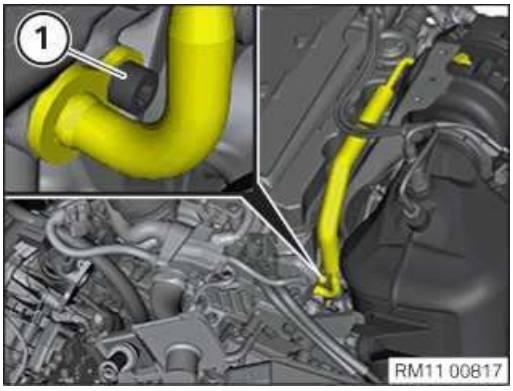


Release screws (1).
Detach cable in marked area.
Remove heat shield (2) towards top.



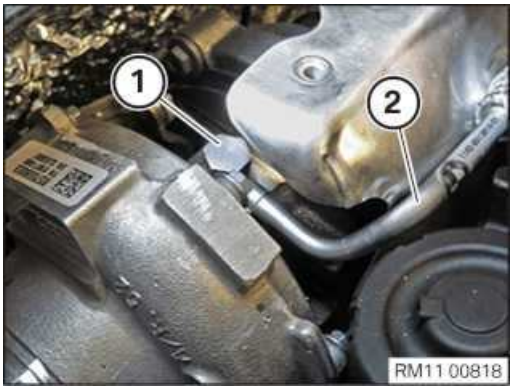
Detach all cables in marked area.

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Release screw (1).

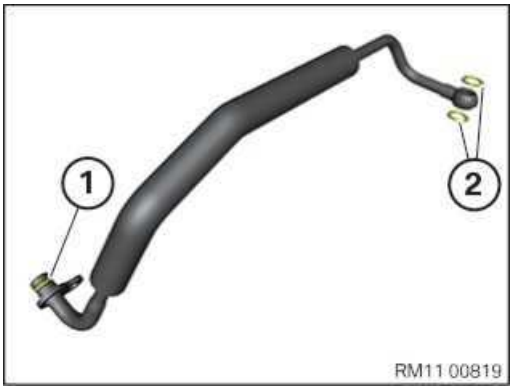
Pull off oil feed line from cylinder head.



Unfasten banjo bolt (2).

Remove oil feed line.

Installation:

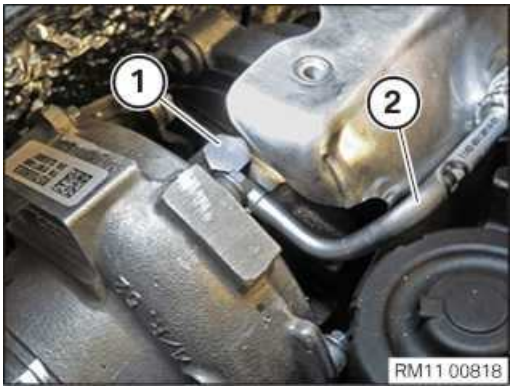


Replace sealing rings (2).

Parts: Sealing ring

Check sealing ring (1) for damage, renew oil feed line if necessary.

Parts: Oil feed line

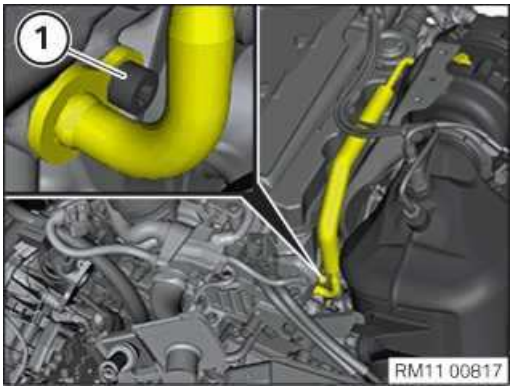


Position oil feed line (2).

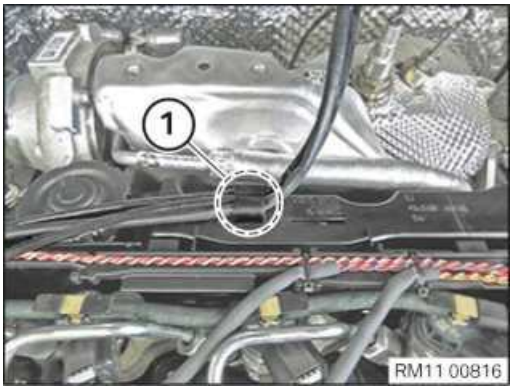
Tighten banjo bolt (1).

Tightening torque 11 42 8AZ.

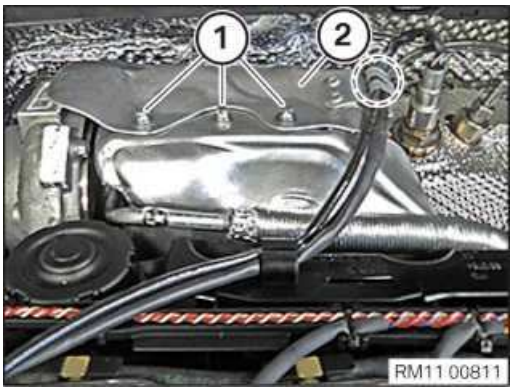
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Position oil feed line in cylinder head.
Tighten screw (1).
Tightening torques 11 42 2AZ.



Attach all cables in the marked area (1).



Install heat shield (2).
Tighten down screws (1).
Attach oxygen sensor cable in the marked area.



Tighten down screws (1).

Required follow-up work:

- Install exhaust-gas recirculation cooler.
- Install clean air pipe.

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11 42 210 Removing and installing/replacing oil return line (B47AO0)

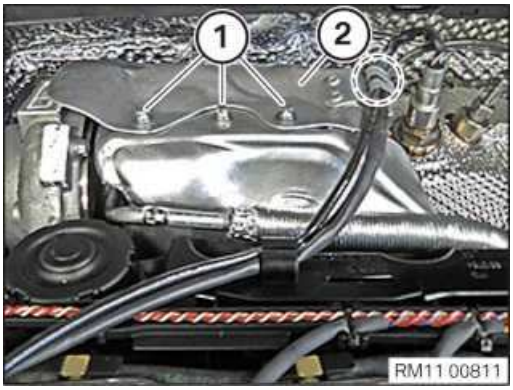
Necessary preliminary work:

- Remove right charge-air duct
- Remove clean air pipe

Removal:



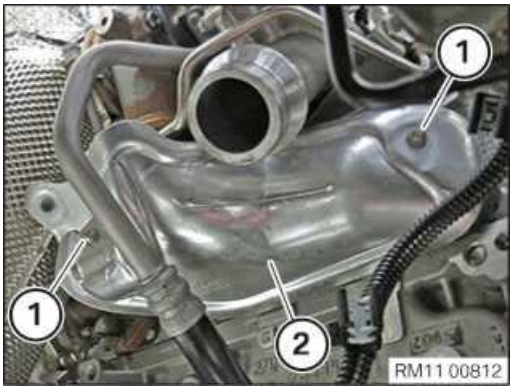
Release screws (1).



Detach cable for oxygen sensors at marked area.

Release screws (1).

Remove heat shield (2) towards top.



Note:
Heat shield (2) can only be completely removed after dismantling of oil return line.

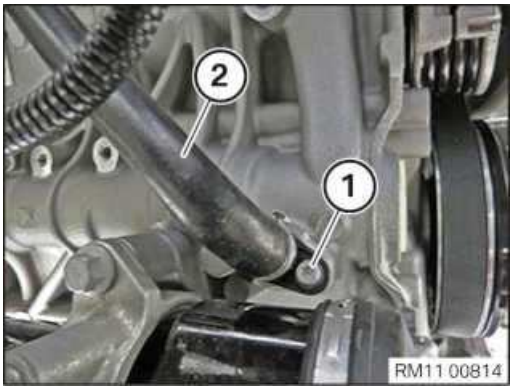
Release screws (1).

Lay heat shield (2) to one side.

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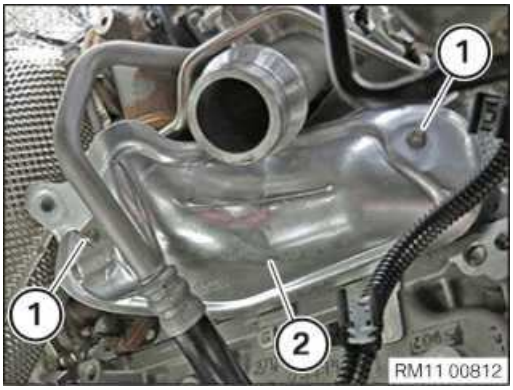


Release screws (1).

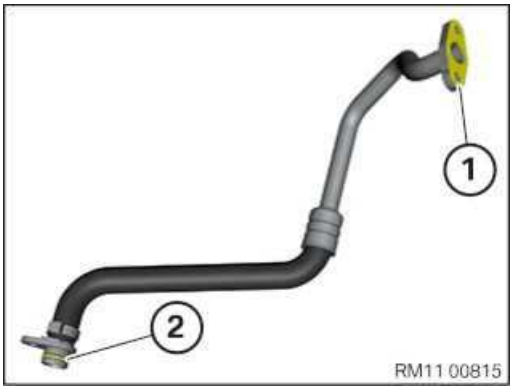


Release screw (1).
Remove oil return line (2).

Installation:

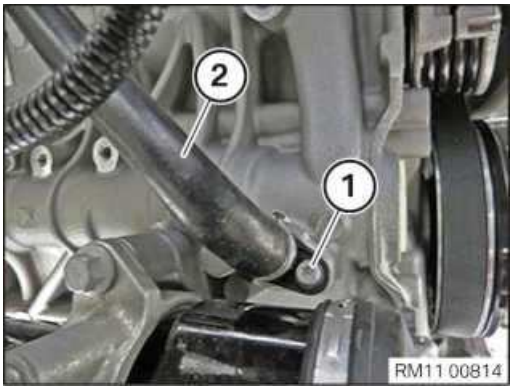


Install heat shield (2).
Tighten screws (1).



Parts: Renew seal (1).
Parts: Replace O-ring (2).

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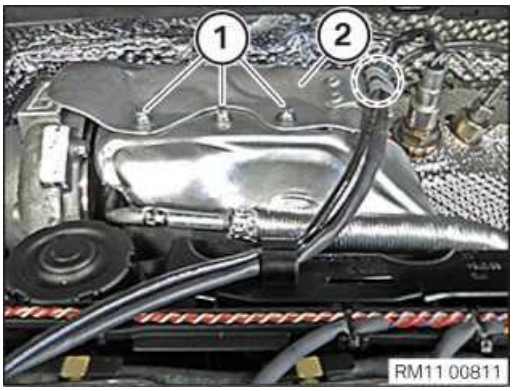


Position oil return line (2).
Tighten screw (1).
Tightening torque 11 42 3AZ.



Note:
Make sure gasket is correctly seated.

Position oil return line on exhaust turbocharger.
Tighten screws (1).
Tightening torque 11 42 4AZ.



Install heat shield (2)
Tighten screws (1).
Attach oxygen sensor cable (3) in marked area.



Tighten screws (1).

Required follow-up work:

- Install front underbody protection
- Install clean air pipe

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11 42 230 Removing and installing/sealing or replacing oil feed line for high-pressure exhaust turbocharger

WARNING

Vehicle may slip off the vehicle hoist if the vehicle hoist is handled incorrectly.

Danger! Life-threatening injuries!

- Observe safety information on raising the vehicle using a vehicle hoist.
- For additional information see: 00 ... Raising the vehicle using a vehicle hoist.

WARNING

Motor vehicle may slip off the vehicle hoist where components are supported.

Danger! Life-threatening injuries!

- Secure the vehicle hoist against lowering and lifting.

WARNING

Motor vehicle may slip off the vehicle hoist if the weight is distributed unevenly.

Danger! Life-threatening injuries!

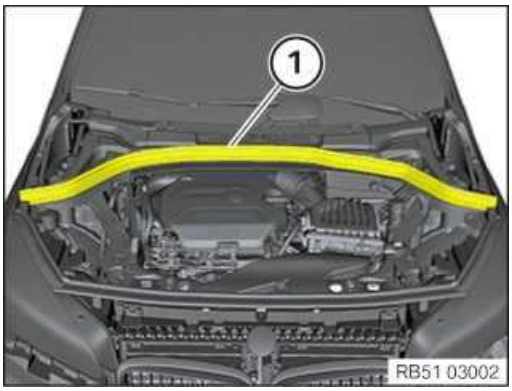
- Ensure there is a specific weight compensation on the motor vehicle.

PRELIMINARY WORK

1 – Remove the seal for the rear bonnet

NOTICE

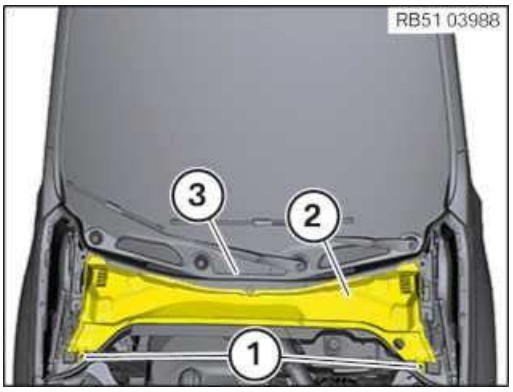
Schematic diagram is for example purposes. Some parts may differ in certain details.



- Pull off rear bonnet seal (1) towards the top and remove.

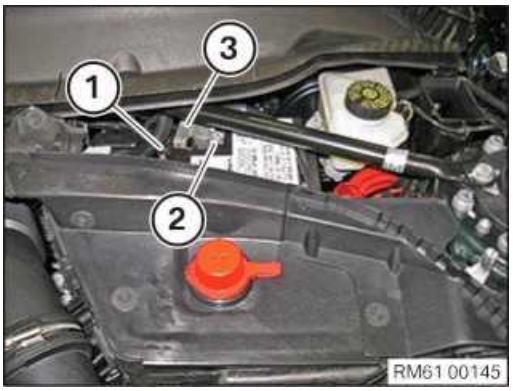
2 – Removing front cowl panel cover

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- Loosen the expanding rivet (1).
- Feed out and remove front cowl panel cover (2) from the rear cowl panel cover(3).

3 – Disconnecting the battery earth lead

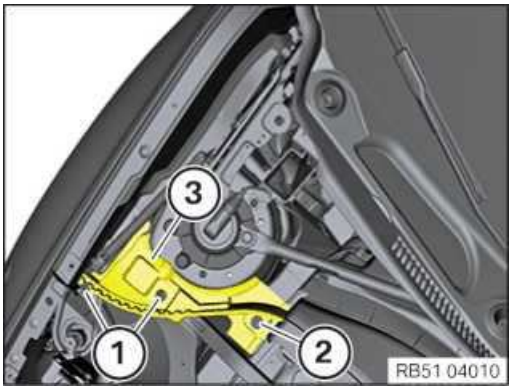


- Unlock plug connection (1) and disconnect.
- Unfasten nut (2).
- Remove the battery earth lead (3) and secure to one side.

4 – Remove suspension cross-brace

TECHNICAL INFORMATION

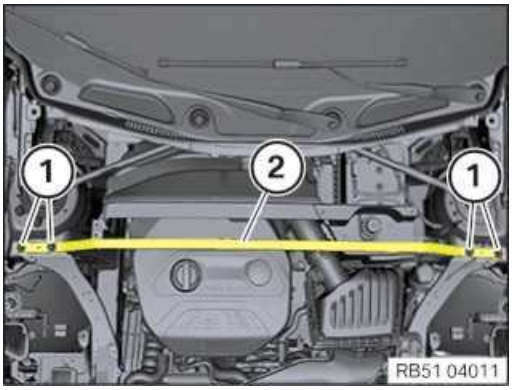
Driving without the strut brace/front end or tension strut is not permitted.



NOTICE

Description is for right component only. The procedure on the left side is identical.

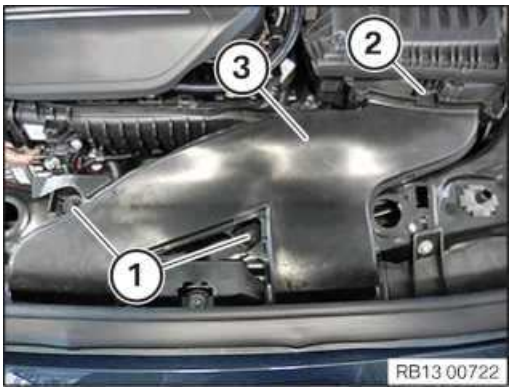
- Loosen expanding rivet (1).
- Loosen screw (2).
- Remove the cover (3).



- Loosen screws (1).
- Remove strut brace (2).

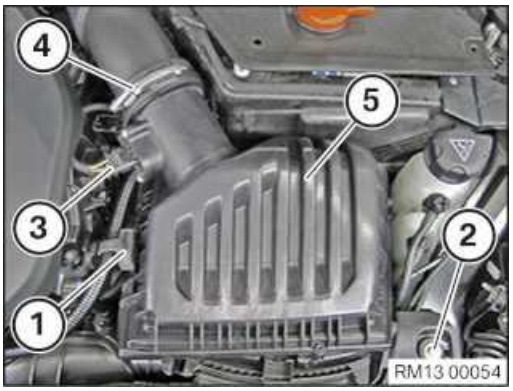
5 – Remove the intake neck for intake silencer housing

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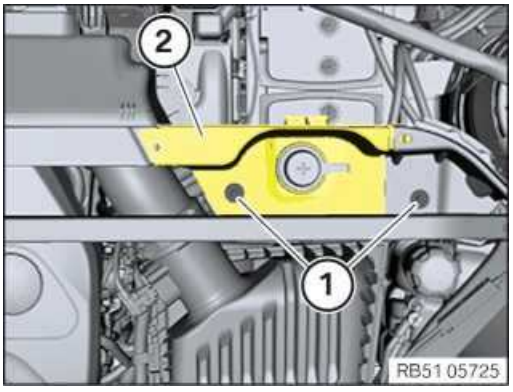
- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

6 – Removing intake silencer housing

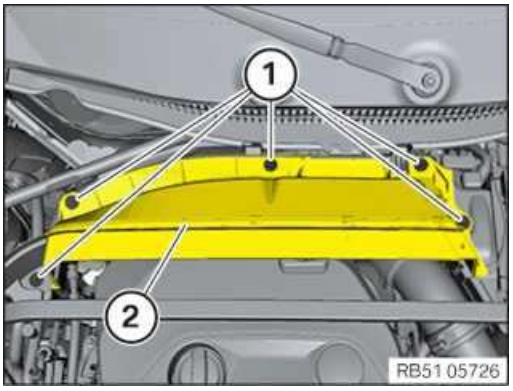


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

7 – Removing the upper bulkhead cover



- Loosen screws (1).
- Guide out and remove the cover (2).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

8 – Remove vehicle battery

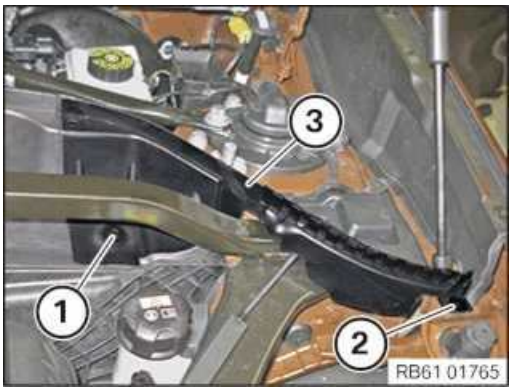
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WARNING

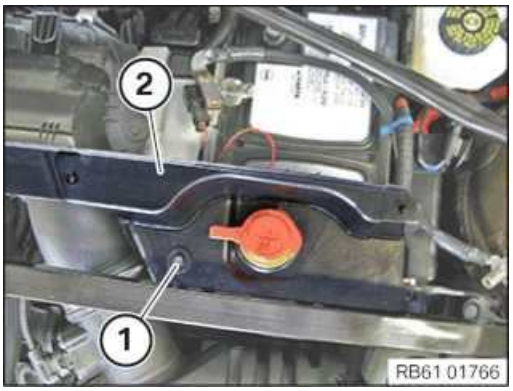
Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

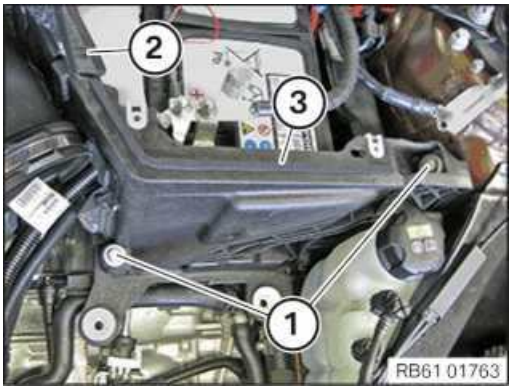
- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.



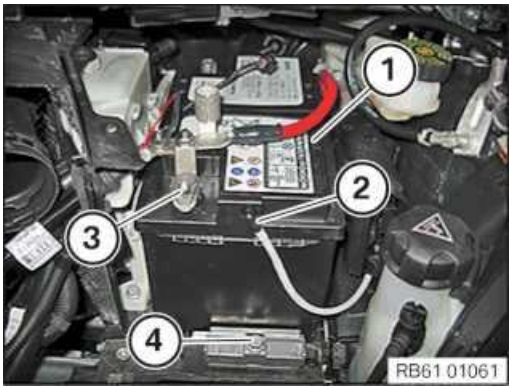
- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).



- Loosen screw (1).
- Remove the cover (2).



- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.



- Pull off the vent hose (2).
- Slacken the nut (3) on the positive battery terminal and remove the positive battery terminal.

WARNING

Unprotected battery terminals.

Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

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9 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

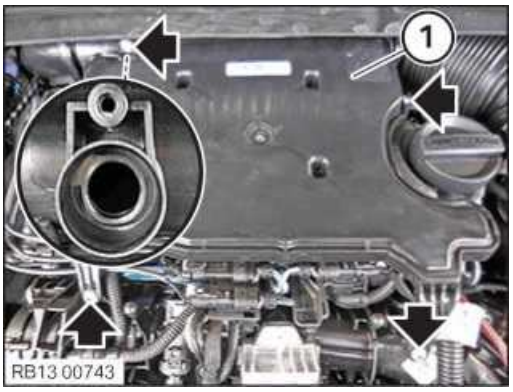
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

10 – Remove resonator



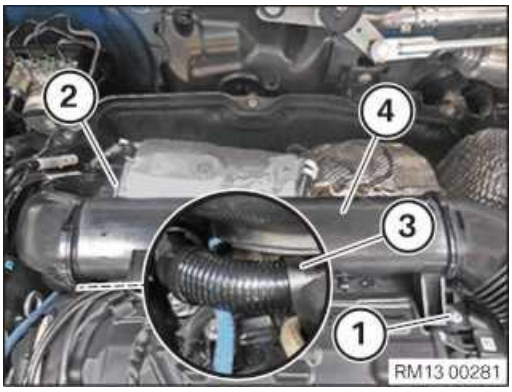
- Remove screws (arrows).
- Guide out and remove the resonator (1).

11 – Removing clean air pipe



- Detach clamp (1) on the clean air pipe.
- Pull off the clean air pipe from the intake silencer housing.

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- Loosen screw (1).
- Loosen clamp (2).
- Unlock the ventilation line (3) and pull it off the cylinder head cover.
- Feed out clean air pipe and remove.

12 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

TECHNICAL INFORMATION

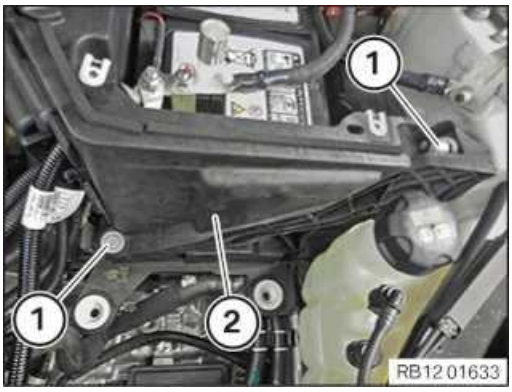
Follow instructions for removing and installing control units.

For additional information see: 12 00 ... Notes on removal and installation of control units

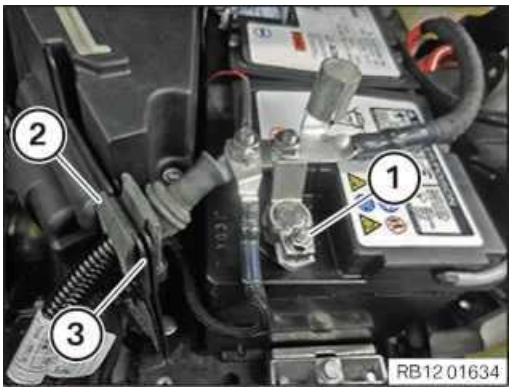
TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.

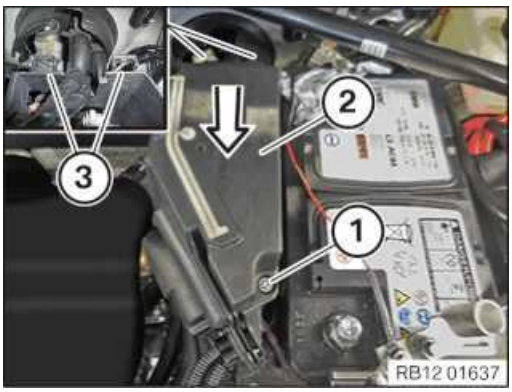
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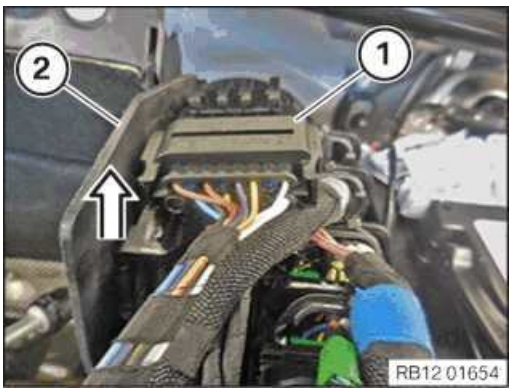
- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.



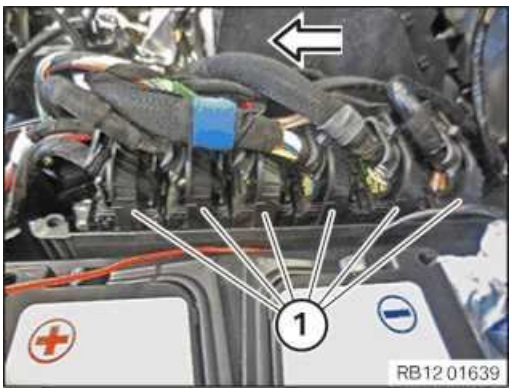
- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).

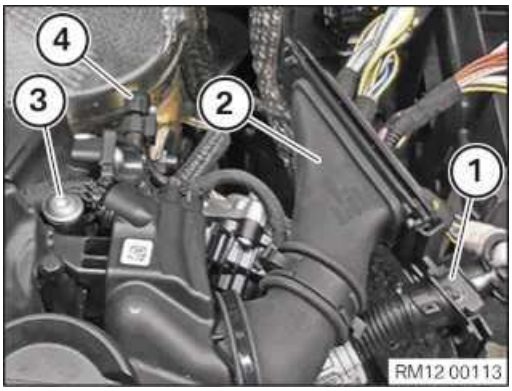


- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

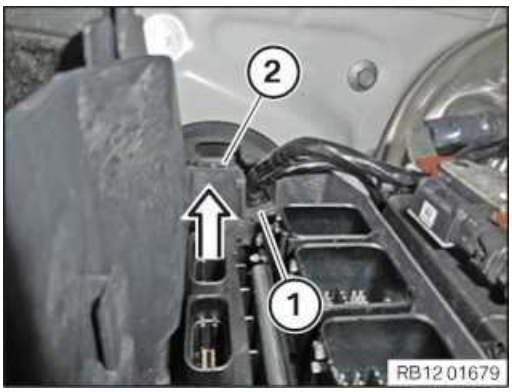
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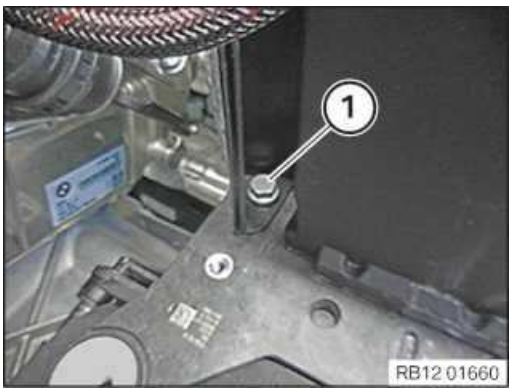
- Unlock and loosen connector (1).



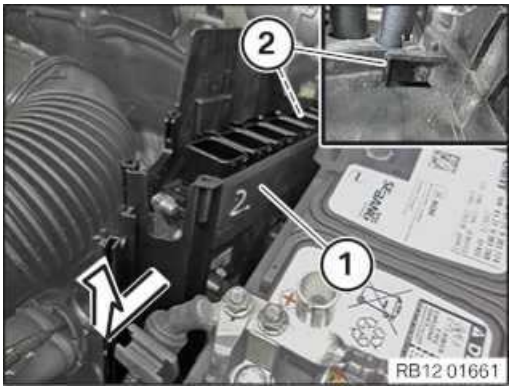
- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.



- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.



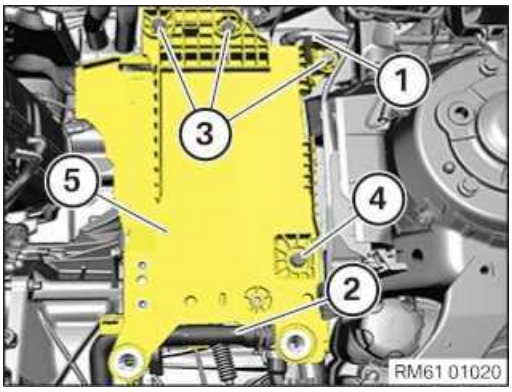
- Loosen screw (1).



- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

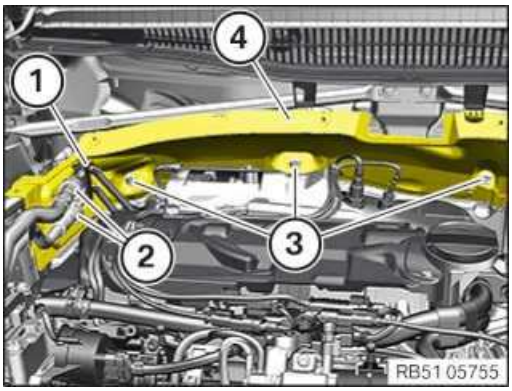
13 – Remove battery holder

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- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

14 – Remove the rear bulkhead upper part



- Unlock the holder (1) and disconnect.
- Guide out and remove the fuel lines (2).
- Loosen screws (3).
- Guide out the rear bulkhead upper part (4) and remove.

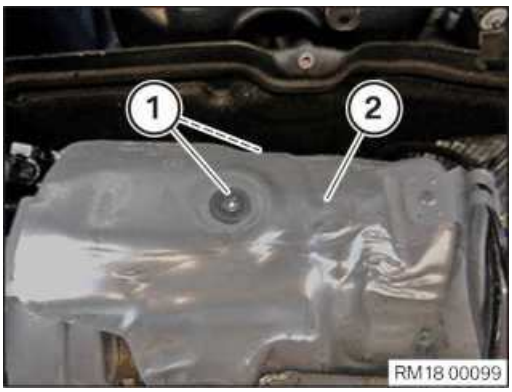
15 – Removing heat shield from top exhaust turbocharger

WARNING

Hot surfaces.

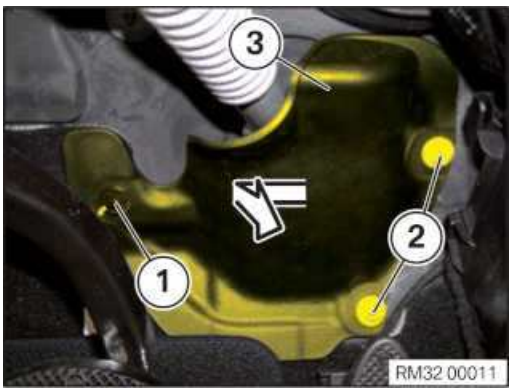
Risk of burning!

- Perform all work only on components that have cooled down.



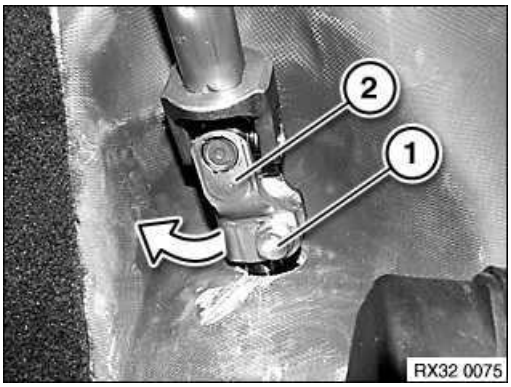
- Release cable from holders.
- Release the screws (1) at the top and bottom of the heat shield.
- Feed out and remove the heat shield (2).

16 – Releasing lower steering shaft from steering gear



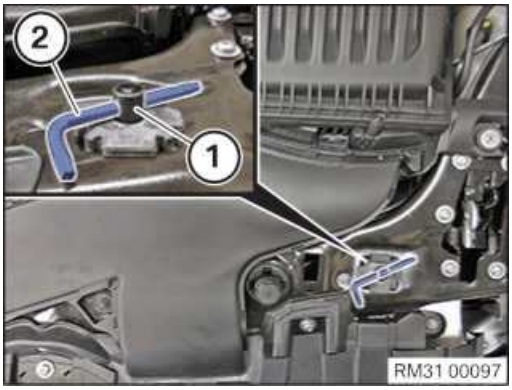
- **If installed:**
- Unfasten nut (1).
- Unscrew the nuts (2) by 1 rotation.
  Do not remove the nuts (2) !
- Remove the cover (3) on the steering column in the direction of the arrow.
  The side footwell trim must not be disassembled!

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- Loosen screw (1).
- Swivel out the universal joint (2) of the bottom steering shaft from the steering gear in the direction of the arrow.

17 – Securing radiator on left and right



NOTICE

Perform the operations on the left and right side.

- Fasten radiator at centring pin (1) with suitable tool (2).

18 – Removing both front wheels

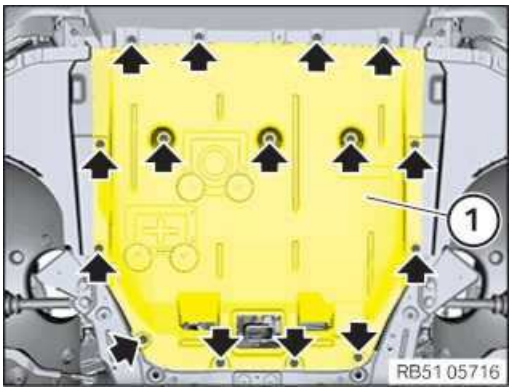
▸ **Removing the wheel**



- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Unscrew the wheel bolts (arrows) and remove the wheel.

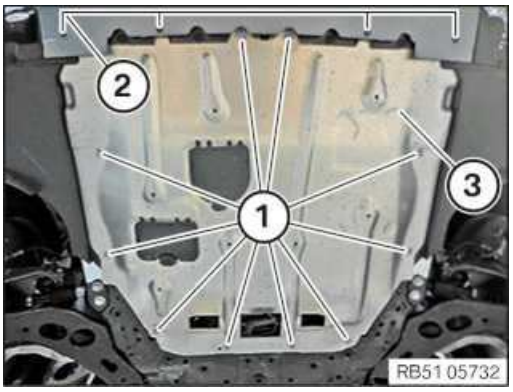
  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

19 – Removing the front underbody protection



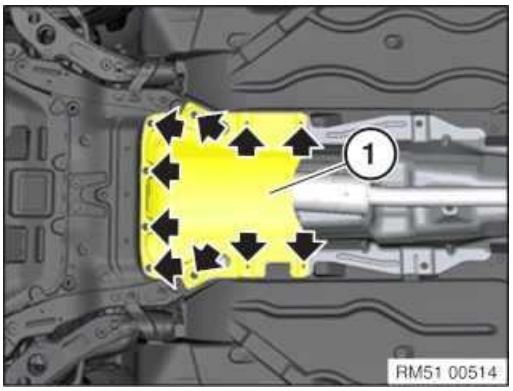
- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.

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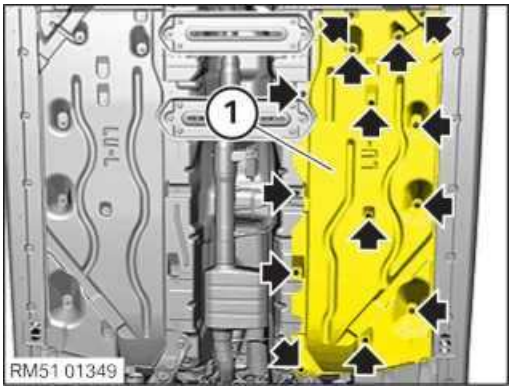
- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

20 – If installed: Removing rear underbody protection



- Remove screws (arrows).
- Remove the rear underbody protection (1).

21 – Removing right underbody panelling



- Unscrew all bolts and nuts (arrows).
- Remove the underbody panelling (1).

22 – Removing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

▸ **Remove the front wheel arch trim**

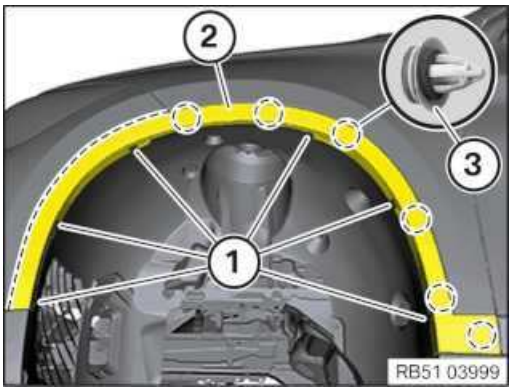
NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

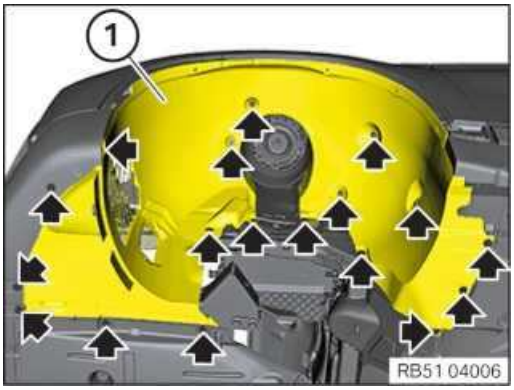
Description is for left component only. Procedure on the right side is identical.

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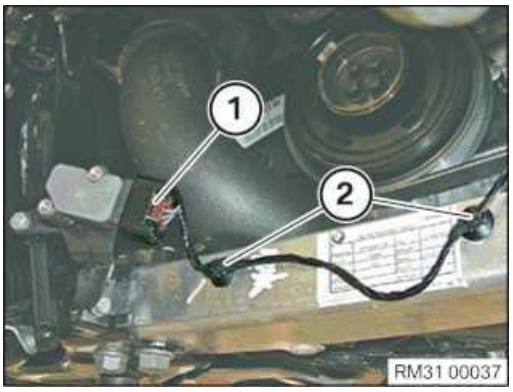
- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.

▶ **Remove front wheel arch cover**



- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

23 – With right installation: Detaching ride height sensor cable



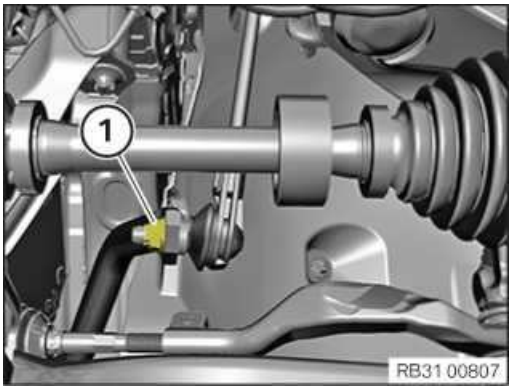
- Unlock plug connection (1) and disconnect.
- Release cable clip (2) from deformation element adapter.

24 – Releasing anti-roll bar on left and right from anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▶ **Detach the anti-roll bar from the anti-roll bar link**



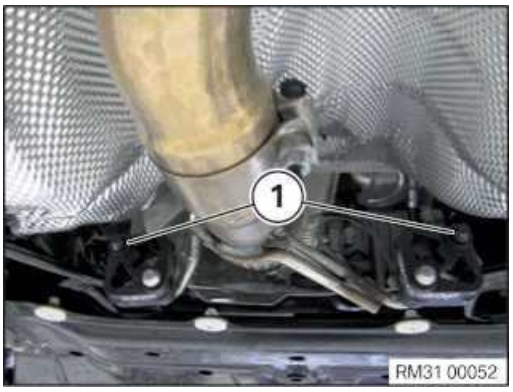
- Unfasten nut (1).

Note: Use the Torx socket for counter support.

- Loosen the anti-roll bar link from the anti-roll bar .

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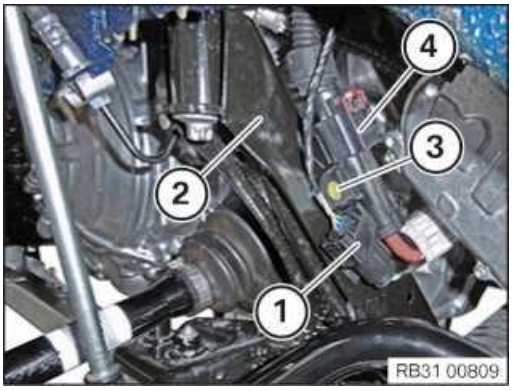
25 – Detaching rubber mount from front axle support



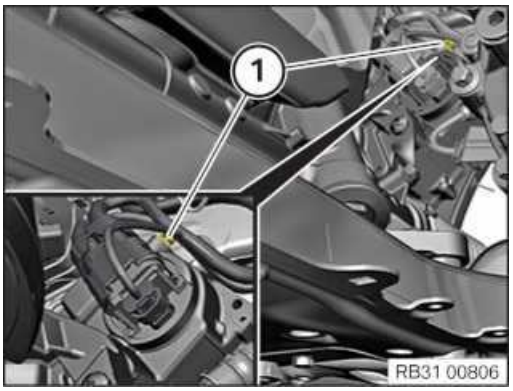
- Spray rubber mount (1) with lubricant and release from holder on front axle support.

26 – Disconnecting plug connections from steering gear

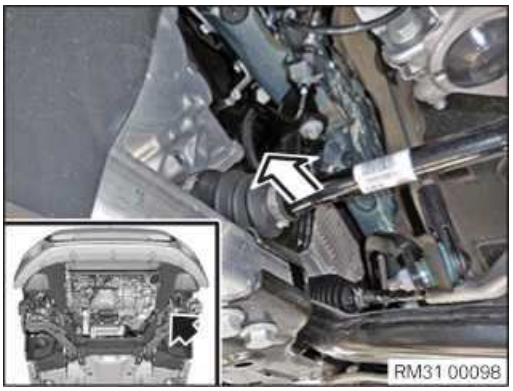
▸ **If installed: Detach connectors from the front axle carrier**



- Release the plug connection (1) from the front axle support (2).
- Loosen screw (3).
- Release the plug connection (4) from the front axle support (2).



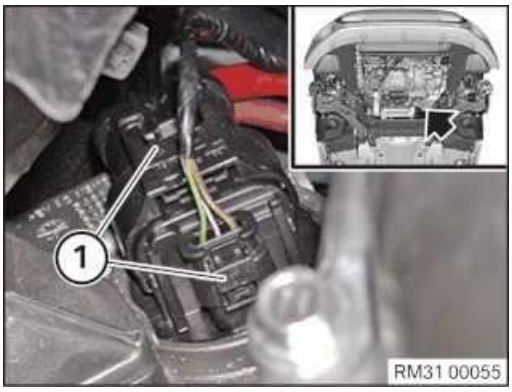
- Disconnect wiring harness (1) from steering gear.



- To unlock the plug connections (see the following work step): unlock plug connections (arrow) with the right hand.

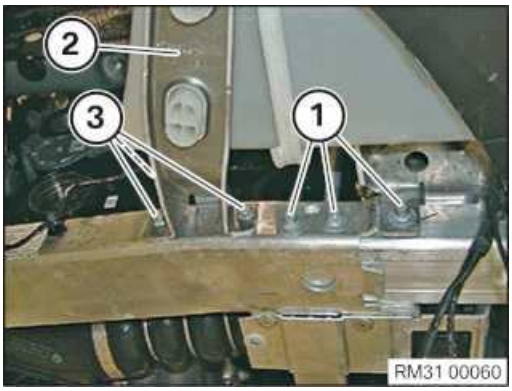
  The plug connections can be reached via the left-hand output shaft.

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- Unlock plug connections (arrow) (1)and disconnect from the steering gear.
- Make sure when lowering the front axle that the cables are not damaged!

27 – Releasing the mounted part from the front axle support

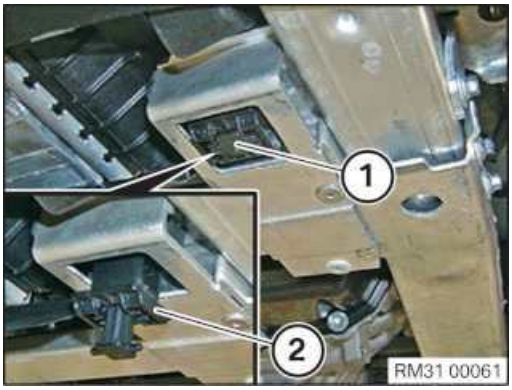


- **Only on right side:** Loosen screws (3) and remove holder for washer fluid reservoir (2).

NOTICE

Perform the operations on the left and right side.

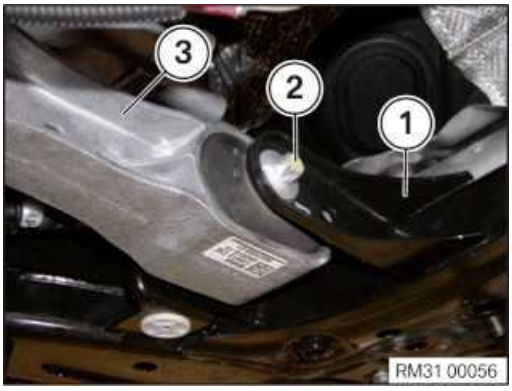
- Loosen screws (1).



NOTICE

Perform the operations on the left and right side.

- Unlock safety catch (1) of the lock (2) from the holder for the charge air cooler.
- Completely remove locks (2).



- Loosen screw (2) of the engine support (3) on the front axle (1).



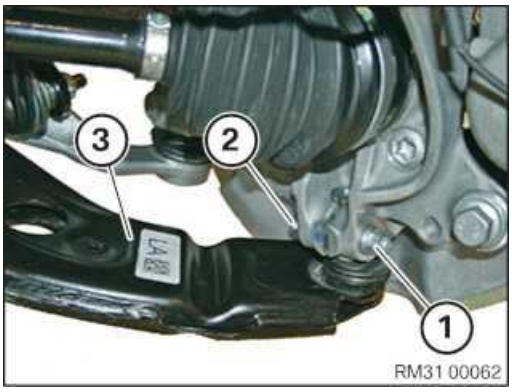
NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

28 – Detaching and removing front axle completely

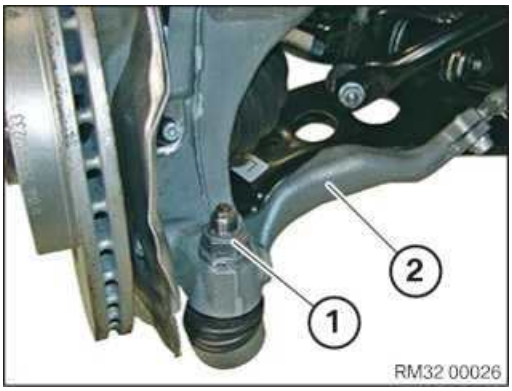
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NOTICE

Perform the operations on the left and right side.

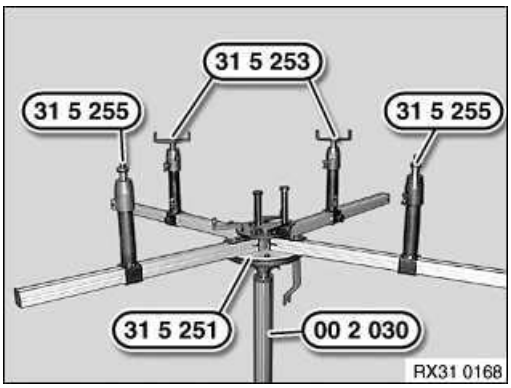
- Unfasten nut (1).
- (2)Pull out screw.
- Detach the wishbone (3) from the swivel bearing .



NOTICE

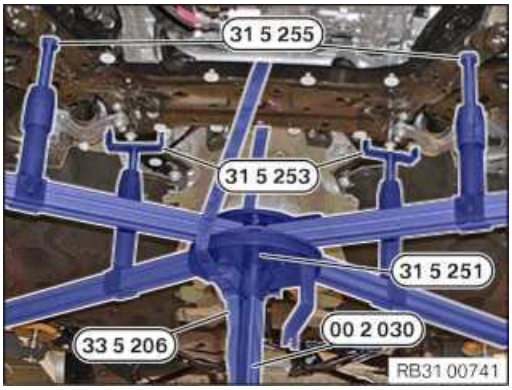
Perform the operations on the left and right side.

- Unfasten nut (1).
- Detach the track rod (2) from the swivel bearing.



- Fit the special tool completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools in telescopic supports of a profile rail pair.
- Insert special tools in telescopic supports of other profile rail pair.

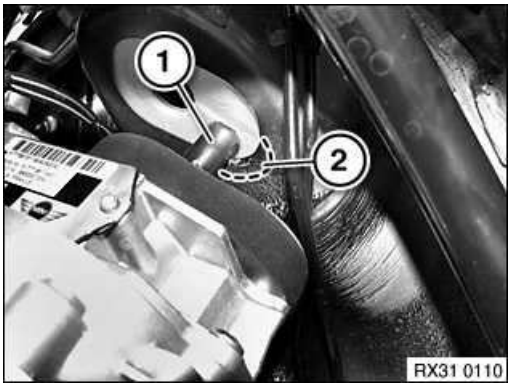
Note: In a profile rail pair, two profile rails are connected to one another by gearing.



- Align special tools and to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool to special tool .



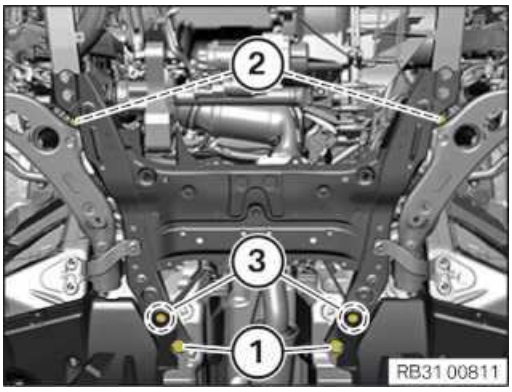
TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!

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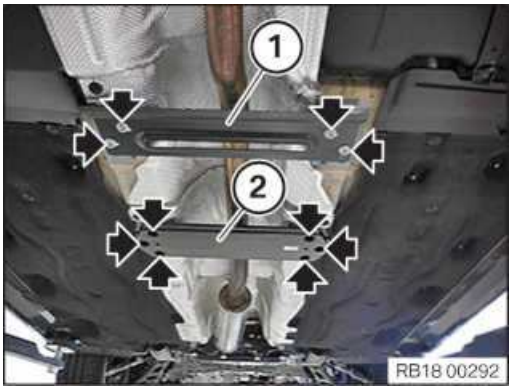
- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and remove the front axle.

TECHNICAL INFORMATION

Note the information on thread repairs using Helicoil thread inserts.
For more information see: 41 00 ... Notes on repairing threads

- Check threads for damage; if necessary, repair with Helicoil thread inserts.

29 – Removing the connecting support from the tunnel in front and back

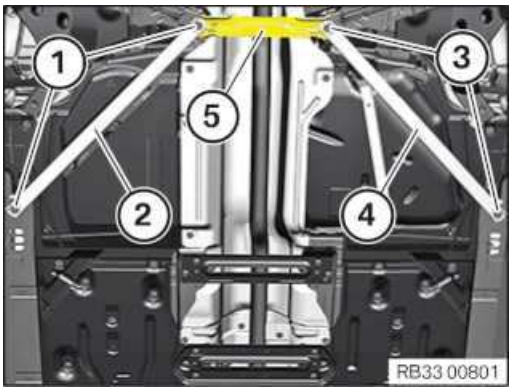


- Unscrew the bolts (arrows) from the connecting support (1).
- Feed out and remove the crossbeam (1).
- Unscrew the bolts (arrows) from the connecting support (2).
- Feed out and remove the crossbeam (2).

30 – Remove the cross strut with the torsion strut

TECHNICAL INFORMATION

Driving without a torsion strut is not permitted.



- Loosen screws (1).
- Thread out torsion strut (2) at left and remove.
- Loosen screws (3).
- Thread out torsion strut (4) at right and remove.
- Feed out and remove the cross-member (5).

31 – Remove exhaust system

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WARNING

Hot surfaces.

Risk of burning!

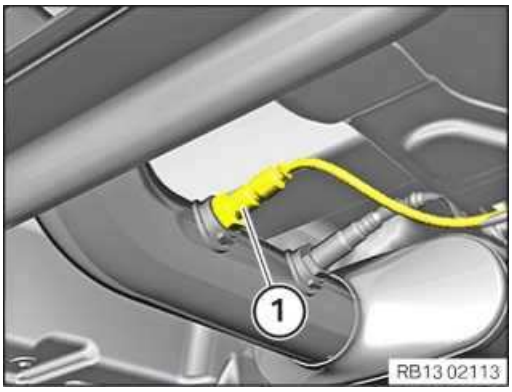
- Perform all work only on components that have cooled down.

CAUTION

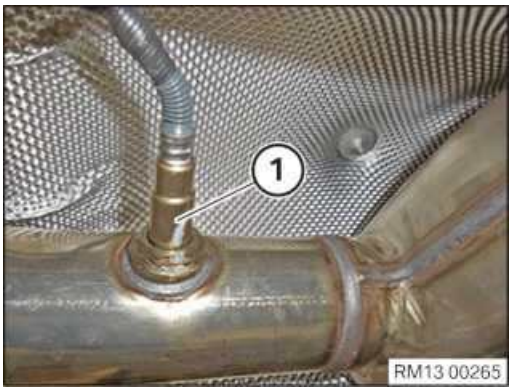
Heavy component.

Heavy components can lead to injury or damage.

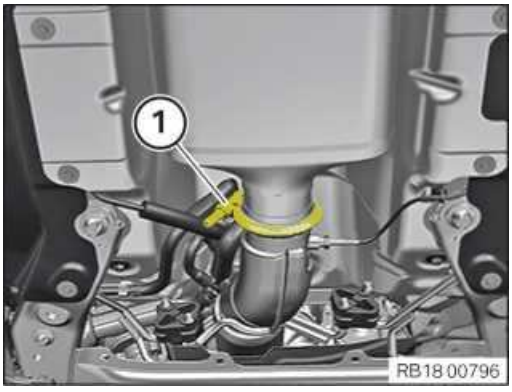
- Remove and install heavy components with the aid of another person/other persons.



- Release the nitrogen oxide sensor (1) downstream of the SCR catalytic converter, guide it out and set it aside.

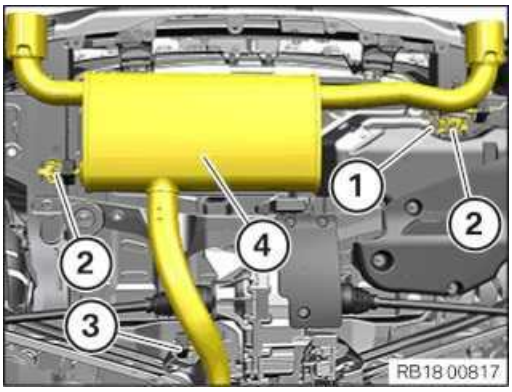


- Release the diesel particulate sensor (1), guide it out and set it aside.



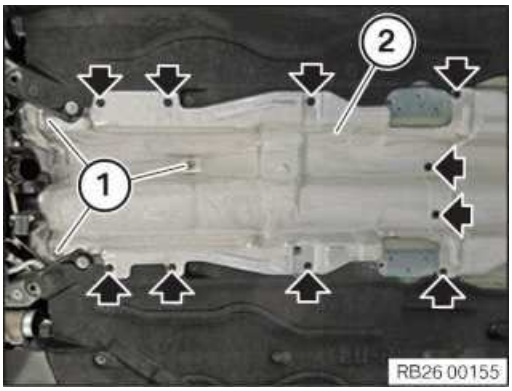
- Loosen V-band clamp (1).

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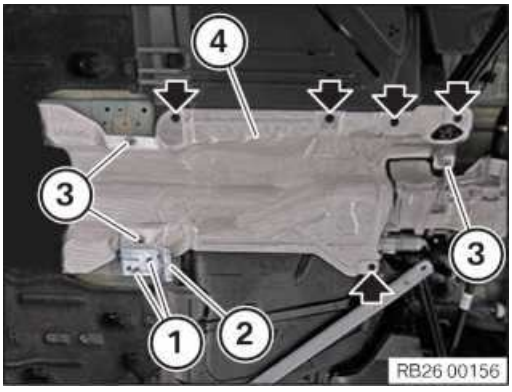
- Loosen screw (1).
- Loosen nuts (2).
- Release the rubber mount (3) of the exhaust system (4).
- Lower and guide out the exhaust system (4) with assistance of a second person and remove it.

32 – Remove front heat shield



- Remove screws (arrows).
- Loosen nuts (1).
- Guide the heat shield (2) out and remove it.

33 – Remove heat shield at rear.



- Loosen screws (1).
- Guide out and remove holder (2).
- Remove screws (arrows).
- Loosen nuts (3).
- Guide the heat shield (4) out and remove it.

34 – Remove propeller shaft

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

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RISK OF DAMAGE

Damage to propeller shaft during removal.

Non-observance of the removal guidelines for the propeller shaft on the rear axle differential may cause severe damage.

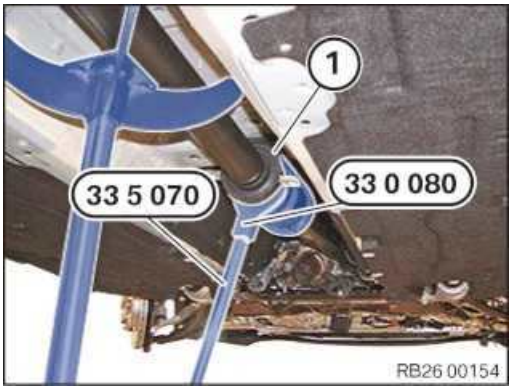
- Do not disassemble the three-hole flange, flexible disc and propeller shaft. The three-hole flange to the rear axle differential is balanced with the flexible disc and propeller shaft.
- Loosen the recessed nut against the direction of travel in clockwise direction. The propeller shaft must be loosened on the recessed nut only and exclusively in the direction of rotation otherwise the anti-twist lock of the bi-hexagonal flange nut is damaged.
- In the event of a damaged anti-twist lock on the bi-hexagonal flange nut: Replace the rear axle differential.



- Install the special too l between the front and rear propeller shaft.
- Make sure that the arrows on the special tool point forward in the direction of travel.



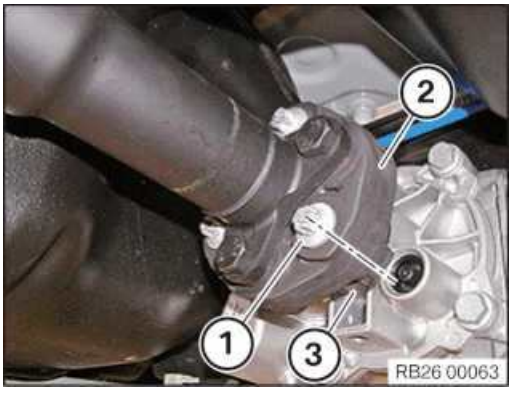
- Always support the propeller shaft (1) with a conventional jack.



- Protect the propeller shaft (1) with the special tools **0 495 554 (33 5 070)** and from twisting.

TECHNICAL INFORMATION

Compliance with the following instructions is required to avoid a humming noise from the propeller shaft after refitting the propeller shaft.

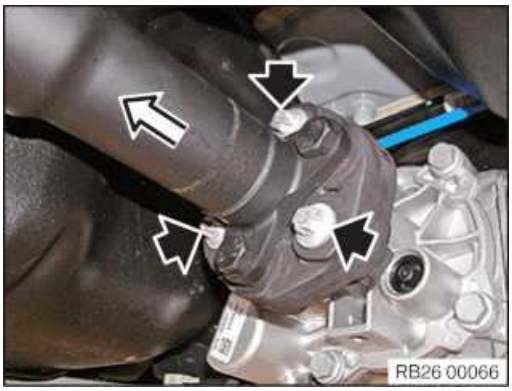


- Mark the installation position of the screw connection (1), the flexible disc (2) and the three-hole flange (3) on the same level.
- Loosen the screw connection (1).

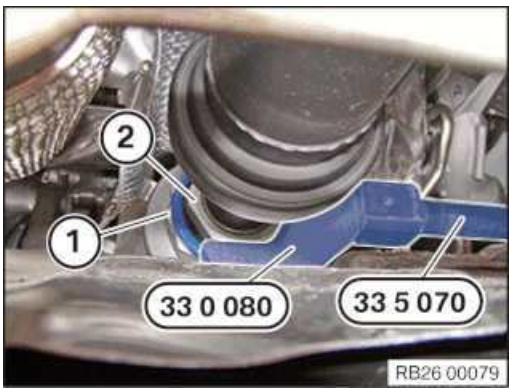
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- Loosen screws (1).



- Remove screws (arrows).
- Guide the propeller shaft out in the direction of the arrow and set it aside.



RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.

- Protect the recessed nut (2) on the transfer box from twisting with the special tools **0 495 554 (33 5 070)** and .

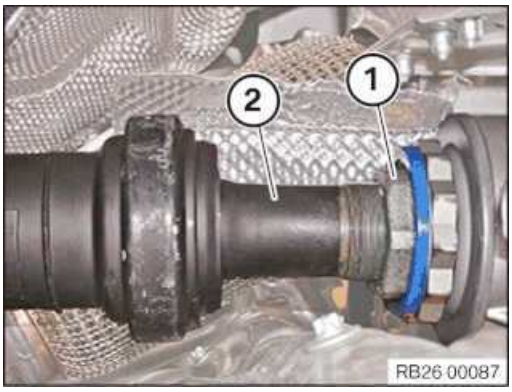
  The recessed nut (2) on the transfer box must **not** be used to detach the propeller shaft.

  The double hexagon flange nut (1) must **not** be used for counter support.

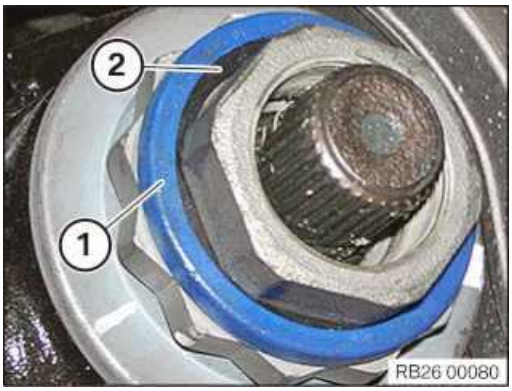


- Release the front propeller shaft with the special tools **0 495 554 (33 5 070)** and in the direction of the arrow.

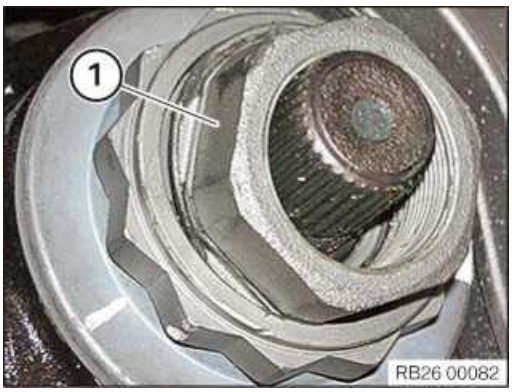
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- Thread the propeller shaft (2) out of the recessed nut (1) and remove.



- Thread the retaining clip (1) and the seal (2) out and remove.



- Thread out and remove the recessed nut (1).

35 – Removing starter motor

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and loosen connector (1).
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).



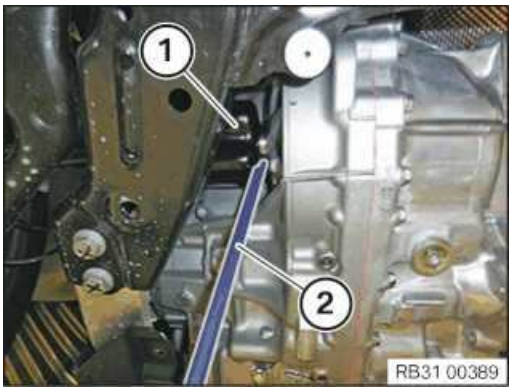
- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.



- Loosen screws (1).
- Feed out starter motor and remove.

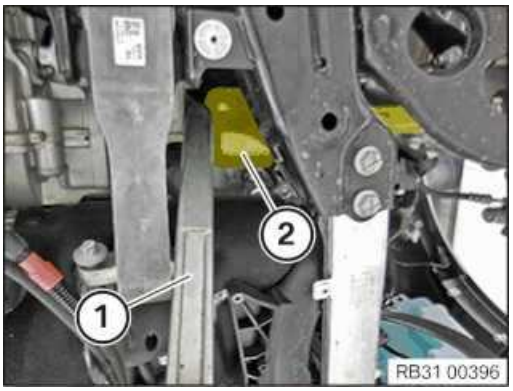
36 – Partially removing the left output shaft

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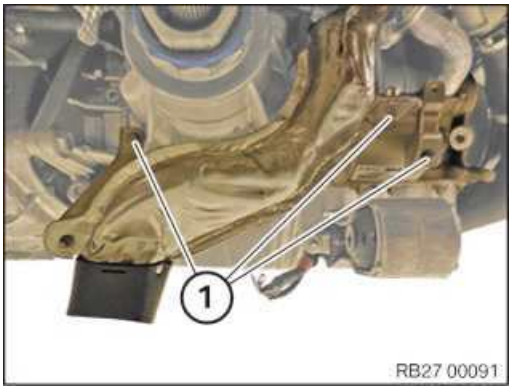
- Protect the output shaft (1) from falling.
- Lever out the output shaft (1) with a mounting lever (2) from the transmission.
- Tie up output shaft (1).

37 – Partially removing right output shaft

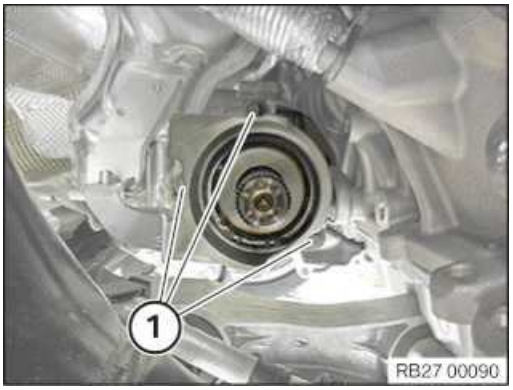


- Lever out the output shaft (2) with a mounting lever (1).
- Tie up output shaft (1).

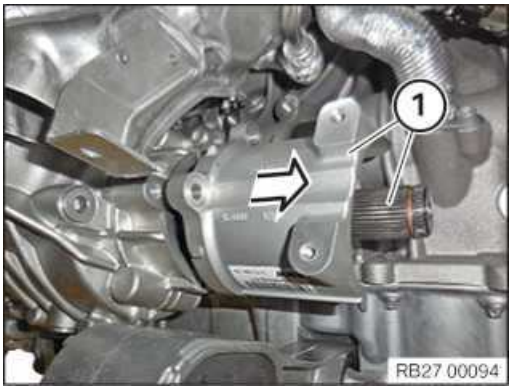
38 – Remove the intermediate shaft with the support tube



- With air duct installation: Loosen screws (1).
- Remove air duct



- Loosen screws (1).



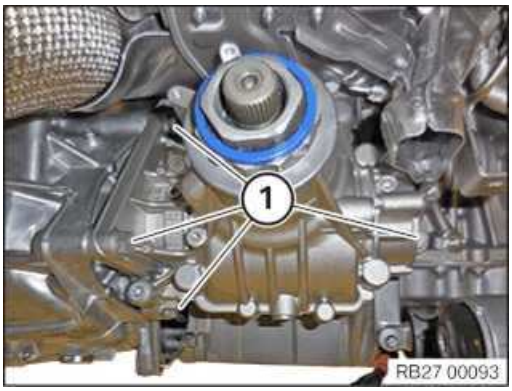
- Pull the intermediate shaft with the support tube (1) out of the transfer box.

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39 – Remove transfer box (VTG)



- Loosen screws (1).
- Remove heat shield.



- Loosen screws (1).
- Remove the transfer box (VTG).

40 – Remove the monitoring oxygen sensor

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

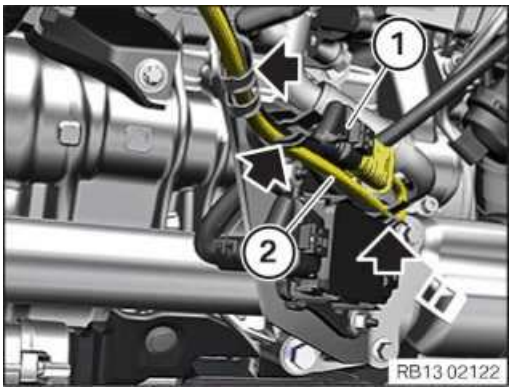
RISK OF DAMAGE

Electrostatic discharge.

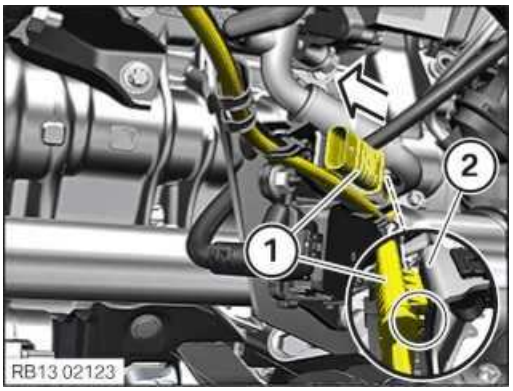
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

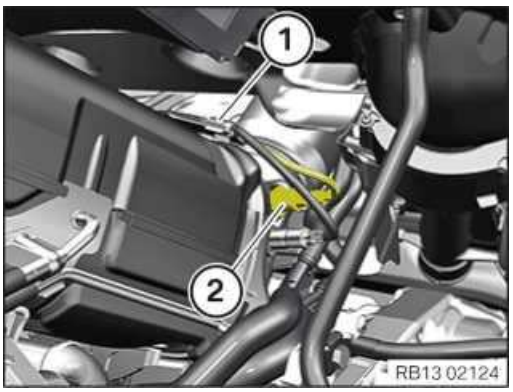
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- Unlock plug connection (1) and disconnect.
- Feed oxygen monitor sensor cable (1) out of the clamps (arrows).



- Unlock the connector (1) in the marked area and disconnect it from the holder (2) in the direction of arrow.



- Guide the cable of the monitoring oxygen sensor (2) out of the clamp (1).
- Release the monitoring oxygen sensor (2) using special tool **0 491 074 (11 7 020)**.
- Remove the monitoring oxygen sensor (2).

41 – Removing the nitrogen oxide sensor before SCR catalytic converter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

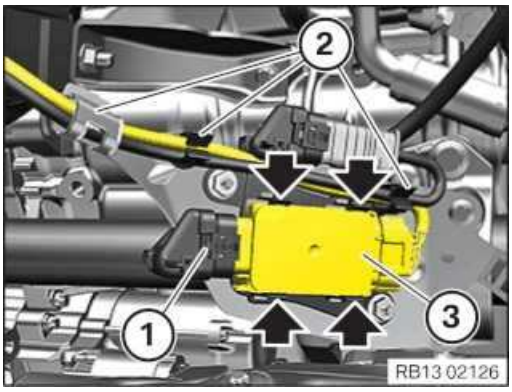
RISK OF DAMAGE

Electrostatic discharge.

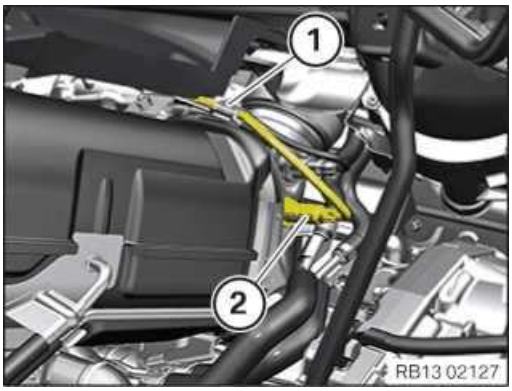
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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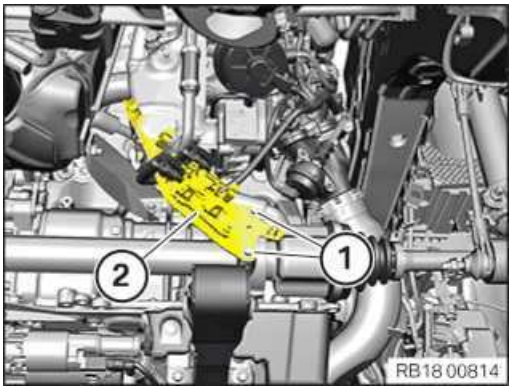


- Unlock plug connection (1) and disconnect.
- Slide the cable of the nitrogen oxide sensor evaluation electronics (3) out of the clamps (2) and remove.
- Unlock (arrows) and remove the evaluation electronics for the nitrogen oxide sensor (3).



- Slide the cable of the nitrogen oxide sensor before the SCR catalytic converter (2) out of the clamps (1) and remove.
- Detach the nitrogen oxide sensor before the SCR catalytic converter (2) using the special tool **0 491 074 (11 7 020)**.
- Guide out and remove the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

42 – Remove holder for oxygen sensor



- Loosen screws (1).
- Thread out the holder (2) for the oxygen sensor and remove.

43 – Remove the exhaust temperature sensor on the catalytic converter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

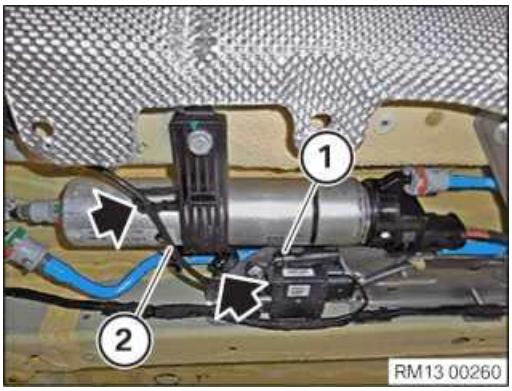
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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

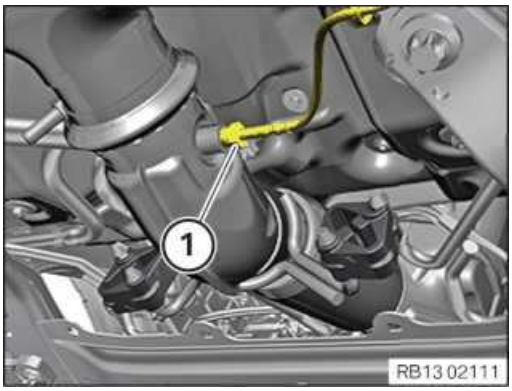
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and loosen connector (1).
- Feed out the cable (2) of the exhaust temperature sensor from the clamps (arrows) and remove.



- Loosen the cable clip (1).



- Loosen exhaust temperature sensor (1).
- Feed out and remove exhaust temperature sensor (1).

44 – Removing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

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WARNING

Hot surfaces.

Risk of burning!

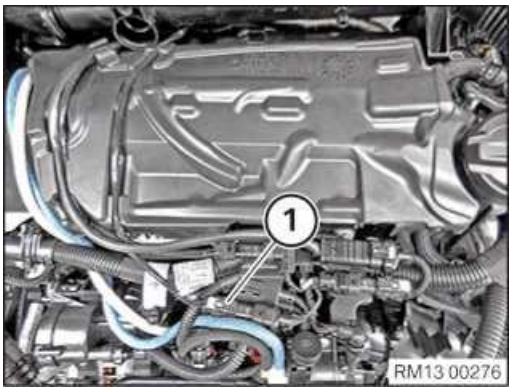
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

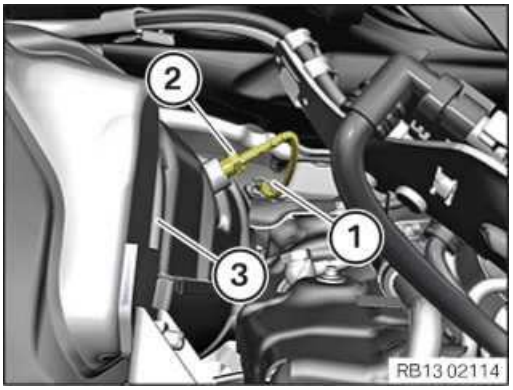
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and loosen connector (1).
- Uncover the exhaust temperature sensor cable.



- Guide the exhaust temperature sensor cable (2) out of the clamp (1) and place it to one side.
- Release the exhaust temperature sensor (2) with conventional tools .
- Feed out and remove the exhaust temperature sensor (2) from the diesel particulate filter (3).

45 – Remove the exhaust temperature sensor on the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

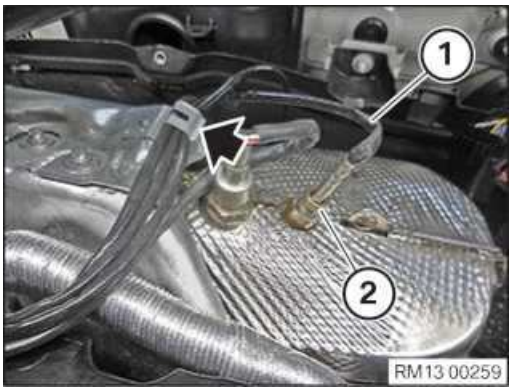
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect connector (1).
- Put the cable of the exhaust temperature sensor to one side.



- Guide cable (1) of the exhaust temperature sensor out of the clamp (arrow) and remove it.
- Loosen exhaust temperature sensor (2).
- Feed out and remove exhaust temperature sensor (2).

46 – Remove the control sensor

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock plug connection (1) and disconnect.
- Detach the connector (2) from the holder .
- Release the front oxygen sensor cable.



- Detach the control sensor (1) with the special tool .
- Feed out and remove the control sensor (1).

47 – Removing the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

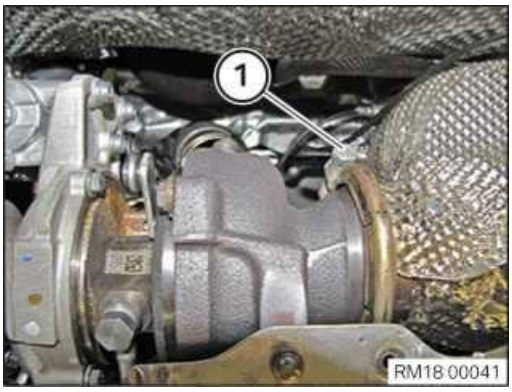
CAUTION

Heavy component.

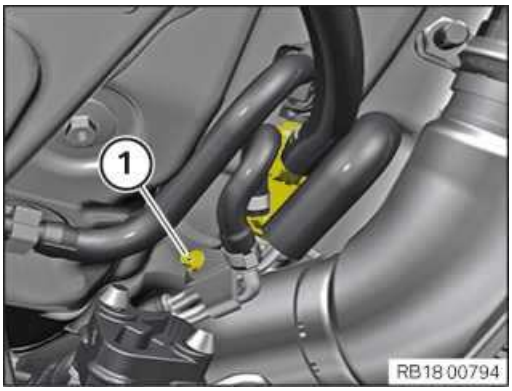
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

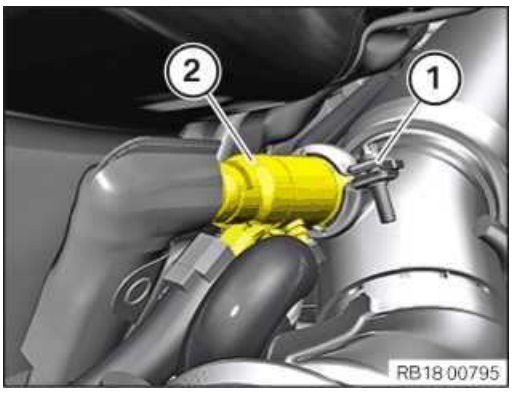
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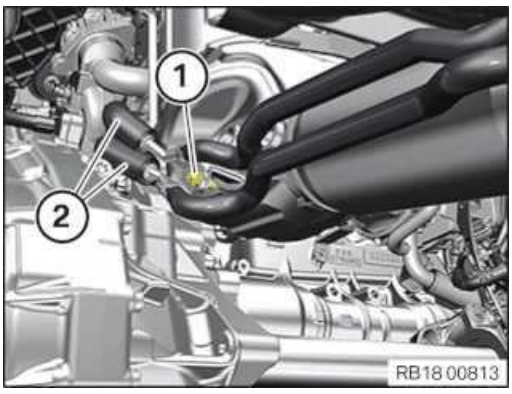
- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.



- Loosen screw (1).



- Loosen V-band clamp (1).
- Remove the SCR metering module (2) and set it aside.



- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.

▸ **Remove differential pressure sensor**

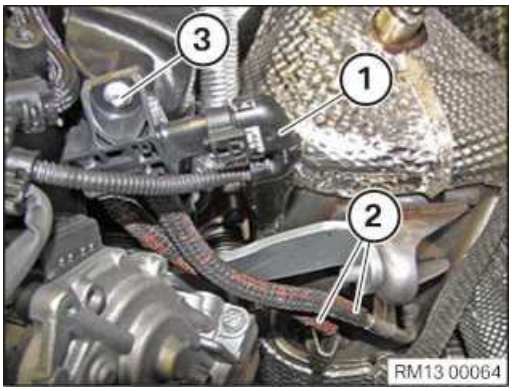
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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

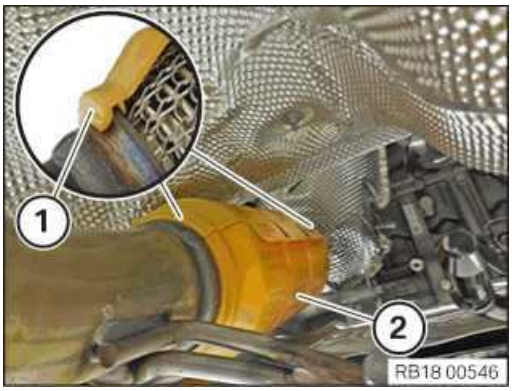
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



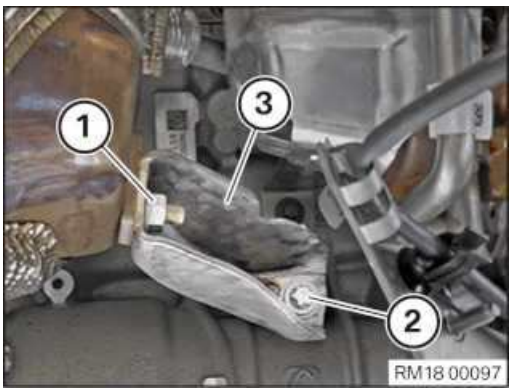
- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.



- Loosen nuts (1).

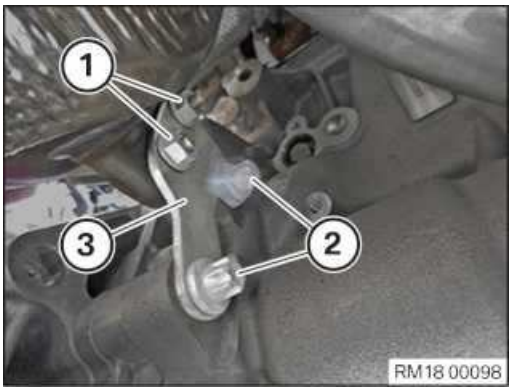


- Mount fitting aid (2).
- Make sure that the fitting aid is correctly position on the edges (1) of the flexible tube.

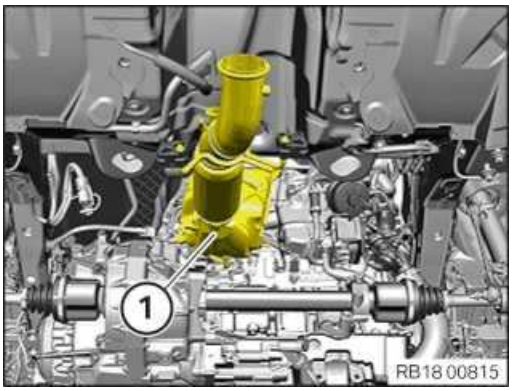


- Unfasten nut (1).
- Loosen screw (2).
- Remove holder (3).

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- Loosen nuts (1).
- Loosen screws (2).
- Remove holder (3).



- Feed out diesel particulate filter (1) toward the bottom and remove.

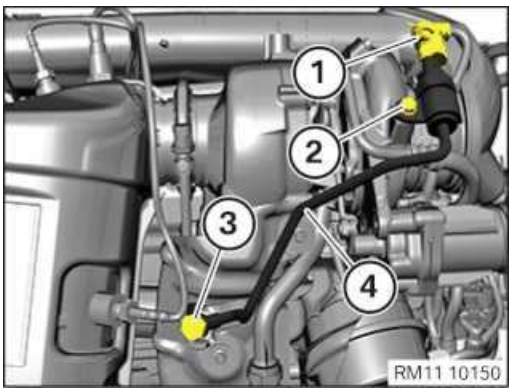
48 – Remove the heat shield from the exhaust turbocharger at the bottom

WARNING

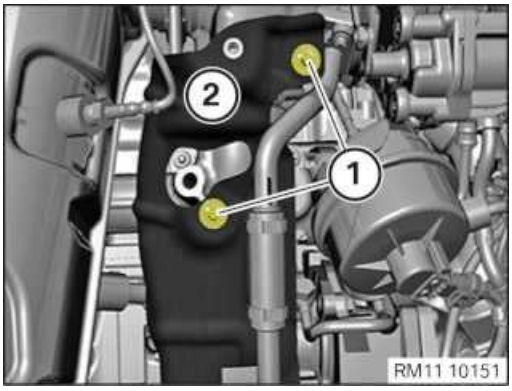
Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Unlock and disconnect connector (1).
- Unscrew the banjo bolt (3).
- The seals of the banjo bolt (3) must be renewed.
- Loosen screw (2).
- Remove the exhaust gas pressure pipe (4).



- Unscrew the bolts (1) on the heat shield .
- Feed out and remove the heat shield (2).

49 – Removing the low-pressure stage turbocharger

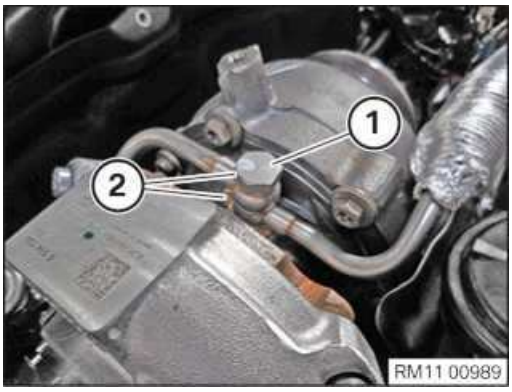
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WARNING

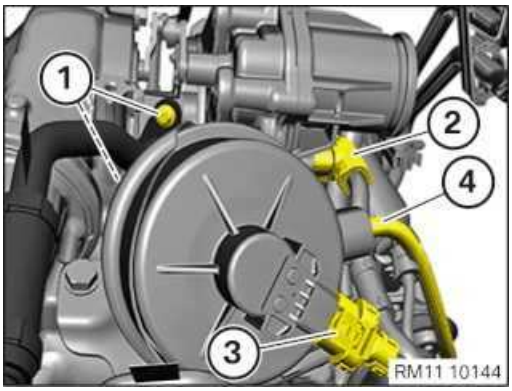
Hot surfaces.

Risk of burning!

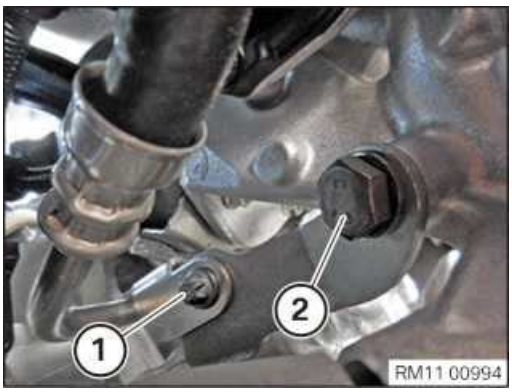
- Perform all work only on components that have cooled down.



- Release the banjo bolt (1) of the oil feed lines.
- Remove sealing rings (2).
- Place oil feed lines to one side.



- Release the screws (1) of the oil return line.
- Unlock and disconnect the plug connections (2) and (3).
- Pull off the vacuum hose (4) carefully.

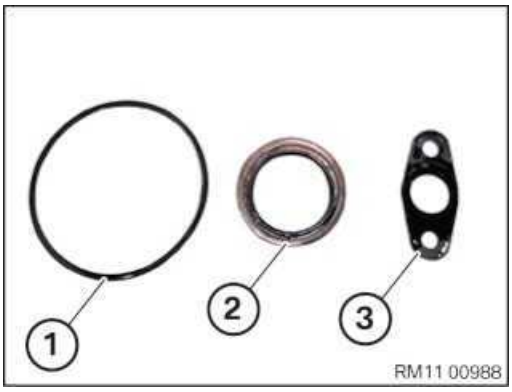


- Undo the bolt (1) of the oil feed line.
- Loosen screw (2).

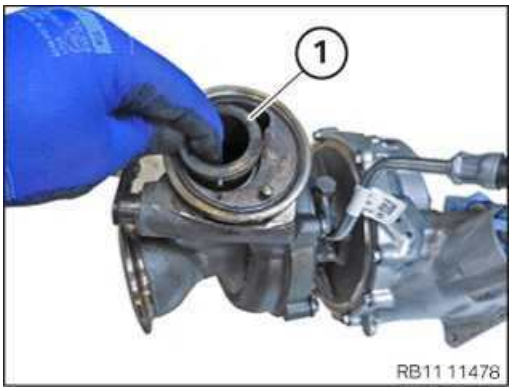


- Loosen screw (1).
- Remove the V hose clamp.
- Guide the low-pressure stage turbocharger out towards the top and remove.

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- Remove seals (1), (2) and (3).



- Remove the spacer ring (1).

MAIN WORK

POSTPROCESSES

50 – Prepare for the installation of the exhaust turbocharger

- Check the oil feed lines and the oil return lines for contamination or obstruction, clean or renew if necessary.
- If the oil feed lines and/or oil return lines are heavily contaminated, we recommend changing the engine oil and the oil filter.
- If installed: Check the coolant feed lines and the coolant return lines for the exhaust turbocharger for contamination or obstruction, clean or renew if necessary.
- Check that the screw connections and the plug connections of all the lines are correct.
- Check air cleaner for contamination and clean or renew as needed.
- Check correct functioning of crankcase ventilation.
- Replace all gaskets.

  Parts: Seals

51 – Installing the low-pressure stage turbocharger

RISK OF DAMAGE

Damage to the surface.

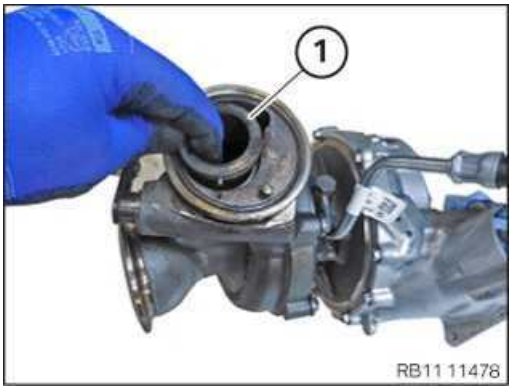
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

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TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.



- Check the spacer plug (1) for damage, renew if necessary.

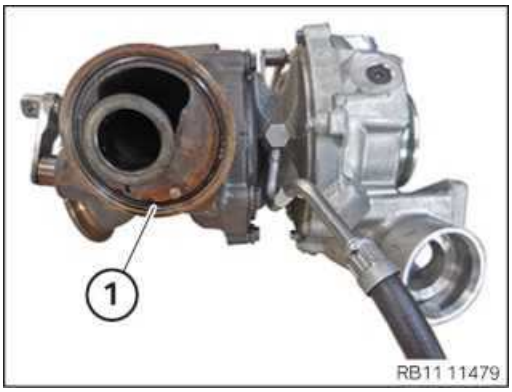
  Parts: Spacer ring
- Insert and install the spacer ring (1).
- Position spacer ring (1) correctly.



- Renew gasket (1).

  Parts: Gasket
- Position the seal (1).
- Renew the sleeve(2).

  Parts: Holding sleeve



- Renew sealing ring (1).

  Parts: Sealing ring
- Affix the sealing rings on the exhaust turbocharger.



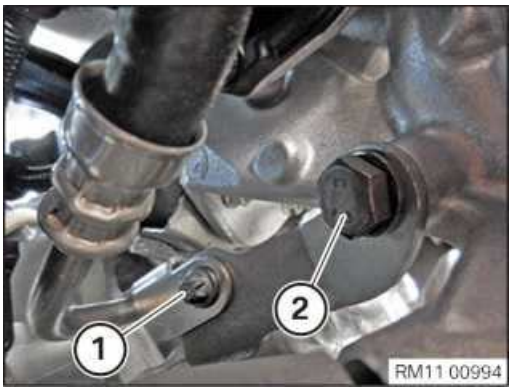
- Insert and install the low-pressure stage exhaust turbocharger on the exhaust manifold .
- Feed in and install V-band clamp .
- Tighten V-band clamp (2).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Screw in nut (1) with 2 **revolutions**.

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- Tighten down screw (1).

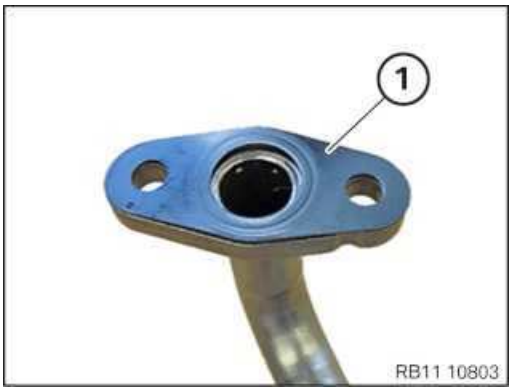
Oil feed line to bracket

Torx screw M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

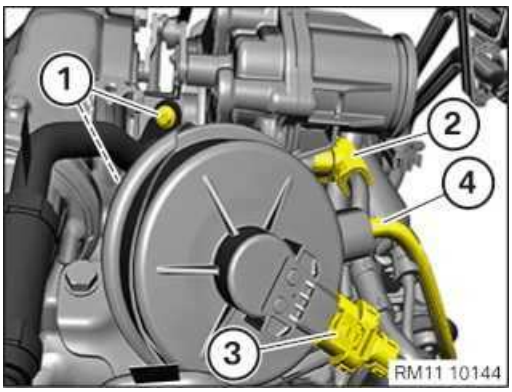
Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm



- Renew seal (1) on the oil return line.

  Parts: Gasket



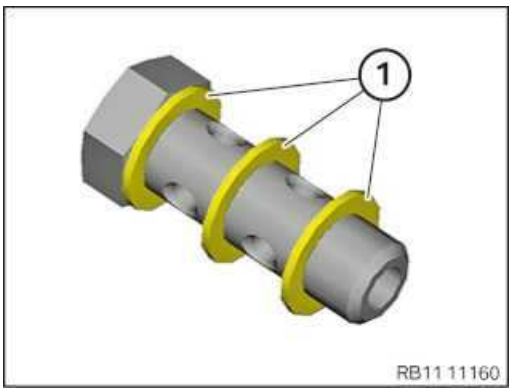
- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

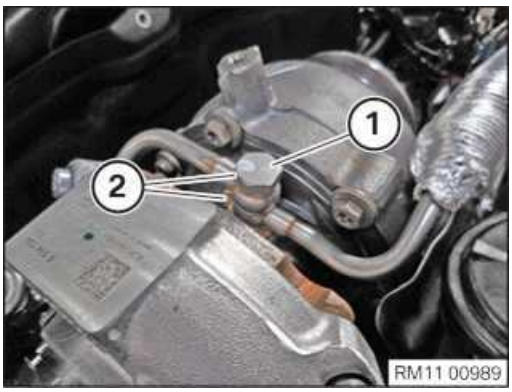
M6x12		Tightening torque	8 Nm

- Connect and lock connectors (2) and (3).

  The locks must engage audibly.
- Connect vacuum hose (4).



- Renew banjo bolt and sealing rings (1).
- **Parts:** Banjo bolt, sealing rings



- Install sealing rings (1).
- Tighten the banjo bolt (1).
- Ensure that the lines do not rest against the adjacent components.

52 – Installing heat shield on exhaust turbocharger at bottom

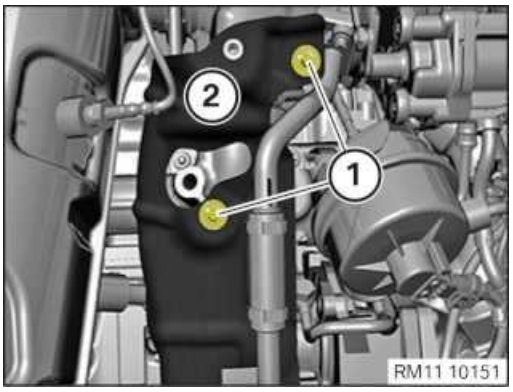
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WARNING

Hot surfaces.

Risk of burning!

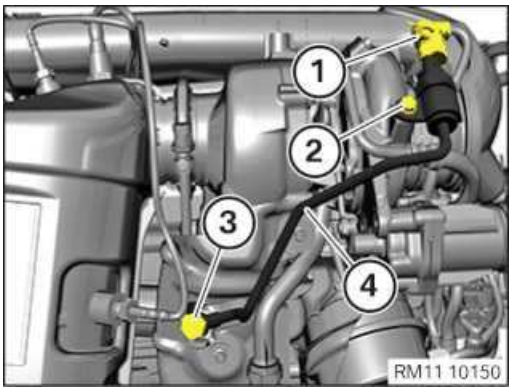
- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (2).
- Tighten the bolts (1) on the heat shield .

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm



- Position the exhaust gas pressure pipe (4).
- Hand-tighten the bolt (2).
- Renew sealing rings on the banjo bolt (3).

  Parts: Sealing ring
- Tighten the banjo bolt (3).

Banjo bolt for exhaust pressure pipe to exhaust manifold

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

- Tighten down screw (2).

Standard screw connection M6

M6		8 Nm

- Connect connectors (1) and lock.

  Lock must audibly engage.

53 – Installing the diesel particulate filter

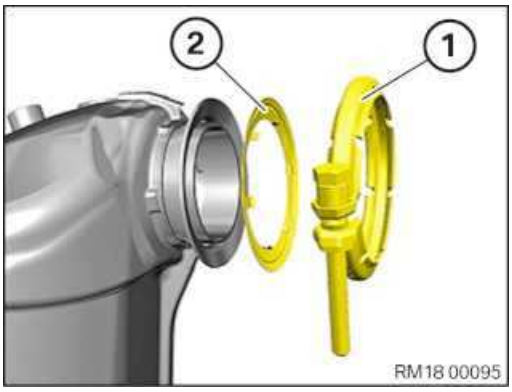
CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

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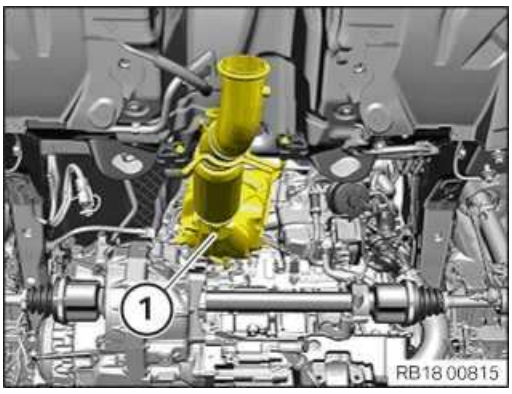
- Renew the V-clip (1).

  Parts: V-band clamp
- Renew the gasket (2).

  Parts: Gasket



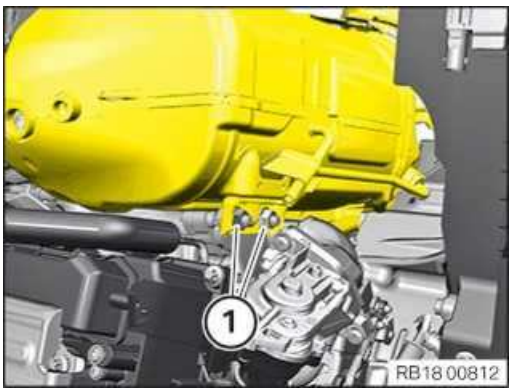
- Before installing the diesel particulate filter: Mount fitting aid (1) for the flexible tube.



- Carefully insert and install the diesel particulate filter (1).

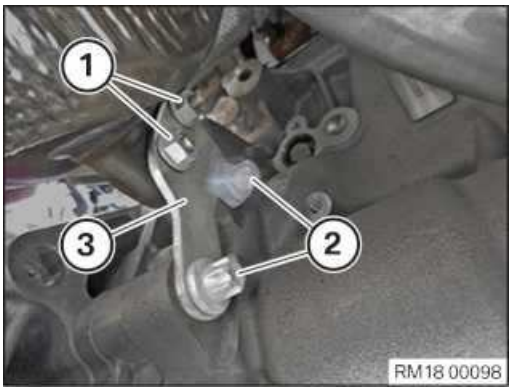


- Feed in and install V-band clamp (1).
- Make sure that the seal between the diesel particulate filter and the exhaust turbocharger is installed correctly.
- Align the diesel particulate filter on the exhaust turbocharger.
- Position V-clip (1).
- Hand-tighten the V-clip (1).

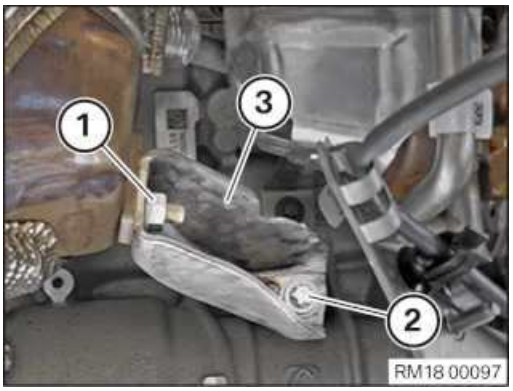


- Tighten nuts (1) by hand.

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- Install holder (3).
- Hand-tighten the bolts (2).
- Tighten nuts (1) by hand.



- Install holder (3).
- Tighten the nut (1) hand-tight.
- Hand-tighten the bolt (2).



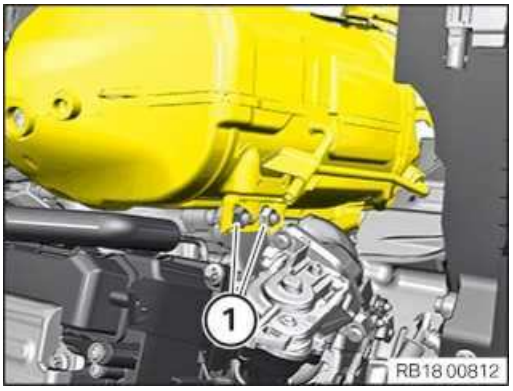
- Remove fitting aid (1) for the flexible tube.



- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

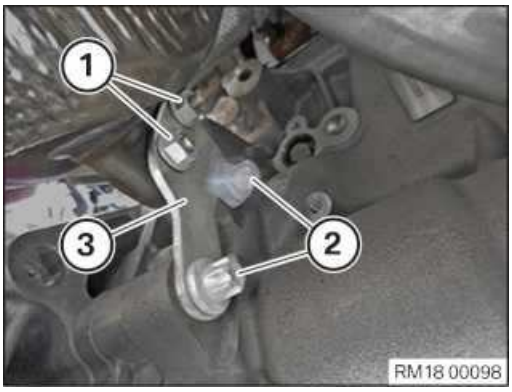


- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm

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- Tighten down screws (2).

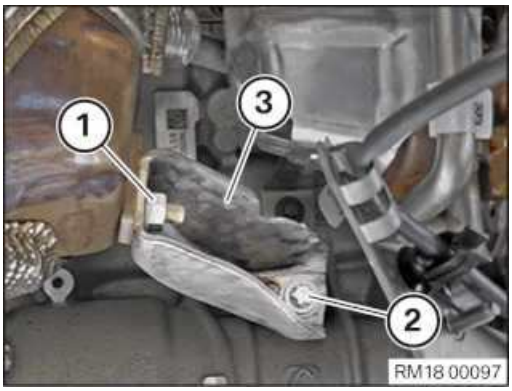
Diesel particulate filter holder to gearbox

M12x75		Tightening torque	66 Nm

- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screw (2).

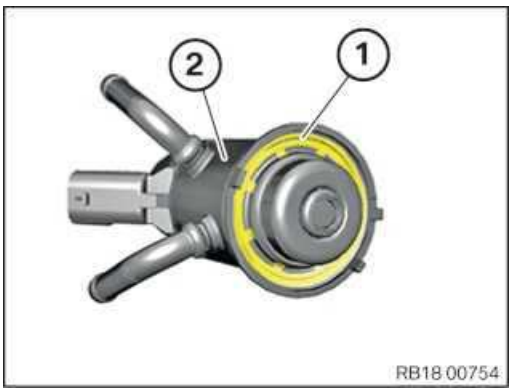
Diesel particulate filter bracket to crankcase

M10x35		Tightening torque	38 Nm

- Tighten nut (1).

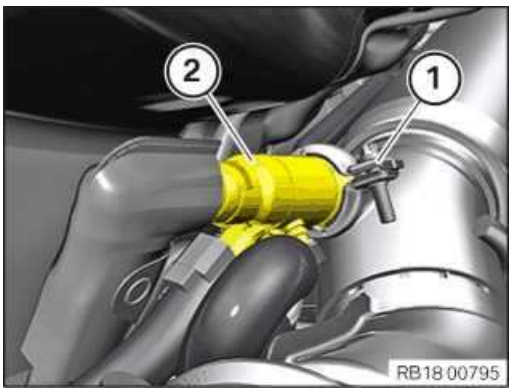
Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Renew sealing ring (1) of the SCR metering module (2).

  Parts: Sealing ring

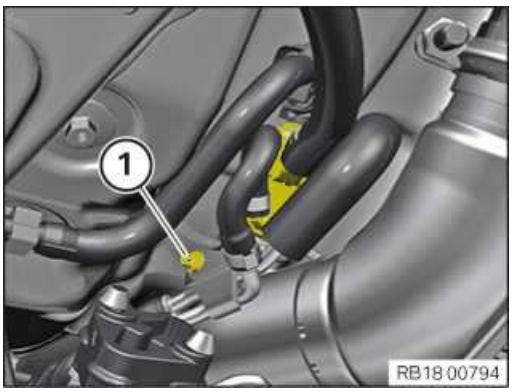


- Insert and install the SCR metering module (2).
- Renew the V-clip (1).

  Parts: V-band clamp
- Tighten V-band clamp (1).

SCR metering module V-clip to exhaust system

V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm

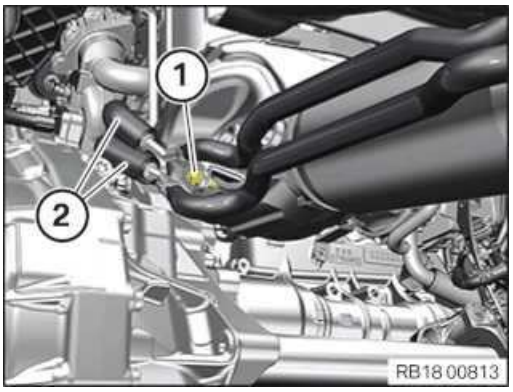


- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm

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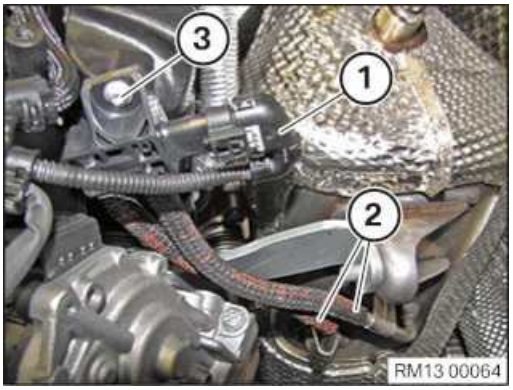


- Thread in and install coolant line (2) of the SCR metering module.
- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm

▶ **Installing differential pressure sensor**



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

54 – Install the control sensor

TECHNICAL INFORMATION

New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

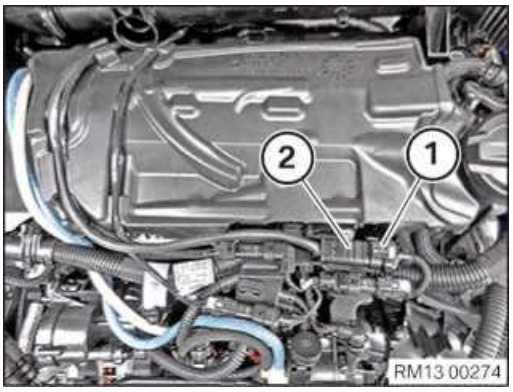


- Feed in front oxygen sensor (1) and install.
- Tighten front oxygen sensor (1) using special tool .

Control sensor

Control sensor		Tightening torque	50 Nm

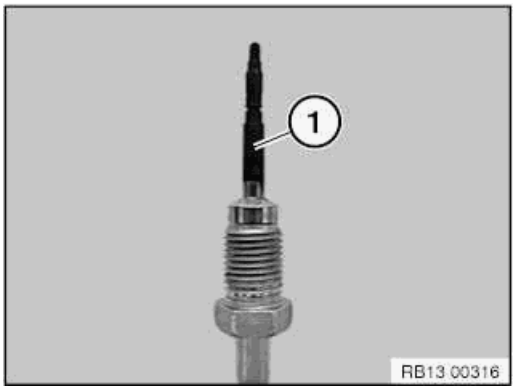
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- Lay and secure cable of oxygen control sensor.
- Secure the connector (2) to the holder.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

55 – Install the exhaust-gas temperature sensor on the diesel particulate filter



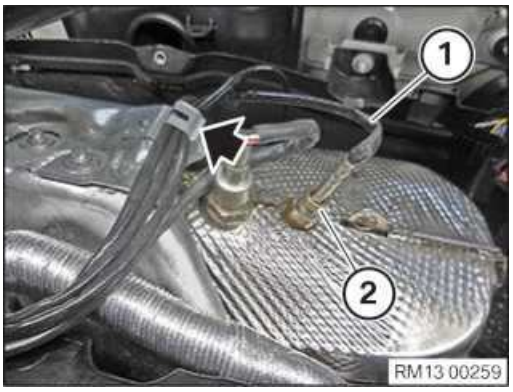
RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

- Check the gauge tip (1) for damage and renew the exhaust temperature sensor as needed.



- Feed in and install the exhaust temperature sensor (2).
- Tighten the exhaust temperature sensor (2).

Exhaust temperature sensor to diesel particulate filter

Exhaust-gas temperature sensor		Tightening torque	28 Nm

- Insert and install cable (1) of the exhaust temperature sensor in the clamp (arrow).



- Lay and fasten the cable of the exhaust gas temperature sensor.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

56 – Installing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

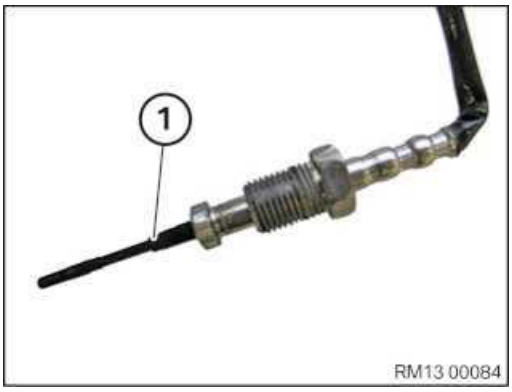
RISK OF DAMAGE

Damage of exhaust temperature sensor.

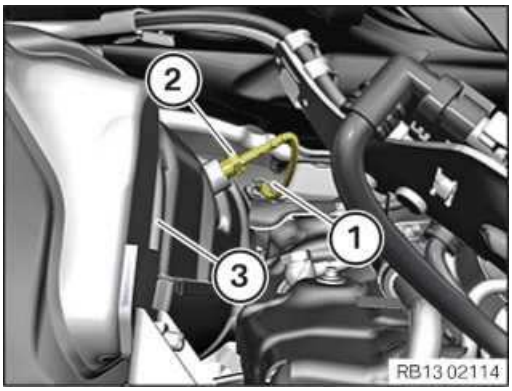
Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

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- Make sure the gauge tip (1) is not damaged during installation.



- Guide the exhaust temperature sensor (2) into diesel particulate filter (3) and install.
- Tighten the exhaust temperature sensor (2) with conventional tools .

Exhaust temperature sensor to diesel particulate filter

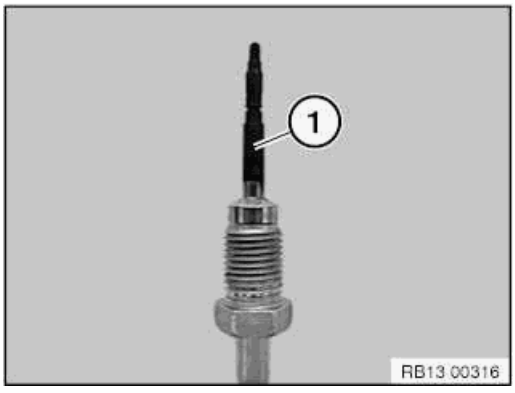
Exhaust-gas temperature sensor		Tightening torque	28 Nm



- Insert and install the cable of the exhaust temperature sensor (2) in the clamps (1).
- Lay and fasten the cable of the exhaust gas temperature sensor.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

57 – Installing exhaust temperature sensor on catalytic converter



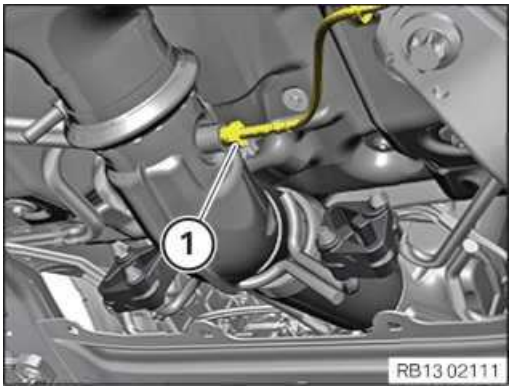
RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

- Check the gauge tip (1) for damage and replace the exhaust temperature sensor as needed.



- Feed in and install the exhaust temperature sensor (1).
- Tighten the exhaust temperature sensor (1).

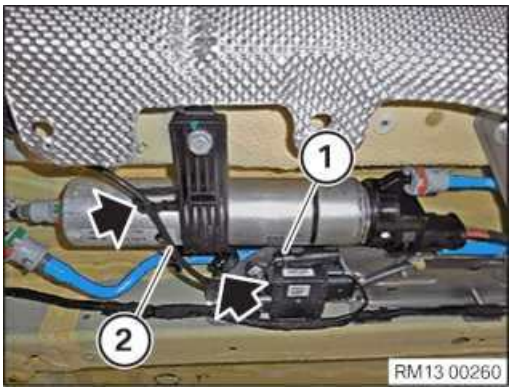
Exhaust-gas temperature sensor to exhaust system

Exhaust-gas temperature sensor		Tightening torque	28 Nm

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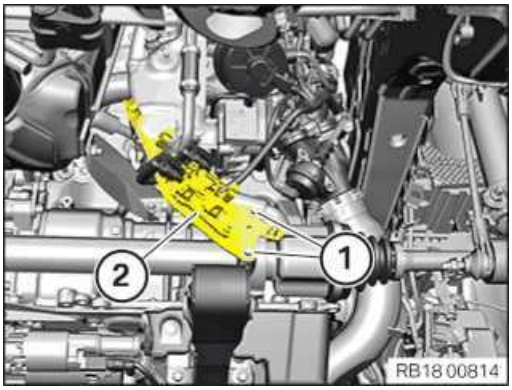
- Secure the cable clips (1).



- Feed cable (2) from exhaust temperature sensor into the clamps (arrows) and install.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

58 – Install holder for oxygen sensor

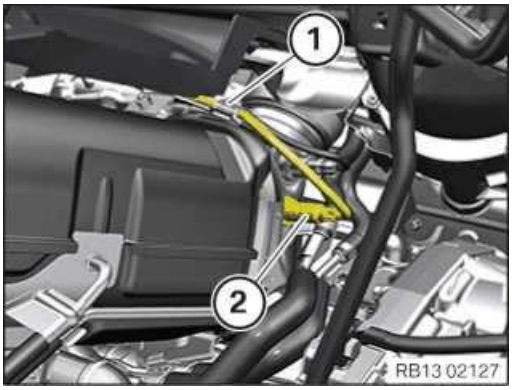


- Insert and install the holder (2).
- Tighten the screws (1).

Oxygen sensor holder to intermediate shaft

Hexagon screw M6x16		Tightening torque	8 Nm

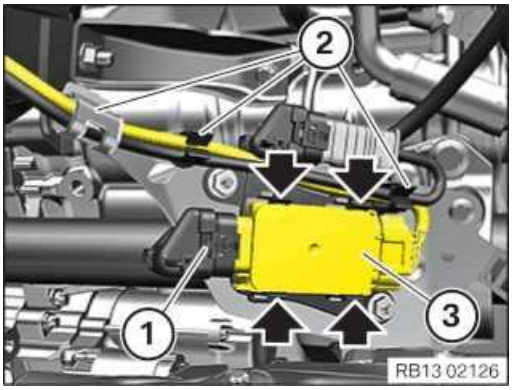
59 – Installing the nitrogen oxide sensor before SCR catalytic converter



- Insert nitrogen oxide sensor before the SCR catalytic converter (2) and install.
- Tighten the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

Nitrogen oxide sensor before SCR catalytic converter

Sensor		Tightening torque	50 Nm



- Install and lock the evaluation electronics for the nitrogen oxide sensor (3) (arrows).
- Insert the evaluation electronics cable for the nitrogen oxide sensor (3) into the clamps (2) and install.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

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60 – Install the monitoring sensor

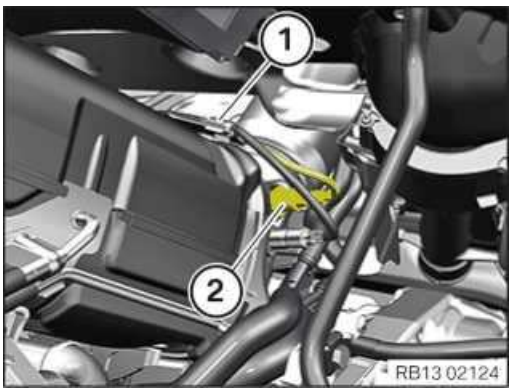
TECHNICAL INFORMATION

New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

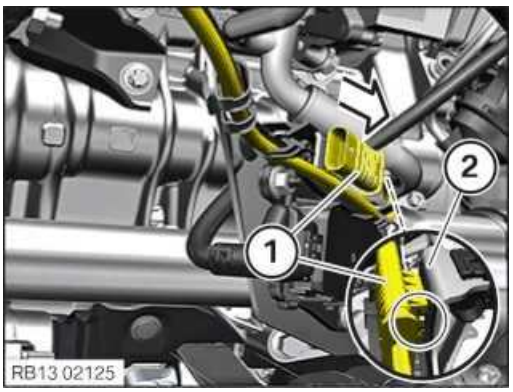


- Feed in the monitoring oxygen sensor (2) and install.
- Tighten the monitoring oxygen sensor (2) with special tool **0 491 074 (11 7 020)**.

Monitoring sensor

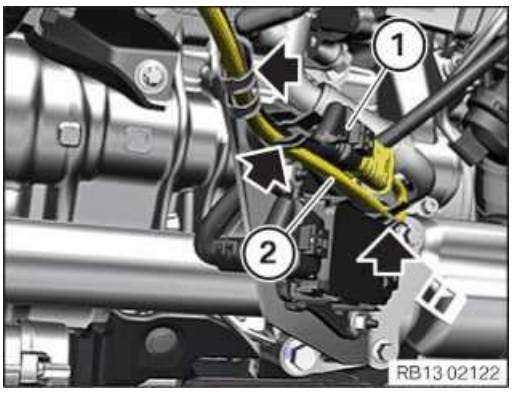
Sensor		Tightening torque	50 Nm

- Insert the cable of the monitoring oxygen sensor (2) into the clamp (1) and secure it.



- Connect the connector (1) with the bracket (2) in the direction of arrow.
- Make sure that the connector (1) is locked correctly in the marked area.

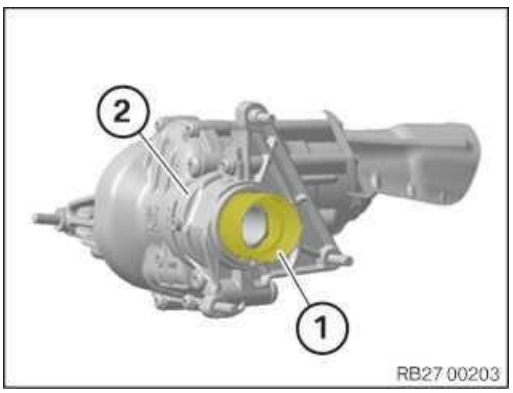
  The connector (1) must engage audibly.



- Insert and attach the cable of the monitoring oxygen sensor (2) to the clamps (arrows).
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

61 – Install the transfer box (VTG)



- If intermediate shaft (1) gets caught on transfer box (VTG) (2), renew intermediate shaft (1) and the radial shaft seals in the automatic or manual transmission.

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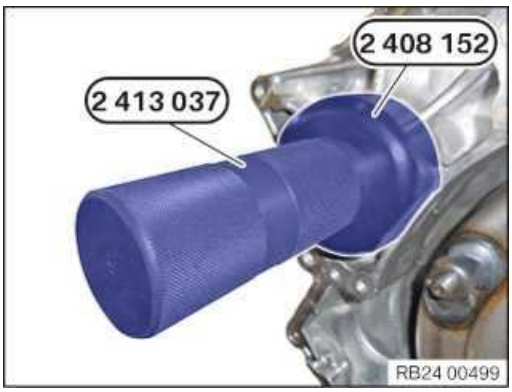
- Screw special tool **2 409 025** into the outer radial shaft seal.
- Turn the screw on the special tool **2 409 025** until the outer radial shaft seal has been pulled out.



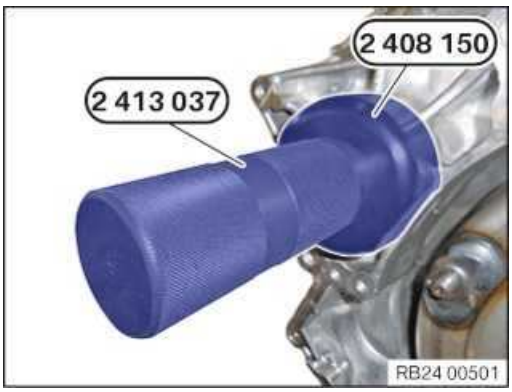
- Insert special tool **2 411 739** into the inner radial shaft seal.



- Screw special tool **2 411 739** into the inner radial shaft seal.
- Turn the screw on the special tool **2 411 739** until the inner radial shaft seal has been pulled out.

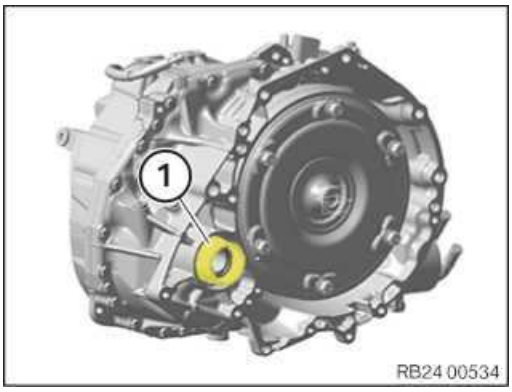


- Drive in the inner radial shaft seal using special tools **2 408 152** and **2 413 037** up to the limit position.



- Drive in the outer radial shaft seal using special tools **2 413 037** and **2 408 150** up to the limit position.

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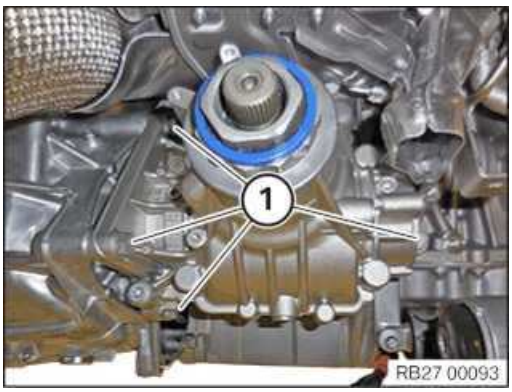
- If necessary, connect the new intermediate shaft (1) to the output flange of the automatic transmission or manual transmission.



- Coat the inside of the output flange (arrows) evenly with approx. 5 g of grease.

Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the transfer box (VTG).
- Tighten the screws (1).

Transfer box to transmission

M10		Tightening torque	56 Nm



- Install heat shield.
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Heat shield to transfer box

M6	Renew screws.	Tightening torque	6 Nm

▸ **Check the transfer box oil level**

RISK OF DAMAGE

Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.

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- Check transfer case oil level, correct:
- Open the oil filler plug (1).
- Check transfer box oil level.
- If necessary, top up transmission oil up to the lower edge of the oil filler plug opening (1).

Transmission oil

Technically suitable transfer box and electrical transmission oils	

Main group 27

- Tighten the oil filler plug (1).

Oil filler plug on transfer box (VTG)

M18x1.5		Tightening torque	35 Nm

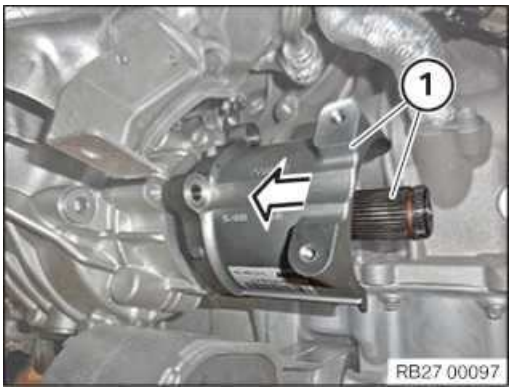
62 – Install the intermediate shaft with the support tube



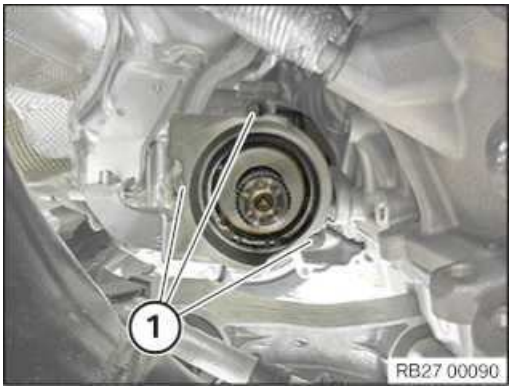
- Coat gearing of the intermediate shaft uniformly with 5 g of grease.

Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the intermediate shaft with support tube (1) in the transfer box.



- Position screws (1).

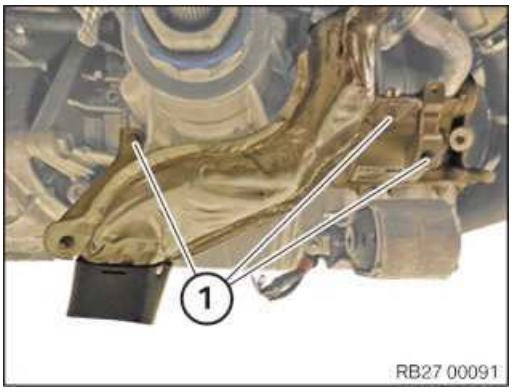
Note: Check for correct screw length! Bolt M8x35 8.8

- Tighten the screws (1).

Intermediate shaft to transfer box

M8x35		Tightening torque	19 Nm

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- If installed: Install air duct.
- Tighten the screws (1).

63 – Installing starter motor

CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.



- Insert and install the starter motor .
- Tighten the screws (1).

Starter motor to transmission

M8x45		Tightening torque	19 Nm



- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

Battery positive lead to starter

M8		Tightening torque	13,5 Nm



- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.

64 – Installing right output shaft partially

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- Renew the circlip (1).

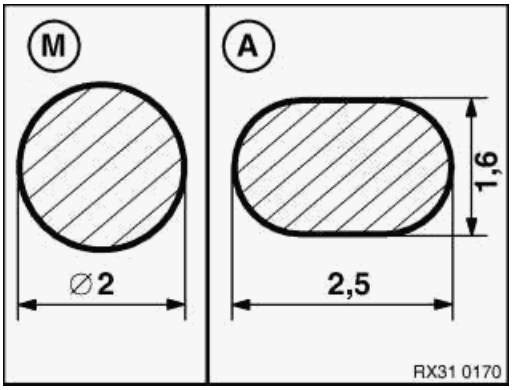
  Parts: Circlip
- Slide output shaft into the transmission as far as the limit position.
- Check for secure seat by levering.

65 – Partially installing the left output shaft



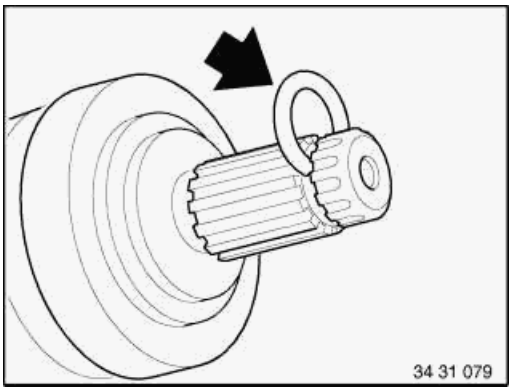
- **With automatic transmission only:**
- Lever out O-ring (1).
- Renew O-ring (1).

  Parts: O-ring
- Insert new O-ring (1).

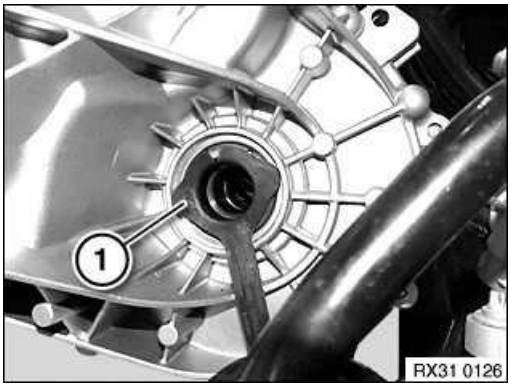


- Do not mix up circlips.

  Different types of output shafts fitted:
  - M: Manual transmission
  - A: Automatic transmission

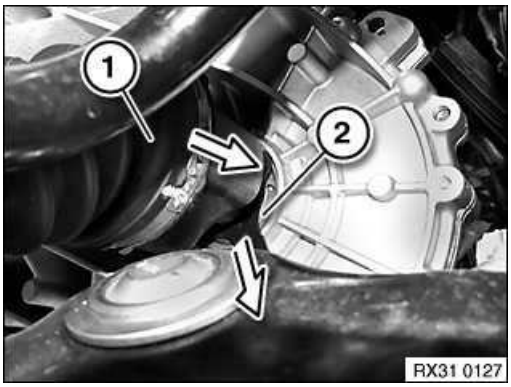


- Renew circlip (arrow).



- Insert installation protection ring (1) into the radial shaft seal.
- Make sure the tool fits over the lip of the radial shaft seal so there is no damage to sealing ring when the output shaft is inserted.

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- Insert output shaft (1) into transmission.
- **Manual gearbox only:** Pull on the handle to remove the installation protection ring (2) and dispose of it.
- Slide output shaft (1) into the transmission as far as the limit position.

  The output shaft (1) must engage audibly.
- Check for secure seat by levering.

66 – Install propeller shaft.

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

RISK OF DAMAGE

Damage to the propeller shaft during installation.

Non-observance of the installation guidelines for the propeller shaft on the rear axle differential may cause severe damage.

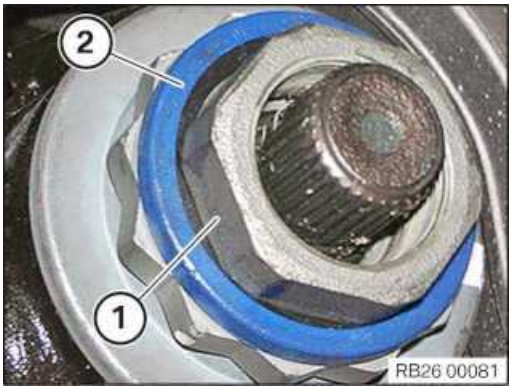
- Always renew the recessed nut on the rear axle differential. Screw locking must be available.
- Strictly observe a minimum hardening time of two hours after having screwed in the recessed nut. The hardening time may be longer at lower temperatures.

RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.



- Renew recessed nut (1).

  Parts: Insert nut
- Renew the retaining clip (2) and the seal.

  Parts: Retaining clip, seal
- Insert the seal with the recessed nut (1) and install.
- Insert the retaining clip (2) and install.
- Make sure that recessed nut (1) is screwed in within 5 min.
- Make sure that the hardening time of **minimum** 2 h for the recessed nut is observed.

  The hardening time must be extended at lower temperatures.

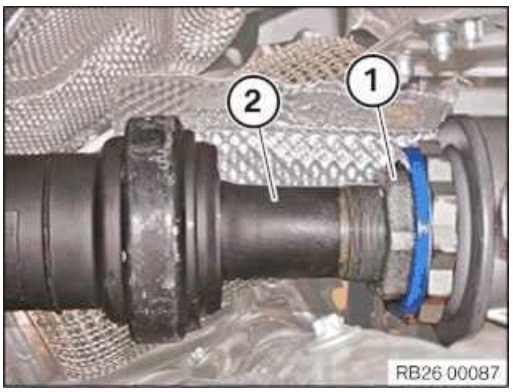
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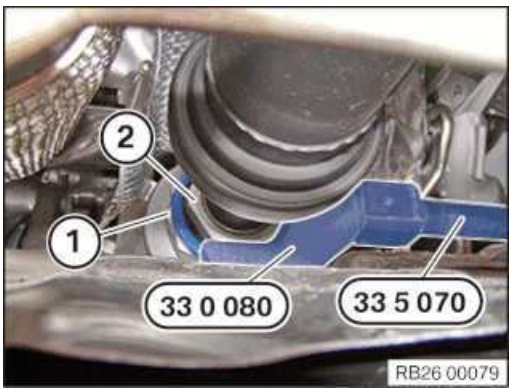
- Insert the propeller shaft (1) and install.
- Always support the propeller shaft (1) with a conventional jack.



- Hand-tighten the bolts (1).



- Push the propeller shaft (2) against the recessed nut (1) up to the limit position.
- Screw the propeller shaft (2) at least 2 thread starts onto the recessed nut (1) by hand.



RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

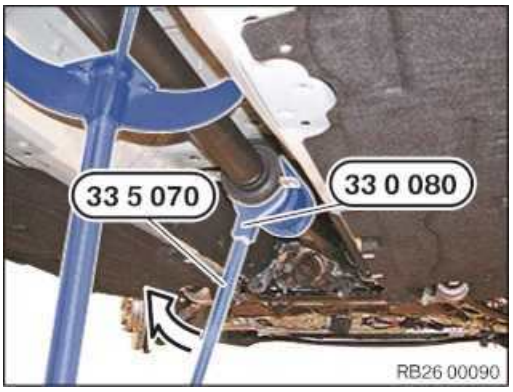
- Do not use the double hexagon head flange nut as counter support.

- Protect the recessed nut (2) on the transfer box from twisting with the special tools **0 495 554 (33 5 070)** and .

  The recessed nut (2) on the transfer box must **not** be used to tighten the propeller shaft.

  The double hexagon flange nut (1) must **not** be used for counter support.

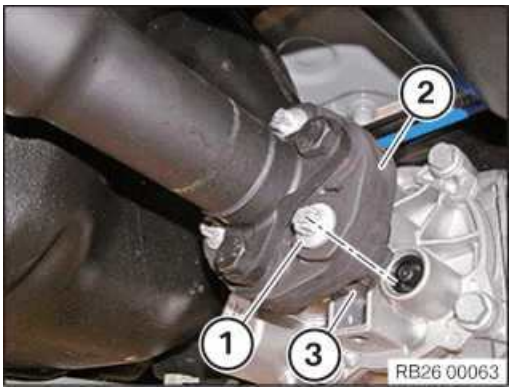
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- Tighten the front propeller shaft with the special tools **0 495 554 (33 5 070)** and in the direction of the arrow.

Propeller shaft to transfer box

		Tightening torque	80 Nm



TECHNICAL INFORMATION

Compliance with the following instructions is required to avoid a humming noise from the propeller shaft after refitting the propeller shaft.

- Assemble the screw connection (1) of the flexible disc (2) and the three-hole flange (3) according to the mark.
- Renew screws (1).

  Parts: Bolts
- Hand-tighten the bolts (1).



- Protect the propeller shaft (1) with the special tools **0 495 554 (33 5 070)** and from twisting.



- Tighten the bolts with the special tools **0 490 504 (00 9 120)** and .

Flexible disc to rear axle final drive

M12x1.5	Renew screws.	Tightening torque	55 Nm 90 °



- Tighten the screws (1).

Centre mount to body

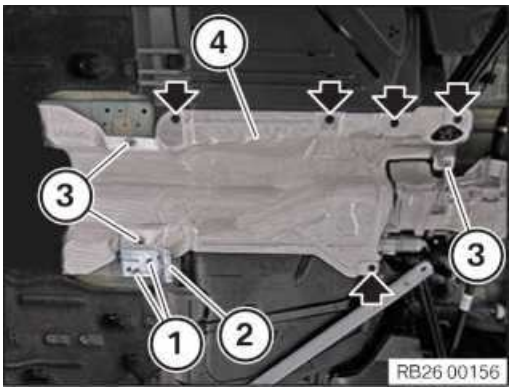
M8		Tightening torque	19 Nm

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- Guide the special too l out between the front and rear propeller shaft and remove.

67 – Installing the rear heat shield



- Insert and install the heat shield (4).
- Tighten screws (arrows).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

- Tighten nuts (3).

Heat shield to body

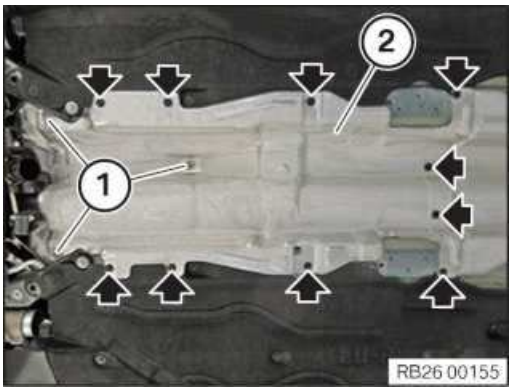
Bolts/nut		Tightening torque	3 Nm

- Insert and install the holder (2).
- Tighten the screws (1).

Bracket to body

M8		Tightening torque	21 Nm

68 – Install the front heat shield



- Insert and install the heat shield (2).
- Tighten screws (arrows).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

- Tighten nuts (1).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

69 – Install exhaust system

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

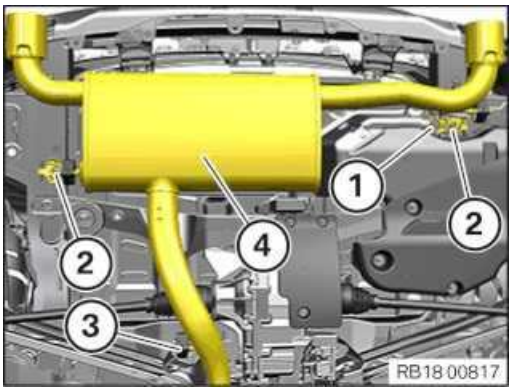
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CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Feed in and install the exhaust system (4) with a second person.
- Renew nuts (2).

  Parts: Nuts
- Tighten nuts (2).

Exhaust system to body

M8	Replace nuts.	Tightening torque	19 Nm

- Tighten down screw (1).

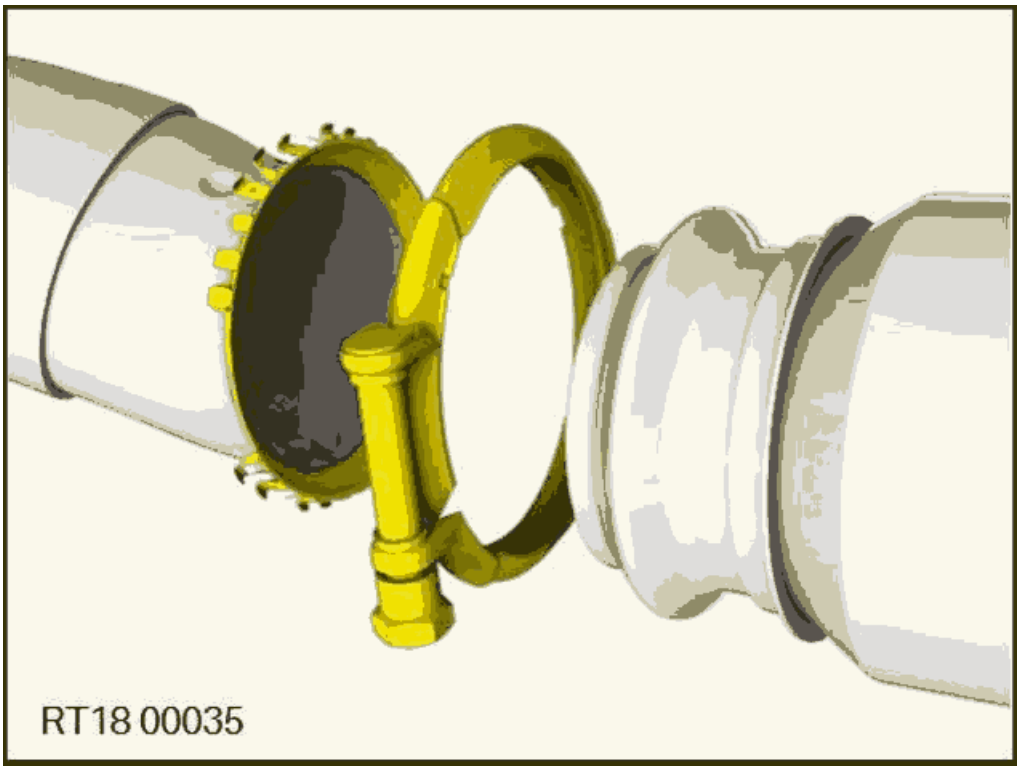
Exhaust bracket on body

Hexagon screw M8x30		Tightening torque	19 Nm

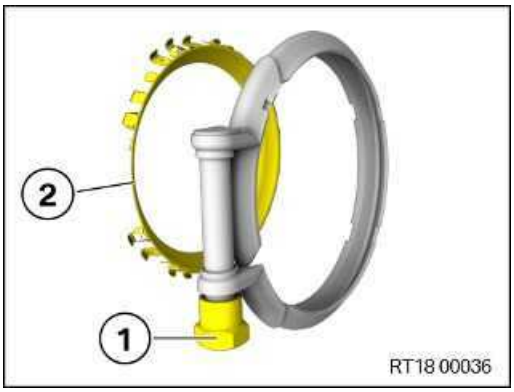
- Check the rubber mount (3) for damage and renew as needed.
- Mount rubber mount (3) on the exhaust system (4).

▸ **Install the V-clip**

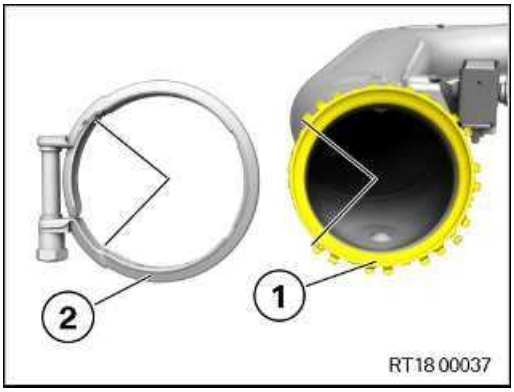
V-band clamp



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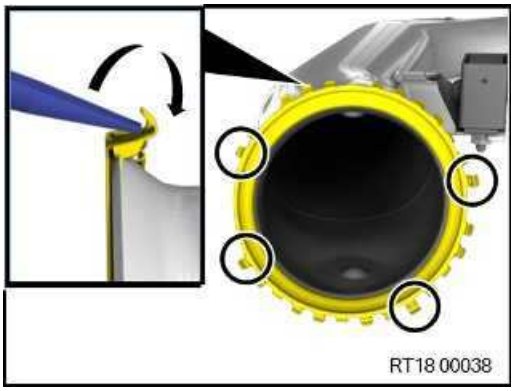


- Unscrew the nut (1) and remove the sealing ring (2).

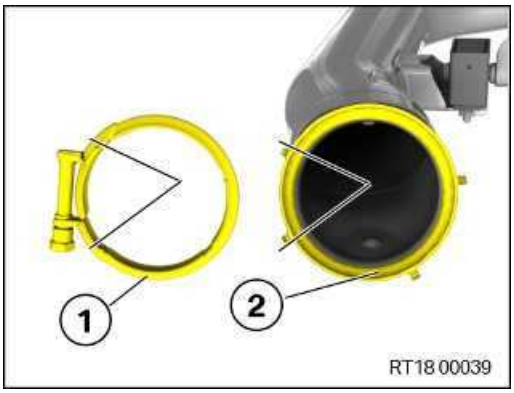


- Renew the V-clip (2).

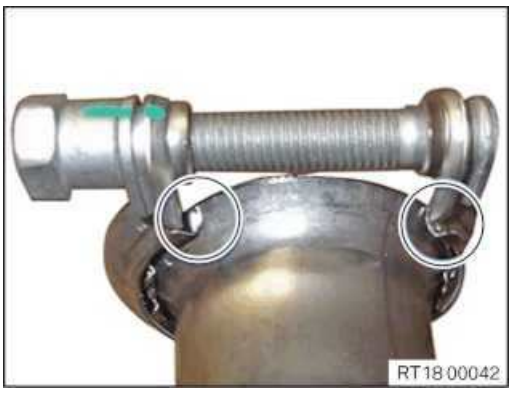
  Parts: V-band clamp
- Mount the sealing ring (1) on the exhaust system.
- Ensure that the sealing ring (1) for the V-clip (2) is positioned correctly.



- Bend all sheet metal tabs over with a suitable tool, except those in the marked areas.

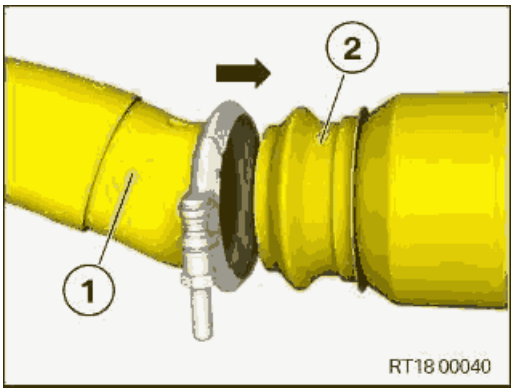


- Mount the V-clip (1) on the sealing ring (2).
- Make sure that the V-clip (1) is positioned correctly on the sealing ring (2).

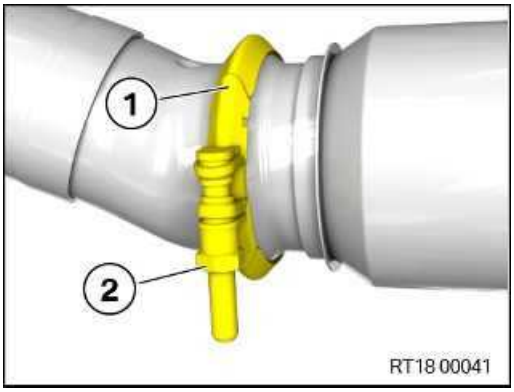


- Make sure that the V-clip rests against the sheet metal tabs after mounting (marks).

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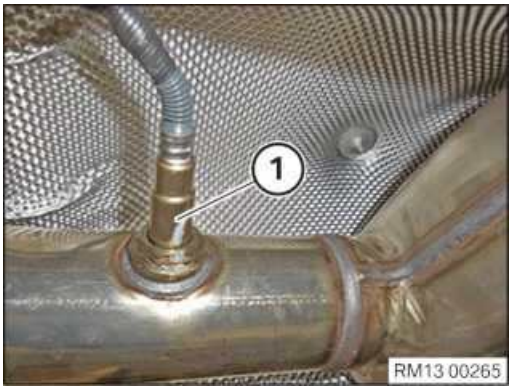
- Connect the exhaust system (1) with the catalytic converter (2) and position correctly.



- Make sure that V-clip (1) is fitted correctly.
- Tighten down screw (2).

V-clip to catalytic converter

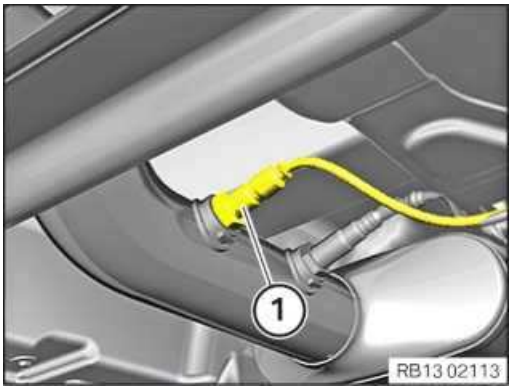
V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm



- Feed in, install and tighten diesel particulate sensor (1).

Diesel particulate sensor to exhaust system

Sensor		Tightening torque	50 Nm



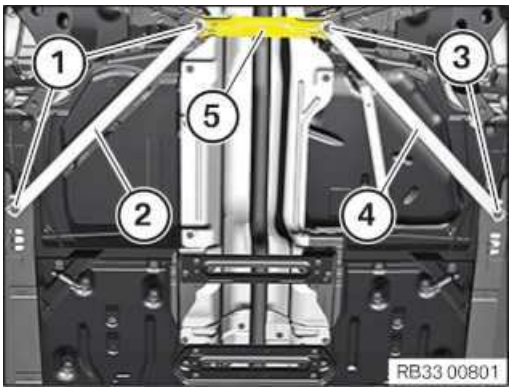
- Feed in, install and tighten nitrogen oxide sensor (1).

Nitrogen oxide sensor downstream of SCR catalytic converter

Sensor		Tightening torque	50 Nm

70 – Install the cross-member with torsion struts

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- Insert and install the cross-member (5).
- Thread in torsion strut (4) at right and install.
- Renew screws (3).

  Parts: Bolts
- Tighten down screws (3).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

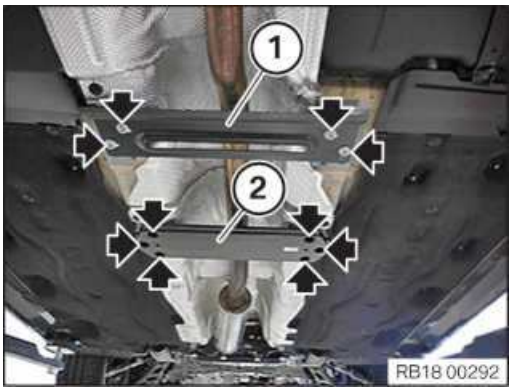
- Guide in and install the left torsion strut (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

71 – Install the connecting support on the tunnel in front and back



- Insert and install connecting supports (2).
- Tighten the screws (arrows) from the connecting support (2).

Front connection carrier to body

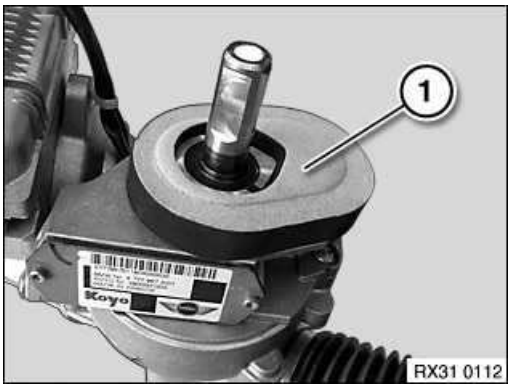
M10x18		Tightening torque	56 Nm

- Insert and install connecting supports (1).
- Tighten the screws (arrows) from the connecting support (1).

Rear connection carrier to body

M8x18		Tightening torque	28 Nm

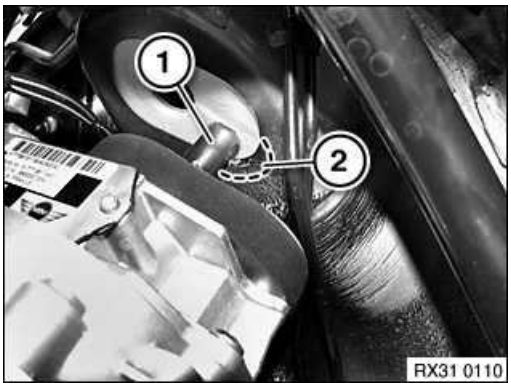
72 – Mount and secure the complete front axle



- Remove the seal (1).
- Clean surface on steering gear.
- Renew gasket (1).

  Parts: Gasket
- Position the seal (1) and glue it on.

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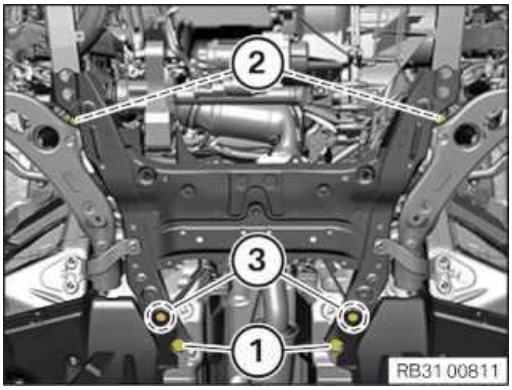


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- Position front axle support.
- Bend underbody panellings in the areas (3) to one side.
- Raise front axle support.
- When raising, insert charge air cooler into the rubber mount of the charge air cooler on cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

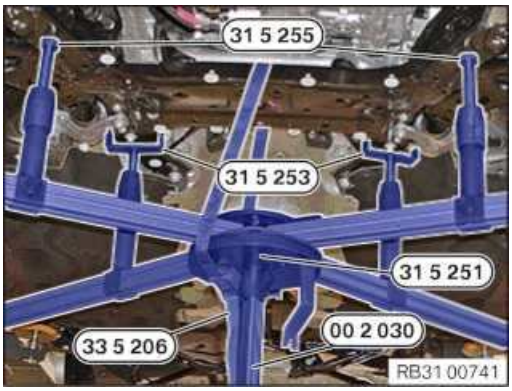
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

- If necessary, tighten the screws in the areas (3).

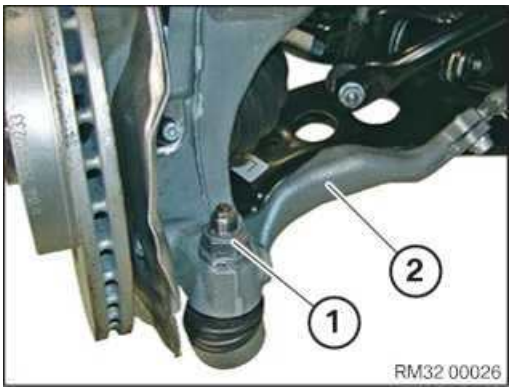
Underbody protection to body

Screw		Tightening torque	3 Nm



- Remove special tool from special tool .
- Lower universal jack **0 490 133 (00 2 030)** with the special tool and place it to the side.

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NOTICE

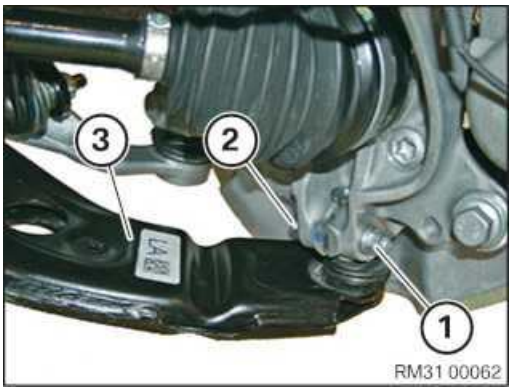
Perform the operations on the left and right side.

- Position the track rod (2) on the swivel bearing .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Track rod end to swivel bearing

M14	Renew nut.	Tightening torque	175 Nm



NOTICE

Perform the operations on the left and right side.

- Position the wishbone (3) on the swivel bearing .
- Renew the bolt (2) and the nut (1).

  Parts: Bolt, nut
- Insert screw (2).
- Tighten nut (1).

Wishbone to swivel bearing

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

73 – Install the mounted parts on the front axle support



NOTICE

Perform the operations on the left and right side.

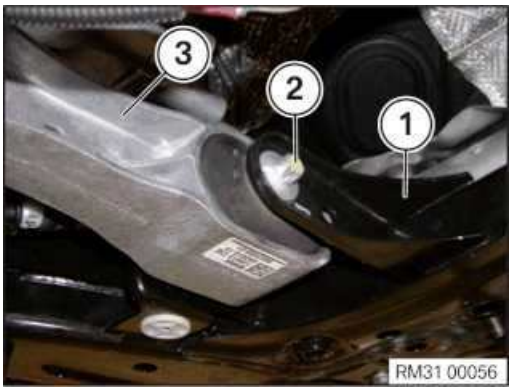
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Holder, wishbone rubber mount, to body

M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °

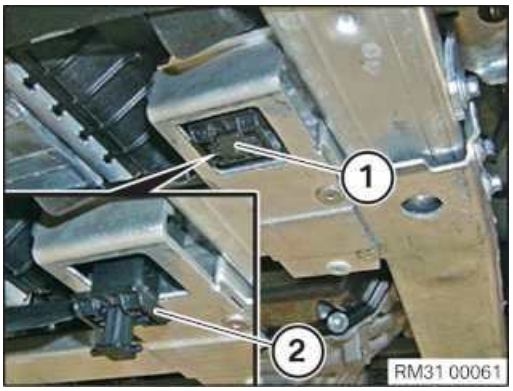
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- Position the engine support (3) on the front axle support (1).
- Tighten down screw (2).

Holder with rubber mount to front axle support

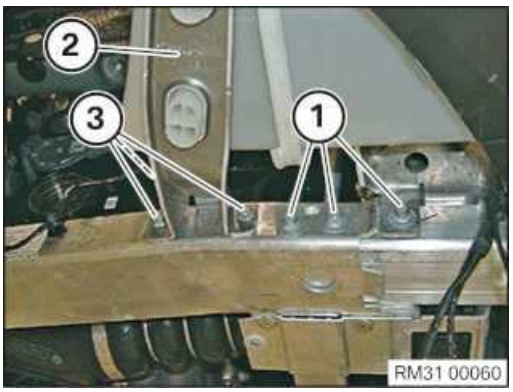
M12 screw		100 Nm



NOTICE

Perform the operations on the left and right side.

- Position the lock (2).
- Lock the bracket (1) of the lock (2) of the holder for the charge air cooler.



- **Only on right side:** Position the holder for the washer fluid reservoir (2).
- Tighten down screws (3).

Washer fluid reservoir holder to front axle support adapter plate

		Tightening torque	10 Nm

NOTICE

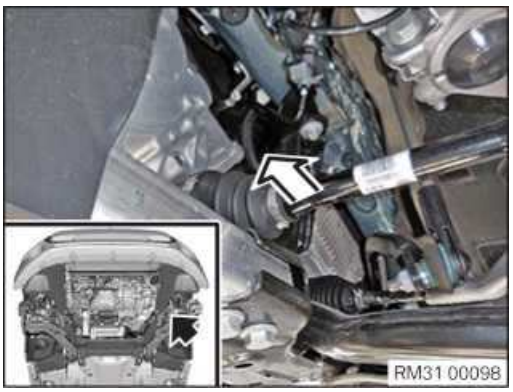
Perform the operations on the left and right side.

- Tighten the screws (1).

Deformation element, bottom, to adapter plate, front axle carrier

		Tightening torque	11,8 Nm

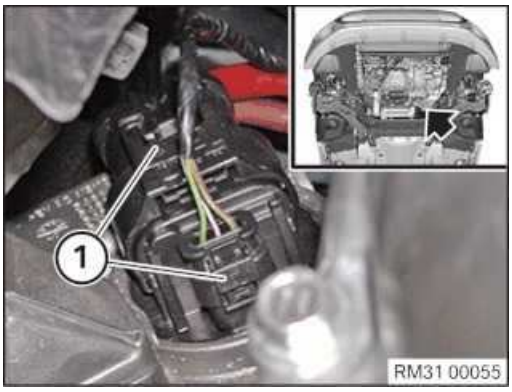
74 – Attaching connector at steering gear



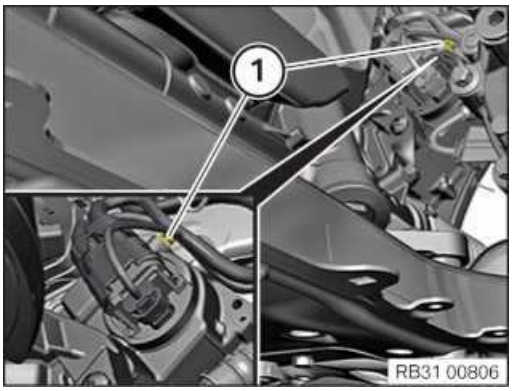
- To connect the connector (see the following step): Connect the connector with the right hand.

  The connectors can be accessed via the left output shaft.

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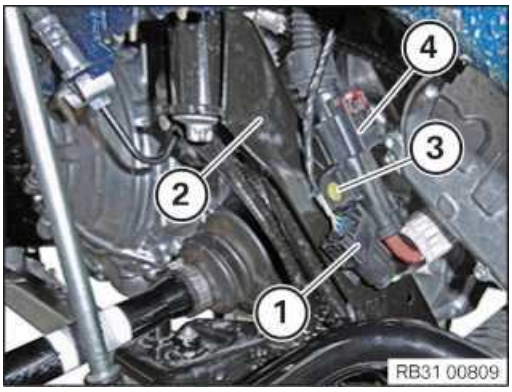


- Connect and lock connector (arrow) (1) with the steering gear.



- Fasten the wiring harness (1) on the steering gear.

▸ **If installed: Fasten the plug connections at the front axle support**



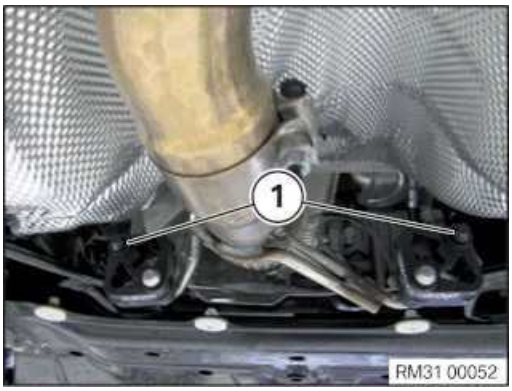
- Position the plug connection (4) at the front axle support (2).
- Tighten down screw (3).

Holder to front axle support

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

- Fasten the plug connection (1) at the front axle support (2).

75 – Securing rubber mount on front axle support



- Check rubber mount (1), replace if necessary.

  Parts: Rubber mount
- Spray rubber mount (1) with lubricant and slide onto holder on front axle support.

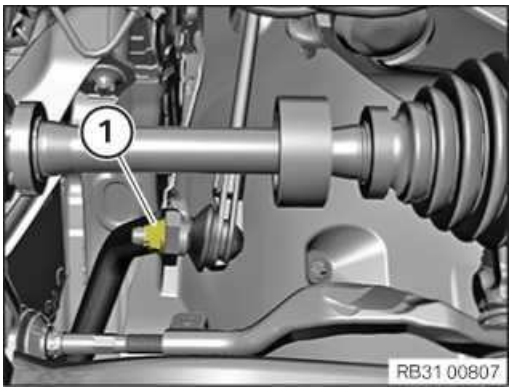
76 – Securing anti-roll bar on left and right on the anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▸ **Fastening anti-roll bar on the anti-roll bar link**

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- Position the anti-roll bar link on the anti-roll bar .
- Renew nut (1).

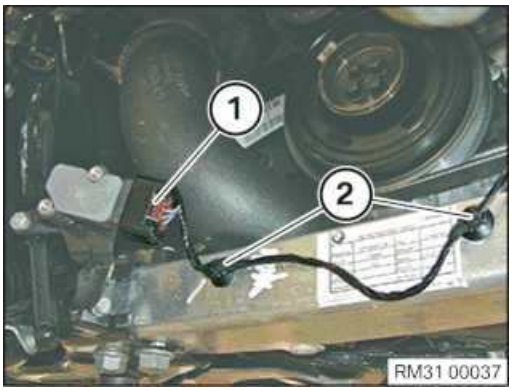
  Parts: Nut
- Tighten nut (1).

Note: Use the Torx socket for counter support.

Anti-roll bar link to anti-roll bar

M10	Renew nut.	Tightening torque	56 Nm

77 – With right installation: Securing the cable for the ride height sensor



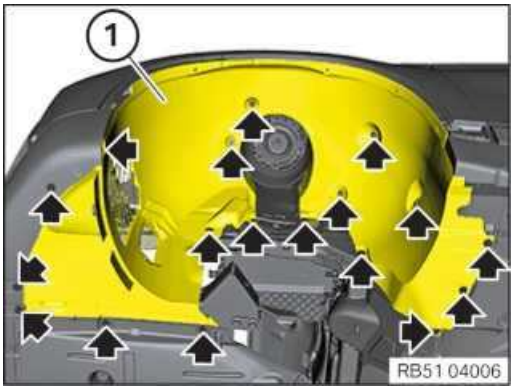
- Secure the cable clip (2) on the adapter of the deformation element.
- Connect connectors (1) and lock.

78 – Installing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

▸ **Installing the front wheel arch cover**



- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Plastic nut		Tightening torque	2,6 Nm
Screw		Tightening torque	2,6 Nm

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

▸ **Installing front wheel arch trim**

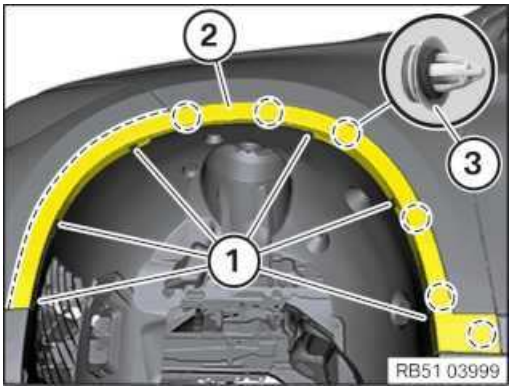
NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

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NOTICE

Description is for left component only. Procedure on the right side is identical.



- Check the clips (3) for damage and renew where required.

  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

79 – Installing both front wheels

▶ **Mounting the wheel**

▷ **Clean the contact surfaces between the brake disc and the wheel rim**



TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

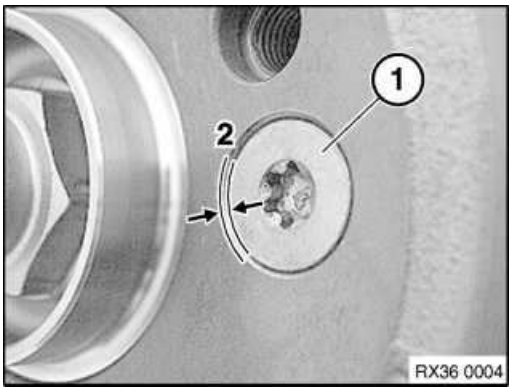
  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue in the area of the wheel bolt holes, remove and clean the brake disc.



- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

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- Renew mounting bolt (1).

  Parts: Mounting bolt

- Check that the mounting bolt (1) for the brake disc is securely seated.

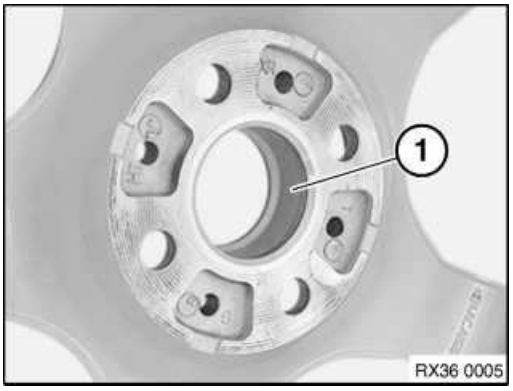
  The mounting bolt (1) for the brake disc may not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to rear wheel hub

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub

M8	Renew screw.	Tightening torque	16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring (1).

◁

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

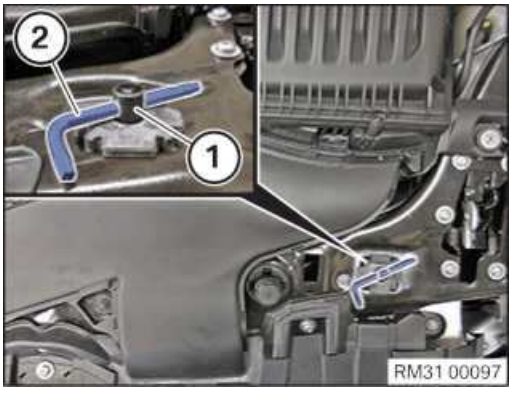
  Parts: Wheel bolts
- Clean the wheel bolts.
- Check the wheel bolts and threads for damage, renew the wheel bolts if necessary.
- Join and tighten the wheel bolts (arrows).

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

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80 – Removing fastener for left and right radiator



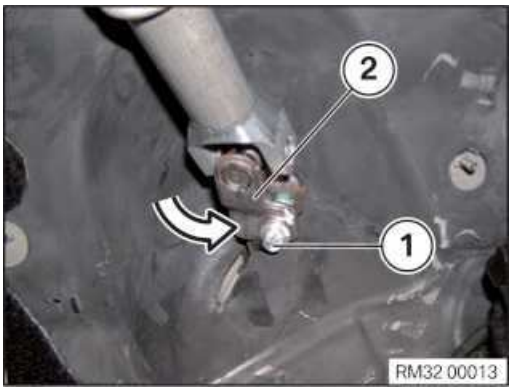
NOTICE

Perform the operations on the left and right side.

- Remove suitable tool (2) from the centering pin (1).

81 – Secure the steering shaft at the bottom on the steering gear

81 – Secure the steering shaft at the bottom on the steering gear



- Clean the screw lock residue from the screw thread in the universal joint (2).
- Pivot the universal joint (2) in the direction of the arrow to the steering gear.
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Lower steering shaft to steering gear

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

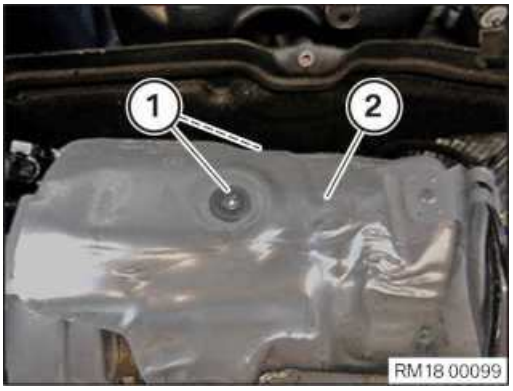


- **If installed:**
- Position the cover on the steering column (2).
- Tighten nuts (1).

Steering column cover to bulkhead

Plastic nut		Tightening torque	3 Nm

82 – Install the heat shield on the exhaust turbocharger



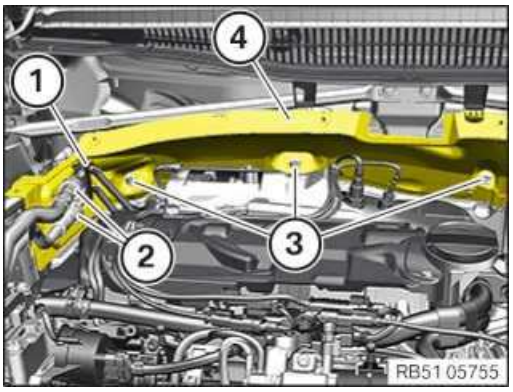
- Feed in and install the heat shield (2).
- Tighten the screws (1) at the top and bottom of the heat shield.

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Fasten the cable at the clips .

83 – Installing rear bulkhead upper part



- Feed in and install the rear bulkhead upper part (4).
- Tighten down screws (3).

Rear bulkhead upper part to lower section of bulkhead

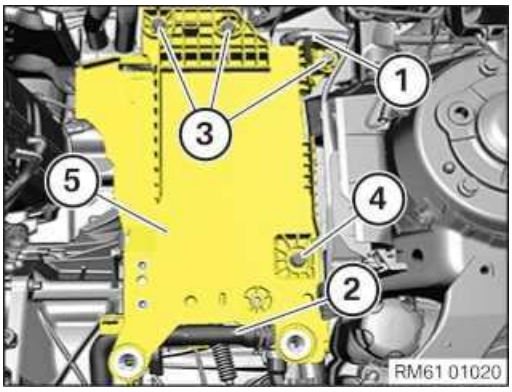
Oval-head screw		Tightening torque	5 Nm

- Feed the fuel line (2) into the holder (1) and install.
- Connect and lock the holder (1).

  The holder (1) must engage audibly.

84 – Install the battery holder

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- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

85 – Install electronics box

Prerequisite

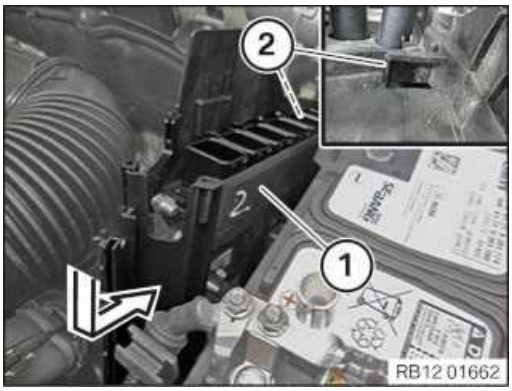
Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.

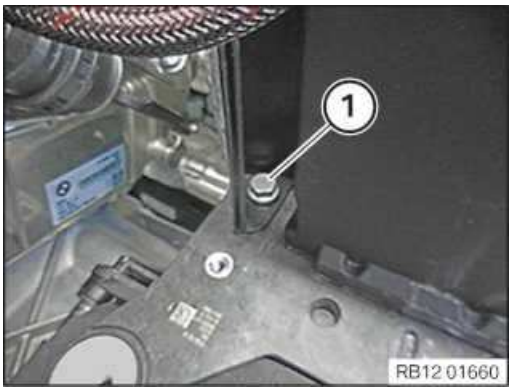


- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.



- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).

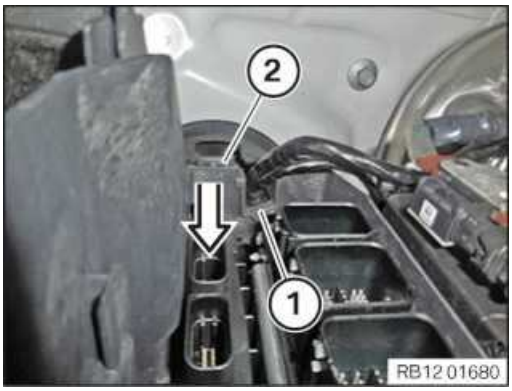
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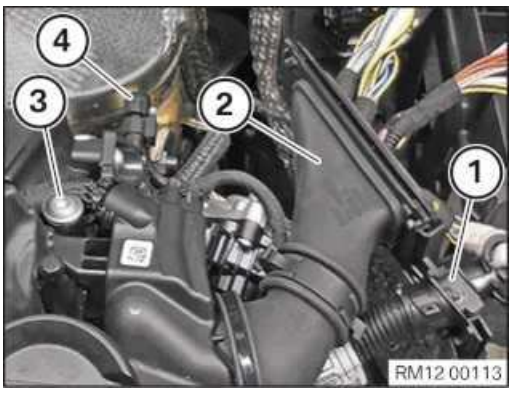
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.

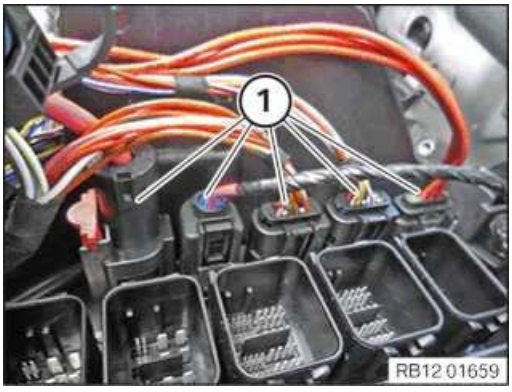


- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

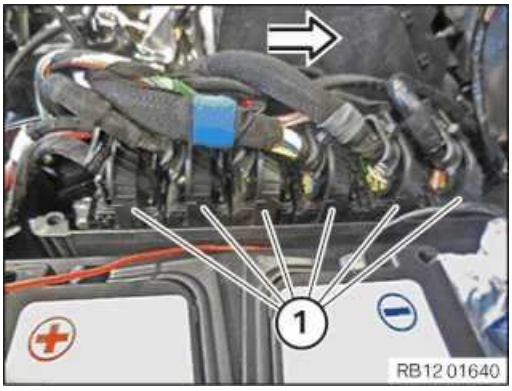
Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.

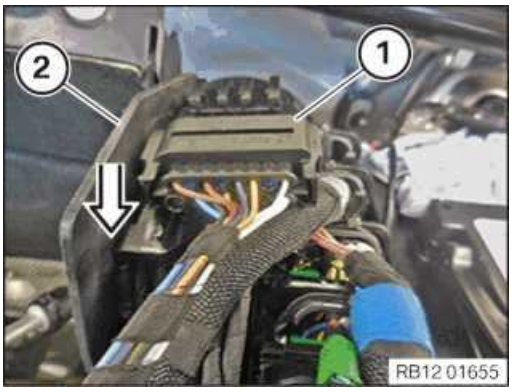


- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.

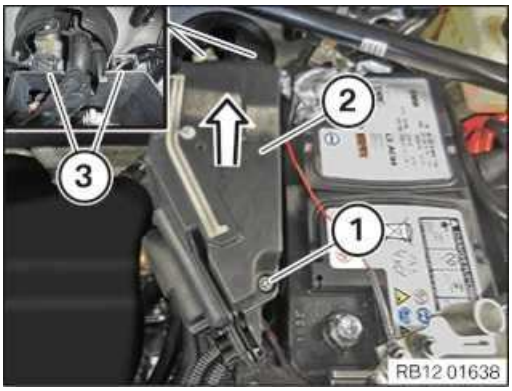


- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.

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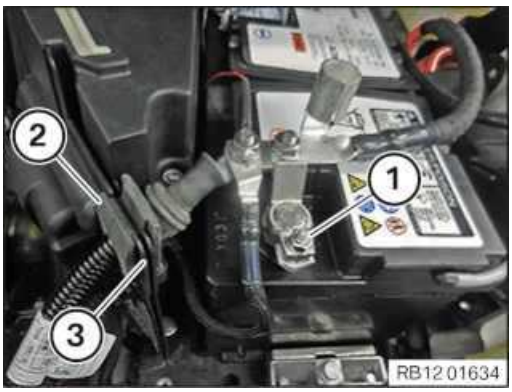
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

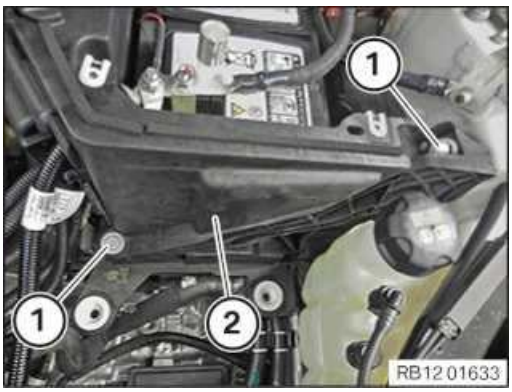
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

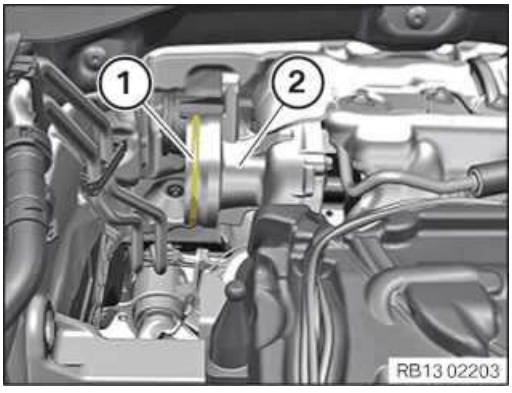


- Feed in and install tension strut (2).
- Tighten the screws (1).

Tension strut to spring strut dome/battery tray

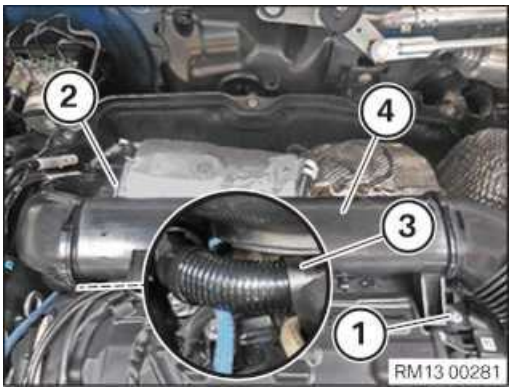
M8		Tightening torque	19 Nm

86 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.

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- Feed in clean air pipe and install.
- Connect clean air pipe to the exhaust turbocharger and lock audibly in the clamps (2).
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Connect ventilation line (3) to the cylinder head cover and lock audibly.

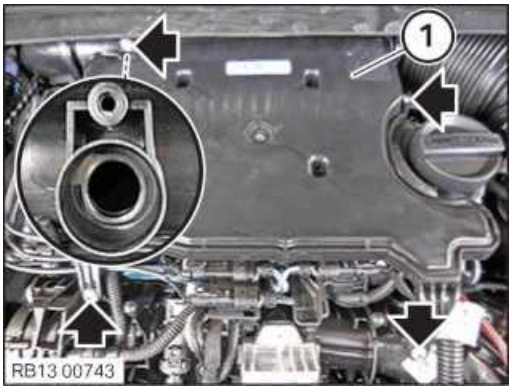


- Mount clean air pipe onto the intake filter housing.
- Tighten clamp (1) on the clean air pipe.

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

87 – Install resonator



- Insert and install the resonator (1).
- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

88 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

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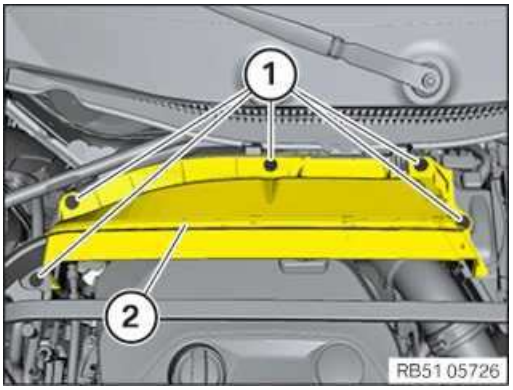


- Check for correct installation of all rubber mounts in the acoustic cover (1).



- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

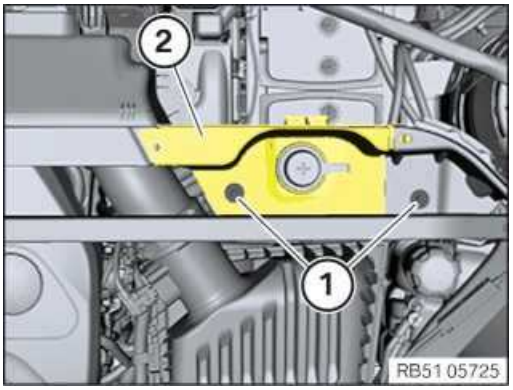
89 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Cover of top bulkhead

Screw		Tightening torque	2,6 Nm



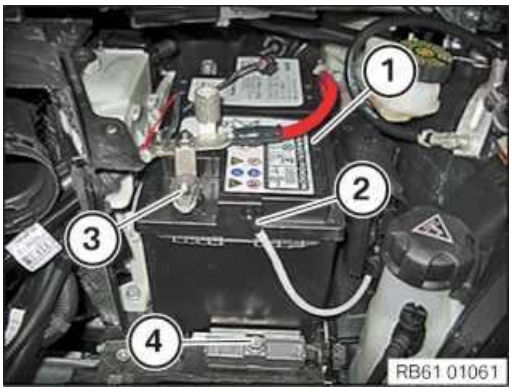
- Guide in and install cover (2).
- Tighten down screw (1).

Cover of remote positive terminal

Screw		Tightening torque	2,6 Nm

90 – Install vehicle battery

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- Install vehicle battery (1).
- Position the bracket and tighten with the screw (4) .

Battery terminal rail to battery tray

M8		19 Nm

- Position the vent hose (2) and clip it in.
- Position the positive battery terminal and tighten with the nut (3) .

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

▸ **Check the vent holes of the battery**

WARNING

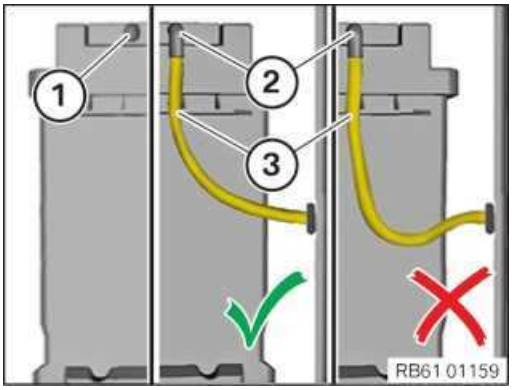
Gas emission.

Danger of injury! Danger of explosion!

- Assign the vent holes correctly.
- Route the vent hose correctly.

TECHNICAL INFORMATION

The battery has two vent holes, opposite:
One vent hole (1) must be closed correctly with a dummy plug.
The vent hose (3) must be correctly connected and routed at the other vent hole (2).



Check

- Check if the vent hole (1) is correctly closed with a dummy plug.

Result

» No dummy plug.

Measure

- Close the vent hole (1) correctly with a dummy plug.

Check

- Check if the vent hole (2) has a correctly connected vent hose (3).

Result

» The vent hose (3) is not correctly connected.

Measure

- At the vent hole (2), connect the vent hose (3) correctly.

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Check

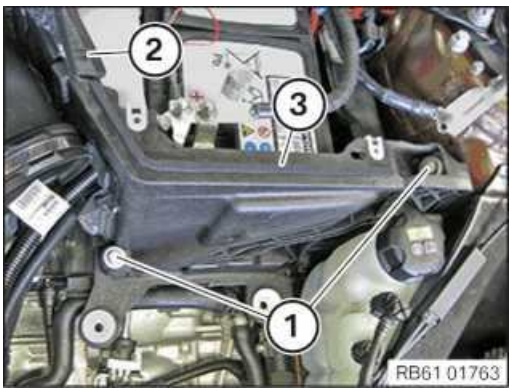
- Check if the vent hose (3) is routed to the outside with a downhill gradient (**no siphon formation!**).

Result

» The vent hose (3) is not correctly routed as shown in the image on the right.

Measure

- Route the vent hose (3) correctly as shown in the centre image.



- Insert tension strut (3) and tighten with screws (1).

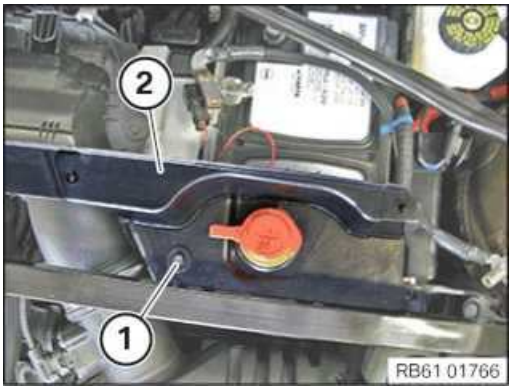
Trailing link

M8		Tightening torque	19 Nm

- Tighten down screw (2).

Battery cover

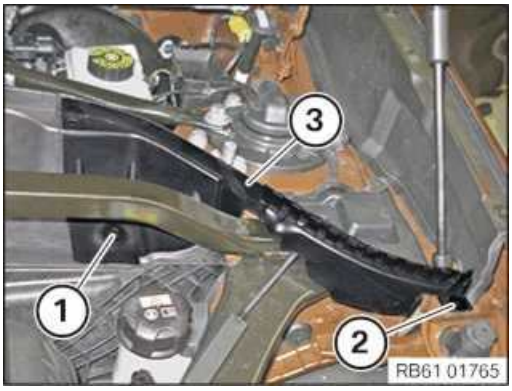
M8		2,8 Nm



- Position the cover (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm

91 – Connecting the battery earth lead

TECHNICAL INFORMATION

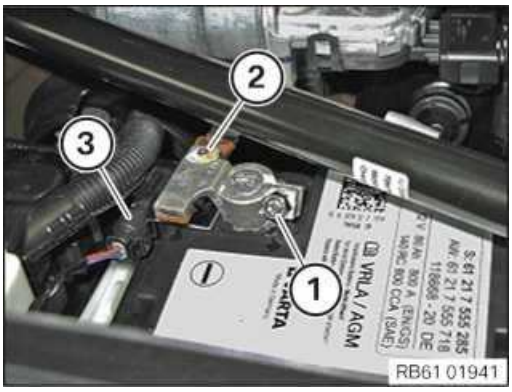
For additional information see:

61 00 ... Safety information on handling the vehicle battery

61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery

61 12 ... Notes on the intelligent battery sensor (IBS)

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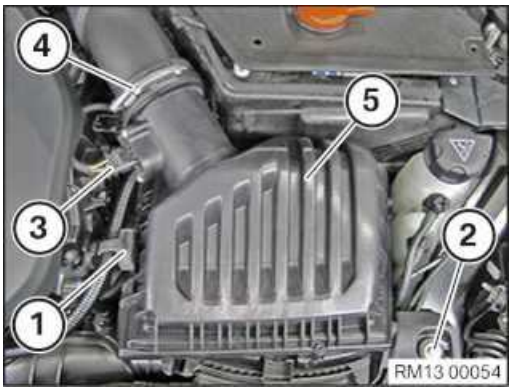
- Remove the protective cover of the positive battery terminal.
- Position the battery earth lead (2).
- Tighten nut (1).

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

- If required, connect the connector (3).

92 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.

  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

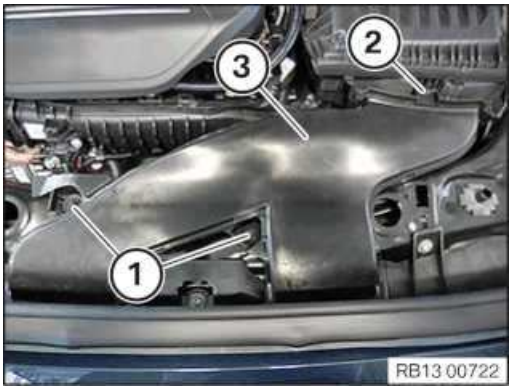
Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Insert and install the holder (1).

93 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

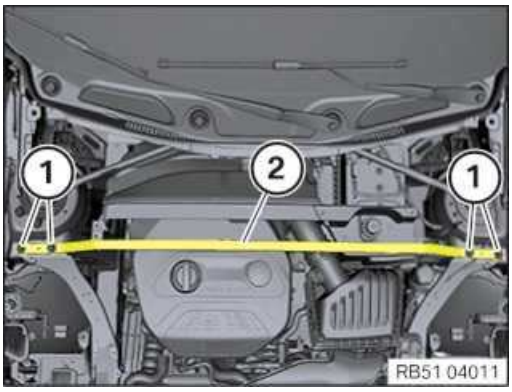
M6		Tightening torque	8 Nm

94 – Install strut brace

TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.

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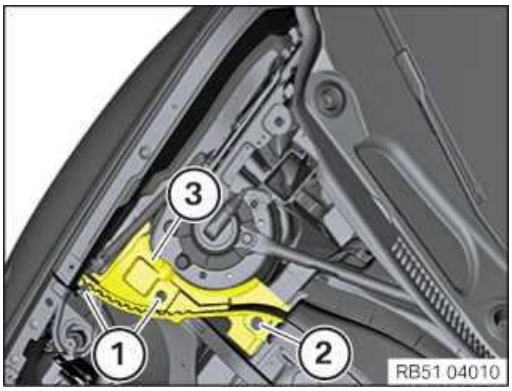


- Install the strut brace (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-brace to spring strut dome

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °



NOTICE

Description is for right component only. The procedure on the left side is identical.

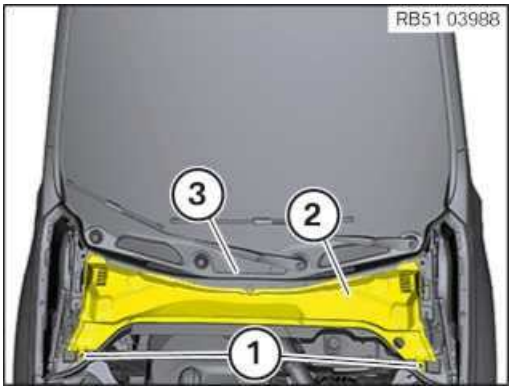
- Install the cover (3).
- Tighten down screw (2).

Cover on body

Hexagon screw		Tightening torque	3 Nm

- Install the expanding rivet (1).

95 – Installing front cowl panel cover

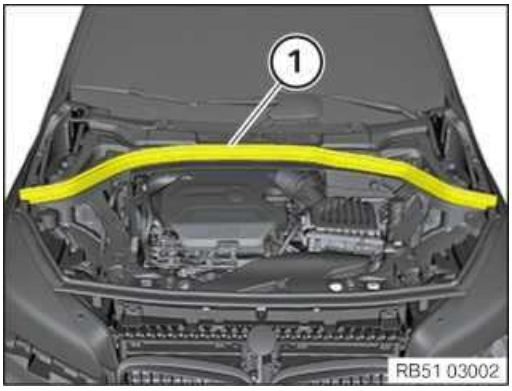


- Insert and install cowl panel cover at front (2) into cowl panel cover at rear (3).
- Check cowl panel cover at front is correctly seated (2).
- Secure expanding rivet (1).

96 – Install the seal for the bonnet

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

97 – Checking/topping up oil level in automatic gearbox (AISIN GA8G45)

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Prerequisite

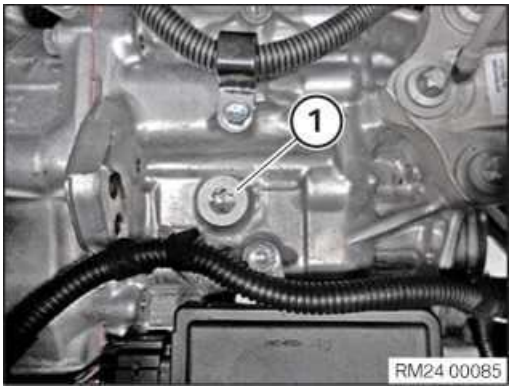
Vehicle in horizontal position.

CAUTION

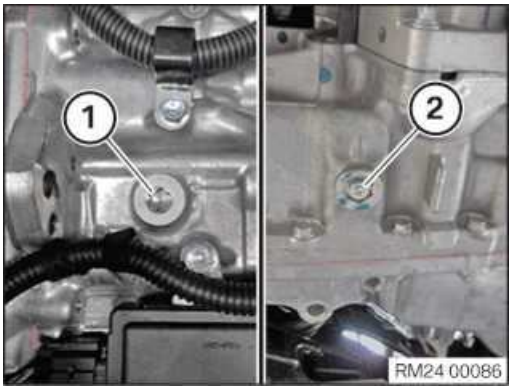
Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.



- Move the selector lever to the "P" position.
- Secure vehicle to prevent it rolling.
- Connect diagnosis system.
- Release the oil filler plug (1) using the Torx T55 .



- **Topping up the automatic transmission fluid (the automatic transmission fluid was drained):**
- Release oil filler plug (1) from engine compartment.
- Loosen the overflow plug (2) below at the transmission.
- Top up automatic transmission fluid at oil filler plug (1) until oil emerges at overflow plug (2).
- Start engine and run at idle speed.
- Check whether the automatic transmission fluid is leaking at the overflow plug (2) .
- If there is no automatic transmission fluid leaking at the overflow plug (2) , fill in the automatic transmission fluid to the oil filler plug (1) .
- Press the footbrake and, when idle, shift through all the gears from "P" to "D" 2 times for more than 2 seconds .
- Move the selector lever to the "P" position.
- Check again whether the automatic transmission fluid is leaking at the overflow plug(2) .
- Read the temperature of the automatic transmission fluid with the diagnosis system.
- Increase temperature of automatic transmission fluid to 35 °C to 45 °C.
- Top up automatic transmission fluid until it flows over.
- Renew sealing rings.

  Parts: Sealing ring
- Screw in and fasten oil filler plug (1) and overflow plug (2).

Oil filler plug to transmission housing

M14	Renew the sealing ring.	Tightening torque	45 Nm

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Overflow screw in oil drain plug

M6	Renew the sealing ring.		8 Nm

- **Check oil level (transmission oil temperature must be between** 35 °C **and** 45 °C **):**
- Open the oil filler plug (1).
- Slacken overflow plug (2).
- Start engine and run at idle speed.
- Unscrew and remove overflow plug (2).
- Check whether the automatic transmission fluid is leaking at the overflow plug (2) .
- If there is no automatic transmission fluid leaking at the overflow plug (2) , fill in the automatic transmission fluid to the oil filler plug (1) .
- Top up the automatic transmission fluid until it overflows at the overflow plug (2) .
- Press the footbrake and, when idle, shift through all the gears from "P" to "D" 2 times for more than 2 seconds .
- Move the selector lever to the "P" position.
- Check the oil level again.
- Renew sealing rings.

  Parts: Sealing ring
- If the oil escapes slightly from the overflow plug (2) , tighten the overflow plug (2) and the oil filler plug (1) .

Overflow screw in oil drain plug

M6	Renew the sealing ring.		8 Nm

Oil filler plug to transmission housing

M14	Renew the sealing ring.	Tightening torque	45 Nm

98 – Topping up oil level in the manual gearbox (GS6X60DA)

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

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TECHNICAL INFORMATION

Make sure during removal of the filling/level control screw to note the installed filling/level control screw variant.

It is **mandatory** to use variant 1 in transmissions up to production date 08/2015.

It is **mandatory** to use variant 2 in transmissions from production date 08/2015.

Failure to observe will result in a leak on the transmission.

- Variant 1 **until** production date 08/2015.
- Variant 2 **from** production date 08/2015.



- Unscrew filling/level control screw (1) and fill the transmission until the oil overflows.

Transmission oil capacity

Transmission oil GS6-60DA, GS6X60DA/Owner's Handbook	2,2 l

Transmission oil: Technically suitable manual gearbox oil

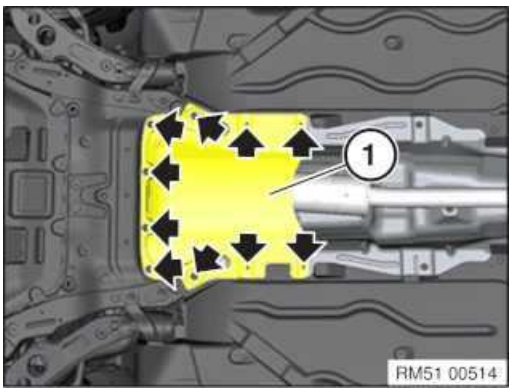
- Allow surplus oil to drain off.
- Renew the filling/level control screw (1).

  Parts: Filling/level control screw
- Tighten filling/level control screw (1).

Oil drain plug / oil filler plug

Hexagon socket		Tightening torque	43 Nm

99 – If installed: Installing underbody protection at rear

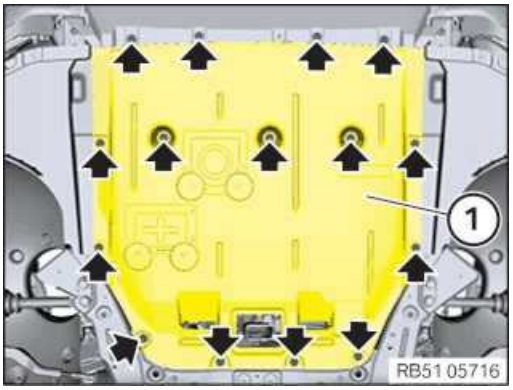


- Position rear underbody protection (1).
- Tighten screws (arrows).

Underbody protection to body

Screw		Tightening torque	3 Nm

100 – Installing the front underbody protection

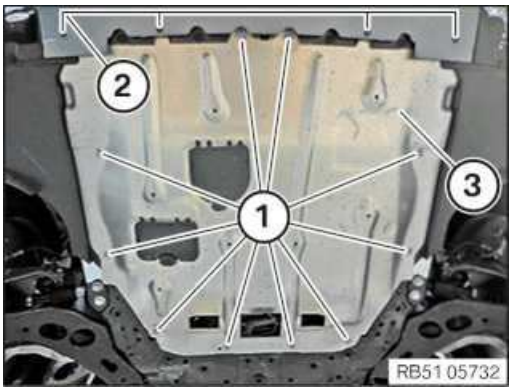


- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

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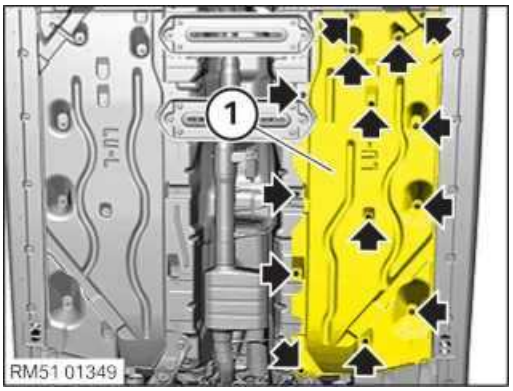


- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

101 – Installing underbody panelling , right



- Correctly position the underbody panelling (1).
- Tighten all bolts and nuts (arrows).

Underbody panelling, side

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side

Plastic nut		Tightening torque	2,6 Nm

Additional Information

Overview of Tightening Torques

Exhaust turbocharger to exhaust manifold Used in step 51

V-band clamp		Tightening torque	19 Nm

Oil feed line to bracket Used in step 51

Torx screw M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase Used in step 51

M8x16		Tightening torque	22 Nm

Oil return line to turbocharger Used in step 51

M6x12		Tightening torque	8 Nm

Heat shield for exhaust turbocharger Used in step 52

Torx screw BM 6x12		Tightening torque	10 Nm

Banjo bolt for exhaust pressure pipe to exhaust manifold Used in step 52

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

Standard screw connection M6 Used in step 52

M6			8 Nm

Diesel particulate filter V-clip to exhaust turbocharger Used in step 53

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

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Diesel particle filter to holder — Used in step 53

M8 hexagon nut		Tightening torque	19 Nm

Diesel particulate filter holder to gearbox — Used in step 53

M12x75		Tightening torque	66 Nm

Diesel particulate filter bracket to crankcase — Used in step 53

M10x35		Tightening torque	38 Nm

SCR metering module V-clip to exhaust system — Used in step 53

V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm

Holder for coolant lines to diesel particulate filter — Used in step 53

Torx bolt BM6x16		Tightening torque	8 Nm

Differential pressure sensor to holder — Used in step 53

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor — Used in step 53

Clamp 15–19mm		Tightening torque	3 Nm

Control sensor — Used in step 54

Control sensor		Tightening torque	50 Nm

Exhaust temperature sensor to diesel particulate filter — Used in step 55 56

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Exhaust-gas temperature sensor to exhaust system — Used in step 57

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Oxygen sensor holder to intermediate shaft — Used in step 58

Hexagon screw M6x16		Tightening torque	8 Nm

Nitrogen oxide sensor before SCR catalytic converter — Used in step 59

Sensor		Tightening torque	50 Nm

Monitoring sensor — Used in step 60

Sensor		Tightening torque	50 Nm

Transfer box to transmission — Used in step 61

M10		Tightening torque	56 Nm

Heat shield to transfer box — Used in step 61

M6	Renew screws.	Tightening torque	6 Nm

Oil filler plug on transfer box (VTG) — Used in step 61

M18x1.5		Tightening torque	35 Nm

Intermediate shaft to transfer box — Used in step 62

M8x35		Tightening torque	19 Nm

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Starter motor to transmission — Used in step 63

M8x45		Tightening torque	19 Nm

Battery positive lead to starter — Used in step 63

M8		Tightening torque	13,5 Nm

Propeller shaft to transfer box — Used in step 66

		Tightening torque	80 Nm

Flexible disc to rear axle final drive — Used in step 66

M12x1.5	Renew screws.	Tightening torque	55 Nm 90 °

Centre mount to body — Used in step 66

M8		Tightening torque	19 Nm

Heat shield to body — Used in step 67 68

Bolts/nut		Tightening torque	3 Nm

Bracket to body — Used in step 67

M8		Tightening torque	21 Nm

Exhaust system to body — Used in step 69

M8	Replace nuts.	Tightening torque	19 Nm

Exhaust bracket on body — Used in step 69

Hexagon screw M8x30		Tightening torque	19 Nm

V-clip to catalytic converter — Used in step 69

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

Diesel particulate sensor to exhaust system — Used in step 69

Sensor		Tightening torque	50 Nm

Nitrogen oxide sensor downstream of SCR catalytic converter — Used in step 69

Sensor		Tightening torque	50 Nm

Cross-member/torsion strut to axle support and mounting — Used in step 70

M12x48	Renew screws.	Jointing torque Angle of rotation	100 Nm 90 °

Front connection carrier to body — Used in step 71

M10x18		Tightening torque	56 Nm

Rear connection carrier to body — Used in step 71

M8x18		Tightening torque	28 Nm

Rear end of front axle support to body — Used in step 72

M14 screw	Renew screw.	Tightening torque	175 Nm

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Front axle support, front to body

Used in step 72

M12 screw	Renew screw.	Tightening torque	108 Nm

Underbody protection to body

Used in step 72 99

Screw		Tightening torque	3 Nm

Track rod end to swivel bearing

Used in step 72

M14	Renew nut.	Tightening torque	175 Nm

Wishbone to swivel bearing

Used in step 72

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

Holder, wishbone rubber mount, to body

Used in step 73

M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °

Holder with rubber mount to front axle support

Used in step 73

M12 screw			100 Nm

Washer fluid reservoir holder to front axle support adapter plate

Used in step 73

		Tightening torque	10 Nm

Deformation element, bottom, to adapter plate, front axle carrier

Used in step 73

		Tightening torque	11,8 Nm

Holder to front axle support

Used in step 74

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

Anti-roll bar link to anti-roll bar

Used in step 76

M10	Renew nut.	Tightening torque	56 Nm

Wheel arch cover to body

Used in step 78

Plastic nut		Tightening torque	2,6 Nm
Screw		Tightening torque	2,6 Nm

Wheel arch cover to body

Used in step 78

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Used in step 78

Plastic nut		Tightening torque	3 Nm

Brake disc to rear wheel hub

Used in step 79

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub

Used in step 79

M8	Renew screw.	Tightening torque	16 Nm

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Wheel bolts

Used in step 79

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Lower steering shaft to steering gear

Used in step 81

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

Steering column cover to bulkhead

Used in step 81

Plastic nut		Tightening torque	3 Nm

Heat shield for exhaust turbocharger

Used in step 82

Torx screw BM 6x12		Tightening torque	10 Nm

Rear bulkhead upper part to lower section of bulkhead

Used in step 83

Oval-head screw		Tightening torque	5 Nm

Battery holder to engine support

Used in step 84

Hexagon screw M8x30		Tightening torque	19 Nm

Electronics box to battery tray

Used in step 85

M8X16		Tightening torque	15 Nm

Wiring harness to cylinder head cover

Used in step 85

TS5x20		Tightening torque	3,5 Nm

Cover to electronics box

Used in step 85

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery

Used in step 85

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray

Used in step 85

M8		Tightening torque	19 Nm

Clean air pipe to cylinder head cover

Used in step 86

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing

Used in step 86 92

Clamp		Tightening torque	3 Nm

Resonator to manifold and clean air pipe

Used in step 87

Screw TS6	Renew screw.	Tightening torque	5 Nm

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Cover of top bulkhead

Used in step 89

Screw		Tightening torque	2,6 Nm

Cover of remote positive terminal

Used in step 89

Screw		Tightening torque	2,6 Nm

Battery terminal rail to battery tray

Used in step 90

M8			19 Nm

Battery terminal with IBS positive battery terminal / negative battery terminal

Used in step 90 91

NutM6			5 Nm

Trailing link

Used in step 90

M8		Tightening torque	19 Nm

Battery cover

Used in step 90

M8			2,8 Nm

Intake silencer housing to lock bridge

Used in step 92

M6X30		Tightening torque	8 Nm

Intake neck to cross connection

Used in step 93

M6		Tightening torque	8 Nm

Cross-brace to spring strut dome

Used in step 94

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

Cover on body

Used in step 94

Hexagon screw		Tightening torque	3 Nm

Oil filler plug to transmission housing

Used in step 97

M14	Renew the sealing ring.	Tightening torque	45 Nm

Overflow screw in oil drain plug

Used in step 97

M6	Renew the sealing ring.		8 Nm

Oil drain plug / oil filler plug

Used in step 98

Hexagon socket		Tightening torque	43 Nm

Underbody protection front

Used in step 100

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Underbody panelling, side

Used in step 101

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side

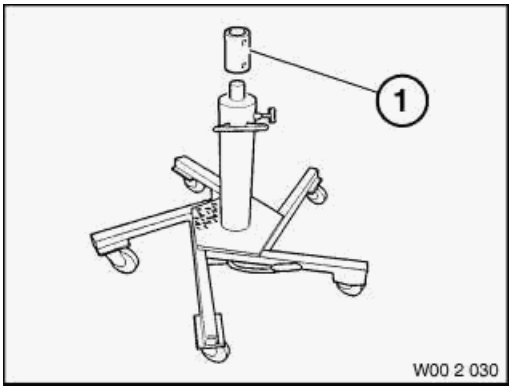
Used in step 101

Plastic nut		Tightening torque	2,6 Nm

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Overview of Special Tools

0 490 133 (00 2 030) Device



Common Used in step 28 72

Usage	(universal hydraulic lifter base unit) Chassis and hydraulic lifter - For removing and installing rear axle supports and gearboxes. Also for soft top mounts. Is replaced by 81 22 2 219 012
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 90 (207)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 490 134 (00 2 031)		**Adapter** (adapter for gearbox holder) Model series: E30, E31, E32, E34, E36	

0 495 554 (33 5 070) Extension



Common Used in step 34 66

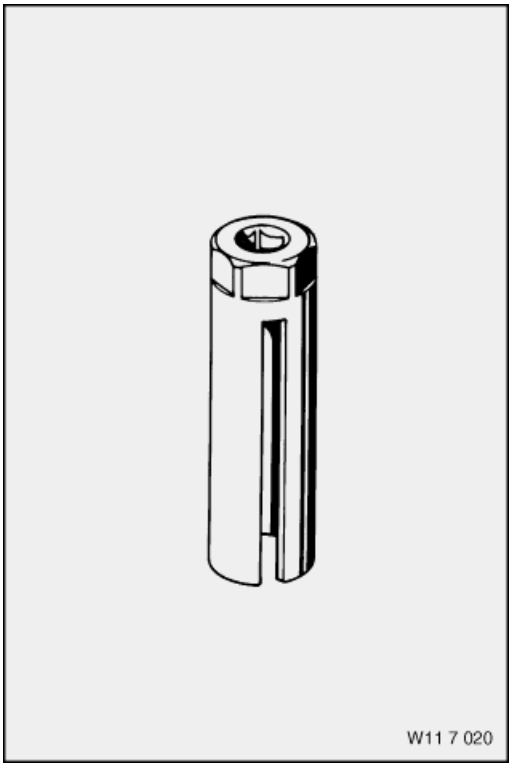
Usage	Pull-out extension for 33 5 040, 33 5 050, 33 5 060.
Included in the tool or work	
Storage location	A18
Replaced by	
In connection with	
SI-Number	01 21 06 (300)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 592 (33 5 071)		**Extension** (Extension (1 item)) discontinued, can only be ordered using complete tool	

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0 491 074 (11 7 020) Socket wrench insert



Common

Used in step 40 41 60

Usage	(Socket wrench insert 22 mm) For loosening and tightening the oxygen sensor
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	

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2 409 025 Puller



Common	Used in step 61
Usage	For disassembly of the outer radial shaft seal of the transmission output shaft, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A76
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 411 739 Puller



Common	Used in step 61
Usage	For disassembly of the inner radial shaft seal of the output, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C78
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

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2 408 152 Striking element



Common	Used in step 61
Usage	For installation of the right radial shaft seal transmission output shaft (inner). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

2 413 037 Handle



Common	Used in step 61
Usage	Universal drift handle. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C77
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

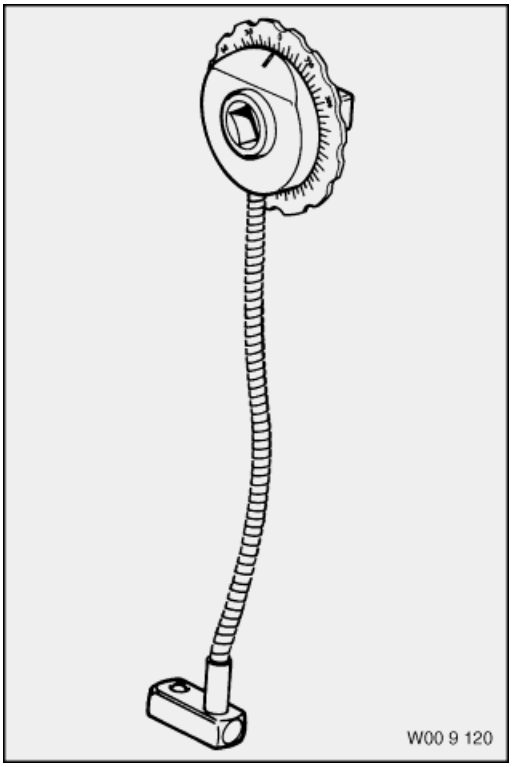
2 408 150 Striking element



Common	Used in step 61
Usage	For installing the right radial shaft seal transmission output shaft (outer). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

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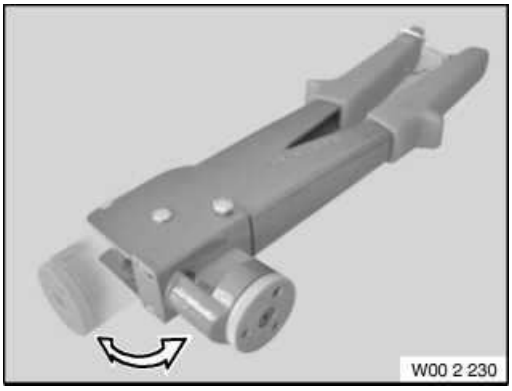
0 490 504 (00 9 120) Torque angle measuring dial



Common Used in step 66

Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

0 496 521 (00 2 230) Pliers



Common Used in step 78

Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

2 344 011 Tool



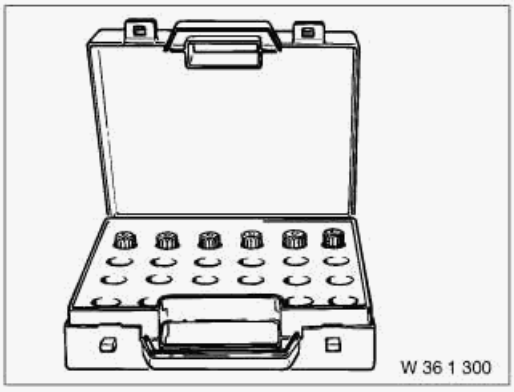
Common Used in step 79

Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

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0 495 221 (36 1 323) Wheel stud



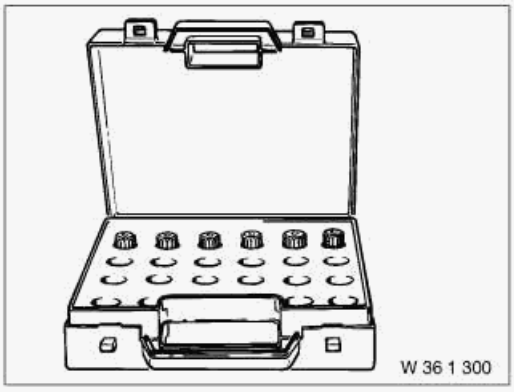
Common	Used in step 18
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud



Common	Used in step 18
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

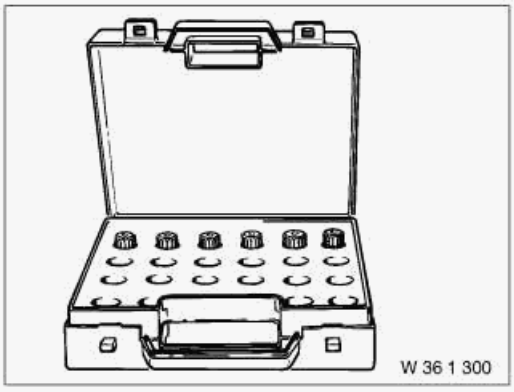
0 495 225 (36 1 327) Wheel stud



Common	Used in step 18
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 226 (36 1 328) Wheel stud



Common	Used in step 18
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud



Common	Used in step 18
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

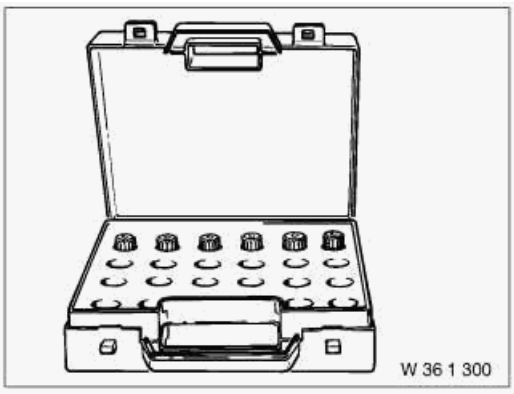
0 495 228 (36 1 331) Wheel stud



Common	Used in step 18
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

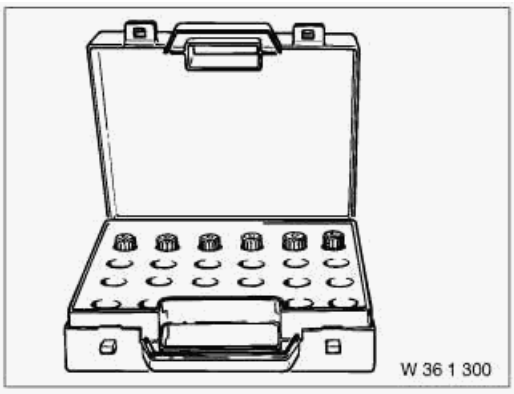
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0 495 229 (36 1 332) Wheel stud



Common	Used in step 18
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud



Common	Used in step 18
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Transmission oil capacity	Used in step 98
Transmission oil GS6-60DA, GS6X60DA/Owner's Handbook	2,2 l
Transmission oil: Technically suitable manual gearbox oil	

Links

General repair instructions	Used in step
61 20 ... Notes on AGM battery	91
61 12 ... Notes on intelligent battery sensor (IBS)	91
61 00 ... Notes for disconnecting and connecting battery	91
41 00 ... Notes on repairing threads	
61 00 ... Safety information for handling vehicle battery	

Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	12 40 41 43 44 45 46 47
00 .. ... Raising the vehicle using a vehicle hoist	

Operating materials	Used in step
2.0 Grease for wheel centring	79

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Operating materials	Used in step

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11 42 235 Removing and installing/sealing or replacing oil feed line for low pressure exhaust turbocharger

WARNING

Vehicle may slip off the vehicle hoist if the vehicle hoist is handled incorrectly.

Danger! Life-threatening injuries!

- Observe safety information on raising the vehicle using a vehicle hoist.
- For additional information see: 00 ... Raising the vehicle using a vehicle hoist.

WARNING

Motor vehicle may slip off the vehicle hoist where components are supported.

Danger! Life-threatening injuries!

- Secure the vehicle hoist against lowering and lifting.

WARNING

Motor vehicle may slip off the vehicle hoist if the weight is distributed unevenly.

Danger! Life-threatening injuries!

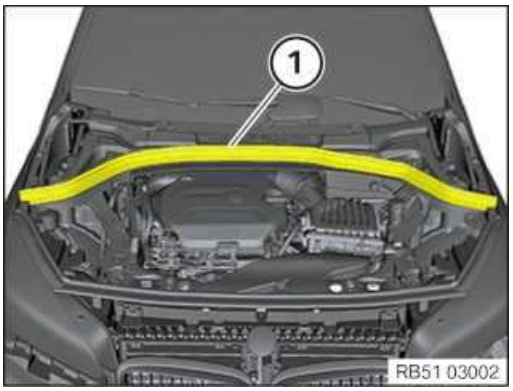
- Ensure there is a specific weight compensation on the motor vehicle.

PRELIMINARY WORK

1 – Remove the seal for the rear bonnet

NOTICE

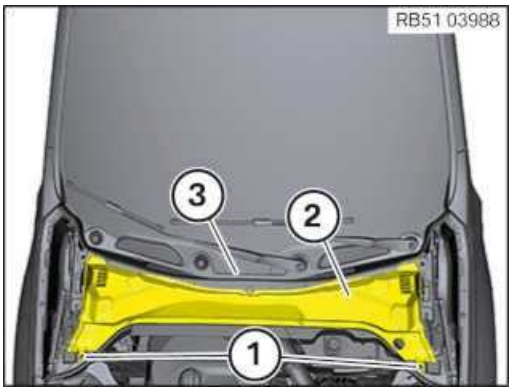
Schematic diagram is for example purposes. Some parts may differ in certain details.



- Pull off rear bonnet seal (1) towards the top and remove.

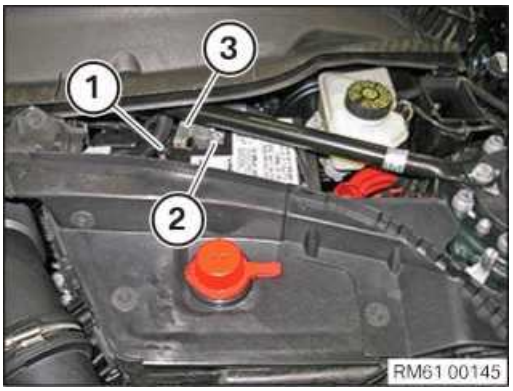
2 – Removing front cowl panel cover

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- Loosen the expanding rivet (1).
- Feed out and remove front cowl panel cover (2) from the rear cowl panel cover(3).

3 – Disconnecting the battery earth lead

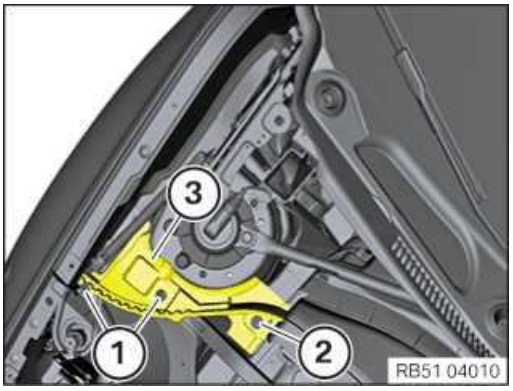


- Unlock plug connection (1) and disconnect.
- Unfasten nut (2).
- Remove the battery earth lead (3) and secure to one side.

4 – Remove suspension cross-brace

TECHNICAL INFORMATION

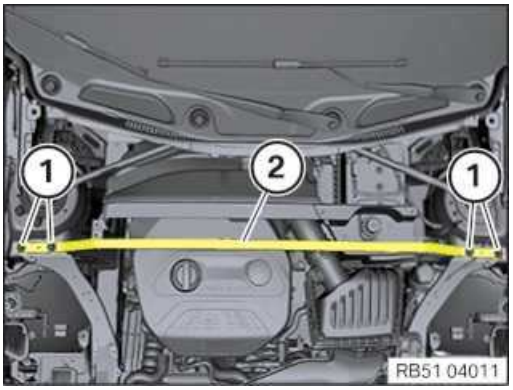
Driving without the strut brace/front end or tension strut is not permitted.



NOTICE

Description is for right component only. The procedure on the left side is identical.

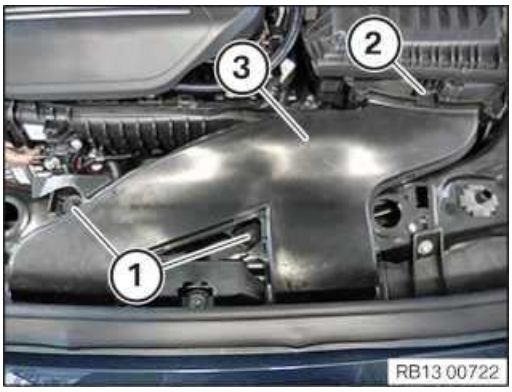
- Loosen expanding rivet (1).
- Loosen screw (2).
- Remove the cover (3).



- Loosen screws (1).
- Remove strut brace (2).

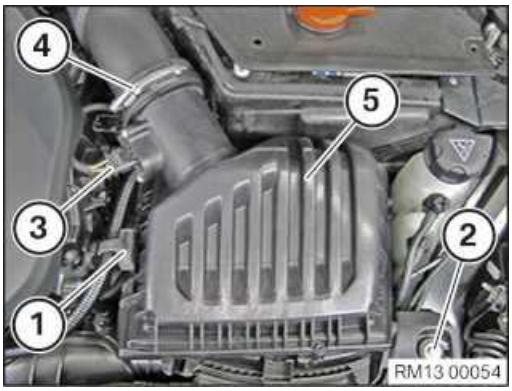
5 – Remove the intake neck for intake silencer housing

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- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

6 – Removing intake silencer housing



- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

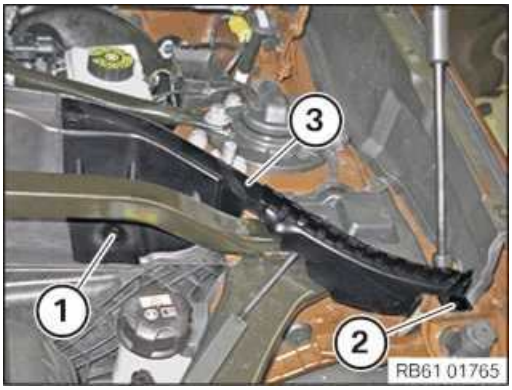
7 – Remove vehicle battery

WARNING

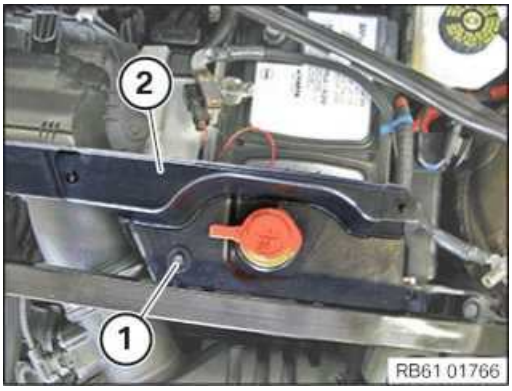
Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

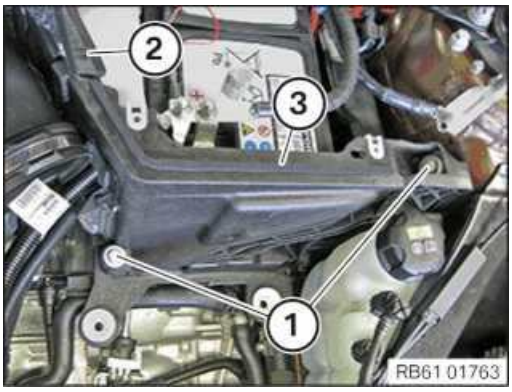


- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

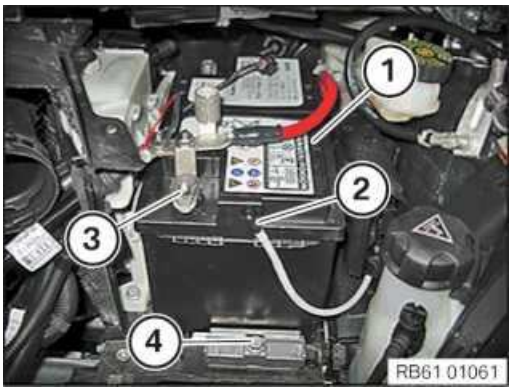


- Loosen screw (1).
- Remove the cover (2).

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- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.



- Pull off the vent hose (2).
- Slacken the nut (3) on the positive battery terminal and remove the positive battery terminal.

WARNING

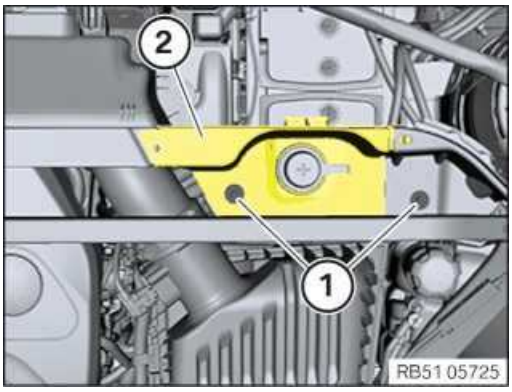
Unprotected battery terminals.

Risk of short circuits! Risk of fire!

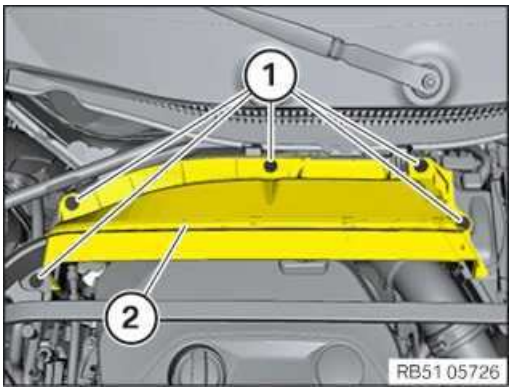
- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

8 – Removing the upper bulkhead cover



- Loosen screws (1).
- Guide out and remove the cover (2).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

9 – Removing the acoustic cover

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

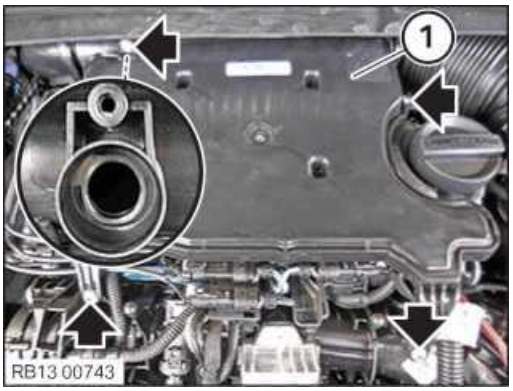
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

10 – Remove resonator



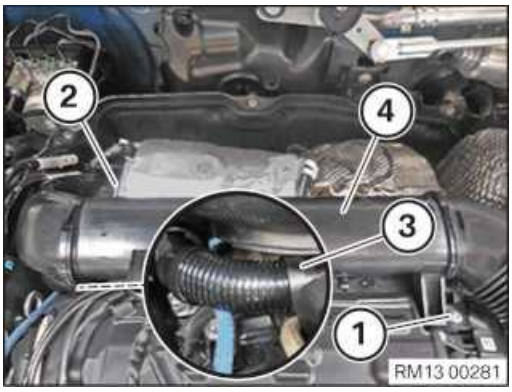
- Remove screws (arrows).
- Guide out and remove the resonator (1).

11 – Removing clean air pipe



- Detach clamp (1) on the clean air pipe.
- Pull off the clean air pipe from the intake silencer housing.

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- Loosen screw (1).
- Loosen clamp (2).
- Unlock the ventilation line (3) and pull it off the cylinder head cover.
- Feed out clean air pipe and remove.

12 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

TECHNICAL INFORMATION

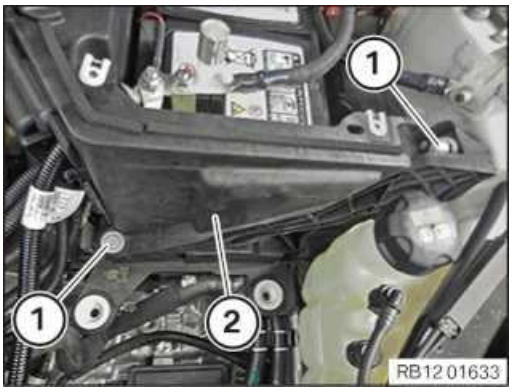
Follow instructions for removing and installing control units.

For additional information see: 12 00 ... Notes on removal and installation of control units

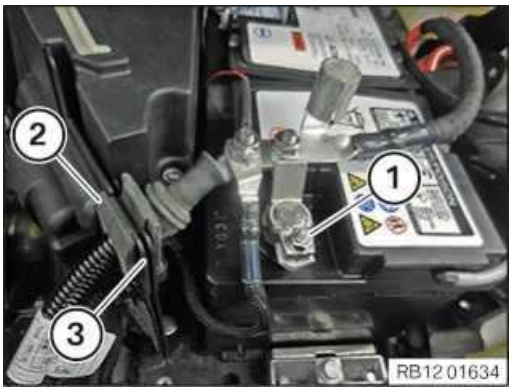
TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.

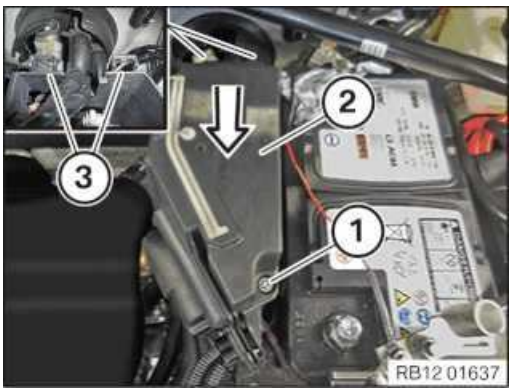
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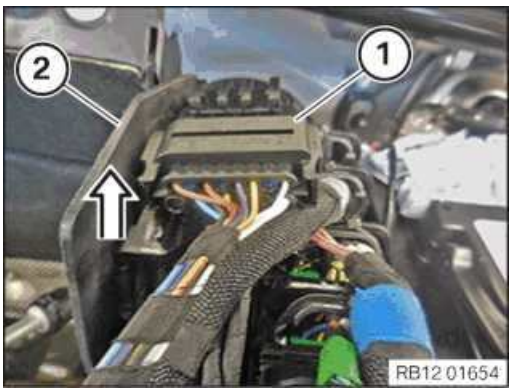
- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.



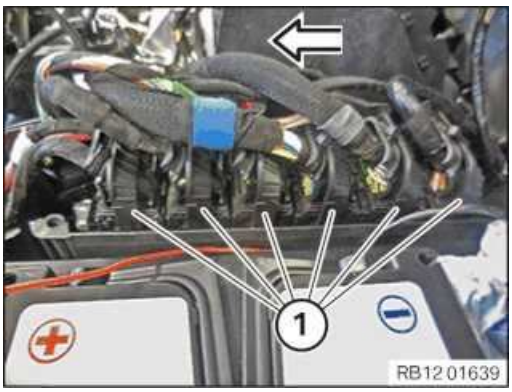
- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).

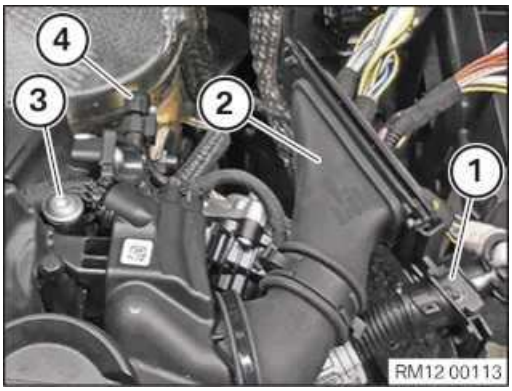


- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

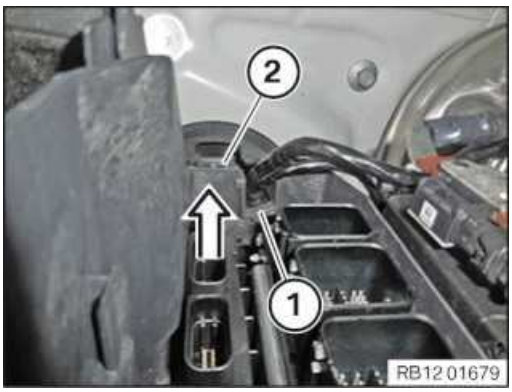
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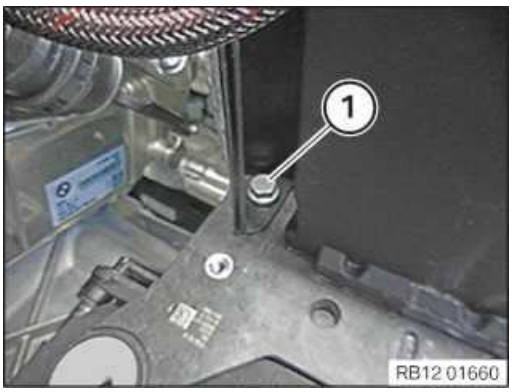
- Unlock and loosen connector (1).



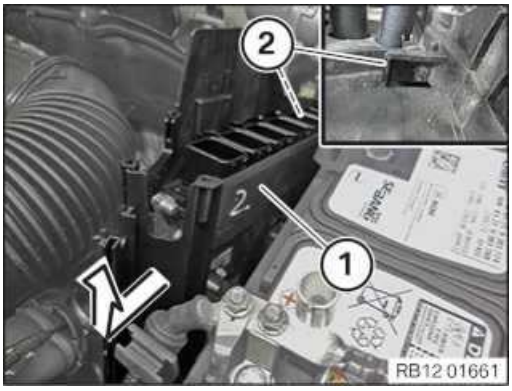
- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.



- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.



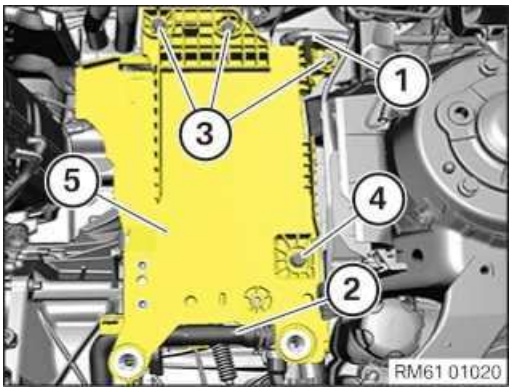
- Loosen screw (1).



- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

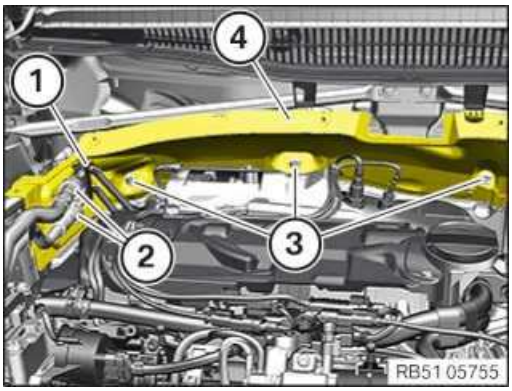
13 – Remove battery holder

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- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

14 – Remove the rear bulkhead upper part



- Unlock the holder (1) and disconnect.
- Guide out and remove the fuel lines (2).
- Loosen screws (3).
- Guide out the rear bulkhead upper part (4) and remove.

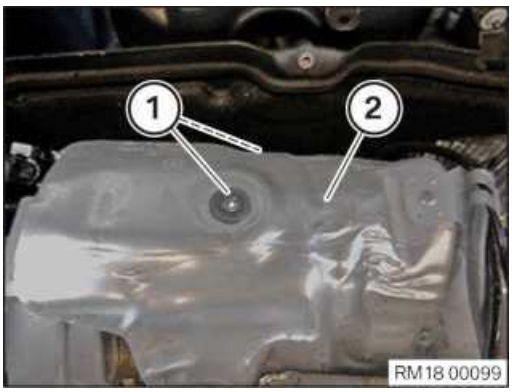
15 – Removing heat shield from top exhaust turbocharger

WARNING

Hot surfaces.

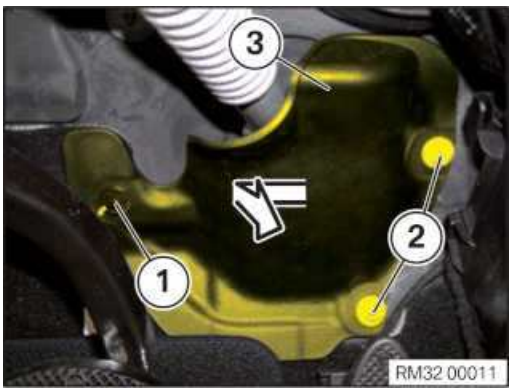
Risk of burning!

- Perform all work only on components that have cooled down.



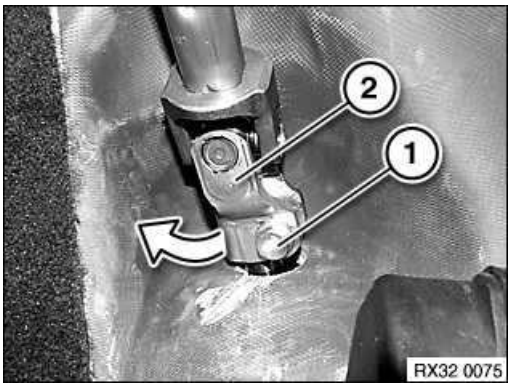
- Release cable from holders.
- Release the screws (1) at the top and bottom of the heat shield.
- Feed out and remove the heat shield (2).

16 – Releasing lower steering shaft from steering gear



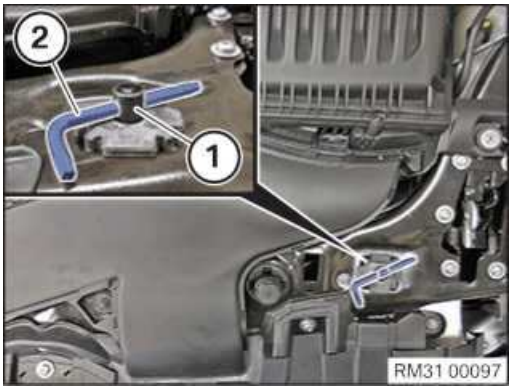
- **If installed:**
- Unfasten nut (1).
- Unscrew the nuts (2) by 1 rotation.
  Do not remove the nuts (2) !
- Remove the cover (3) on the steering column in the direction of the arrow.
  The side footwell trim must not be disassembled!

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- Loosen screw (1).
- Swivel out the universal joint (2) of the bottom steering shaft from the steering gear in the direction of the arrow.

17 – Securing radiator on left and right



NOTICE

Perform the operations on the left and right side.

- Fasten radiator at centring pin (1) with suitable tool (2).

18 – Removing both front wheels

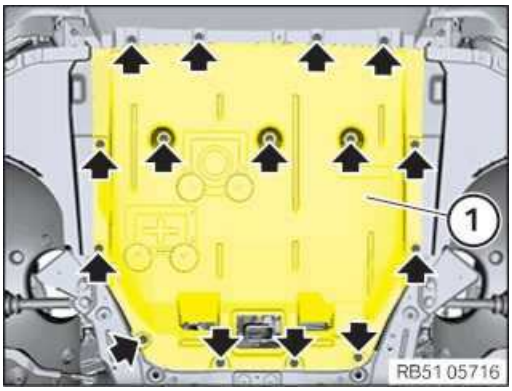
▸ **Removing the wheel**



- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Unscrew the wheel bolts (arrows) and remove the wheel.

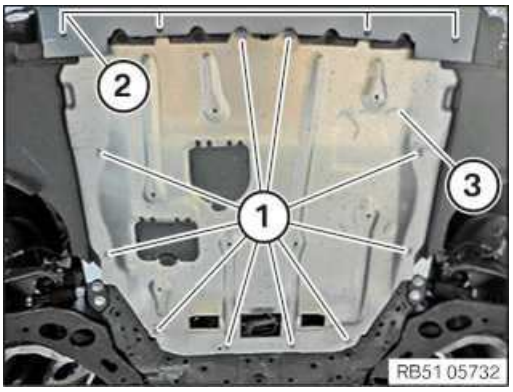
  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

19 – Removing the front underbody protection



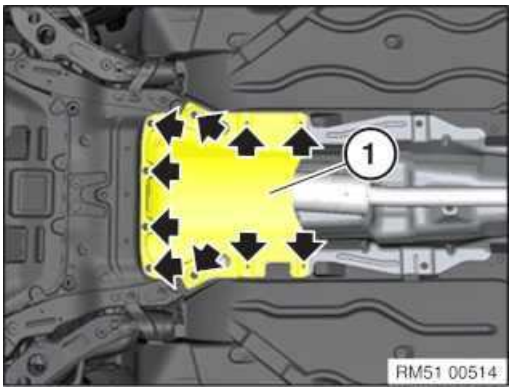
- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.

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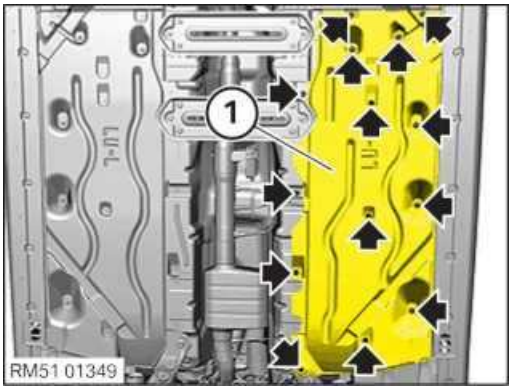
- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

20 – If installed: Removing rear underbody protection



- Remove screws (arrows).
- Remove the rear underbody protection (1).

21 – Removing right underbody panelling



- Unscrew all bolts and nuts (arrows).
- Remove the underbody panelling (1).

22 – Removing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

▸ **Remove the front wheel arch trim**

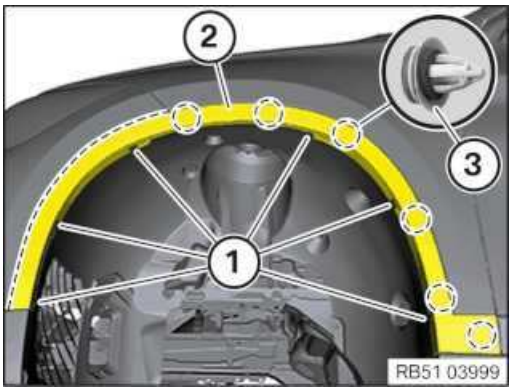
NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

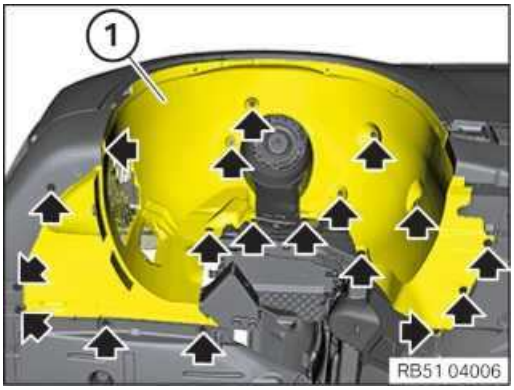
Description is for left component only. Procedure on the right side is identical.

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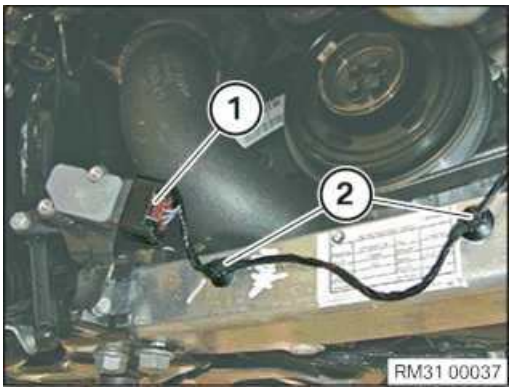
- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.

▶ **Remove front wheel arch cover**



- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

23 – With right installation: Detaching ride height sensor cable



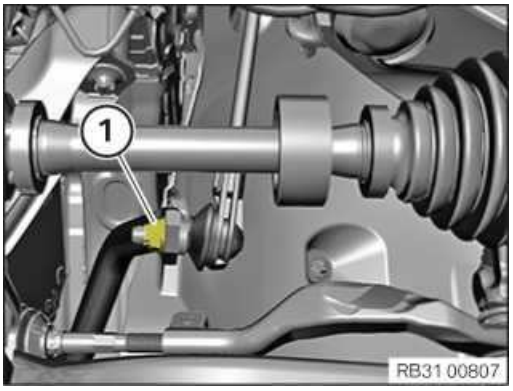
- Unlock plug connection (1) and disconnect.
- Release cable clip (2) from deformation element adapter.

24 – Releasing anti-roll bar on left and right from anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▶ **Detach the anti-roll bar from the anti-roll bar link**



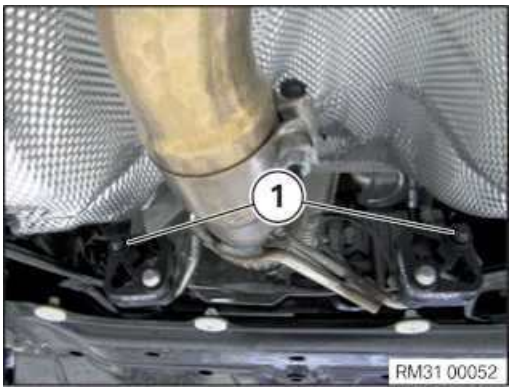
- Unfasten nut (1).

Note: Use the Torx socket for counter support.

- Loosen the anti-roll bar link from the anti-roll bar .

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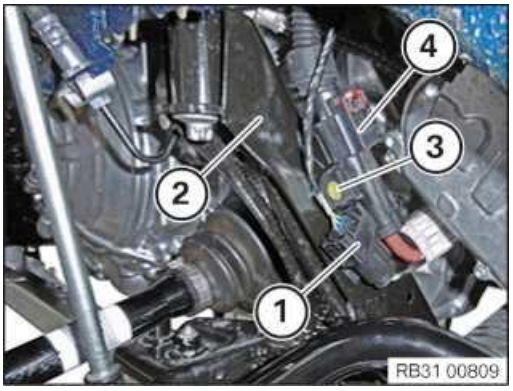
25 – Detaching rubber mount from front axle support



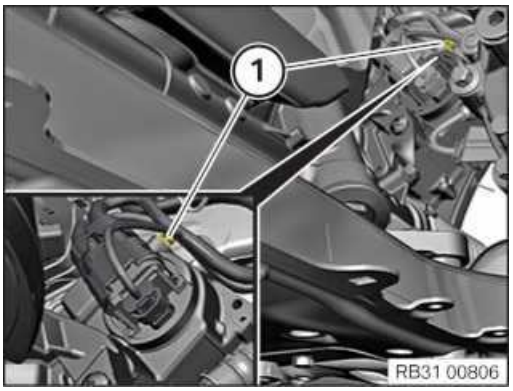
- Spray rubber mount (1) with lubricant and release from holder on front axle support.

26 – Disconnecting plug connections from steering gear

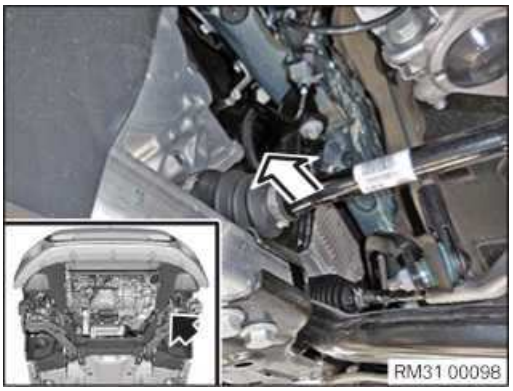
▸ **If installed: Detach connectors from the front axle carrier**



- Release the plug connection (1) from the front axle support (2).
- Loosen screw (3).
- Release the plug connection (4) from the front axle support (2).



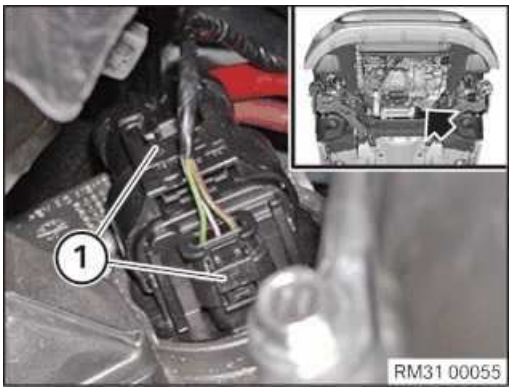
- Disconnect wiring harness (1) from steering gear.



- To unlock the plug connections (see the following work step): unlock plug connections (arrow) with the right hand.

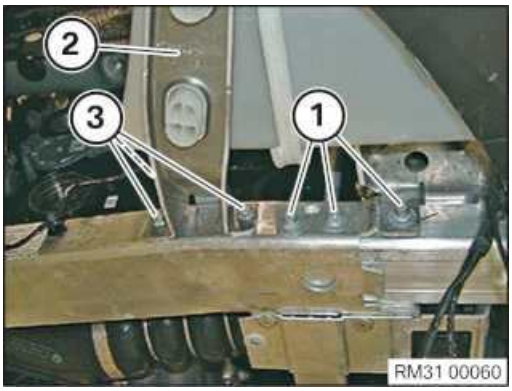
  The plug connections can be reached via the left-hand output shaft.

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- Unlock plug connections (arrow) (1)and disconnect from the steering gear.
- Make sure when lowering the front axle that the cables are not damaged!

27 – Releasing the mounted part from the front axle support

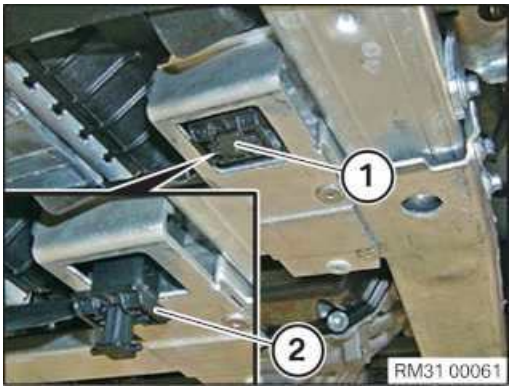


- **Only on right side:** Loosen screws (3) and remove holder for washer fluid reservoir (2).

NOTICE

Perform the operations on the left and right side.

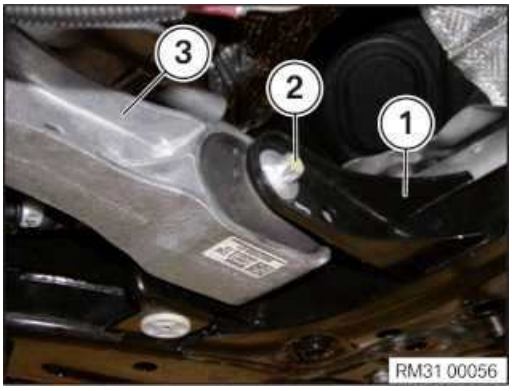
- Loosen screws (1).



NOTICE

Perform the operations on the left and right side.

- Unlock safety catch (1) of the lock (2) from the holder for the charge air cooler.
- Completely remove locks (2).



- Loosen screw (2) of the engine support (3) on the front axle (1).



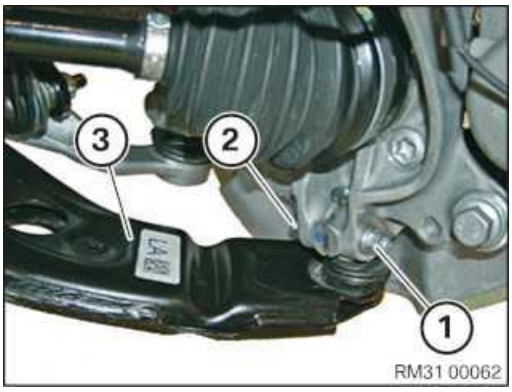
NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

28 – Detaching and removing front axle completely

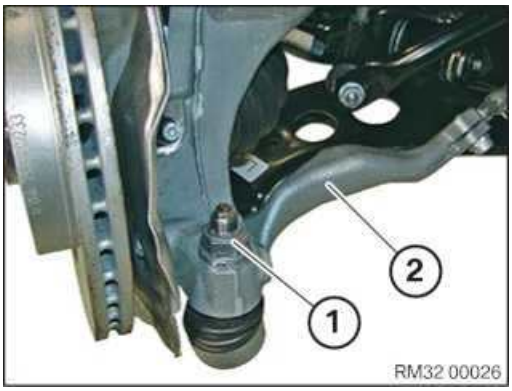
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NOTICE

Perform the operations on the left and right side.

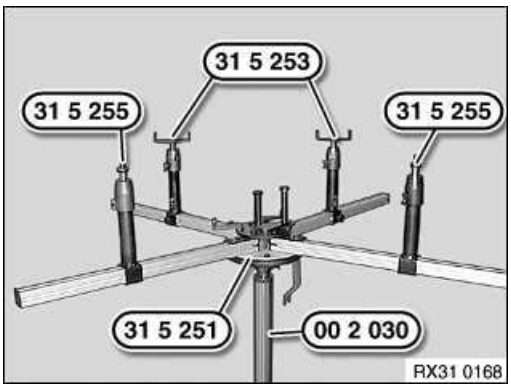
- Unfasten nut (1).
- (2)Pull out screw.
- Detach the wishbone (3) from the swivel bearing .



NOTICE

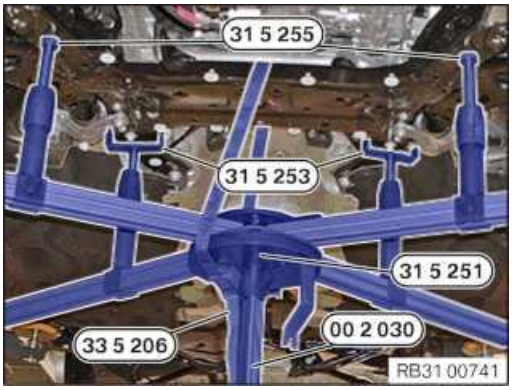
Perform the operations on the left and right side.

- Unfasten nut (1).
- Detach the track rod (2) from the swivel bearing.



- Fit the special tool completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools in telescopic supports of a profile rail pair.
- Insert special tools in telescopic supports of other profile rail pair.

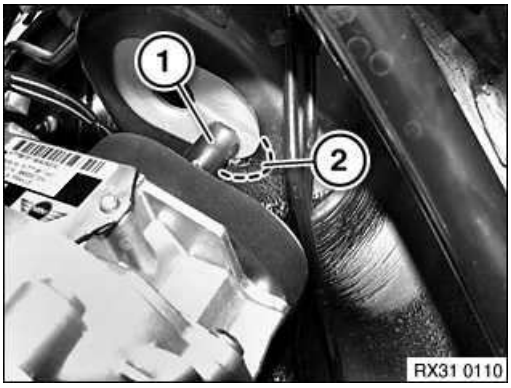
Note: In a profile rail pair, two profile rails are connected to one another by gearing.



- Align special tools and to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool to special tool .



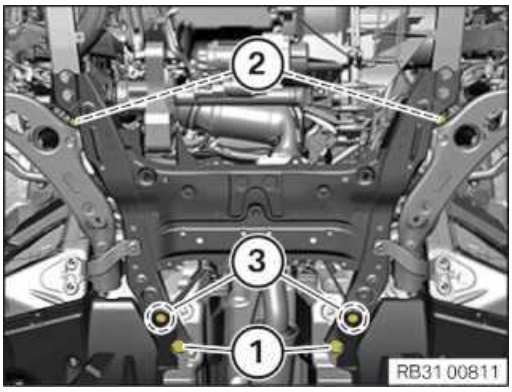
TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!

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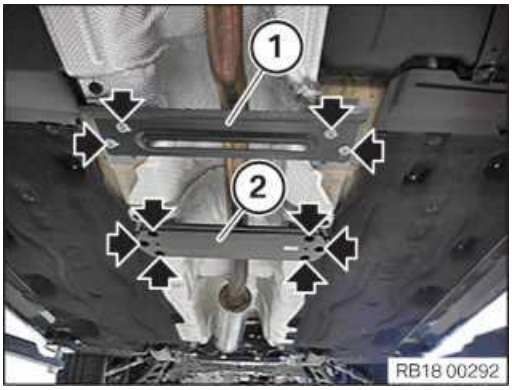
- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and remove the front axle.

TECHNICAL INFORMATION

Note the information on thread repairs using Helicoil thread inserts.
For more information see: 41 00 ... Notes on repairing threads

- Check threads for damage; if necessary, repair with Helicoil thread inserts.

29 – Removing the connecting support from the tunnel in front and back

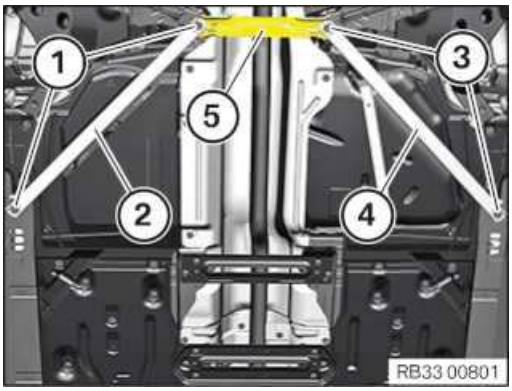


- Unscrew the bolts (arrows) from the connecting support (1).
- Feed out and remove the crossbeam (1).
- Unscrew the bolts (arrows) from the connecting support (2).
- Feed out and remove the crossbeam (2).

30 – Remove the cross strut with the torsion strut

TECHNICAL INFORMATION

Driving without a torsion strut is not permitted.



- Loosen screws (1).
- Thread out torsion strut (2) at left and remove.
- Loosen screws (3).
- Thread out torsion strut (4) at right and remove.
- Feed out and remove the cross-member (5).

31 – Remove exhaust system

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WARNING

Hot surfaces.

Risk of burning!

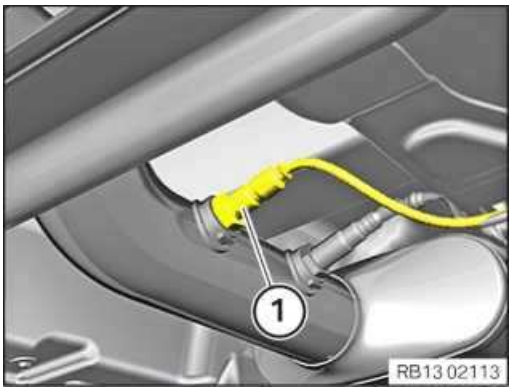
- Perform all work only on components that have cooled down.

CAUTION

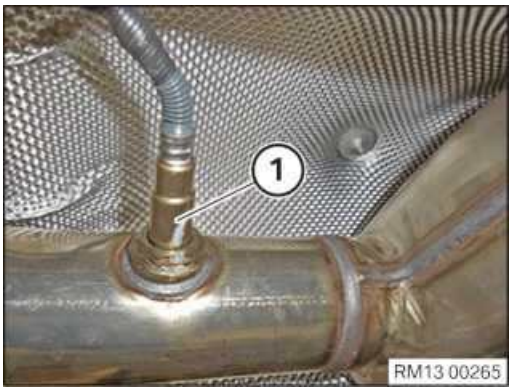
Heavy component.

Heavy components can lead to injury or damage.

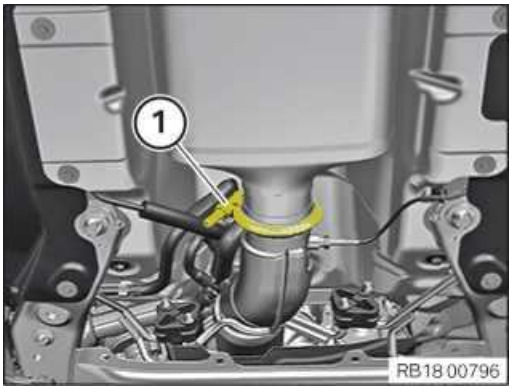
- Remove and install heavy components with the aid of another person/other persons.



- Release the nitrogen oxide sensor (1) downstream of the SCR catalytic converter, guide it out and set it aside.

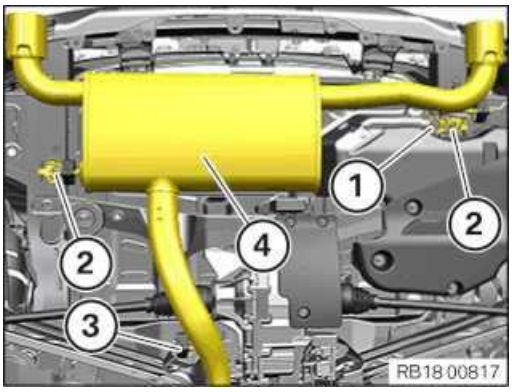


- Release the diesel particulate sensor (1), guide it out and set it aside.



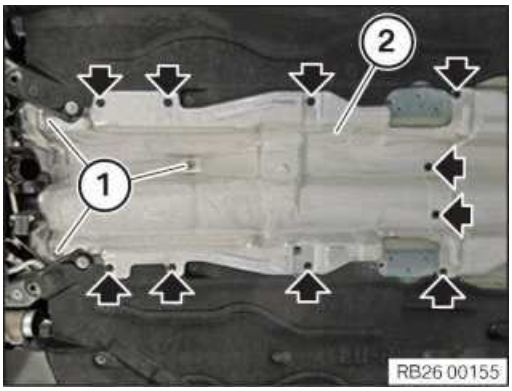
- Loosen V-band clamp (1).

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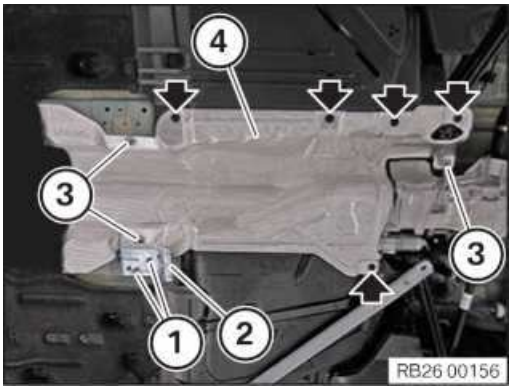
- Loosen screw (1).
- Loosen nuts (2).
- Release the rubber mount (3) of the exhaust system (4).
- Lower and guide out the exhaust system (4) with assistance of a second person and remove it.

32 – Remove front heat shield



- Remove screws (arrows).
- Loosen nuts (1).
- Guide the heat shield (2) out and remove it.

33 – Remove heat shield at rear.



- Loosen screws (1).
- Guide out and remove holder (2).
- Remove screws (arrows).
- Loosen nuts (3).
- Guide the heat shield (4) out and remove it.

34 – Remove propeller shaft

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

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RISK OF DAMAGE

Damage to propeller shaft during removal.

Non-observance of the removal guidelines for the propeller shaft on the rear axle differential may cause severe damage.

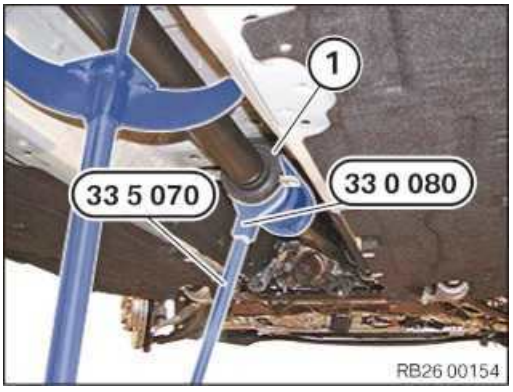
- Do not disassemble the three-hole flange, flexible disc and propeller shaft. The three-hole flange to the rear axle differential is balanced with the flexible disc and propeller shaft.
- Loosen the recessed nut against the direction of travel in clockwise direction. The propeller shaft must be loosened on the recessed nut only and exclusively in the direction of rotation otherwise the anti-twist lock of the bi-hexagonal flange nut is damaged.
- In the event of a damaged anti-twist lock on the bi-hexagonal flange nut: Replace the rear axle differential.



- Install the special too l between the front and rear propeller shaft.
- Make sure that the arrows on the special tool point forward in the direction of travel.



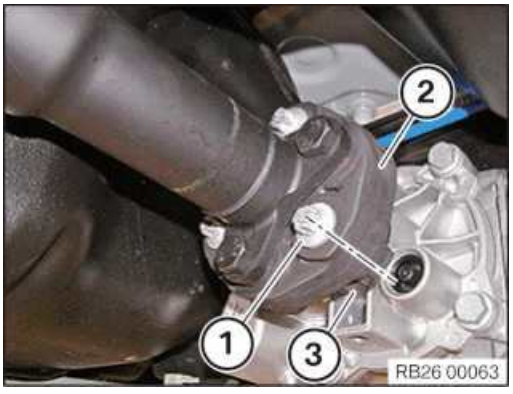
- Always support the propeller shaft (1) with a conventional jack.



- Protect the propeller shaft (1) with the special tools **0 495 554 (33 5 070)** and from twisting.

TECHNICAL INFORMATION

Compliance with the following instructions is required to avoid a humming noise from the propeller shaft after refitting the propeller shaft.

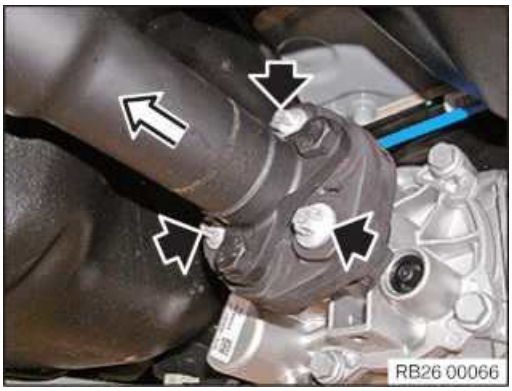


- Mark the installation position of the screw connection (1), the flexible disc (2) and the three-hole flange (3) on the same level.
- Loosen the screw connection (1).

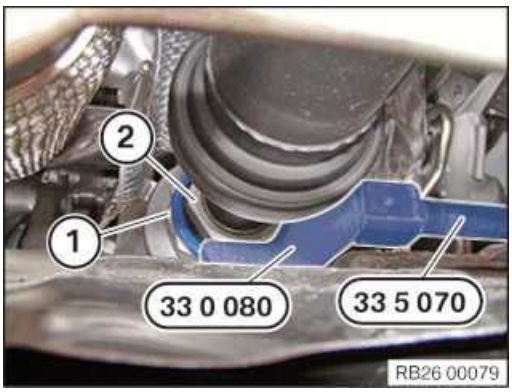
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- Loosen screws (1).



- Remove screws (arrows).
- Guide the propeller shaft out in the direction of the arrow and set it aside.



RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.

- Protect the recessed nut (2) on the transfer box from twisting with the special tools **0 495 554 (33 5 070)** and .

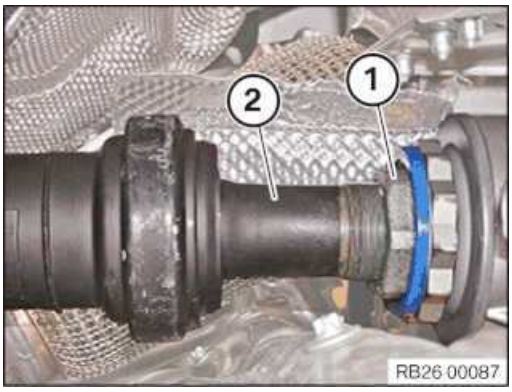
  The recessed nut (2) on the transfer box must **not** be used to detach the propeller shaft.

  The double hexagon flange nut (1) must **not** be used for counter support.

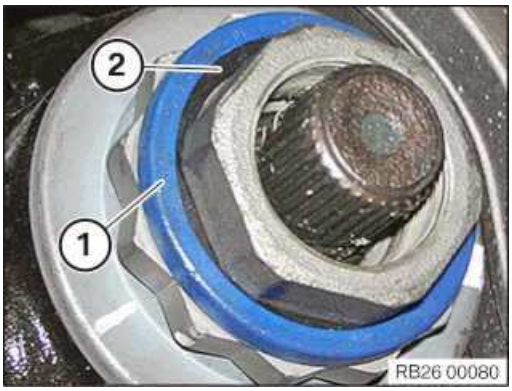


- Release the front propeller shaft with the special tools **0 495 554 (33 5 070)** and in the direction of the arrow.

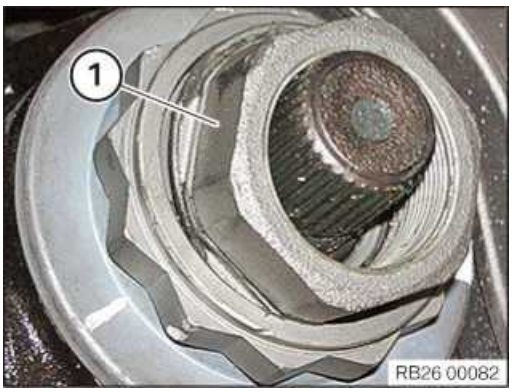
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- Thread the propeller shaft (2) out of the recessed nut (1) and remove.



- Thread the retaining clip (1) and the seal (2) out and remove.



- Thread out and remove the recessed nut (1).

35 – Removing starter motor

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and loosen connector (1).
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).



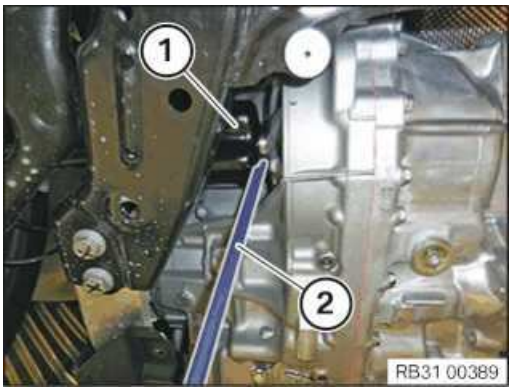
- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.



- Loosen screws (1).
- Feed out starter motor and remove.

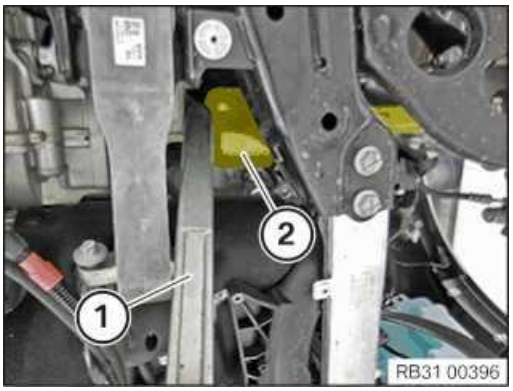
36 – Partially removing the left output shaft

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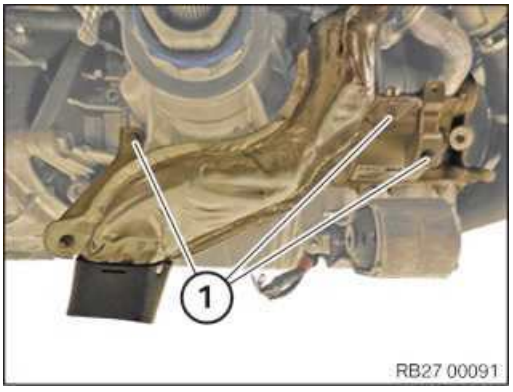
- Protect the output shaft (1) from falling.
- Lever out the output shaft (1) with a mounting lever (2) from the transmission.
- Tie up output shaft (1).

37 – Partially removing right output shaft

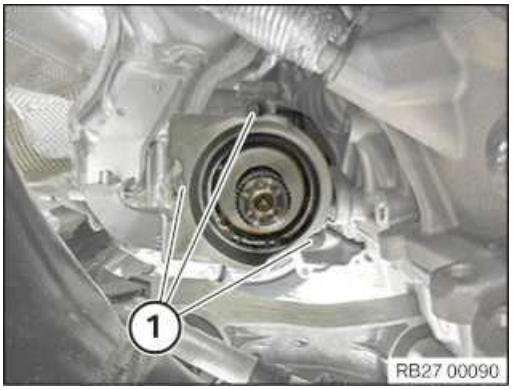


- Lever out the output shaft (2) with a mounting lever (1).
- Tie up output shaft (1).

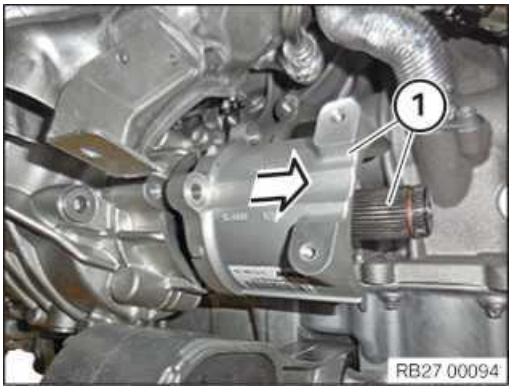
38 – Remove the intermediate shaft with the support tube



- With air duct installation: Loosen screws (1).
- Remove air duct



- Loosen screws (1).



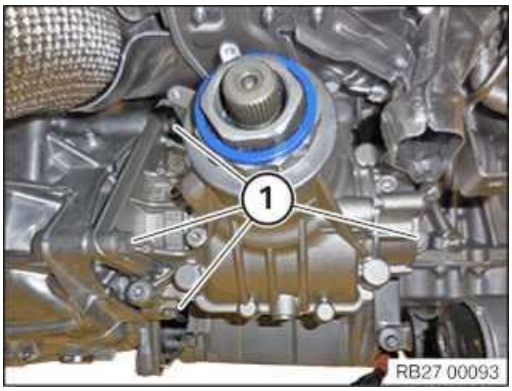
- Pull the intermediate shaft with the support tube (1) out of the transfer box.

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39 – Remove transfer box (VTG)



- Loosen screws (1).
- Remove heat shield.



- Loosen screws (1).
- Remove the transfer box (VTG).

40 – Remove the monitoring oxygen sensor

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

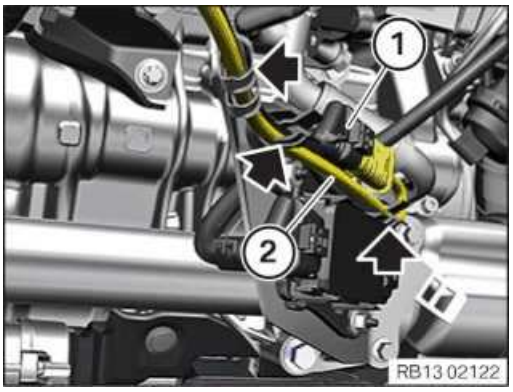
RISK OF DAMAGE

Electrostatic discharge.

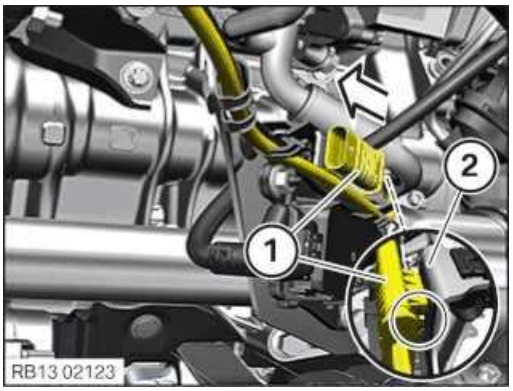
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

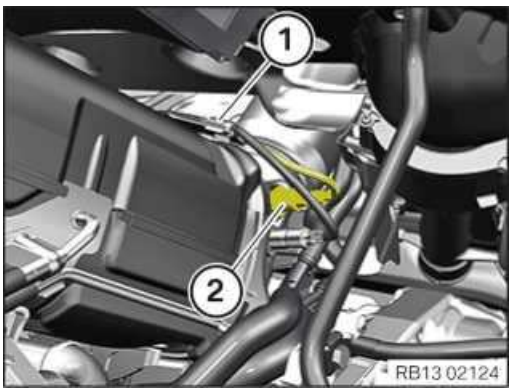
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- Unlock plug connection (1) and disconnect.
- Feed oxygen monitor sensor cable (1) out of the clamps (arrows).



- Unlock the connector (1) in the marked area and disconnect it from the holder (2) in the direction of arrow.



- Guide the cable of the monitoring oxygen sensor (2) out of the clamp (1).
- Release the monitoring oxygen sensor (2) using special tool **0 491 074 (11 7 020)**.
- Remove the monitoring oxygen sensor (2).

41 – Removing the nitrogen oxide sensor before SCR catalytic converter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

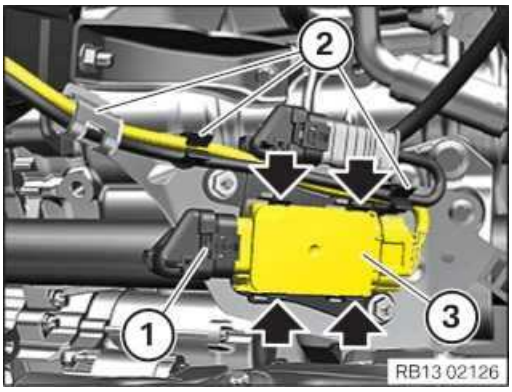
RISK OF DAMAGE

Electrostatic discharge.

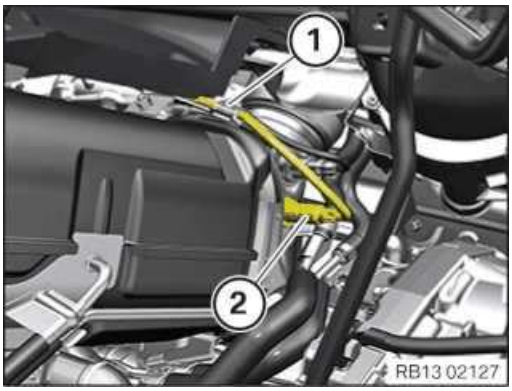
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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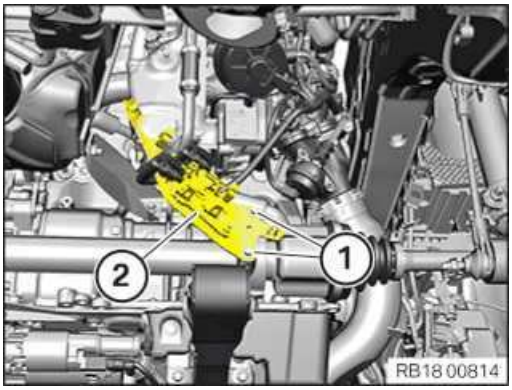


- Unlock plug connection (1) and disconnect.
- Slide the cable of the nitrogen oxide sensor evaluation electronics (3) out of the clamps (2) and remove.
- Unlock (arrows) and remove the evaluation electronics for the nitrogen oxide sensor (3).



- Slide the cable of the nitrogen oxide sensor before the SCR catalytic converter (2) out of the clamps (1) and remove.
- Detach the nitrogen oxide sensor before the SCR catalytic converter (2) using the special tool **0 491 074 (11 7 020)**.
- Guide out and remove the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

42 – Remove holder for oxygen sensor



- Loosen screws (1).
- Thread out the holder (2) for the oxygen sensor and remove.

43 – Remove the exhaust temperature sensor on the catalytic converter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

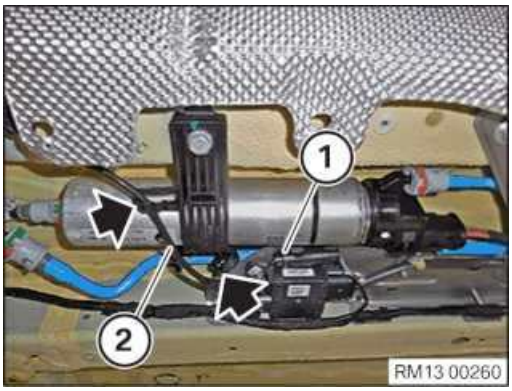
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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

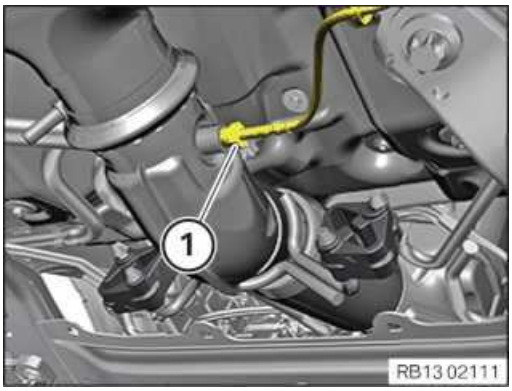
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and loosen connector (1).
- Feed out the cable (2) of the exhaust temperature sensor from the clamps (arrows) and remove.



- Loosen the cable clip (1).



- Loosen exhaust temperature sensor (1).
- Feed out and remove exhaust temperature sensor (1).

44 – Removing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

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WARNING

Hot surfaces.

Risk of burning!

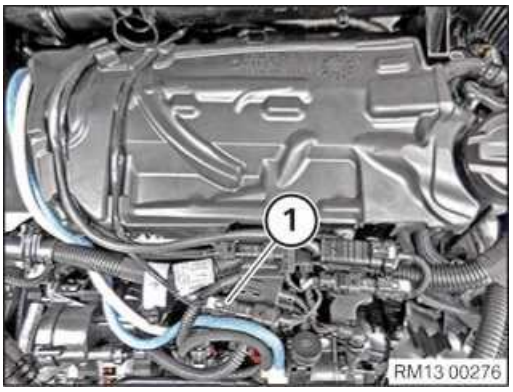
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

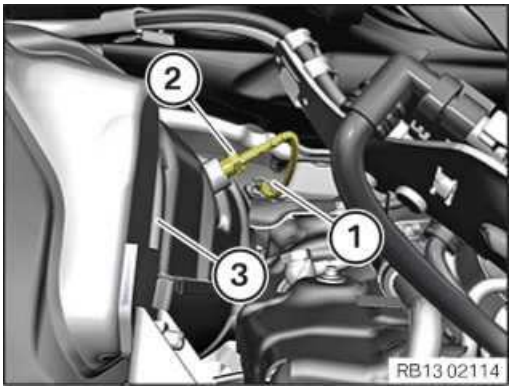
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and loosen connector (1).
- Uncover the exhaust temperature sensor cable.



- Guide the exhaust temperature sensor cable (2) out of the clamp (1) and place it to one side.
- Release the exhaust temperature sensor (2) with conventional tools .
- Feed out and remove the exhaust temperature sensor (2) from the diesel particulate filter (3).

45 – Remove the exhaust temperature sensor on the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

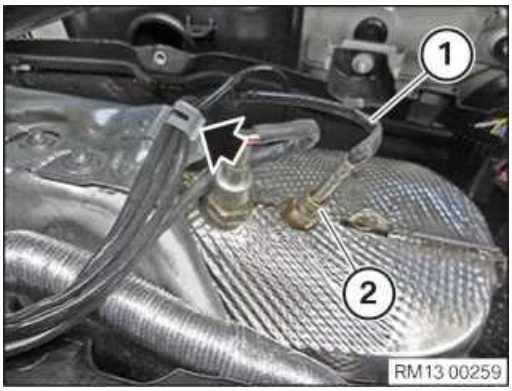
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect connector (1).
- Put the cable of the exhaust temperature sensor to one side.



- Guide cable (1) of the exhaust temperature sensor out of the clamp (arrow) and remove it.
- Loosen exhaust temperature sensor (2).
- Feed out and remove exhaust temperature sensor (2).

46 – Remove the control sensor

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock plug connection (1) and disconnect.
- Detach the connector (2) from the holder .
- Release the front oxygen sensor cable.



- Detach the control sensor (1) with the special tool .
- Feed out and remove the control sensor (1).

47 – Removing the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

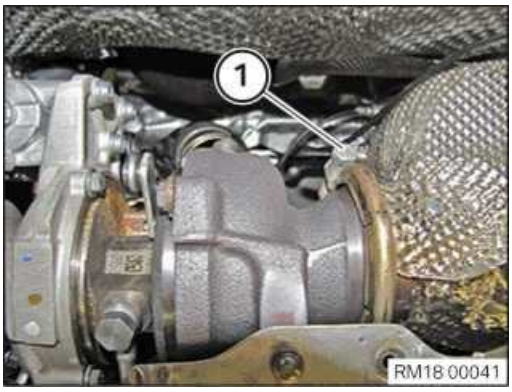
CAUTION

Heavy component.

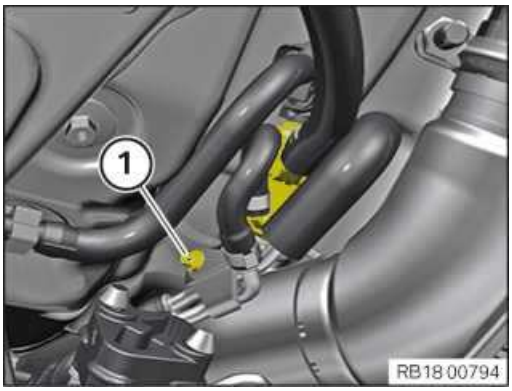
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

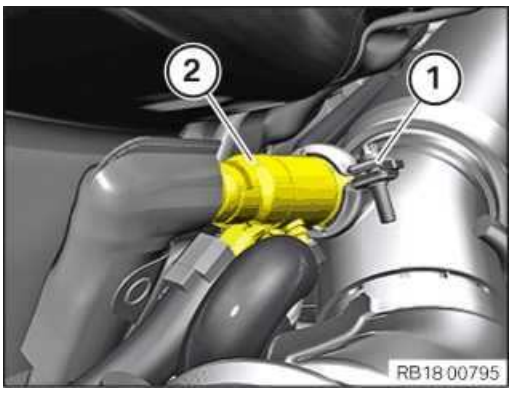
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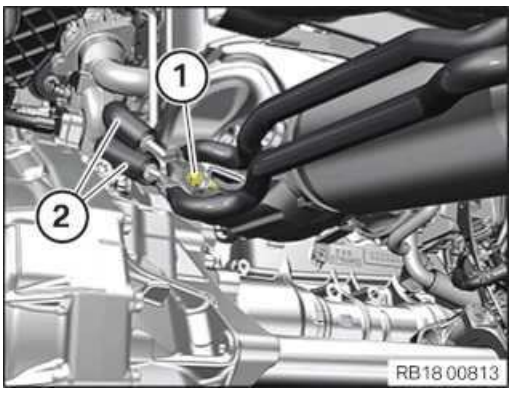
- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.



- Loosen screw (1).



- Loosen V-band clamp (1).
- Remove the SCR metering module (2) and set it aside.



- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.

▸ **Remove differential pressure sensor**

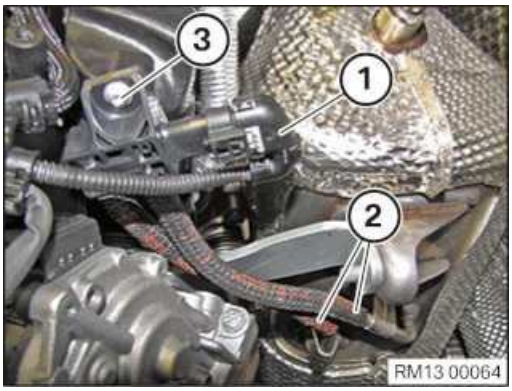
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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

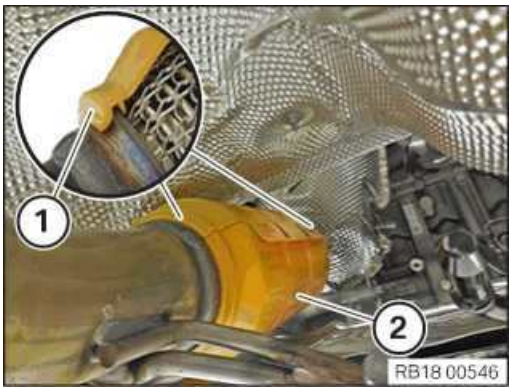
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



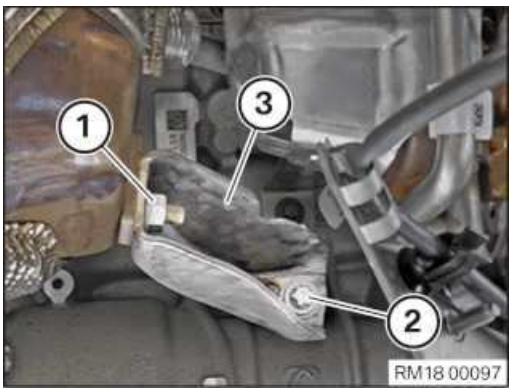
- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.



- Loosen nuts (1).

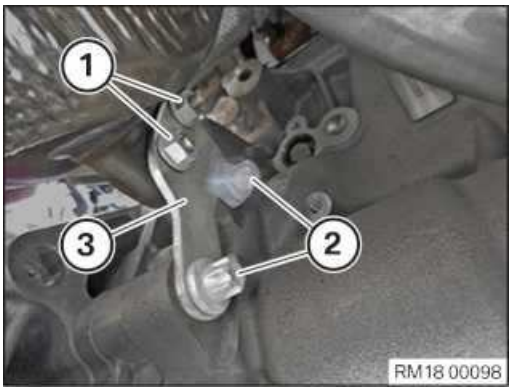


- Mount fitting aid (2).
- Make sure that the fitting aid is correctly position on the edges (1) of the flexible tube.

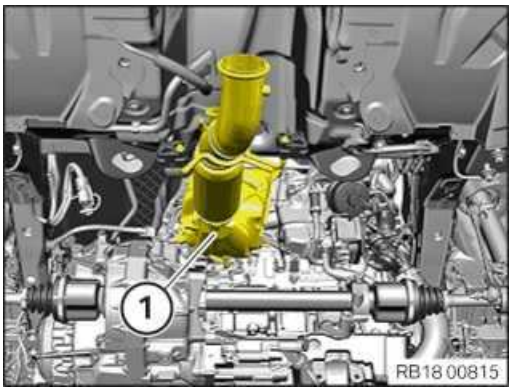


- Unfasten nut (1).
- Loosen screw (2).
- Remove holder (3).

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- Loosen nuts (1).
- Loosen screws (2).
- Remove holder (3).



- Feed out diesel particulate filter (1) toward the bottom and remove.

MAIN WORK

POSTPROCESSES

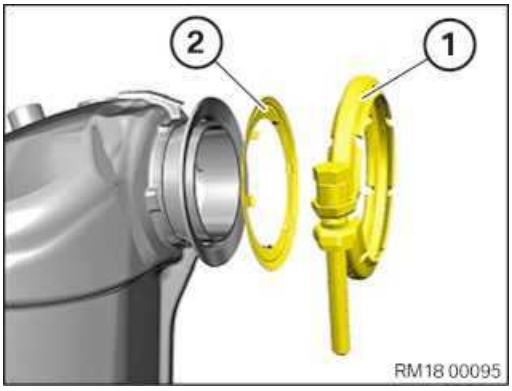
48 – Installing the diesel particulate filter

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

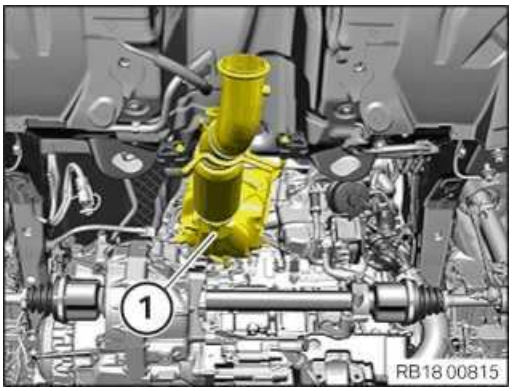


- Renew the V-clip (1).
  Parts: V-band clamp
- Renew the gasket (2).
  Parts: Gasket

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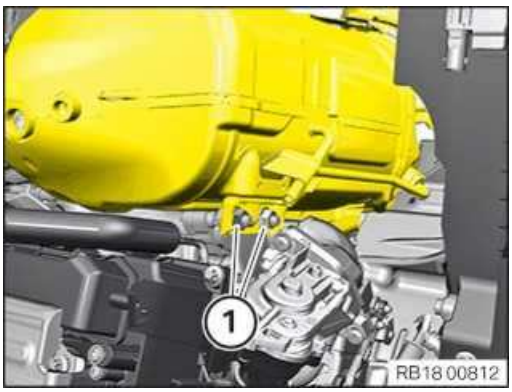
- Before installing the diesel particulate filter: Mount fitting aid (1) for the flexible tube.



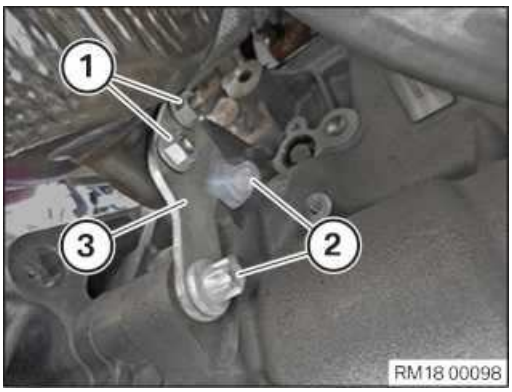
- Carefully insert and install the diesel particulate filter (1).



- Feed in and install V-band clamp (1).
- Make sure that the seal between the diesel particulate filter and the exhaust turbocharger is installed correctly.
- Align the diesel particulate filter on the exhaust turbocharger.
- Position V-clip (1).
- Hand-tighten the V-clip (1).

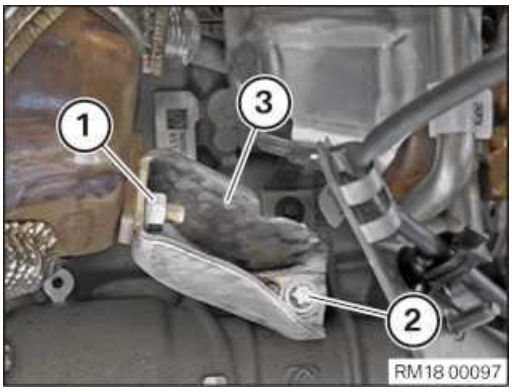


- Tighten nuts (1) by hand.



- Install holder (3).
- Hand-tighten the bolts (2).
- Tighten nuts (1) by hand.

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- Install holder (3).
- Tighten the nut (1) hand-tight.
- Hand-tighten the bolt (2).



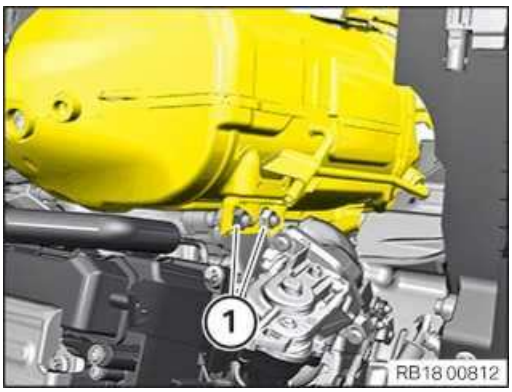
- Remove fitting aid (1) for the flexible tube.



- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

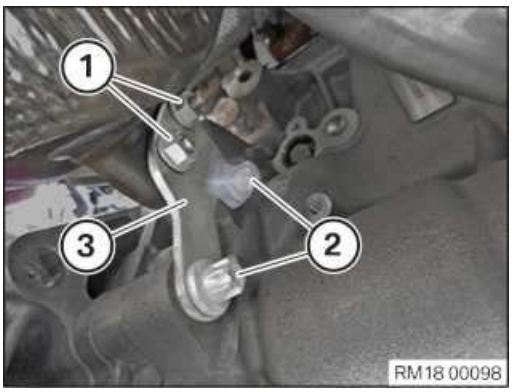
V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm



- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screws (2).

Diesel particulate filter holder to gearbox

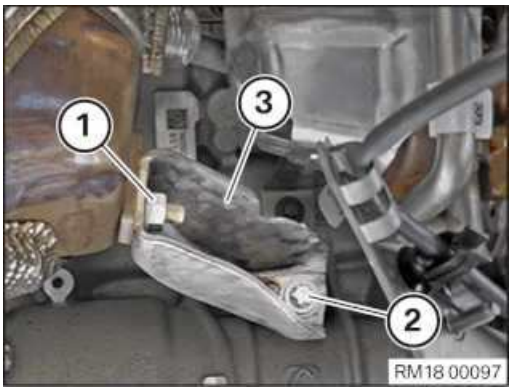
M12x75		Tightening torque	66 Nm

- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm

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- Tighten down screw (2).

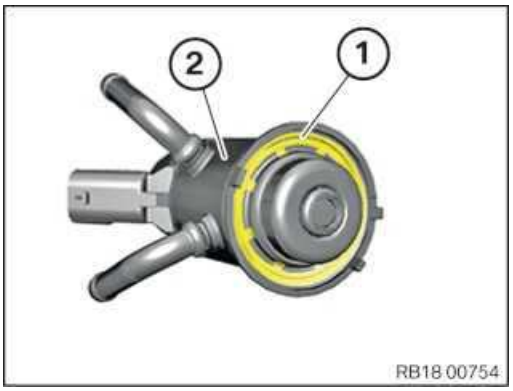
Diesel particulate filter bracket to crankcase

M10x35		Tightening torque	38 Nm

- Tighten nut (1).

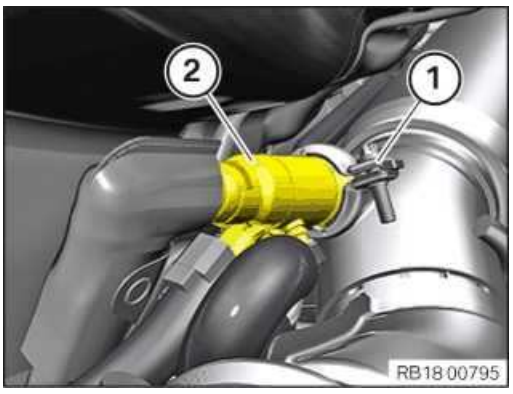
Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Renew sealing ring (1) of the SCR metering module (2).

  Parts: Sealing ring

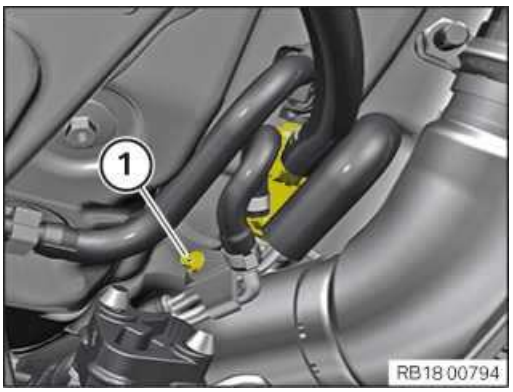


- Insert and install the SCR metering module (2).
- Renew the V-clip (1).

  Parts: V-band clamp
- Tighten V-band clamp (1).

SCR metering module V-clip to exhaust system

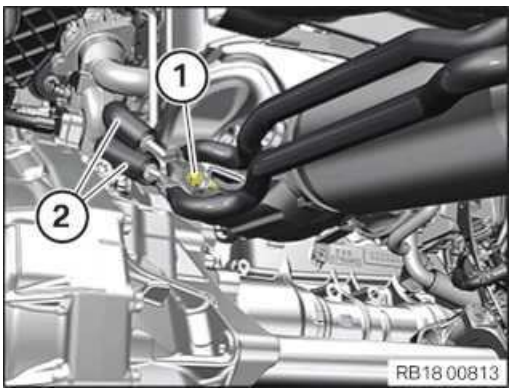
V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm



- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm



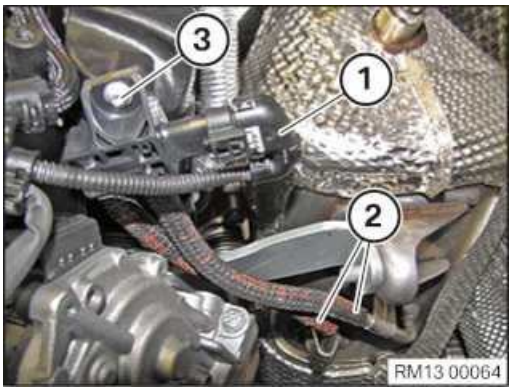
- Thread in and install coolant line (2) of the SCR metering module.
- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm

▸ **Installing differential pressure sensor**

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- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

49 – Install the control sensor

TECHNICAL INFORMATION

New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue



- Feed in front oxygen sensor (1) and install.
- Tighten front oxygen sensor (1) using special tool .

Control sensor

Control sensor		Tightening torque	50 Nm

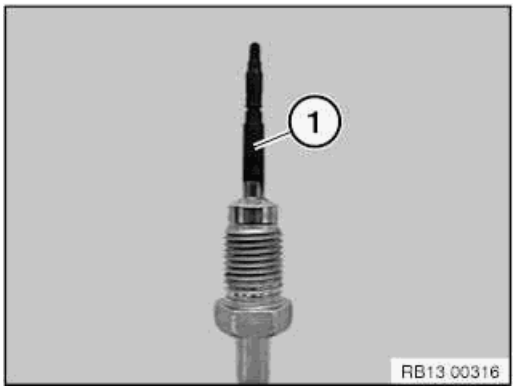


- Lay and secure cable of oxygen control sensor.
- Secure the connector (2) to the holder.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

50 – Install the exhaust-gas temperature sensor on the diesel particulate filter

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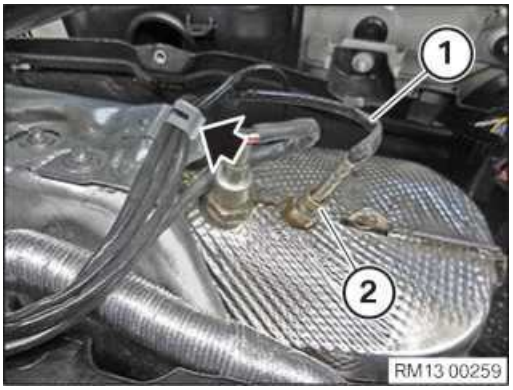
RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

- Check the gauge tip (1) for damage and renew the exhaust temperature sensor as needed.



- Feed in and install the exhaust temperature sensor (2).
- Tighten the exhaust temperature sensor (2).

Exhaust temperature sensor to diesel particulate filter

Exhaust-gas temperature sensor		Tightening torque	28 Nm



- Insert and install cable (1) of the exhaust temperature sensor in the clamp (arrow).
- Lay and fasten the cable of the exhaust gas temperature sensor.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

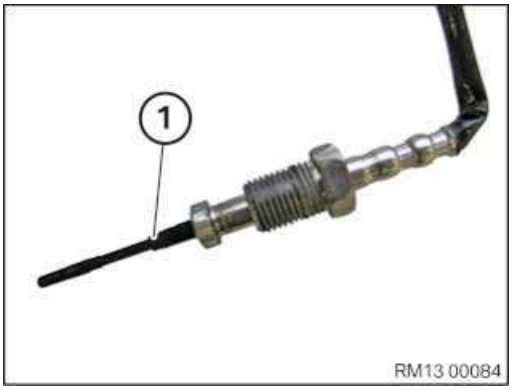
51 – Installing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

RISK OF DAMAGE

Damage of exhaust temperature sensor.

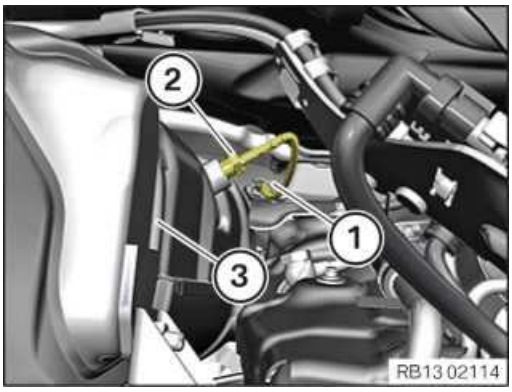
Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.



- Make sure the gauge tip (1) is not damaged during installation.

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- Guide the exhaust temperature sensor (2) into diesel particulate filter (3) and install.
- Tighten the exhaust temperature sensor (2) with conventional tools .

Exhaust temperature sensor to diesel particulate filter

Exhaust-gas temperature sensor		Tightening torque	28 Nm

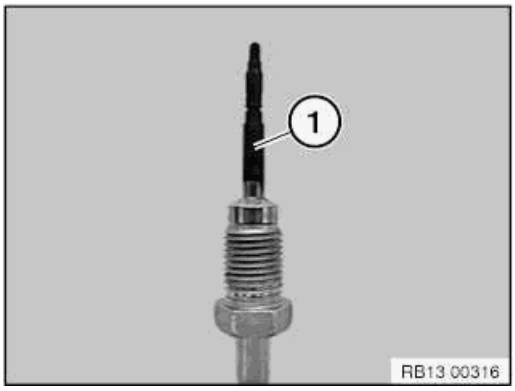
- Insert and install the cable of the exhaust temperature sensor (2) in the clamps (1).



- Lay and fasten the cable of the exhaust gas temperature sensor.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

52 – Installing exhaust temperature sensor on catalytic converter



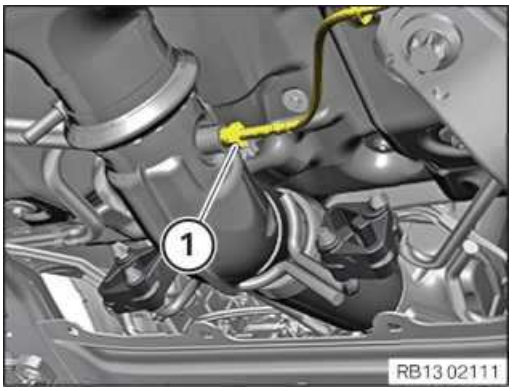
RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

- Check the gauge tip (1) for damage and replace the exhaust temperature sensor as needed.



- Feed in and install the exhaust temperature sensor (1).
- Tighten the exhaust temperature sensor (1).

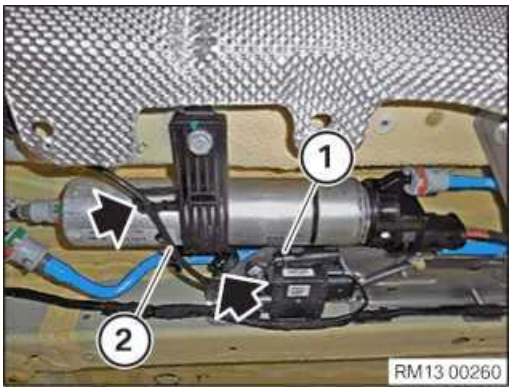
Exhaust-gas temperature sensor to exhaust system

Exhaust-gas temperature sensor		Tightening torque	28 Nm



- Secure the cable clips (1).

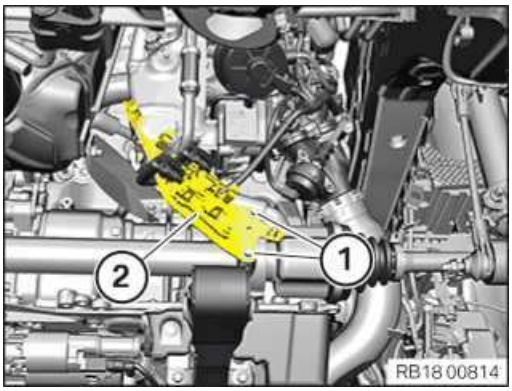
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- Feed cable (2) from exhaust temperature sensor into the clamps (arrows) and install.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

53 – Install holder for oxygen sensor

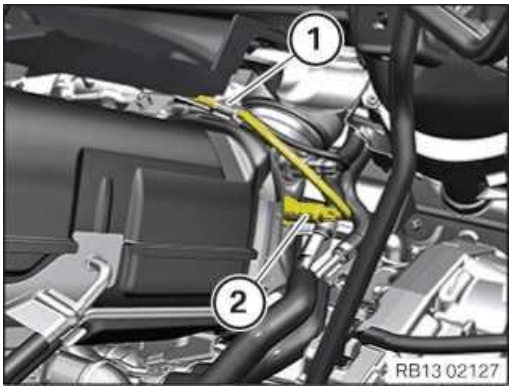


- Insert and install the holder (2).
- Tighten the screws (1).

Oxygen sensor holder to intermediate shaft

Hexagon screw M6x16		Tightening torque	8 Nm

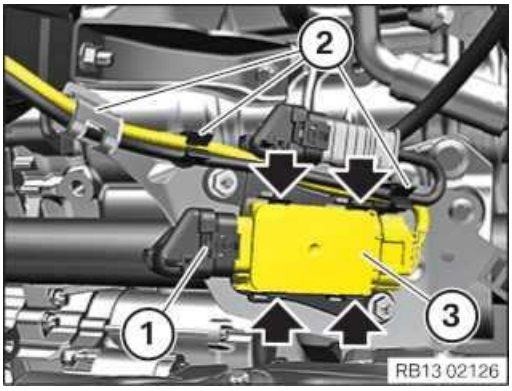
54 – Installing the nitrogen oxide sensor before SCR catalytic converter



- Insert nitrogen oxide sensor before the SCR catalytic converter (2) and install.
- Tighten the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

Nitrogen oxide sensor before SCR catalytic converter

Sensor		Tightening torque	50 Nm



- Install and lock the evaluation electronics for the nitrogen oxide sensor (3) (arrows).
- Insert the evaluation electronics cable for the nitrogen oxide sensor (3) into the clamps (2) and install.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

55 – Install the monitoring sensor

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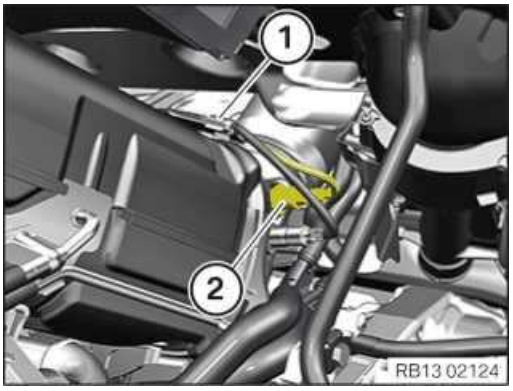
TECHNICAL INFORMATION

New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

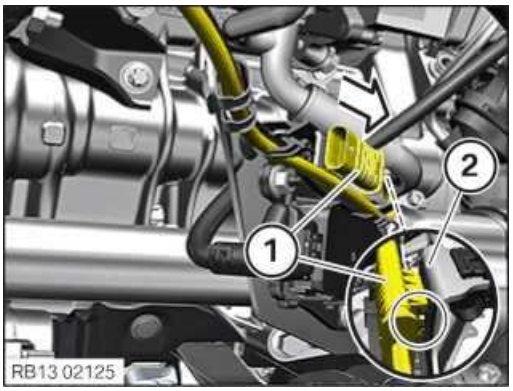


- Feed in the monitoring oxygen sensor (2) and install.
- Tighten the monitoring oxygen sensor (2) with special tool **0 491 074 (11 7 020)**.

Monitoring sensor

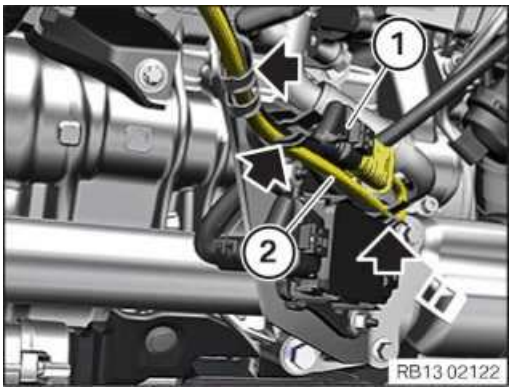
Sensor		Tightening torque	50 Nm

- Insert the cable of the monitoring oxygen sensor (2) into the clamp (1) and secure it.



- Connect the connector (1) with the bracket (2) in the direction of arrow.
- Make sure that the connector (1) is locked correctly in the marked area.

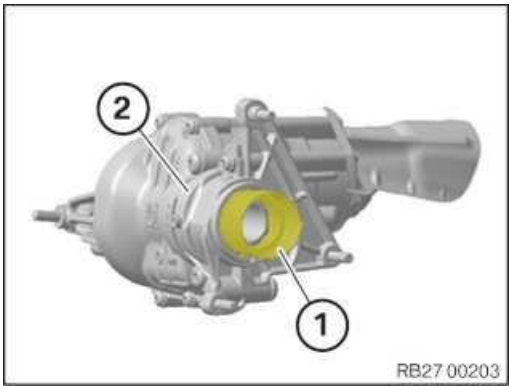
  The connector (1) must engage audibly.



- Insert and attach the cable of the monitoring oxygen sensor (2) to the clamps (arrows).
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

56 – Install the transfer box (VTG)



- If intermediate shaft (1) gets caught on transfer box (VTG) (2), renew intermediate shaft (1) and the radial shaft seals in the automatic or manual transmission.

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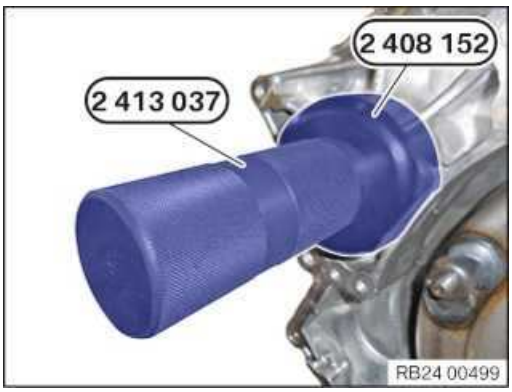
- Screw special tool **2 409 025** into the outer radial shaft seal.
- Turn the screw on the special tool **2 409 025** until the outer radial shaft seal has been pulled out.



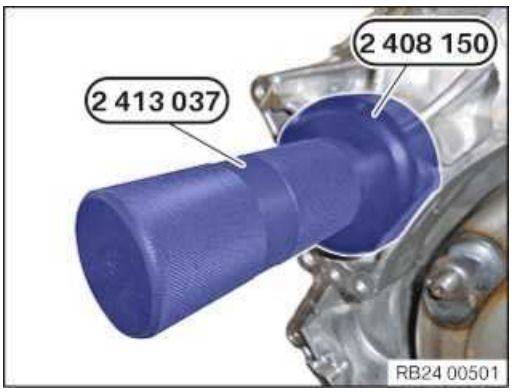
- Insert special tool **2 411 739** into the inner radial shaft seal.



- Screw special tool **2 411 739** into the inner radial shaft seal.
- Turn the screw on the special tool **2 411 739** until the inner radial shaft seal has been pulled out.

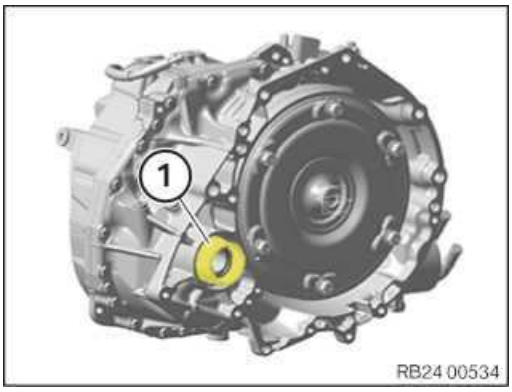


- Drive in the inner radial shaft seal using special tools **2 408 152** and **2 413 037** up to the limit position.



- Drive in the outer radial shaft seal using special tools **2 413 037** and **2 408 150** up to the limit position.

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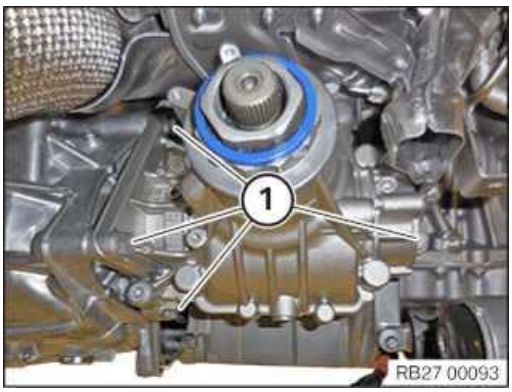
- If necessary, connect the new intermediate shaft (1) to the output flange of the automatic transmission or manual transmission.



- Coat the inside of the output flange (arrows) evenly with approx. 5 g of grease.

Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the transfer box (VTG).
- Tighten the screws (1).

Transfer box to transmission

M10		Tightening torque	56 Nm



- Install heat shield.
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Heat shield to transfer box

M6	Renew screws.	Tightening torque	6 Nm

▸ **Check the transfer box oil level**

RISK OF DAMAGE

Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.

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- Check transfer case oil level, correct:
- Open the oil filler plug (1).
- Check transfer box oil level.
- If necessary, top up transmission oil up to the lower edge of the oil filler plug opening (1).

Transmission oil

Technically suitable transfer box and electrical transmission oils		

Main group 27

- Tighten the oil filler plug (1).

Oil filler plug on transfer box (VTG)

M18x1.5		Tightening torque	35 Nm

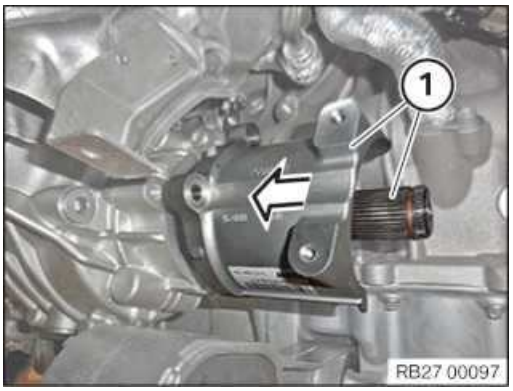
57 – Install the intermediate shaft with the support tube



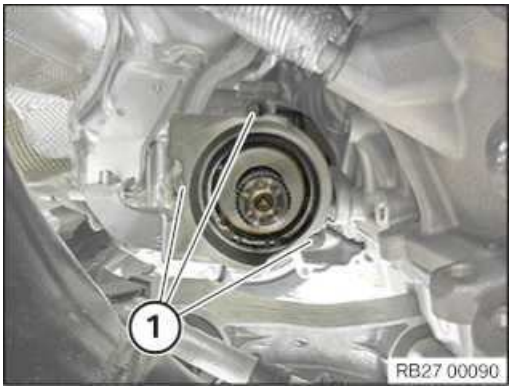
- Coat gearing of the intermediate shaft uniformly with 5 g of grease.

Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the intermediate shaft with support tube (1) in the transfer box.



- Position screws (1).

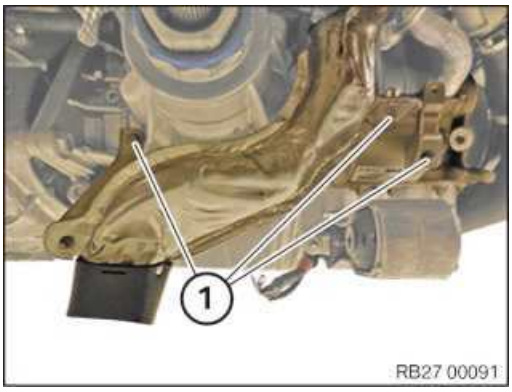
Note: Check for correct screw length! Bolt M8x35 8.8

- Tighten the screws (1).

Intermediate shaft to transfer box

M8x35		Tightening torque	19 Nm

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- If installed: Install air duct.
- Tighten the screws (1).

58 – Installing starter motor

CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.



- Insert and install the starter motor .
- Tighten the screws (1).

Starter motor to transmission

M8x45		Tightening torque	19 Nm



- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

Battery positive lead to starter

M8		Tightening torque	13,5 Nm



- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.

59 – Installing right output shaft partially

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- Renew the circlip (1).

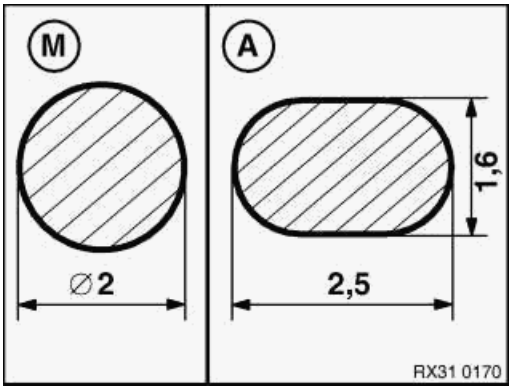
  Parts: Circlip
- Slide output shaft into the transmission as far as the limit position.
- Check for secure seat by levering.

60 – Partially installing the left output shaft



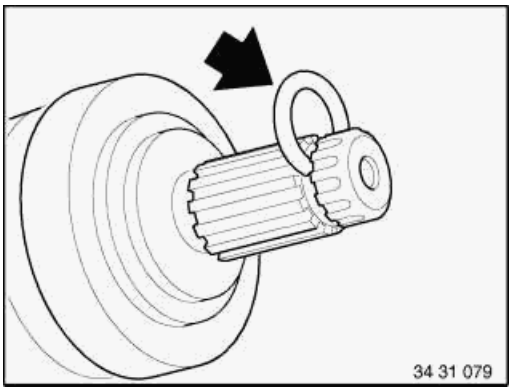
- **With automatic transmission only:**
- Lever out O-ring (1).
- Renew O-ring (1).

  Parts: O-ring
- Insert new O-ring (1).

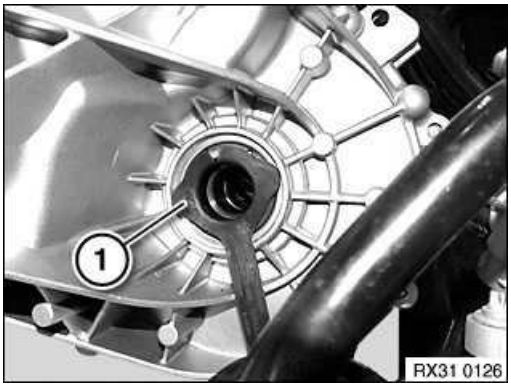


- Do not mix up circlips.

  Different types of output shafts fitted:
  - M: Manual transmission
  - A: Automatic transmission

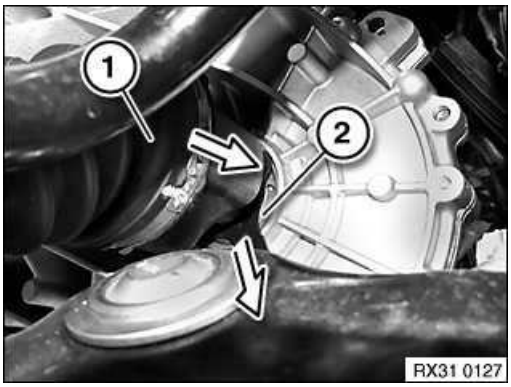


- Renew circlip (arrow).



- Insert installation protection ring (1) into the radial shaft seal.
- Make sure the tool fits over the lip of the radial shaft seal so there is no damage to sealing ring when the output shaft is inserted.

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- Insert output shaft (1) into transmission.
- **Manual gearbox only:** Pull on the handle to remove the installation protection ring (2) and dispose of it.
- Slide output shaft (1) into the transmission as far as the limit position.

  The output shaft (1) must engage audibly.
- Check for secure seat by levering.

61 – Install propeller shaft.

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

RISK OF DAMAGE

Damage to the propeller shaft during installation.

Non-observance of the installation guidelines for the propeller shaft on the rear axle differential may cause severe damage.

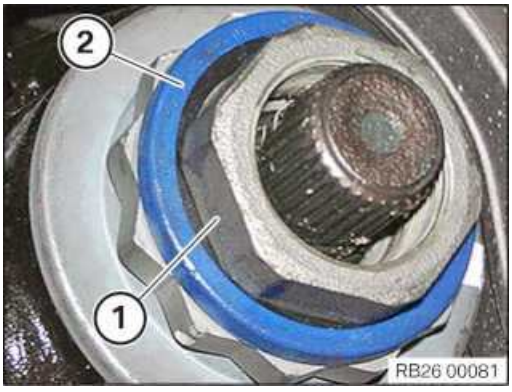
- Always renew the recessed nut on the rear axle differential. Screw locking must be available.
- Strictly observe a minimum hardening time of two hours after having screwed in the recessed nut. The hardening time may be longer at lower temperatures.

RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.



- Renew recessed nut (1).

  Parts: Insert nut
- Renew the retaining clip (2) and the seal.

  Parts: Retaining clip, seal
- Insert the seal with the recessed nut (1) and install.
- Insert the retaining clip (2) and install.
- Make sure that recessed nut (1) is screwed in within 5 min.
- Make sure that the hardening time of **minimum** 2 h for the recessed nut is observed.

  The hardening time must be extended at lower temperatures.

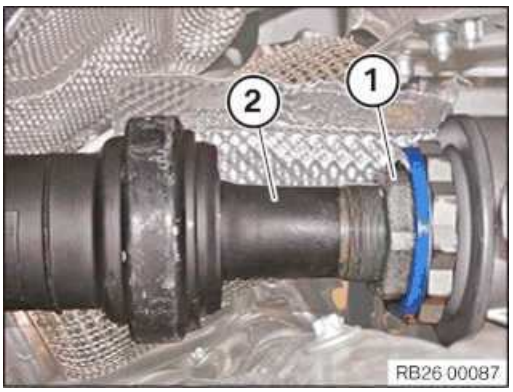
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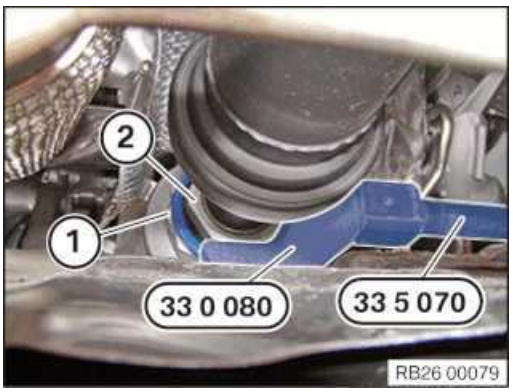
- Insert the propeller shaft (1) and install.
- Always support the propeller shaft (1) with a conventional jack.



- Hand-tighten the bolts (1).



- Push the propeller shaft (2) against the recessed nut (1) up to the limit position.
- Screw the propeller shaft (2) at least 2 thread starts onto the recessed nut (1) by hand.



RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

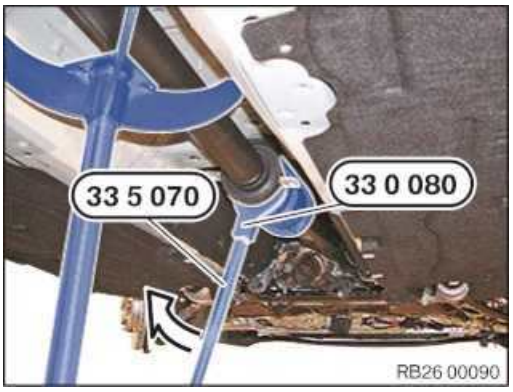
- Do not use the double hexagon head flange nut as counter support.

- Protect the recessed nut (2) on the transfer box from twisting with the special tools **0 495 554 (33 5 070)** and .

  The recessed nut (2) on the transfer box must **not** be used to tighten the propeller shaft.

  The double hexagon flange nut (1) must **not** be used for counter support.

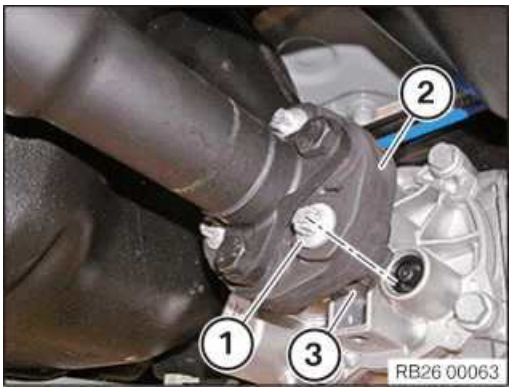
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- Tighten the front propeller shaft with the special tools **0 495 554 (33 5 070)** and in the direction of the arrow.

Propeller shaft to transfer box

		Tightening torque	80 Nm



TECHNICAL INFORMATION

Compliance with the following instructions is required to avoid a humming noise from the propeller shaft after refitting the propeller shaft.

- Assemble the screw connection (1) of the flexible disc (2) and the three-hole flange (3) according to the mark.
- Renew screws (1).

  Parts: Bolts
- Hand-tighten the bolts (1).



- Protect the propeller shaft (1) with the special tools **0 495 554 (33 5 070)** and from twisting.



- Tighten the bolts with the special tools **0 490 504 (00 9 120)** and .

Flexible disc to rear axle final drive

M12x1.5	Renew screws.	Tightening torque	55 Nm 90 °



- Tighten the screws (1).

Centre mount to body

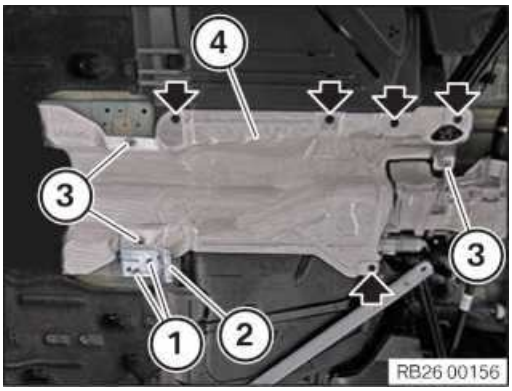
M8		Tightening torque	19 Nm

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- Guide the special too l out between the front and rear propeller shaft and remove.

62 – Installing the rear heat shield



- Insert and install the heat shield (4).
- Tighten screws (arrows).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

- Tighten nuts (3).

Heat shield to body

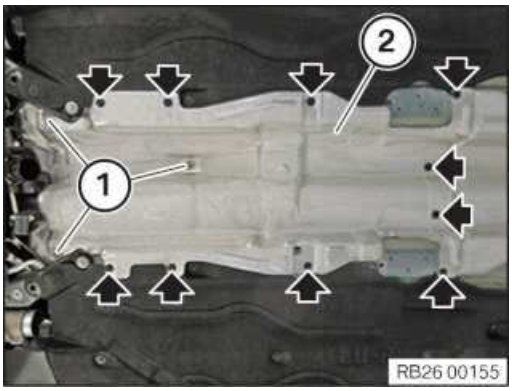
Bolts/nut		Tightening torque	3 Nm

- Insert and install the holder (2).
- Tighten the screws (1).

Bracket to body

M8		Tightening torque	21 Nm

63 – Install the front heat shield



- Insert and install the heat shield (2).
- Tighten screws (arrows).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

- Tighten nuts (1).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

64 – Install exhaust system

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

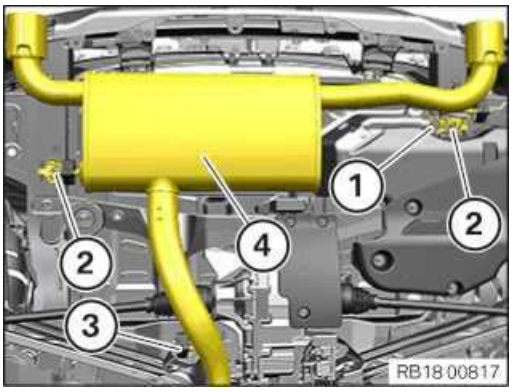
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CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Feed in and install the exhaust system (4) with a second person.
- Renew nuts (2).

  Parts: Nuts
- Tighten nuts (2).

Exhaust system to body

M8	Replace nuts.	Tightening torque	19 Nm

- Tighten down screw (1).

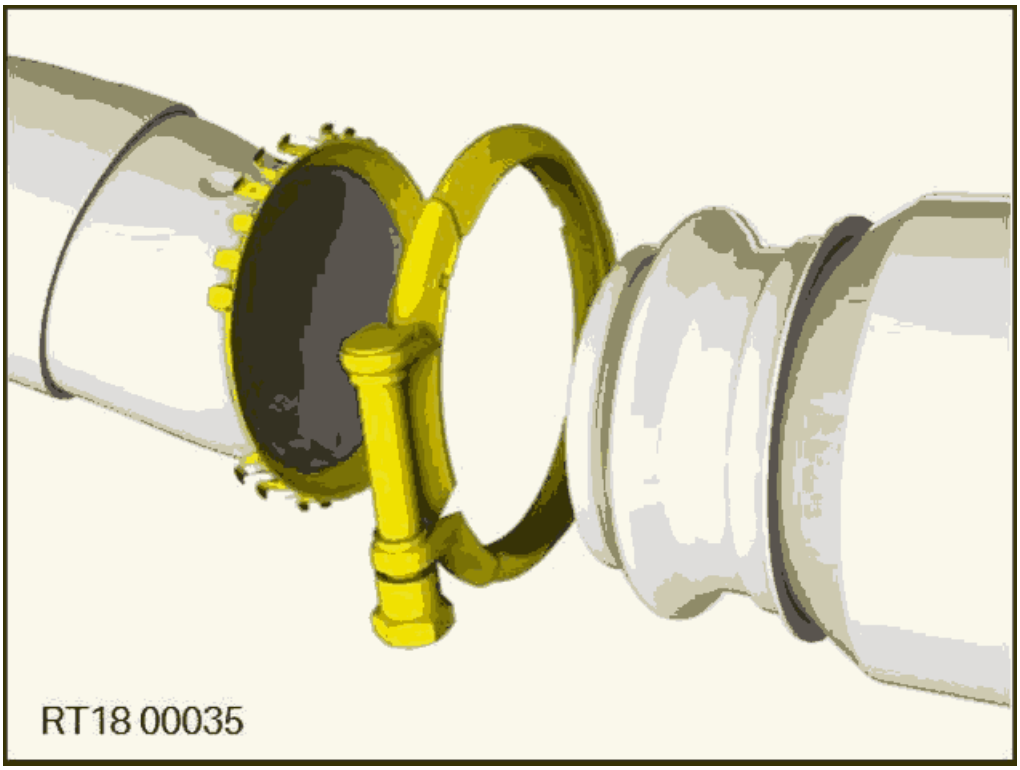
Exhaust bracket on body

Hexagon screw M8x30		Tightening torque	19 Nm

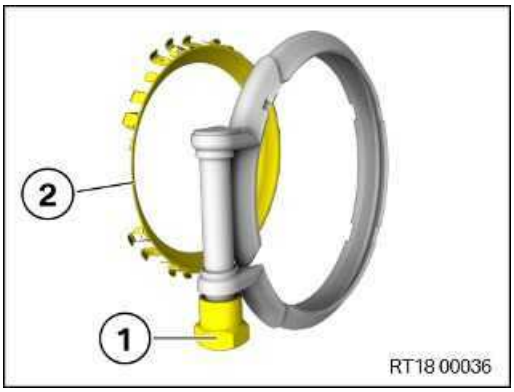
- Check the rubber mount (3) for damage and renew as needed.
- Mount rubber mount (3) on the exhaust system (4).

▸ **Install the V-clip**

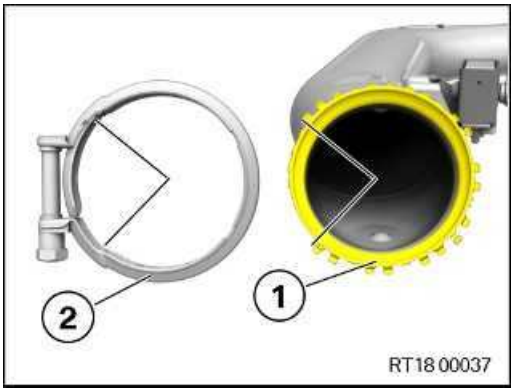
V-band clamp



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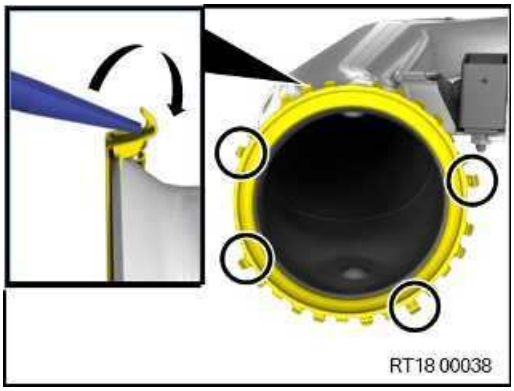


- Unscrew the nut (1) and remove the sealing ring (2).

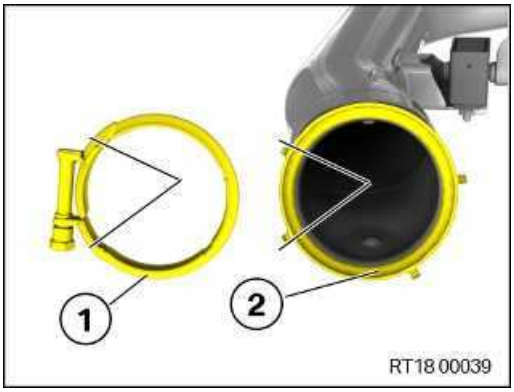


- Renew the V-clip (2).

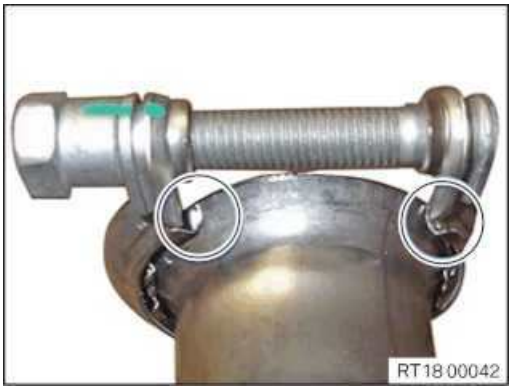
  Parts: V-band clamp
- Mount the sealing ring (1) on the exhaust system.
- Ensure that the sealing ring (1) for the V-clip (2) is positioned correctly.



- Bend all sheet metal tabs over with a suitable tool, except those in the marked areas.

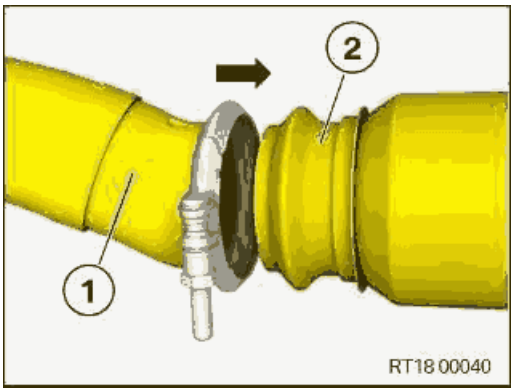


- Mount the V-clip (1) on the sealing ring (2).
- Make sure that the V-clip (1) is positioned correctly on the sealing ring (2).

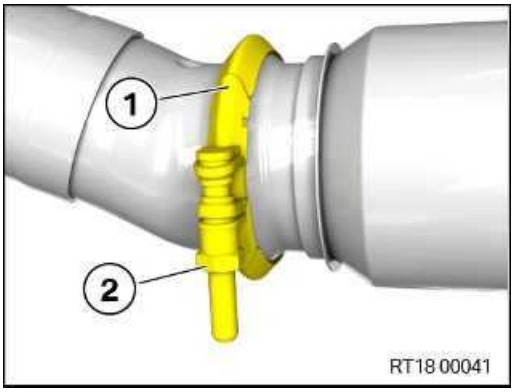


- Make sure that the V-clip rests against the sheet metal tabs after mounting (marks).

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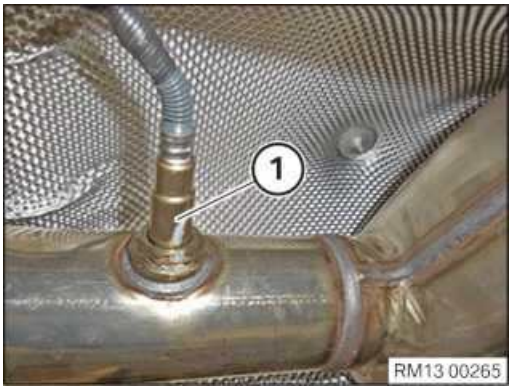
- Connect the exhaust system (1) with the catalytic converter (2) and position correctly.



- Make sure that V-clip (1) is fitted correctly.
- Tighten down screw (2).

V-clip to catalytic converter

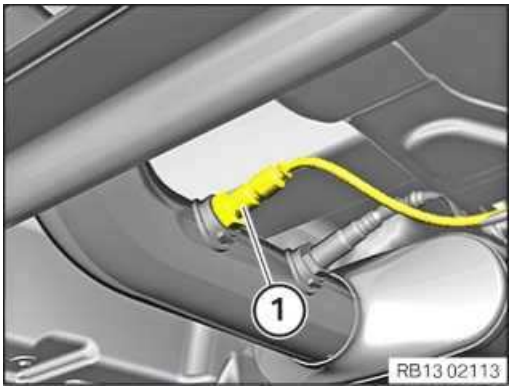
V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm



- Feed in, install and tighten diesel particulate sensor (1).

Diesel particulate sensor to exhaust system

Sensor		Tightening torque	50 Nm



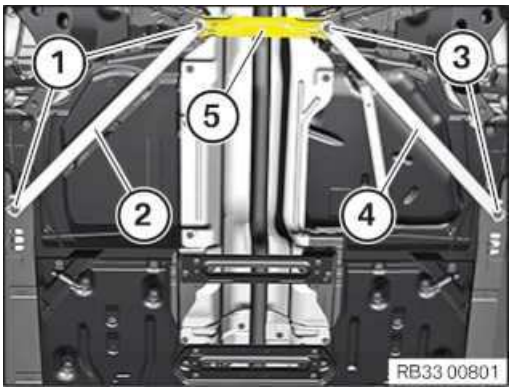
- Feed in, install and tighten nitrogen oxide sensor (1).

Nitrogen oxide sensor downstream of SCR catalytic converter

Sensor		Tightening torque	50 Nm

65 – Install the cross-member with torsion struts

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- Insert and install the cross-member (5).
- Thread in torsion strut (4) at right and install.
- Renew screws (3).

  Parts: Bolts
- Tighten down screws (3).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

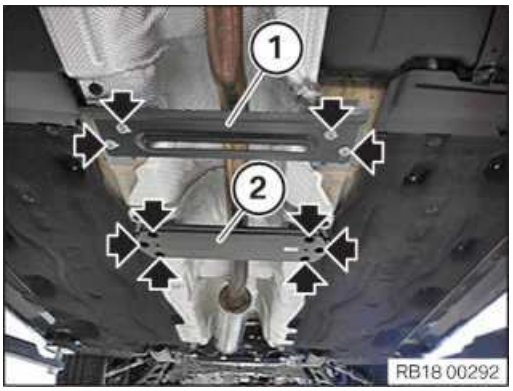
- Guide in and install the left torsion strut (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

66 – Install the connecting support on the tunnel in front and back



- Insert and install connecting supports (2).
- Tighten the screws (arrows) from the connecting support (2).

Front connection carrier to body

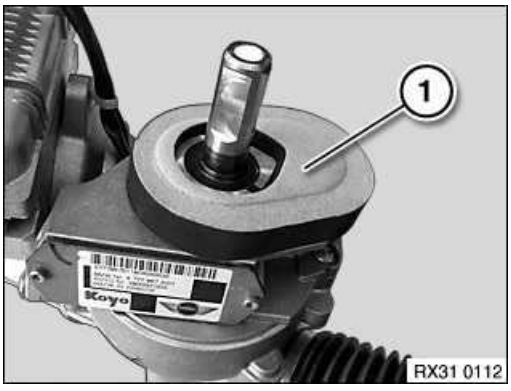
M10x18		Tightening torque	56 Nm

- Insert and install connecting supports (1).
- Tighten the screws (arrows) from the connecting support (1).

Rear connection carrier to body

M8x18		Tightening torque	28 Nm

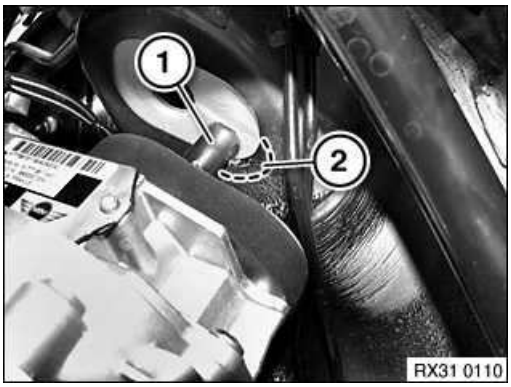
67 – Mount and secure the complete front axle



- Remove the seal (1).
- Clean surface on steering gear.
- Renew gasket (1).

  Parts: Gasket
- Position the seal (1) and glue it on.

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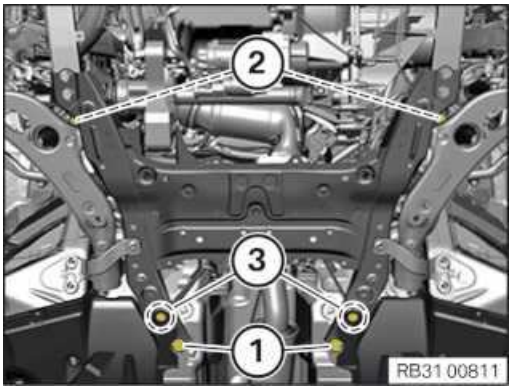


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- Position front axle support.
- Bend underbody panellings in the areas (3) to one side.
- Raise front axle support.
- When raising, insert charge air cooler into the rubber mount of the charge air cooler on cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

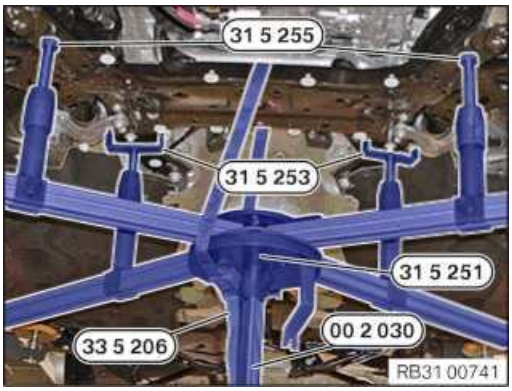
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

- If necessary, tighten the screws in the areas (3).

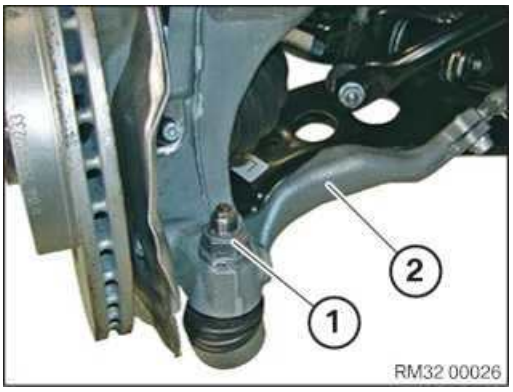
Underbody protection to body

Screw		Tightening torque	3 Nm



- Remove special tool from special tool .
- Lower universal jack **0 490 133 (00 2 030)** with the special tool and place it to the side.

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NOTICE

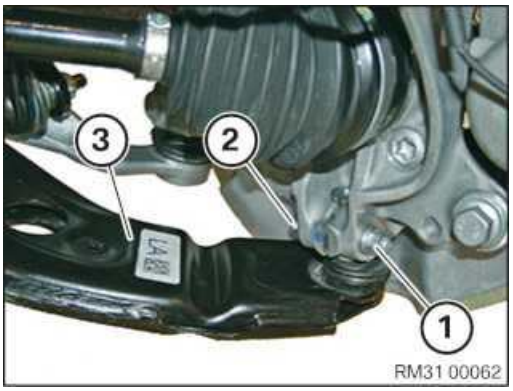
Perform the operations on the left and right side.

- Position the track rod (2) on the swivel bearing .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Track rod end to swivel bearing

M14	Renew nut.	Tightening torque	175 Nm



NOTICE

Perform the operations on the left and right side.

- Position the wishbone (3) on the swivel bearing .
- Renew the bolt (2) and the nut (1).

  Parts: Bolt, nut
- Insert screw (2).
- Tighten nut (1).

Wishbone to swivel bearing

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

68 – Install the mounted parts on the front axle support



NOTICE

Perform the operations on the left and right side.

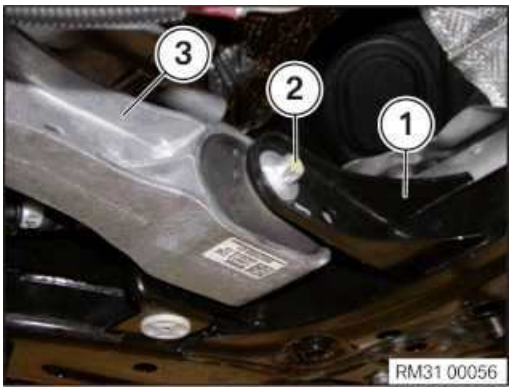
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Holder, wishbone rubber mount, to body

M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °

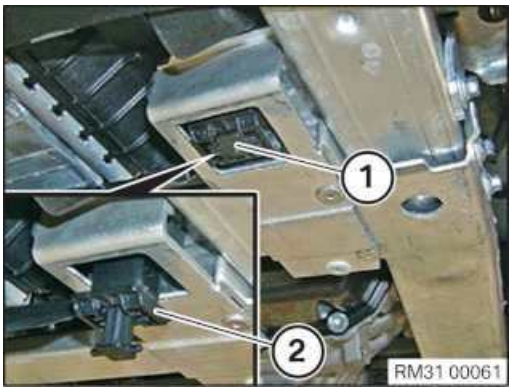
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- Position the engine support (3) on the front axle support (1).
- Tighten down screw (2).

Holder with rubber mount to front axle support

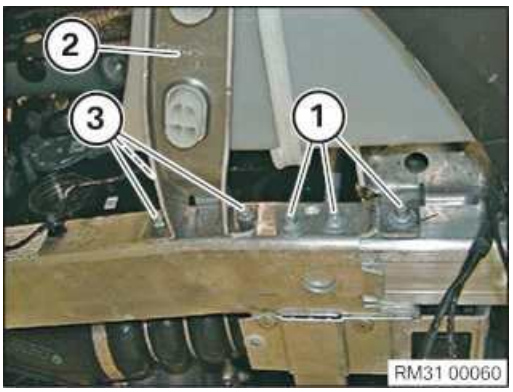
M12 screw		100 Nm



NOTICE

Perform the operations on the left and right side.

- Position the lock (2).
- Lock the bracket (1) of the lock (2) of the holder for the charge air cooler.



- **Only on right side:** Position the holder for the washer fluid reservoir (2).
- Tighten down screws (3).

Washer fluid reservoir holder to front axle support adapter plate

		Tightening torque	10 Nm

NOTICE

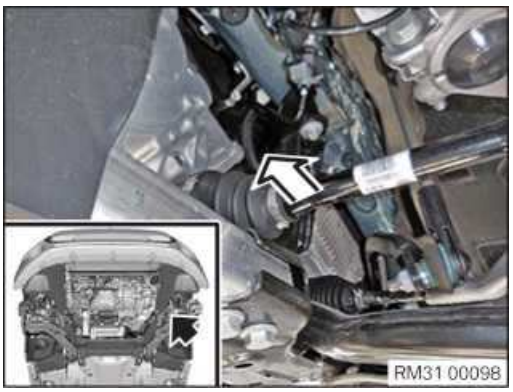
Perform the operations on the left and right side.

- Tighten the screws (1).

Deformation element, bottom, to adapter plate, front axle carrier

		Tightening torque	11,8 Nm

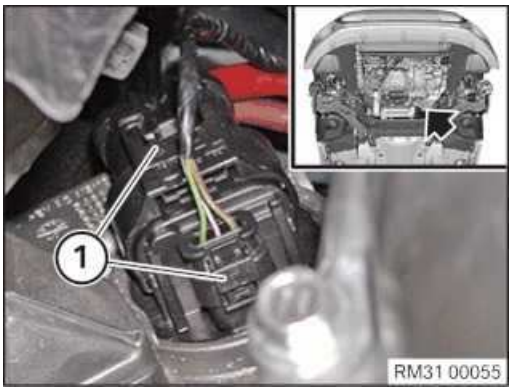
69 – Attaching connector at steering gear



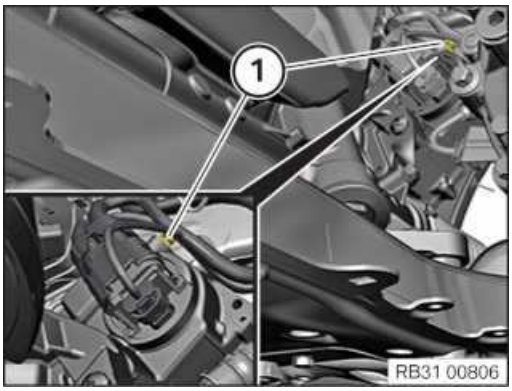
- To connect the connector (see the following step): Connect the connector with the right hand.

  The connectors can be accessed via the left output shaft.

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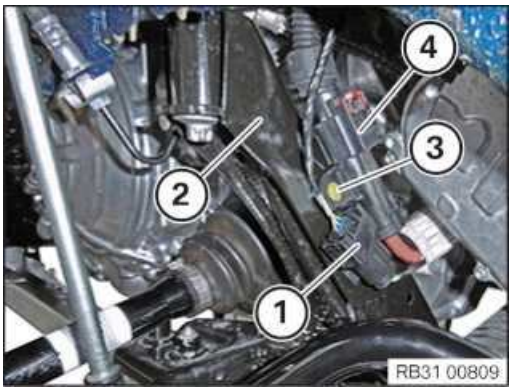


- Connect and lock connector (arrow) (1) with the steering gear.



- Fasten the wiring harness (1) on the steering gear.

▶ **If installed: Fasten the plug connections at the front axle support**



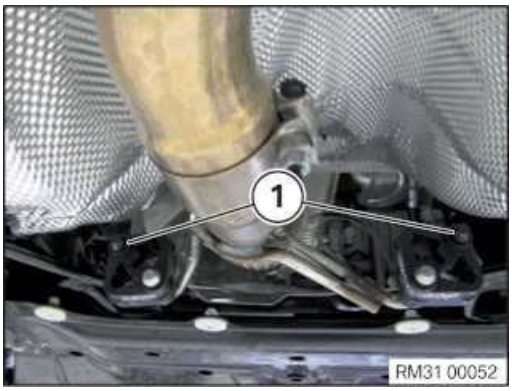
- Position the plug connection (4) at the front axle support (2).
- Tighten down screw (3).

Holder to front axle support

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

- Fasten the plug connection (1) at the front axle support (2).

70 – Securing rubber mount on front axle support



- Check rubber mount (1), replace if necessary.

  Parts: Rubber mount
- Spray rubber mount (1) with lubricant and slide onto holder on front axle support.

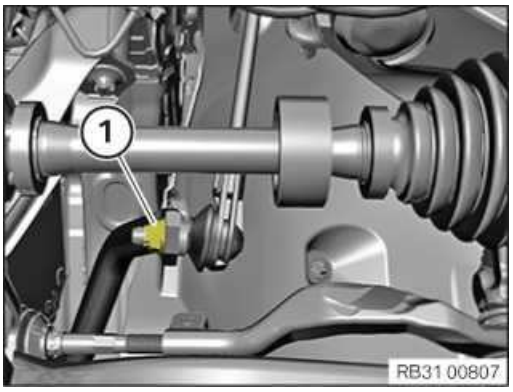
71 – Securing anti-roll bar on left and right on the anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▶ **Fastening anti-roll bar on the anti-roll bar link**

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- Position the anti-roll bar link on the anti-roll bar .
- Renew nut (1).

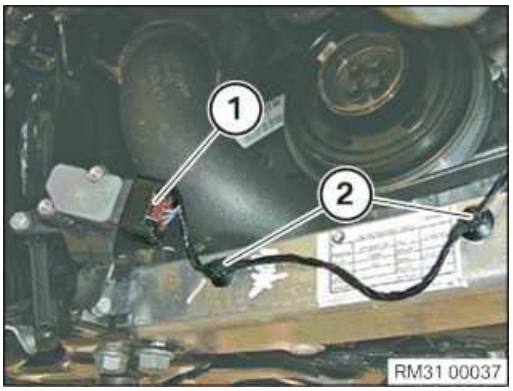
  Parts: Nut
- Tighten nut (1).

Note: Use the Torx socket for counter support.

Anti-roll bar link to anti-roll bar

M10	Renew nut.	Tightening torque	56 Nm

72 – With right installation: Securing the cable for the ride height sensor



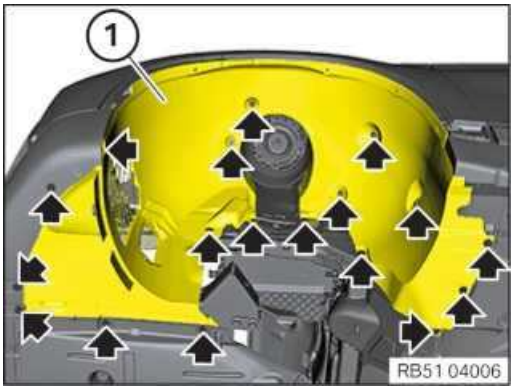
- Secure the cable clip (2) on the adapter of the deformation element.
- Connect connectors (1) and lock.

73 – Installing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

▸ **Installing the front wheel arch cover**



- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Plastic nut		Tightening torque	2,6 Nm
Screw		Tightening torque	2,6 Nm

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

▸ **Installing front wheel arch trim**

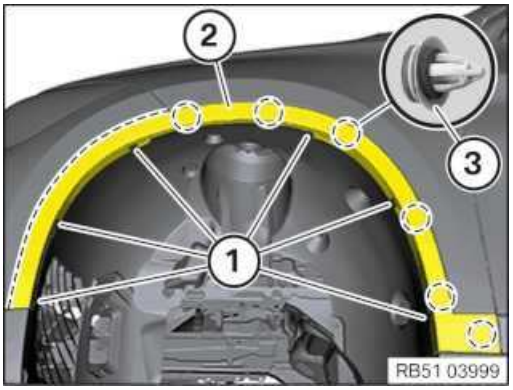
NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

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NOTICE

Description is for left component only. Procedure on the right side is identical.



- Check the clips (3) for damage and renew where required.

  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

74 – Installing both front wheels

▶ **Mounting the wheel**

▷ **Clean the contact surfaces between the brake disc and the wheel rim**



TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

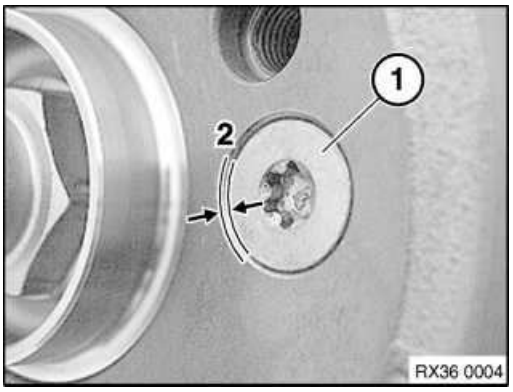
  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue in the area of the wheel bolt holes, remove and clean the brake disc.



- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

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- Renew mounting bolt (1).

  Parts: Mounting bolt

- Check that the mounting bolt (1) for the brake disc is securely seated.

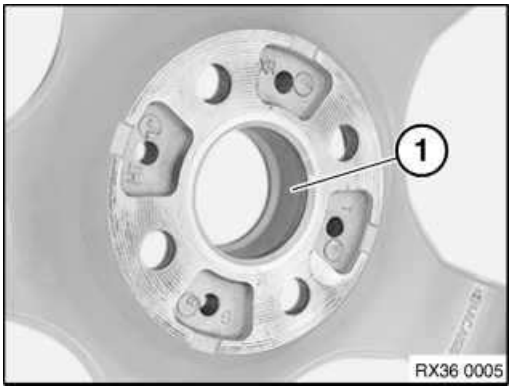
  The mounting bolt (1) for the brake disc may not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to rear wheel hub

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub

M8	Renew screw.	Tightening torque	16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring (1).

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

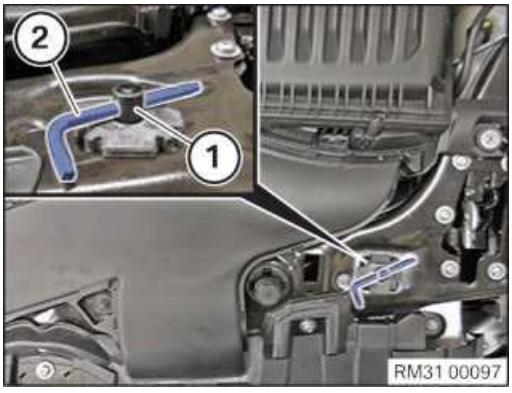
  Parts: Wheel bolts
- Clean the wheel bolts.
- Check the wheel bolts and threads for damage, renew the wheel bolts if necessary.
- Join and tighten the wheel bolts (arrows).

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

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75 – Removing fastener for left and right radiator



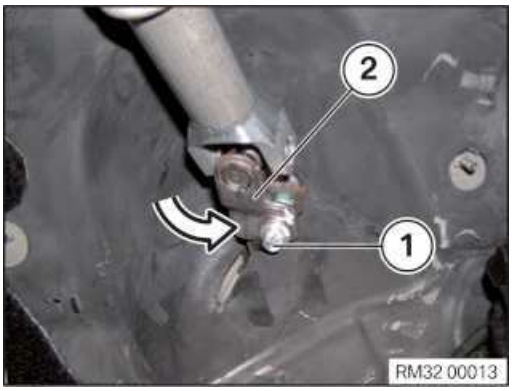
NOTICE

Perform the operations on the left and right side.

- Remove suitable tool (2) from the centering pin (1).

76 – Secure the steering shaft at the bottom on the steering gear

76 – Secure the steering shaft at the bottom on the steering gear



- Clean the screw lock residue from the screw thread in the universal joint (2).
- Pivot the universal joint (2) in the direction of the arrow to the steering gear.
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Lower steering shaft to steering gear

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

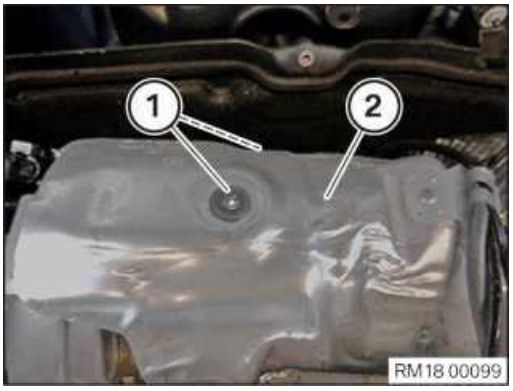


- **If installed:**
- Position the cover on the steering column (2).
- Tighten nuts (1).

Steering column cover to bulkhead

Plastic nut		Tightening torque	3 Nm

77 – Install the heat shield on the exhaust turbocharger



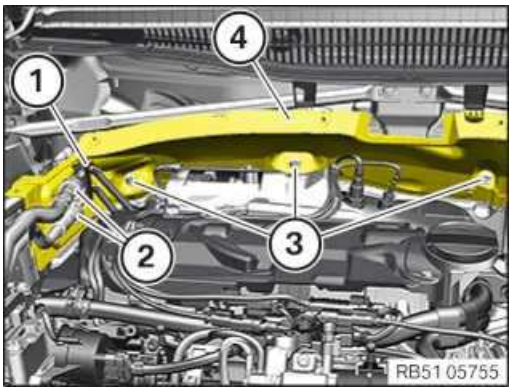
- Feed in and install the heat shield (2).
- Tighten the screws (1) at the top and bottom of the heat shield.

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Fasten the cable at the clips .

78 – Installing rear bulkhead upper part



- Feed in and install the rear bulkhead upper part (4).
- Tighten down screws (3).

Rear bulkhead upper part to lower section of bulkhead

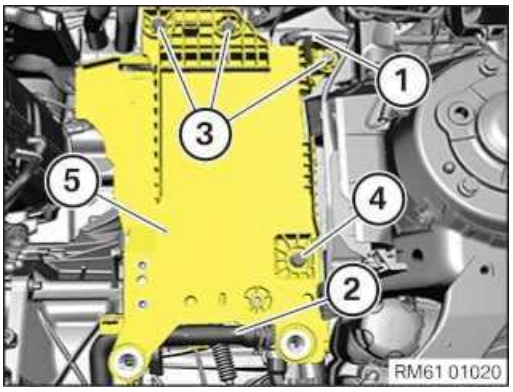
Oval-head screw		Tightening torque	5 Nm

- Feed the fuel line (2) into the holder (1) and install.
- Connect and lock the holder (1).

  The holder (1) must engage audibly.

79 – Install the battery holder

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- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

80 – Install electronics box

Prerequisite

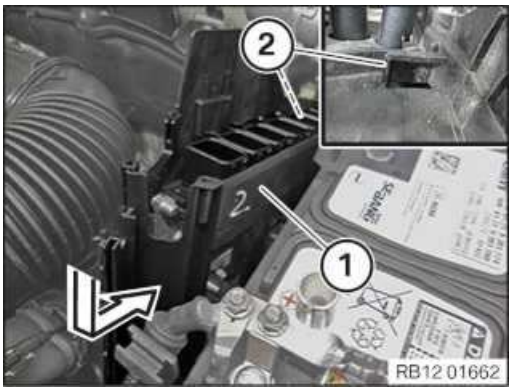
Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.

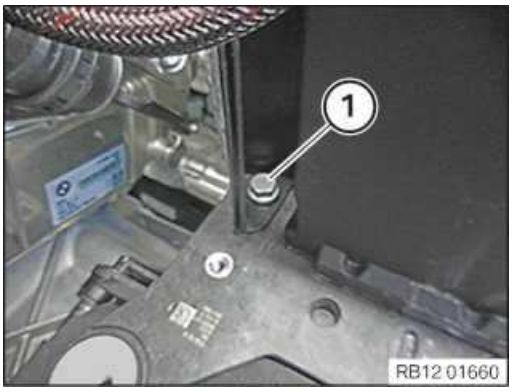


- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.



- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).

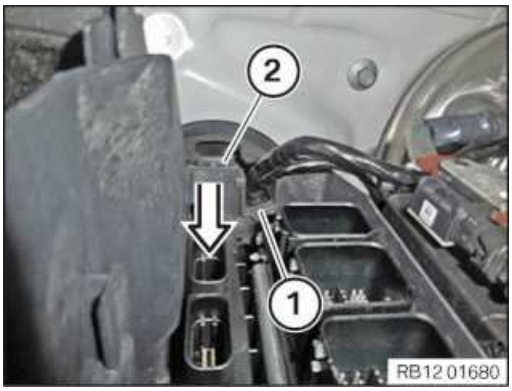
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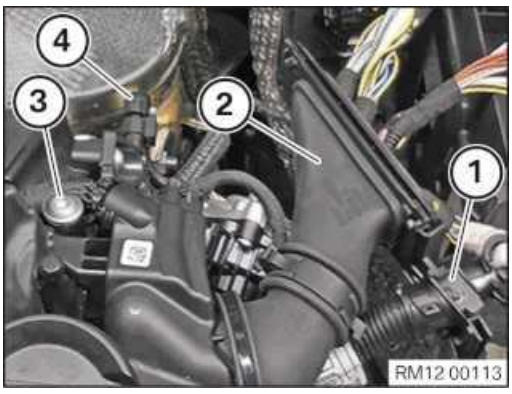
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.

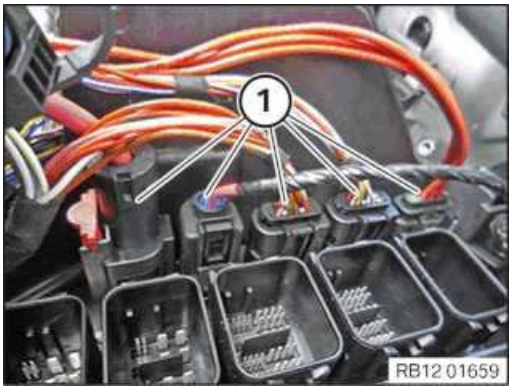


- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

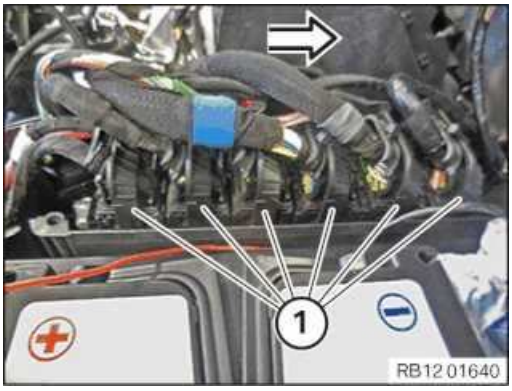
Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.

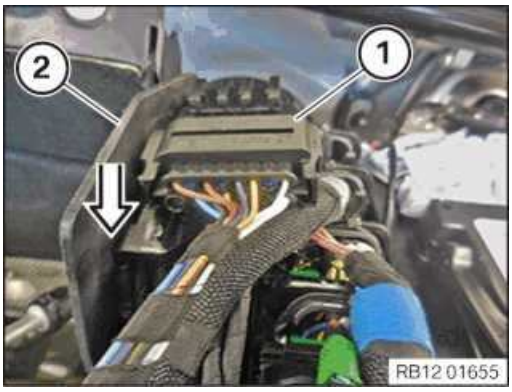


- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.

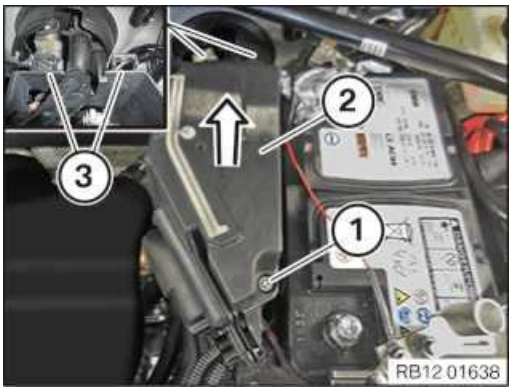


- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.

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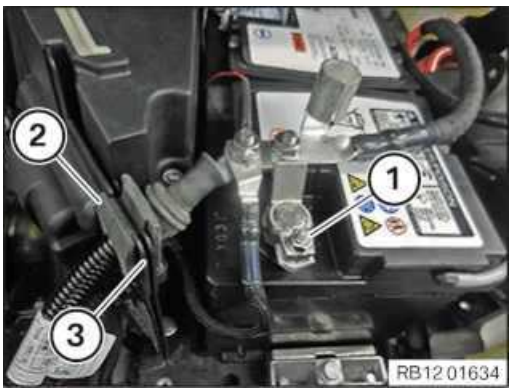
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

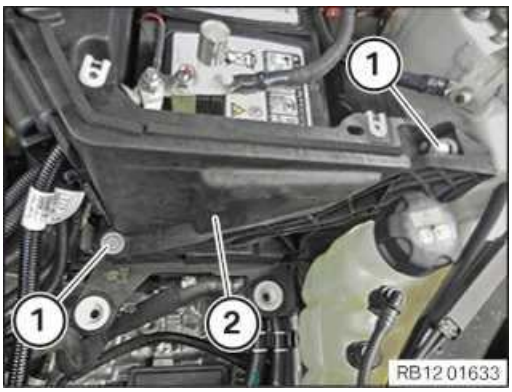
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

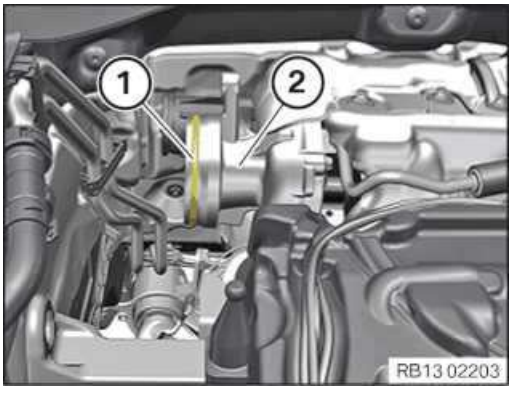


- Feed in and install tension strut (2).
- Tighten the screws (1).

Tension strut to spring strut dome/battery tray

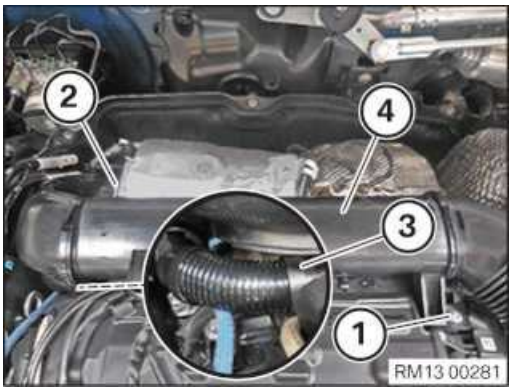
M8		Tightening torque	19 Nm

81 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.

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- Feed in clean air pipe and install.
- Connect clean air pipe to the exhaust turbocharger and lock audibly in the clamps (2).
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Connect ventilation line (3) to the cylinder head cover and lock audibly.

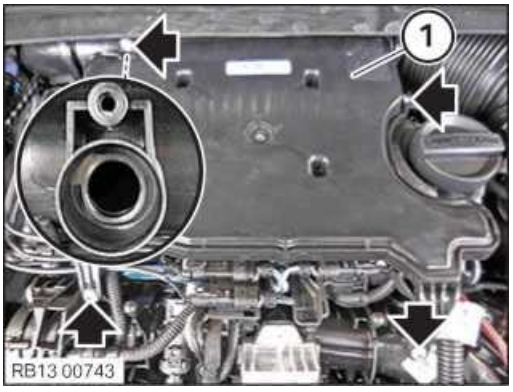


- Mount clean air pipe onto the intake filter housing.
- Tighten clamp (1) on the clean air pipe.

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

82 – Install resonator



- Insert and install the resonator (1).
- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

83 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

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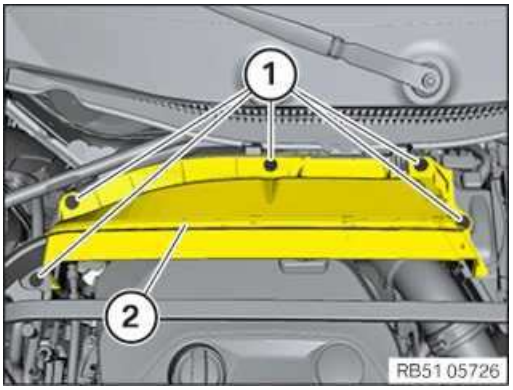


- Check for correct installation of all rubber mounts in the acoustic cover (1).



- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

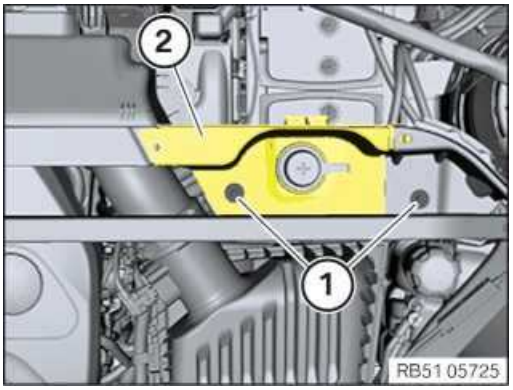
84 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Cover of top bulkhead

Screw		Tightening torque	2,6 Nm



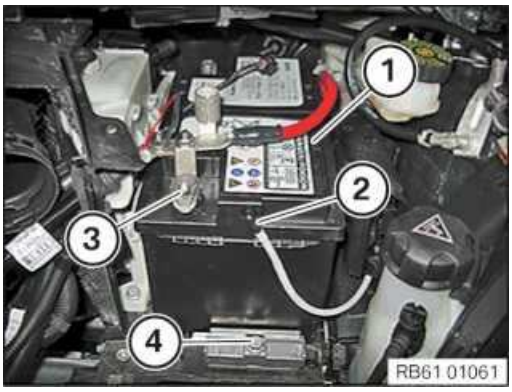
- Guide in and install cover (2).
- Tighten down screw (1).

Cover of remote positive terminal

Screw		Tightening torque	2,6 Nm

85 – Install vehicle battery

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- Install vehicle battery (1).
- Position the bracket and tighten with the screw (4) .

Battery terminal rail to battery tray

M8		19 Nm

- Position the vent hose (2) and clip it in.
- Position the positive battery terminal and tighten with the nut (3) .

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

▸ **Check the vent holes of the battery**

WARNING

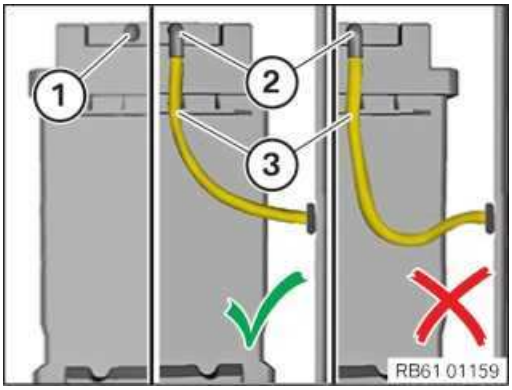
Gas emission.

Danger of injury! Danger of explosion!

- Assign the vent holes correctly.
- Route the vent hose correctly.

TECHNICAL INFORMATION

The battery has two vent holes, opposite:
One vent hole (1) must be closed correctly with a dummy plug.
The vent hose (3) must be correctly connected and routed at the other vent hole (2).



Check

- Check if the vent hole (1) is correctly closed with a dummy plug.

Result

» No dummy plug.

Measure

- Close the vent hole (1) correctly with a dummy plug.

Check

- Check if the vent hole (2) has a correctly connected vent hose (3).

Result

» The vent hose (3) is not correctly connected.

Measure

- At the vent hole (2), connect the vent hose (3) correctly.

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Check

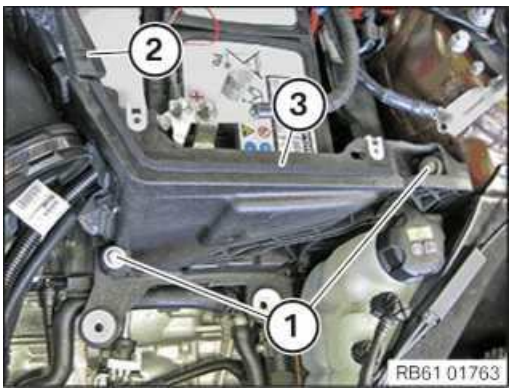
- Check if the vent hose (3) is routed to the outside with a downhill gradient (**no siphon formation!**).

Result

» The vent hose (3) is not correctly routed as shown in the image on the right.

Measure

- Route the vent hose (3) correctly as shown in the centre image.



- Insert tension strut (3) and tighten with screws (1).

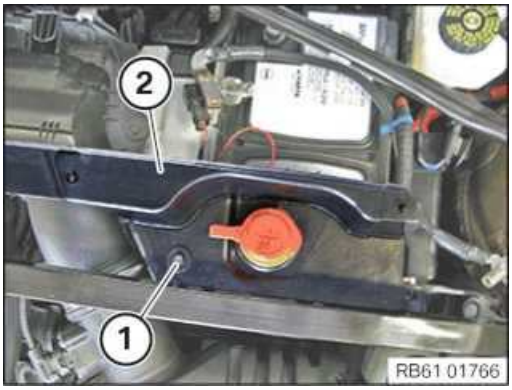
Trailing link

M8		Tightening torque	19 Nm

- Tighten down screw (2).

Battery cover

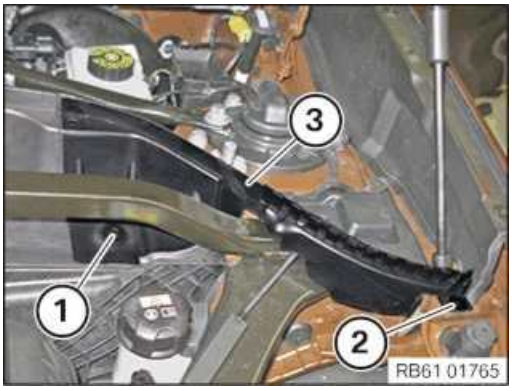
M8		2,8 Nm



- Position the cover (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm

86 – Connecting the battery earth lead

TECHNICAL INFORMATION

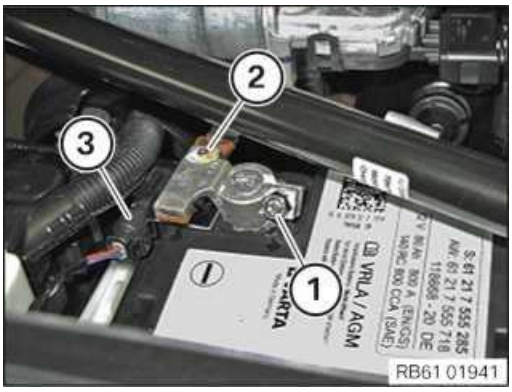
For additional information see:

61 00 ... Safety information on handling the vehicle battery

61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery

61 12 ... Notes on the intelligent battery sensor (IBS)

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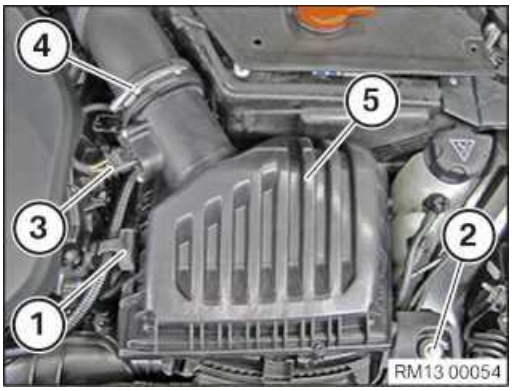
- Remove the protective cover of the positive battery terminal.
- Position the battery earth lead (2).
- Tighten nut (1).

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

- If required, connect the connector (3).

87 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.

  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

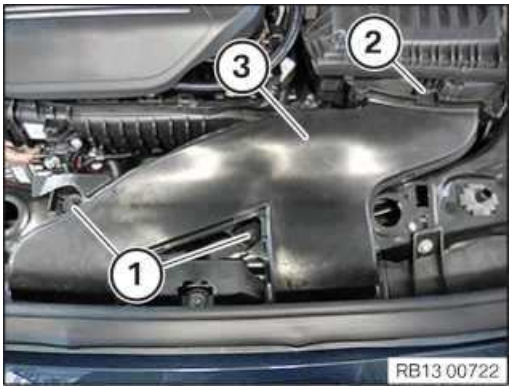
Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Insert and install the holder (1).

88 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

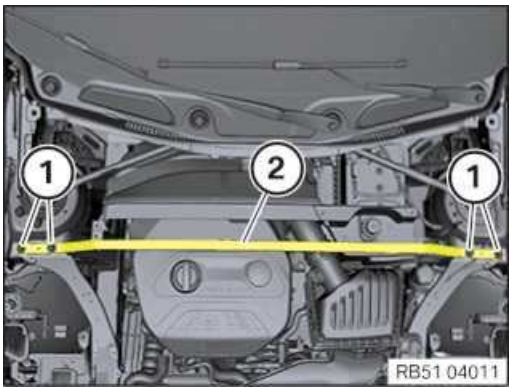
M6		Tightening torque	8 Nm

89 – Install strut brace

TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.

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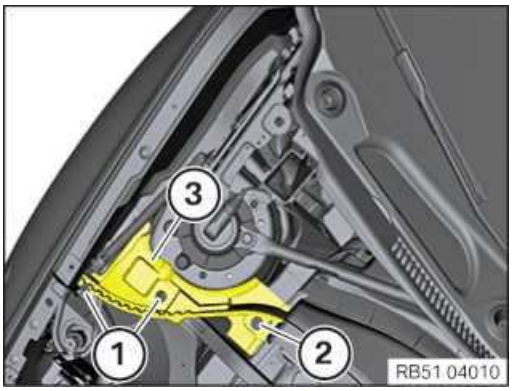


- Install the strut brace (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-brace to spring strut dome

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °



NOTICE

Description is for right component only. The procedure on the left side is identical.

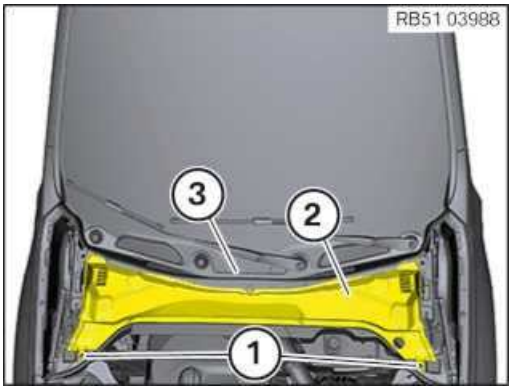
- Install the cover (3).
- Tighten down screw (2).

Cover on body

Hexagon screw		Tightening torque	3 Nm

- Install the expanding rivet (1).

90 – Installing front cowl panel cover

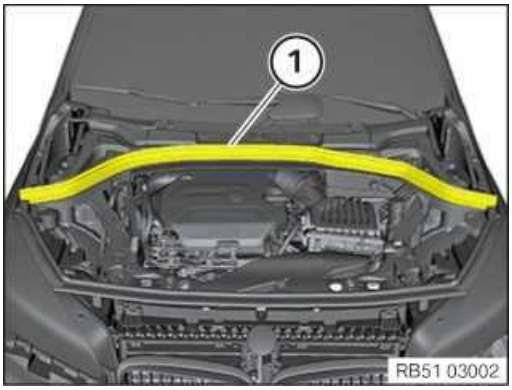


- Insert and install cowl panel cover at front (2) into cowl panel cover at rear (3).
- Check cowl panel cover at front is correctly seated (2).
- Secure expanding rivet (1).

91 – Install the seal for the bonnet

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

92 – Checking/topping up oil level in automatic gearbox (AISIN GA8G45)

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Prerequisite

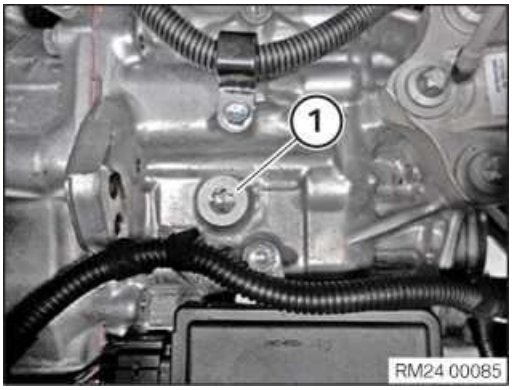
Vehicle in horizontal position.

CAUTION

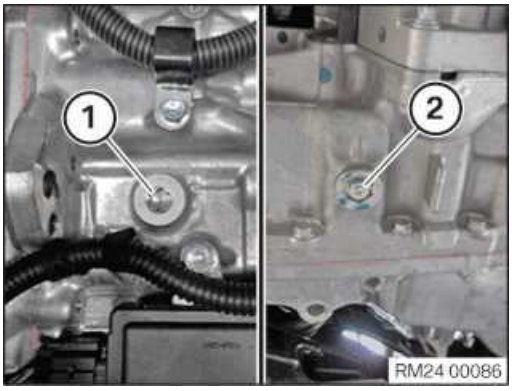
Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.



- Move the selector lever to the "P" position.
- Secure vehicle to prevent it rolling.
- Connect diagnosis system.
- Release the oil filler plug (1) using the Torx T55 .



- **Topping up the automatic transmission fluid (the automatic transmission fluid was drained):**
- Release oil filler plug (1) from engine compartment.
- Loosen the overflow plug (2) below at the transmission.
- Top up automatic transmission fluid at oil filler plug (1) until oil emerges at overflow plug (2).
- Start engine and run at idle speed.
- Check whether the automatic transmission fluid is leaking at the overflow plug (2) .
- If there is no automatic transmission fluid leaking at the overflow plug (2) , fill in the automatic transmission fluid to the oil filler plug (1) .
- Press the footbrake and, when idle, shift through all the gears from "P" to "D" 2 times for more than 2 seconds .
- Move the selector lever to the "P" position.
- Check again whether the automatic transmission fluid is leaking at the overflow plug(2) .
- Read the temperature of the automatic transmission fluid with the diagnosis system.
- Increase temperature of automatic transmission fluid to 35 °C to 45 °C.
- Top up automatic transmission fluid until it flows over.
- Renew sealing rings.

  Parts: Sealing ring
- Screw in and fasten oil filler plug (1) and overflow plug (2).

Oil filler plug to transmission housing

M14	Renew the sealing ring.	Tightening torque	45 Nm

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Overflow screw in oil drain plug

M6	Renew the sealing ring.		8 Nm

- **Check oil level (transmission oil temperature must be between** 35 °C **and** 45 °C **):**
- Open the oil filler plug (1).
- Slacken overflow plug (2).
- Start engine and run at idle speed.
- Unscrew and remove overflow plug (2).
- Check whether the automatic transmission fluid is leaking at the overflow plug (2) .
- If there is no automatic transmission fluid leaking at the overflow plug (2) , fill in the automatic transmission fluid to the oil filler plug (1) .
- Top up the automatic transmission fluid until it overflows at the overflow plug (2) .
- Press the footbrake and, when idle, shift through all the gears from "P" to "D" 2 times for more than 2 seconds .
- Move the selector lever to the "P" position.
- Check the oil level again.
- Renew sealing rings.

  Parts: Sealing ring
- If the oil escapes slightly from the overflow plug (2) , tighten the overflow plug (2) and the oil filler plug (1) .

Overflow screw in oil drain plug

M6	Renew the sealing ring.		8 Nm

Oil filler plug to transmission housing

M14	Renew the sealing ring.	Tightening torque	45 Nm

93 – Topping up oil level in the manual gearbox (GS6X60DA)

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

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TECHNICAL INFORMATION

Make sure during removal of the filling/level control screw to note the installed filling/level control screw variant.

It is **mandatory** to use variant 1 in transmissions up to production date 08/2015.

It is **mandatory** to use variant 2 in transmissions from production date 08/2015.

Failure to observe will result in a leak on the transmission.

- Variant 1 **until** production date 08/2015.
- Variant 2 **from** production date 08/2015.



- Unscrew filling/level control screw (1) and fill the transmission until the oil overflows.

Transmission oil capacity

Transmission oil GS6-60DA, GS6X60DA/Owner's Handbook	2,2 l

Transmission oil: Technically suitable manual gearbox oil

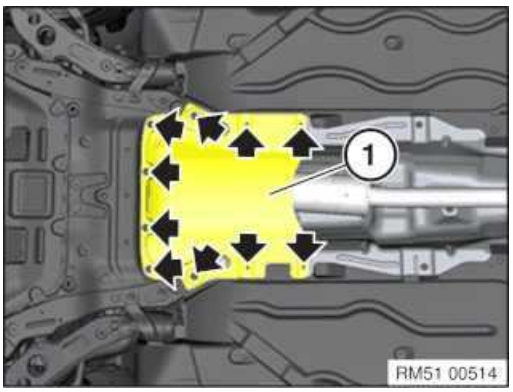
- Allow surplus oil to drain off.
- Renew the filling/level control screw (1).

  Parts: Filling/level control screw
- Tighten filling/level control screw (1).

Oil drain plug / oil filler plug

Hexagon socket		Tightening torque	43 Nm

94 – If installed: Installing underbody protection at rear

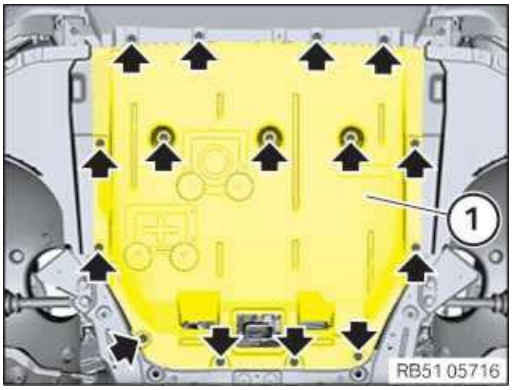


- Position rear underbody protection (1).
- Tighten screws (arrows).

Underbody protection to body

Screw		Tightening torque	3 Nm

95 – Installing the front underbody protection

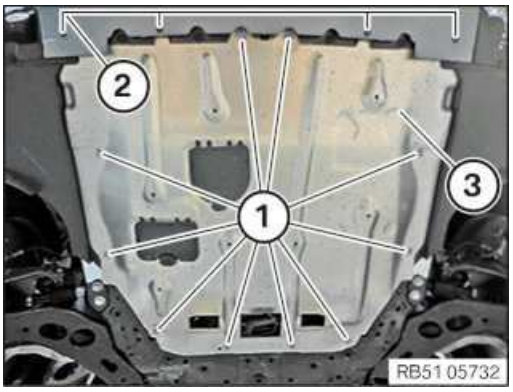


- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

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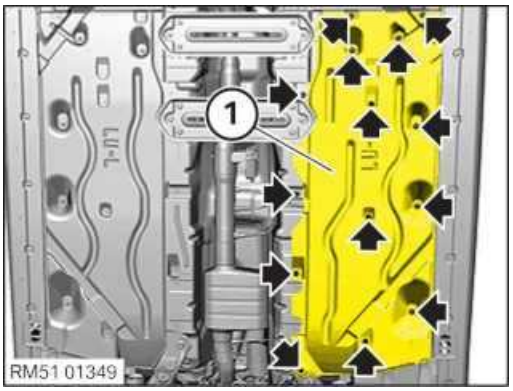


- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

96 – Installing underbody panelling , right



- Correctly position the underbody panelling (1).
- Tighten all bolts and nuts (arrows).

Underbody panelling, side

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side

Plastic nut		Tightening torque	2,6 Nm

Additional Information

Overview of Tightening Torques

Diesel particulate filter V-clip to exhaust turbocharger Used in step 48

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Diesel particle filter to holder Used in step 48

M8 hexagon nut		Tightening torque	19 Nm

Diesel particulate filter holder to gearbox Used in step 48

M12x75		Tightening torque	66 Nm

Diesel particulate filter bracket to crankcase Used in step 48

M10x35		Tightening torque	38 Nm

SCR metering module V-clip to exhaust system Used in step 48

V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm

Holder for coolant lines to diesel particulate filter Used in step 48

Torx bolt BM6x16		Tightening torque	8 Nm

Differential pressure sensor to holder Used in step 48

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor Used in step 48

Clamp 15–19mm		Tightening torque	3 Nm

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Control sensor

Used in step 49

Control sensor		Tightening torque	50 Nm

Exhaust temperature sensor to diesel particulate filter

Used in step 50 51

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Exhaust-gas temperature sensor to exhaust system

Used in step 52

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Oxygen sensor holder to intermediate shaft

Used in step 53

Hexagon screw M6x16		Tightening torque	8 Nm

Nitrogen oxide sensor before SCR catalytic converter

Used in step 54

Sensor		Tightening torque	50 Nm

Monitoring sensor

Used in step 55

Sensor		Tightening torque	50 Nm

Transfer box to transmission

Used in step 56

M10		Tightening torque	56 Nm

Heat shield to transfer box

Used in step 56

M6	Renew screws.	Tightening torque	6 Nm

Oil filler plug on transfer box (VTG)

Used in step 56

M18x1.5		Tightening torque	35 Nm

Intermediate shaft to transfer box

Used in step 57

M8x35		Tightening torque	19 Nm

Starter motor to transmission

Used in step 58

M8x45		Tightening torque	19 Nm

Battery positive lead to starter

Used in step 58

M8		Tightening torque	13,5 Nm

Propeller shaft to transfer box

Used in step 61

		Tightening torque	80 Nm

Flexible disc to rear axle final drive

Used in step 61

M12x1.5	Renew screws.	Tightening torque	55 Nm 90 °

Centre mount to body

Used in step 61

M8		Tightening torque	19 Nm

Heat shield to body

Used in step 62 63

Bolts/nut		Tightening torque	3 Nm

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Bracket to body — Used in step 62

M8		Tightening torque	21 Nm

Exhaust system to body — Used in step 64

M8	Replace nuts.	Tightening torque	19 Nm

Exhaust bracket on body — Used in step 64

Hexagon screw M8x30		Tightening torque	19 Nm

V-clip to catalytic converter — Used in step 64

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

Diesel particulate sensor to exhaust system — Used in step 64

Sensor		Tightening torque	50 Nm

Nitrogen oxide sensor downstream of SCR catalytic converter — Used in step 64

Sensor		Tightening torque	50 Nm

Cross-member/torsion strut to axle support and mounting — Used in step 65

M12x48	Renew screws.	Jointing torque Angle of rotation	100 Nm 90 °

Front connection carrier to body — Used in step 66

M10x18		Tightening torque	56 Nm

Rear connection carrier to body — Used in step 66

M8x18		Tightening torque	28 Nm

Rear end of front axle support to body — Used in step 67

M14 screw	Renew screw.	Tightening torque	175 Nm

Front axle support, front to body — Used in step 67

M12 screw	Renew screw.	Tightening torque	108 Nm

Underbody protection to body — Used in step 67 94

Screw		Tightening torque	3 Nm

Track rod end to swivel bearing — Used in step 67

M14	Renew nut.	Tightening torque	175 Nm

Wishbone to swivel bearing — Used in step 67

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

Holder, wishbone rubber mount, to body — Used in step 68

M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °

Holder with rubber mount to front axle support — Used in step 68

M12 screw			100 Nm

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Washer fluid reservoir holder to front axle support adapter plate

Used in step 68

		Tightening torque	10 Nm

Deformation element, bottom, to adapter plate, front axle carrier

Used in step 68

		Tightening torque	11,8 Nm

Holder to front axle support

Used in step 69

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

Anti-roll bar link to anti-roll bar

Used in step 71

M10	Renew nut.	Tightening torque	56 Nm

Wheel arch cover to body

Used in step 73

Plastic nut		Tightening torque	2,6 Nm
Screw		Tightening torque	2,6 Nm

Wheel arch cover to body

Used in step 73

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Used in step 73

Plastic nut		Tightening torque	3 Nm

Brake disc to rear wheel hub

Used in step 74

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub

Used in step 74

M8	Renew screw.	Tightening torque	16 Nm

Wheel bolts

Used in step 74

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Lower steering shaft to steering gear

Used in step 76

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

Steering column cover to bulkhead

Used in step 76

Plastic nut		Tightening torque	3 Nm

Heat shield for exhaust turbocharger

Used in step 77

Torx screw BM 6x12		Tightening torque	10 Nm

Rear bulkhead upper part to lower section of bulkhead

Used in step 78

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Oval-head screw		Tightening torque	5 Nm

Battery holder to engine support Used in step 79

Hexagon screw M8x30		Tightening torque	19 Nm

Electronics box to battery tray Used in step 80

M8X16		Tightening torque	15 Nm

Wiring harness to cylinder head cover Used in step 80

TS5x20		Tightening torque	3,5 Nm

Cover to electronics box Used in step 80

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery Used in step 80

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray Used in step 80

M8		Tightening torque	19 Nm

Clean air pipe to cylinder head cover Used in step 81

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing Used in step 81 87

Clamp		Tightening torque	3 Nm

Resonator to manifold and clean air pipe Used in step 82

Screw TS6	Renew screw.	Tightening torque	5 Nm

Cover of top bulkhead Used in step 84

Screw		Tightening torque	2,6 Nm

Cover of remote positive terminal Used in step 84

Screw		Tightening torque	2,6 Nm

Battery terminal rail to battery tray Used in step 85

M8			19 Nm

Battery terminal with IBS positive battery terminal / negative battery terminal Used in step 85 86

NutM6			5 Nm

Trailing link Used in step 85

M8		Tightening torque	19 Nm

Battery cover Used in step 85

M8			2,8 Nm

Intake silencer housing to lock bridge Used in step 87

M6X30		Tightening torque	8 Nm

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Intake neck to cross connection — Used in step 88

M6		Tightening torque	8 Nm

Cross-brace to spring strut dome — Used in step 89

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

Cover on body — Used in step 89

Hexagon screw		Tightening torque	3 Nm

Oil filler plug to transmission housing — Used in step 92

M14	Renew the sealing ring.	Tightening torque	45 Nm

Overflow screw in oil drain plug — Used in step 92

M6	Renew the sealing ring.		8 Nm

Oil drain plug / oil filler plug — Used in step 93

Hexagon socket		Tightening torque	43 Nm

Underbody protection front — Used in step 95

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Underbody panelling, side — Used in step 96

Hexagon screw		Tightening torque	2,6 Nm

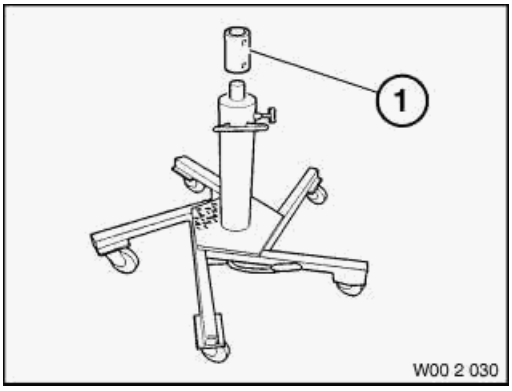
Underbody panelling, side — Used in step 96

Plastic nut		Tightening torque	2,6 Nm

Overview of Special Tools

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0 490 133 (00 2 030) Device



Common

Used in step 28 67

Usage	(universal hydraulic lifter base unit) Chassis and hydraulic lifter - For removing and installing rear axle supports and gearboxes. Also for soft top mounts. Is replaced by 81 22 2 219 012
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 90 (207)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 490 134 (00 2 031)		**Adapter** (adapter for gearbox holder) Model series: E30, E31, E32, E34, E36	

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0 495 554 (33 5 070) Extension



Common

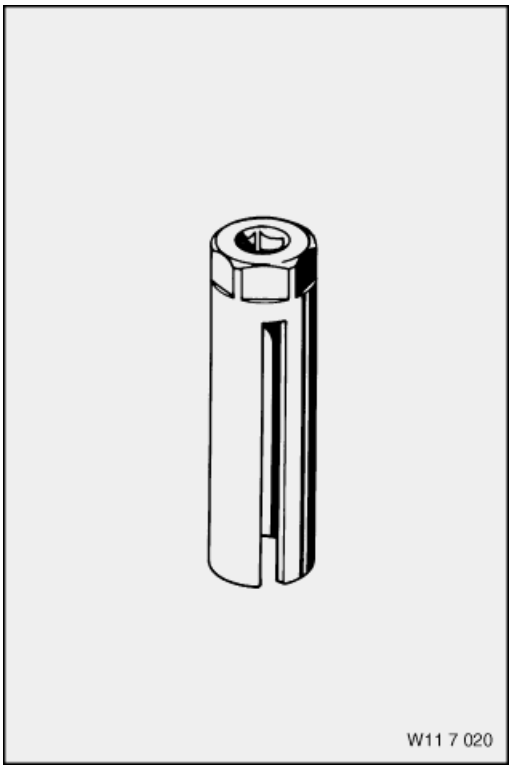
Used in step 34 61

Usage	Pull-out extension for 33 5 040, 33 5 050, 33 5 060.
Included in the tool or work	
Storage location	A18
Replaced by	
In connection with	
SI-Number	01 21 06 (300)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 592 (33 5 071)		**Extension** (Extension (1 item)) discontinued, can only be ordered using complete tool	

0 491 074 (11 7 020) Socket wrench insert



Common

Used in step 40 41 55

Usage	(Socket wrench insert 22 mm) For loosening and tightening the oxygen sensor
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	

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2 409 025 Puller



Common Used in step 56

Usage	For disassembly of the outer radial shaft seal of the transmission output shaft, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A76
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 411 739 Puller



Common Used in step 56

Usage	For disassembly of the inner radial shaft seal of the output, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C78
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 408 152 Striking element



Common Used in step 56

Usage	For installation of the right radial shaft seal transmission output shaft (inner). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

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2 413 037 Handle



Common	Used in step 56
Usage	Universal drift handle. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C77
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

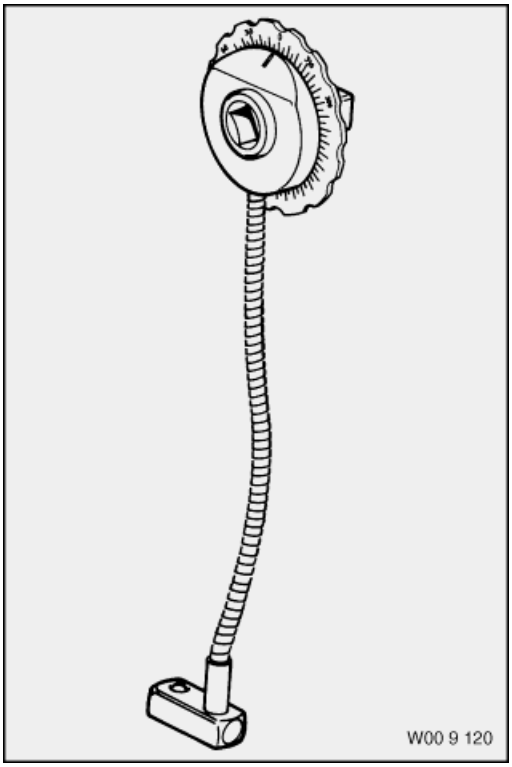
2 408 150 Striking element



Common	Used in step 56
Usage	For installing the right radial shaft seal transmission output shaft (outer). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

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0 490 504 (00 9 120) Torque angle measuring dial



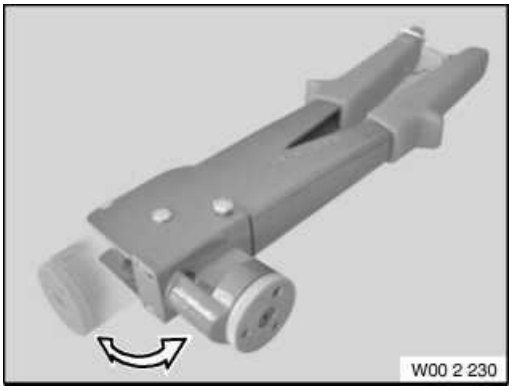
Common

Used in step 61

Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

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0 496 521 (00 2 230) Pliers



Common	Used in step 73
Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

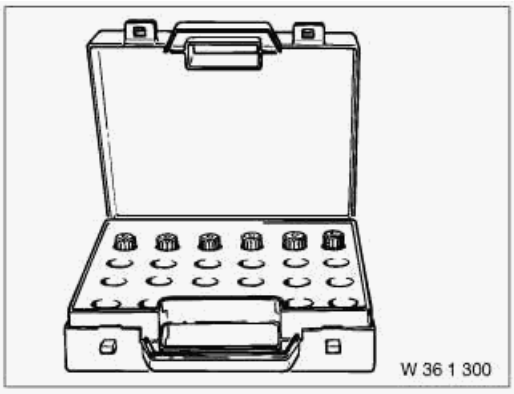
2 344 011 Tool



Common	Used in step 74
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

0 495 221 (36 1 323) Wheel stud



Common	Used in step 18
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

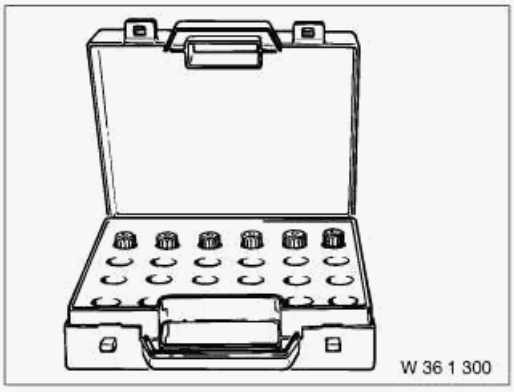
0 495 224 (36 1 326) Wheel stud



Common	Used in step 18
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

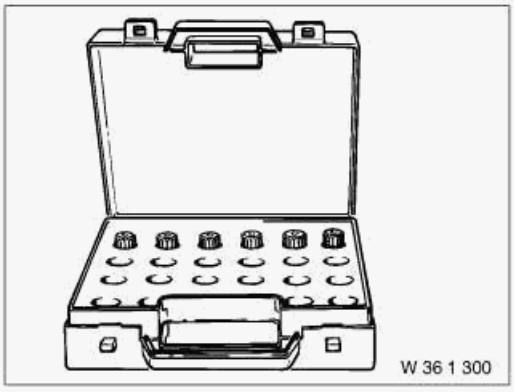
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0 495 225 (36 1 327) Wheel stud



Common	Used in step 18
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud



Common	Used in step 18
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud



Common	Used in step 18
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

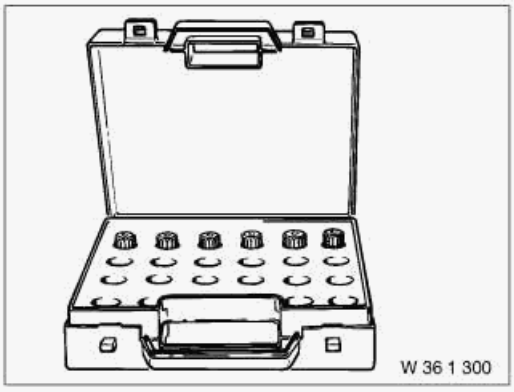
0 495 228 (36 1 331) Wheel stud



Common	Used in step 18
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 229 (36 1 332) Wheel stud



Common	Used in step 18
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud



Common	Used in step 18
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Transmission oil capacity	Used in step 93
Transmission oil GS6-60DA, GS6X60DA/Owner's Handbook	2,2 l
Transmission oil: Technically suitable manual gearbox oil	

Links

General repair instructions	Used in step
61 20 ... Notes on AGM battery	86
61 12 ... Notes on intelligent battery sensor (IBS)	86
61 00 ... Notes for disconnecting and connecting battery	86
41 00 ... Notes on repairing threads	
61 00 ... Safety information for handling vehicle battery	

Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	12 40 41 43 44 45 46 47
00 .. ... Raising the vehicle using a vehicle hoist	

Operating materials	Used in step
2.0 Grease for wheel centring	74
14.0 Automatic transmission fluid for ZF-transmission GA8HP45Z / GA8HP50Z / GA8HP70Z / GA8HP90Z / GA8P70H / GA8P75H / GA8HP75Z	92

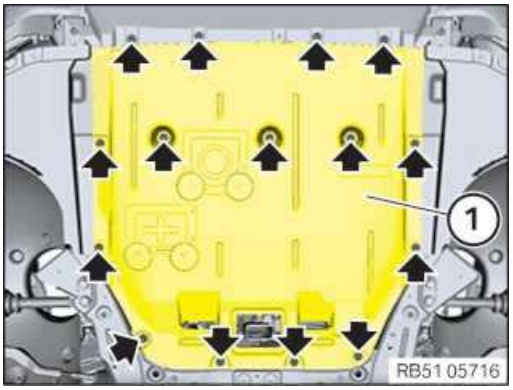
Operating materials	Used in step

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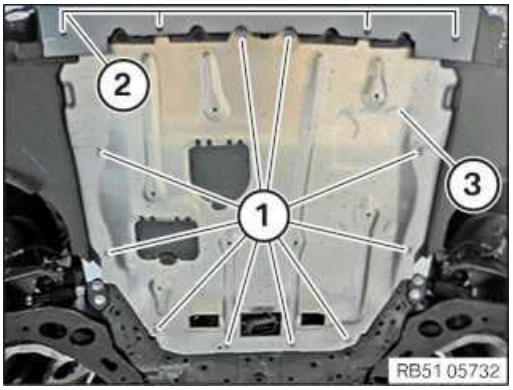
11 42 245 Removing and installing/sealing or replacing the oil return line for low pressure exhaust turbocharger

PRELIMINARY WORK

1 – Removing the front underbody protection



- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.



- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

Damage to the acoustic cover.

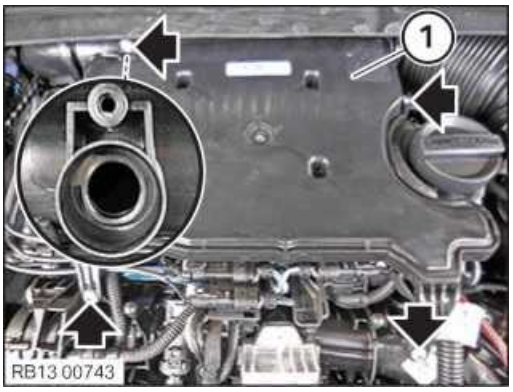
Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

3 – Remove resonator

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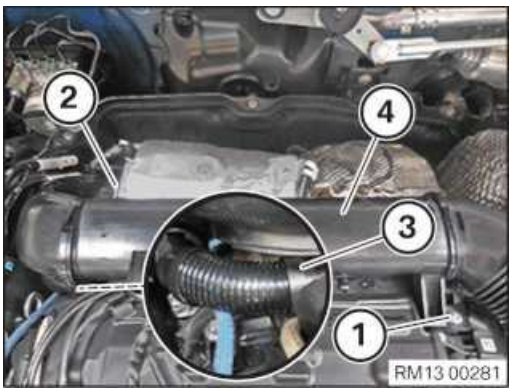


- Remove screws (arrows).
- Guide out and remove the resonator (1).

4 – Removing clean air pipe



- Detach clamp (1) on the clean air pipe.
- Pull off the clean air pipe from the intake silencer housing.



- Loosen screw (1).
- Loosen clamp (2).
- Unlock the ventilation line (3) and pull it off the cylinder head cover.
- Feed out clean air pipe and remove.

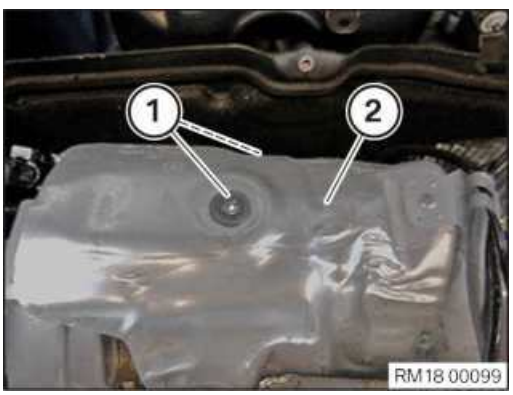
5 – Removing heat shield from top exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from holders.
- Release the screws (1) at the top and bottom of the heat shield.
- Feed out and remove the heat shield (2).

6 – Remove the heat shield from the exhaust turbocharger at the bottom

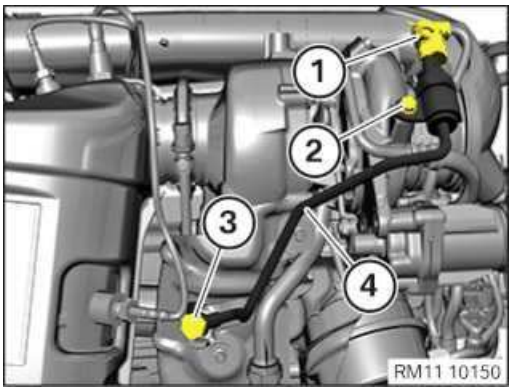
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WARNING

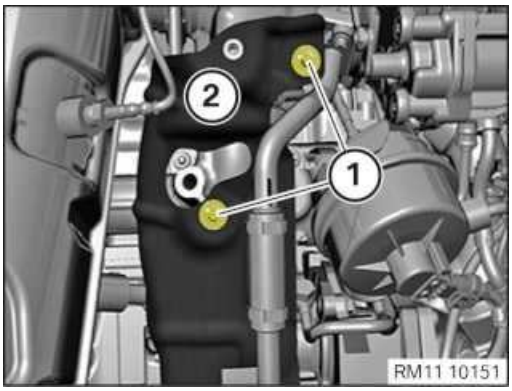
Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Unlock and disconnect connector (1).
- Unscrew the banjo bolt (3).
- The seals of the banjo bolt (3) must be renewed.
- Loosen screw (2).
- Remove the exhaust gas pressure pipe (4).



- Unscrew the bolts (1) on the heat shield .
- Feed out and remove the heat shield (2).

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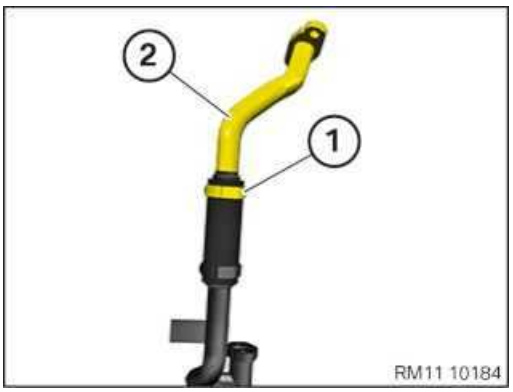
7 – Remove the oil return line for the low-pressure stage turbocharger

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.



- Detach the clamp (1).

TECHNICAL INFORMATION

- Note the installation position of the component. The component may be installed in various installation positions.

- Guide out and remove the oil return line (2).

  The oil return line (2) must be reinstalled in the same mounting orientation, make marks if applicable.

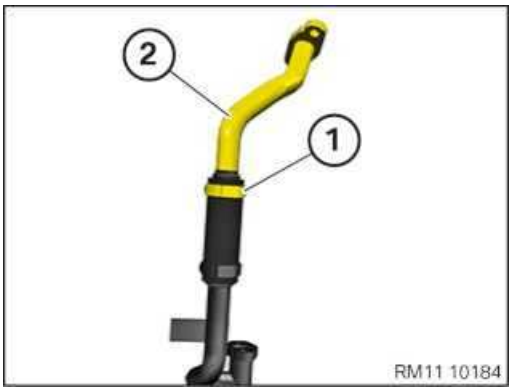
8 – Install the oil return line for the low-pressure stage turbocharger

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Renew the clamp (1).

  Parts: Clamp

- Insert and install the clamp (1).

TECHNICAL INFORMATION

Incorrect assembly is possible. Ensure correct installation position.

- Thread in the oil return line (2) in the correct mounting orientation and install. Observe any marks that may exist.
- Position and secure the clamp (1).

POSTPROCESSES

9 – Installing heat shield on exhaust turbocharger at bottom

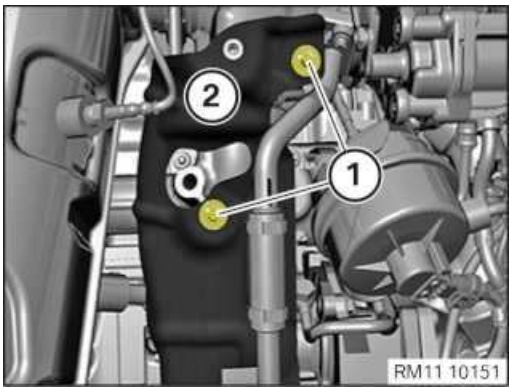
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WARNING

Hot surfaces.

Risk of burning!

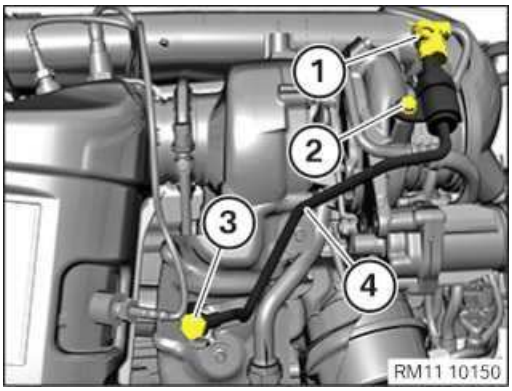
- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (2).
- Tighten the bolts (1) on the heat shield .

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm



- Position the exhaust gas pressure pipe (4).
- Hand-tighten the bolt (2).
- Renew sealing rings on the banjo bolt (3).

  Parts: Sealing ring
- Tighten the banjo bolt (3).

Banjo bolt for exhaust pressure pipe to exhaust manifold

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

- Tighten down screw (2).

Standard screw connection M6

M6		8 Nm

- Connect connectors (1) and lock.

  Lock must audibly engage.

10 – Install the heat shield on the exhaust turbocharger



- Feed in and install the heat shield (2).
- Tighten the screws (1) at the top and bottom of the heat shield.

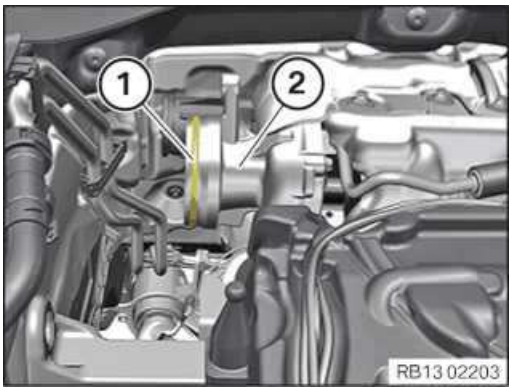
Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

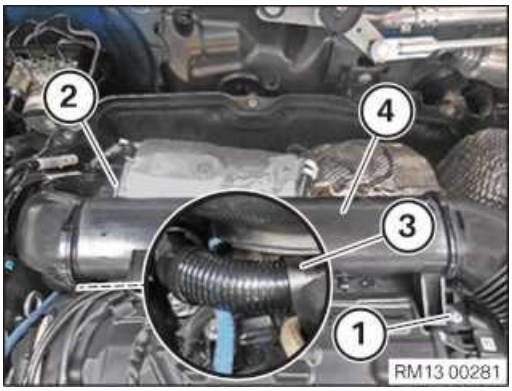
- Fasten the cable at the clips .

11 – Installing clean air pipe

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- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.



- Feed in clean air pipe and install.
- Connect clean air pipe to the exhaust turbocharger and lock audibly in the clamps (2).
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Connect ventilation line (3) to the cylinder head cover and lock audibly.

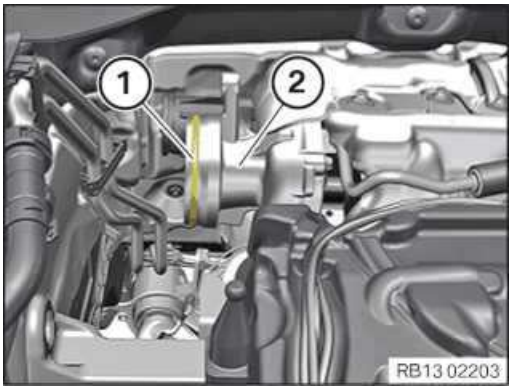


- Mount clean air pipe onto the intake filter housing.
- Tighten clamp (1) on the clean air pipe.

Clean air pipe to intake silencer housing

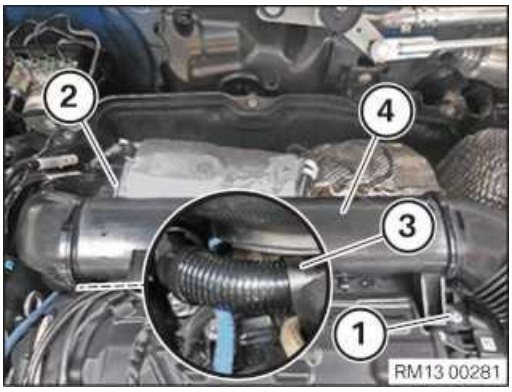
Clamp		Tightening torque	3 Nm

12 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.

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- Feed in clean air pipe and install.
- Connect clean air pipe to the exhaust turbocharger and lock audibly in the clamps (2).
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Connect ventilation line (3) to the cylinder head cover and lock audibly.



- Mount clean air pipe onto the intake filter housing.
- Tighten clamp (1) on the clean air pipe.

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

13 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



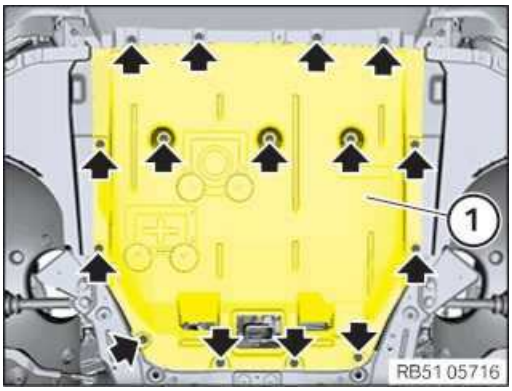
- Check for correct installation of all rubber mounts in the acoustic cover (1).

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- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

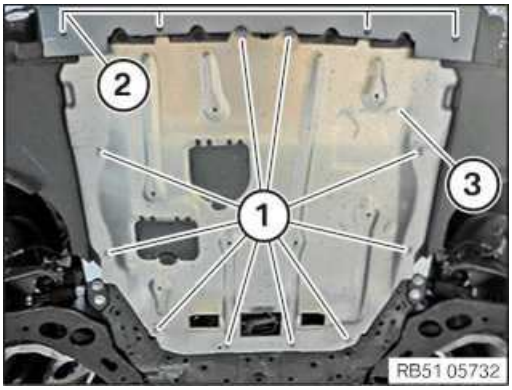
14 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm



- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

15 – Check engine oil level

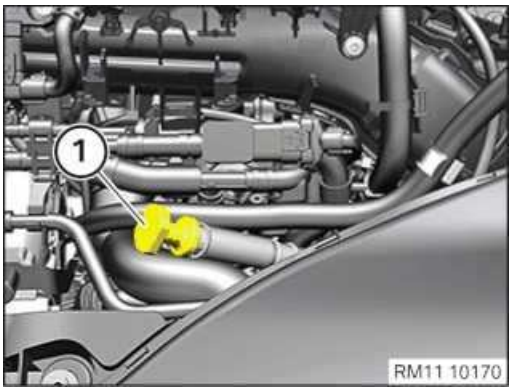
- Park vehicle on a horizontal surface.
- In the case of automatic transmission, shift to selector lever position N or P.
- Accelerator pedal is not pressed.
- Engine is running and is at operating temperature.
- Read off the engine oil level in the instrument cluster (KOMBI) or on the control display.
- Top up engine oil if necessary.

▸ **Check engine oil level**

TECHNICAL INFORMATION

Always check the engine oil level when the engine is at operating temperature (engine oil temperature > 70°C).

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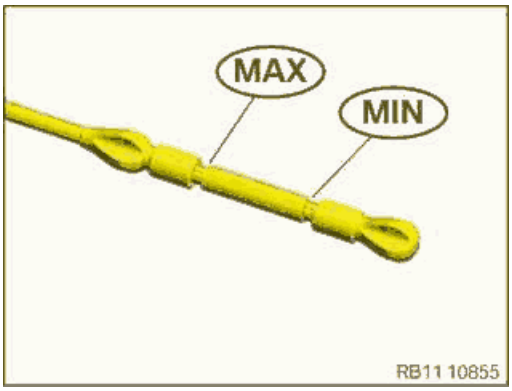


- Park vehicle on a horizontal surface.
- Stop the engine and wait for 5 minutes.
- Pull out the oil dipstick (1) and wipe off using a lint-free cloth.

TECHNICAL INFORMATION

Do not pull out or insert the oil dipstick into the guide tube too quickly or slowly.

- Push the oil dipstick (1) into the guide tube up to the limit position and pull it out again.



TECHNICAL INFORMATION

The engine oil level must be between the minimum mark and the maximum mark of the oil dipstick.

- Read the engine oil level on the oil dipstick.
- Top up engine oil if necessary.

Additional Information

Overview of Tightening Torques

Heat shield for exhaust turbocharger — Used in step 9

Torx screw BM 6x12		Tightening torque	10 Nm

Banjo bolt for exhaust pressure pipe to exhaust manifold — Used in step 9

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

Standard screw connection M6 — Used in step 9

M6			8 Nm

Heat shield for exhaust turbocharger — Used in step 10

Torx screw BM 6x12		Tightening torque	10 Nm

Clean air pipe to cylinder head cover — Used in step 11 12

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 11 12

Clamp		Tightening torque	3 Nm

Underbody protection front — Used in step 14

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Overview Technical Data

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Parts

Parts required

Designation	Used in step

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11 42 827 Replace control valve of central piston cooling

WARNING

Vehicle may slip off the vehicle hoist if the vehicle hoist is handled incorrectly.

Danger! Life-threatening injuries!

- Observe safety information on raising the vehicle using a vehicle hoist.
- For additional information see: 00 ... Raising the vehicle using a vehicle hoist.

WARNING

Motor vehicle may slip off the vehicle hoist where components are supported.

Danger! Life-threatening injuries!

- Secure the vehicle hoist against lowering and lifting.

WARNING

Motor vehicle may slip off the vehicle hoist if the weight is distributed unevenly.

Danger! Life-threatening injuries!

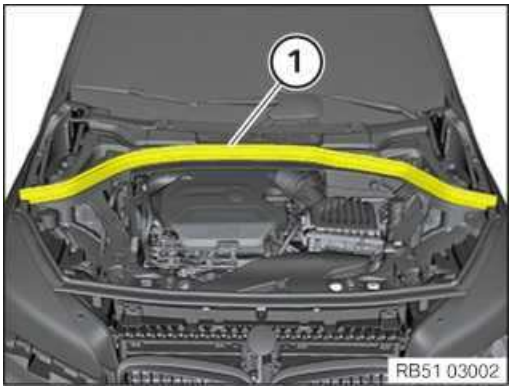
- Ensure there is a specific weight compensation on the motor vehicle.

PRELIMINARY WORK

1 – Remove the seal for the rear bonnet

NOTICE

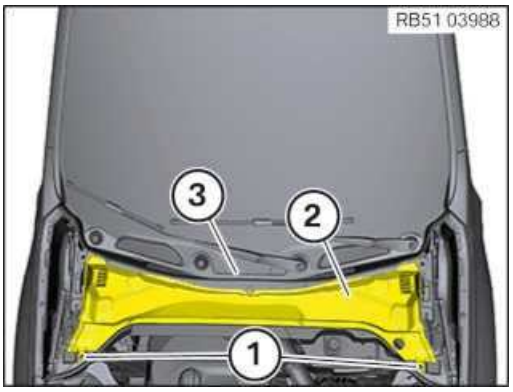
Schematic diagram is for example purposes. Some parts may differ in certain details.



- Pull off rear bonnet seal (1) towards the top and remove.

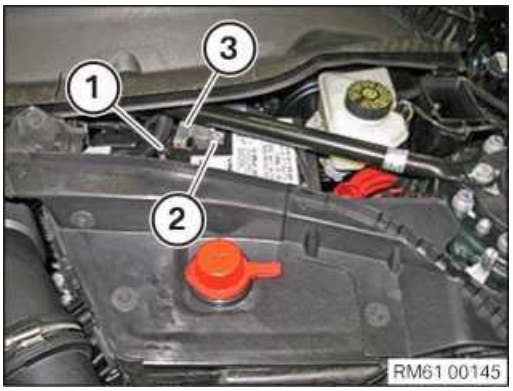
2 – Removing front cowl panel cover

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- Loosen the expanding rivet (1).
- Feed out and remove front cowl panel cover (2) from the rear cowl panel cover(3).

3 – Disconnecting the battery earth lead

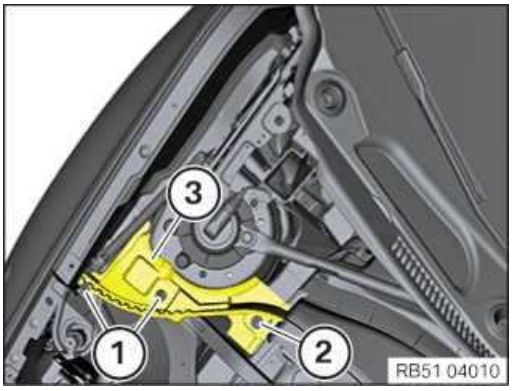


- Unlock plug connection (1) and disconnect.
- Unfasten nut (2).
- Remove the battery earth lead (3) and secure to one side.

4 – Remove suspension cross-brace

TECHNICAL INFORMATION

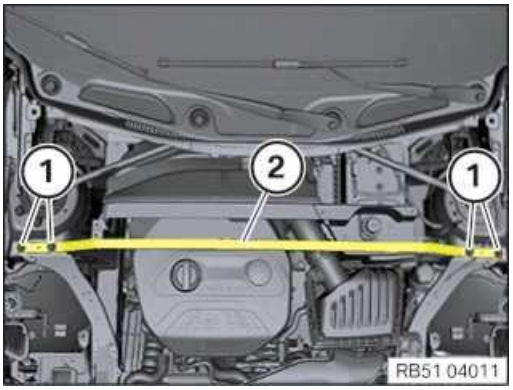
Driving without the strut brace/front end or tension strut is not permitted.



NOTICE

Description is for right component only. The procedure on the left side is identical.

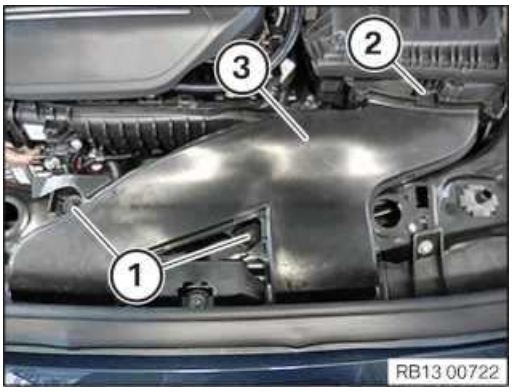
- Loosen expanding rivet (1).
- Loosen screw (2).
- Remove the cover (3).



- Loosen screws (1).
- Remove strut brace (2).

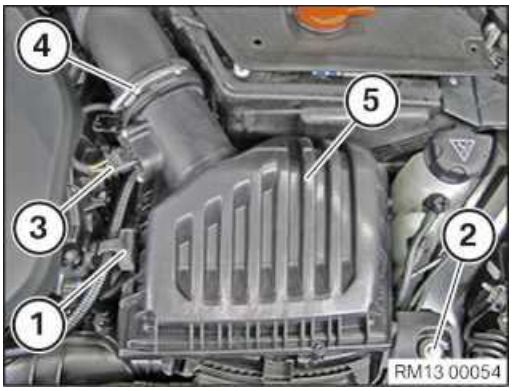
5 – Remove the intake neck for intake silencer housing

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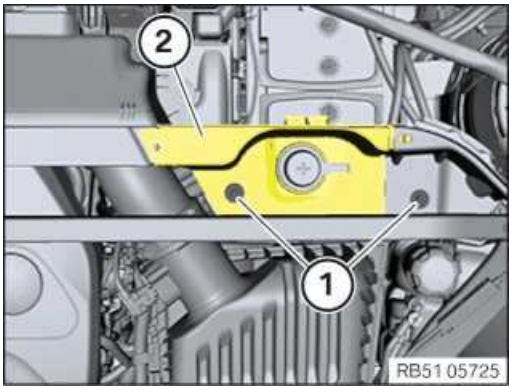
- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

6 – Removing intake silencer housing

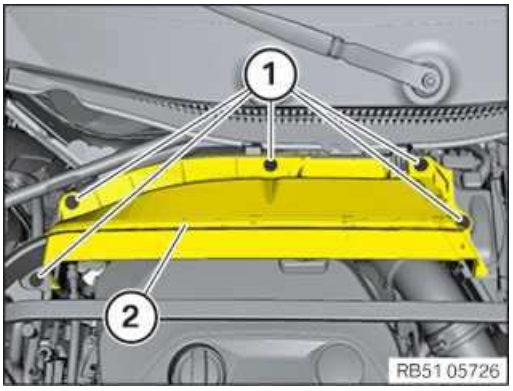


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

7 – Removing the upper bulkhead cover



- Loosen screws (1).
- Guide out and remove the cover (2).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

8 – Remove vehicle battery

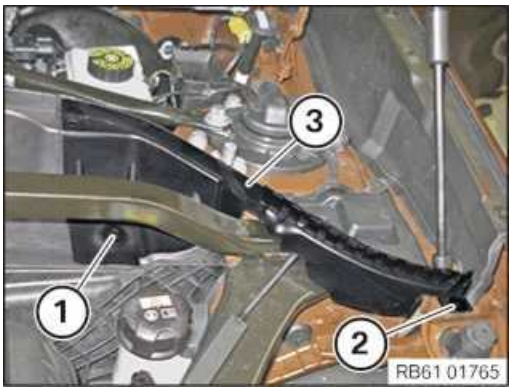
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WARNING

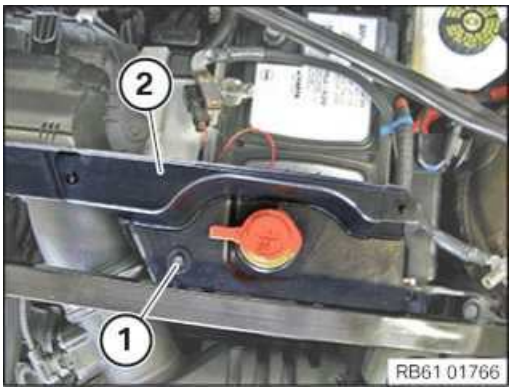
Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

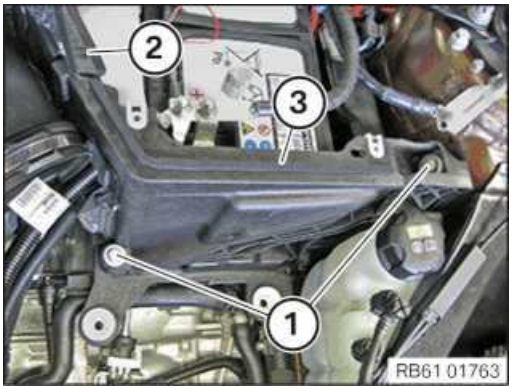
- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.



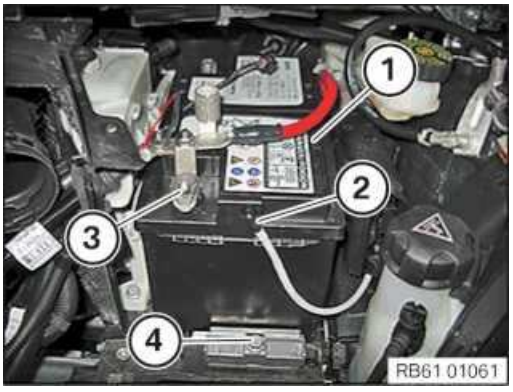
- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).



- Loosen screw (1).
- Remove the cover (2).



- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.



- Pull off the vent hose (2).
- Slacken the nut (3) on the positive battery terminal and remove the positive battery terminal.

WARNING

Unprotected battery terminals.

Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

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9 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

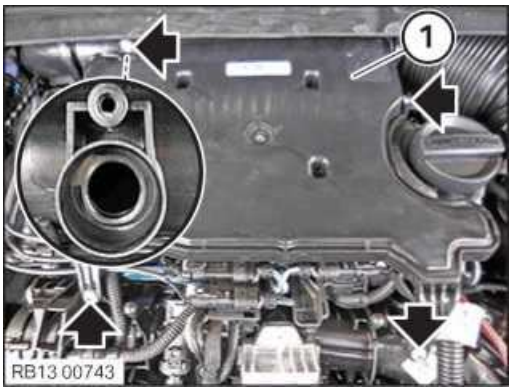
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

10 – Remove resonator



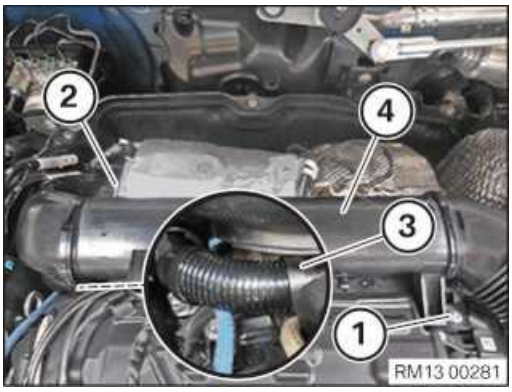
- Remove screws (arrows).
- Guide out and remove the resonator (1).

11 – Removing clean air pipe



- Detach clamp (1) on the clean air pipe.
- Pull off the clean air pipe from the intake silencer housing.

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- Loosen screw (1).
- Loosen clamp (2).
- Unlock the ventilation line (3) and pull it off the cylinder head cover.
- Feed out clean air pipe and remove.

12 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

TECHNICAL INFORMATION

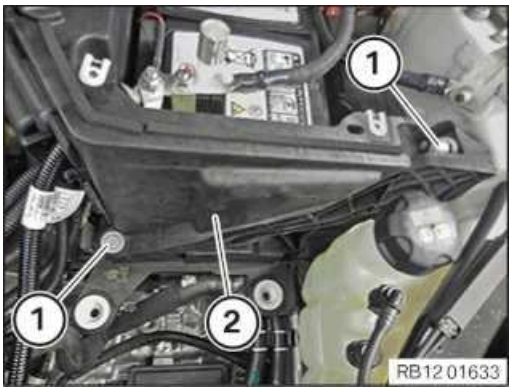
Follow instructions for removing and installing control units.

For additional information see: 12 00 ... Notes on removal and installation of control units

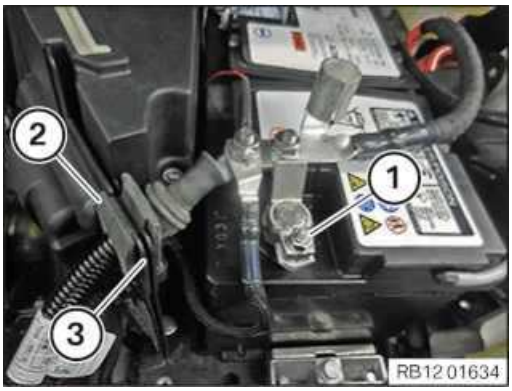
TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.

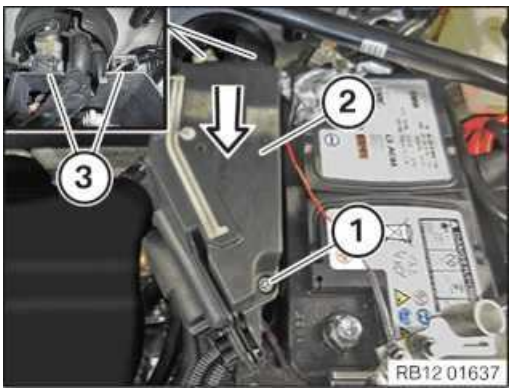
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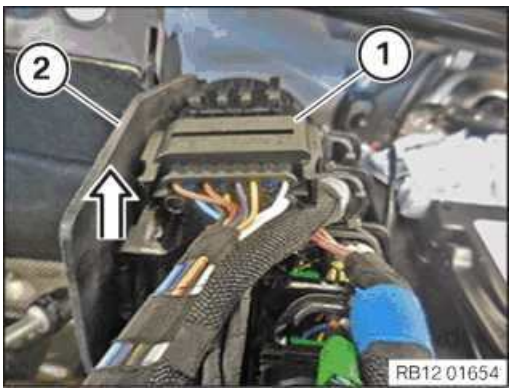
- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.



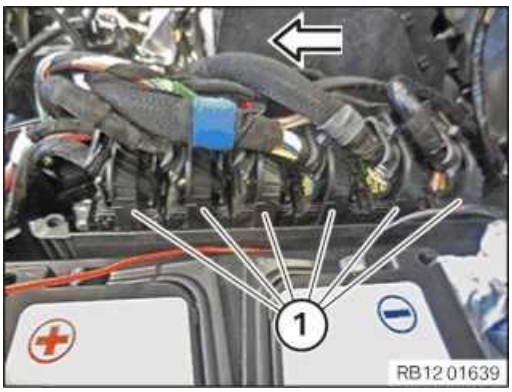
- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).

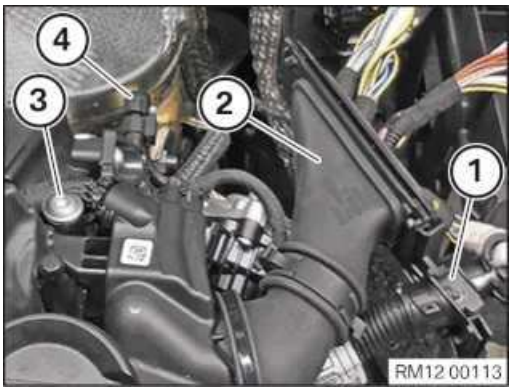


- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

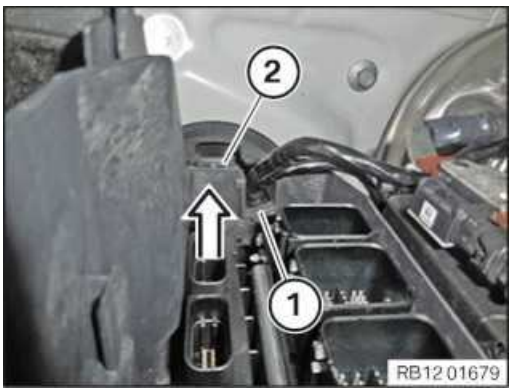
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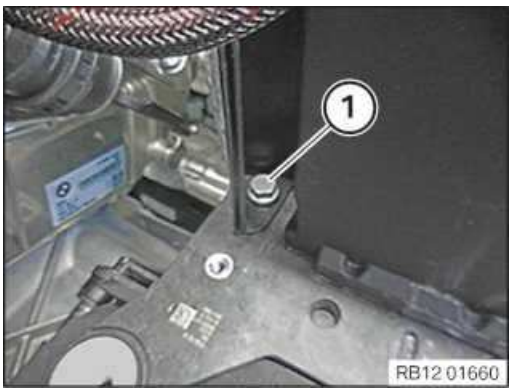
- Unlock and loosen connector (1).



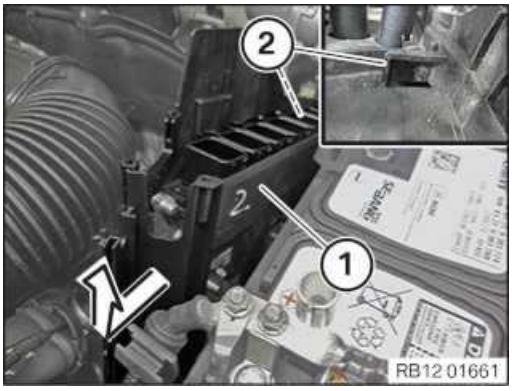
- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.



- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.



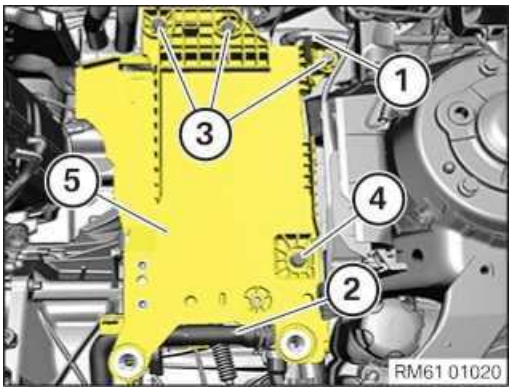
- Loosen screw (1).



- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

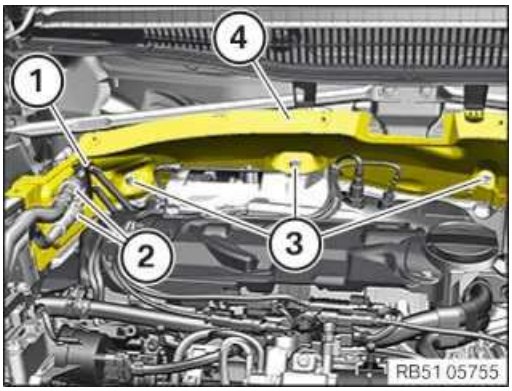
13 – Remove battery holder

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- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

14 – Remove the rear bulkhead upper part



- Unlock the holder (1) and disconnect.
- Guide out and remove the fuel lines (2).
- Loosen screws (3).
- Guide out the rear bulkhead upper part (4) and remove.

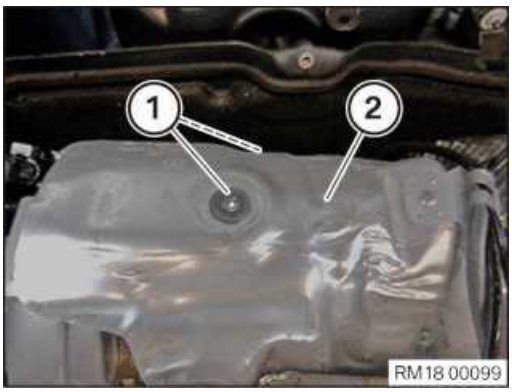
15 – Removing heat shield from top exhaust turbocharger

WARNING

Hot surfaces.

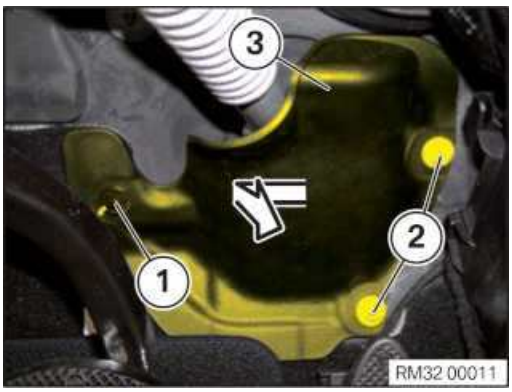
Risk of burning!

- Perform all work only on components that have cooled down.



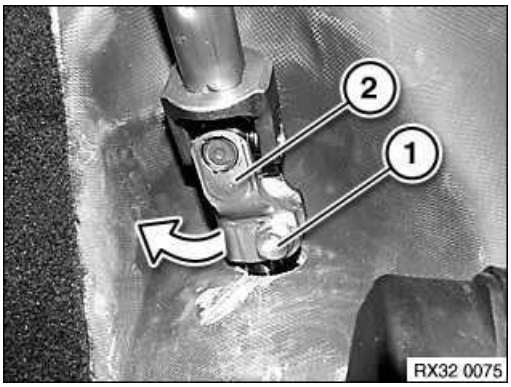
- Release cable from holders.
- Release the screws (1) at the top and bottom of the heat shield.
- Feed out and remove the heat shield (2).

16 – Releasing lower steering shaft from steering gear



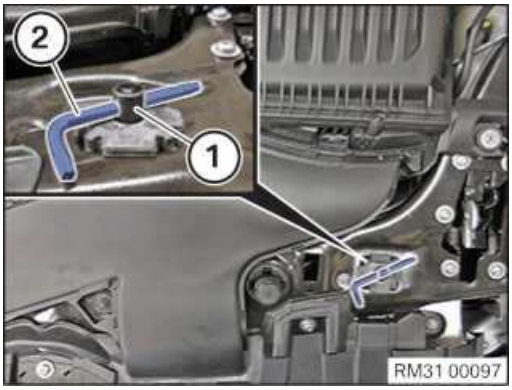
- **If installed:**
- Unfasten nut (1).
- Unscrew the nuts (2) by 1 rotation.
  Do not remove the nuts (2) !
- Remove the cover (3) on the steering column in the direction of the arrow.
  The side footwell trim must not be disassembled!

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- Loosen screw (1).
- Swivel out the universal joint (2) of the bottom steering shaft from the steering gear in the direction of the arrow.

17 – Securing radiator on left and right



NOTICE

Perform the operations on the left and right side.

- Fasten radiator at centring pin (1) with suitable tool (2).

18 – Removing both front wheels

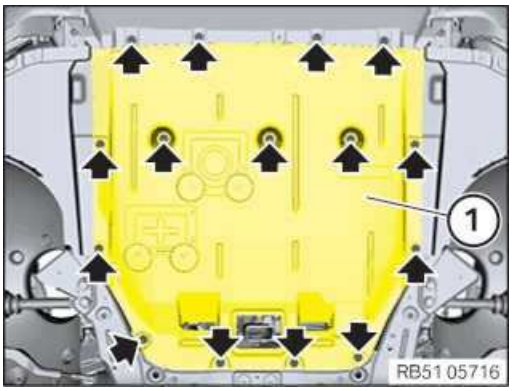
▸ **Removing the wheel**



- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Unscrew the wheel bolts (arrows) and remove the wheel.

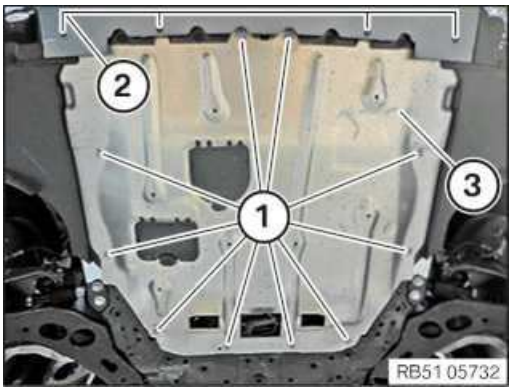
  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

19 – Removing the front underbody protection



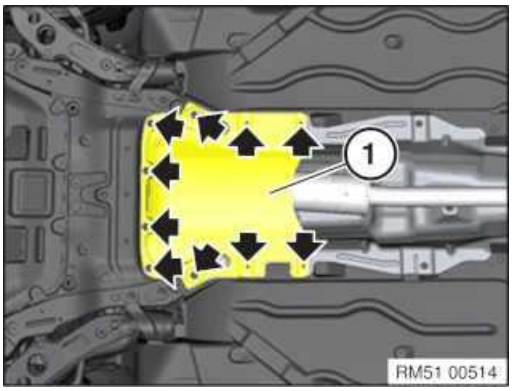
- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.

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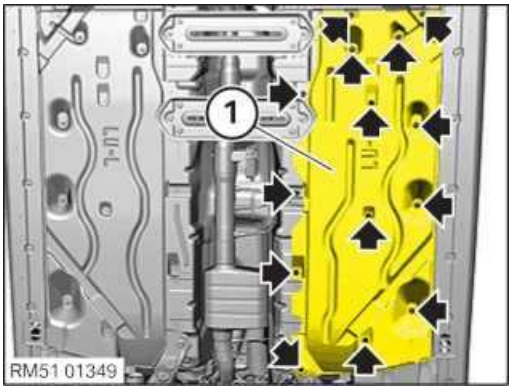
- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

20 – If installed: Removing rear underbody protection



- Remove screws (arrows).
- Remove the rear underbody protection (1).

21 – Removing right underbody panelling



- Unscrew all bolts and nuts (arrows).
- Remove the underbody panelling (1).

22 – Removing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

▸ **Remove the front wheel arch trim**

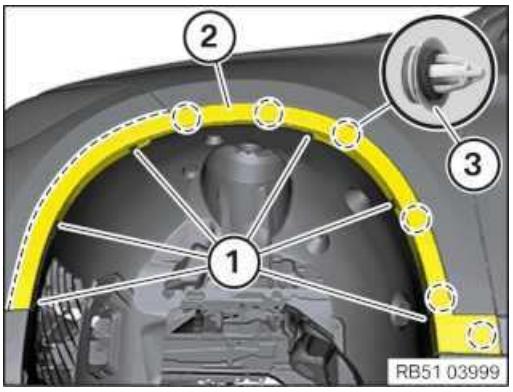
NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

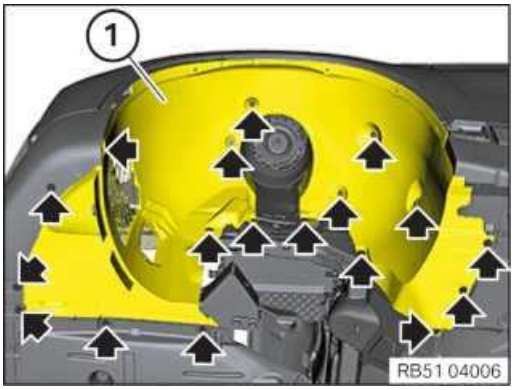
Description is for left component only. Procedure on the right side is identical.

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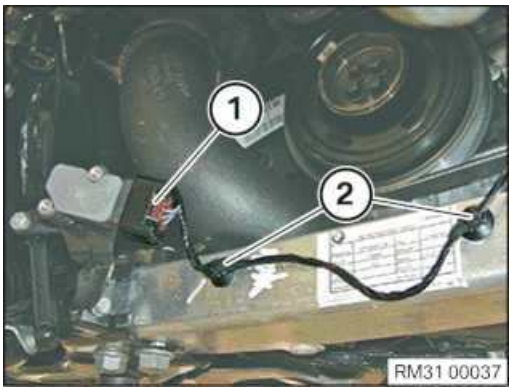
- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.

▶ **Remove front wheel arch cover**



- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

23 – With right installation: Detaching ride height sensor cable



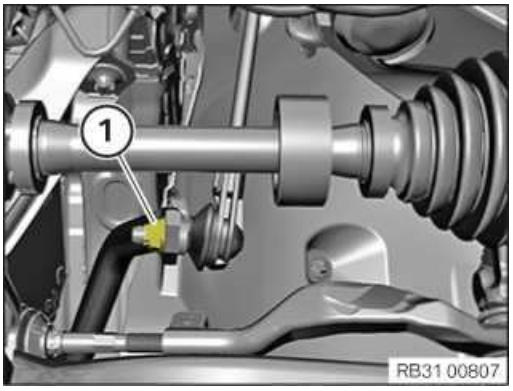
- Unlock plug connection (1) and disconnect.
- Release cable clip (2) from deformation element adapter.

24 – Releasing anti-roll bar on left and right from anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▶ **Detach the anti-roll bar from the anti-roll bar link**



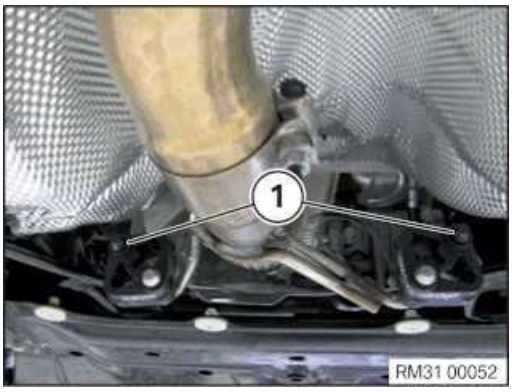
- Unfasten nut (1).

Note: Use the Torx socket for counter support.

- Loosen the anti-roll bar link from the anti-roll bar .

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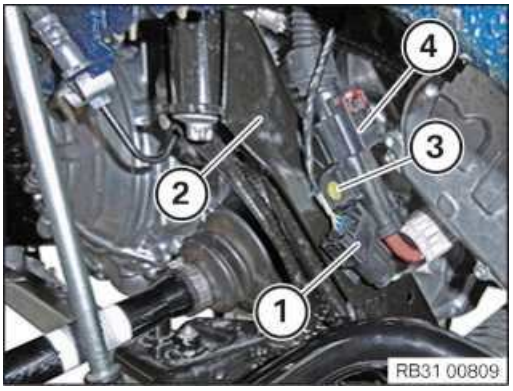
25 – Detaching rubber mount from front axle support



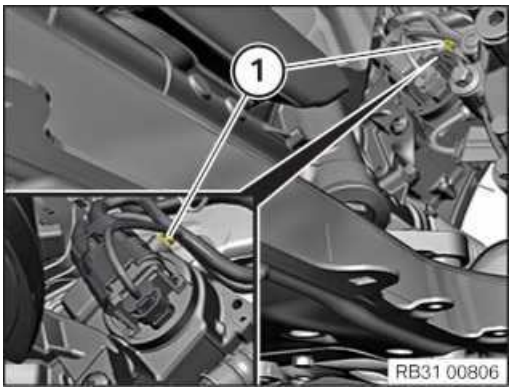
- Spray rubber mount (1) with lubricant and release from holder on front axle support.

26 – Disconnecting plug connections from steering gear

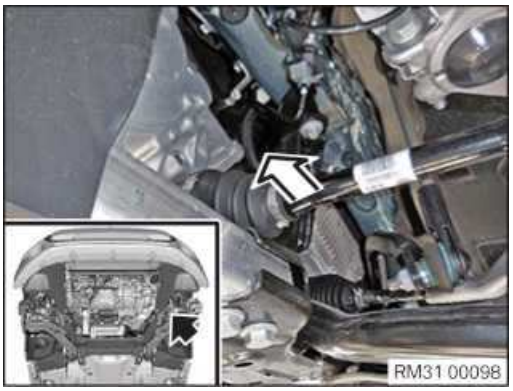
▸ **If installed: Detach connectors from the front axle carrier**



- Release the plug connection (1) from the front axle support (2).
- Loosen screw (3).
- Release the plug connection (4) from the front axle support (2).



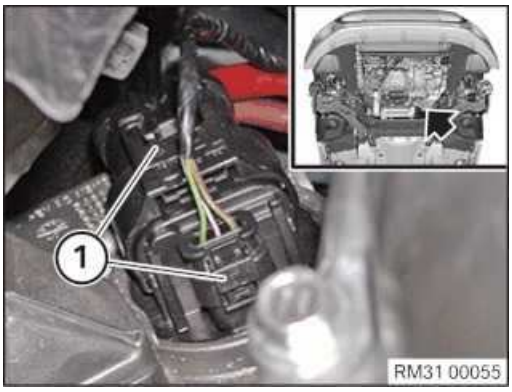
- Disconnect wiring harness (1) from steering gear.



- To unlock the plug connections (see the following work step): unlock plug connections (arrow) with the right hand.

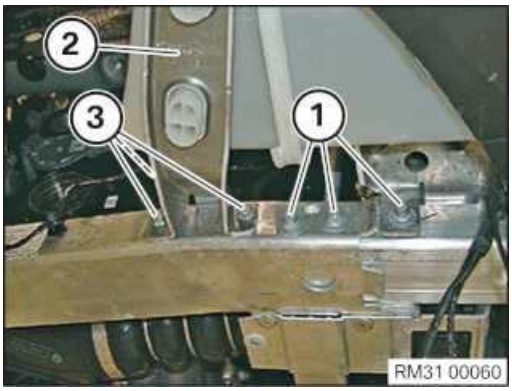
  The plug connections can be reached via the left-hand output shaft.

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- Unlock plug connections (arrow) (1)and disconnect from the steering gear.
- Make sure when lowering the front axle that the cables are not damaged!

27 – Releasing the mounted part from the front axle support

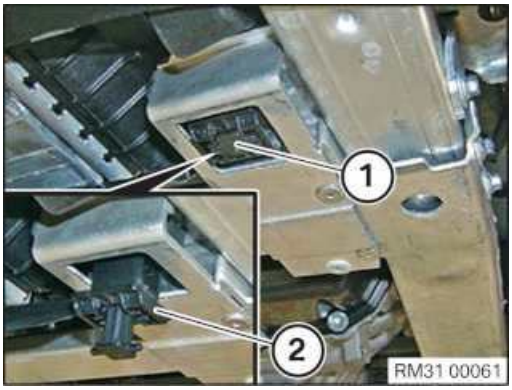


- **Only on right side:** Loosen screws (3) and remove holder for washer fluid reservoir (2).

NOTICE

Perform the operations on the left and right side.

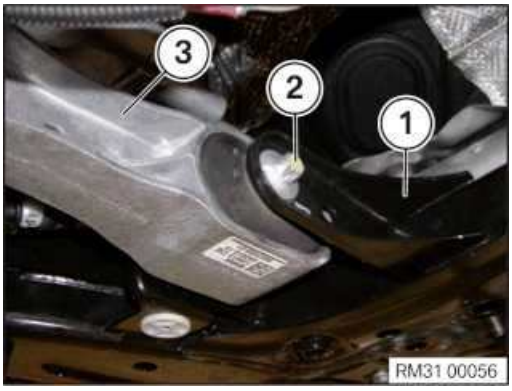
- Loosen screws (1).



NOTICE

Perform the operations on the left and right side.

- Unlock safety catch (1) of the lock (2) from the holder for the charge air cooler.
- Completely remove locks (2).



- Loosen screw (2) of the engine support (3) on the front axle (1).



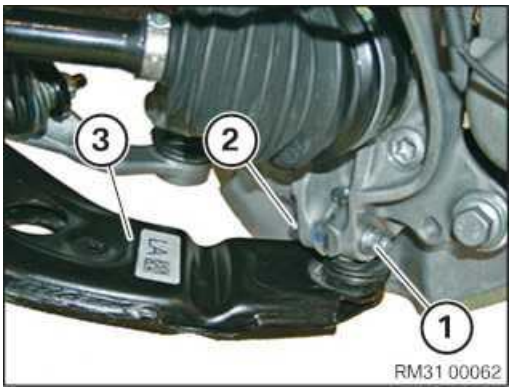
NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

28 – Detaching and removing front axle completely

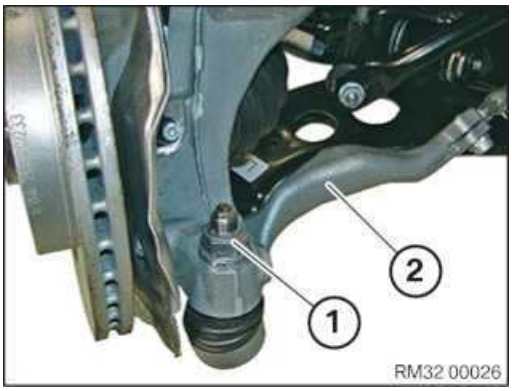
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NOTICE

Perform the operations on the left and right side.

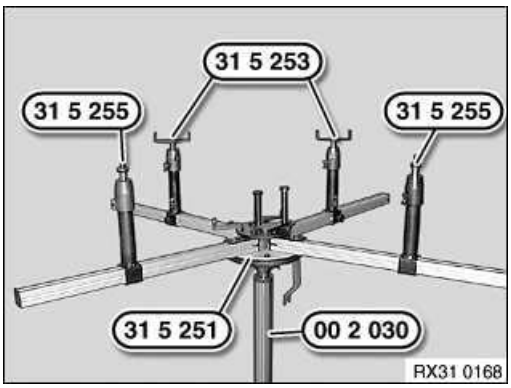
- Unfasten nut (1).
- (2)Pull out screw.
- Detach the wishbone (3) from the swivel bearing .



NOTICE

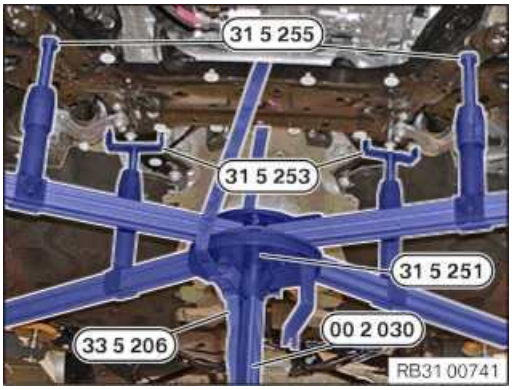
Perform the operations on the left and right side.

- Unfasten nut (1).
- Detach the track rod (2) from the swivel bearing.



- Fit the special tool completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools in telescopic supports of a profile rail pair.
- Insert special tools in telescopic supports of other profile rail pair.

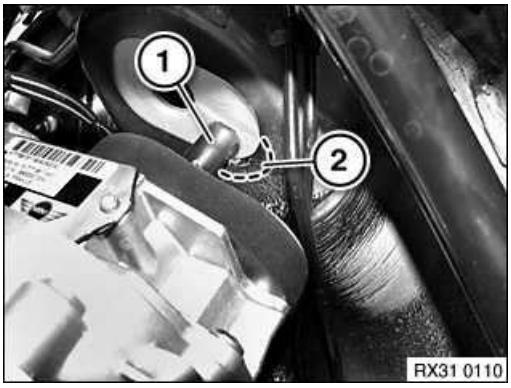
Note: In a profile rail pair, two profile rails are connected to one another by gearing.



- Align special tools and to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool to special tool .



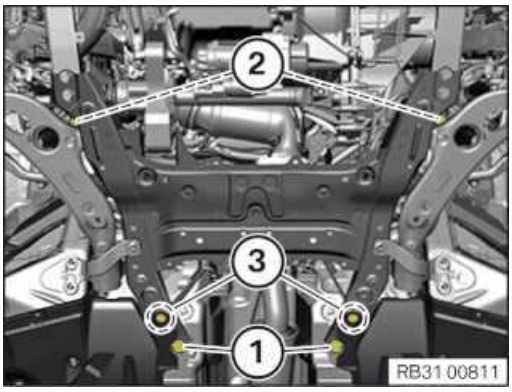
TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!

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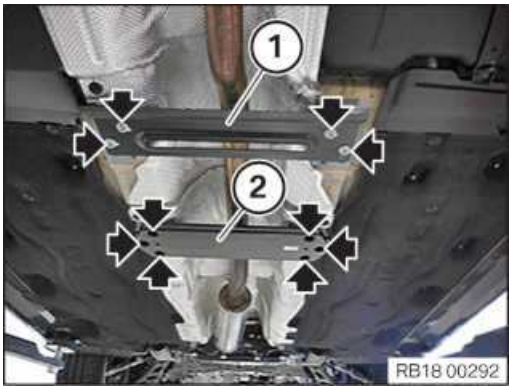
- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and remove the front axle.

TECHNICAL INFORMATION

Note the information on thread repairs using Helicoil thread inserts.
For more information see: 41 00 ... Notes on repairing threads

- Check threads for damage; if necessary, repair with Helicoil thread inserts.

29 – Removing the connecting support from the tunnel in front and back

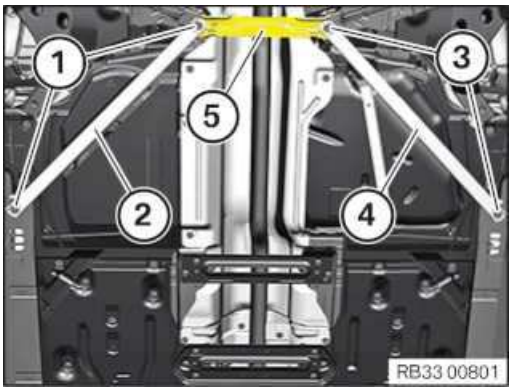


- Unscrew the bolts (arrows) from the connecting support (1).
- Feed out and remove the crossbeam (1).
- Unscrew the bolts (arrows) from the connecting support (2).
- Feed out and remove the crossbeam (2).

30 – Remove the cross strut with the torsion strut

TECHNICAL INFORMATION

Driving without a torsion strut is not permitted.



- Loosen screws (1).
- Thread out torsion strut (2) at left and remove.
- Loosen screws (3).
- Thread out torsion strut (4) at right and remove.
- Feed out and remove the cross-member (5).

31 – Remove exhaust system

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WARNING

Hot surfaces.

Risk of burning!

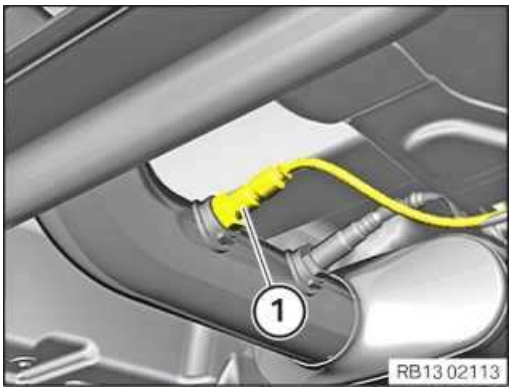
- Perform all work only on components that have cooled down.

CAUTION

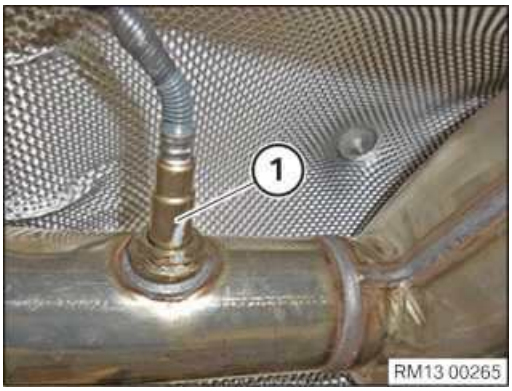
Heavy component.

Heavy components can lead to injury or damage.

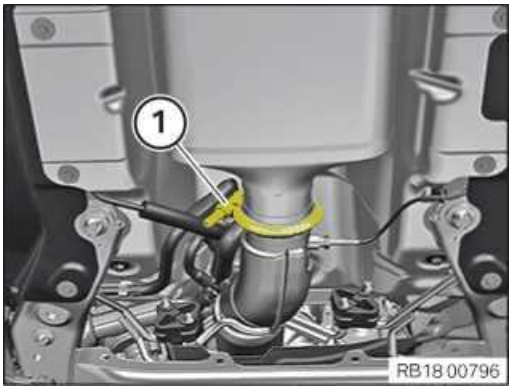
- Remove and install heavy components with the aid of another person/other persons.



- Release the nitrogen oxide sensor (1) downstream of the SCR catalytic converter, guide it out and set it aside.

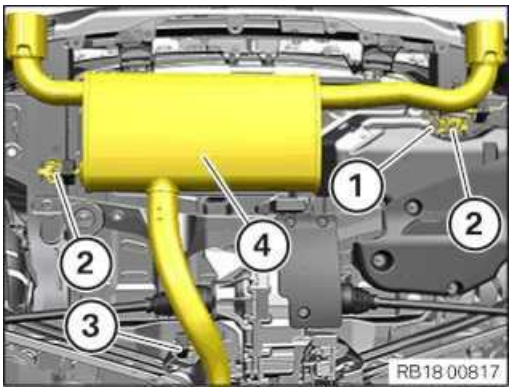


- Release the diesel particulate sensor (1), guide it out and set it aside.



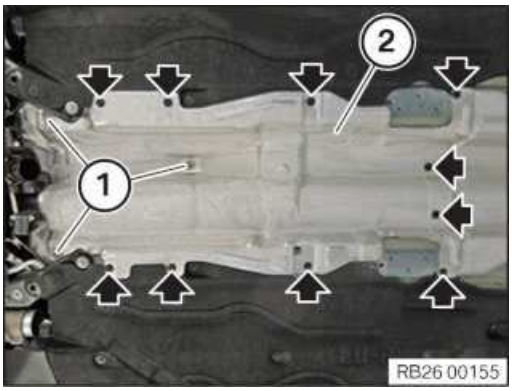
- Loosen V-band clamp (1).

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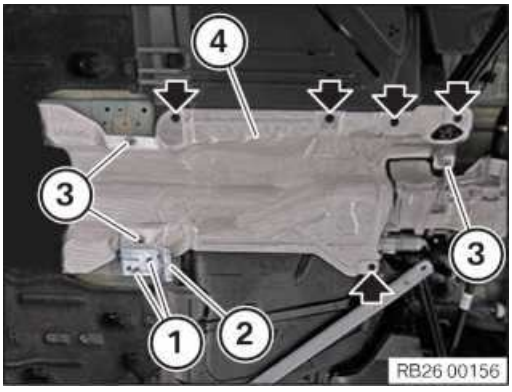
- Loosen screw (1).
- Loosen nuts (2).
- Release the rubber mount (3) of the exhaust system (4).
- Lower and guide out the exhaust system (4) with assistance of a second person and remove it.

32 – Remove front heat shield



- Remove screws (arrows).
- Loosen nuts (1).
- Guide the heat shield (2) out and remove it.

33 – Remove heat shield at rear.



- Loosen screws (1).
- Guide out and remove holder (2).
- Remove screws (arrows).
- Loosen nuts (3).
- Guide the heat shield (4) out and remove it.

34 – Remove propeller shaft

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

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RISK OF DAMAGE

Damage to propeller shaft during removal.

Non-observance of the removal guidelines for the propeller shaft on the rear axle differential may cause severe damage.

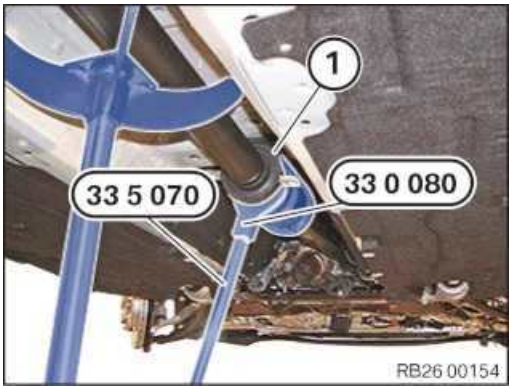
- Do not disassemble the three-hole flange, flexible disc and propeller shaft. The three-hole flange to the rear axle differential is balanced with the flexible disc and propeller shaft.
- Loosen the recessed nut against the direction of travel in clockwise direction. The propeller shaft must be loosened on the recessed nut only and exclusively in the direction of rotation otherwise the anti-twist lock of the bi-hexagonal flange nut is damaged.
- In the event of a damaged anti-twist lock on the bi-hexagonal flange nut: Replace the rear axle differential.



- Install the special too l between the front and rear propeller shaft.
- Make sure that the arrows on the special tool point forward in the direction of travel.



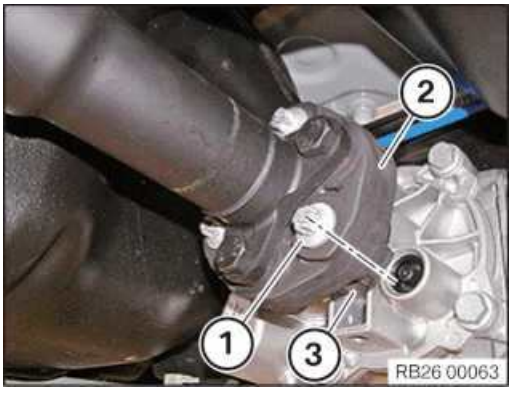
- Always support the propeller shaft (1) with a conventional jack.



- Protect the propeller shaft (1) with the special tools **0 495 554 (33 5 070)** and from twisting.

TECHNICAL INFORMATION

Compliance with the following instructions is required to avoid a humming noise from the propeller shaft after refitting the propeller shaft.

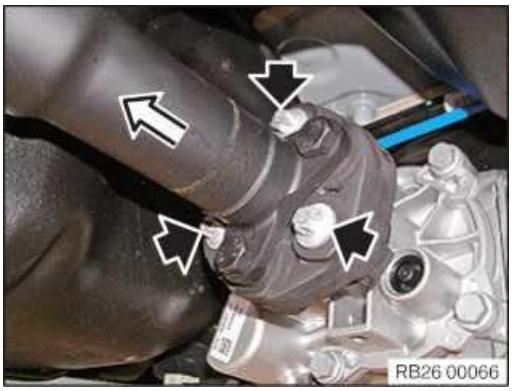


- Mark the installation position of the screw connection (1), the flexible disc (2) and the three-hole flange (3) on the same level.
- Loosen the screw connection (1).

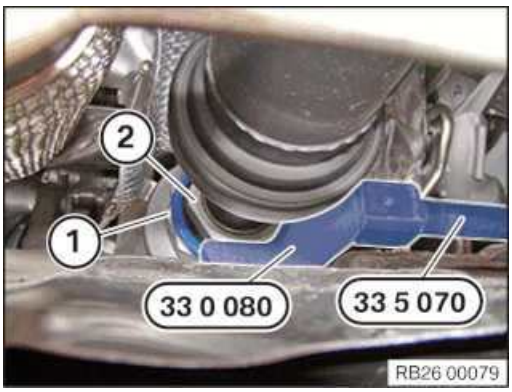
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- Loosen screws (1).



- Remove screws (arrows).
- Guide the propeller shaft out in the direction of the arrow and set it aside.



RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.

- Protect the recessed nut (2) on the transfer box from twisting with the special tools **0 495 554 (33 5 070)** and .

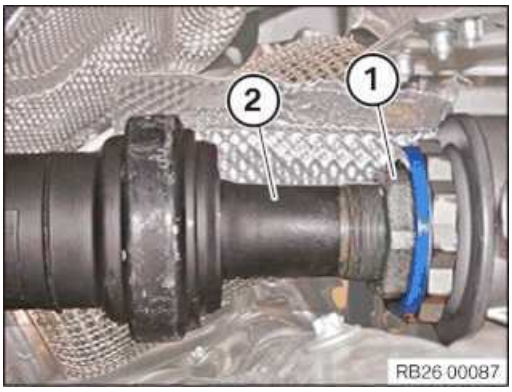
  The recessed nut (2) on the transfer box must **not** be used to detach the propeller shaft.

  The double hexagon flange nut (1) must **not** be used for counter support.

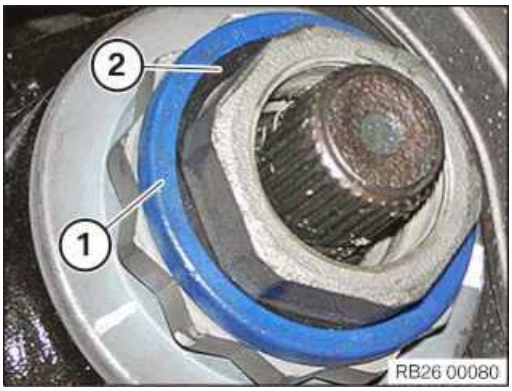


- Release the front propeller shaft with the special tools **0 495 554 (33 5 070)** and in the direction of the arrow.

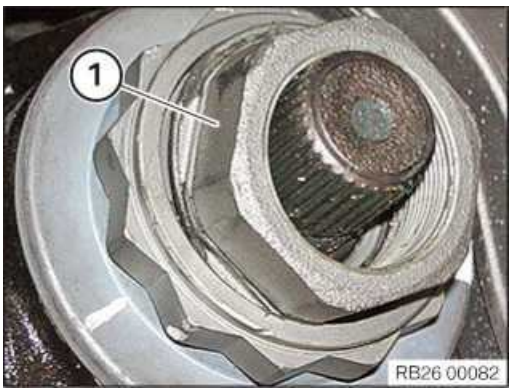
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- Thread the propeller shaft (2) out of the recessed nut (1) and remove.



- Thread the retaining clip (1) and the seal (2) out and remove.



- Thread out and remove the recessed nut (1).

35 – Removing starter motor

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and loosen connector (1).
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).



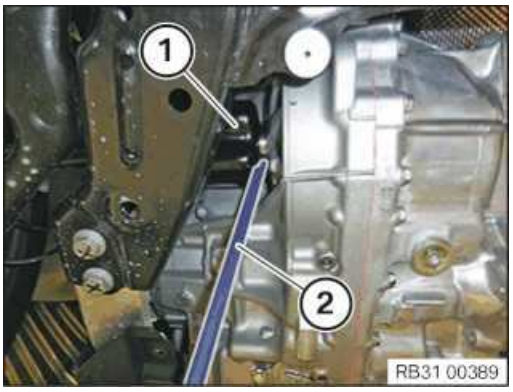
- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.



- Loosen screws (1).
- Feed out starter motor and remove.

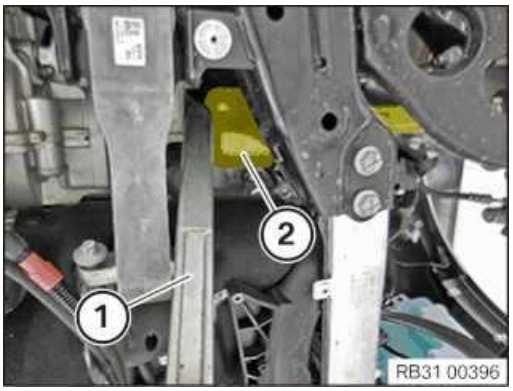
36 – Partially removing the left output shaft

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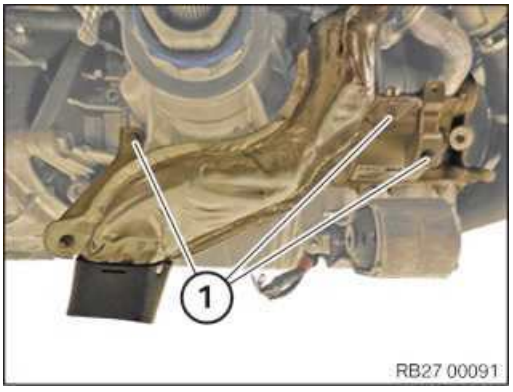
- Protect the output shaft (1) from falling.
- Lever out the output shaft (1) with a mounting lever (2) from the transmission.
- Tie up output shaft (1).

37 – Partially removing right output shaft

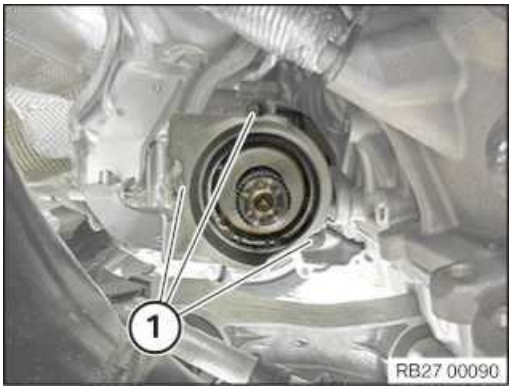


- Lever out the output shaft (2) with a mounting lever (1).
- Tie up output shaft (1).

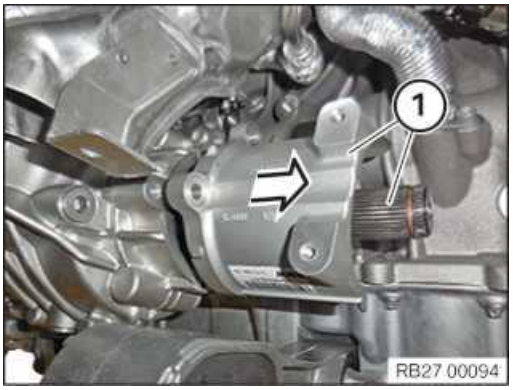
38 – Remove the intermediate shaft with the support tube



- With air duct installation: Loosen screws (1).
- Remove air duct



- Loosen screws (1).



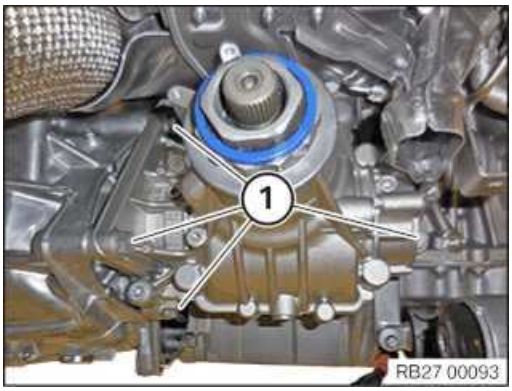
- Pull the intermediate shaft with the support tube (1) out of the transfer box.

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39 – Remove transfer box (VTG)



- Loosen screws (1).
- Remove heat shield.



- Loosen screws (1).
- Remove the transfer box (VTG).

40 – Remove the monitoring oxygen sensor

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

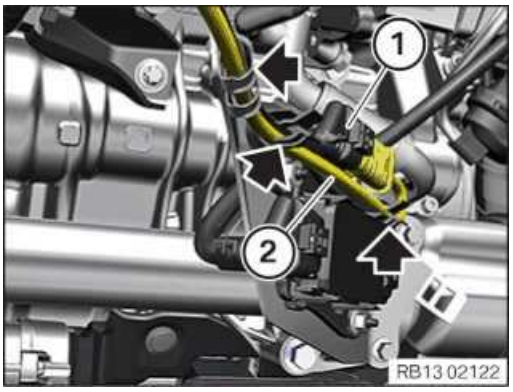
RISK OF DAMAGE

Electrostatic discharge.

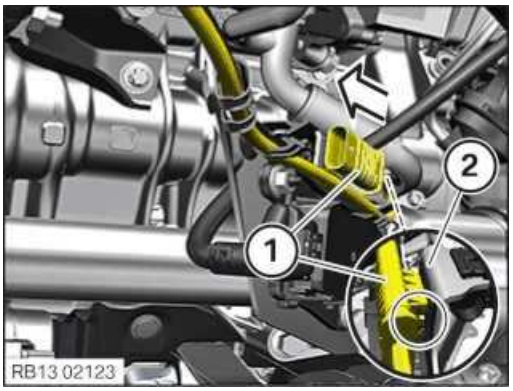
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

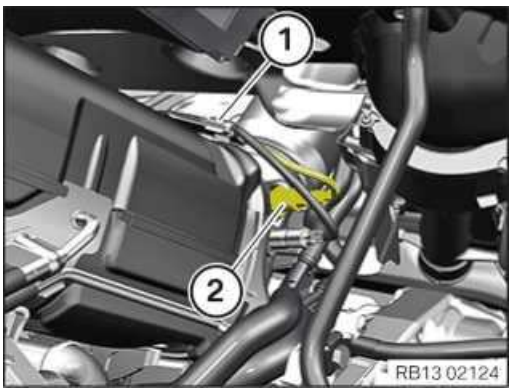
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- Unlock plug connection (1) and disconnect.
- Feed oxygen monitor sensor cable (1) out of the clamps (arrows).



- Unlock the connector (1) in the marked area and disconnect it from the holder (2) in the direction of arrow.



- Guide the cable of the monitoring oxygen sensor (2) out of the clamp (1).
- Release the monitoring oxygen sensor (2) using special tool **0 491 074 (11 7 020)**.
- Remove the monitoring oxygen sensor (2).

41 – Removing the nitrogen oxide sensor before SCR catalytic converter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

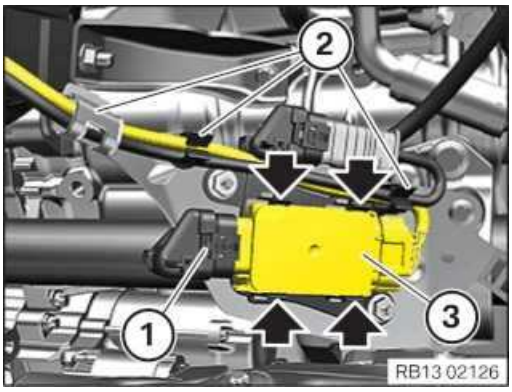
RISK OF DAMAGE

Electrostatic discharge.

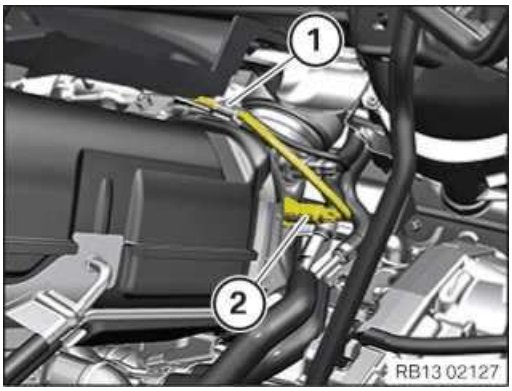
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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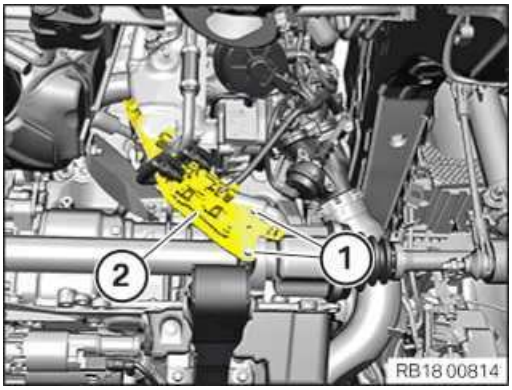


- Unlock plug connection (1) and disconnect.
- Slide the cable of the nitrogen oxide sensor evaluation electronics (3) out of the clamps (2) and remove.
- Unlock (arrows) and remove the evaluation electronics for the nitrogen oxide sensor (3).



- Slide the cable of the nitrogen oxide sensor before the SCR catalytic converter (2) out of the clamps (1) and remove.
- Detach the nitrogen oxide sensor before the SCR catalytic converter (2) using the special tool **0 491 074 (11 7 020)**.
- Guide out and remove the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

42 – Remove holder for oxygen sensor



- Loosen screws (1).
- Thread out the holder (2) for the oxygen sensor and remove.

43 – Remove the exhaust temperature sensor on the catalytic converter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

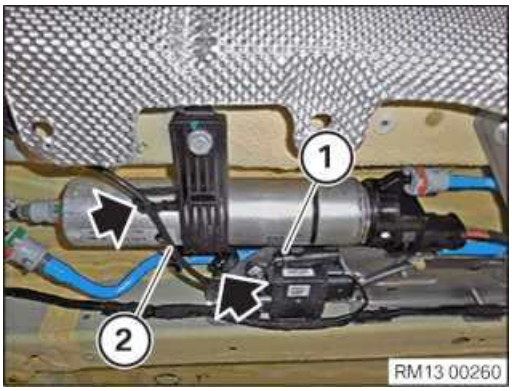
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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

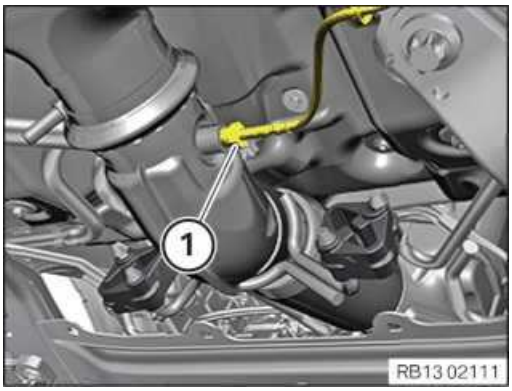
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and loosen connector (1).
- Feed out the cable (2) of the exhaust temperature sensor from the clamps (arrows) and remove.



- Loosen the cable clip (1).



- Loosen exhaust temperature sensor (1).
- Feed out and remove exhaust temperature sensor (1).

44 – Removing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

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WARNING

Hot surfaces.

Risk of burning!

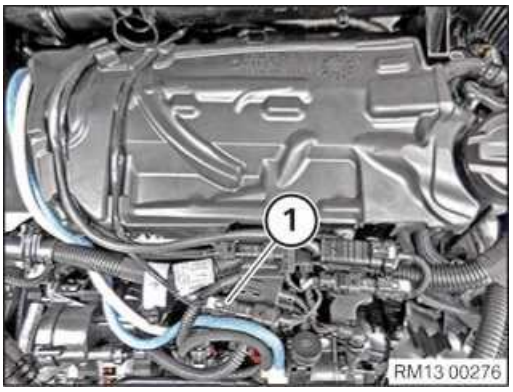
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

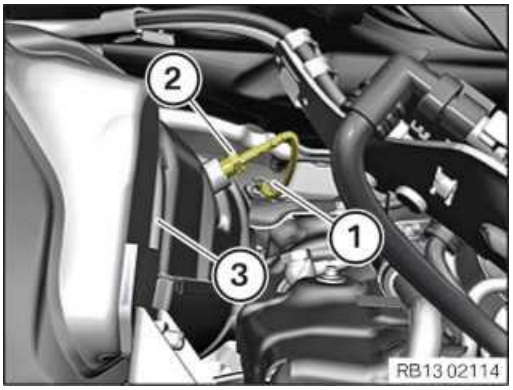
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and loosen connector (1).
- Uncover the exhaust temperature sensor cable.



- Guide the exhaust temperature sensor cable (2) out of the clamp (1) and place it to one side.
- Release the exhaust temperature sensor (2) with conventional tools .
- Feed out and remove the exhaust temperature sensor (2) from the diesel particulate filter (3).

45 – Remove the exhaust temperature sensor on the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

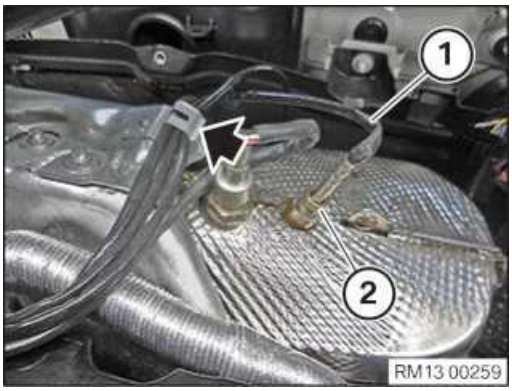
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect connector (1).
- Put the cable of the exhaust temperature sensor to one side.



- Guide cable (1) of the exhaust temperature sensor out of the clamp (arrow) and remove it.
- Loosen exhaust temperature sensor (2).
- Feed out and remove exhaust temperature sensor (2).

46 – Remove the control sensor

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock plug connection (1) and disconnect.
- Detach the connector (2) from the holder .
- Release the front oxygen sensor cable.



- Detach the control sensor (1) with the special tool .
- Feed out and remove the control sensor (1).

47 – Removing the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

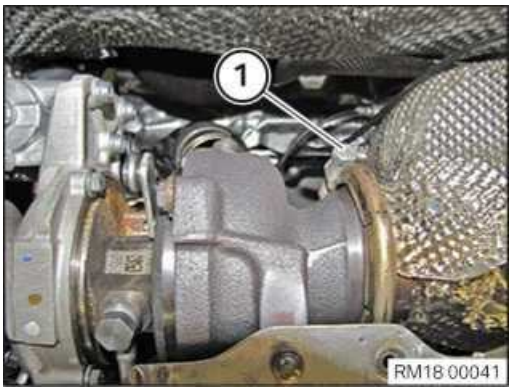
CAUTION

Heavy component.

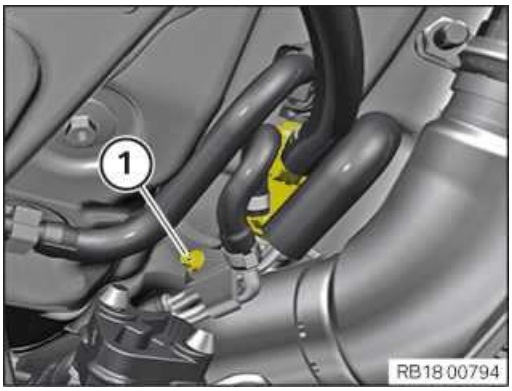
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

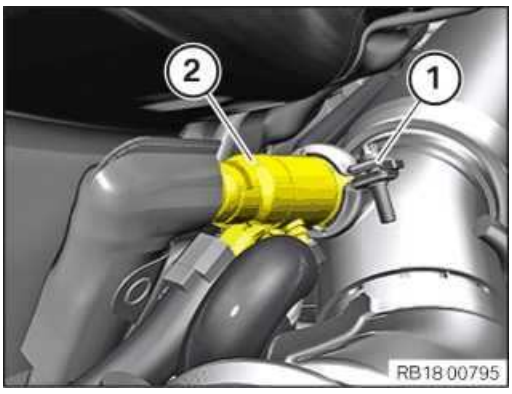
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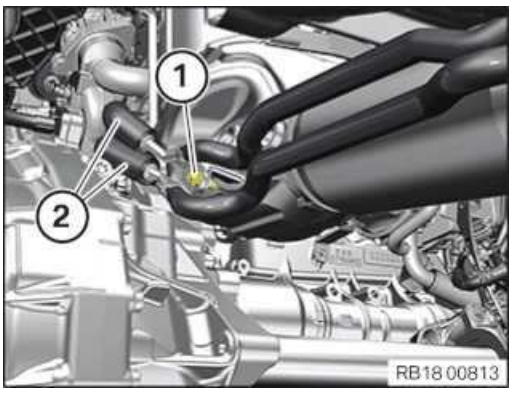
- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.



- Loosen screw (1).



- Loosen V-band clamp (1).
- Remove the SCR metering module (2) and set it aside.



- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.

▸ **Remove differential pressure sensor**

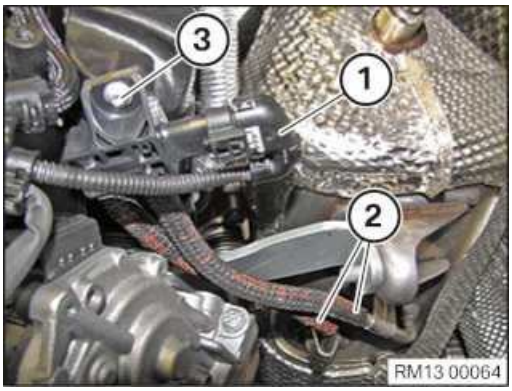
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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

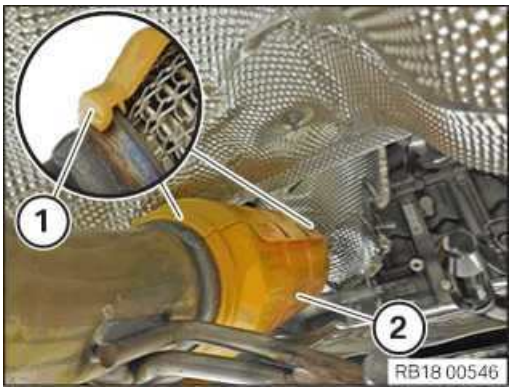
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



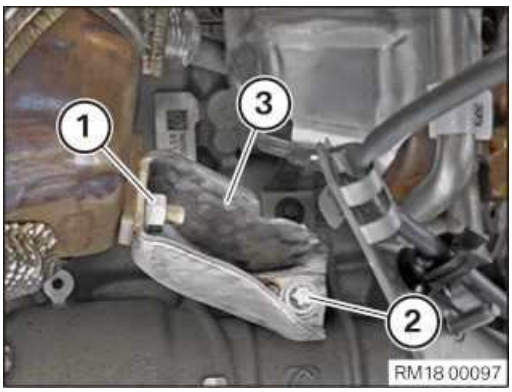
- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.



- Loosen nuts (1).

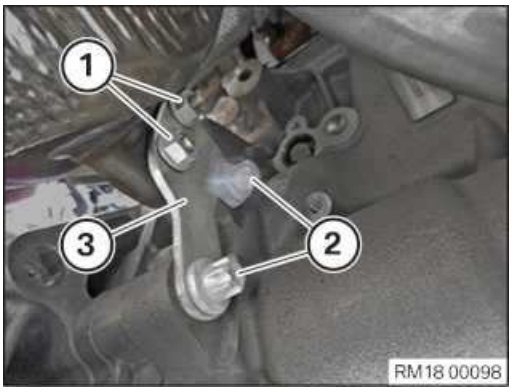


- Mount fitting aid (2).
- Make sure that the fitting aid is correctly position on the edges (1) of the flexible tube.

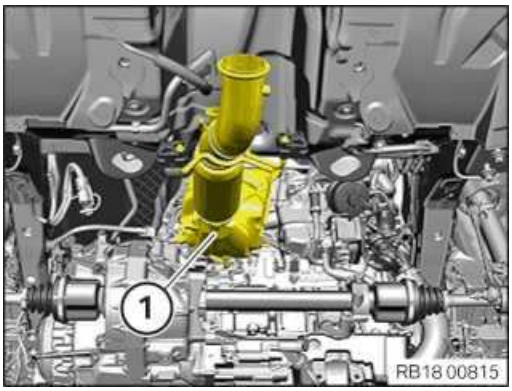


- Unfasten nut (1).
- Loosen screw (2).
- Remove holder (3).

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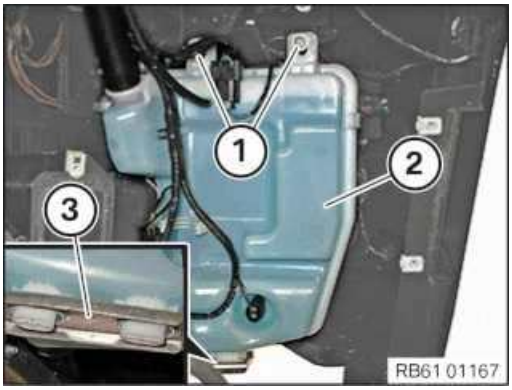


- Loosen nuts (1).
- Loosen screws (2).
- Remove holder (3).



- Feed out diesel particulate filter (1) toward the bottom and remove.

48 – Remove the washer fluid reservoir from the fixture



- Loosen screws (1).
- Guide the washer fluid reservoir (2) up and out of the fixture (3) and set it aside.

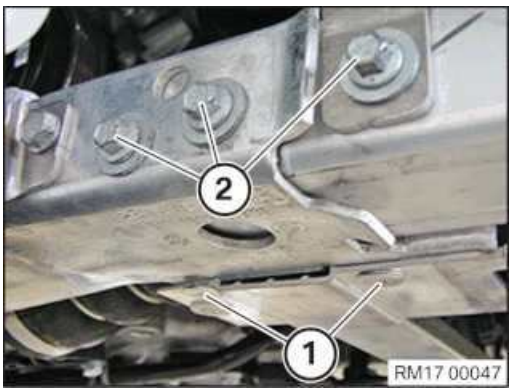
49 – Removing the right charge air duct between the exhaust turbocharger and the charge air cooler

WARNING

Hot surfaces.

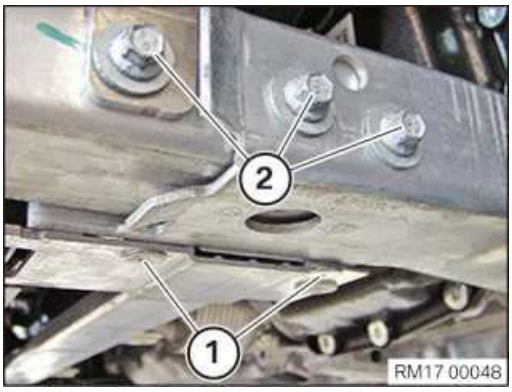
Risk of burning!

- Perform all work only on components that have cooled down.

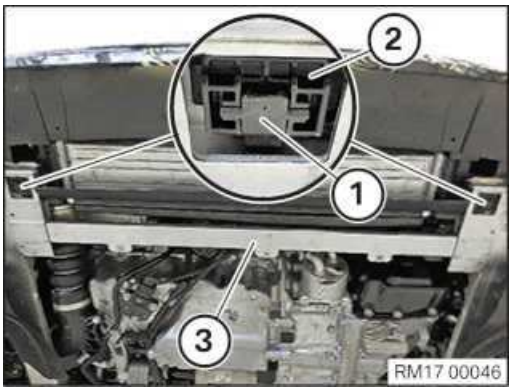


- Undo screws (2) at front left.
- Drill out blind rivets (1) at front left.

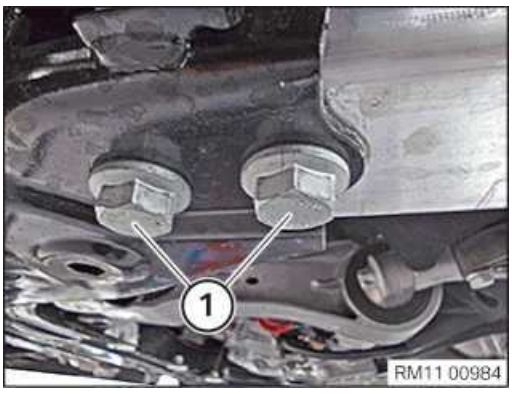
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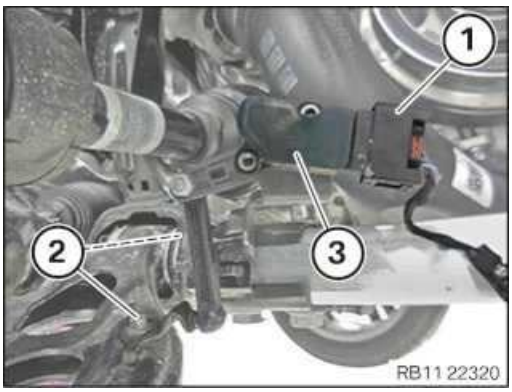
- Undo screws (2) at front right.
- Drill out blind rivets (1) at front right.



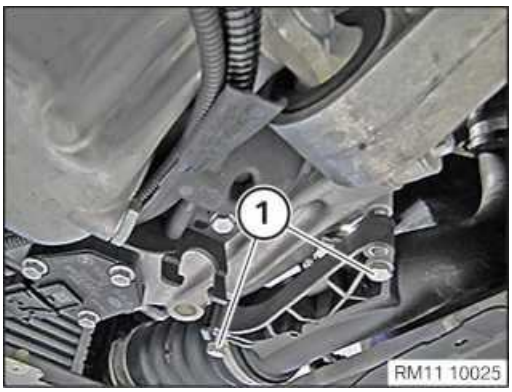
- Unlock locking pins (1).
- Thread out and remove locks (2).
- Thread out and remove cross connection (3).



- Release the screws (1) on the right front axle support.

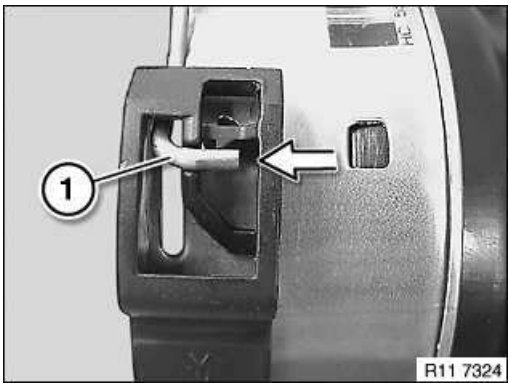


- **If installed:**
- Unlock and release plug connection (1).
- Loosen screws (2).
- Feed out the ride height sensor (3) and remove.



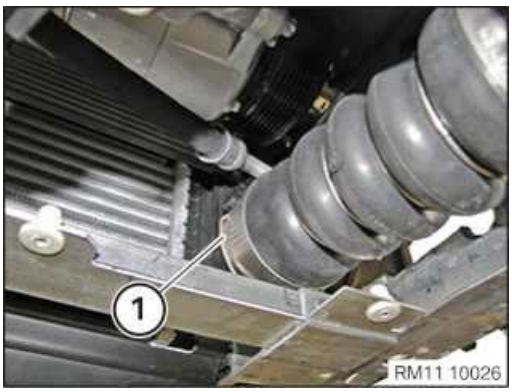
- Release screws (1) of charge air duct on right oil sump.

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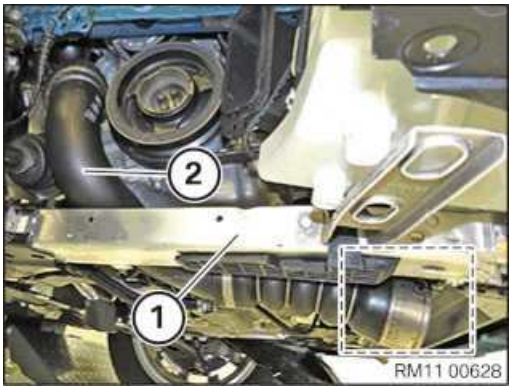


- Unlock lock (1).

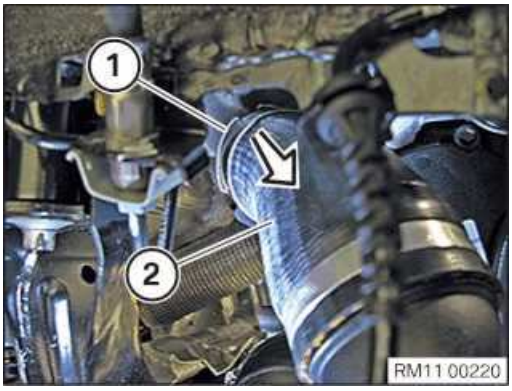
  The lock (1) must engage in the bracket during unlocking (arrow).



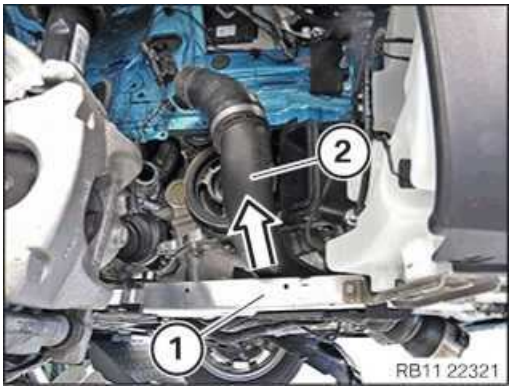
- Unlock and release the charge air duct (1) on the charge air cooler.



- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed out the charge air duct (2) in the **marked** area towards the bottom and set it aside.



- Unlock and detach the locks (1) on both sides.
- Feed out the charge air duct (2) on the exhaust turbocharger in the direction of the arrow and set it aside.



- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed out the charge air duct (1) in the direction of arrow between the side member and the deformation element and remove.

50 – Remove the heat shield from the exhaust turbocharger at the bottom

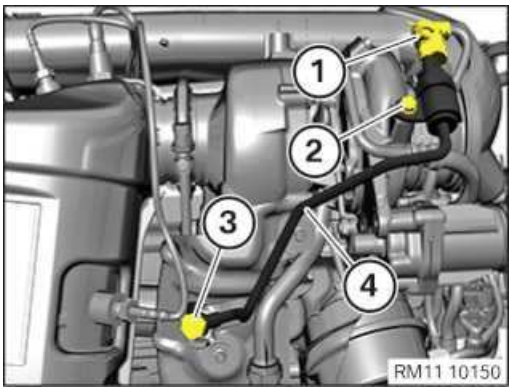
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WARNING

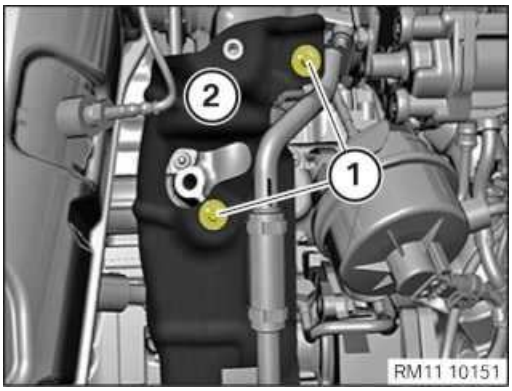
Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Unlock and disconnect connector (1).
- Unscrew the banjo bolt (3).
- The seals of the banjo bolt (3) must be renewed.
- Loosen screw (2).
- Remove the exhaust gas pressure pipe (4).



- Unscrew the bolts (1) on the heat shield .
- Feed out and remove the heat shield (2).

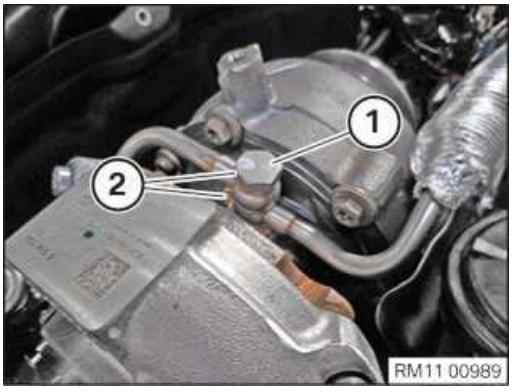
51 – Removing the low-pressure stage turbocharger

WARNING

Hot surfaces.

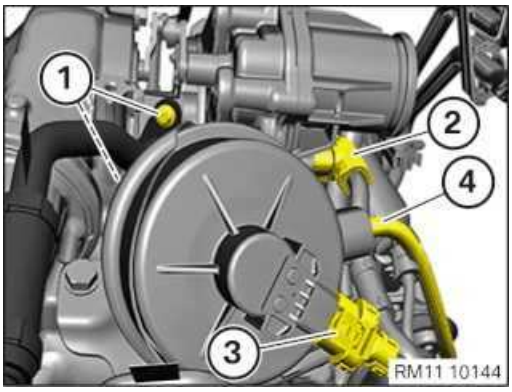
Risk of burning!

- Perform all work only on components that have cooled down.

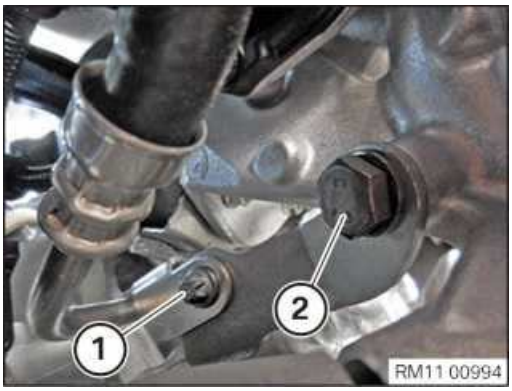


- Release the banjo bolt (1) of the oil feed lines.
- Remove sealing rings (2).
- Place oil feed lines to one side.

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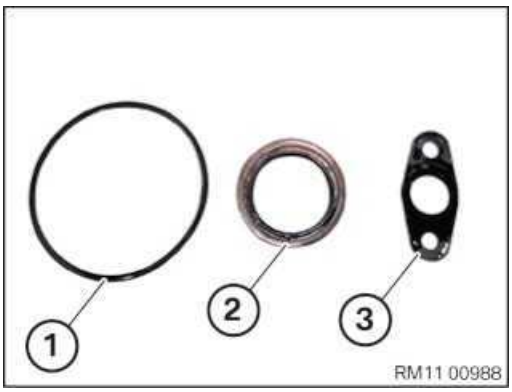
- Release the screws (1) of the oil return line.
- Unlock and disconnect the plug connections (2) and (3).
- Pull off the vacuum hose (4) carefully.



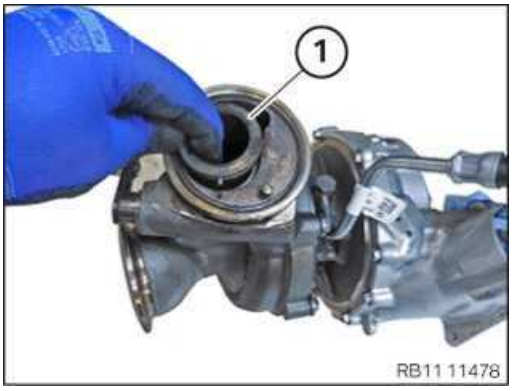
- Undo the bolt (1) of the oil feed line.
- Loosen screw (2).



- Loosen screw (1).
- Remove the V hose clamp.
- Guide the low-pressure stage turbocharger out towards the top and remove.



- Remove seals (1), (2) and (3).



- Remove the spacer ring (1).

52 – Removing the high-pressure stage exhaust turbocharger

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WARNING

Hot surfaces.

Risk of burning!

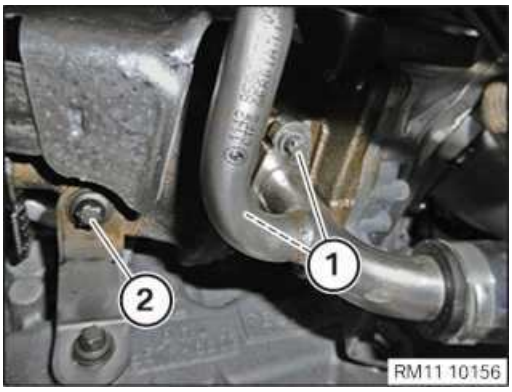
- Perform all work only on components that have cooled down.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

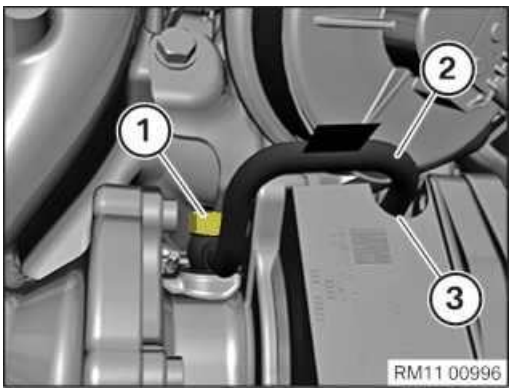
- Remove and install heavy components with the aid of another person/other persons.



- Unscrew the bolts (1) on the oil return line .
- Loosen screw (2).

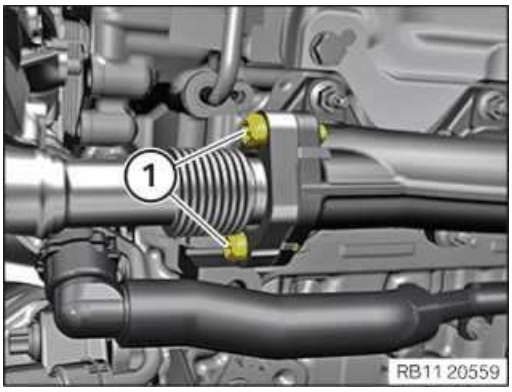


- Release screw (1) from the right wheel arch.

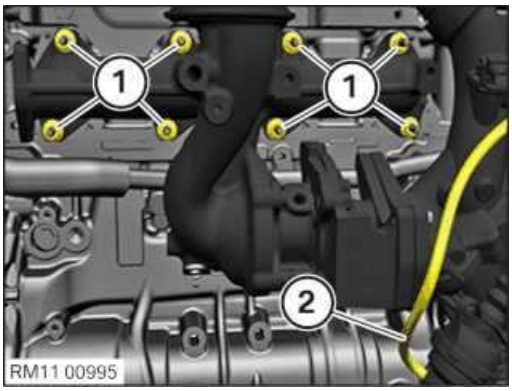


- Unscrew the banjo bolt (1).
- Guide out oil feed line (2) from holder (3).

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- Loosen screws (1).



- Pull off the vacuum hose (2).
- Loosen nuts (1).
- Guide out the exhaust manifold and the high-pressure stage exhaust turbocharger to the top and remove them.

MAIN WORK

53 – Removing the control valve for central piston cooling

RISK OF DAMAGE

Contaminant or foreign body.

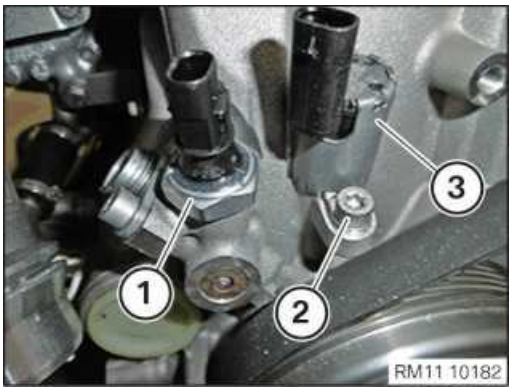
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unlock and disconnect plug connections (1).

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- Loosen and remove the oil pressure switch (1).
- Loosen screw (2).

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the control valve (3) for central piston cooling.

54 – Installing the control valve for central piston cooling

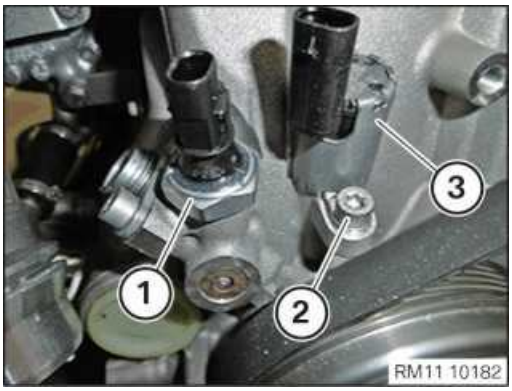
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Renew the gasket (1) using the special tool **0 496 714 (00 9 030)**.

  Parts: Gasket



- Clean sealing surface.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

- Install the control valve (3) for central piston cooling.
- Tighten down screw (2).

Central piston cooling valve to crankcase

M6x16		Tightening torque	8 Nm

- Replace oil pressure switch (1) .

  Parts: Oil pressure switch

- Install and tighten the oil pressure switch (1).

Oil pressure switch to crankcase

Sensor	Replace oil pressure switch.	Tightening torque	22 Nm

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- Connect and lock the connector (1).

  The connectors (1) must engage audibly.

POSTPROCESSES

55 – Prepare for the installation of the exhaust turbocharger

- Check the oil feed lines and the oil return lines for contamination or obstruction, clean or renew if necessary.
- If the oil feed lines and/or oil return lines are heavily contaminated, we recommend changing the engine oil and the oil filter.
- If installed: Check the coolant feed lines and the coolant return lines for the exhaust turbocharger for contamination or obstruction, clean or renew if necessary.
- Check that the screw connections and the plug connections of all the lines are correct.
- Check air cleaner for contamination and clean or renew as needed.
- Check correct functioning of crankcase ventilation.
- Replace all gaskets.

  Parts: Seals

56 – Installing the high-pressure stage exhaust turbocharger

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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RISK OF DAMAGE

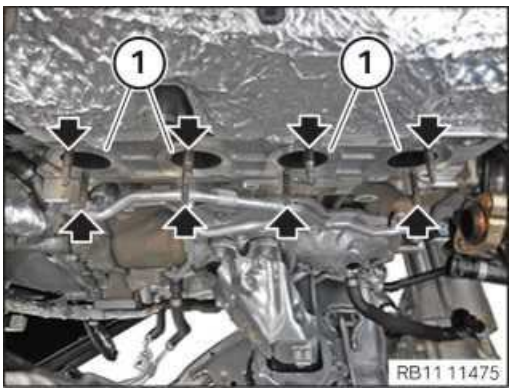
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

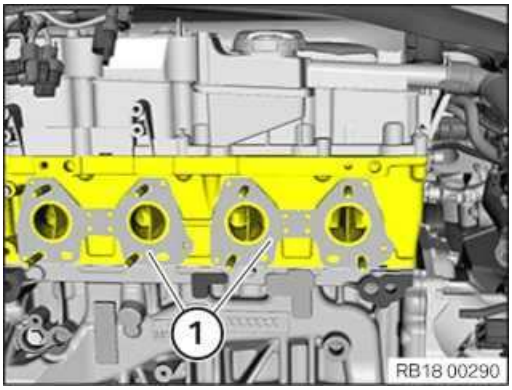
The sealing surfaces must be free from oils, grease and cleaning agents.



- Clean the sealing surfaces (1) on the cylinder head using special tool **0 495 102 (11 4 470)**.
- Check the stud bolts (arrows) on the cylinder head for correct fit.



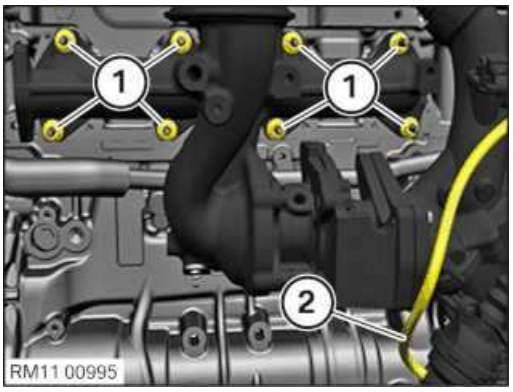
- Clean the sealing surfaces on the exhaust manifold using special tool **0 495 102 (11 4 470)**.



- Renew gasket (1).

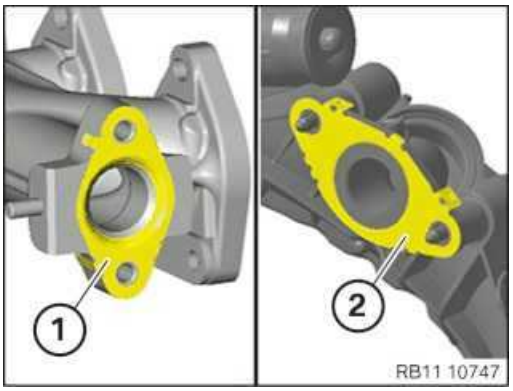
  Parts: Gasket
- Install new gasket (1).

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- Feed in and install the exhaust manifold and the high-pressure stage exhaust turbocharger.
- Tighten nuts (1).

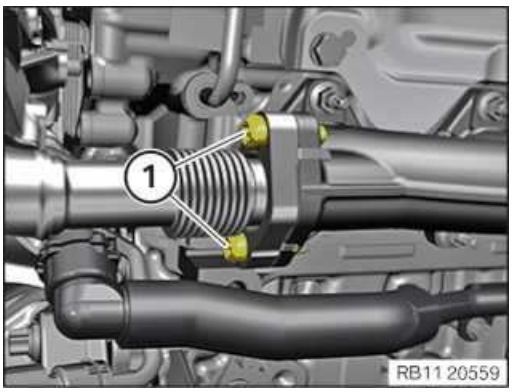
  Parts: Nuts
- Connect vacuum hose(2).



- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket
- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

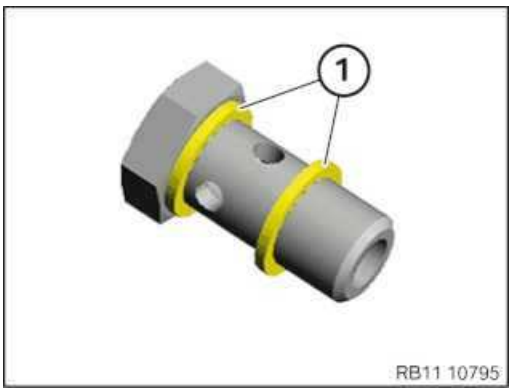
  Parts: Gasket



- Tighten the screws (1).

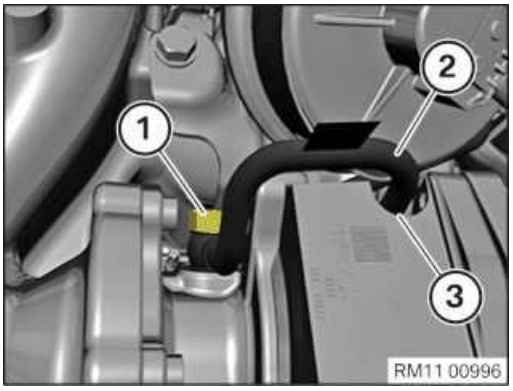
Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm



- Renew sealing rings (1) of banjo bolt.

  Parts: Sealing ring

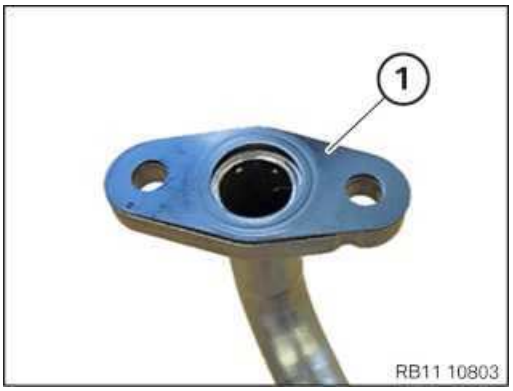


- Guide the oil feed line into the holder (3) and install it.
- Tighten down screw (1).

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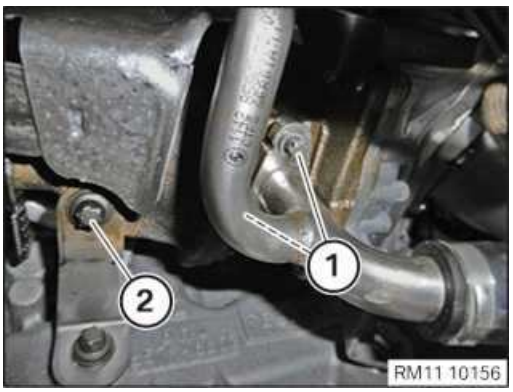


- Tighten bolt (1) from the right wheel arch.



- Renew seal (1) of oil return line.

  Parts: Gasket



- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

57 – Installing the low-pressure stage turbocharger

RISK OF DAMAGE

Damage to the surface.

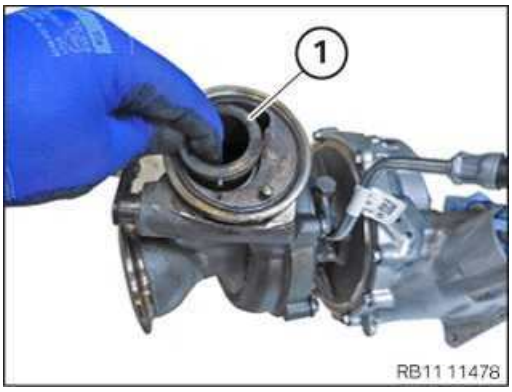
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

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- Check the spacer plug (1) for damage, renew if necessary.

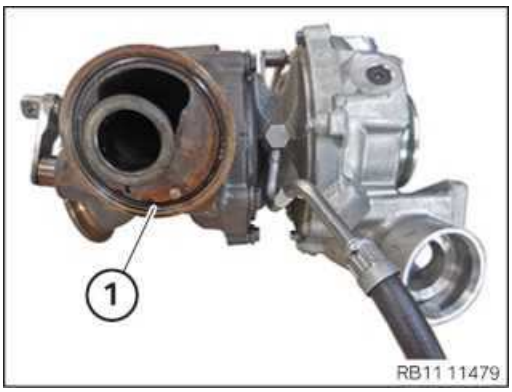
  Parts: Spacer ring
- Insert and install the spacer ring (1).
- Position spacer ring (1) correctly.



- Renew gasket (1).

  Parts: Gasket
- Position the seal (1).
- Renew the sleeve(2).

  Parts: Holding sleeve



- Renew sealing ring (1).

  Parts: Sealing ring
- Affix the sealing rings on the exhaust turbocharger.

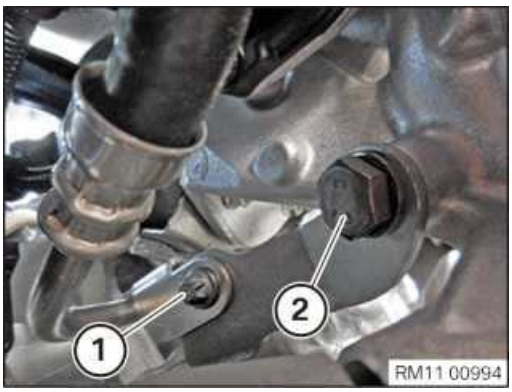


- Insert and install the low-pressure stage exhaust turbocharger on the exhaust manifold .
- Feed in and install V-band clamp .
- Tighten V-band clamp (2).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Screw in nut (1) with 2 **revolutions**.



- Tighten down screw (1).

Oil feed line to bracket

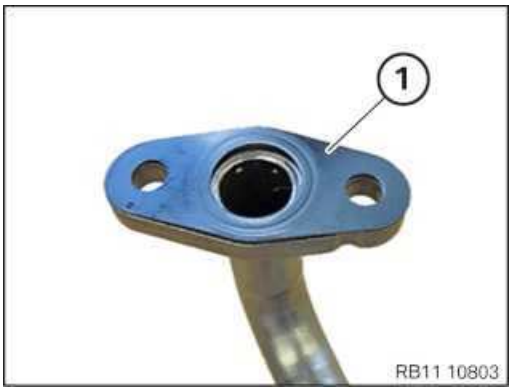
Torx screw M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

Holder to exhaust turbocharger and crankcase

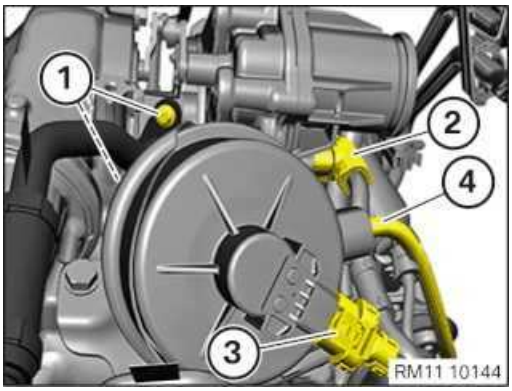
M8x16		Tightening torque	22 Nm

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- Renew seal (1) on the oil return line.

  Parts: Gasket



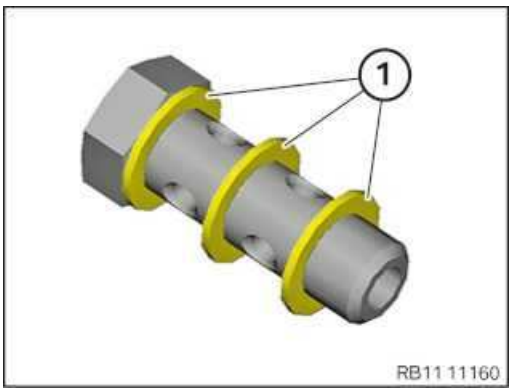
- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

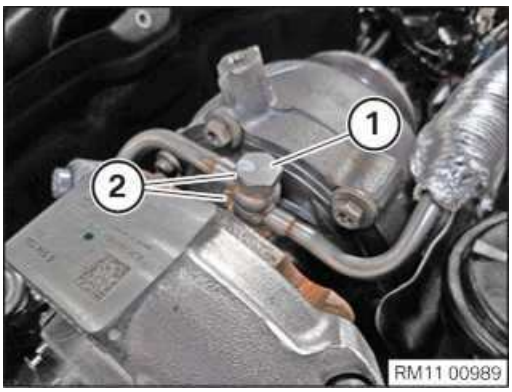
M6x12		Tightening torque	8 Nm

- Connect and lock connectors (2) and (3).

  The locks must engage audibly.
- Connect vacuum hose (4).



- Renew banjo bolt and sealing rings (1).
- **Parts:** Banjo bolt, sealing rings



- Install sealing rings (1).
- Tighten the banjo bolt (1).
- Ensure that the lines do not rest against the adjacent components.

58 – Installing heat shield on exhaust turbocharger at bottom

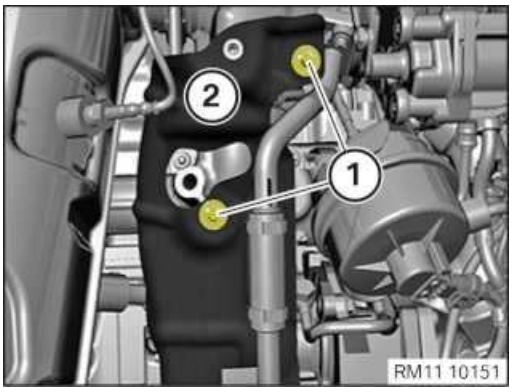
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

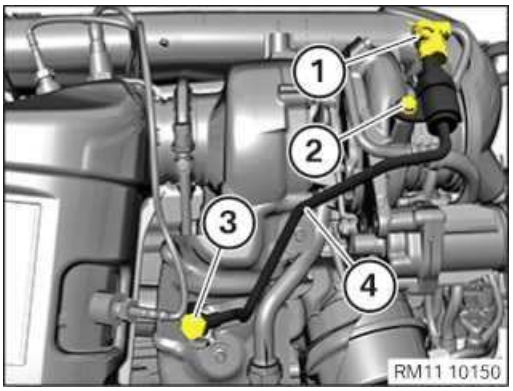
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- Feed in and install the heat shield (2).
- Tighten the bolts (1) on the heat shield .

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm



- Position the exhaust gas pressure pipe (4).
- Hand-tighten the bolt (2).
- Renew sealing rings on the banjo bolt (3).

  Parts: Sealing ring
- Tighten the banjo bolt (3).

Banjo bolt for exhaust pressure pipe to exhaust manifold

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

- Tighten down screw (2).

Standard screw connection M6

M6		8 Nm

- Connect connectors (1) and lock.

  Lock must audibly engage.

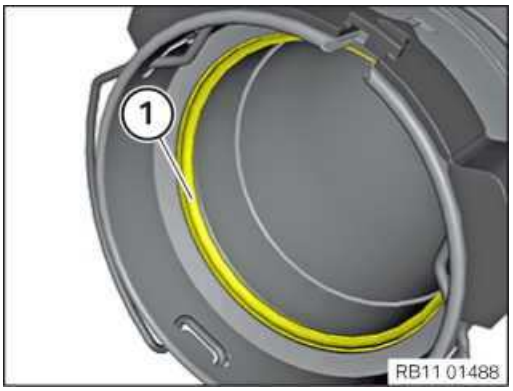
59 – Installing the right charge air duct between the exhaust turbocharger and the charge air cooler

RISK OF DAMAGE

Damage to the exhaust turbocharger.

A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.



- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

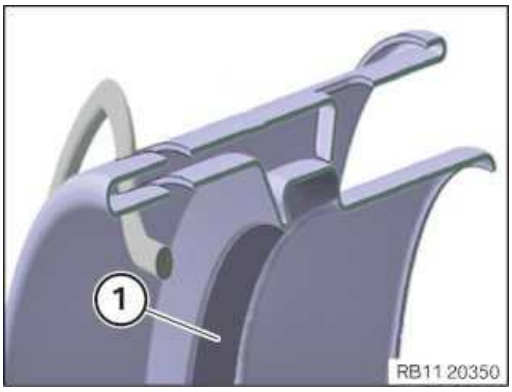
  Parts: Gasket

▸ **Replace damaged gasket**

TECHNICAL INFORMATION

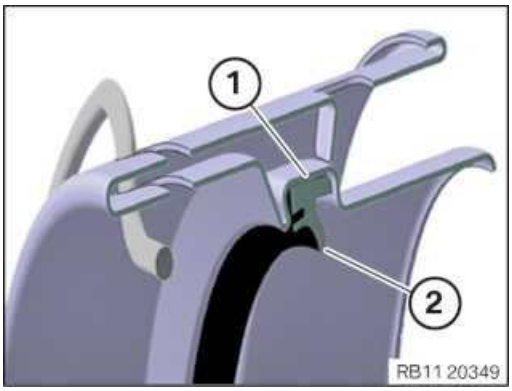
Do not use pointed or sharp-edged tools for the installation and/or removal.

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- Remove damaged seal.
- Clean gasket groove (1) with a dry towel.

  The gasket groove (1) must be clean.



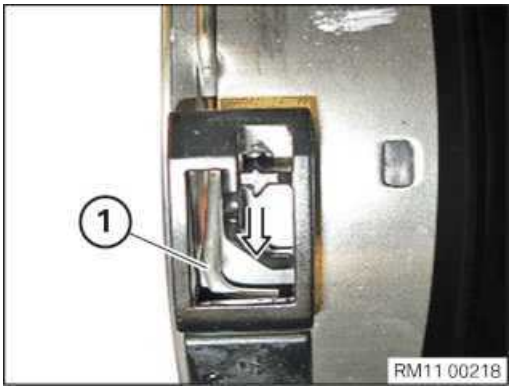
- Renew gasket.

  Parts: Gasket
- Install seal dry without lubricant or mounting agent.

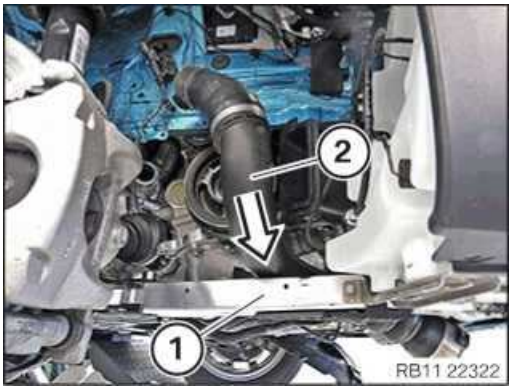
TECHNICAL INFORMATION

Incorrect assembly is possible. Ensure correct installation position.

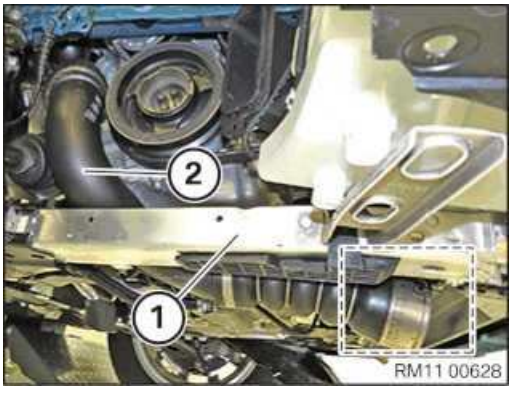
- Feed in and install the seal.
- Make sure the seal is correctly installed in the gasket groove (1).
- Make sure that the sealing lip (2) is pointing downwards (see figure).



- Detach the locks (1) in the direction of the arrow from the brackets.
- Ensure that the locks (1) engage audibly.

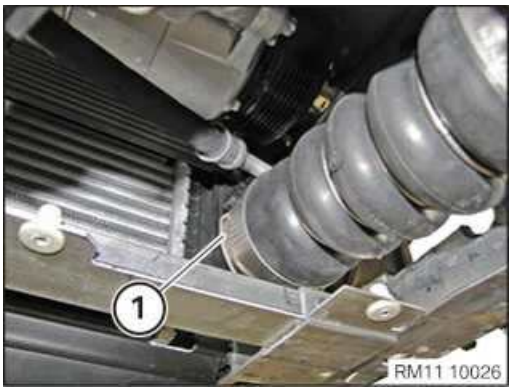


- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed in the charge air duct (1) in the **direction** of arrow between the side member and the deformation element and position.

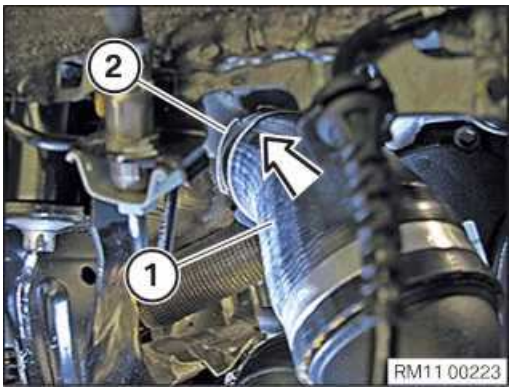


- Pull the adapter of the front axle support (1) downwards to the front right.
- Position the charge air duct (2) in **marked** area on the charge air cooler.

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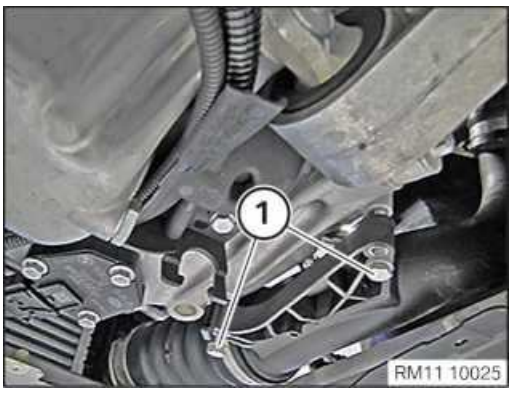


- Feed in and install the charge air duct (1) on the charge air cooler .
- Make sure the charge air duct (1) engages audibly on the charge air cooler.



- Feed in and install charge air duct (1) in the **direction** of the arrow on exhaust turbocharger.

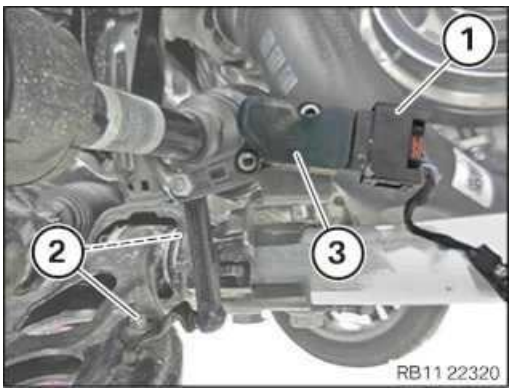
  The locks (2) must engage audibly.



- Tighten the screws (1).

Charge air duct to oil sump

M6		Tightening torque	8 Nm



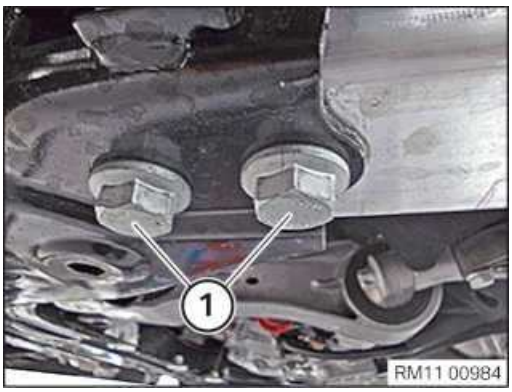
- **If installed:**
- Feed in and install the ride height sensor (3).
- Tighten the screws (2).

Ride height sensor holder to front axle support

M6		Tightening torque	8 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

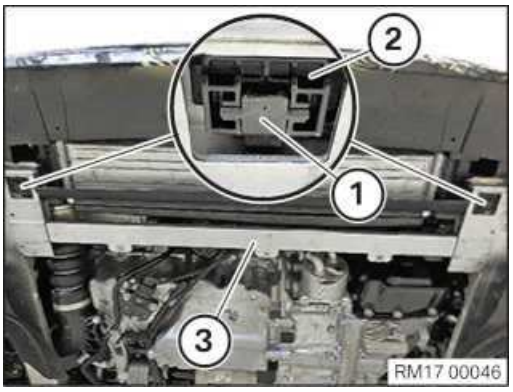


- Tighten the screws (1) on the adapter of the front axle support.

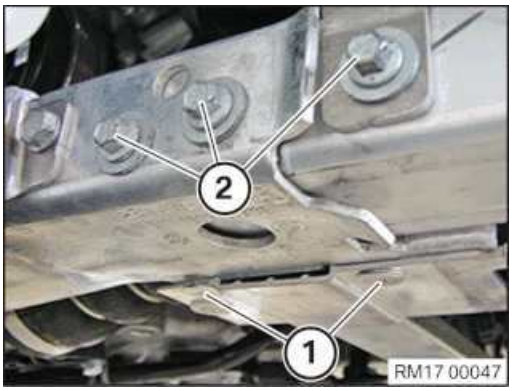
Adapter, front axle support to front axle support

		Tightening torque	100 Nm

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- Guide in cross connection (3) and install.
- Guide in locks (2) and install.
- Lock the locking pins (1).
- Ensure that the locking pins (1) audibly engage.



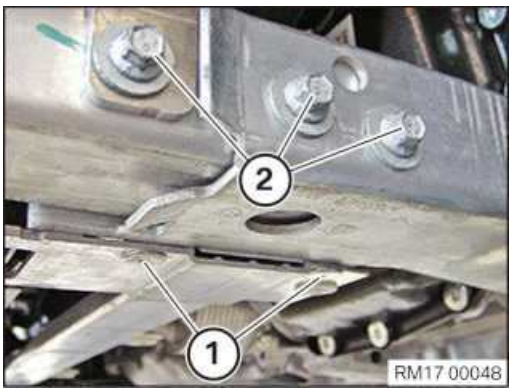
- Tighten the bolts (2) at the front left.

Cross connection to front axle support

M6		Tightening torque	12 Nm

- Renew the blind rivet (1).

  Parts: Blind rivet
- Mount the blind rivets (1) at the front left.



- Tighten the bolts (2) at the front right.

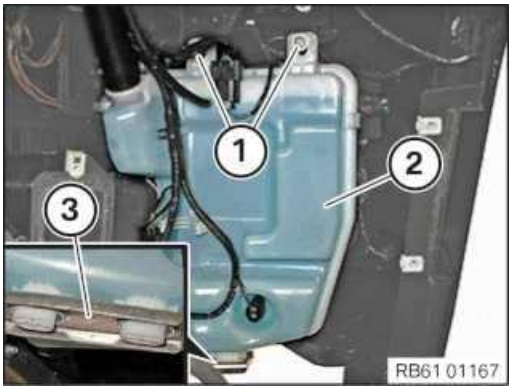
Cross connection to front axle support

M6		Tightening torque	12 Nm

- Renew the blind rivet (1).

  Parts: Blind rivet
- Mount the blind rivets (1) at the front right.

60 – Install the washer fluid reservoir in the fixture



- Feed washer fluid reservoir (2) into the mounting (3) and install.
- Tighten the screws (1).

Washer fluid reservoir to body

M6x20		Tightening torque	8 Nm

61 – Installing the diesel particulate filter

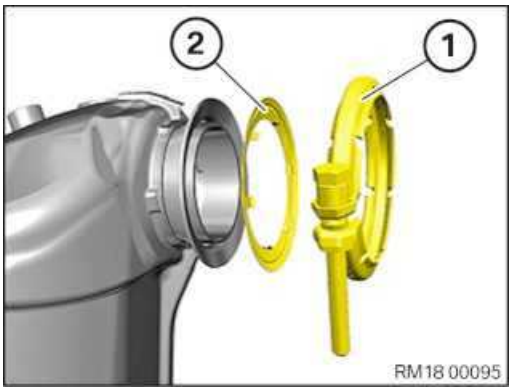
CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

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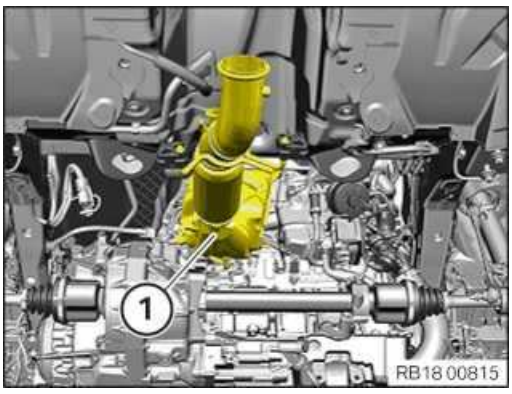
- Renew the V-clip (1).

  Parts: V-band clamp
- Renew the gasket (2).

  Parts: Gasket



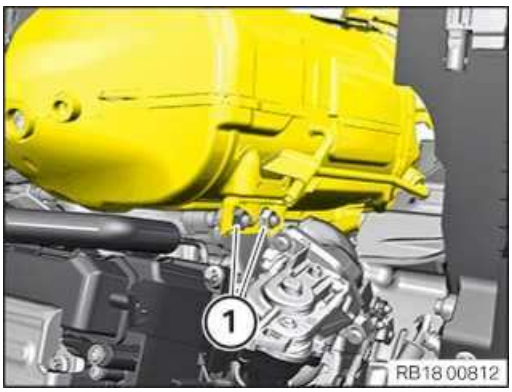
- Before installing the diesel particulate filter: Mount fitting aid (1) for the flexible tube.



- Carefully insert and install the diesel particulate filter (1).

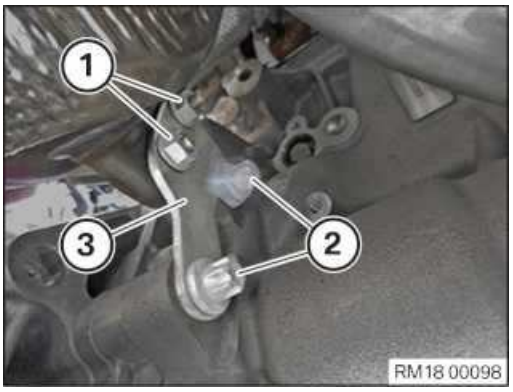


- Feed in and install V-band clamp (1).
- Make sure that the seal between the diesel particulate filter and the exhaust turbocharger is installed correctly.
- Align the diesel particulate filter on the exhaust turbocharger.
- Position V-clip (1).
- Hand-tighten the V-clip (1).

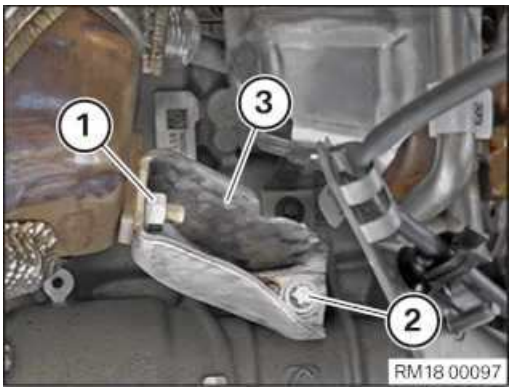


- Tighten nuts (1) by hand.

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- Install holder (3).
- Hand-tighten the bolts (2).
- Tighten nuts (1) by hand.



- Install holder (3).
- Tighten the nut (1) hand-tight.
- Hand-tighten the bolt (2).



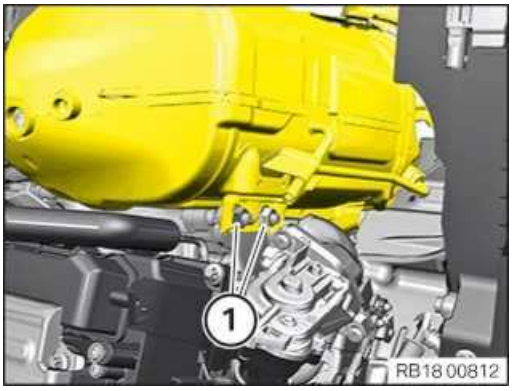
- Remove fitting aid (1) for the flexible tube.



- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

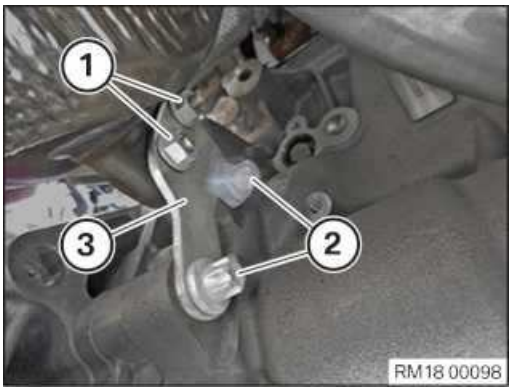


- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm

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- Tighten down screws (2).

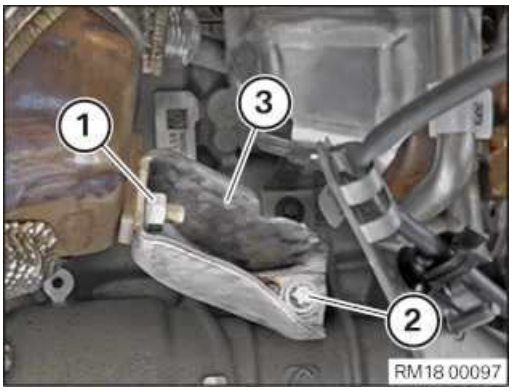
Diesel particulate filter holder to gearbox

M12x75		Tightening torque	66 Nm

- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screw (2).

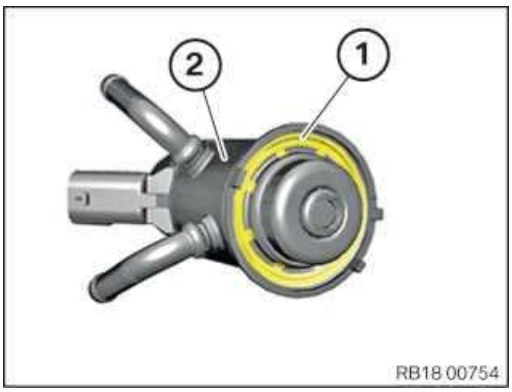
Diesel particulate filter bracket to crankcase

M10x35		Tightening torque	38 Nm

- Tighten nut (1).

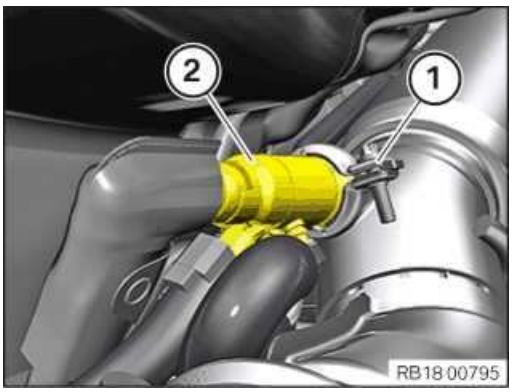
Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Renew sealing ring (1) of the SCR metering module (2).

  Parts: Sealing ring

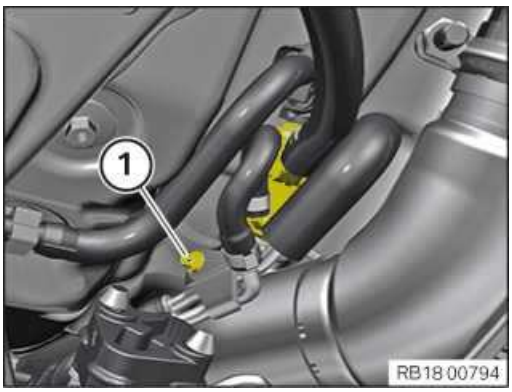


- Insert and install the SCR metering module (2).
- Renew the V-clip (1).

  Parts: V-band clamp
- Tighten V-band clamp (1).

SCR metering module V-clip to exhaust system

V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm

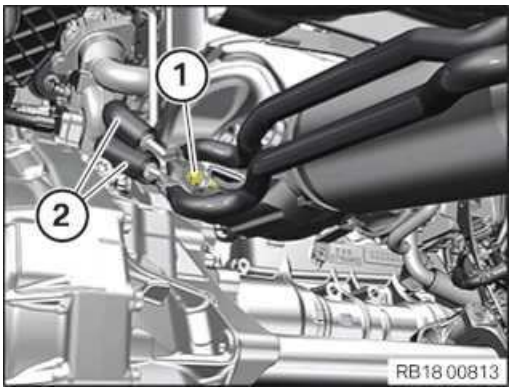


- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm

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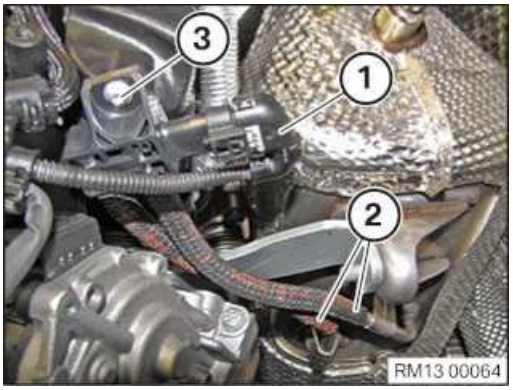


- Thread in and install coolant line (2) of the SCR metering module.
- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm

▸ **Installing differential pressure sensor**



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

62 – Install the control sensor

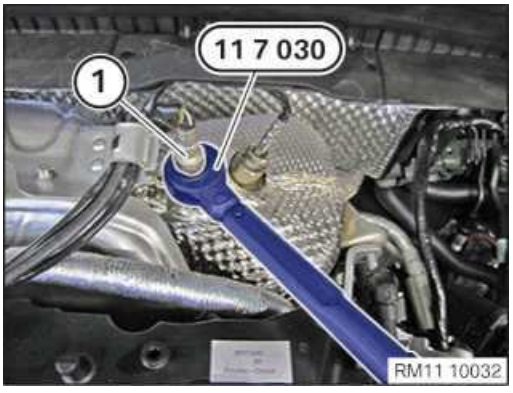
TECHNICAL INFORMATION

New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

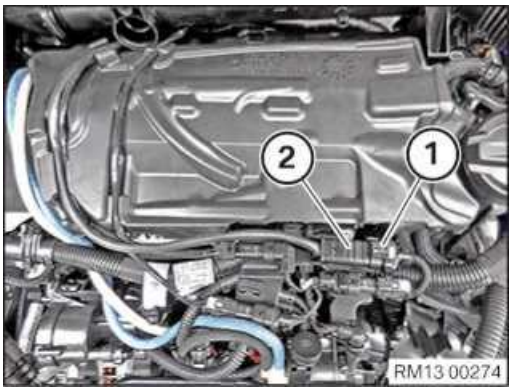


- Feed in front oxygen sensor (1) and install.
- Tighten front oxygen sensor (1) using special tool .

Control sensor

Control sensor		Tightening torque	50 Nm

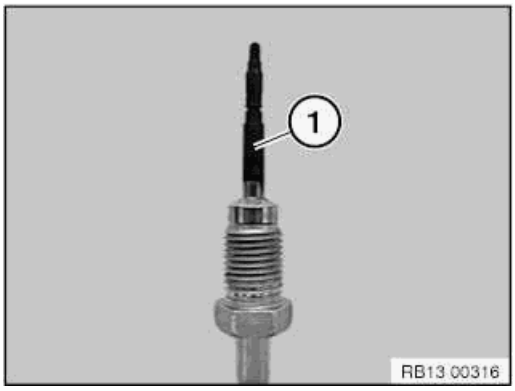
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- Lay and secure cable of oxygen control sensor.
- Secure the connector (2) to the holder.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

63 – Install the exhaust-gas temperature sensor on the diesel particulate filter

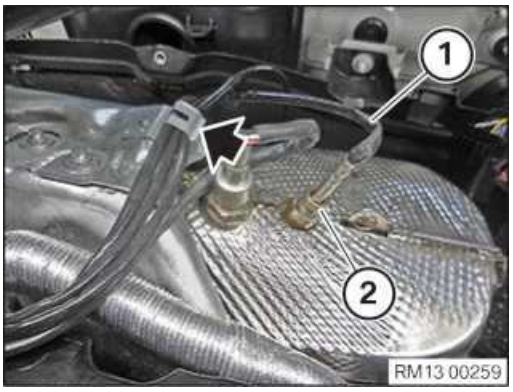


RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.
- Check the gauge tip (1) for damage and renew the exhaust temperature sensor as needed.



- Feed in and install the exhaust temperature sensor (2).
- Tighten the exhaust temperature sensor (2).

Exhaust temperature sensor to diesel particulate filter

Exhaust-gas temperature sensor		Tightening torque	28 Nm

- Insert and install cable (1) of the exhaust temperature sensor in the clamp (arrow).



- Lay and fasten the cable of the exhaust gas temperature sensor.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

64 – Installing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

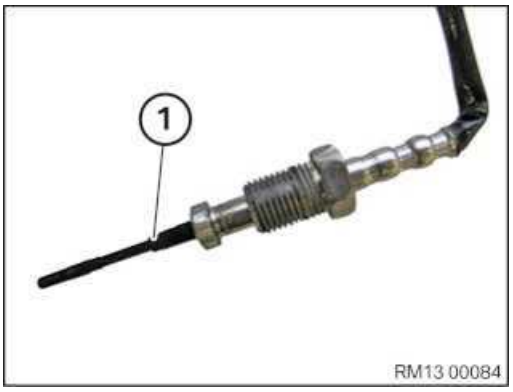
RISK OF DAMAGE

Damage of exhaust temperature sensor.

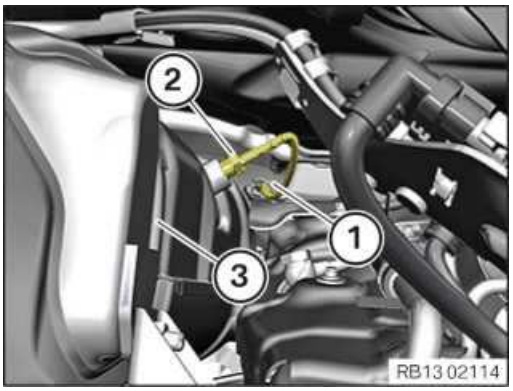
Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

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- Make sure the gauge tip (1) is not damaged during installation.



- Guide the exhaust temperature sensor (2) into diesel particulate filter (3) and install.
- Tighten the exhaust temperature sensor (2) with conventional tools .

Exhaust temperature sensor to diesel particulate filter

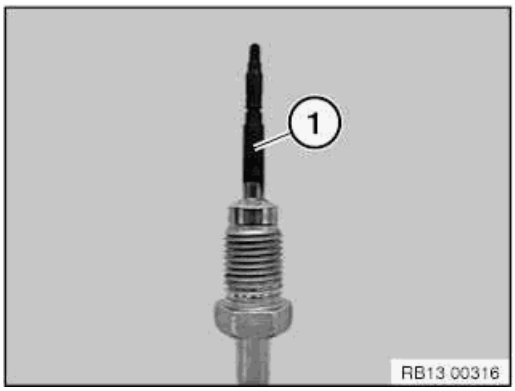
Exhaust-gas temperature sensor		Tightening torque	28 Nm



- Insert and install the cable of the exhaust temperature sensor (2) in the clamps (1).
- Lay and fasten the cable of the exhaust gas temperature sensor.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

65 – Installing exhaust temperature sensor on catalytic converter



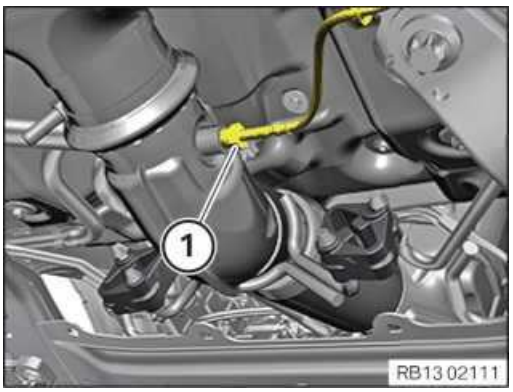
RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

- Check the gauge tip (1) for damage and replace the exhaust temperature sensor as needed.



- Feed in and install the exhaust temperature sensor (1).
- Tighten the exhaust temperature sensor (1).

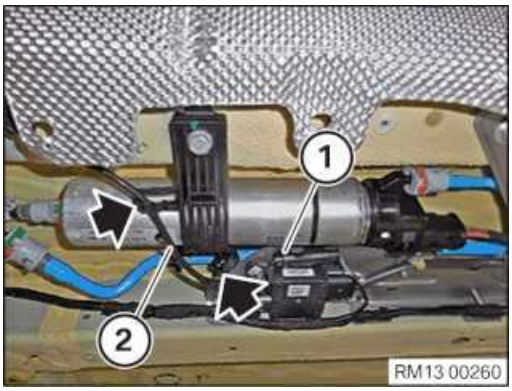
Exhaust-gas temperature sensor to exhaust system

Exhaust-gas temperature sensor		Tightening torque	28 Nm

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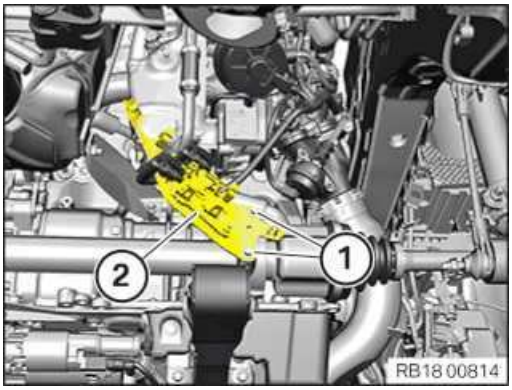
- Secure the cable clips (1).



- Feed cable (2) from exhaust temperature sensor into the clamps (arrows) and install.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

66 – Install holder for oxygen sensor

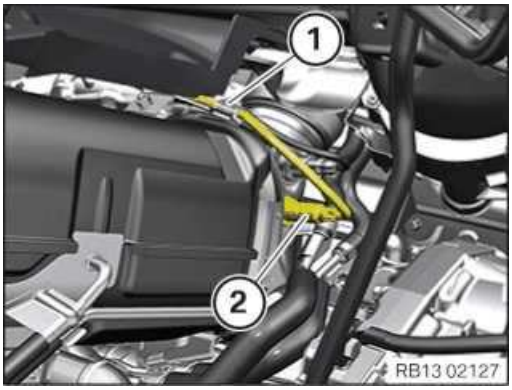


- Insert and install the holder (2).
- Tighten the screws (1).

Oxygen sensor holder to intermediate shaft

Hexagon screw M6x16		Tightening torque	8 Nm

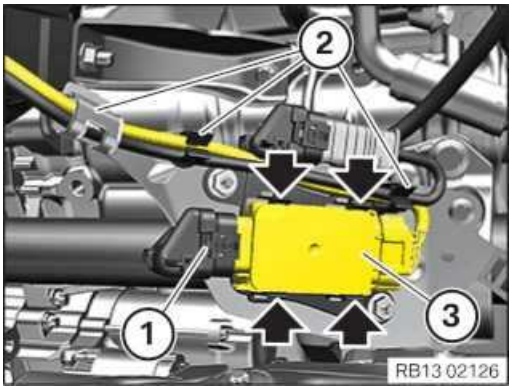
67 – Installing the nitrogen oxide sensor before SCR catalytic converter



- Insert nitrogen oxide sensor before the SCR catalytic converter (2) and install.
- Tighten the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

Nitrogen oxide sensor before SCR catalytic converter

Sensor		Tightening torque	50 Nm



- Install and lock the evaluation electronics for the nitrogen oxide sensor (3) (arrows).
- Insert the evaluation electronics cable for the nitrogen oxide sensor (3) into the clamps (2) and install.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

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68 – Install the monitoring sensor

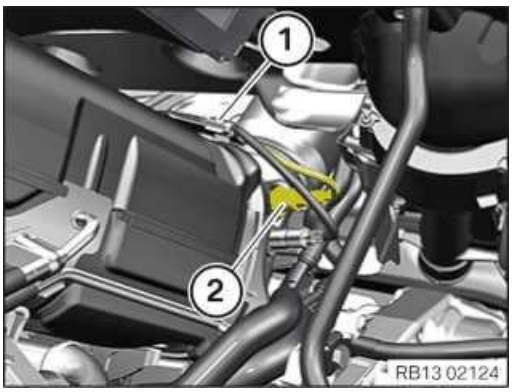
TECHNICAL INFORMATION

New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

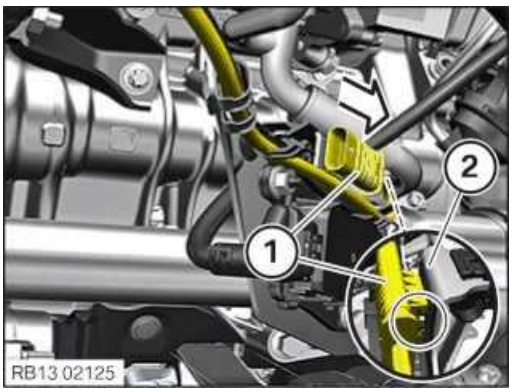


- Feed in the monitoring oxygen sensor (2) and install.
- Tighten the monitoring oxygen sensor (2) with special tool **0 491 074 (11 7 020)**.

Monitoring sensor

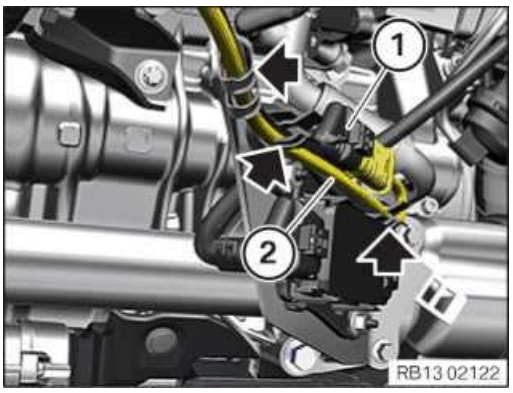
Sensor		Tightening torque	50 Nm

- Insert the cable of the monitoring oxygen sensor (2) into the clamp (1) and secure it.



- Connect the connector (1) with the bracket (2) in the direction of arrow.
- Make sure that the connector (1) is locked correctly in the marked area.

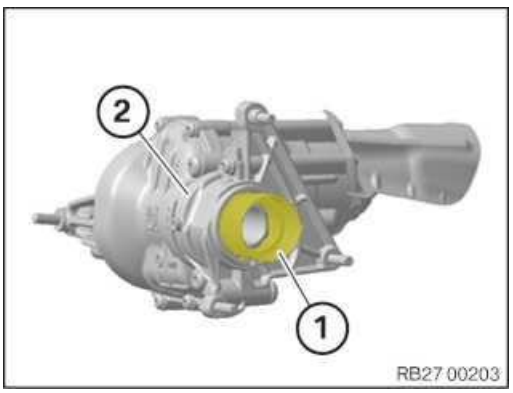
  The connector (1) must engage audibly.



- Insert and attach the cable of the monitoring oxygen sensor (2) to the clamps (arrows).
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

69 – Install the transfer box (VTG)



- If intermediate shaft (1) gets caught on transfer box (VTG) (2), renew intermediate shaft (1) and the radial shaft seals in the automatic or manual transmission.

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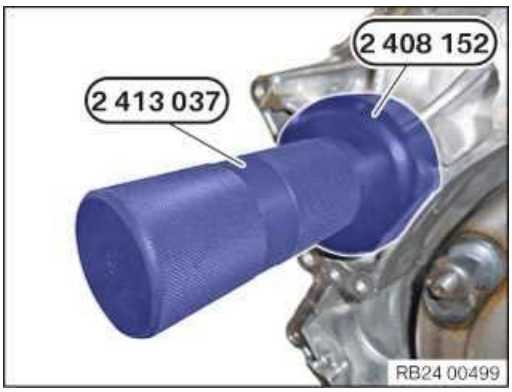
- Screw special tool **2 409 025** into the outer radial shaft seal.
- Turn the screw on the special tool **2 409 025** until the outer radial shaft seal has been pulled out.



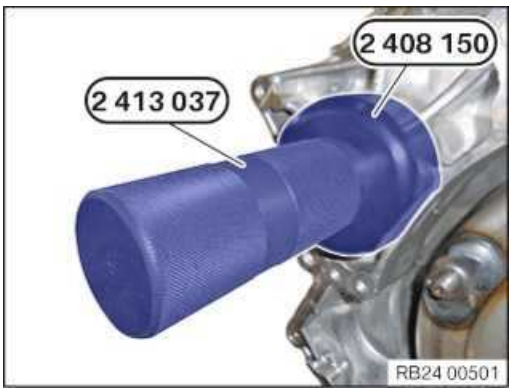
- Insert special tool **2 411 739** into the inner radial shaft seal.



- Screw special tool **2 411 739** into the inner radial shaft seal.
- Turn the screw on the special tool **2 411 739** until the inner radial shaft seal has been pulled out.

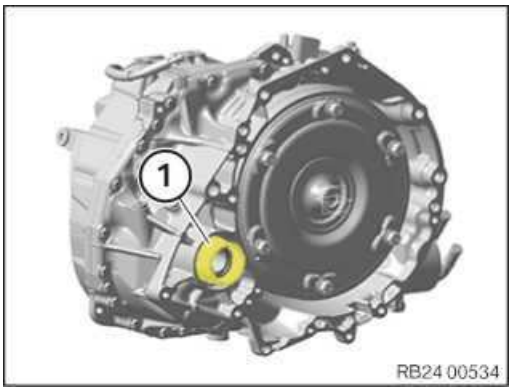


- Drive in the inner radial shaft seal using special tools **2 408 152** and **2 413 037** up to the limit position.



- Drive in the outer radial shaft seal using special tools **2 413 037** and **2 408 150** up to the limit position.

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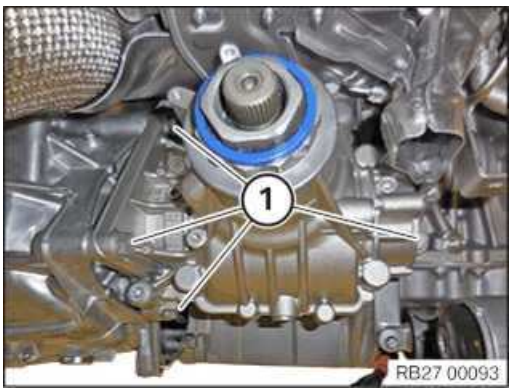
- If necessary, connect the new intermediate shaft (1) to the output flange of the automatic transmission or manual transmission.



- Coat the inside of the output flange (arrows) evenly with approx. 5 g of grease.

Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the transfer box (VTG).
- Tighten the screws (1).

Transfer box to transmission

M10		Tightening torque	56 Nm



- Install heat shield.
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Heat shield to transfer box

M6	Renew screws.	Tightening torque	6 Nm

▸ **Check the transfer box oil level**

RISK OF DAMAGE

Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.

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- Check transfer case oil level, correct:
- Open the oil filler plug (1).
- Check transfer box oil level.
- If necessary, top up transmission oil up to the lower edge of the oil filler plug opening (1).

Transmission oil

Technically suitable transfer box and electrical transmission oils	

Main group 27

- Tighten the oil filler plug (1).

Oil filler plug on transfer box (VTG)

M18x1.5		Tightening torque	35 Nm

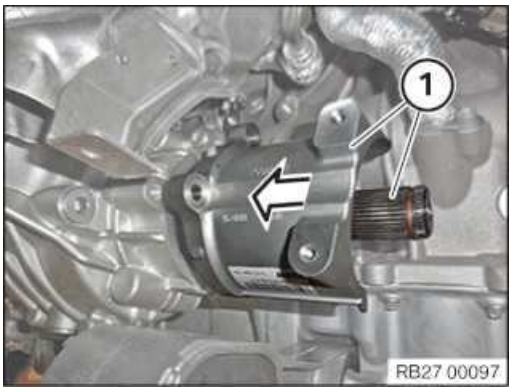
70 – Install the intermediate shaft with the support tube



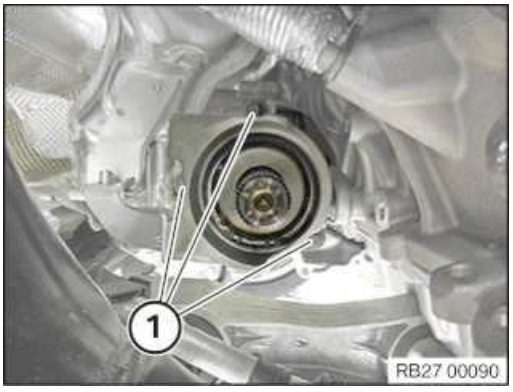
- Coat gearing of the intermediate shaft uniformly with 5 g of grease.

Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the intermediate shaft with support tube (1) in the transfer box.



- Position screws (1).

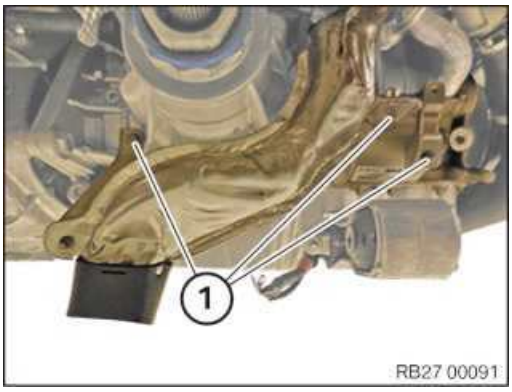
Note: Check for correct screw length! Bolt M8x35 8.8

- Tighten the screws (1).

Intermediate shaft to transfer box

M8x35		Tightening torque	19 Nm

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- If installed: Install air duct.
- Tighten the screws (1).

71 – Installing starter motor

CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.



- Insert and install the starter motor .
- Tighten the screws (1).

Starter motor to transmission

M8x45		Tightening torque	19 Nm



- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

Battery positive lead to starter

M8		Tightening torque	13,5 Nm



- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.

72 – Installing right output shaft partially

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- Renew the circlip (1).

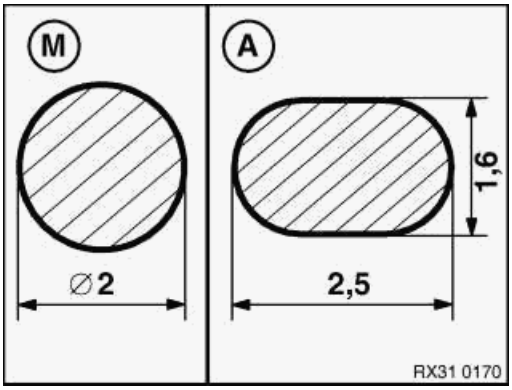
  Parts: Circlip
- Slide output shaft into the transmission as far as the limit position.
- Check for secure seat by levering.

73 – Partially installing the left output shaft



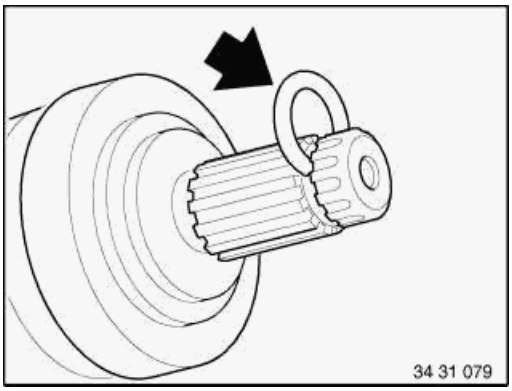
- **With automatic transmission only:**
- Lever out O-ring (1).
- Renew O-ring (1).

  Parts: O-ring
- Insert new O-ring (1).

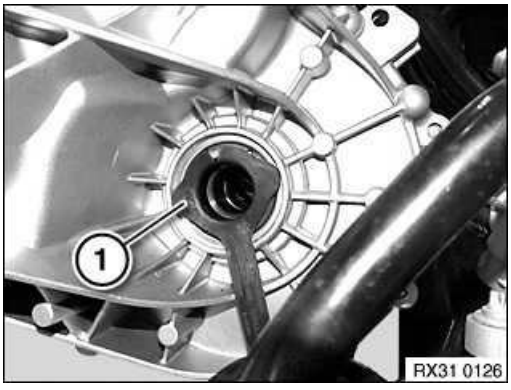


- Do not mix up circlips.

  Different types of output shafts fitted:
  - M: Manual transmission
  - A: Automatic transmission

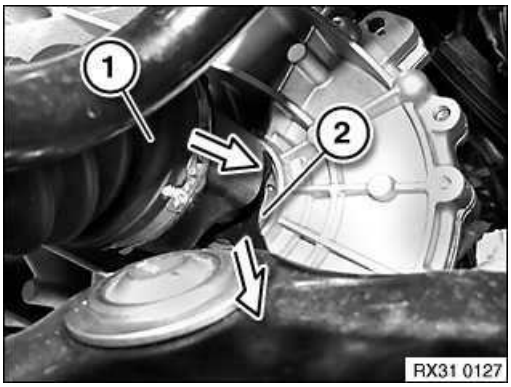


- Renew circlip (arrow).



- Insert installation protection ring (1) into the radial shaft seal.
- Make sure the tool fits over the lip of the radial shaft seal so there is no damage to sealing ring when the output shaft is inserted.

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- Insert output shaft (1) into transmission.
- **Manual gearbox only:** Pull on the handle to remove the installation protection ring (2) and dispose of it.
- Slide output shaft (1) into the transmission as far as the limit position.

  The output shaft (1) must engage audibly.
- Check for secure seat by levering.

74 – Install propeller shaft.

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

RISK OF DAMAGE

Damage to the propeller shaft during installation.

Non-observance of the installation guidelines for the propeller shaft on the rear axle differential may cause severe damage.

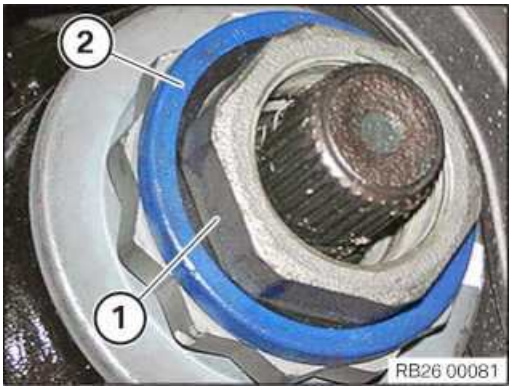
- Always renew the recessed nut on the rear axle differential. Screw locking must be available.
- Strictly observe a minimum hardening time of two hours after having screwed in the recessed nut. The hardening time may be longer at lower temperatures.

RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.



- Renew recessed nut (1).

  Parts: Insert nut
- Renew the retaining clip (2) and the seal.

  Parts: Retaining clip, seal
- Insert the seal with the recessed nut (1) and install.
- Insert the retaining clip (2) and install.
- Make sure that recessed nut (1) is screwed in within 5 min.
- Make sure that the hardening time of **minimum** 2 h for the recessed nut is observed.

  The hardening time must be extended at lower temperatures.

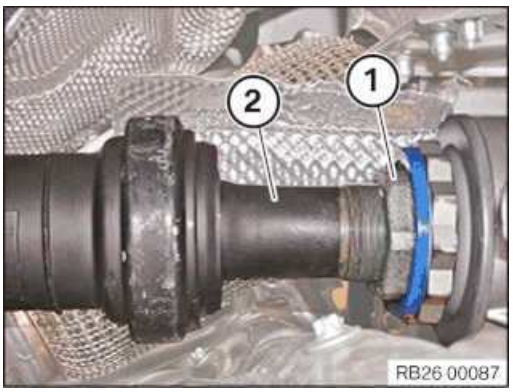
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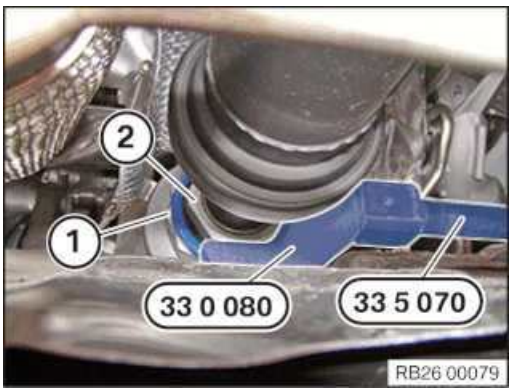
- Insert the propeller shaft (1) and install.
- Always support the propeller shaft (1) with a conventional jack.



- Hand-tighten the bolts (1).



- Push the propeller shaft (2) against the recessed nut (1) up to the limit position.
- Screw the propeller shaft (2) at least 2 thread starts onto the recessed nut (1) by hand.



RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

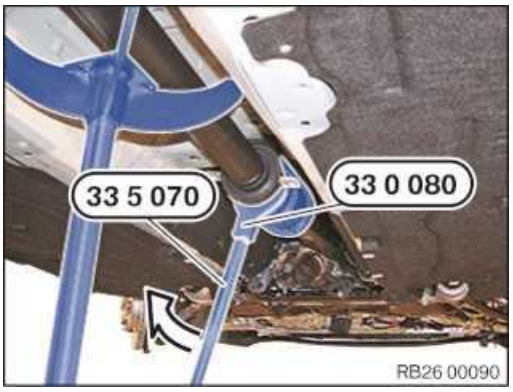
- Do not use the double hexagon head flange nut as counter support.

- Protect the recessed nut (2) on the transfer box from twisting with the special tools **0 495 554 (33 5 070)** and .

  The recessed nut (2) on the transfer box must **not** be used to tighten the propeller shaft.

  The double hexagon flange nut (1) must **not** be used for counter support.

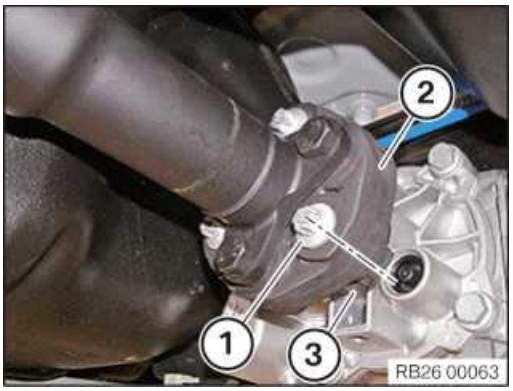
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- Tighten the front propeller shaft with the special tools **0 495 554 (33 5 070)** and in the direction of the arrow.

Propeller shaft to transfer box

		Tightening torque	80 Nm



TECHNICAL INFORMATION

Compliance with the following instructions is required to avoid a humming noise from the propeller shaft after refitting the propeller shaft.

- Assemble the screw connection (1) of the flexible disc (2) and the three-hole flange (3) according to the mark.
- Renew screws (1).

  Parts: Bolts
- Hand-tighten the bolts (1).



- Protect the propeller shaft (1) with the special tools **0 495 554 (33 5 070)** and from twisting.



- Tighten the bolts with the special tools **0 490 504 (00 9 120)** and .

Flexible disc to rear axle final drive

M12x1.5	Renew screws.	Tightening torque	55 Nm 90 °



- Tighten the screws (1).

Centre mount to body

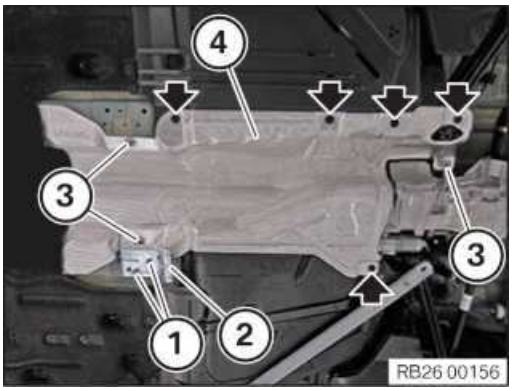
M8		Tightening torque	19 Nm

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- Guide the special too l out between the front and rear propeller shaft and remove.

75 – Installing the rear heat shield



- Insert and install the heat shield (4).
- Tighten screws (arrows).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

- Tighten nuts (3).

Heat shield to body

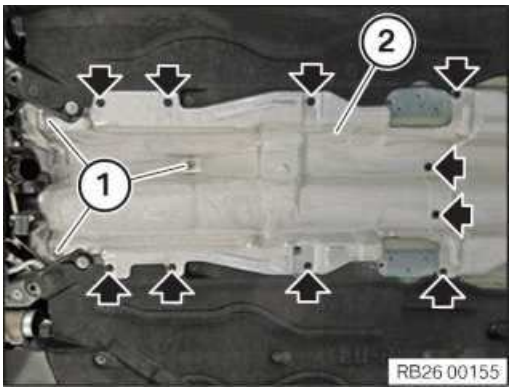
Bolts/nut		Tightening torque	3 Nm

- Insert and install the holder (2).
- Tighten the screws (1).

Bracket to body

M8		Tightening torque	21 Nm

76 – Install the front heat shield



- Insert and install the heat shield (2).
- Tighten screws (arrows).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

- Tighten nuts (1).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

77 – Install exhaust system

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

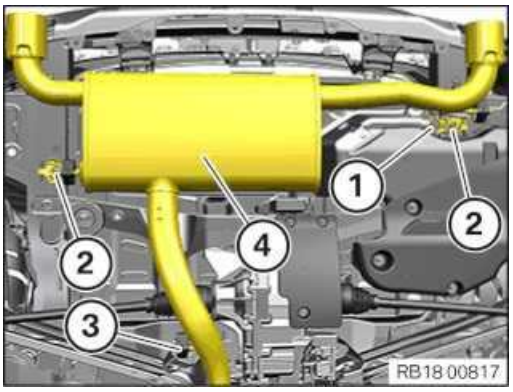
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CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Feed in and install the exhaust system (4) with a second person.
- Renew nuts (2).

  Parts: Nuts
- Tighten nuts (2).

Exhaust system to body

M8	Replace nuts.	Tightening torque	19 Nm

- Tighten down screw (1).

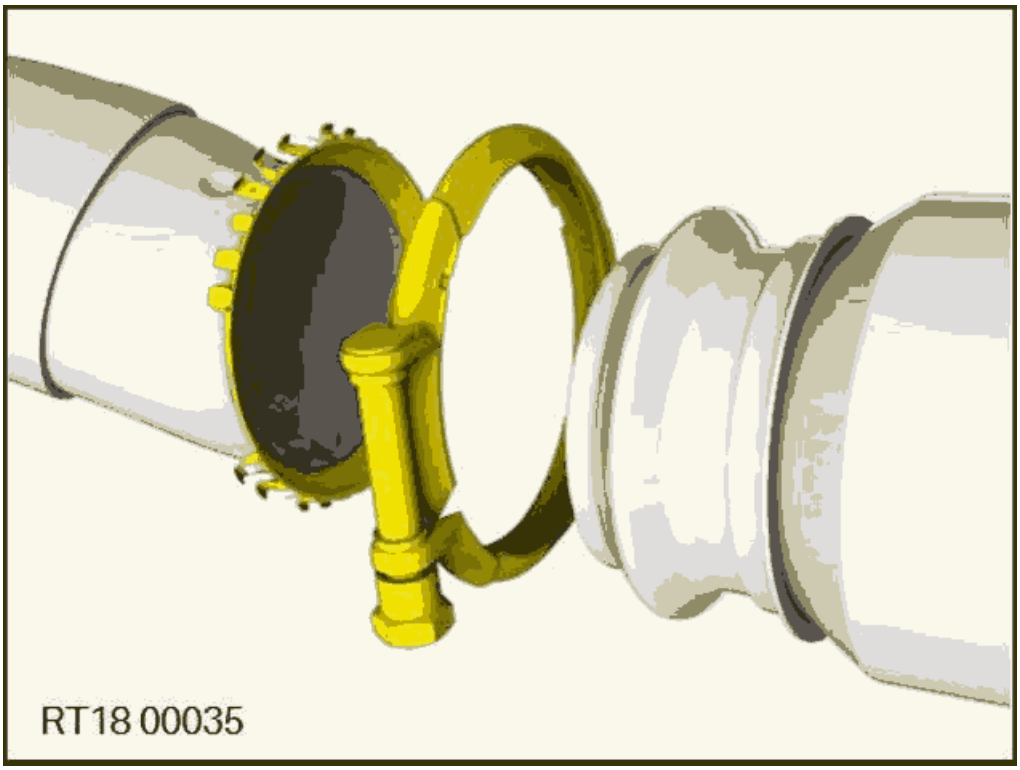
Exhaust bracket on body

Hexagon screw M8x30		Tightening torque	19 Nm

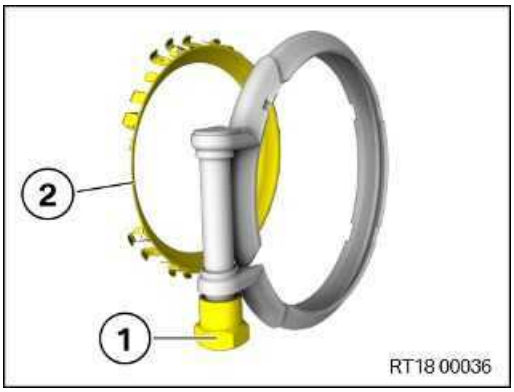
- Check the rubber mount (3) for damage and renew as needed.
- Mount rubber mount (3) on the exhaust system (4).

▸ **Install the V-clip**

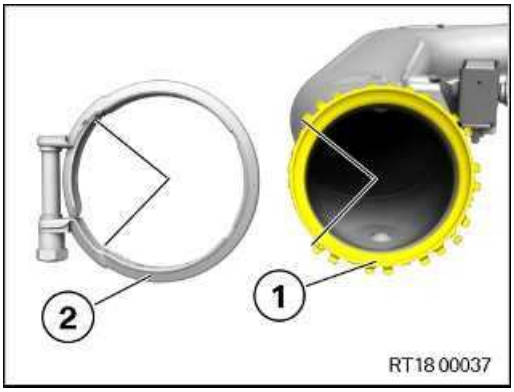
V-band clamp



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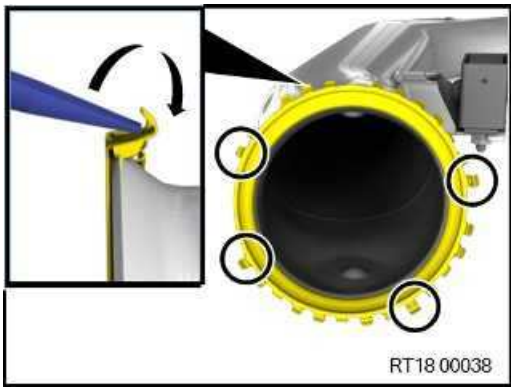


- Unscrew the nut (1) and remove the sealing ring (2).

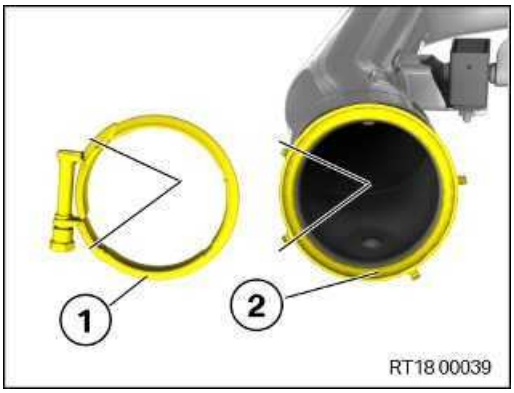


- Renew the V-clip (2).

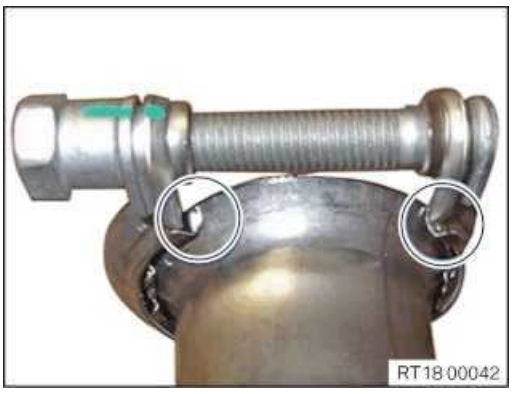
  Parts: V-band clamp
- Mount the sealing ring (1) on the exhaust system.
- Ensure that the sealing ring (1) for the V-clip (2) is positioned correctly.



- Bend all sheet metal tabs over with a suitable tool, except those in the marked areas.

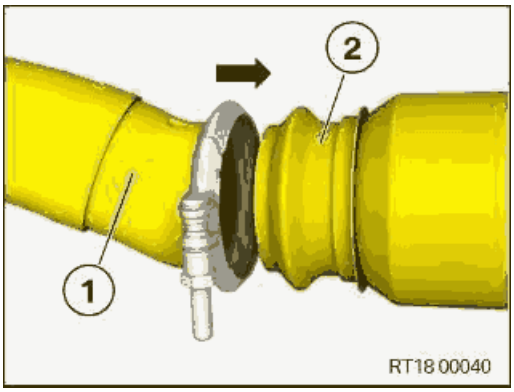


- Mount the V-clip (1) on the sealing ring (2).
- Make sure that the V-clip (1) is positioned correctly on the sealing ring (2).

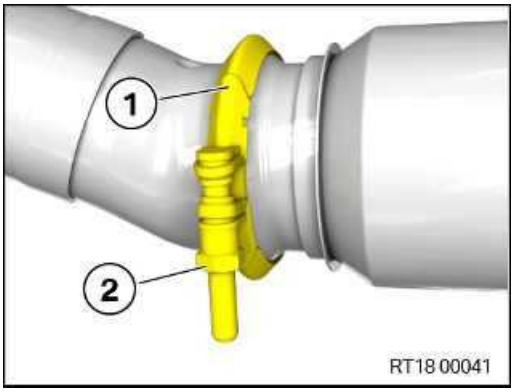


- Make sure that the V-clip rests against the sheet metal tabs after mounting (marks).

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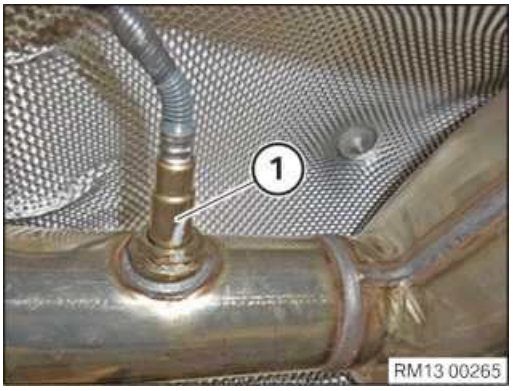
- Connect the exhaust system (1) with the catalytic converter (2) and position correctly.



- Make sure that V-clip (1) is fitted correctly.
- Tighten down screw (2).

V-clip to catalytic converter

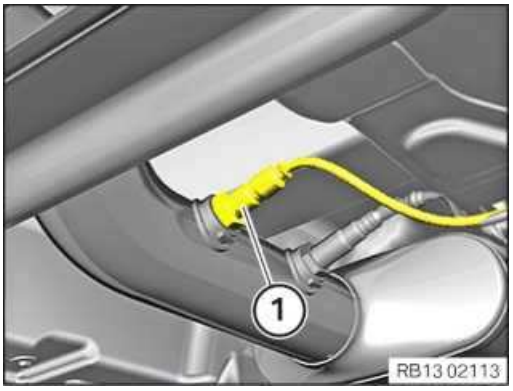
V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm



- Feed in, install and tighten diesel particulate sensor (1).

Diesel particulate sensor to exhaust system

Sensor		Tightening torque	50 Nm



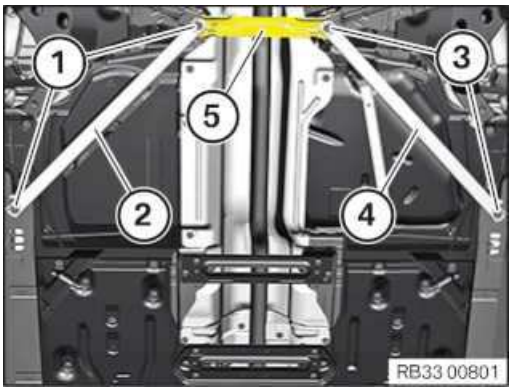
- Feed in, install and tighten nitrogen oxide sensor (1).

Nitrogen oxide sensor downstream of SCR catalytic converter

Sensor		Tightening torque	50 Nm

78 – Install the cross-member with torsion struts

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- Insert and install the cross-member (5).
- Thread in torsion strut (4) at right and install.
- Renew screws (3).

  Parts: Bolts
- Tighten down screws (3).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

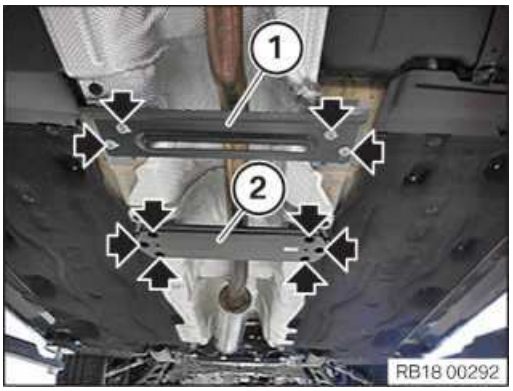
- Guide in and install the left torsion strut (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

79 – Install the connecting support on the tunnel in front and back



- Insert and install connecting supports (2).
- Tighten the screws (arrows) from the connecting support (2).

Front connection carrier to body

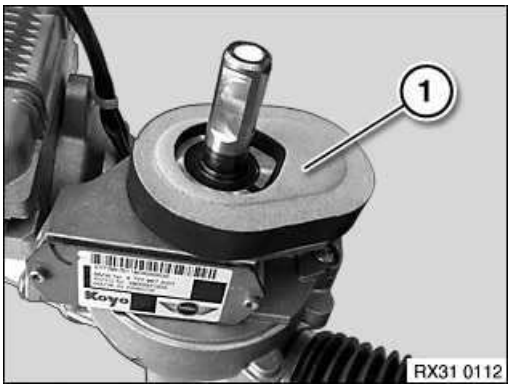
M10x18		Tightening torque	56 Nm

- Insert and install connecting supports (1).
- Tighten the screws (arrows) from the connecting support (1).

Rear connection carrier to body

M8x18		Tightening torque	28 Nm

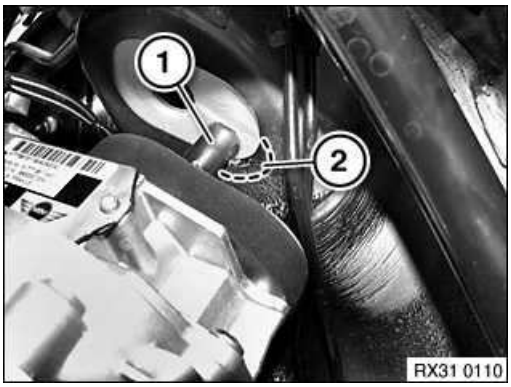
80 – Mount and secure the complete front axle



- Remove the seal (1).
- Clean surface on steering gear.
- Renew gasket (1).

  Parts: Gasket
- Position the seal (1) and glue it on.

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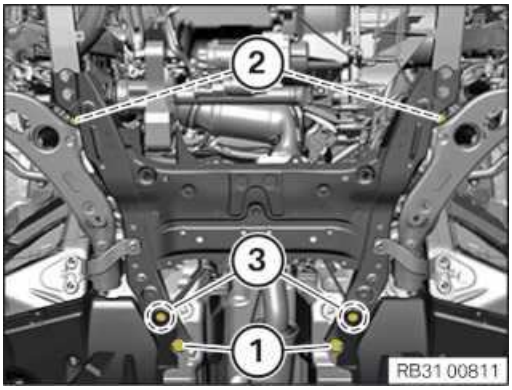


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- Position front axle support.
- Bend underbody panellings in the areas (3) to one side.
- Raise front axle support.
- When raising, insert charge air cooler into the rubber mount of the charge air cooler on cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

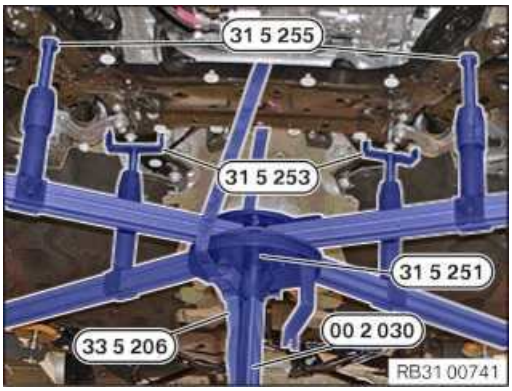
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

- If necessary, tighten the screws in the areas (3).

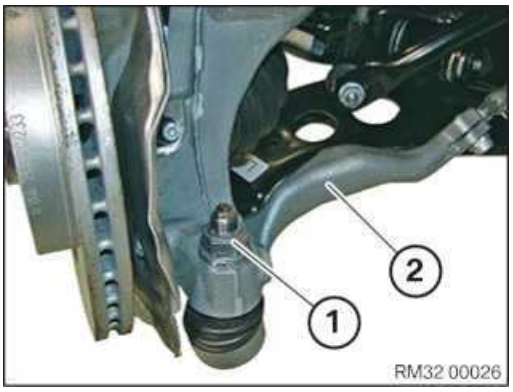
Underbody protection to body

Screw		Tightening torque	3 Nm



- Remove special tool from special tool .
- Lower universal jack **0 490 133 (00 2 030)** with the special tool and place it to the side.

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NOTICE

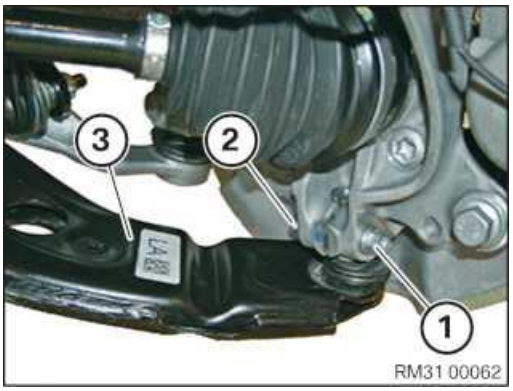
Perform the operations on the left and right side.

- Position the track rod (2) on the swivel bearing .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Track rod end to swivel bearing

M14	Renew nut.	Tightening torque	175 Nm



NOTICE

Perform the operations on the left and right side.

- Position the wishbone (3) on the swivel bearing .
- Renew the bolt (2) and the nut (1).

  Parts: Bolt, nut
- Insert screw (2).
- Tighten nut (1).

Wishbone to swivel bearing

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

81 – Install the mounted parts on the front axle support



NOTICE

Perform the operations on the left and right side.

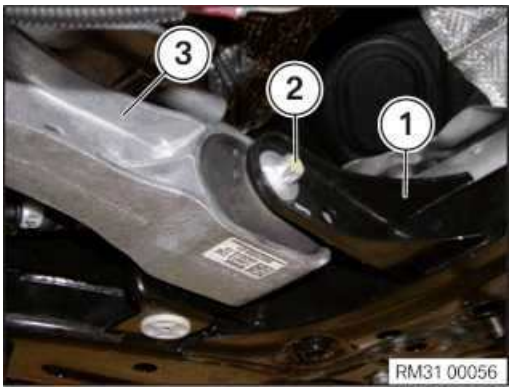
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Holder, wishbone rubber mount, to body

M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °

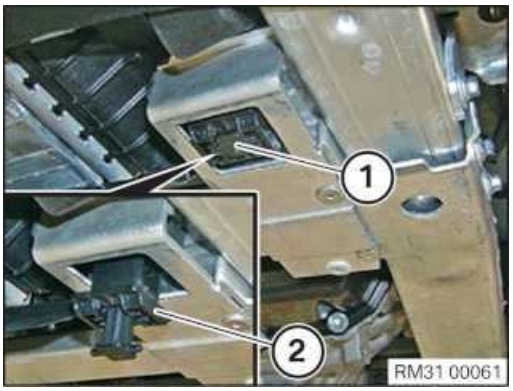
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- Position the engine support (3) on the front axle support (1).
- Tighten down screw (2).

Holder with rubber mount to front axle support

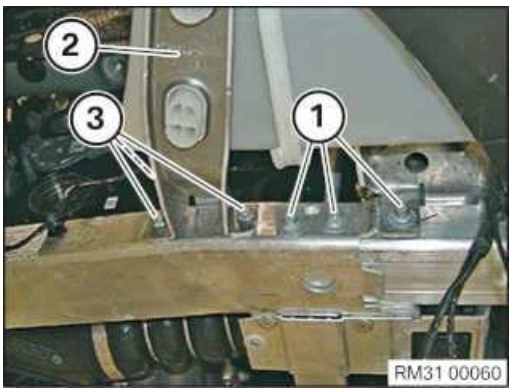
M12 screw		100 Nm



NOTICE

Perform the operations on the left and right side.

- Position the lock (2).
- Lock the bracket (1) of the lock (2) of the holder for the charge air cooler.



- **Only on right side:** Position the holder for the washer fluid reservoir (2).
- Tighten down screws (3).

Washer fluid reservoir holder to front axle support adapter plate

		Tightening torque	10 Nm

NOTICE

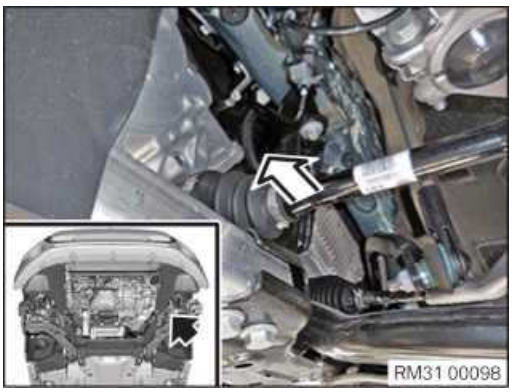
Perform the operations on the left and right side.

- Tighten the screws (1).

Deformation element, bottom, to adapter plate, front axle carrier

		Tightening torque	11,8 Nm

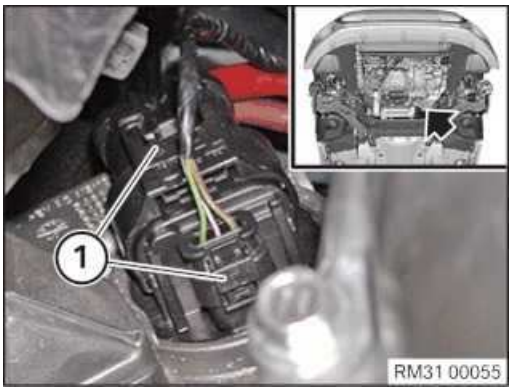
82 – Attaching connector at steering gear



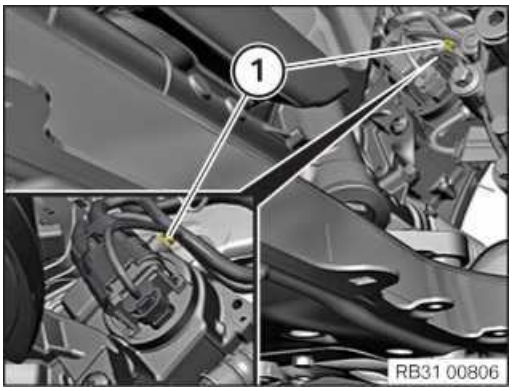
- To connect the connector (see the following step): Connect the connector with the right hand.

  The connectors can be accessed via the left output shaft.

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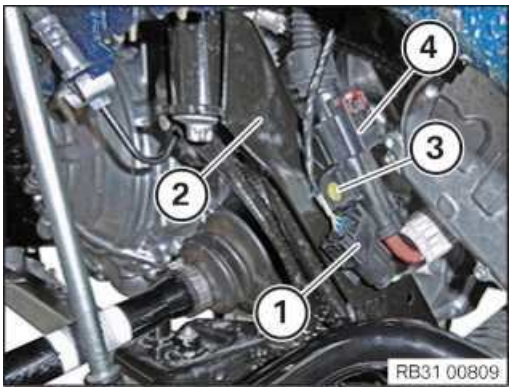


- Connect and lock connector (arrow) (1) with the steering gear.



- Fasten the wiring harness (1) on the steering gear.

▶ **If installed: Fasten the plug connections at the front axle support**



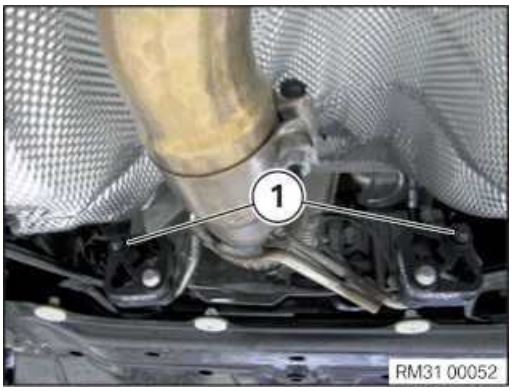
- Position the plug connection (4) at the front axle support (2).
- Tighten down screw (3).

Holder to front axle support

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

- Fasten the plug connection (1) at the front axle support (2).

83 – Securing rubber mount on front axle support



- Check rubber mount (1), replace if necessary.

  Parts: Rubber mount
- Spray rubber mount (1) with lubricant and slide onto holder on front axle support.

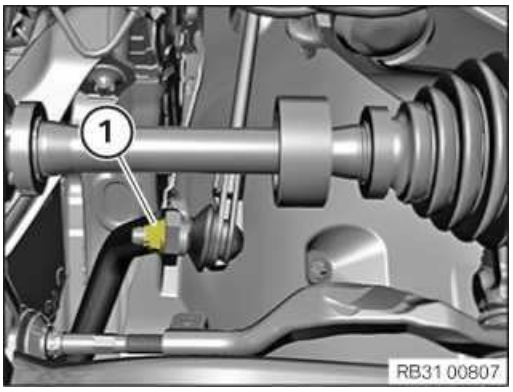
84 – Securing anti-roll bar on left and right on the anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▶ **Fastening anti-roll bar on the anti-roll bar link**

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- Position the anti-roll bar link on the anti-roll bar .
- Renew nut (1).

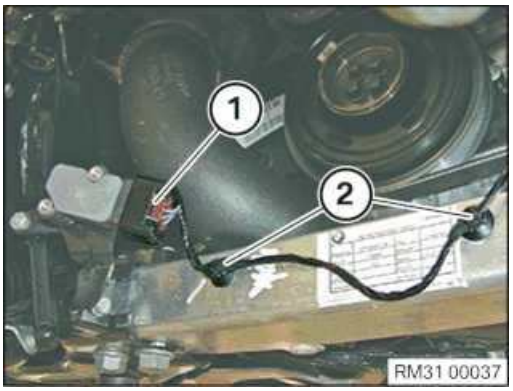
  Parts: Nut
- Tighten nut (1).

Note: Use the Torx socket for counter support.

Anti-roll bar link to anti-roll bar

M10	Renew nut.	Tightening torque	56 Nm

85 – With right installation: Securing the cable for the ride height sensor



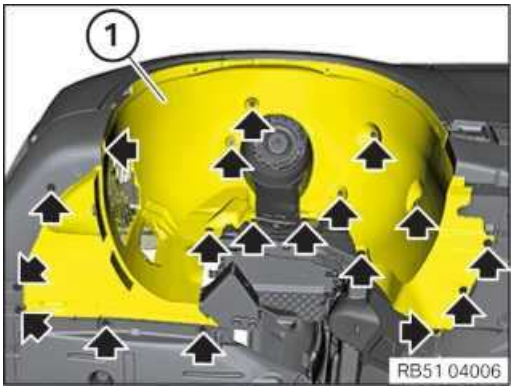
- Secure the cable clip (2) on the adapter of the deformation element.
- Connect connectors (1) and lock.

86 – Installing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

▸ **Installing the front wheel arch cover**



- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Plastic nut		Tightening torque	2,6 Nm
Screw		Tightening torque	2,6 Nm

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

▸ **Installing front wheel arch trim**

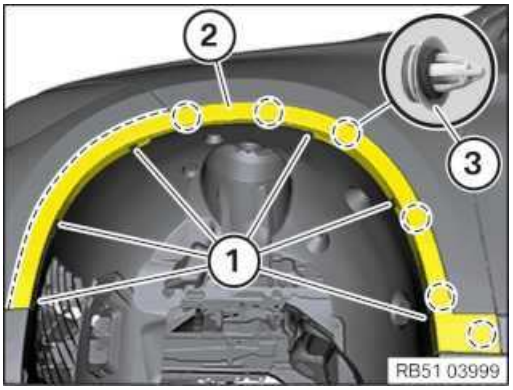
NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

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NOTICE

Description is for left component only. Procedure on the right side is identical.



- Check the clips (3) for damage and renew where required.

  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

87 – Installing both front wheels

▶ **Mounting the wheel**

▷ **Clean the contact surfaces between the brake disc and the wheel rim**



TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

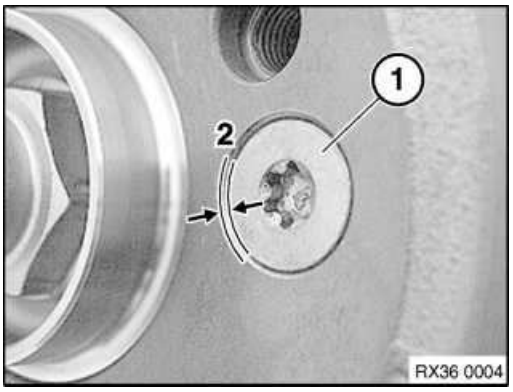
  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue in the area of the wheel bolt holes, remove and clean the brake disc.



- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

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- Renew mounting bolt (1).

  Parts: Mounting bolt

- Check that the mounting bolt (1) for the brake disc is securely seated.

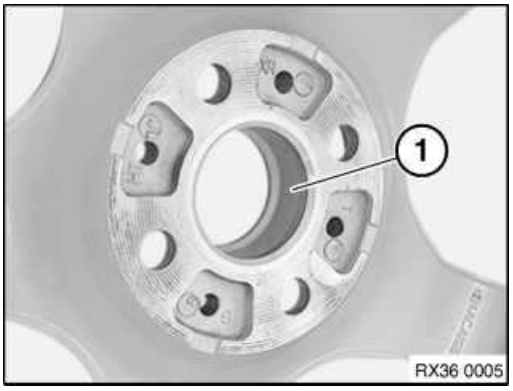
  The mounting bolt (1) for the brake disc may not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to rear wheel hub

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub

M8	Renew screw.	Tightening torque	16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring (1).

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

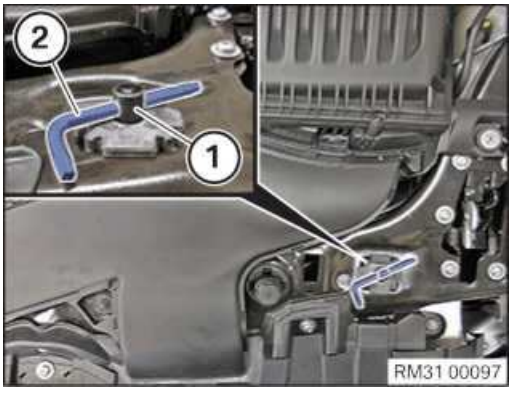
  Parts: Wheel bolts
- Clean the wheel bolts.
- Check the wheel bolts and threads for damage, renew the wheel bolts if necessary.
- Join and tighten the wheel bolts (arrows).

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

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88 – Removing fastener for left and right radiator



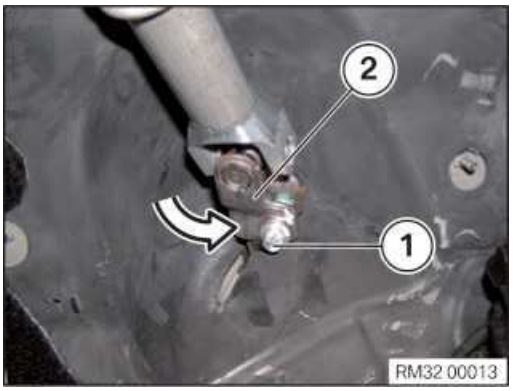
NOTICE

Perform the operations on the left and right side.

- Remove suitable tool (2) from the centering pin (1).

89 – Secure the steering shaft at the bottom on the steering gear

89 – Secure the steering shaft at the bottom on the steering gear



- Clean the screw lock residue from the screw thread in the universal joint (2).
- Pivot the universal joint (2) in the direction of the arrow to the steering gear.
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Lower steering shaft to steering gear

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

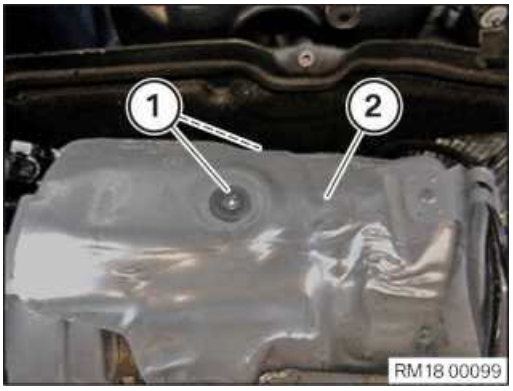


- **If installed:**
- Position the cover on the steering column (2).
- Tighten nuts (1).

Steering column cover to bulkhead

Plastic nut		Tightening torque	3 Nm

90 – Install the heat shield on the exhaust turbocharger



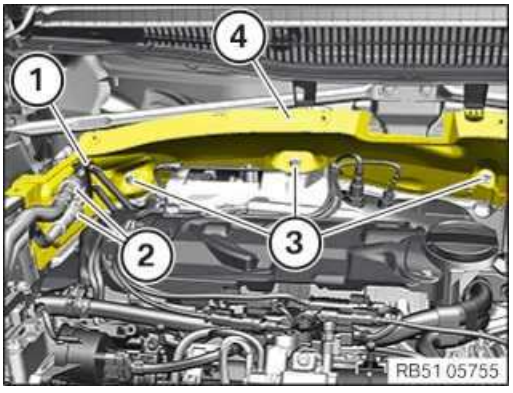
- Feed in and install the heat shield (2).
- Tighten the screws (1) at the top and bottom of the heat shield.

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Fasten the cable at the clips .

91 – Installing rear bulkhead upper part



- Feed in and install the rear bulkhead upper part (4).
- Tighten down screws (3).

Rear bulkhead upper part to lower section of bulkhead

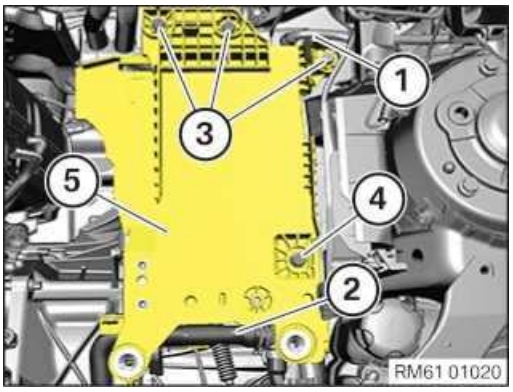
Oval-head screw		Tightening torque	5 Nm

- Feed the fuel line (2) into the holder (1) and install.
- Connect and lock the holder (1).

  The holder (1) must engage audibly.

92 – Install the battery holder

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- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

93 – Install electronics box

Prerequisite

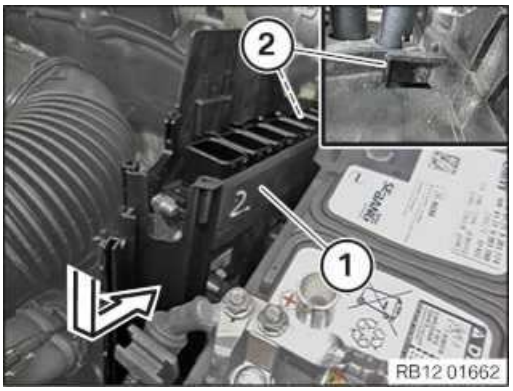
Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.

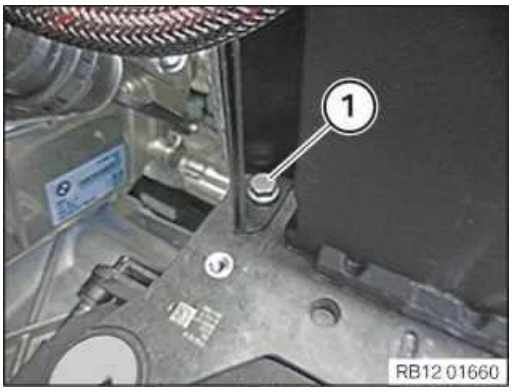


- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.



- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).

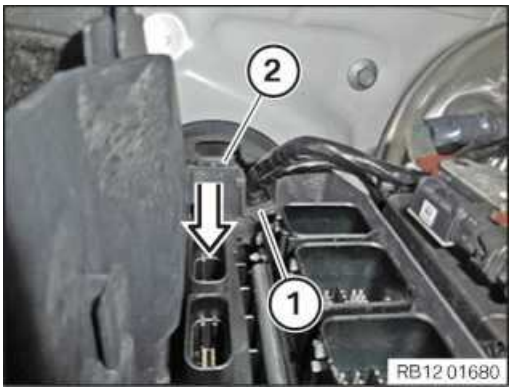
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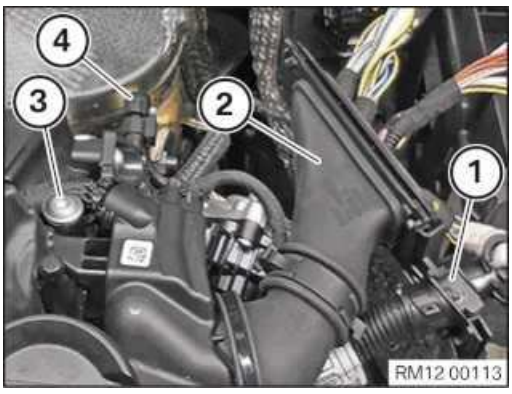
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.

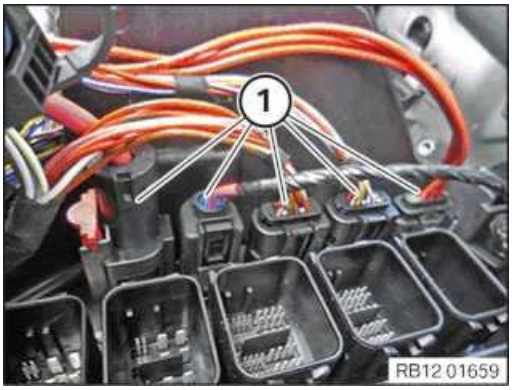


- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

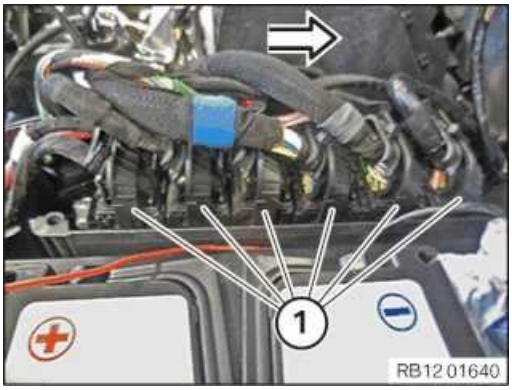
Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.

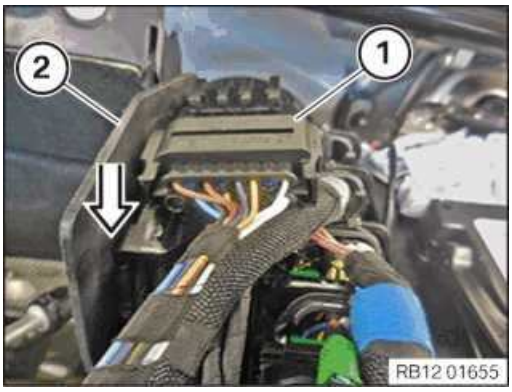


- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.

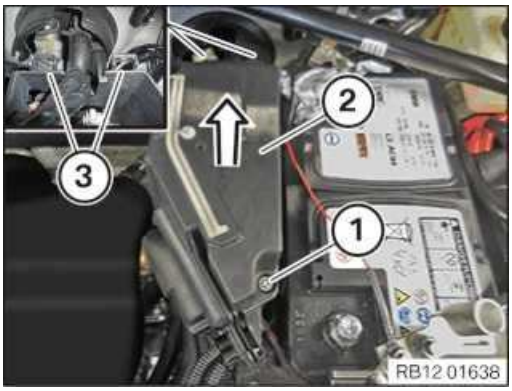


- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.

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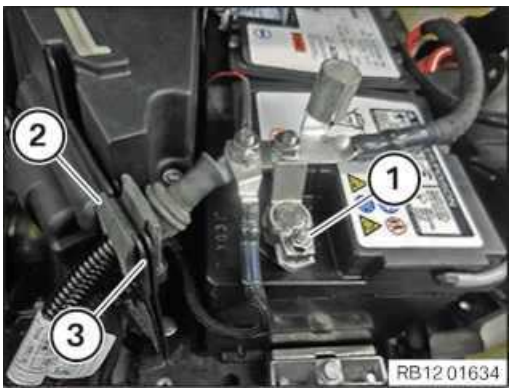
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

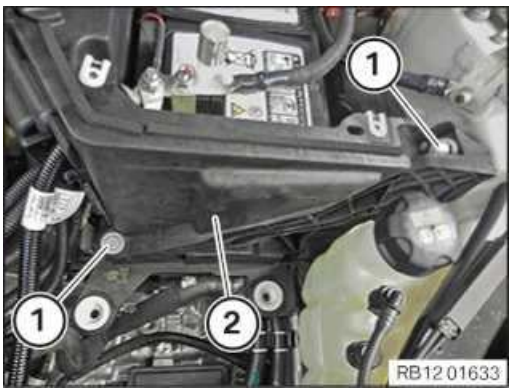
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

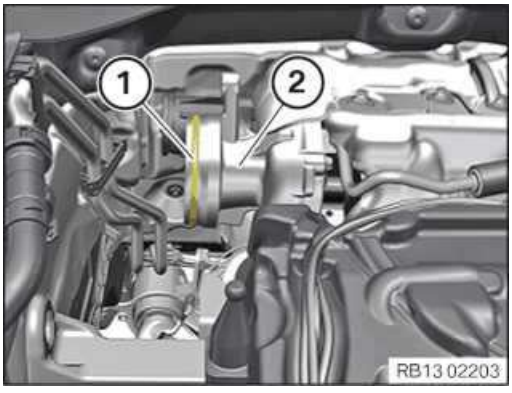


- Feed in and install tension strut (2).
- Tighten the screws (1).

Tension strut to spring strut dome/battery tray

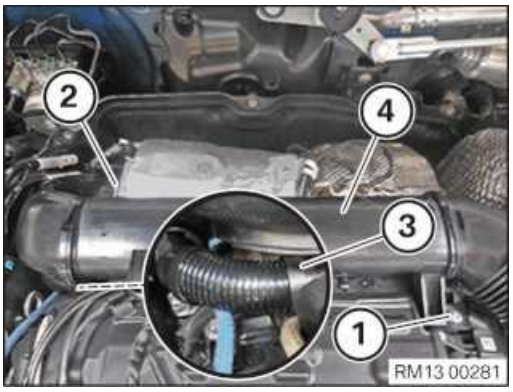
M8		Tightening torque	19 Nm

94 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.

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- Feed in clean air pipe and install.
- Connect clean air pipe to the exhaust turbocharger and lock audibly in the clamps (2).
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Connect ventilation line (3) to the cylinder head cover and lock audibly.

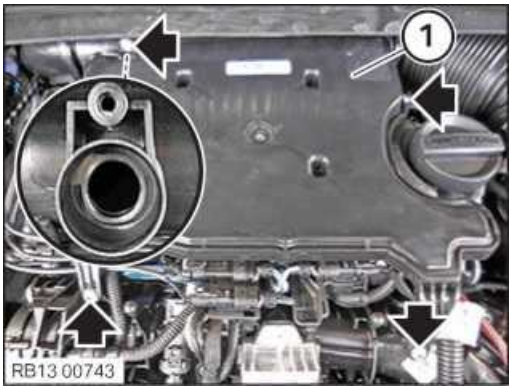


- Mount clean air pipe onto the intake filter housing.
- Tighten clamp (1) on the clean air pipe.

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

95 – Install resonator



- Insert and install the resonator (1).
- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

96 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

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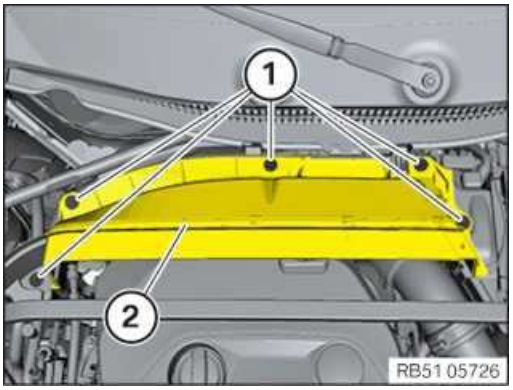


- Check for correct installation of all rubber mounts in the acoustic cover (1).



- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

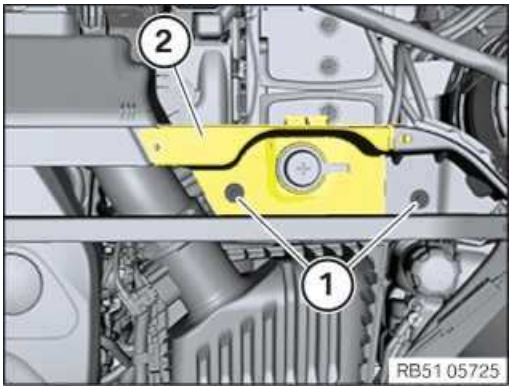
97 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Cover of top bulkhead

Screw		Tightening torque	2,6 Nm



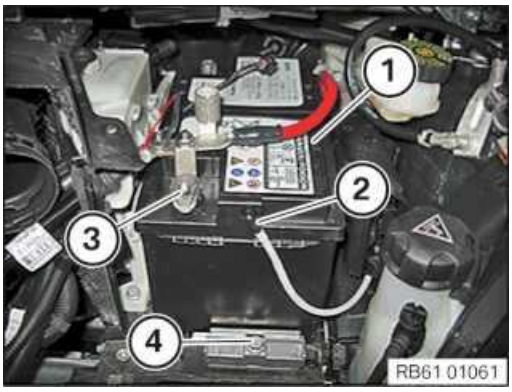
- Guide in and install cover (2).
- Tighten down screw (1).

Cover of remote positive terminal

Screw		Tightening torque	2,6 Nm

98 – Install vehicle battery

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- Install vehicle battery (1).
- Position the bracket and tighten with the screw (4) .

Battery terminal rail to battery tray

M8		19 Nm

- Position the vent hose (2) and clip it in.
- Position the positive battery terminal and tighten with the nut (3) .

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

▸ **Check the vent holes of the battery**

WARNING

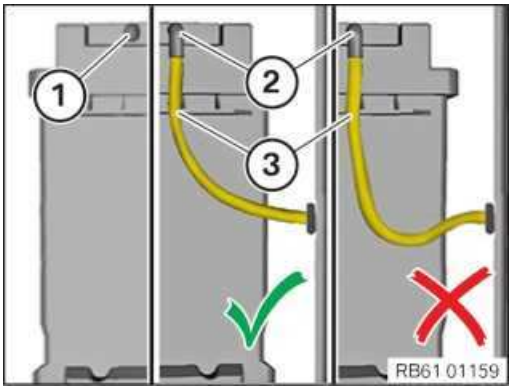
Gas emission.

Danger of injury! Danger of explosion!

- Assign the vent holes correctly.
- Route the vent hose correctly.

TECHNICAL INFORMATION

The battery has two vent holes, opposite:
One vent hole (1) must be closed correctly with a dummy plug.
The vent hose (3) must be correctly connected and routed at the other vent hole (2).



Check

- Check if the vent hole (1) is correctly closed with a dummy plug.

Result

» No dummy plug.

Measure

- Close the vent hole (1) correctly with a dummy plug.

Check

- Check if the vent hole (2) has a correctly connected vent hose (3).

Result

» The vent hose (3) is not correctly connected.

Measure

- At the vent hole (2), connect the vent hose (3) correctly.

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Check

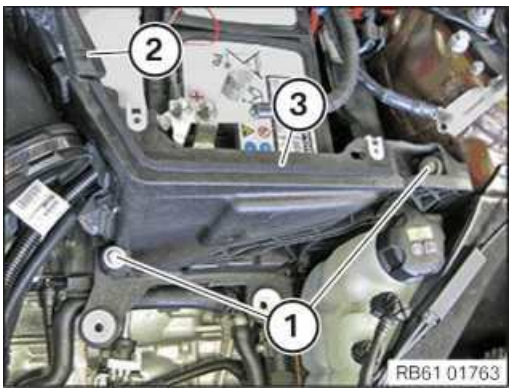
- Check if the vent hose (3) is routed to the outside with a downhill gradient (**no siphon formation!**).

Result

» The vent hose (3) is not correctly routed as shown in the image on the right.

Measure

- Route the vent hose (3) correctly as shown in the centre image.



- Insert tension strut (3) and tighten with screws (1).

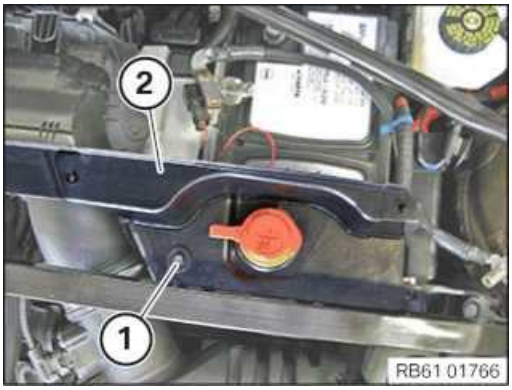
Trailing link

M8		Tightening torque	19 Nm

- Tighten down screw (2).

Battery cover

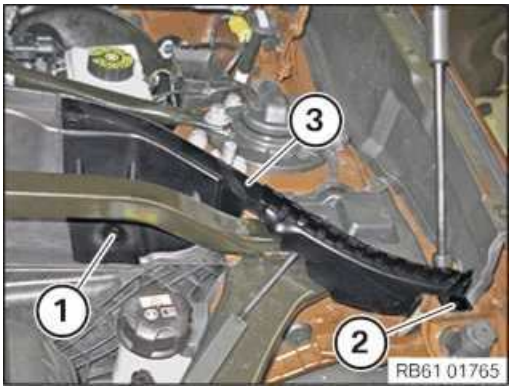
M8		2,8 Nm



- Position the cover (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm

99 – Connecting the battery earth lead

TECHNICAL INFORMATION

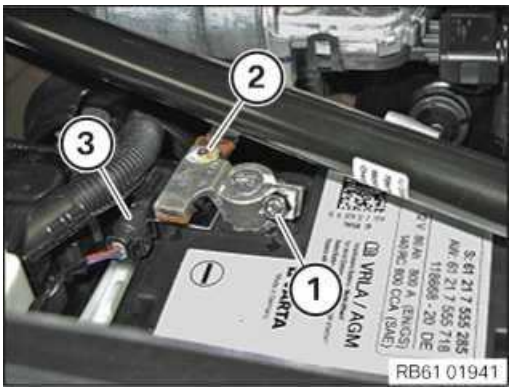
For additional information see:

61 00 ... Safety information on handling the vehicle battery

61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery

61 12 ... Notes on the intelligent battery sensor (IBS)

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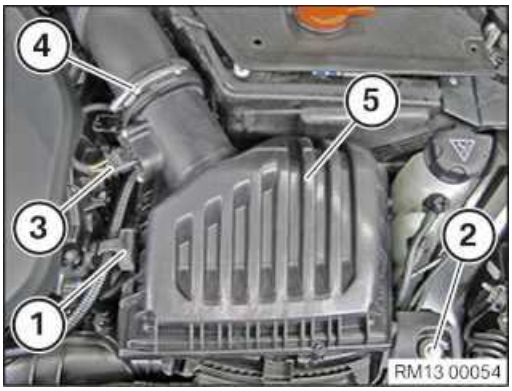
- Remove the protective cover of the positive battery terminal.
- Position the battery earth lead (2).
- Tighten nut (1).

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

- If required, connect the connector (3).

100 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.

  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

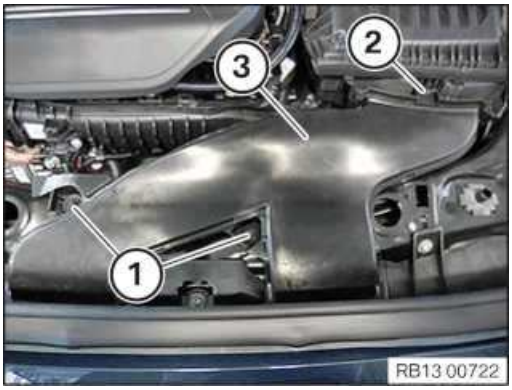
Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Insert and install the holder (1).

101 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

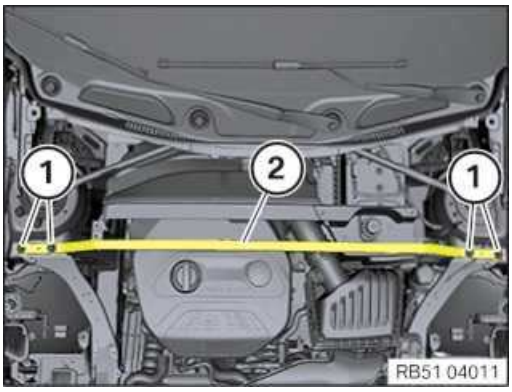
M6		Tightening torque	8 Nm

102 – Install strut brace

TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.

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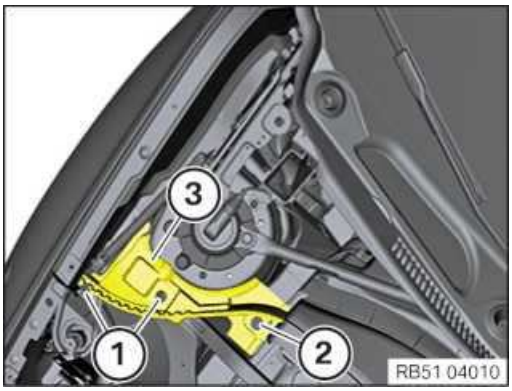


- Install the strut brace (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-brace to spring strut dome

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °



NOTICE

Description is for right component only. The procedure on the left side is identical.

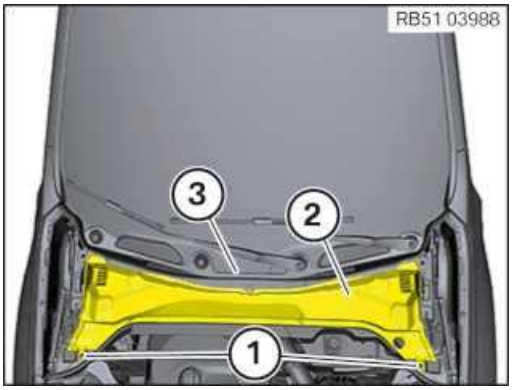
- Install the cover (3).
- Tighten down screw (2).

Cover on body

Hexagon screw		Tightening torque	3 Nm

- Install the expanding rivet (1).

103 – Installing front cowl panel cover

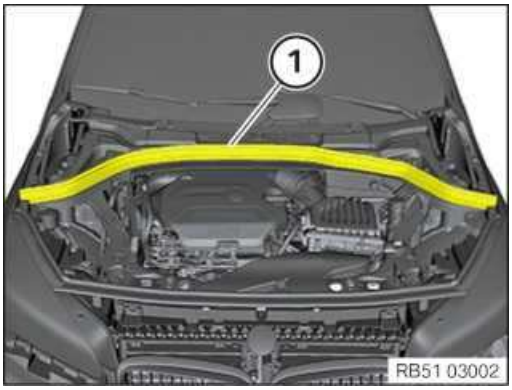


- Insert and install cowl panel cover at front (2) into cowl panel cover at rear (3).
- Check cowl panel cover at front is correctly seated (2).
- Secure expanding rivet (1).

104 – Install the seal for the bonnet

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

105 – Checking/topping up oil level in automatic gearbox (AISIN GA8G45)

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Prerequisite

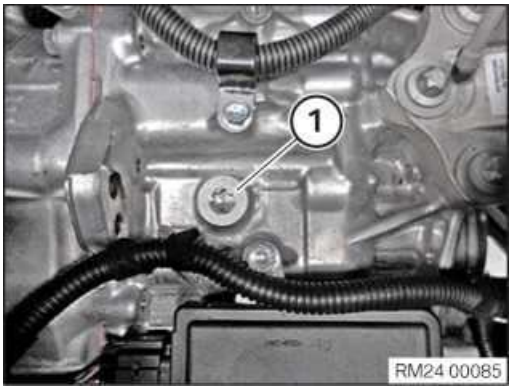
Vehicle in horizontal position.

CAUTION

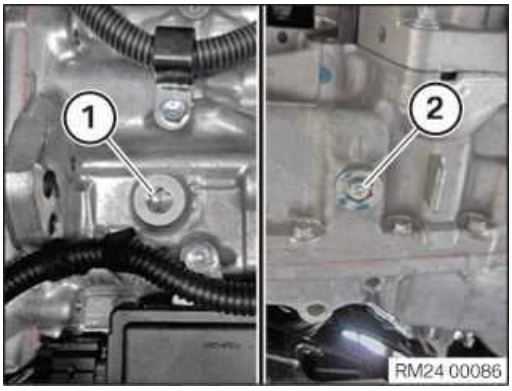
Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.



- Move the selector lever to the "P" position.
- Secure vehicle to prevent it rolling.
- Connect diagnosis system.
- Release the oil filler plug (1) using the Torx T55 .



- **Topping up the automatic transmission fluid (the automatic transmission fluid was drained):**
- Release oil filler plug (1) from engine compartment.
- Loosen the overflow plug (2) below at the transmission.
- Top up automatic transmission fluid at oil filler plug (1) until oil emerges at overflow plug (2).
- Start engine and run at idle speed.
- Check whether the automatic transmission fluid is leaking at the overflow plug (2) .
- If there is no automatic transmission fluid leaking at the overflow plug (2) , fill in the automatic transmission fluid to the oil filler plug (1) .
- Press the footbrake and, when idle, shift through all the gears from "P" to "D" 2 times for more than 2 seconds .
- Move the selector lever to the "P" position.
- Check again whether the automatic transmission fluid is leaking at the overflow plug(2) .
- Read the temperature of the automatic transmission fluid with the diagnosis system.
- Increase temperature of automatic transmission fluid to 35 °C to 45 °C.
- Top up automatic transmission fluid until it flows over.
- Renew sealing rings.

  Parts: Sealing ring
- Screw in and fasten oil filler plug (1) and overflow plug (2).

Oil filler plug to transmission housing

M14	Renew the sealing ring.	Tightening torque	45 Nm

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Overflow screw in oil drain plug

M6	Renew the sealing ring.		8 Nm

- **Check oil level (transmission oil temperature must be between** 35 °C **and** 45 °C **):**
- Open the oil filler plug (1).
- Slacken overflow plug (2).
- Start engine and run at idle speed.
- Unscrew and remove overflow plug (2).
- Check whether the automatic transmission fluid is leaking at the overflow plug (2) .
- If there is no automatic transmission fluid leaking at the overflow plug (2) , fill in the automatic transmission fluid to the oil filler plug (1) .
- Top up the automatic transmission fluid until it overflows at the overflow plug (2) .
- Press the footbrake and, when idle, shift through all the gears from "P" to "D" 2 times for more than 2 seconds .
- Move the selector lever to the "P" position.
- Check the oil level again.
- Renew sealing rings.

  Parts: Sealing ring
- If the oil escapes slightly from the overflow plug (2) , tighten the overflow plug (2) and the oil filler plug (1) .

Overflow screw in oil drain plug

M6	Renew the sealing ring.		8 Nm

Oil filler plug to transmission housing

M14	Renew the sealing ring.	Tightening torque	45 Nm

106 – Topping up oil level in the manual gearbox (GS6X60DA)

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

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TECHNICAL INFORMATION

Make sure during removal of the filling/level control screw to note the installed filling/level control screw variant.

It is **mandatory** to use variant 1 in transmissions up to production date 08/2015.

It is **mandatory** to use variant 2 in transmissions from production date 08/2015.

Failure to observe will result in a leak on the transmission.

- Variant 1 **until** production date 08/2015.
- Variant 2 **from** production date 08/2015.



- Unscrew filling/level control screw (1) and fill the transmission until the oil overflows.

Transmission oil capacity

Transmission oil GS6-60DA, GS6X60DA/Owner's Handbook	2,2 l

Transmission oil: Technically suitable manual gearbox oil

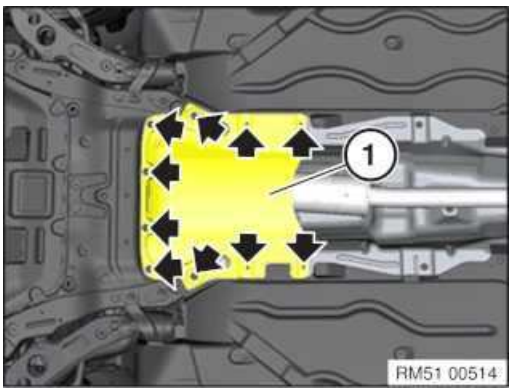
- Allow surplus oil to drain off.
- Renew the filling/level control screw (1).

  Parts: Filling/level control screw
- Tighten filling/level control screw (1).

Oil drain plug / oil filler plug

Hexagon socket		Tightening torque	43 Nm

107 – If installed: Installing underbody protection at rear

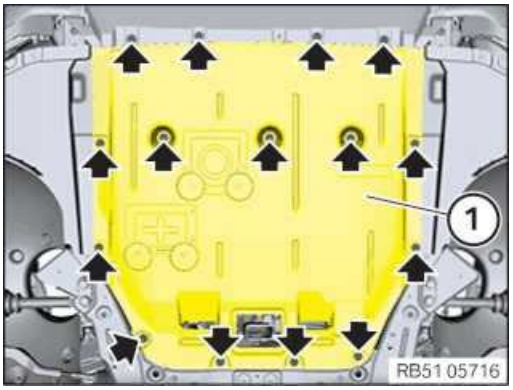


- Position rear underbody protection (1).
- Tighten screws (arrows).

Underbody protection to body

Screw		Tightening torque	3 Nm

108 – Installing the front underbody protection

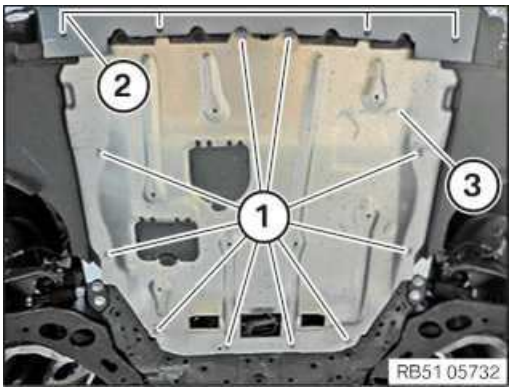


- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

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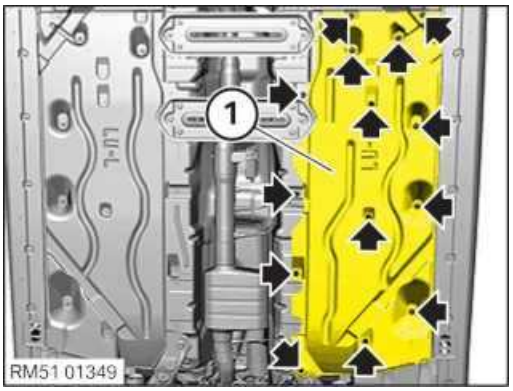


- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

109 – Installing underbody panelling , right



- Correctly position the underbody panelling (1).
- Tighten all bolts and nuts (arrows).

Underbody panelling, side

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side

Plastic nut		Tightening torque	2,6 Nm

Additional Information

Overview of Tightening Torques

Central piston cooling valve to crankcase — Used in step 54

M6x16		Tightening torque	8 Nm

Oil pressure switch to crankcase — Used in step 54

Sensor	Replace oil pressure switch.	Tightening torque	22 Nm

Exhaust-gas recirculation cooler to exhaust manifold — Used in step 56

M8x28	Replace screws	Tightening torque	32 Nm

Oil return line to turbocharger — Used in step 56 57

M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase — Used in step 56

M8x16		Tightening torque	22 Nm

Exhaust turbocharger to exhaust manifold — Used in step 57

V-band clamp		Tightening torque	19 Nm

Oil feed line to bracket — Used in step 57

Torx screw M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase — Used in step 57

M8x16		Tightening torque	22 Nm

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Heat shield for exhaust turbocharger

Used in step 58

Torx screw BM 6x12		Tightening torque	10 Nm

Banjo bolt for exhaust pressure pipe to exhaust manifold

Used in step 58

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

Standard screw connection M6

Used in step 58

M6			8 Nm

Charge air duct to oil sump

Used in step 59

M6		Tightening torque	8 Nm

Ride height sensor holder to front axle support

Used in step 59

M6		Tightening torque	8 Nm

Adapter, front axle support to front axle support

Used in step 59

		Tightening torque	100 Nm

Cross connection to front axle support

Used in step 59

M6		Tightening torque	12 Nm

Washer fluid reservoir to body

Used in step 60

M6x20		Tightening torque	8 Nm

Diesel particulate filter V-clip to exhaust turbocharger

Used in step 61

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Diesel particle filter to holder

Used in step 61

M8 hexagon nut		Tightening torque	19 Nm

Diesel particulate filter holder to gearbox

Used in step 61

M12x75		Tightening torque	66 Nm

Diesel particulate filter bracket to crankcase

Used in step 61

M10x35		Tightening torque	38 Nm

SCR metering module V-clip to exhaust system

Used in step 61

V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm

Holder for coolant lines to diesel particulate filter

Used in step 61

Torx bolt BM6x16		Tightening torque	8 Nm

Differential pressure sensor to holder

Used in step 61

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor

Used in step 61

Clamp 15–19mm		Tightening torque	3 Nm

Control sensor

Used in step 62

Control sensor		Tightening torque	50 Nm

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Exhaust temperature sensor to diesel particulate filter

Used in step 63 64

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Exhaust-gas temperature sensor to exhaust system

Used in step 65

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Oxygen sensor holder to intermediate shaft

Used in step 66

Hexagon screw M6x16		Tightening torque	8 Nm

Nitrogen oxide sensor before SCR catalytic converter

Used in step 67

Sensor		Tightening torque	50 Nm

Monitoring sensor

Used in step 68

Sensor		Tightening torque	50 Nm

Transfer box to transmission

Used in step 69

M10		Tightening torque	56 Nm

Heat shield to transfer box

Used in step 69

M6	Renew screws.	Tightening torque	6 Nm

Oil filler plug on transfer box (VTG)

Used in step 69

M18x1.5		Tightening torque	35 Nm

Intermediate shaft to transfer box

Used in step 70

M8x35		Tightening torque	19 Nm

Starter motor to transmission

Used in step 71

M8x45		Tightening torque	19 Nm

Battery positive lead to starter

Used in step 71

M8		Tightening torque	13,5 Nm

Propeller shaft to transfer box

Used in step 74

		Tightening torque	80 Nm

Flexible disc to rear axle final drive

Used in step 74

M12x1.5	Renew screws.	Tightening torque	55 Nm 90 °

Centre mount to body

Used in step 74

M8		Tightening torque	19 Nm

Heat shield to body

Used in step 75 76

Bolts/nut		Tightening torque	3 Nm

Bracket to body

Used in step 75

M8		Tightening torque	21 Nm

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Exhaust system to body — Used in step 77

M8	Replace nuts.	Tightening torque	19 Nm

Exhaust bracket on body — Used in step 77

Hexagon screw M8x30		Tightening torque	19 Nm

V-clip to catalytic converter — Used in step 77

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

Diesel particulate sensor to exhaust system — Used in step 77

Sensor		Tightening torque	50 Nm

Nitrogen oxide sensor downstream of SCR catalytic converter — Used in step 77

Sensor		Tightening torque	50 Nm

Cross-member/torsion strut to axle support and mounting — Used in step 78

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

Front connection carrier to body — Used in step 79

M10x18		Tightening torque	56 Nm

Rear connection carrier to body — Used in step 79

M8x18		Tightening torque	28 Nm

Rear end of front axle support to body — Used in step 80

M14 screw	Renew screw.	Tightening torque	175 Nm

Front axle support, front to body — Used in step 80

M12 screw	Renew screw.	Tightening torque	108 Nm

Underbody protection to body — Used in step 80 107

Screw		Tightening torque	3 Nm

Track rod end to swivel bearing — Used in step 80

M14	Renew nut.	Tightening torque	175 Nm

Wishbone to swivel bearing — Used in step 80

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

Holder, wishbone rubber mount, to body — Used in step 81

M10 screw	Renew screw.	Jointing torque	56 Nm
		Angle of rotation	90 °

Holder with rubber mount to front axle support — Used in step 81

M12 screw			100 Nm

Washer fluid reservoir holder to front axle support adapter plate — Used in step 81

		Tightening torque	10 Nm

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Deformation element, bottom, to adapter plate, front axle carrier

Used in step 81

		Tightening torque	11,8 Nm

Holder to front axle support

Used in step 82

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

Anti-roll bar link to anti-roll bar

Used in step 84

M10	Renew nut.	Tightening torque	56 Nm

Wheel arch cover to body

Used in step 86

Plastic nut		Tightening torque	2,6 Nm
Screw		Tightening torque	2,6 Nm

Wheel arch cover to body

Used in step 86

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Used in step 86

Plastic nut		Tightening torque	3 Nm

Brake disc to rear wheel hub

Used in step 87

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub

Used in step 87

M8	Renew screw.	Tightening torque	16 Nm

Wheel bolts

Used in step 87

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Lower steering shaft to steering gear

Used in step 89

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

Steering column cover to bulkhead

Used in step 89

Plastic nut		Tightening torque	3 Nm

Heat shield for exhaust turbocharger

Used in step 90

Torx screw BM 6x12		Tightening torque	10 Nm

Rear bulkhead upper part to lower section of bulkhead

Used in step 91

Oval-head screw		Tightening torque	5 Nm

Battery holder to engine support

Used in step 92

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Hexagon screw M8x30		Tightening torque	19 Nm

Electronics box to battery tray Used in step 93

M8X16		Tightening torque	15 Nm

Wiring harness to cylinder head cover Used in step 93

TS5x20		Tightening torque	3,5 Nm

Cover to electronics box Used in step 93

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery Used in step 93

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray Used in step 93

M8		Tightening torque	19 Nm

Clean air pipe to cylinder head cover Used in step 94

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing Used in step 94 100

Clamp		Tightening torque	3 Nm

Resonator to manifold and clean air pipe Used in step 95

Screw TS6	Renew screw.	Tightening torque	5 Nm

Cover of top bulkhead Used in step 97

Screw		Tightening torque	2,6 Nm

Cover of remote positive terminal Used in step 97

Screw		Tightening torque	2,6 Nm

Battery terminal rail to battery tray Used in step 98

M8			19 Nm

Battery terminal with IBS positive battery terminal / negative battery terminal Used in step 98 99

NutM6			5 Nm

Trailing link Used in step 98

M8		Tightening torque	19 Nm

Battery cover Used in step 98

M8			2,8 Nm

Intake silencer housing to lock bridge Used in step 100

M6X30		Tightening torque	8 Nm

Intake neck to cross connection Used in step 101

M6		Tightening torque	8 Nm

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Cross-brace to spring strut dome

Used in step 102

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

Cover on body

Used in step 102

Hexagon screw		Tightening torque	3 Nm

Oil filler plug to transmission housing

Used in step 105

M14	Renew the sealing ring.	Tightening torque	45 Nm

Overflow screw in oil drain plug

Used in step 105

M6	Renew the sealing ring.		8 Nm

Oil drain plug / oil filler plug

Used in step 106

Hexagon socket		Tightening torque	43 Nm

Underbody protection front

Used in step 108

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Underbody panelling, side

Used in step 109

Hexagon screw		Tightening torque	2,6 Nm

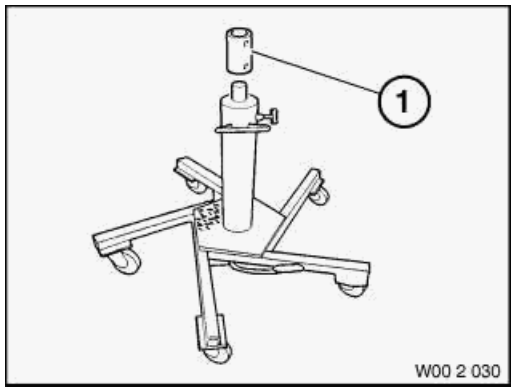
Underbody panelling, side

Used in step 109

Plastic nut		Tightening torque	2,6 Nm

Overview of Special Tools

0 490 133 (00 2 030) Device



Common

Used in step 28 80

Usage	(universal hydraulic lifter base unit) Chassis and hydraulic lifter - For removing and installing rear axle supports and gearboxes. Also for soft top mounts. Is replaced by 81 22 2 219 012
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 90 (207)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 490 134 (00 2 031)		**Adapter** (adapter for gearbox holder) Model series: E30, E31, E32, E34, E36	

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0 495 554 (33 5 070) Extension



Common

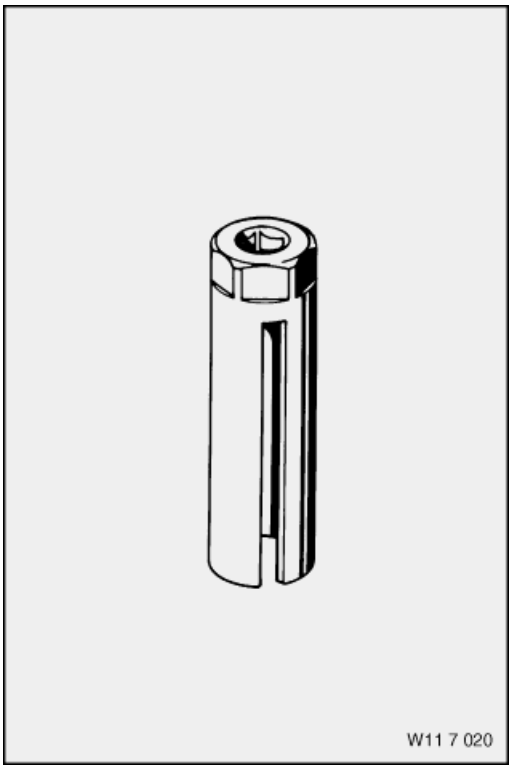
Used in step 34 74

Usage	Pull-out extension for 33 5 040, 33 5 050, 33 5 060.
Included in the tool or work	
Storage location	A18
Replaced by	
In connection with	
SI-Number	01 21 06 (300)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 592 (33 5 071)		**Extension** (Extension (1 item)) discontinued, can only be ordered using complete tool	

0 491 074 (11 7 020) Socket wrench insert



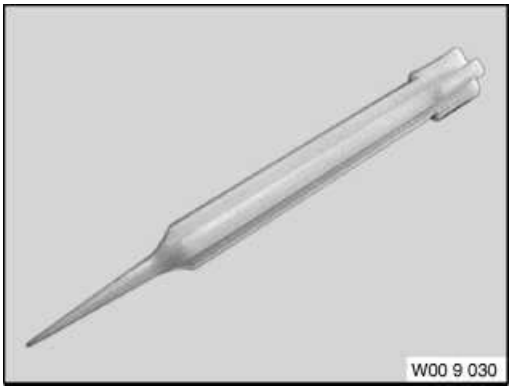
Common

Used in step 40 41 68

Usage	(Socket wrench insert 22 mm) For loosening and tightening the oxygen sensor
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	

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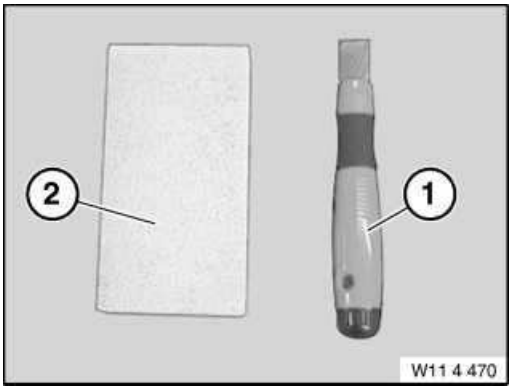
0 496 714 (00 9 030) Wedge



Common Used in step 54

Usage	For dismantling O-rings, gaskets and trim panels. This special tool replaces special tool 00 9 316.
Included in the tool or work	
Storage location	A50
Replaced by	
In connection with	
SI-Number	01 20 09 (581)

0 495 102 (11 4 470) Tool



Common Used in step 56

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

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2 409 025 Puller



Common	Used in step 69
Usage	For disassembly of the outer radial shaft seal of the transmission output shaft, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A76
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 411 739 Puller



Common	Used in step 69
Usage	For disassembly of the inner radial shaft seal of the output, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C78
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

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2 408 152 Striking element



Common	Used in step 69
Usage	For installation of the right radial shaft seal transmission output shaft (inner). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

2 413 037 Handle



Common	Used in step 69
Usage	Universal drift handle. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C77
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

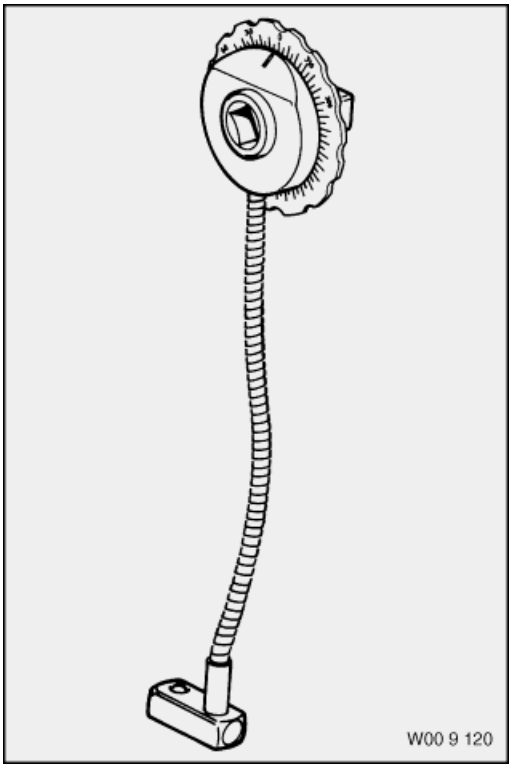
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2 408 150 Striking element



Common	Used in step 69
Usage	For installing the right radial shaft seal transmission output shaft (outer). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

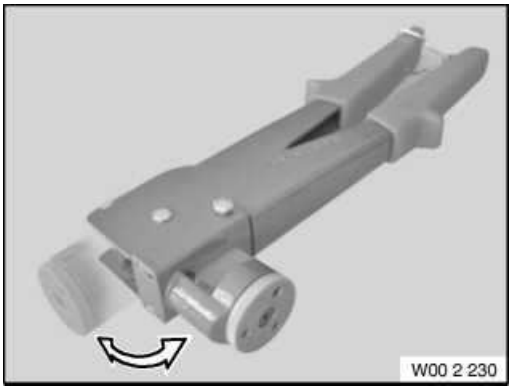
0 490 504 (00 9 120) Torque angle measuring dial



Common	Used in step 74
Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

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0 496 521 (00 2 230) Pliers



Common	Used in step 86
Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

2 344 011 Tool



Common	Used in step 87
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

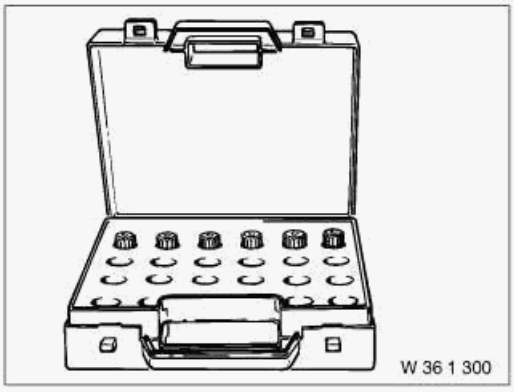
0 495 221 (36 1 323) Wheel stud



Common	Used in step 18
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 224 (36 1 326) Wheel stud



Common	Used in step 18
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud



Common	Used in step 18
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud



Common	Used in step 18
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 227 (36 1 329) Wheel stud



Common	Used in step 18
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud



Common	Used in step 18
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

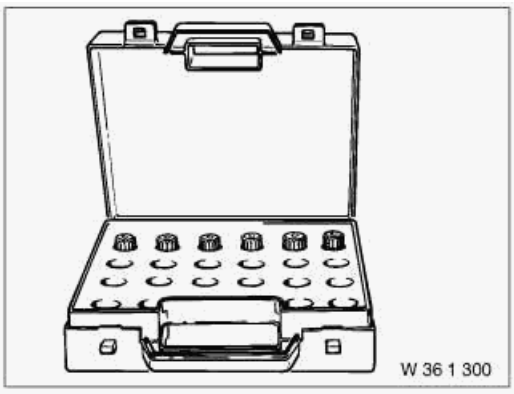
0 495 229 (36 1 332) Wheel stud



Common	Used in step 18
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 230 (36 1 333) Wheel stud



Common	Used in step 18
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Transmission oil capacity	Used in step 106
Transmission oil GS6-60DA, GS6X60DA/Owner's Handbook	2,2 l
Transmission oil: Technically suitable manual gearbox oil	

Links

General repair instructions	Used in step
61 20 ... Notes on AGM battery	99
61 12 ... Notes on intelligent battery sensor (IBS)	99
61 00 ... Notes for disconnecting and connecting battery	99
41 00 ... Notes on repairing threads	
61 00 ... Safety information for handling vehicle battery	

Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	12 40 41 43 44 45 46 47
00 .. ... Raising the vehicle using a vehicle hoist	

Operating materials	Used in step
2.0 Grease for wheel centring	87
14.0 Automatic transmission fluid for ZF-transmission GA8HP45Z / GA8HP50Z / GA8HP70Z / GA8HP90Z / GA8P70H / GA8P75H / GA8HP75Z	105

Operating materials	Used in step

Parts

Parts required

Designation	Used in step
Seal of central piston cooling control valve to crankcase	54

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11 42 826 Replace switch valve of central piston cooling

WARNING

Vehicle may slip off the vehicle hoist if the vehicle hoist is handled incorrectly.

Danger! Life-threatening injuries!

- Observe safety information on raising the vehicle using a vehicle hoist.
- For additional information see: 00 ... Raising the vehicle using a vehicle hoist.

WARNING

Motor vehicle may slip off the vehicle hoist where components are supported.

Danger! Life-threatening injuries!

- Secure the vehicle hoist against lowering and lifting.

WARNING

Motor vehicle may slip off the vehicle hoist if the weight is distributed unevenly.

Danger! Life-threatening injuries!

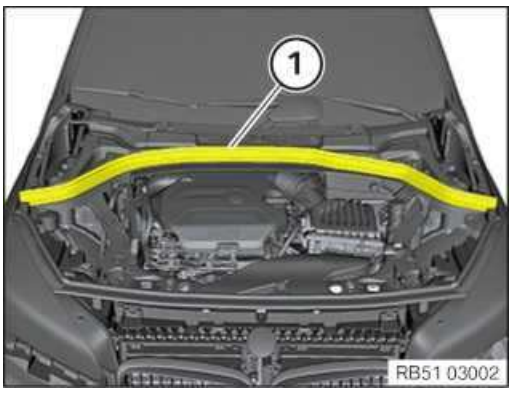
- Ensure there is a specific weight compensation on the motor vehicle.

PRELIMINARY WORK

1 – Remove the seal for the rear bonnet

NOTICE

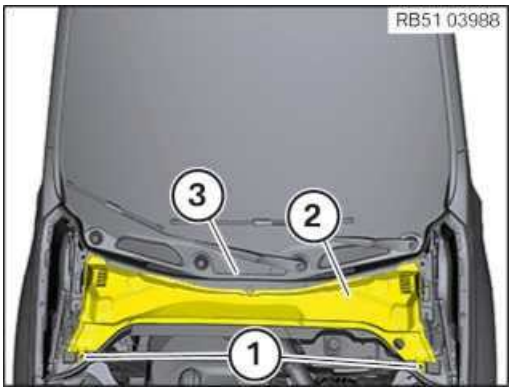
Schematic diagram is for example purposes. Some parts may differ in certain details.



- Pull off rear bonnet seal (1) towards the top and remove.

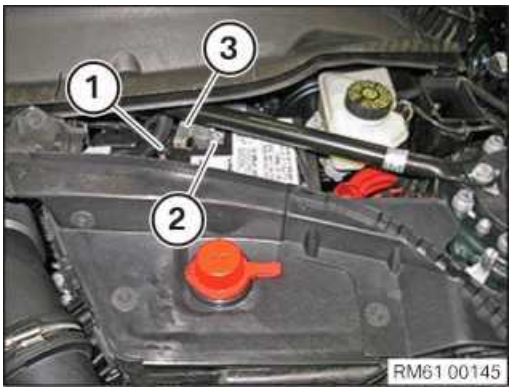
2 – Removing front cowl panel cover

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- Loosen the expanding rivet (1).
- Feed out and remove front cowl panel cover (2) from the rear cowl panel cover(3).

3 – Disconnecting the battery earth lead

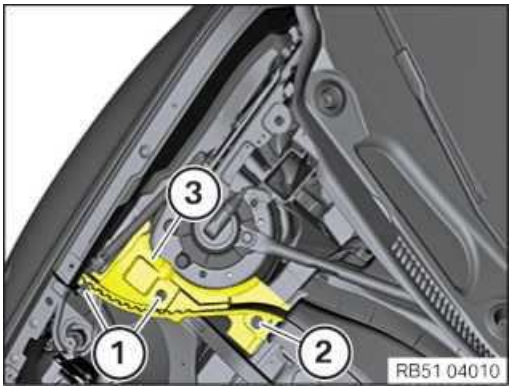


- Unlock plug connection (1) and disconnect.
- Unfasten nut (2).
- Remove the battery earth lead (3) and secure to one side.

4 – Remove suspension cross-brace

TECHNICAL INFORMATION

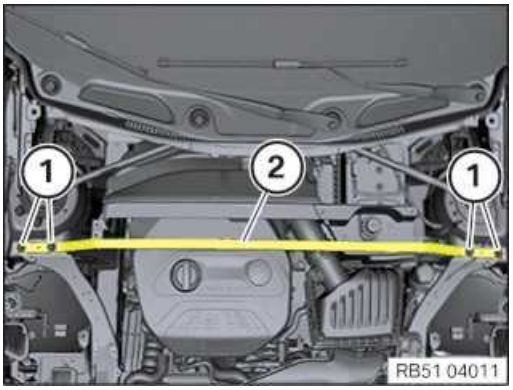
Driving without the strut brace/front end or tension strut is not permitted.



NOTICE

Description is for right component only. The procedure on the left side is identical.

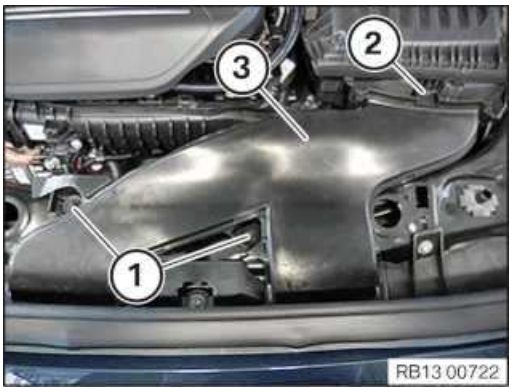
- Loosen expanding rivet (1).
- Loosen screw (2).
- Remove the cover (3).



- Loosen screws (1).
- Remove strut brace (2).

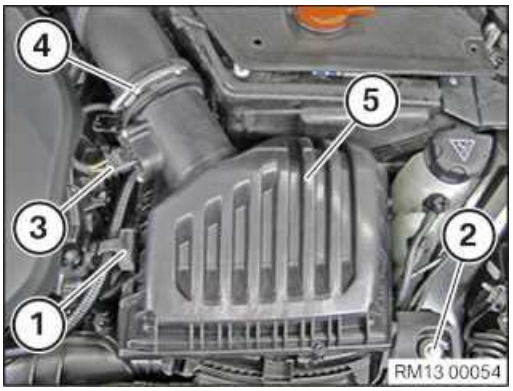
5 – Remove the intake neck for intake silencer housing

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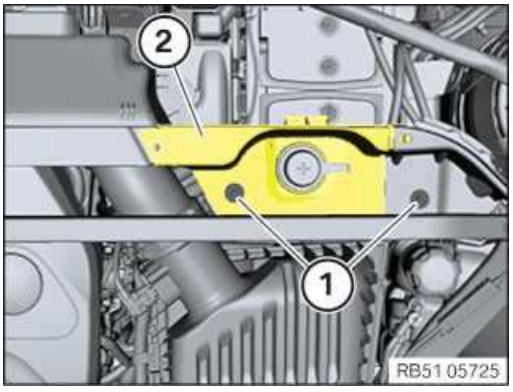
- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

6 – Removing intake silencer housing

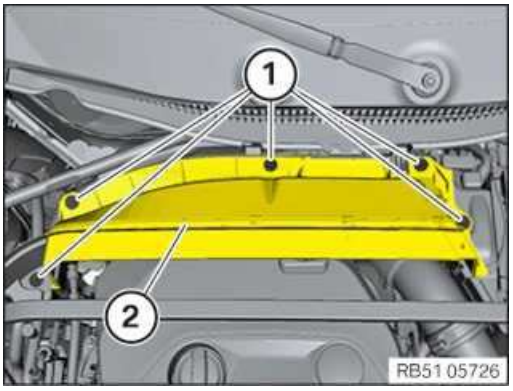


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

7 – Removing the upper bulkhead cover



- Loosen screws (1).
- Guide out and remove the cover (2).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

8 – Remove vehicle battery

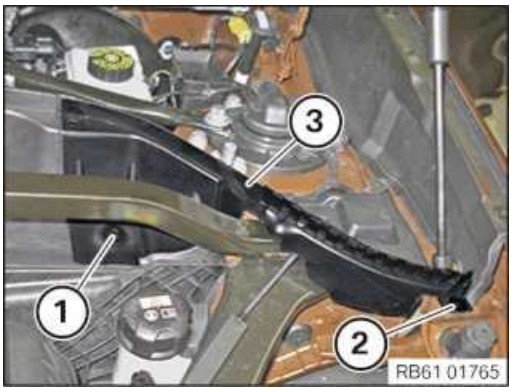
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WARNING

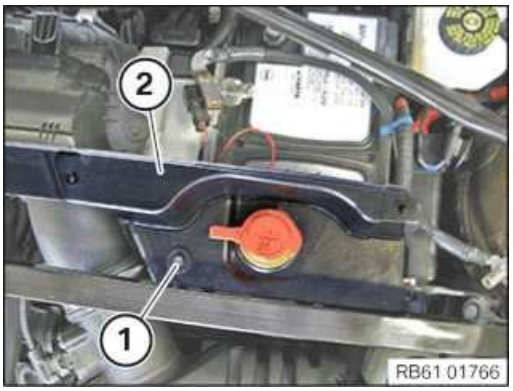
Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

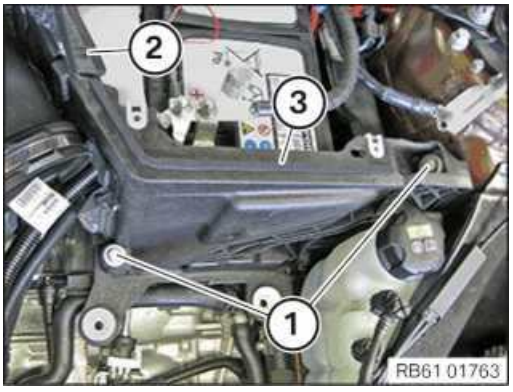
- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.



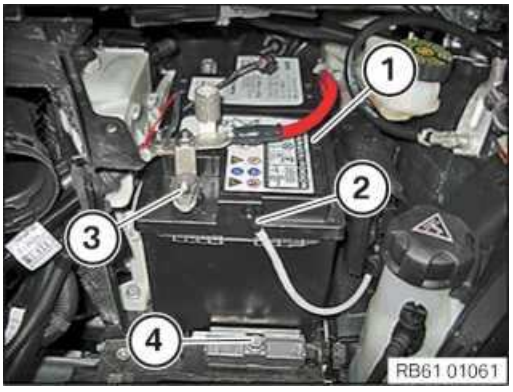
- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).



- Loosen screw (1).
- Remove the cover (2).



- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.



- Pull off the vent hose (2).
- Slacken the nut (3) on the positive battery terminal and remove the positive battery terminal.

WARNING

Unprotected battery terminals.

Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

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9 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

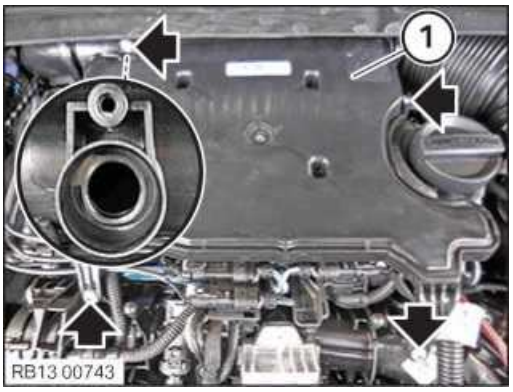
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

10 – Remove resonator



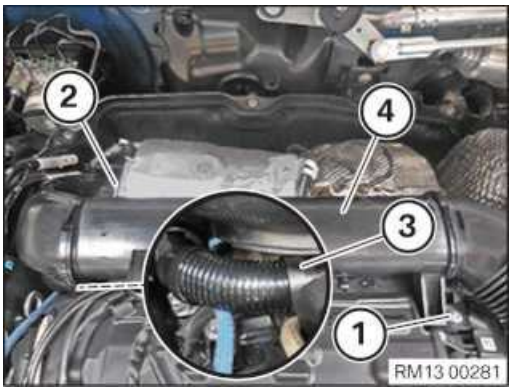
- Remove screws (arrows).
- Guide out and remove the resonator (1).

11 – Removing clean air pipe



- Detach clamp (1) on the clean air pipe.
- Pull off the clean air pipe from the intake silencer housing.

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- Loosen screw (1).
- Loosen clamp (2).
- Unlock the ventilation line (3) and pull it off the cylinder head cover.
- Feed out clean air pipe and remove.

12 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

TECHNICAL INFORMATION

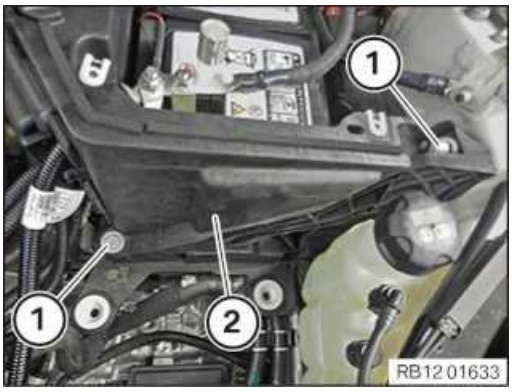
Follow instructions for removing and installing control units.

For additional information see: 12 00 ... Notes on removal and installation of control units

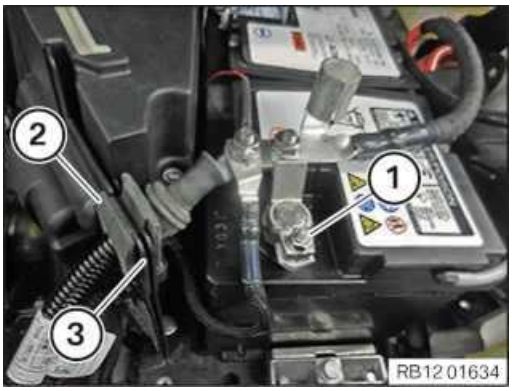
TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.

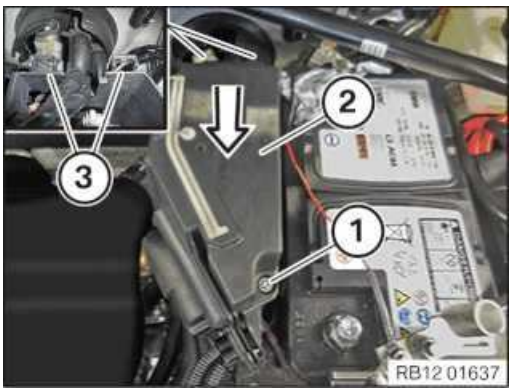
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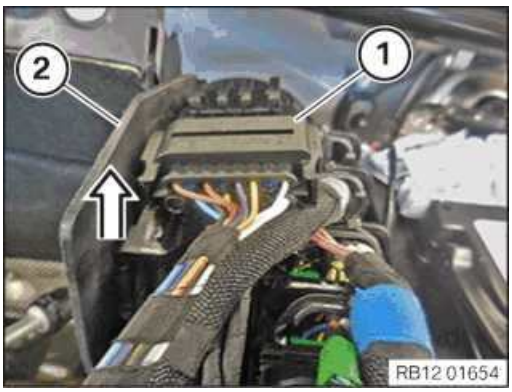
- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.



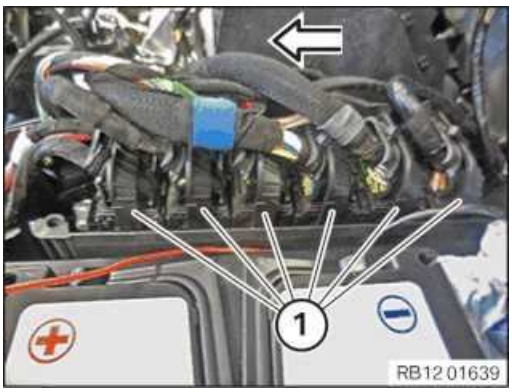
- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).

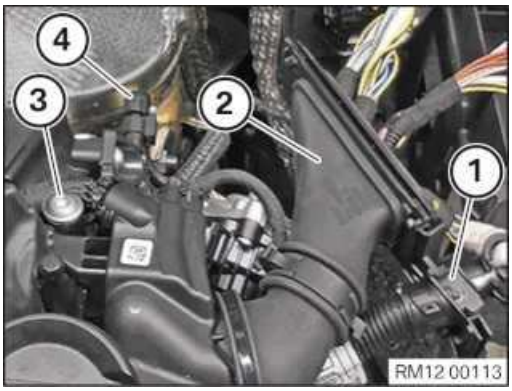


- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

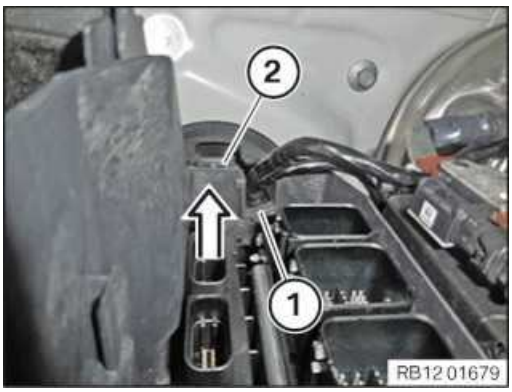
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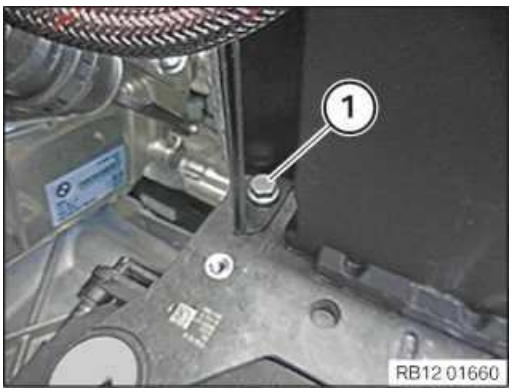
- Unlock and loosen connector (1).



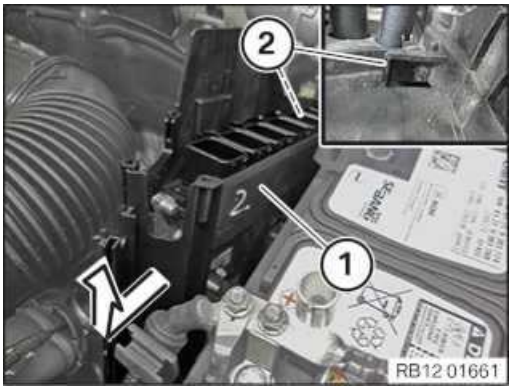
- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.



- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.



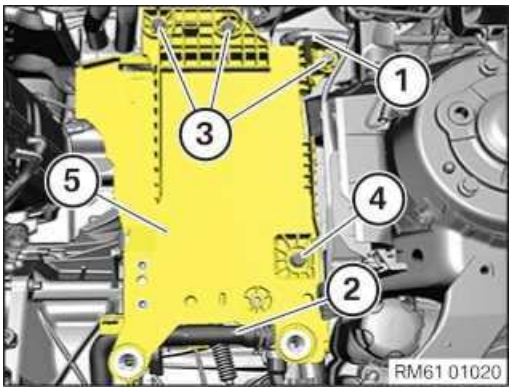
- Loosen screw (1).



- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

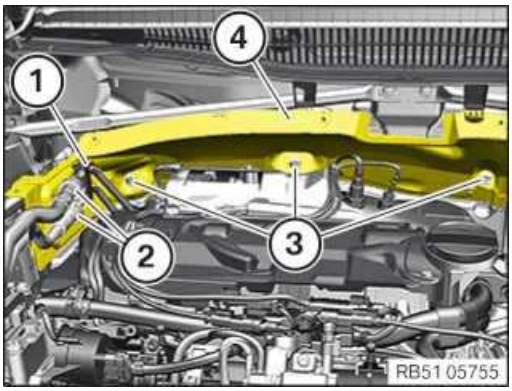
13 – Remove battery holder

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- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

14 – Remove the rear bulkhead upper part



- Unlock the holder (1) and disconnect.
- Guide out and remove the fuel lines (2).
- Loosen screws (3).
- Guide out the rear bulkhead upper part (4) and remove.

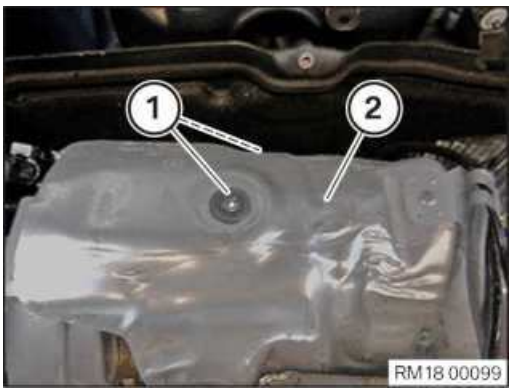
15 – Removing heat shield from top exhaust turbocharger

WARNING

Hot surfaces.

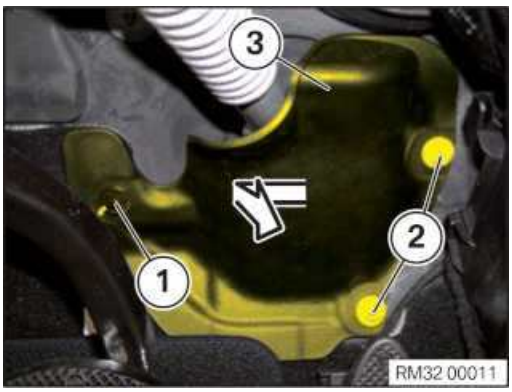
Risk of burning!

- Perform all work only on components that have cooled down.



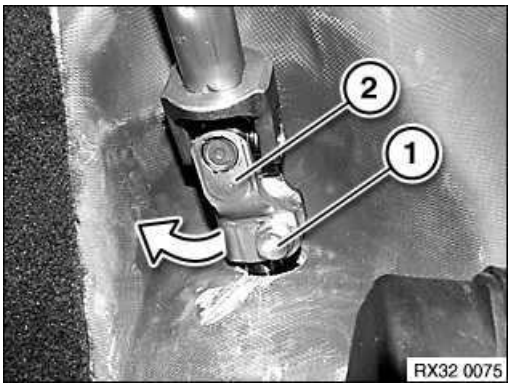
- Release cable from holders.
- Release the screws (1) at the top and bottom of the heat shield.
- Feed out and remove the heat shield (2).

16 – Releasing lower steering shaft from steering gear



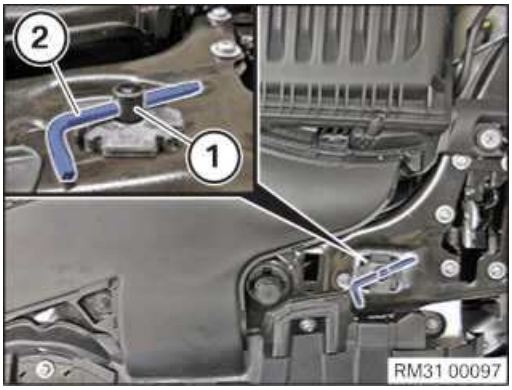
- **If installed:**
- Unfasten nut (1).
- Unscrew the nuts (2) by 1 rotation.
  Do not remove the nuts (2) !
- Remove the cover (3) on the steering column in the direction of the arrow.
  The side footwell trim must not be disassembled!

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- Loosen screw (1).
- Swivel out the universal joint (2) of the bottom steering shaft from the steering gear in the direction of the arrow.

17 – Securing radiator on left and right



NOTICE

Perform the operations on the left and right side.

- Fasten radiator at centring pin (1) with suitable tool (2).

18 – Removing both front wheels

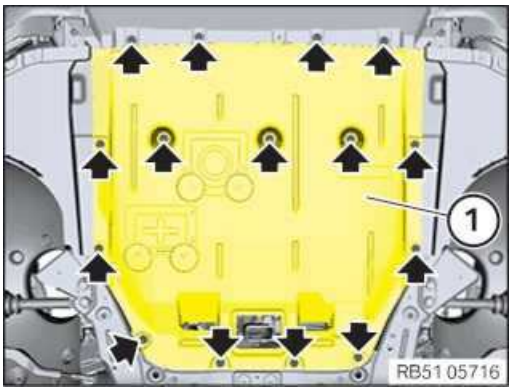
▸ **Removing the wheel**



- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Unscrew the wheel bolts (arrows) and remove the wheel.

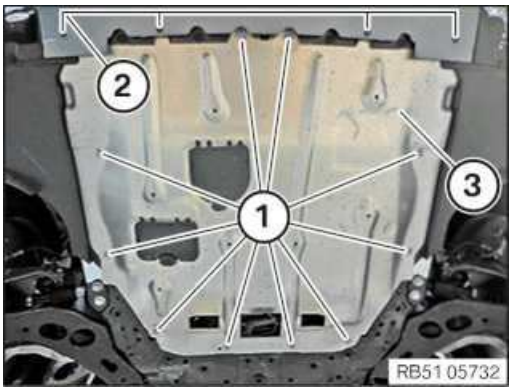
  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

19 – Removing the front underbody protection



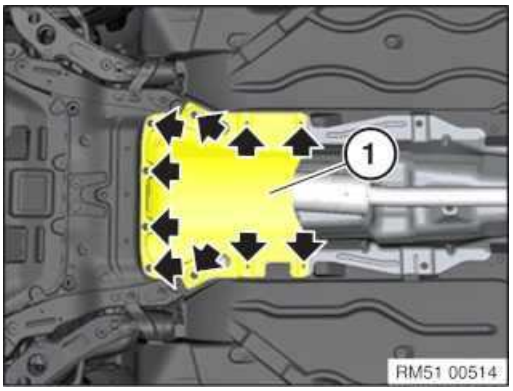
- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.

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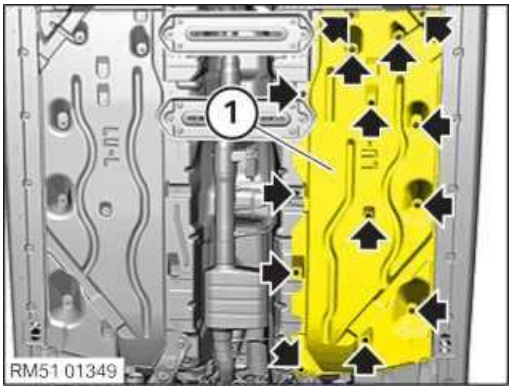
- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

20 – If installed: Removing rear underbody protection



- Remove screws (arrows).
- Remove the rear underbody protection (1).

21 – Removing right underbody panelling



- Unscrew all bolts and nuts (arrows).
- Remove the underbody panelling (1).

22 – Removing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

▸ **Remove the front wheel arch trim**

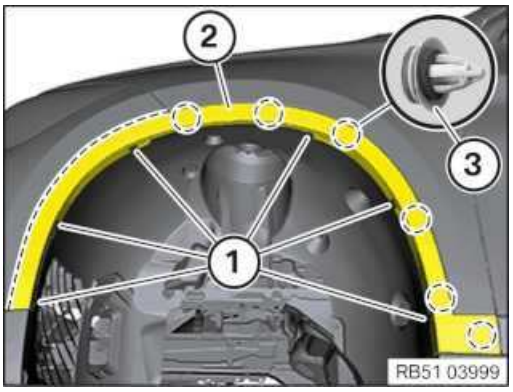
NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

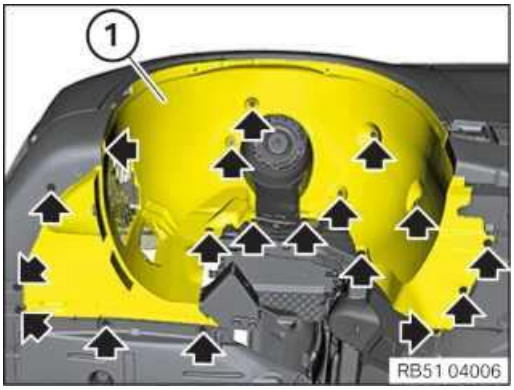
Description is for left component only. Procedure on the right side is identical.

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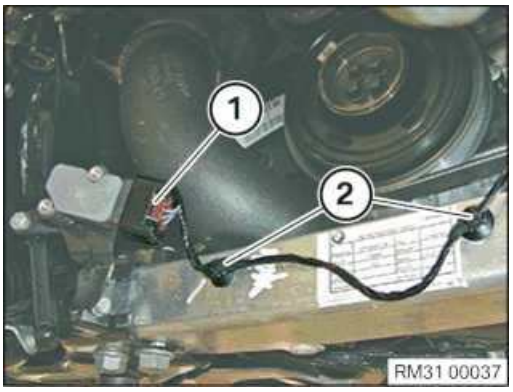
- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.

▶ **Remove front wheel arch cover**



- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

23 – With right installation: Detaching ride height sensor cable



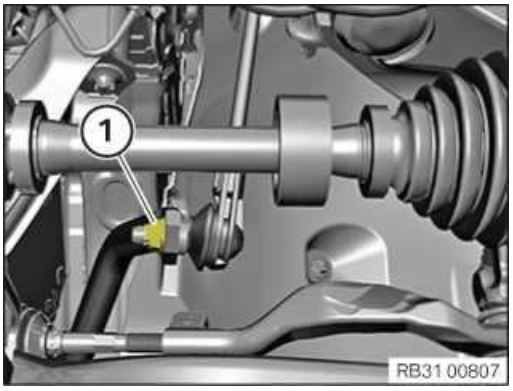
- Unlock plug connection (1) and disconnect.
- Release cable clip (2) from deformation element adapter.

24 – Releasing anti-roll bar on left and right from anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▶ **Detach the anti-roll bar from the anti-roll bar link**



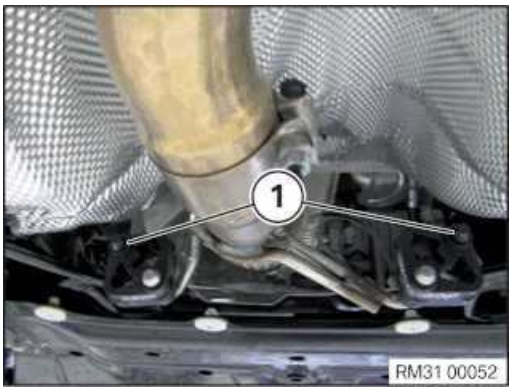
- Unfasten nut (1).

Note: Use the Torx socket for counter support.

- Loosen the anti-roll bar link from the anti-roll bar .

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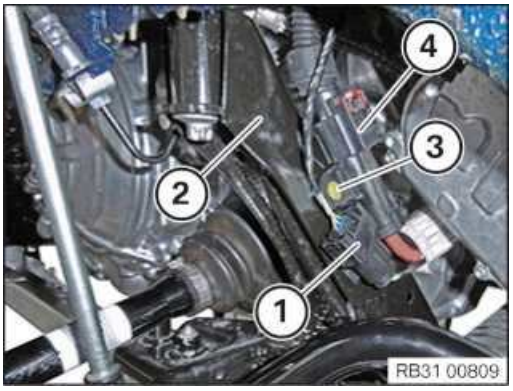
25 – Detaching rubber mount from front axle support



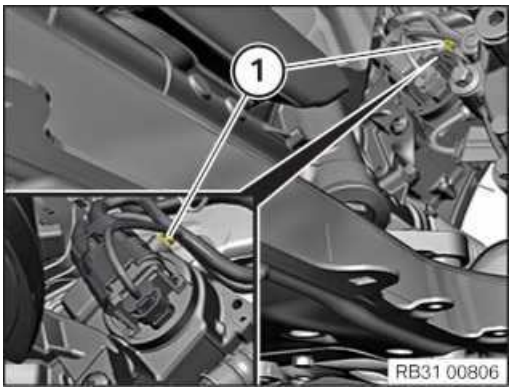
- Spray rubber mount (1) with lubricant and release from holder on front axle support.

26 – Disconnecting plug connections from steering gear

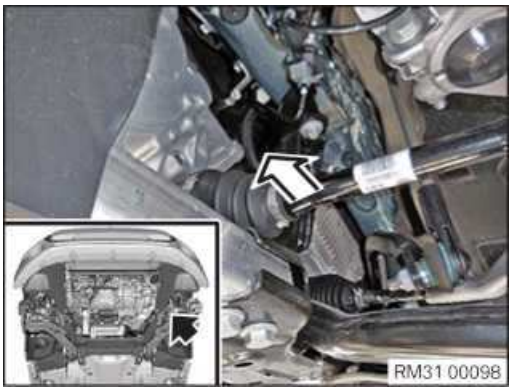
▸ **If installed: Detach connectors from the front axle carrier**



- Release the plug connection (1) from the front axle support (2).
- Loosen screw (3).
- Release the plug connection (4) from the front axle support (2).



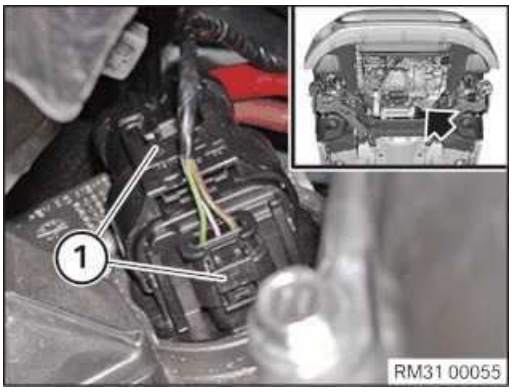
- Disconnect wiring harness (1) from steering gear.



- To unlock the plug connections (see the following work step): unlock plug connections (arrow) with the right hand.

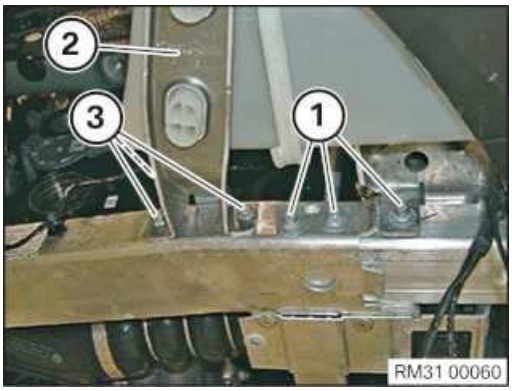
  The plug connections can be reached via the left-hand output shaft.

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- Unlock plug connections (arrow) (1)and disconnect from the steering gear.
- Make sure when lowering the front axle that the cables are not damaged!

27 – Releasing the mounted part from the front axle support

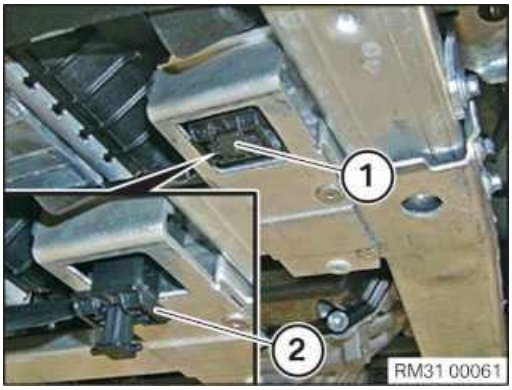


- **Only on right side:** Loosen screws (3) and remove holder for washer fluid reservoir (2).

NOTICE

Perform the operations on the left and right side.

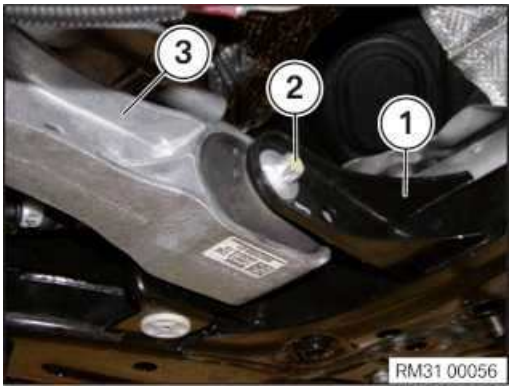
- Loosen screws (1).



NOTICE

Perform the operations on the left and right side.

- Unlock safety catch (1) of the lock (2) from the holder for the charge air cooler.
- Completely remove locks (2).



- Loosen screw (2) of the engine support (3) on the front axle (1).



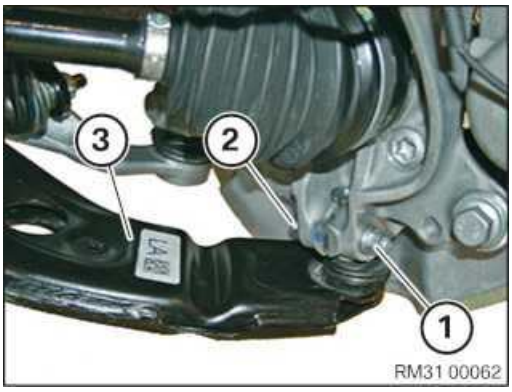
NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

28 – Detaching and removing front axle completely

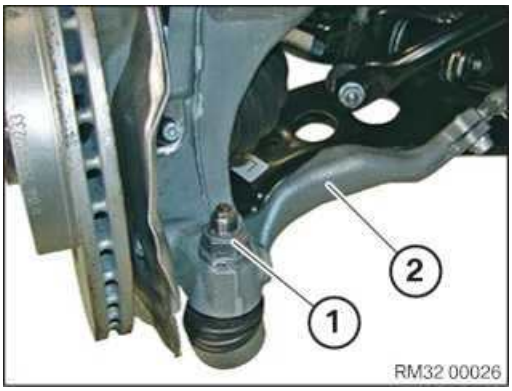
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NOTICE

Perform the operations on the left and right side.

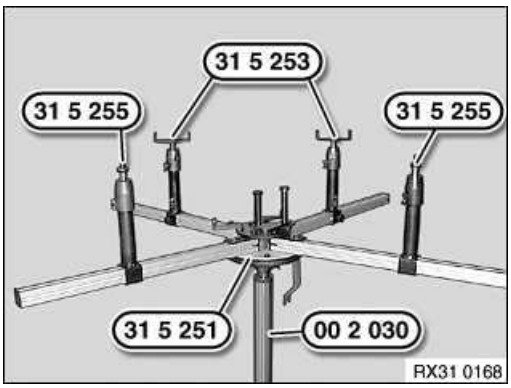
- Unfasten nut (1).
- (2)Pull out screw.
- Detach the wishbone (3) from the swivel bearing .



NOTICE

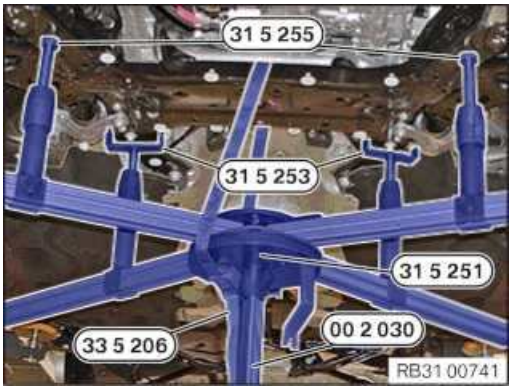
Perform the operations on the left and right side.

- Unfasten nut (1).
- Detach the track rod (2) from the swivel bearing.



- Fit the special tool completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools in telescopic supports of a profile rail pair.
- Insert special tools in telescopic supports of other profile rail pair.

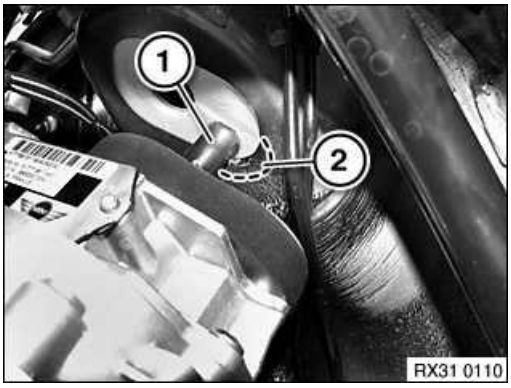
Note: In a profile rail pair, two profile rails are connected to one another by gearing.



- Align special tools and to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool to special tool .



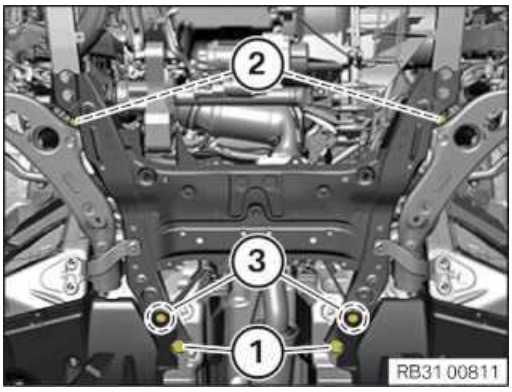
TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!

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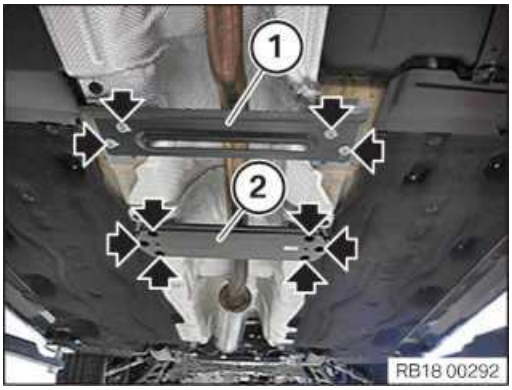
- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and remove the front axle.

TECHNICAL INFORMATION

Note the information on thread repairs using Helicoil thread inserts.
For more information see: 41 00 ... Notes on repairing threads

- Check threads for damage; if necessary, repair with Helicoil thread inserts.

29 – Removing the connecting support from the tunnel in front and back

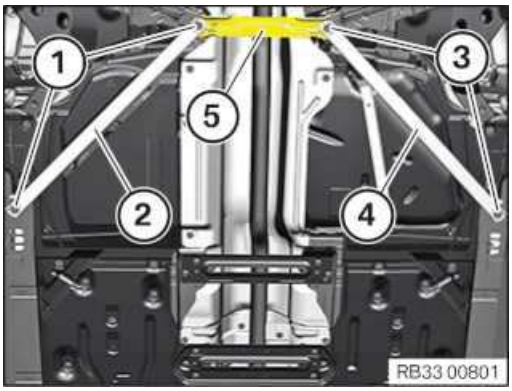


- Unscrew the bolts (arrows) from the connecting support (1).
- Feed out and remove the crossbeam (1).
- Unscrew the bolts (arrows) from the connecting support (2).
- Feed out and remove the crossbeam (2).

30 – Remove the cross strut with the torsion strut

TECHNICAL INFORMATION

Driving without a torsion strut is not permitted.



- Loosen screws (1).
- Thread out torsion strut (2) at left and remove.
- Loosen screws (3).
- Thread out torsion strut (4) at right and remove.
- Feed out and remove the cross-member (5).

31 – Remove exhaust system

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WARNING

Hot surfaces.

Risk of burning!

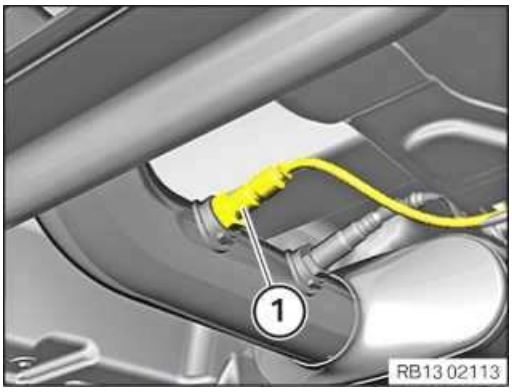
- Perform all work only on components that have cooled down.

CAUTION

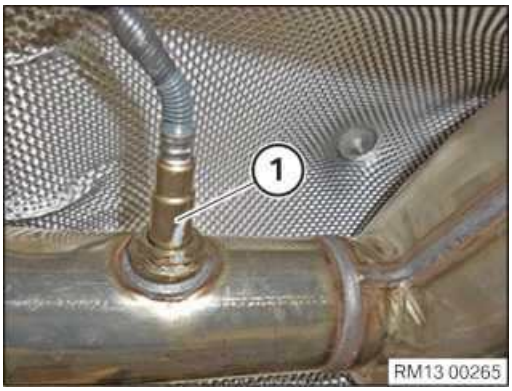
Heavy component.

Heavy components can lead to injury or damage.

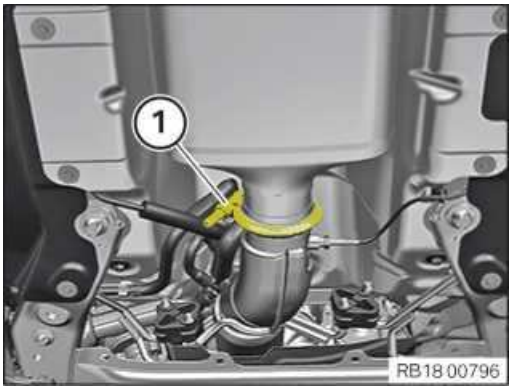
- Remove and install heavy components with the aid of another person/other persons.



- Release the nitrogen oxide sensor (1) downstream of the SCR catalytic converter, guide it out and set it aside.

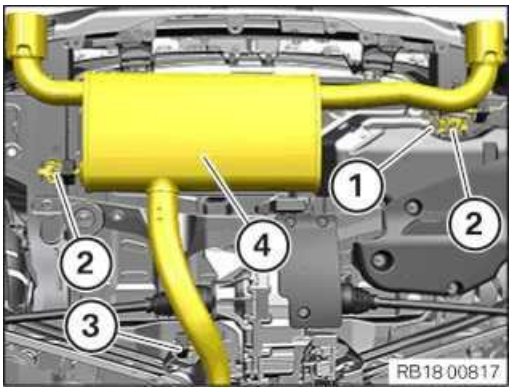


- Release the diesel particulate sensor (1), guide it out and set it aside.



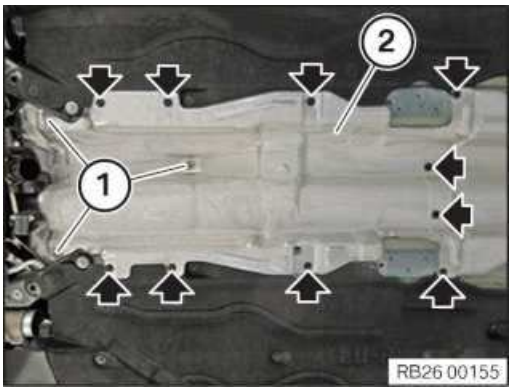
- Loosen V-band clamp (1).

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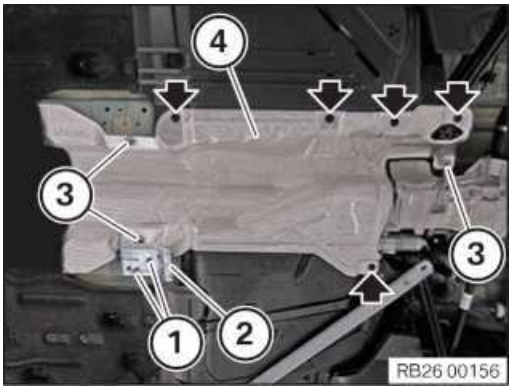
- Loosen screw (1).
- Loosen nuts (2).
- Release the rubber mount (3) of the exhaust system (4).
- Lower and guide out the exhaust system (4) with assistance of a second person and remove it.

32 – Remove front heat shield



- Remove screws (arrows).
- Loosen nuts (1).
- Guide the heat shield (2) out and remove it.

33 – Remove heat shield at rear.



- Loosen screws (1).
- Guide out and remove holder (2).
- Remove screws (arrows).
- Loosen nuts (3).
- Guide the heat shield (4) out and remove it.

34 – Remove propeller shaft

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

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RISK OF DAMAGE

Damage to propeller shaft during removal.

Non-observance of the removal guidelines for the propeller shaft on the rear axle differential may cause severe damage.

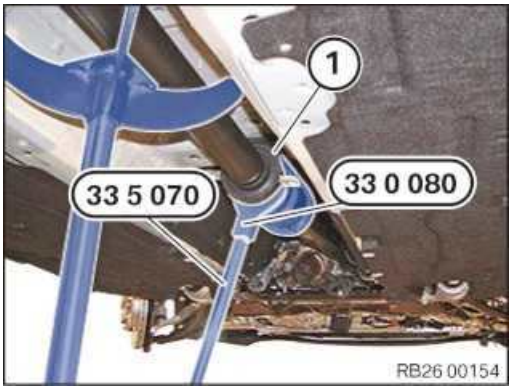
- Do not disassemble the three-hole flange, flexible disc and propeller shaft. The three-hole flange to the rear axle differential is balanced with the flexible disc and propeller shaft.
- Loosen the recessed nut against the direction of travel in clockwise direction. The propeller shaft must be loosened on the recessed nut only and exclusively in the direction of rotation otherwise the anti-twist lock of the bi-hexagonal flange nut is damaged.
- In the event of a damaged anti-twist lock on the bi-hexagonal flange nut: Replace the rear axle differential.



- Install the special too l between the front and rear propeller shaft.
- Make sure that the arrows on the special tool point forward in the direction of travel.



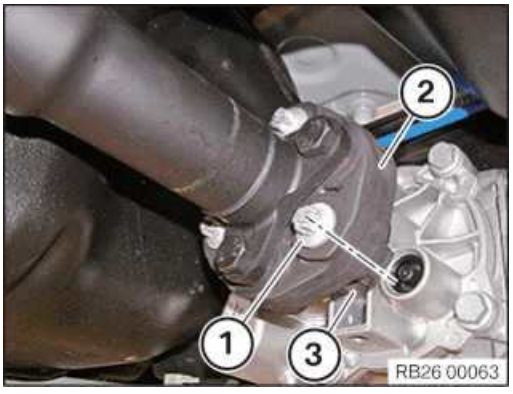
- Always support the propeller shaft (1) with a conventional jack.



- Protect the propeller shaft (1) with the special tools **0 495 554 (33 5 070)** and from twisting.

TECHNICAL INFORMATION

Compliance with the following instructions is required to avoid a humming noise from the propeller shaft after refitting the propeller shaft.

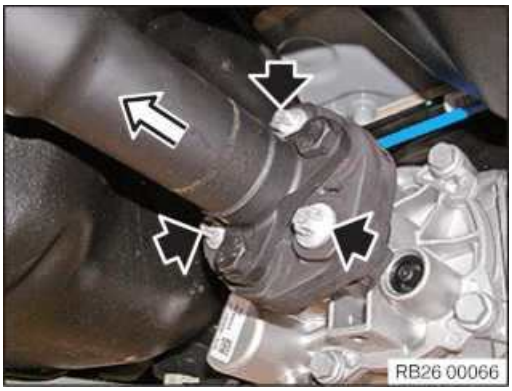


- Mark the installation position of the screw connection (1), the flexible disc (2) and the three-hole flange (3) on the same level.
- Loosen the screw connection (1).

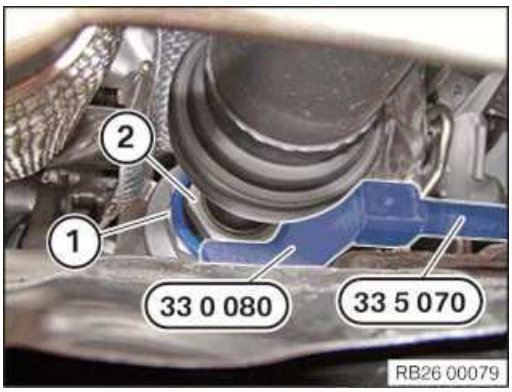
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- Loosen screws (1).



- Remove screws (arrows).
- Guide the propeller shaft out in the direction of the arrow and set it aside.



RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.

- Protect the recessed nut (2) on the transfer box from twisting with the special tools **0 495 554 (33 5 070)** and .

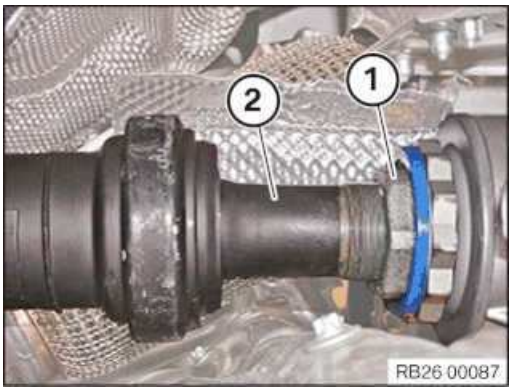
  The recessed nut (2) on the transfer box must **not** be used to detach the propeller shaft.

  The double hexagon flange nut (1) must **not** be used for counter support.

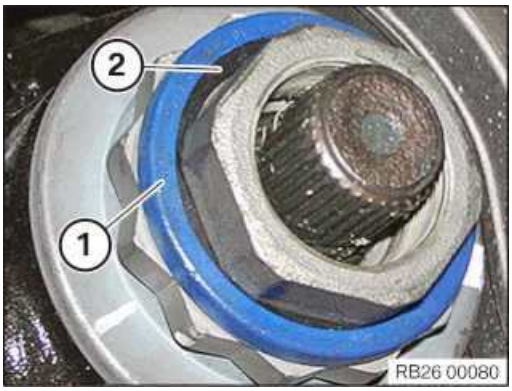


- Release the front propeller shaft with the special tools **0 495 554 (33 5 070)** and in the direction of the arrow.

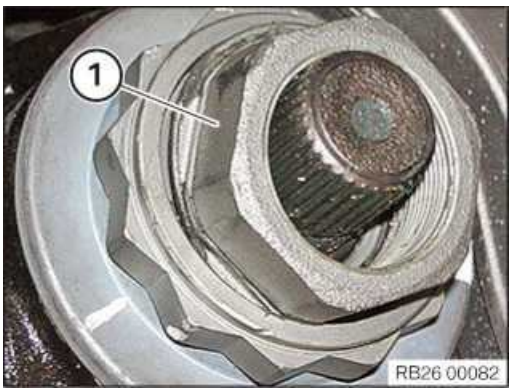
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- Thread the propeller shaft (2) out of the recessed nut (1) and remove.



- Thread the retaining clip (1) and the seal (2) out and remove.



- Thread out and remove the recessed nut (1).

35 – Removing starter motor

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and loosen connector (1).
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).



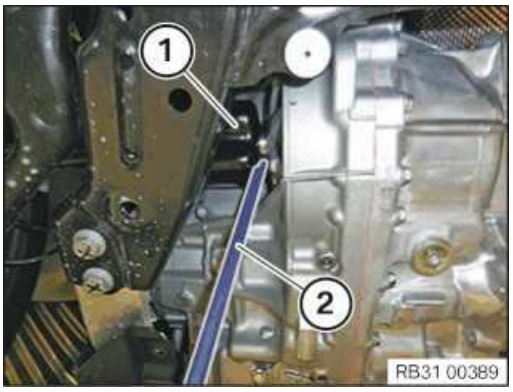
- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.



- Loosen screws (1).
- Feed out starter motor and remove.

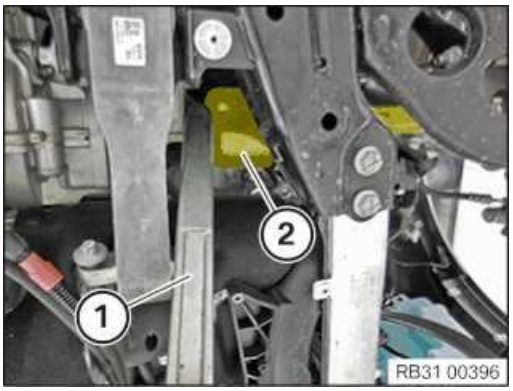
36 – Partially removing the left output shaft

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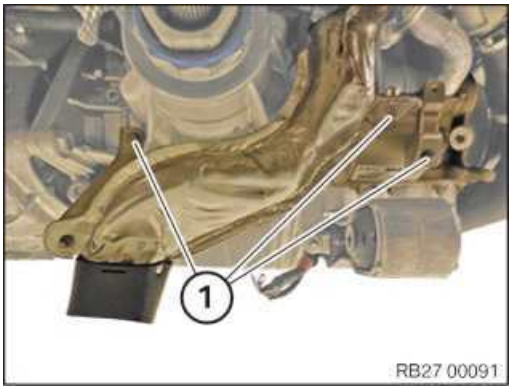
- Protect the output shaft (1) from falling.
- Lever out the output shaft (1) with a mounting lever (2) from the transmission.
- Tie up output shaft (1).

37 – Partially removing right output shaft

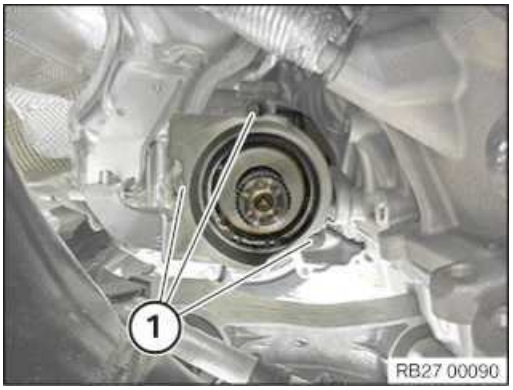


- Lever out the output shaft (2) with a mounting lever (1).
- Tie up output shaft (1).

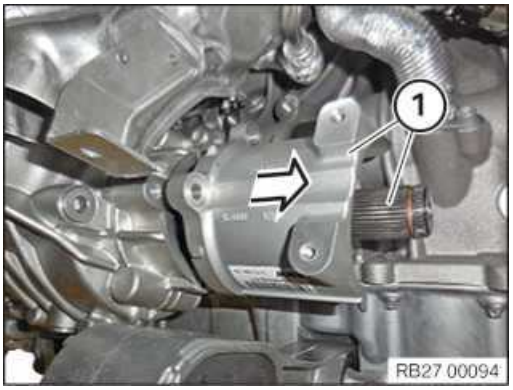
38 – Remove the intermediate shaft with the support tube



- With air duct installation: Loosen screws (1).
- Remove air duct



- Loosen screws (1).



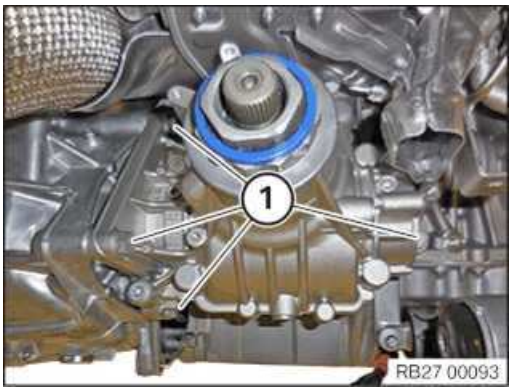
- Pull the intermediate shaft with the support tube (1) out of the transfer box.

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39 – Remove transfer box (VTG)



- Loosen screws (1).
- Remove heat shield.



- Loosen screws (1).
- Remove the transfer box (VTG).

40 – Remove the monitoring oxygen sensor

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

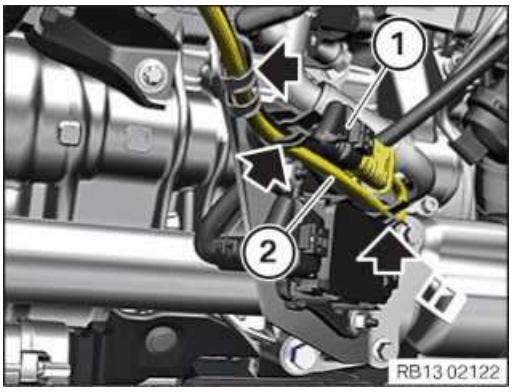
RISK OF DAMAGE

Electrostatic discharge.

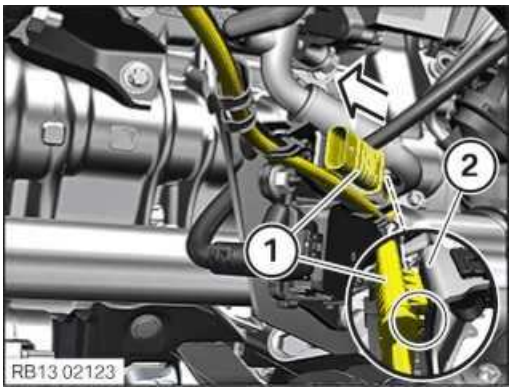
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

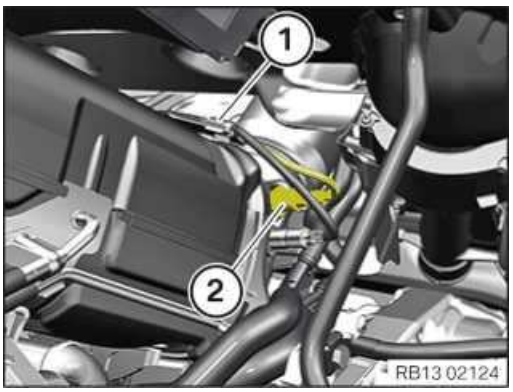
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- Unlock plug connection (1) and disconnect.
- Feed oxygen monitor sensor cable (1) out of the clamps (arrows).



- Unlock the connector (1) in the marked area and disconnect it from the holder (2) in the direction of arrow.



- Guide the cable of the monitoring oxygen sensor (2) out of the clamp (1).
- Release the monitoring oxygen sensor (2) using special tool **0 491 074 (11 7 020)**.
- Remove the monitoring oxygen sensor (2).

41 – Removing the nitrogen oxide sensor before SCR catalytic converter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

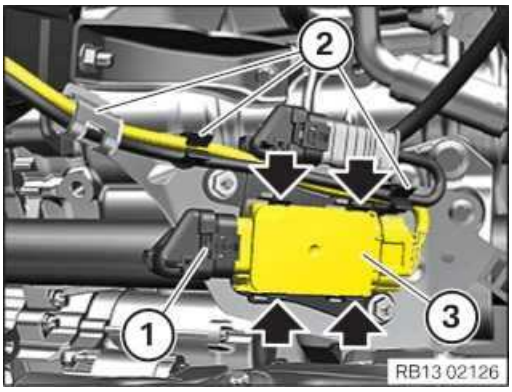
RISK OF DAMAGE

Electrostatic discharge.

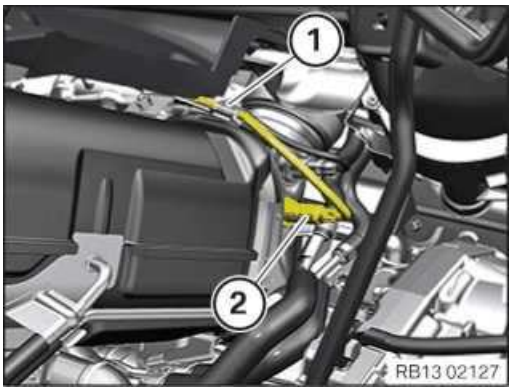
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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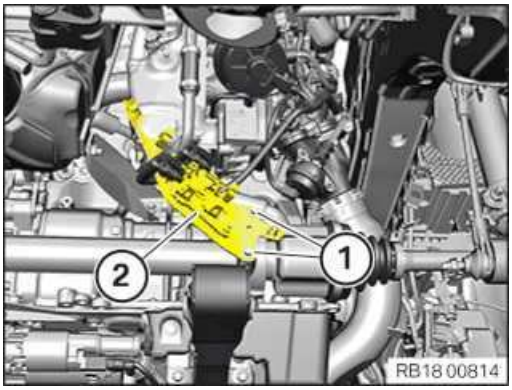


- Unlock plug connection (1) and disconnect.
- Slide the cable of the nitrogen oxide sensor evaluation electronics (3) out of the clamps (2) and remove.
- Unlock (arrows) and remove the evaluation electronics for the nitrogen oxide sensor (3).



- Slide the cable of the nitrogen oxide sensor before the SCR catalytic converter (2) out of the clamps (1) and remove.
- Detach the nitrogen oxide sensor before the SCR catalytic converter (2) using the special tool **0 491 074 (11 7 020)**.
- Guide out and remove the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

42 – Remove holder for oxygen sensor



- Loosen screws (1).
- Thread out the holder (2) for the oxygen sensor and remove.

43 – Remove the exhaust temperature sensor on the catalytic converter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

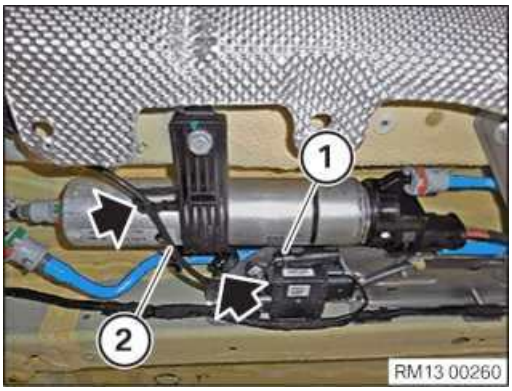
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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

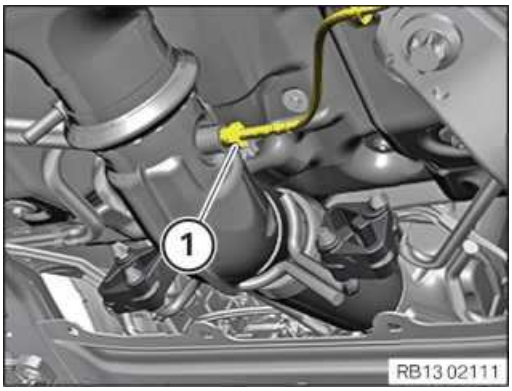
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and loosen connector (1).
- Feed out the cable (2) of the exhaust temperature sensor from the clamps (arrows) and remove.



- Loosen the cable clip (1).



- Loosen exhaust temperature sensor (1).
- Feed out and remove exhaust temperature sensor (1).

44 – Removing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

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WARNING

Hot surfaces.

Risk of burning!

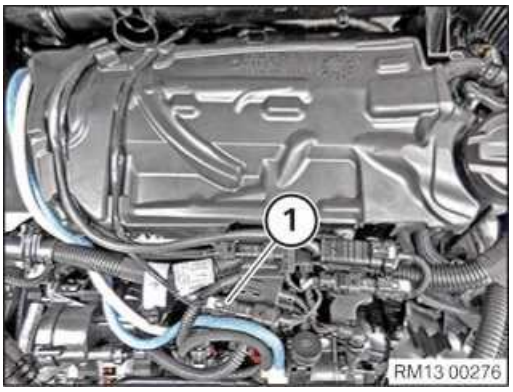
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

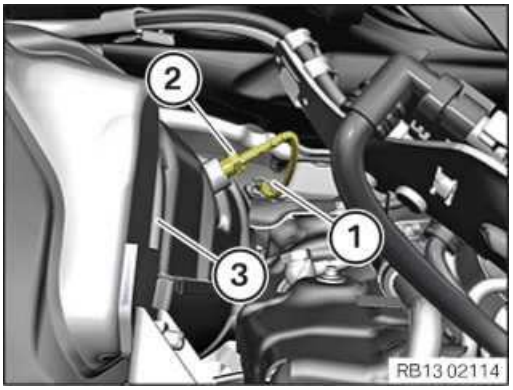
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and loosen connector (1).
- Uncover the exhaust temperature sensor cable.



- Guide the exhaust temperature sensor cable (2) out of the clamp (1) and place it to one side.
- Release the exhaust temperature sensor (2) with conventional tools .
- Feed out and remove the exhaust temperature sensor (2) from the diesel particulate filter (3).

45 – Remove the exhaust temperature sensor on the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

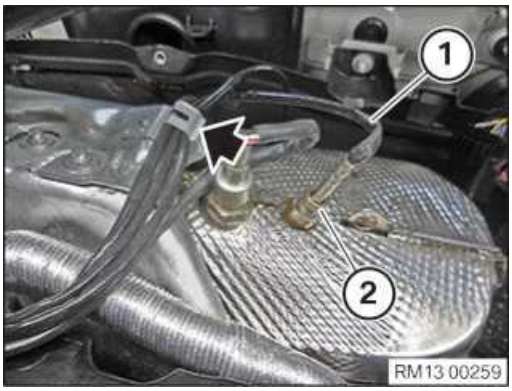
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect connector (1).
- Put the cable of the exhaust temperature sensor to one side.



- Guide cable (1) of the exhaust temperature sensor out of the clamp (arrow) and remove it.
- Loosen exhaust temperature sensor (2).
- Feed out and remove exhaust temperature sensor (2).

46 – Remove the control sensor

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock plug connection (1) and disconnect.
- Detach the connector (2) from the holder .
- Release the front oxygen sensor cable.



- Detach the control sensor (1) with the special tool .
- Feed out and remove the control sensor (1).

47 – Removing the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

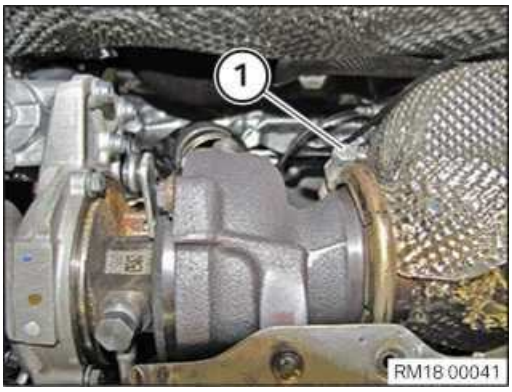
CAUTION

Heavy component.

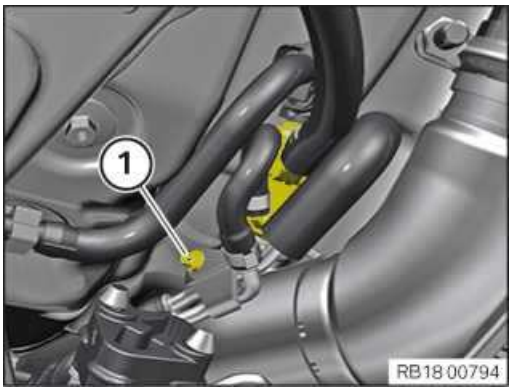
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

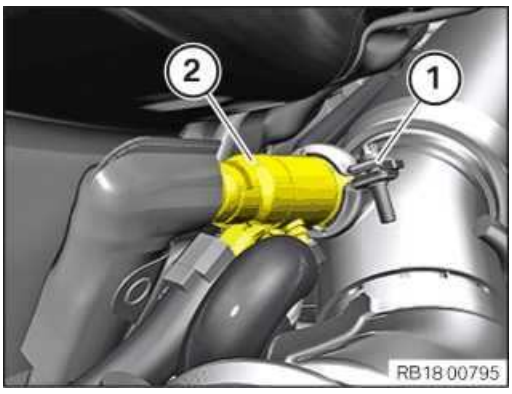
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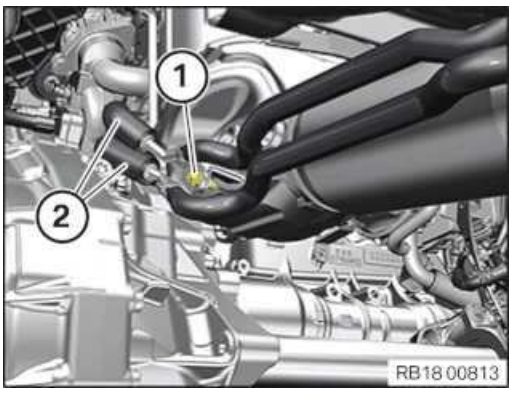
- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.



- Loosen screw (1).



- Loosen V-band clamp (1).
- Remove the SCR metering module (2) and set it aside.



- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.

▸ **Remove differential pressure sensor**

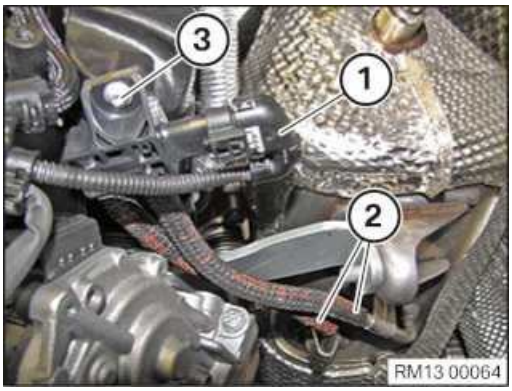
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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

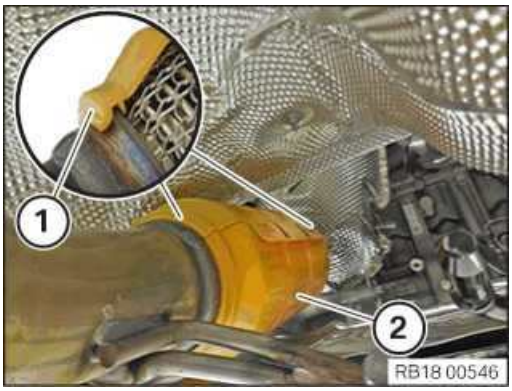
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



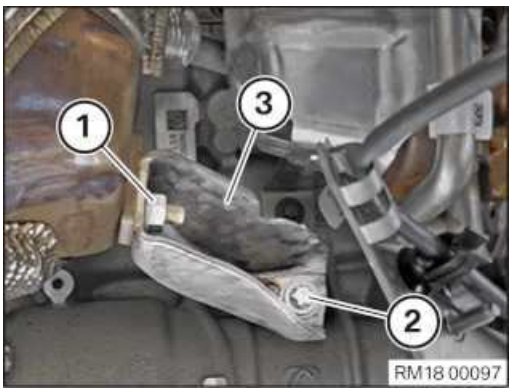
- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.



- Loosen nuts (1).

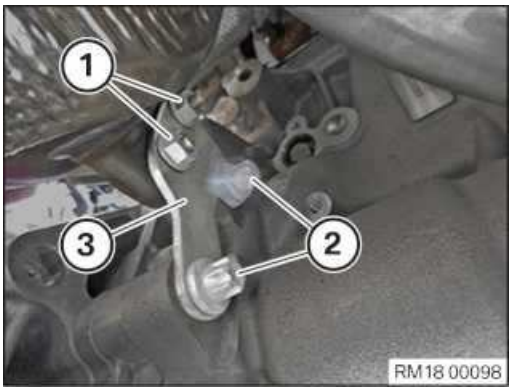


- Mount fitting aid (2).
- Make sure that the fitting aid is correctly position on the edges (1) of the flexible tube.

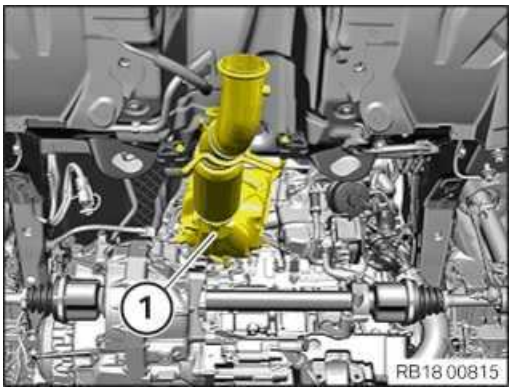


- Unfasten nut (1).
- Loosen screw (2).
- Remove holder (3).

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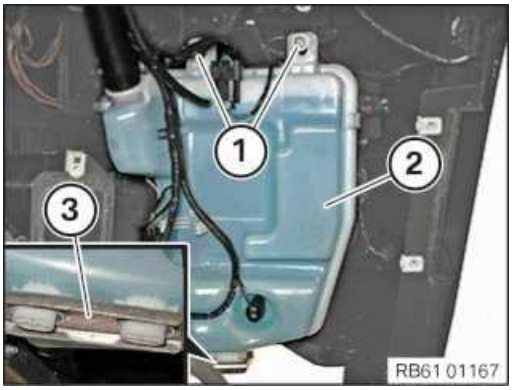


- Loosen nuts (1).
- Loosen screws (2).
- Remove holder (3).



- Feed out diesel particulate filter (1) toward the bottom and remove.

48 – Remove the washer fluid reservoir from the fixture



- Loosen screws (1).
- Guide the washer fluid reservoir (2) up and out of the fixture (3) and set it aside.

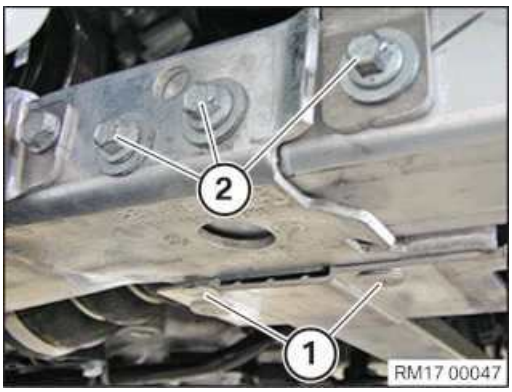
49 – Removing the right charge air duct between the exhaust turbocharger and the charge air cooler

WARNING

Hot surfaces.

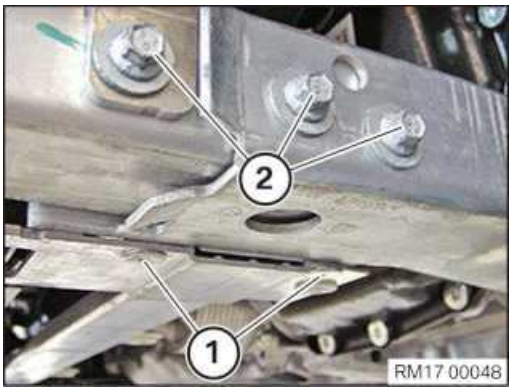
Risk of burning!

- Perform all work only on components that have cooled down.

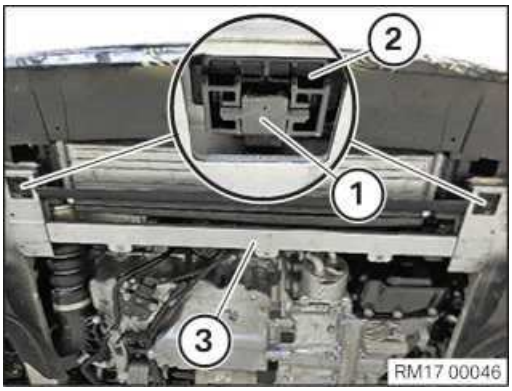


- Undo screws (2) at front left.
- Drill out blind rivets (1) at front left.

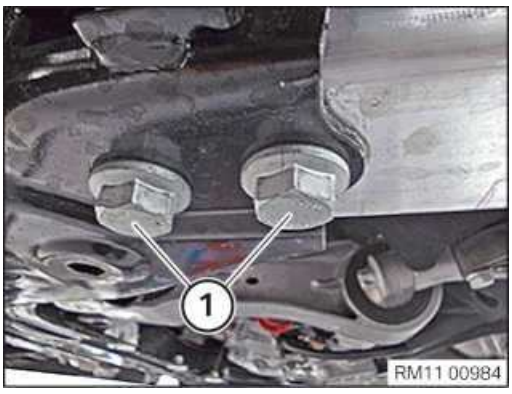
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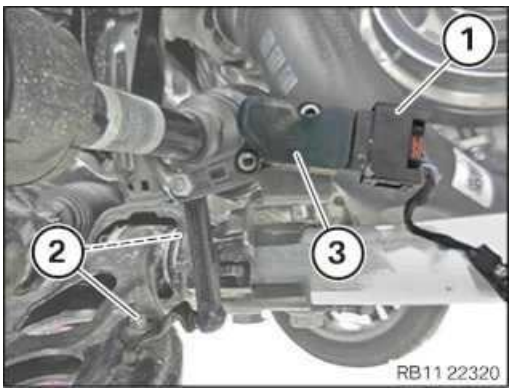
- Undo screws (2) at front right.
- Drill out blind rivets (1) at front right.



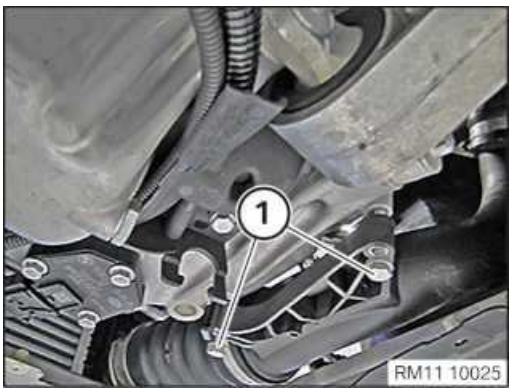
- Unlock locking pins (1).
- Thread out and remove locks (2).
- Thread out and remove cross connection (3).



- Release the screws (1) on the right front axle support.

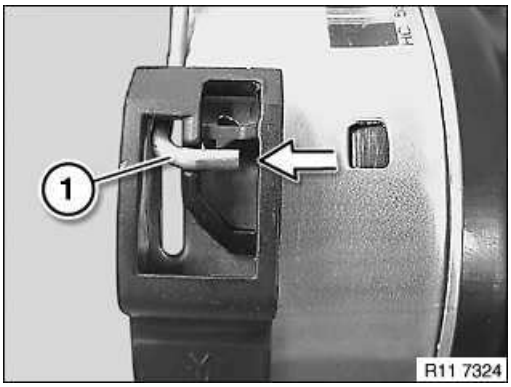


- **If installed:**
- Unlock and release plug connection (1).
- Loosen screws (2).
- Feed out the ride height sensor (3) and remove.



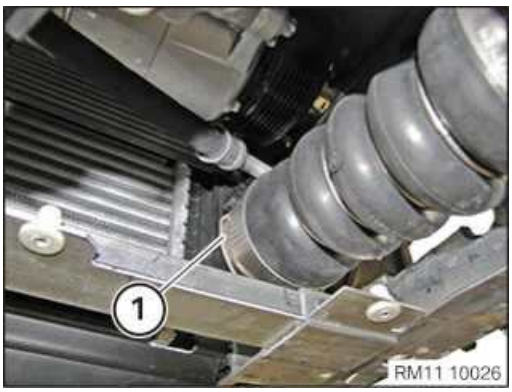
- Release screws (1) of charge air duct on right oil sump.

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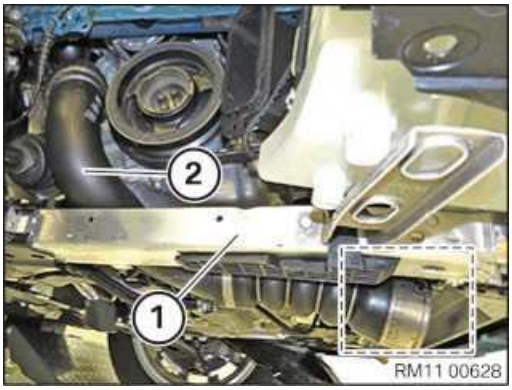


- Unlock lock (1).

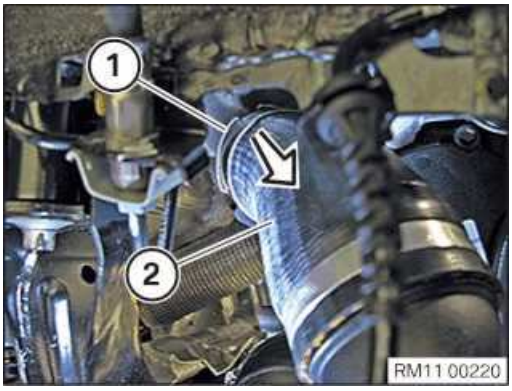
  The lock (1) must engage in the bracket during unlocking (arrow).



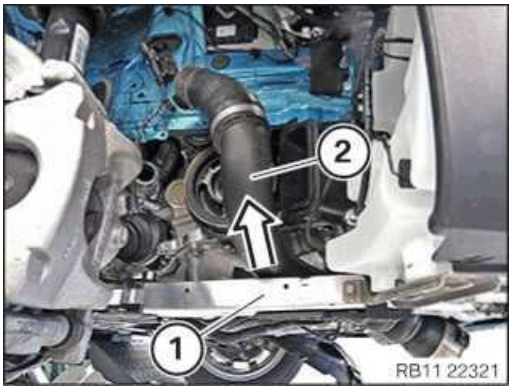
- Unlock and release the charge air duct (1) on the charge air cooler.



- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed out the charge air duct (2) in the **marked** area towards the bottom and set it aside.



- Unlock and detach the locks (1) on both sides.
- Feed out the charge air duct (2) on the exhaust turbocharger in the direction of the arrow and set it aside.



- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed out the charge air duct (1) in the direction of arrow between the side member and the deformation element and remove.

50 – Remove the heat shield from the exhaust turbocharger at the bottom

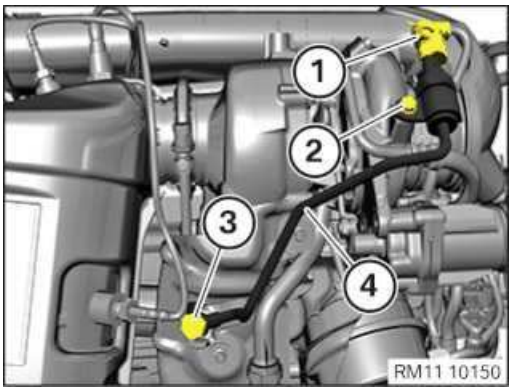
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WARNING

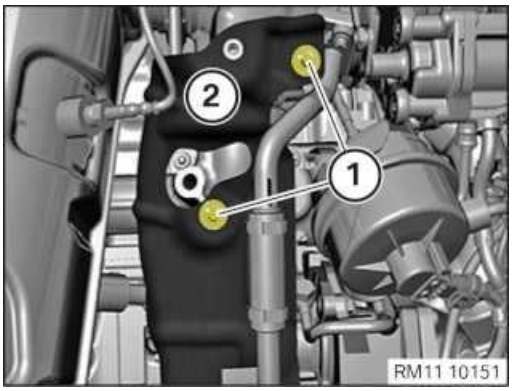
Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Unlock and disconnect connector (1).
- Unscrew the banjo bolt (3).
- The seals of the banjo bolt (3) must be renewed.
- Loosen screw (2).
- Remove the exhaust gas pressure pipe (4).



- Unscrew the bolts (1) on the heat shield .
- Feed out and remove the heat shield (2).

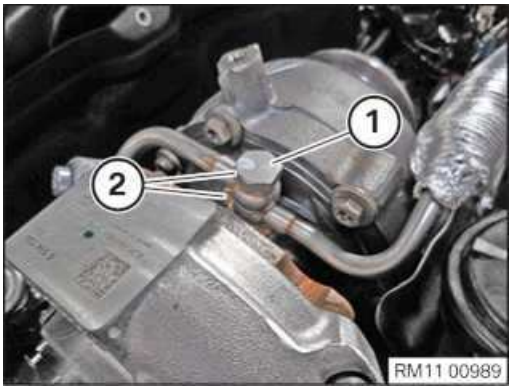
51 – Removing the low-pressure stage turbocharger

WARNING

Hot surfaces.

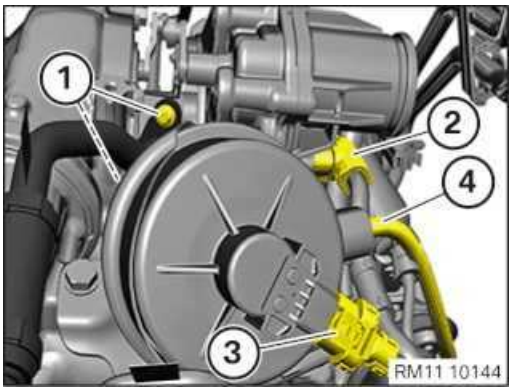
Risk of burning!

- Perform all work only on components that have cooled down.

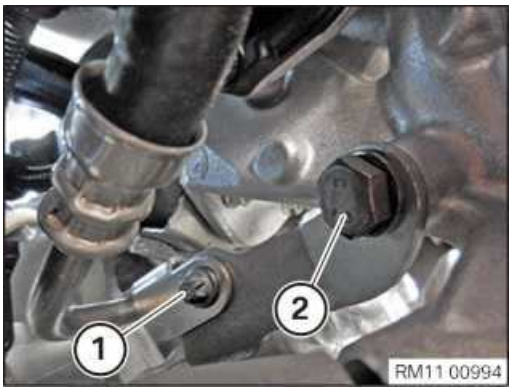


- Release the banjo bolt (1) of the oil feed lines.
- Remove sealing rings (2).
- Place oil feed lines to one side.

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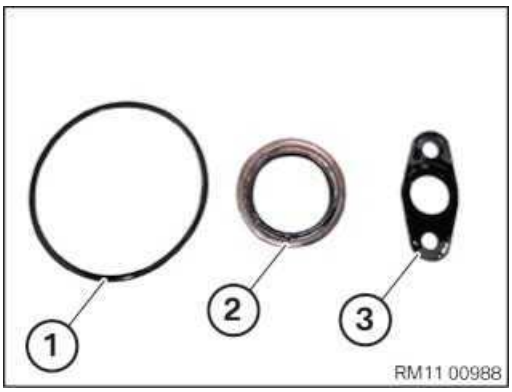
- Release the screws (1) of the oil return line.
- Unlock and disconnect the plug connections (2) and (3).
- Pull off the vacuum hose (4) carefully.



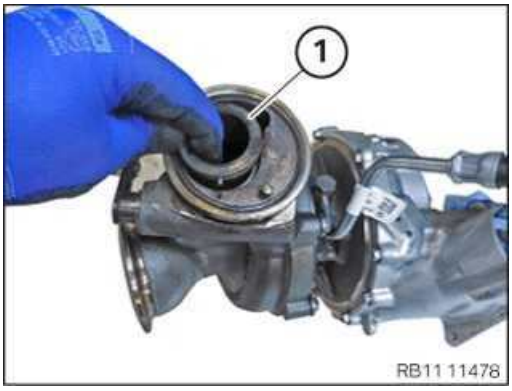
- Undo the bolt (1) of the oil feed line.
- Loosen screw (2).



- Loosen screw (1).
- Remove the V hose clamp.
- Guide the low-pressure stage turbocharger out towards the top and remove.



- Remove seals (1), (2) and (3).



- Remove the spacer ring (1).

52 – Removing the high-pressure stage exhaust turbocharger

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WARNING

Hot surfaces.

Risk of burning!

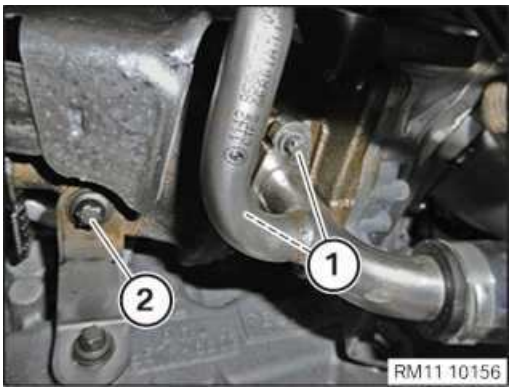
- Perform all work only on components that have cooled down.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

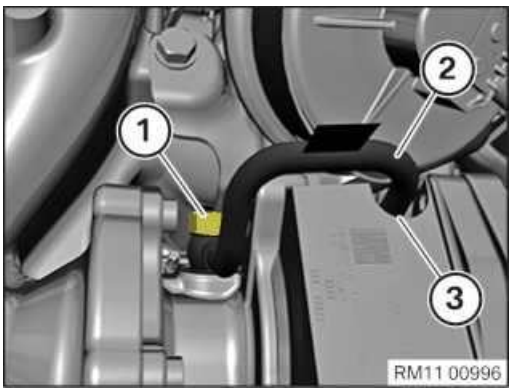
- Remove and install heavy components with the aid of another person/other persons.



- Unscrew the bolts (1) on the oil return line .
- Loosen screw (2).

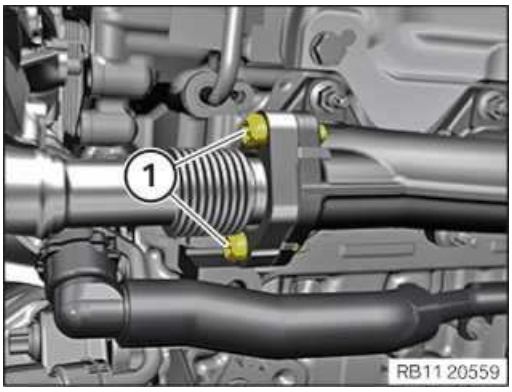


- Release screw (1) from the right wheel arch.

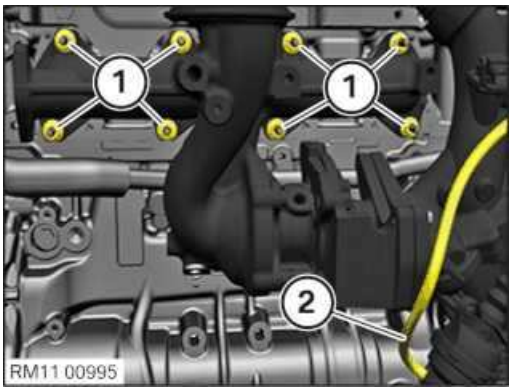


- Unscrew the banjo bolt (1).
- Guide out oil feed line (2) from holder (3).

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- Loosen screws (1).



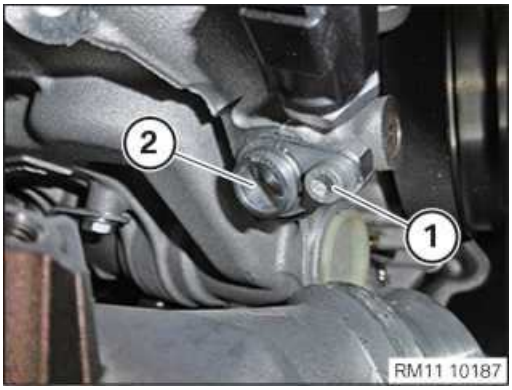
- Pull off the vacuum hose (2).
- Loosen nuts (1).
- Guide out the exhaust manifold and the high-pressure stage exhaust turbocharger to the top and remove them.

MAIN WORK

53 – Removing the central piston cooling relay valve

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Loosen screw (1).

RISK OF DAMAGE

Contaminant or foreign body.

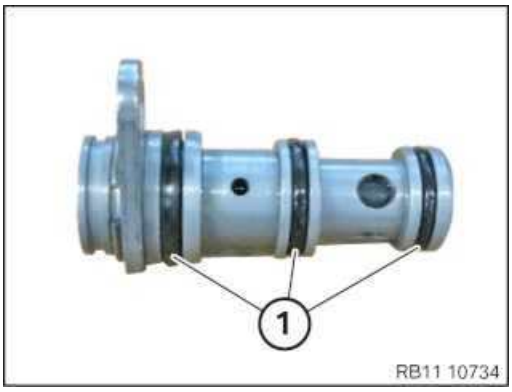
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

- Remove the relay valve (2) for the central piston cooling.

54 – Installing the relay valve for central piston cooling

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- Renew the seals (1) with the special tool **0 496 714 (00 9 030)**.

  Parts: Seals



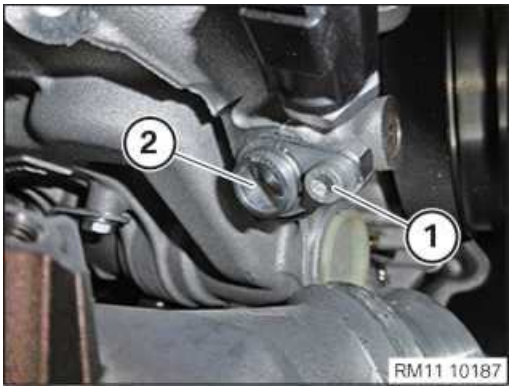
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

- Clean sealing surface.



- Install the relay valve (2) for central piston cooling.
- Tighten down screw (1).

Central piston cooling valve to crankcase

M6x16		Tightening torque	8 Nm

POSTPROCESSES

55 – Prepare for the installation of the exhaust turbocharger

- Check the oil feed lines and the oil return lines for contamination or obstruction, clean or renew if necessary.
- If the oil feed lines and/or oil return lines are heavily contaminated, we recommend changing the engine oil and the oil filter.
- If installed: Check the coolant feed lines and the coolant return lines for the exhaust turbocharger for contamination or obstruction, clean or renew if necessary.
- Check that the screw connections and the plug connections of all the lines are correct.
- Check air cleaner for contamination and clean or renew as needed.
- Check correct functioning of crankcase ventilation.
- Replace all gaskets.

  Parts: Seals

56 – Installing the high-pressure stage exhaust turbocharger

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CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

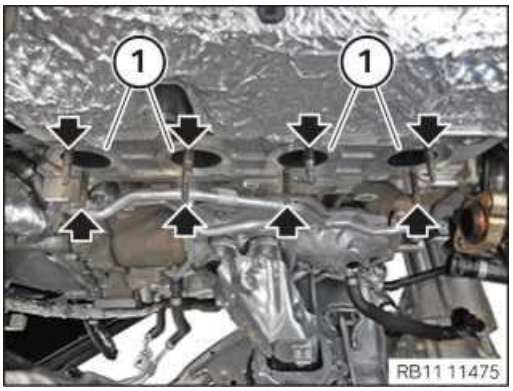
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

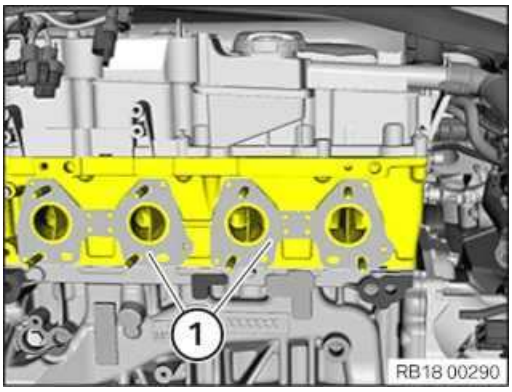


- Clean the sealing surfaces (1) on the cylinder head using special tool **0 495 102 (11 4 470)**.
- Check the stud bolts (arrows) on the cylinder head for correct fit.



- Clean the sealing surfaces on the exhaust manifold using special tool **0 495 102 (11 4 470)**.

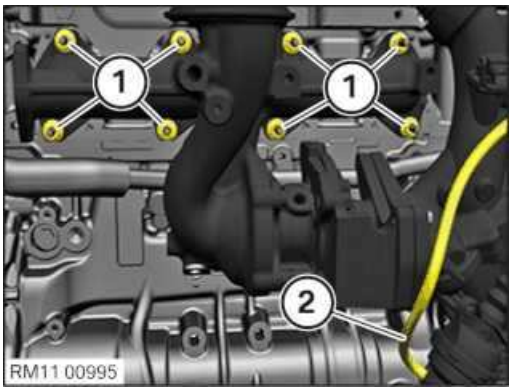
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- Renew gasket (1).

  Parts: Gasket

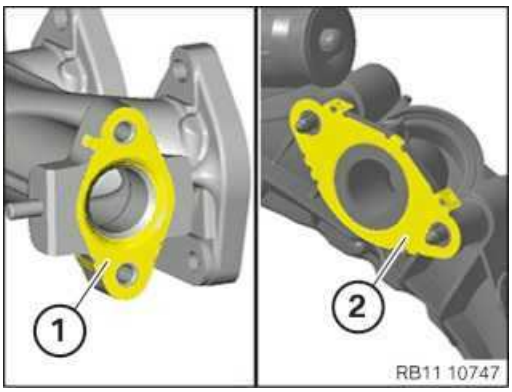
- Install new gasket (1).



- Feed in and install the exhaust manifold and the high-pressure stage exhaust turbocharger.
- Tighten nuts (1).

  Parts: Nuts

- Connect vacuum hose(2).

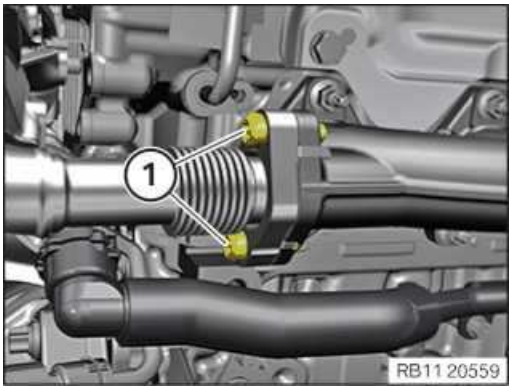


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

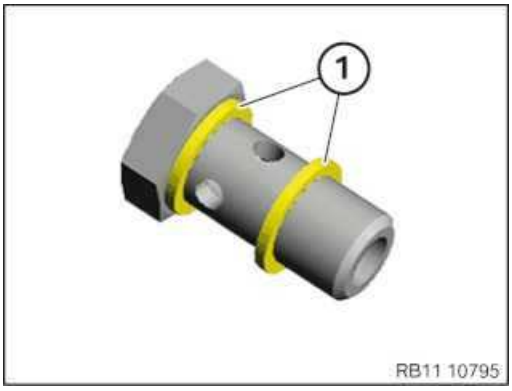
  Parts: Gasket



- Tighten the screws (1).

Exhaust-gas recirculation cooler to exhaust manifold

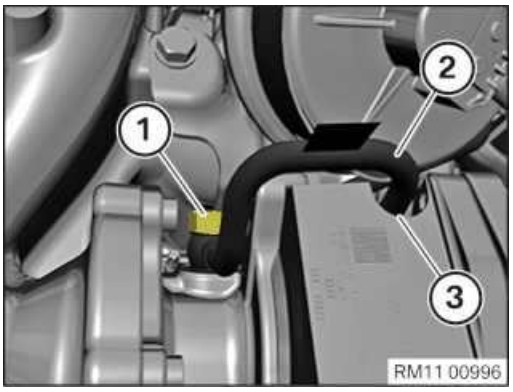
M8x28	Replace screws	Tightening torque	32 Nm



- Renew sealing rings (1) of banjo bolt.

  Parts: Sealing ring

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- Guide the oil feed line into the holder (3) and install it.
- Tighten down screw (1).

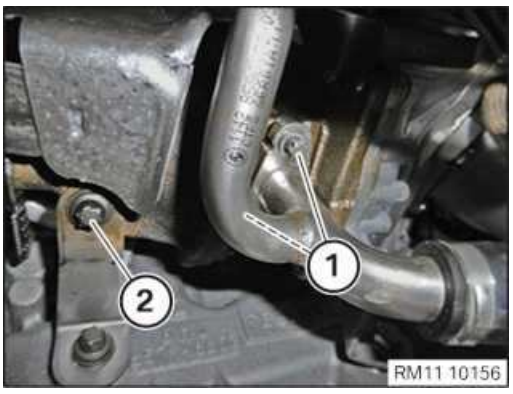


- Tighten bolt (1) from the right wheel arch.



- Renew seal (1) of oil return line.

  Parts: Gasket



- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

57 – Installing the low-pressure stage turbocharger

RISK OF DAMAGE

Damage to the surface.

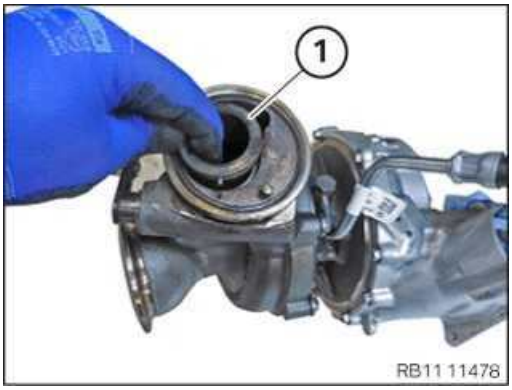
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

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TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.



- Check the spacer plug (1) for damage, renew if necessary.

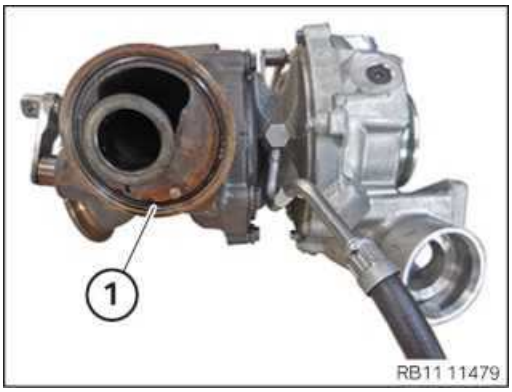
  Parts: Spacer ring
- Insert and install the spacer ring (1).
- Position spacer ring (1) correctly.



- Renew gasket (1).

  Parts: Gasket
- Position the seal (1).
- Renew the sleeve(2).

  Parts: Holding sleeve



- Renew sealing ring (1).

  Parts: Sealing ring
- Affix the sealing rings on the exhaust turbocharger.



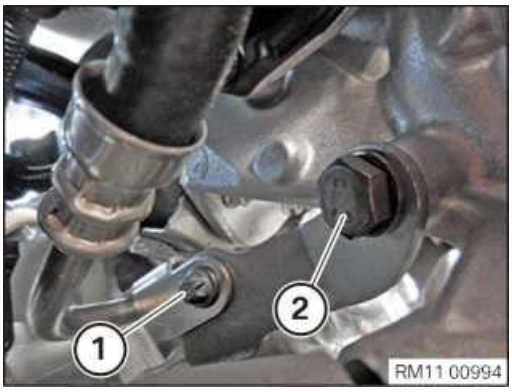
- Insert and install the low-pressure stage exhaust turbocharger on the exhaust manifold .
- Feed in and install V-band clamp .
- Tighten V-band clamp (2).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Screw in nut (1) with 2 **revolutions**.

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- Tighten down screw (1).

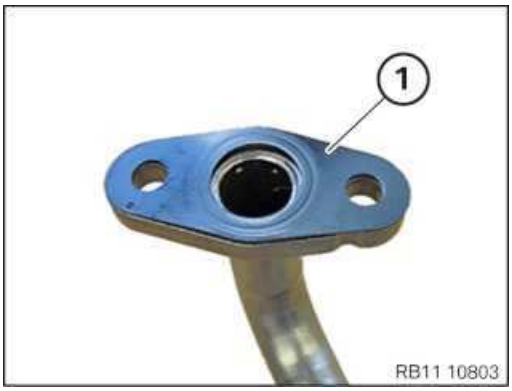
Oil feed line to bracket

Torx screw M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

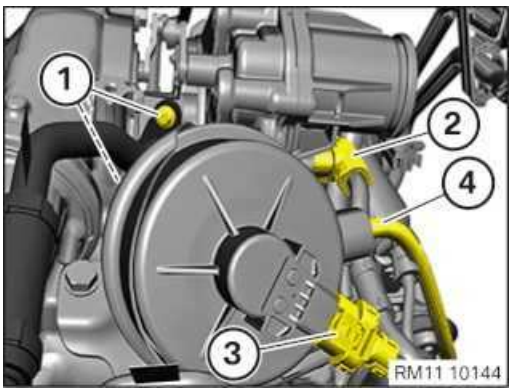
Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm



- Renew seal (1) on the oil return line.

  Parts: Gasket



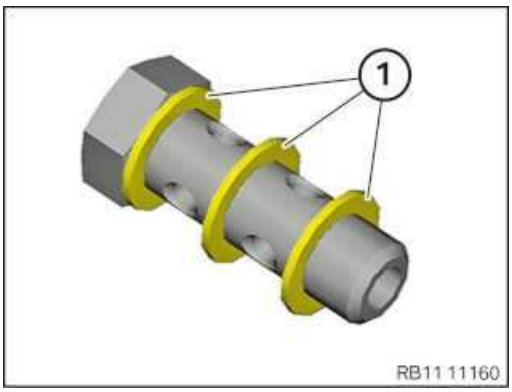
- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

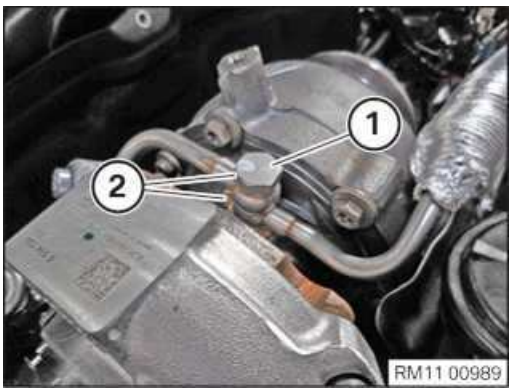
M6x12		Tightening torque	8 Nm

- Connect and lock connectors (2) and (3).

  The locks must engage audibly.
- Connect vacuum hose (4).



- Renew banjo bolt and sealing rings (1).
- **Parts:** Banjo bolt, sealing rings



- Install sealing rings (1).
- Tighten the banjo bolt (1).
- Ensure that the lines do not rest against the adjacent components.

58 – Installing heat shield on exhaust turbocharger at bottom

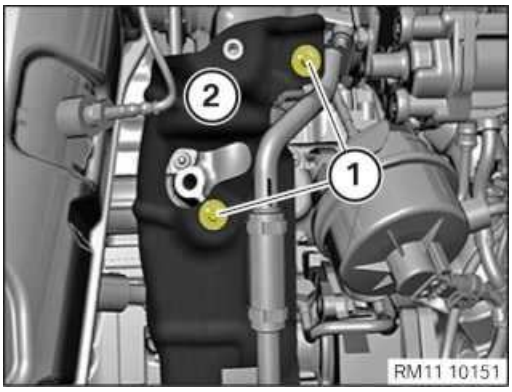
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WARNING

Hot surfaces.

Risk of burning!

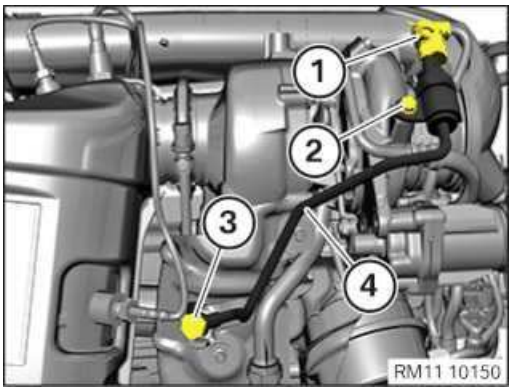
- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (2).
- Tighten the bolts (1) on the heat shield .

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm



- Position the exhaust gas pressure pipe (4).
- Hand-tighten the bolt (2).
- Renew sealing rings on the banjo bolt (3).

  Parts: Sealing ring
- Tighten the banjo bolt (3).

Banjo bolt for exhaust pressure pipe to exhaust manifold

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

- Tighten down screw (2).

Standard screw connection M6

M6		8 Nm

- Connect connectors (1) and lock.

  Lock must audibly engage.

59 – Installing the right charge air duct between the exhaust turbocharger and the charge air cooler

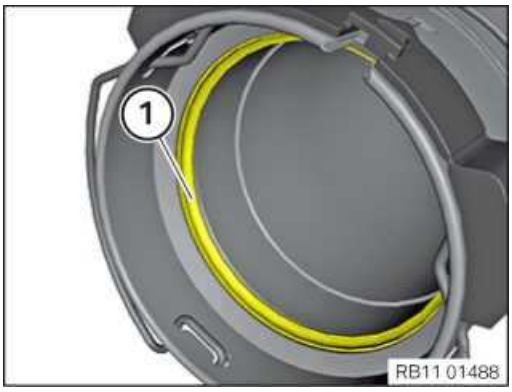
RISK OF DAMAGE

Damage to the exhaust turbocharger.

A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.

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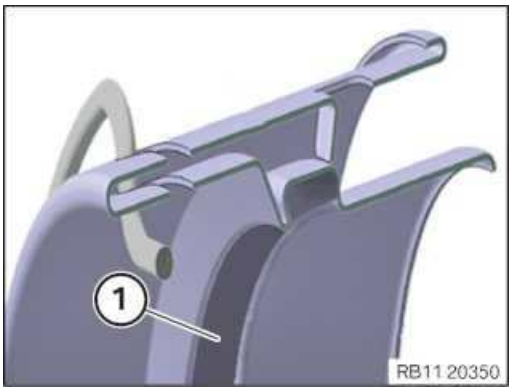
- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Gasket

▶ **Replace damaged gasket**

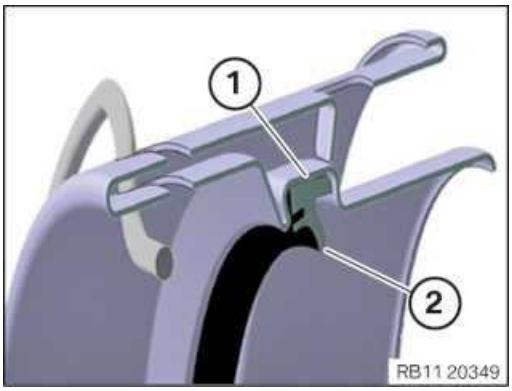
TECHNICAL INFORMATION

Do not use pointed or sharp-edged tools for the installation and/or removal.



- Remove damaged seal.
- Clean gasket groove (1) with a dry towel.

  The gasket groove (1) must be clean.



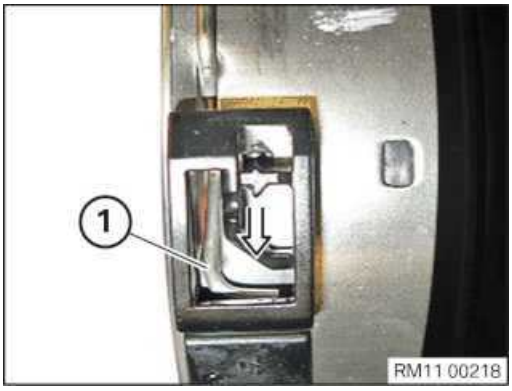
- Renew gasket.

  Parts: Gasket
- Install seal dry without lubricant or mounting agent.

TECHNICAL INFORMATION

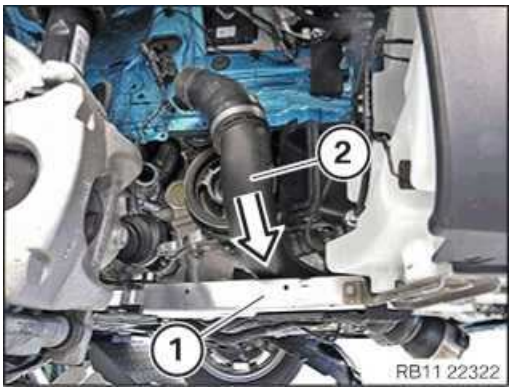
Incorrect assembly is possible. Ensure correct installation position.

- Feed in and install the seal.
- Make sure the seal is correctly installed in the gasket groove (1).
- Make sure that the sealing lip (2) is pointing downwards (see figure).

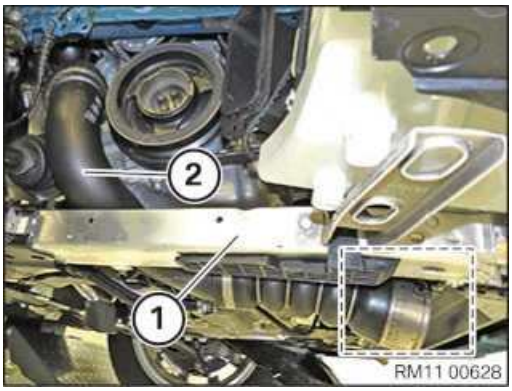


- Detach the locks (1) in the direction of the arrow from the brackets.
- Ensure that the locks (1) engage audibly.

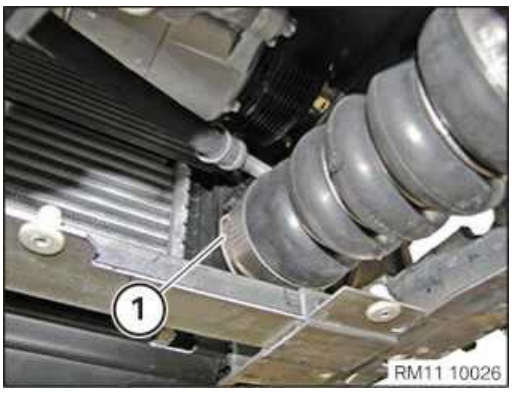
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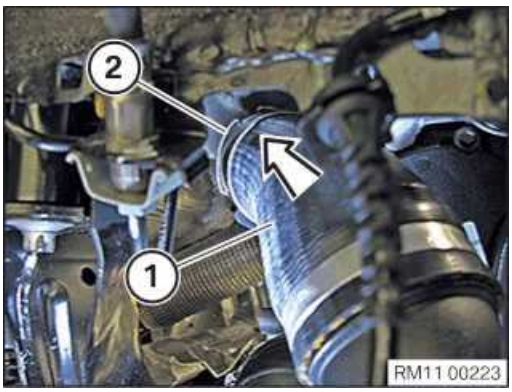
- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed in the charge air duct (1) in the **direction** of arrow between the side member and the deformation element and position.



- Pull the adapter of the front axle support (1) downwards to the front right.
- Position the charge air duct (2) in **marked** area on the charge air cooler.

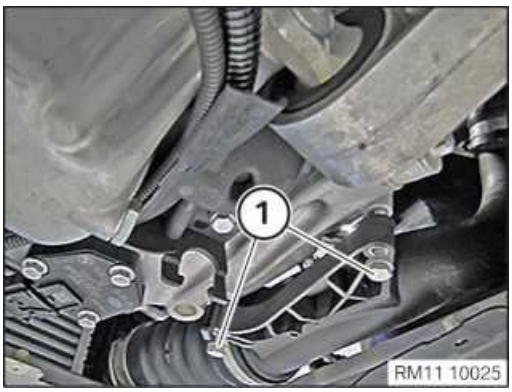


- Feed in and install the charge air duct (1) on the charge air cooler .
- Make sure the charge air duct (1) engages audibly on the charge air cooler.



- Feed in and install charge air duct (1) in the **direction** of the arrow on exhaust turbocharger.

  The locks (2) must engage audibly.

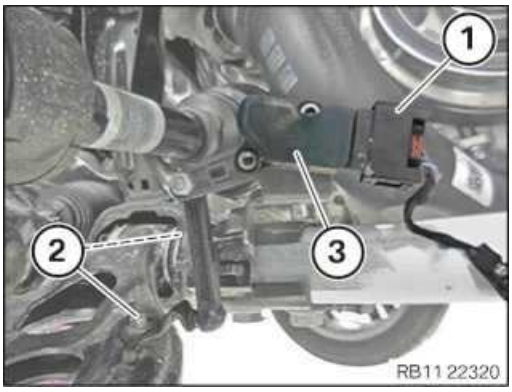


- Tighten the screws (1).

Charge air duct to oil sump

M6		Tightening torque	8 Nm

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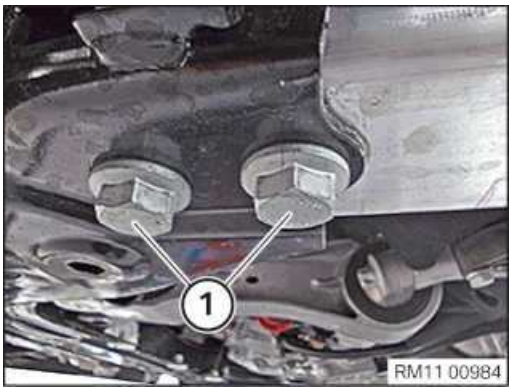
- **If installed:**
- Feed in and install the ride height sensor (3).
- Tighten the screws (2).

Ride height sensor holder to front axle support

M6		Tightening torque	8 Nm

- Connect and lock the connector (1).

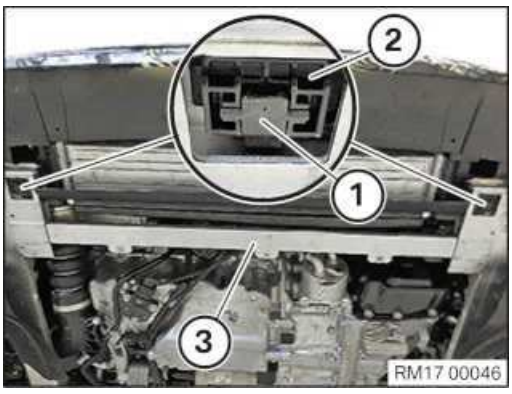
  The connector (1) must engage audibly.



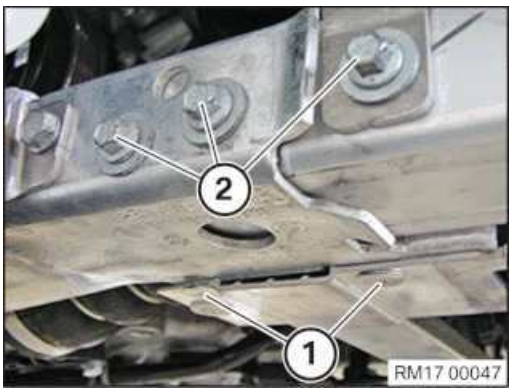
- Tighten the screws (1) on the adapter of the front axle support.

Adapter, front axle support to front axle support

		Tightening torque	100 Nm



- Guide in cross connection (3) and install.
- Guide in locks (2) and install.
- Lock the locking pins (1).
- Ensure that the locking pins (1) audibly engage.



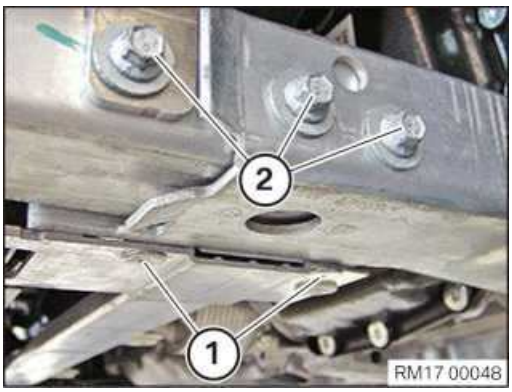
- Tighten the bolts (2) at the front left.

Cross connection to front axle support

M6		Tightening torque	12 Nm

- Renew the blind rivet (1).

  Parts: Blind rivet
- Mount the blind rivets (1) at the front left.



- Tighten the bolts (2) at the front right.

Cross connection to front axle support

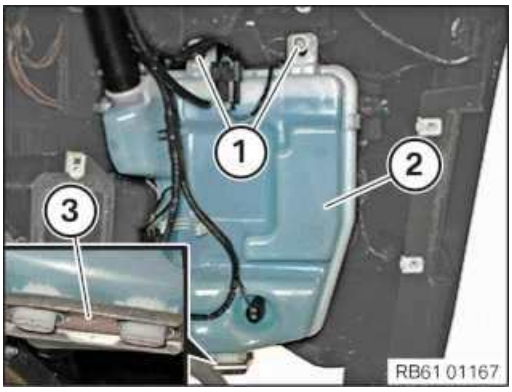
M6		Tightening torque	12 Nm

- Renew the blind rivet (1).

  Parts: Blind rivet
- Mount the blind rivets (1) at the front right.

60 – Install the washer fluid reservoir in the fixture

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- Feed washer fluid reservoir (2) into the mounting (3) and install.
- Tighten the screws (1).

Washer fluid reservoir to body

M6x20		Tightening torque	8 Nm

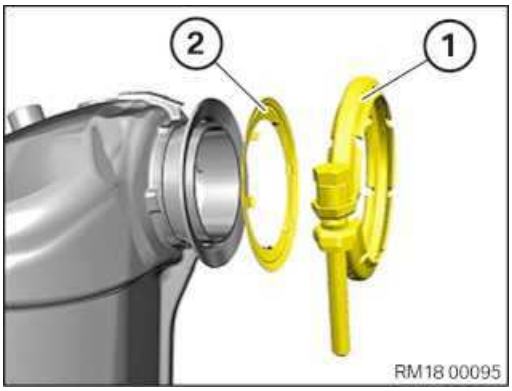
61 – Installing the diesel particulate filter

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



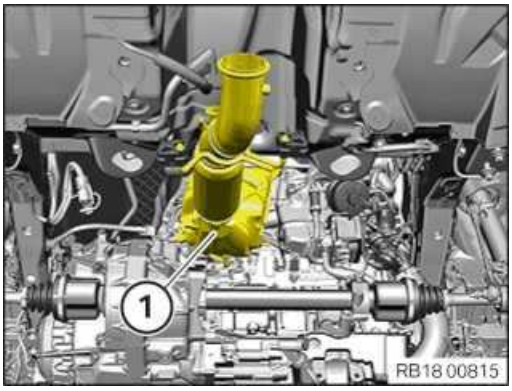
- Renew the V-clip (1).

  Parts: V-band clamp
- Renew the gasket (2).

  Parts: Gasket

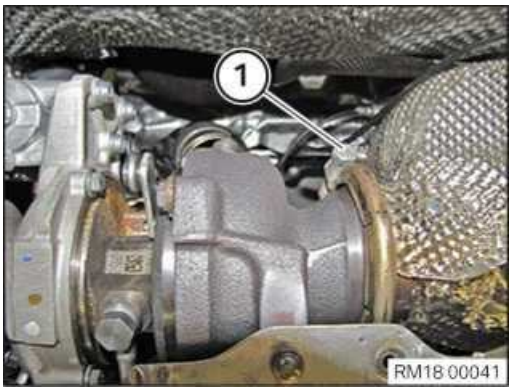


- Before installing the diesel particulate filter: Mount fitting aid (1) for the flexible tube.



- Carefully insert and install the diesel particulate filter (1).

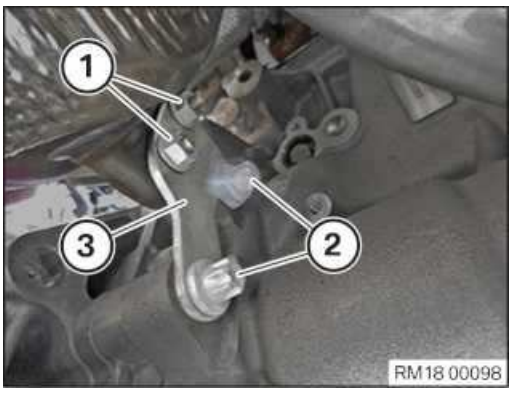
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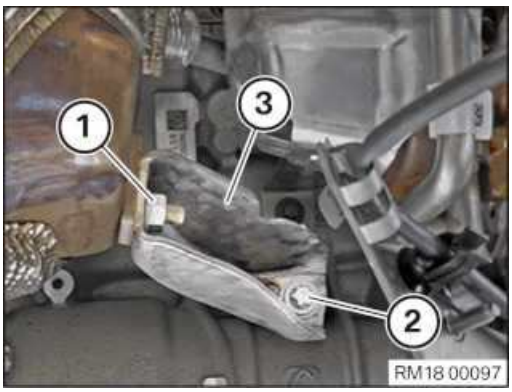
- Feed in and install V-band clamp (1).
- Make sure that the seal between the diesel particulate filter and the exhaust turbocharger is installed correctly.
- Align the diesel particulate filter on the exhaust turbocharger.
- Position V-clip (1).
- Hand-tighten the V-clip (1).



- Tighten nuts (1) by hand.



- Install holder (3).
- Hand-tighten the bolts (2).
- Tighten nuts (1) by hand.

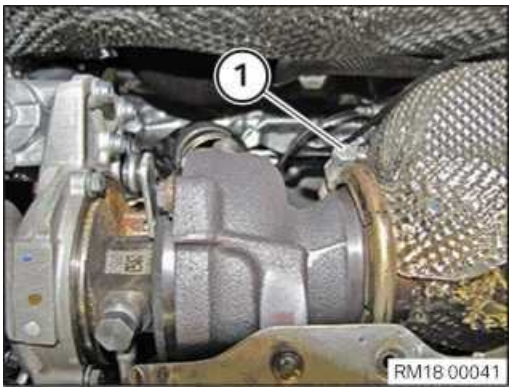


- Install holder (3).
- Tighten the nut (1) hand-tight.
- Hand-tighten the bolt (2).



- Remove fitting aid (1) for the flexible tube.

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- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

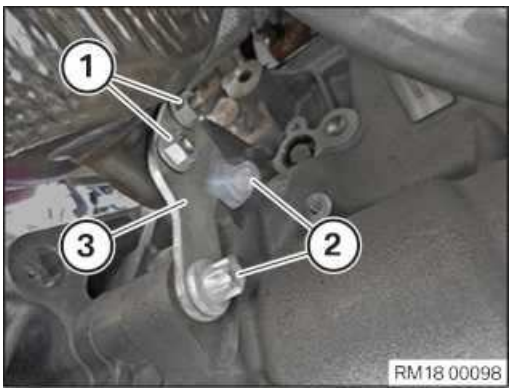
V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm



- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screws (2).

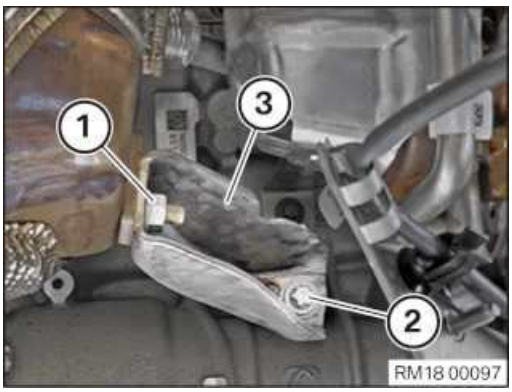
Diesel particulate filter holder to gearbox

M12x75		Tightening torque	66 Nm

- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screw (2).

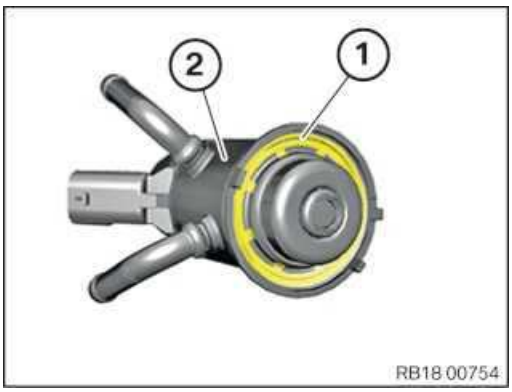
Diesel particulate filter bracket to crankcase

M10x35		Tightening torque	38 Nm

- Tighten nut (1).

Diesel particle filter to holder

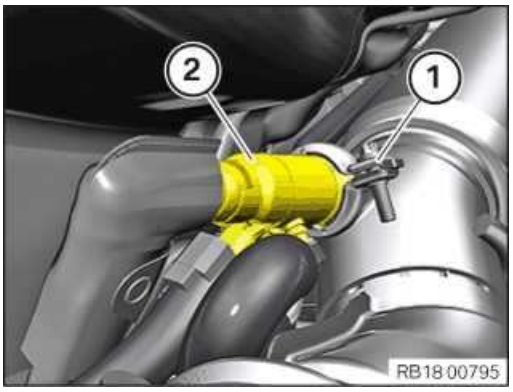
M8 hexagon nut		Tightening torque	19 Nm



- Renew sealing ring (1) of the SCR metering module (2).

  Parts: Sealing ring

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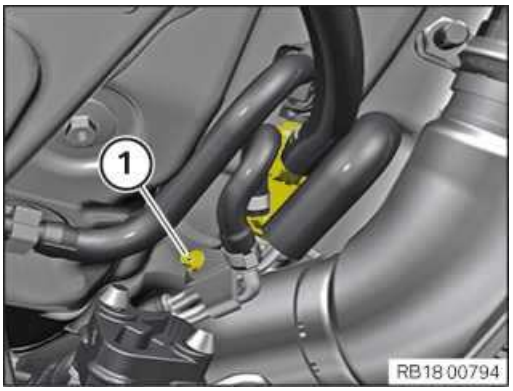


- Insert and install the SCR metering module (2).
- Renew the V-clip (1).

  Parts: V-band clamp
- Tighten V-band clamp (1).

SCR metering module V-clip to exhaust system

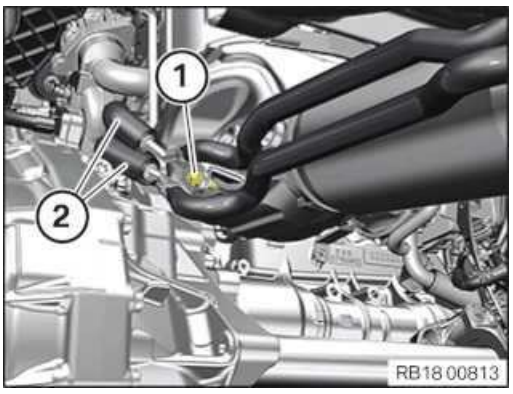
V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm



- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm

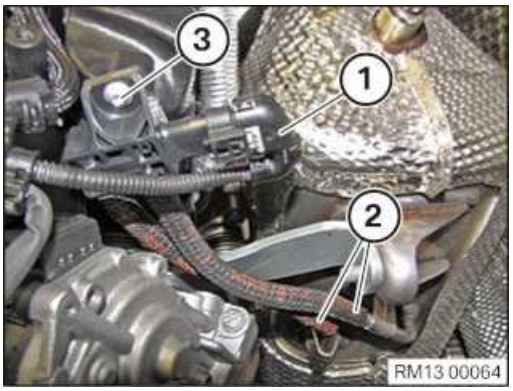


- Thread in and install coolant line (2) of the SCR metering module.
- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm

▸ **Installing differential pressure sensor**



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

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TECHNICAL INFORMATION

New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

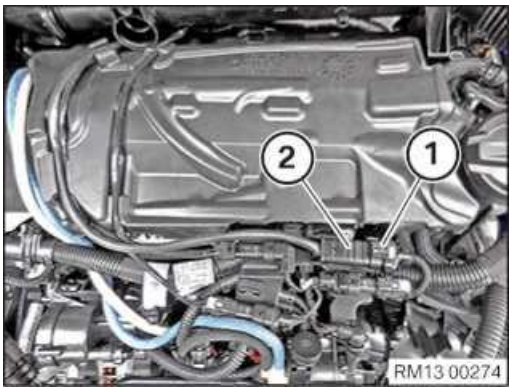
For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue



- Feed in front oxygen sensor (1) and install.
- Tighten front oxygen sensor (1) using special tool .

Control sensor

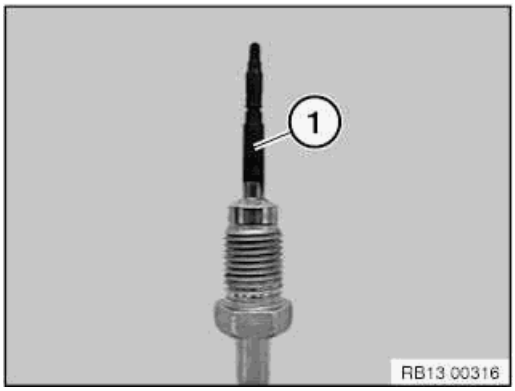
Control sensor		Tightening torque	50 Nm



- Lay and secure cable of oxygen control sensor.
- Secure the connector (2) to the holder.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

63 – Install the exhaust-gas temperature sensor on the diesel particulate filter



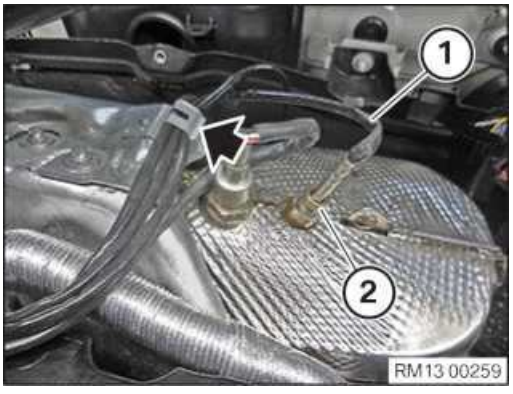
RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

- Check the gauge tip (1) for damage and renew the exhaust temperature sensor as needed.



- Feed in and install the exhaust temperature sensor (2).
- Tighten the exhaust temperature sensor (2).

Exhaust temperature sensor to diesel particulate filter

Exhaust-gas temperature sensor		Tightening torque	28 Nm

- Insert and install cable (1) of the exhaust temperature sensor in the clamp (arrow).

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- Lay and fasten the cable of the exhaust gas temperature sensor.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

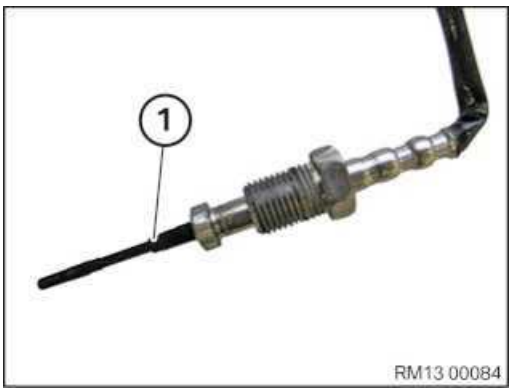
64 – Installing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

RISK OF DAMAGE

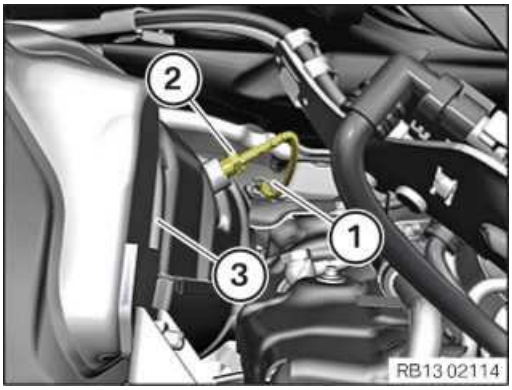
Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.



- Make sure the gauge tip (1) is not damaged during installation.

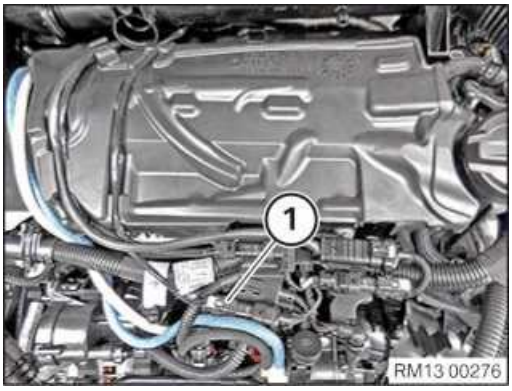


- Guide the exhaust temperature sensor (2) into diesel particulate filter (3) and install.
- Tighten the exhaust temperature sensor (2) with conventional tools .

Exhaust temperature sensor to diesel particulate filter

Exhaust-gas temperature sensor		Tightening torque	28 Nm

- Insert and install the cable of the exhaust temperature sensor (2) in the clamps (1).

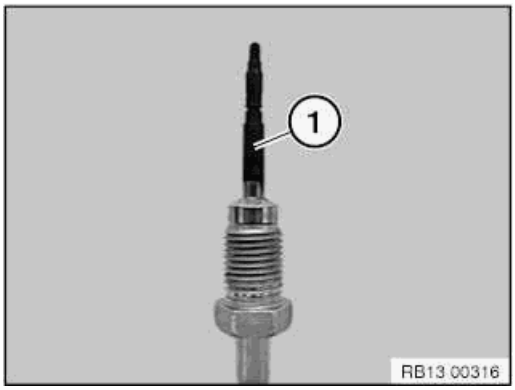


- Lay and fasten the cable of the exhaust gas temperature sensor.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

65 – Installing exhaust temperature sensor on catalytic converter

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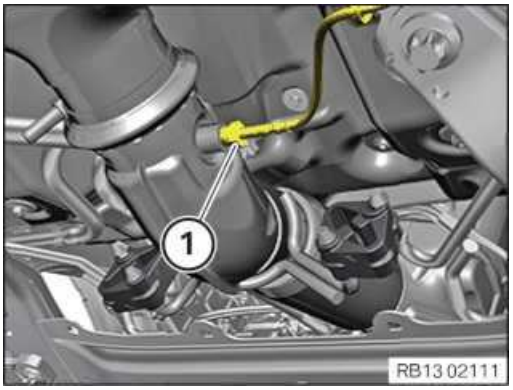
RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

- Check the gauge tip (1) for damage and replace the exhaust temperature sensor as needed.



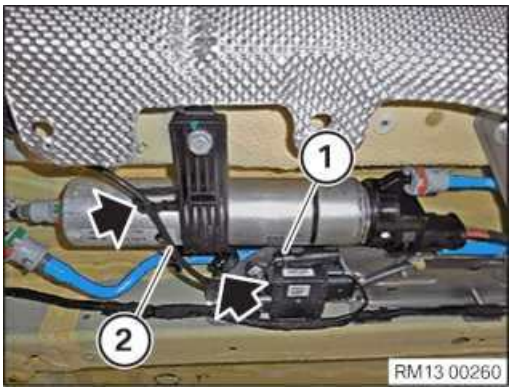
- Feed in and install the exhaust temperature sensor (1).
- Tighten the exhaust temperature sensor (1).

Exhaust-gas temperature sensor to exhaust system

Exhaust-gas temperature sensor		Tightening torque	28 Nm



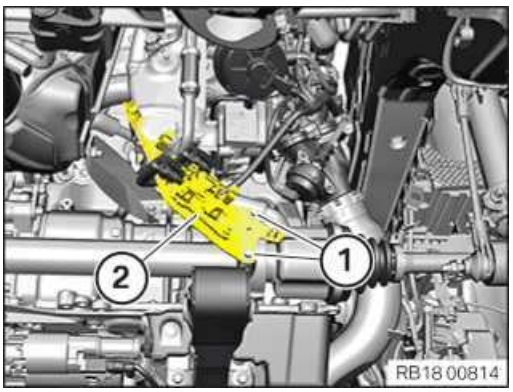
- Secure the cable clips (1).



- Feed cable (2) from exhaust temperature sensor into the clamps (arrows) and install.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

66 – Install holder for oxygen sensor



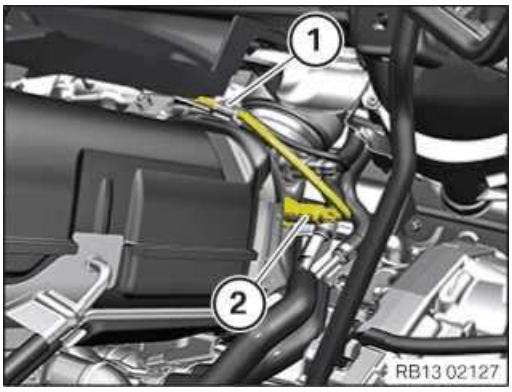
- Insert and install the holder (2).
- Tighten the screws (1).

Oxygen sensor holder to intermediate shaft

Hexagon screw M6x16		Tightening torque	8 Nm

67 – Installing the nitrogen oxide sensor before SCR catalytic converter

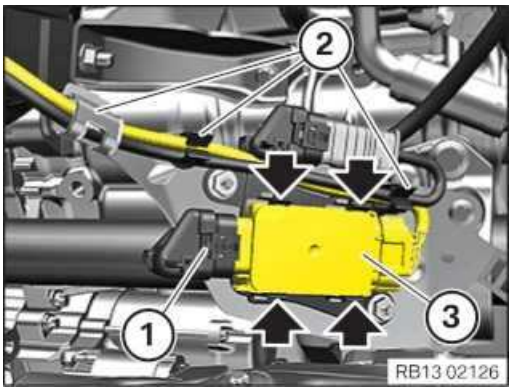
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- Insert nitrogen oxide sensor before the SCR catalytic converter (2) and install.
- Tighten the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

Nitrogen oxide sensor before SCR catalytic converter

Sensor		Tightening torque	50 Nm



- Install and lock the evaluation electronics for the nitrogen oxide sensor (3) (arrows).
- Insert the evaluation electronics cable for the nitrogen oxide sensor (3) into the clamps (2) and install.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

68 – Install the monitoring sensor

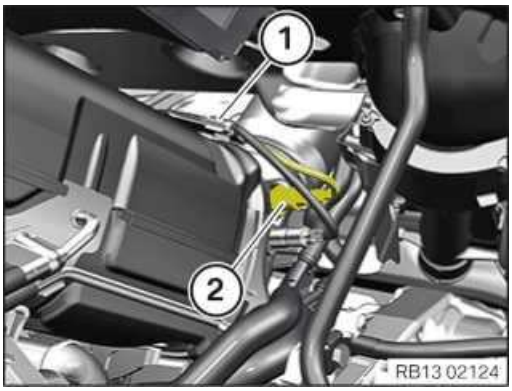
TECHNICAL INFORMATION

New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

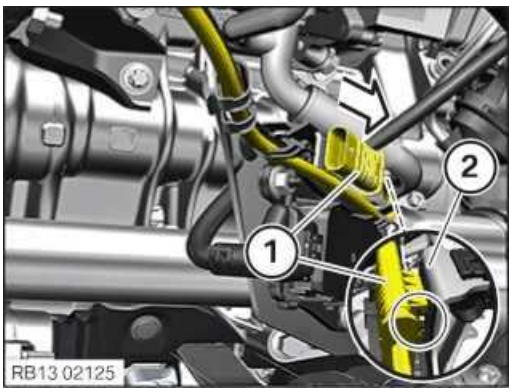


- Feed in the monitoring oxygen sensor (2) and install.
- Tighten the monitoring oxygen sensor (2) with special tool **0 491 074 (11 7 020)**.

Monitoring sensor

Sensor		Tightening torque	50 Nm

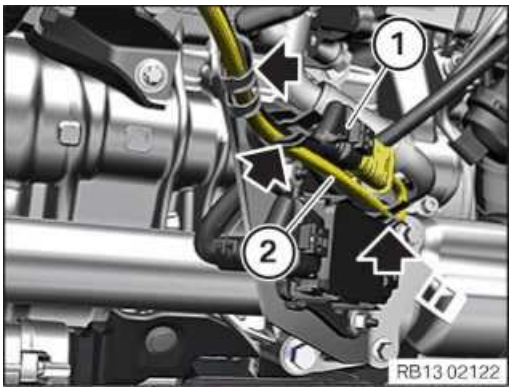
- Insert the cable of the monitoring oxygen sensor (2) into the clamp (1) and secure it.



- Connect the connector (1) with the bracket (2) in the direction of arrow.
- Make sure that the connector (1) is locked correctly in the marked area.

  The connector (1) must engage audibly.

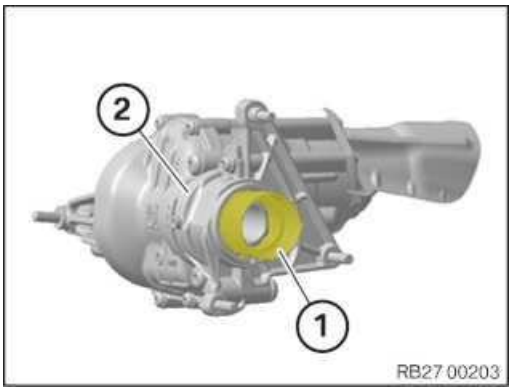
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- Insert and attach the cable of the monitoring oxygen sensor (2) to the clamps (arrows).
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

69 – Install the transfer box (VTG)



- If intermediate shaft (1) gets caught on transfer box (VTG) (2), renew intermediate shaft (1) and the radial shaft seals in the automatic or manual transmission.



- Screw special tool **2 409 025** into the outer radial shaft seal.
- Turn the screw on the special tool **2 409 025** until the outer radial shaft seal has been pulled out.

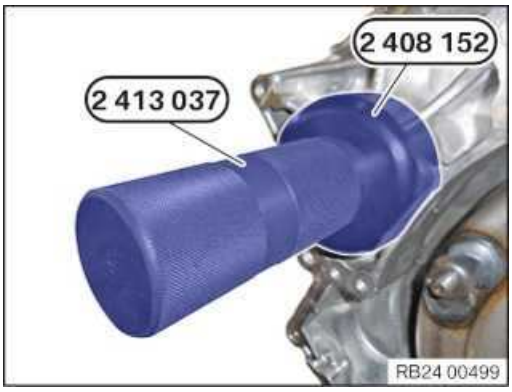


- Insert special tool **2 411 739** into the inner radial shaft seal.

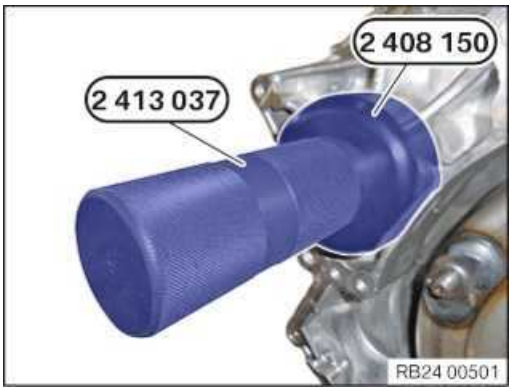


- Screw special tool **2 411 739** into the inner radial shaft seal.
- Turn the screw on the special tool **2 411 739** until the inner radial shaft seal has been pulled out.

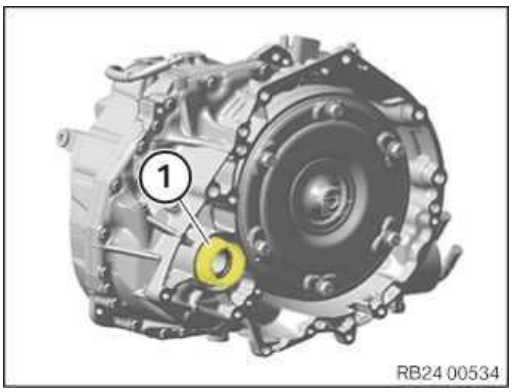
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- Drive in the inner radial shaft seal using special tools **2 408 152** and **2 413 037** up to the limit position.



- Drive in the outer radial shaft seal using special tools **2 413 037** and **2 408 150** up to the limit position.



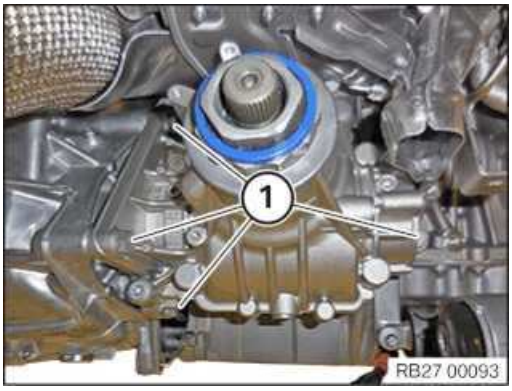
- If necessary, connect the new intermediate shaft (1) to the output flange of the automatic transmission or manual transmission.



- Coat the inside of the output flange (arrows) evenly with approx. 5 g of grease.

Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754

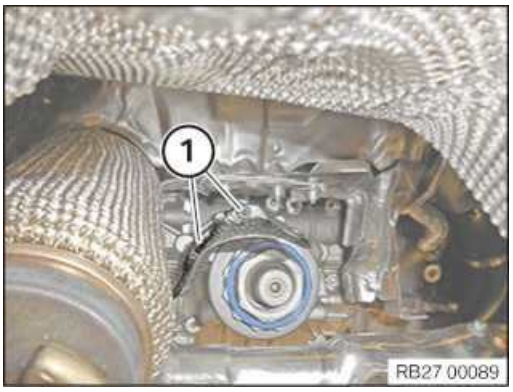


- Install the transfer box (VTG).
- Tighten the screws (1).

Transfer box to transmission

M10		Tightening torque	56 Nm

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- Install heat shield.
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Heat shield to transfer box

M6	Renew screws.	Tightening torque	6 Nm

▸ **Check the transfer box oil level**

RISK OF DAMAGE

Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.



- Check transfer case oil level, correct:
- Open the oil filler plug (1).
- Check transfer box oil level.
- If necessary, top up transmission oil up to the lower edge of the oil filler plug opening (1).

Transmission oil

Technically suitable transfer box and electrical transmission oils	

Main group 27

- Tighten the oil filler plug (1).

Oil filler plug on transfer box (VTG)

M18x1.5		Tightening torque	35 Nm

70 – Install the intermediate shaft with the support tube

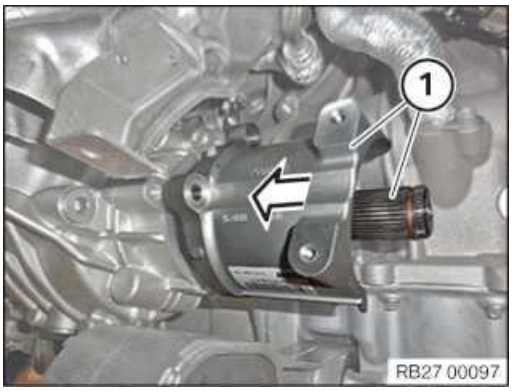


- Coat gearing of the intermediate shaft uniformly with 5 g of grease.

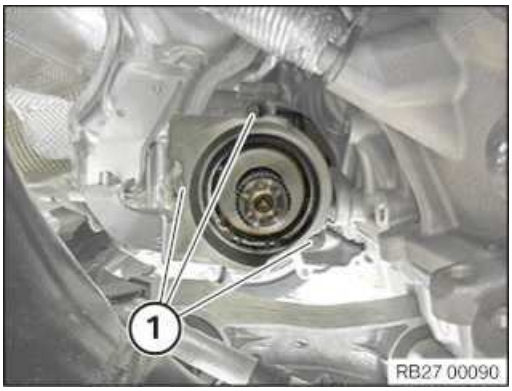
Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754

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- Install the intermediate shaft with support tube (1) in the transfer box.



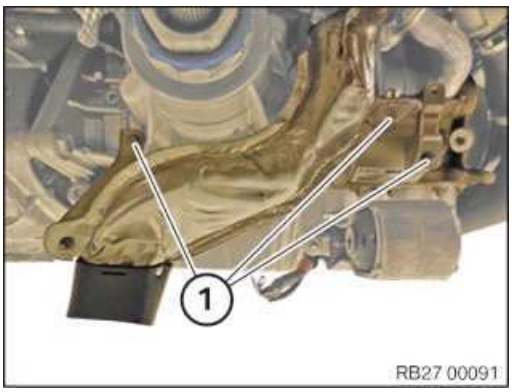
- Position screws (1).

Note: Check for correct screw length! Bolt M8x35 8.8

- Tighten the screws (1).

Intermediate shaft to transfer box

M8x35		Tightening torque	19 Nm



- If installed: Install air duct.
- Tighten the screws (1).

71 – Installing starter motor

CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.



- Insert and install the starter motor .
- Tighten the screws (1).

Starter motor to transmission

M8x45		Tightening torque	19 Nm

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- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

Battery positive lead to starter

M8		Tightening torque	13,5 Nm



- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.

72 – Installing right output shaft partially



- Renew the circlip (1).

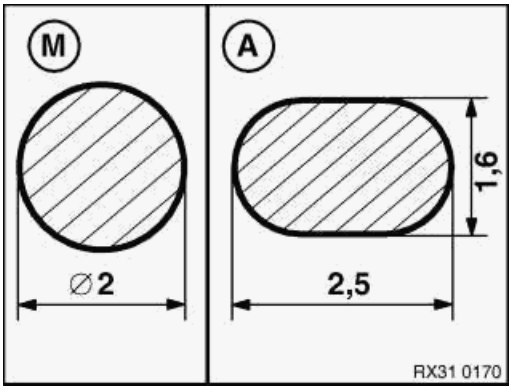
  Parts: Circlip
- Slide output shaft into the transmission as far as the limit position.
- Check for secure seat by levering.

73 – Partially installing the left output shaft



- **With automatic transmission only:**
- Lever out O-ring (1).
- Renew O-ring (1).

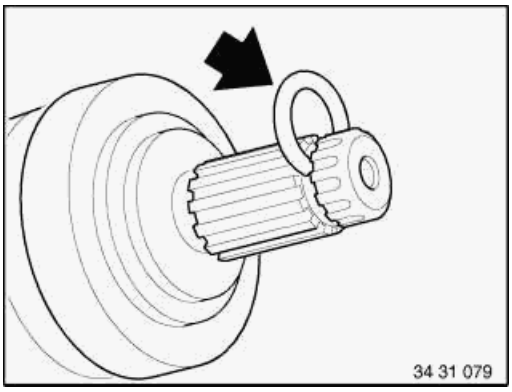
  Parts: O-ring
- Insert new O-ring (1).



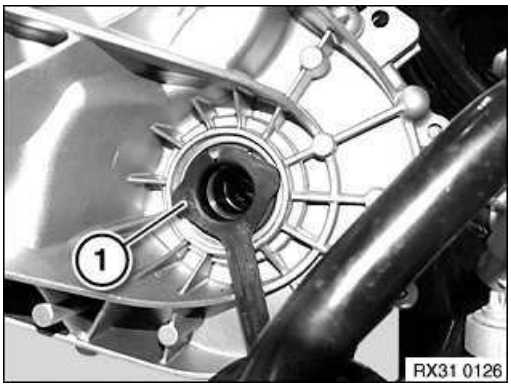
- Do not mix up circlips.

  Different types of output shafts fitted:
  - M: Manual transmission
  - A: Automatic transmission

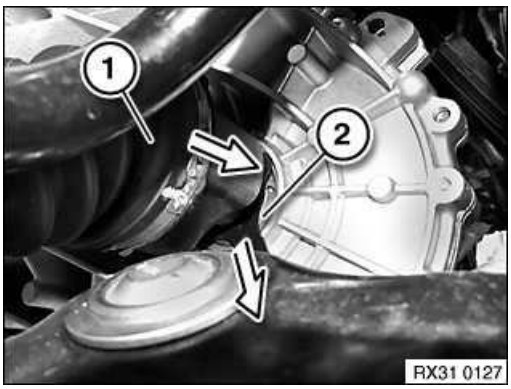
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- Renew circlip (arrow).



- Insert installation protection ring (1) into the radial shaft seal.
- Make sure the tool fits over the lip of the radial shaft seal so there is no damage to sealing ring when the output shaft is inserted.



- Insert output shaft (1) into transmission.
- **Manual gearbox only:** Pull on the handle to remove the installation protection ring (2) and dispose of it.
- Slide output shaft (1) into the transmission as far as the limit position.

  The output shaft (1) must engage audibly.
- Check for secure seat by levering.

74 – Install propeller shaft.

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

RISK OF DAMAGE

Damage to the propeller shaft during installation.

Non-observance of the installation guidelines for the propeller shaft on the rear axle differential may cause severe damage.

- Always renew the recessed nut on the rear axle differential. Screw locking must be available.
- Strictly observe a minimum hardening time of two hours after having screwed in the recessed nut. The hardening time may be longer at lower temperatures.

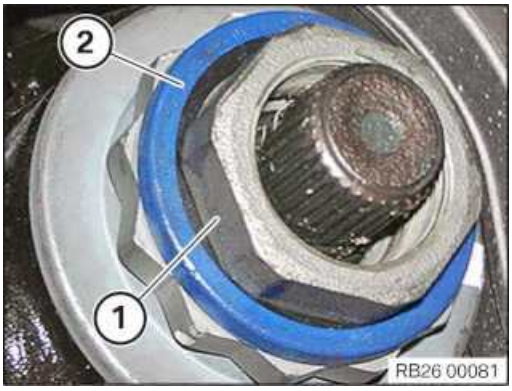
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RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.



- Renew recessed nut (1).

  Parts: Insert nut
- Renew the retaining clip (2) and the seal.

  Parts: Retaining clip, seal
- Insert the seal with the recessed nut (1) and install.
- Insert the retaining clip (2) and install.
- Make sure that recessed nut (1) is screwed in within 5 min.
- Make sure that the hardening time of **minimum** 2 h for the recessed nut is observed.

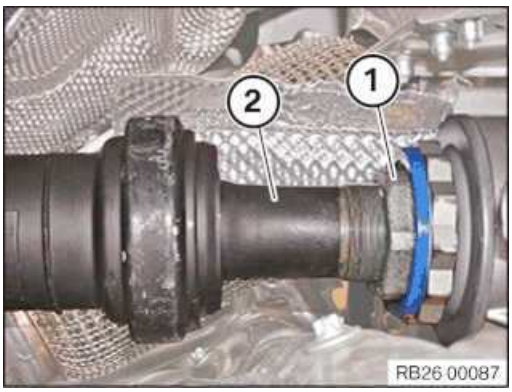
  The hardening time must be extended at lower temperatures.



- Insert the propeller shaft (1) and install.
- Always support the propeller shaft (1) with a conventional jack.

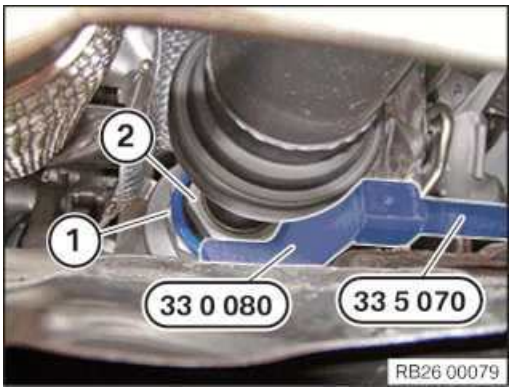


- Hand-tighten the bolts (1).



- Push the propeller shaft (2) against the recessed nut (1) up to the limit position.
- Screw the propeller shaft (2) at least 2 thread starts onto the recessed nut (1) by hand.

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RISK OF DAMAGE

Damage to the transfer box.

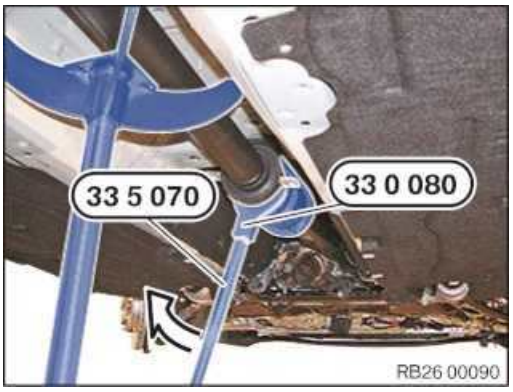
Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.

- Protect the recessed nut (2) on the transfer box from twisting with the special tools **0 495 554 (33 5 070)** and .

  The recessed nut (2) on the transfer box must **not** be used to tighten the propeller shaft.

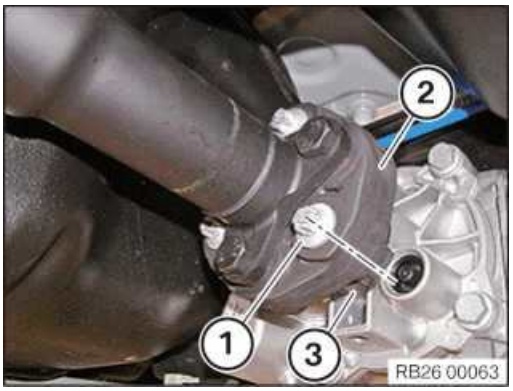
  The double hexagon flange nut (1) must **not** be used for counter support.



- Tighten the front propeller shaft with the special tools **0 495 554 (33 5 070)** and in the direction of the arrow.

Propeller shaft to transfer box

		Tightening torque	80 Nm

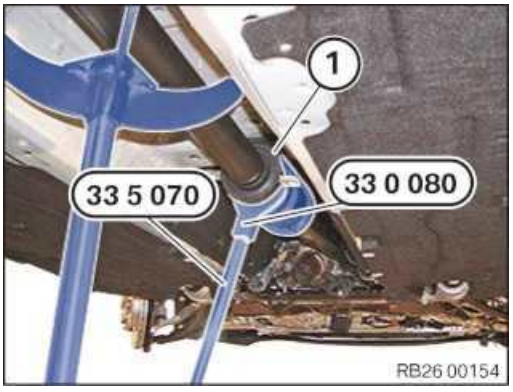


TECHNICAL INFORMATION

Compliance with the following instructions is required to avoid a humming noise from the propeller shaft after refitting the propeller shaft.

- Assemble the screw connection (1) of the flexible disc (2) and the three-hole flange (3) according to the mark.
- Renew screws (1).

  Parts: Bolts
- Hand-tighten the bolts (1).



- Protect the propeller shaft (1) with the special tools **0 495 554 (33 5 070)** and from twisting.

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- Tighten the bolts with the special tools **0 490 504 (00 9 120)** and .

Flexible disc to rear axle final drive

M12x1.5	Renew screws.	Tightening torque	55 Nm 90 °



- Tighten the screws (1).

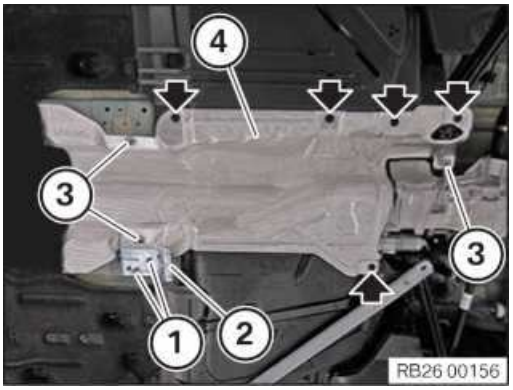
Centre mount to body

M8		Tightening torque	19 Nm



- Guide the special too l out between the front and rear propeller shaft and remove.

75 – Installing the rear heat shield



- Insert and install the heat shield (4).
- Tighten screws (arrows).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

- Tighten nuts (3).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

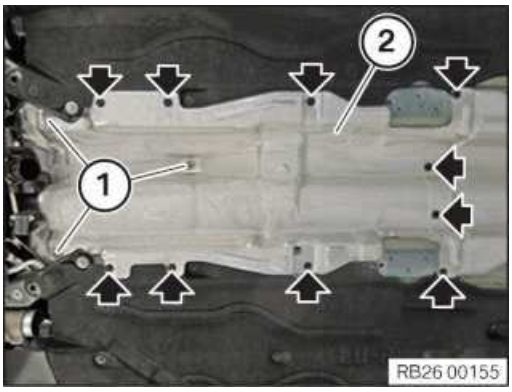
- Insert and install the holder (2).
- Tighten the screws (1).

Bracket to body

M8		Tightening torque	21 Nm

76 – Install the front heat shield

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- Insert and install the heat shield (2).
- Tighten screws (arrows).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

- Tighten nuts (1).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

77 – Install exhaust system

CAUTION

Component with heavy weight.

Danger of injury!

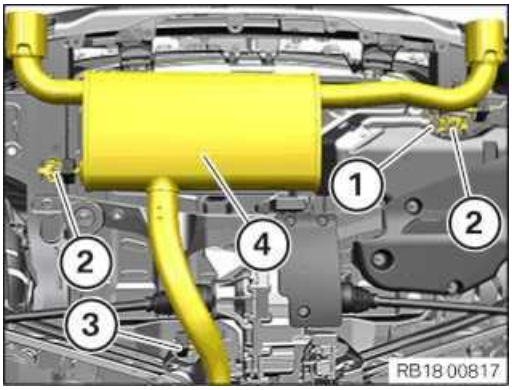
- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Feed in and install the exhaust system (4) with a second person.
- Renew nuts (2).

  Parts: Nuts
- Tighten nuts (2).

Exhaust system to body

M8	Replace nuts.	Tightening torque	19 Nm

- Tighten down screw (1).

Exhaust bracket on body

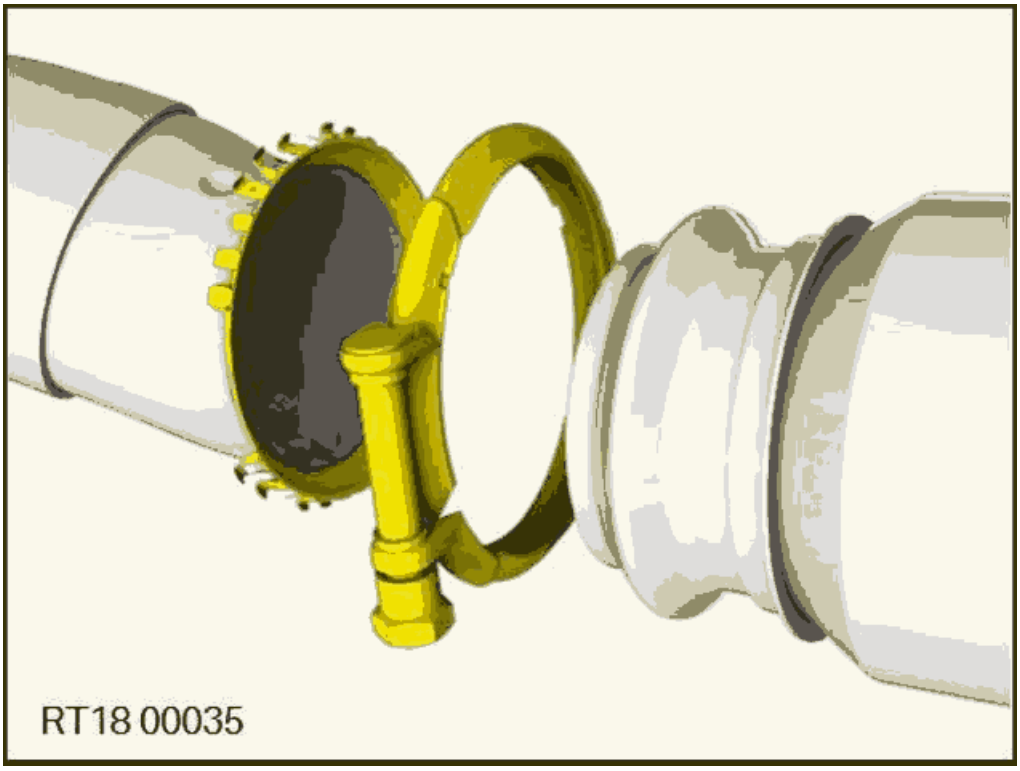
Hexagon screw M8x30		Tightening torque	19 Nm

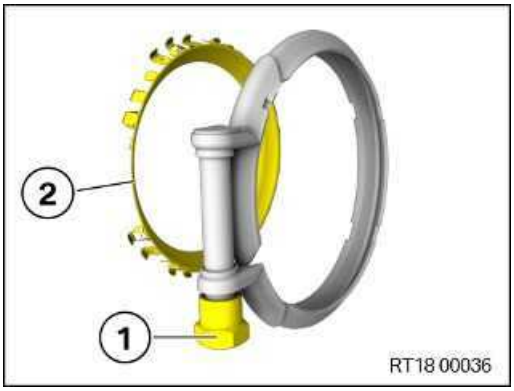
- Check the rubber mount (3) for damage and renew as needed.
- Mount rubber mount (3) on the exhaust system (4).

▸ **Install the V-clip**

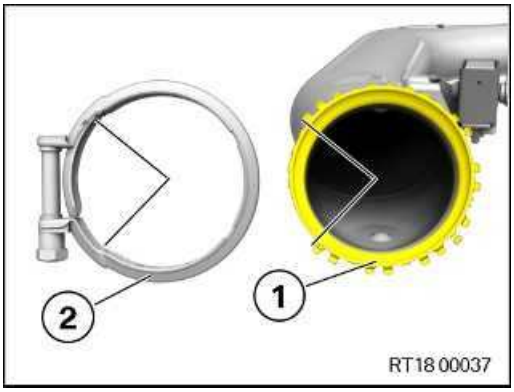
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V-band clamp



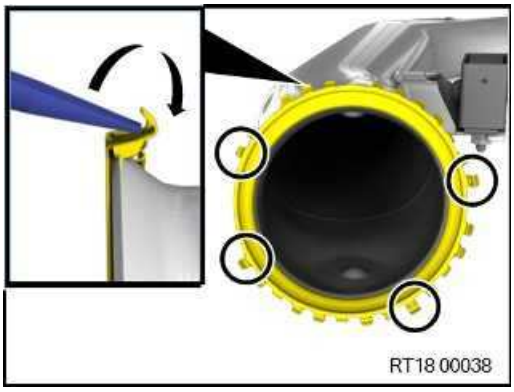


- Unscrew the nut (1) and remove the sealing ring (2).



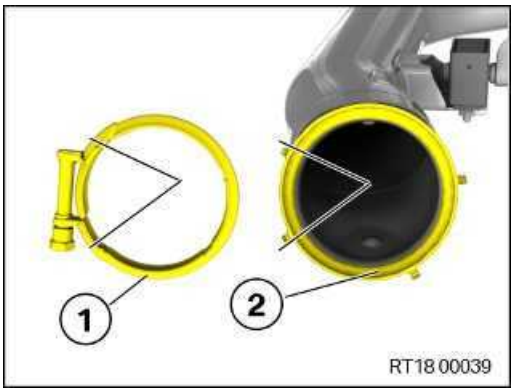
- Renew the V-clip (2).

  Parts: V-band clamp
- Mount the sealing ring (1) on the exhaust system.
- Ensure that the sealing ring (1) for the V-clip (2) is positioned correctly.



- Bend all sheet metal tabs over with a suitable tool, except those in the marked areas.

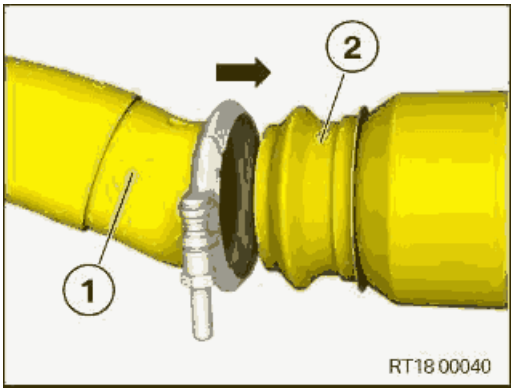
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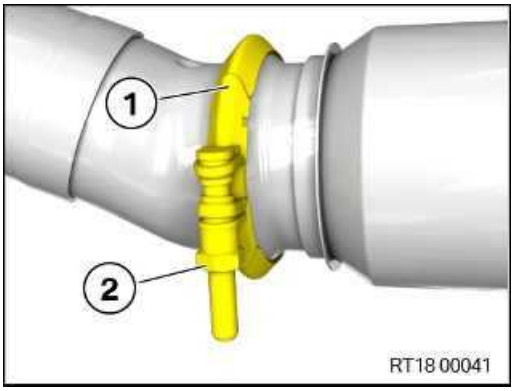
- Mount the V-clip (1) on the sealing ring (2).
- Make sure that the V-clip (1) is positioned correctly on the sealing ring (2).



- Make sure that the V-clip rests against the sheet metal tabs after mounting (marks).



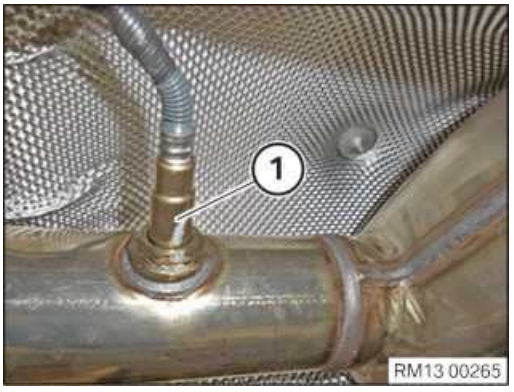
- Connect the exhaust system (1) with the catalytic converter (2) and position correctly.



- Make sure that V-clip (1) is fitted correctly.
- Tighten down screw (2).

V-clip to catalytic converter

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

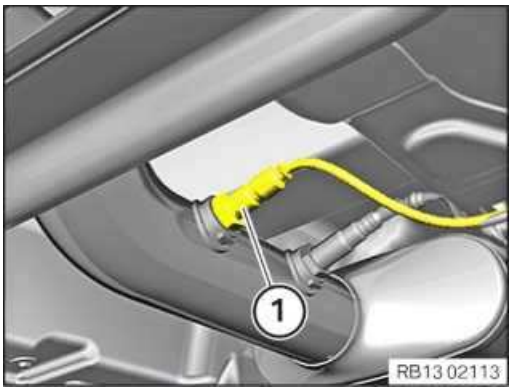


- Feed in, install and tighten diesel particulate sensor (1).

Diesel particulate sensor to exhaust system

Sensor		Tightening torque	50 Nm

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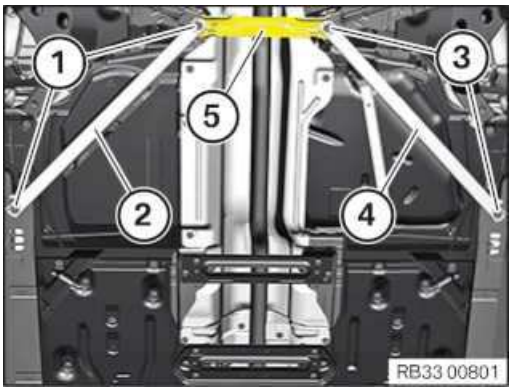


- Feed in, install and tighten nitrogen oxide sensor (1).

Nitrogen oxide sensor downstream of SCR catalytic converter

Sensor		Tightening torque	50 Nm

78 – Install the cross-member with torsion struts



- Insert and install the cross-member (5).
- Thread in torsion strut (4) at right and install.
- Renew screws (3).

  Parts: Bolts
- Tighten down screws (3).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

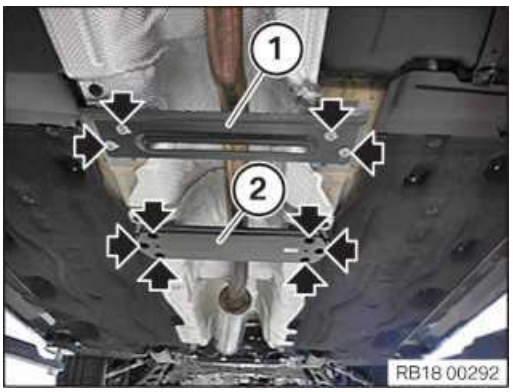
- Guide in and install the left torsion strut (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

79 – Install the connecting support on the tunnel in front and back



- Insert and install connecting supports (2).
- Tighten the screws (arrows) from the connecting support (2).

Front connection carrier to body

M10x18		Tightening torque	56 Nm

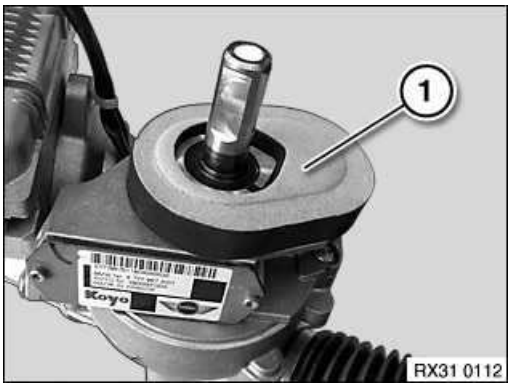
- Insert and install connecting supports (1).
- Tighten the screws (arrows) from the connecting support (1).

Rear connection carrier to body

M8x18		Tightening torque	28 Nm

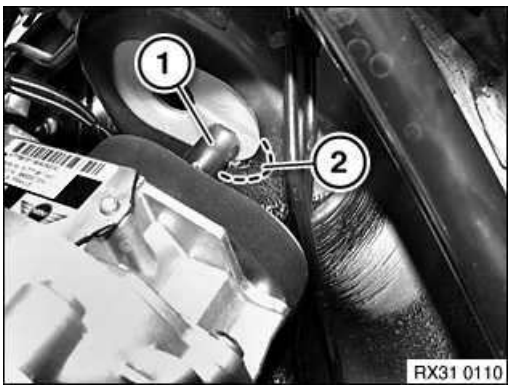
80 – Mount and secure the complete front axle

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- Remove the seal (1).
- Clean surface on steering gear.
- Renew gasket (1).

  Parts: Gasket
- Position the seal (1) and glue it on.

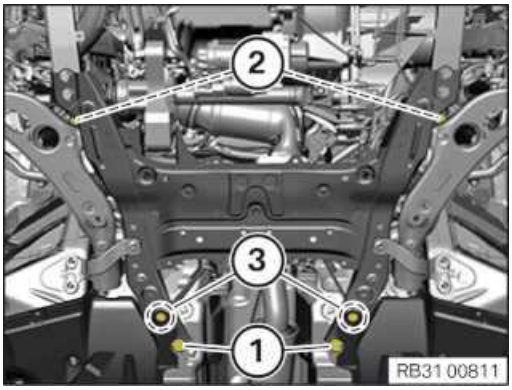


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- Position front axle support.
- Bend underbody panellings in the areas (3) to one side.
- Raise front axle support.
- When raising, insert charge air cooler into the rubber mount of the charge air cooler on cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

Front axle support, front to body

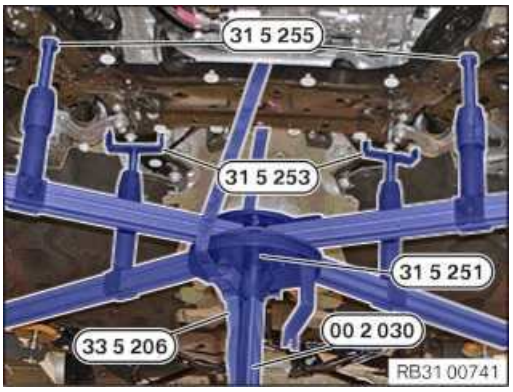
M12 screw	Renew screw.	Tightening torque	108 Nm

- If necessary, tighten the screws in the areas (3).

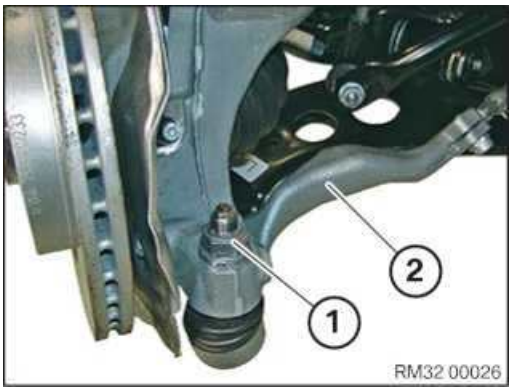
Underbody protection to body

Screw		Tightening torque	3 Nm

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- Remove special tool from special tool .
- Lower universal jack **0 490 133 (00 2 030)** with the special tool and place it to the side.



NOTICE

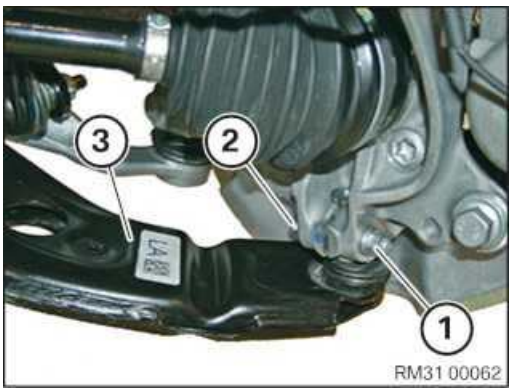
Perform the operations on the left and right side.

- Position the track rod (2) on the swivel bearing .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Track rod end to swivel bearing

M14	Renew nut.	Tightening torque	175 Nm



NOTICE

Perform the operations on the left and right side.

- Position the wishbone (3) on the swivel bearing .
- Renew the bolt (2) and the nut (1).

  Parts: Bolt, nut
- Insert screw (2).
- Tighten nut (1).

Wishbone to swivel bearing

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

81 – Install the mounted parts on the front axle support

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NOTICE

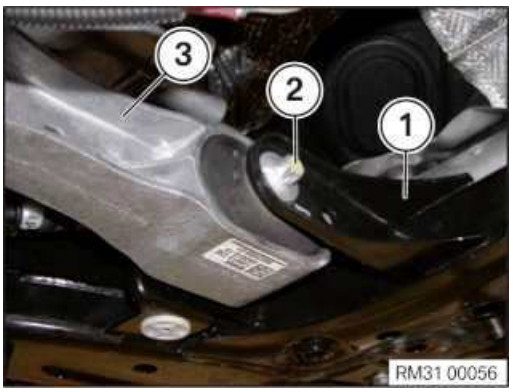
Perform the operations on the left and right side.

- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Holder, wishbone rubber mount, to body

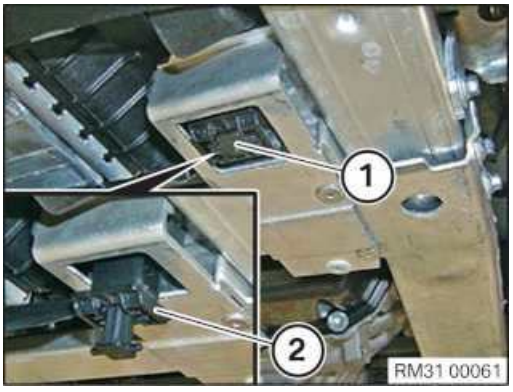
M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °



- Position the engine support (3) on the front axle support (1).
- Tighten down screw (2).

Holder with rubber mount to front axle support

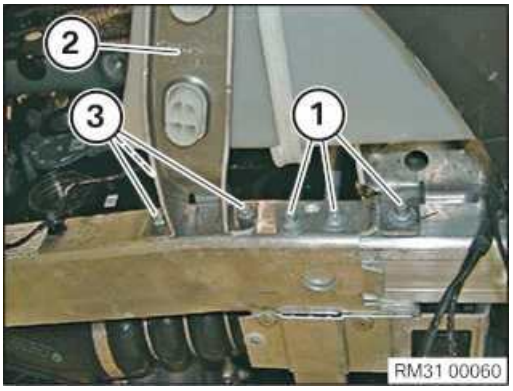
M12 screw		100 Nm



NOTICE

Perform the operations on the left and right side.

- Position the lock (2).
- Lock the bracket (1) of the lock (2) of the holder for the charge air cooler.



- **Only on right side:** Position the holder for the washer fluid reservoir (2).
- Tighten down screws (3).

Washer fluid reservoir holder to front axle support adapter plate

		Tightening torque	10 Nm

NOTICE

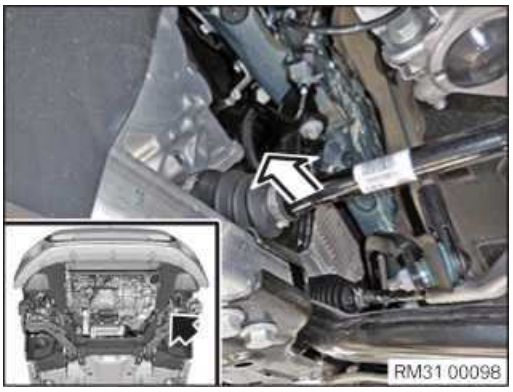
Perform the operations on the left and right side.

- Tighten the screws (1).

Deformation element, bottom, to adapter plate, front axle carrier

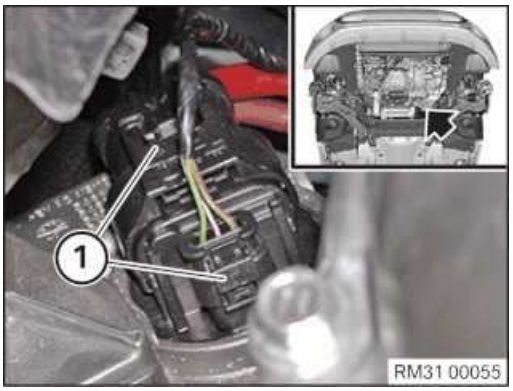
		Tightening torque	11,8 Nm

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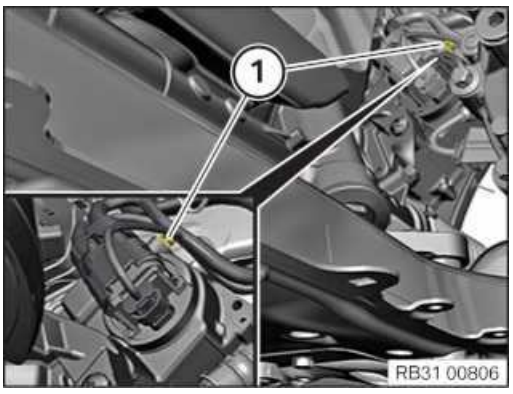


- To connect the connector (see the following step): Connect the connector with the right hand.

  The connectors can be accessed via the left output shaft.

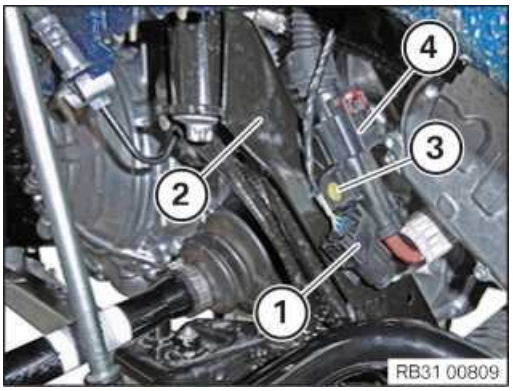


- Connect and lock connector (arrow) (1) with the steering gear.



- Fasten the wiring harness (1) on the steering gear.

▶ **If installed: Fasten the plug connections at the front axle support**



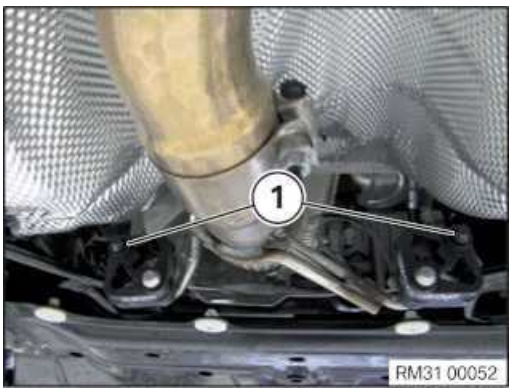
- Position the plug connection (4) at the front axle support (2).
- Tighten down screw (3).

Holder to front axle support

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

- Fasten the plug connection (1) at the front axle support (2).

83 – Securing rubber mount on front axle support



- Check rubber mount (1), replace if necessary.

  Parts: Rubber mount

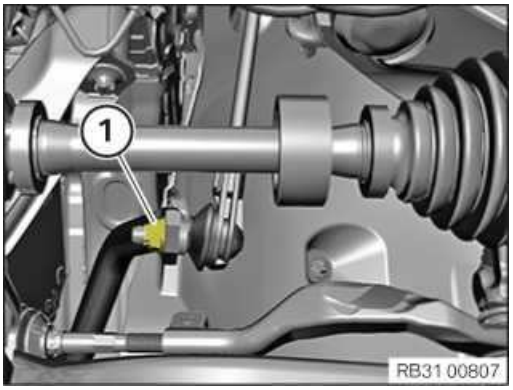
- Spray rubber mount (1) with lubricant and slide onto holder on front axle support.

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84 – Securing anti-roll bar on left and right on the anti-roll bar link

NOTICE

Perform the operations on the left and right side.



▸ **Fastening anti-roll bar on the anti-roll bar link**

- Position the anti-roll bar link on the anti-roll bar .
- Renew nut (1).

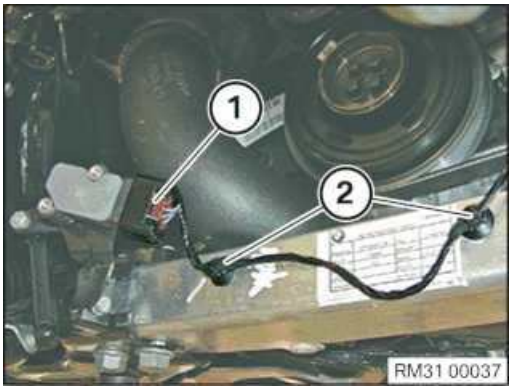
  Parts: Nut
- Tighten nut (1).

Note: Use the Torx socket for counter support.

Anti-roll bar link to anti-roll bar

M10	Renew nut.	Tightening torque	56 Nm

85 – With right installation: Securing the cable for the ride height sensor



- Secure the cable clip (2) on the adapter of the deformation element.
- Connect connectors (1) and lock.

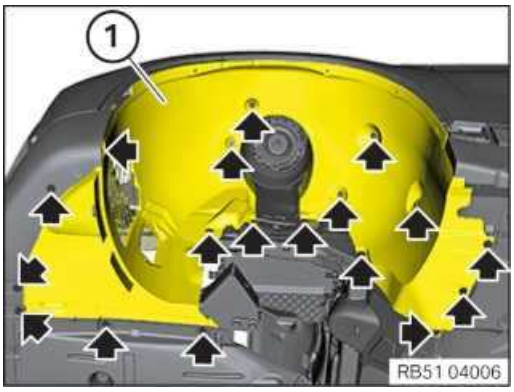
86 – Installing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

▸ **Installing the front wheel arch cover**

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- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Plastic nut		Tightening torque	2,6 Nm
Screw		Tightening torque	2,6 Nm

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

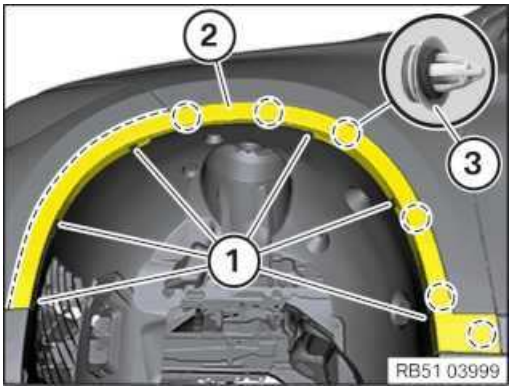
▸ **Installing front wheel arch trim**

NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.



87 – Installing both front wheels

- Check the clips (3) for damage and renew where required.

  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

▸ **Mounting the wheel**

▹ **Clean the contact surfaces between the brake disc and the wheel rim**

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TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

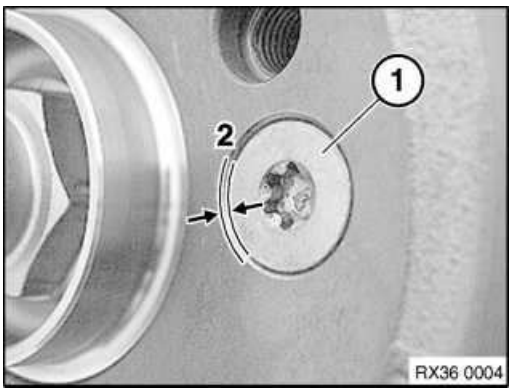
- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue in the area of the wheel bolt holes, remove and clean the brake disc.



- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).



- Renew mounting bolt (1).

  Parts: Mounting bolt
- Check that the mounting bolt (1) for the brake disc is securely seated.

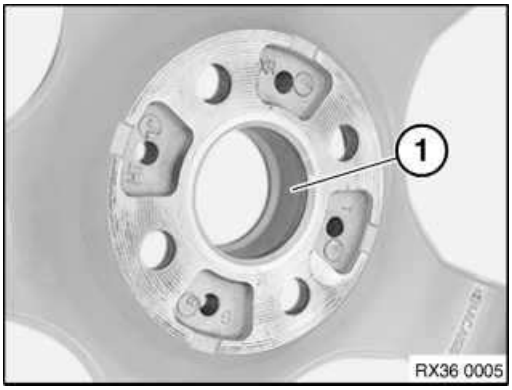
  The mounting bolt (1) for the brake disc may not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to rear wheel hub

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub

M8	Renew screw.	Tightening torque	16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring (1).

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

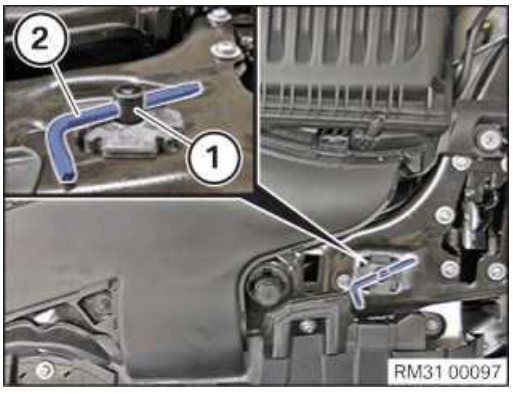
- Renew corroded wheel bolts.

  Parts: Wheel bolts
- Clean the wheel bolts.
- Check the wheel bolts and threads for damage, renew the wheel bolts if necessary.
- Join and tighten the wheel bolts (arrows).

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

88 – Removing fastener for left and right radiator



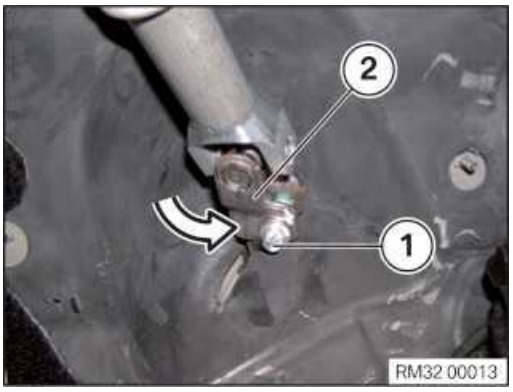
NOTICE

Perform the operations on the left and right side.

- Remove suitable tool (2) from the centering pin (1).

89 – Secure the steering shaft at the bottom on the steering gear

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- Clean the screw lock residue from the screw thread in the universal joint (2).
- Pivot the universal joint (2) in the direction of the arrow to the steering gear.
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Lower steering shaft to steering gear

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

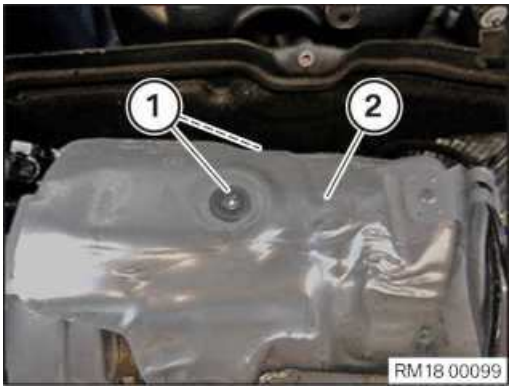


- **If installed:**
- Position the cover on the steering column (2).
- Tighten nuts (1).

Steering column cover to bulkhead

Plastic nut		Tightening torque	3 Nm

90 – Install the heat shield on the exhaust turbocharger



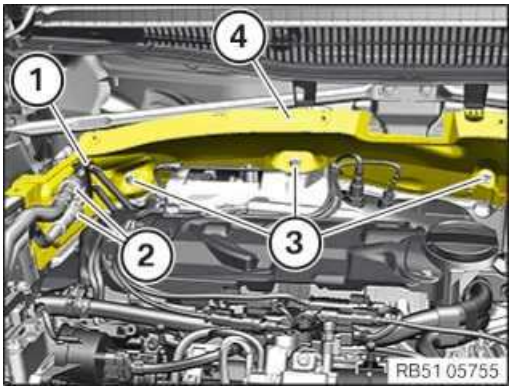
- Feed in and install the heat shield (2).
- Tighten the screws (1) at the top and bottom of the heat shield.

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Fasten the cable at the clips .

91 – Installing rear bulkhead upper part



- Feed in and install the rear bulkhead upper part (4).
- Tighten down screws (3).

Rear bulkhead upper part to lower section of bulkhead

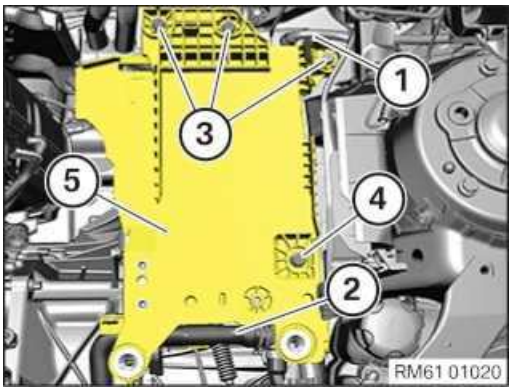
Oval-head screw		Tightening torque	5 Nm

- Feed the fuel line (2) into the holder (1) and install.
- Connect and lock the holder (1).

  The holder (1) must engage audibly.

92 – Install the battery holder

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- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

93 – Install electronics box

Prerequisite

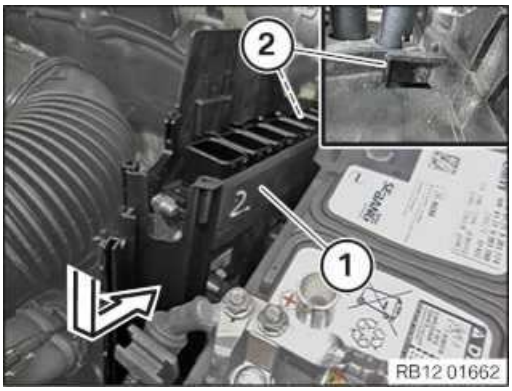
Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.

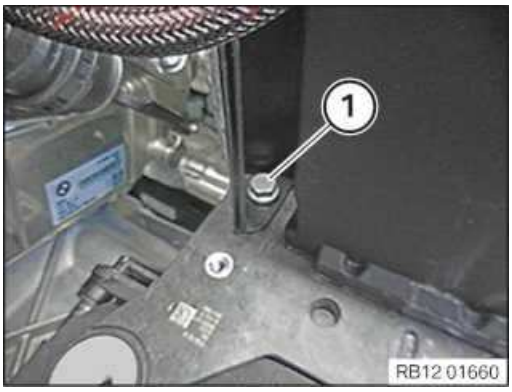


- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.



- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).

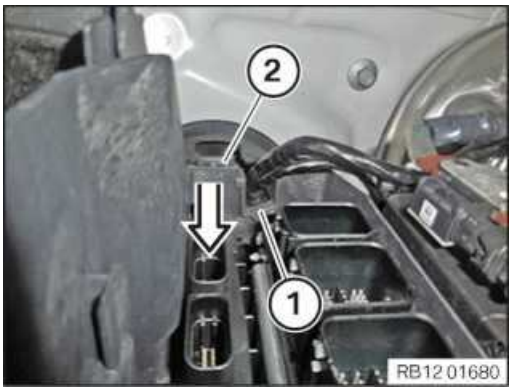
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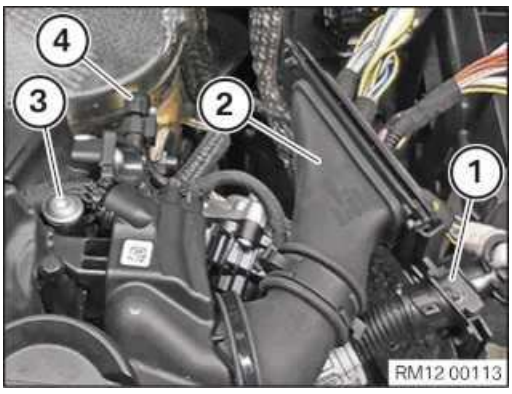
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.

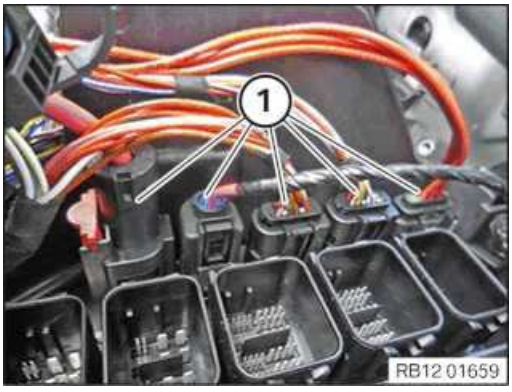


- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

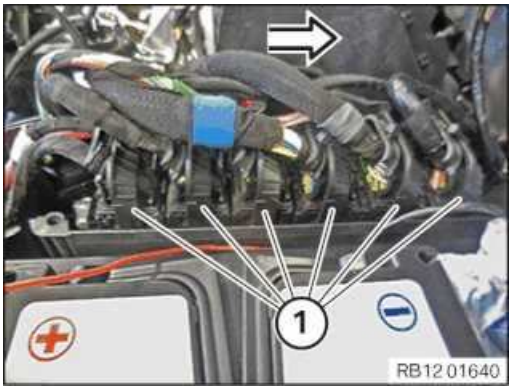
Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.

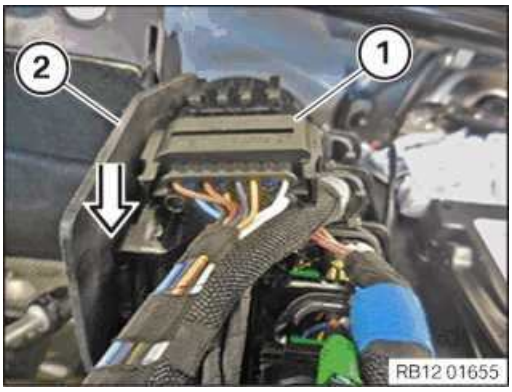


- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.

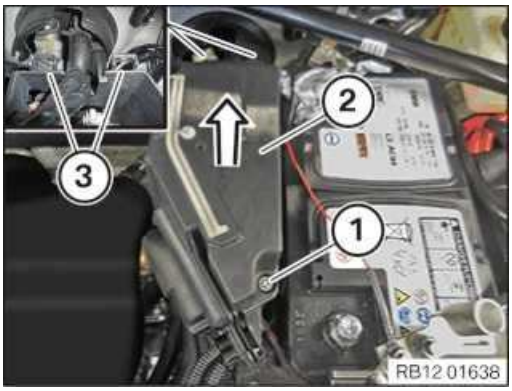


- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.

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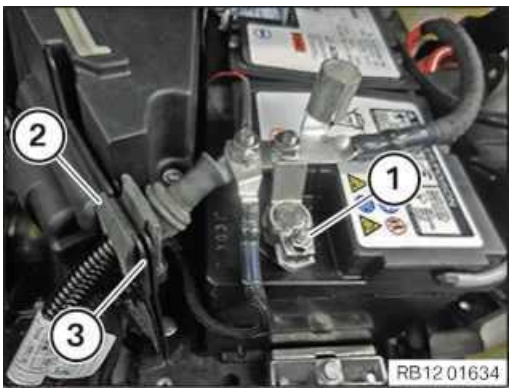
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

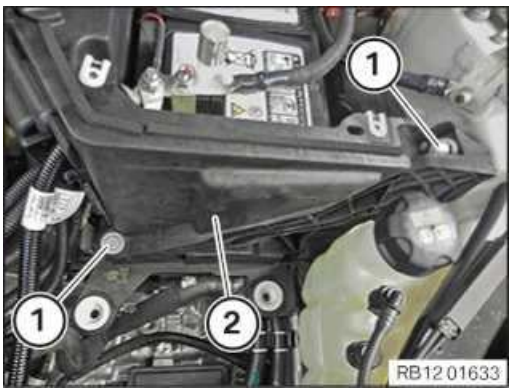
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

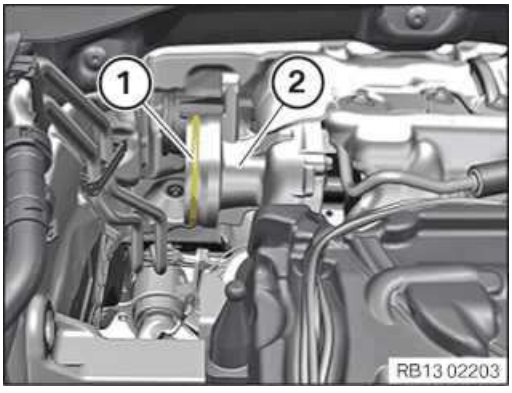


- Feed in and install tension strut (2).
- Tighten the screws (1).

Tension strut to spring strut dome/battery tray

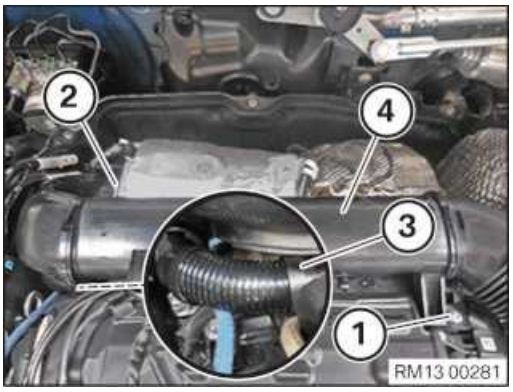
M8		Tightening torque	19 Nm

94 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.

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- Feed in clean air pipe and install.
- Connect clean air pipe to the exhaust turbocharger and lock audibly in the clamps (2).
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Connect ventilation line (3) to the cylinder head cover and lock audibly.

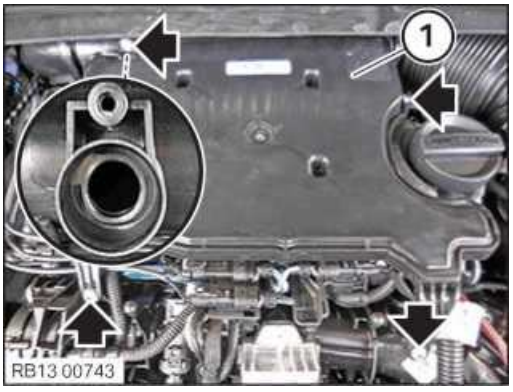


- Mount clean air pipe onto the intake filter housing.
- Tighten clamp (1) on the clean air pipe.

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

95 – Install resonator



- Insert and install the resonator (1).
- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

96 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

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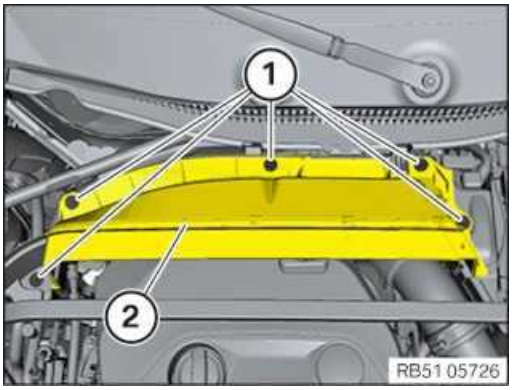


- Check for correct installation of all rubber mounts in the acoustic cover (1).



- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

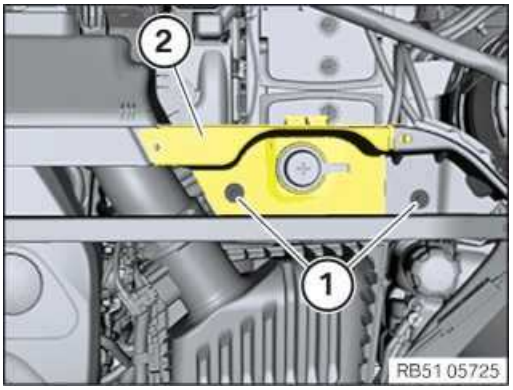
97 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Cover of top bulkhead

Screw		Tightening torque	2,6 Nm



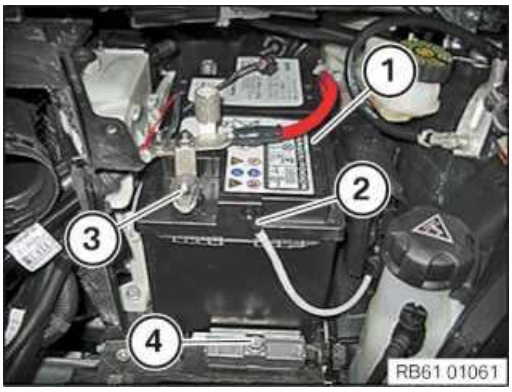
- Guide in and install cover (2).
- Tighten down screw (1).

Cover of remote positive terminal

Screw		Tightening torque	2,6 Nm

98 – Install vehicle battery

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- Install vehicle battery (1).
- Position the bracket and tighten with the screw (4) .

Battery terminal rail to battery tray

M8		19 Nm

- Position the vent hose (2) and clip it in.
- Position the positive battery terminal and tighten with the nut (3) .

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

▸ **Check the vent holes of the battery**

WARNING

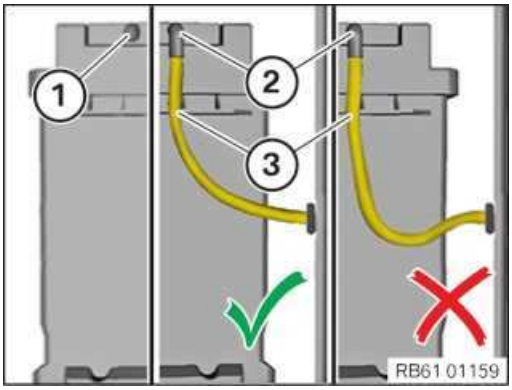
Gas emission.

Danger of injury! Danger of explosion!

- Assign the vent holes correctly.
- Route the vent hose correctly.

TECHNICAL INFORMATION

The battery has two vent holes, opposite:
One vent hole (1) must be closed correctly with a dummy plug.
The vent hose (3) must be correctly connected and routed at the other vent hole (2).



Check

- Check if the vent hole (1) is correctly closed with a dummy plug.

Result

» No dummy plug.

Measure

- Close the vent hole (1) correctly with a dummy plug.

Check

- Check if the vent hole (2) has a correctly connected vent hose (3).

Result

» The vent hose (3) is not correctly connected.

Measure

- At the vent hole (2), connect the vent hose (3) correctly.

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Check

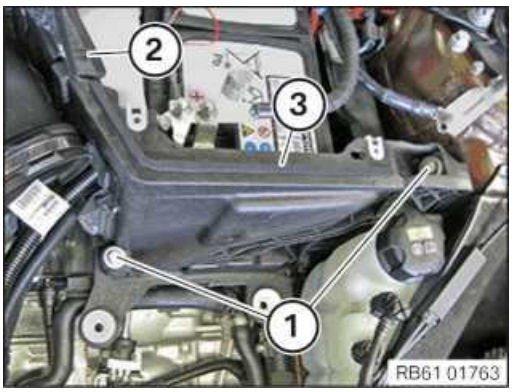
- Check if the vent hose (3) is routed to the outside with a downhill gradient (**no siphon formation!**).

Result

» The vent hose (3) is not correctly routed as shown in the image on the right.

Measure

- Route the vent hose (3) correctly as shown in the centre image.



- Insert tension strut (3) and tighten with screws (1).

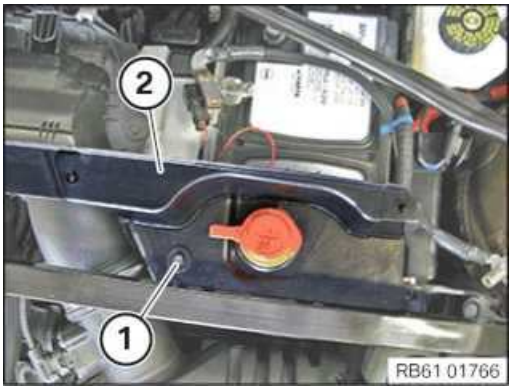
Trailing link

M8		Tightening torque	19 Nm

- Tighten down screw (2).

Battery cover

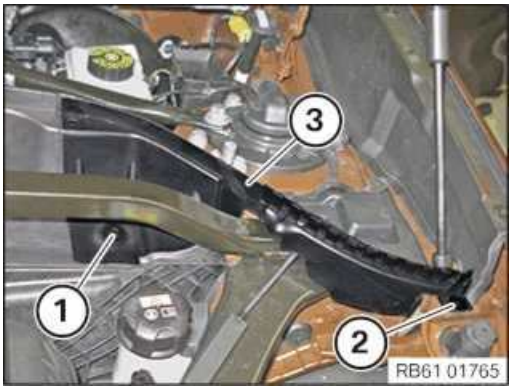
M8		2,8 Nm



- Position the cover (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm

99 – Connecting the battery earth lead

TECHNICAL INFORMATION

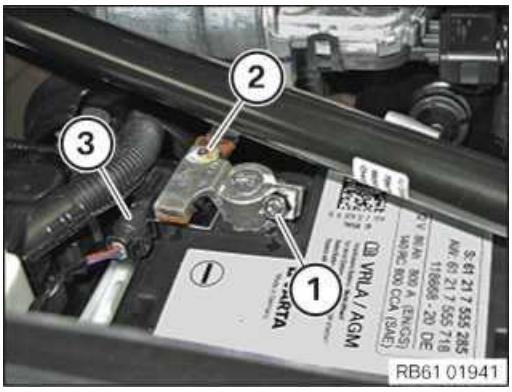
For additional information see:

61 00 ... Safety information on handling the vehicle battery

61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery

61 12 ... Notes on the intelligent battery sensor (IBS)

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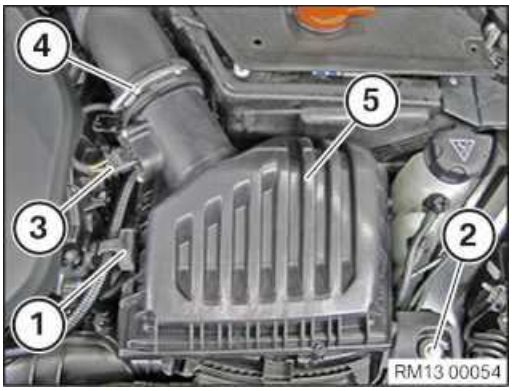
- Remove the protective cover of the positive battery terminal.
- Position the battery earth lead (2).
- Tighten nut (1).

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

- If required, connect the connector (3).

100 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.

  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

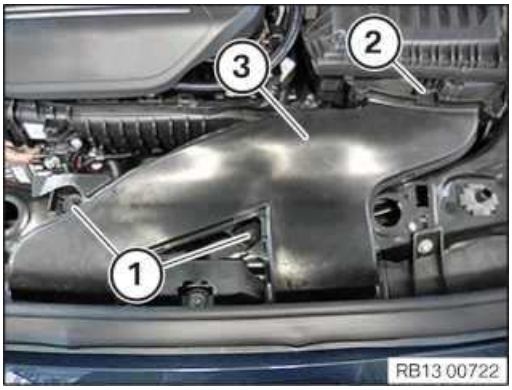
Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Insert and install the holder (1).

101 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

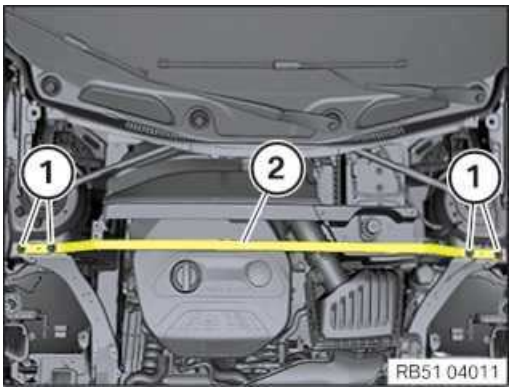
M6		Tightening torque	8 Nm

102 – Install strut brace

TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.

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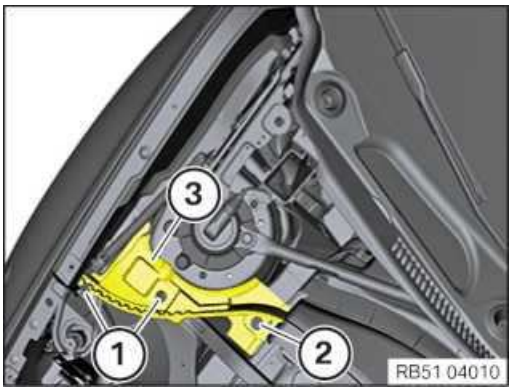


- Install the strut brace (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-brace to spring strut dome

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °



NOTICE

Description is for right component only. The procedure on the left side is identical.

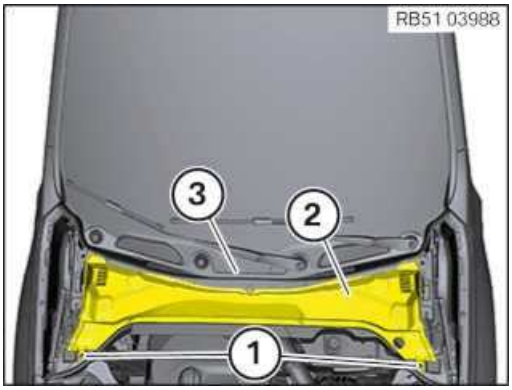
- Install the cover (3).
- Tighten down screw (2).

Cover on body

Hexagon screw		Tightening torque	3 Nm

- Install the expanding rivet (1).

103 – Installing front cowl panel cover

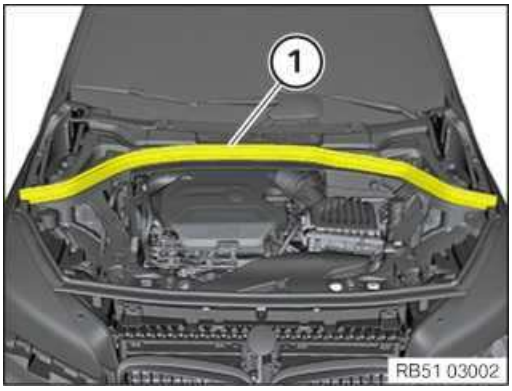


- Insert and install cowl panel cover at front (2) into cowl panel cover at rear (3).
- Check cowl panel cover at front is correctly seated (2).
- Secure expanding rivet (1).

104 – Install the seal for the bonnet

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

105 – Checking/topping up oil level in automatic gearbox (AISIN GA8G45)

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Prerequisite

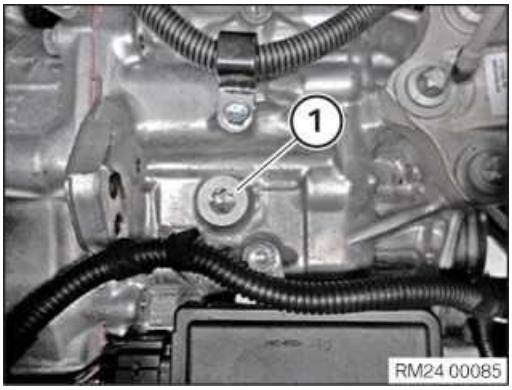
Vehicle in horizontal position.

CAUTION

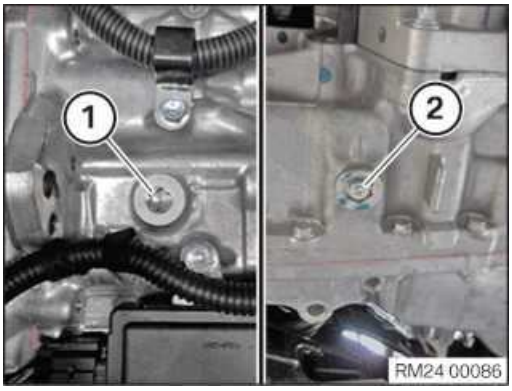
Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.



- Move the selector lever to the "P" position.
- Secure vehicle to prevent it rolling.
- Connect diagnosis system.
- Release the oil filler plug (1) using the Torx T55 .



- **Topping up the automatic transmission fluid (the automatic transmission fluid was drained):**
- Release oil filler plug (1) from engine compartment.
- Loosen the overflow plug (2) below at the transmission.
- Top up automatic transmission fluid at oil filler plug (1) until oil emerges at overflow plug (2).
- Start engine and run at idle speed.
- Check whether the automatic transmission fluid is leaking at the overflow plug (2) .
- If there is no automatic transmission fluid leaking at the overflow plug (2) , fill in the automatic transmission fluid to the oil filler plug (1) .
- Press the footbrake and, when idle, shift through all the gears from "P" to "D" 2 times for more than 2 seconds .
- Move the selector lever to the "P" position.
- Check again whether the automatic transmission fluid is leaking at the overflow plug(2) .
- Read the temperature of the automatic transmission fluid with the diagnosis system.
- Increase temperature of automatic transmission fluid to 35 °C to 45 °C.
- Top up automatic transmission fluid until it flows over.
- Renew sealing rings.

  Parts: Sealing ring
- Screw in and fasten oil filler plug (1) and overflow plug (2).

Oil filler plug to transmission housing

M14	Renew the sealing ring.	Tightening torque	45 Nm

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Overflow screw in oil drain plug

M6	Renew the sealing ring.		8 Nm

- **Check oil level (transmission oil temperature must be between** 35 °C **and** 45 °C **):**
- Open the oil filler plug (1).
- Slacken overflow plug (2).
- Start engine and run at idle speed.
- Unscrew and remove overflow plug (2).
- Check whether the automatic transmission fluid is leaking at the overflow plug (2) .
- If there is no automatic transmission fluid leaking at the overflow plug (2) , fill in the automatic transmission fluid to the oil filler plug (1) .
- Top up the automatic transmission fluid until it overflows at the overflow plug (2) .
- Press the footbrake and, when idle, shift through all the gears from "P" to "D" 2 times for more than 2 seconds .
- Move the selector lever to the "P" position.
- Check the oil level again.
- Renew sealing rings.

  Parts: Sealing ring
- If the oil escapes slightly from the overflow plug (2) , tighten the overflow plug (2) and the oil filler plug (1) .

Overflow screw in oil drain plug

M6	Renew the sealing ring.		8 Nm

Oil filler plug to transmission housing

M14	Renew the sealing ring.	Tightening torque	45 Nm

106 – Topping up oil level in the manual gearbox (GS6X60DA)

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

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TECHNICAL INFORMATION

Make sure during removal of the filling/level control screw to note the installed filling/level control screw variant.

It is **mandatory** to use variant 1 in transmissions up to production date 08/2015.

It is **mandatory** to use variant 2 in transmissions from production date 08/2015.

Failure to observe will result in a leak on the transmission.

- Variant 1 **until** production date 08/2015.
- Variant 2 **from** production date 08/2015.



- Unscrew filling/level control screw (1) and fill the transmission until the oil overflows.

Transmission oil capacity

Transmission oil GS6-60DA, GS6X60DA/Owner's Handbook	2,2 l

Transmission oil: Technically suitable manual gearbox oil

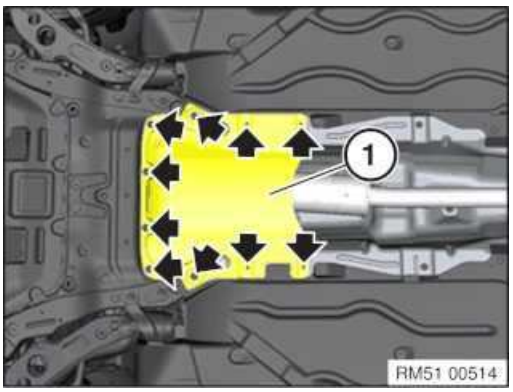
- Allow surplus oil to drain off.
- Renew the filling/level control screw (1).

  Parts: Filling/level control screw
- Tighten filling/level control screw (1).

Oil drain plug / oil filler plug

Hexagon socket		Tightening torque	43 Nm

107 – If installed: Installing underbody protection at rear

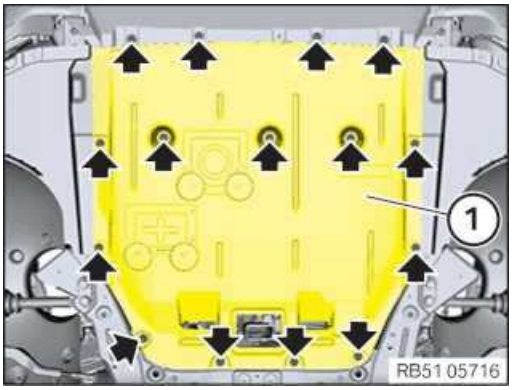


- Position rear underbody protection (1).
- Tighten screws (arrows).

Underbody protection to body

Screw		Tightening torque	3 Nm

108 – Installing the front underbody protection

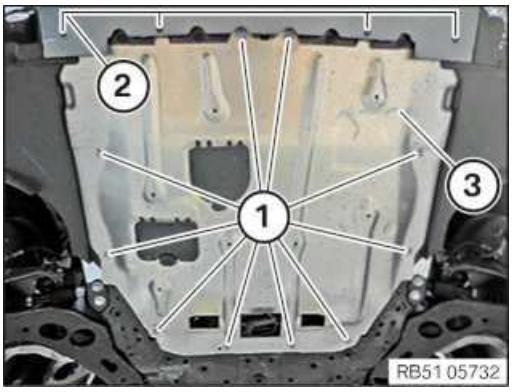


- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

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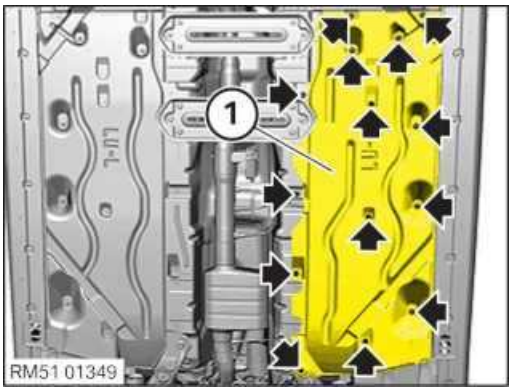


- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

109 – Installing underbody panelling , right



- Correctly position the underbody panelling (1).
- Tighten all bolts and nuts (arrows).

Underbody panelling, side

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side

Plastic nut		Tightening torque	2,6 Nm

Additional Information

Overview of Tightening Torques

Central piston cooling valve to crankcase — Used in step 54

M6x16		Tightening torque	8 Nm

Exhaust-gas recirculation cooler to exhaust manifold — Used in step 56

M8x28	Replace screws	Tightening torque	32 Nm

Oil return line to turbocharger — Used in step 56 57

M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase — Used in step 56

M8x16		Tightening torque	22 Nm

Exhaust turbocharger to exhaust manifold — Used in step 57

V-band clamp		Tightening torque	19 Nm

Oil feed line to bracket — Used in step 57

Torx screw M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase — Used in step 57

M8x16		Tightening torque	22 Nm

Heat shield for exhaust turbocharger — Used in step 58

Torx screw BM 6x12		Tightening torque	10 Nm

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Banjo bolt for exhaust pressure pipe to exhaust manifold — Used in step 58

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

Standard screw connection M6 — Used in step 58

M6			8 Nm

Charge air duct to oil sump — Used in step 59

M6		Tightening torque	8 Nm

Ride height sensor holder to front axle support — Used in step 59

M6		Tightening torque	8 Nm

Adapter, front axle support to front axle support — Used in step 59

		Tightening torque	100 Nm

Cross connection to front axle support — Used in step 59

M6		Tightening torque	12 Nm

Washer fluid reservoir to body — Used in step 60

M6x20		Tightening torque	8 Nm

Diesel particulate filter V-clip to exhaust turbocharger — Used in step 61

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Diesel particle filter to holder — Used in step 61

M8 hexagon nut		Tightening torque	19 Nm

Diesel particulate filter holder to gearbox — Used in step 61

M12x75		Tightening torque	66 Nm

Diesel particulate filter bracket to crankcase — Used in step 61

M10x35		Tightening torque	38 Nm

SCR metering module V-clip to exhaust system — Used in step 61

V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm

Holder for coolant lines to diesel particulate filter — Used in step 61

Torx bolt BM6x16		Tightening torque	8 Nm

Differential pressure sensor to holder — Used in step 61

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor — Used in step 61

Clamp 15–19mm		Tightening torque	3 Nm

Control sensor — Used in step 62

Control sensor		Tightening torque	50 Nm

Exhaust temperature sensor to diesel particulate filter — Used in step 63 64

Exhaust-gas temperature sensor		Tightening torque	28 Nm

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Exhaust-gas temperature sensor to exhaust system

Used in step 65

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Oxygen sensor holder to intermediate shaft

Used in step 66

Hexagon screw M6x16		Tightening torque	8 Nm

Nitrogen oxide sensor before SCR catalytic converter

Used in step 67

Sensor		Tightening torque	50 Nm

Monitoring sensor

Used in step 68

Sensor		Tightening torque	50 Nm

Transfer box to transmission

Used in step 69

M10		Tightening torque	56 Nm

Heat shield to transfer box

Used in step 69

M6	Renew screws.	Tightening torque	6 Nm

Oil filler plug on transfer box (VTG)

Used in step 69

M18x1.5		Tightening torque	35 Nm

Intermediate shaft to transfer box

Used in step 70

M8x35		Tightening torque	19 Nm

Starter motor to transmission

Used in step 71

M8x45		Tightening torque	19 Nm

Battery positive lead to starter

Used in step 71

M8		Tightening torque	13,5 Nm

Propeller shaft to transfer box

Used in step 74

		Tightening torque	80 Nm

Flexible disc to rear axle final drive

Used in step 74

M12x1.5	Renew screws.	Tightening torque	55 Nm 90 °

Centre mount to body

Used in step 74

M8		Tightening torque	19 Nm

Heat shield to body

Used in step 75 76

Bolts/nut		Tightening torque	3 Nm

Bracket to body

Used in step 75

M8		Tightening torque	21 Nm

Exhaust system to body

Used in step 77

M8	Replace nuts.	Tightening torque	19 Nm

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Exhaust bracket on body

Used in step 77

Hexagon screw M8x30		Tightening torque	19 Nm

V-clip to catalytic converter

Used in step 77

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

Diesel particulate sensor to exhaust system

Used in step 77

Sensor		Tightening torque	50 Nm

Nitrogen oxide sensor downstream of SCR catalytic converter

Used in step 77

Sensor		Tightening torque	50 Nm

Cross-member/torsion strut to axle support and mounting

Used in step 78

M12x48	Renew screws.	Jointing torque Angle of rotation	100 Nm 90 °

Front connection carrier to body

Used in step 79

M10x18		Tightening torque	56 Nm

Rear connection carrier to body

Used in step 79

M8x18		Tightening torque	28 Nm

Rear end of front axle support to body

Used in step 80

M14 screw	Renew screw.	Tightening torque	175 Nm

Front axle support, front to body

Used in step 80

M12 screw	Renew screw.	Tightening torque	108 Nm

Underbody protection to body

Used in step 80 107

Screw		Tightening torque	3 Nm

Track rod end to swivel bearing

Used in step 80

M14	Renew nut.	Tightening torque	175 Nm

Wishbone to swivel bearing

Used in step 80

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

Holder, wishbone rubber mount, to body

Used in step 81

M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °

Holder with rubber mount to front axle support

Used in step 81

M12 screw			100 Nm

Washer fluid reservoir holder to front axle support adapter plate

Used in step 81

		Tightening torque	10 Nm

Deformation element, bottom, to adapter plate, front axle carrier

Used in step 81

		Tightening torque	11,8 Nm

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Holder to front axle support

Used in step 82

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

Anti-roll bar link to anti-roll bar

Used in step 84

M10	Renew nut.	Tightening torque	56 Nm

Wheel arch cover to body

Used in step 86

Plastic nut		Tightening torque	2,6 Nm
Screw		Tightening torque	2,6 Nm

Wheel arch cover to body

Used in step 86

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Used in step 86

Plastic nut		Tightening torque	3 Nm

Brake disc to rear wheel hub

Used in step 87

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub

Used in step 87

M8	Renew screw.	Tightening torque	16 Nm

Wheel bolts

Used in step 87

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Lower steering shaft to steering gear

Used in step 89

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

Steering column cover to bulkhead

Used in step 89

Plastic nut		Tightening torque	3 Nm

Heat shield for exhaust turbocharger

Used in step 90

Torx screw BM 6x12		Tightening torque	10 Nm

Rear bulkhead upper part to lower section of bulkhead

Used in step 91

Oval-head screw		Tightening torque	5 Nm

Battery holder to engine support

Used in step 92

Hexagon screw M8x30		Tightening torque	19 Nm

Electronics box to battery tray

Used in step 93

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M8X16		Tightening torque	15 Nm

Wiring harness to cylinder head cover Used in step 93

TS5x20		Tightening torque	3,5 Nm

Cover to electronics box Used in step 93

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery Used in step 93

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray Used in step 93

M8		Tightening torque	19 Nm

Clean air pipe to cylinder head cover Used in step 94

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing Used in step 94 100

Clamp		Tightening torque	3 Nm

Resonator to manifold and clean air pipe Used in step 95

Screw TS6	Renew screw.	Tightening torque	5 Nm

Cover of top bulkhead Used in step 97

Screw		Tightening torque	2,6 Nm

Cover of remote positive terminal Used in step 97

Screw		Tightening torque	2,6 Nm

Battery terminal rail to battery tray Used in step 98

M8			19 Nm

Battery terminal with IBS positive battery terminal / negative battery terminal Used in step 98 99

NutM6			5 Nm

Trailing link Used in step 98

M8		Tightening torque	19 Nm

Battery cover Used in step 98

M8			2,8 Nm

Intake silencer housing to lock bridge Used in step 100

M6X30		Tightening torque	8 Nm

Intake neck to cross connection Used in step 101

M6		Tightening torque	8 Nm

Cross-brace to spring strut dome Used in step 102

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

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Cover on body

Used in step 102

Hexagon screw		Tightening torque	3 Nm

Oil filler plug to transmission housing

Used in step 105

M14	Renew the sealing ring.	Tightening torque	45 Nm

Overflow screw in oil drain plug

Used in step 105

M6	Renew the sealing ring.		8 Nm

Oil drain plug / oil filler plug

Used in step 106

Hexagon socket		Tightening torque	43 Nm

Underbody protection front

Used in step 108

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Underbody panelling, side

Used in step 109

Hexagon screw		Tightening torque	2,6 Nm

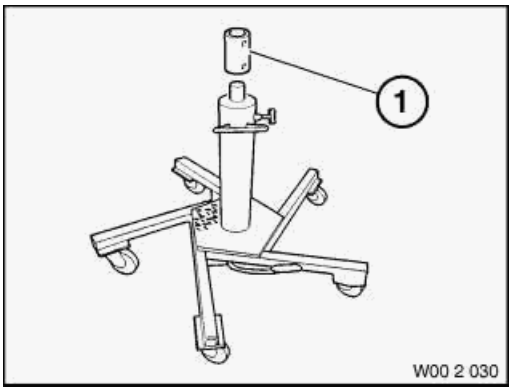
Underbody panelling, side

Used in step 109

Plastic nut		Tightening torque	2,6 Nm

Overview of Special Tools

0 490 133 (00 2 030) Device



Common

Used in step 28 80

Usage	(universal hydraulic lifter base unit) Chassis and hydraulic lifter - For removing and installing rear axle supports and gearboxes. Also for soft top mounts. Is replaced by 81 22 2 219 012
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 90 (207)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 490 134 (00 2 031)		**Adapter** (adapter for gearbox holder) Model series: E30, E31, E32, E34, E36	

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0 495 554 (33 5 070) Extension



Common

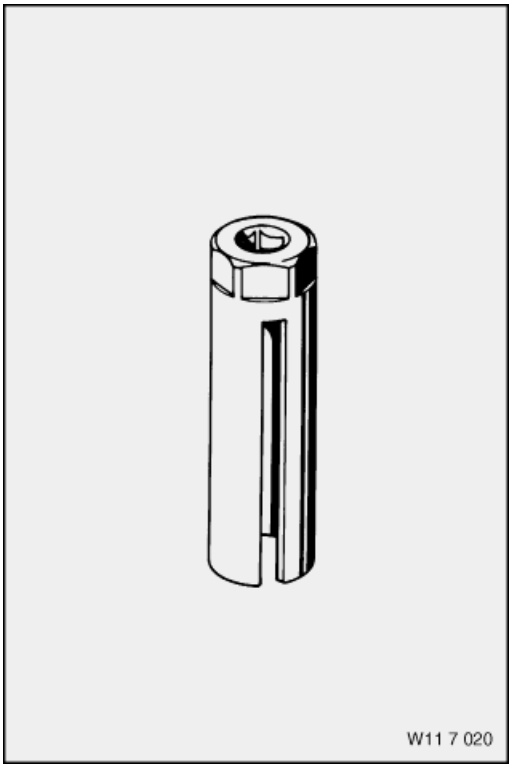
Used in step 34 74

Usage	Pull-out extension for 33 5 040, 33 5 050, 33 5 060.
Included in the tool or work	
Storage location	A18
Replaced by	
In connection with	
SI-Number	01 21 06 (300)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 592 (33 5 071)		**Extension** (Extension (1 item)) discontinued, can only be ordered using complete tool	

0 491 074 (11 7 020) Socket wrench insert



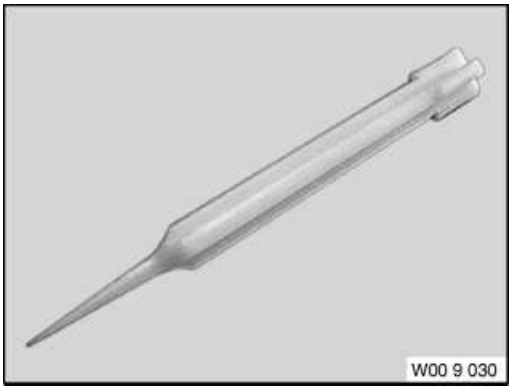
Common

Used in step 40 41 68

Usage	(Socket wrench insert 22 mm) For loosening and tightening the oxygen sensor
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	

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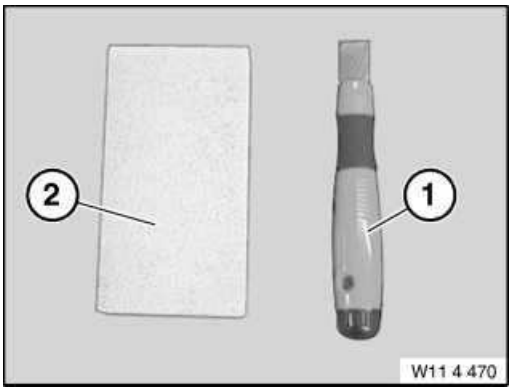
0 496 714 (00 9 030) Wedge



Common Used in step 54

Usage	For dismantling O-rings, gaskets and trim panels. This special tool replaces special tool 00 9 316.
Included in the tool or work	
Storage location	A50
Replaced by	
In connection with	
SI-Number	01 20 09 (581)

0 495 102 (11 4 470) Tool



Common Used in step 56

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

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2 409 025 Puller



Common	Used in step 69
Usage	For disassembly of the outer radial shaft seal of the transmission output shaft, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A76
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 411 739 Puller



Common	Used in step 69
Usage	For disassembly of the inner radial shaft seal of the output, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C78
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

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2 408 152 Striking element



Common	Used in step 69
Usage	For installation of the right radial shaft seal transmission output shaft (inner). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

2 413 037 Handle



Common	Used in step 69
Usage	Universal drift handle. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C77
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

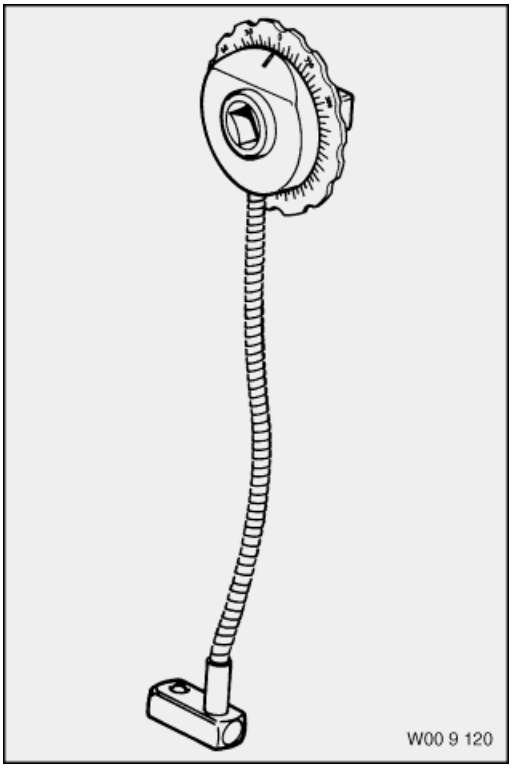
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2 408 150 Striking element



Common	Used in step 69
Usage	For installing the right radial shaft seal transmission output shaft (outer). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

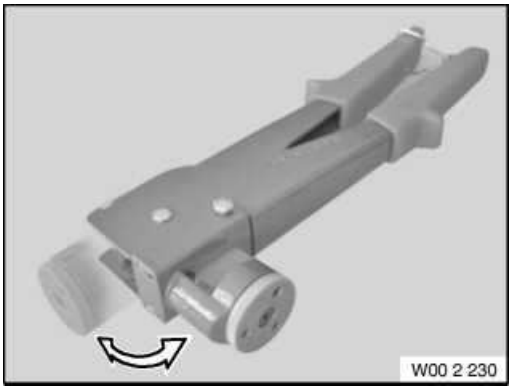
0 490 504 (00 9 120) Torque angle measuring dial



Common	Used in step 74
Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

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0 496 521 (00 2 230) Pliers



Common	Used in step 86
Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

2 344 011 Tool



Common	Used in step 87
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

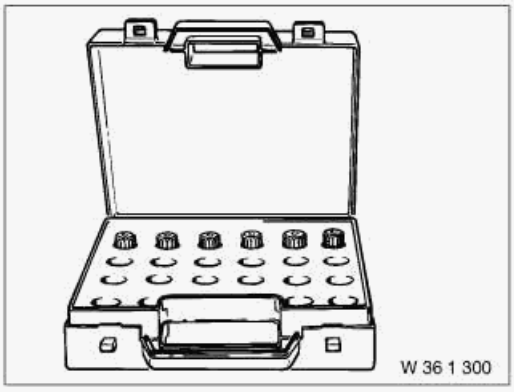
0 495 221 (36 1 323) Wheel stud



Common	Used in step 18
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 224 (36 1 326) Wheel stud



Common	Used in step 18
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud



Common	Used in step 18
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

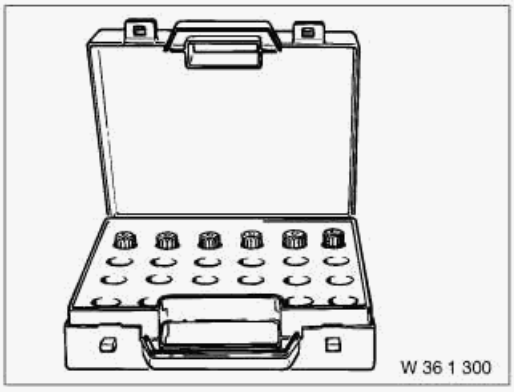
0 495 226 (36 1 328) Wheel stud



Common	Used in step 18
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 227 (36 1 329) Wheel stud



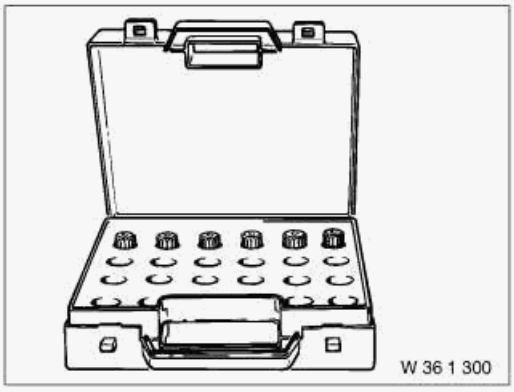
Common	Used in step 18
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud



Common	Used in step 18
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

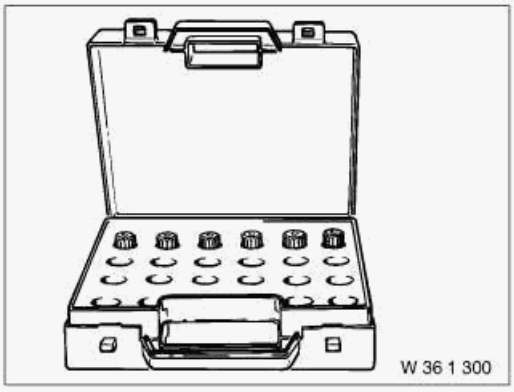
0 495 229 (36 1 332) Wheel stud



Common	Used in step 18
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 230 (36 1 333) Wheel stud



Common	Used in step 18
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Transmission oil capacity	Used in step 106
Transmission oil GS6-60DA, GS6X60DA/Owner's Handbook	2,2 l
Transmission oil: Technically suitable manual gearbox oil	

Links

General repair instructions	Used in step
61 20 ... Notes on AGM battery	99
61 12 ... Notes on intelligent battery sensor (IBS)	99
61 00 ... Notes for disconnecting and connecting battery	99
41 00 ... Notes on repairing threads	
61 00 ... Safety information for handling vehicle battery	

Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	12 40 41 43 44 45 46 47
00 .. ... Raising the vehicle using a vehicle hoist	

Operating materials	Used in step
2.0 Grease for wheel centring	87
14.0 Automatic transmission fluid for ZF-transmission GA8HP45Z / GA8HP50Z / GA8HP70Z / GA8HP90Z / GA8P70H / GA8P75H / GA8HP75Z	105

Operating materials	Used in step

Parts

Parts required

Designation	Used in step
Seal, shift valve, central piston cooling to crankcase	54

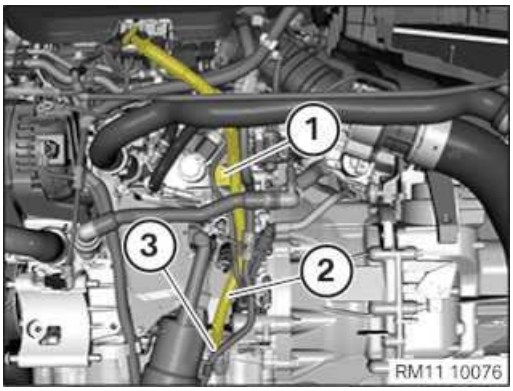
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11 43 000 Removing and installing or replacing guide tube for dipstick (B47)

Necessary preliminary tasks:

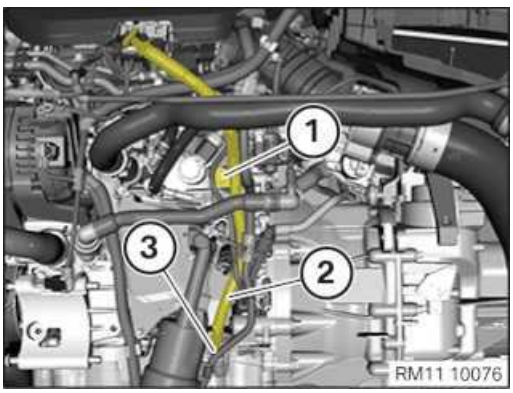
- Remove fan cowl

Removal:



Release screw (1).
Remove guide tube (2) in an upward direction.

Installation:



Part: Replace O-ring.
Mount new O-ring (3) on guide tube.
Install guide tube (2).
Tighten screw (1).

Required follow-up work:

- Install fan cowl.

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11 43 000 Removing and installing/sealing the oil dipstick guide tube

TECHNICAL INFORMATION

- When the engine is stopped after the end of the journey, it may be necessary to run the electric fan. In rare cases, operation of the electric fan can last up to 11 min. This protects the components. In this case, replacing the electric fan will not remedy the problem!

PRELIMINARY WORK

1 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

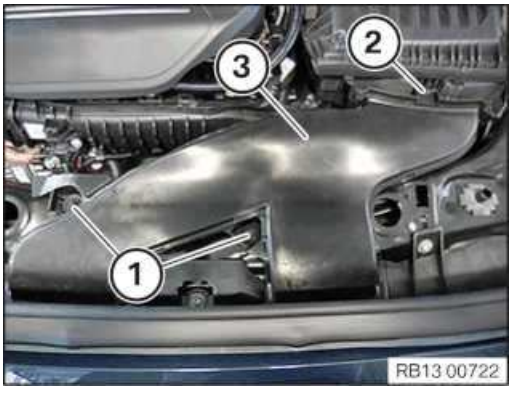
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

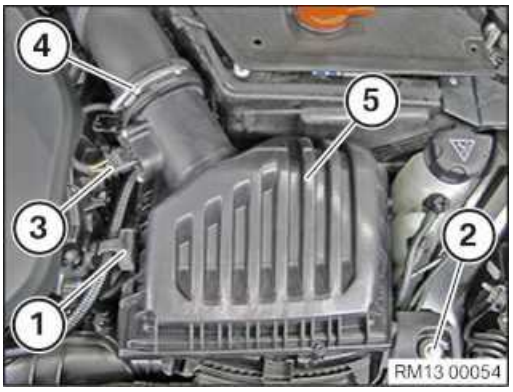
2 – Remove the intake neck for intake silencer housing



- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

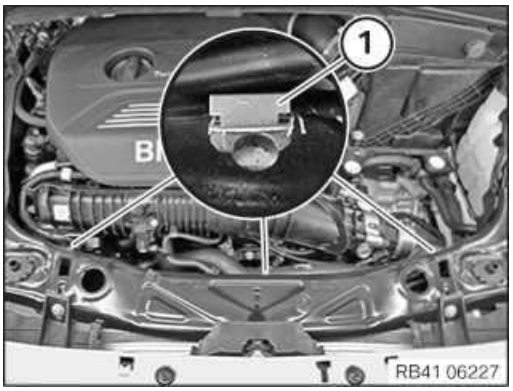
3 – Removing intake silencer housing

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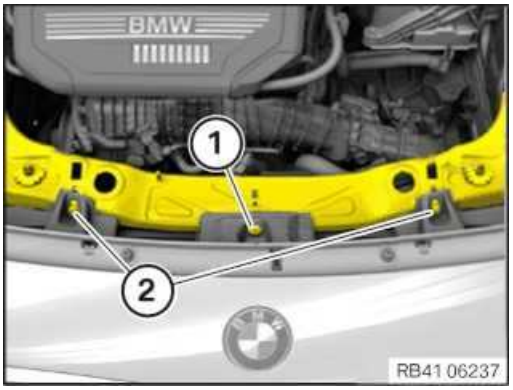


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

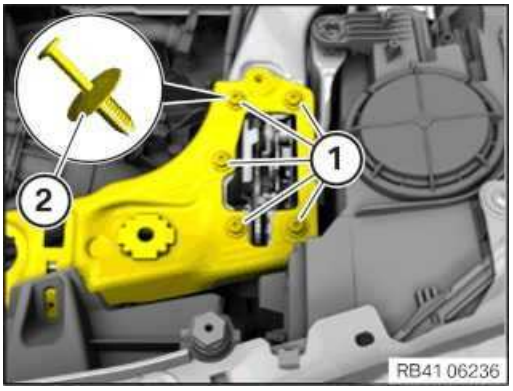
4 – Remove front cross connection



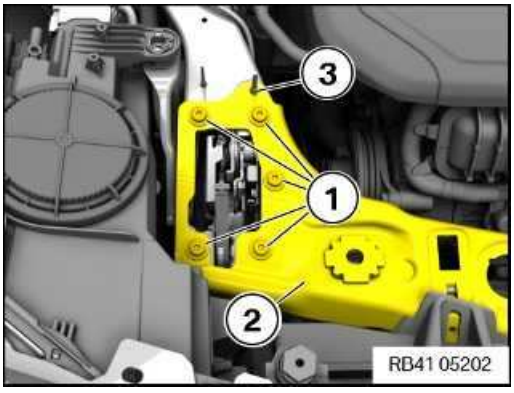
- Detach the clamps (1) for the Bowden cable of the bonnet locks from the cross connection.



- Loosen screw (1).
- Loosen screws (2).



- Loosen screws (1).
- Lever out expanding rivet (2).



- Loosen screws (1).
- Unclip the front cross connection (2) from the rubber retainer (3) and remove it upward.

5 – Removing the fan cowl with electric fan

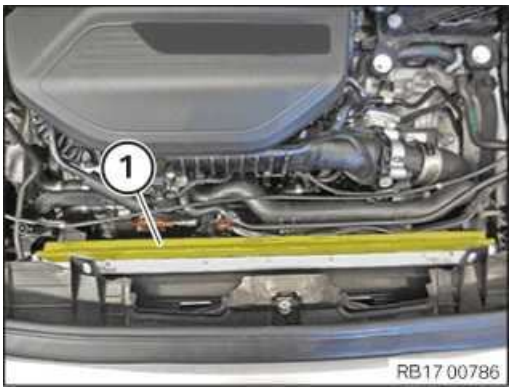
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WARNING

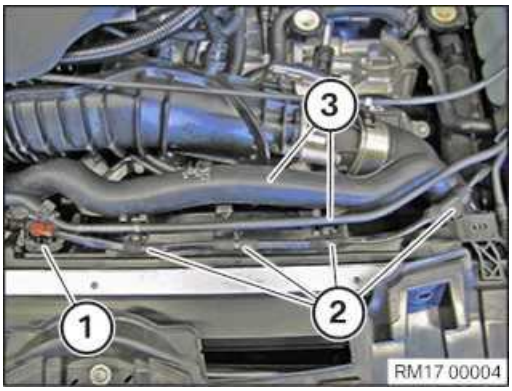
Hot surfaces.

Risk of burning!

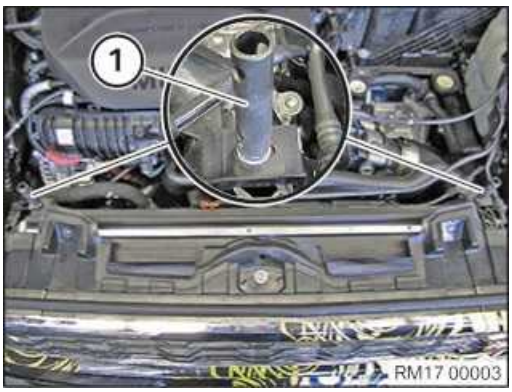
- Perform all work only on components that have cooled down.



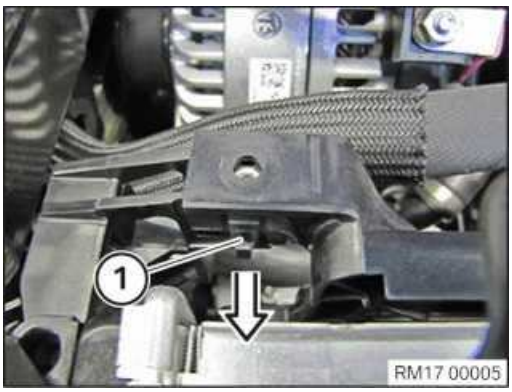
- Feed out and remove the sealing (1) from the radiator.



- Unlock plug connection (1) and disconnect.
- Unlock and loosen the clamps (2).
- Feed out connector (1) and place to one side.
- Thread off coolant line (3) and place to the side.

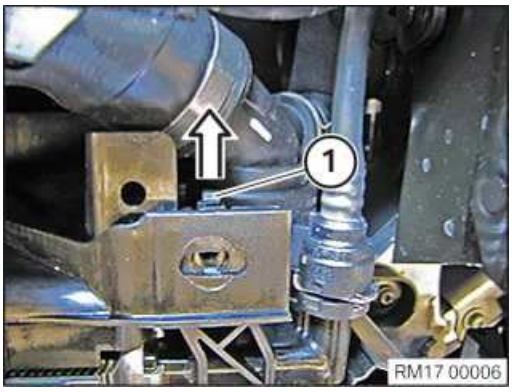


- Loosen screws (1).

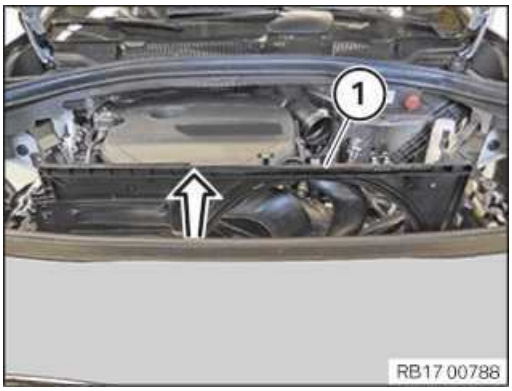


- Unlock the right lock (1) on the fan cowl in the direction of the arrow.

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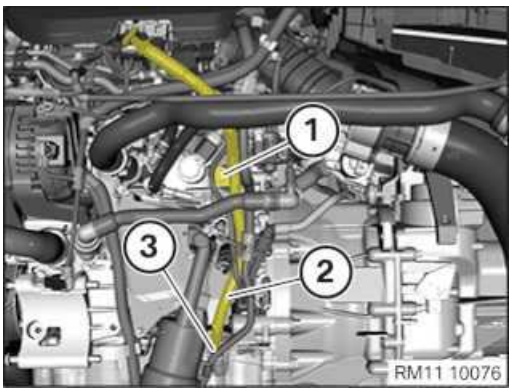
- Unlock the left lock (1) on the fan cowl in the direction of the arrow.



- Guide out fan cowl (1) in direction of arrow and remove.

MAIN WORK

6 – Removing the guide tube for the oil dipstick



- Unscrew the bolt (1) in the marked area.
- Disconnect the guide tube (2) for the oil dipstick toward the top from the oil sump and remove it.
- Remove sealing ring (3) from oil sump if necessary.

7 – Installing guide tube for oil dipstick

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

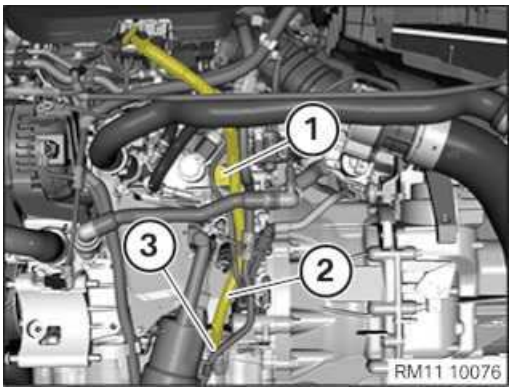
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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- Renew O-ring (1).

  Parts: O-ring



- Guide in guide tube (2) for oil dipstick and slide it into the oil sump.
- Make sure the sealing ring (3) is positioned correctly in the oil sump.
- Tighten down screw (1).

Guide tube for oil dipstick on engine

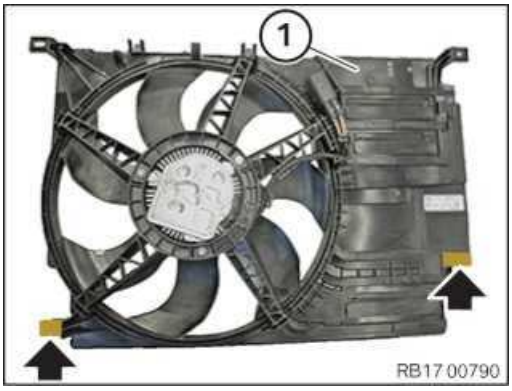
M8x16		Tightening torque	19 Nm

POSTPROCESSES

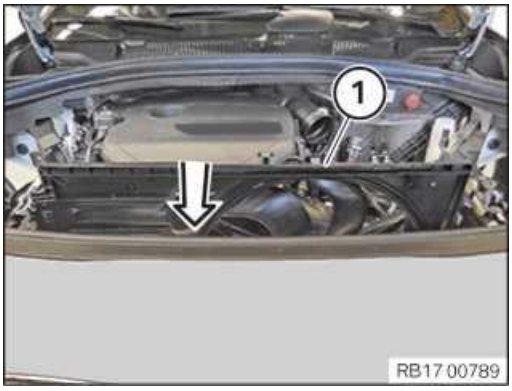
8 – Installing fan cowl with electric fan

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Feed the guides (arrows) of the fan cowl (1) into the charge air cooler.

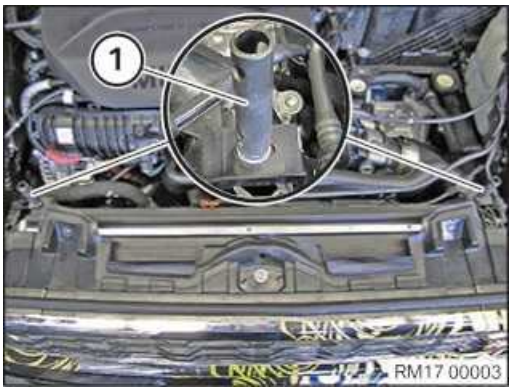


- Feed in and install the fan cowl (1) in the direction of the arrow.

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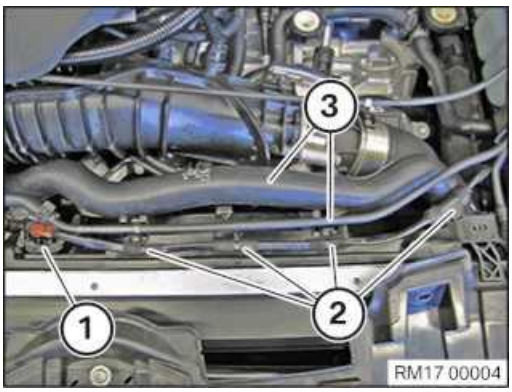
- Lock the left and right locks (arrows).



- Tighten the screws (1).

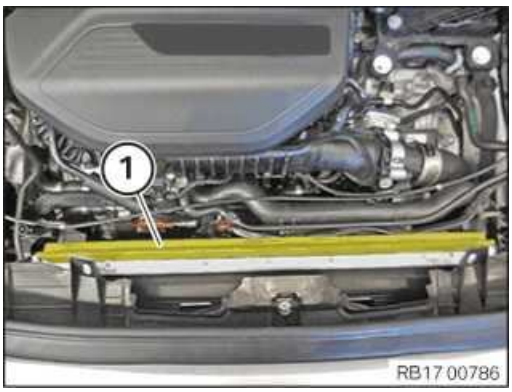
Fan cowl on radiator

M6X12		Tightening torque	6 Nm



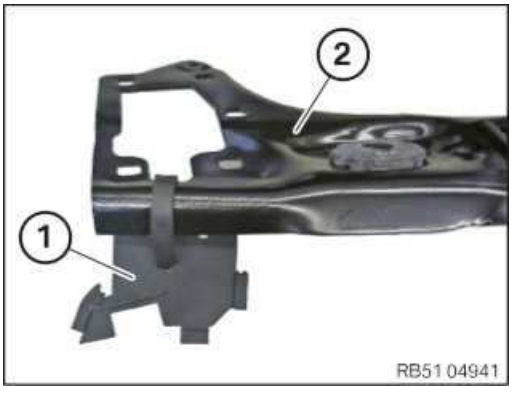
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.
- Secure clamps (2).
- Thread in and install coolant line (3).



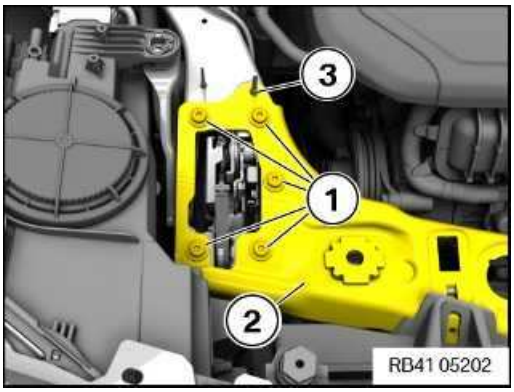
- Guide the sealing (1) on the radiator in and install it.

9 – Install front cross connection



- Right side of vehicle only: Secure spray guard (1) on the cross connection (2) as pictured.

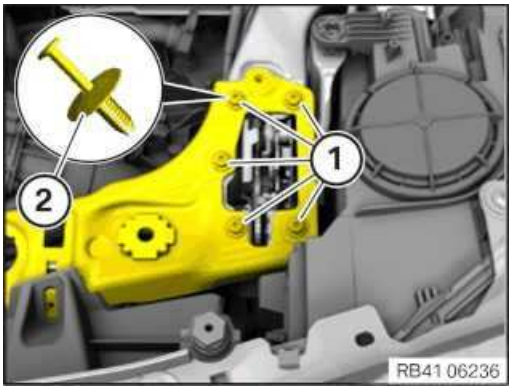
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- Position front cross connection (2) and clip front cross connection (2) into the rubber retainer (3) at the same time.
- Tighten the screws (1).

Cross connection to carrier support

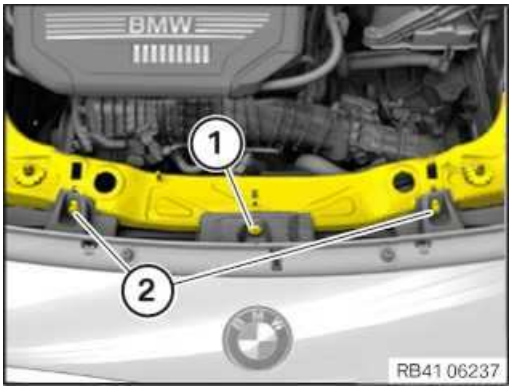
Screws M6x20		Tightening torque	11,8 Nm



- Tighten the screws (1).

Cross connection to carrier support

Screws M6x20		Tightening torque	11,8 Nm



- Position screws (3) on the rubber mounts for the radiator and tighten.

Screw connection for rubber mount of coolant radiator to coolant radiator

Bolt to rubber mount		Tightening torque	8 Nm

- Tighten down screws (2).

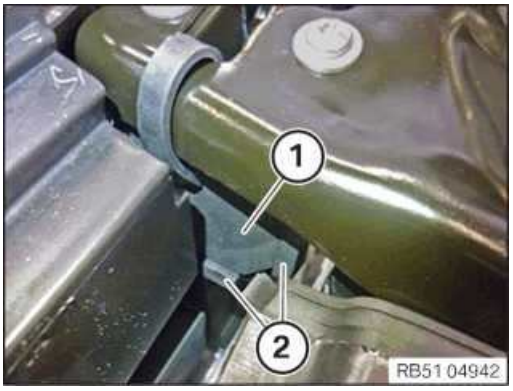
Air duct to upper connection

M6x20 screw		Tightening torque	11,8 Nm

- Tighten down screw (1).

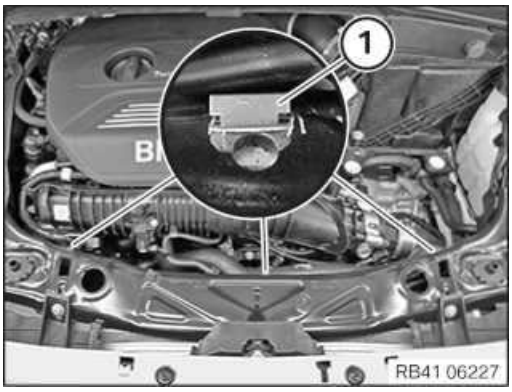
Bracing strut to upper connection

M8x20 screw		Tightening torque	28 Nm



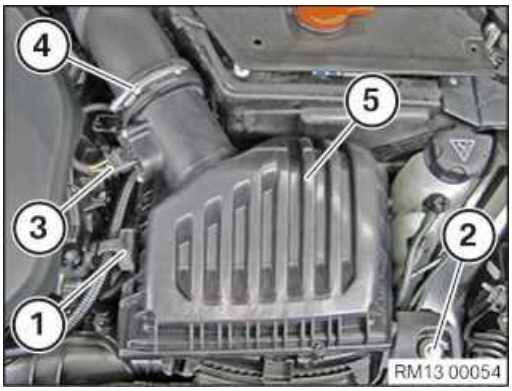
- Right side of vehicle only: Properly mount spray guard (1) to prevent corrosion.
- Secure spray guard (1) to the bridge with retaining tabs (2).

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- Fasten the clamps (1) from the Bowden cable of the bonnet lock on the cross connection.

10 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.

  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

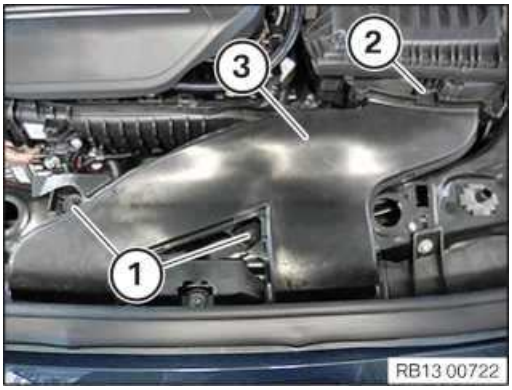
Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Insert and install the holder (1).

11 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

12 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

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- Check for correct installation of all rubber mounts in the acoustic cover (1).



- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

Additional Information

Overview of Tightening Torques

Guide tube for oil dipstick on engine — Used in step 7

M8x16		Tightening torque	19 Nm

Fan cowl on radiator — Used in step 8

M6X12		Tightening torque	6 Nm

Cross connection to carrier support — Used in step 9

Screws M6x20		Tightening torque	11,8 Nm

Screw connection for rubber mount of coolant radiator to coolant radiator — Used in step 9

Bolt to rubber mount		Tightening torque	8 Nm

Air duct to upper connection — Used in step 9

M6x20 screw		Tightening torque	11,8 Nm

Bracing strut to upper connection — Used in step 9

M8x20 screw		Tightening torque	28 Nm

Intake silencer housing to lock bridge — Used in step 10

M6X30		Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 10

Clamp		Tightening torque	3 Nm

Intake neck to cross connection — Used in step 11

M6		Tightening torque	8 Nm

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Links

Functional descriptions	Used in step
Oil supply	7

Parts

Parts required

Designation	Used in step
Seal, guide tube for oil dipstick on oil sump	7

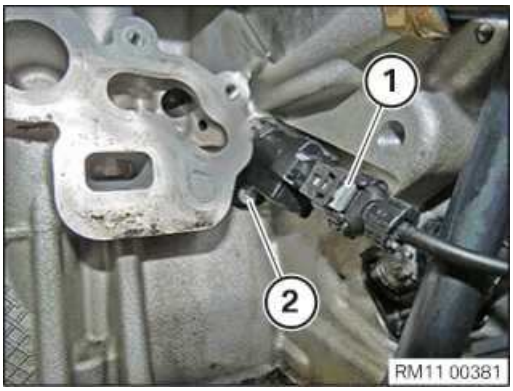
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11 41 115 Removing and installing/replacing hydraulic valve (B47)

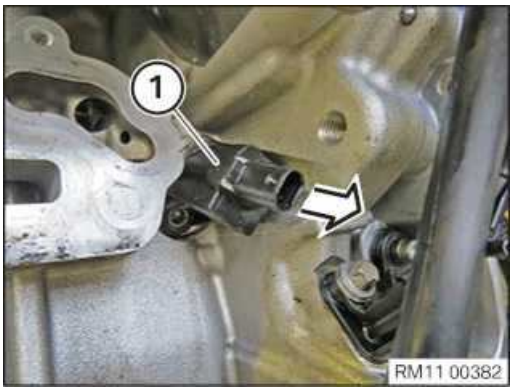
Necessary preliminary tasks:

- Remove full-flow oil filter.

Removal:

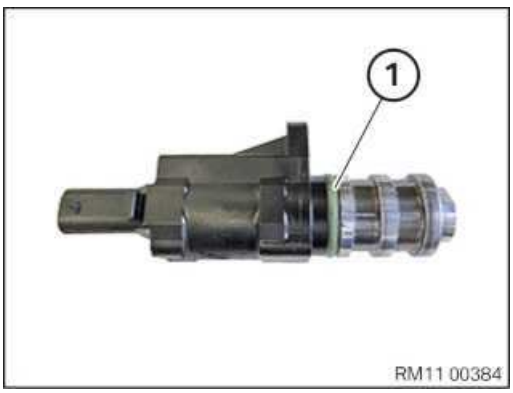


Unlock and disconnect the connector (1).
Release screw (2).



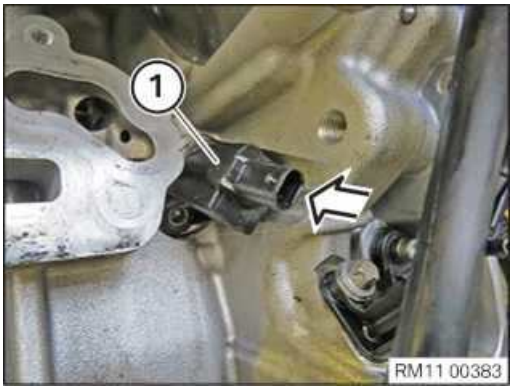
Remove hydraulic valve (1) in direction of arrow.

Installation:

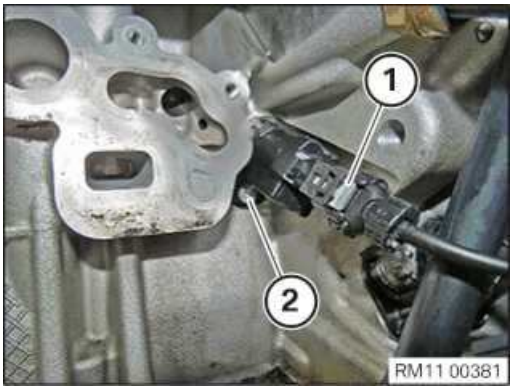


Parts: Replace O-ring (1).
Oil O-ring (1).

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Install hydraulic valve (1) in direction of arrow.



Tighten screw (2).
Tightening torque: 11 00 2AZ.
Connect the plug (1).

Required follow-up work:

- Install full-flow oil filter
- Assemble engine

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11 44 000 Removing and installing/replacing oil-to-water heat exchanger (B47)

Necessary preliminary tasks:

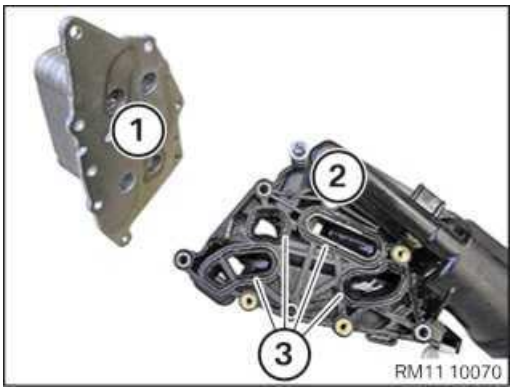
- Remove full-flow oil filter.

Removal:



Release screws (1).

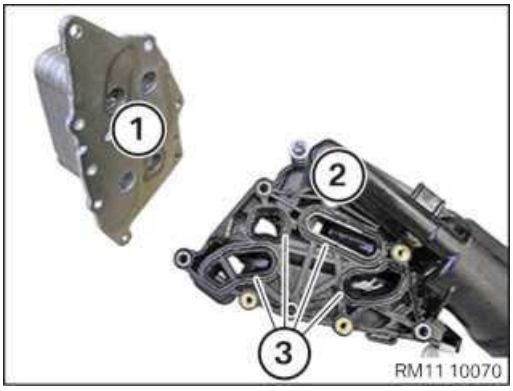
Remove heat exchanger.



Replace gaskets (3) on full-flow oil filter (2).

Installation:

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Installation note:
All sealing surfaces and gaskets must be cleaned and free of oil.

Replace gaskets (3).

Place oil-to-water heat exchanger (1) on full-flow oil filter (2).



Tighten down screws (1).

Tightening torque: 11 42 7AZ.

Required follow-up work:

- Install full-flow oil filter

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11 51 000 Removing and installing/replacing coolant pump (B47)

Warning!

Risk of scalding!

Only perform these tasks on an engine that has cooled down.

Recycling:

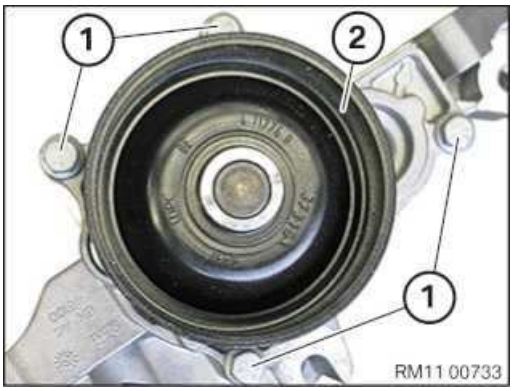
Catch and dispose of drained coolant.

Observe country-specific waste disposal regulations.

Necessary preliminary tasks:

- Remove alternator bracket

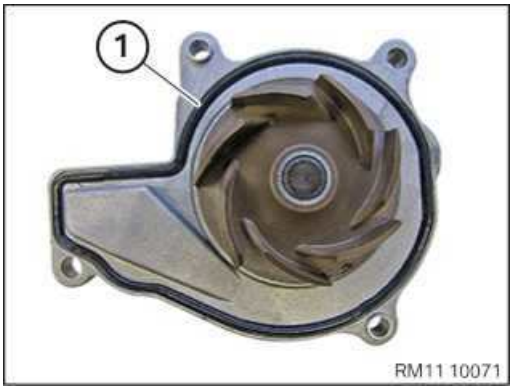
Removal:



Release screws (1).

Remove coolant pump (2) from alternator bracket.

Installation:

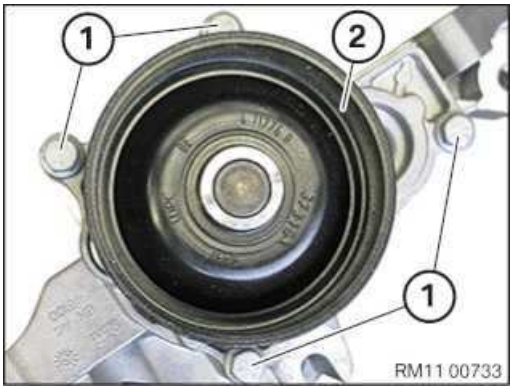


Sealing bead (1) is applied to housing of coolant pump.*Installation note:* If the sealing bead (1) protrudes slightly and if the sealing bead (1) is not damaged, the coolant pump can be reinstalled.

If the sealing bead (1) is damaged, remove sealing bead (1) with a suitable tool and replace with sealing compound 2.2 (Loctite 5970).

Sealant height approximately 2 to 2.5 mm.

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Position coolant pump (2) at alternator bracket.
Tighten down screws (1).
Tightening torque 11 51 1AZ.

Required follow-up work:

- Install alternator bracket
- Assemble engine
- Check engine for leak tightness

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11 51 000 Removing and installing/replacing the coolant pump

TECHNICAL INFORMATION

- When the engine is stopped after the end of the journey, it may be necessary to run the electric fan. In rare cases, operation of the electric fan can last up to 11 min. This protects the components. In this case, replacing the electric fan will not remedy the problem!

PRELIMINARY WORK

1 – Disconnecting all battery earth leads



- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

Damage to the acoustic cover.

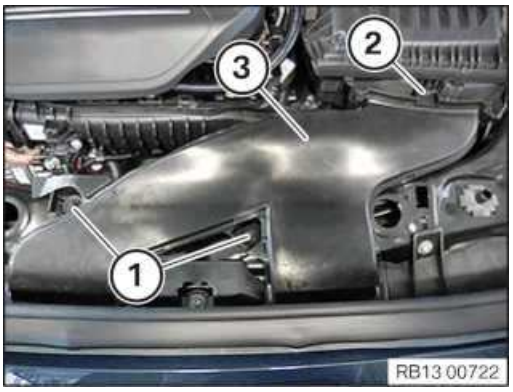
Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

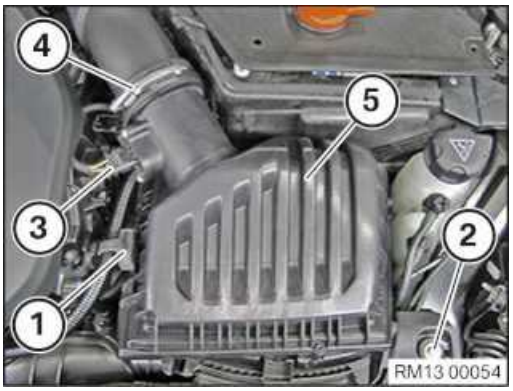
3 – Remove the intake neck for intake silencer housing

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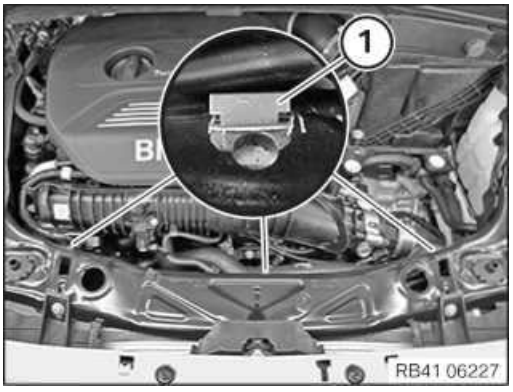
- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

4 – Removing intake silencer housing

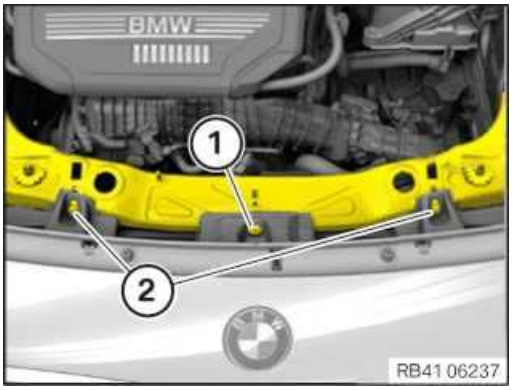


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

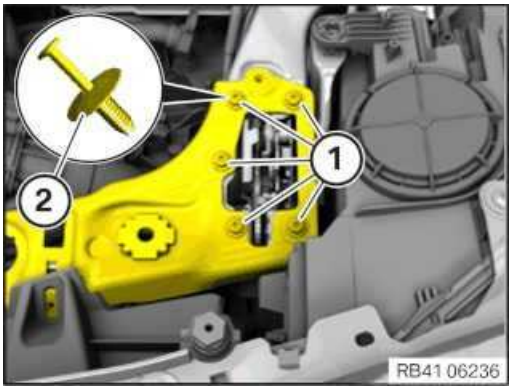
5 – Remove front cross connection



- Detach the clamps (1) for the Bowden cable of the bonnet locks from the cross connection.

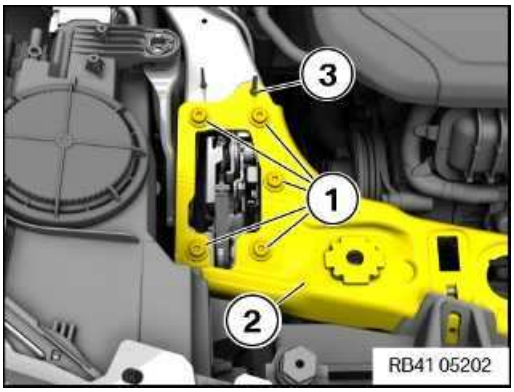


- Loosen screw (1).
- Loosen screws (2).



- Loosen screws (1).
- Lever out expanding rivet (2).

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- Loosen screws (1).
- Unclip the front cross connection (2) from the rubber retainer (3) and remove it upward.

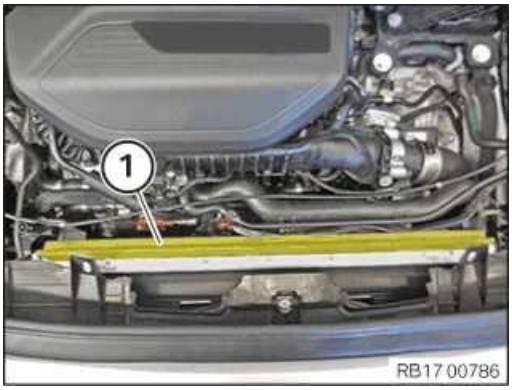
6 – Removing the fan cowl with electric fan

WARNING

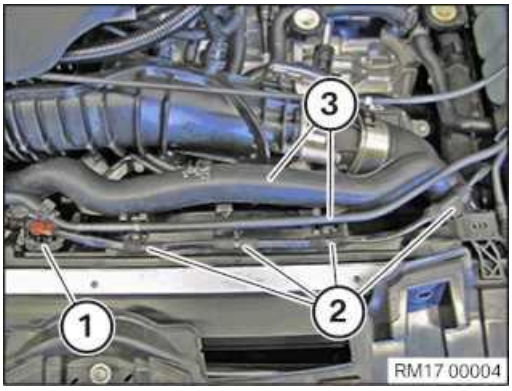
Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Feed out and remove the sealing (1) from the radiator.

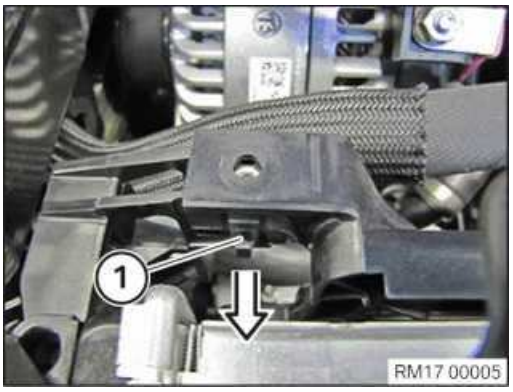


- Unlock plug connection (1) and disconnect.
- Unlock and loosen the clamps (2).
- Feed out connector (1) and place to one side.
- Thread off coolant line (3) and place to the side.

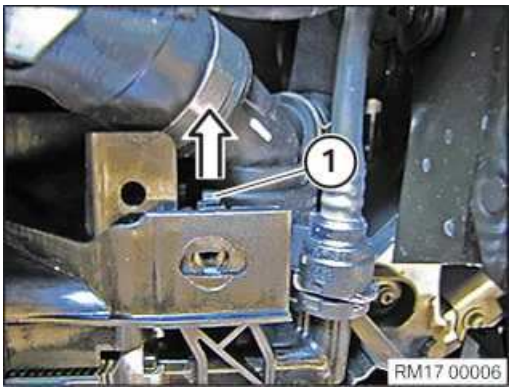


- Loosen screws (1).

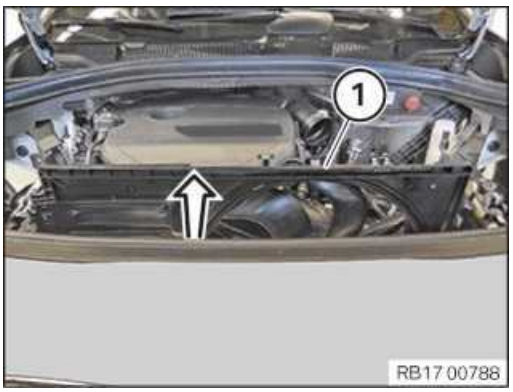
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- Unlock the right lock (1) on the fan cowl in the direction of the arrow.

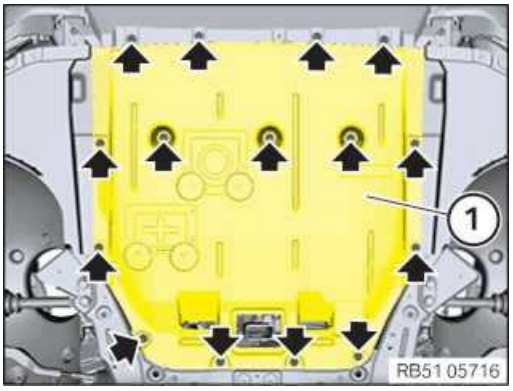


- Unlock the left lock (1) on the fan cowl in the direction of the arrow.

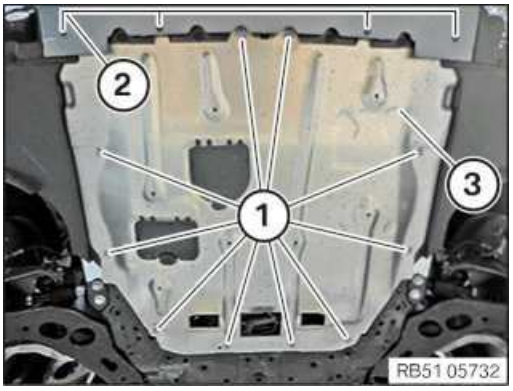


- Guide out fan cowl (1) in direction of arrow and remove.

7 – Removing the front underbody protection



- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.



- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

8 – Draining coolant

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WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

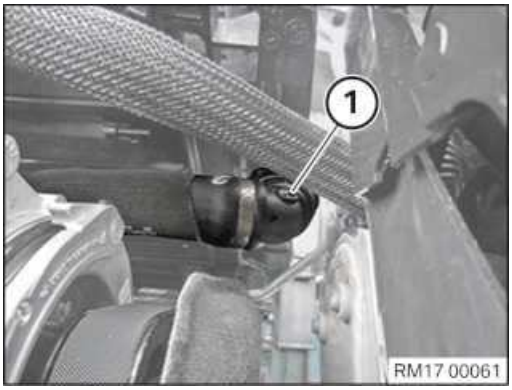
In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

TECHNICAL INFORMATION

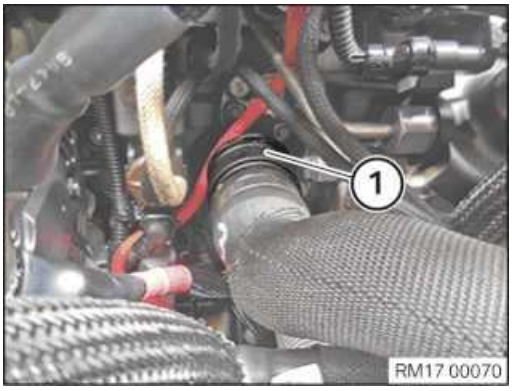
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Loosen sealing cap (1).



- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.



- Unlock the coolant line (1) and pull it off the connecting branch.
- Catch and dispose of escaping coolant.

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9 – Remove front right wheel

TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

TECHNICAL INFORMATION

Strictly observe the specified procedure to prevent clamping errors and imbalance.



- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

10 – Removing the front right wheel arch cover

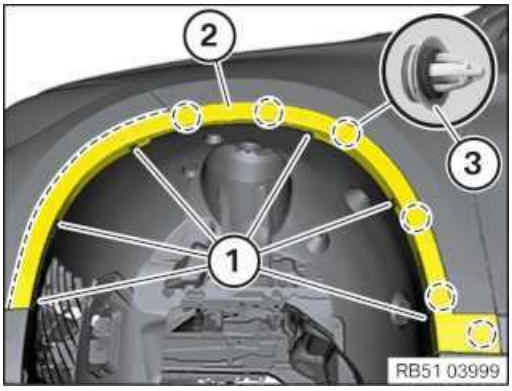
▸ **Remove the front wheel arch trim**

NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

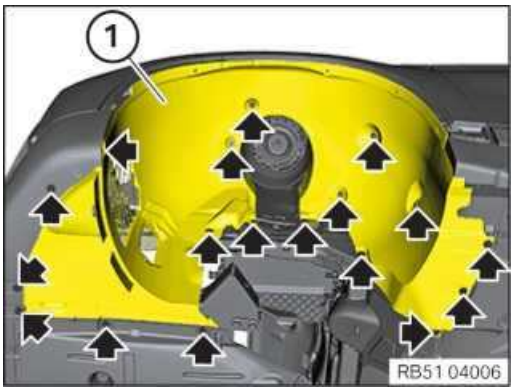
NOTICE

Description is for left component only. Procedure on the right side is identical.



- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.

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NOTICE

Description is for left component only. Procedure on the right side is identical.

- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

11 – Removing the drive belt for alternator

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

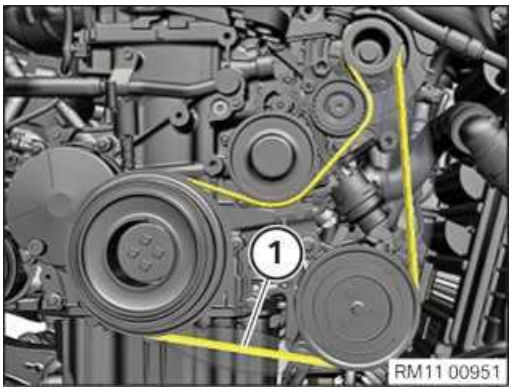
TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.



- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool **0 496 268 (11 0 390)**.

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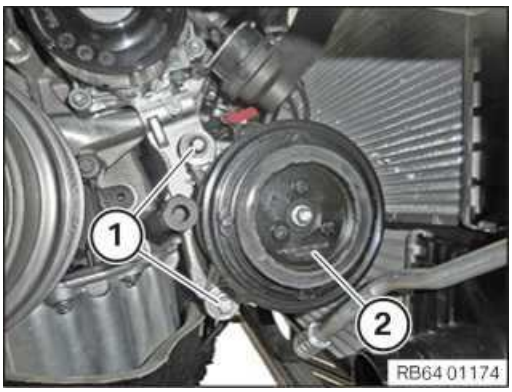


- Guide out the drive belt for the alternator (1) and remove it.

12 – Removing the alternator

Prerequisite

Battery earth lead is disconnected.

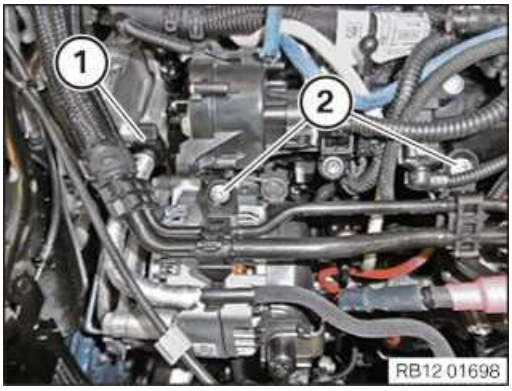


TECHNICAL INFORMATION

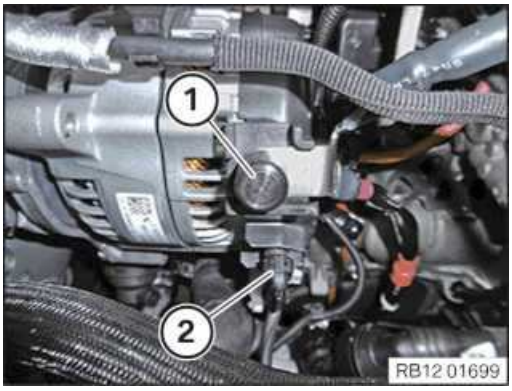
Secure component against falling.

- Loosen screws (1).
- Detach the air conditioning compressor (2) from the component carrier and protect it from falling.

Note: Tie the air conditioning compressor up.



- Unlock the coolant ventilation line (1) and pull it off the cylinder head.
- Catch and dispose of escaping coolant.
- Loosen screws (2).
- Place fuel feed and return line to one side.

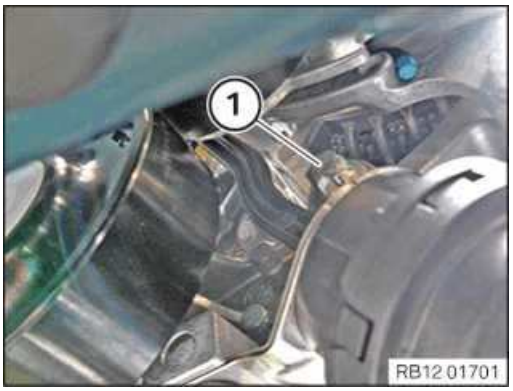


- Remove the cover (1) and loosen the nut below.
- Disconnect positive battery cable from alternator.
- Unlock and disconnect the connector (2) from the alternator.

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- Detach screw (1) on top on the alternator.

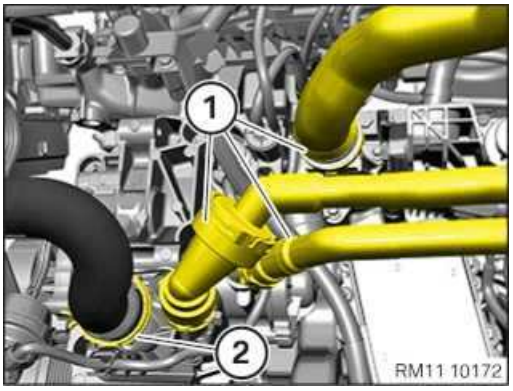


- Detach screw (1) below on the alternator.

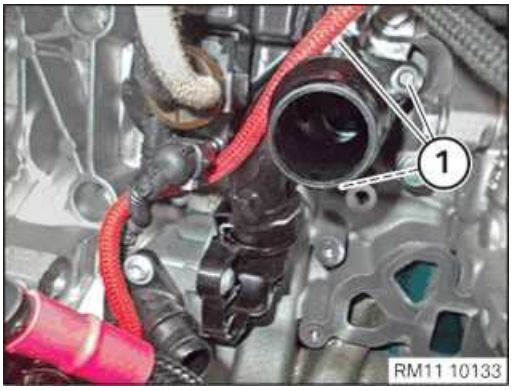


- Feed out alternator (1) along with the screw (2) on the bottom of the alternator through the slot on the support and remove.

13 – Removing the component carrier

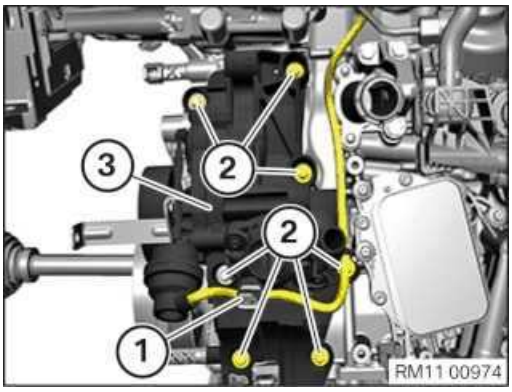


- Unlock the lock of the coolant lines.
- Pull off coolant lines (1) and place to one side.
- Loosen hose clamp (2).
- Remove coolant hose.



- Loosen screws (1).

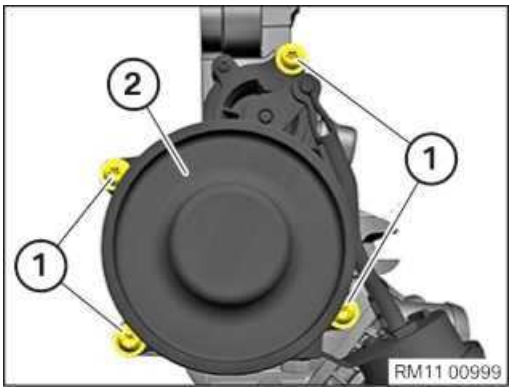
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- Disconnect the vacuum line (1) from the vacuum unit and detach it from the clamp on the component carrier.
- Loosen screws (2).
- Lift off and remove the component carrier (3) from the crankcase.

MAIN WORK

14 – Removing the coolant pump



- Loosen screws (1).

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Feed out and remove the coolant pump (2).

15 – Installing coolant pumps



RISK OF DAMAGE

Contaminant or foreign body.

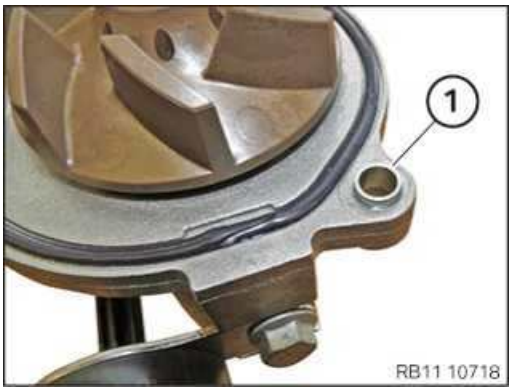
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

- Clean the sealing surfaces (1) with the special tool **0 495 102 (11 4 470)**.

Check

- Check the fitting sleeve (1) for damage.



desired state

- Fitting sleeve must not be scratched or deformed.

Result

» Fitting sleeve is damaged.

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Measure

- Completely renew the coolant pump.

  Parts: Coolant pump

Check



- Check the sealing bead for damage.
- Measure the height of the sealing bead in reference to the surface.

Height of the sealing bead

	2,0 mm ... 2,5 mm

Result

» The sealing bead is damaged or the measured dimension deviates.

Measure

- Remove sealing bead.

11 00 ... Overview of consumables (Electronic Parts Catalogue)

- Reapply sealing bead.

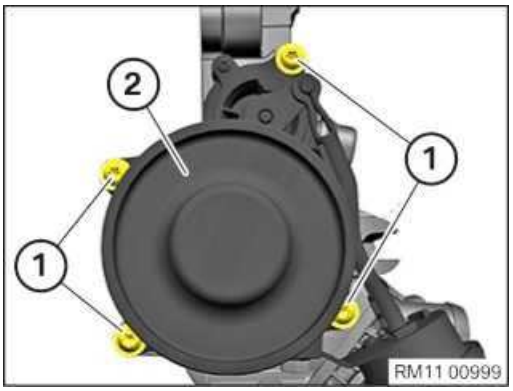
Sealing compound

Loctite 5970 liquid sealing compound	50 ml, Cartridge	83190404517

Overview of consumables (Electronic Parts Catalogue)

Processing time of liquid sealing compound

	< 12 min



- Insert and install the coolant pump (2).
- Tighten bolts (1).

Coolant pump to crankcase

M6	If reusing the coolant pump: Apply Loctite 5970 For additional information see: 11 00 ... Overview of consumables in EPC (Electronic Parts Catalogue) sealing compound 2.2	Tightening torque	8 Nm

POSTPROCESSES

16 – Installing the component carrier

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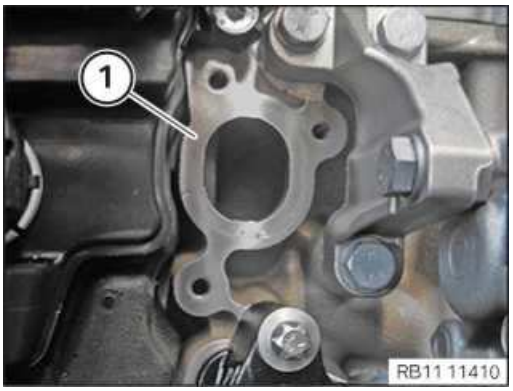
RISK OF DAMAGE

Contaminant or foreign body.

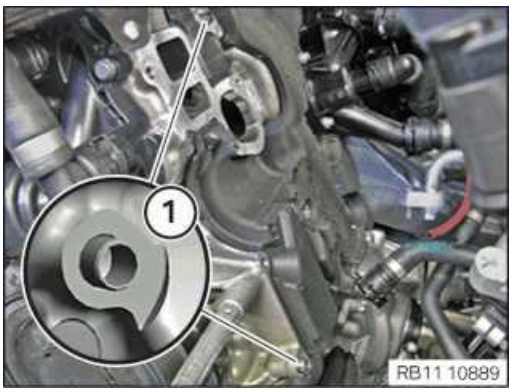
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

- Clean the sealing surface using special tool **0 495 102 (11 4 470)**.



- Clean the sealing surface (1) using special tool **0 495 102 (11 4 470)**.



Check

- Check the fitting sleeves (1) for damage.

desired state

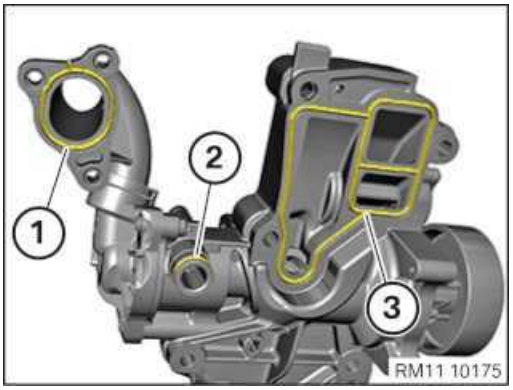
- Fitting sleeves must not be scratched or deformed.

Result

» Fitting sleeves are damaged.

Measure

- Renew fitting sleeves.



- Renew gasket (1).

  Parts: Gasket

- Replace O-ring (2).

  Parts: O-ring

- Check the sealing bead (3) for damage.
- Check the height of the sealing bead in reference to the surface.

Height of the sealing bead

	2,0 mm ... 2,5 mm

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- If necessary, reapply the sealing bead.

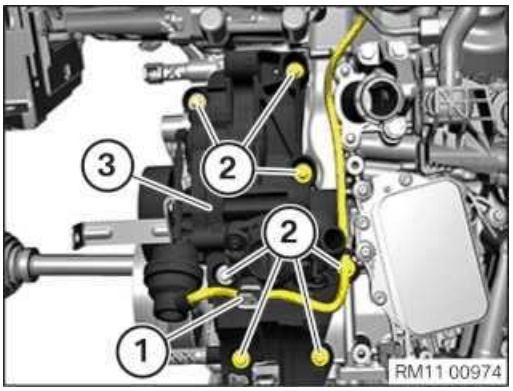
Sealing compound

Loctite 5970 liquid sealing compound	50 ml, Cartridge	83190404517

Overview of consumables (Electronic Parts Catalogue)

Processing time of liquid sealing compound

< 12 min

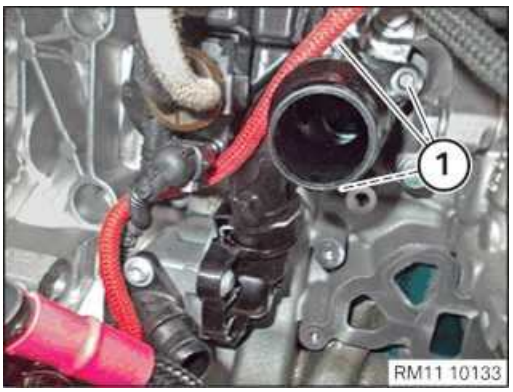


- Position the component carrier (3) on the crankcase.
- Tighten down screws (2).

Component carrier to crankcase

M8x35		Tightening torque	19 Nm

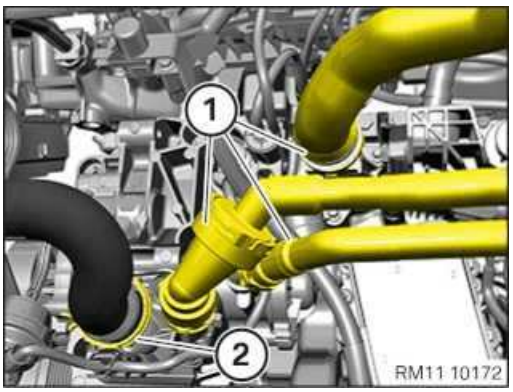
- Connect the vacuum line (1) on the vacuum unit and attach it in the clamp on the component carrier.



- Tighten the screws (1).

Connecting branch to engine block

M6x25		Tightening torque	8 Nm



- Connect and lock the coolant lines (1).

  The locks must engage audibly.
- Connect the coolant hose and fasten the hose clamp (2).

17 – Installing the alternator

Prerequisite

Battery earth lead is disconnected.

CAUTION

Improper routing of the positive battery cable.

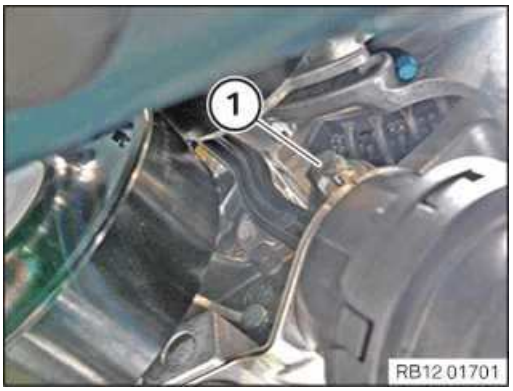
Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

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- Insert and install alternator (1) along with the screw (2) on the bottom of the alternator through the slot on the support.



- Tighten the screw (1) below on the alternator.

Alternator to component carrier

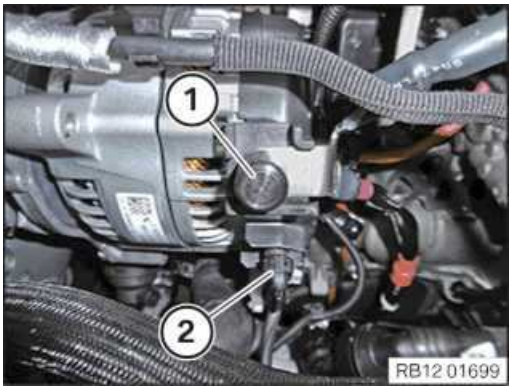
M10x75 / M10x125		Tightening torque	38 Nm



- Tighten the bolt (1) on top on the alternator.

Alternator to component carrier

M10x75 / M10x125		Tightening torque	38 Nm

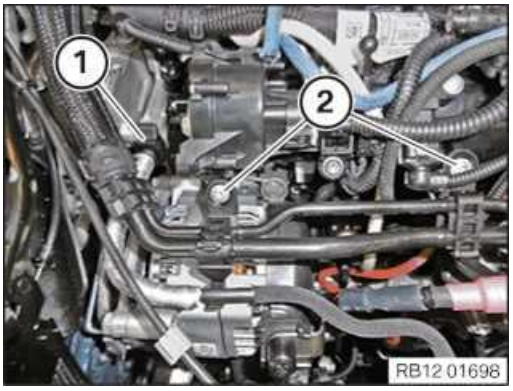


- Mount positive battery cable to the alternator.
- Tighten nut.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

- Mount the cover (1).
- Connect the connector (2) to the alternator and lock audibly.



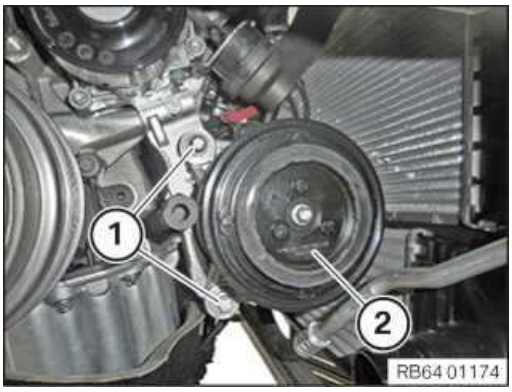
- Mount fuel supply and return line.
- Tighten down screws (2).

Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

- Connect the coolant ventilation line (1) to the cylinder head and audibly lock.

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- Correctly position the air conditioning compressor (2).
- Tighten the screws (1).

Air conditioning compressor in component carrier

M10		Tightening torque	38 Nm

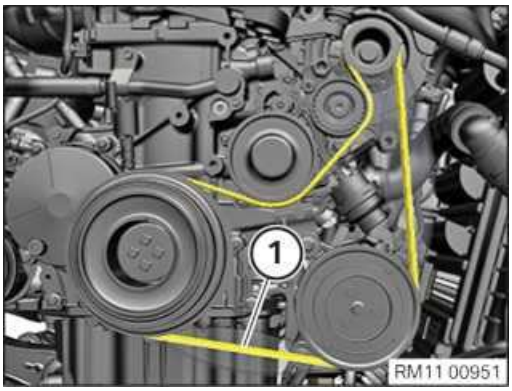
18 – Installing the drive belt for alternator

TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.



- Feed in the drive belt for the alternator (1) and install it.



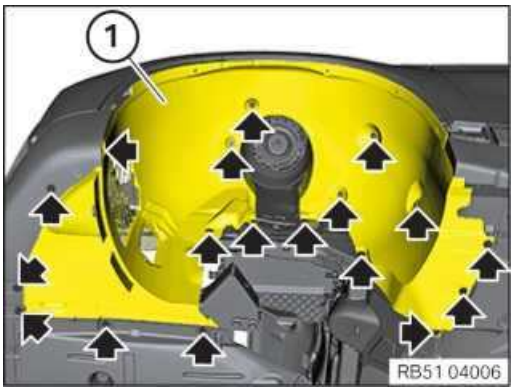
- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool **0 496 268 (11 0 390)** out of the belt tensioner and remove it.

19 – Installing the front right wheel arch cover

NOTICE

Description is for left component only. Procedure on the right side is identical.

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- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

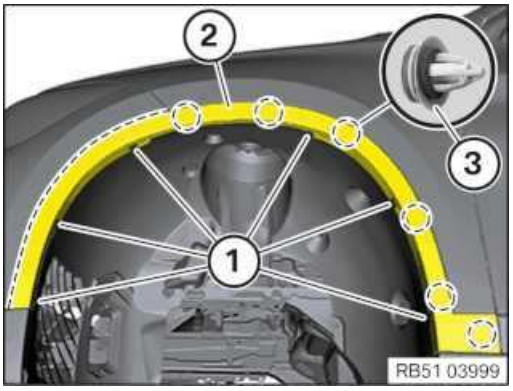
▸ **Installing front wheel arch trim**

NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Check the clips (3) for damage and renew where required.

  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

20 – Installing the front right wheel

▸ **Clean the contact surfaces between the brake disc and the wheel rim**



TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

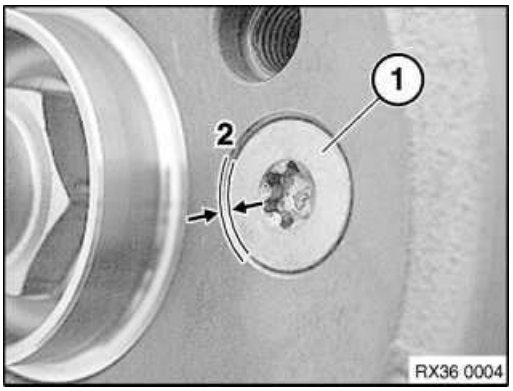
  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.

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- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

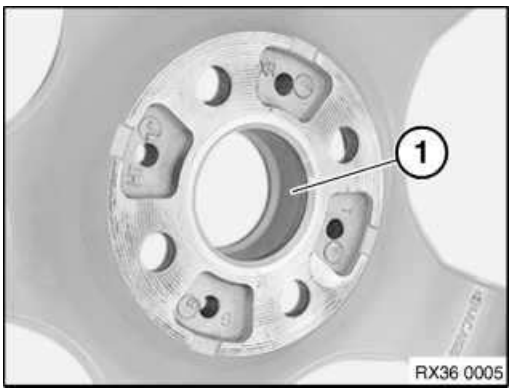


- Check the mounting bolt for the brake disc (1) for secure fit.

  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

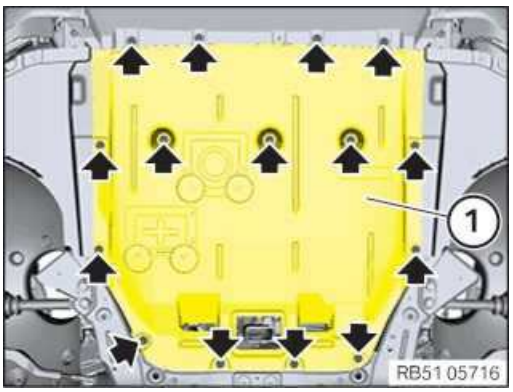
  Parts: Wheel bolts
- Clean the wheel bolts and check the threads for damage. Renew the wheel bolts as needed.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

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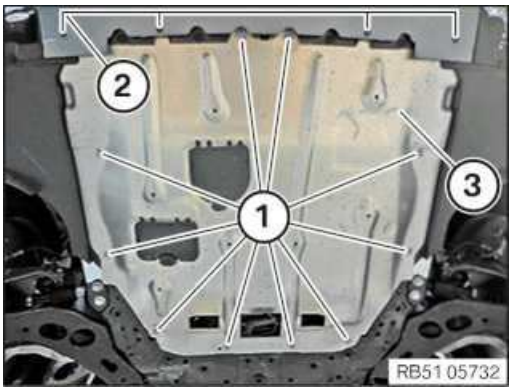
21 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm



- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

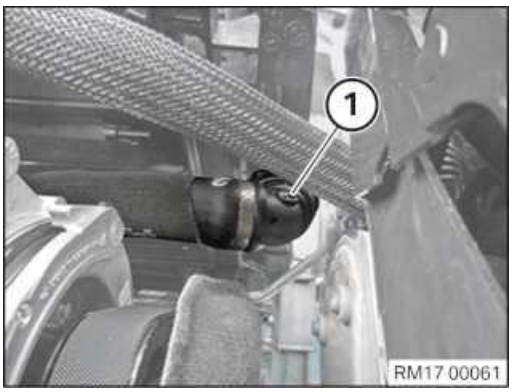
Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

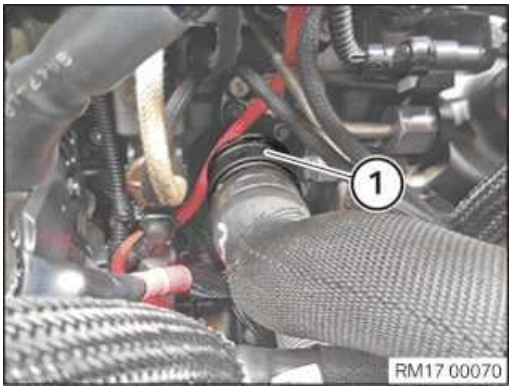
22 – Connect the coolant line

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Connect the right coolant line (1) to the radiator and lock audibly.



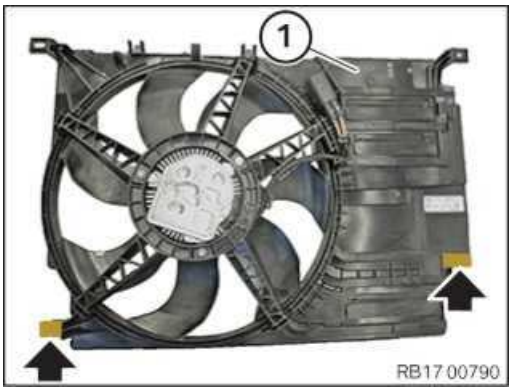
- Connect the coolant line (1) to the connecting branch and lock audibly.

23 – Installing fan cowl with electric fan

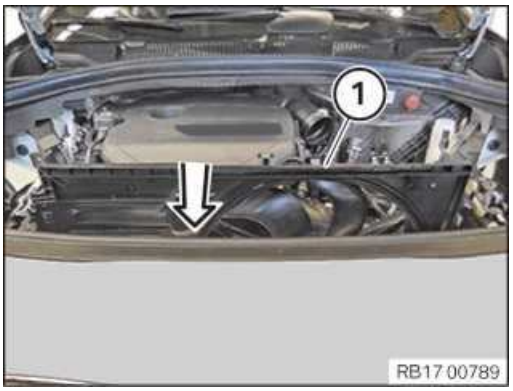
TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

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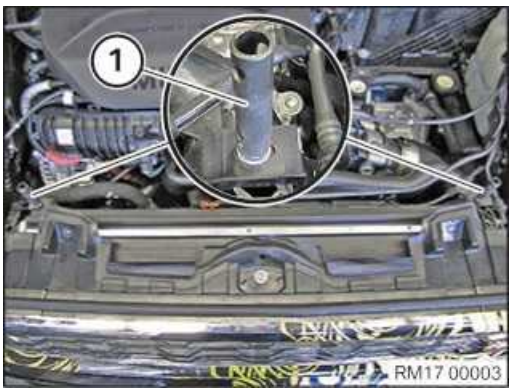
- Feed the guides (arrows) of the fan cowl (1) into the charge air cooler.



- Feed in and install the fan cowl (1) in the direction of the arrow.



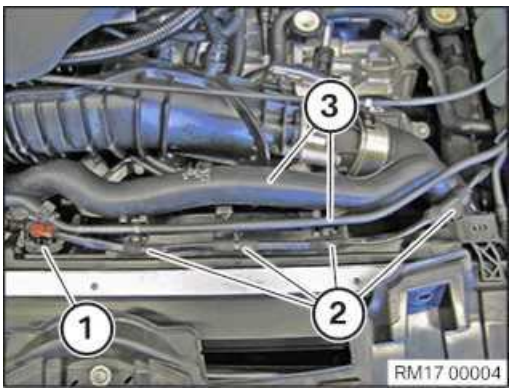
- Lock the left and right locks (arrows).



- Tighten the screws (1).

Fan cowl on radiator

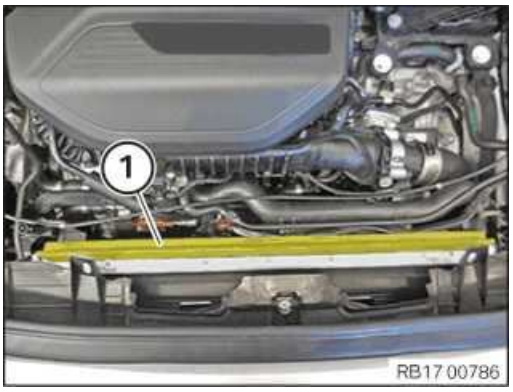
M6X12		Tightening torque	6 Nm



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.
- Secure clamps (2).
- Thread in and install coolant line (3).

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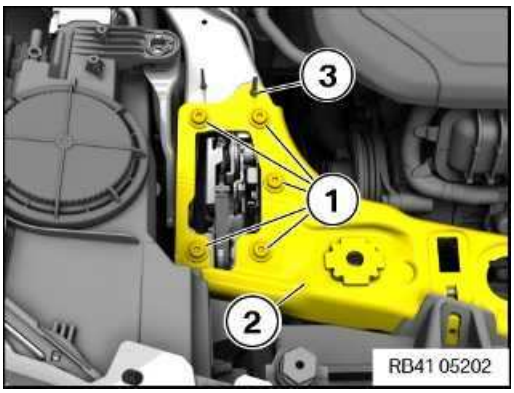


- Guide the sealing (1) on the radiator in and install it.

24 – Install front cross connection



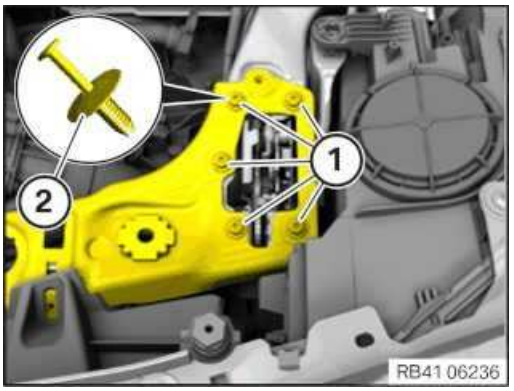
- Right side of vehicle only: Secure spray guard (1) on the cross connection (2) as pictured.



- Position front cross connection (2) and clip front cross connection (2) into the rubber retainer (3) at the same time.
- Tighten the screws (1).

Cross connection to carrier support

Screws M6x20		Tightening torque	11,8 Nm

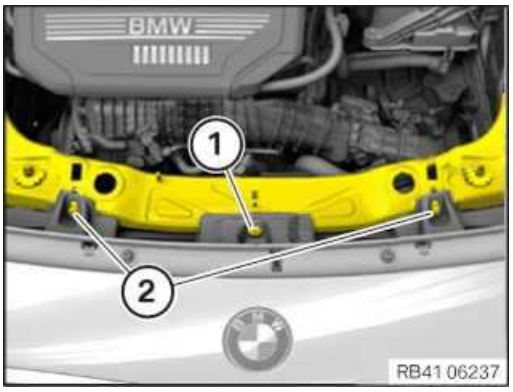


- Tighten the screws (1).

Cross connection to carrier support

Screws M6x20		Tightening torque	11,8 Nm

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- Position screws (3) on the rubber mounts for the radiator and tighten.

Screw connection for rubber mount of coolant radiator to coolant radiator

Bolt to rubber mount		Tightening torque	8 Nm

- Tighten down screws (2).

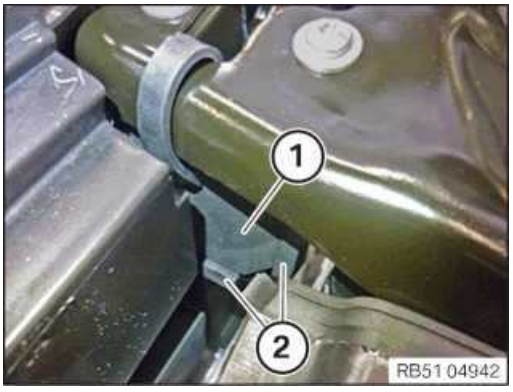
Air duct to upper connection

M6x20 screw		Tightening torque	11,8 Nm

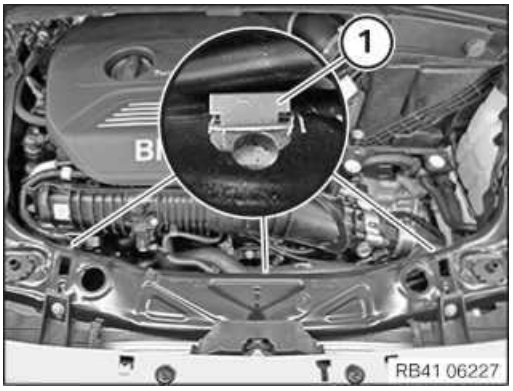
- Tighten down screw (1).

Bracing strut to upper connection

M8x20 screw		Tightening torque	28 Nm

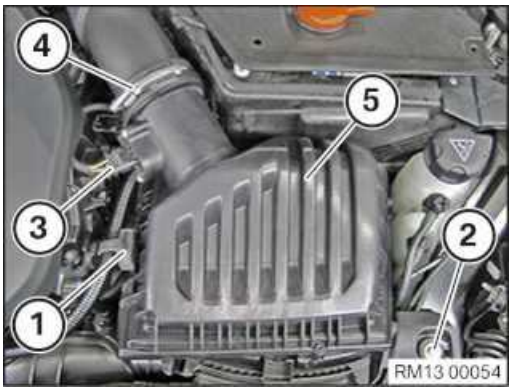


- Right side of vehicle only: Properly mount spray guard (1) to prevent corrosion.
- Secure spray guard (1) to the bridge with retaining tabs (2).



- Fasten the clamps (1) from the Bowden cable of the bonnet lock on the cross connection.

25 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.

  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

Clean air pipe to intake silencer housing

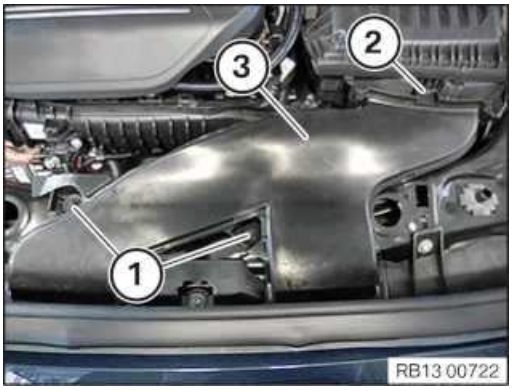
Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Insert and install the holder (1).

26 – Install the intake neck for the intake filter housing

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- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

27 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Check for correct installation of all rubber mounts in the acoustic cover (1).



- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

28 – Disconnecting all battery earth leads

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- See additional information.

29 – Fill and bleed the coolant circuit

▶ **Filling and bleed the high-temperature coolant circuit**



- See additional information.

Additional Information

Overview of Tightening Torques

Coolant pump to crankcase			Used in step 15
M6	If reusing the coolant pump: Apply Loctite 5970 For additional information see: 11 00 ... Overview of consumables in EPC (Electronic Parts Catalogue) sealing compound 2.2	Tightening torque	8 Nm

Component carrier to crankcase			Used in step 16
M8x35		Tightening torque	19 Nm

Connecting branch to engine block			Used in step 16
M6x25		Tightening torque	8 Nm

Alternator to component carrier			Used in step 17
M10x75 / M10x125		Tightening torque	38 Nm

Positive battery cable to alternator			Used in step 17
M8		Tightening torque	19 Nm

Fuel line to intake plenum			Used in step 17
TS6x20		Tightening torque	5 Nm

Air conditioning compressor in component carrier			Used in step 17
M10		Tightening torque	38 Nm

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Wheel arch cover to body — Used in step 19

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body — Used in step 19

Plastic nut		Tightening torque	3 Nm

Brake disc to front wheel hub — Used in step 20

M8	Renew screw.		16 Nm

Wheel bolts — Used in step 20

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Underbody protection front — Used in step 21

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Fan cowl on radiator — Used in step 23

M6X12		Tightening torque	6 Nm

Cross connection to carrier support — Used in step 24

Screws M6x20		Tightening torque	11,8 Nm

Screw connection for rubber mount of coolant radiator to coolant radiator — Used in step 24

Bolt to rubber mount		Tightening torque	8 Nm

Air duct to upper connection — Used in step 24

M6x20 screw		Tightening torque	11,8 Nm

Bracing strut to upper connection — Used in step 24

M8x20 screw		Tightening torque	28 Nm

Intake silencer housing to lock bridge — Used in step 25

M6X30		Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 25

Clamp		Tightening torque	3 Nm

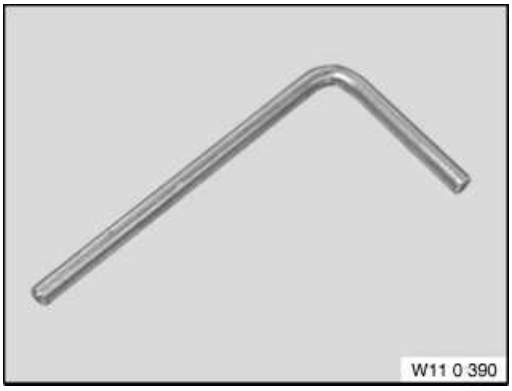
Intake neck to cross connection — Used in step 26

M6		Tightening torque	8 Nm

Overview of Special Tools

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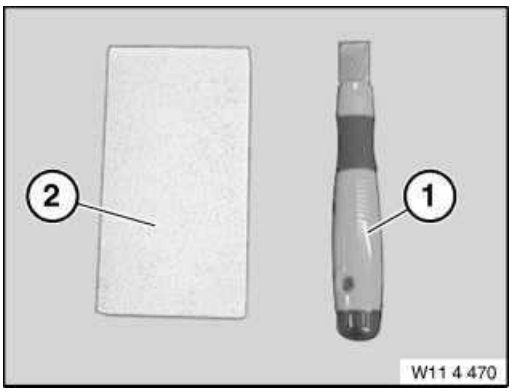
0 496 268 (11 0 390) Pin



Common Used in step 11 18

Usage	(roll pin) For securing new tensioning pulley (poly-V belt)
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 15 07 (390)

0 495 102 (11 4 470) Tool



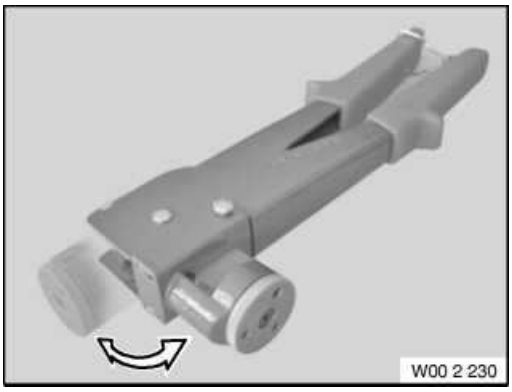
Common Used in step 15 16

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

0 496 521 (00 2 230) Pliers



Common Used in step 19

Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

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2 344 011 Tool



Common	Used in step 20
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

0 495 221 (36 1 323) Wheel stud



Common	Used in step 9
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

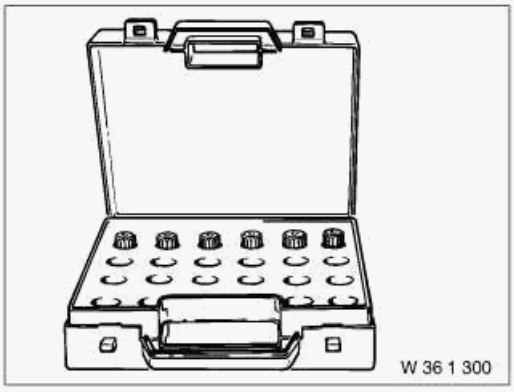
0 495 224 (36 1 326) Wheel stud



Common	Used in step 9
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

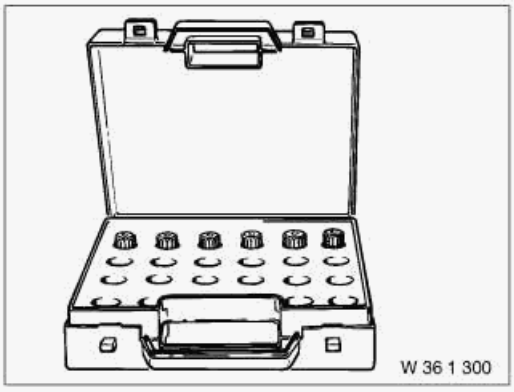
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0 495 225 (36 1 327) Wheel stud



Common	Used in step 9
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud



Common	Used in step 9
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud



Common	Used in step 9
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

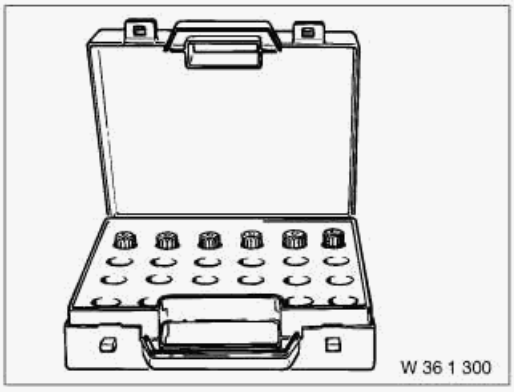
0 495 228 (36 1 331) Wheel stud



Common	Used in step 9
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 229 (36 1 332) Wheel stud



Common	Used in step 9
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud



Common	Used in step 9
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Height of the sealing bead	Used in step 15 16
	2,0 mm ... 2,5 mm

Processing time of liquid sealing compound	Used in step 15 16
	< 12 min

Links

General repair instructions	Used in step
11 00 ... Overview of consumables (Electronic Parts Catalogue)	15

Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	1 28
61 20 900 Disconnecting and connecting battery earth lead	1 28
61 20 900 Disconnecting and connecting battery earth lead	1 28
61 20 900 Disconnecting and connecting battery earth lead	1 28
61 20 900 Disconnecting and connecting battery earth lead	1 28
61 20 900 Disconnecting and connecting battery earth lead	1 28
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 28
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 28
61 20 900 Disconnecting and connecting battery earth lead	1 28
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 28
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	1 28

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61 20 900 Disconnecting and connecting battery earth lead 1 28
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61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads) 1 28
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61 20 900 Disconnecting and connecting battery earth lead 1 28
61 20 900 Disconnecting and connecting battery earth lead 1 28
61 20 900 Disconnecting and connecting battery earth lead 1 28
17 00 008 Draining and topping up coolant for high-temperature circuit 29
17 00 008 Draining and topping up coolant for high-temperature circuit 29
17 00 008 Draining and topping up coolant for high-temperature circuit 29
17 00 039 Bleed the cooling system and check it for watertightness with the special tool

17 00 039 Bleed the cooling system and check it for watertightness with the special tool	29
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	29
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	29
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	29
17 00 039 Bleeding the cooling system (B36, B38, B46, B48)	29
17 00 039 Bleeding cooling system (B37, B47)	29
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	29
17 00 039 Filling and bleeding the high-temperature cooling system vacuum filler device (B48)	29
17 00 008 Draining and topping up the high-temperature coolant circuit	29
17 00 008 Draining and topping up the high-temperature coolant circuit	29
17 00 016 Draining and topping up coolant circuit for Range Extender \PREMIUM	29
17 00 008 Draining and topping up the high-temperature coolant circuit	29
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	29
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	29
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	29
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	29
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	29

Operating materials	Used in step
2.0 Grease for wheel centring	20

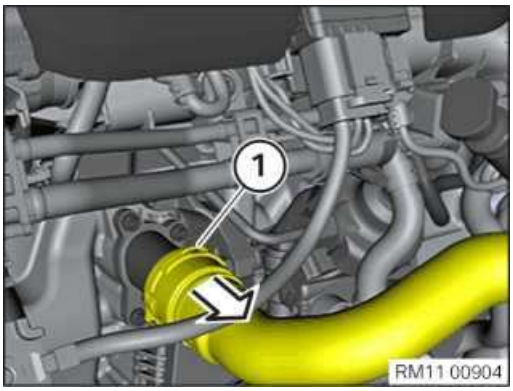
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11 53 942 Remove and install (replace) connecting branch (B47)

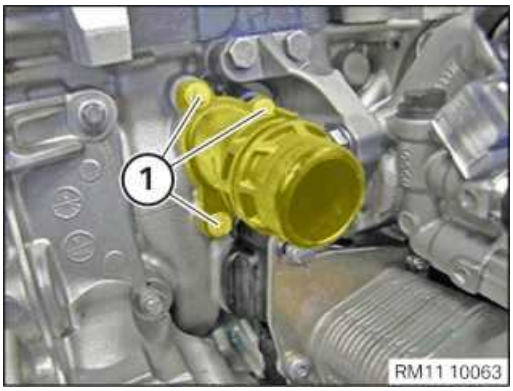
Necessary preliminary tasks:

- Drain coolant

Removal:

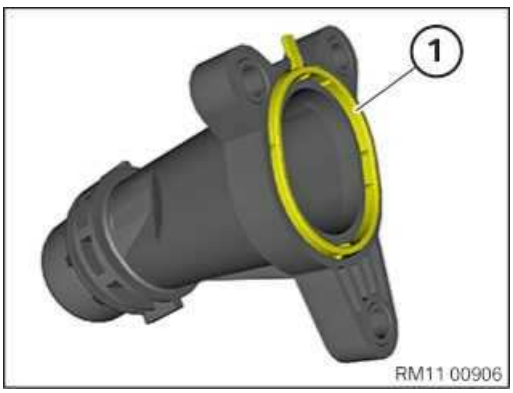


Unlock coolant hose (1) and disconnect from connecting branch.



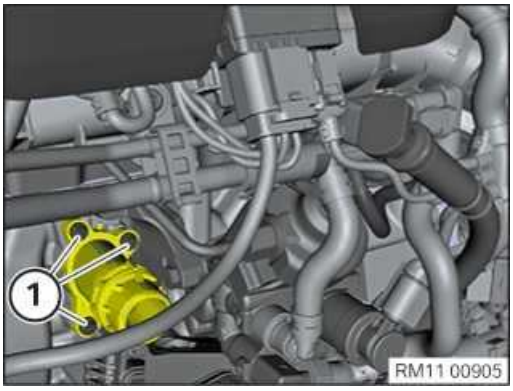
Release screws (1) on connecting branch.
Remove connecting branch.

Installation:

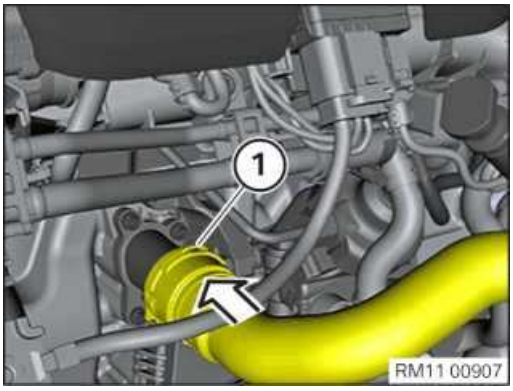


Part: Replace gasket (1).
Install gasket (1).

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Position connecting branch.
Tighten screws (1) on connecting branch.
Tightening torque 11 51 2AZ.



Mount coolant hose on connecting branch (1).
Lock must snap audibly into place.

Required follow-up work:

- Add coolant

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11 53 000 Removing and installing or replacing coolant thermostat (B47)

Recycling:

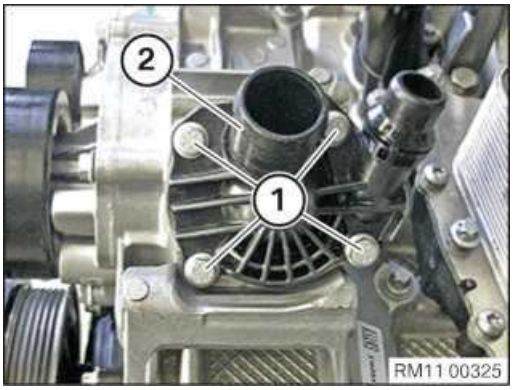
Catch and dispose of drained coolant.

Observe country-specific waste disposal regulations.

Necessary preliminary tasks:

- Remove alternator bracket.

Removal:



Release screws (1).

Remove thermostat housing (2).



Remove thermostat (1) from housing in direction of arrow.

Installation:

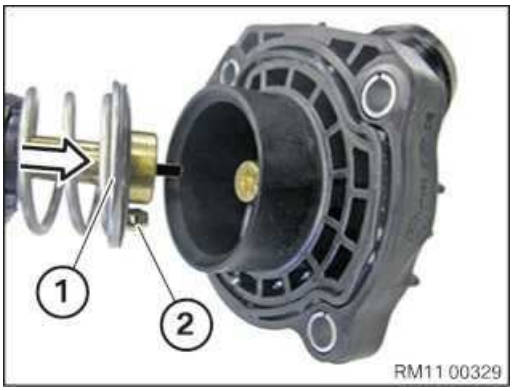
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Note:
Guide sleeve (1) must not be damaged or missing.

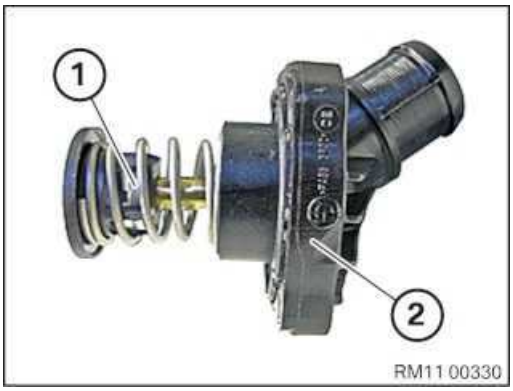


Parts: Replace profile seal (1).



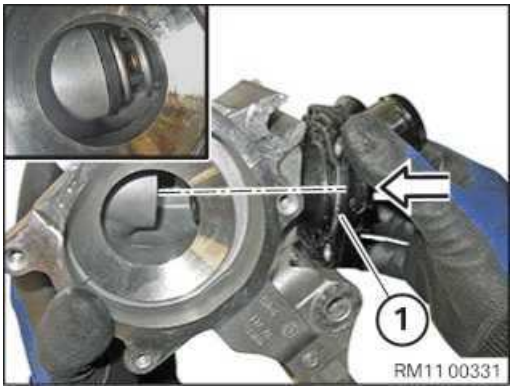
Note:
Valve (2) must be positioned at bottom.

Insert thermostat (1) in housing.



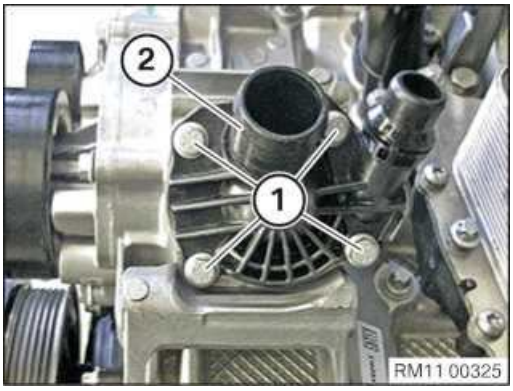
Important!
Thermostat (1) must not tilt out of housing (2) during installation.

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Note:
Alternator bracket dismantled for improved clarity.

Install thermostat housing (1) with thermostat in a straight line and free from stress.



Tighten down screws (1).

Tightening torque: 11 00 2AZ.

Required follow-up work:

- Install alternator bracket.

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11 53 000 Removing and installing/replacing coolant thermostat

TECHNICAL INFORMATION

- When the engine is stopped after the end of the journey, it may be necessary to run the electric fan. In rare cases, operation of the electric fan can last up to 11 min. This protects the components. In this case, replacing the electric fan will not remedy the problem!

PRELIMINARY WORK

1 – Disconnecting all battery earth leads



- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

Damage to the acoustic cover.

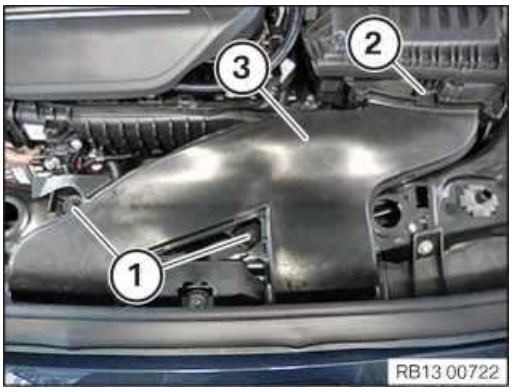
Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

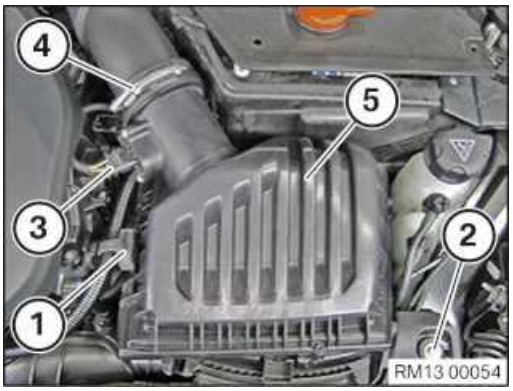
3 – Remove the intake neck for intake silencer housing

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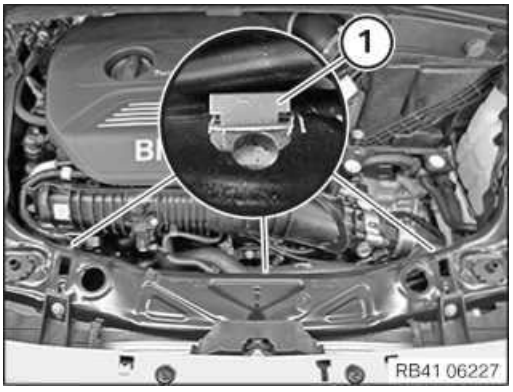
- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

4 – Removing intake silencer housing

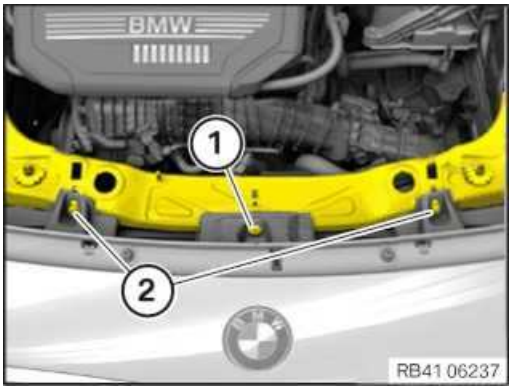


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

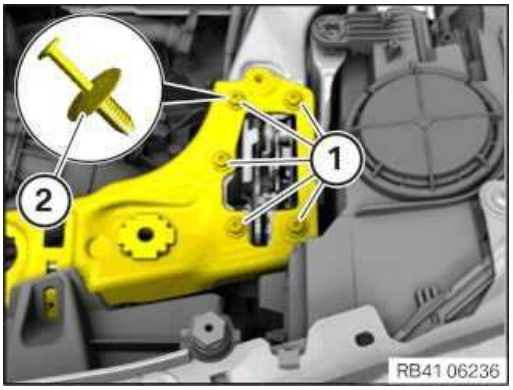
5 – Remove front cross connection



- Detach the clamps (1) for the Bowden cable of the bonnet locks from the cross connection.

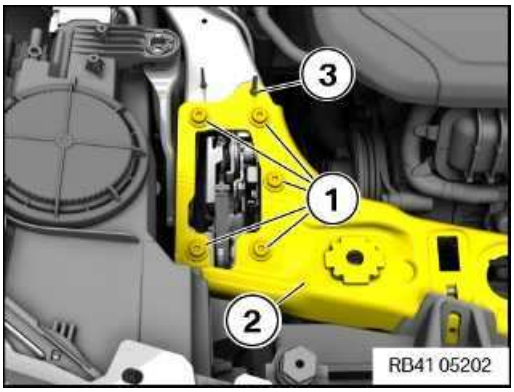


- Loosen screw (1).
- Loosen screws (2).



- Loosen screws (1).
- Lever out expanding rivet (2).

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- Loosen screws (1).
- Unclip the front cross connection (2) from the rubber retainer (3) and remove it upward.

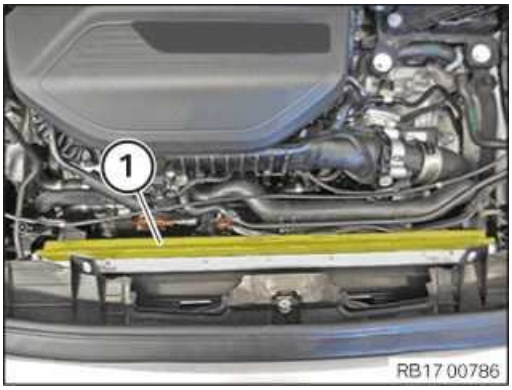
6 – Removing the fan cowl with electric fan

WARNING

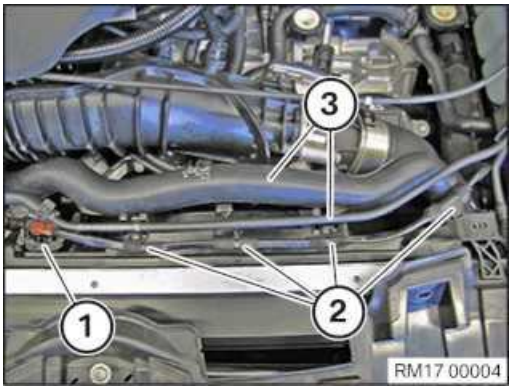
Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Feed out and remove the sealing (1) from the radiator.

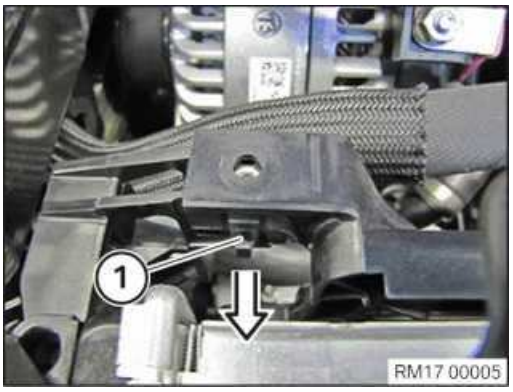


- Unlock plug connection (1) and disconnect.
- Unlock and loosen the clamps (2).
- Feed out connector (1) and place to one side.
- Thread off coolant line (3) and place to the side.

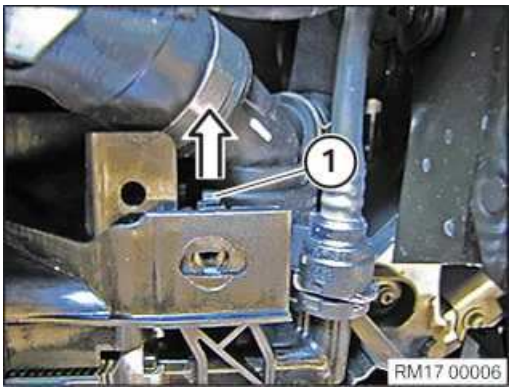


- Loosen screws (1).

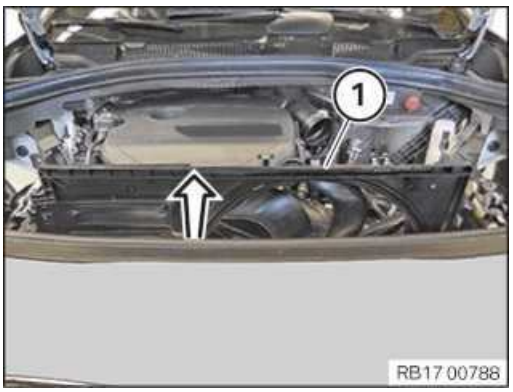
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- Unlock the right lock (1) on the fan cowl in the direction of the arrow.

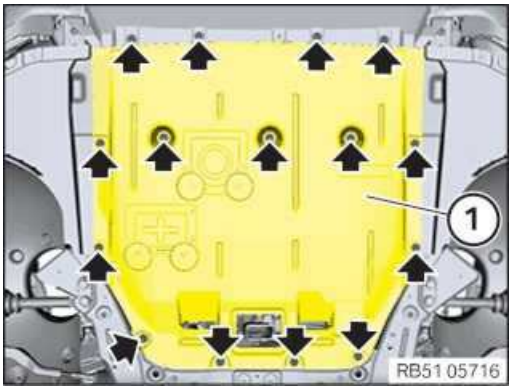


- Unlock the left lock (1) on the fan cowl in the direction of the arrow.

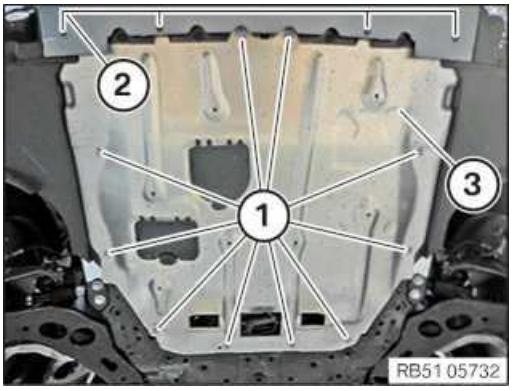


- Guide out fan cowl (1) in direction of arrow and remove.

7 – Removing the front underbody protection



- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.



- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

8 – Draining coolant

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WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

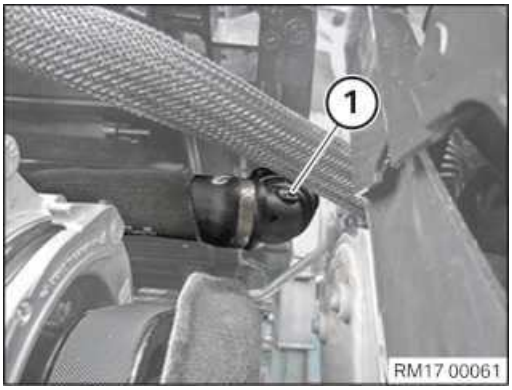
In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

TECHNICAL INFORMATION

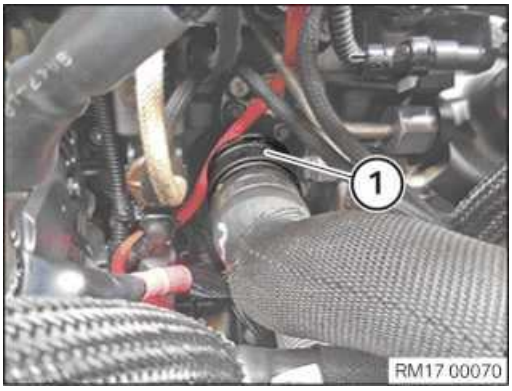
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Loosen sealing cap (1).



- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.



- Unlock the coolant line (1) and pull it off the connecting branch.
- Catch and dispose of escaping coolant.

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9 – Remove front right wheel

TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

TECHNICAL INFORMATION

Strictly observe the specified procedure to prevent clamping errors and imbalance.



- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

10 – Removing the front right wheel arch cover

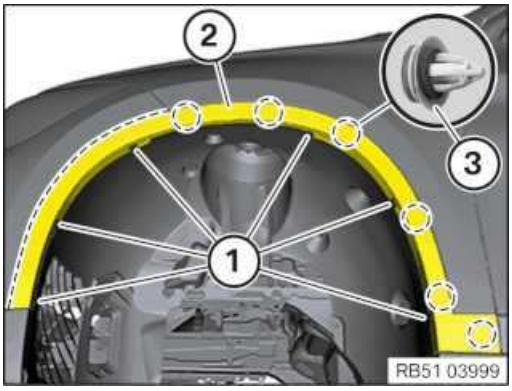
▸ **Remove the front wheel arch trim**

NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

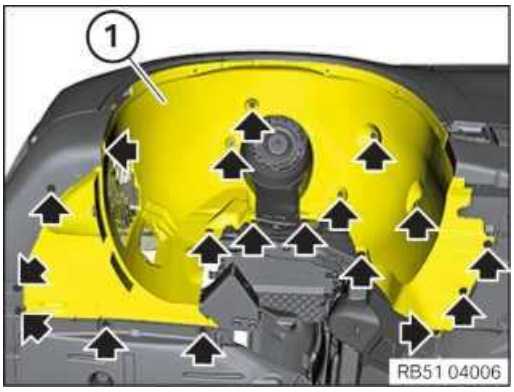
NOTICE

Description is for left component only. Procedure on the right side is identical.



- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.

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NOTICE

Description is for left component only. Procedure on the right side is identical.

- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

11 – Removing the drive belt for alternator

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

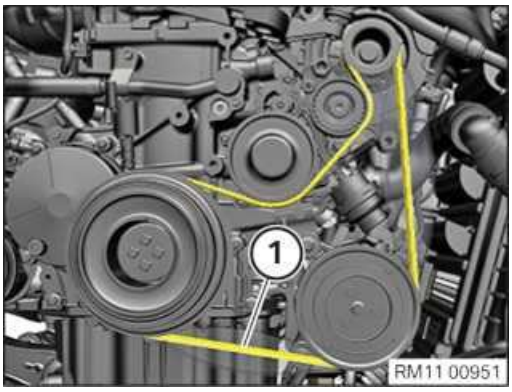
TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.



- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool **0 496 268 (11 0 390)**.

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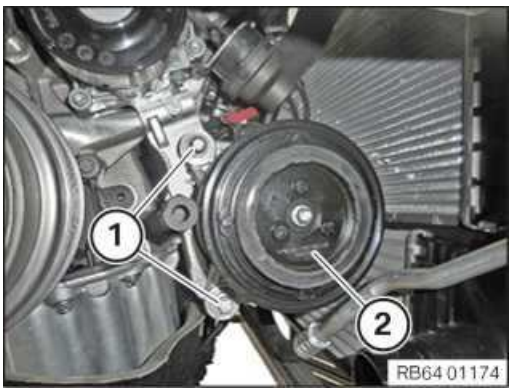


- Guide out the drive belt for the alternator (1) and remove it.

12 – Removing the alternator

Prerequisite

Battery earth lead is disconnected.

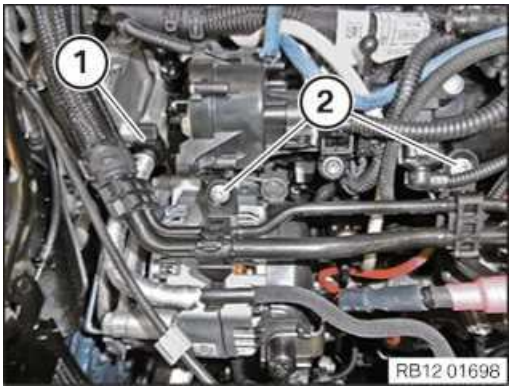


TECHNICAL INFORMATION

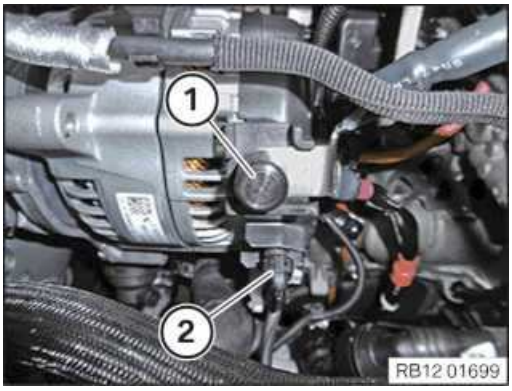
Secure component against falling.

- Loosen screws (1).
- Detach the air conditioning compressor (2) from the component carrier and protect it from falling.

Note: Tie the air conditioning compressor up.



- Unlock the coolant ventilation line (1) and pull it off the cylinder head.
- Catch and dispose of escaping coolant.
- Loosen screws (2).
- Place fuel feed and return line to one side.

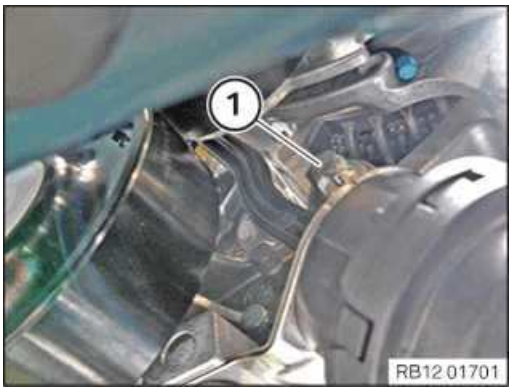


- Remove the cover (1) and loosen the nut below.
- Disconnect positive battery cable from alternator.
- Unlock and disconnect the connector (2) from the alternator.

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- Detach screw (1) on top on the alternator.



- Detach screw (1) below on the alternator.



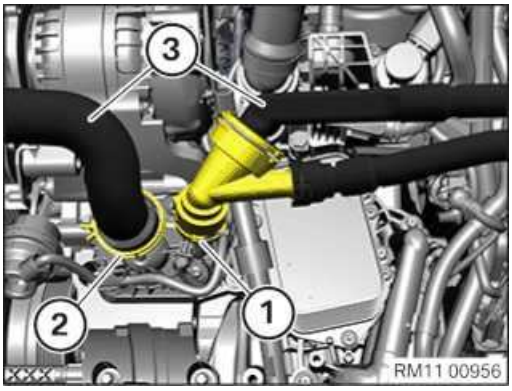
- Feed out alternator (1) along with the screw (2) on the bottom of the alternator through the slot on the support and remove.

MAIN WORK

13 – Removing the coolant thermostat

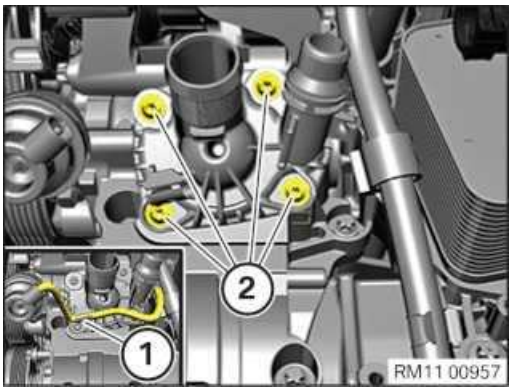
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Unlock the lock of the coolant pipe on the thermostat housing (1).
- Loosen hose clamp (2).
- Disconnect the coolant pipe and coolant hose (3) from the thermostat housing and set aside.
- Catch and dispose of escaping coolant.

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- Take the vacuum hose (1) out of the holder.
- Unscrew the bolts (2) on the thermostat housing.
- Thread out and remove the thermostat housing.
- Catch and dispose of escaping coolant.

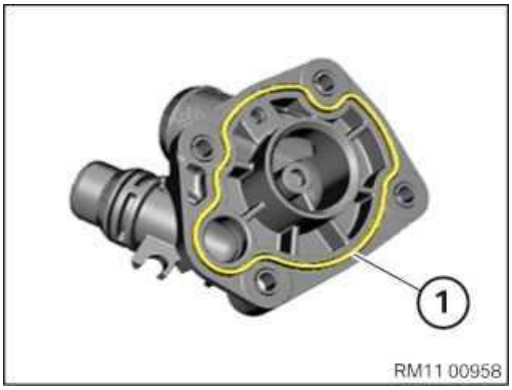


- Remove the coolant thermostat (1) from the thermostat housing in the direction of the arrow.

14 – Installing the coolant thermostat

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Renew seal (1) from thermostat housing.

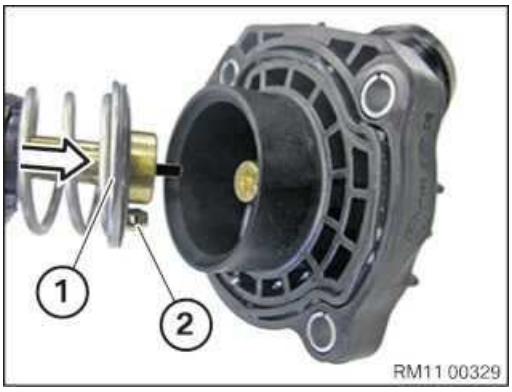
  Parts: Gasket



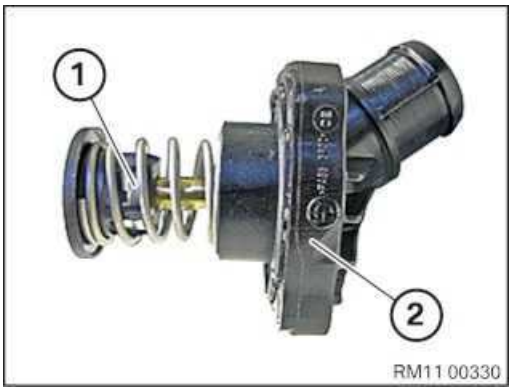
- Check the guide sleeve (1) for damage and renew if necessary.

  The guide sleeve (1) must not be damaged or missing.

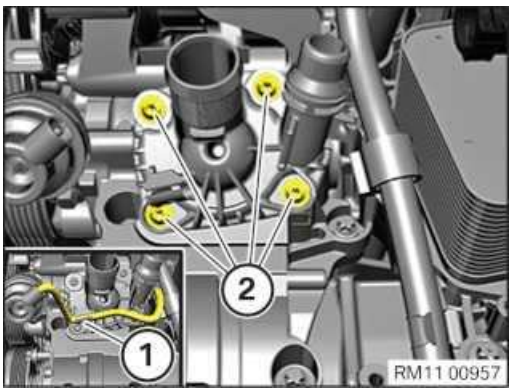
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- Insert the coolant thermostat (1) into the thermostat housing so that the valve (2) is on the bottom.



- Make sure that the coolant thermostat (1) does not fall out of the thermostat housing (2) during the installation.

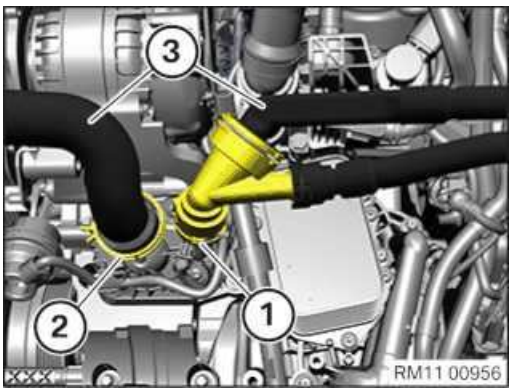


- Install the thermostat housing with the coolant thermostat.
- Tighten down screws (2).

Thermostat housing to component carrier

M6		Tightening torque	8 Nm

- Secure vacuum hose (1) in holder on thermostat housing.



- Connect coolant line and coolant hose (3).
- Make sure that the coolant line (3) engages audibly on the thermostat housing.
- Secure coolant hose with hose clamp (2).

POSTPROCESSES

15 – Installing the alternator

Prerequisite

Battery earth lead is disconnected.

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CAUTION

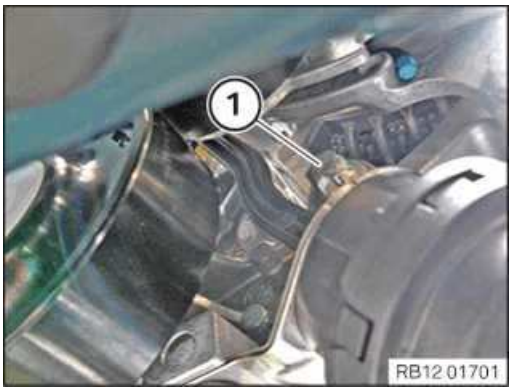
Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.



- Insert and install alternator (1) along with the screw (2) on the bottom of the alternator through the slot on the support.



- Tighten the screw (1) below on the alternator.

Alternator to component carrier

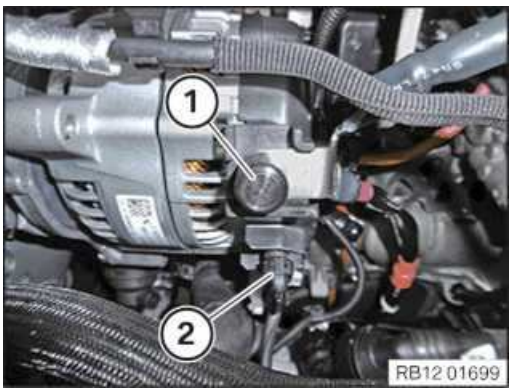
M10x75 / M10x125		Tightening torque	38 Nm



- Tighten the bolt (1) on top on the alternator.

Alternator to component carrier

M10x75 / M10x125		Tightening torque	38 Nm



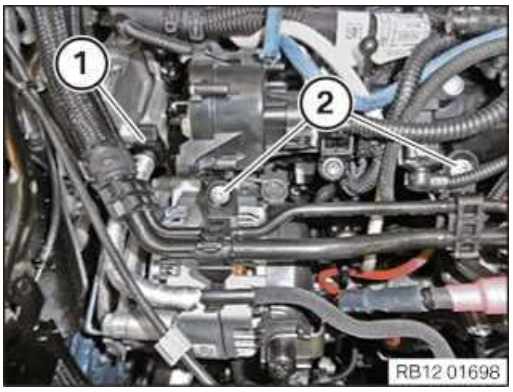
- Mount positive battery cable to the alternator.
- Tighten nut.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

- Mount the cover (1).
- Connect the connector (2) to the alternator and lock audibly.

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- Mount fuel supply and return line.
- Tighten down screws (2).

Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

- Connect the coolant ventilation line (1) to the cylinder head and audibly lock.



- Correctly position the air conditioning compressor (2).
- Tighten the screws (1).

Air conditioning compressor in component carrier

M10		Tightening torque	38 Nm

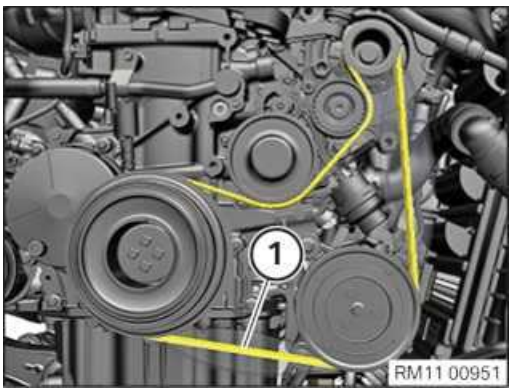
16 – Installing the drive belt for alternator

TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.



- Feed in the drive belt for the alternator (1) and install it.



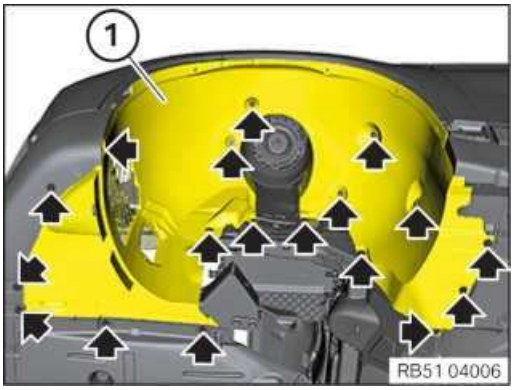
- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool **0 496 268 (11 0 390)** out of the belt tensioner and remove it.

17 – Installing the front right wheel arch cover

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NOTICE

Description is for left component only. Procedure on the right side is identical.



- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

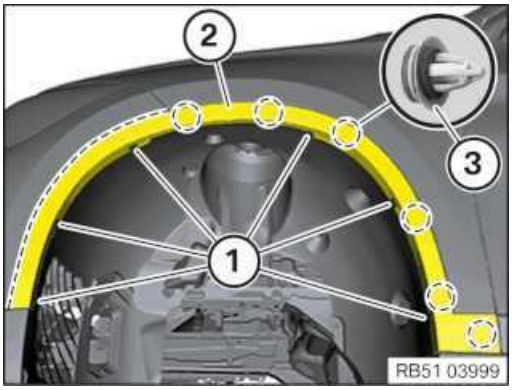
▸ **Installing front wheel arch trim**

NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Check the clips (3) for damage and renew where required.

  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

18 – Installing the front right wheel

▸ **Clean the contact surfaces between the brake disc and the wheel rim**

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TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

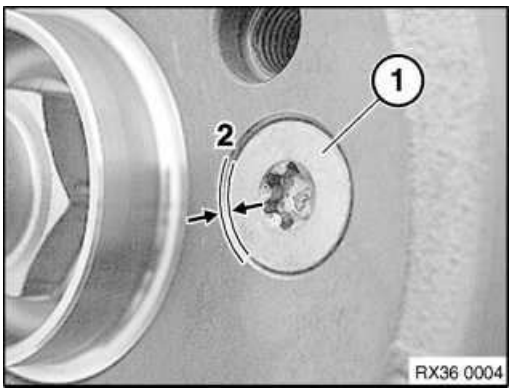
- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.



- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

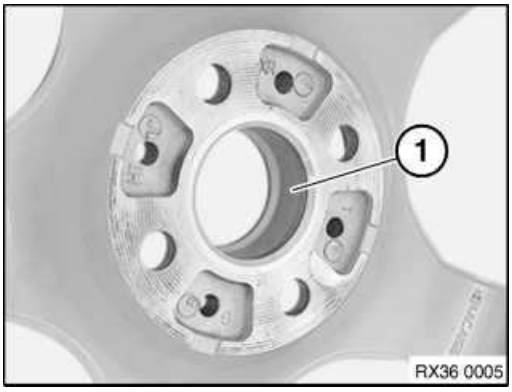


- Check the mounting bolt for the brake disc (1) for secure fit.

  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

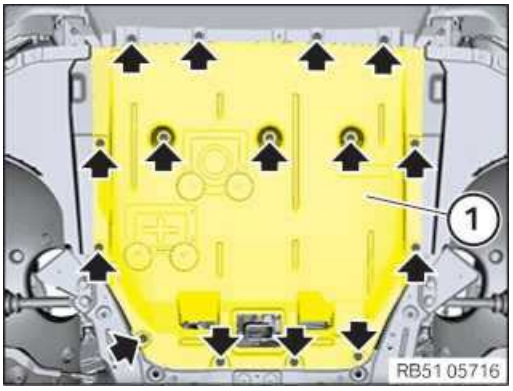
- Renew corroded wheel bolts.

  Parts: Wheel bolts
- Clean the wheel bolts and check the threads for damage. Renew the wheel bolts as needed.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

19 – Installing the front underbody protection

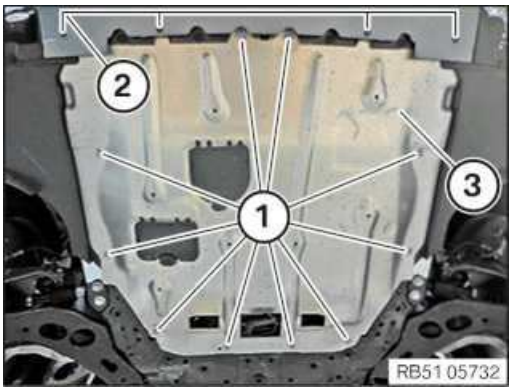


- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

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- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

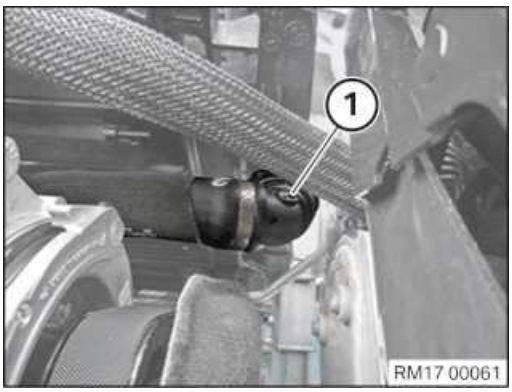
Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

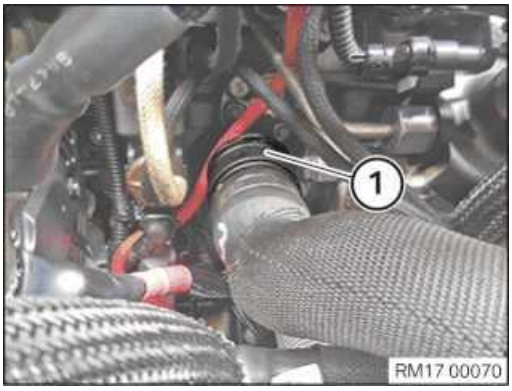
20 – Connect the coolant line

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Connect the right coolant line (1) to the radiator and lock audibly.



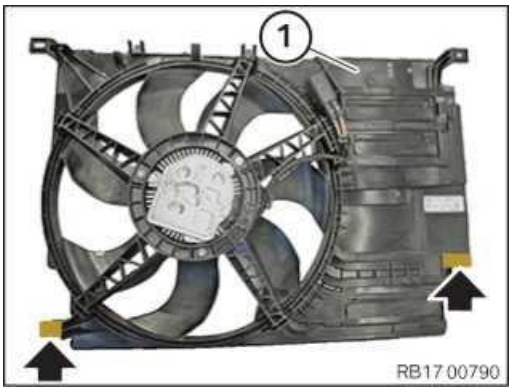
- Connect the coolant line (1) to the connecting branch and lock audibly.

21 – Installing fan cowl with electric fan

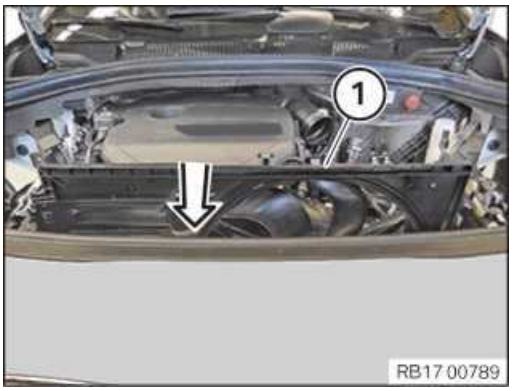
TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

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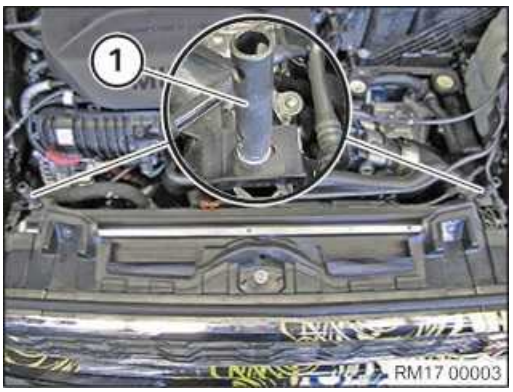
- Feed the guides (arrows) of the fan cowl (1) into the charge air cooler.



- Feed in and install the fan cowl (1) in the direction of the arrow.



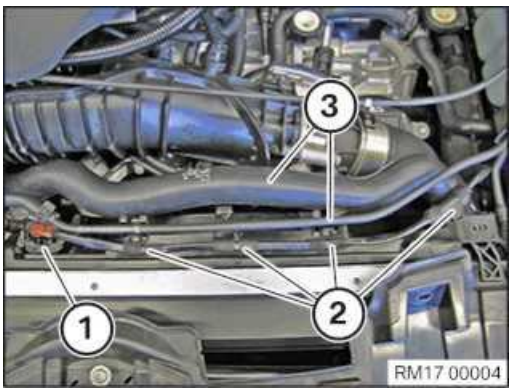
- Lock the left and right locks (arrows).



- Tighten the screws (1).

Fan cowl on radiator

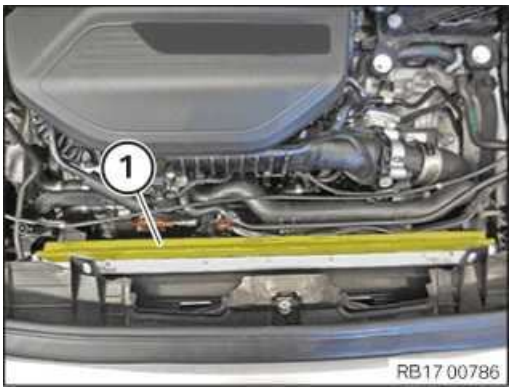
M6X12		Tightening torque	6 Nm



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.
- Secure clamps (2).
- Thread in and install coolant line (3).

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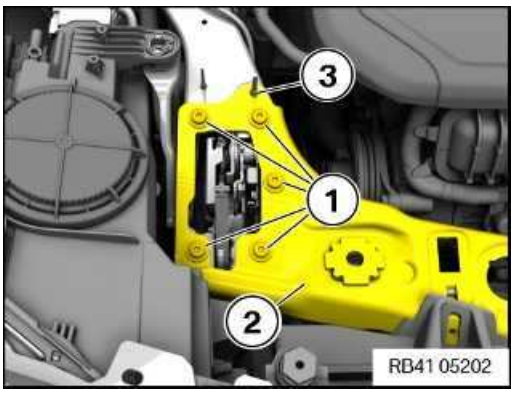


- Guide the sealing (1) on the radiator in and install it.

22 – Install front cross connection



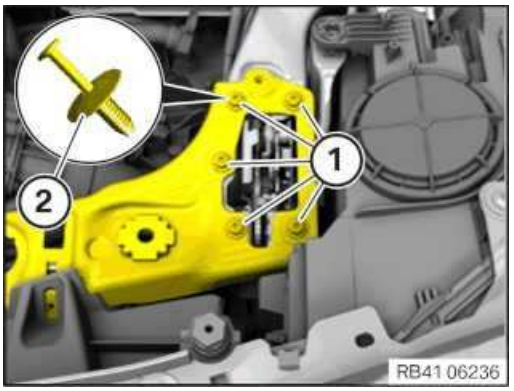
- Right side of vehicle only: Secure spray guard (1) on the cross connection (2) as pictured.



- Position front cross connection (2) and clip front cross connection (2) into the rubber retainer (3) at the same time.
- Tighten the screws (1).

Cross connection to carrier support

Screws M6x20		Tightening torque	11,8 Nm

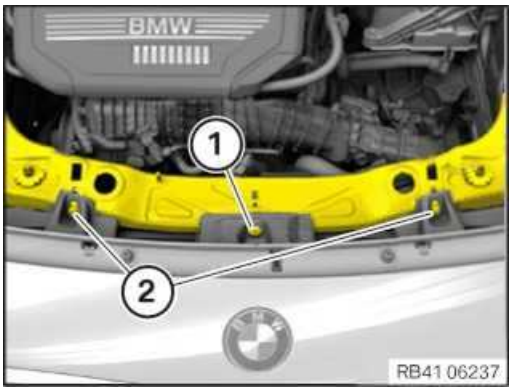


- Tighten the screws (1).

Cross connection to carrier support

Screws M6x20		Tightening torque	11,8 Nm

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- Position screws (3) on the rubber mounts for the radiator and tighten.

Screw connection for rubber mount of coolant radiator to coolant radiator

Bolt to rubber mount		Tightening torque	8 Nm

- Tighten down screws (2).

Air duct to upper connection

M6x20 screw		Tightening torque	11,8 Nm

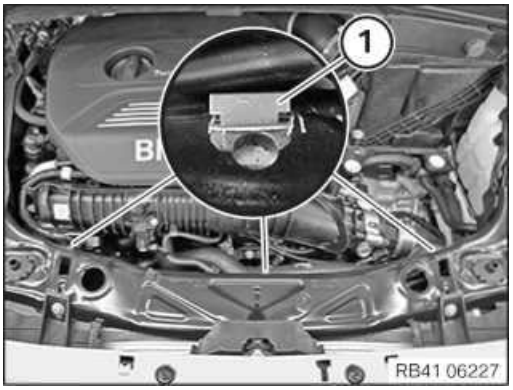
- Tighten down screw (1).

Bracing strut to upper connection

M8x20 screw		Tightening torque	28 Nm

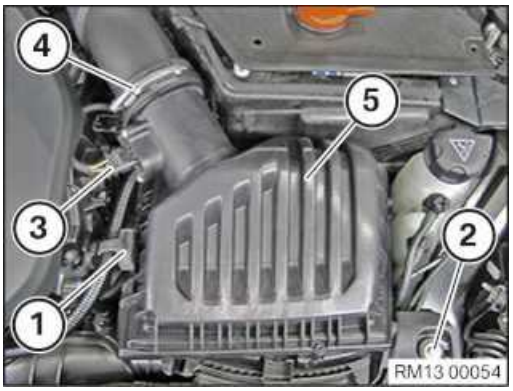


- Right side of vehicle only: Properly mount spray guard (1) to prevent corrosion.
- Secure spray guard (1) to the bridge with retaining tabs (2).



- Fasten the clamps (1) from the Bowden cable of the bonnet lock on the cross connection.

23 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.

  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

Clean air pipe to intake silencer housing

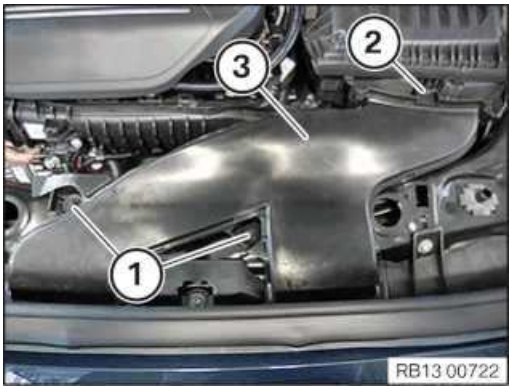
Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Insert and install the holder (1).

24 – Install the intake neck for the intake filter housing

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- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

25 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Check for correct installation of all rubber mounts in the acoustic cover (1).



- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

26 – Disconnecting all battery earth leads

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- See additional information.

27 – Fill and bleed the coolant circuit

▶ **Filling and bleed the high-temperature coolant circuit**



- See additional information.

Additional Information

Overview of Tightening Torques

Thermostat housing to component carrier			Used in step 14
M6		Tightening torque	8 Nm

Alternator to component carrier			Used in step 15
M10x75 / M10x125		Tightening torque	38 Nm

Positive battery cable to alternator			Used in step 15
M8		Tightening torque	19 Nm

Fuel line to intake plenum			Used in step 15
TS6x20		Tightening torque	5 Nm

Air conditioning compressor in component carrier			Used in step 15
M10		Tightening torque	38 Nm

Wheel arch cover to body			Used in step 17
Screw		Tightening torque	2,5 Nm

Wheel arch cover to body			Used in step 17
Plastic nut		Tightening torque	3 Nm

Brake disc to front wheel hub			Used in step 18
M8	Renew screw.		16 Nm

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Wheel bolts

Used in step 18

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Underbody protection front

Used in step 19

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Fan cowl on radiator

Used in step 21

M6X12		Tightening torque	6 Nm

Cross connection to carrier support

Used in step 22

Screws M6x20		Tightening torque	11,8 Nm

Screw connection for rubber mount of coolant radiator to coolant radiator

Used in step 22

Bolt to rubber mount		Tightening torque	8 Nm

Air duct to upper connection

Used in step 22

M6x20 screw		Tightening torque	11,8 Nm

Bracing strut to upper connection

Used in step 22

M8x20 screw		Tightening torque	28 Nm

Intake silencer housing to lock bridge

Used in step 23

M6X30		Tightening torque	8 Nm

Clean air pipe to intake silencer housing

Used in step 23

Clamp		Tightening torque	3 Nm

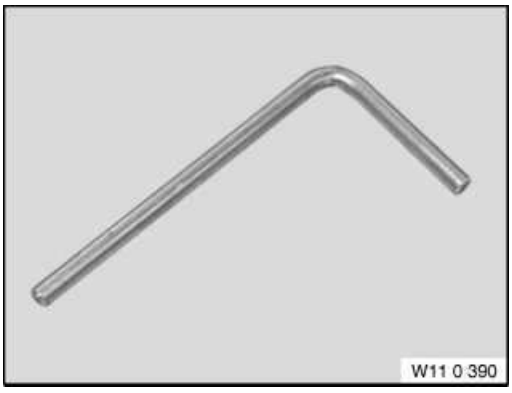
Intake neck to cross connection

Used in step 24

M6		Tightening torque	8 Nm

Overview of Special Tools

0 496 268 (11 0 390) Pin



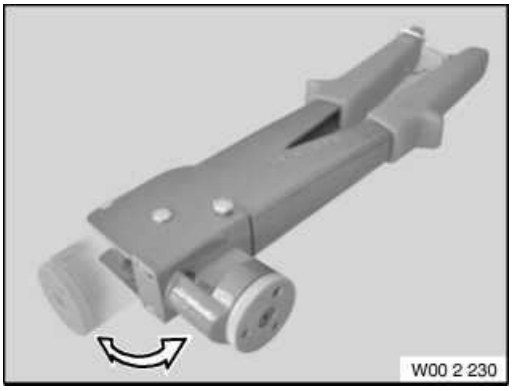
Common

Used in step 11 16

Usage	(roll pin) For securing new tensioning pulley (poly-V belt)
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 15 07 (390)

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0 496 521 (00 2 230) Pliers



Common	Used in step 17
Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

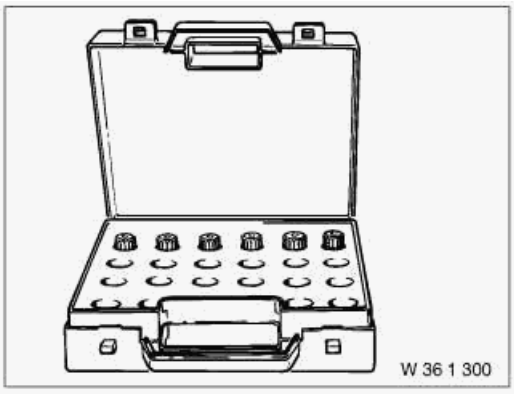
2 344 011 Tool



Common	Used in step 18
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

0 495 221 (36 1 323) Wheel stud



Common	Used in step 9
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

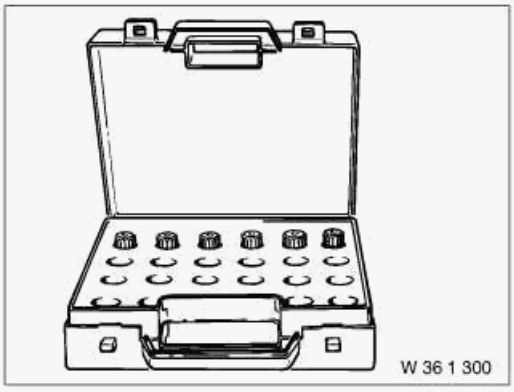
0 495 224 (36 1 326) Wheel stud



Common	Used in step 9
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

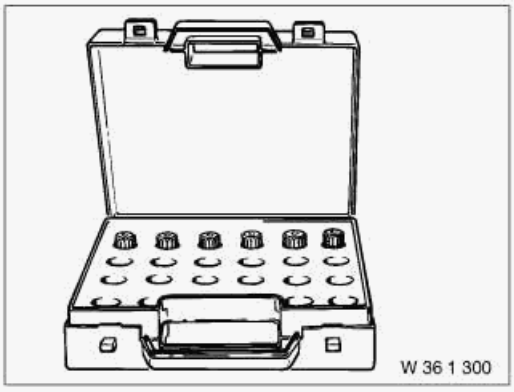
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0 495 225 (36 1 327) Wheel stud



Common	Used in step 9
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud



Common	Used in step 9
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud



Common	Used in step 9
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

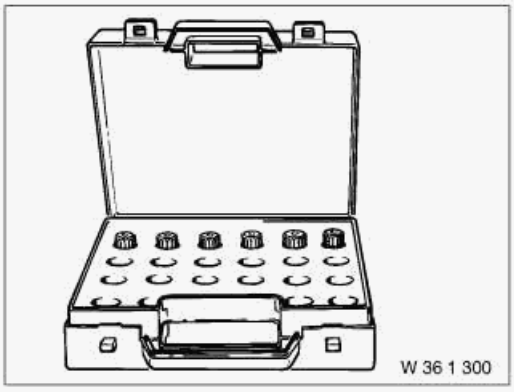
0 495 228 (36 1 331) Wheel stud



Common	Used in step 9
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 229 (36 1 332) Wheel stud



Common	Used in step 9
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud



Common	Used in step 9
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Links

Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	1 26
61 20 900 Disconnecting and connecting battery earth lead	1 26
61 20 900 Disconnecting and connecting battery earth lead	1 26
61 20 900 Disconnecting and connecting battery earth lead	1 26
61 20 900 Disconnecting and connecting battery earth lead	1 26
61 20 900 Disconnecting and connecting battery earth lead	1 26
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 26
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 26
61 20 900 Disconnecting and connecting battery earth lead	1 26
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 26
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	1 26
61 20 900 Disconnecting and connecting battery earth lead	1 26
61 20 900 Disconnecting and connecting battery earth lead	1 26
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61 20 900 Disconnecting and connecting battery earth lead	1 26
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17 00 008 Draining and topping up coolant for high-temperature circuit 27
17 00 008 Draining and topping up coolant for high-temperature circuit 27
17 00 008 Draining and topping up coolant for high-temperature circuit 27
17 00 039 Bleed the cooling system and check it for watertightness with the special tool

17 00 016 Draining and topping up coolant circuit for Range Extender \PREMIUM	27
17 00 008 Draining and topping up the high-temperature coolant circuit	27
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	27
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	27
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	27
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	27
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	27

Operating materials	Used in step
2.0 Grease for wheel centring	18

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11 53 002 Removing and installing/replacing the secondary coolant thermostat

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

RISK OF DAMAGE

Engine damage caused by excessively filling the engine with engine oil.

Filling an excessive quantity of engine oil may cause engine damage.

- Observe the exact engine oil filling capacity.
- Drain the engine oil.

TECHNICAL INFORMATION

- When the engine is stopped after the end of the journey, it may be necessary to run the electric fan. In rare cases, operation of the electric fan can last up to 11 min. This protects the components. In this case, replacing the electric fan will not remedy the problem!

PRELIMINARY WORK

1 – Disconnecting all battery earth leads



- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

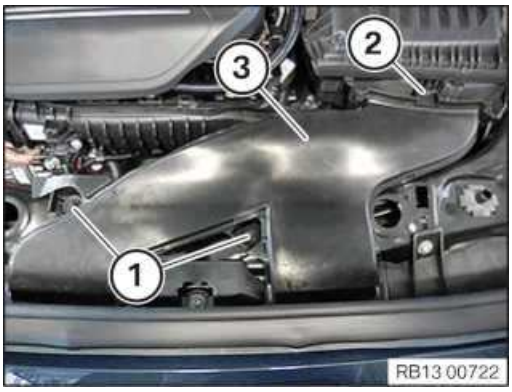
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

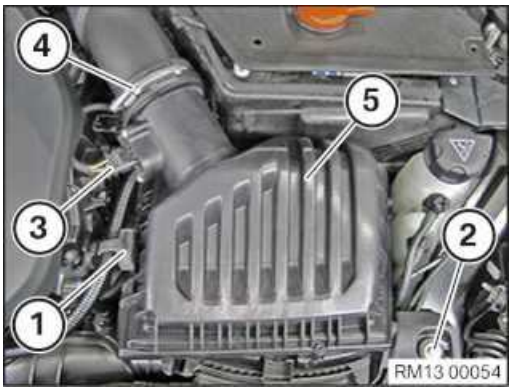
- Unclip the acoustic cover from the marked areas towards the top.

3 – Remove the intake neck for intake silencer housing



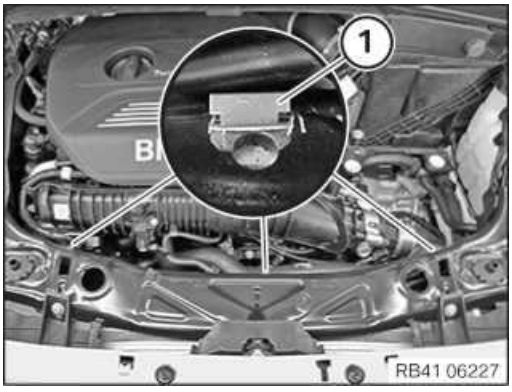
- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

4 – Removing intake silencer housing



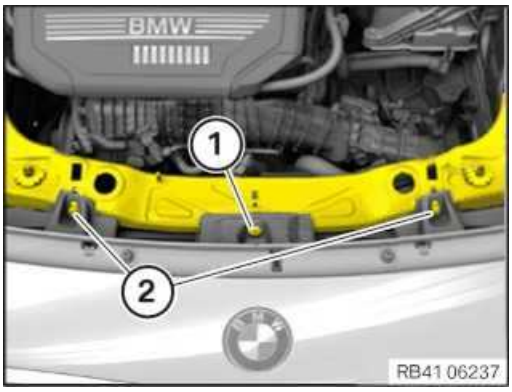
- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

5 – Remove front cross connection

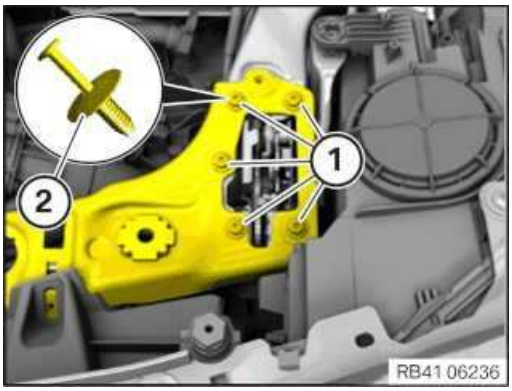


- Detach the clamps (1) for the Bowden cable of the bonnet locks from the cross connection.

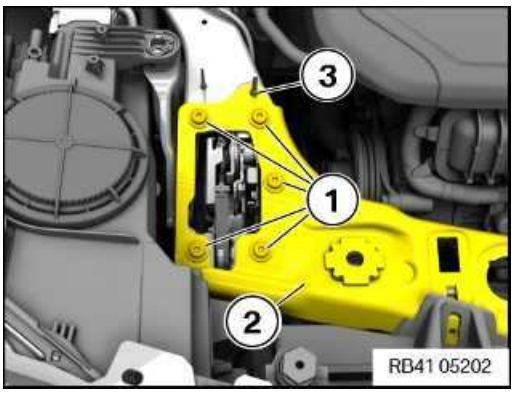
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- Loosen screw (1).
- Loosen screws (2).



- Loosen screws (1).
- Lever out expanding rivet (2).



- Loosen screws (1).
- Unclip the front cross connection (2) from the rubber retainer (3) and remove it upward.

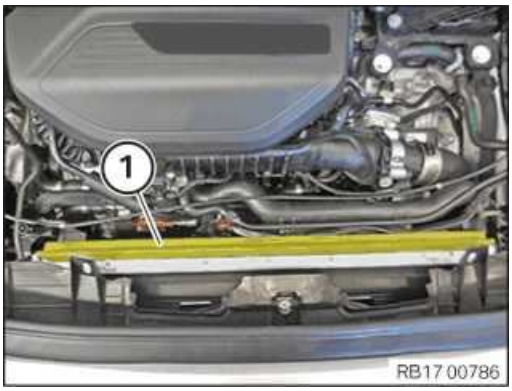
6 – Removing the fan cowl with electric fan

WARNING

Hot surfaces.

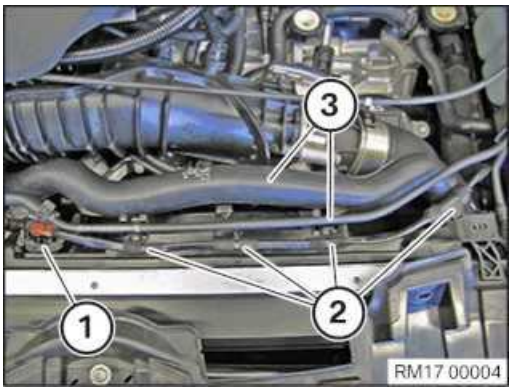
Risk of burning!

- Perform all work only on components that have cooled down.

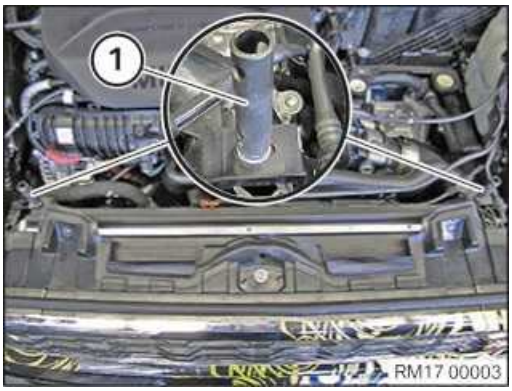


- Feed out and remove the sealing (1) from the radiator.

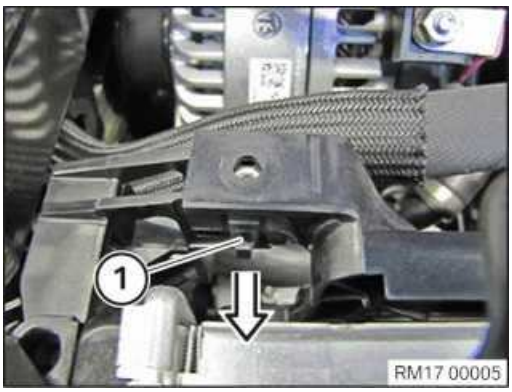
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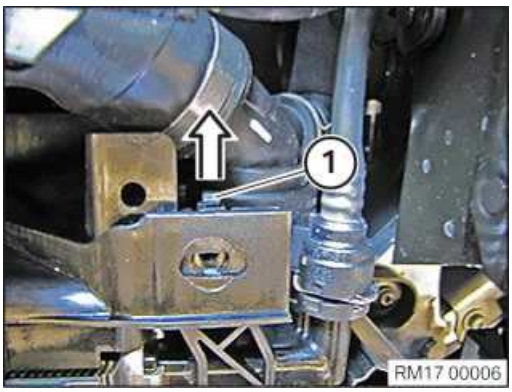
- Unlock plug connection (1) and disconnect.
- Unlock and loosen the clamps (2).
- Feed out connector (1) and place to one side.
- Thread off coolant line (3) and place to the side.



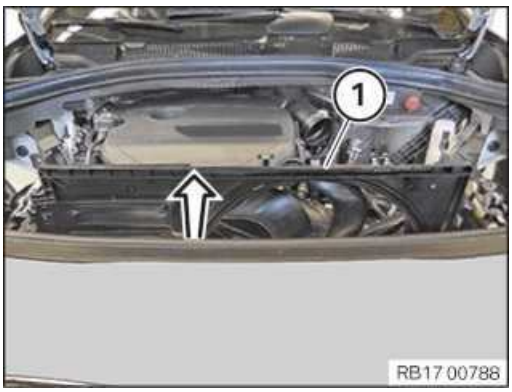
- Loosen screws (1).



- Unlock the right lock (1) on the fan cowl in the direction of the arrow.



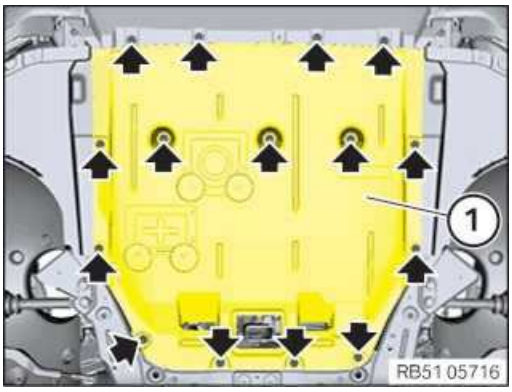
- Unlock the left lock (1) on the fan cowl in the direction of the arrow.



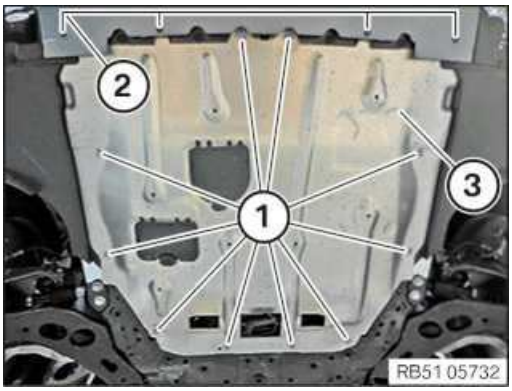
- Guide out fan cowl (1) in direction of arrow and remove.

7 – Removing the front underbody protection

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- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.



- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

8 – Draining coolant

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

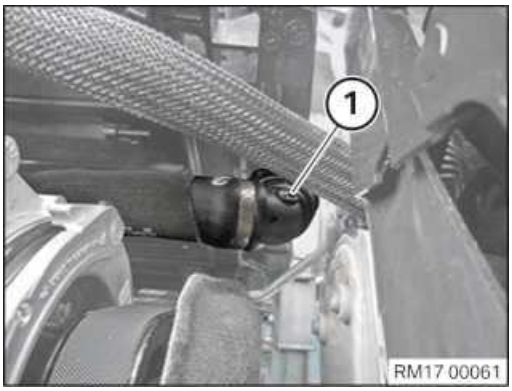
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

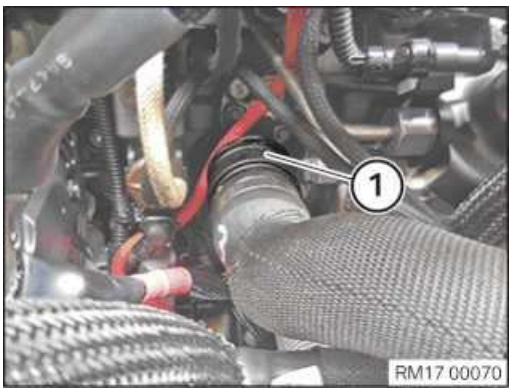
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- Loosen sealing cap (1).



- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.



- Unlock the coolant line (1) and pull it off the connecting branch.
- Catch and dispose of escaping coolant.

9 – Remove front right wheel

TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

TECHNICAL INFORMATION

Strictly observe the specified procedure to prevent clamping errors and imbalance.



- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

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10 – Removing the front right wheel arch cover

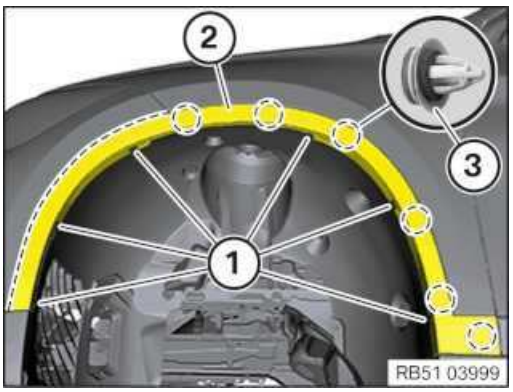
▶ **Remove the front wheel arch trim**

NOTICE

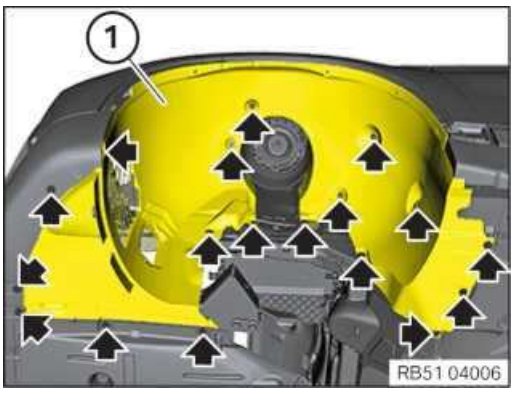
To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.



NOTICE

Description is for left component only. Procedure on the right side is identical.

- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

11 – Removing the oil filler cap



- Open oil filler cap (1).

12 – Releasing the oil drain plug

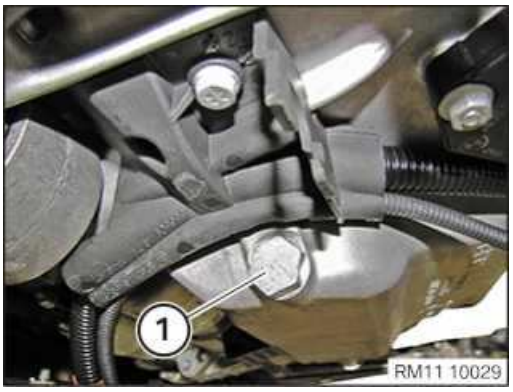
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WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

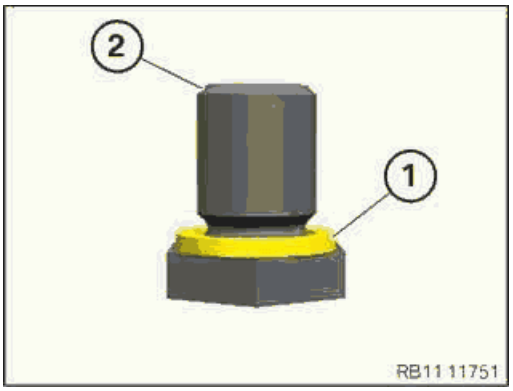


TECHNICAL INFORMATION

Catch and dispose of drained engine oil in a suitable collecting vessel. Observe country-specific waste disposal regulations.

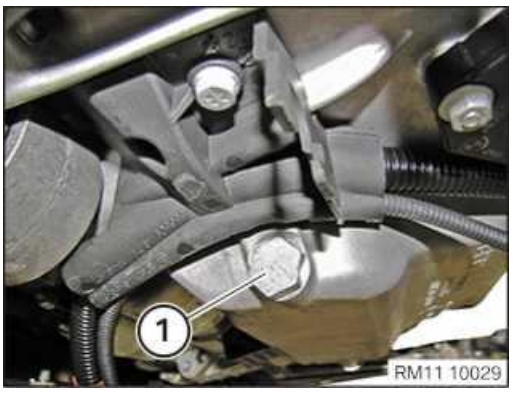
- Release oil drain plug (1).
- Drain engine oil.

13 – Tightening the oil drain plug



- Renew sealing ring (1) on the oil drain plug (2).

  Parts: Sealing ring
- Guide in the sealing ring (1) on the oil drain plug (2) and install.



- Renew the sealing ring.

  Parts: Sealing ring
- Position oil drain plug (1) on the oil sump and tighten.

Oil drain plug on oil sump

M12x1.5	Renew the sealing ring.	Tightening torque	25 Nm

14 – Undoing the oil drain plug on the oil filter cover

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

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TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Undo the oil drain plug (1) on the oil filter cover (2).
- Feed out and remove oil drain plug (1).
- Catch and dispose of emerging engine oil.

15 – Tightening the oil drain plug on the oil filter cover



- Renew oil drain plug (1) with the sealing ring (2).

  Parts: Oil drain plug, sealing ring



- Feed in and install the oil drain plug (1).
- Tighten the oil drain plug (1) on the oil filter cover (2).

Oil drain plug to oil filter cover

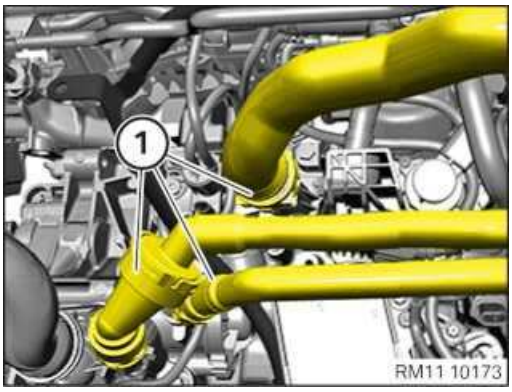
	Renewoil drain plug.	Tightening torque	6 Nm

16 – Remove full-flow oil filter

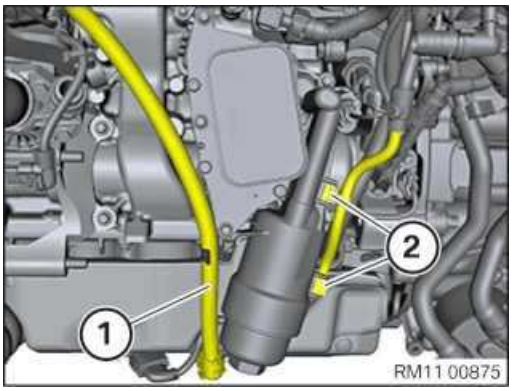
TECHNICAL INFORMATION

Make sure that there are no particles or impurities in the medium openings. Coolant or foreign substances in the oil can cause engine damage such as damage to the connecting rod bearing.

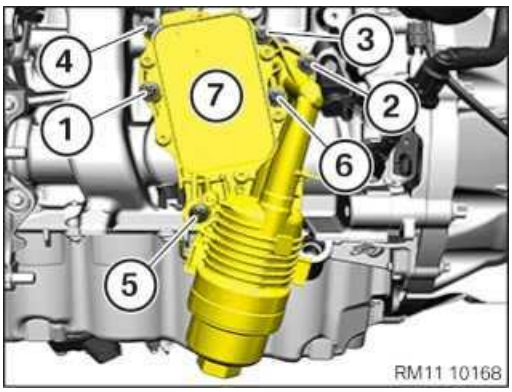
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- Unlock coolant lines (1).
- Pull off coolant lines (1) and place to one side.
- Catch and dispose of escaping coolant.



- Release positive battery cable (1) on full-flow oil filter from the clamp.
- Release the engine wiring harness (2) from the full-flow oil filter.



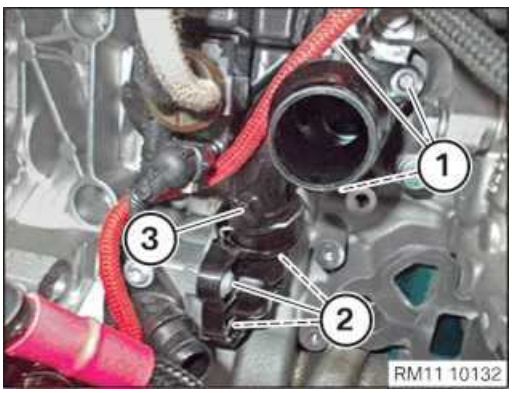
- Loosen screws in the order (6) to (1).
- Guide out the full-flow oil filter (7) upwards and remove.

MAIN WORK

17 – Removing the secondary coolant thermostat

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Loosen screws (1).
- Loosen screws (2).
- Guide out and remove the connecting branch (3).

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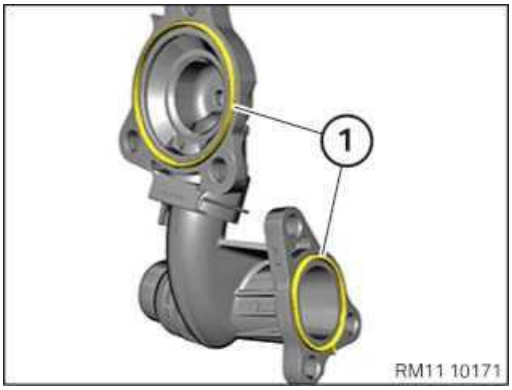


- Removing the secondary coolant thermostat.
- Ensure that the guide sleeve (1) is present on the secondary coolant thermostat.

18 – Installing the secondary coolant thermostat

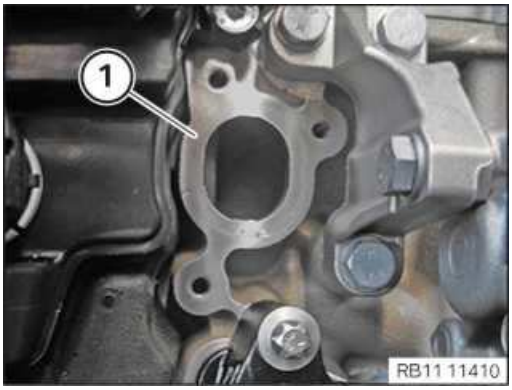
TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

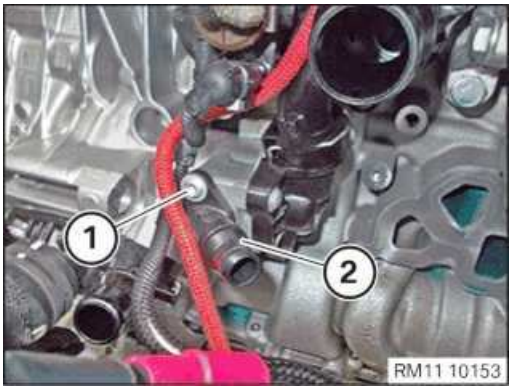


- Replace the seals (1).

  Parts: Seals



- Clean the sealing surfaces (1) on the engine block and component carriers with special tool **0 495 102 (11 4 470)**.



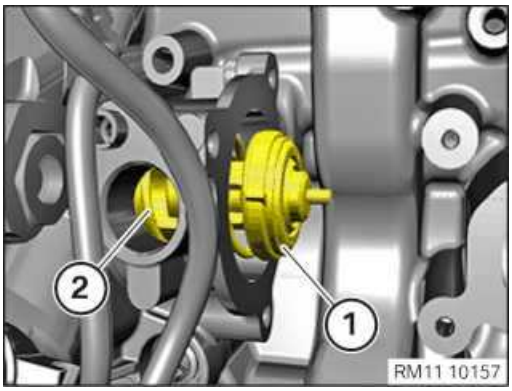
- Loosen screw (1).
- Guide out and remove the connecting branch (2).

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- Ensure that the guide (1) is present on the secondary coolant thermostat.

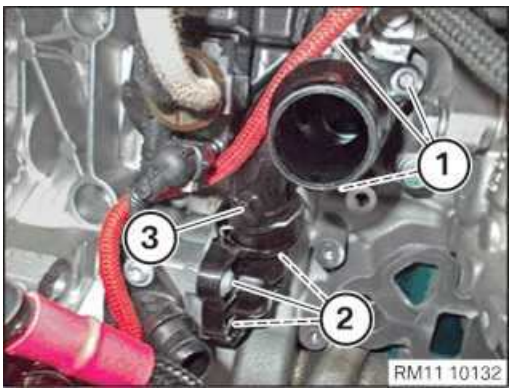
  The guide (1) must not be damaged or missing, replace coolant thermostat if necessary.



- Position the coolant thermostat (1) in the component carrier.
- Fasten the coolant thermostat through the opening (2).



- When positioning the housing, make absolutely sure that the guide of the coolant thermostat (1) sits correctly in the housing (2).



- Feed in the connecting branch (2) and position it so that the coolant thermostat sits in the guide.
- Tighten down screws (2).

Connecting branch to component carrier

M6x20		Tightening torque	8 Nm

- Tighten the screws (1).

Connecting branch to engine block

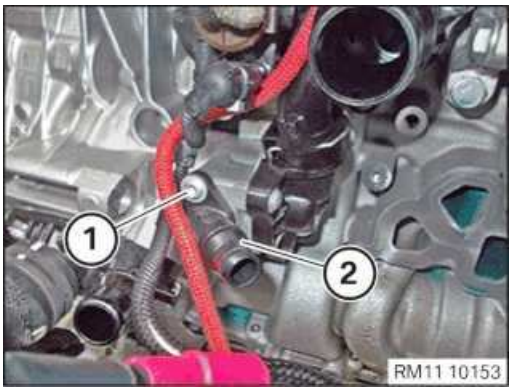
M6x25		Tightening torque	8 Nm



- Renew the O-ring (1) on the connecting branch.

  Parts: O-ring.

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- Insert connecting branch (2) and install.
- Tighten down screw (1).

Connecting branch to component carrier

M6x20		Tightening torque	8 Nm

POSTPROCESSES

19 – Install full-flow oil filter

RISK OF DAMAGE

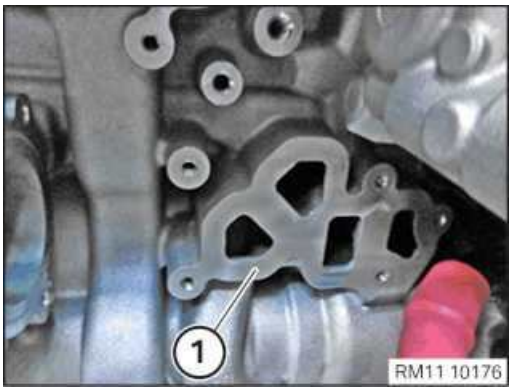
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.



- Clean any sealing residue on the sealing surface of the crankcase (1) with special tool **0 495 102 (11 4 470)**.



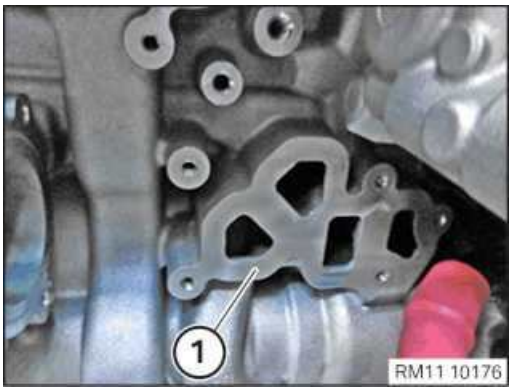
- Remove seals (1) using a suitable tool.
- Clean the sealing residue from the full-flow oil filter.
- Renew gaskets (1).

  Parts: Sealing kit
- Install seal (1).

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- Crank the engine twice with the special tool **0 493 380 (11 6 480)** in the direction of rotation.

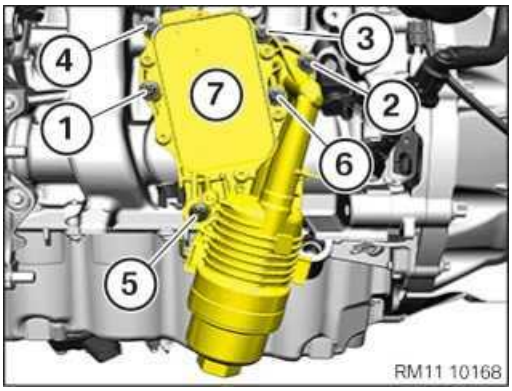


- Have a cleaning cloth ready.
- Catch any engine oil leaking from the oil duct of the crankcase (1) and dispose of this.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

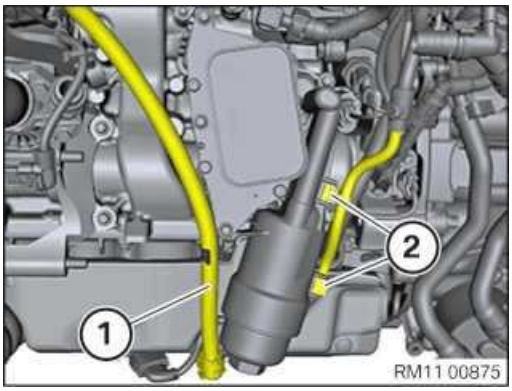
- Clean sealing surface (1).



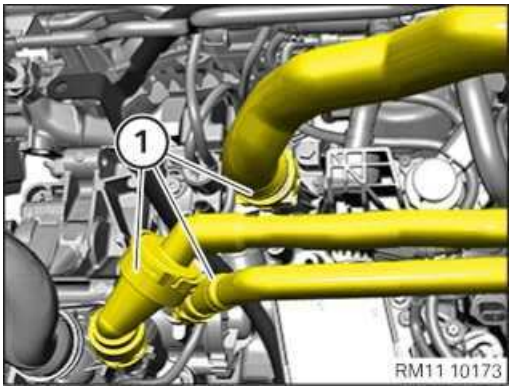
- Feed in and install the full-flow oil filter (7).
- Make sure seals are correctly seated.
- Tighten screws in the order (1) to (6).

Full-flow oil filter to crankcase

Screw M6	Observe tightening sequence.	Jointing torque Tighten down	8 Nm 8 Nm



- Secure the positive battery cable (1) on the full-flow oil filter in the clamp.
- Secure engine wiring harness (2) on full-flow oil filter.



- Connect and lock the coolant lines (1).

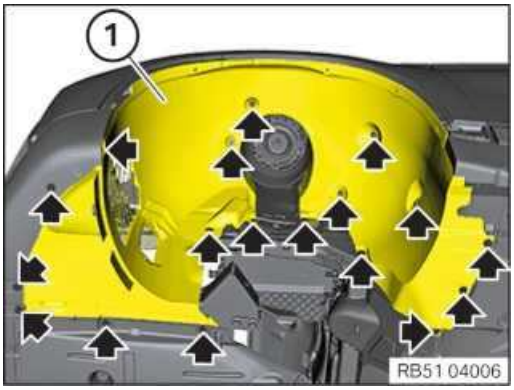
  The locks of the coolant lines (1) must audibly engage.

20 – Installing the front right wheel arch cover

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NOTICE

Description is for left component only. Procedure on the right side is identical.



- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

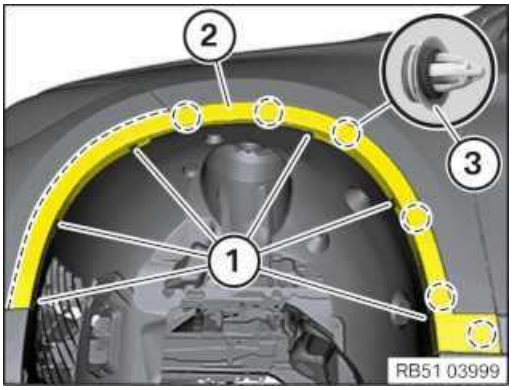
▸ **Installing front wheel arch trim**

NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Check the clips (3) for damage and renew where required.

  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

21 – Installing the front right wheel

▸ **Clean the contact surfaces between the brake disc and the wheel rim**

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TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

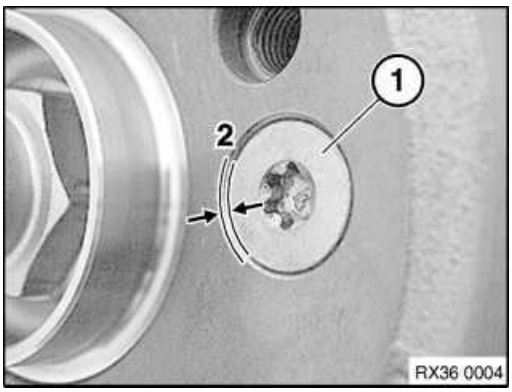
- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.



- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

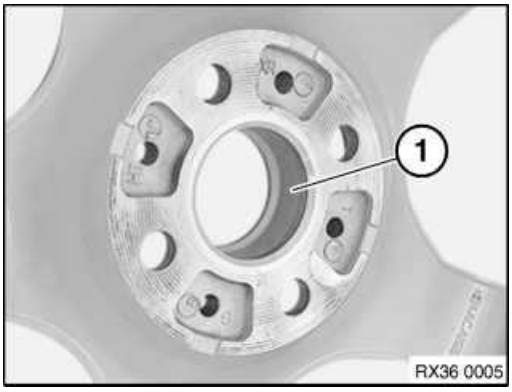


- Check the mounting bolt for the brake disc (1) for secure fit.

  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

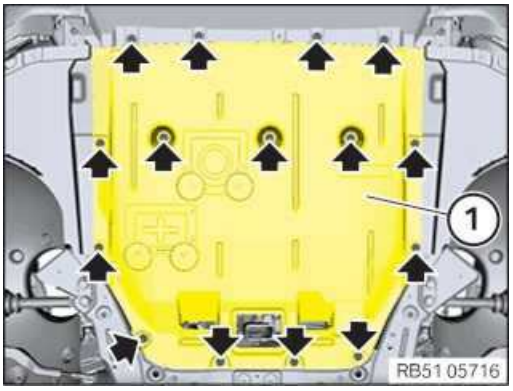
  Parts: Wheel bolts
- Clean the wheel bolts and check the threads for damage. Renew the wheel bolts as needed.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

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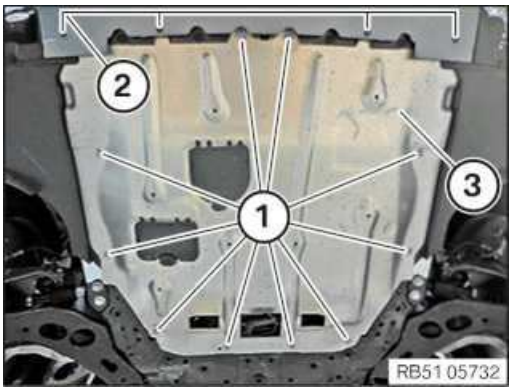
22 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm



- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

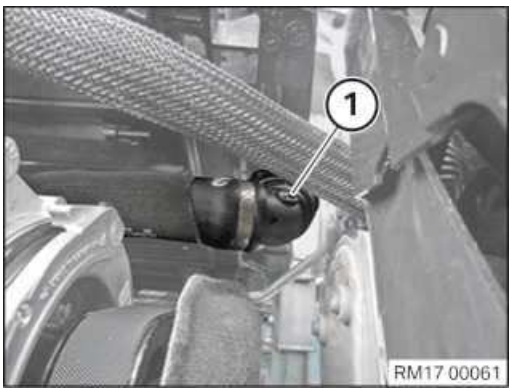
Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

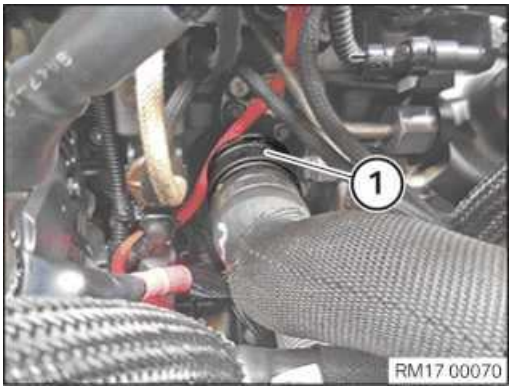
23 – Connect the coolant line

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Connect the right coolant line (1) to the radiator and lock audibly.



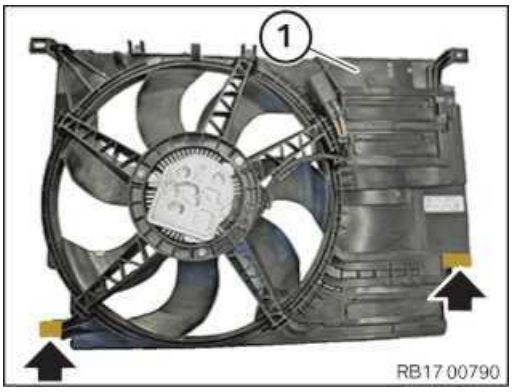
- Connect the coolant line (1) to the connecting branch and lock audibly.

24 – Installing fan cowl with electric fan

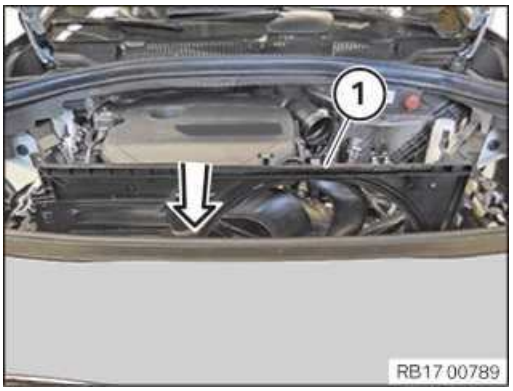
TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

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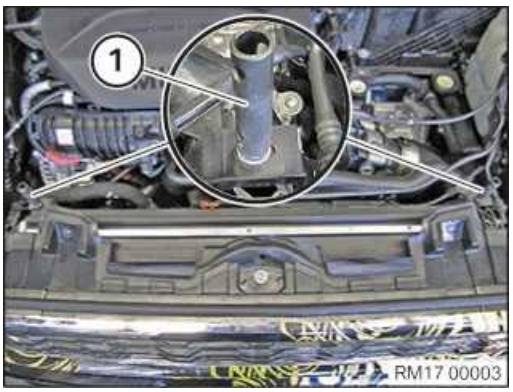
- Feed the guides (arrows) of the fan cowl (1) into the charge air cooler.



- Feed in and install the fan cowl (1) in the direction of the arrow.



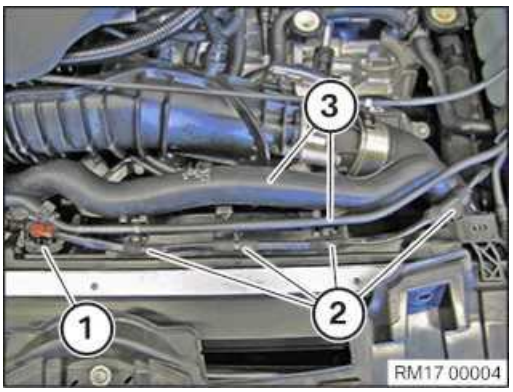
- Lock the left and right locks (arrows).



- Tighten the screws (1).

Fan cowl on radiator

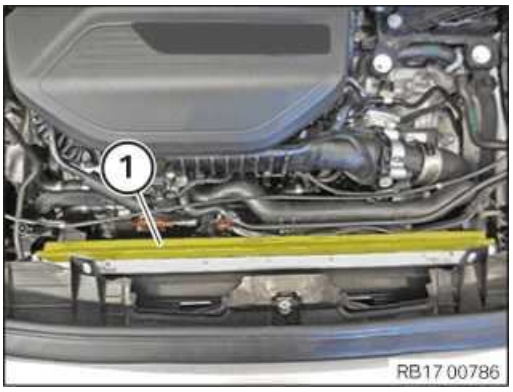
M6X12		Tightening torque	6 Nm



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.
- Secure clamps (2).
- Thread in and install coolant line (3).

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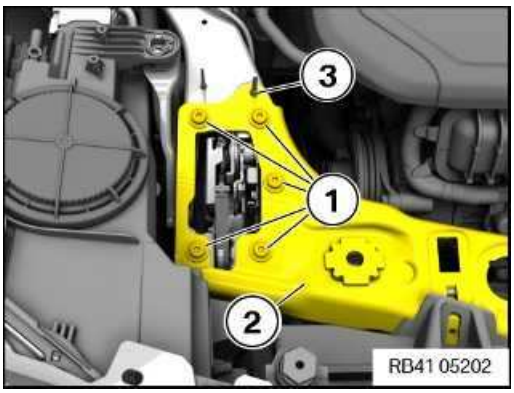


- Guide the sealing (1) on the radiator in and install it.

25 – Install front cross connection



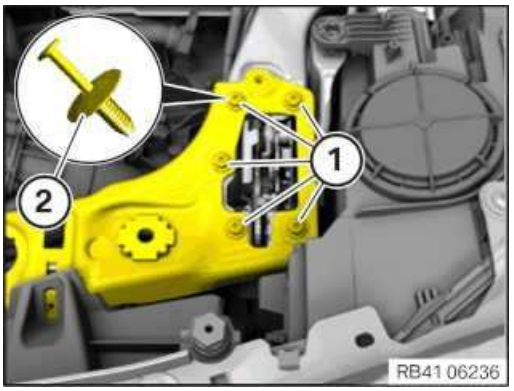
- Right side of vehicle only: Secure spray guard (1) on the cross connection (2) as pictured.



- Position front cross connection (2) and clip front cross connection (2) into the rubber retainer (3) at the same time.
- Tighten the screws (1).

Cross connection to carrier support

Screws M6x20		Tightening torque	11,8 Nm

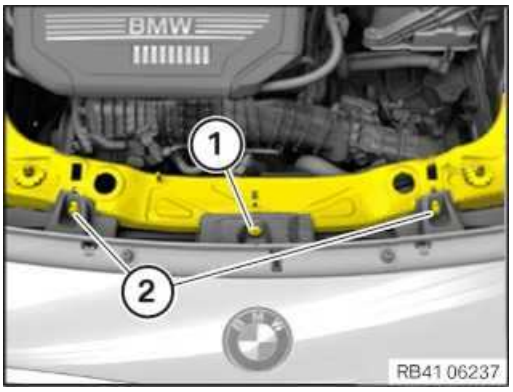


- Tighten the screws (1).

Cross connection to carrier support

Screws M6x20		Tightening torque	11,8 Nm

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- Position screws (3) on the rubber mounts for the radiator and tighten.

Screw connection for rubber mount of coolant radiator to coolant radiator

Bolt to rubber mount		Tightening torque	8 Nm

- Tighten down screws (2).

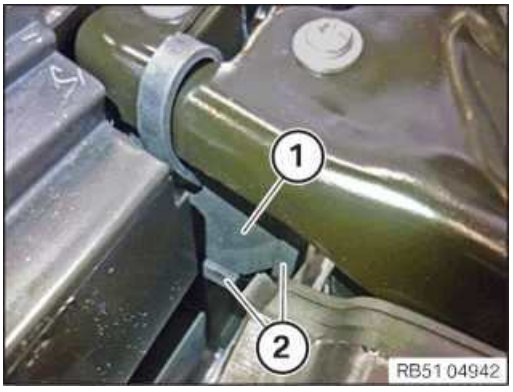
Air duct to upper connection

M6x20 screw		Tightening torque	11,8 Nm

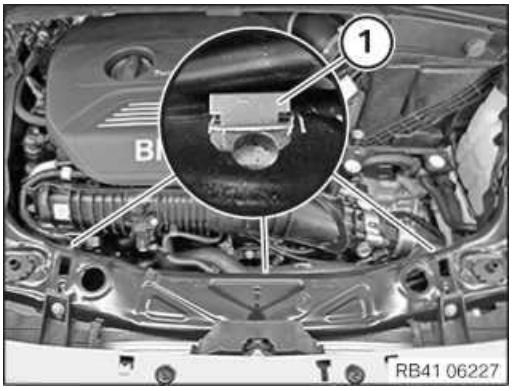
- Tighten down screw (1).

Bracing strut to upper connection

M8x20 screw		Tightening torque	28 Nm

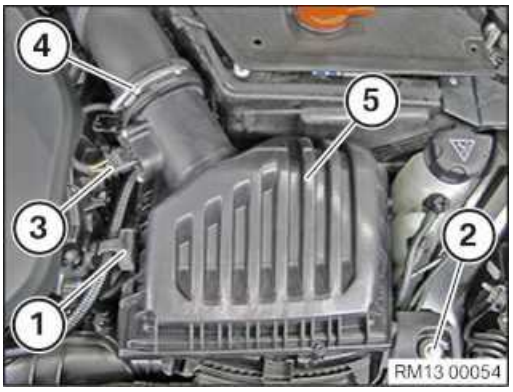


- Right side of vehicle only: Properly mount spray guard (1) to prevent corrosion.
- Secure spray guard (1) to the bridge with retaining tabs (2).



- Fasten the clamps (1) from the Bowden cable of the bonnet lock on the cross connection.

26 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.

  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

Clean air pipe to intake silencer housing

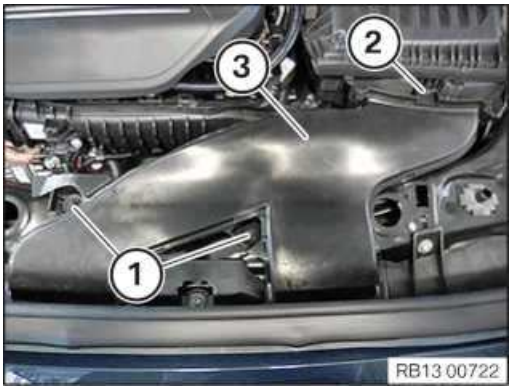
Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Insert and install the holder (1).

27 – Install the intake neck for the intake filter housing

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- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

28 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Check for correct installation of all rubber mounts in the acoustic cover (1).



- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

29 – Topping up the engine oil

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RISK OF DAMAGE

Damage to the petrol particulate filter.

Vehicles equipped with a petrol particulate filter must be operated with low-ash engine oil only.

- Use BMW Longlife-04 , BMW Longlife-12 FE or BMW Longlife-17 FE+ engine oils or engine oils approved by BMW matching the same specifications only.
- For additional information see: Overview of approved engine oils for BMW Group engines.

RISK OF DAMAGE

Engine damage caused by excessively filling the engine with engine oil.

Filling an excessive quantity of engine oil may cause engine damage.

- Observe the exact engine oil filling capacity.
- Drain the engine oil.

- Pour in engine oil.

Engine oilB47TÜ1

Capacity of engine oil	5,5 l

Engine oil: Technically suitable engine oils for BMW Group engines

30 – Installing the oil filler cap



- Close oil filler cap (1).

31 – Check engine oil level

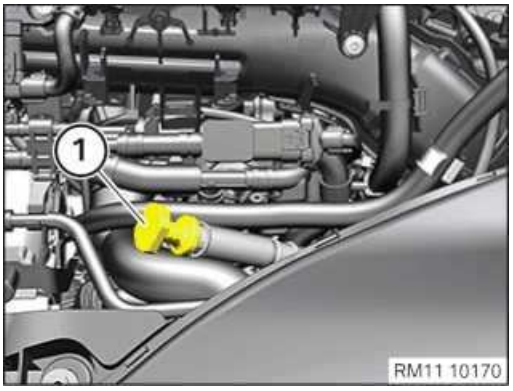
- Park vehicle on a horizontal surface.
- In the case of automatic transmission, shift to selector lever position N or P.
- Accelerator pedal is not pressed.
- Engine is running and is at operating temperature.
- Read off the engine oil level in the instrument cluster (KOMBI) or on the control display.
- Top up engine oil if necessary.

▸ **Check engine oil level**

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TECHNICAL INFORMATION

Always check the engine oil level when the engine is at operating temperature (engine oil temperature > 70°C).

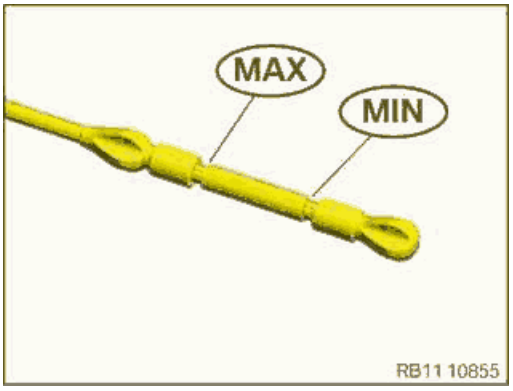


- Park vehicle on a horizontal surface.
- Stop the engine and wait for 5 minutes.
- Pull out the oil dipstick (1) and wipe off using a lint-free cloth.

TECHNICAL INFORMATION

Do not pull out or insert the oil dipstick into the guide tube too quickly or slowly.

- Push the oil dipstick (1) into the guide tube up to the limit position and pull it out again.



TECHNICAL INFORMATION

The engine oil level must be between the minimum mark and the maximum mark of the oil dipstick.

- Read the engine oil level on the oil dipstick.
- Top up engine oil if necessary.

32 – Disconnecting all battery earth leads



- See additional information.

33 – Fill and bleed the coolant circuit

▶ **Filling and bleed the high-temperature coolant circuit**



- See additional information.

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Additional Information

Overview of Tightening Torques

Oil drain plug on oil sump

Used in step 13

M12x1.5	Renew the sealing ring.	Tightening torque	25 Nm

Oil drain plug to oil filter cover

Used in step 15

	Renewoil drain plug.	Tightening torque	6 Nm

Connecting branch to component carrier

Used in step 18

M6x20		Tightening torque	8 Nm

Connecting branch to engine block

Used in step 18

M6x25		Tightening torque	8 Nm

Full-flow oil filter to crankcase

Used in step 19

Screw M6	Observe tightening sequence.	Jointing torque Tighten down	8 Nm 8 Nm

Wheel arch cover to body

Used in step 20

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Used in step 20

Plastic nut		Tightening torque	3 Nm

Brake disc to front wheel hub

Used in step 21

M8	Renew screw.		16 Nm

Wheel bolts

Used in step 21

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Underbody protection front

Used in step 22

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Fan cowl on radiator

Used in step 24

M6X12		Tightening torque	6 Nm

Cross connection to carrier support

Used in step 25

Screws M6x20		Tightening torque	11,8 Nm

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Screw connection for rubber mount of coolant radiator to coolant radiator			Used in step 25
Bolt to rubber mount		Tightening torque	8 Nm

Air duct to upper connection			Used in step 25
M6x20 screw		Tightening torque	11,8 Nm

Bracing strut to upper connection			Used in step 25
M8x20 screw		Tightening torque	28 Nm

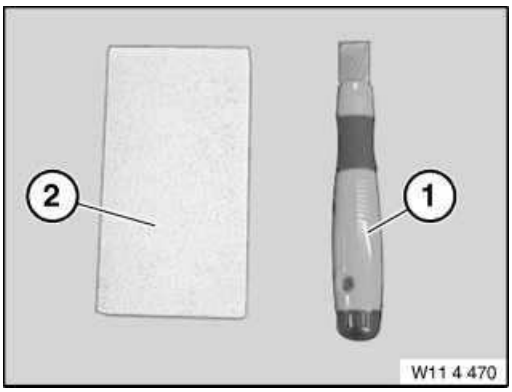
Intake silencer housing to lock bridge			Used in step 26
M6X30		Tightening torque	8 Nm

Clean air pipe to intake silencer housing			Used in step 26
Clamp		Tightening torque	3 Nm

Intake neck to cross connection			Used in step 27
M6		Tightening torque	8 Nm

Overview of Special Tools

0 495 102 (11 4 470) Tool

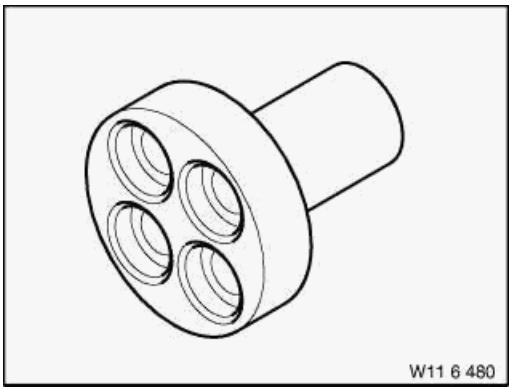


Common	Used in step 18 19
Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

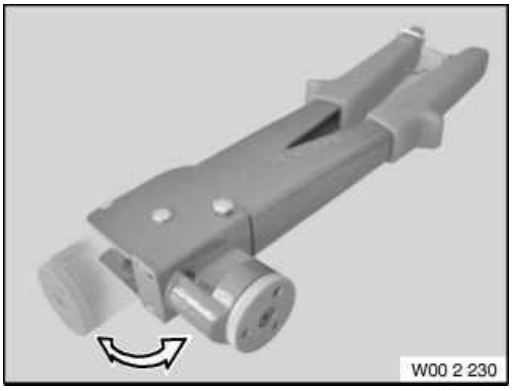
0 493 380 (11 6 480) Connector



Common	Used in step 19
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

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0 496 521 (00 2 230) Pliers



Common	Used in step 20
Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

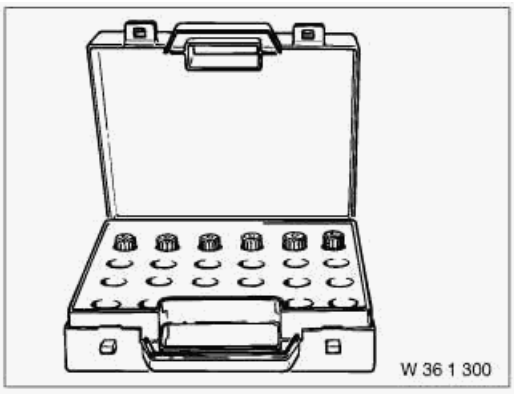
2 344 011 Tool



Common	Used in step 21
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

0 495 221 (36 1 323) Wheel stud



Common	Used in step 9
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

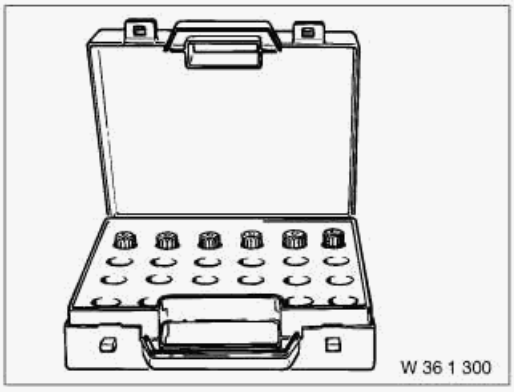
0 495 224 (36 1 326) Wheel stud



Common	Used in step 9
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 225 (36 1 327) Wheel stud



Common	Used in step 9
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud



Common	Used in step 9
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud



Common	Used in step 9
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

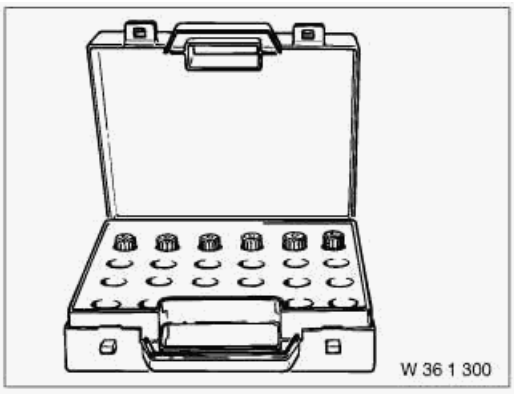
0 495 228 (36 1 331) Wheel stud



Common	Used in step 9
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 229 (36 1 332) Wheel stud



Common	Used in step 9
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud



Common	Used in step 9
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Engine oilB47TÜ1	Used in step 29
Capacity of engine oil	5,5 l

Engine oil: Technically suitable engine oils for BMW Group engines

Links

Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	1 32
61 20 900 Disconnecting and connecting battery earth lead	1 32
61 20 900 Disconnecting and connecting battery earth lead	1 32
61 20 900 Disconnecting and connecting battery earth lead	1 32
61 20 900 Disconnecting and connecting battery earth lead	1 32
61 20 900 Disconnecting and connecting battery earth lead	1 32
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 32
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 32

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61 20 900 Disconnecting and connecting battery earth lead 1 32
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads) 1 32
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle) 1 32
61 20 900 Disconnecting and connecting battery earth lead 1 32
61 20 900 Disconnecting and connecting battery earth lead 1 32
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61 20 900 Disconnecting and connecting battery earth lead 1 32
61 20 900 Disconnecting and connecting battery earth lead 1 32
61 20 900 Disconnecting and connecting battery earth lead 1 32
17 00 008 Draining and topping up coolant for high-temperature circuit 33
17 00 008 Draining and topping up coolant for high-temperature circuit 33
17 00 008 Draining and topping up coolant for high-temperature circuit 33
17 00 039 Bleed the cooling system and check it for watertightness with the special tool 33
17 00 039 Bleed the cooling system and check it for watertightness with the special tool 33
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17 00 039 Bleed the cooling system and check it for watertightness with the special tool 33

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17 00 039 Bleed the cooling system and check it for watertightness with the special tool	33
17 00 039 Bleed the cooling system and check for watertightness with the special tool (coolant circuit for low temperature)	33
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	33
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	33
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	33
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	33
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	33
17 00 039 Bleeding the cooling system (B36, B38, B46, B48)	33
17 00 039 Bleeding cooling system (B37, B47)	33
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	33
17 00 039 Filling and bleeding the high-temperature cooling system vacuum filler device (B48)	33
17 00 008 Draining and topping up the high-temperature coolant circuit	33
17 00 008 Draining and topping up the high-temperature coolant circuit	33
17 00 016 Draining and topping up coolant circuit for Range Extender \PREMIUM	33
17 00 008 Draining and topping up the high-temperature coolant circuit	33
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	33
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	33
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	33
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	33
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	33

Operating materials	Used in step
2.0 Grease for wheel centring	21
3.0 Technically appropriate engine oils for BMW Group engines	29

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11 61 730 BMW leakage test for differentiated intake system

Special tools required:

- 81 29 0 426 464
- 81 31 2 353 954
- 2 409 665
- 2 358 459
- 0 426 464
- 81 31 2 357 800
- 2 353 954



Caution!

Excess pressure and vacuum lines can be recognised by the size of their fasteners and are colour-coded blue and red respectively.

Identification:

- Pressure line blue
- Vacuum line red

Excess pressure and vacuum lines must not be mixed up.

Mixing up the lines will result in engine damage.

Necessary preliminary work:

- Release the intake filter housing.
- Prepare BMW diagnosis system
- Start diagnosis program
  1. Power train
  2. Engine electronics
  3. Air supply
  4. Charging pressure control system or perception of lack of power

Ordering information:

- Workshop Equipment - Start BMW
- Workshop equipment catalogue
- Measuring and test equipment
- Service and diagnosis
- Order number 81 29 0 426 464
- Order number 81 31 2 353 954

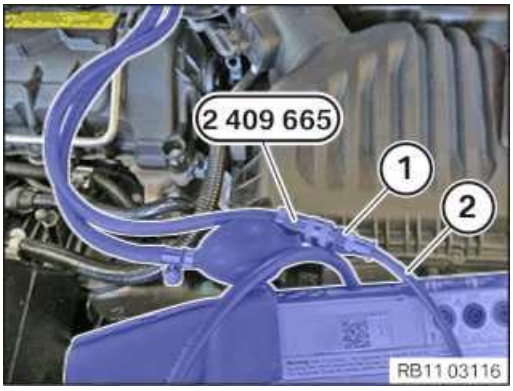
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Check intake system for leaks:

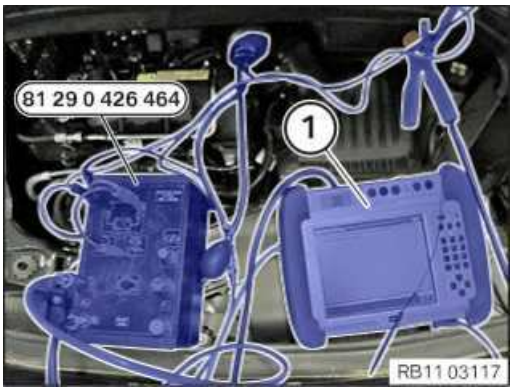
For a precise leakage test, both clean air pipes must be closed with the special tool 2 409 665 .

Connect the pressure hose (1) with special tool 2 358 459 .



Insert the blue excess pressure line (2) into the pneumatic coupling (1) up to the limit position.

Connect the pressure lines with the diagnosis system and the IMIB.

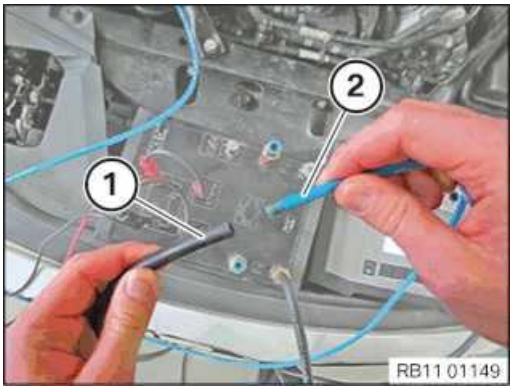


Insert the blue overpressure lines on the diagnosis auxiliary device 0 426 464 on the connector (1).

Connect Integrated Measurement Interface Box (1 via the hose 81 31 2 357 800 (previously: 81 38 2 201 924) with the connection piece of the diagnostics aid.



Installation note:
Follow diagnosis instruction.



Leak detection with BMW smoke tester:

Disconnect the overpressure line (2) on the diagnosis auxiliary device.

Connect pressure line (1) from the BMW smoke tester 2 353 954 with the overpressure line (2).

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Put the BMW smoke tester 2 353 954 into operation according to the operating instructions.

Observe BMW diagnosis instructions.

Leaks on the air intake duct are detected by escaping smoke.

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11 12 800 Clean cylinder head intake channels and intake plenums

Special tools required:

- 11 8 880
- 11 0 235
- 2 302 630
- 11 6 480
- 11 6 050
- 2 356 969
- 2 356 966
- 2 356 967

Necessary preliminary work:

- Disconnect negative battery lead
- Removing intake plenum
- Remove front right wheel arch panel

Dismantle intake plenum:

- Remove throttle body
- Remove adjuster
- Remove charging pressure sensor
- Remove the temperature sensor for the exhaust-gas recirculation
- If applicable, remove preheating control unit



Wear protective goggles and gloves.



Caution!
Never place electrical components in cleaning agent!

Cleaning intake plenum:

- Wear personal protective clothing/equipment
- Prepare cleaning agent: Mix 2 parts water with 1 part BMW universal cleaner (see Section 3.2)
- Place intake plenum in cleaning agent
- Observe application time of at least 1 hour

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Cleaning intake ports: Caution!

Risk of engine damage!

When cleaning the intake ports, it must be ensured that the intake valves of the corresponding cylinder are closed.

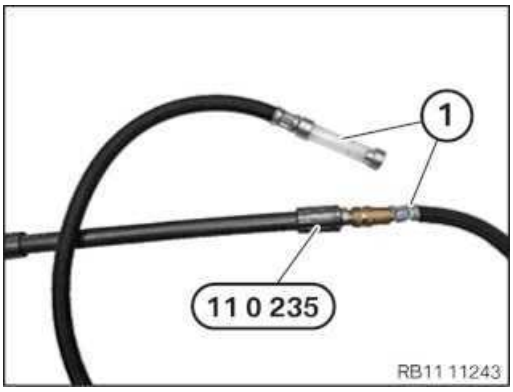
Determine the TDC (intake valves closed) using a TDC determination unit via the glow-plug hole.

Start with the 1st cylinder when cleaning the intake ports.



Remove glow-plug cylinder 1.

Screw in special tools 11 8 880 and 11 0 235 .



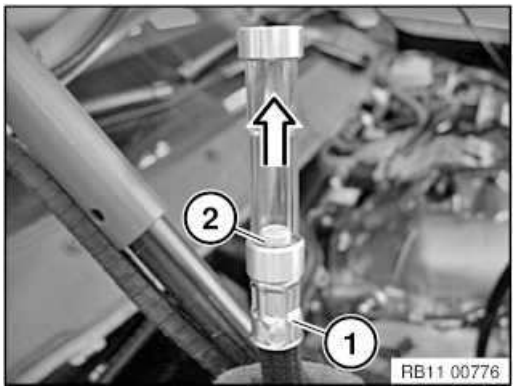
Connect TDC determination unit (1) from special tool 2 302 630 with special tool 11 0 235 .



Turn the engine with special tool 11 6 480 on the central bolt till cylinder 1 is in TDC position.**Caution!**

Do not crank engine in reverse direction.

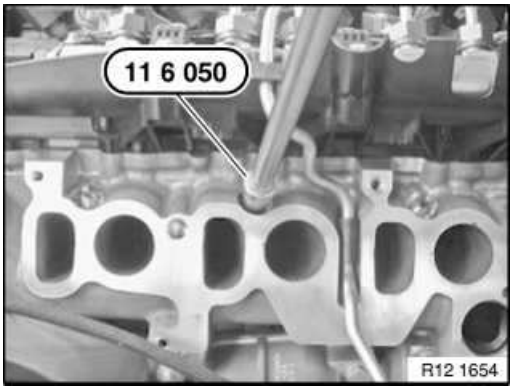
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Caution!

Determine the TDC (intake valves closed) using a TDC determination unit (1) via the glow-plug hole.

Turn the engine on the central bolt until cylinder 1 is in TDC position.

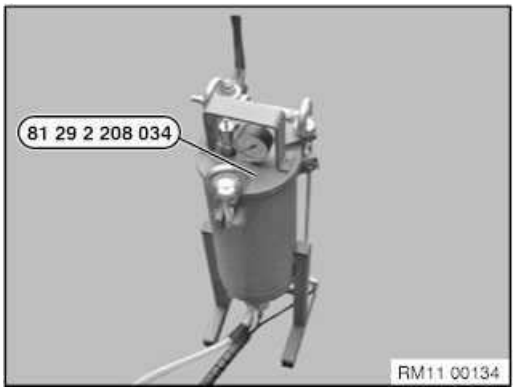


Remove special tools.

Reinstall glow-plug using special tool 11 6 050 .

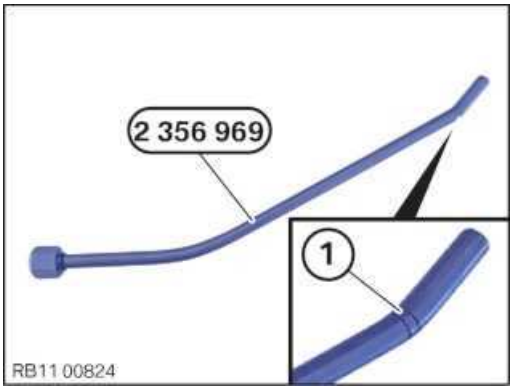
Installation note:

Tightening torque 12 23 1AZ.



The following are required:

- Blasting tool 81 29 2 208 034
- Walnut shell granulate
- Vacuum cleaner



Caution!

Front area of sensors is marked with two notches. These can additionally be highlighted in colour.

During the blasting process, only pull the wands out of the vacuum adapter until the mark becomes visible.

Blasting wand for swirl ports:

- 2 356 969

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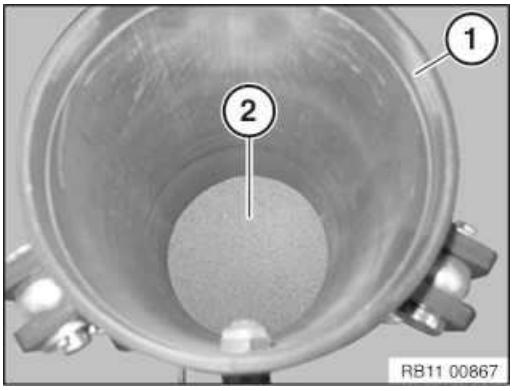


Vacuum adapter for tangential swirl port:

- 2 356 966

Vacuum adapter for swirl port:

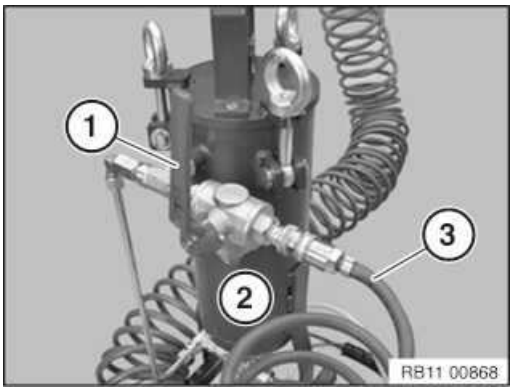
- 2 356 967



Note:
Use 2 litres of granulate per cleaning operation; this corresponds to a blasting duration of approx. 20 seconds.

Open blasting tool (1) and pour in 2 litres of granulate (2).

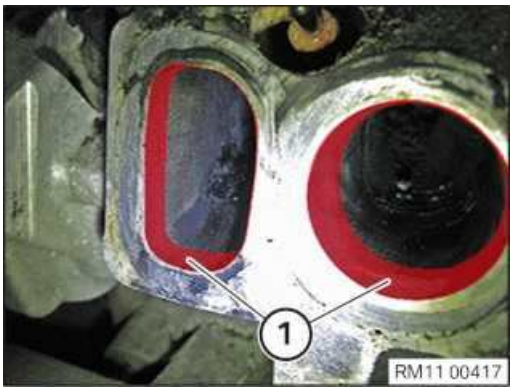
Close the device again.



Note:
Operating pressure 6 - 8 bar.

Close main valve (1) on blasting tool (2).

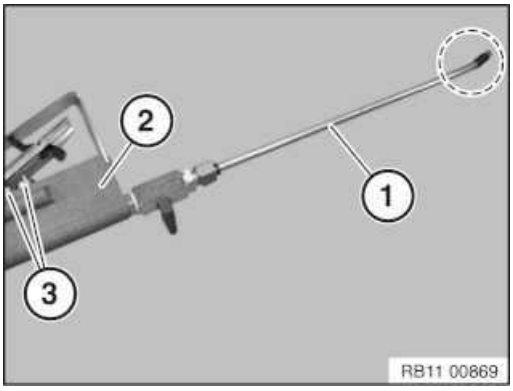
Connect compressed air (3).



Cleaning the swirl port of 1st cylinder:

Prior to the blasting process, clean the front area of both intake ports (1) of first cylinder with a suitable tool (e.g. plastic scraper, brushes 83 19 2 298 237).

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Screw together blasting wand 2 356 969 (1) and actuator (2).

Open blasting tool and pour in 2 l granulate.

Close the device again.

Note:
Actuator (3) has two stages!

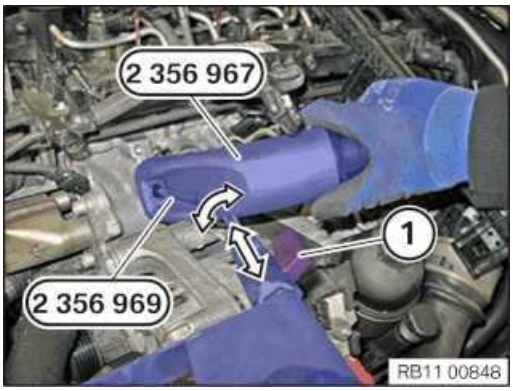
In stage one, only compressed air flows through the blasting wand.

In stage two (operation is fully pressed), granulate is added (blasting process).



Connect vacuum adapter 2 356 967 to vacuum cleaner. Hold vacuum adapter 2 356 967 against swirl port at no. 1 cylinder.

Open the main valve on the blasting tool and switch the vacuum cleaner on.



Caution!

Danger of injury!

Risk of damage!

Second person required to assist.

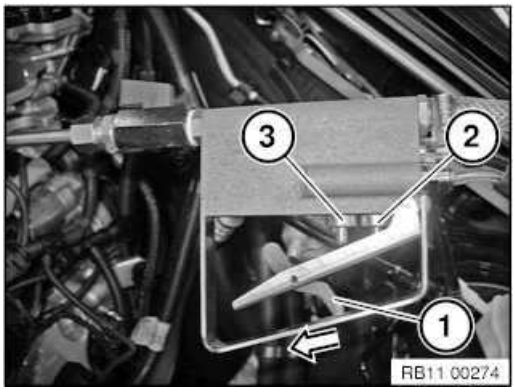
Blasting wand may only be pulled out until the mark becomes visible.



Wear safety goggles.

Insert blasting wand 2 356 969 in the adapter 2 356 967 .

Open the actuator valve (1).



Slide locking lever (1) to the front in direction of arrow.

Operate compressed-air valve (2) at stage one; compressed air can now flow in.

Fully operate valve (3) at stage two; walnut shell granulate is now injected.

Clean intake port, rotating the blasting wand and moving it vertically up and down.

Blasting wand may only be pulled out until the mark becomes visible.

When you notice that the collection container is becoming empty, continue operation for at least 10 seconds at stage one in order to swirl up and draw off the remaining granulate.

Close operation valve. Close main valve, check pressure drop at the pressure gauge.

Evaluate result if necessary.

If necessary, repeat procedure.

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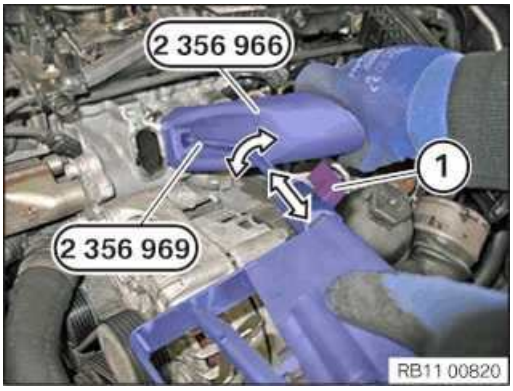
Cleaning the tangential swirl port of 1st cylinder:

Open blasting tool and pour in 2 l granulate.

Close the device again.

Connect vacuum adapter 2 356 966 to vacuum cleaner. Hold vacuum adapter 2 356 966 on swirl port of first cylinder.

Open the main valve on the blasting tool and switch the vacuum cleaner on.



Caution!

Danger of injury!

Risk of damage!

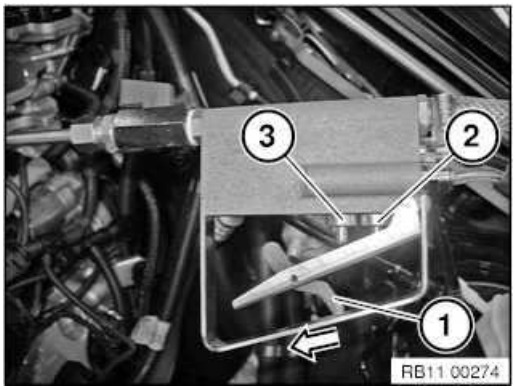
Second person required to assist.

Blasting wand may only be pulled out until the mark becomes visible.

Wear safety goggles.

Insert blasting wand 2 356 969 in the adapter 2 356 966 .

Open the actuator valve (1).



Slide locking lever (1) to the front in direction of arrow.

Operate compressed-air valve (2) at stage one; compressed air can now flow in.

Fully operate valve (3) at stage two; walnut shell granulate is now injected.

Clean intake port, rotating the blasting wand and moving it vertically up and down.

Blasting wand may only be pulled out until the mark becomes visible.

When you notice that the collection container is becoming empty, continue operation for at least 10 seconds at stage one in order to swirl up and draw off the remaining granulate.

Close operation valve. Close main valve, check pressure drop at the pressure gauge.

Evaluate result if necessary.

If necessary, repeat procedure.

Cleaning the other cylinders:

Clean the tangential ports and swirl ports of the next cylinder using the same procedure.

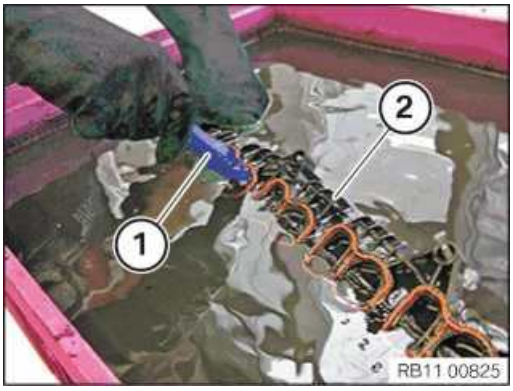
Caution!

When cleaning the intake ports, it must be ensured that the intake valves of the corresponding cylinder are closed.

Determine the TDC (intake valves closed) using a TDC determination unit via the glow-plug hole.

Do not crank engine in reverse direction.

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Wear protective goggles and gloves.

Caution!
Do not clean electrical components with a parts cleaning unit or high pressure cleaner!

Cleaning intake plenum:

- Remove the intake plenum (2) from the cleaning agent
- Clean the openings on intake plenum (2) and swirl flap using the brush (1)

  (Part number: 83 19 2 298 237)
- Clean throttle valve, exhaust-gas recirculation valve, mixing tube and mounted parts with the brush (1) if necessary
- Then clean intake plenum (2) with a parts cleaning unit or a high-pressure cleaner
- Check all seals for damage and renew, if applicable

Observe country-specific waste disposal regulations.

Required follow-up work:

Assemble intake plenum:

- Installing the throttle body
- Install adjuster
- Install the charging pressure sensor
- Install the temperature sensor for the exhaust-gas recirculation
- If applicable, install preheating control unit

- Crank the engine at the central bolt at minimum twice
- Install front right wheel arch panel trim
- Install intake plenum
- Connect battery earth lead

- Reset the quantity correction under:
  - Service functions
  - 01 Drive
  - Digital Diesel Electronics
  - Reset correction values of injectors

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11 12 ... Clean intake plenum (B37, B47)

Necessary preliminary work:

- Remove intake plenum

Dismantle intake plenum:

- Remove throttle body
- Remove adjuster
- Remove charging pressure sensor
- Remove the temperature sensor for the exhaust-gas recirculation .
- If applicable, remove preheating control unit

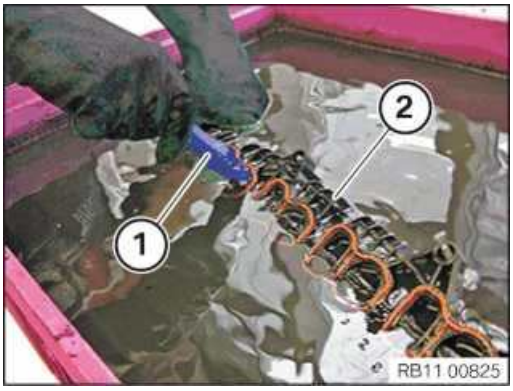


Wear protective goggles and gloves.



Caution!
Never place electrical components in cleaning agent!

- Put on personal protective clothing/equipment!
- Prepare cleaning agent: Mix 2 parts water with 1 part BMW universal cleaner (part number: 83 19 2 360 981) mixed
- Place intake plenum in cleaning agent
- Adhere to an application time of at least 1 h





Wear protective goggles and gloves.



Caution!
Do not clean electrical components with a parts cleaning unit or high pressure cleaner.

- Remove the intake plenum (2) from the cleaning agent
- Clean the openings of the intake plenum (2) and swirl flaps using the brush (1)

  (Part number: 83 19 2 298 237)
- Clean throttle valve, exhaust-gas recirculation valve, mixing tube and mounted parts with brush (1) if necessary
- Clean the intake plenum (2) with a parts cleaning unit or a high-pressure cleaner.
- Check all seals for damage and renew, if applicable.

Pay attention to country specific instructions for disposal.

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Required follow-up work:

Assemble intake plenum:

- Installing the throttle body
- Install adjuster
- Install the charging pressure sensor
- Install the temperature sensor for the exhaust-gas recirculation.
- If applicable, install preheating control unit

- Install intake plenum

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11 61 050 Removing and installing the intake plenum.

PRELIMINARY WORK

1 – Disconnecting all battery earth leads

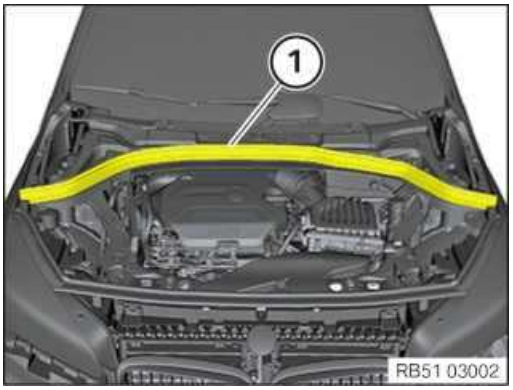


- See additional information.

2 – Remove the seal for the rear bonnet

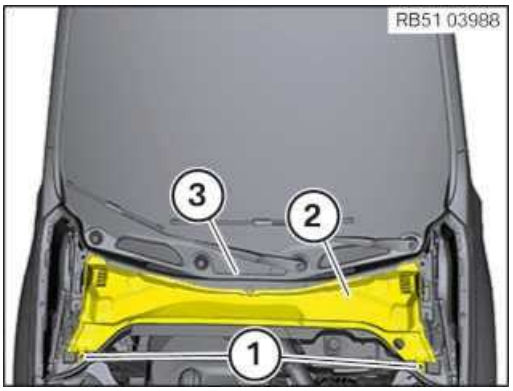
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Pull off rear bonnet seal (1) towards the top and remove.

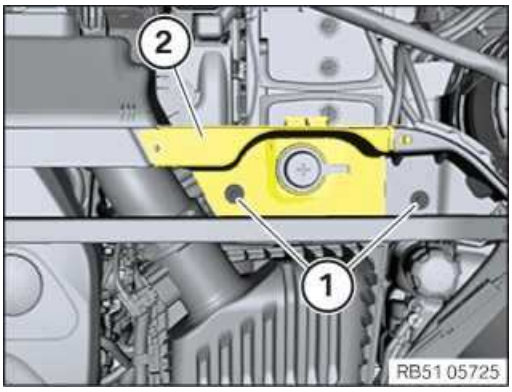
3 – Removing front cowl panel cover



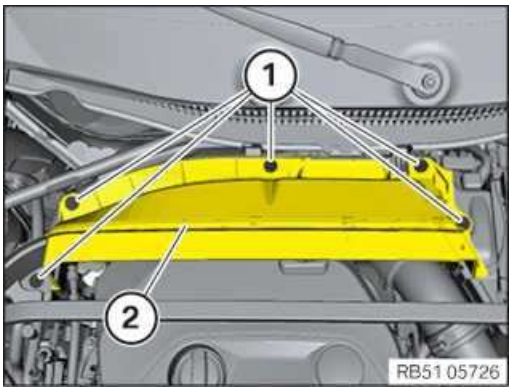
- Loosen the expanding rivet (1).
- Feed out and remove front cowl panel cover (2) from the rear cowl panel cover(3).

4 – Removing the upper bulkhead cover

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- Loosen screws (1).
- Guide out and remove the cover (2).

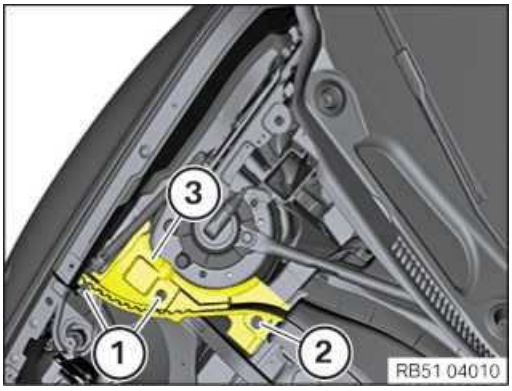


- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

5 – Remove suspension cross-brace

TECHNICAL INFORMATION

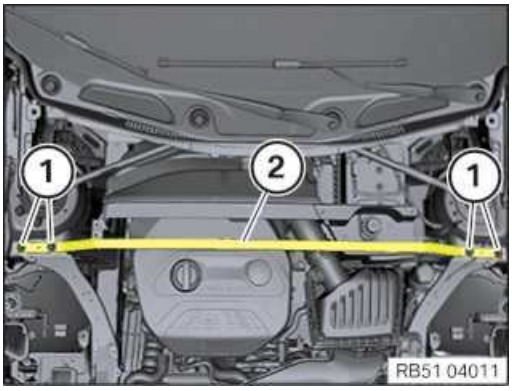
Driving without the strut brace/front end or tension strut is not permitted.



NOTICE

Description is for right component only. The procedure on the left side is identical.

- Loosen expanding rivet (1).
- Loosen screw (2).
- Remove the cover (3).



- Loosen screws (1).
- Remove strut brace (2).

6 – Removing the acoustic cover

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

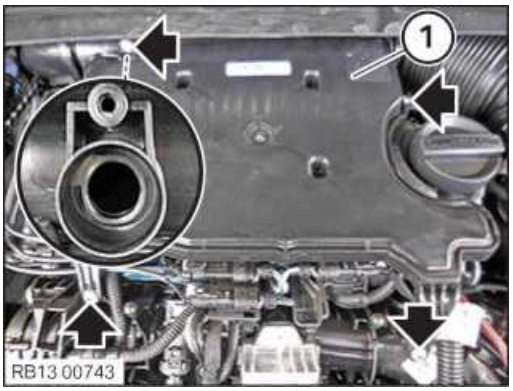
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

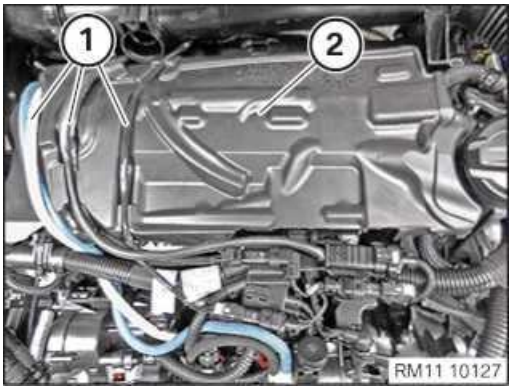
- Unclip the acoustic cover from the marked areas towards the top.

7 – Remove resonator



- Remove screws (arrows).
- Guide out and remove the resonator (1).

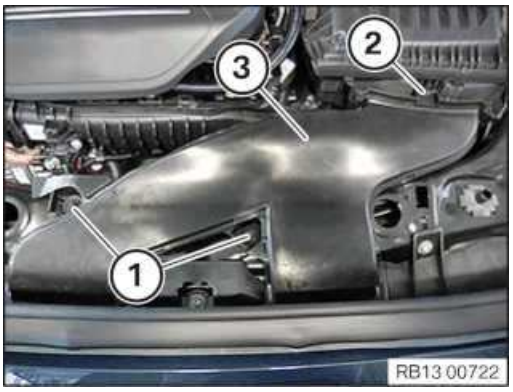
8 – Remove the acoustic cover for the injectors



- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

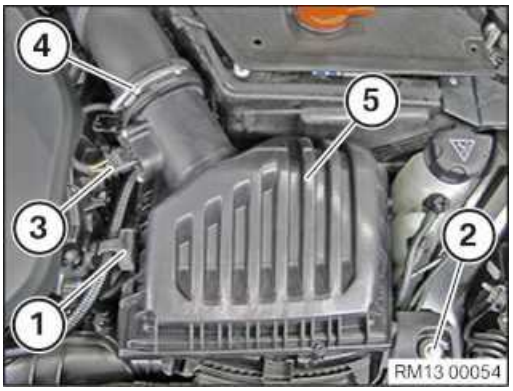
9 – Remove the intake neck for intake silencer housing

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- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

10 – Removing intake silencer housing

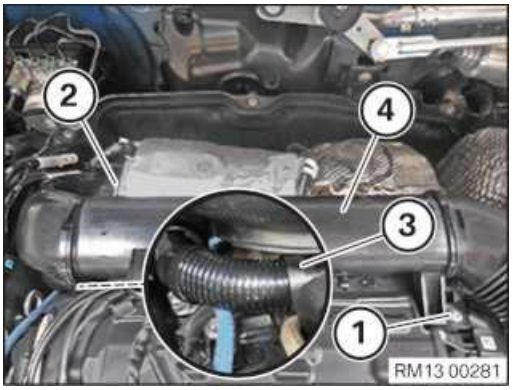


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

11 – Removing clean air pipe



- Detach clamp (1) on the clean air pipe.
- Pull off the clean air pipe from the intake silencer housing.

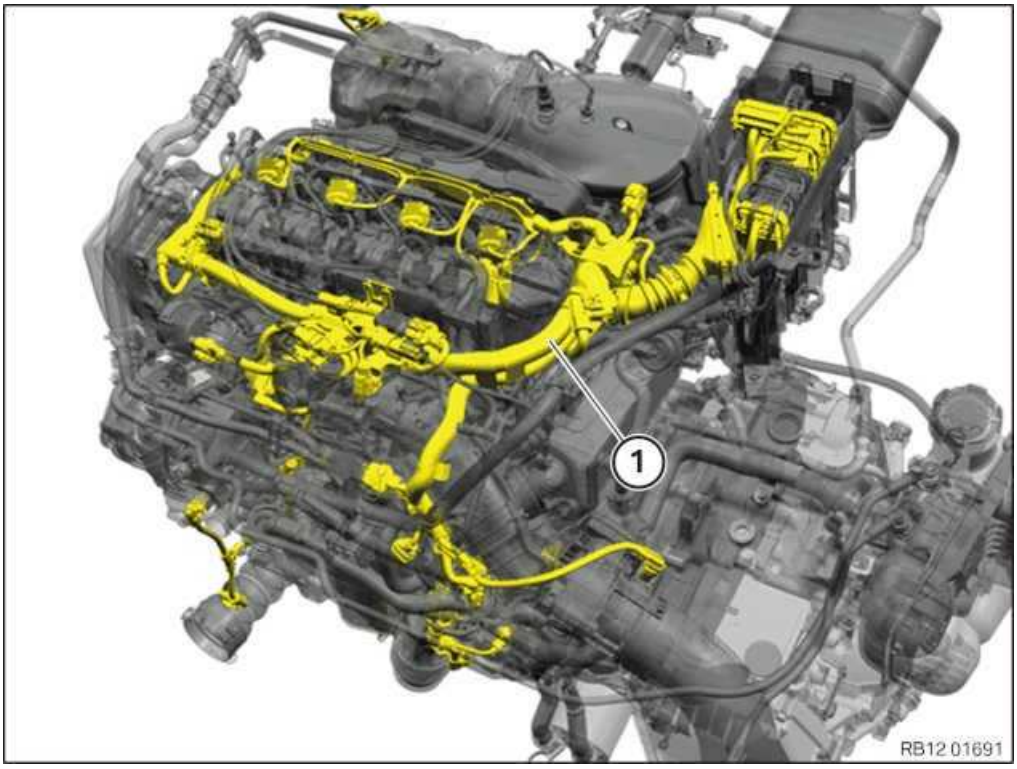


- Loosen screw (1).
- Loosen clamp (2).
- Unlock the ventilation line (3) and pull it off the cylinder head cover.
- Feed out clean air pipe and remove.

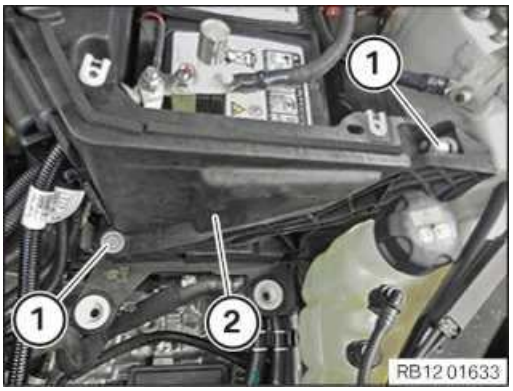
12 – Releasing the wiring harness section for the intake plenum

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Overview: Wiring harness section for the engine



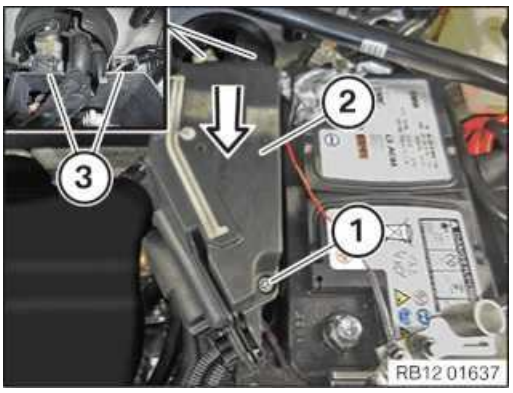
1 Wiring harness section for the engine



- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.

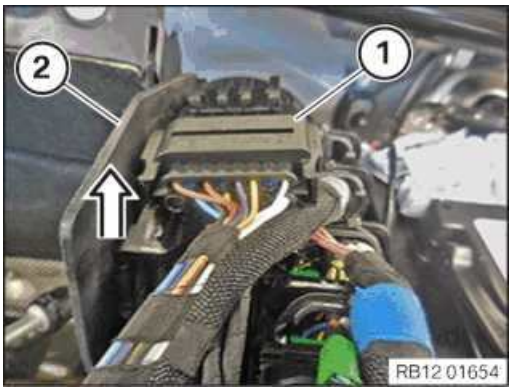


- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

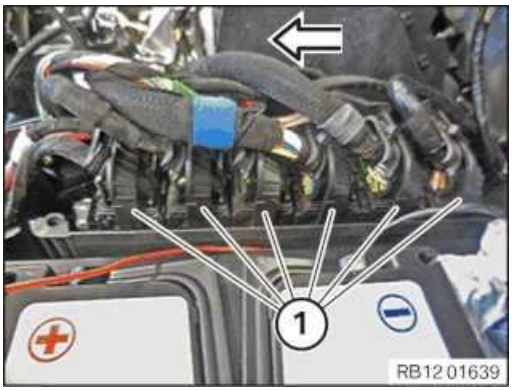


- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.

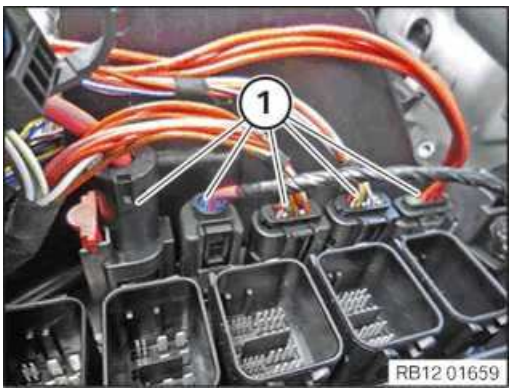
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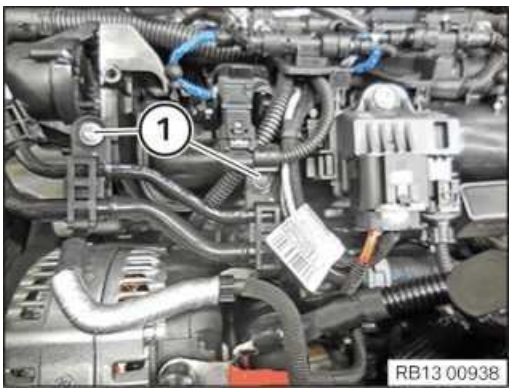
- Guide the connector (1)out of the electronics box (2) in the direction of arrow and remove it.
- Unlock and loosen connector (1).



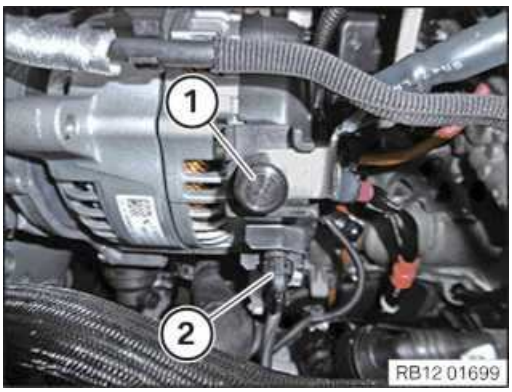
- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



- Unlock and loosen connector (1).

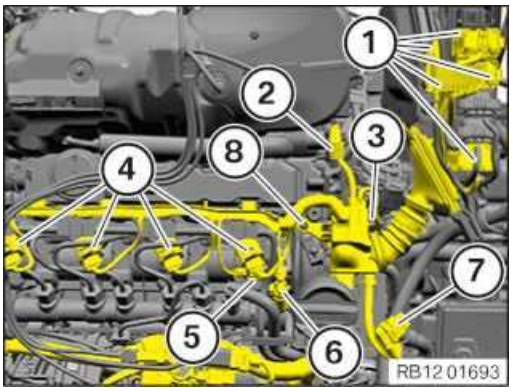


- Loosen screws (1).

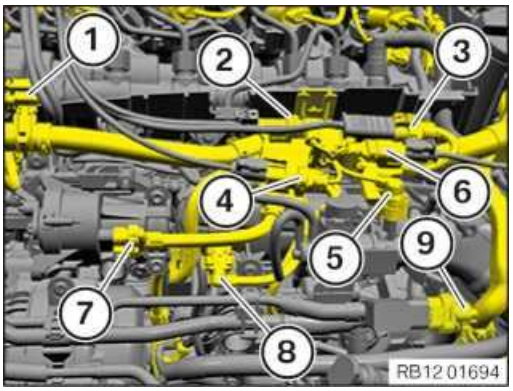


- Release the positive battery cable (1) on the alternator and place to one side.
- Unlock connector (2) and pull off.

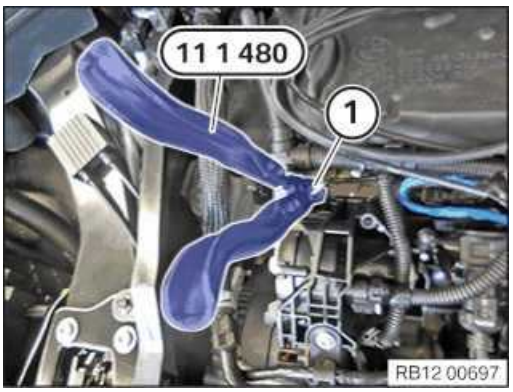
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- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock the connector (2) and disconnect it from the differential pressure sensor.
- Unlock the connector (3) and disconnect it from the exhaust-gas recirculation valve.
- Unlock the connector (4) and pull off from the injectors.
- Unlock the connector (5) and disconnect it from the camshaft sensor.
- Unlock the connector (6) and disconnect it from the fuel pressure regulator.
- Unlock connector (7) and pull off from hot film air mass meter.
- Loosen screw (8).

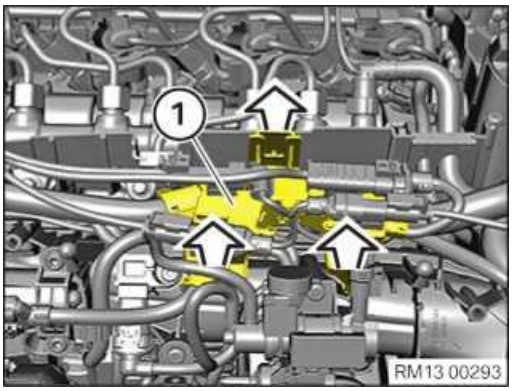


- Unlock connector (1) and pull off from the rail pressure sensor.
- Unlock the connector (2) and disconnect it from the exhaust temperature sensor before the diesel particulate filter.
- Unlock and disconnect the connector (3) from the front oxygen sensor.
- Unlock the connector (4) and disconnect it from the exhaust temperature sensor after the diesel particulate filter.
- Unlock and disconnect the connector (5) from the electric changeover valve.
- Unlock the connector (6) and disconnect it from the exhaust temperature sensor for the exhaust-gas recirculation cooler.
- Unlock the connector (7) and disconnect it from the servomotor for the swirl flaps.
- Unlock the connector (8) and pull it off the charging pressure sensor.
- Unlock the connector (9) and disconnect from the fuel pressure and temperature sensor.



- Unlock the connectors (1) of all glow elements with the special tool **0 490 796 (11 1 480)** and release them.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.

▶ **Removing the cable clips from the intake plenum**



- Detach the cable clip (1) in the direction of the arrow.
- Guide out the cable clip (1) in direction of arrow and set it aside.

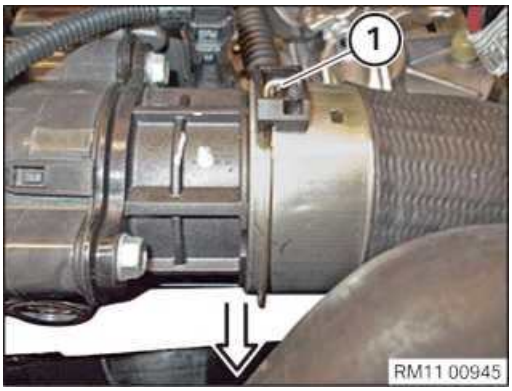
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TECHNICAL INFORMATION

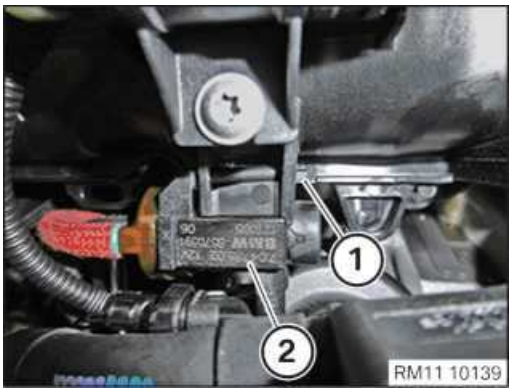
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



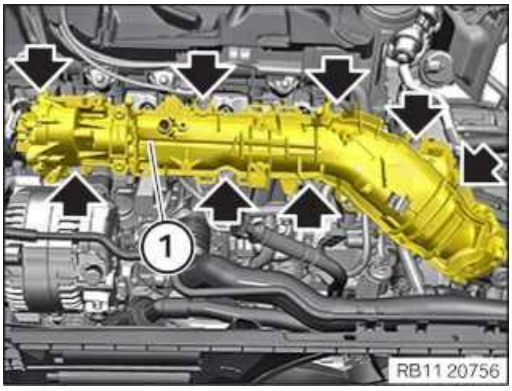
- Unlock the lock (1).



- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.

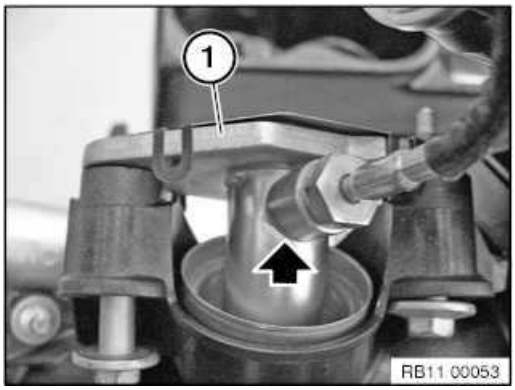


- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



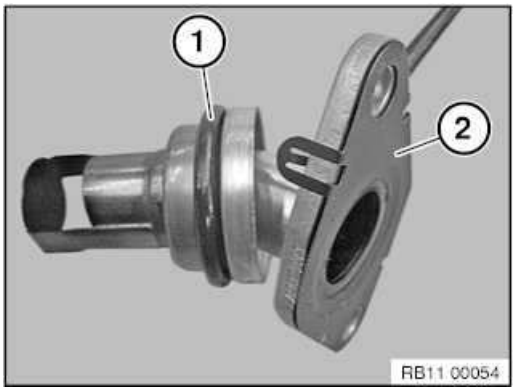
- Release the screws (arrows) from the intake plenum (1).
- Guide the intake plenum (1) out forwards and remove it.

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- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

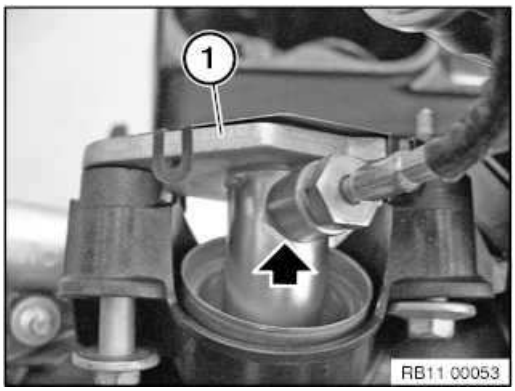
14 – Installing the intake plenum



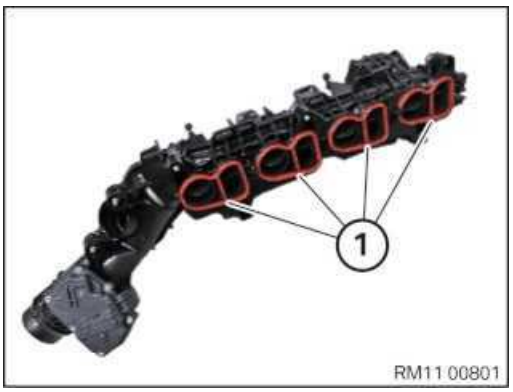
- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position the seal (2) and clip it in.

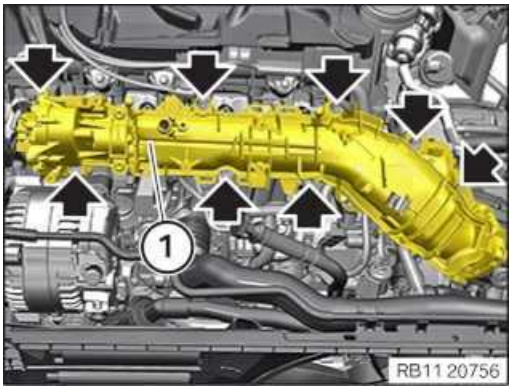


- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (1).

  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.

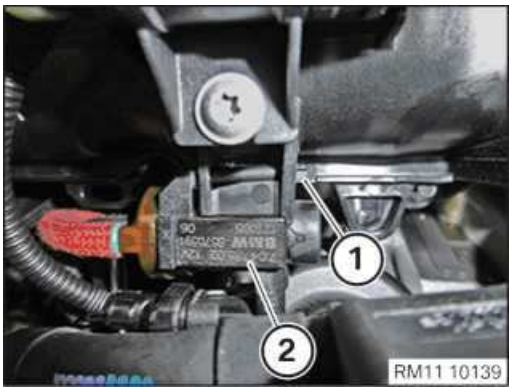


- Guide in and install intake (1) plenum.
- Tighten screws (arrows).

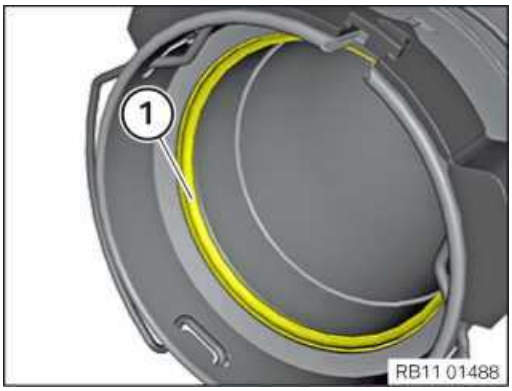
Intake plenum to cylinder head

M6		Tightening torque	11 Nm

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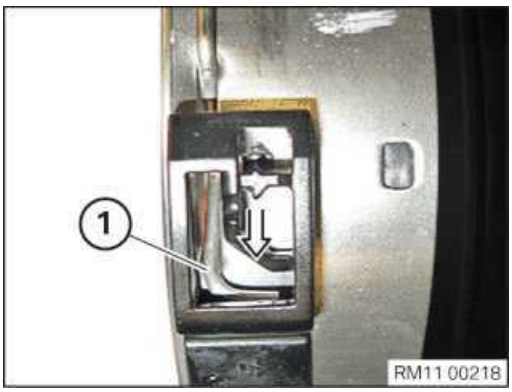


- Install the electric changeover valve (2) in the holder on the plenum from left to right.
- Lock (1) must engage audibly.

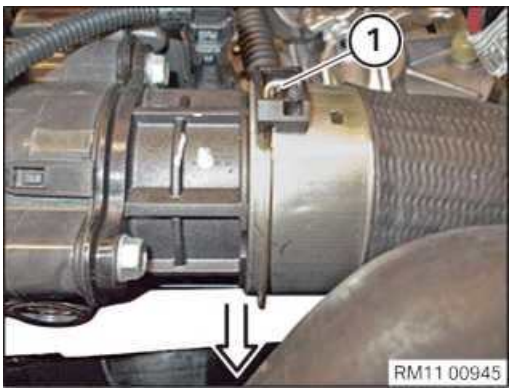


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring



- Engage the lock (1) on the bracket (arrow).



- Connect the charge air line to the throttle valve.

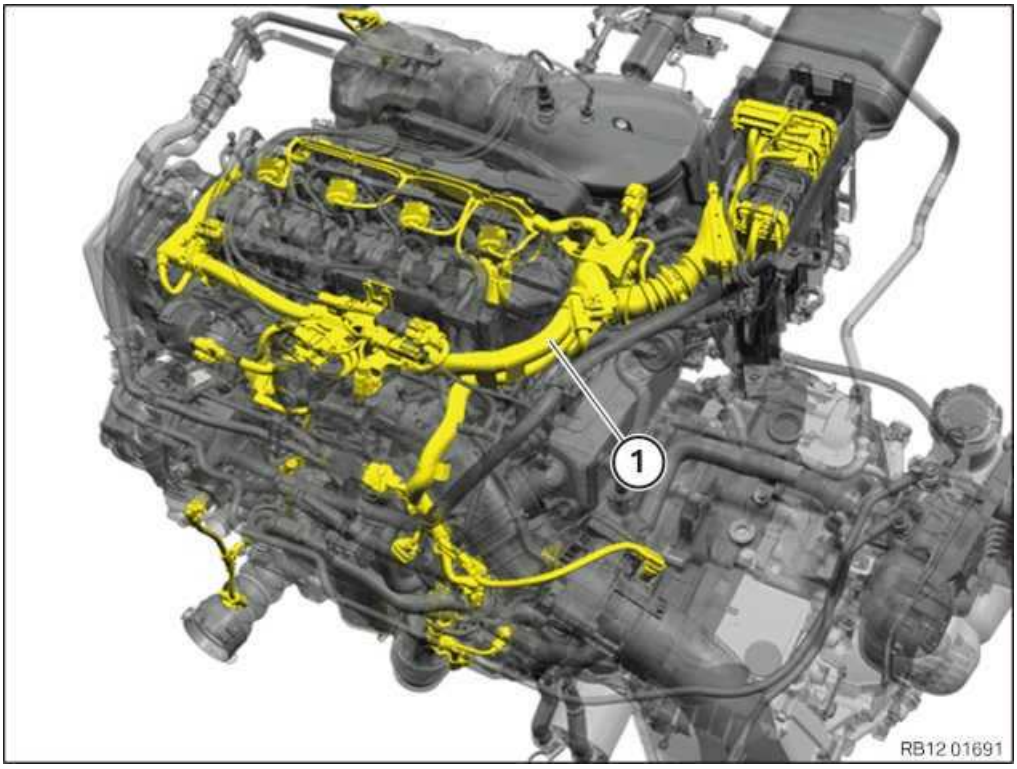
  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

POSTPROCESSES

15 – Fastening the wiring harness section for the intake plenum

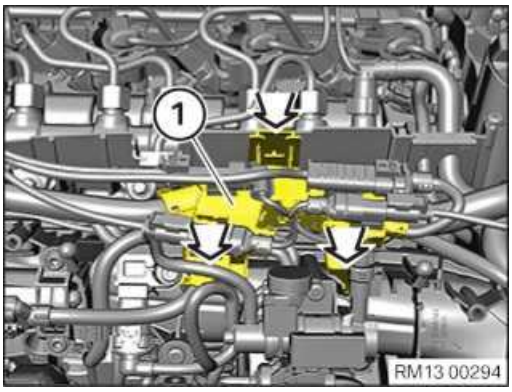
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Overview: Wiring harness section for the engine

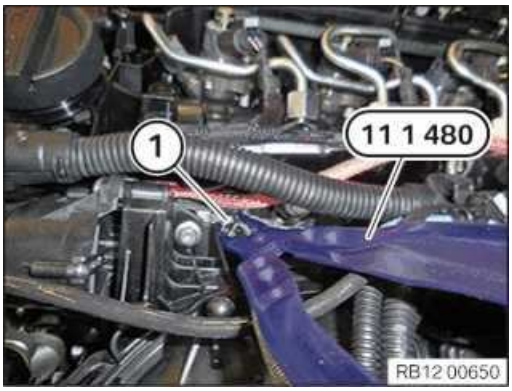


1 Wiring harness section for the engine

▶ **Installing the cable clip for the intake plenum**

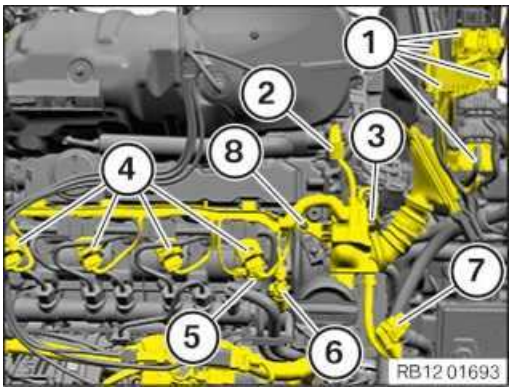


- Insert and install the cable clip (1) in the direction of the arrow.
- Make sure the cable clip (1) is fitted correctly.



- Connect and lock the connector (1) on the glow elements.
  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.

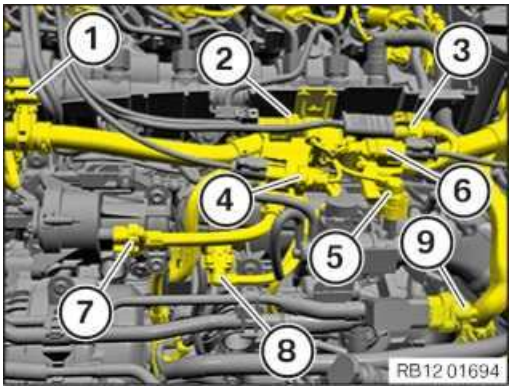
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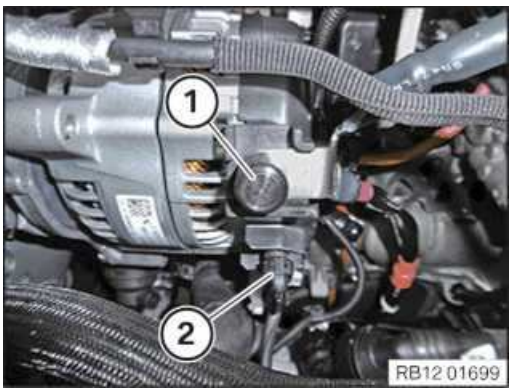
- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the DME control unit and remove the integrated supply module (PDM).
- Attach connector (2) to the differential pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust-gas recirculation valve and lock audibly.
- Attach connector (4) to the injectors and lock it audibly.
- Attach connector (5) to the camshaft sensor and lock it audibly.
- Attach connector (6) to the fuel pressure regulator and lock it audibly.
- Connect and audibly lock the connector (7) to the hot film air mass meter.
- Tighten down screw (8).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm



- Connect the connector (1) to the rail pressure sensor and lock it audibly.
- Attach connector (2) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (3) to the front oxygen sensor and lock audibly.
- Attach connector (4) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Connect the connector (5) to the electric changeover valve and lock audibly.
- Attach connector (6) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (7) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (8) to the charging pressure sensor and lock it audibly.
- Attach connector (9) to the fuel pressure and temperature sensor and lock it audibly.



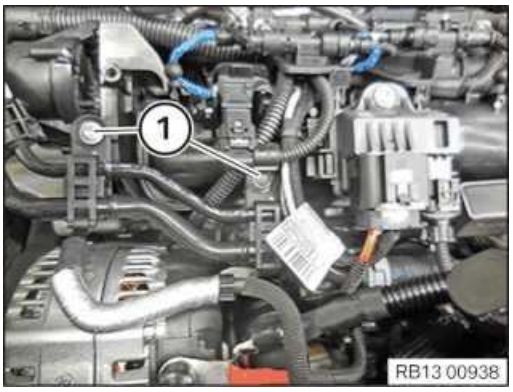
- Connect and lock the connector (2).

  Lock must snap audibly into place.
- Connect the positive battery cable (1) and tighten.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

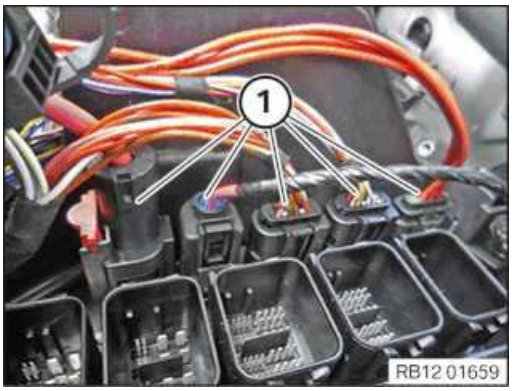
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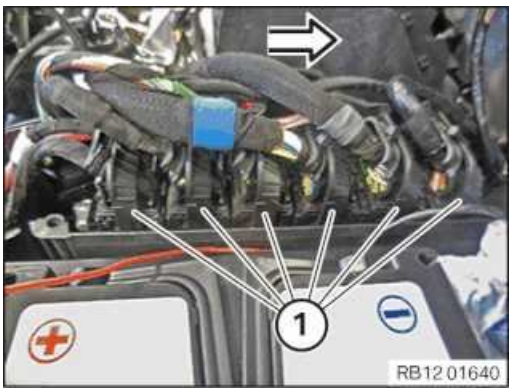
- Position the fuel line.
- Tighten the screws (1).

Fuel line to intake plenum

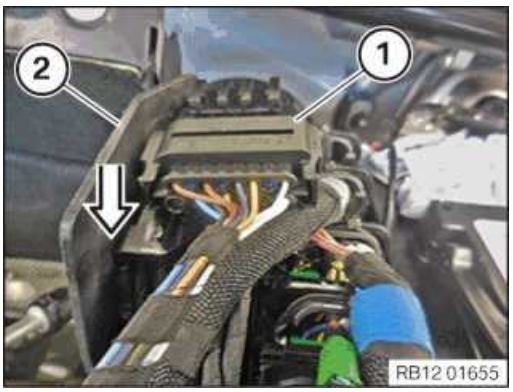
TS6x20		Tightening torque	5 Nm



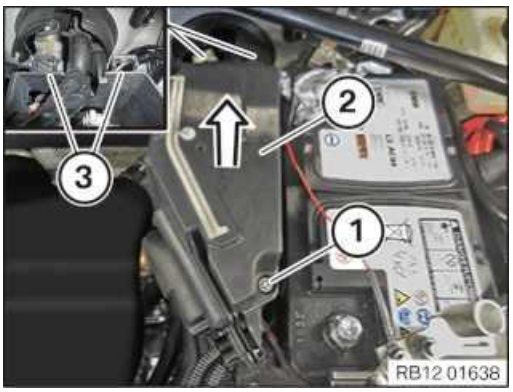
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.

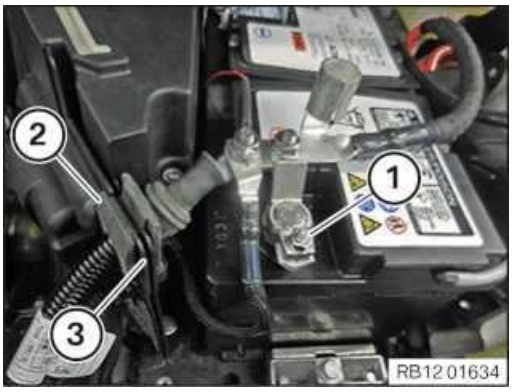


- Insert and install the cover (2) into the guides (3) in the direction of the arrow.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

RF5x26.5		Tightening torque	2,5 Nm

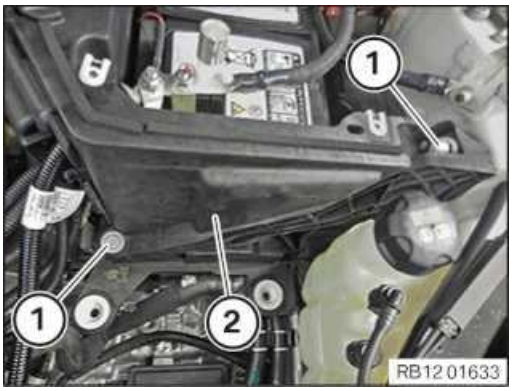
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- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

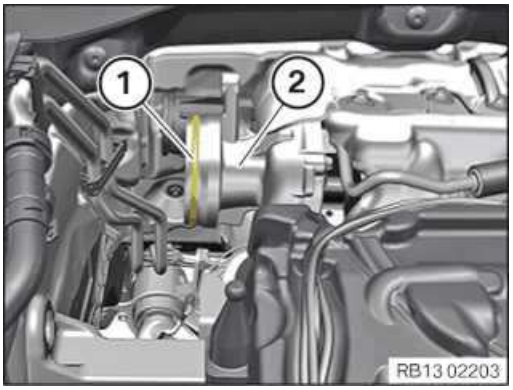


- Feed in and install tension strut (2).
- Tighten the screws (1).

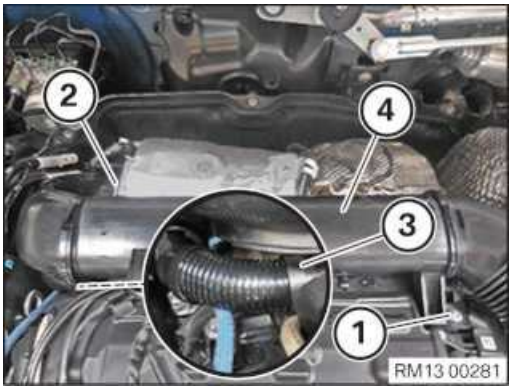
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

16 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.



- Feed in clean air pipe and install.
- Connect clean air pipe to the exhaust turbocharger and lock audibly in the clamps (2).
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Connect ventilation line (3) to the cylinder head cover and lock audibly.



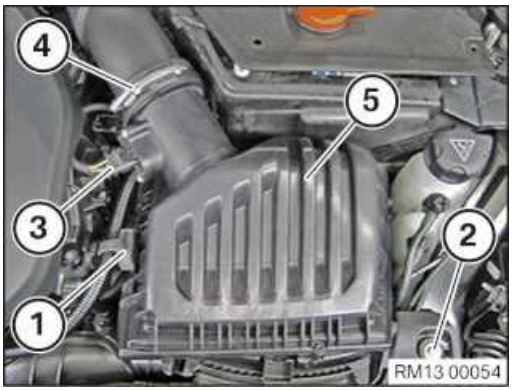
- Mount clean air pipe onto the intake filter housing.
- Tighten clamp (1) on the clean air pipe.

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

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17 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

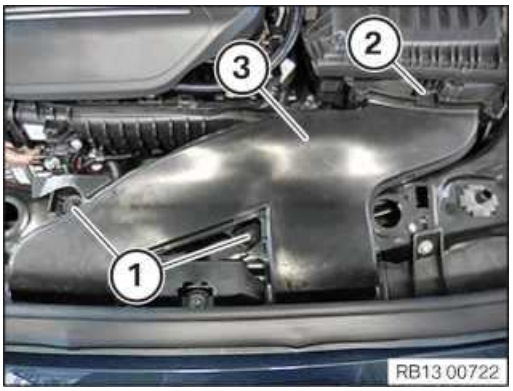
- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

18 – Install the intake neck for the intake filter housing

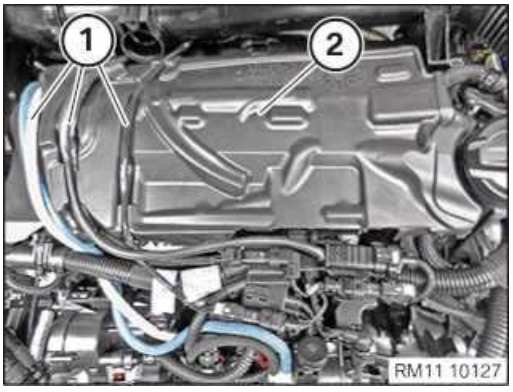


- Insert and install the intake neck (3).
  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

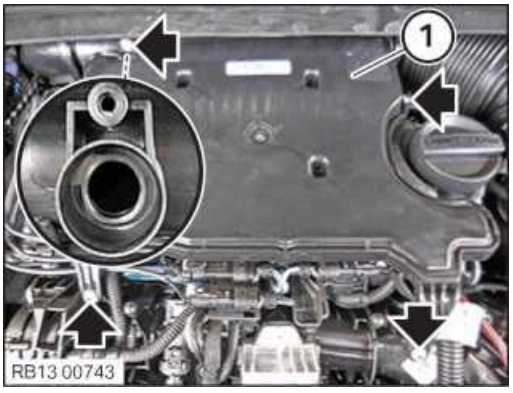
M6		Tightening torque	8 Nm

19 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the vehicle wiring harness (1) in the brackets.

20 – Install resonator



- Insert and install the resonator (1).
- Renew the bolts (arrows).
  Parts: Bolts
- Tighten screws (arrows).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

21 – Install acoustic cover

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21 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Check for correct installation of all rubber mounts in the acoustic cover (1).

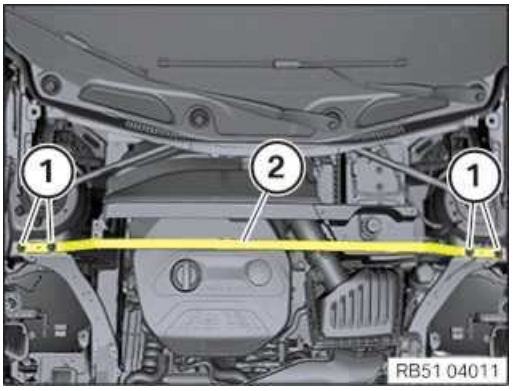


- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

22 – Install strut brace

TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.



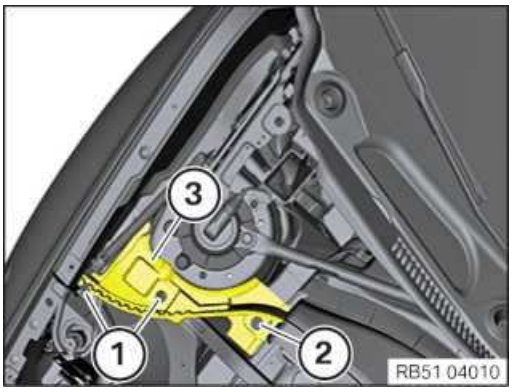
- Install the strut brace (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-brace to spring strut dome

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

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NOTICE

Description is for right component only. The procedure on the left side is identical.

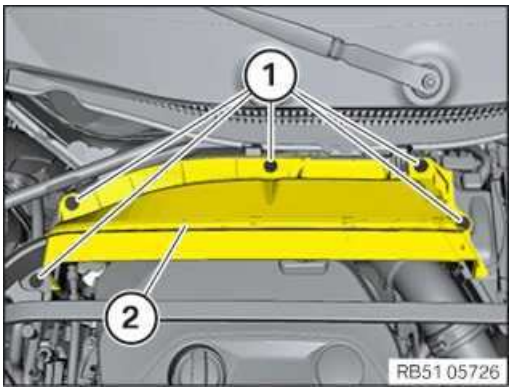
- Install the cover (3).
- Tighten down screw (2).

Cover on body

Hexagon screw		Tightening torque	3 Nm

- Install the expanding rivet (1).

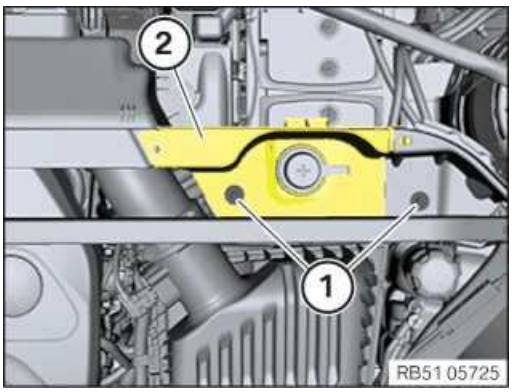
23 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Cover of top bulkhead

Screw		Tightening torque	2,6 Nm

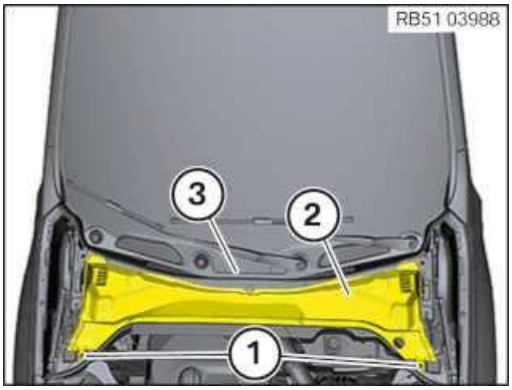


- Guide in and install cover (2).
- Tighten down screw (1).

Cover of remote positive terminal

Screw		Tightening torque	2,6 Nm

24 – Installing front cowl panel cover



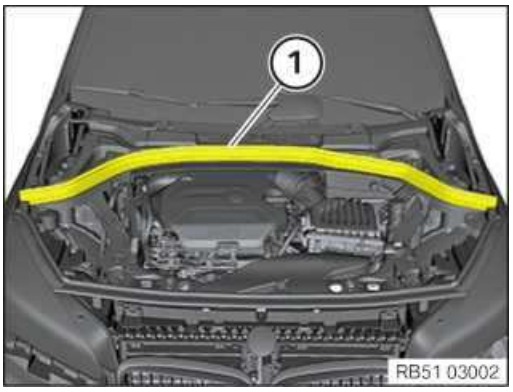
- Insert and install cowl panel cover at front (2) into cowl panel cover at rear (3).
- Check cowl panel cover at front is correctly seated (2).
- Secure expanding rivet (1).

25 – Install the seal for the bonnet

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

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- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

26 – Disconnecting all battery earth leads



- See additional information.

Additional Information

Overview of Tightening Torques

Intake plenum to cylinder head — Used in step 14

M6		Tightening torque	11 Nm

Wiring harness to cylinder head cover — Used in step 15

TS5x20		Tightening torque	3,5 Nm

Positive battery cable to alternator — Used in step 15

M8		Tightening torque	19 Nm

Fuel line to intake plenum — Used in step 15

TS6x20		Tightening torque	5 Nm

Cover to electronics box — Used in step 15

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery — Used in step 15

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray — Used in step 15

M8		Tightening torque	19 Nm

Clean air pipe to cylinder head cover — Used in step 16

Oval-head screw	Renew screw.	Tightening torque	8 Nm

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Clean air pipe to intake silencer housing — Used in step 16 17

Clamp		Tightening torque	3 Nm

Intake silencer housing to lock bridge — Used in step 17

M6X30		Tightening torque	8 Nm

Intake neck to cross connection — Used in step 18

M6		Tightening torque	8 Nm

Resonator to manifold and clean air pipe — Used in step 20

Screw TS6	Renew screw.	Tightening torque	5 Nm

Cross-brace to spring strut dome — Used in step 22

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

Cover on body — Used in step 22

Hexagon screw		Tightening torque	3 Nm

Cover of top bulkhead — Used in step 23

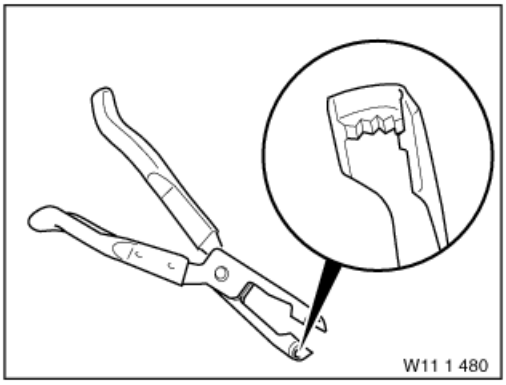
Screw		Tightening torque	2,6 Nm

Cover of remote positive terminal — Used in step 23

Screw		Tightening torque	2,6 Nm

Overview of Special Tools

0 490 796 (11 1 480) Pliers



Common — Used in step 12

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

Links

Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	1 26
61 20 900 Disconnecting and connecting battery earth lead	1 26
61 20 900 Disconnecting and connecting battery earth lead	1 26
61 20 900 Disconnecting and connecting battery earth lead	1 26
61 20 900 Disconnecting and connecting battery earth lead	1 26
61 20 900 Disconnecting and connecting battery earth lead	1 26
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 26
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 26

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61 20 900 Disconnecting and connecting battery earth lead	1	26
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1	26
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	1	26
61 20 900 Disconnecting and connecting battery earth lead	1	26
61 20 900 Disconnecting and connecting battery earth lead	1	26
61 20 900 Disconnecting and connecting battery earth lead	1	26
61 20 900 Disconnecting and connecting battery earth lead	1	26
61 20 900 Disconnecting and connecting battery earth lead	1	26
61 20 900 Disconnecting and connecting battery earth lead	1	26
61 20 900 Disconnecting and connecting battery earth lead	1	26
61 20 900 Disconnecting and connecting battery earth lead	1	26
61 20 900 Disconnecting and connecting battery earth lead	1	26
61 20 900 Disconnecting and connecting battery earth lead	1	26
61 20 900 Disconnecting and connecting battery earth lead	1	26
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1	26
61 20 900 Disconnecting and connecting battery earth lead	1	26
61 20 900 Disconnecting and connecting battery earth lead	1	26
61 20 900 Disconnecting and connecting battery earth lead	1	26
61 20 900 Disconnecting and connecting battery earth lead	1	26
61 20 900 Disconnecting and connecting battery earth lead	1	26
61 20 900 Disconnecting and connecting battery earth lead	1	26
61 20 900 Disconnecting and connecting battery earth lead	1	26

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11 61 085 Removing and installing/replacing adjuster (B47)

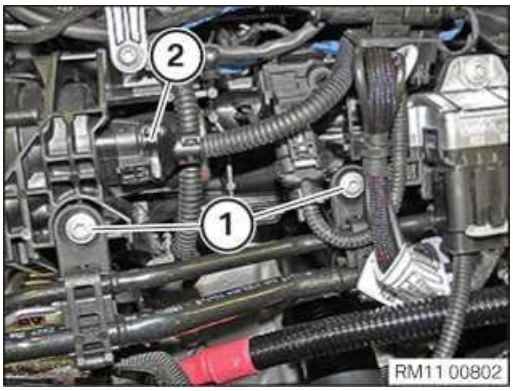
Attention!

The adaptation values must be reset before the adjuster is replaced.

Necessary preliminary work:

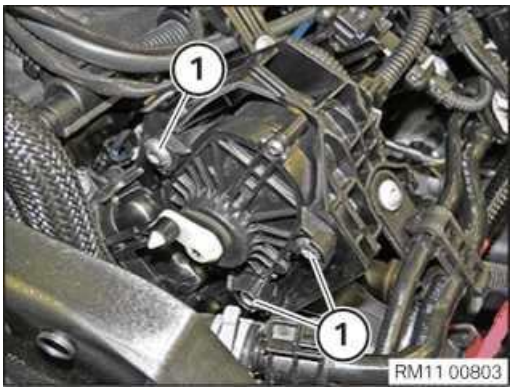
- Reset adaptation values with diagnosis system
- Remove acoustic cover

Removal:



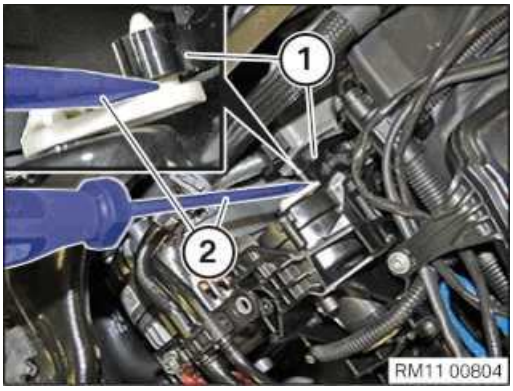
Release screws (1).

Unlock and disconnect connector (2).



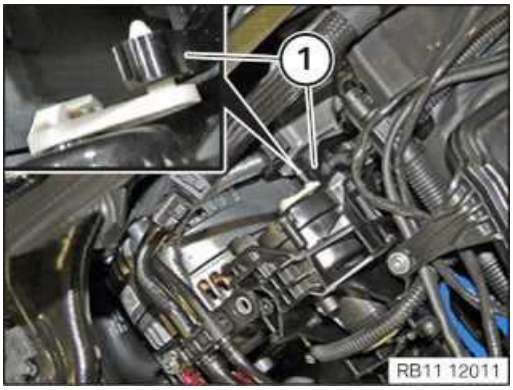
Release screws (1).

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Unclip linkage (1) using screwdriver (2).
Remove adjuster.

Installation:

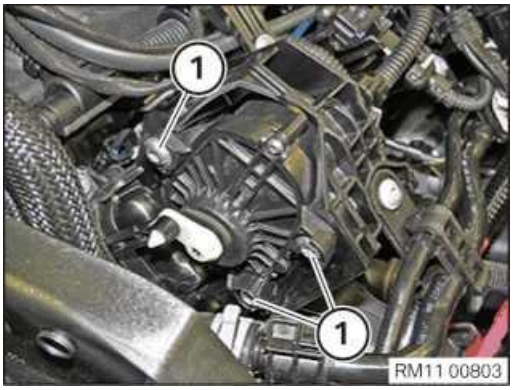


Attention!

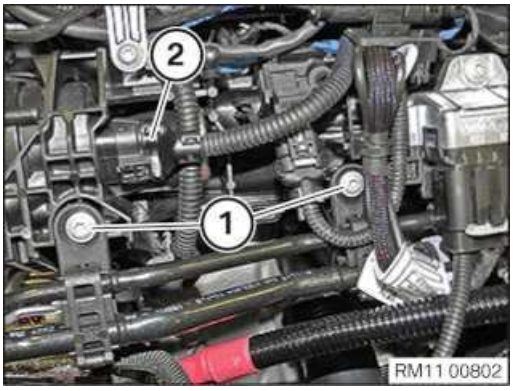
Incorrect assembly will lead to malfunction of the intake system.

Make sure linkage (1) is correctly installed!

Install adjuster.
Attach linkage (1).



Tighten down screws (1).
Tightening torque 11 61 5AZ.



Connect connector (2).
Attach holder for fuel lines and secure with screws (1).

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Required follow-up work:

- Install acoustic cover



Perform vehicle test and initialise limit positions.

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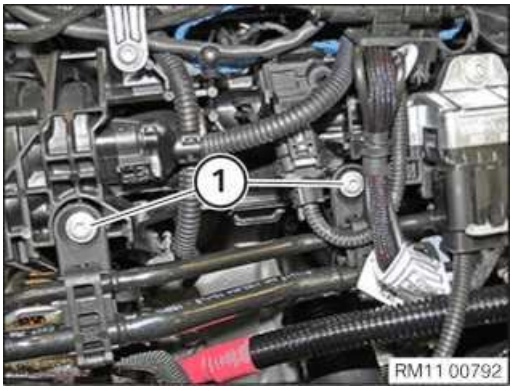
11 61 050 Removing and installing/replacing intake plenum (B47)

Note:
Follow diagnosis instruction.

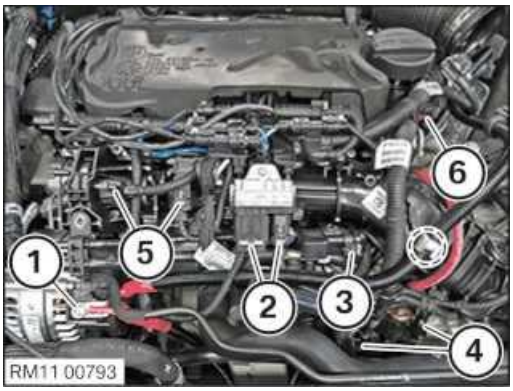
Necessary preliminary work:

- Disconnect negative battery lead.
- Remove resonator
- Remove fan cowl
- Remove underbody protection
- When replacing the intake plenum, check the part number and clear adaptations

Removal:

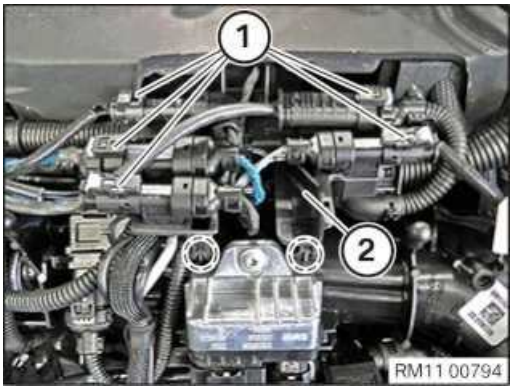


Release screws (1).
Release fuel lines with holder from intake plenum.

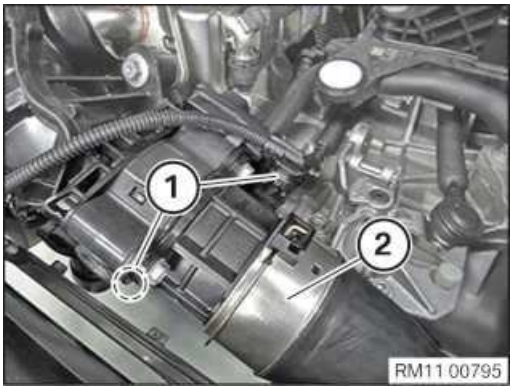


Slacken nut (1).
Release positive battery cable from alternator.
Release positive battery cable from clamp in marked area.
Unlock both connectors (2) on preheating control unit and disconnect.
Unlock and disconnect connector (3).
Unlock both connectors (4) and disconnect.
Unlock both connectors (5) and disconnect.
Release vacuum hose (6) from exhaust-gas recirculation valve.

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Unlock and disconnect all connectors (1).
Release holder (2) at clips in marked area towards top.



Unlock both connectors (1) and disconnect.
Unlock charge air duct (1) and pull off of intake plenum.

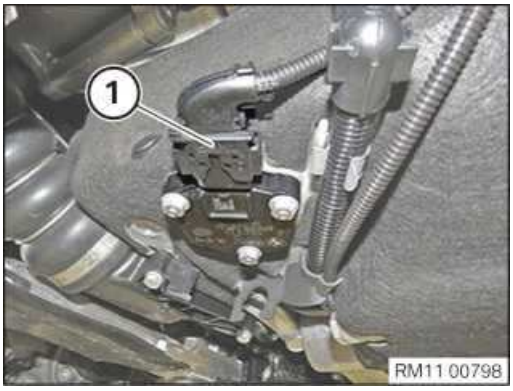


Release wiring harness at clips (1) from oil filter housing.

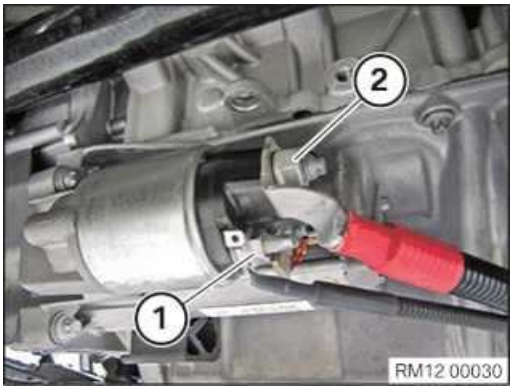


Unlock both connectors (1) and disconnect.

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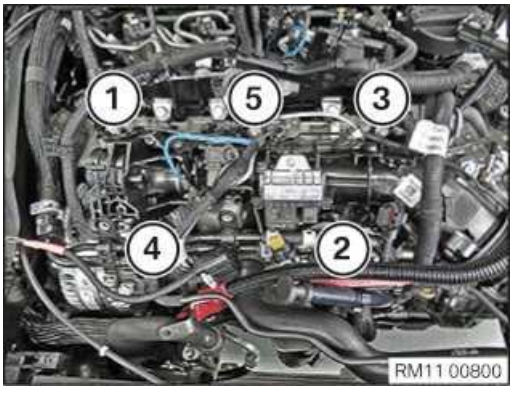
Unlock and disconnect connector (1) at oil-level sensor.



Releases nut (1) and disconnect terminal 50 cable from starter motor.
Release nut (2) and disconnect positive battery cable from starter motor.

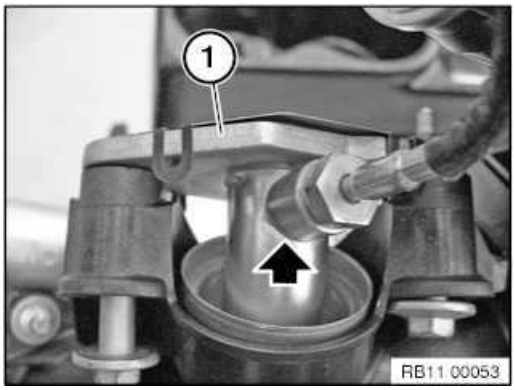


Loosen screws (1) on exhaust-gas recirculation cooler.



Release bolts (1-5).

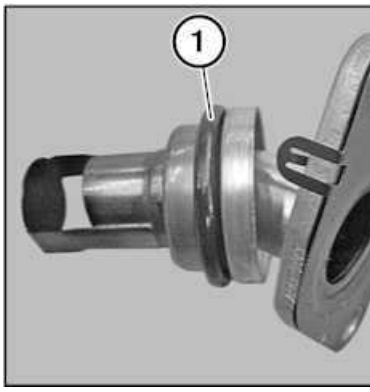
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Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

Remove intake plenum towards front.

Installation:



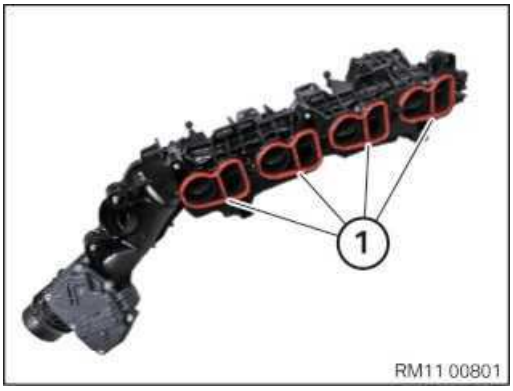
Note:

Parts: Replace O-ring.

Install O-ring (1).

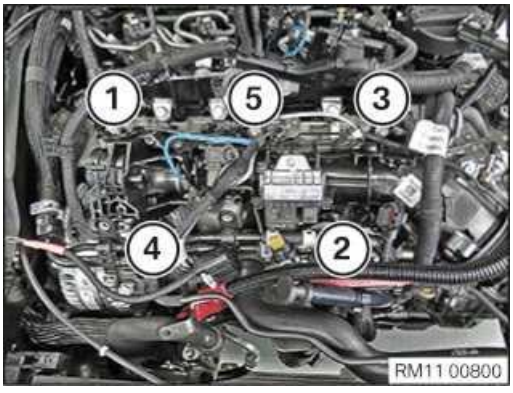
Parts: Replace beaded metal gasket.

Clip in beaded metal gasket (2).



Parts: Renew gaskets.

Install all sealing rings (2).



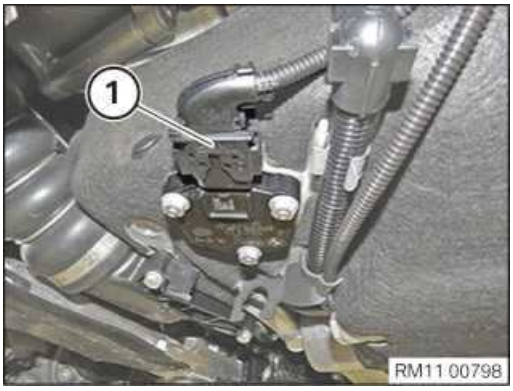
Tighten screws in order (5-1).

Tightening torque 11 61 1AZ.

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Tighten screws (1) on exhaust-gas recirculation cooler.
Tightening torque 11 61 2AZ.



Connect connector (1) for oil-level sensor.

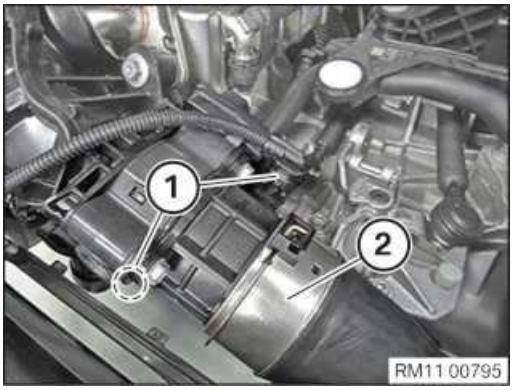


Connect both connectors (1).



Attach wiring harness with clips (1) on oil filter housing.

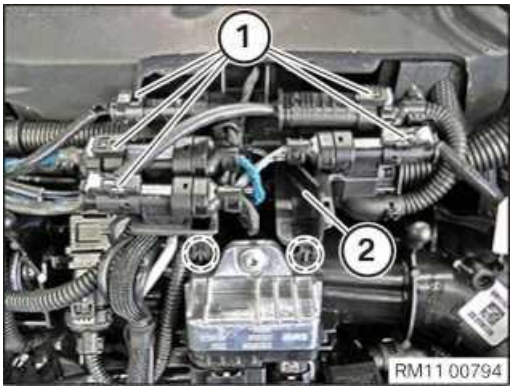
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Connect both connectors (1).

Connect pressure pipe (2).

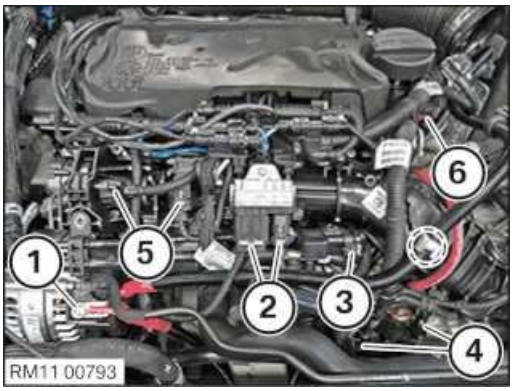
Note:
Make sure pressure pipe (2) is correctly seated on intake plenum.



Position holder (2) on cylinder head cover.

Attach holder (2) with clamps to intake plenum.

Connect all connectors (1).



Connect vacuum hose (6) to exhaust-gas recirculation valve.

Connect both connectors (5).

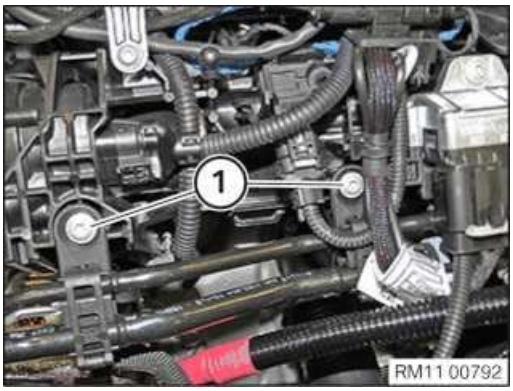
Connect both connectors (4).

Connect connector (3).

Connect both connectors (2) to preheating control unit.

Firmly screw positive battery cable (1) onto alternator and clip into holder.

Tightening torque 12 52 2AZ.



Position both holders for fuel lines at intake plenum.

Tighten screws (1).

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Required follow-up work:

- Remove underbody protection
- Remove fan cowl
- Install resonator
- Disconnect negative battery lead.

Assemble engine.

Check intake system for tightness.

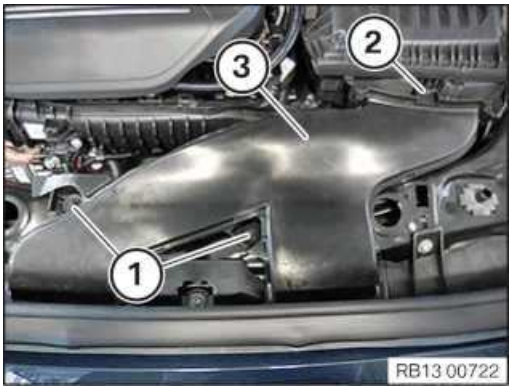
Check function of DDE Digital Diesel Electronics.

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11 61 365 Removing and installing/replacing left charge air duct

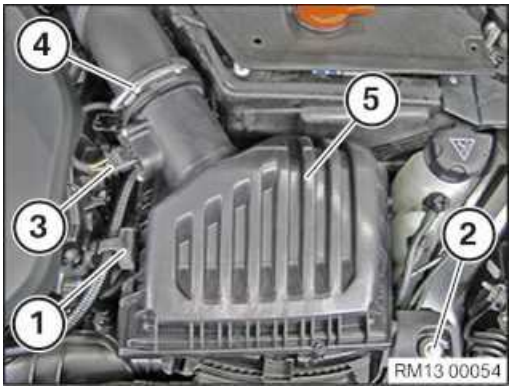
PRELIMINARY WORK

1 – Remove the intake neck for intake silencer housing



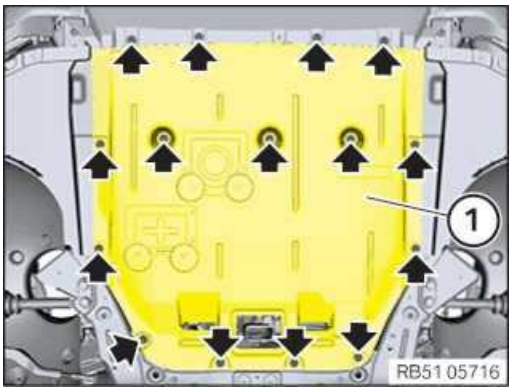
- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

2 – Removing intake silencer housing

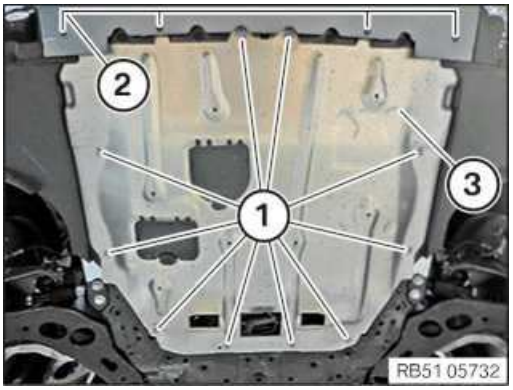


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

3 – Removing the front underbody protection



- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.



- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

MAIN WORK

4 – Remove the pressure pipe between the throttle body and the charge air cooler

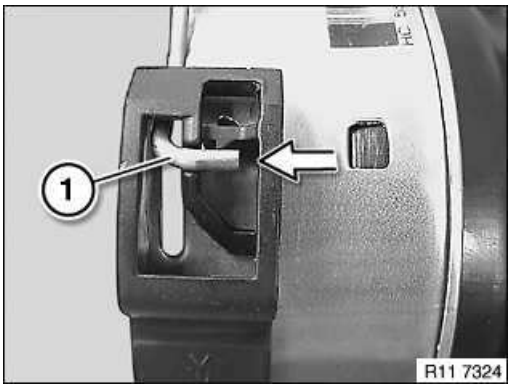
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WARNING

Hot surfaces.

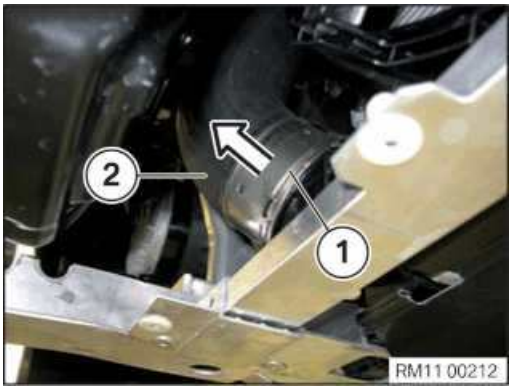
Risk of burning!

- Perform all work only on components that have cooled down.

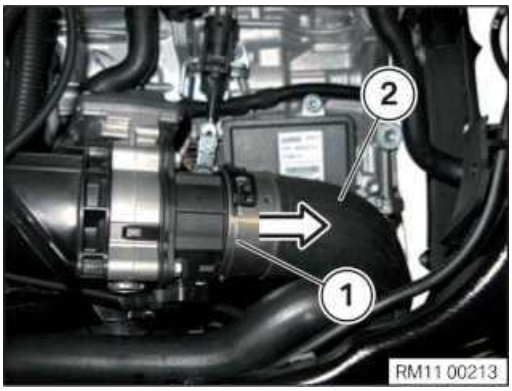


- Unlock the lock (1).

  The lock (1) must engage in the bracket (arrow).



- Unlock and detach the locks (1) on both sides.
- Guide out the pressure pipe (2) in the direction of the arrow and set it aside.



- Unlock and detach the locks (1) on both sides.
- Guide out the pressure pipe (2) in the direction of the arrow and set it aside.



- Remove the pressure pipe (1) in the direction of the arrow.

5 – Installing pressure pipe between throttle body and charge air cooler

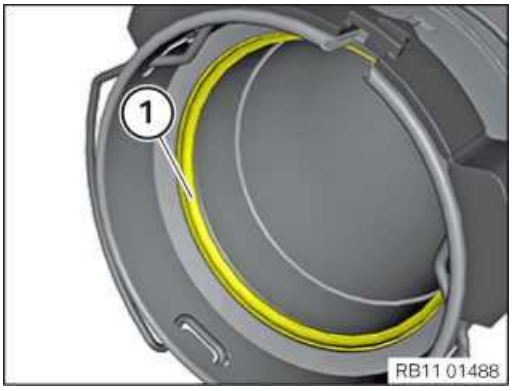
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RISK OF DAMAGE

Damage to the exhaust turbocharger.

A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.



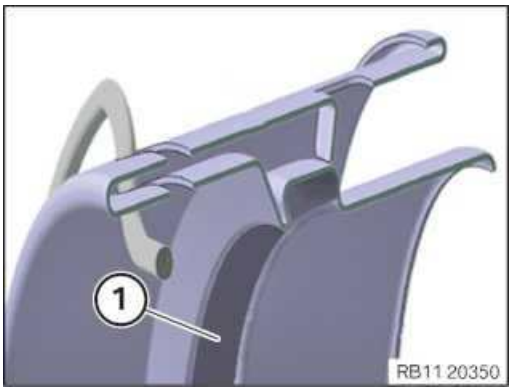
- Check seal (1) for damage and renew seal (1) as needed.

  Parts: Gasket

▶ **Replace damaged gasket**

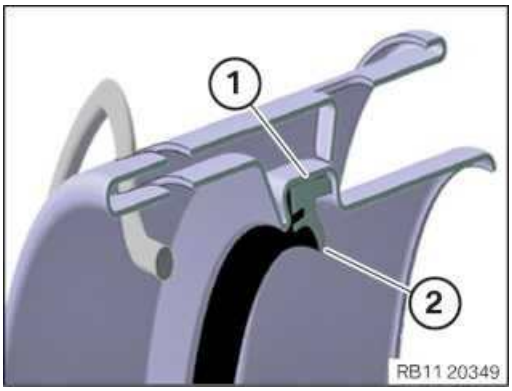
TECHNICAL INFORMATION

Do not use pointed or sharp-edged tools for the installation and/or removal.



- Remove damaged seal.
- Clean gasket groove (1) with a dry towel.

  The gasket groove (1) must be clean.



- Renew gasket.

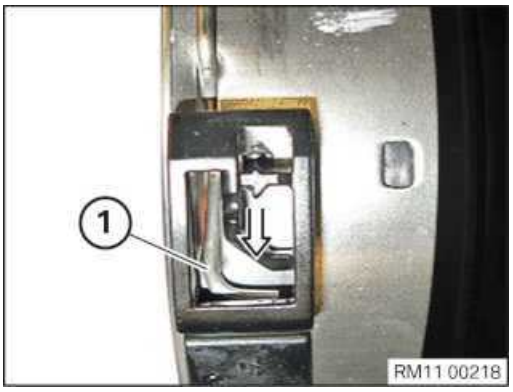
  Parts: Gasket
- Install seal dry without lubricant or mounting agent.

TECHNICAL INFORMATION

Incorrect assembly is possible. Ensure correct installation position.

- Feed in and install the seal.
- Make sure the seal is correctly installed in the gasket groove (1).
- Make sure that the sealing lip (2) is pointing downwards (see figure).

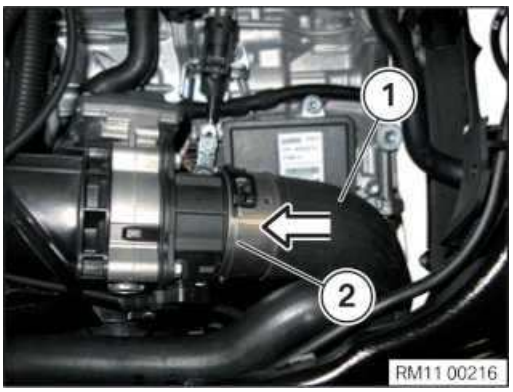
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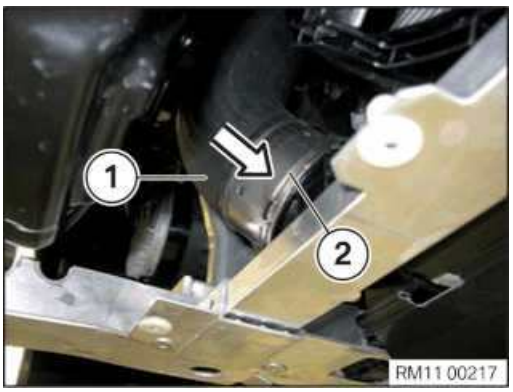
- Detach the locks (1) in the direction of the arrow from the brackets.



- Insert and install the pressure pipe (1) in the direction of the arrow.



- Insert and install the pressure pipe (1) in the direction of the arrow.
- Ensure that the locks (1) engage audibly.

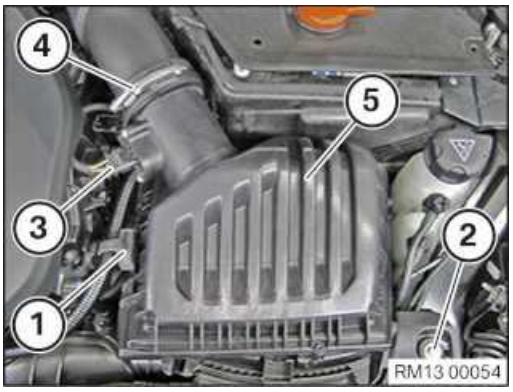


- Insert and install the pressure pipe (1) in the direction of the arrow.
- Ensure that the locks (2)engage audibly.

POSTPROCESSES

6 – Installing intake silencer housing

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- Insert the intake silencer housing (5) into the rubber mounts and install it.

  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

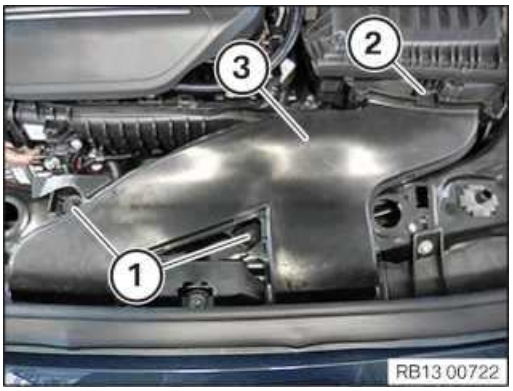
Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Insert and install the holder (1).

7 – Install the intake neck for the intake filter housing



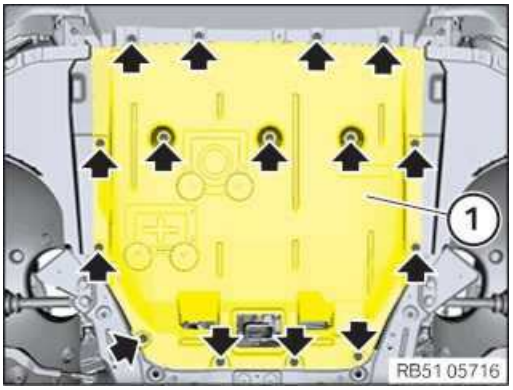
- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

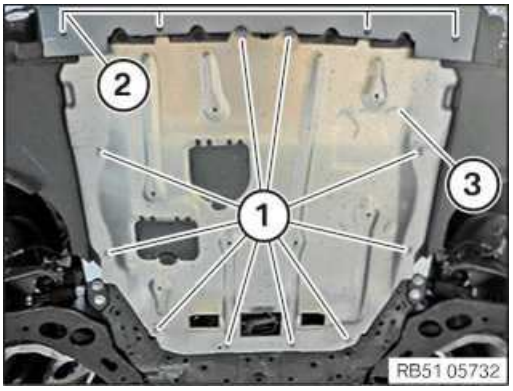
8 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm



- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Additional Information

Overview of Tightening Torques

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Overview of tightening torques

Intake silencer housing to lock bridge

Used in step 6

M6X30		Tightening torque	8 Nm

Clean air pipe to intake silencer housing

Used in step 6

Clamp		Tightening torque	3 Nm

Intake neck to cross connection

Used in step 7

M6		Tightening torque	8 Nm

Underbody protection front

Used in step 8

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

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11 61 365 Removing and installing/replacing left charge air line (B47)

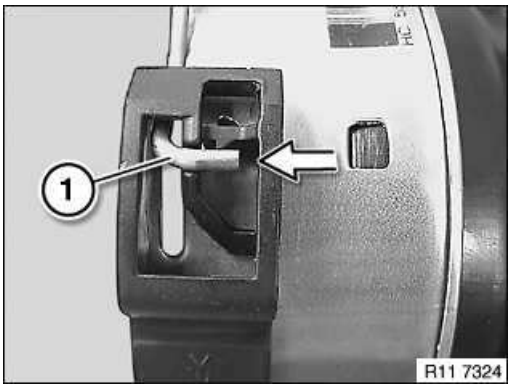
Safety information:

- In the event of a leak at the pressure pipe, there is a **risk of damage** to the exhaust turbocharger.

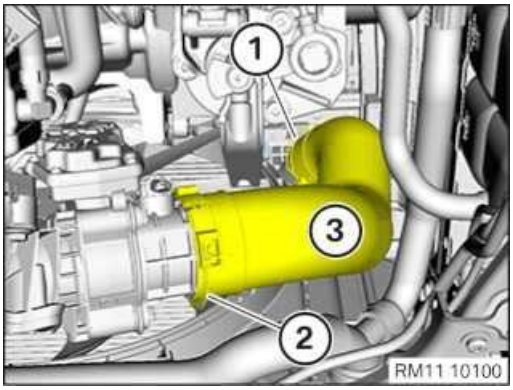
Necessary preliminary tasks:

- Remove front underbody protection
- Remove intake silencer housing

Removal:



Unlock lock of charge air line.*Note:*
Lock (1) must engage during unlocking (see arrow).



Unlock lock (1) on charge air cooler.

Unlock lock (2) on throttle body.

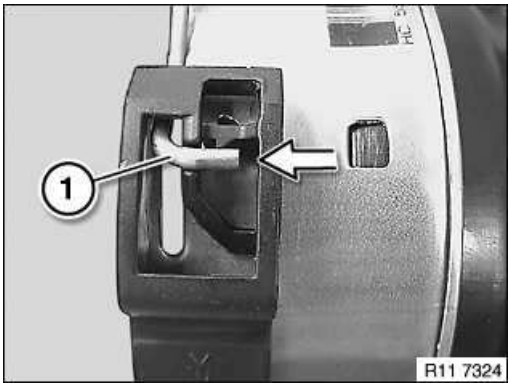
Pull off charge air line (3) from charge air cooler and exhaust turbocharger.

Preparation:

Release lock (1) of charge air line on both sides out of retaining lug.

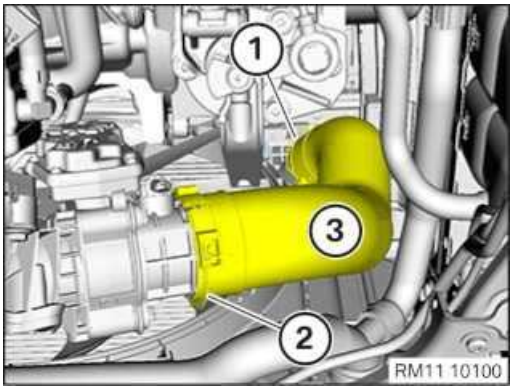
Installation:

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Note:
Release lock (1) of charge air line on both sides out of retaining lug (see arrow).

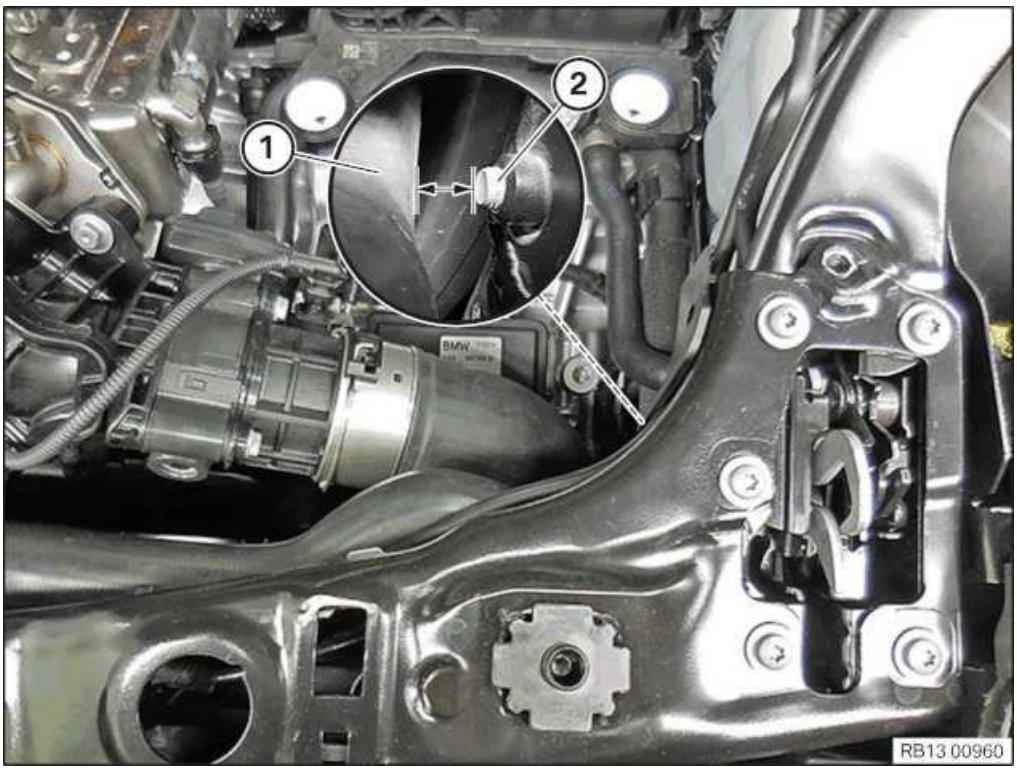
Lock must snap audibly into place.



Connect charge air line to charge air cooler and throttle body.

Lock (1) on charge air cooler must audibly engage.

Lock (2) on throttle body must audibly engage.



After installing the charge air line (1), check whether the distance to the screw connection (2) on the side member is sufficient.

Install abrasion protection, if necessary.

Required follow-up work:

- Install front underbody protection
- Install intake silencer housing

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11 61 362 Removing and installing/replacing right charge-air duct (B47AO0)

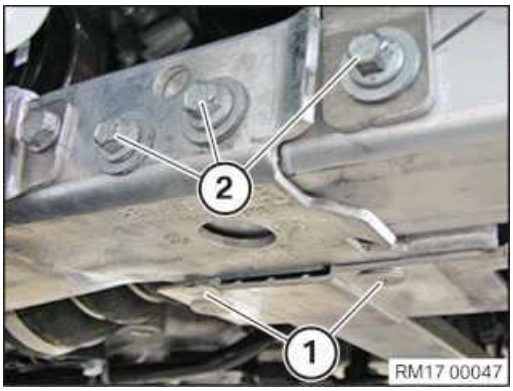
Safety information:

- In the event of a leak at the pressure pipe, there is a **risk of damage** on the exhaust turbocharger!

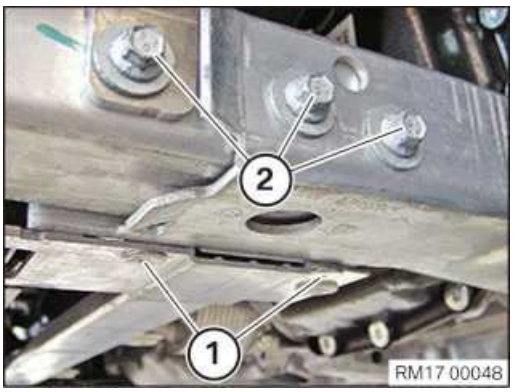
Necessary preliminary tasks:

- Remove front underbody protection
- Remove front right wheel arch panel
- Release front left wheel arch panel at bottom.

Removal:

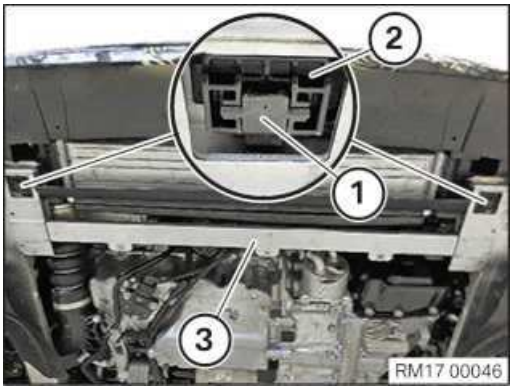


Release screws (2) for front left cross connection.
Drill out blind rivets (1) for front left cross connection.

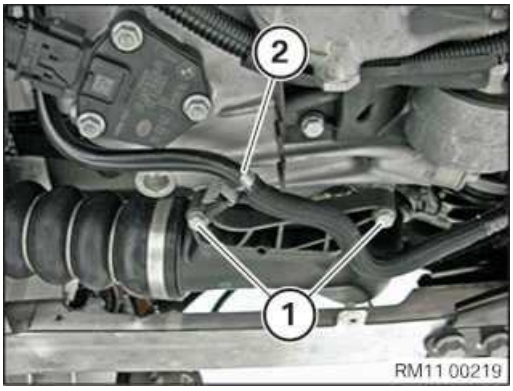


Release screws (2) for front right cross connection.
Drill out blind rivets (1) for front right cross connection.

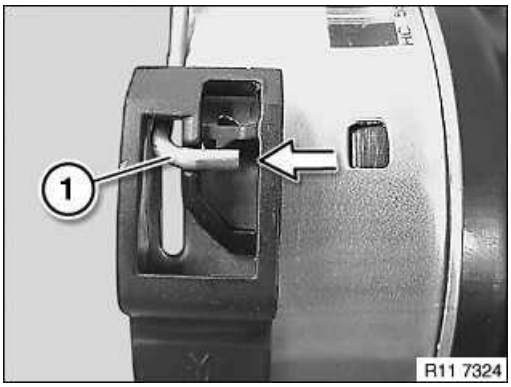
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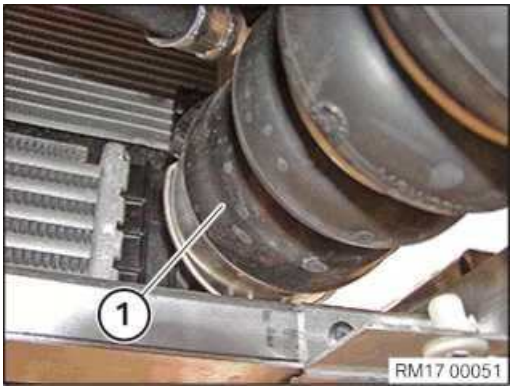
Release front left and right locking pins (1) and remove locks (2).
Remove cross connection (3).



Release screws (1).
Unclip line (2).



Note:
Locks (1) must engage in brackets (see arrow).

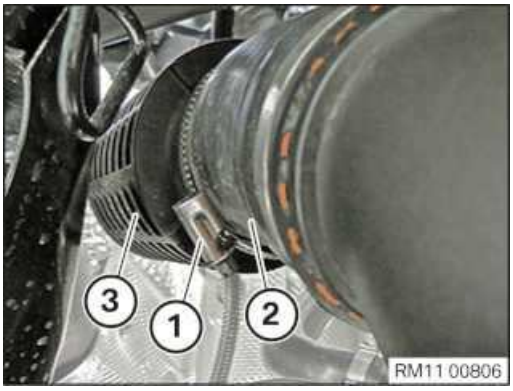


Unlock lock of charge air cooler on both sides by means of suitable tool.
Detach charge air line (1) from exhaust turbocharger.

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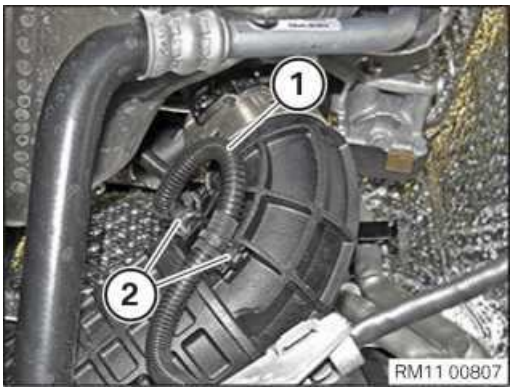


Release screw (1).

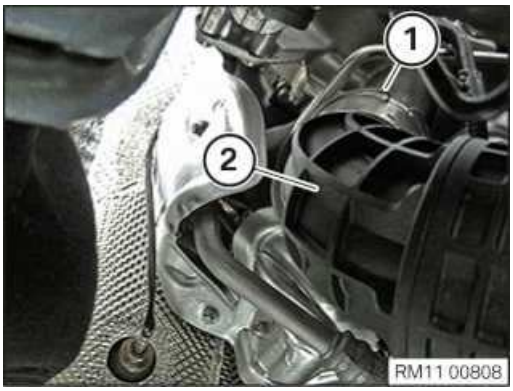


Release clamp (1).

Detach pressure pipe upper section (2) from pressure pipe lower section (3).



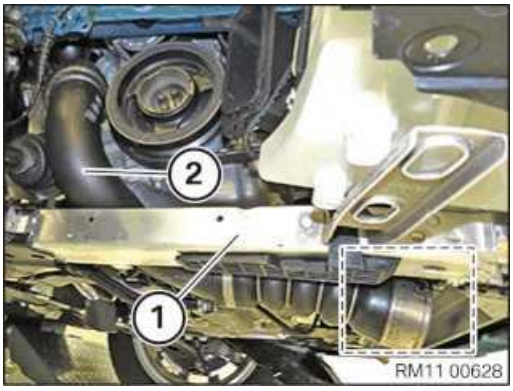
Release cable (1) from pressure pipe at clamps (2).



Unlock lock (1) of exhaust turbocharger on both sides by means of suitable tool.

Detach charge air line (2) from exhaust turbocharger.

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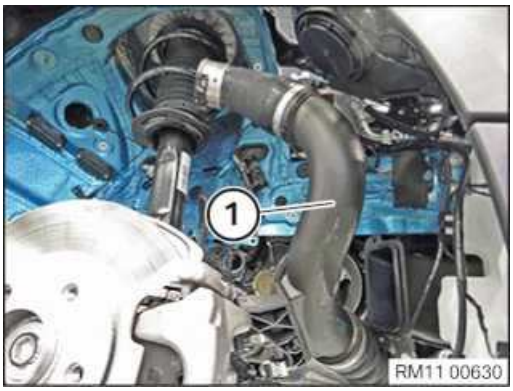


Slightly pull right deformation element (1) downwards.

Feed out lower section of charge air line (2) inside the marked area downwards.



Feed out upper section of charge air line (1) inside the marked area along the side member.



Remove charge air line (1) through the wheel arch.



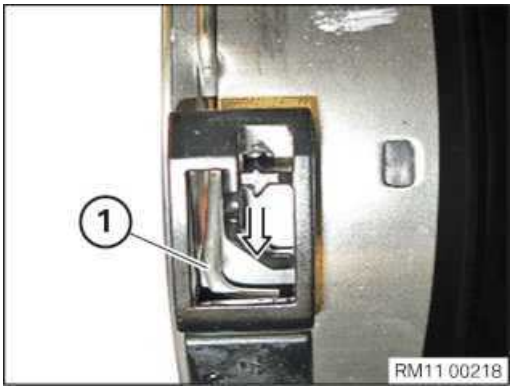
Feed out pressure pipe upper section (1) towards bottom.

Installation:

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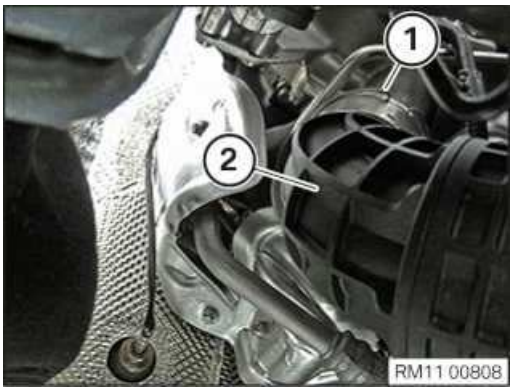


Feed in pressure pipe upper section (1).

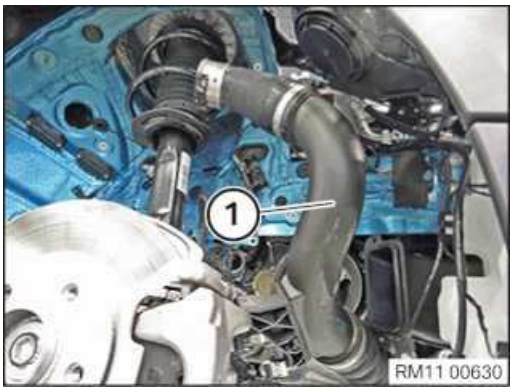


Release locks (1) from brackets.

Locks must engage.



Mount pressure pipe upper section (2) on exhaust turbocharger until lock (1) engages on both sides.

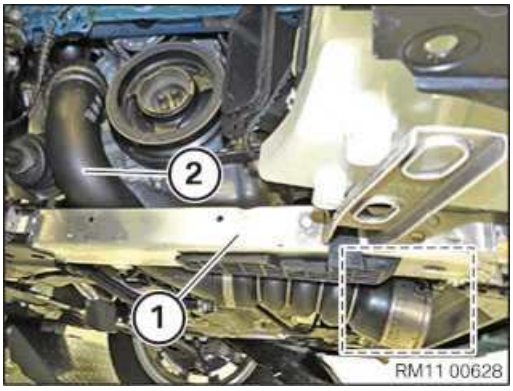


Remove charge air line (1) through the front right wheel arch.

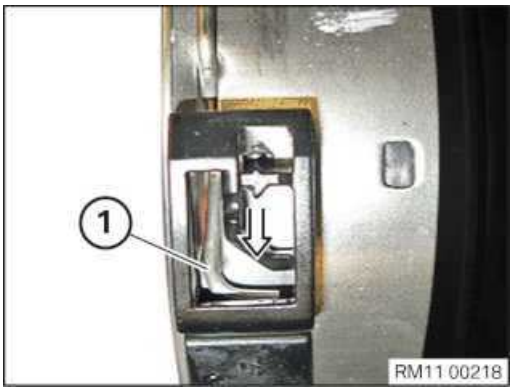
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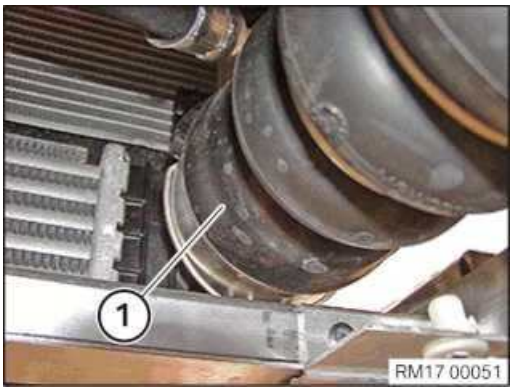
Feed in upper section of charge air line (1) passing the side member.



Feed in lower section of charge air line (2) inside the marked area.
Push right deformation element (1) upwards into initial position.

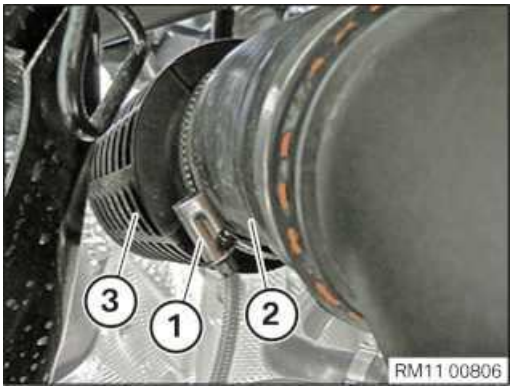


Release locks (1) from brackets.
Locks must engage.



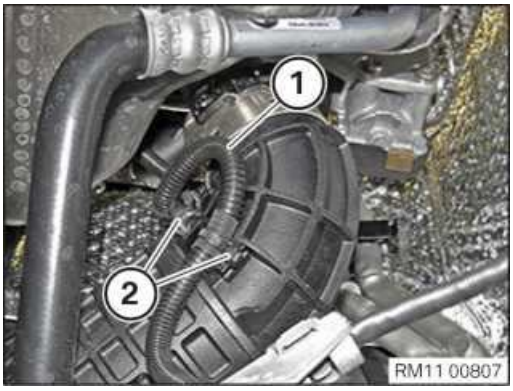
Connect front right charge air hose (1) and lock.
Charge air hose (1) must audibly engage on charge air cooler.

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Mount pressure pipe lower section (2) on pressure pipe upper section (3).

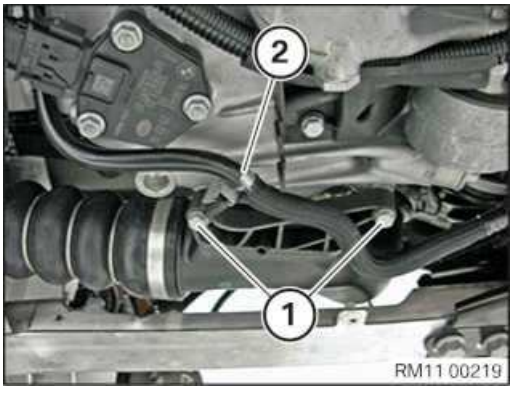
Tighten clamp (1).



Attach cable (1) to charge air line with clamps (2).



Tighten screw (1).

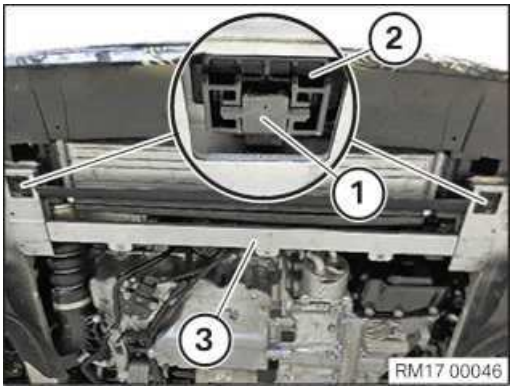


Tighten down screws (1).

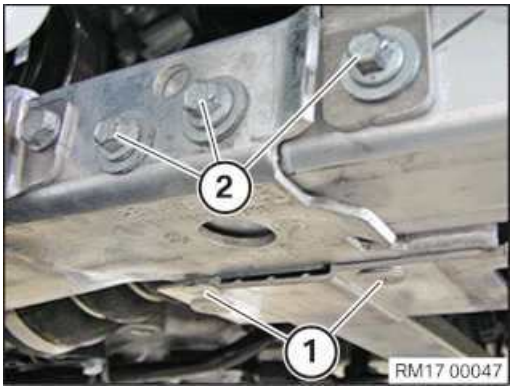
Tightening torque: 11 00 2AZ.

Clip in line (2).

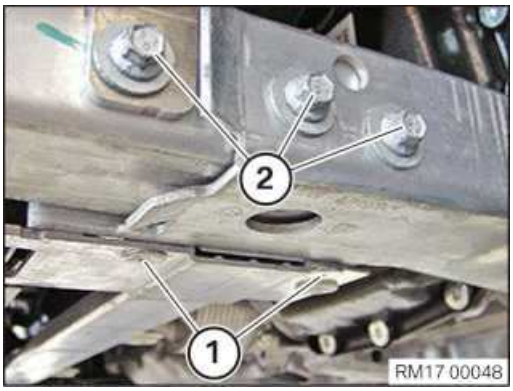
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Install cross connection (3).
Install locks (2) and lock with locking pins (1).



Replace screws (2) for front right cross connection and tighten.
Tightening torque 17 10 9AZ.
Replace blind rivets (1) for cross connection and rivet.
Parts: Renew blind rivets (1).



Renew screws (2) for front left cross connection and tighten.
Tightening torque 17 10 9AZ.
Replace blind rivets (1) for cross connection and rivet.
Parts: Renew blind rivets (1).

Required follow-up work:

- Install front right wheel arch panel
- Install front left wheel arch panel
- Install front underbody protection
- Check charge air path for tightness
- Check function of DME.

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11 61 362 Removing and installing/replacing the right charge-air duct

PRELIMINARY WORK

1 – Remove front right wheel

TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

TECHNICAL INFORMATION

Strictly observe the specified procedure to prevent clamping errors and imbalance.



- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

2 – Removing the front right wheel arch cover

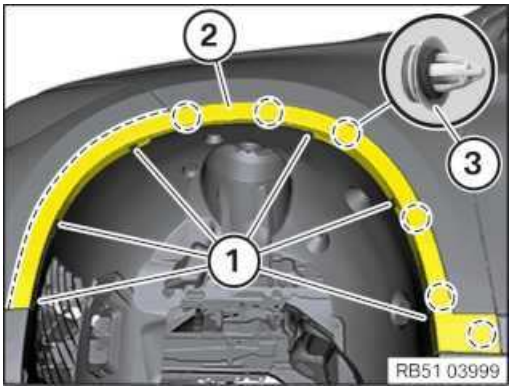
▶ **Remove the front wheel arch trim**

NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

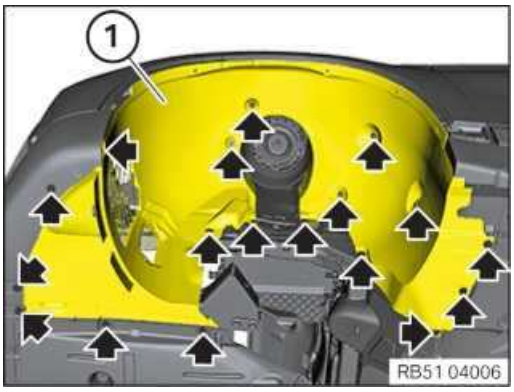
NOTICE

Description is for left component only. Procedure on the right side is identical.



- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.

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NOTICE

Description is for left component only. Procedure on the right side is identical.

- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

3 – Partially remove the front wheel arch cover

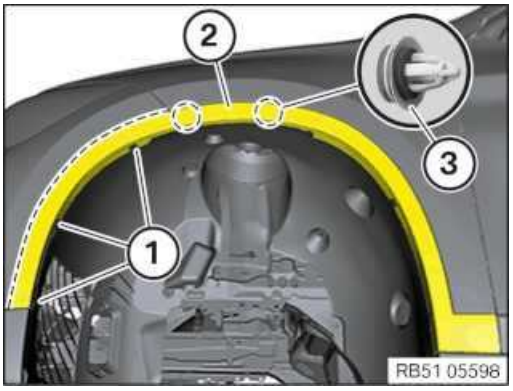
▶ Partially removing the front wheel arch trim

NOTICE

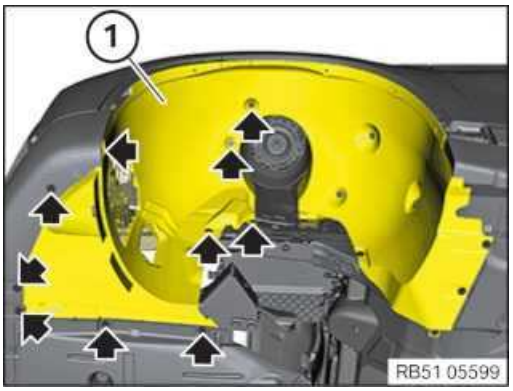
To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.



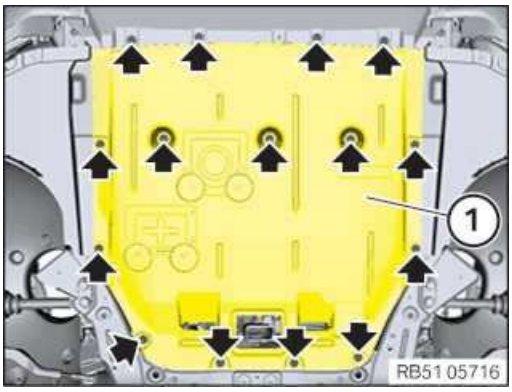
NOTICE

Description is for left component only. Procedure on the right side is identical.

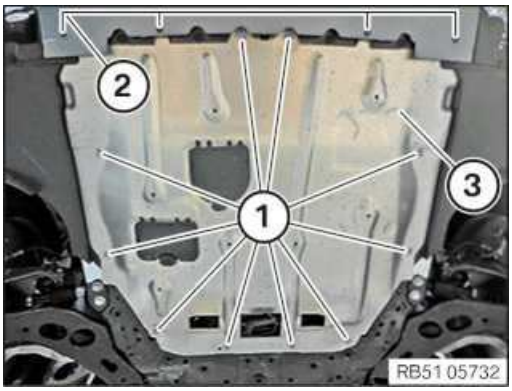
- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (2) out.

4 – Removing the front underbody protection

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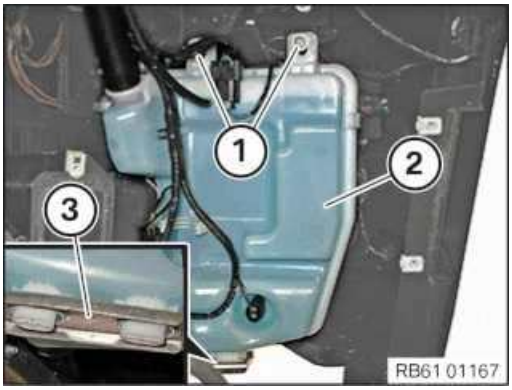


- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.



- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

5 – Remove the washer fluid reservoir from the fixture



- Loosen screws (1).
- Guide the washer fluid reservoir (2) up and out of the fixture (3) and set it aside.

MAIN WORK

6 – Removing the right charge air duct between the exhaust turbocharger and the charge air cooler

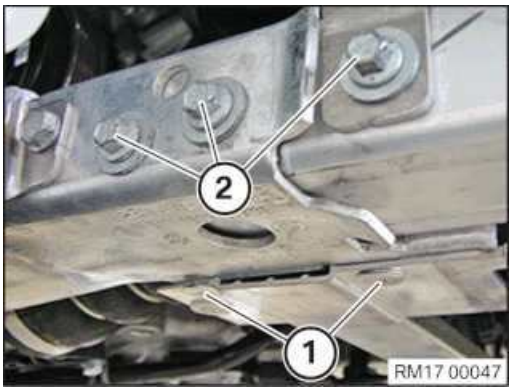
WARNING

Hot surfaces.

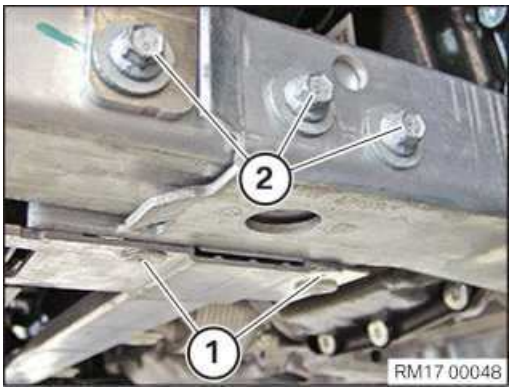
Risk of burning!

- Perform all work only on components that have cooled down.

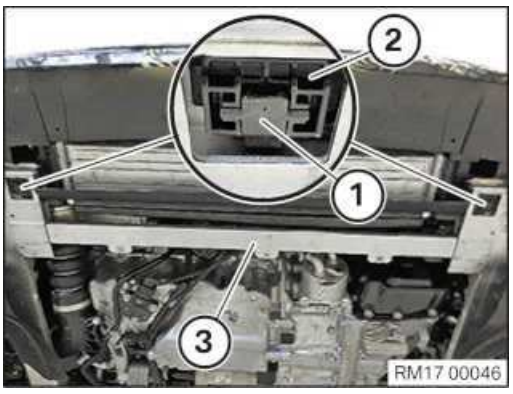
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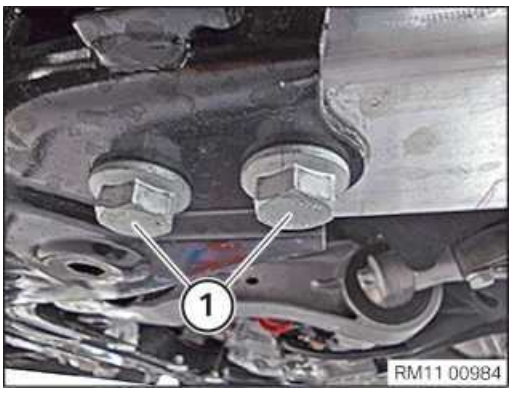
- Undo screws (2) at front left.
- Drill out blind rivets (1) at front left.



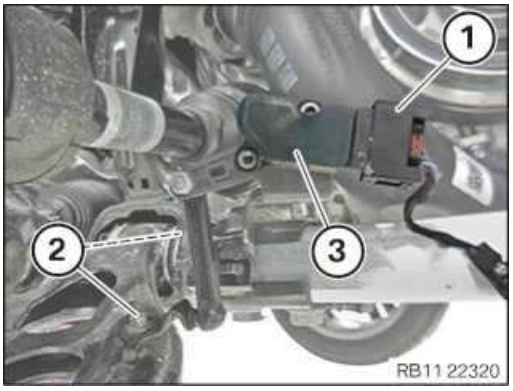
- Undo screws (2) at front right.
- Drill out blind rivets (1) at front right.



- Unlock locking pins (1).
- Thread out and remove locks (2).
- Thread out and remove cross connection (3).

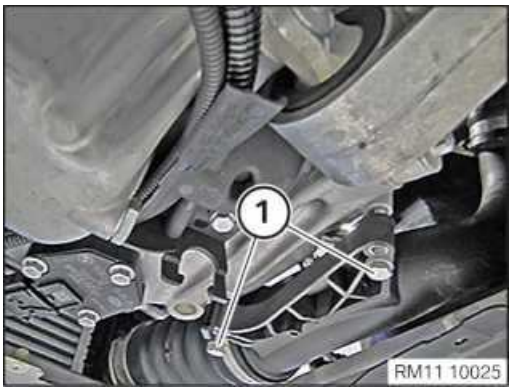


- Release the screws (1) on the right front axle support.

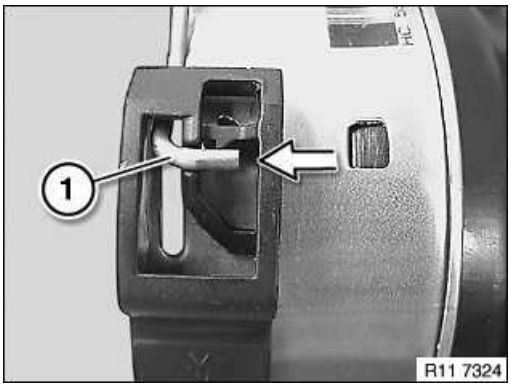


- **If installed:**
- Unlock and release plug connection (1).
- Loosen screws (2).
- Feed out the ride height sensor (3) and remove.

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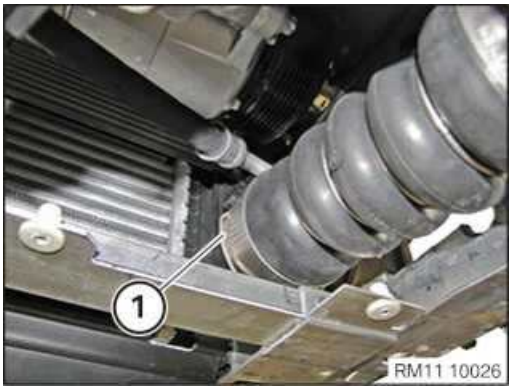


- Release screws (1) of charge air duct on right oil sump.

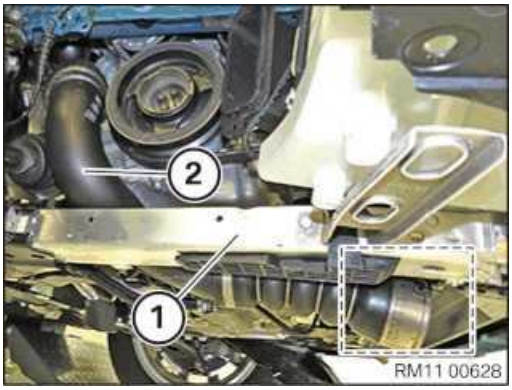


- Unlock lock (1).

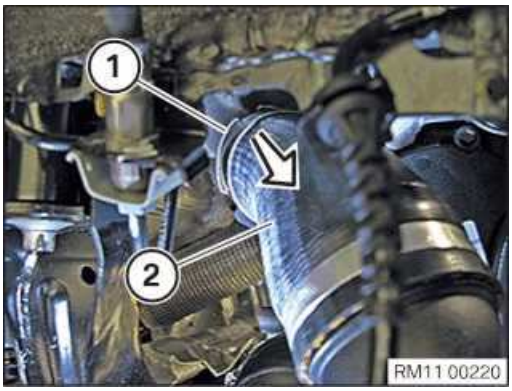
  The lock (1) must engage in the bracket during unlocking (arrow).



- Unlock and release the charge air duct (1) on the charge air cooler.

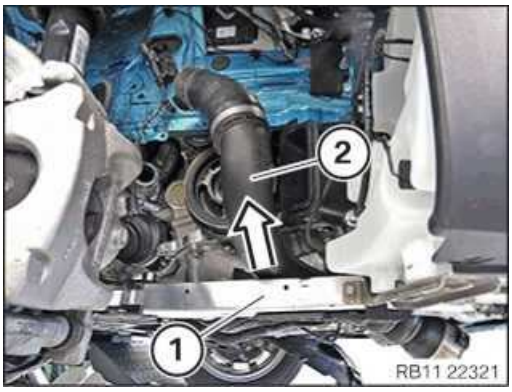


- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed out the charge air duct (2) in the **marked** area towards the bottom and set it aside.



- Unlock and detach the locks (1) on both sides.
- Feed out the charge air duct (2) on the exhaust turbocharger in the direction of the arrow and set it aside.

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- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed out the charge air duct (1) in the direction of arrow between the side member and the deformation element and remove.

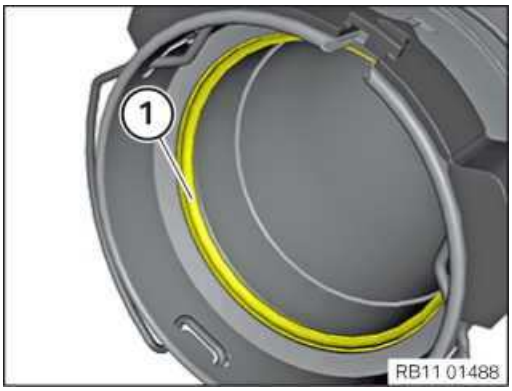
7 – Installing the right charge air duct between the exhaust turbocharger and the charge air cooler

RISK OF DAMAGE

Damage to the exhaust turbocharger.

A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.



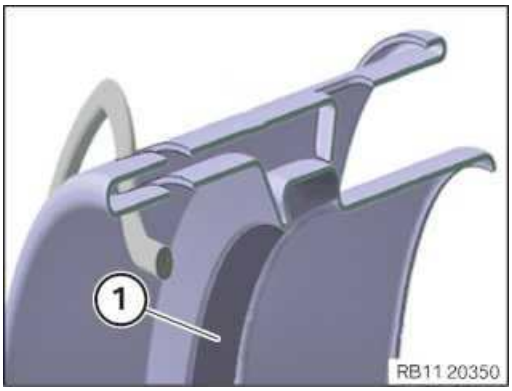
- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Gasket

▶ **Replace damaged gasket**

TECHNICAL INFORMATION

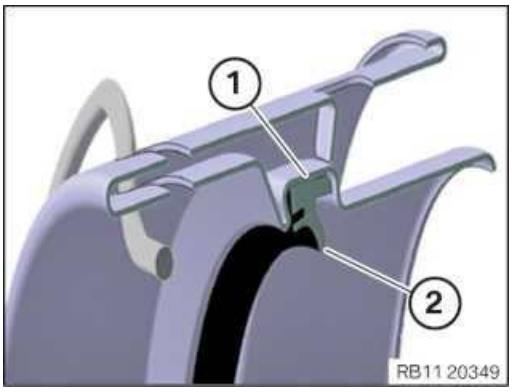
Do not use pointed or sharp-edged tools for the installation and/or removal.



- Remove damaged seal.
- Clean gasket groove (1) with a dry towel.

  The gasket groove (1) must be clean.

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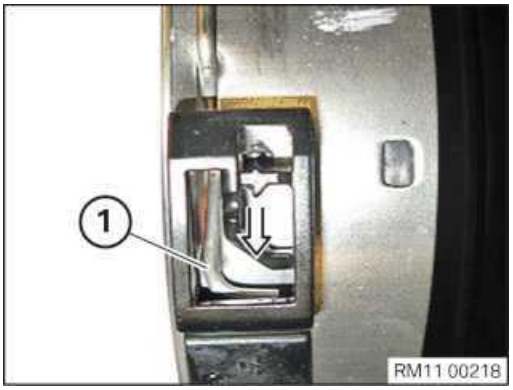
- Renew gasket.

  Parts: Gasket
- Install seal dry without lubricant or mounting agent.

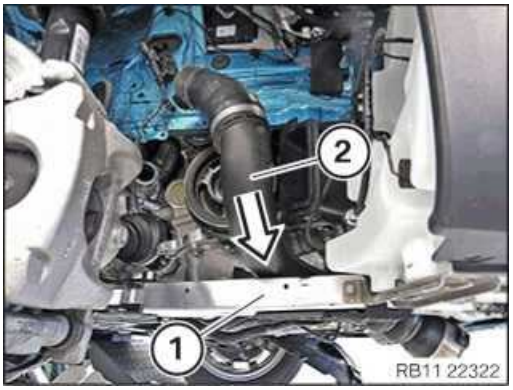
TECHNICAL INFORMATION

Incorrect assembly is possible. Ensure correct installation position.

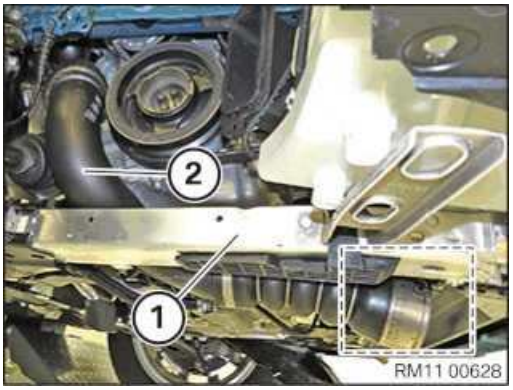
- Feed in and install the seal.
- Make sure the seal is correctly installed in the gasket groove (1).
- Make sure that the sealing lip (2) is pointing downwards (see figure).



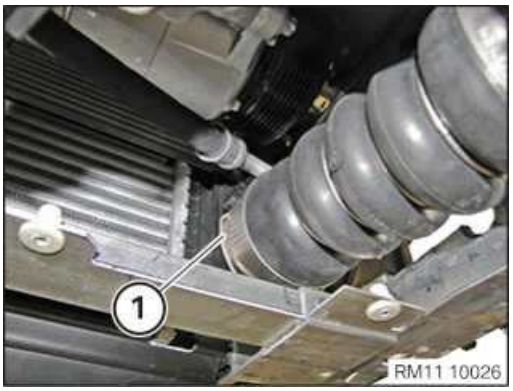
- Detach the locks (1) in the direction of the arrow from the brackets.
- Ensure that the locks (1) engage audibly.



- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed in the charge air duct (1) in the **direction** of arrow between the side member and the deformation element and position.

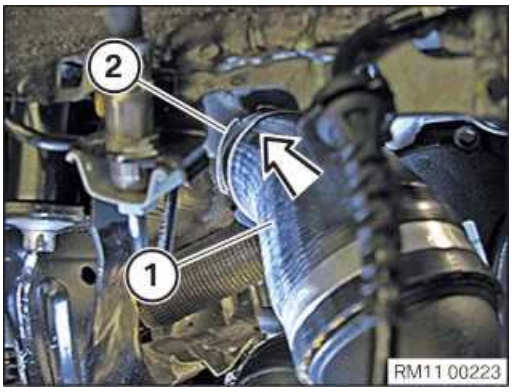


- Pull the adapter of the front axle support (1) downwards to the front right.
- Position the charge air duct (2) in **marked** area on the charge air cooler.



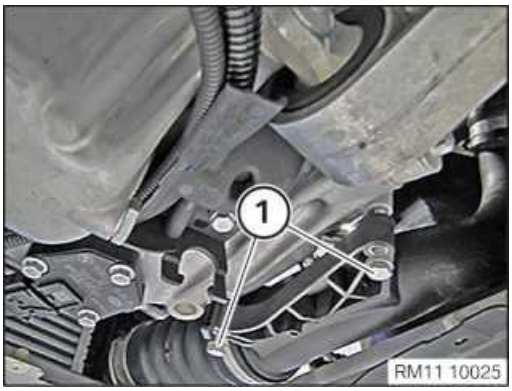
- Feed in and install the charge air duct (1) on the charge air cooler .
- Make sure the charge air duct (1) engages audibly on the charge air cooler.

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- Feed in and install charge air duct (1) in the **direction** of the arrow on exhaust turbocharger.

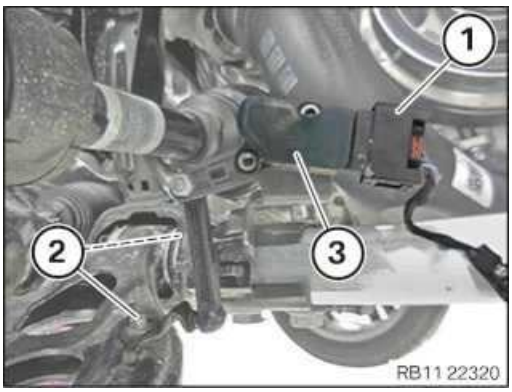
  The locks (2) must engage audibly.



- Tighten the screws (1).

Charge air duct to oil sump

M6		Tightening torque	8 Nm



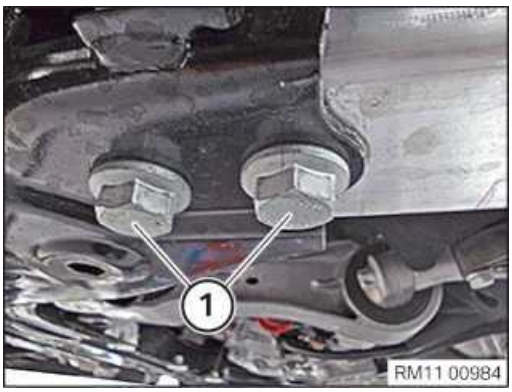
- **If installed:**
- Feed in and install the ride height sensor (3).
- Tighten the screws (2).

Ride height sensor holder to front axle support

M6		Tightening torque	8 Nm

- Connect and lock the connector (1).

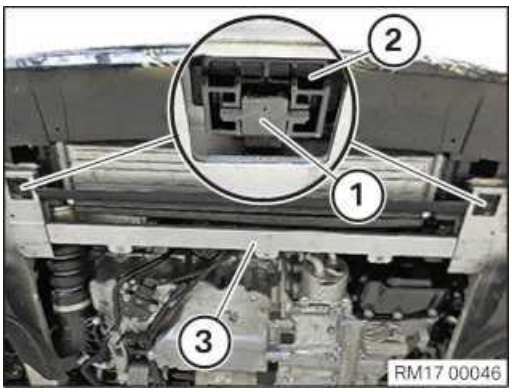
  The connector (1) must engage audibly.



- Tighten the screws (1) on the adapter of the front axle support.

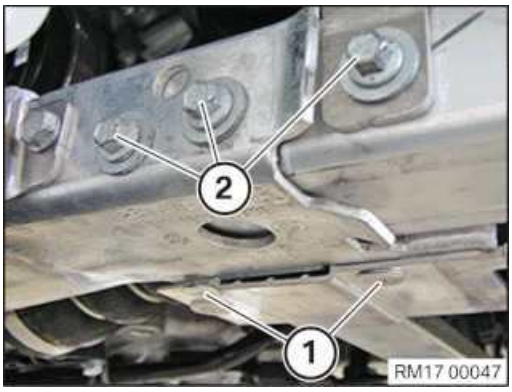
Adapter, front axle support to front axle support

		Tightening torque	100 Nm



- Guide in cross connection (3) and install.
- Guide in locks (2) and install.
- Lock the locking pins (1).
- Ensure that the locking pins (1) audibly engage.

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- Tighten the bolts (2) at the front left.

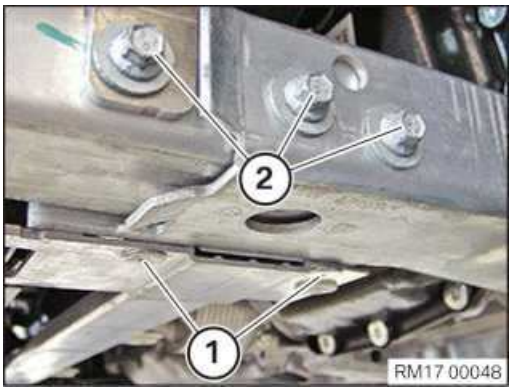
Cross connection to front axle support

M6		Tightening torque	12 Nm

- Renew the blind rivet (1).

  Parts: Blind rivet

- Mount the blind rivets (1) at the front left.



- Tighten the bolts (2) at the front right.

Cross connection to front axle support

M6		Tightening torque	12 Nm

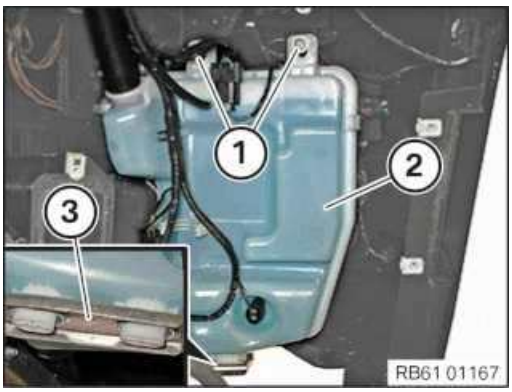
- Renew the blind rivet (1).

  Parts: Blind rivet

- Mount the blind rivets (1) at the front right.

POSTPROCESSES

8 – Install the washer fluid reservoir in the fixture



- Feed washer fluid reservoir (2) into the mounting (3) and install.
- Tighten the screws (1).

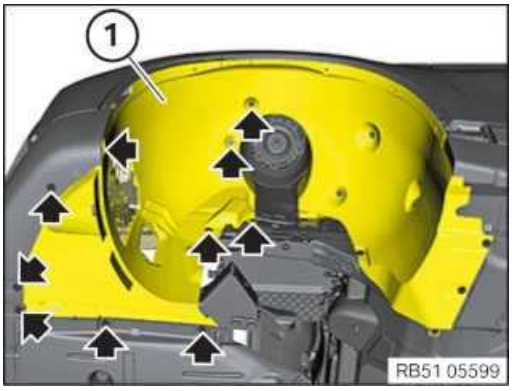
Washer fluid reservoir to body

M6x20		Tightening torque	8 Nm

9 – Partially install the front wheel arch cover

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

▸ **Partly install the front wheel arch trim**

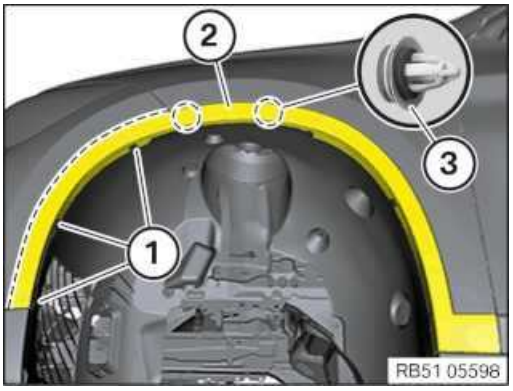
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NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.



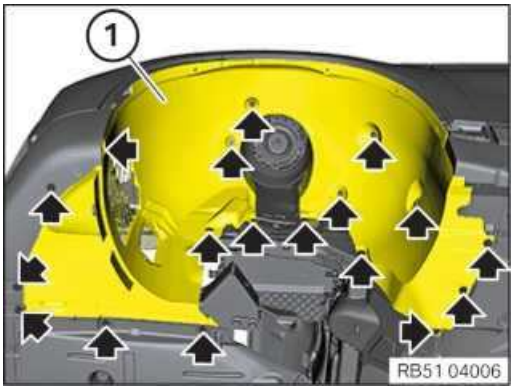
- Check the clips (3) for damage and renew where required.

  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

10 – Installing the front right wheel arch cover

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

▸ **Installing front wheel arch trim**

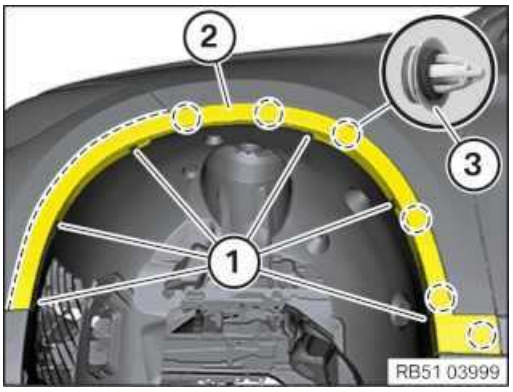
NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.

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- Check the clips (3) for damage and renew where required.

  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

11 – Installing the front right wheel

▸ **Clean the contact surfaces between the brake disc and the wheel rim**



TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

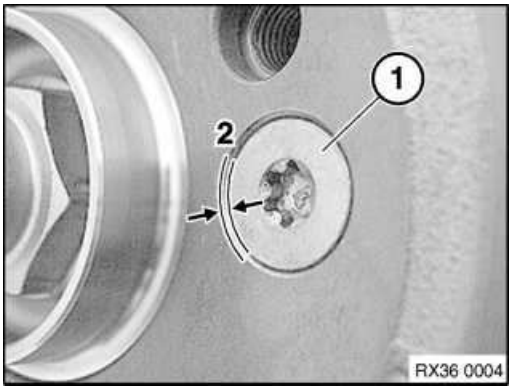
- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.



- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).



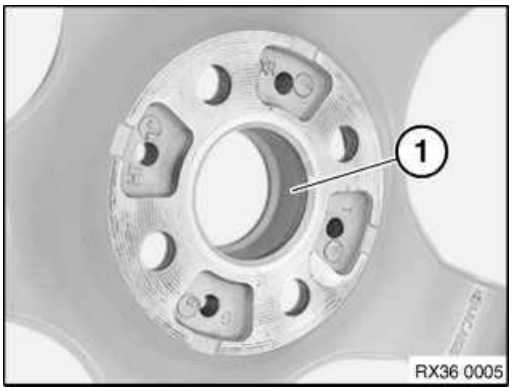
- Check the mounting bolt for the brake disc (1) for secure fit.

  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm

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- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.



TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

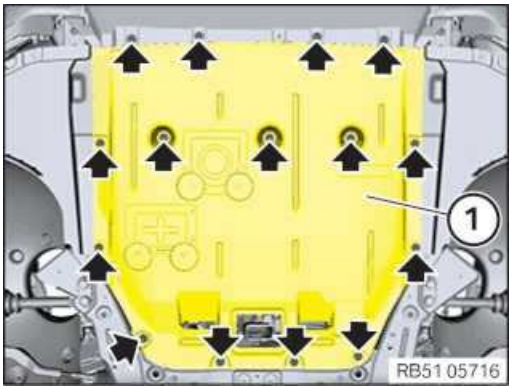
  Parts: Wheel bolts

- Clean the wheel bolts and check the threads for damage. Renew the wheel bolts as needed.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

12 – Installing the front underbody protection

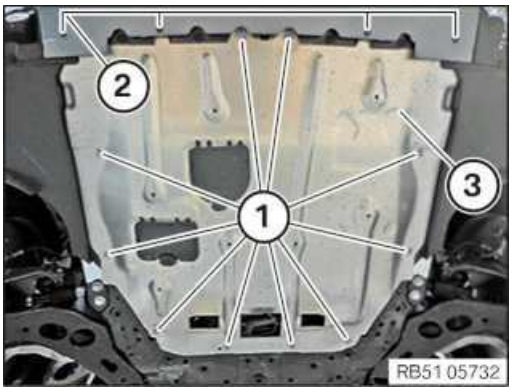


- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

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- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Additional Information

Overview of Tightening Torques

Charge air duct to oil sump — Used in step 7

M6		Tightening torque	8 Nm

Ride height sensor holder to front axle support — Used in step 7

M6		Tightening torque	8 Nm

Adapter, front axle support to front axle support — Used in step 7

		Tightening torque	100 Nm

Cross connection to front axle support — Used in step 7

M6		Tightening torque	12 Nm

Washer fluid reservoir to body — Used in step 8

M6x20		Tightening torque	8 Nm

Wheel arch cover to body — Used in step 9 10

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body — Used in step 9 10

Plastic nut		Tightening torque	3 Nm

Brake disc to front wheel hub — Used in step 11

M8	Renew screw.		16 Nm

Wheel bolts — Used in step 11

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

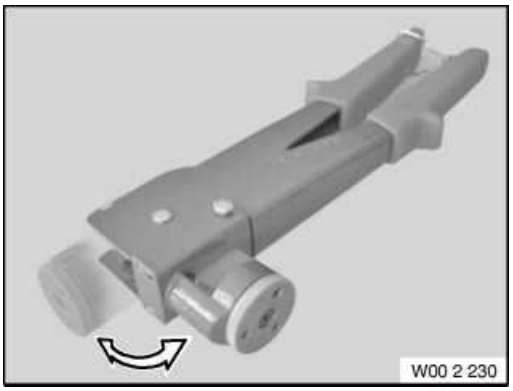
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Underbody protection front Used in step 12

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Overview of Special Tools

0 496 521 (00 2 230) Pliers



Common Used in step 9 10

Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

2 344 011 Tool



Common Used in step 11

Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

0 495 221 (36 1 323) Wheel stud

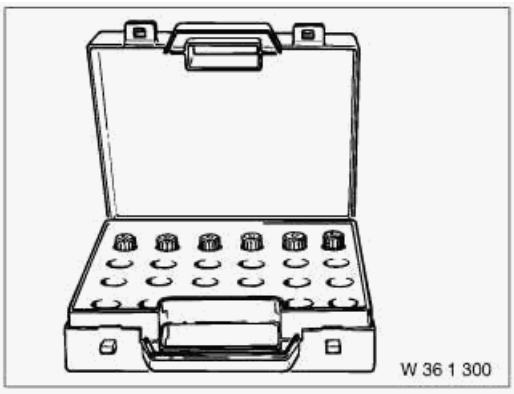


Common Used in step 1

Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 224 (36 1 326) Wheel stud



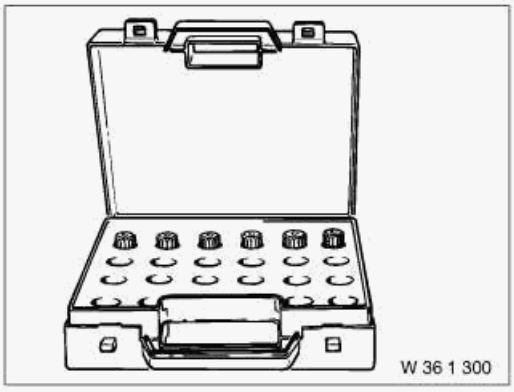
Common	Used in step 1
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud



Common	Used in step 1
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud



Common	Used in step 1
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

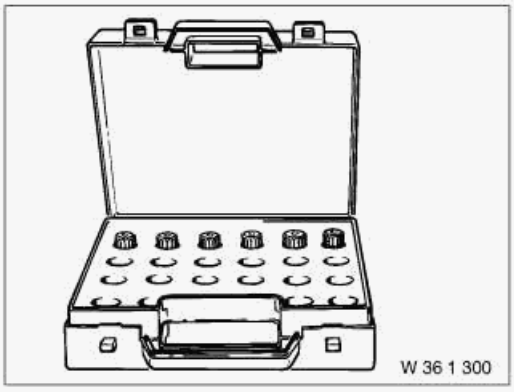
0 495 227 (36 1 329) Wheel stud



Common	Used in step 1
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 228 (36 1 331) Wheel stud



Common	Used in step 1
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 229 (36 1 332) Wheel stud



Common	Used in step 1
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud



Common	Used in step 1
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Links

Operating materials	Used in step
2.0 Grease for wheel centring	11

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11 61 085 Removing and installing/replacing the swirl-flap controller

PRELIMINARY WORK

1 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

Damage to the acoustic cover.

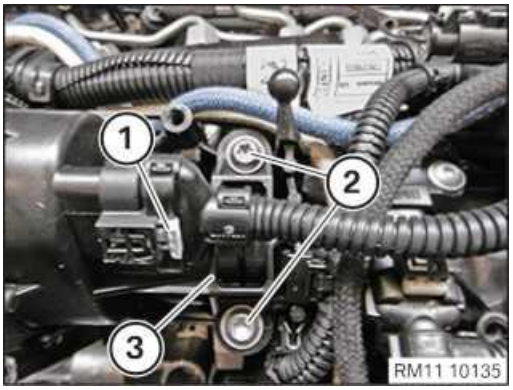
Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

MAIN WORK

2 – Remove the swirl-flap controller

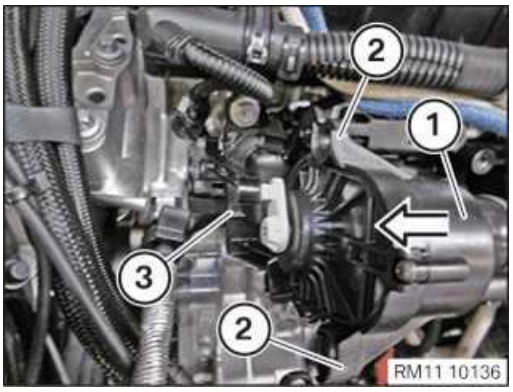


- Unlock and disconnect connector (1).
- Place wiring harness to one side.
- Loosen screws (2).
- Remove holder (3).



- Release the screws (1) with a suitable tool.

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- Slightly lift the rear swirl-flap controller (1) and feed it out of the guides (2) forwards in direction of arrow.
- Slightly tilt the swirl-flap controller.
- Carefully release the drive arm from the adjustment lever (3).
- Remove the swirl-flap controller .

3 – When replacing the swirl-flap controller: Delete adaptations

- Replace swirl-flap actuator.

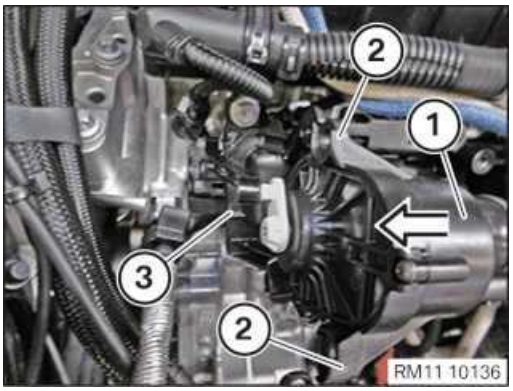
  Parts: Swirl-flap controller

▶ **Delete adaptations**



- Connect diagnosis system.
  - Power train
  - Digital Diesel Electronics
  - Reset adaptations
  - Delete adaptations

4 – Install the swirl-flap controller



- Feed in the swirl-flap controller (1) in direction of arrow at a slight angle.
- Carefully engage the drive arm in the adjustment lever (3).
- Insert and install the swirl-flap controller (1) in the guides (2).

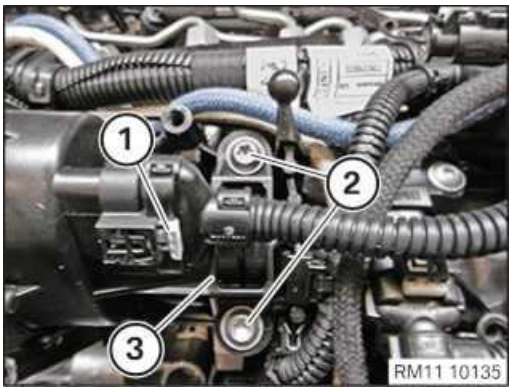


- Tighten the screws (1).

Swirl-flap controller to intake plenum

M6 x 16	Tighten the bolts in alternating order until flush.	4 Nm

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- Position holder (3).
- Tighten down screws (2).

Swirl-flap controller to intake plenum

M6 x 16	Tighten the bolts in alternating order until flush.	4 Nm

- Connect connectors (1) and lock.

  Lock must audibly engage.

POSTPROCESSES

5 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Check for correct installation of all rubber mounts in the acoustic cover (1).



- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

Additional Information

Overview of Tightening Torques

Swirl-flap controller to intake plenum Used in step 4

M6 x 16	Tighten the bolts in alternating order until flush.	4 Nm

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Links

Functional descriptions	Used in step
Delete adaptations	2 3 4

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11 61 051 Replace intake plenum

PRELIMINARY WORK

1 – Disconnecting all battery earth leads

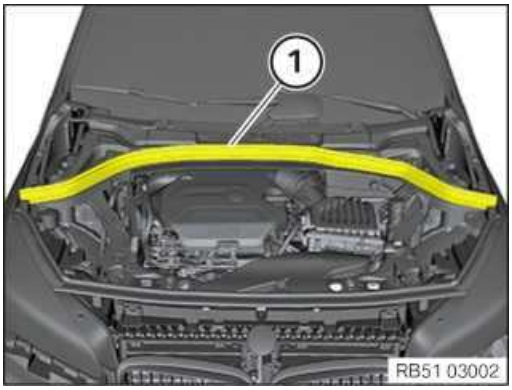


- See additional information.

2 – Remove the seal for the rear bonnet

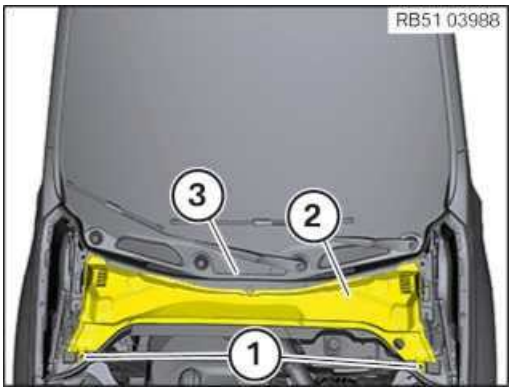
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Pull off rear bonnet seal (1) towards the top and remove.

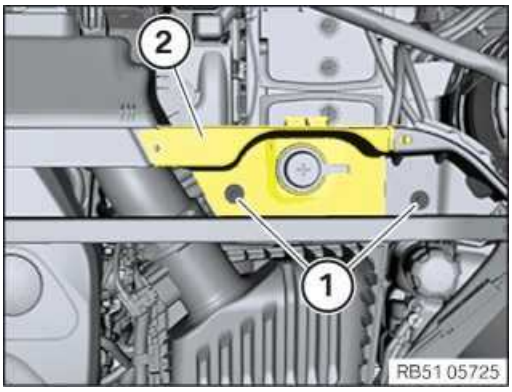
3 – Removing front cowl panel cover



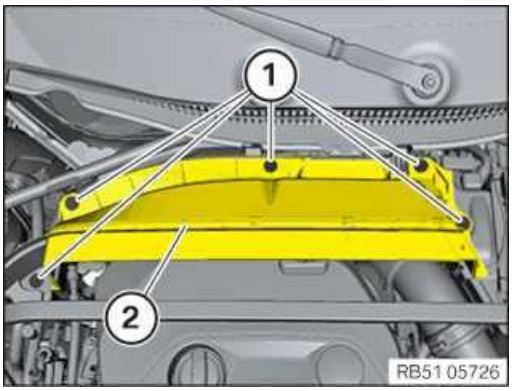
- Loosen the expanding rivet (1).
- Feed out and remove front cowl panel cover (2) from the rear cowl panel cover(3).

4 – Removing the upper bulkhead cover

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- Loosen screws (1).
- Guide out and remove the cover (2).

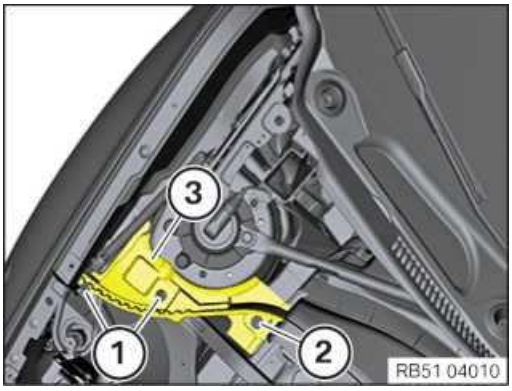


- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

5 – Remove suspension cross-brace

TECHNICAL INFORMATION

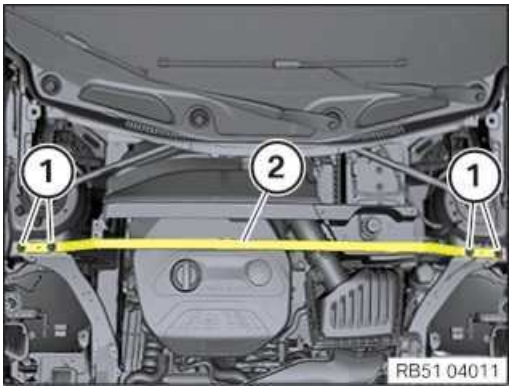
Driving without the strut brace/front end or tension strut is not permitted.



NOTICE

Description is for right component only. The procedure on the left side is identical.

- Loosen expanding rivet (1).
- Loosen screw (2).
- Remove the cover (3).



- Loosen screws (1).
- Remove strut brace (2).

6 – Removing the acoustic cover

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

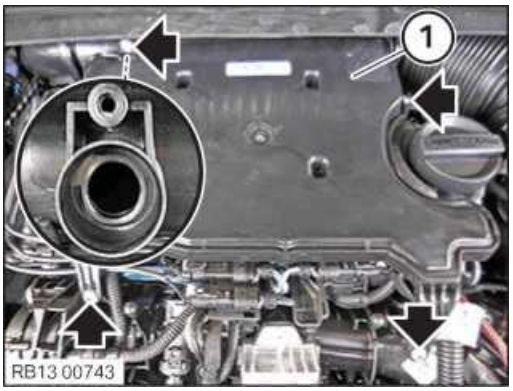
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

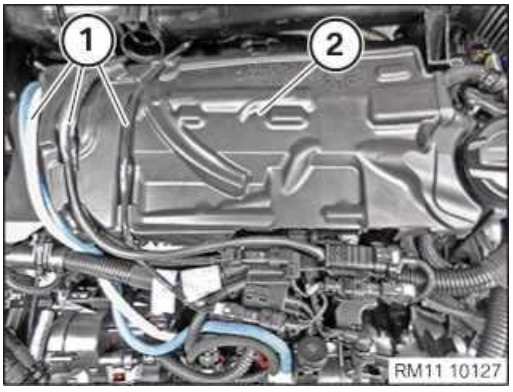
- Unclip the acoustic cover from the marked areas towards the top.

7 – Remove resonator



- Remove screws (arrows).
- Guide out and remove the resonator (1).

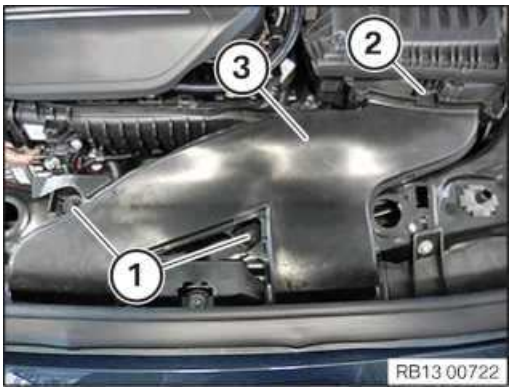
8 – Remove the acoustic cover for the injectors



- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

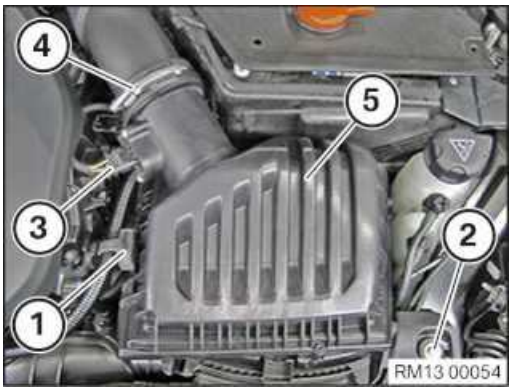
9 – Remove the intake neck for intake silencer housing

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- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

10 – Removing intake silencer housing

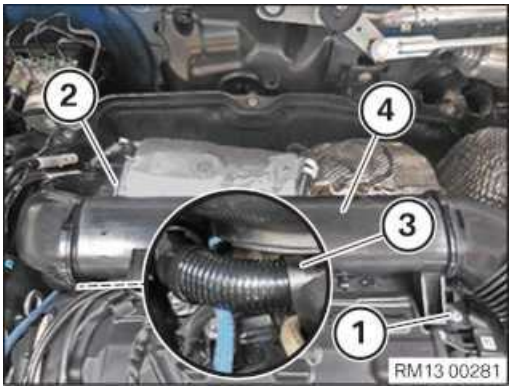


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

11 – Removing clean air pipe



- Detach clamp (1) on the clean air pipe.
- Pull off the clean air pipe from the intake silencer housing.

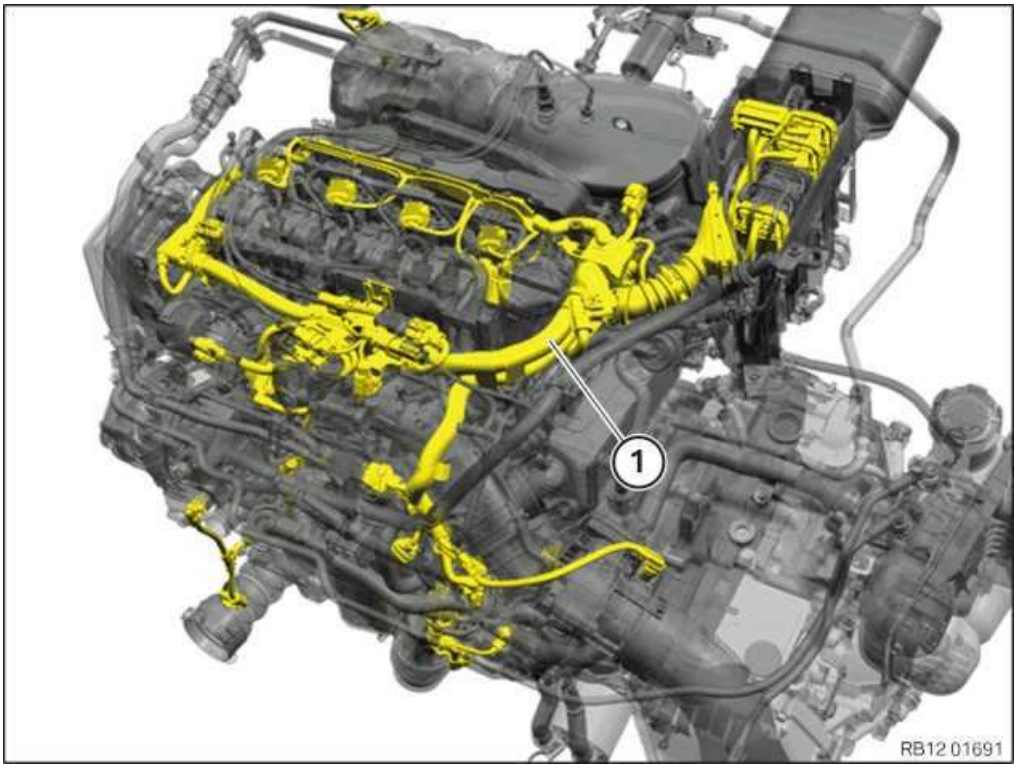


- Loosen screw (1).
- Loosen clamp (2).
- Unlock the ventilation line (3) and pull it off the cylinder head cover.
- Feed out clean air pipe and remove.

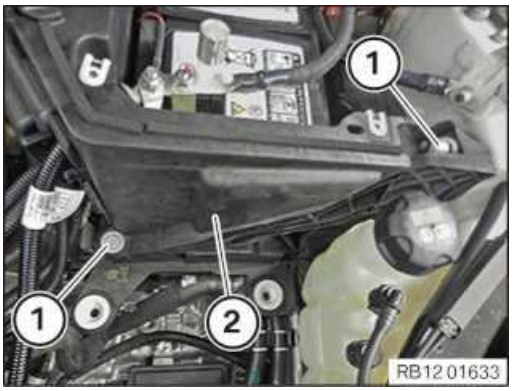
12 – Releasing the wiring harness section for the intake plenum

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Overview: Wiring harness section for the engine



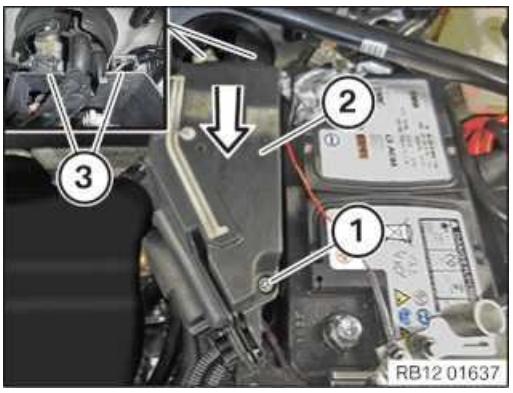
1 Wiring harness section for the engine



- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.

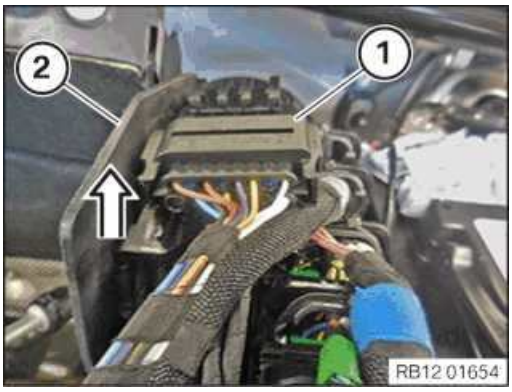


- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

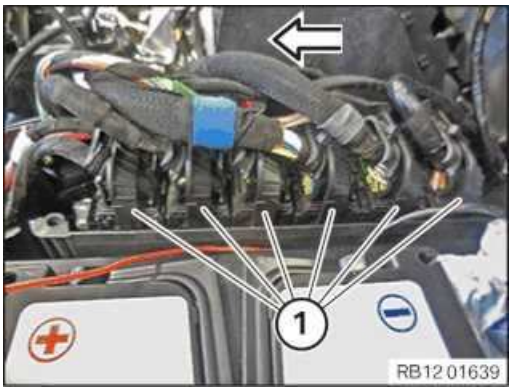


- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.

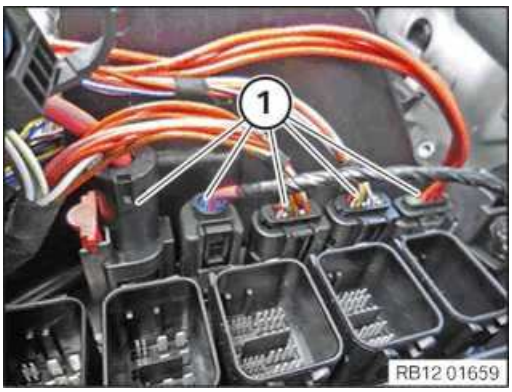
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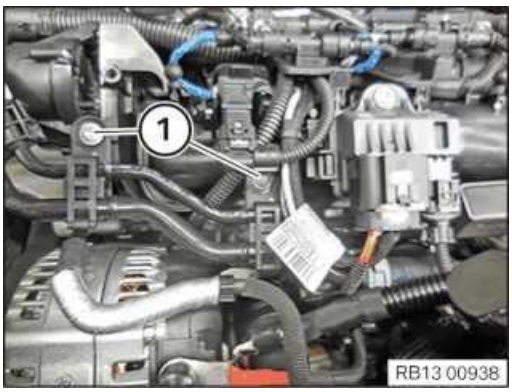
- Guide the connector (1)out of the electronics box (2) in the direction of arrow and remove it.
- Unlock and loosen connector (1).



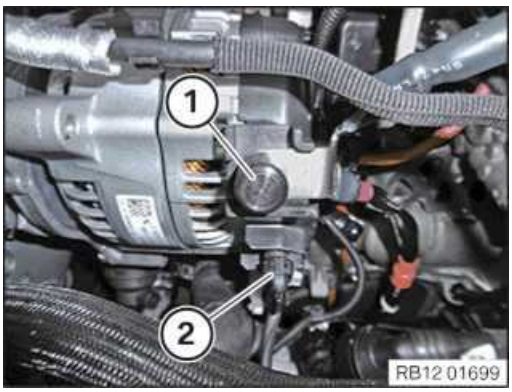
- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



- Unlock and loosen connector (1).

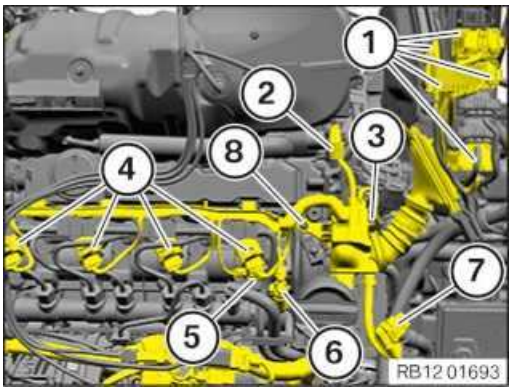


- Loosen screws (1).

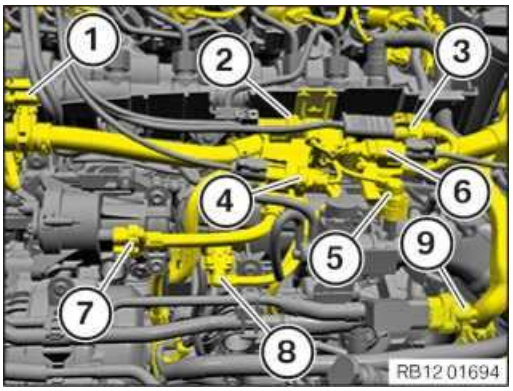


- Release the positive battery cable (1) on the alternator and place to one side.
- Unlock connector (2) and pull off.

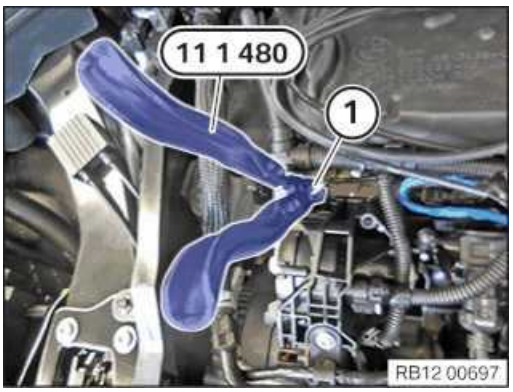
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- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock the connector (2) and disconnect it from the differential pressure sensor.
- Unlock the connector (3) and disconnect it from the exhaust-gas recirculation valve.
- Unlock the connector (4) and pull off from the injectors.
- Unlock the connector (5) and disconnect it from the camshaft sensor.
- Unlock the connector (6) and disconnect it from the fuel pressure regulator.
- Unlock connector (7) and pull off from hot film air mass meter.
- Loosen screw (8).

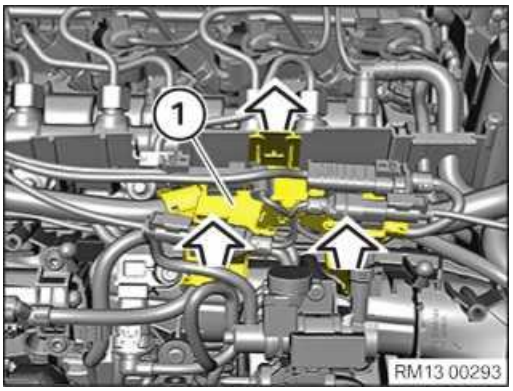


- Unlock connector (1) and pull off from the rail pressure sensor.
- Unlock the connector (2) and disconnect it from the exhaust temperature sensor before the diesel particulate filter.
- Unlock and disconnect the connector (3) from the front oxygen sensor.
- Unlock the connector (4) and disconnect it from the exhaust temperature sensor after the diesel particulate filter.
- Unlock and disconnect the connector (5) from the electric changeover valve.
- Unlock the connector (6) and disconnect it from the exhaust temperature sensor for the exhaust-gas recirculation cooler.
- Unlock the connector (7) and disconnect it from the servomotor for the swirl flaps.
- Unlock the connector (8) and pull it off the charging pressure sensor.
- Unlock the connector (9) and disconnect from the fuel pressure and temperature sensor.



- Unlock the connectors (1) of all glow elements with the special tool **0 490 796 (11 1 480)** and release them.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.

▶ **Removing the cable clips from the intake plenum**



- Detach the cable clip (1) in the direction of the arrow.
- Guide out the cable clip (1) in direction of arrow and set it aside.

13 – Removing the intake plenum

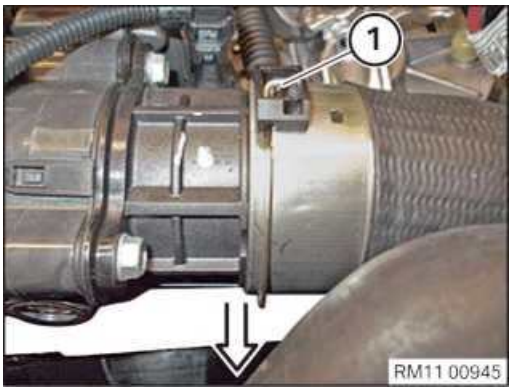
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TECHNICAL INFORMATION

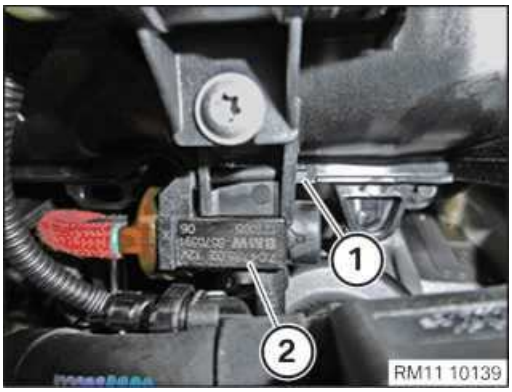
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



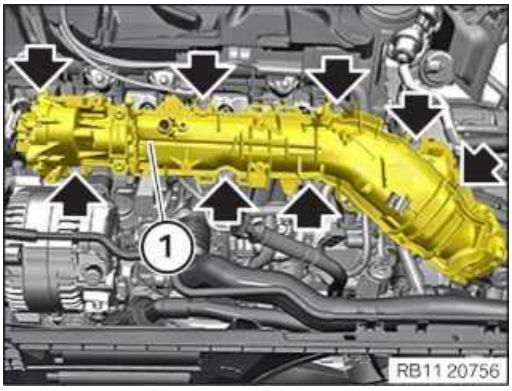
- Unlock the lock (1).



- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.

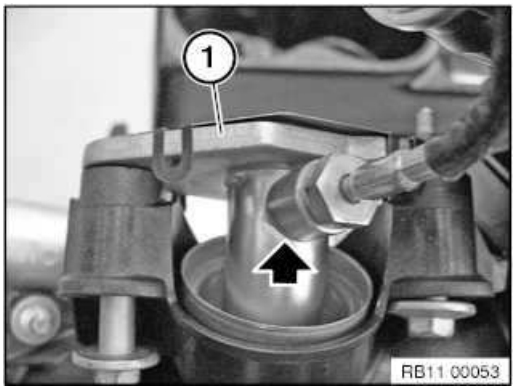


- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



- Release the screws (arrows) from the intake plenum (1).
- Guide the intake plenum (1) out forwards and remove it.

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- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

MAIN WORK

14 – Replacement: Checking part number of the intake plenum

NOTICE

For vehicles with Real Driving Emissions (RDE) with a production date from 03/2019:

The intake plenum and the exhaust-gas recirculation cooler vary.

When replacing the intake plenum or the exhaust-gas recirculation cooler: Make sure the part number is correct. Note the part number of the removed component and assign the corresponding, suitable part number.

In the electronic Parts Catalogue (EPC), components with the auxiliary "RDE" and components without the auxiliary "RDE" will be provided. Only the following combinations are permitted:

Intake plenum **with** the auxiliary **"RDE"** and exhaust-gas recirculation cooler **with** the auxiliary **"RDE"**.

Intake plenum **without** the auxiliary **"RDE"** and exhaust-gas recirculation cooler **without** the auxiliary **"RDE"**.

Components without the auxiliary "RDE" must not be installed with components with auxiliary "RDE".



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Note down part number (1).
- Select new part using the part number from the Electronic Parts Catalogue (EPC).

15 – When replacing the intake plenum: Remount components

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

▸ Remove the electric changeover valve of the low-pressure stage turbocharger

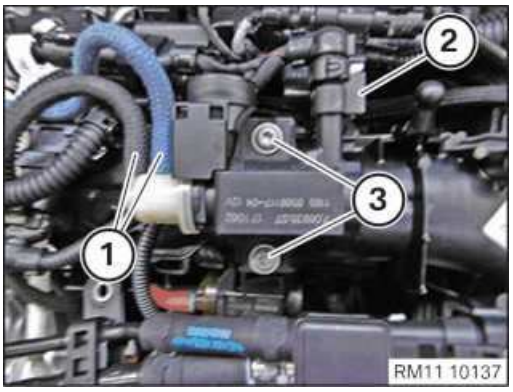
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RISK OF DAMAGE

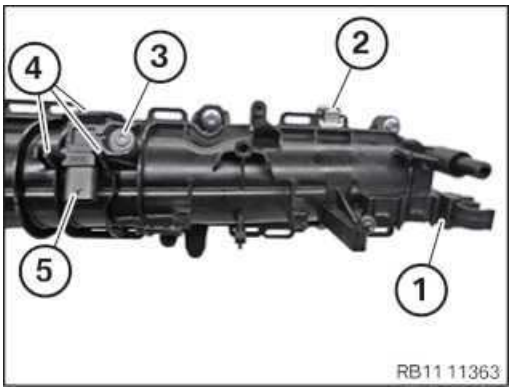
Electrostatic discharge.

Damage to or destruction of electrical components.

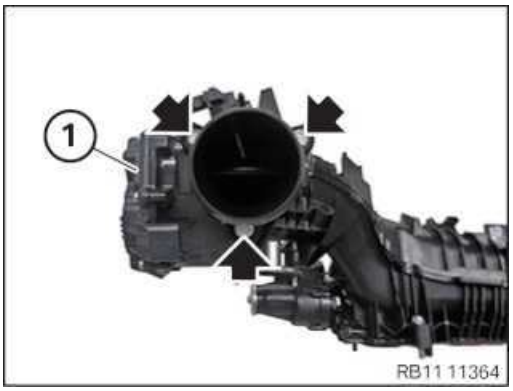
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



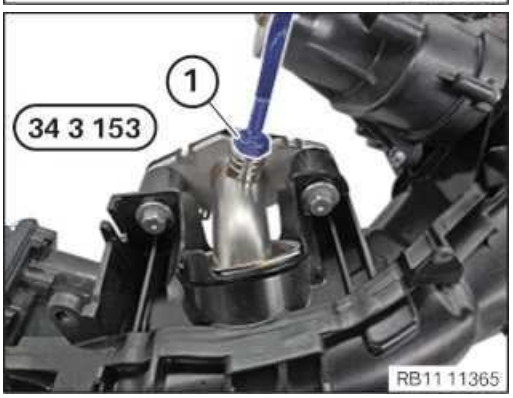
- Pull off the vacuum hoses (1).
- Make sure that the green O-ring is **not** lost between the blue vacuum hose and the electric changeover valve.
- Unlock connector (2) and pull off.
- Loosen screws (3).
- Remove electric changeover valve.



- Guide out and remove holder (1).
- Feed out and remove the clamp (2).
- Loosen screw (3).
- Unlock the locks (4).
- Remove the charging pressure sensor (5).



- Remove screws (arrows).
- Remove the throttle bodies (1).



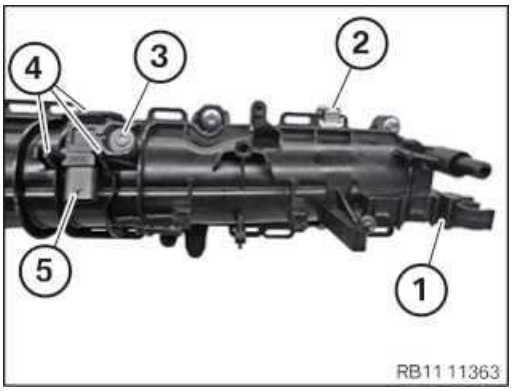
- Release exhaust temperature sensor (1) using special tool .
- Feed out and remove exhaust temperature sensor (1).
- Replace intake plenum.

  Parts: Plenum

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- Check the sealing ring (1) for damage and renew where required.
- Lightly coat the sealing ring (1) on the charging pressure sensor with lubricant for the installation.



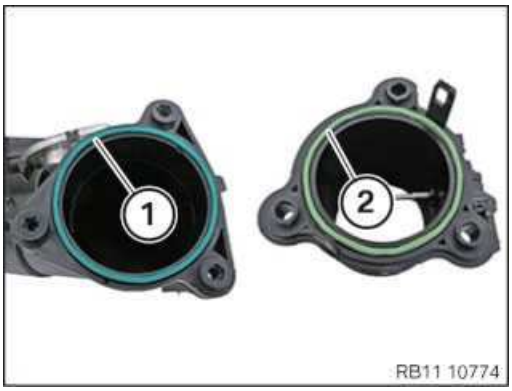
- Insert and install the charging pressure sensor (5).
- Lock the locks (4).

  The locks (4) must engage audibly.
- Tighten down screw (3).

Charging pressure sensor to intake plenum

TS6X20		Tightening torque	4 Nm

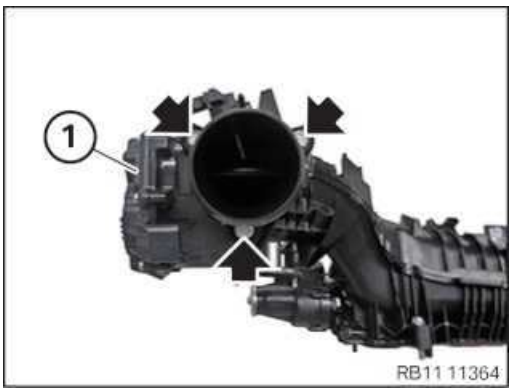
- Feed in and install the clamp (2).
- Insert and install the holder (1).



- Renew the gasket (1) between the intake system and the throttle body.

  Parts: Gasket.
- Renew gasket (2) between throttle body and charge air pipe.

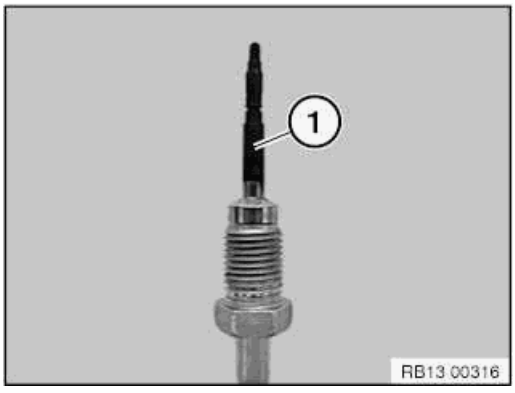
  Parts: Gasket.



- Feed in and install the throttle body (1).
- Tighten screws (arrows).

Throttle body to intake plenum

6x50		Tightening torque	7 Nm



RISK OF DAMAGE

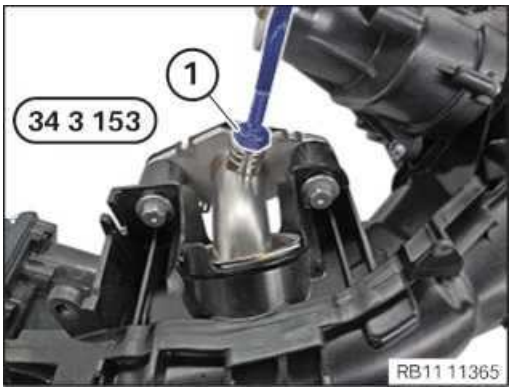
Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

- Check the gauge tip (1) for damage and the exhaust temperature sensor as needed.

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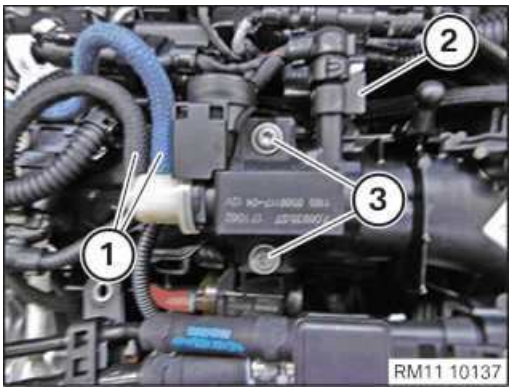


- Feed in and install the exhaust temperature sensor (1).
- Tighten the exhaust temperature sensor (1) with the special tool .

Exhaust temperature sensor for EGR

Sensor		Tightening torque	21,7 Nm

▸ Installing the electric changeover valve of the low-pressure stage turbocharger



- Position the electric changeover valve.
- Tighten down screws (3).

Electric changeover valve to intake plenum

TS6x20		Tightening torque	5 Nm

- Connect the blue vacuum hose (1) to the electric changeover valve.

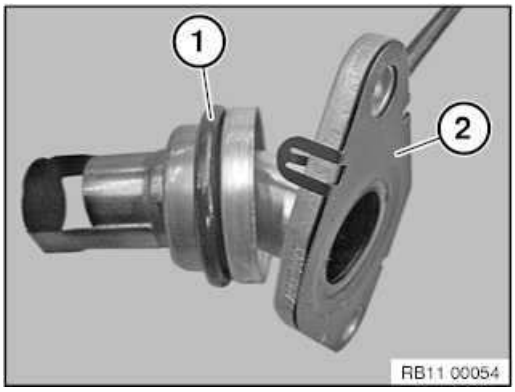
Note: The connection for the blue vacuum hose has a green rubber ring.

- Connect black vacuum hose (1) to the electric changeover valve.
- Connect and lock the connector (2).

  Lock must audibly engage.

POSTPROCESSES

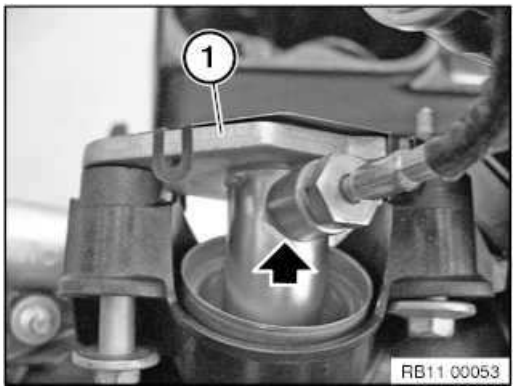
16 – Installing the intake plenum



- Renew O-ring (1).

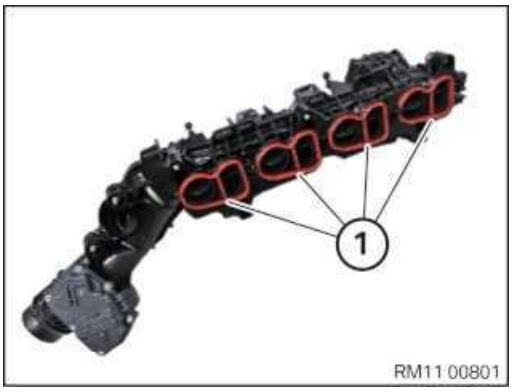
  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position the seal (2) and clip it in.



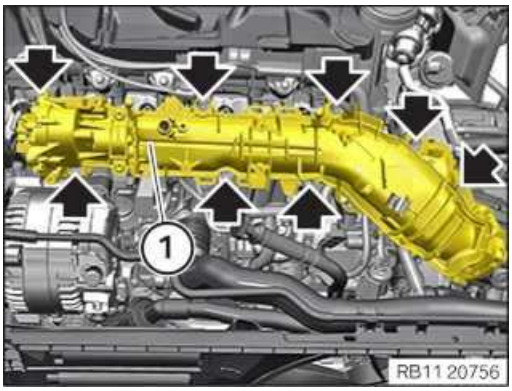
- Install the exhaust-gas recirculation pipe (1) in the intake plenum.

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- Renew gaskets (1).

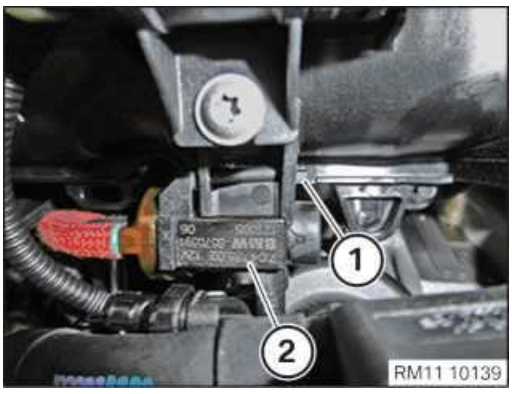
  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.



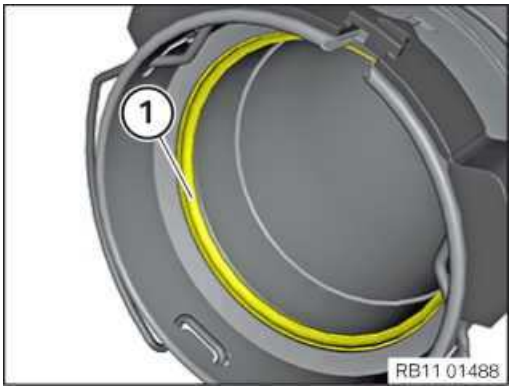
- Guide in and install intake (1) plenum.
- Tighten screws (arrows).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm

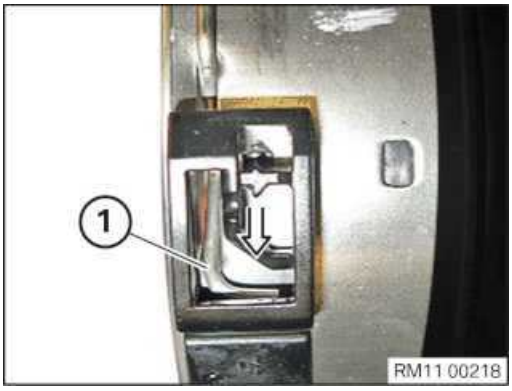


- Install the electric changeover valve (2) in the holder on the plenum from left to right.
- Lock (1) must engage audibly.



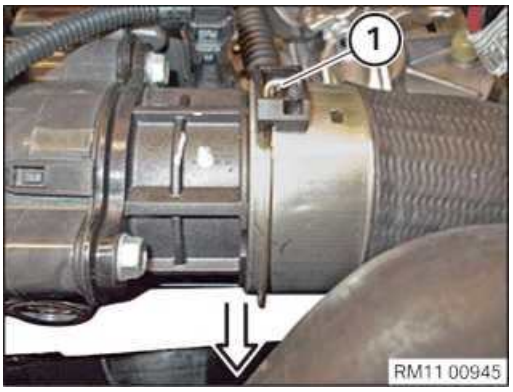
- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring



- Engage the lock (1) on the bracket (arrow).

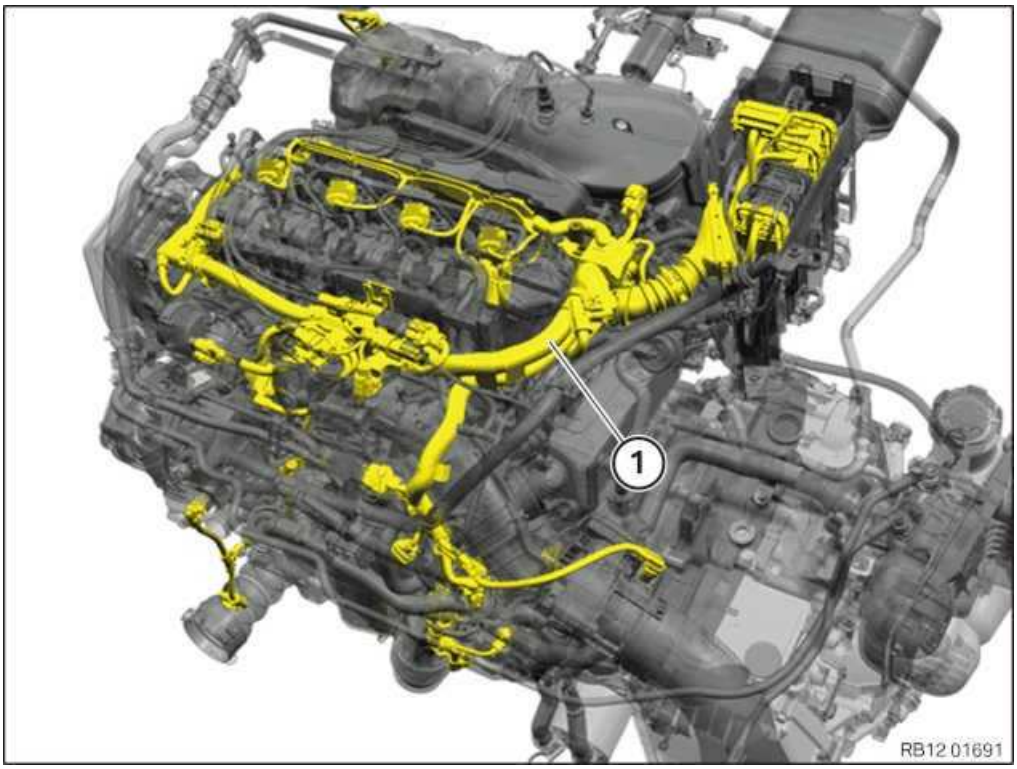
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- Connect the charge air line to the throttle valve.
  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

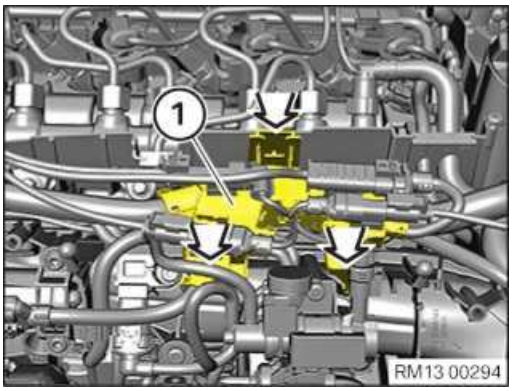
17 – Fastening the wiring harness section for the intake plenum

Overview: Wiring harness section for the engine



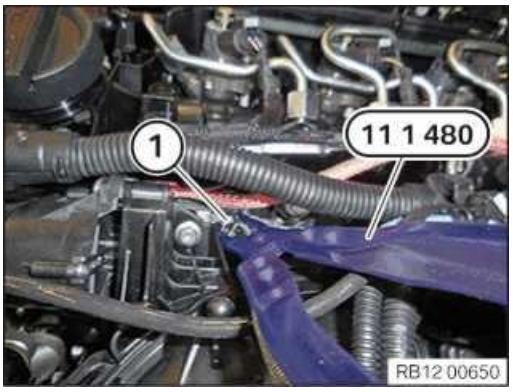
1 Wiring harness section for the engine

▸ **Installing the cable clip for the intake plenum**



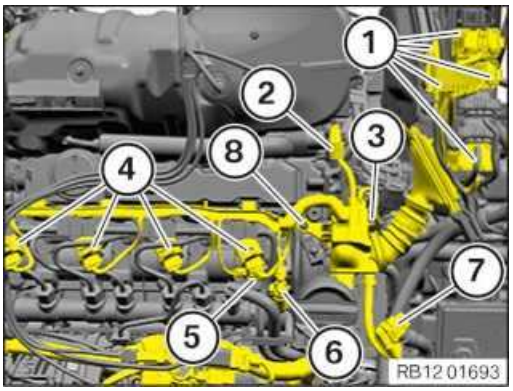
- Insert and install the cable clip (1) in the direction of the arrow.
- Make sure the cable clip (1) is fitted correctly.

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- Connect and lock the connector (1) on the glow elements.

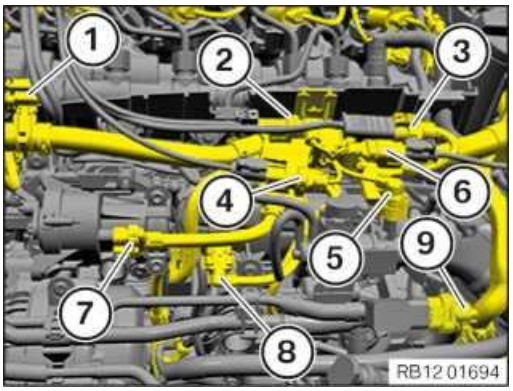
  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.



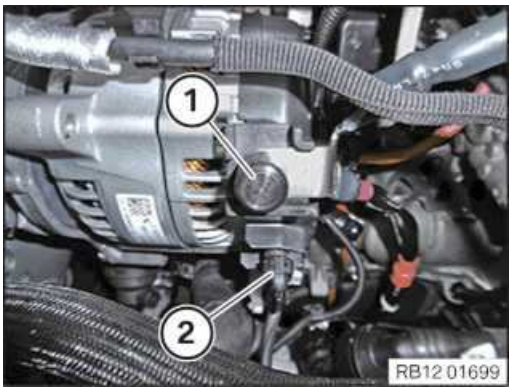
- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the DME control unit and remove the integrated supply module (PDM).
- Attach connector (2) to the differential pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust-gas recirculation valve and lock audibly.
- Attach connector (4) to the injectors and lock it audibly.
- Attach connector (5) to the camshaft sensor and lock it audibly.
- Attach connector (6) to the fuel pressure regulator and lock it audibly.
- Connect and audibly lock the connector (7) to the hot film air mass meter.
- Tighten down screw (8).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm



- Connect the connector (1) to the rail pressure sensor and lock it audibly.
- Attach connector (2) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (3) to the front oxygen sensor and lock audibly.
- Attach connector (4) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Connect the connector (5) to the electric changeover valve and lock audibly.
- Attach connector (6) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (7) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (8) to the charging pressure sensor and lock it audibly.
- Attach connector (9) to the fuel pressure and temperature sensor and lock it audibly.



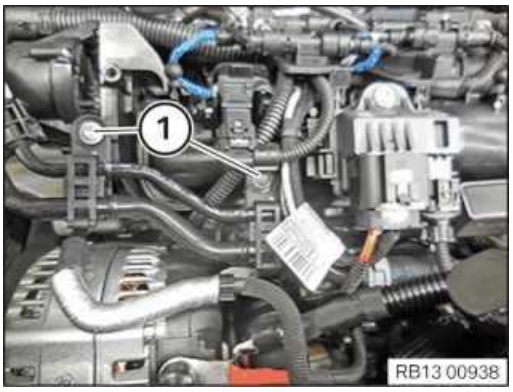
- Connect and lock the connector (2).

  Lock must snap audibly into place.
- Connect the positive battery cable (1) and tighten.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

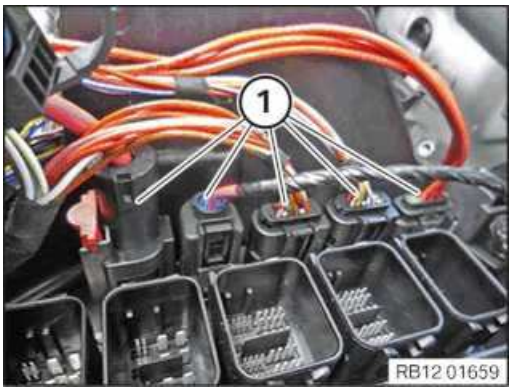
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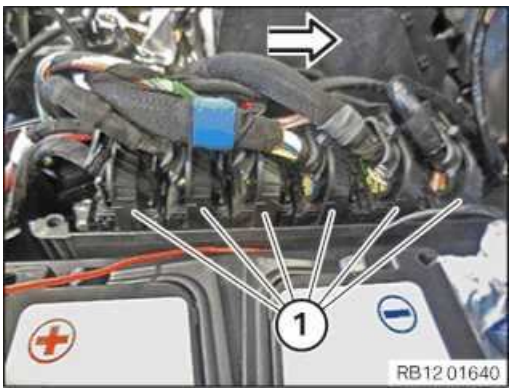
- Position the fuel line.
- Tighten the screws (1).

Fuel line to intake plenum

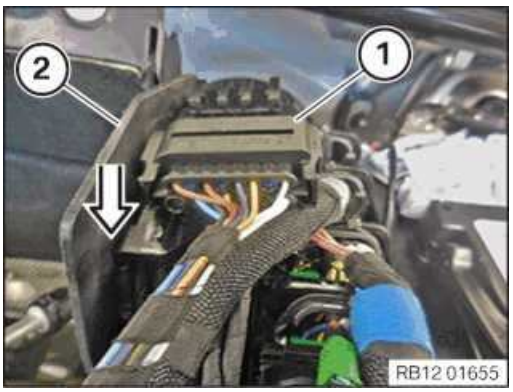
TS6x20		Tightening torque	5 Nm



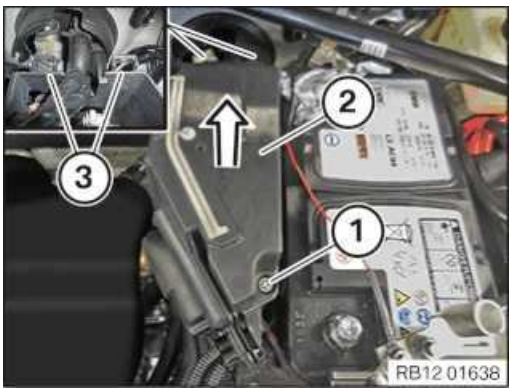
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.

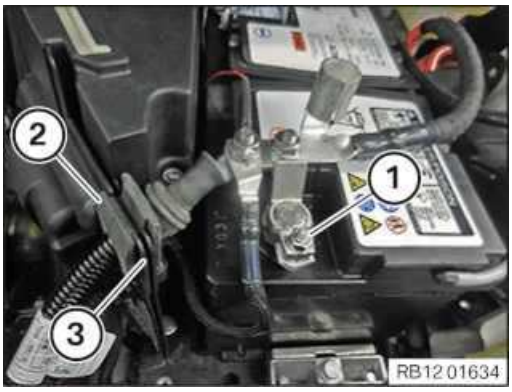


- Insert and install the cover (2) into the guides (3) in the direction of the arrow.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

RF5x26.5		Tightening torque	2,5 Nm

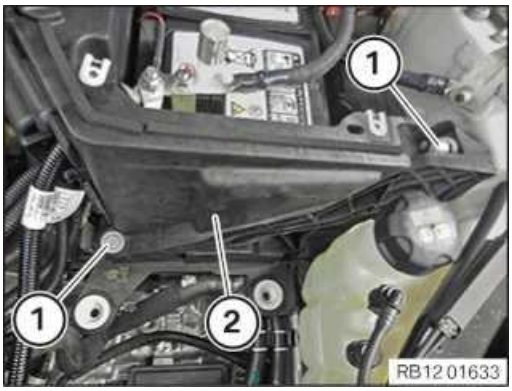
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- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

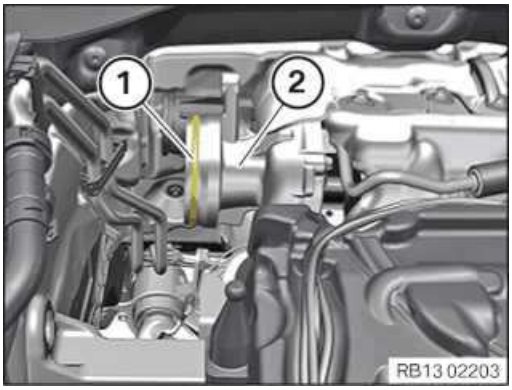


- Feed in and install tension strut (2).
- Tighten the screws (1).

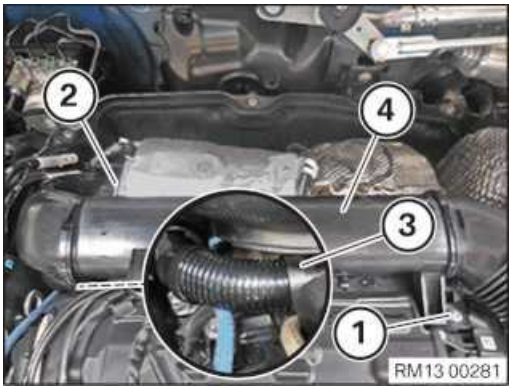
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

18 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.



- Feed in clean air pipe and install.
- Connect clean air pipe to the exhaust turbocharger and lock audibly in the clamps (2).
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Connect ventilation line (3) to the cylinder head cover and lock audibly.



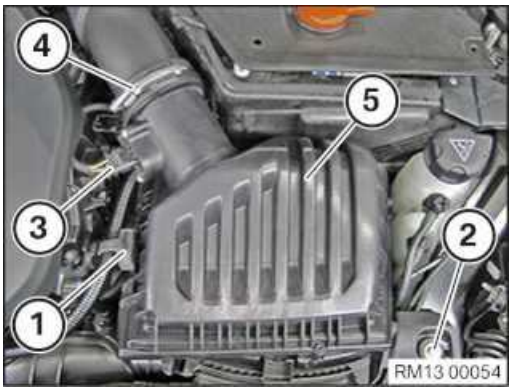
- Mount clean air pipe onto the intake filter housing.
- Tighten clamp (1) on the clean air pipe.

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

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19 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

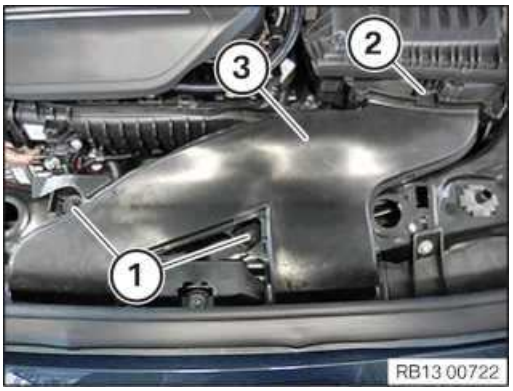
- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

20 – Install the intake neck for the intake filter housing

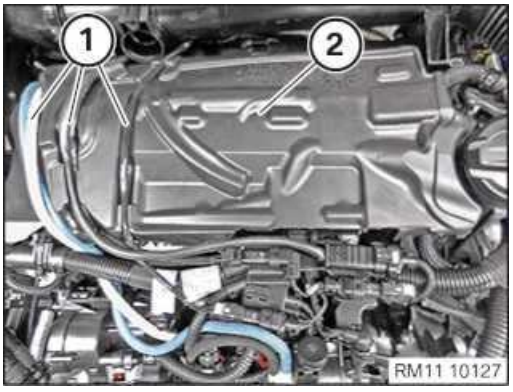


- Insert and install the intake neck (3).
  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

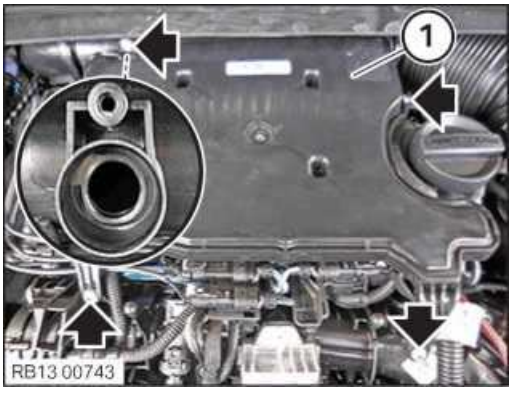
M6		Tightening torque	8 Nm

21 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the vehicle wiring harness (1) in the brackets.

22 – Install resonator



- Insert and install the resonator (1).
- Renew the bolts (arrows).
  Parts: Bolts
- Tighten screws (arrows).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

23 – Install acoustic cover

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23 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Check for correct installation of all rubber mounts in the acoustic cover (1).

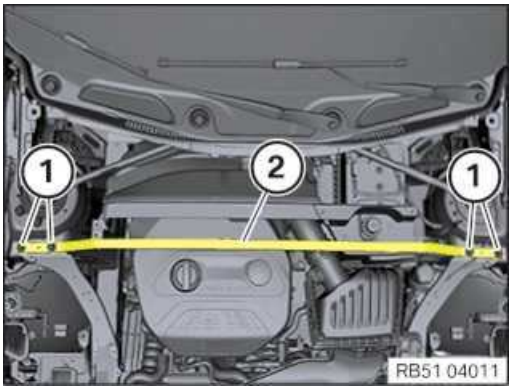


- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

24 – Install strut brace

TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.



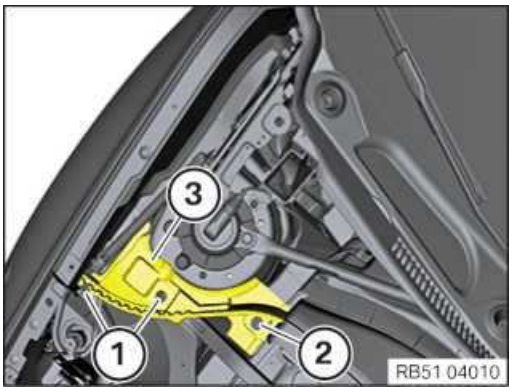
- Install the strut brace (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-brace to spring strut dome

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

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NOTICE

Description is for right component only. The procedure on the left side is identical.

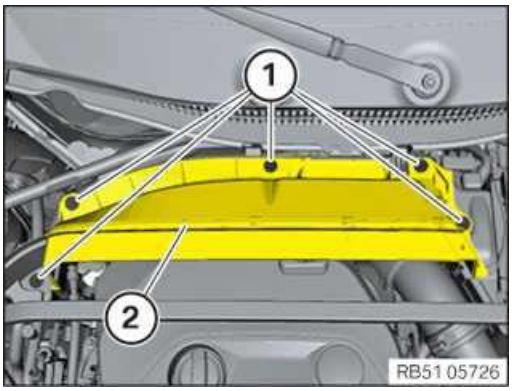
- Install the cover (3).
- Tighten down screw (2).

Cover on body

Hexagon screw		Tightening torque	3 Nm

- Install the expanding rivet (1).

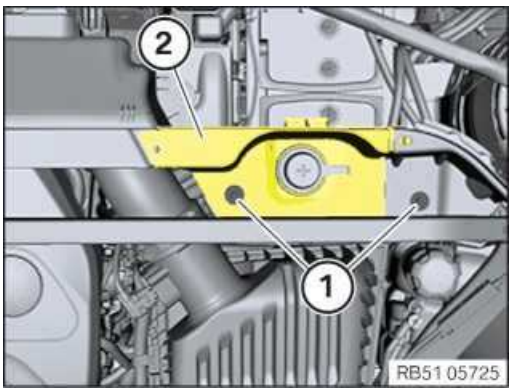
25 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Cover of top bulkhead

Screw		Tightening torque	2,6 Nm

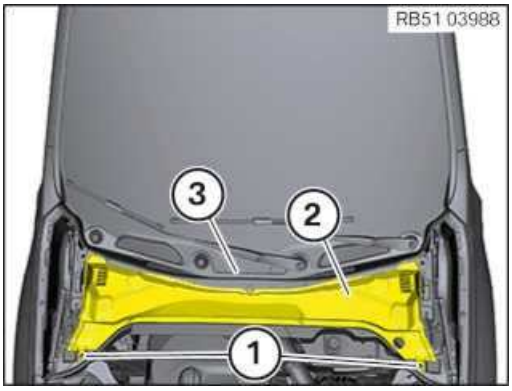


- Guide in and install cover (2).
- Tighten down screw (1).

Cover of remote positive terminal

Screw		Tightening torque	2,6 Nm

26 – Installing front cowl panel cover



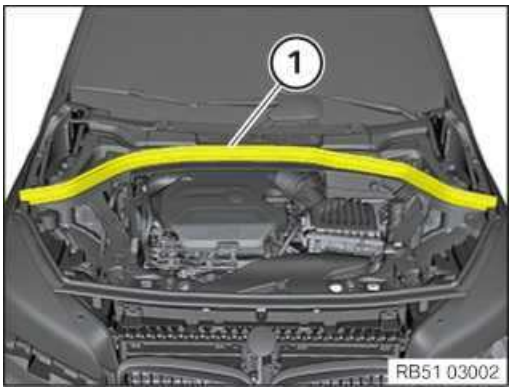
- Insert and install cowl panel cover at front (2) into cowl panel cover at rear (3).
- Check cowl panel cover at front is correctly seated (2).
- Secure expanding rivet (1).

27 – Install the seal for the bonnet

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

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- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

28 – Disconnecting all battery earth leads



- See additional information.

29 – Reset the adaptations for the swirl-flap controller



- Connect the diagnosis system and reset the adaptations:
  - Power train
  - Digital Diesel Electronics
  - Reset adaptations
  - Delete adaptations

Additional Information

Overview of Tightening Torques

Charging pressure sensor to intake plenum			Used in step 15
TS6X20		Tightening torque	4 Nm

Throttle body to intake plenum			Used in step 15
6x50		Tightening torque	7 Nm

Exhaust temperature sensor for EGR			Used in step 15
Sensor		Tightening torque	21,7 Nm

Electric changeover valve to intake plenum			Used in step 15
TS6x20		Tightening torque	5 Nm

Intake plenum to cylinder head			Used in step 16
M6		Tightening torque	11 Nm

Wiring harness to cylinder head cover			Used in step 17
TS5x20		Tightening torque	3,5 Nm

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Positive battery cable to alternator — Used in step 17

M8		Tightening torque	19 Nm

Fuel line to intake plenum — Used in step 17

TS6x20		Tightening torque	5 Nm

Cover to electronics box — Used in step 17

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery — Used in step 17

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray — Used in step 17

M8		Tightening torque	19 Nm

Clean air pipe to cylinder head cover — Used in step 18

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 18 19

Clamp		Tightening torque	3 Nm

Intake silencer housing to lock bridge — Used in step 19

M6X30		Tightening torque	8 Nm

Intake neck to cross connection — Used in step 20

M6		Tightening torque	8 Nm

Resonator to manifold and clean air pipe — Used in step 22

Screw TS6	Renew screw.	Tightening torque	5 Nm

Cross-brace to spring strut dome — Used in step 24

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

Cover on body — Used in step 24

Hexagon screw		Tightening torque	3 Nm

Cover of top bulkhead — Used in step 25

Screw		Tightening torque	2,6 Nm

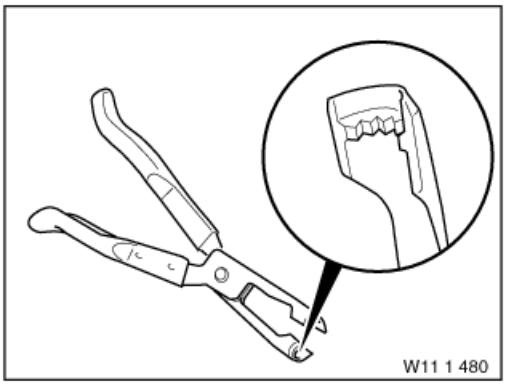
Cover of remote positive terminal — Used in step 25

Screw		Tightening torque	2,6 Nm

Overview of Special Tools

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0 490 796 (11 1 480) Pliers



Common	Used in step 12
Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

Links

Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	1 28
61 20 900 Disconnecting and connecting battery earth lead	1 28
61 20 900 Disconnecting and connecting battery earth lead	1 28
61 20 900 Disconnecting and connecting battery earth lead	1 28
61 20 900 Disconnecting and connecting battery earth lead	1 28
61 20 900 Disconnecting and connecting battery earth lead	1 28
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 28
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 28
61 20 900 Disconnecting and connecting battery earth lead	1 28
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 28
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	1 28
61 20 900 Disconnecting and connecting battery earth lead	1 28
61 20 900 Disconnecting and connecting battery earth lead	1 28
61 20 900 Disconnecting and connecting battery earth lead	1 28
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61 20 900 Disconnecting and connecting battery earth lead	1 28
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 28

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61 20 900 Disconnecting and connecting battery earth lead 1 28
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61 20 900 Disconnecting and connecting battery earth lead 1 28
61 20 900 Disconnecting and connecting battery earth lead 1 28
61 35 ... Notes on ESD protection (Electro Static Discharge) 15

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18 40 040 Removing and installing, sealing/replacing exhaust manifold (B47)

Warning!

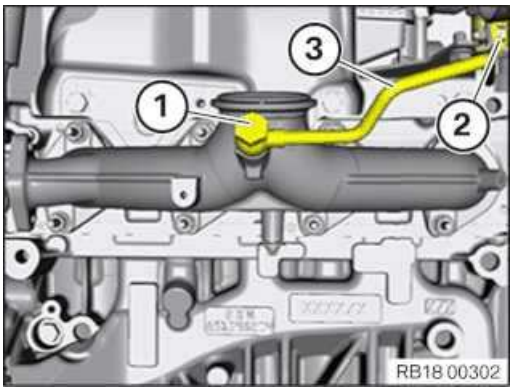
Risk of burning!

Only perform this repair work on an engine that has cooled down.

Necessary preliminary tasks:

- Remove diesel particulate filter.
- Remove exhaust turbocharger.

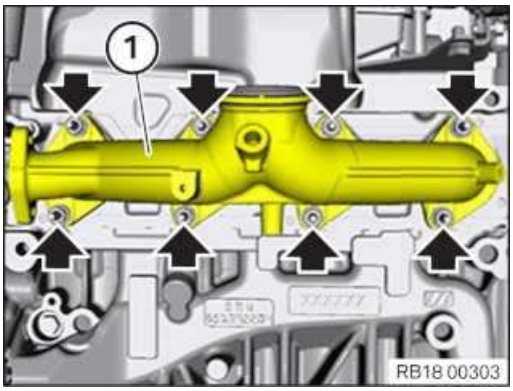
Removal:



Release banjo bolt (1).

Release screw (2).

Set exhaust gas pressure pipe (3) to one side.



Loosen nut along arrows.

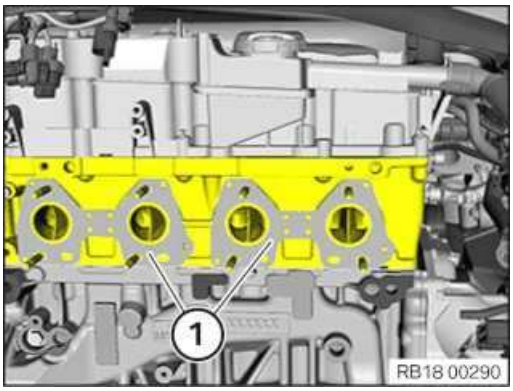
Release exhaust manifold (1) from cylinder head.

Preparation for installation:

Clean connection points.

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Installation:

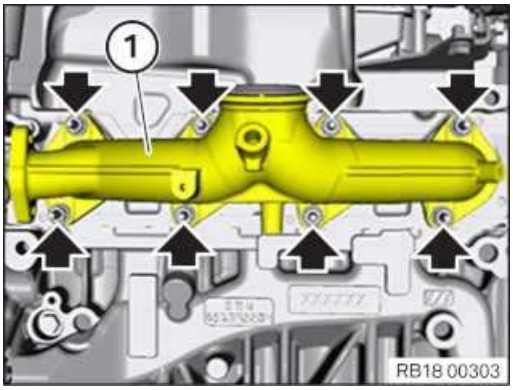


Replace gasket (1).

Part: Gasket

Attention!

The coated side must be fitted facing the manifold side.

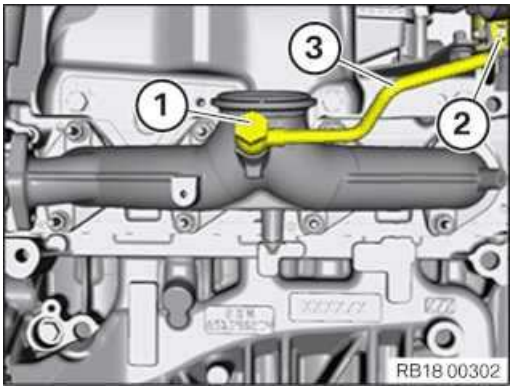


Install exhaust manifold (1).

Position nuts and tighten in sequence.

Observe tightening specification!

Tightening torque 18 30 9AZ.



Install exhaust gas pressure pipe (3) and tighten screw (2).

Tightening torque 18 30 7AZ.

Tighten banjo bolt (1).

Tightening torque 18 30 8AZ.

Required follow-up work:

- Install exhaust turbocharger.
- Install diesel particulate filter.

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11 65 020 Damage on the exhaust turbocharger due to obstructed oil supply lines



Caution!

If there is damage on the exhaust turbocharger:

- **Complaint:**

  Power loss, malfunction indicator lamp on

  Damage to the exhaust turbocharger.

  After damage to the exhaust turbochargers, the oil supply lines are often not replaced and the oil is not changed, this can lead to damage to the exhaust turbocharger again.

  Further, fault code entries in the preheating system or to the charging pressure controller (variable turbine geometry) are not considered.

  For N57X, additionally the following faults can be stored: 292200 Charging pressure controller (variable turbine geometry): Position sensor in charging pressure controller faulty or undervoltage 48F6 in charging pressure controller (variable turbine geometry)

  Attention: Subsequent damage is not covered by the warranty!

- **Cause**

  The oil supply lines for the exhaust turbocharger are clogged or blocked by oil sludge/coking. Due to that, oil supply to the exhaust turbocharger may be inadequate and can cause damage to the exhaust turbocharger again.

  Malfunctions in the preheating system can lead to clogging of the diesel particulate filter and thus to problems with the charging pressure control or the charging pressure build-up. Consequence: Problems at cold start or the engine does not start due to a faulty preheating system. Power loss or overheating of the exhaust branch.

  If the new exhaust turbocharger is not filled with enough oil prior to installation, the shaft bearings can be damaged at the first starting operation itself.

- **Solution**

  Proceed as follows in response to a customer complaint:

  If fault code entries are available for the preheating system, the preheating system must be repaired. Then delete the fault memory.

  Caution!

  If the engine does not heat up or only heats up very slowly because of a defective thermostat, this can result in premature or repeated damage to the exhaust turbocharger. **Always** check the coolant thermostat and thermostat for the EGR cooling if there is a complaint, and repair if applicable.

  Engine oil and filter exchange must be carried out on the engine absolutely, so as to guarantee operation of the changed exhaust turbocharger with fresh oil!

  Since the oil feed line as well as the oil return line may coke with increased mileage especially in the cable connection area of the exhaust turbocharger, the followings rules are applicable:

  Engines with one exhaust turbocharger:

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- Exhaust turbocharger exchange due to electrical fault on the exhaust turbocharger (vehicle mileage/km up to 100,000 km):
  - Check the oil feed line, oil return line and the associated banjo bolts for coking, **replace if applicable**.
  - If the oil return line is replaced, the connecting pipe on the crankcase must **always** be cleaned, as it is also subject to coking!
  - If a replacement is not necessary: If the exhaust turbocharger is offered only along with the oil return line and oil feed line in the Electronic Parts Catalogue (EPC), it can be removed from the order list again.
- Exhaust turbocharger exchange due to electrical fault on the exhaust turbocharger (vehicle mileage/km starting at 100,000 km):
  - Replace the oil feed line, oil return line and the associated banjo bolts.
  - If the oil return line is replaced, the connecting pipe on the crankcase must **always** be cleaned, as it is also subject to coking!
- Exchanging the exhaust turbocharger if there is mechanical damage on the exhaust turbocharger:
  - Always replace the oil feed line, oil return line and the associated banjo bolts.
  - If the oil return line is replaced, the connecting pipe on the crankcase must **always** be cleaned, as it is also subject to coking!

Engines with several exhaust turbochargers:

- Exchanging one or several exhaust turbochargers due to electrical faults on the exhaust turbocharger (vehicle mileage/km up to 100,000 km):
  - Check the oil feed lines, oil return lines and the associated banjo bolts of **all** exhaust turbochargers (including the intact exhaust turbocharger) for coking, **replace if applicable**.
  - If all the oil return lines are replaced, all the connecting pipes on the crankcase must **always** be cleaned, as they are also subject to coking!
  - If a replacement is not necessary: If the exhaust turbocharger is offered only along with the oil return line and oil feed line in the Electronic Parts Catalogue (EPC), it can be removed from the order list again.
- Exchanging one or several exhaust turbochargers due to electrical faults on the exhaust turbocharger (vehicle mileage/km starting at 100,000 km):
  - Replace the oil feed lines, oil return lines and the associated banjo bolts of **all** exhaust turbochargers (including the intact exhaust turbocharger).
  - If all the oil return lines are replaced, all the connecting pipes on the crankcase must **always** be cleaned, as they are also subject to coking!
- Exchanging one or several exhaust turbochargers if there is mechanical damage on the exhaust turbocharger:
  - Always replace the oil feed lines, oil return lines and the associated banjo bolts of **all** exhaust turbochargers (including the intact exhaust turbocharger).
  - If all the oil return lines are replaced, all the connecting pipes on the crankcase must **always** be cleaned, as they are also subject to coking!

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In case the diesel particulate filter is foul with oil, clean or replace it, if necessary.

In order to exclude that the oil supply to the exhaust turbocharger is not impaired due to faulty crankcase ventilation, carry out a function check of the crankcase ventilation in this regard. The corresponding test module can be found in ISTA at:

- Power train
- Digital Diesel Electronics
- Engine ventilation
- Internal engine pressure

When installing the exhaust turbocharger, the exhaust turbocharger itself needs to be filled to capacity with fresh engine oil through the oil intake hole before the oil feed line is mounted. Important: Never use liquid sealing compounds when connecting the engine oil pipe as they can block the oil ducts.

After installing the exhaust turbocharger, start the engine and let it run at idle for 2 to 3 minutes before increasing the speed.

If required, initiate a regeneration of the diesel particulate filter

Important: For vehicles with N57x engines that have fault memory entries that are at the top, a successful diesel particulate filter regeneration must be carried out.

Then delete the fault memory.

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11 65 020 Removing and installing or replacing exhaust turbocharger (B47)

Warning!

Risk of burning!

Only perform this repair work on an engine that has cooled down.

Note:

Troubleshooting on exhaust turbocharger.

Caution!

For exhaust turbocharger damage:

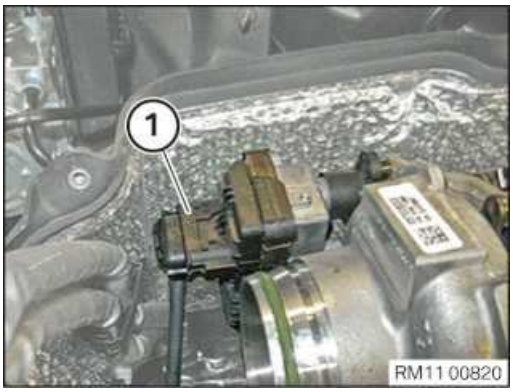
In order to avoid subsequent damage, the following notes and test steps must be followed absolutely.

Necessary preliminary work:

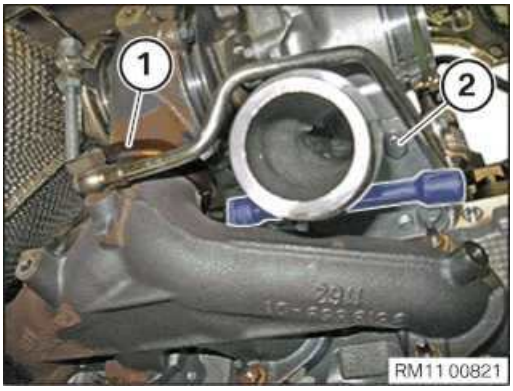
- Remove upper bulkhead cover
- Remove right charge air duct
- Remove clean air pipe
- Remove oil return line

Removal:

Disconnect plug connection (1).

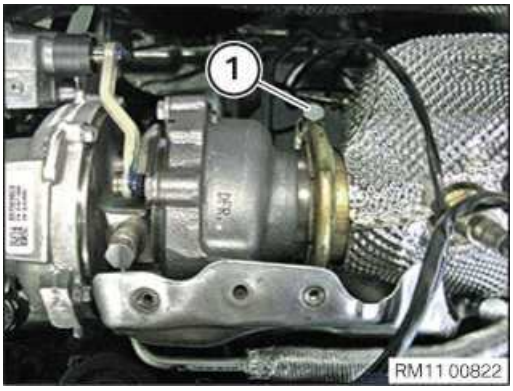


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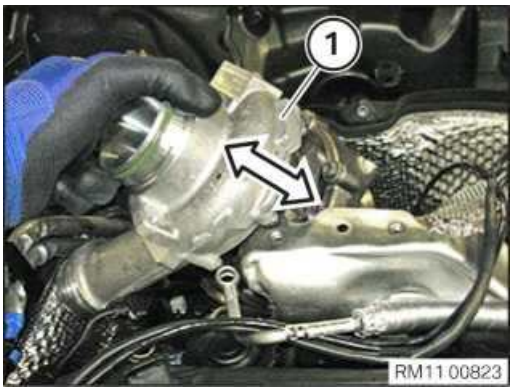
Release V-band clamp (1) between exhaust turbocharger and exhaust manifold.

Loosen screw (2) from the holder of the exhaust turbocharger.



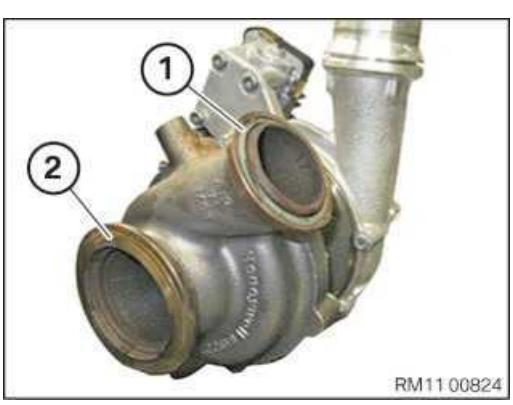
Loosen oil feed line on exhaust turbocharger.

Release V-band clamp (1) between exhaust turbocharger and diesel particulate filter.



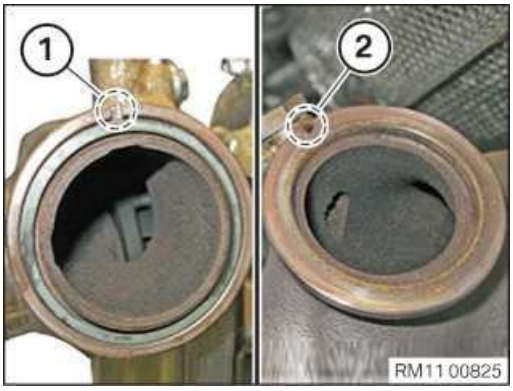
Remove exhaust turbocharger (1) towards the top.

Installation:

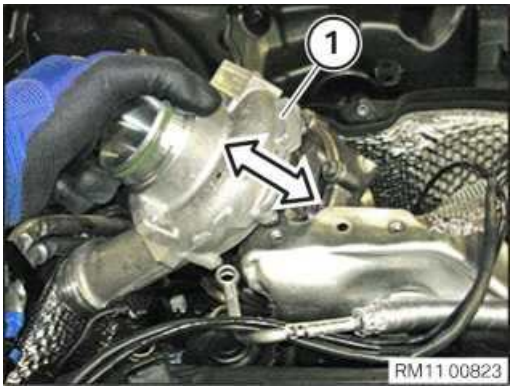


Parts: Replace seals (1 and 2).

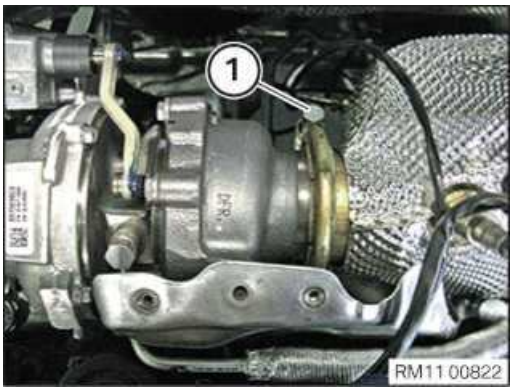
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Note:
Recess (1) on exhaust turbocharger must be correctly positioned on the guide (2) on the exhaust manifold.



Install exhaust turbocharger (1) from above.

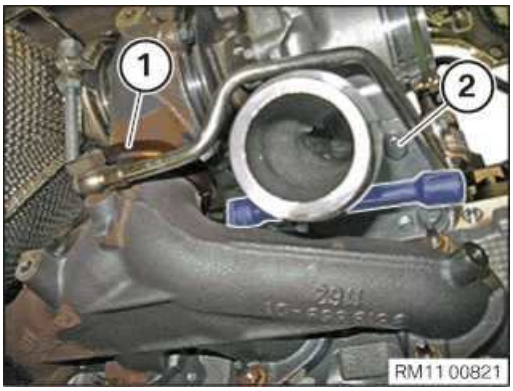


Parts: Renew V-band clamp (1).

Position exhaust turbocharger correctly.

Mount V-band clamp (1) between exhaust turbocharger and diesel particulate filter.

Tightening torque 11 65 4AZ .



Parts: Renew V-band clamp (1).

Mount V-band clamp (1) between exhaust turbocharger and exhaust manifold.

Tighten both V-band clamps.

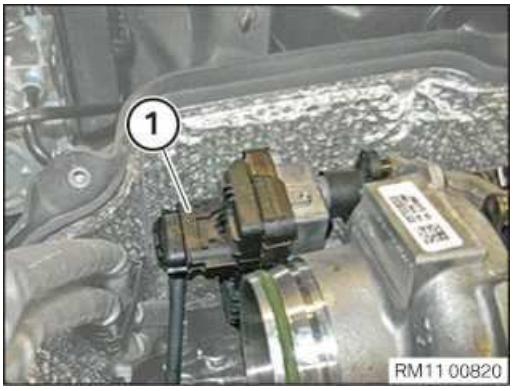
Tightening torque 11 65 1AZ.

Tighten screw (2) on exhaust turbocharger holder on crankcase.

Tightening torque 11 65 2AZ.

Tighten oil feed line on exhaust turbocharger.

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Connect the connector (1).

Required follow-up work:

- Install oil return line
- Install right charge air line
- Install clean air pipe
- Install upper bulkhead cover
- Check engine for tightness

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11 65 040 Removing and installing/replacing high-pressure stage exhaust turbocharger

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE



Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

For exhaust turbocharger damage: Check the pressure pipes, charge air cooler and intake plenum for foreign matter, damage and correct functionality.

If the oil return line is exchanged, then the connecting pipe to the oil sump must ALWAYS be cleaned, as the connecting pipe can coke.

TECHNICAL INFORMATION

With exhaust turbocharger damage, it is imperative to observe the additional information.

For additional information see: 11 65 020 Exhaust turbocharger damage due to plugged oil supply lines

TECHNICAL INFORMATION

Prior to replacing the exhaust turbocharger: Observe the notes on troubleshooting on the exhaust turbocharger.

For additional information see: FUB-FUB-FB-130003-A10 Troubleshooting on the exhaust turbocharger

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

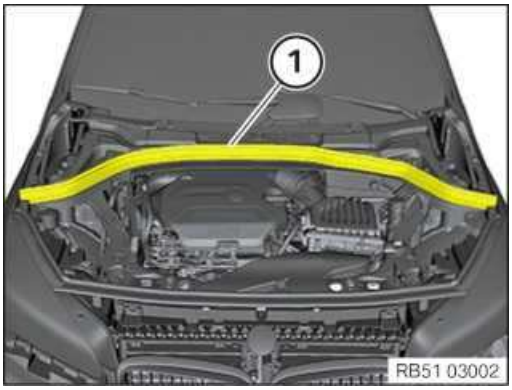
Maintain conditions of absolute cleanliness.

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1 – Remove the seal for the rear bonnet

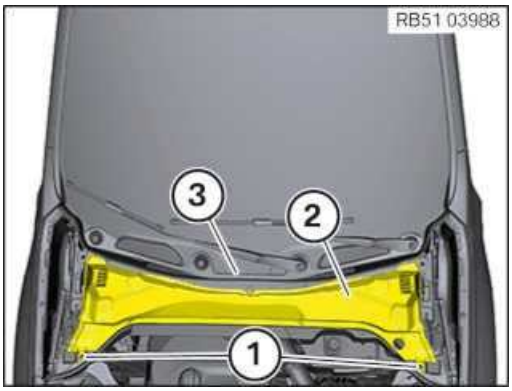
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



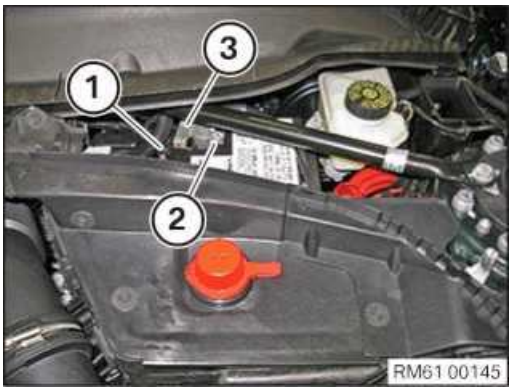
- Pull off rear bonnet seal (1) towards the top and remove.

2 – Removing front cowl panel cover



- Loosen the expanding rivet (1).
- Feed out and remove front cowl panel cover (2) from the rear cowl panel cover(3).

3 – Disconnecting the battery earth lead



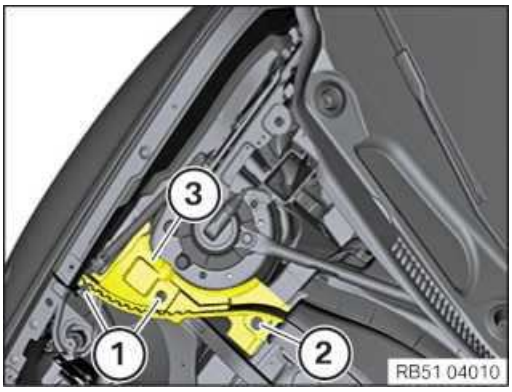
- Unlock plug connection (1) and disconnect.
- Unfasten nut (2).
- Remove the battery earth lead (3) and secure to one side.

4 – Remove suspension cross-brace

TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.

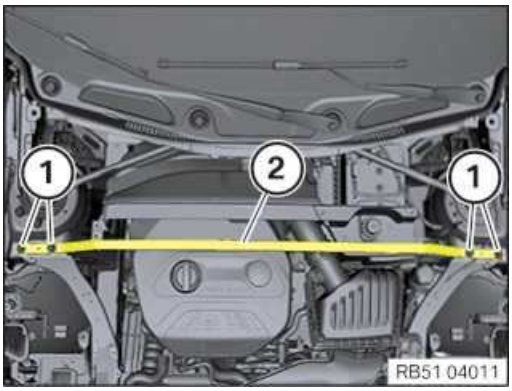
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NOTICE

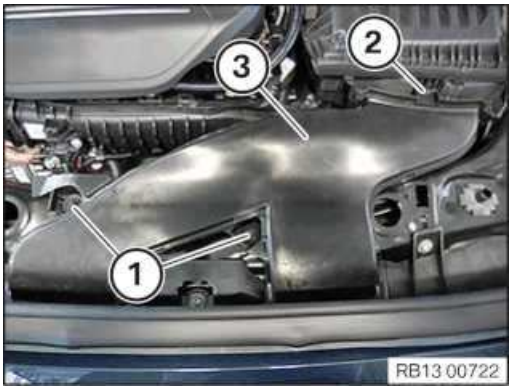
Description is for right component only. The procedure on the left side is identical.

- Loosen expanding rivet (1).
- Loosen screw (2).
- Remove the cover (3).



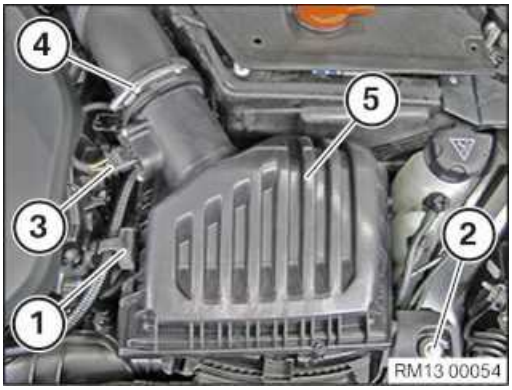
- Loosen screws (1).
- Remove strut brace (2).

5 – Remove the intake neck for intake silencer housing



- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

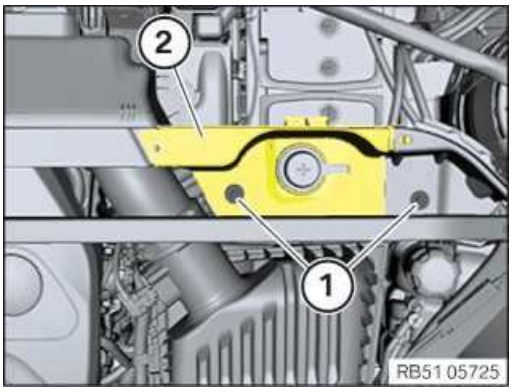
6 – Removing intake silencer housing



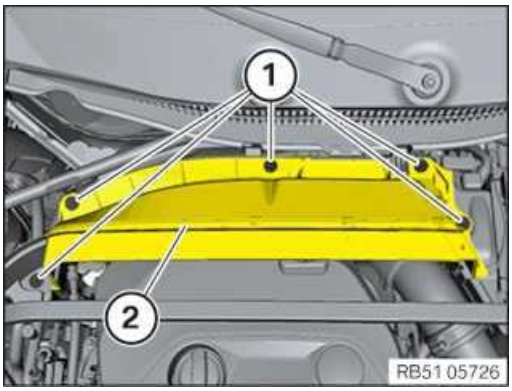
- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

7 – Removing the upper bulkhead cover

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- Loosen screws (1).
- Guide out and remove the cover (2).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

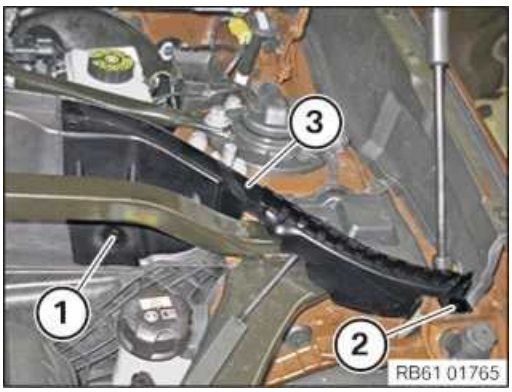
8 – Remove vehicle battery

WARNING

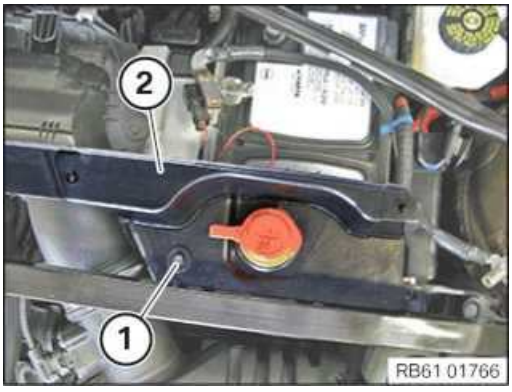
Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

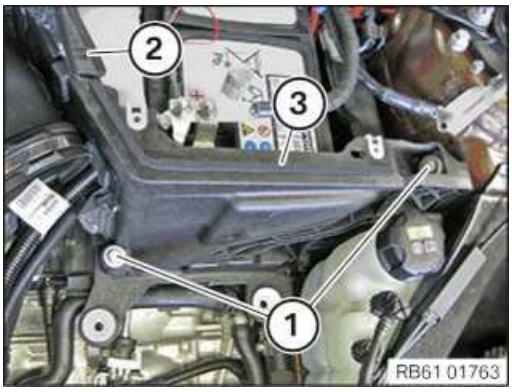


- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

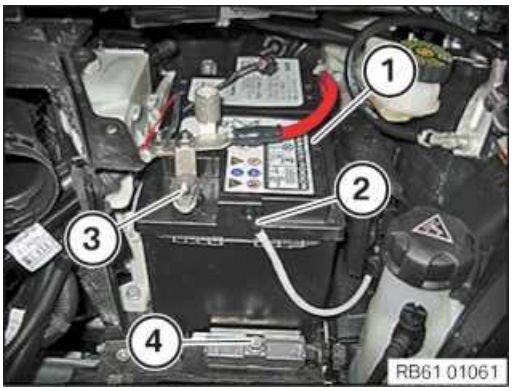


- Loosen screw (1).
- Remove the cover (2).

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- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.



- Pull off the vent hose (2).
- Slacken the nut (3) on the positive battery terminal and remove the positive battery terminal.

WARNING

Unprotected battery terminals.

Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

9 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

Damage to the acoustic cover.

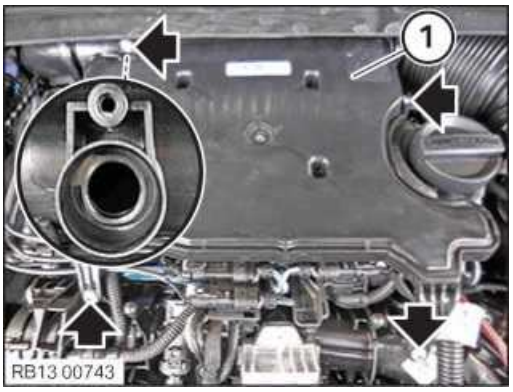
Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

10 – Remove resonator

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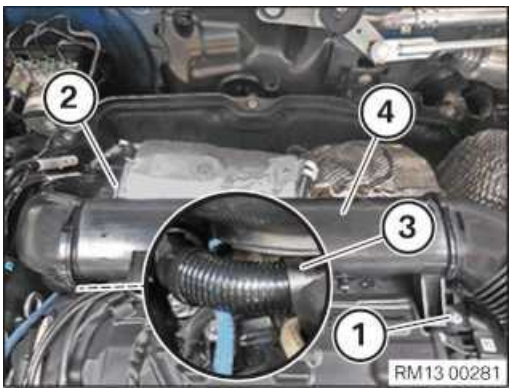


- Remove screws (arrows).
- Guide out and remove the resonator (1).

11 – Removing clean air pipe



- Detach clamp (1) on the clean air pipe.
- Pull off the clean air pipe from the intake silencer housing.



- Loosen screw (1).
- Loosen clamp (2).
- Unlock the ventilation line (3) and pull it off the cylinder head cover.
- Feed out clean air pipe and remove.

12 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

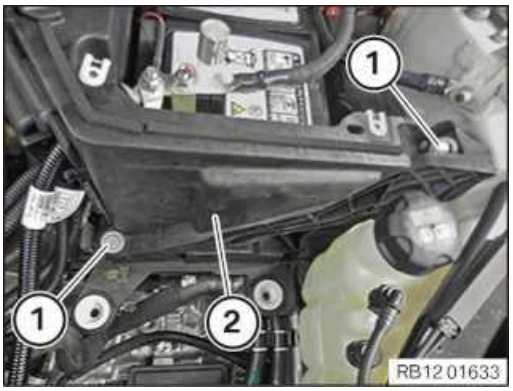
TECHNICAL INFORMATION

Follow instructions for removing and installing control units.

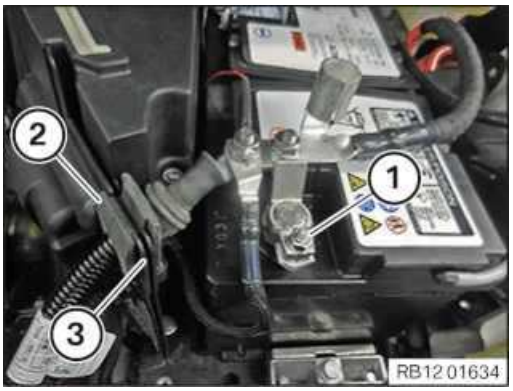
For additional information see: 12 00 ... Notes on removal and installation of control units

TECHNICAL INFORMATION

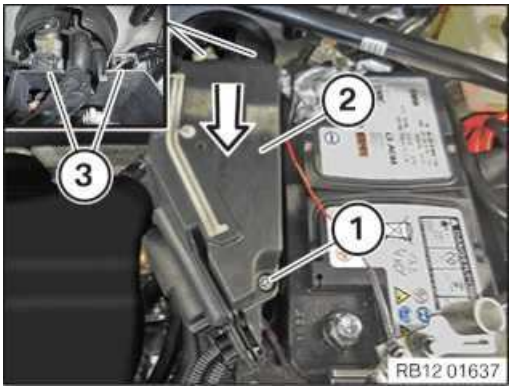
Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.



- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.

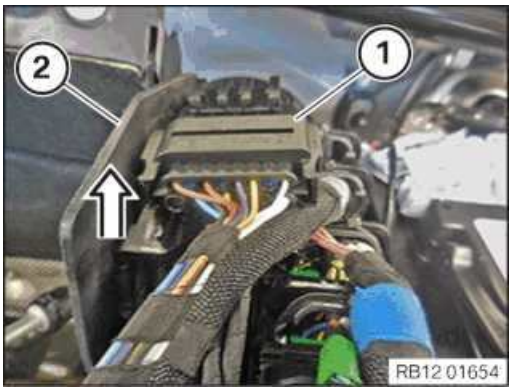


- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

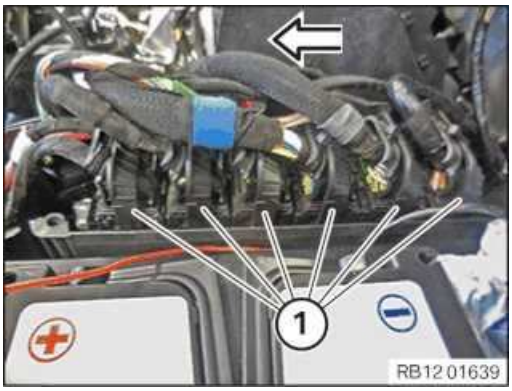


- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.

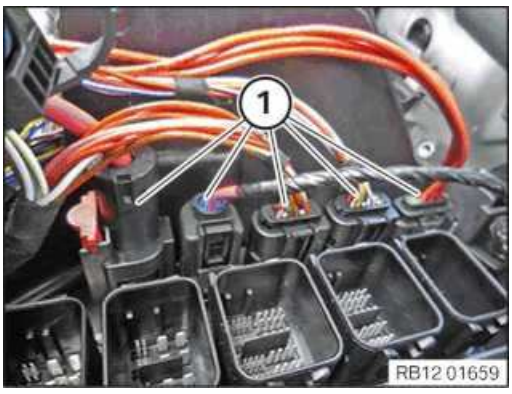
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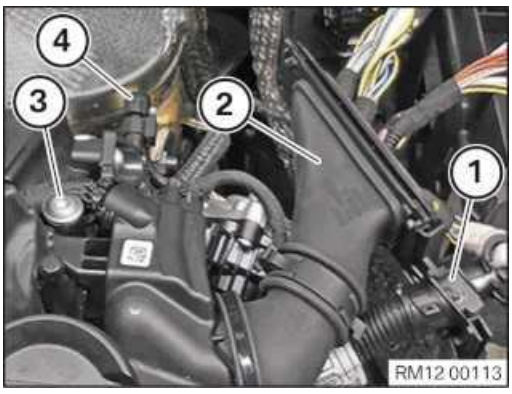
- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).



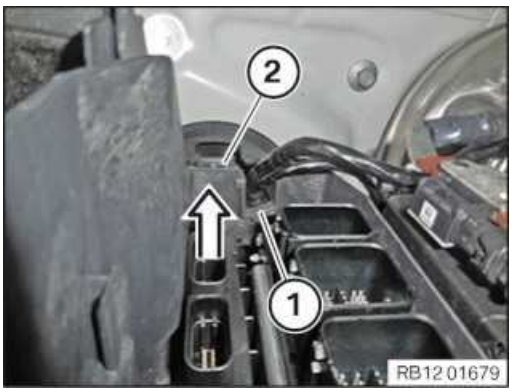
- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



- Unlock and loosen connector (1).

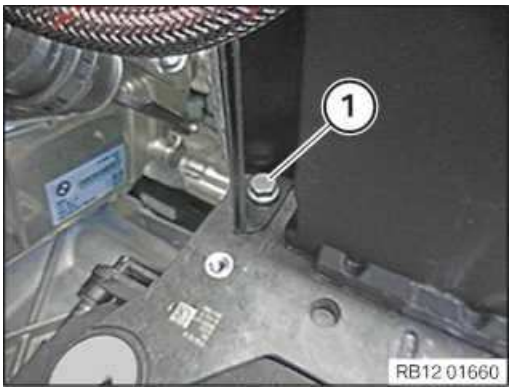


- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.

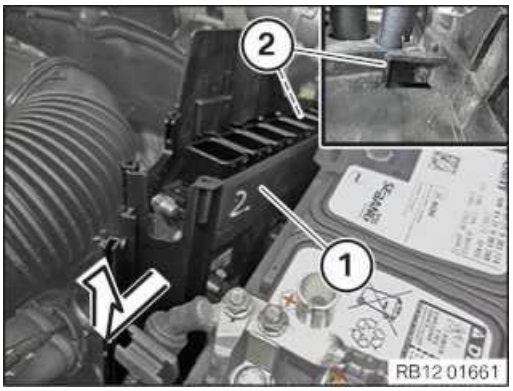


- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.

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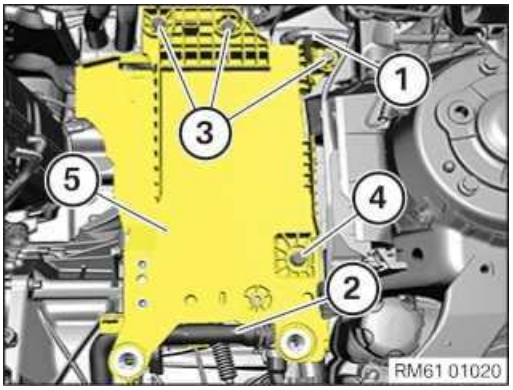


- Loosen screw (1).



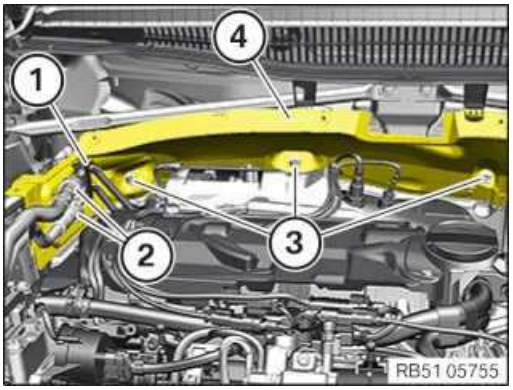
- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

13 – Remove battery holder



- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

14 – Remove the rear bulkhead upper part



- Unlock the holder (1) and disconnect.
- Guide out and remove the fuel lines (2).
- Loosen screws (3).
- Guide out the rear bulkhead upper part (4) and remove.

15 – Removing heat shield from top exhaust turbocharger

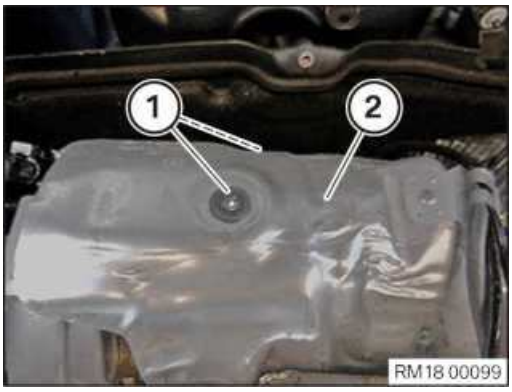
WARNING

Hot surfaces.

Risk of burning!

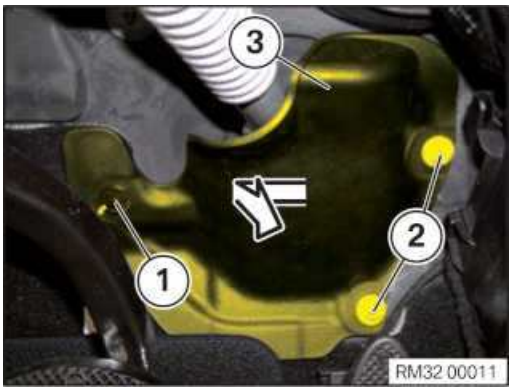
- Perform all work only on components that have cooled down.

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- Release cable from holders.
- Release the screws (1) at the top and bottom of the heat shield.
- Feed out and remove the heat shield (2).

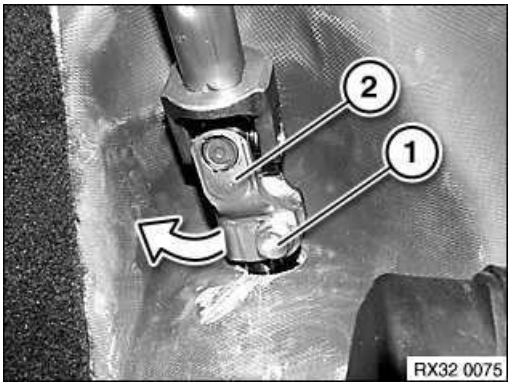
16 – Releasing lower steering shaft from steering gear



- **If installed:**
- Unfasten nut (1).
- Unscrew the nuts (2) by 1 rotation.

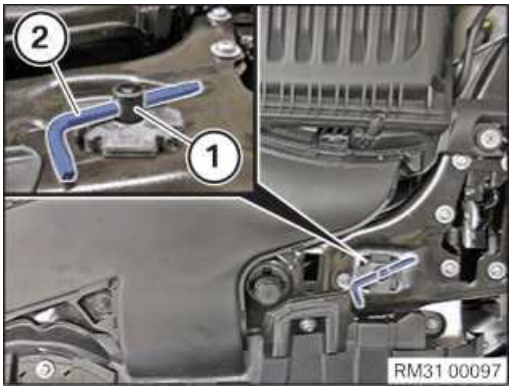
  Do not remove the nuts (2) !
- Remove the cover (3) on the steering column in the direction of the arrow.

  The side footwell trim must not be disassembled!



- Loosen screw (1).
- Swivel out the universal joint (2) of the bottom steering shaft from the steering gear in the direction of the arrow.

17 – Securing radiator on left and right



NOTICE

Perform the operations on the left and right side.

- Fasten radiator at centring pin (1) with suitable tool (2).

18 – Removing both front wheels

▸ **Removing the wheel**

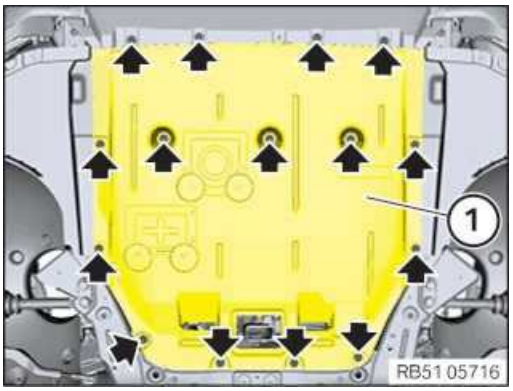
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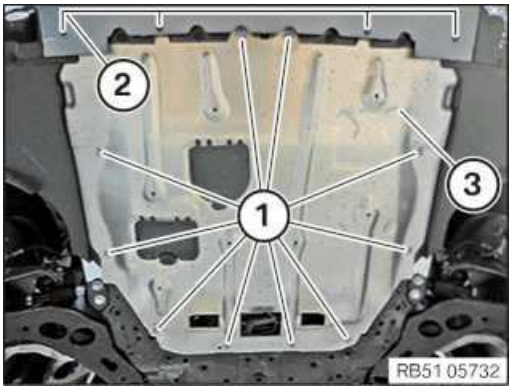
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Unscrew the wheel bolts (arrows) and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

19 – Removing the front underbody protection

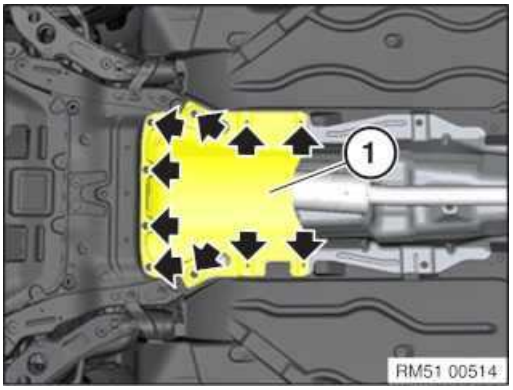


- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.



- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

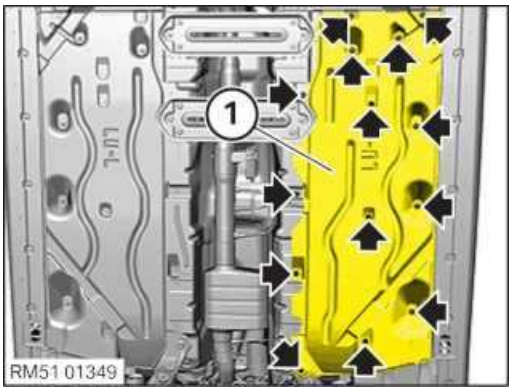
20 – If installed: Removing rear underbody protection



- Remove screws (arrows).
- Remove the rear underbody protection (1).

21 – Removing right underbody panelling

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- Unscrew all bolts and nuts (arrows).
- Remove the underbody panelling (1).

22 – Removing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

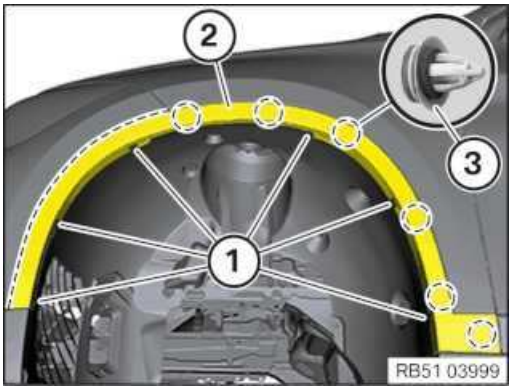
▸ **Remove the front wheel arch trim**

NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

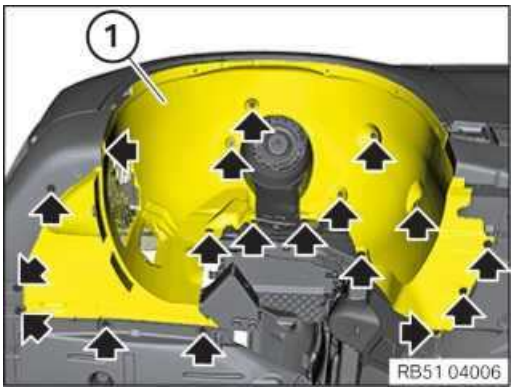
NOTICE

Description is for left component only. Procedure on the right side is identical.



- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.

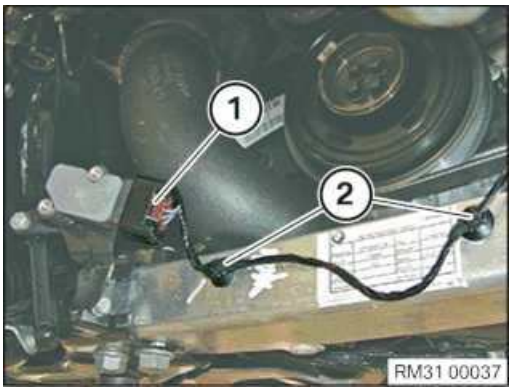
▸ **Remove front wheel arch cover**



- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

23 – With right installation: Detaching ride height sensor cable

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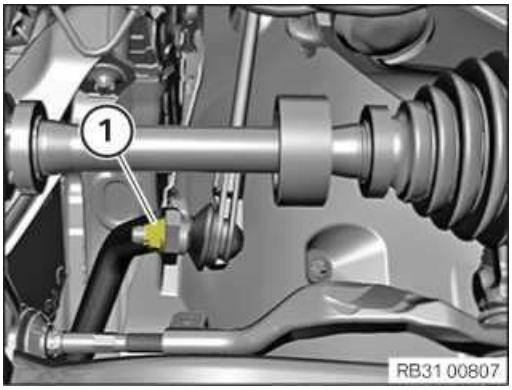
- Unlock plug connection (1) and disconnect.
- Release cable clip (2) from deformation element adapter.

24 – Releasing anti-roll bar on left and right from anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▸ **Detach the anti-roll bar from the anti-roll bar link**

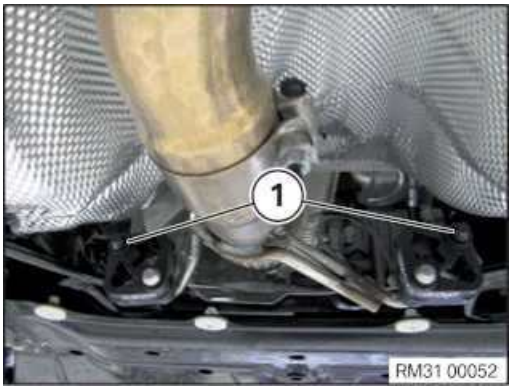


- Unfasten nut (1).

Note: Use the Torx socket for counter support.

- Loosen the anti-roll bar link from the anti-roll bar .

25 – Detaching rubber mount from front axle support

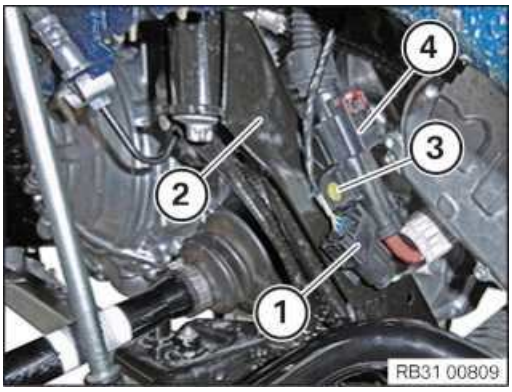


- Spray rubber mount (1) with lubricant and release from holder on front axle support.

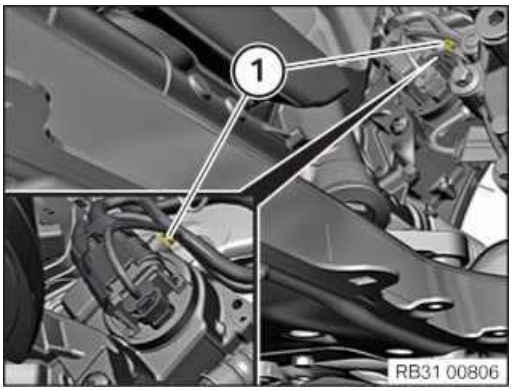
26 – Disconnecting plug connections from steering gear

▸ **If installed: Detach connectors from the front axle carrier**

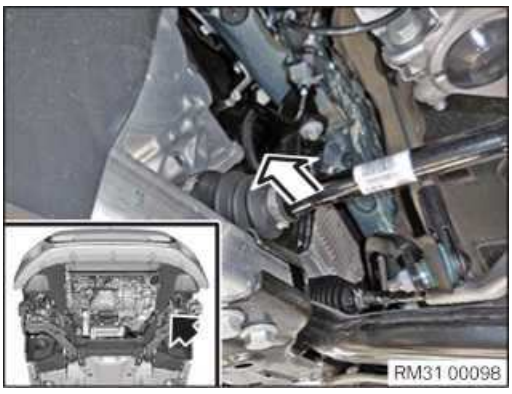
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- Release the plug connection (1) from the front axle support (2).
- Loosen screw (3).
- Release the plug connection (4) from the front axle support (2).

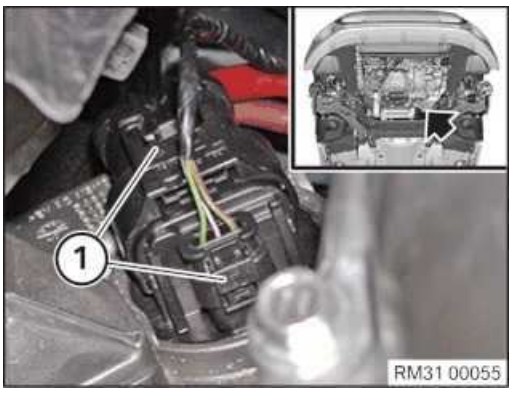


- Disconnect wiring harness (1) from steering gear.



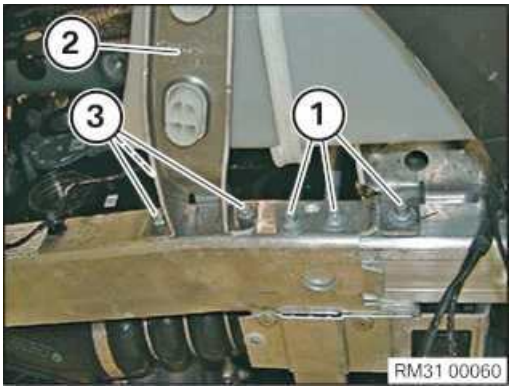
- To unlock the plug connections (see the following work step): unlock plug connections (arrow) with the right hand.

  The plug connections can be reached via the left-hand output shaft.



- Unlock plug connections (arrow) (1)and disconnect from the steering gear.
- Make sure when lowering the front axle that the cables are not damaged!

27 – Releasing the mounted part from the front axle support



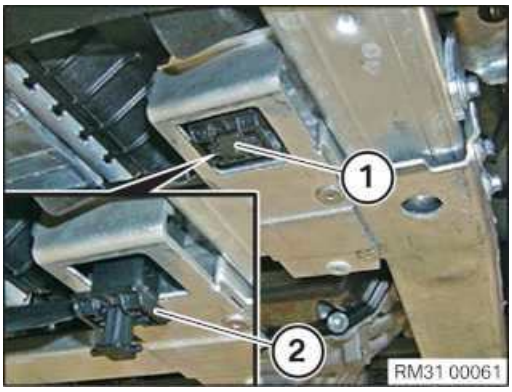
- **Only on right side:** Loosen screws (3) and remove holder for washer fluid reservoir (2).

NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

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NOTICE

Perform the operations on the left and right side.

- Unlock safety catch (1) of the lock (2) from the holder for the charge air cooler.
- Completely remove locks (2).



- Loosen screw (2) of the engine support (3) on the front axle (1).

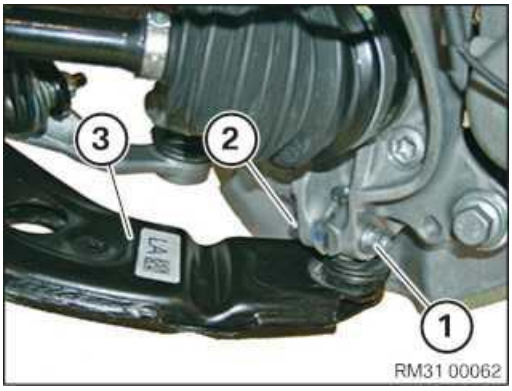


NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

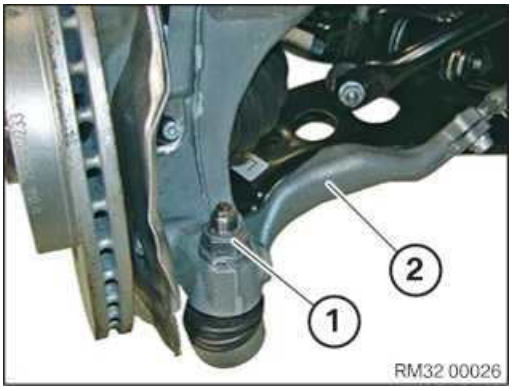
28 – Detaching and removing front axle completely



NOTICE

Perform the operations on the left and right side.

- Unfasten nut (1).
- (2)Pull out screw.
- Detach the wishbone (3) from the swivel bearing .

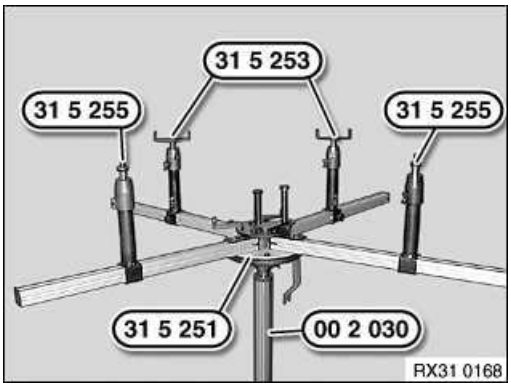


NOTICE

Perform the operations on the left and right side.

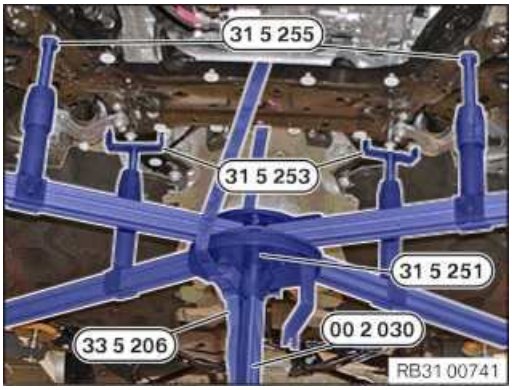
- Unfasten nut (1).
- Detach the track rod (2) from the swivel bearing.

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- Fit the special tool completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools in telescopic supports of a profile rail pair.
- Insert special tools in telescopic supports of other profile rail pair.

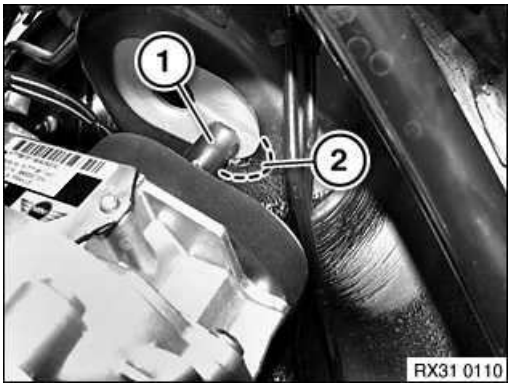
Note: In a profile rail pair, two profile rails are connected to one another by gearing.



- Align special tools and to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool to special tool .

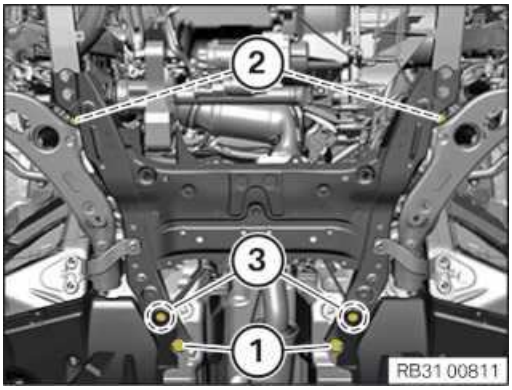


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and remove the front axle.

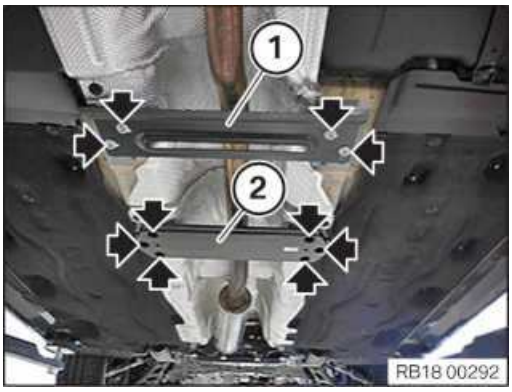
TECHNICAL INFORMATION

Note the information on thread repairs using Helicoil thread inserts.
For more information see: 41 00 ... Notes on repairing threads

- Check threads for damage; if necessary, repair with Helicoil thread inserts.

29 – Removing the connecting support from the tunnel in front and back

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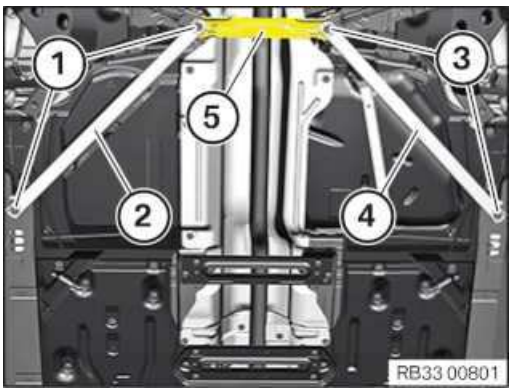


- Unscrew the bolts (arrows) from the connecting support (1).
- Feed out and remove the crossbeam (1).
- Unscrew the bolts (arrows) from the connecting support (2).
- Feed out and remove the crossbeam (2).

30 – Remove the cross strut with the torsion strut

TECHNICAL INFORMATION

Driving without a torsion strut is not permitted.



- Loosen screws (1).
- Thread out torsion strut (2) at left and remove.
- Loosen screws (3).
- Thread out torsion strut (4) at right and remove.
- Feed out and remove the cross-member (5).

31 – Remove exhaust system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

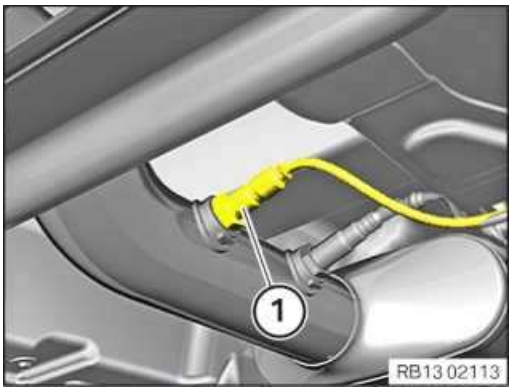
CAUTION

Heavy component.

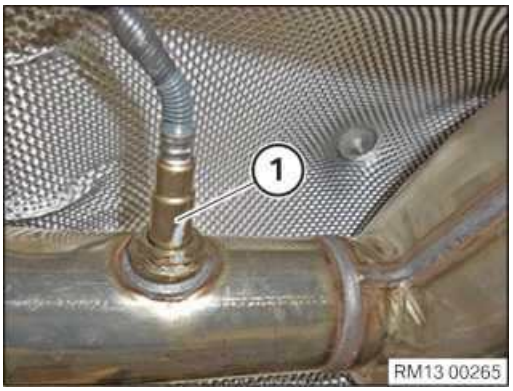
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

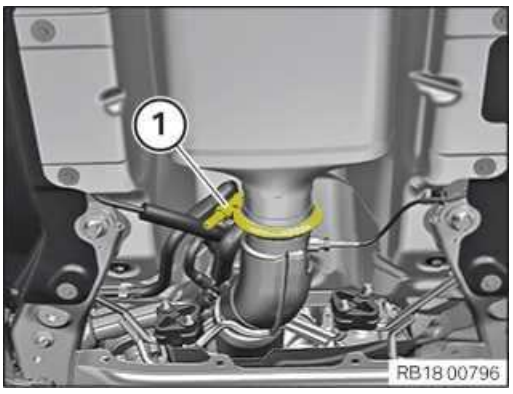
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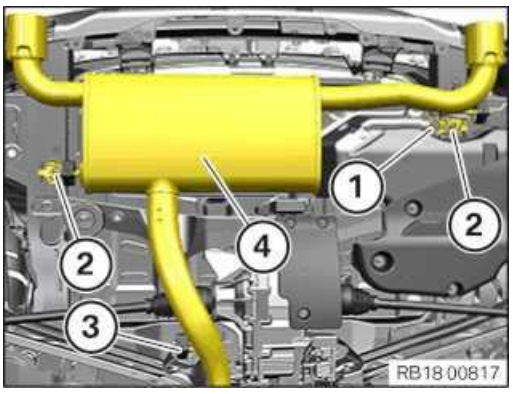
- Release the nitrogen oxide sensor (1) downstream of the SCR catalytic converter, guide it out and set it aside.



- Release the diesel particulate sensor (1), guide it out and set it aside.

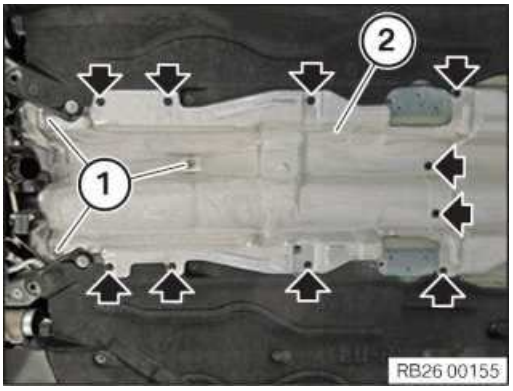


- Loosen V-band clamp (1).



- Loosen screw (1).
- Loosen nuts (2).
- Release the rubber mount (3) of the exhaust system (4).
- Lower and guide out the exhaust system (4) with assistance of a second person and remove it.

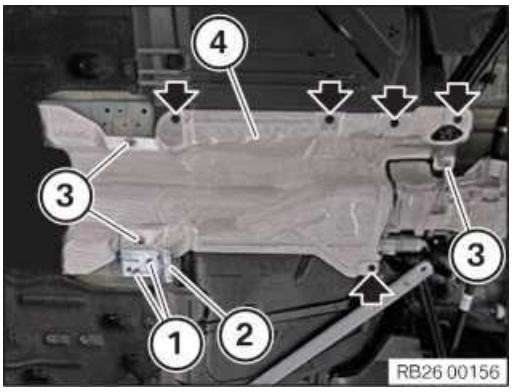
32 – Remove front heat shield



- Remove screws (arrows).
- Loosen nuts (1).
- Guide the heat shield (2) out and remove it.

33 – Remove heat shield at rear.

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- Loosen screws (1).
- Guide out and remove holder (2).
- Remove screws (arrows).
- Loosen nuts (3).
- Guide the heat shield (4) out and remove it.

34 – Remove propeller shaft

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

RISK OF DAMAGE

Damage to propeller shaft during removal.

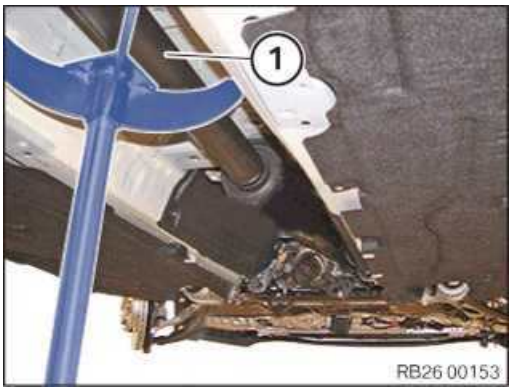
Non-observance of the removal guidelines for the propeller shaft on the rear axle differential may cause severe damage.

- Do not disassemble the three-hole flange, flexible disc and propeller shaft. The three-hole flange to the rear axle differential is balanced with the flexible disc and propeller shaft.
- Loosen the recessed nut against the direction of travel in clockwise direction. The propeller shaft must be loosened on the recessed nut only and exclusively in the direction of rotation otherwise the anti-twist lock of the bi-hexagonal flange nut is damaged.
- In the event of a damaged anti-twist lock on the bi-hexagonal flange nut: Replace the rear axle differential.



- Install the special too l between the front and rear propeller shaft.
- Make sure that the arrows on the special tool point forward in the direction of travel.

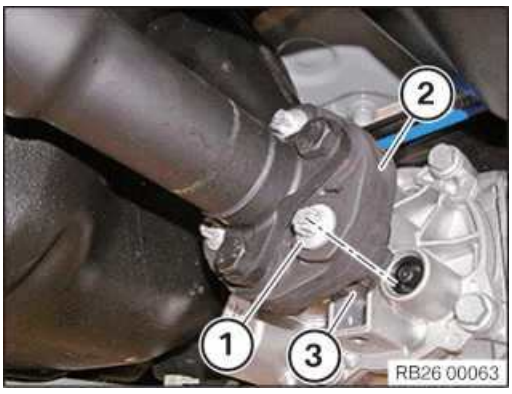
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- Always support the propeller shaft (1) with a conventional jack.



- Protect the propeller shaft (1) with the special tools **0 495 554 (33 5 070)** and from twisting.



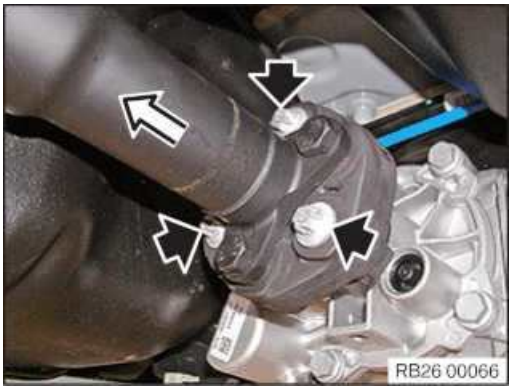
TECHNICAL INFORMATION

Compliance with the following instructions is required to avoid a humming noise from the propeller shaft after refitting the propeller shaft.

- Mark the installation position of the screw connection (1), the flexible disc (2) and the three-hole flange (3) on the same level.
- Loosen the screw connection (1).

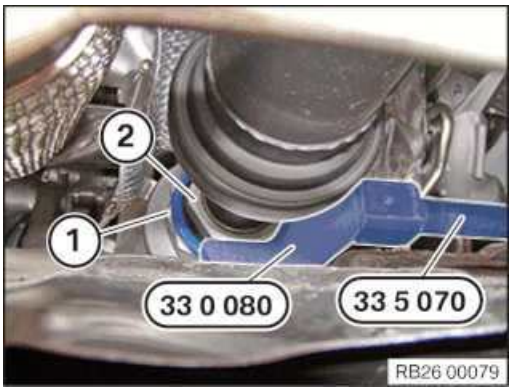


- Loosen screws (1).



- Remove screws (arrows).
- Guide the propeller shaft out in the direction of the arrow and set it aside.

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RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.

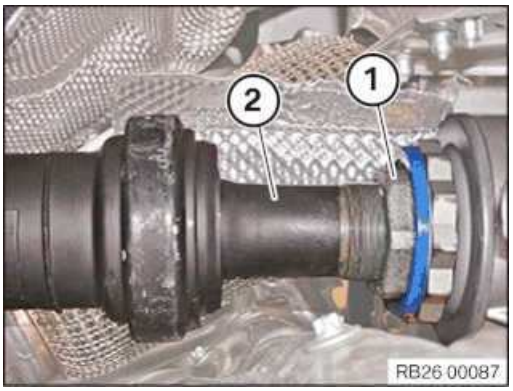
- Protect the recessed nut (2) on the transfer box from twisting with the special tools **0 495 554 (33 5 070)** and .

  The recessed nut (2) on the transfer box must **not** be used to detach the propeller shaft.

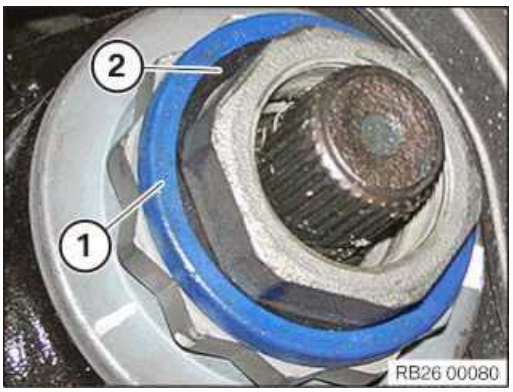
  The double hexagon flange nut (1) must **not** be used for counter support.



- Release the front propeller shaft with the special tools **0 495 554 (33 5 070)** and in the direction of the arrow.

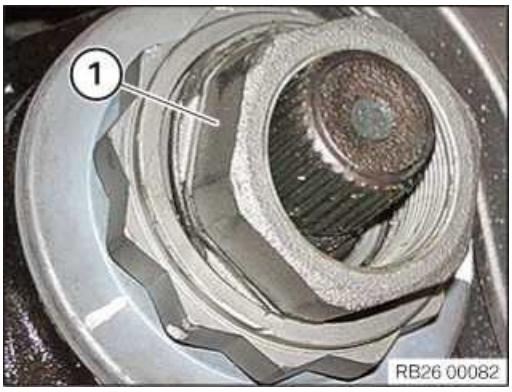


- Thread the propeller shaft (2) out of the recessed nut (1) and remove.



- Thread the retaining clip (1) and the seal (2) out and remove.

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- Thread out and remove the recessed nut (1).

35 – Removing starter motor

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and loosen connector (1).
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).

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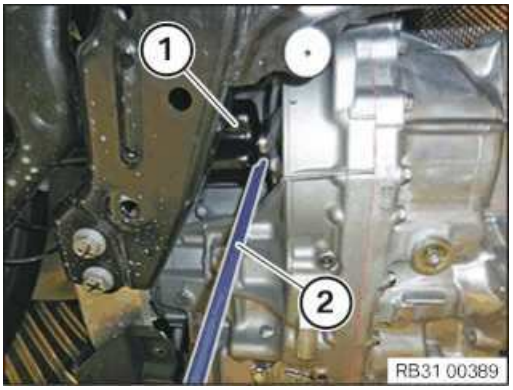


- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.



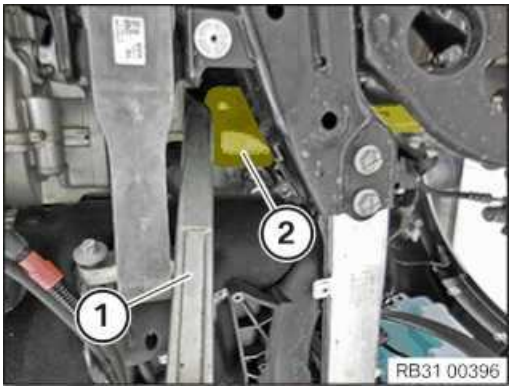
- Loosen screws (1).
- Feed out starter motor and remove.

36 – Partially removing the left output shaft



- Protect the output shaft (1) from falling.
- Lever out the output shaft (1) with a mounting lever (2) from the transmission.
- Tie up output shaft (1).

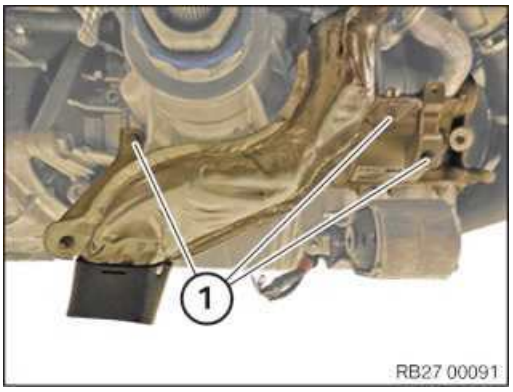
37 – Partially removing right output shaft



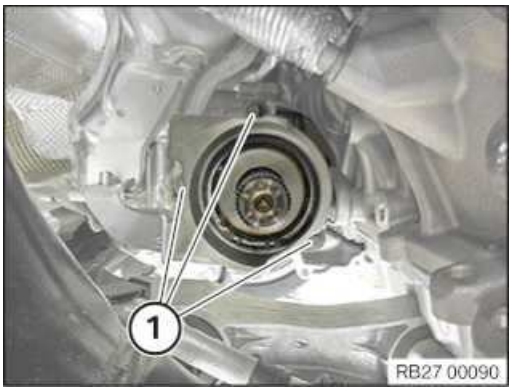
- Lever out the output shaft (2) with a mounting lever (1).
- Tie up output shaft (1).

38 – Remove the intermediate shaft with the support tube

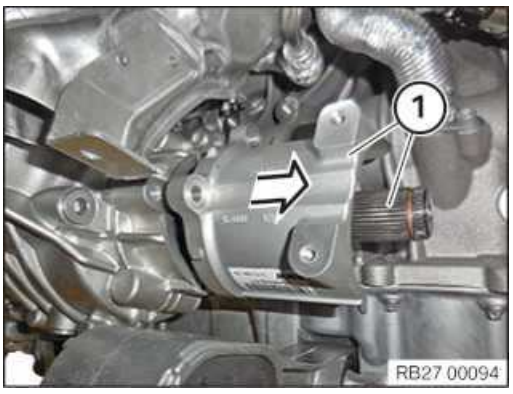
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- With air duct installation: Loosen screws (1).
- Remove air duct

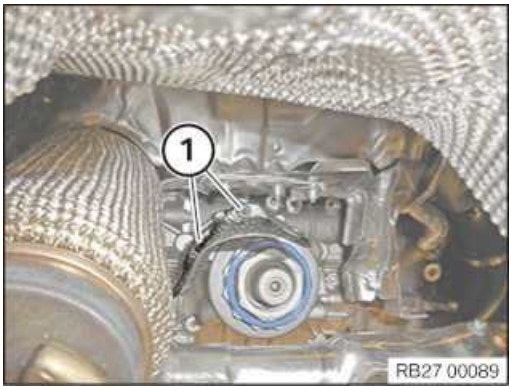


- Loosen screws (1).

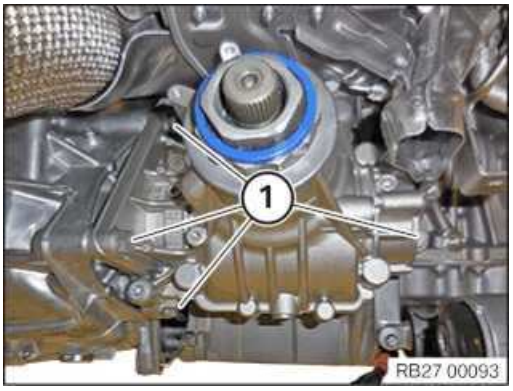


- Pull the intermediate shaft with the support tube (1) out of the transfer box.

39 – Remove transfer box (VTG)



- Loosen screws (1).
- Remove heat shield.



- Loosen screws (1).
- Remove the transfer box (VTG).

40 – Remove the monitoring oxygen sensor

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WARNING

Hot surfaces.

Risk of burning!

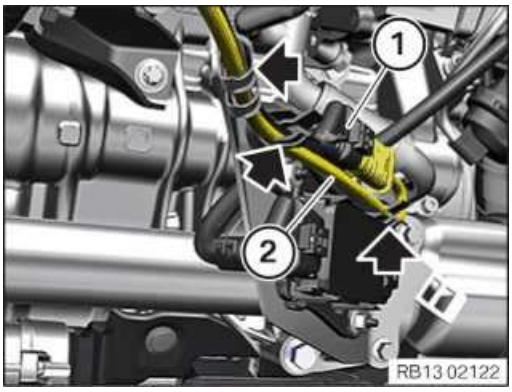
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

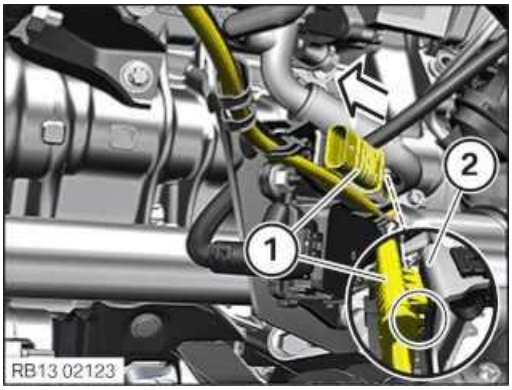
Electrostatic discharge.

Damage to or destruction of electrical components.

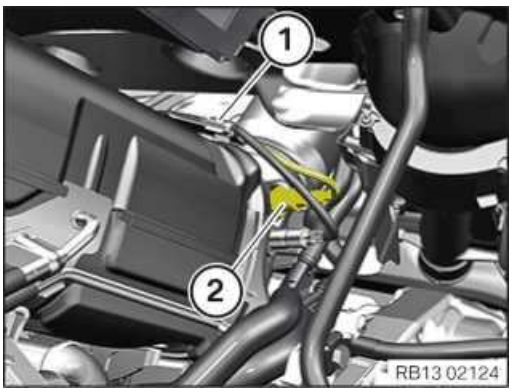
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock plug connection (1) and disconnect.
- Feed oxygen monitor sensor cable (1) out of the clamps (arrows).



- Unlock the connector (1) in the marked area and disconnect it from the holder (2) in the direction of arrow.



- Guide the cable of the monitoring oxygen sensor (2) out of the clamp (1).
- Release the monitoring oxygen sensor (2) using special tool **0 491 074 (11 7 020)**.
- Remove the monitoring oxygen sensor (2).

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WARNING

Hot surfaces.

Risk of burning!

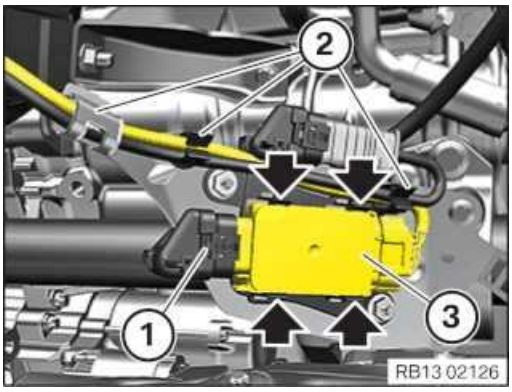
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

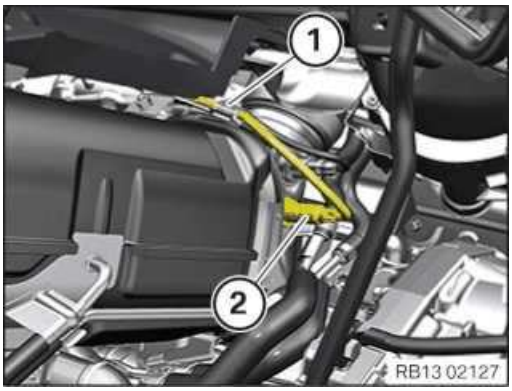
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



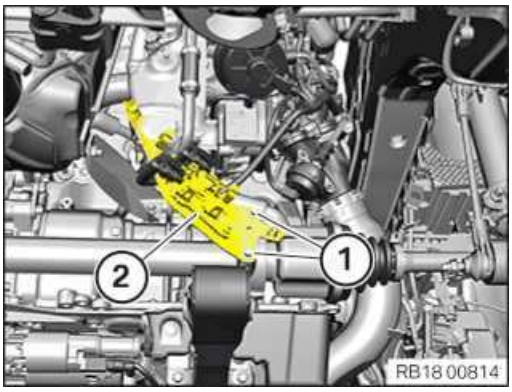
- Unlock plug connection (1) and disconnect.
- Slide the cable of the nitrogen oxide sensor evaluation electronics (3) out of the clamps (2) and remove.
- Unlock (arrows) and remove the evaluation electronics for the nitrogen oxide sensor (3).



- Slide the cable of the nitrogen oxide sensor before the SCR catalytic converter (2) out of the clamps (1) and remove.
- Detach the nitrogen oxide sensor before the SCR catalytic converter (2) using the special tool **0 491 074 (11 7 020)**.
- Guide out and remove the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

42 – Remove holder for oxygen sensor

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- Loosen screws (1).
- Thread out the holder (2) for the oxygen sensor and remove.

43 – Remove the exhaust temperature sensor on the catalytic converter

WARNING

Hot surfaces.

Risk of burning!

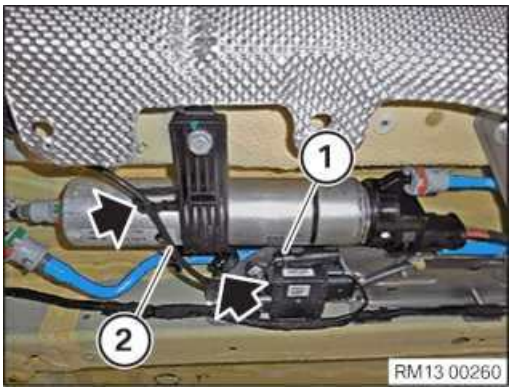
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

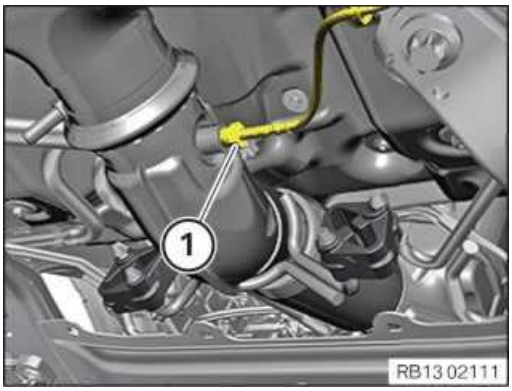


- Unlock and loosen connector (1).
- Feed out the cable (2) of the exhaust temperature sensor from the clamps (arrows) and remove.

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- Loosen the cable clip (1).



- Loosen exhaust temperature sensor (1).
- Feed out and remove exhaust temperature sensor (1).

44 – Removing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

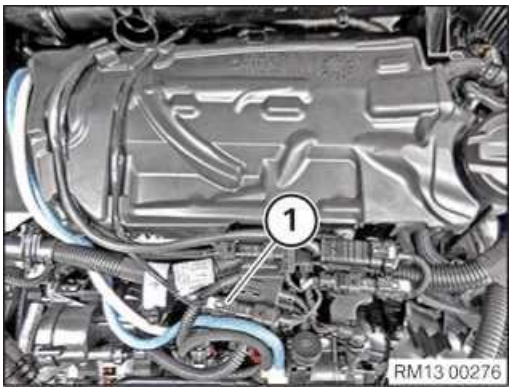
RISK OF DAMAGE

Electrostatic discharge.

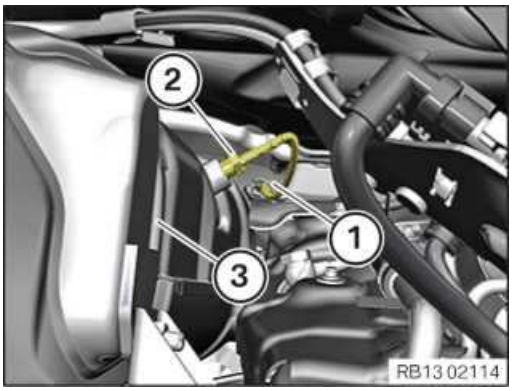
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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- Unlock and loosen connector (1).
- Uncover the exhaust temperature sensor cable.



- Guide the exhaust temperature sensor cable (2) out of the clamp (1) and place it to one side.
- Release the exhaust temperature sensor (2) with conventional tools .
- Feed out and remove the exhaust temperature sensor (2) from the diesel particulate filter (3).

45 – Remove the exhaust temperature sensor on the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

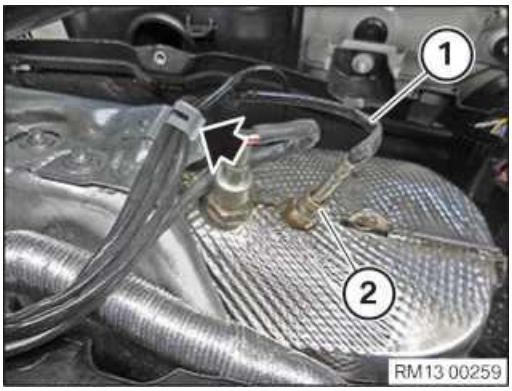
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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- Unlock and disconnect connector (1).
- Put the cable of the exhaust temperature sensor to one side.



- Guide cable (1) of the exhaust temperature sensor out of the clamp (arrow) and remove it.
- Loosen exhaust temperature sensor (2).
- Feed out and remove exhaust temperature sensor (2).

46 – Remove the control sensor

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

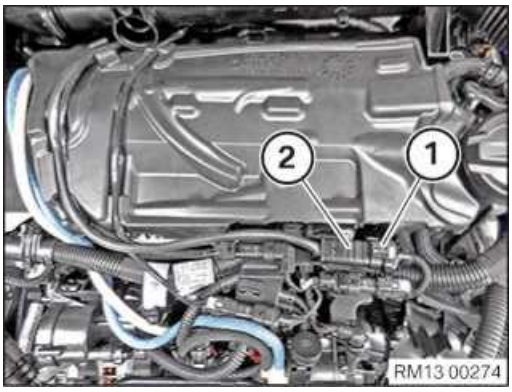
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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- Unlock plug connection (1) and disconnect.
- Detach the connector (2) from the holder .
- Release the front oxygen sensor cable.



- Detach the control sensor (1) with the special tool .
- Feed out and remove the control sensor (1).

47 – Removing the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

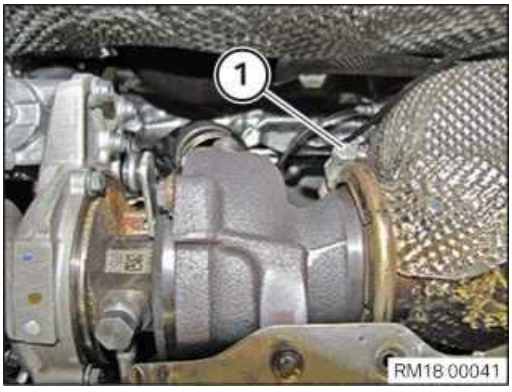
- Perform all work only on components that have cooled down.

CAUTION

Heavy component.

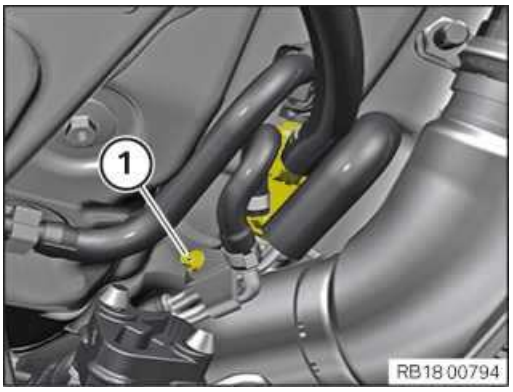
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

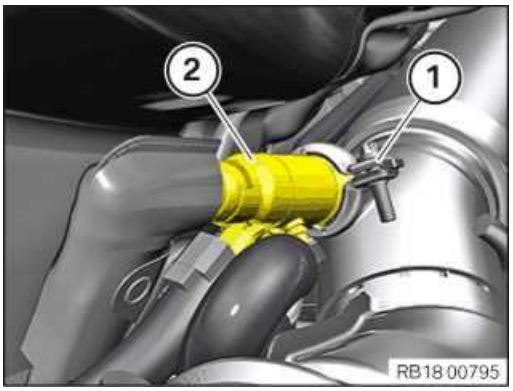


- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.

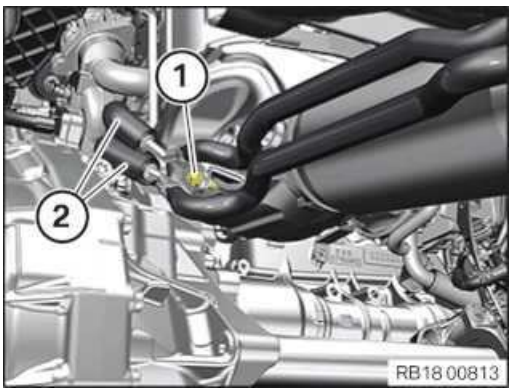
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- Loosen screw (1).



- Loosen V-band clamp (1).
- Remove the SCR metering module (2) and set it aside.



- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.

▸ **Remove differential pressure sensor**

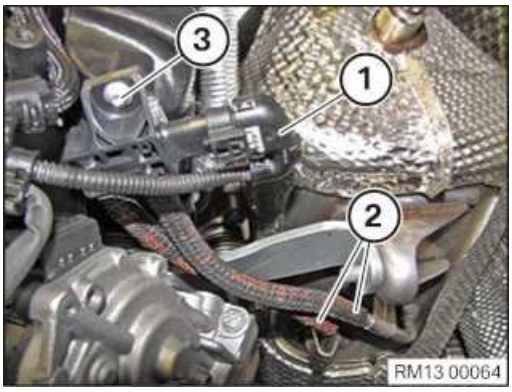
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

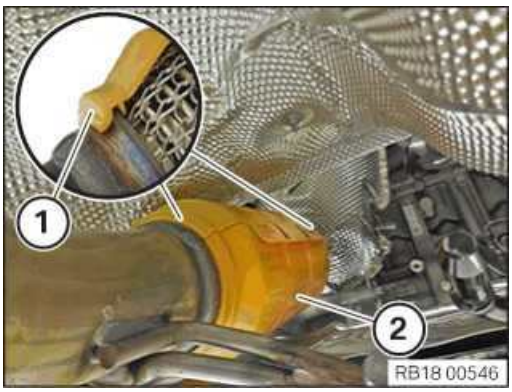
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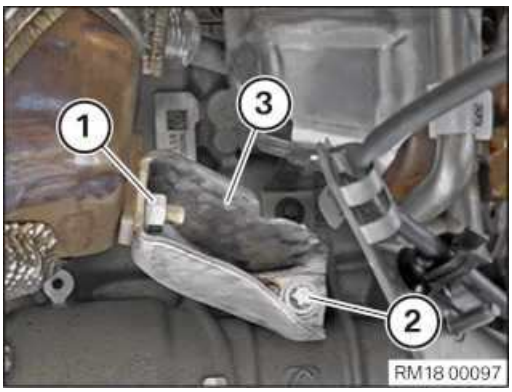
- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.



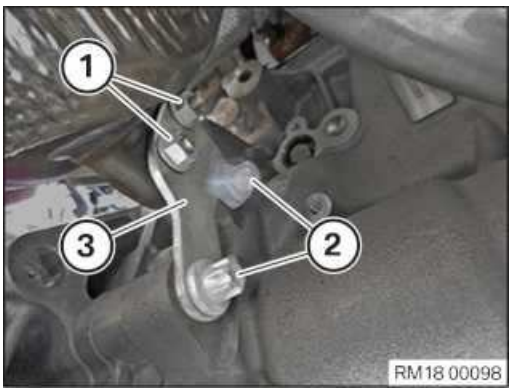
- Loosen nuts (1).



- Mount fitting aid (2).
- Make sure that the fitting aid is correctly position on the edges (1) of the flexible tube.

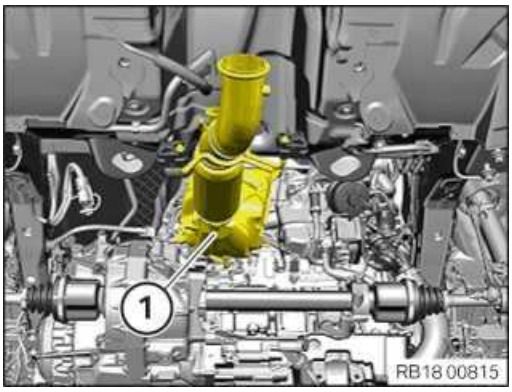


- Unfasten nut (1).
- Loosen screw (2).
- Remove holder (3).



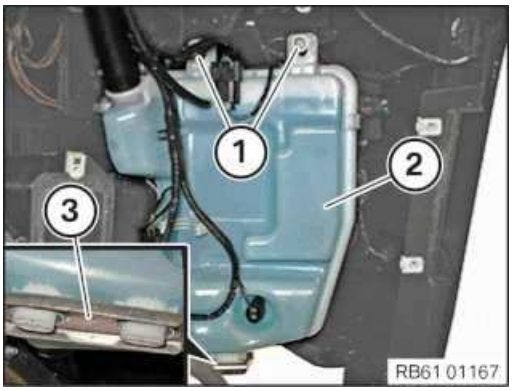
- Loosen nuts (1).
- Loosen screws (2).
- Remove holder (3).

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- Feed out diesel particulate filter (1) toward the bottom and remove.

48 – Remove the washer fluid reservoir from the fixture



- Loosen screws (1).
- Guide the washer fluid reservoir (2) up and out of the fixture (3) and set it aside.

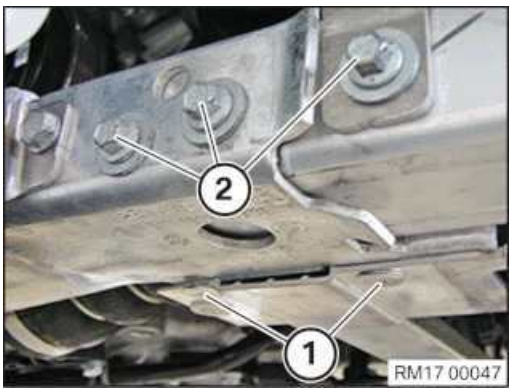
49 – Removing the right charge air duct between the exhaust turbocharger and the charge air cooler

WARNING

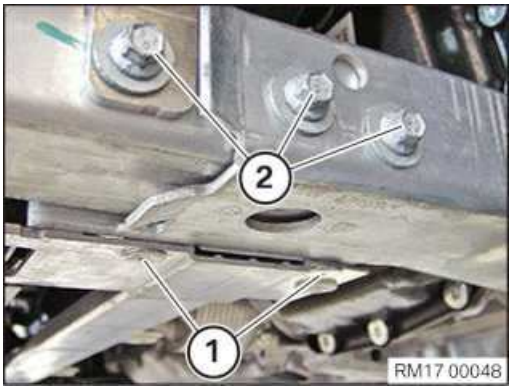
Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

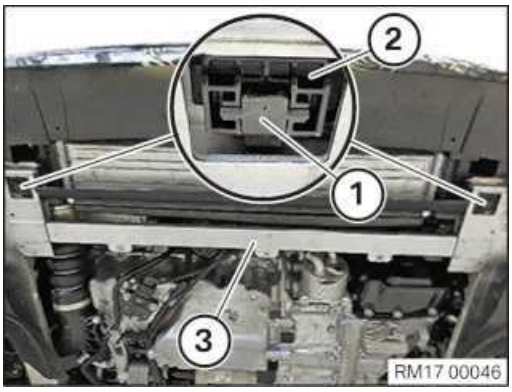


- Undo screws (2) at front left.
- Drill out blind rivets (1) at front left.

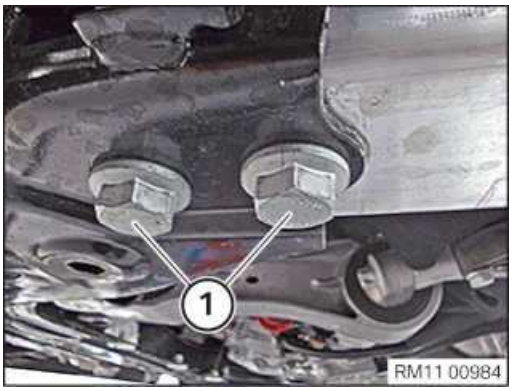


- Undo screws (2) at front right.
- Drill out blind rivets (1) at front right.

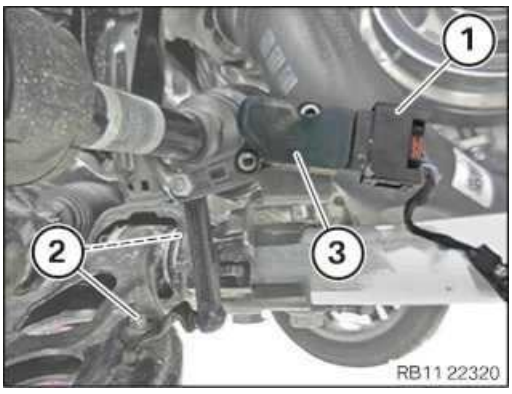
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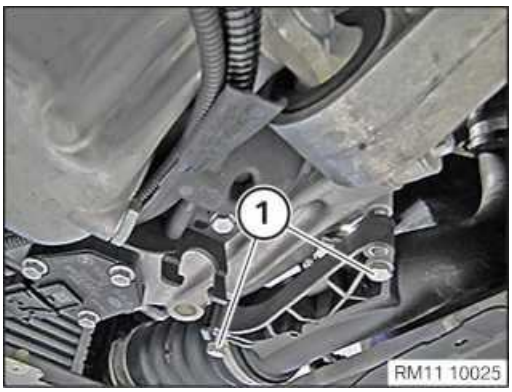
- Unlock locking pins (1).
- Thread out and remove locks (2).
- Thread out and remove cross connection (3).



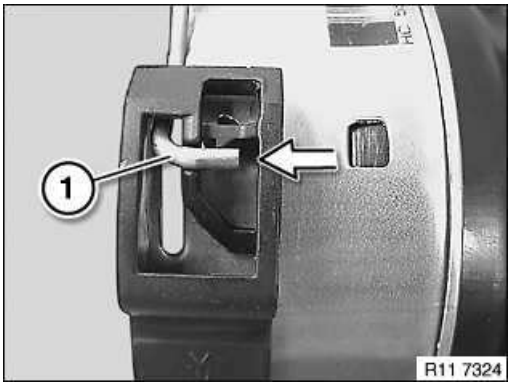
- Release the screws (1) on the right front axle support.



- **If installed:**
- Unlock and release plug connection (1).
- Loosen screws (2).
- Feed out the ride height sensor (3) and remove.



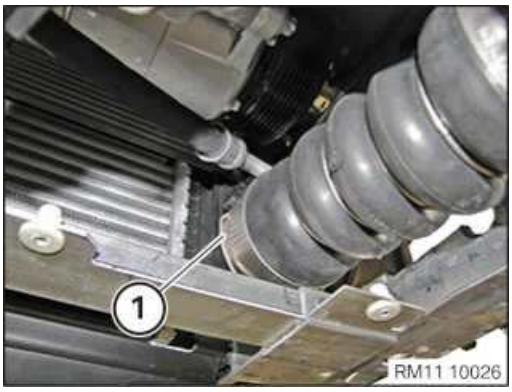
- Release screws (1) of charge air duct on right oil sump.



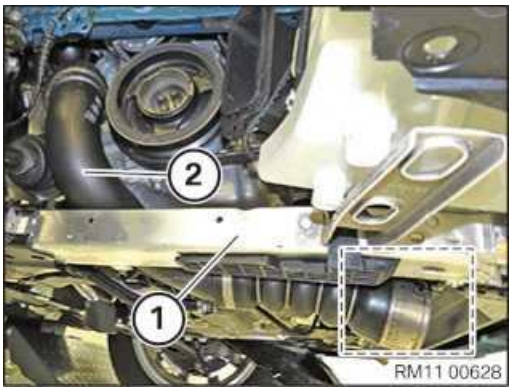
- Unlock lock (1).

  The lock (1) must engage in the bracket during unlocking (arrow).

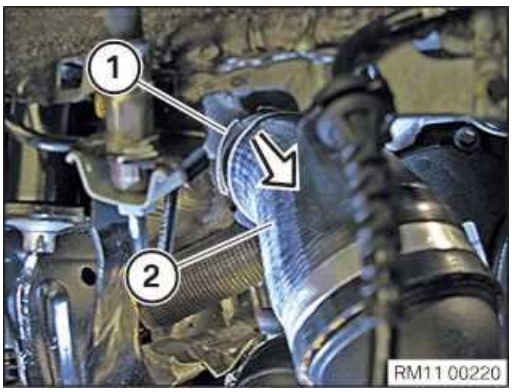
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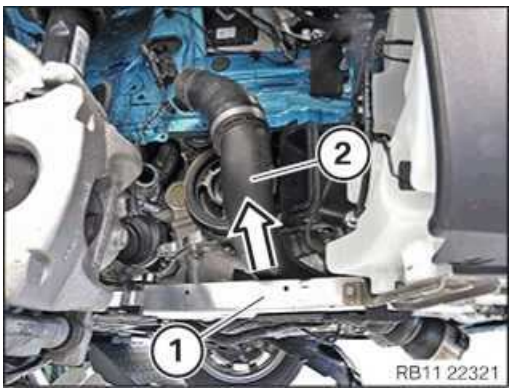
- Unlock and release the charge air duct (1) on the charge air cooler.



- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed out the charge air duct (2) in the **marked** area towards the bottom and set it aside.



- Unlock and detach the locks (1) on both sides.
- Feed out the charge air duct (2) on the exhaust turbocharger in the direction of the arrow and set it aside.



- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed out the charge air duct (1) in the direction of arrow between the side member and the deformation element and remove.

50 – Remove the heat shield from the exhaust turbocharger at the bottom

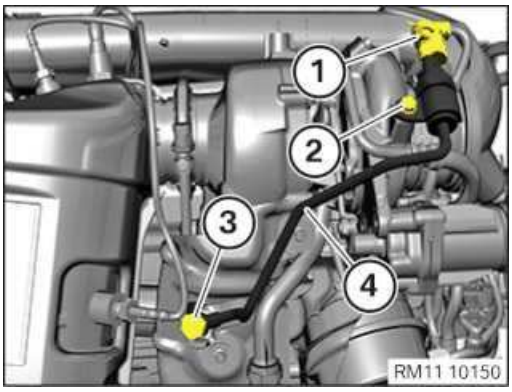
WARNING

Hot surfaces.

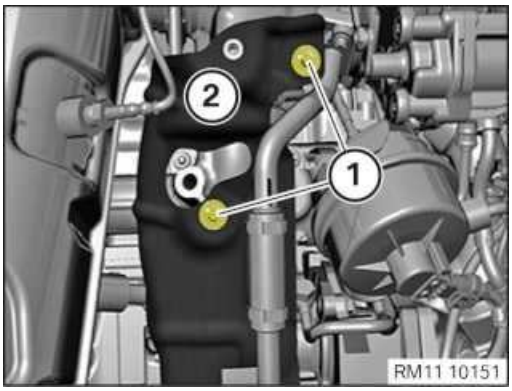
Risk of burning!

- Perform all work only on components that have cooled down.

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- Unlock and disconnect connector (1).
- Unscrew the banjo bolt (3).
- The seals of the banjo bolt (3) must be renewed.
- Loosen screw (2).
- Remove the exhaust gas pressure pipe (4).



- Unscrew the bolts (1) on the heat shield .
- Feed out and remove the heat shield (2).

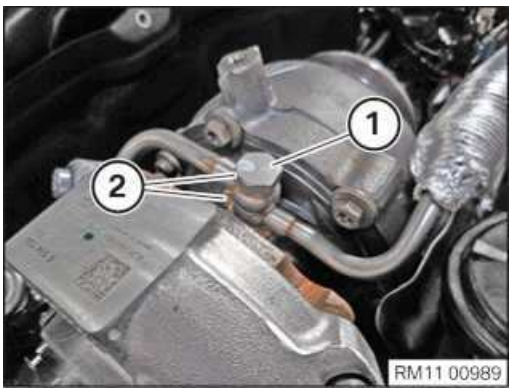
51 – Removing the low-pressure stage turbocharger

WARNING

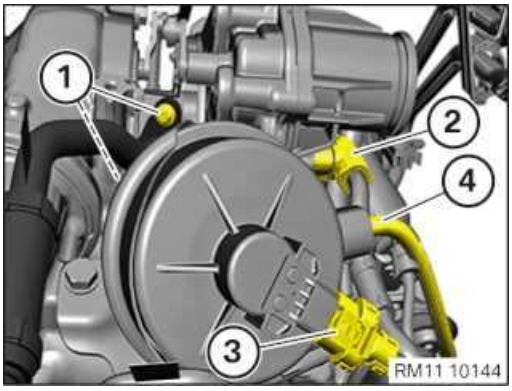
Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

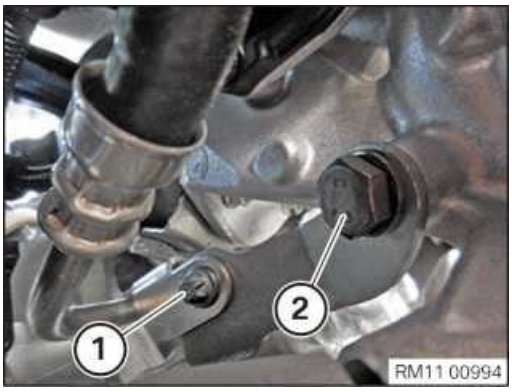


- Release the banjo bolt (1) of the oil feed lines.
- Remove sealing rings (2).
- Place oil feed lines to one side.



- Release the screws (1) of the oil return line.
- Unlock and disconnect the plug connections (2) and (3).
- Pull off the vacuum hose (4) carefully.

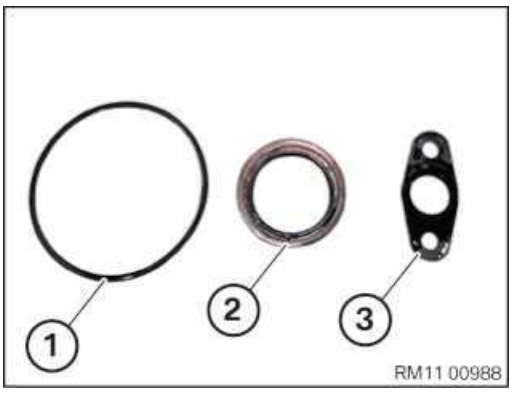
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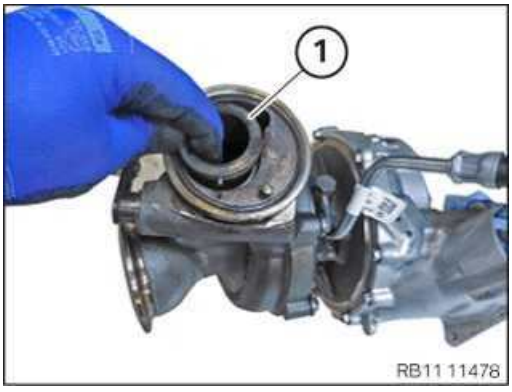
- Undo the bolt (1) of the oil feed line.
- Loosen screw (2).



- Loosen screw (1).
- Remove the V hose clamp.
- Guide the low-pressure stage turbocharger out towards the top and remove.



- Remove seals (1), (2) and (3).



- Remove the spacer ring (1).

MAIN WORK

52 – Removing the high-pressure stage exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

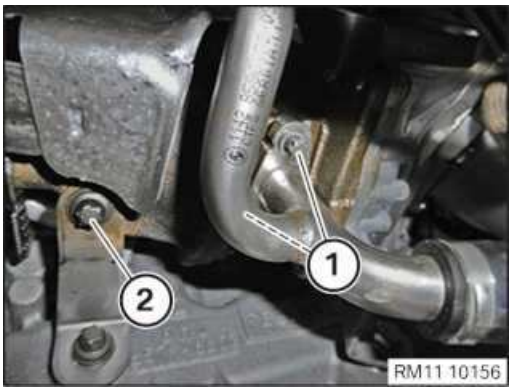
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CAUTION

Heavy component.

Heavy components can lead to injury or damage.

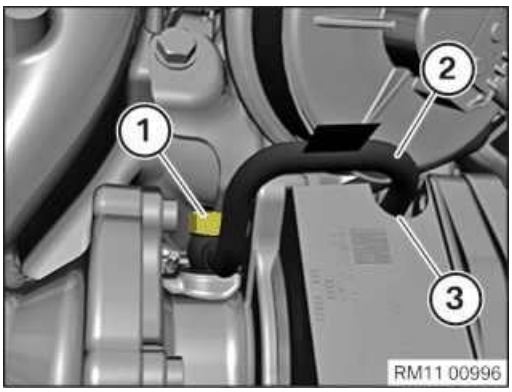
- Remove and install heavy components with the aid of another person/other persons.



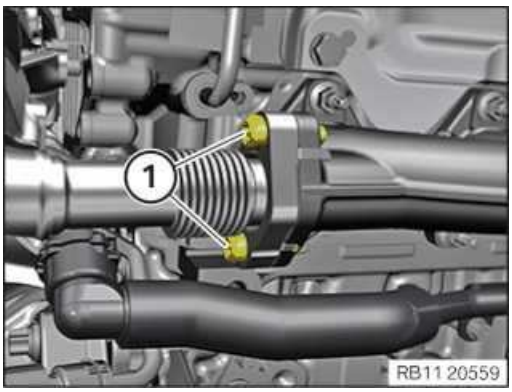
- Unscrew the bolts (1) on the oil return line .
- Loosen screw (2).



- Release screw (1) from the right wheel arch.

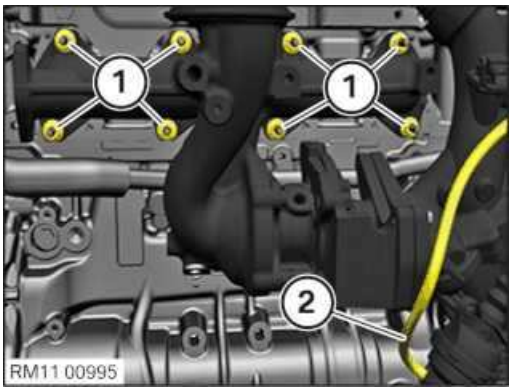


- Unscrew the banjo bolt (1).
- Guide out oil feed line (2) from holder (3).



- Loosen screws (1).

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- Pull off the vacuum hose (2).
- Loosen nuts (1).
- Guide out the exhaust manifold and the high-pressure stage exhaust turbocharger to the top and remove them.

53 – When replacing the exhaust turbocharger

TECHNICAL INFORMATION

- It is imperative to perform certain test steps to prevent subsequent damage in the event of exhaust turbocharger damage. See further information.

54 – Installing the high-pressure stage exhaust turbocharger

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to the surface.

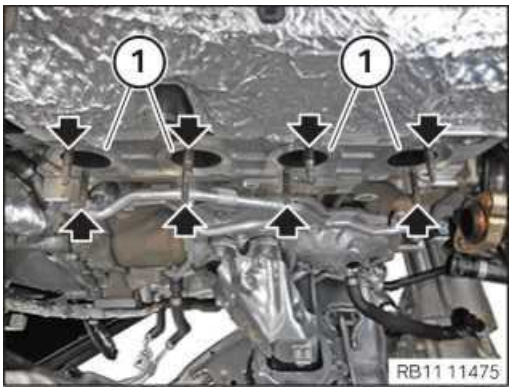
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

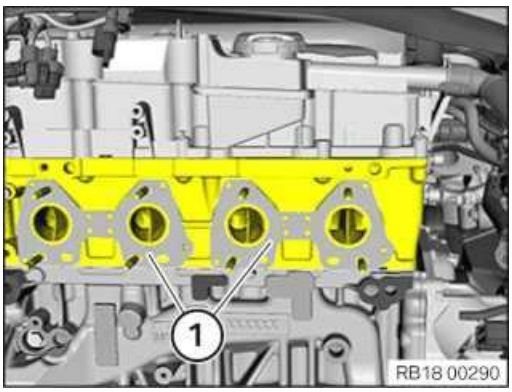
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- Clean the sealing surfaces (1) on the cylinder head using special tool **0 495 102 (11 4 470)**.
- Check the stud bolts (arrows) on the cylinder head for correct fit.

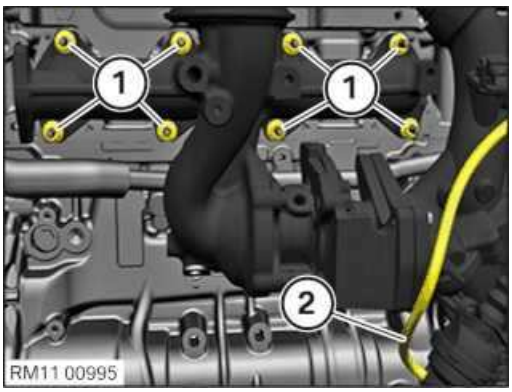


- Clean the sealing surfaces on the exhaust manifold using special tool **0 495 102 (11 4 470)**.



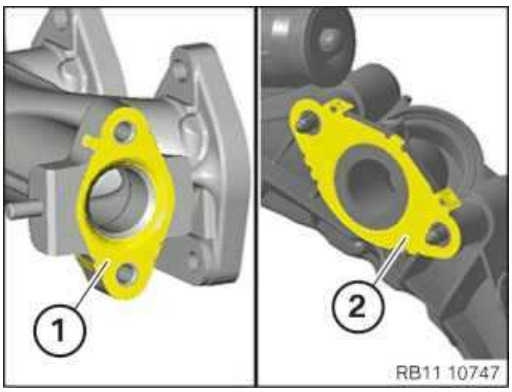
- Renew gasket (1).

  Parts: Gasket
- Install new gasket (1).



- Feed in and install the exhaust manifold and the high-pressure stage exhaust turbocharger.
- Tighten nuts (1).

  Parts: Nuts
- Connect vacuum hose(2).

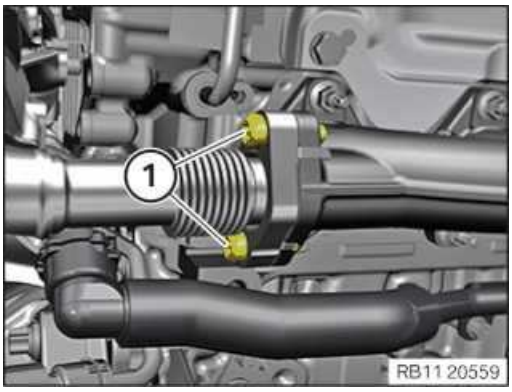


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket
- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket

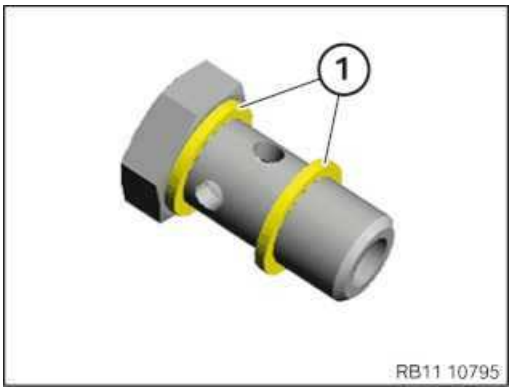
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- Tighten the screws (1).

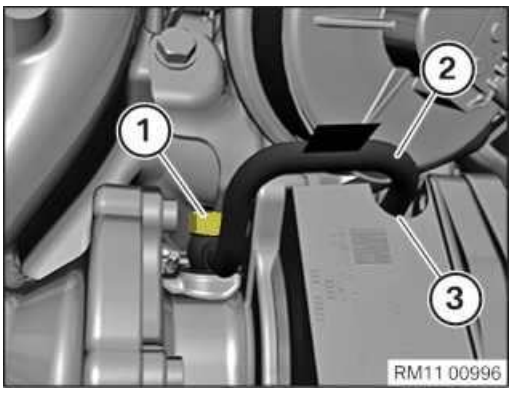
Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm

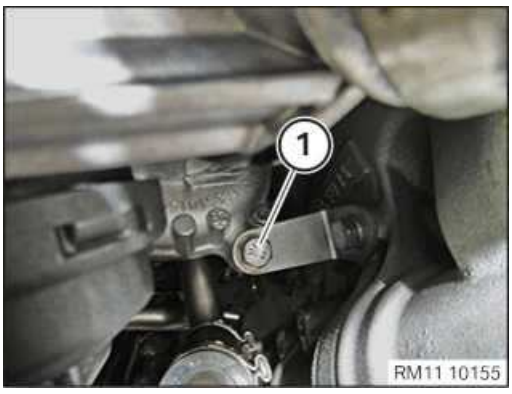


- Renew sealing rings (1) of banjo bolt.

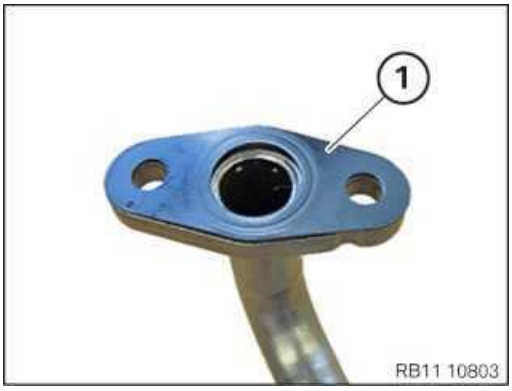
  Parts: Sealing ring



- Guide the oil feed line into the holder (3) and install it.
- Tighten down screw (1).



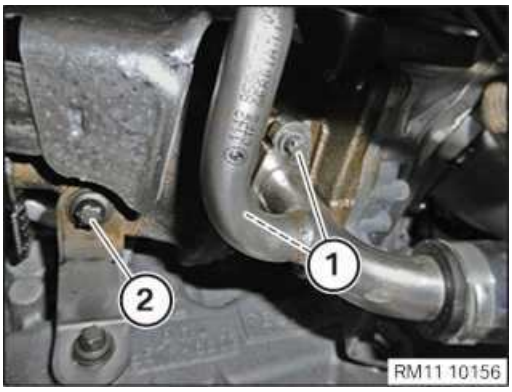
- Tighten bolt (1) from the right wheel arch.



- Renew seal (1) of oil return line.

  Parts: Gasket

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- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

POSTPROCESSES

55 – Prepare for the installation of the exhaust turbocharger

- Check the oil feed lines and the oil return lines for contamination or obstruction, clean or renew if necessary.
- If the oil feed lines and/or oil return lines are heavily contaminated, we recommend changing the engine oil and the oil filter.
- If installed: Check the coolant feed lines and the coolant return lines for the exhaust turbocharger for contamination or obstruction, clean or renew if necessary.
- Check that the screw connections and the plug connections of all the lines are correct.
- Check air cleaner for contamination and clean or renew as needed.
- Check correct functioning of crankcase ventilation.
- Replace all gaskets.

  Parts: Seals

56 – Installing the low-pressure stage turbocharger

RISK OF DAMAGE

Damage to the surface.

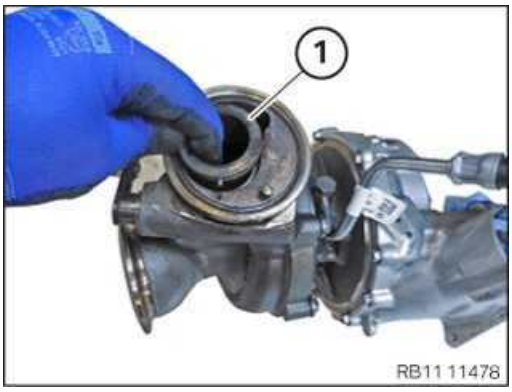
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

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- Check the spacer plug (1) for damage, renew if necessary.

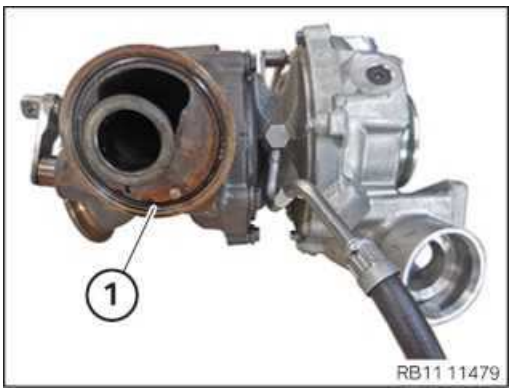
  Parts: Spacer ring
- Insert and install the spacer ring (1).
- Position spacer ring (1) correctly.



- Renew gasket (1).

  Parts: Gasket
- Position the seal (1).
- Renew the sleeve(2).

  Parts: Holding sleeve



- Renew sealing ring (1).

  Parts: Sealing ring
- Affix the sealing rings on the exhaust turbocharger.

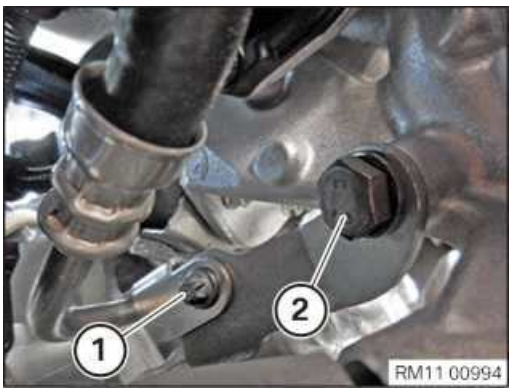


- Insert and install the low-pressure stage exhaust turbocharger on the exhaust manifold .
- Feed in and install V-band clamp .
- Tighten V-band clamp (2).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Screw in nut (1) with 2 **revolutions**.



- Tighten down screw (1).

Oil feed line to bracket

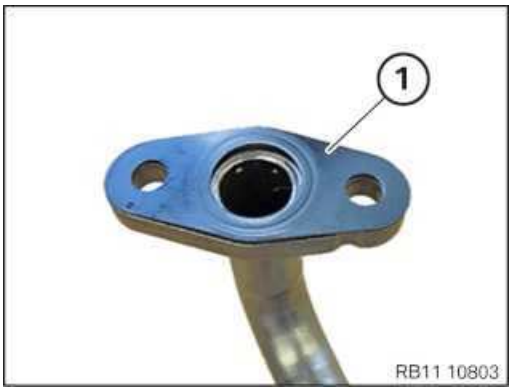
Torx screw M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

Holder to exhaust turbocharger and crankcase

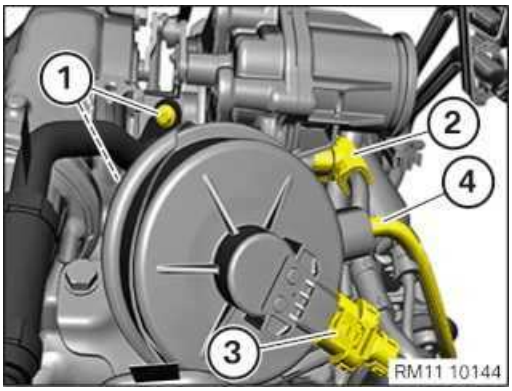
M8x16		Tightening torque	22 Nm

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- Renew seal (1) on the oil return line.

  Parts: Gasket



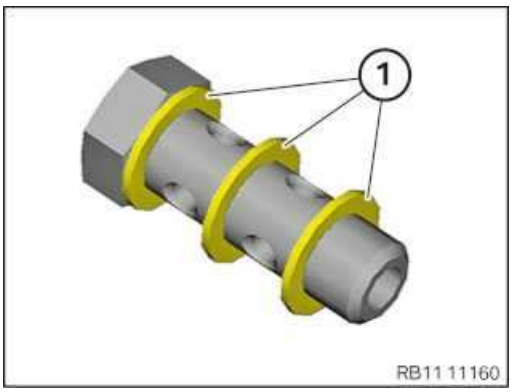
- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

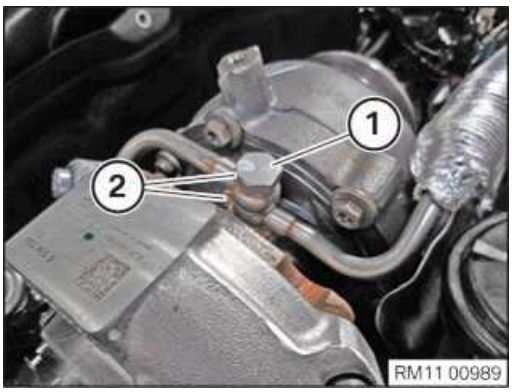
M6x12		Tightening torque	8 Nm

- Connect and lock connectors (2) and (3).

  The locks must engage audibly.
- Connect vacuum hose (4).



- Renew banjo bolt and sealing rings (1).
- **Parts:** Banjo bolt, sealing rings



- Install sealing rings (1).
- Tighten the banjo bolt (1).
- Ensure that the lines do not rest against the adjacent components.

57 – Installing heat shield on exhaust turbocharger at bottom

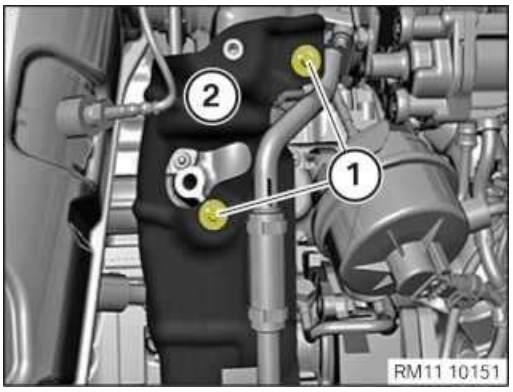
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

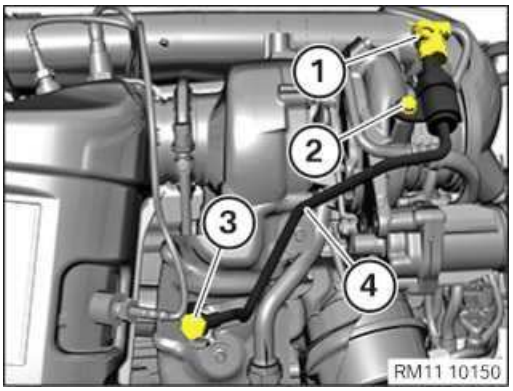
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- Feed in and install the heat shield (2).
- Tighten the bolts (1) on the heat shield .

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm



- Position the exhaust gas pressure pipe (4).
- Hand-tighten the bolt (2).
- Renew sealing rings on the banjo bolt (3).

  Parts: Sealing ring
- Tighten the banjo bolt (3).

Banjo bolt for exhaust pressure pipe to exhaust manifold

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

- Tighten down screw (2).

Standard screw connection M6

M6		8 Nm

- Connect connectors (1) and lock.

  Lock must audibly engage.

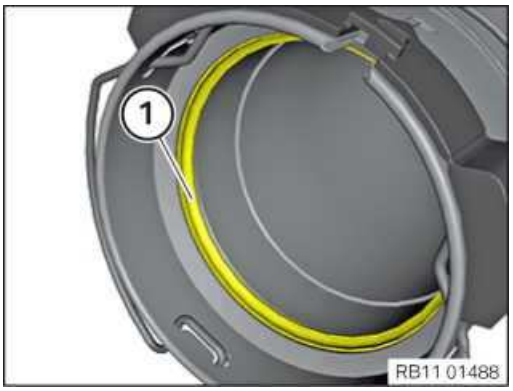
58 – Installing the right charge air duct between the exhaust turbocharger and the charge air cooler

RISK OF DAMAGE

Damage to the exhaust turbocharger.

A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.



- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

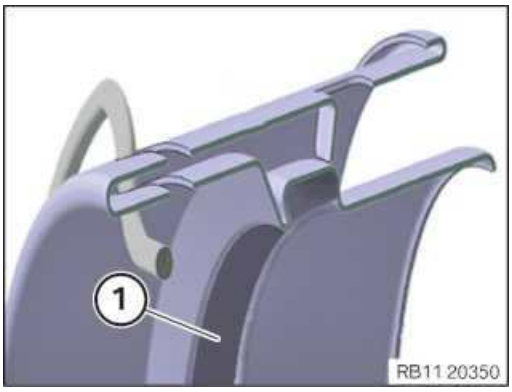
  Parts: Gasket

▸ **Replace damaged gasket**

TECHNICAL INFORMATION

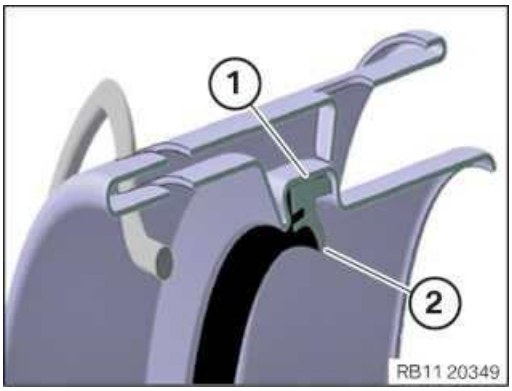
Do not use pointed or sharp-edged tools for the installation and/or removal.

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- Remove damaged seal.
- Clean gasket groove (1) with a dry towel.

  The gasket groove (1) must be clean.



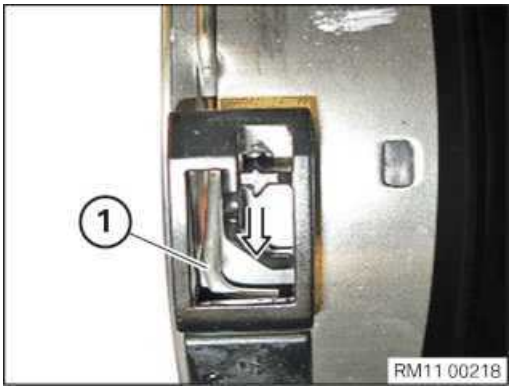
- Renew gasket.

  Parts: Gasket
- Install seal dry without lubricant or mounting agent.

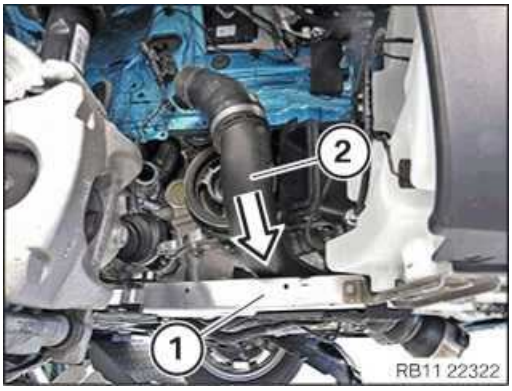
TECHNICAL INFORMATION

Incorrect assembly is possible. Ensure correct installation position.

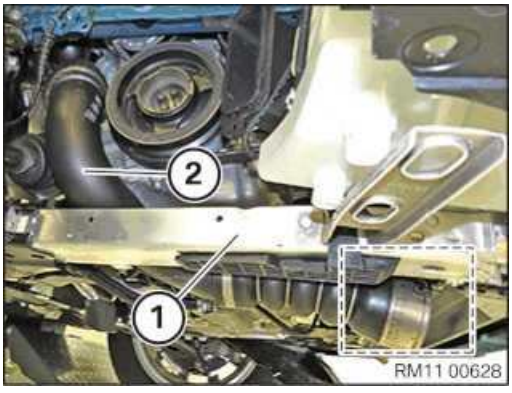
- Feed in and install the seal.
- Make sure the seal is correctly installed in the gasket groove (1).
- Make sure that the sealing lip (2) is pointing downwards (see figure).



- Detach the locks (1) in the direction of the arrow from the brackets.
- Ensure that the locks (1) engage audibly.

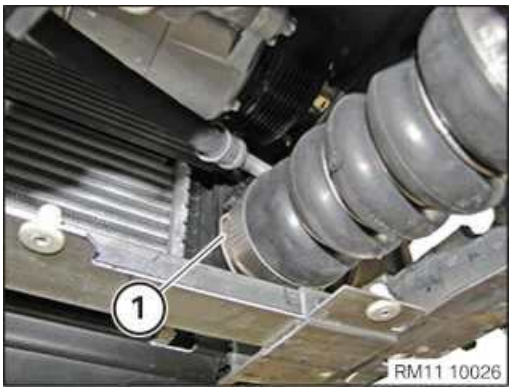


- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed in the charge air duct (1) in the **direction** of arrow between the side member and the deformation element and position.

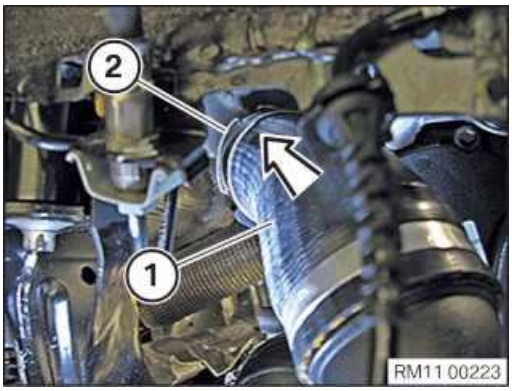


- Pull the adapter of the front axle support (1) downwards to the front right.
- Position the charge air duct (2) in **marked** area on the charge air cooler.

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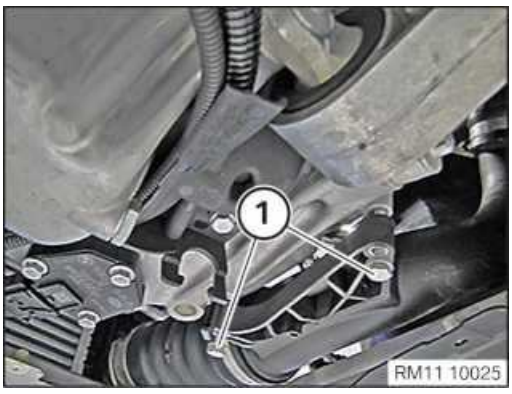


- Feed in and install the charge air duct (1) on the charge air cooler .
- Make sure the charge air duct (1) engages audibly on the charge air cooler.



- Feed in and install charge air duct (1) in the **direction** of the arrow on exhaust turbocharger.

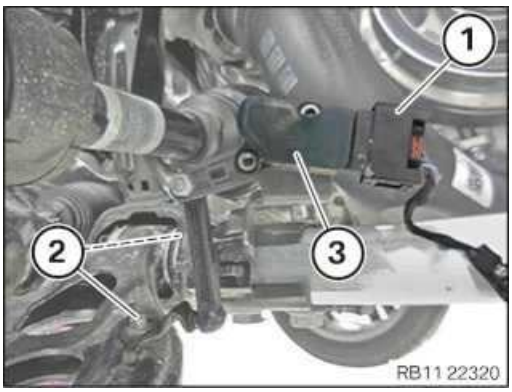
  The locks (2) must engage audibly.



- Tighten the screws (1).

Charge air duct to oil sump

M6		Tightening torque	8 Nm



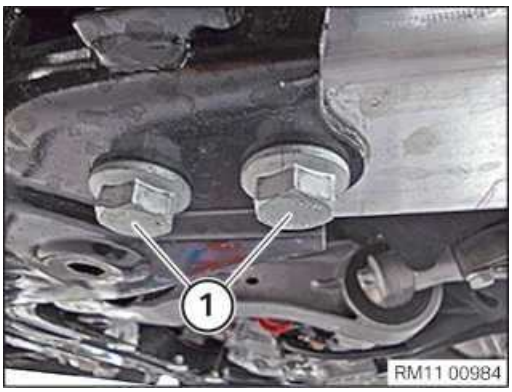
- **If installed:**
- Feed in and install the ride height sensor (3).
- Tighten the screws (2).

Ride height sensor holder to front axle support

M6		Tightening torque	8 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

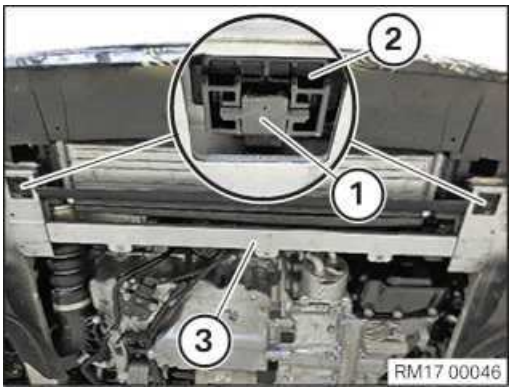


- Tighten the screws (1) on the adapter of the front axle support.

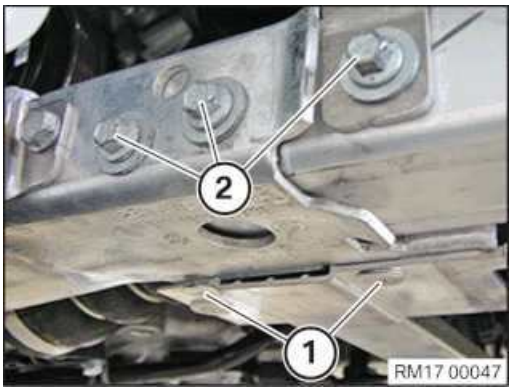
Adapter, front axle support to front axle support

		Tightening torque	100 Nm

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- Guide in cross connection (3) and install.
- Guide in locks (2) and install.
- Lock the locking pins (1).
- Ensure that the locking pins (1) audibly engage.



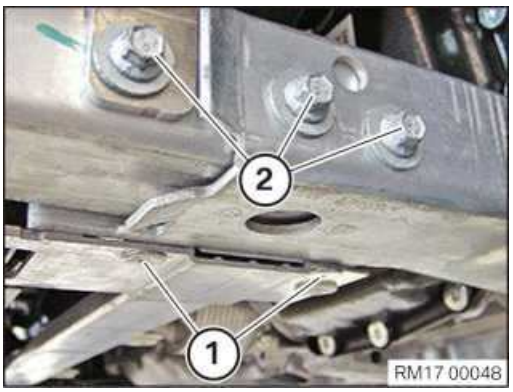
- Tighten the bolts (2) at the front left.

Cross connection to front axle support

M6		Tightening torque	12 Nm

- Renew the blind rivet (1).

  Parts: Blind rivet
- Mount the blind rivets (1) at the front left.



- Tighten the bolts (2) at the front right.

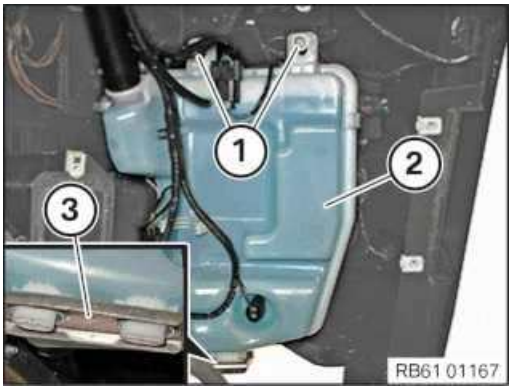
Cross connection to front axle support

M6		Tightening torque	12 Nm

- Renew the blind rivet (1).

  Parts: Blind rivet
- Mount the blind rivets (1) at the front right.

59 – Install the washer fluid reservoir in the fixture



- Feed washer fluid reservoir (2) into the mounting (3) and install.
- Tighten the screws (1).

Washer fluid reservoir to body

M6x20		Tightening torque	8 Nm

60 – Installing the diesel particulate filter

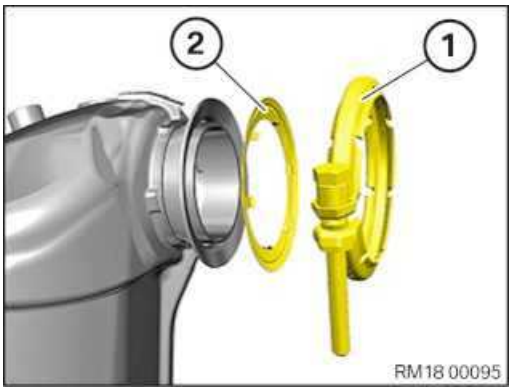
CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

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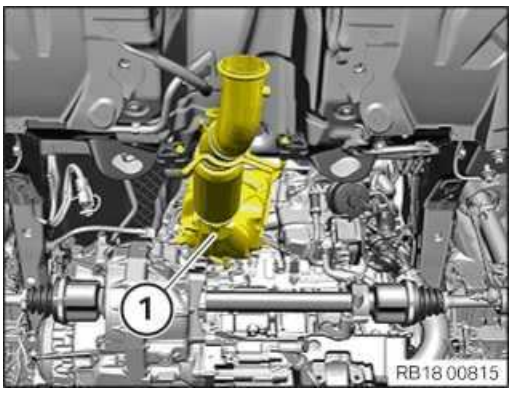
- Renew the V-clip (1).

  Parts: V-band clamp
- Renew the gasket (2).

  Parts: Gasket



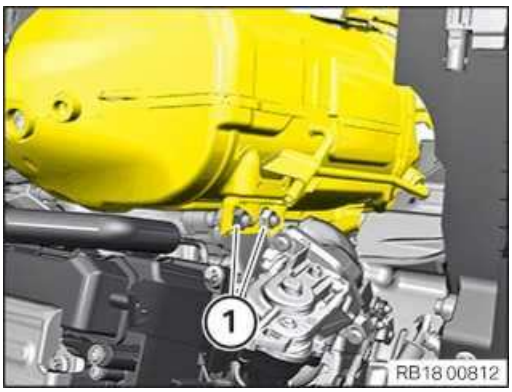
- Before installing the diesel particulate filter: Mount fitting aid (1) for the flexible tube.



- Carefully insert and install the diesel particulate filter (1).

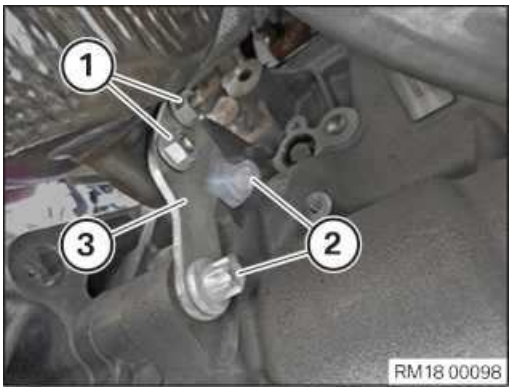


- Feed in and install V-band clamp (1).
- Make sure that the seal between the diesel particulate filter and the exhaust turbocharger is installed correctly.
- Align the diesel particulate filter on the exhaust turbocharger.
- Position V-clip (1).
- Hand-tighten the V-clip (1).

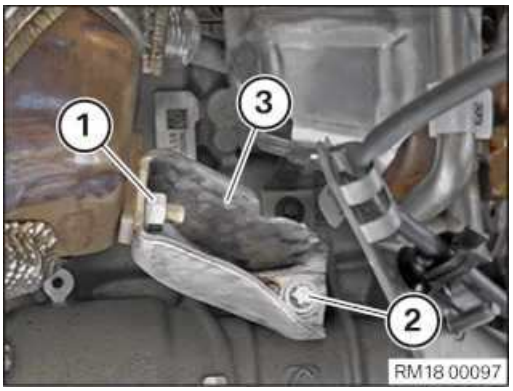


- Tighten nuts (1) by hand.

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- Install holder (3).
- Hand-tighten the bolts (2).
- Tighten nuts (1) by hand.



- Install holder (3).
- Tighten the nut (1) hand-tight.
- Hand-tighten the bolt (2).



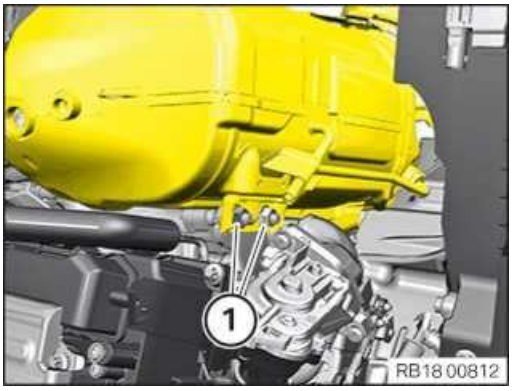
- Remove fitting aid (1) for the flexible tube.



- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

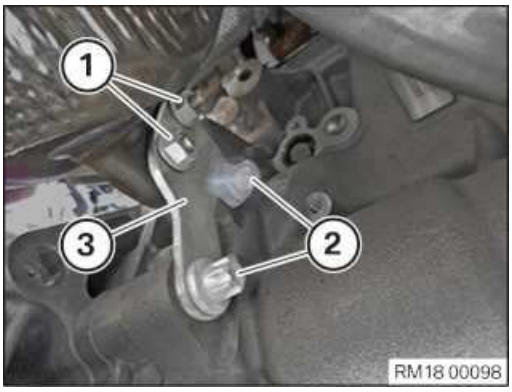


- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm

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- Tighten down screws (2).

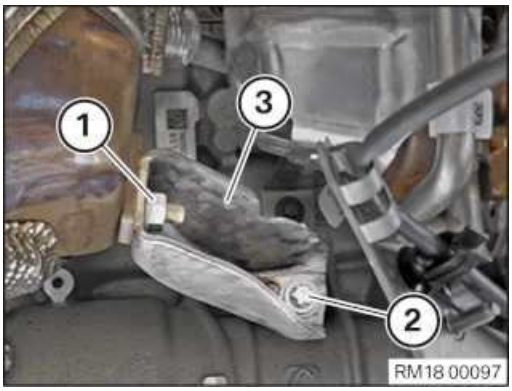
Diesel particulate filter holder to gearbox

M12x75		Tightening torque	66 Nm

- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screw (2).

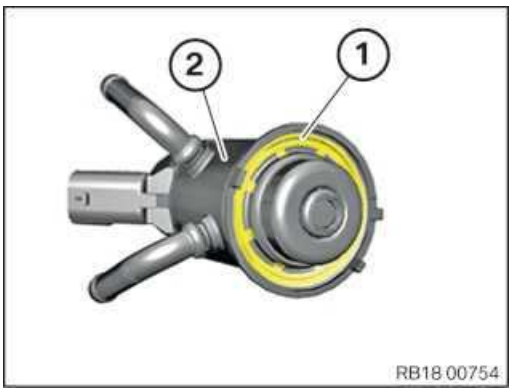
Diesel particulate filter bracket to crankcase

M10x35		Tightening torque	38 Nm

- Tighten nut (1).

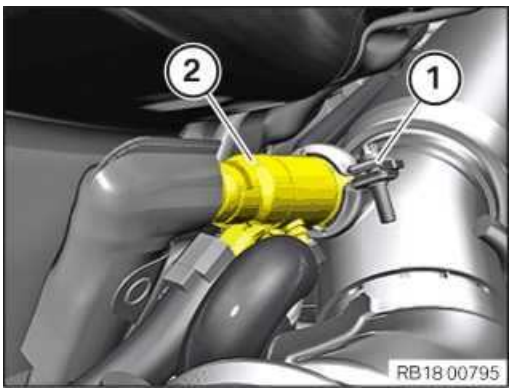
Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Renew sealing ring (1) of the SCR metering module (2).

  Parts: Sealing ring

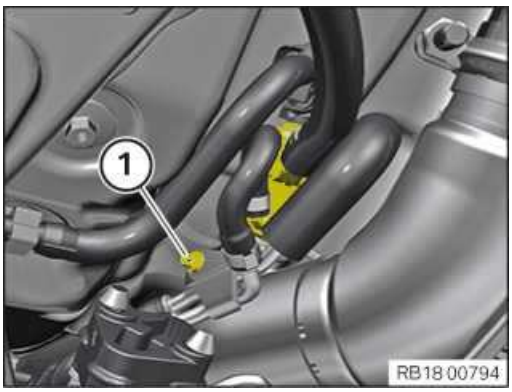


- Insert and install the SCR metering module (2).
- Renew the V-clip (1).

  Parts: V-band clamp
- Tighten V-band clamp (1).

SCR metering module V-clip to exhaust system

V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm

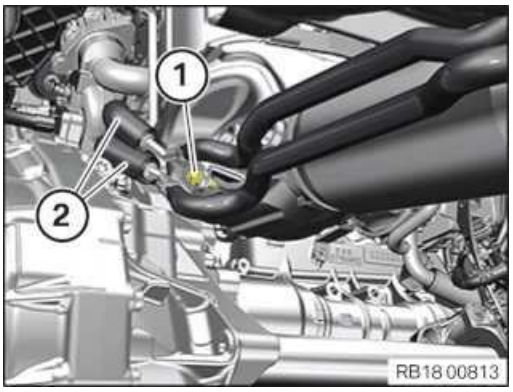


- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm

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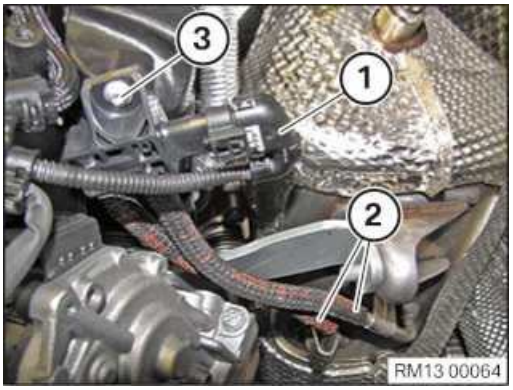


- Thread in and install coolant line (2) of the SCR metering module.
- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm

▸ **Installing differential pressure sensor**



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

61 – Install the control sensor

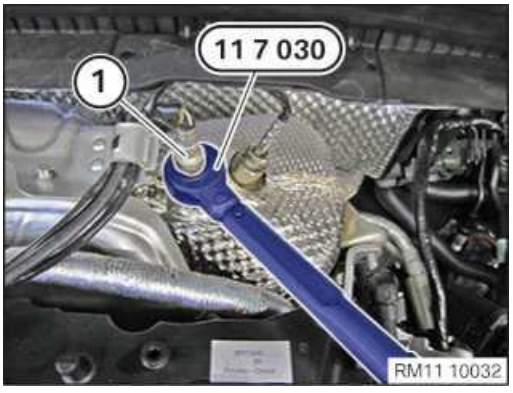
TECHNICAL INFORMATION

New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

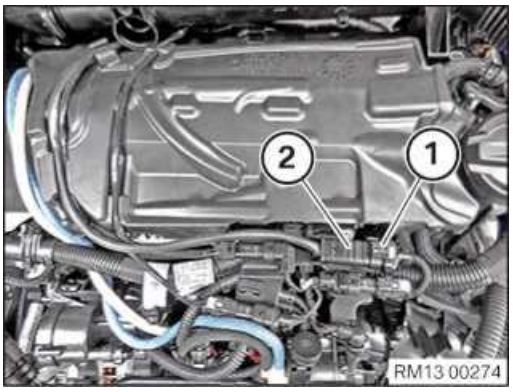


- Feed in front oxygen sensor (1) and install.
- Tighten front oxygen sensor (1) using special tool .

Control sensor

Control sensor		Tightening torque	50 Nm

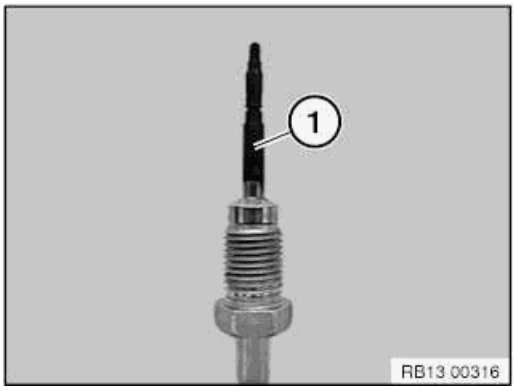
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- Lay and secure cable of oxygen control sensor.
- Secure the connector (2) to the holder.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

62 – Install the exhaust-gas temperature sensor on the diesel particulate filter



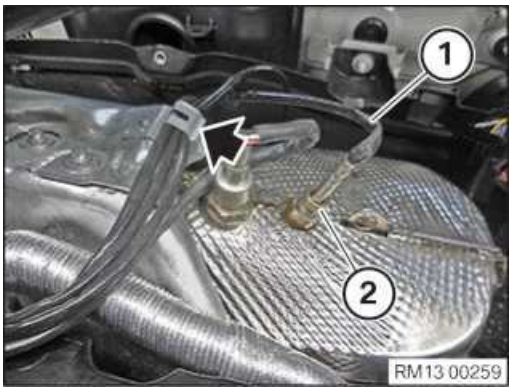
RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

- Check the gauge tip (1) for damage and renew the exhaust temperature sensor as needed.



- Feed in and install the exhaust temperature sensor (2).
- Tighten the exhaust temperature sensor (2).

Exhaust temperature sensor to diesel particulate filter

Exhaust-gas temperature sensor		Tightening torque	28 Nm

- Insert and install cable (1) of the exhaust temperature sensor in the clamp (arrow).



- Lay and fasten the cable of the exhaust gas temperature sensor.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

63 – Installing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

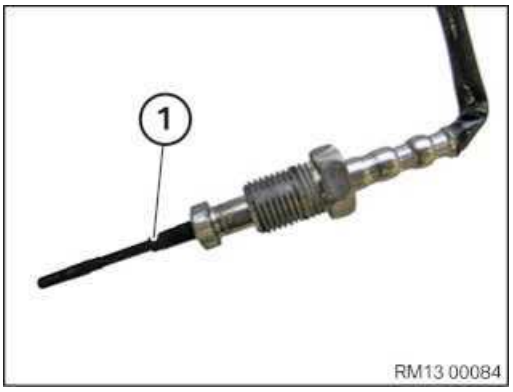
RISK OF DAMAGE

Damage of exhaust temperature sensor.

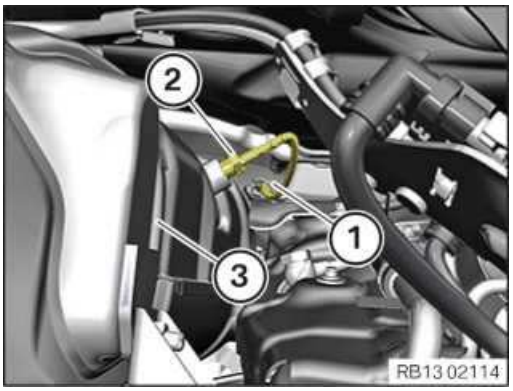
Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

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- Make sure the gauge tip (1) is not damaged during installation.



- Guide the exhaust temperature sensor (2) into diesel particulate filter (3) and install.
- Tighten the exhaust temperature sensor (2) with conventional tools .

Exhaust temperature sensor to diesel particulate filter

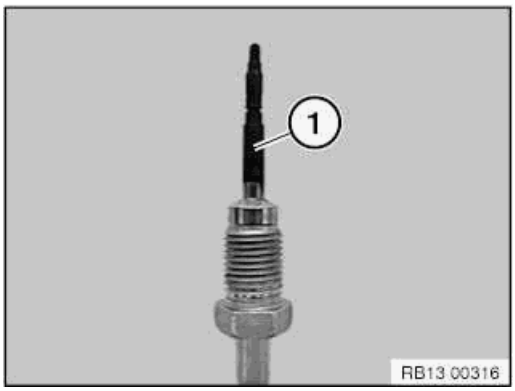
Exhaust-gas temperature sensor		Tightening torque	28 Nm



- Insert and install the cable of the exhaust temperature sensor (2) in the clamps (1).
- Lay and fasten the cable of the exhaust gas temperature sensor.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

64 – Installing exhaust temperature sensor on catalytic converter



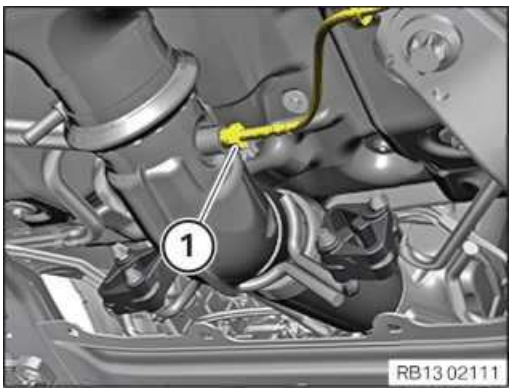
RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

- Check the gauge tip (1) for damage and replace the exhaust temperature sensor as needed.



- Feed in and install the exhaust temperature sensor (1).
- Tighten the exhaust temperature sensor (1).

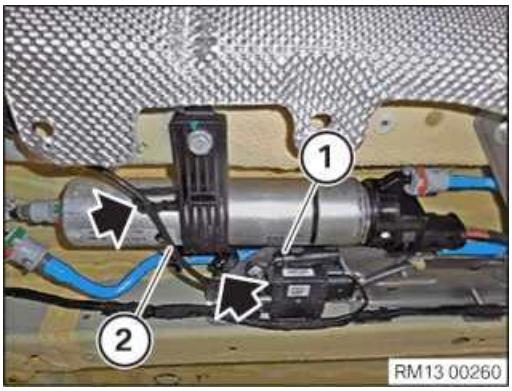
Exhaust-gas temperature sensor to exhaust system

Exhaust-gas temperature sensor		Tightening torque	28 Nm

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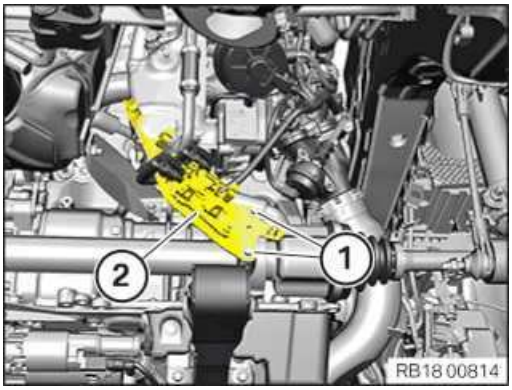
- Secure the cable clips (1).



- Feed cable (2) from exhaust temperature sensor into the clamps (arrows) and install.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

65 – Install holder for oxygen sensor

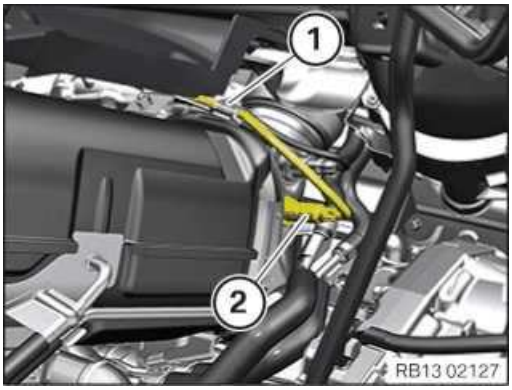


- Insert and install the holder (2).
- Tighten the screws (1).

Oxygen sensor holder to intermediate shaft

Hexagon screw M6x16		Tightening torque	8 Nm

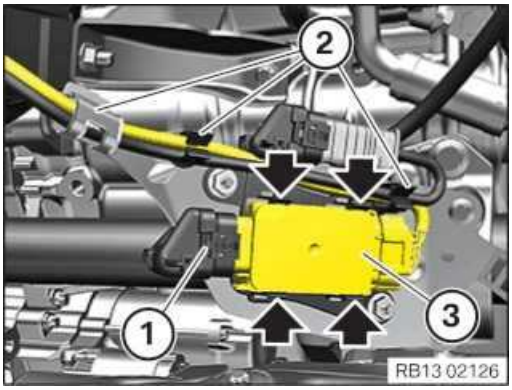
66 – Installing the nitrogen oxide sensor before SCR catalytic converter



- Insert nitrogen oxide sensor before the SCR catalytic converter (2) and install.
- Tighten the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

Nitrogen oxide sensor before SCR catalytic converter

Sensor		Tightening torque	50 Nm



- Install and lock the evaluation electronics for the nitrogen oxide sensor (3) (arrows).
- Insert the evaluation electronics cable for the nitrogen oxide sensor (3) into the clamps (2) and install.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

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67 – Install the monitoring sensor

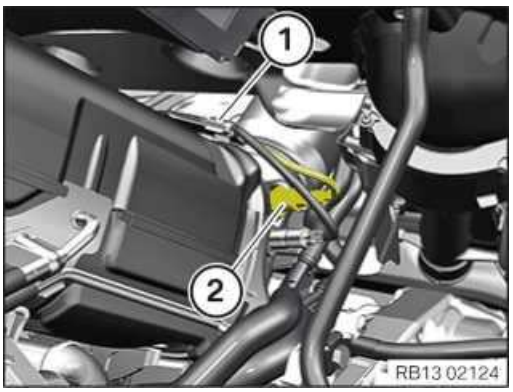
TECHNICAL INFORMATION

New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

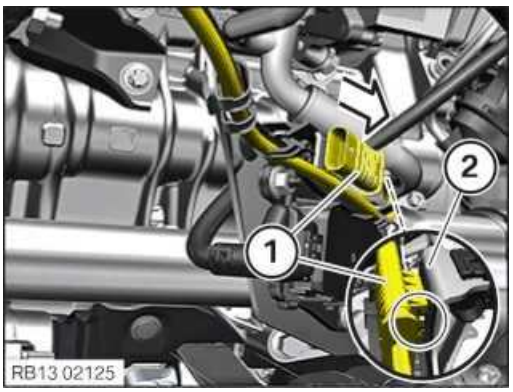


- Feed in the monitoring oxygen sensor (2) and install.
- Tighten the monitoring oxygen sensor (2) with special tool **0 491 074 (11 7 020)**.

Monitoring sensor

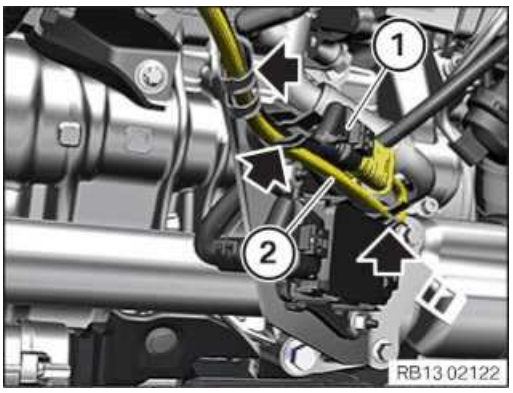
Sensor		Tightening torque	50 Nm

- Insert the cable of the monitoring oxygen sensor (2) into the clamp (1) and secure it.



- Connect the connector (1) with the bracket (2) in the direction of arrow.
- Make sure that the connector (1) is locked correctly in the marked area.

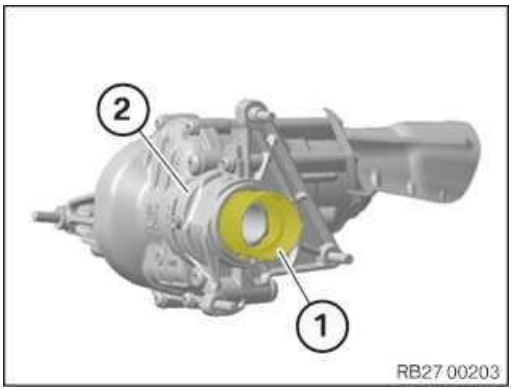
  The connector (1) must engage audibly.



- Insert and attach the cable of the monitoring oxygen sensor (2) to the clamps (arrows).
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

68 – Install the transfer box (VTG)



- If intermediate shaft (1) gets caught on transfer box (VTG) (2), renew intermediate shaft (1) and the radial shaft seals in the automatic or manual transmission.

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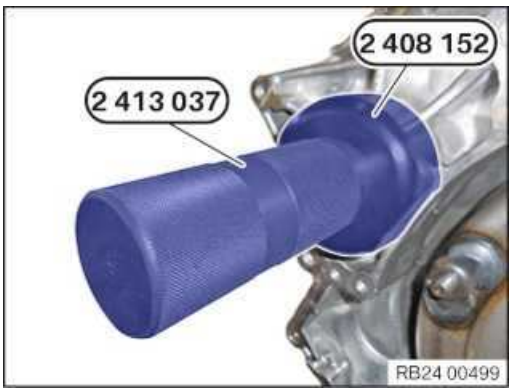
- Screw special tool **2 409 025** into the outer radial shaft seal.
- Turn the screw on the special tool **2 409 025** until the outer radial shaft seal has been pulled out.



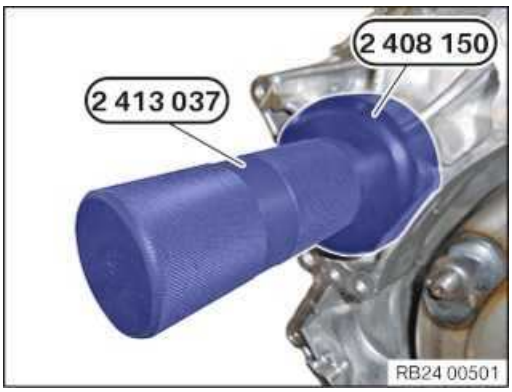
- Insert special tool **2 411 739** into the inner radial shaft seal.



- Screw special tool **2 411 739** into the inner radial shaft seal.
- Turn the screw on the special tool **2 411 739** until the inner radial shaft seal has been pulled out.

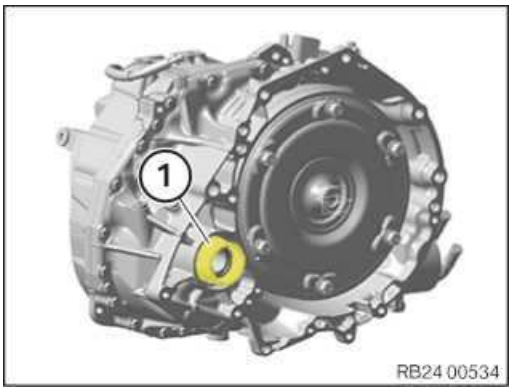


- Drive in the inner radial shaft seal using special tools **2 408 152** and **2 413 037** up to the limit position.



- Drive in the outer radial shaft seal using special tools **2 413 037** and **2 408 150** up to the limit position.

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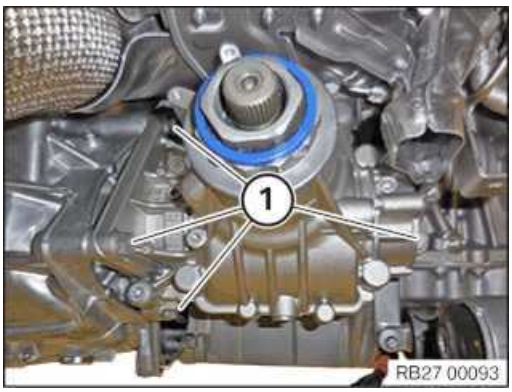
- If necessary, connect the new intermediate shaft (1) to the output flange of the automatic transmission or manual transmission.



- Coat the inside of the output flange (arrows) evenly with approx. 5 g of grease.

Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the transfer box (VTG).
- Tighten the screws (1).

Transfer box to transmission

M10		Tightening torque	56 Nm



- Install heat shield.
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Heat shield to transfer box

M6	Renew screws.	Tightening torque	6 Nm

▸ **Check the transfer box oil level**

RISK OF DAMAGE

Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.

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- Check transfer case oil level, correct:
- Open the oil filler plug (1).
- Check transfer box oil level.
- If necessary, top up transmission oil up to the lower edge of the oil filler plug opening (1).

Transmission oil

Technically suitable transfer box and electrical transmission oils	

Main group 27

- Tighten the oil filler plug (1).

Oil filler plug on transfer box (VTG)

M18x1.5		Tightening torque	35 Nm

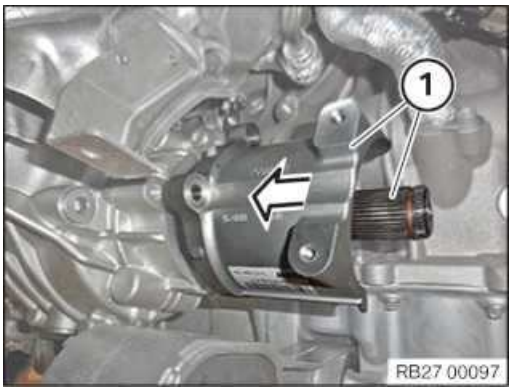
69 – Install the intermediate shaft with the support tube



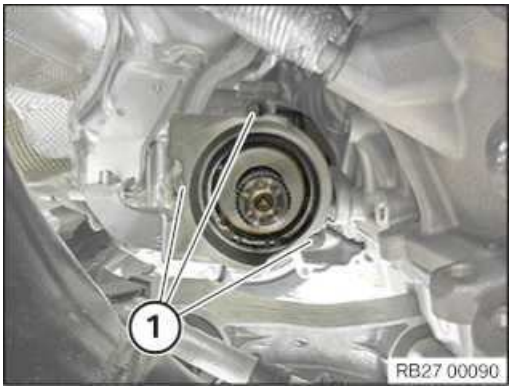
- Coat gearing of the intermediate shaft uniformly with 5 g of grease.

Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the intermediate shaft with support tube (1) in the transfer box.



- Position screws (1).

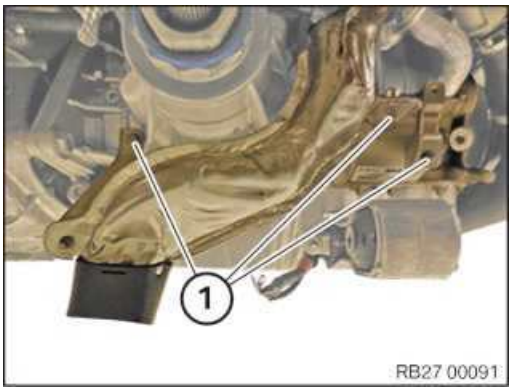
Note: Check for correct screw length! Bolt M8x35 8.8

- Tighten the screws (1).

Intermediate shaft to transfer box

M8x35		Tightening torque	19 Nm

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- If installed: Install air duct.
- Tighten the screws (1).

70 – Installing starter motor

CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.



- Insert and install the starter motor .
- Tighten the screws (1).

Starter motor to transmission

M8x45		Tightening torque	19 Nm



- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

Battery positive lead to starter

M8		Tightening torque	13,5 Nm



- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.

71 – Installing right output shaft partially

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- Renew the circlip (1).

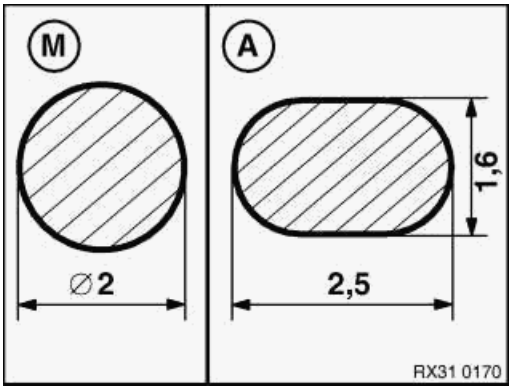
  Parts: Circlip
- Slide output shaft into the transmission as far as the limit position.
- Check for secure seat by levering.

72 – Partially installing the left output shaft



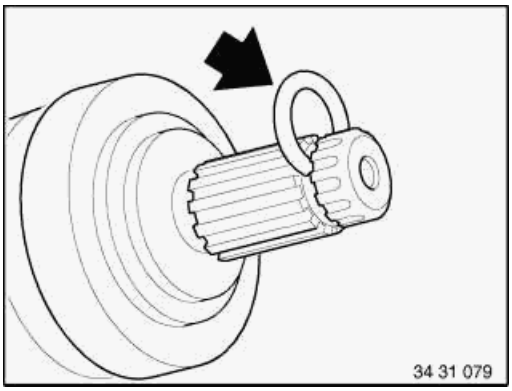
- **With automatic transmission only:**
- Lever out O-ring (1).
- Renew O-ring (1).

  Parts: O-ring
- Insert new O-ring (1).

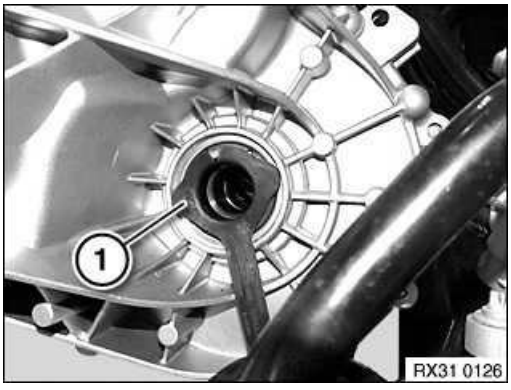


- Do not mix up circlips.

  Different types of output shafts fitted:
  - M: Manual transmission
  - A: Automatic transmission

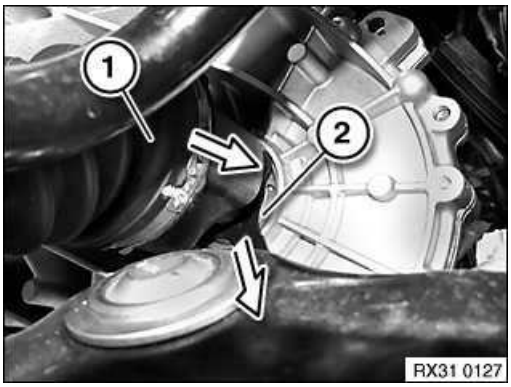


- Renew circlip (arrow).



- Insert installation protection ring (1) into the radial shaft seal.
- Make sure the tool fits over the lip of the radial shaft seal so there is no damage to sealing ring when the output shaft is inserted.

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- Insert output shaft (1) into transmission.
- **Manual gearbox only:** Pull on the handle to remove the installation protection ring (2) and dispose of it.
- Slide output shaft (1) into the transmission as far as the limit position.

  The output shaft (1) must engage audibly.
- Check for secure seat by levering.

73 – Install propeller shaft.

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

RISK OF DAMAGE

Damage to the propeller shaft during installation.

Non-observance of the installation guidelines for the propeller shaft on the rear axle differential may cause severe damage.

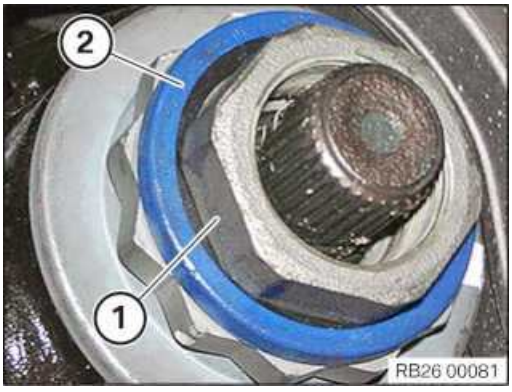
- Always renew the recessed nut on the rear axle differential. Screw locking must be available.
- Strictly observe a minimum hardening time of two hours after having screwed in the recessed nut. The hardening time may be longer at lower temperatures.

RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.



- Renew recessed nut (1).

  Parts: Insert nut
- Renew the retaining clip (2) and the seal.

  Parts: Retaining clip, seal
- Insert the seal with the recessed nut (1) and install.
- Insert the retaining clip (2) and install.
- Make sure that recessed nut (1) is screwed in within 5 min.
- Make sure that the hardening time of **minimum** 2 h for the recessed nut is observed.

  The hardening time must be extended at lower temperatures.

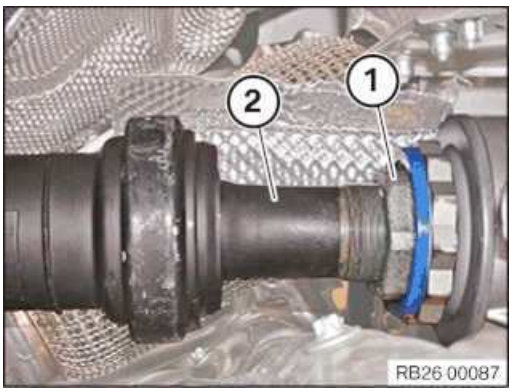
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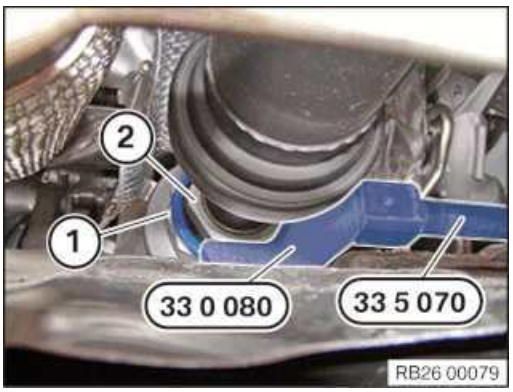
- Insert the propeller shaft (1) and install.
- Always support the propeller shaft (1) with a conventional jack.



- Hand-tighten the bolts (1).



- Push the propeller shaft (2) against the recessed nut (1) up to the limit position.
- Screw the propeller shaft (2) at least 2 thread starts onto the recessed nut (1) by hand.



RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

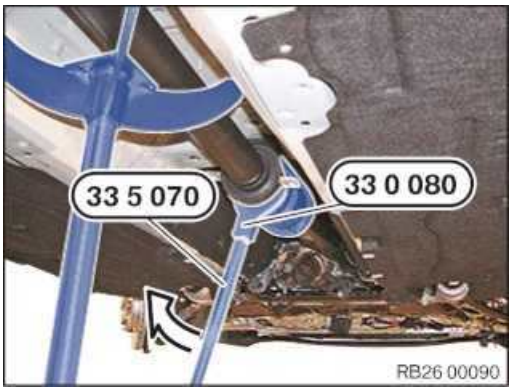
- Do not use the double hexagon head flange nut as counter support.

- Protect the recessed nut (2) on the transfer box from twisting with the special tools **0 495 554 (33 5 070)** and .

  The recessed nut (2) on the transfer box must **not** be used to tighten the propeller shaft.

  The double hexagon flange nut (1) must **not** be used for counter support.

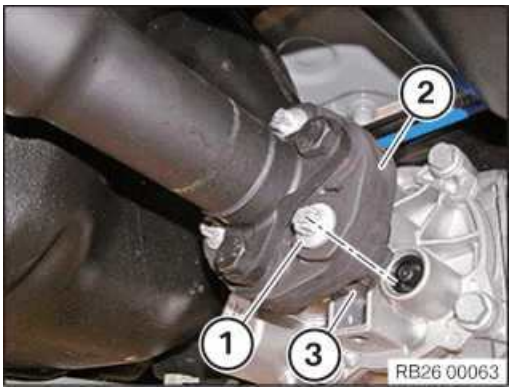
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- Tighten the front propeller shaft with the special tools **0 495 554 (33 5 070)** and in the direction of the arrow.

Propeller shaft to transfer box

		Tightening torque	80 Nm



TECHNICAL INFORMATION

Compliance with the following instructions is required to avoid a humming noise from the propeller shaft after refitting the propeller shaft.

- Assemble the screw connection (1) of the flexible disc (2) and the three-hole flange (3) according to the mark.
- Renew screws (1).

  Parts: Bolts
- Hand-tighten the bolts (1).



- Protect the propeller shaft (1) with the special tools **0 495 554 (33 5 070)** and from twisting.



- Tighten the bolts with the special tools **0 490 504 (00 9 120)** and .

Flexible disc to rear axle final drive

M12x1.5	Renew screws.	Tightening torque	55 Nm 90 °



- Tighten the screws (1).

Centre mount to body

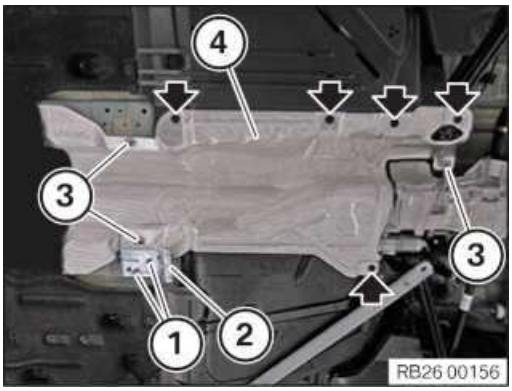
M8		Tightening torque	19 Nm

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- Guide the special too l out between the front and rear propeller shaft and remove.

74 – Installing the rear heat shield



- Insert and install the heat shield (4).
- Tighten screws (arrows).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

- Tighten nuts (3).

Heat shield to body

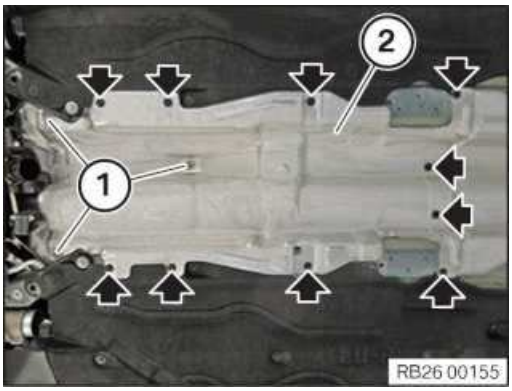
Bolts/nut		Tightening torque	3 Nm

- Insert and install the holder (2).
- Tighten the screws (1).

Bracket to body

M8		Tightening torque	21 Nm

75 – Install the front heat shield



- Insert and install the heat shield (2).
- Tighten screws (arrows).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

- Tighten nuts (1).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

76 – Install exhaust system

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

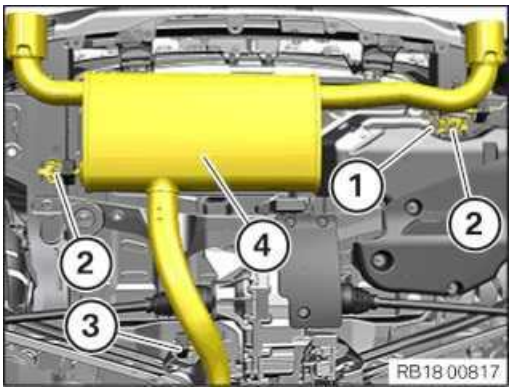
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CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Feed in and install the exhaust system (4) with a second person.
- Renew nuts (2).

  Parts: Nuts
- Tighten nuts (2).

Exhaust system to body

M8	Replace nuts.	Tightening torque	19 Nm

- Tighten down screw (1).

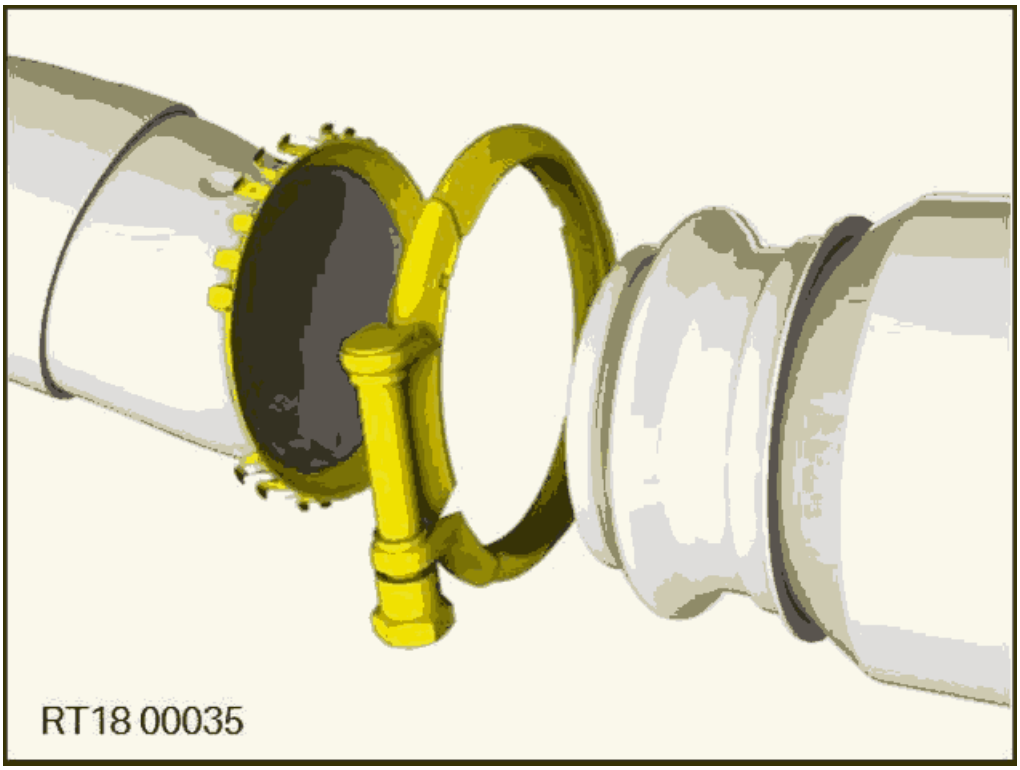
Exhaust bracket on body

Hexagon screw M8x30		Tightening torque	19 Nm

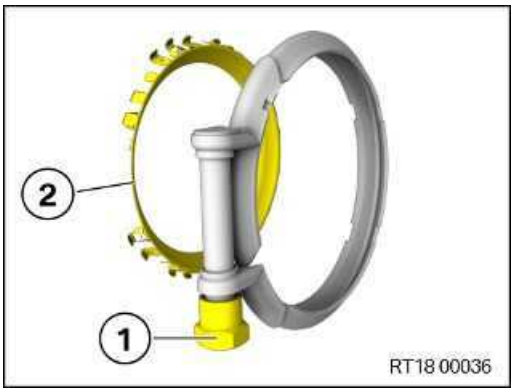
- Check the rubber mount (3) for damage and renew as needed.
- Mount rubber mount (3) on the exhaust system (4).

▸ **Install the V-clip**

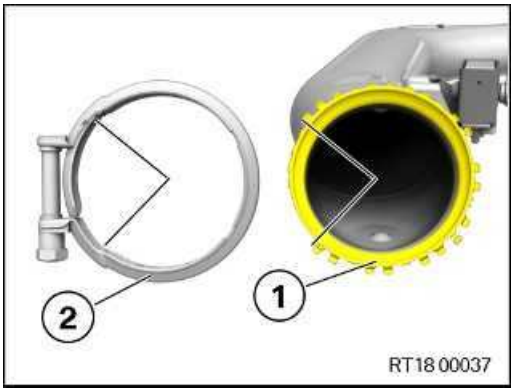
V-band clamp



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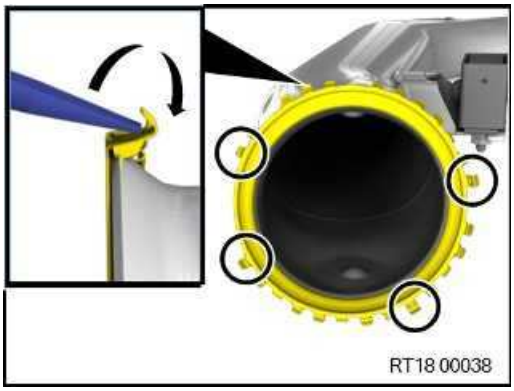


- Unscrew the nut (1) and remove the sealing ring (2).

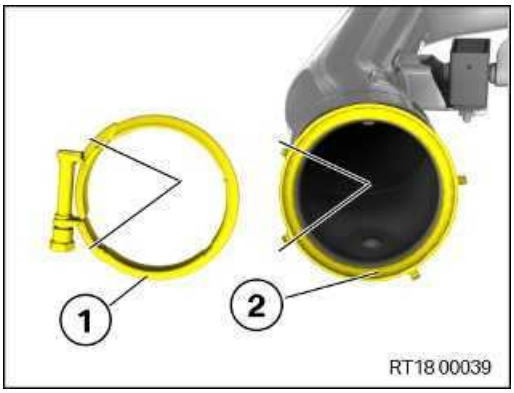


- Renew the V-clip (2).

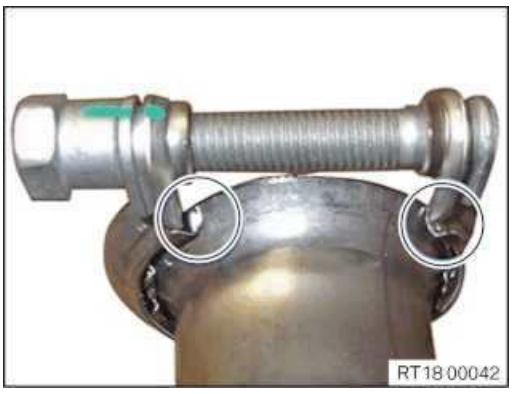
  Parts: V-band clamp
- Mount the sealing ring (1) on the exhaust system.
- Ensure that the sealing ring (1) for the V-clip (2) is positioned correctly.



- Bend all sheet metal tabs over with a suitable tool, except those in the marked areas.

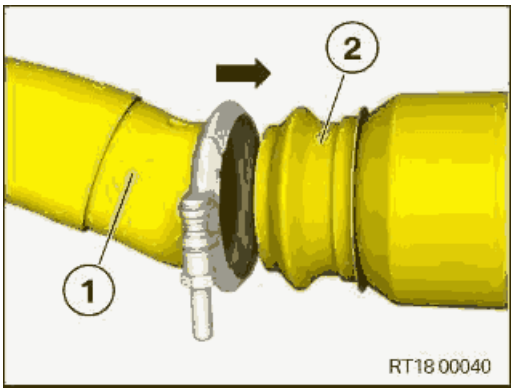


- Mount the V-clip (1) on the sealing ring (2).
- Make sure that the V-clip (1) is positioned correctly on the sealing ring (2).

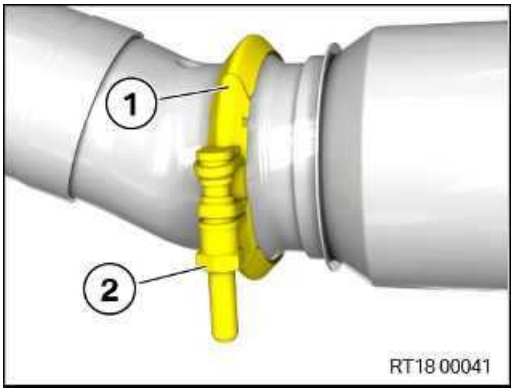


- Make sure that the V-clip rests against the sheet metal tabs after mounting (marks).

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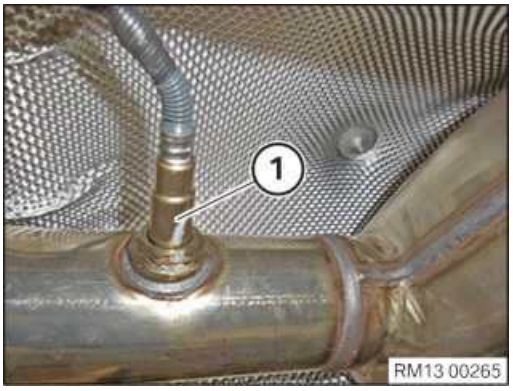
- Connect the exhaust system (1) with the catalytic converter (2) and position correctly.



- Make sure that V-clip (1) is fitted correctly.
- Tighten down screw (2).

V-clip to catalytic converter

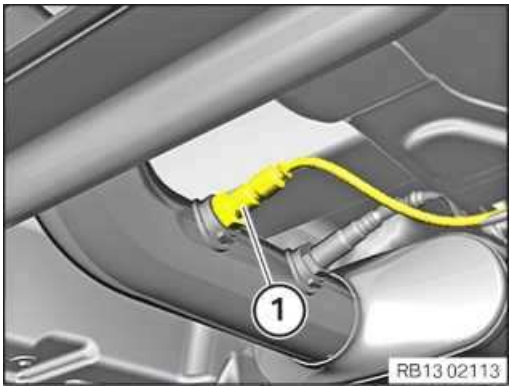
V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm



- Feed in, install and tighten diesel particulate sensor (1).

Diesel particulate sensor to exhaust system

Sensor		Tightening torque	50 Nm



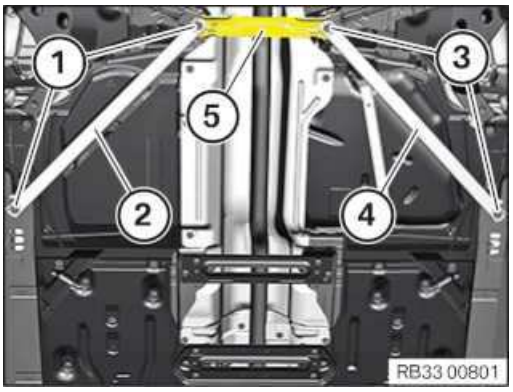
- Feed in, install and tighten nitrogen oxide sensor (1).

Nitrogen oxide sensor downstream of SCR catalytic converter

Sensor		Tightening torque	50 Nm

77 – Install the cross-member with torsion struts

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- Insert and install the cross-member (5).
- Thread in torsion strut (4) at right and install.
- Renew screws (3).

  Parts: Bolts
- Tighten down screws (3).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

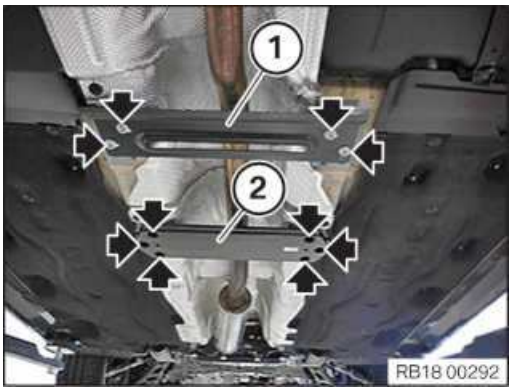
- Guide in and install the left torsion strut (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

78 – Install the connecting support on the tunnel in front and back



- Insert and install connecting supports (2).
- Tighten the screws (arrows) from the connecting support (2).

Front connection carrier to body

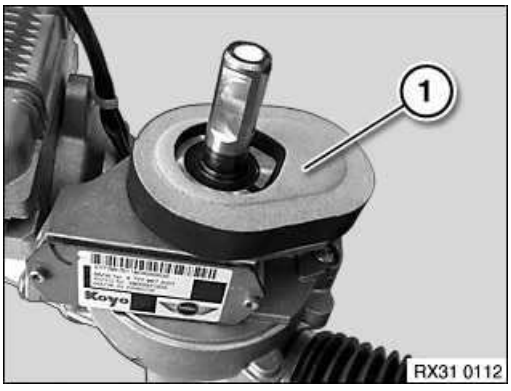
M10x18		Tightening torque	56 Nm

- Insert and install connecting supports (1).
- Tighten the screws (arrows) from the connecting support (1).

Rear connection carrier to body

M8x18		Tightening torque	28 Nm

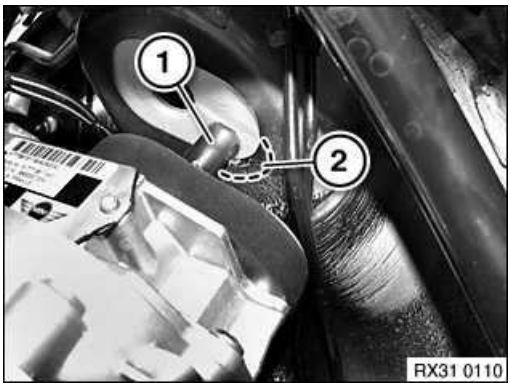
79 – Mount and secure the complete front axle



- Remove the seal (1).
- Clean surface on steering gear.
- Renew gasket (1).

  Parts: Gasket
- Position the seal (1) and glue it on.

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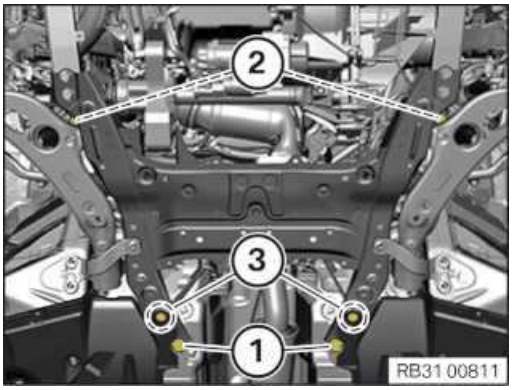


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- Position front axle support.
- Bend underbody panellings in the areas (3) to one side.
- Raise front axle support.
- When raising, insert charge air cooler into the rubber mount of the charge air cooler on cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

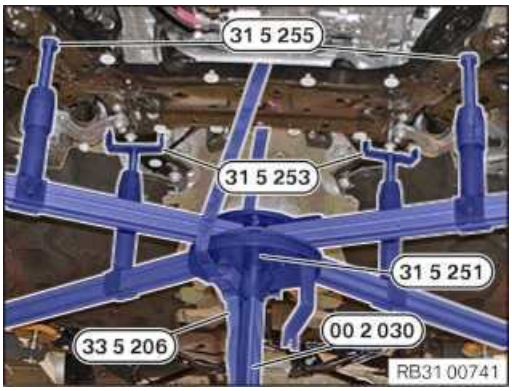
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

- If necessary, tighten the screws in the areas (3).

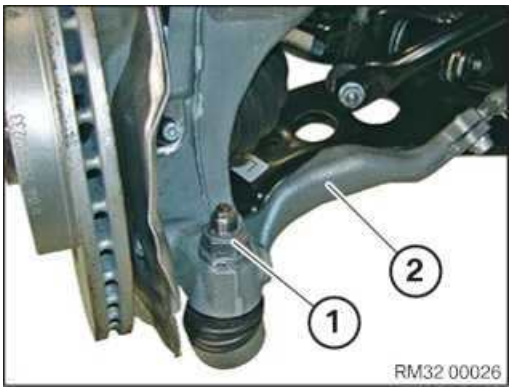
Underbody protection to body

Screw		Tightening torque	3 Nm



- Remove special tool from special tool .
- Lower universal jack **0 490 133 (00 2 030)** with the special tool and place it to the side.

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NOTICE

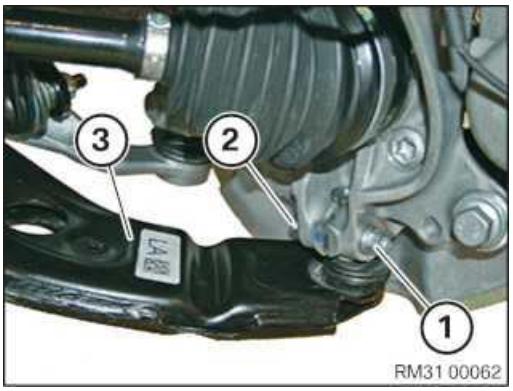
Perform the operations on the left and right side.

- Position the track rod (2) on the swivel bearing .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Track rod end to swivel bearing

M14	Renew nut.	Tightening torque	175 Nm



NOTICE

Perform the operations on the left and right side.

- Position the wishbone (3) on the swivel bearing .
- Renew the bolt (2) and the nut (1).

  Parts: Bolt, nut
- Insert screw (2).
- Tighten nut (1).

Wishbone to swivel bearing

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

80 – Install the mounted parts on the front axle support



NOTICE

Perform the operations on the left and right side.

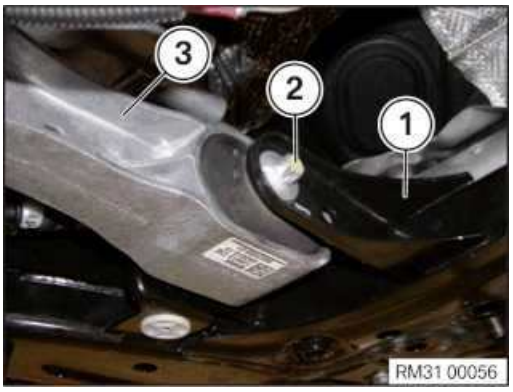
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Holder, wishbone rubber mount, to body

M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °

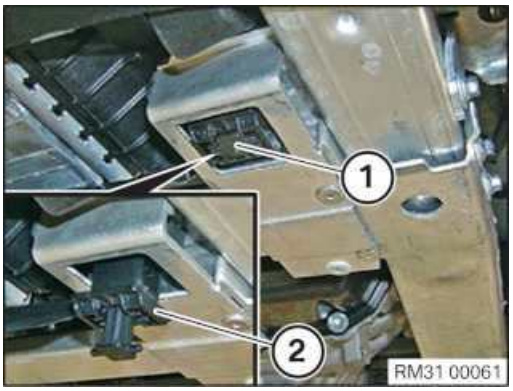
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- Position the engine support (3) on the front axle support (1).
- Tighten down screw (2).

Holder with rubber mount to front axle support

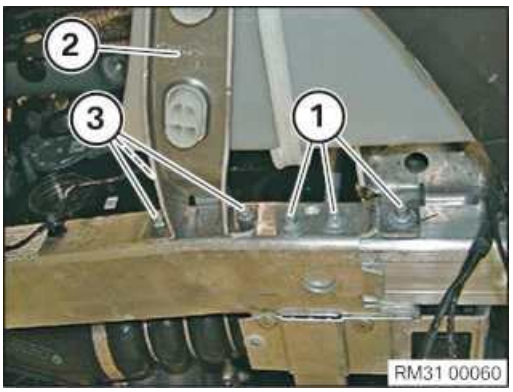
M12 screw		100 Nm



NOTICE

Perform the operations on the left and right side.

- Position the lock (2).
- Lock the bracket (1) of the lock (2) of the holder for the charge air cooler.



- **Only on right side:** Position the holder for the washer fluid reservoir (2).
- Tighten down screws (3).

Washer fluid reservoir holder to front axle support adapter plate

		Tightening torque	10 Nm

NOTICE

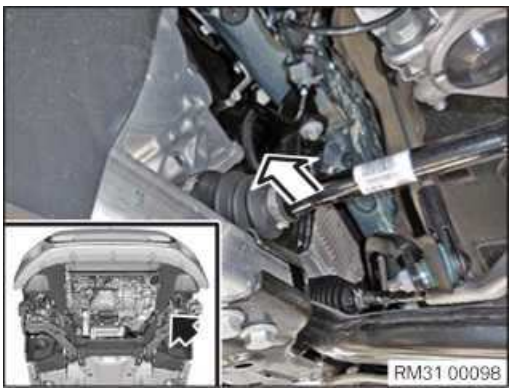
Perform the operations on the left and right side.

- Tighten the screws (1).

Deformation element, bottom, to adapter plate, front axle carrier

		Tightening torque	11,8 Nm

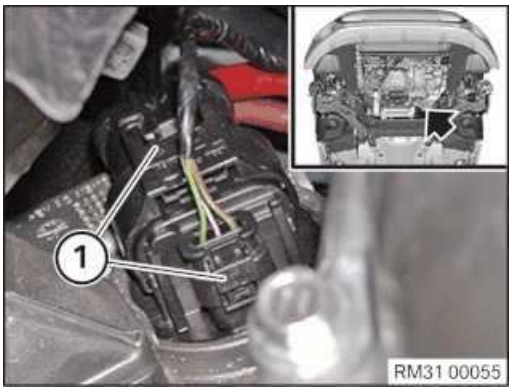
81 – Attaching connector at steering gear



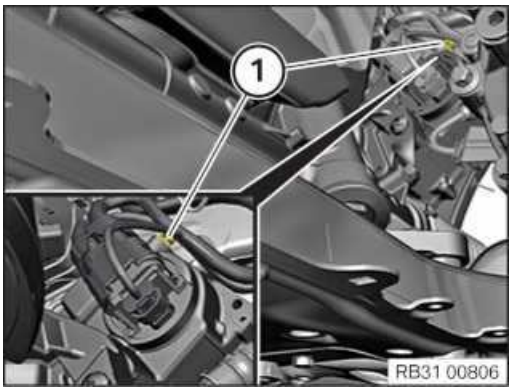
- To connect the connector (see the following step): Connect the connector with the right hand.

  The connectors can be accessed via the left output shaft.

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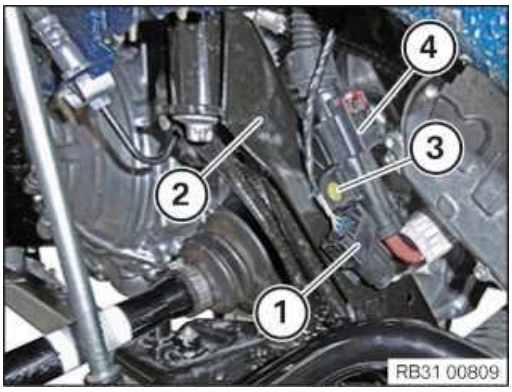


- Connect and lock connector (arrow) (1) with the steering gear.



- Fasten the wiring harness (1) on the steering gear.

▶ **If installed: Fasten the plug connections at the front axle support**



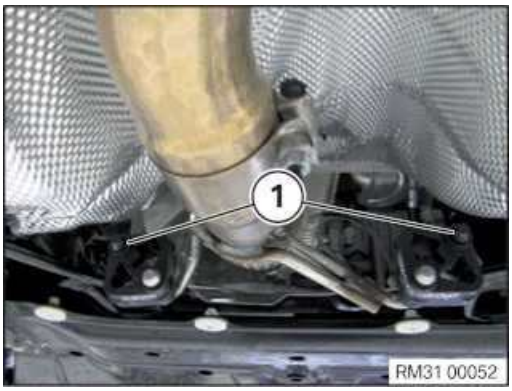
- Position the plug connection (4) at the front axle support (2).
- Tighten down screw (3).

Holder to front axle support

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

- Fasten the plug connection (1) at the front axle support (2).

82 – Securing rubber mount on front axle support



- Check rubber mount (1), replace if necessary.

  Parts: Rubber mount
- Spray rubber mount (1) with lubricant and slide onto holder on front axle support.

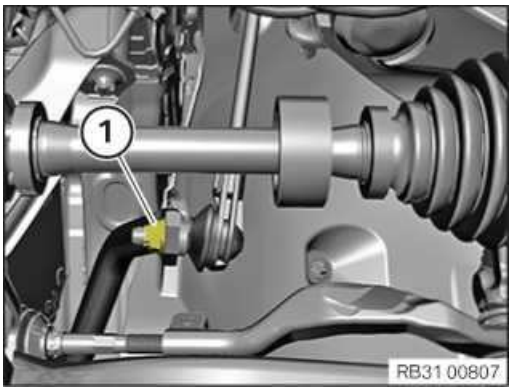
83 – Securing anti-roll bar on left and right on the anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▶ **Fastening anti-roll bar on the anti-roll bar link**

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- Position the anti-roll bar link on the anti-roll bar .
- Renew nut (1).

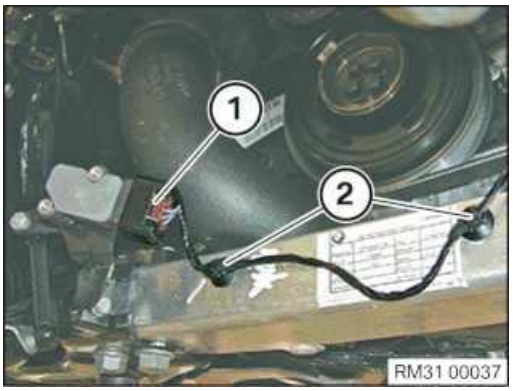
  Parts: Nut
- Tighten nut (1).

Note: Use the Torx socket for counter support.

Anti-roll bar link to anti-roll bar

M10	Renew nut.	Tightening torque	56 Nm

84 – With right installation: Securing the cable for the ride height sensor



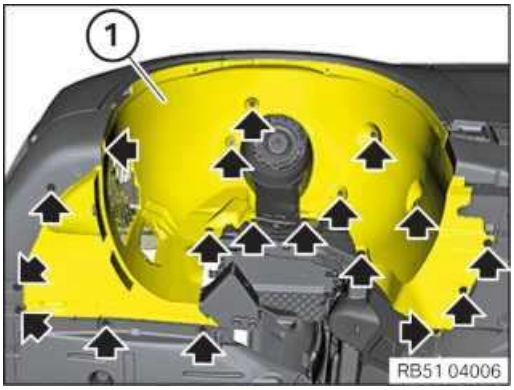
- Secure the cable clip (2) on the adapter of the deformation element.
- Connect connectors (1) and lock.

85 – Installing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

▸ **Installing the front wheel arch cover**



- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Plastic nut		Tightening torque	2,6 Nm
Screw		Tightening torque	2,6 Nm

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

▸ **Installing front wheel arch trim**

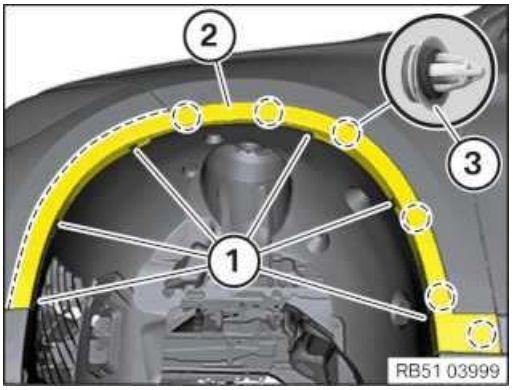
NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

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NOTICE

Description is for left component only. Procedure on the right side is identical.



- Check the clips (3) for damage and renew where required.

  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

86 – Installing both front wheels

▶ **Mounting the wheel**

▷ **Clean the contact surfaces between the brake disc and the wheel rim**



TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

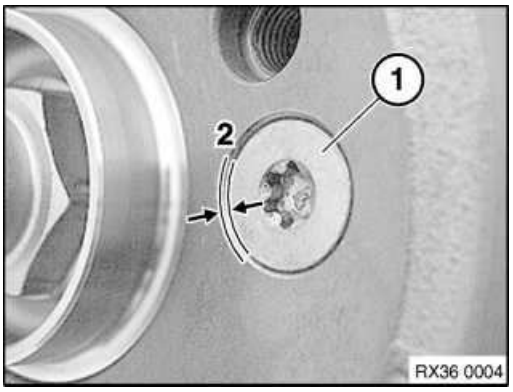
  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue in the area of the wheel bolt holes, remove and clean the brake disc.



- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

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- Renew mounting bolt (1).

  Parts: Mounting bolt

- Check that the mounting bolt (1) for the brake disc is securely seated.

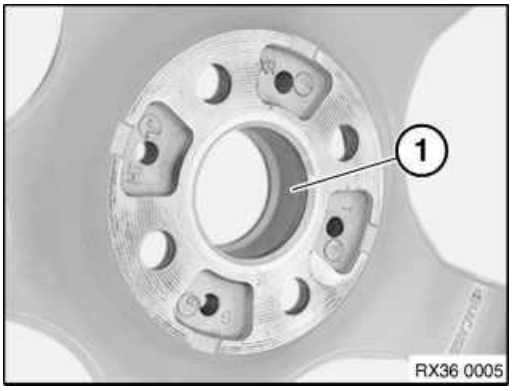
  The mounting bolt (1) for the brake disc may not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to rear wheel hub

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub

M8	Renew screw.	Tightening torque	16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring (1).

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

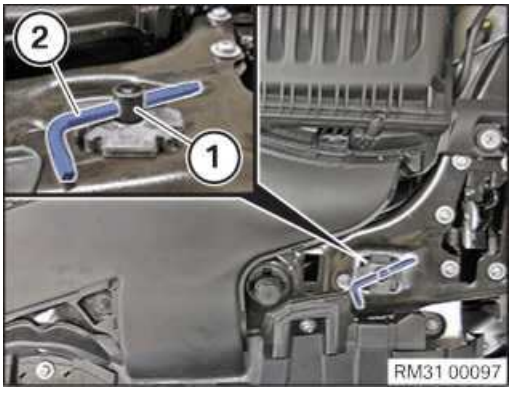
  Parts: Wheel bolts
- Clean the wheel bolts.
- Check the wheel bolts and threads for damage, renew the wheel bolts if necessary.
- Join and tighten the wheel bolts (arrows).

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

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87 – Removing fastener for left and right radiator



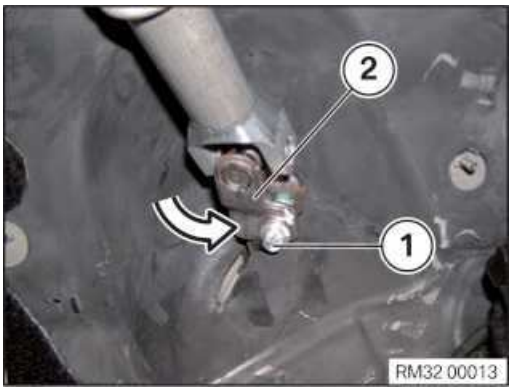
NOTICE

Perform the operations on the left and right side.

- Remove suitable tool (2) from the centering pin (1).

88 – Secure the steering shaft at the bottom on the steering gear

88 – Secure the steering shaft at the bottom on the steering gear



- Clean the screw lock residue from the screw thread in the universal joint (2).
- Pivot the universal joint (2) in the direction of the arrow to the steering gear.
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Lower steering shaft to steering gear

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

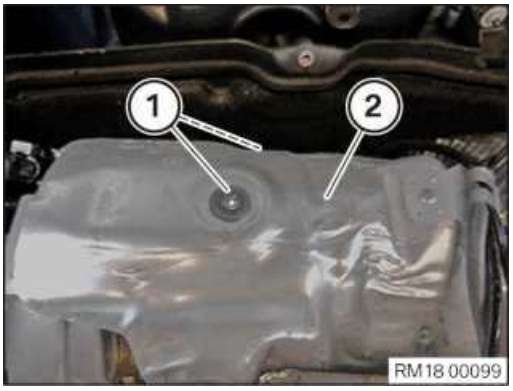


- **If installed:**
- Position the cover on the steering column (2).
- Tighten nuts (1).

Steering column cover to bulkhead

Plastic nut		Tightening torque	3 Nm

89 – Install the heat shield on the exhaust turbocharger



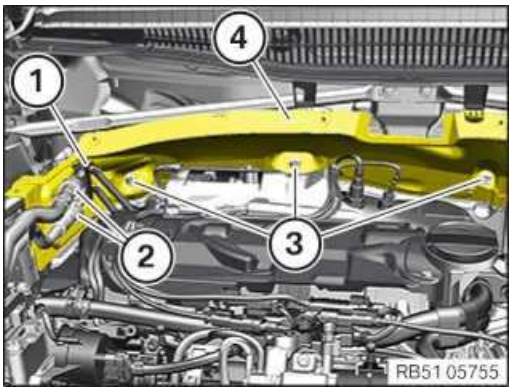
- Feed in and install the heat shield (2).
- Tighten the screws (1) at the top and bottom of the heat shield.

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Fasten the cable at the clips .

90 – Installing rear bulkhead upper part



- Feed in and install the rear bulkhead upper part (4).
- Tighten down screws (3).

Rear bulkhead upper part to lower section of bulkhead

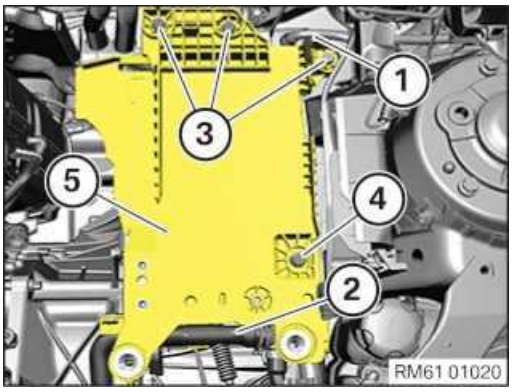
Oval-head screw		Tightening torque	5 Nm

- Feed the fuel line (2) into the holder (1) and install.
- Connect and lock the holder (1).

  The holder (1) must engage audibly.

91 – Install the battery holder

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- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

92 – Install electronics box

Prerequisite

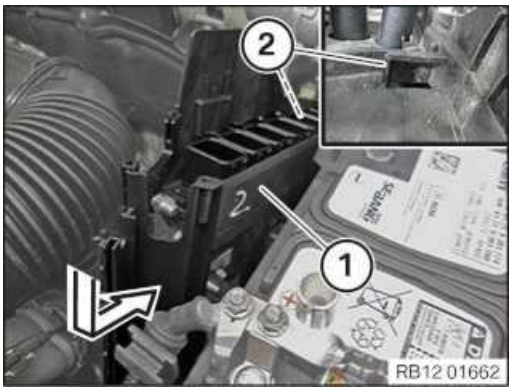
Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.

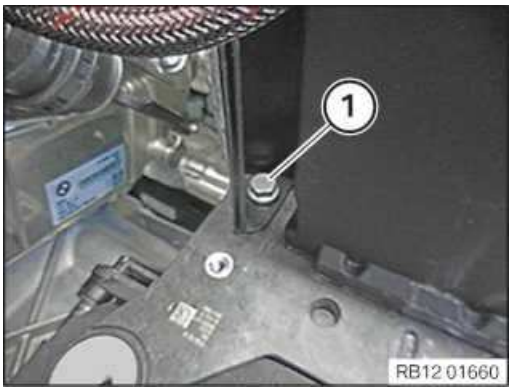


- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.



- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).

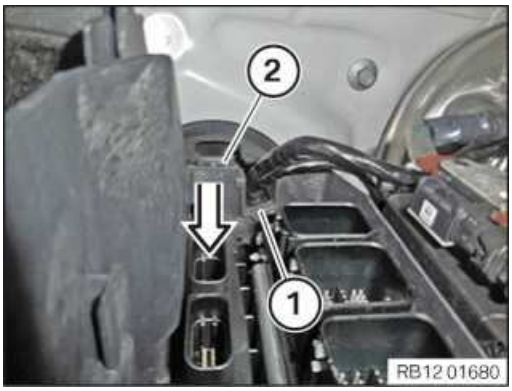
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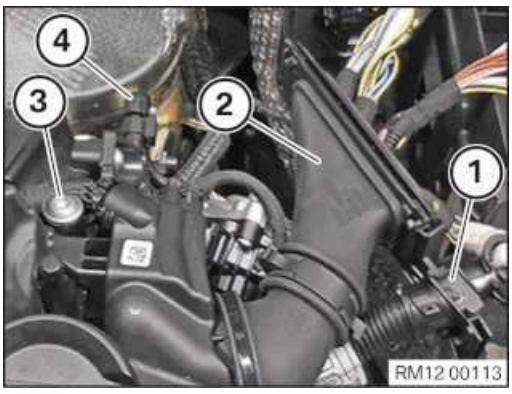
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.

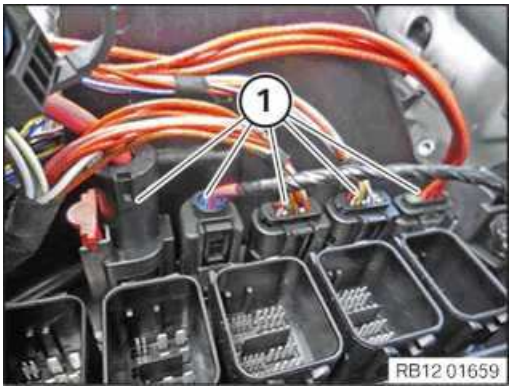


- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

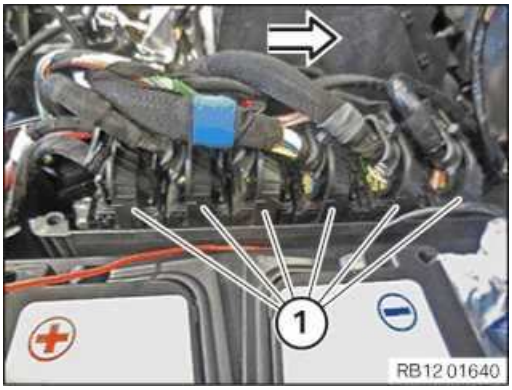
Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.

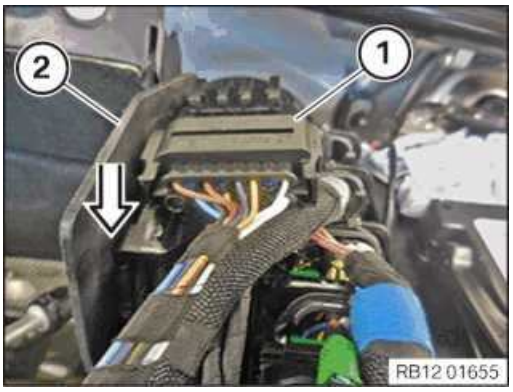


- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.

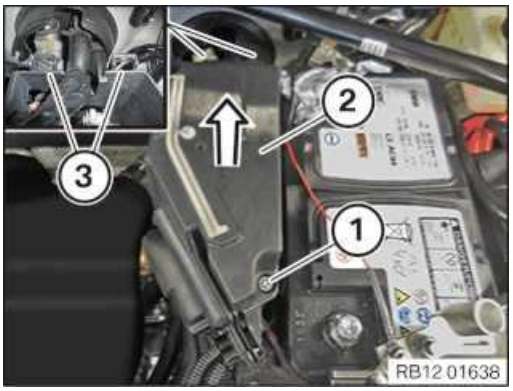


- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.

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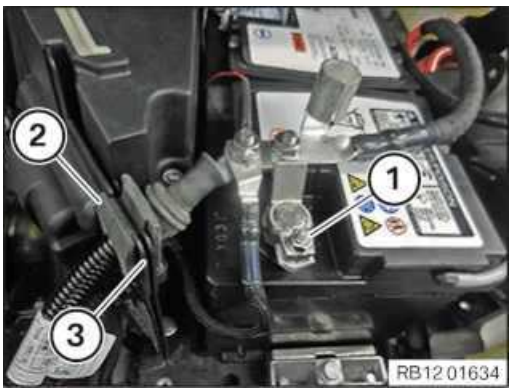
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

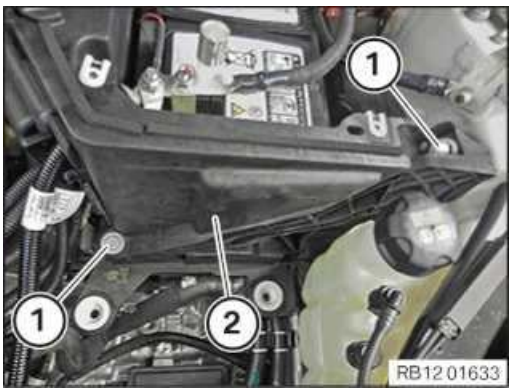
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

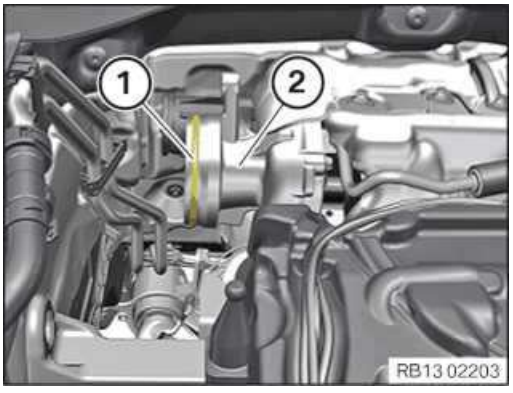


- Feed in and install tension strut (2).
- Tighten the screws (1).

Tension strut to spring strut dome/battery tray

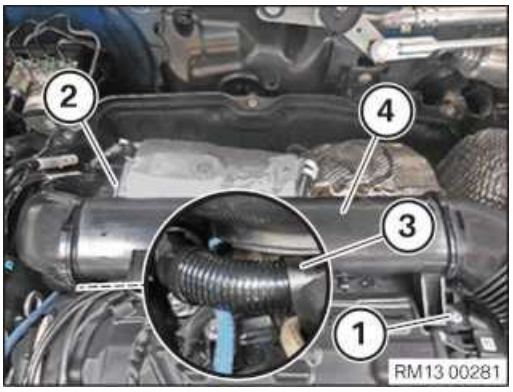
M8		Tightening torque	19 Nm

93 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.

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- Feed in clean air pipe and install.
- Connect clean air pipe to the exhaust turbocharger and lock audibly in the clamps (2).
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Connect ventilation line (3) to the cylinder head cover and lock audibly.

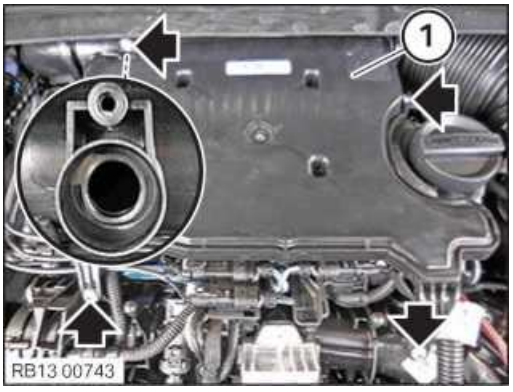


- Mount clean air pipe onto the intake filter housing.
- Tighten clamp (1) on the clean air pipe.

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

94 – Install resonator



- Insert and install the resonator (1).
- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

95 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

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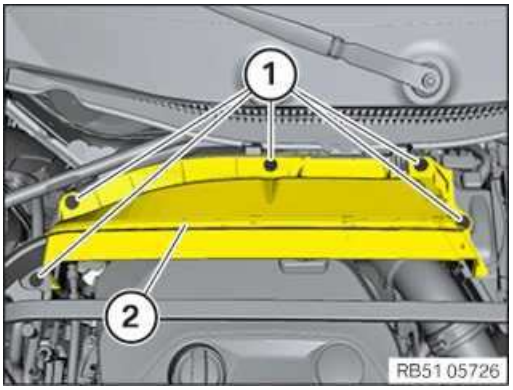


- Check for correct installation of all rubber mounts in the acoustic cover (1).



- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

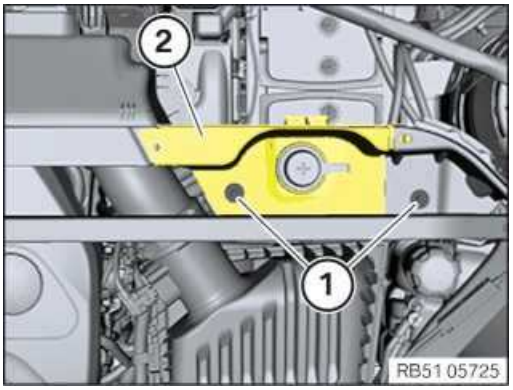
96 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Cover of top bulkhead

Screw		Tightening torque	2,6 Nm



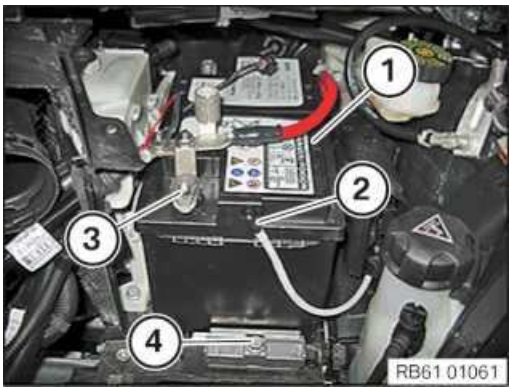
- Guide in and install cover (2).
- Tighten down screw (1).

Cover of remote positive terminal

Screw		Tightening torque	2,6 Nm

97 – Install vehicle battery

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- Install vehicle battery (1).
- Position the bracket and tighten with the screw (4) .

Battery terminal rail to battery tray

M8		19 Nm

- Position the vent hose (2) and clip it in.
- Position the positive battery terminal and tighten with the nut (3) .

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

▸ **Check the vent holes of the battery**

WARNING

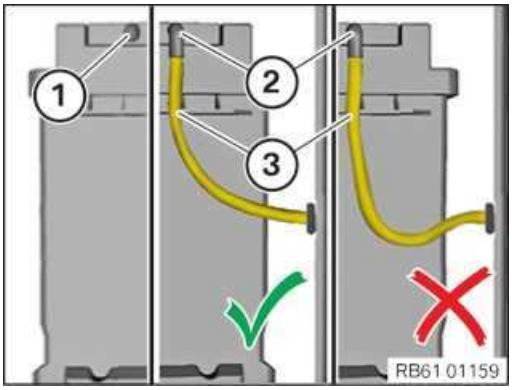
Gas emission.

Danger of injury! Danger of explosion!

- Assign the vent holes correctly.
- Route the vent hose correctly.

TECHNICAL INFORMATION

The battery has two vent holes, opposite:
One vent hole (1) must be closed correctly with a dummy plug.
The vent hose (3) must be correctly connected and routed at the other vent hole (2).



Check

- Check if the vent hole (1) is correctly closed with a dummy plug.

Result

» No dummy plug.

Measure

- Close the vent hole (1) correctly with a dummy plug.

Check

- Check if the vent hole (2) has a correctly connected vent hose (3).

Result

» The vent hose (3) is not correctly connected.

Measure

- At the vent hole (2), connect the vent hose (3) correctly.

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Check

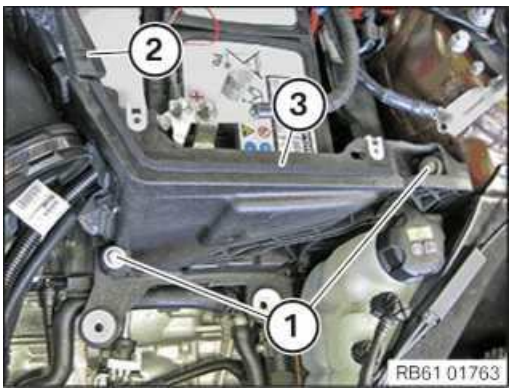
- Check if the vent hose (3) is routed to the outside with a downhill gradient (**no siphon formation!**).

Result

» The vent hose (3) is not correctly routed as shown in the image on the right.

Measure

- Route the vent hose (3) correctly as shown in the centre image.



- Insert tension strut (3) and tighten with screws (1).

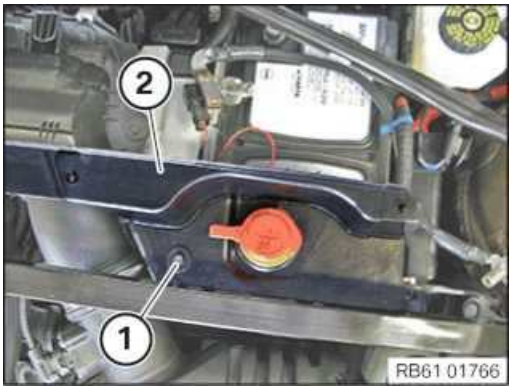
Trailing link

M8		Tightening torque	19 Nm

- Tighten down screw (2).

Battery cover

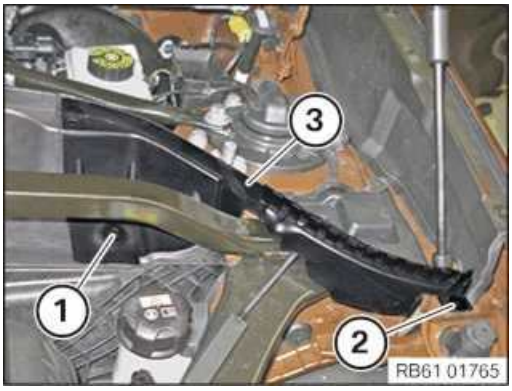
M8		2,8 Nm



- Position the cover (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm

98 – Connecting the battery earth lead

TECHNICAL INFORMATION

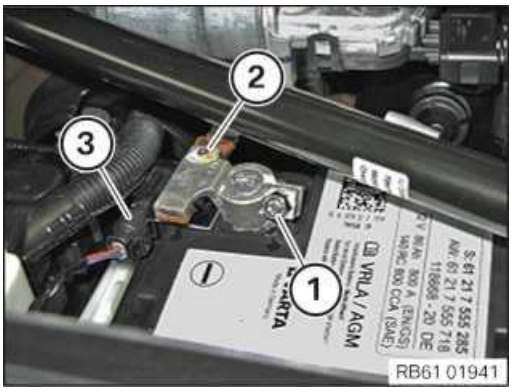
For additional information see:

61 00 ... Safety information on handling the vehicle battery

61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery

61 12 ... Notes on the intelligent battery sensor (IBS)

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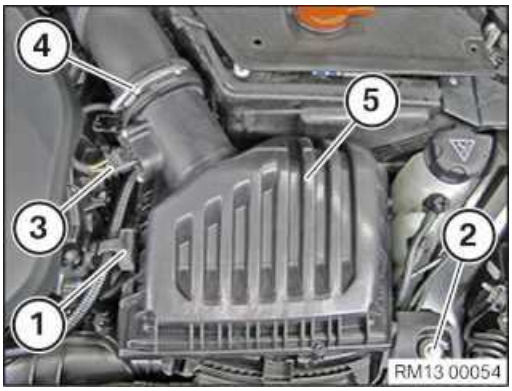
- Remove the protective cover of the positive battery terminal.
- Position the battery earth lead (2).
- Tighten nut (1).

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

- If required, connect the connector (3).

99 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.

  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

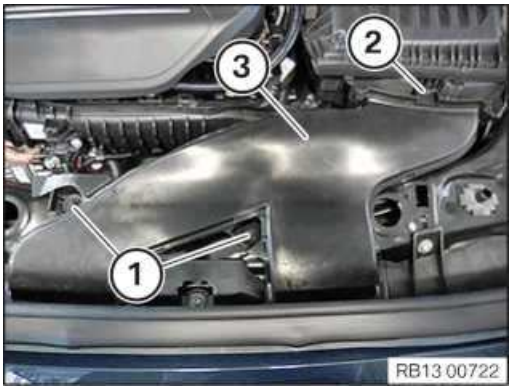
Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Insert and install the holder (1).

100 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

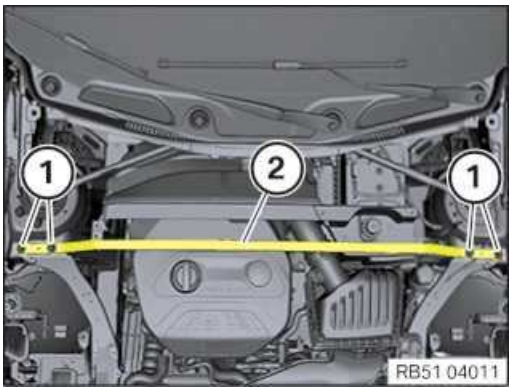
M6		Tightening torque	8 Nm

101 – Install strut brace

TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.

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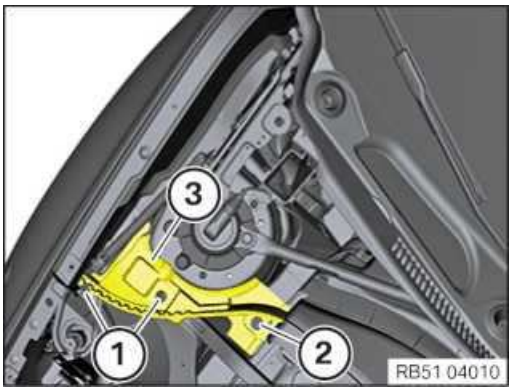


- Install the strut brace (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-brace to spring strut dome

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °



NOTICE

Description is for right component only. The procedure on the left side is identical.

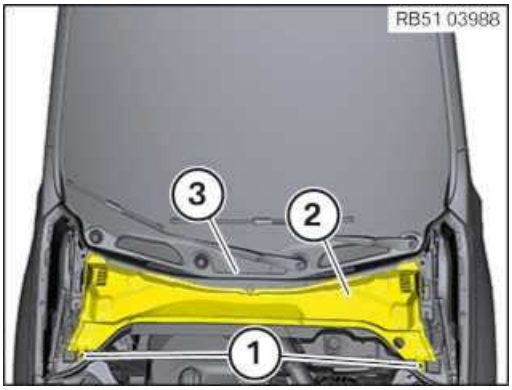
- Install the cover (3).
- Tighten down screw (2).

Cover on body

Hexagon screw		Tightening torque	3 Nm

- Install the expanding rivet (1).

102 – Installing front cowl panel cover

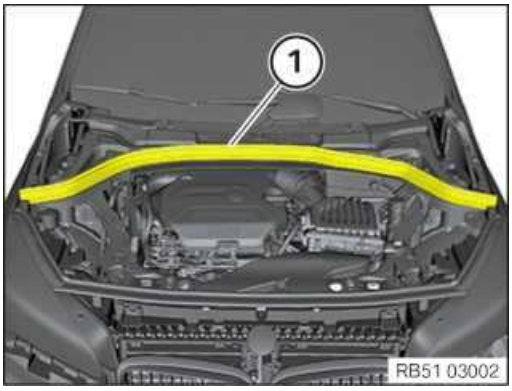


- Insert and install cowl panel cover at front (2) into cowl panel cover at rear (3).
- Check cowl panel cover at front is correctly seated (2).
- Secure expanding rivet (1).

103 – Install the seal for the bonnet

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

104 – Checking/topping up oil level in automatic gearbox (AISIN GA8G45)

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Prerequisite

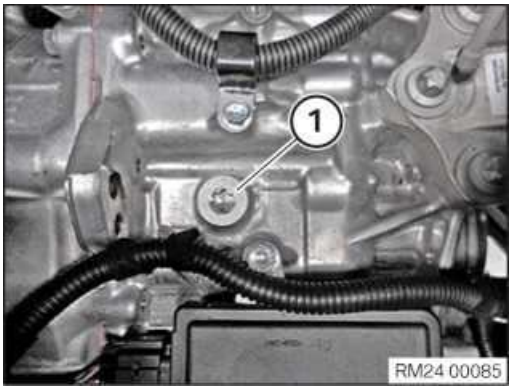
Vehicle in horizontal position.

CAUTION

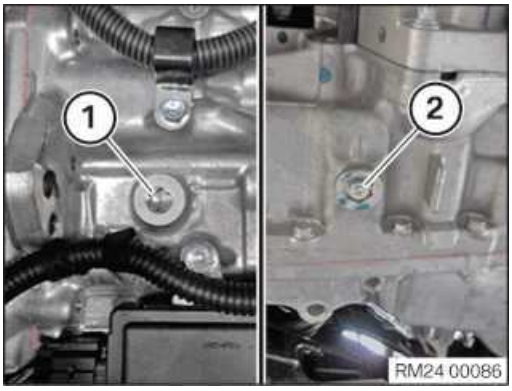
Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.



- Move the selector lever to the "P" position.
- Secure vehicle to prevent it rolling.
- Connect diagnosis system.
- Release the oil filler plug (1) using the Torx T55 .



- **Topping up the automatic transmission fluid (the automatic transmission fluid was drained):**
- Release oil filler plug (1) from engine compartment.
- Loosen the overflow plug (2) below at the transmission.
- Top up automatic transmission fluid at oil filler plug (1) until oil emerges at overflow plug (2).
- Start engine and run at idle speed.
- Check whether the automatic transmission fluid is leaking at the overflow plug (2) .
- If there is no automatic transmission fluid leaking at the overflow plug (2) , fill in the automatic transmission fluid to the oil filler plug (1) .
- Press the footbrake and, when idle, shift through all the gears from "P" to "D" 2 times for more than 2 seconds .
- Move the selector lever to the "P" position.
- Check again whether the automatic transmission fluid is leaking at the overflow plug(2) .
- Read the temperature of the automatic transmission fluid with the diagnosis system.
- Increase temperature of automatic transmission fluid to 35 °C to 45 °C.
- Top up automatic transmission fluid until it flows over.
- Renew sealing rings.

  Parts: Sealing ring
- Screw in and fasten oil filler plug (1) and overflow plug (2).

Oil filler plug to transmission housing

M14	Renew the sealing ring.	Tightening torque	45 Nm

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Overflow screw in oil drain plug

M6	Renew the sealing ring.		8 Nm

- **Check oil level (transmission oil temperature must be between** 35 °C **and** 45 °C **):**
- Open the oil filler plug (1).
- Slacken overflow plug (2).
- Start engine and run at idle speed.
- Unscrew and remove overflow plug (2).
- Check whether the automatic transmission fluid is leaking at the overflow plug (2) .
- If there is no automatic transmission fluid leaking at the overflow plug (2) , fill in the automatic transmission fluid to the oil filler plug (1) .
- Top up the automatic transmission fluid until it overflows at the overflow plug (2) .
- Press the footbrake and, when idle, shift through all the gears from "P" to "D" 2 times for more than 2 seconds .
- Move the selector lever to the "P" position.
- Check the oil level again.
- Renew sealing rings.

  Parts: Sealing ring
- If the oil escapes slightly from the overflow plug (2) , tighten the overflow plug (2) and the oil filler plug (1) .

Overflow screw in oil drain plug

M6	Renew the sealing ring.		8 Nm

Oil filler plug to transmission housing

M14	Renew the sealing ring.	Tightening torque	45 Nm

105 – Topping up oil level in the manual gearbox (GS6X60DA)

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

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TECHNICAL INFORMATION

Make sure during removal of the filling/level control screw to note the installed filling/level control screw variant.

It is **mandatory** to use variant 1 in transmissions up to production date 08/2015.

It is **mandatory** to use variant 2 in transmissions from production date 08/2015.

Failure to observe will result in a leak on the transmission.

- Variant 1 **until** production date 08/2015.
- Variant 2 **from** production date 08/2015.



- Unscrew filling/level control screw (1) and fill the transmission until the oil overflows.

Transmission oil capacity

Transmission oil GS6-60DA, GS6X60DA/Owner's Handbook	2,2 l

Transmission oil: Technically suitable manual gearbox oil

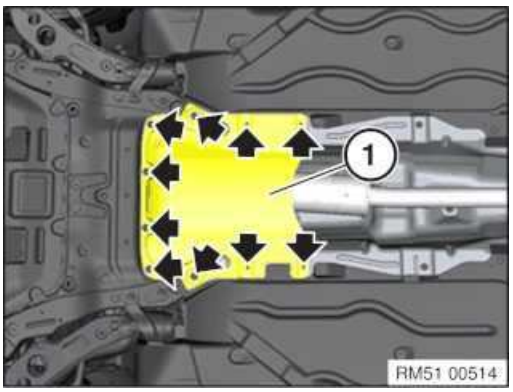
- Allow surplus oil to drain off.
- Renew the filling/level control screw (1).

  Parts: Filling/level control screw
- Tighten filling/level control screw (1).

Oil drain plug / oil filler plug

Hexagon socket		Tightening torque	43 Nm

106 – If installed: Installing underbody protection at rear

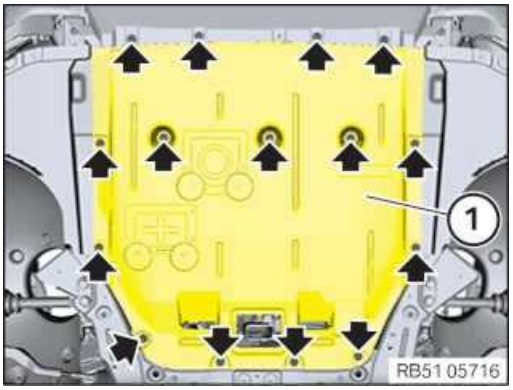


- Position rear underbody protection (1).
- Tighten screws (arrows).

Underbody protection to body

Screw		Tightening torque	3 Nm

107 – Installing the front underbody protection

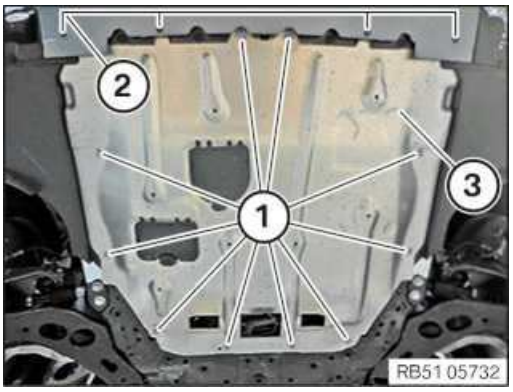


- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

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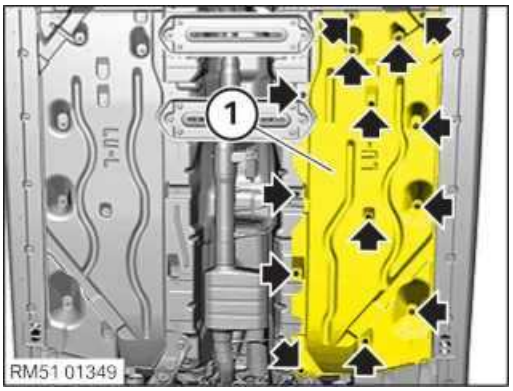


- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

108 – Installing underbody panelling , right



- Correctly position the underbody panelling (1).
- Tighten all bolts and nuts (arrows).

Underbody panelling, side

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side

Plastic nut		Tightening torque	2,6 Nm

Additional Information

Overview of Tightening Torques

Exhaust-gas recirculation cooler to exhaust manifold — Used in step 54

M8x28	Replace screws	Tightening torque	32 Nm

Oil return line to turbocharger — Used in step 54 56

M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase — Used in step 54

M8x16		Tightening torque	22 Nm

Exhaust turbocharger to exhaust manifold — Used in step 56

V-band clamp		Tightening torque	19 Nm

Oil feed line to bracket — Used in step 56

Torx screw M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase — Used in step 56

M8x16		Tightening torque	22 Nm

Heat shield for exhaust turbocharger — Used in step 57

Torx screw BM 6x12		Tightening torque	10 Nm

Banjo bolt for exhaust pressure pipe to exhaust manifold — Used in step 57

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

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Standard screw connection M6 — Used in step 57

M6			8 Nm

Charge air duct to oil sump — Used in step 58

M6		Tightening torque	8 Nm

Ride height sensor holder to front axle support — Used in step 58

M6		Tightening torque	8 Nm

Adapter, front axle support to front axle support — Used in step 58

		Tightening torque	100 Nm

Cross connection to front axle support — Used in step 58

M6		Tightening torque	12 Nm

Washer fluid reservoir to body — Used in step 59

M6x20		Tightening torque	8 Nm

Diesel particulate filter V-clip to exhaust turbocharger — Used in step 60

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Diesel particle filter to holder — Used in step 60

M8 hexagon nut		Tightening torque	19 Nm

Diesel particulate filter holder to gearbox — Used in step 60

M12x75		Tightening torque	66 Nm

Diesel particulate filter bracket to crankcase — Used in step 60

M10x35		Tightening torque	38 Nm

SCR metering module V-clip to exhaust system — Used in step 60

V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm

Holder for coolant lines to diesel particulate filter — Used in step 60

Torx bolt BM6x16		Tightening torque	8 Nm

Differential pressure sensor to holder — Used in step 60

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor — Used in step 60

Clamp 15–19mm		Tightening torque	3 Nm

Control sensor — Used in step 61

Control sensor		Tightening torque	50 Nm

Exhaust temperature sensor to diesel particulate filter — Used in step 62 63

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Exhaust-gas temperature sensor to exhaust system — Used in step 64

Exhaust-gas temperature sensor		Tightening torque	28 Nm

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Oxygen sensor holder to intermediate shaft

Used in step 65

Hexagon screw M6x16		Tightening torque	8 Nm

Nitrogen oxide sensor before SCR catalytic converter

Used in step 66

Sensor		Tightening torque	50 Nm

Monitoring sensor

Used in step 67

Sensor		Tightening torque	50 Nm

Transfer box to transmission

Used in step 68

M10		Tightening torque	56 Nm

Heat shield to transfer box

Used in step 68

M6	Renew screws.	Tightening torque	6 Nm

Oil filler plug on transfer box (VTG)

Used in step 68

M18x1.5		Tightening torque	35 Nm

Intermediate shaft to transfer box

Used in step 69

M8x35		Tightening torque	19 Nm

Starter motor to transmission

Used in step 70

M8x45		Tightening torque	19 Nm

Battery positive lead to starter

Used in step 70

M8		Tightening torque	13,5 Nm

Propeller shaft to transfer box

Used in step 73

		Tightening torque	80 Nm

Flexible disc to rear axle final drive

Used in step 73

M12x1.5	Renew screws.	Tightening torque	55 Nm 90 °

Centre mount to body

Used in step 73

M8		Tightening torque	19 Nm

Heat shield to body

Used in step 74 75

Bolts/nut		Tightening torque	3 Nm

Bracket to body

Used in step 74

M8		Tightening torque	21 Nm

Exhaust system to body

Used in step 76

M8	Replace nuts.	Tightening torque	19 Nm

Exhaust bracket on body

Used in step 76

Hexagon screw M8x30		Tightening torque	19 Nm

V-clip to catalytic converter

Used in step 76

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

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Diesel particulate sensor to exhaust system

Used in step 76

Sensor		Tightening torque	50 Nm

Nitrogen oxide sensor downstream of SCR catalytic converter

Used in step 76

Sensor		Tightening torque	50 Nm

Cross-member/torsion strut to axle support and mounting

Used in step 77

M12x48	Renew screws.	Jointing torque Angle of rotation	100 Nm 90 °

Front connection carrier to body

Used in step 78

M10x18		Tightening torque	56 Nm

Rear connection carrier to body

Used in step 78

M8x18		Tightening torque	28 Nm

Rear end of front axle support to body

Used in step 79

M14 screw	Renew screw.	Tightening torque	175 Nm

Front axle support, front to body

Used in step 79

M12 screw	Renew screw.	Tightening torque	108 Nm

Underbody protection to body

Used in step 79 106

Screw		Tightening torque	3 Nm

Track rod end to swivel bearing

Used in step 79

M14	Renew nut.	Tightening torque	175 Nm

Wishbone to swivel bearing

Used in step 79

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

Holder, wishbone rubber mount, to body

Used in step 80

M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °

Holder with rubber mount to front axle support

Used in step 80

M12 screw			100 Nm

Washer fluid reservoir holder to front axle support adapter plate

Used in step 80

		Tightening torque	10 Nm

Deformation element, bottom, to adapter plate, front axle carrier

Used in step 80

		Tightening torque	11,8 Nm

Holder to front axle support

Used in step 81

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

Anti-roll bar link to anti-roll bar

Used in step 83

M10	Renew nut.	Tightening torque	56 Nm

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Wheel arch cover to body

Used in step 85

Plastic nut		Tightening torque	2,6 Nm
Screw		Tightening torque	2,6 Nm

Wheel arch cover to body

Used in step 85

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Used in step 85

Plastic nut		Tightening torque	3 Nm

Brake disc to rear wheel hub

Used in step 86

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub

Used in step 86

M8	Renew screw.	Tightening torque	16 Nm

Wheel bolts

Used in step 86

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Lower steering shaft to steering gear

Used in step 88

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

Steering column cover to bulkhead

Used in step 88

Plastic nut		Tightening torque	3 Nm

Heat shield for exhaust turbocharger

Used in step 89

Torx screw BM 6x12		Tightening torque	10 Nm

Rear bulkhead upper part to lower section of bulkhead

Used in step 90

Oval-head screw		Tightening torque	5 Nm

Battery holder to engine support

Used in step 91

Hexagon screw M8x30		Tightening torque	19 Nm

Electronics box to battery tray

Used in step 92

M8X16		Tightening torque	15 Nm

Wiring harness to cylinder head cover

Used in step 92

TS5x20		Tightening torque	3,5 Nm

Cover to electronics box

Used in step 92

RF5x26.5		Tightening torque	2,5 Nm

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Positive battery terminal to battery

Used in step 92

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray

Used in step 92

M8		Tightening torque	19 Nm

Clean air pipe to cylinder head cover

Used in step 93

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing

Used in step 93 99

Clamp		Tightening torque	3 Nm

Resonator to manifold and clean air pipe

Used in step 94

Screw TS6	Renew screw.	Tightening torque	5 Nm

Cover of top bulkhead

Used in step 96

Screw		Tightening torque	2,6 Nm

Cover of remote positive terminal

Used in step 96

Screw		Tightening torque	2,6 Nm

Battery terminal rail to battery tray

Used in step 97

M8			19 Nm

Battery terminal with IBS positive battery terminal / negative battery terminal

Used in step 97 98

NutM6			5 Nm

Trailing link

Used in step 97

M8		Tightening torque	19 Nm

Battery cover

Used in step 97

M8			2,8 Nm

Intake silencer housing to lock bridge

Used in step 99

M6X30		Tightening torque	8 Nm

Intake neck to cross connection

Used in step 100

M6		Tightening torque	8 Nm

Cross-brace to spring strut dome

Used in step 101

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

Cover on body

Used in step 101

Hexagon screw		Tightening torque	3 Nm

Oil filler plug to transmission housing

Used in step 104

M14	Renew the sealing ring.	Tightening torque	45 Nm

Overflow screw in oil drain plug

Used in step 104

M6	Renew the sealing ring.		8 Nm

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Oil drain plug / oil filler plug — Used in step 105

Hexagon socket		Tightening torque	43 Nm

Underbody protection front — Used in step 107

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Underbody panelling, side — Used in step 108

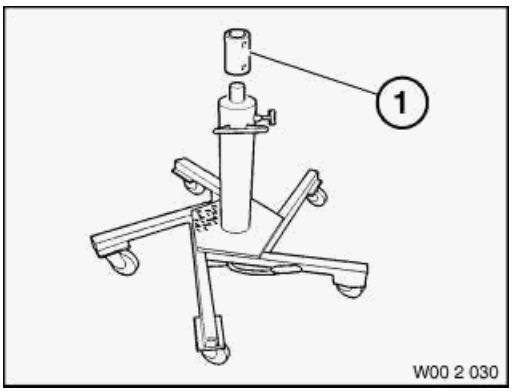
Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side — Used in step 108

Plastic nut		Tightening torque	2,6 Nm

Overview of Special Tools

0 490 133 (00 2 030) Device



Common — Used in step 28 79

Usage	(universal hydraulic lifter base unit) Chassis and hydraulic lifter - For removing and installing rear axle supports and gearboxes. Also for soft top mounts. Is replaced by 81 22 2 219 012
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 90 (207)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 490 134 (00 2 031)		**Adapter** (adapter for gearbox holder) Model series: E30, E31, E32, E34, E36	

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0 495 554 (33 5 070) Extension



Common

Used in step 34 73

Usage	Pull-out extension for 33 5 040, 33 5 050, 33 5 060.
Included in the tool or work	
Storage location	A18
Replaced by	
In connection with	
SI-Number	01 21 06 (300)

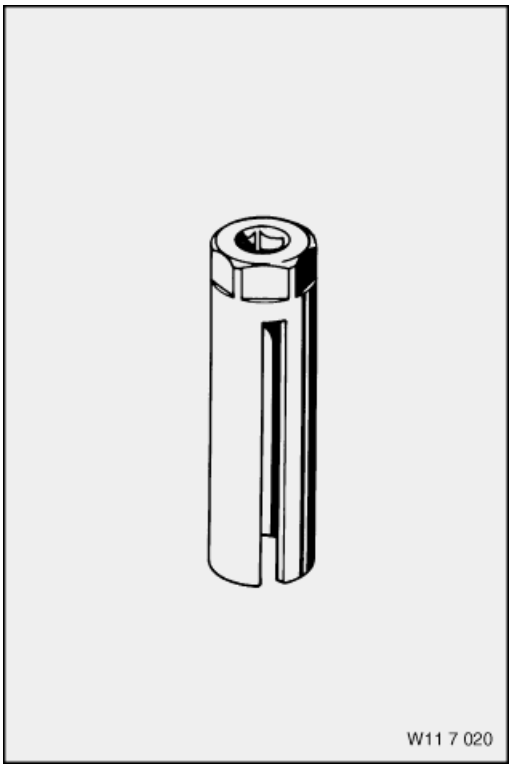
Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 592 (33 5 071)		**Extension** (Extension (1 item)) discontinued, can only be ordered using complete tool	

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0 491 074 (11 7 020) Socket wrench insert

Used in step 40 41 67

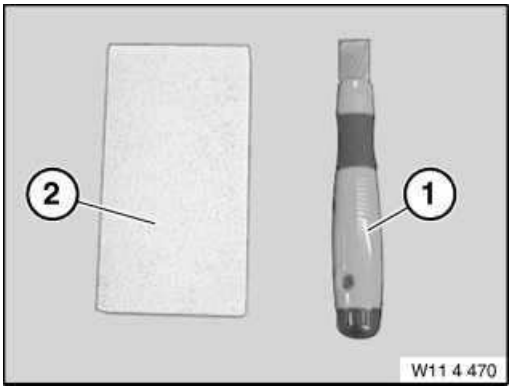


Common

Usage	(Socket wrench insert 22 mm) For loosening and tightening the oxygen sensor
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	

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0 495 102 (11 4 470) Tool



Common

Used in step 54

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

2 409 025 Puller



Common

Used in step 68

Usage	For disassembly of the outer radial shaft seal of the transmission output shaft, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A76
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

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2 411 739 Puller



Common	Used in step 68
Usage	For disassembly of the inner radial shaft seal of the output, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C78
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 408 152 Striking element



Common	Used in step 68
Usage	For installation of the right radial shaft seal transmission output shaft (inner). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

2 413 037 Handle



Common	Used in step 68
Usage	Universal drift handle. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C77
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

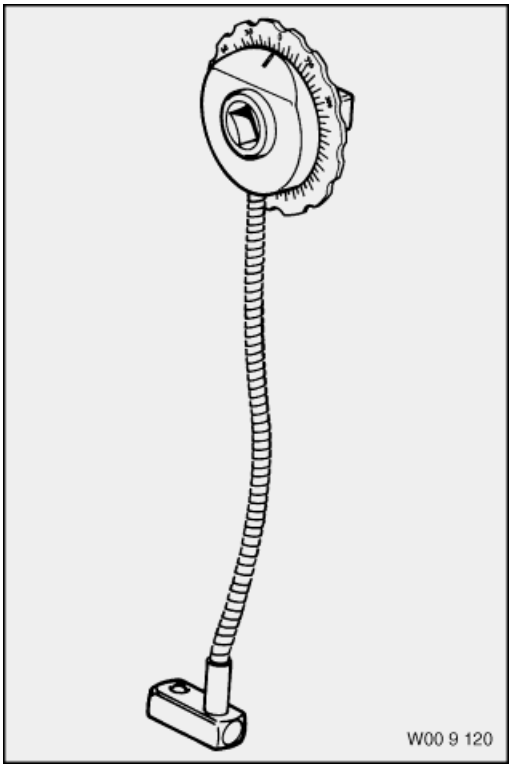
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2 408 150 Striking element



Common	Used in step 68
Usage	For installing the right radial shaft seal transmission output shaft (outer). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

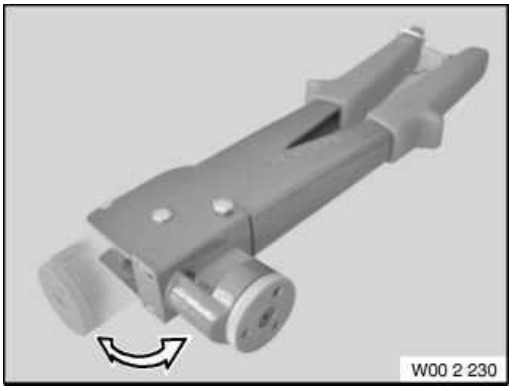
0 490 504 (00 9 120) Torque angle measuring dial



Common	Used in step 73
Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

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0 496 521 (00 2 230) Pliers



Common	Used in step 85
Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

2 344 011 Tool



Common	Used in step 86
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

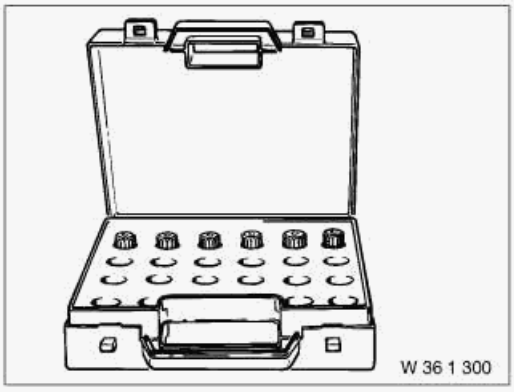
0 495 221 (36 1 323) Wheel stud



Common	Used in step 18
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 224 (36 1 326) Wheel stud



Common	Used in step 18
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud



Common	Used in step 18
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

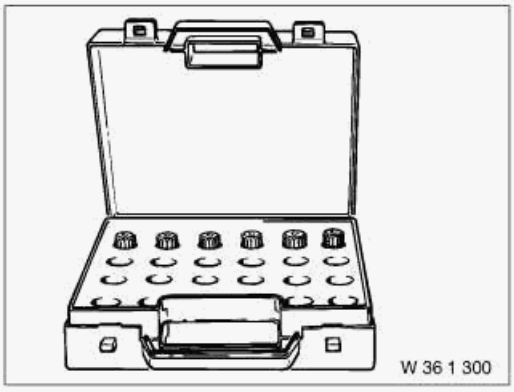
0 495 226 (36 1 328) Wheel stud



Common	Used in step 18
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 227 (36 1 329) Wheel stud



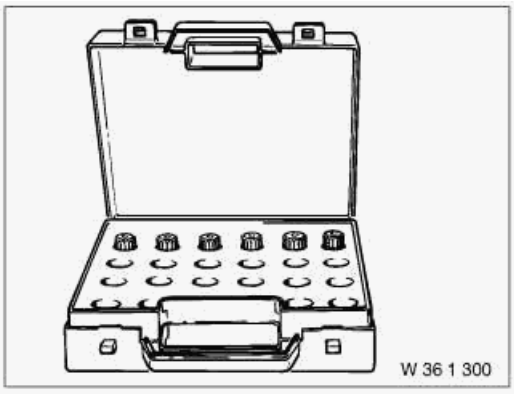
Common	Used in step 18
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud



Common	Used in step 18
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 229 (36 1 332) Wheel stud



Common	Used in step 18
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud



Common	Used in step 18
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

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Transmission oil capacity	Used in step 105
Transmission oil GS6-60DA, GS6X60DA/Owner's Handbook	2,2 l
Transmission oil: Technically suitable manual gearbox oil	

Links

Functional descriptions	Used in step
Troubleshooting on the exhaust turbocharger	53

General repair instructions	Used in step
61 20 ... Notes on AGM battery	98
61 12 ... Notes on intelligent battery sensor (IBS)	98
61 00 ... Notes for disconnecting and connecting battery	98
61 00 ... Safety information for handling vehicle battery	

Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	12 40 41 43 44 45 46 47
11 65 ... Test steps in the event of turbocharger damage	53
11 65 020 Turbocharger damage due to blocked oil supply lines	53

Operating materials	Used in step
2.0 Grease for wheel centring	86
14.0 Automatic transmission fluid for ZF-transmission GA8HP45Z / GA8HP50Z / GA8HP70Z / GA8HP90Z / GA8P70H / GA8P75H / GA8HP75Z	104

Operating materials	Used in step

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11 65 045 Removing and installing/replacing low-pressure stage turbocharger

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE



Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

For exhaust turbocharger damage: Check the pressure pipes, charge air cooler and intake plenum for foreign matter, damage and correct functionality.

If the oil return line is exchanged, then the connecting pipe to the oil sump must ALWAYS be cleaned, as the connecting pipe can coke.

TECHNICAL INFORMATION

With exhaust turbocharger damage, it is imperative to observe the additional information.

For additional information see: 11 65 020 Exhaust turbocharger damage due to plugged oil supply lines

TECHNICAL INFORMATION

Prior to replacing the exhaust turbocharger: Observe the notes on troubleshooting on the exhaust turbocharger.

For additional information see: FUB-FUB-FB-130003-A10 Troubleshooting on the exhaust turbocharger

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

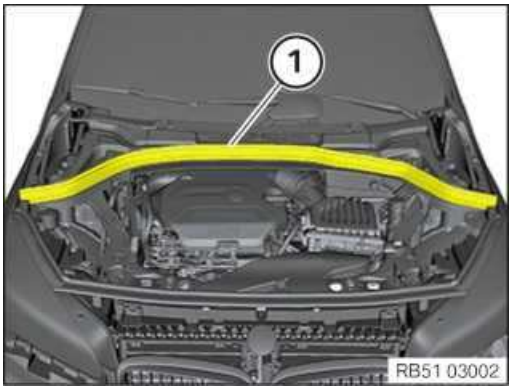
Maintain conditions of absolute cleanliness.

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1 – Remove the seal for the rear bonnet

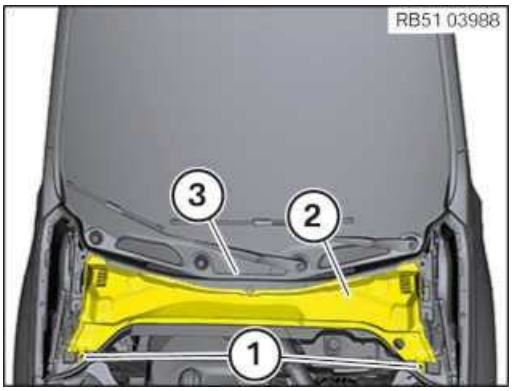
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



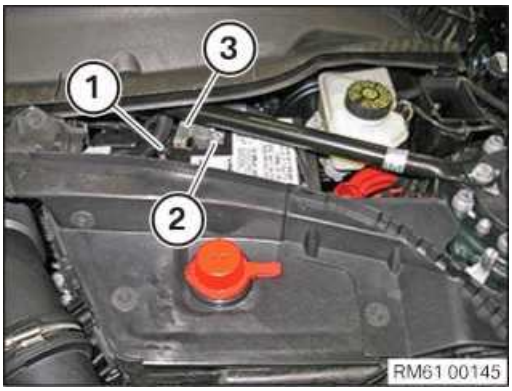
- Pull off rear bonnet seal (1) towards the top and remove.

2 – Removing front cowl panel cover



- Loosen the expanding rivet (1).
- Feed out and remove front cowl panel cover (2) from the rear cowl panel cover(3).

3 – Disconnecting the battery earth lead



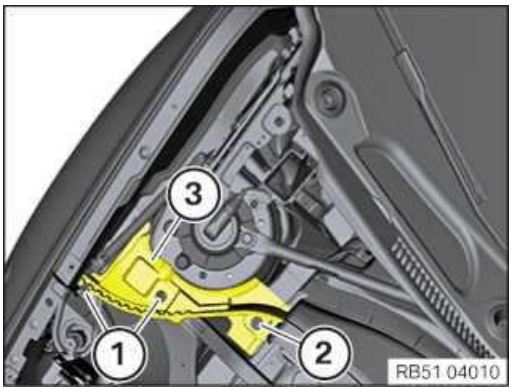
- Unlock plug connection (1) and disconnect.
- Unfasten nut (2).
- Remove the battery earth lead (3) and secure to one side.

4 – Remove suspension cross-brace

TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.

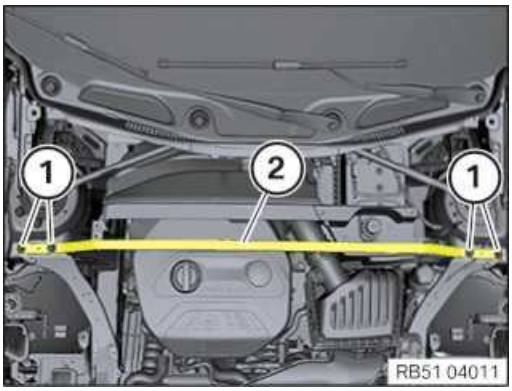
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NOTICE

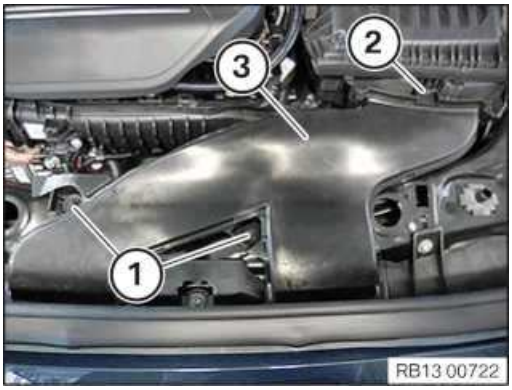
Description is for right component only. The procedure on the left side is identical.

- Loosen expanding rivet (1).
- Loosen screw (2).
- Remove the cover (3).



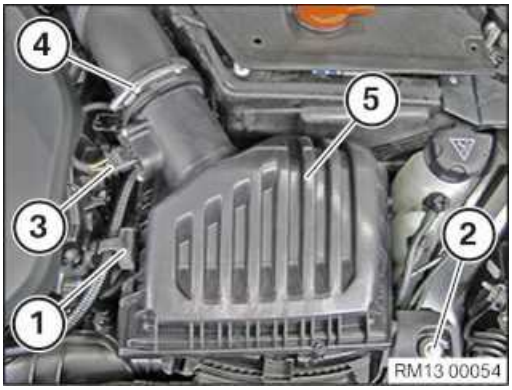
- Loosen screws (1).
- Remove strut brace (2).

5 – Remove the intake neck for intake silencer housing



- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

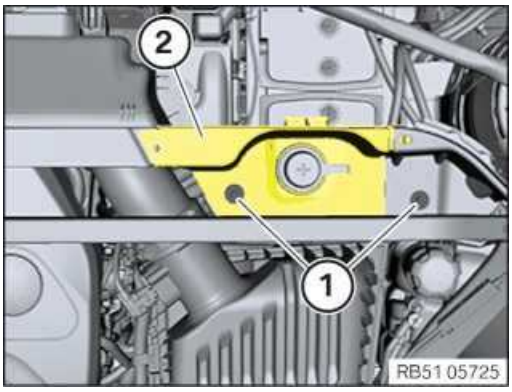
6 – Removing intake silencer housing



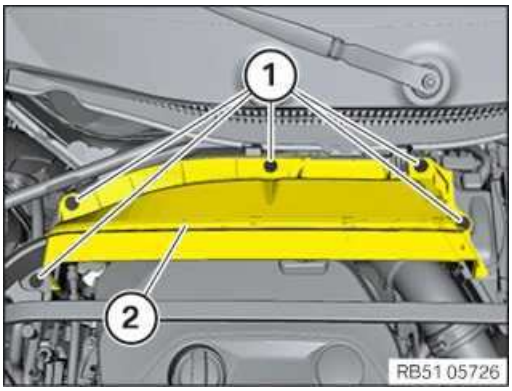
- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

7 – Removing the upper bulkhead cover

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- Loosen screws (1).
- Guide out and remove the cover (2).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

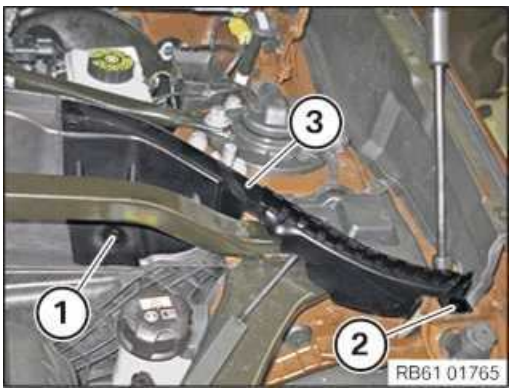
8 – Remove vehicle battery

WARNING

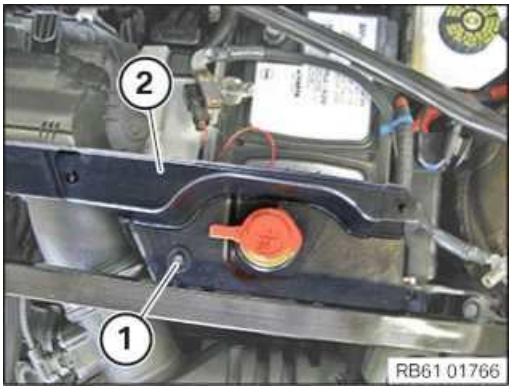
Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

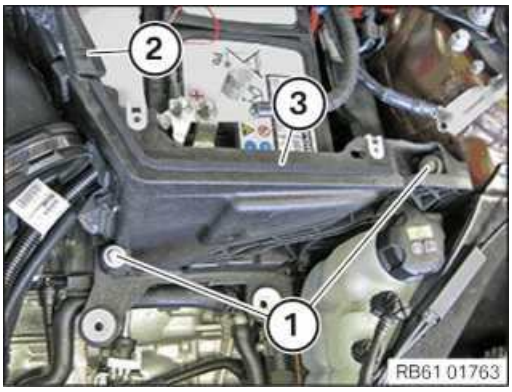


- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

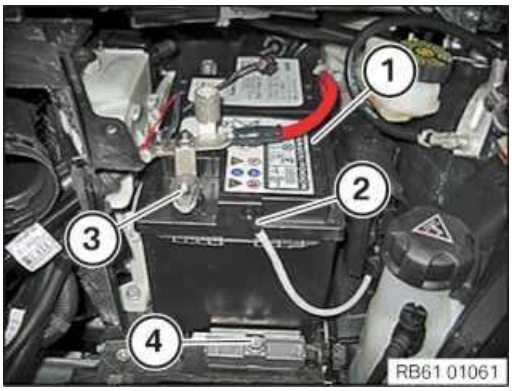


- Loosen screw (1).
- Remove the cover (2).

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- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.



- Pull off the vent hose (2).
- Slacken the nut (3) on the positive battery terminal and remove the positive battery terminal.

WARNING

Unprotected battery terminals.

Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

9 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

Damage to the acoustic cover.

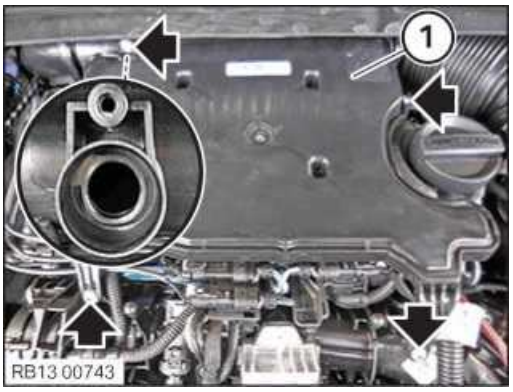
Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

10 – Remove resonator

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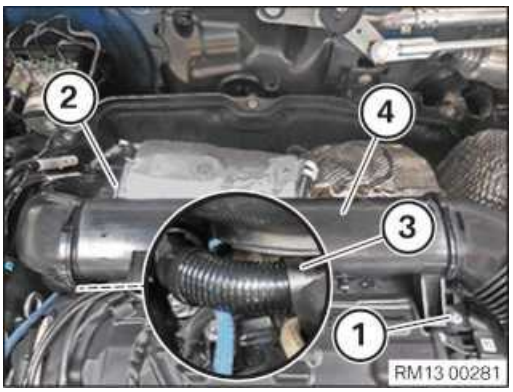


- Remove screws (arrows).
- Guide out and remove the resonator (1).

11 – Removing clean air pipe



- Detach clamp (1) on the clean air pipe.
- Pull off the clean air pipe from the intake silencer housing.



- Loosen screw (1).
- Loosen clamp (2).
- Unlock the ventilation line (3) and pull it off the cylinder head cover.
- Feed out clean air pipe and remove.

12 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

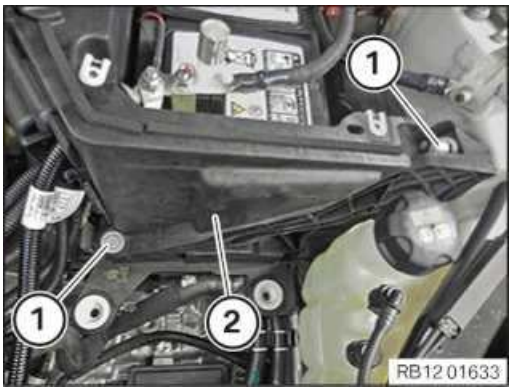
TECHNICAL INFORMATION

Follow instructions for removing and installing control units.

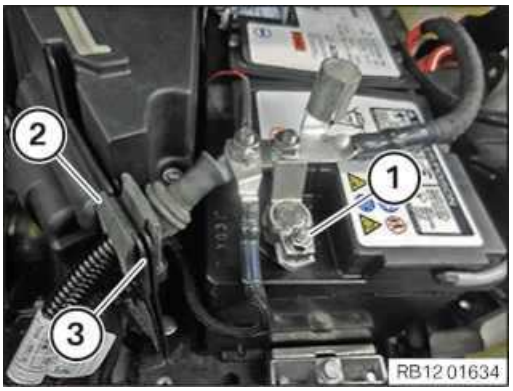
For additional information see: 12 00 ... Notes on removal and installation of control units

TECHNICAL INFORMATION

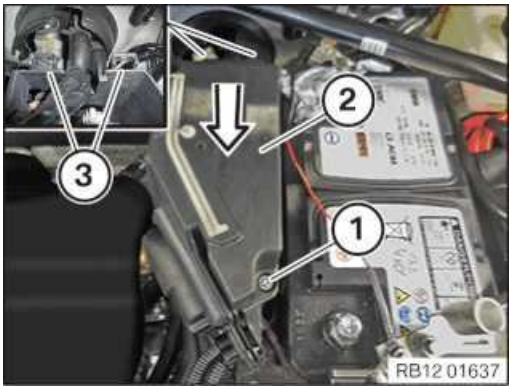
Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.



- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.

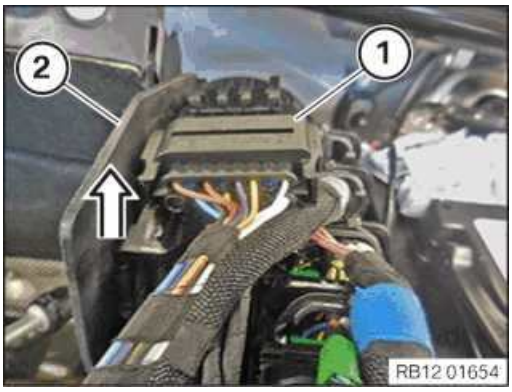


- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

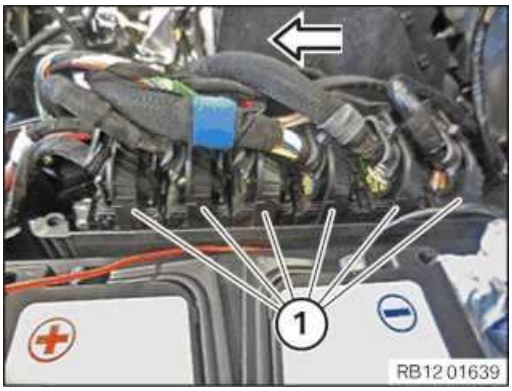


- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.

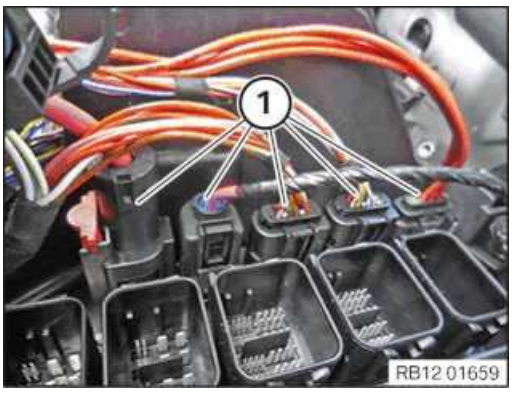
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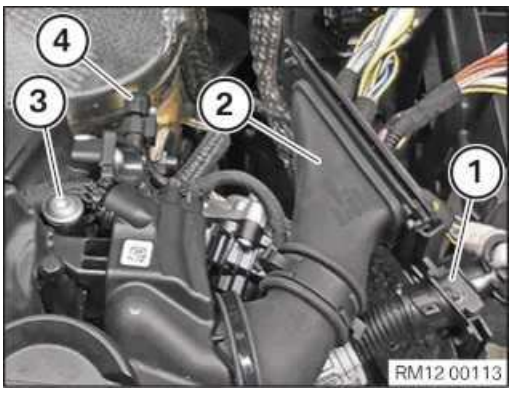
- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).



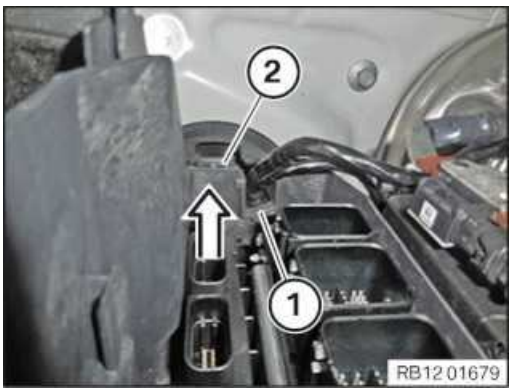
- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



- Unlock and loosen connector (1).

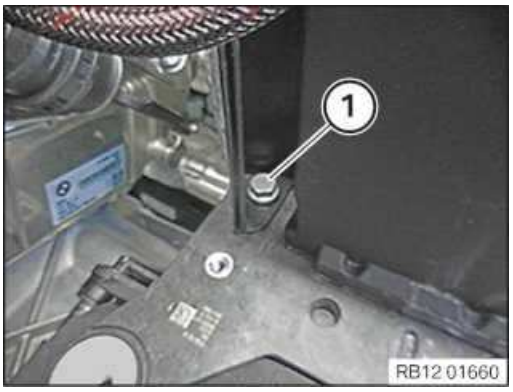


- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.

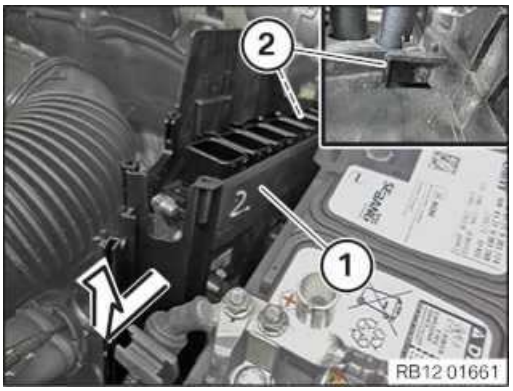


- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.

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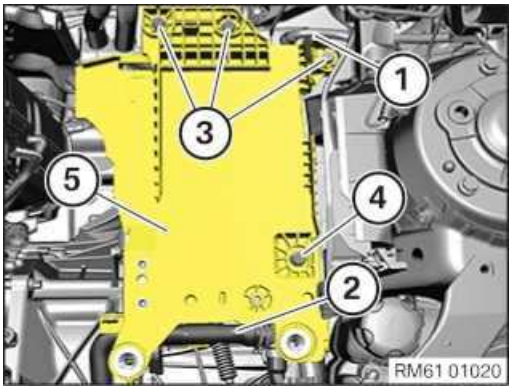


- Loosen screw (1).



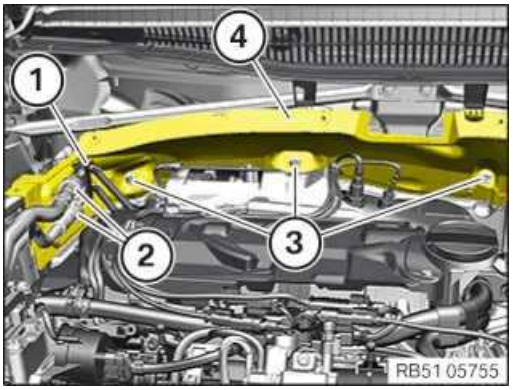
- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

13 – Remove battery holder



- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

14 – Remove the rear bulkhead upper part



- Unlock the holder (1) and disconnect.
- Guide out and remove the fuel lines (2).
- Loosen screws (3).
- Guide out the rear bulkhead upper part (4) and remove.

15 – Removing heat shield from top exhaust turbocharger

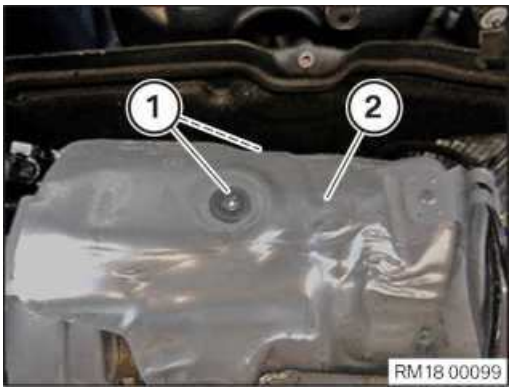
WARNING

Hot surfaces.

Risk of burning!

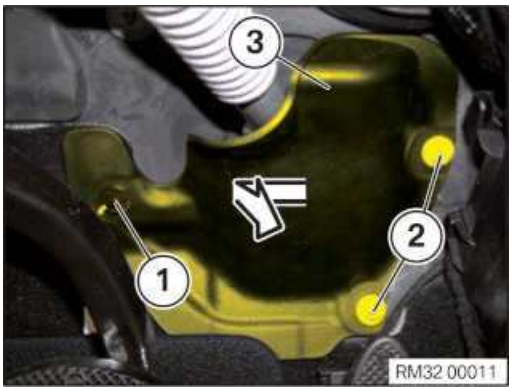
- Perform all work only on components that have cooled down.

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- Release cable from holders.
- Release the screws (1) at the top and bottom of the heat shield.
- Feed out and remove the heat shield (2).

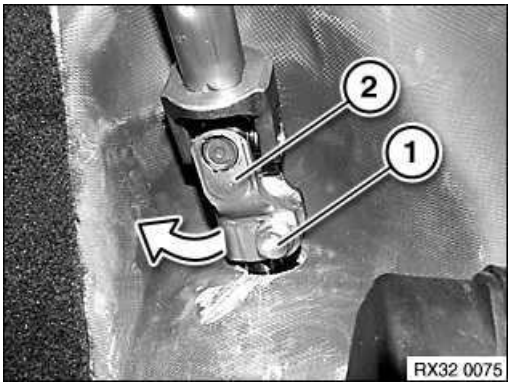
16 – Releasing lower steering shaft from steering gear



- **If installed:**
- Unfasten nut (1).
- Unscrew the nuts (2) by 1 rotation.

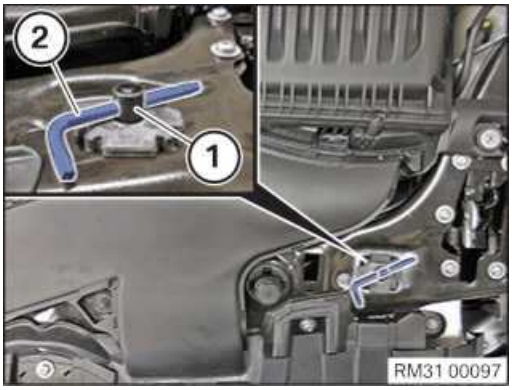
  Do not remove the nuts (2) !
- Remove the cover (3) on the steering column in the direction of the arrow.

  The side footwell trim must not be disassembled!



- Loosen screw (1).
- Swivel out the universal joint (2) of the bottom steering shaft from the steering gear in the direction of the arrow.

17 – Securing radiator on left and right



NOTICE

Perform the operations on the left and right side.

- Fasten radiator at centring pin (1) with suitable tool (2).

18 – Removing both front wheels

▸ **Removing the wheel**

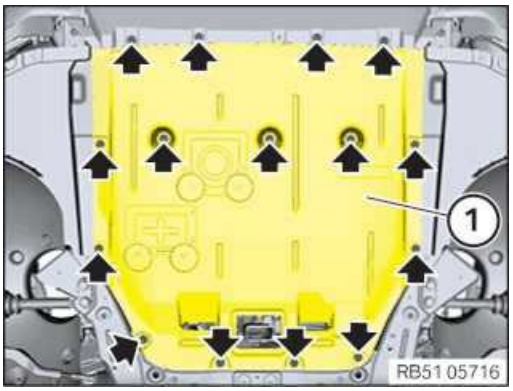
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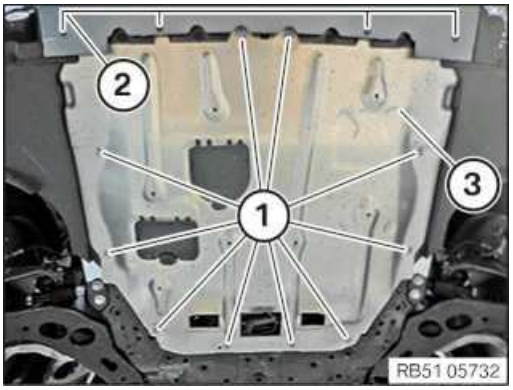
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Unscrew the wheel bolts (arrows) and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

19 – Removing the front underbody protection

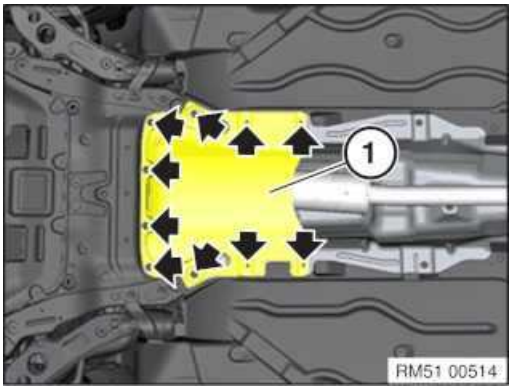


- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.



- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

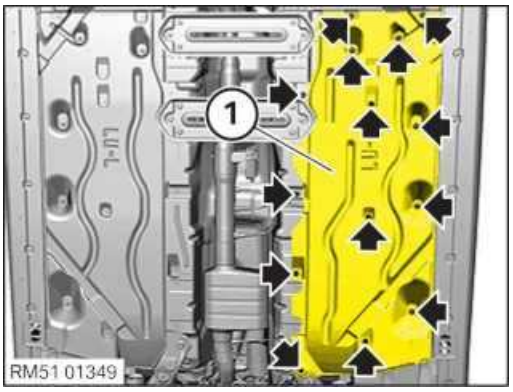
20 – If installed: Removing rear underbody protection



- Remove screws (arrows).
- Remove the rear underbody protection (1).

21 – Removing right underbody panelling

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- Unscrew all bolts and nuts (arrows).
- Remove the underbody panelling (1).

22 – Removing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

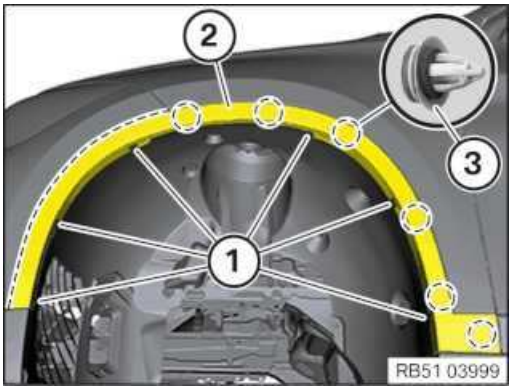
▸ **Remove the front wheel arch trim**

NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

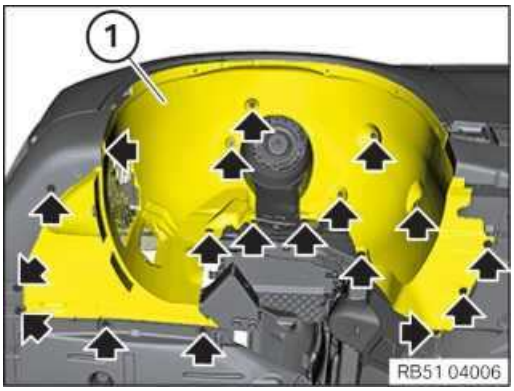
NOTICE

Description is for left component only. Procedure on the right side is identical.



- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.

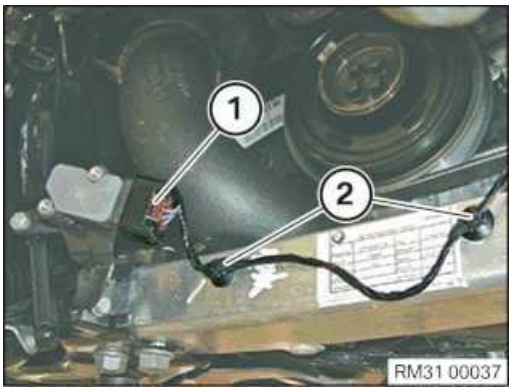
▸ **Remove front wheel arch cover**



- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

23 – With right installation: Detaching ride height sensor cable

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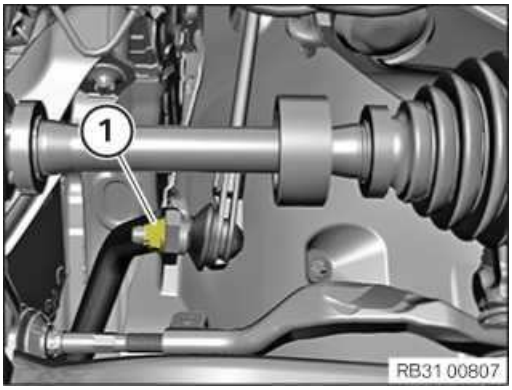
- Unlock plug connection (1) and disconnect.
- Release cable clip (2) from deformation element adapter.

24 – Releasing anti-roll bar on left and right from anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▸ **Detach the anti-roll bar from the anti-roll bar link**

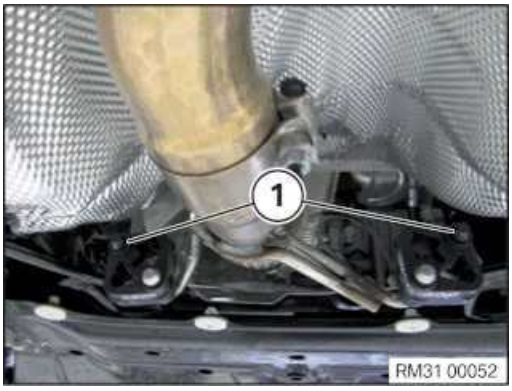


- Unfasten nut (1).

Note: Use the Torx socket for counter support.

- Loosen the anti-roll bar link from the anti-roll bar .

25 – Detaching rubber mount from front axle support

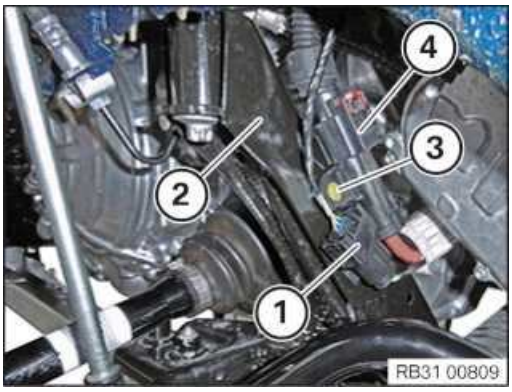


- Spray rubber mount (1) with lubricant and release from holder on front axle support.

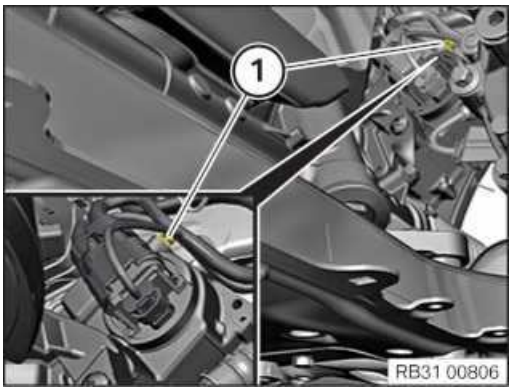
26 – Disconnecting plug connections from steering gear

▸ **If installed: Detach connectors from the front axle carrier**

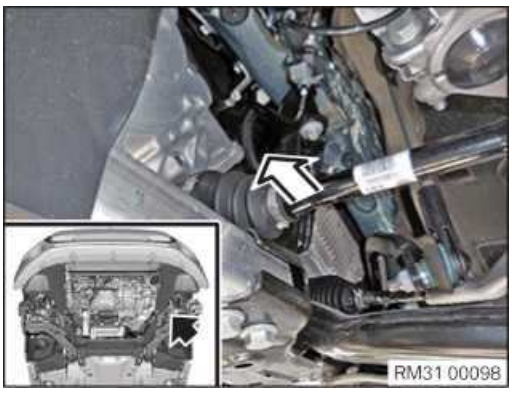
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- Release the plug connection (1) from the front axle support (2).
- Loosen screw (3).
- Release the plug connection (4) from the front axle support (2).

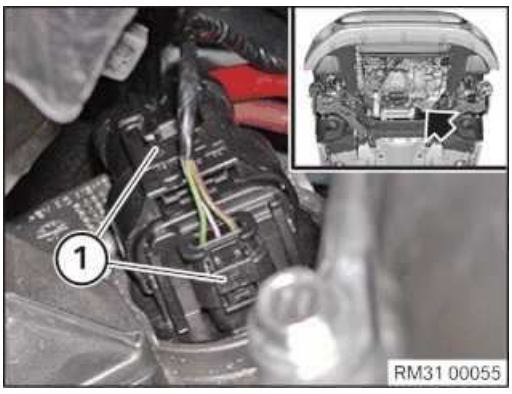


- Disconnect wiring harness (1) from steering gear.



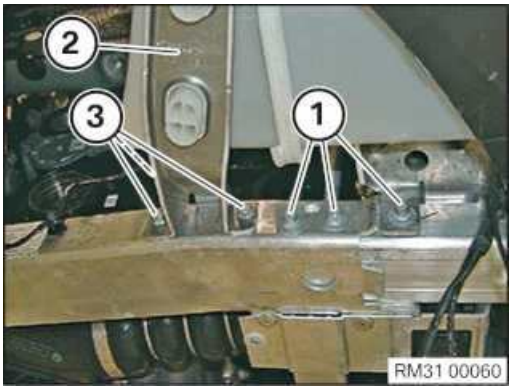
- To unlock the plug connections (see the following work step): unlock plug connections (arrow) with the right hand.

  The plug connections can be reached via the left-hand output shaft.



- Unlock plug connections (arrow) (1)and disconnect from the steering gear.
- Make sure when lowering the front axle that the cables are not damaged!

27 – Releasing the mounted part from the front axle support



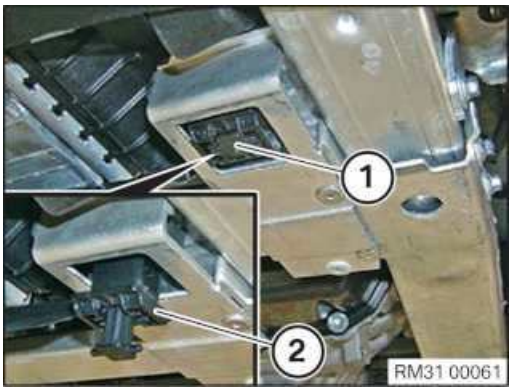
- **Only on right side:** Loosen screws (3) and remove holder for washer fluid reservoir (2).

NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

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NOTICE

Perform the operations on the left and right side.

- Unlock safety catch (1) of the lock (2) from the holder for the charge air cooler.
- Completely remove locks (2).



- Loosen screw (2) of the engine support (3) on the front axle (1).

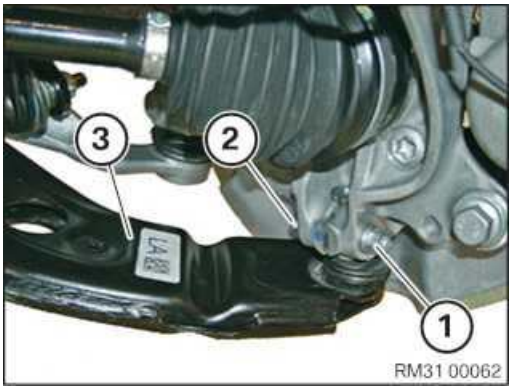


NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

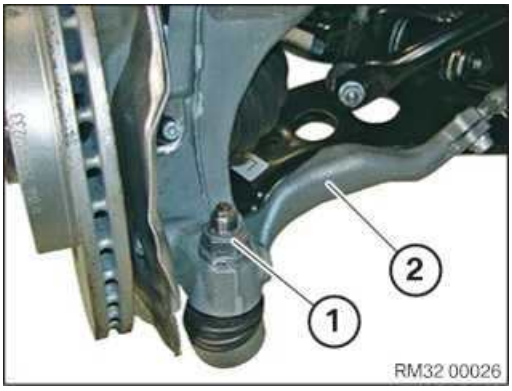
28 – Detaching and removing front axle completely



NOTICE

Perform the operations on the left and right side.

- Unfasten nut (1).
- (2)Pull out screw.
- Detach the wishbone (3) from the swivel bearing .

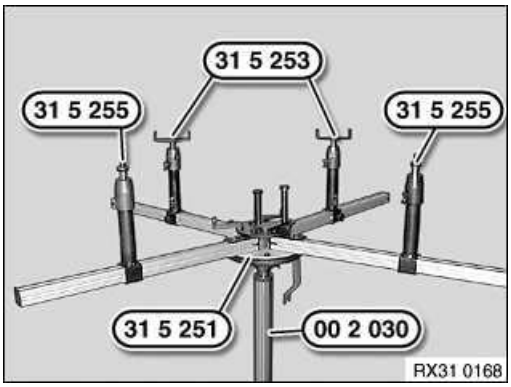


NOTICE

Perform the operations on the left and right side.

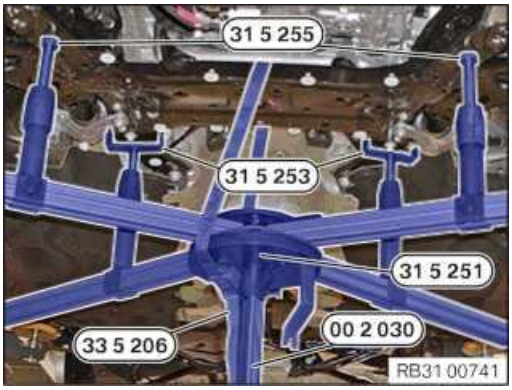
- Unfasten nut (1).
- Detach the track rod (2) from the swivel bearing.

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- Fit the special tool completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools in telescopic supports of a profile rail pair.
- Insert special tools in telescopic supports of other profile rail pair.

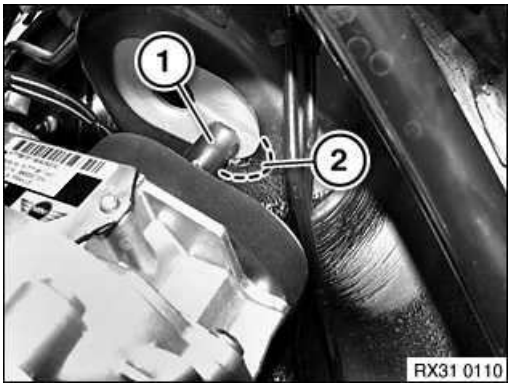
Note: In a profile rail pair, two profile rails are connected to one another by gearing.



- Align special tools and to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool to special tool .

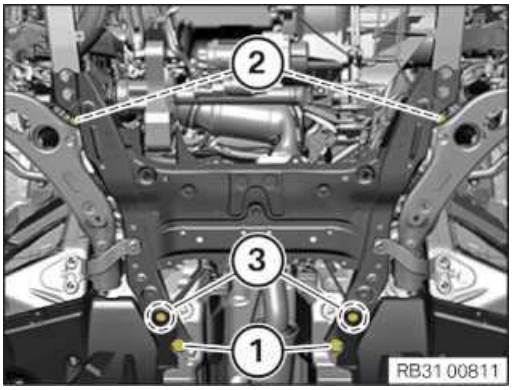


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and remove the front axle.

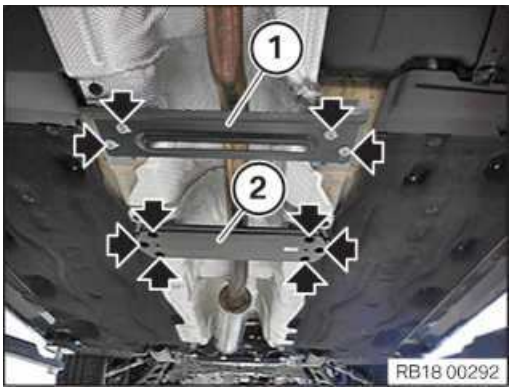
TECHNICAL INFORMATION

Note the information on thread repairs using Helicoil thread inserts.
For more information see: 41 00 ... Notes on repairing threads

- Check threads for damage; if necessary, repair with Helicoil thread inserts.

29 – Removing the connecting support from the tunnel in front and back

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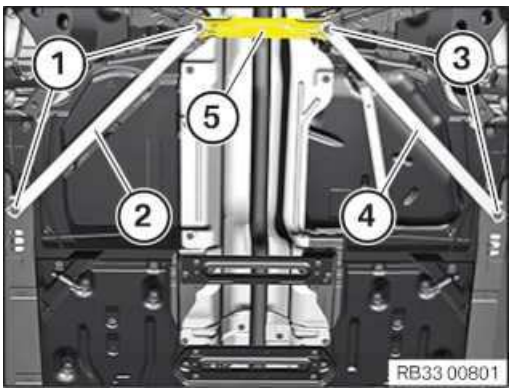


- Unscrew the bolts (arrows) from the connecting support (1).
- Feed out and remove the crossbeam (1).
- Unscrew the bolts (arrows) from the connecting support (2).
- Feed out and remove the crossbeam (2).

30 – Remove the cross strut with the torsion strut

TECHNICAL INFORMATION

Driving without a torsion strut is not permitted.



- Loosen screws (1).
- Thread out torsion strut (2) at left and remove.
- Loosen screws (3).
- Thread out torsion strut (4) at right and remove.
- Feed out and remove the cross-member (5).

31 – Remove exhaust system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

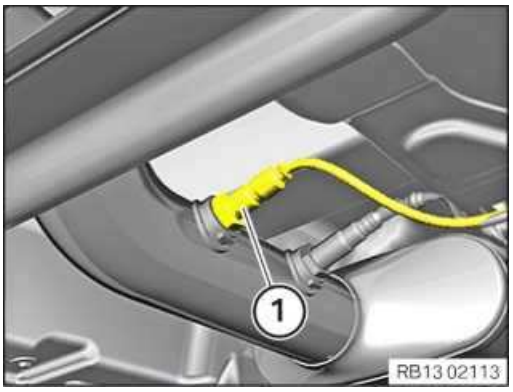
CAUTION

Heavy component.

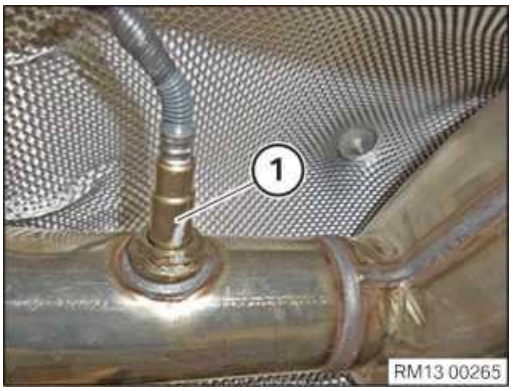
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

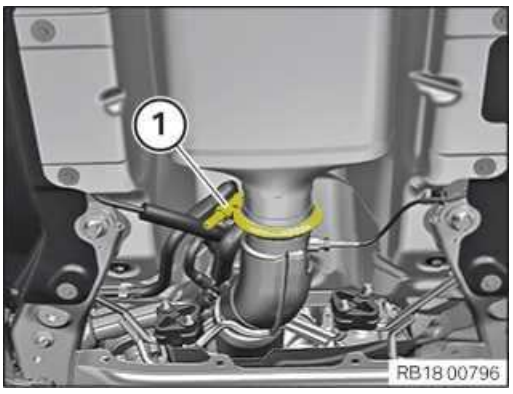
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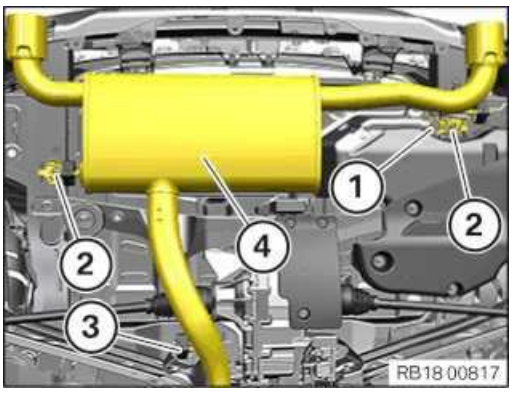
- Release the nitrogen oxide sensor (1) downstream of the SCR catalytic converter, guide it out and set it aside.



- Release the diesel particulate sensor (1), guide it out and set it aside.

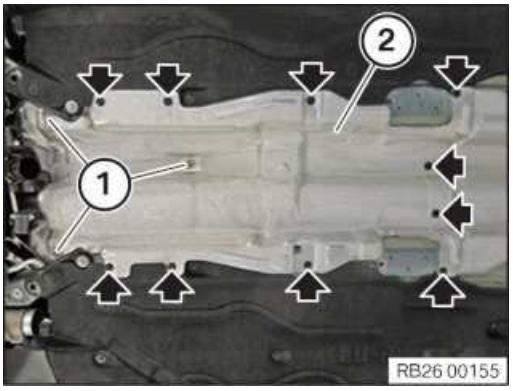


- Loosen V-band clamp (1).



- Loosen screw (1).
- Loosen nuts (2).
- Release the rubber mount (3) of the exhaust system (4).
- Lower and guide out the exhaust system (4) with assistance of a second person and remove it.

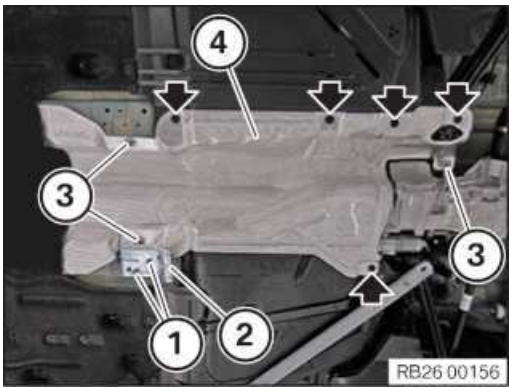
32 – Remove front heat shield



- Remove screws (arrows).
- Loosen nuts (1).
- Guide the heat shield (2) out and remove it.

33 – Remove heat shield at rear.

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- Loosen screws (1).
- Guide out and remove holder (2).
- Remove screws (arrows).
- Loosen nuts (3).
- Guide the heat shield (4) out and remove it.

34 – Remove propeller shaft

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

RISK OF DAMAGE

Damage to propeller shaft during removal.

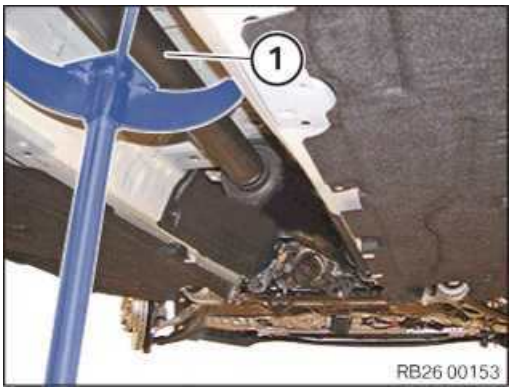
Non-observance of the removal guidelines for the propeller shaft on the rear axle differential may cause severe damage.

- Do not disassemble the three-hole flange, flexible disc and propeller shaft. The three-hole flange to the rear axle differential is balanced with the flexible disc and propeller shaft.
- Loosen the recessed nut against the direction of travel in clockwise direction. The propeller shaft must be loosened on the recessed nut only and exclusively in the direction of rotation otherwise the anti-twist lock of the bi-hexagonal flange nut is damaged.
- In the event of a damaged anti-twist lock on the bi-hexagonal flange nut: Replace the rear axle differential.



- Install the special too l between the front and rear propeller shaft.
- Make sure that the arrows on the special tool point forward in the direction of travel.

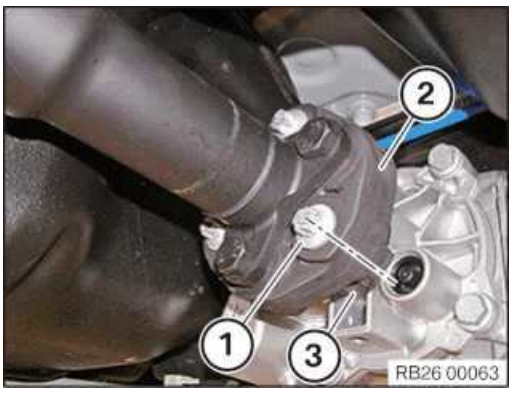
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- Always support the propeller shaft (1) with a conventional jack.



- Protect the propeller shaft (1) with the special tools **0 495 554 (33 5 070)** and from twisting.



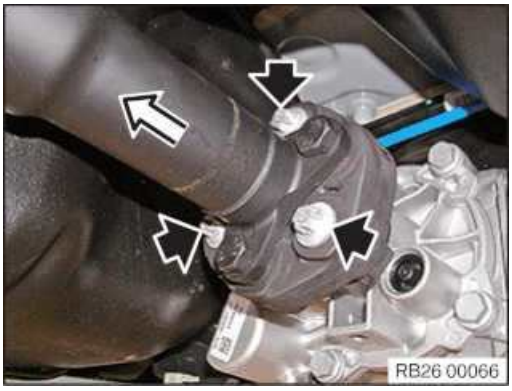
TECHNICAL INFORMATION

Compliance with the following instructions is required to avoid a humming noise from the propeller shaft after refitting the propeller shaft.

- Mark the installation position of the screw connection (1), the flexible disc (2) and the three-hole flange (3) on the same level.
- Loosen the screw connection (1).

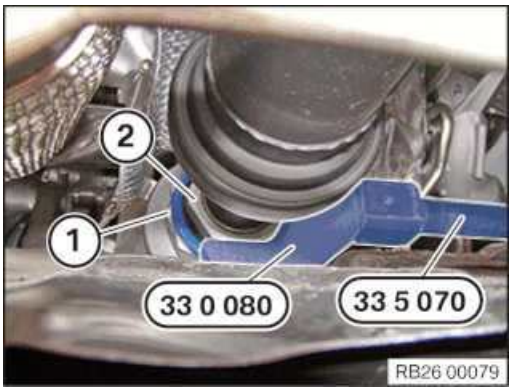


- Loosen screws (1).



- Remove screws (arrows).
- Guide the propeller shaft out in the direction of the arrow and set it aside.

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RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.

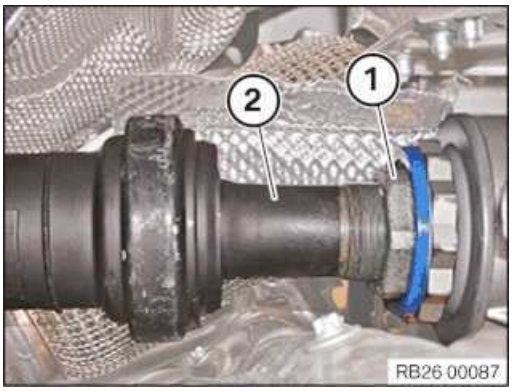
- Protect the recessed nut (2) on the transfer box from twisting with the special tools **0 495 554 (33 5 070)** and .

  The recessed nut (2) on the transfer box must **not** be used to detach the propeller shaft.

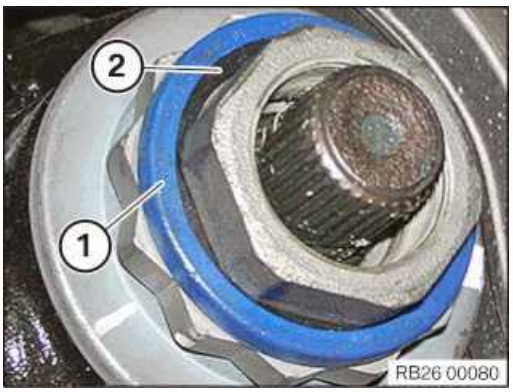
  The double hexagon flange nut (1) must **not** be used for counter support.



- Release the front propeller shaft with the special tools **0 495 554 (33 5 070)** and in the direction of the arrow.

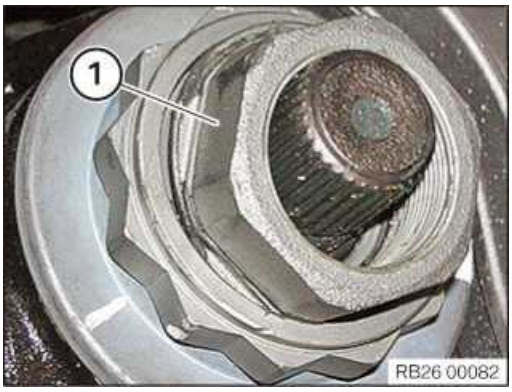


- Thread the propeller shaft (2) out of the recessed nut (1) and remove.



- Thread the retaining clip (1) and the seal (2) out and remove.

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- Thread out and remove the recessed nut (1).

35 – Removing starter motor

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and loosen connector (1).
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).

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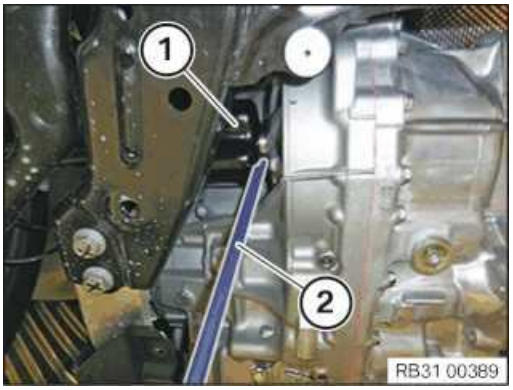


- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.



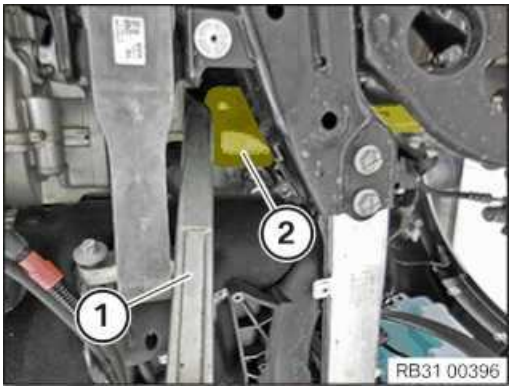
- Loosen screws (1).
- Feed out starter motor and remove.

36 – Partially removing the left output shaft



- Protect the output shaft (1) from falling.
- Lever out the output shaft (1) with a mounting lever (2) from the transmission.
- Tie up output shaft (1).

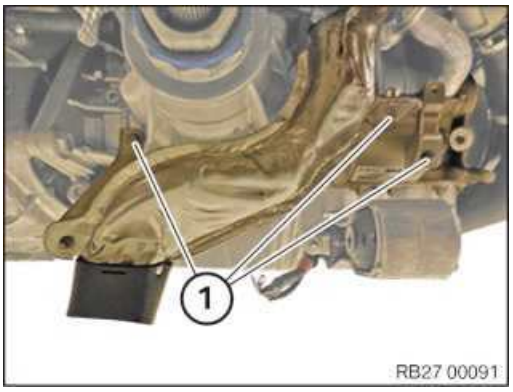
37 – Partially removing right output shaft



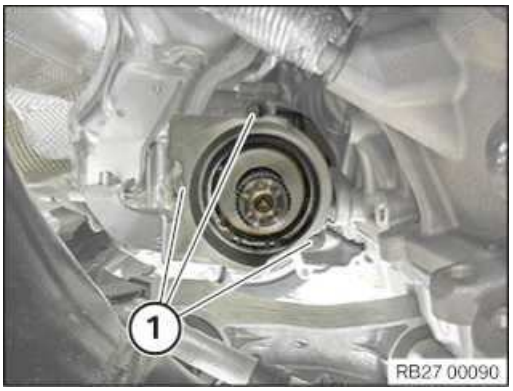
- Lever out the output shaft (2) with a mounting lever (1).
- Tie up output shaft (1).

38 – Remove the intermediate shaft with the support tube

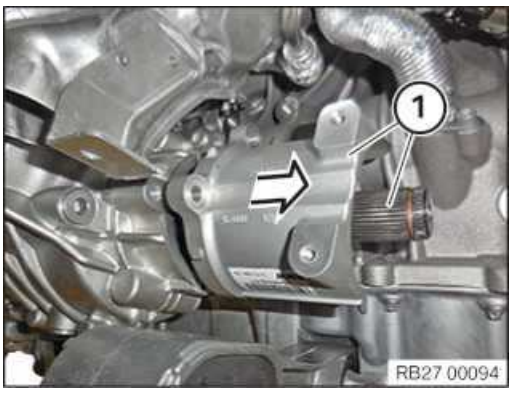
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- With air duct installation: Loosen screws (1).
- Remove air duct

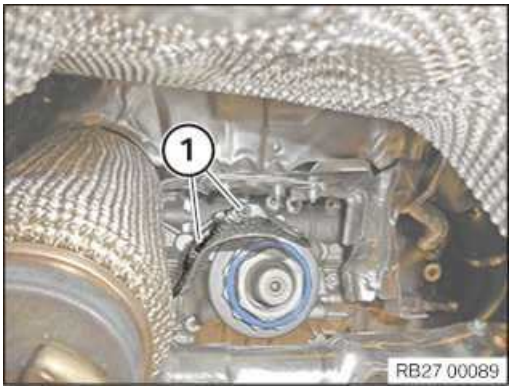


- Loosen screws (1).

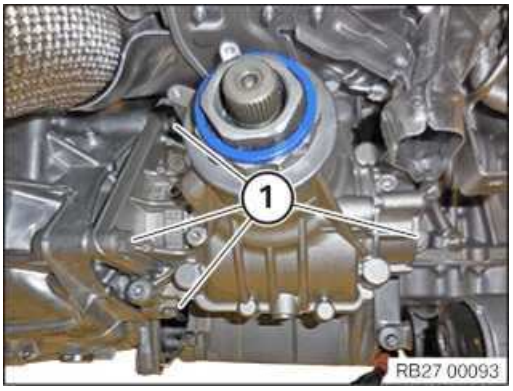


- Pull the intermediate shaft with the support tube (1) out of the transfer box.

39 – Remove transfer box (VTG)



- Loosen screws (1).
- Remove heat shield.



- Loosen screws (1).
- Remove the transfer box (VTG).

40 – Remove the monitoring oxygen sensor

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WARNING

Hot surfaces.

Risk of burning!

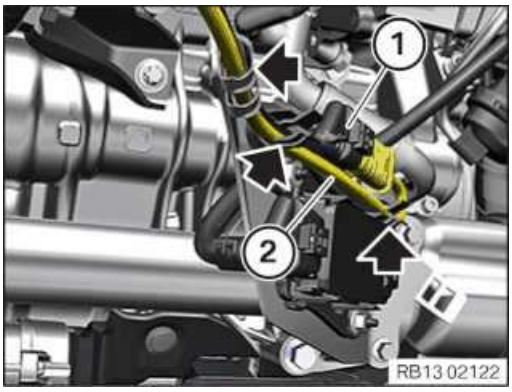
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

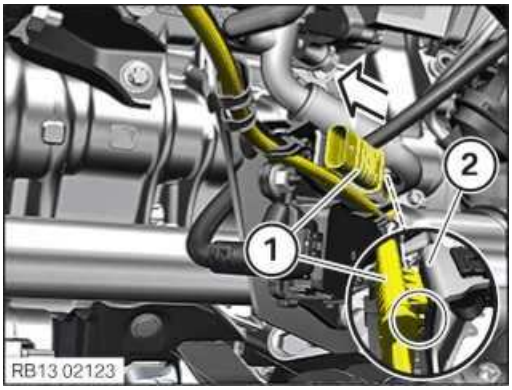
Electrostatic discharge.

Damage to or destruction of electrical components.

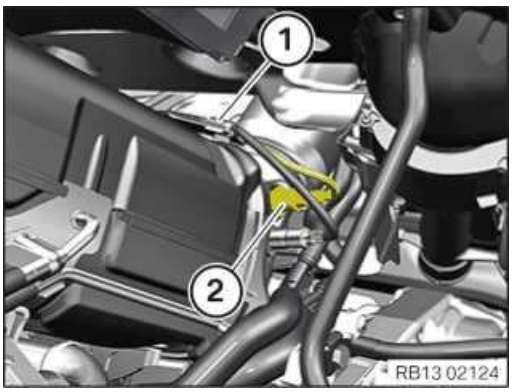
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock plug connection (1) and disconnect.
- Feed oxygen monitor sensor cable (1) out of the clamps (arrows).



- Unlock the connector (1) in the marked area and disconnect it from the holder (2) in the direction of arrow.



- Guide the cable of the monitoring oxygen sensor (2) out of the clamp (1).
- Release the monitoring oxygen sensor (2) using special tool **0 491 074 (11 7 020)**.
- Remove the monitoring oxygen sensor (2).

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WARNING

Hot surfaces.

Risk of burning!

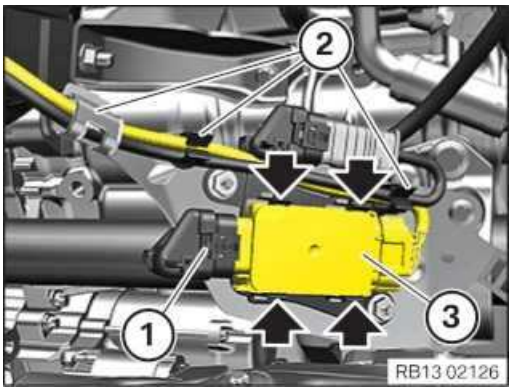
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

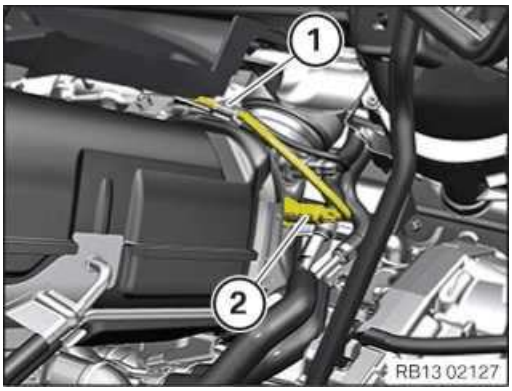
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



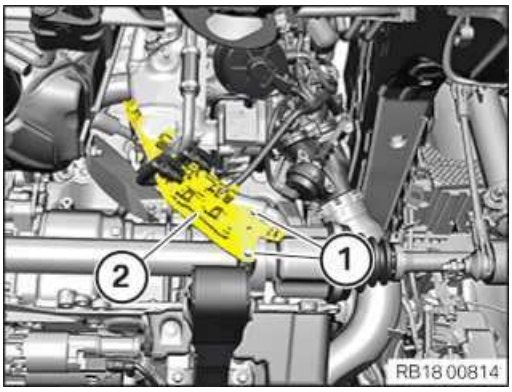
- Unlock plug connection (1) and disconnect.
- Slide the cable of the nitrogen oxide sensor evaluation electronics (3) out of the clamps (2) and remove.
- Unlock (arrows) and remove the evaluation electronics for the nitrogen oxide sensor (3).



- Slide the cable of the nitrogen oxide sensor before the SCR catalytic converter (2) out of the clamps (1) and remove.
- Detach the nitrogen oxide sensor before the SCR catalytic converter (2) using the special tool **0 491 074 (11 7 020)**.
- Guide out and remove the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

42 – Remove holder for oxygen sensor

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- Loosen screws (1).
- Thread out the holder (2) for the oxygen sensor and remove.

43 – Remove the exhaust temperature sensor on the catalytic converter

WARNING

Hot surfaces.

Risk of burning!

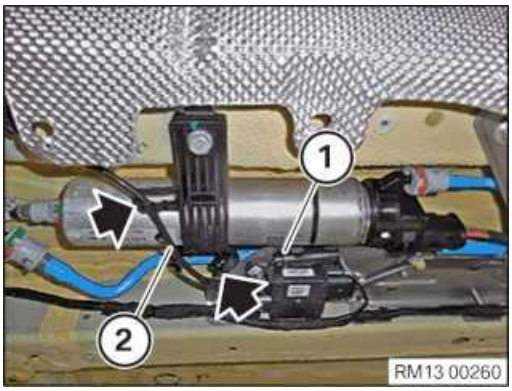
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

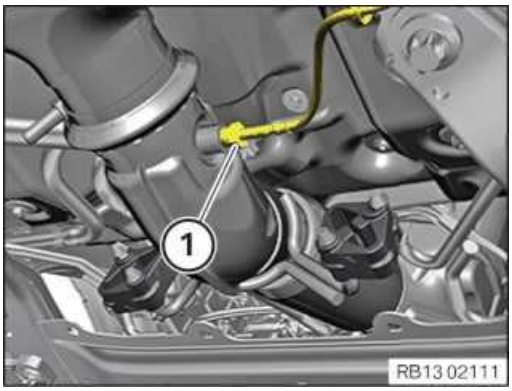


- Unlock and loosen connector (1).
- Feed out the cable (2) of the exhaust temperature sensor from the clamps (arrows) and remove.

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- Loosen the cable clip (1).



- Loosen exhaust temperature sensor (1).
- Feed out and remove exhaust temperature sensor (1).

44 – Removing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

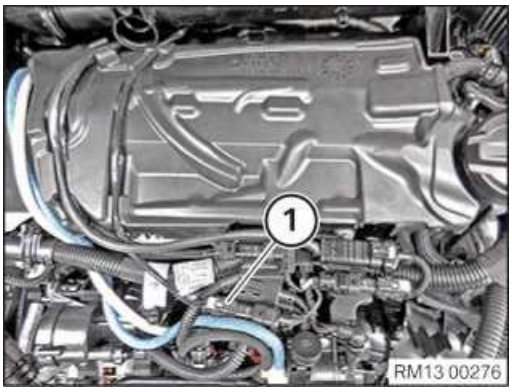
RISK OF DAMAGE

Electrostatic discharge.

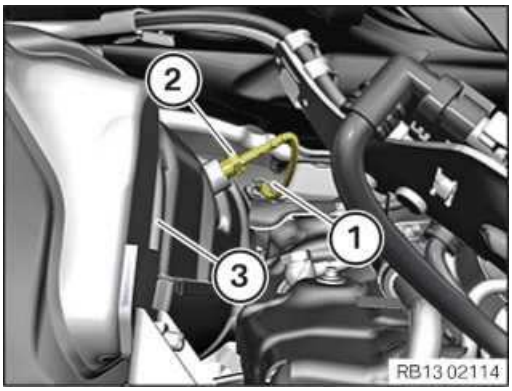
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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- Unlock and loosen connector (1).
- Uncover the exhaust temperature sensor cable.



- Guide the exhaust temperature sensor cable (2) out of the clamp (1) and place it to one side.
- Release the exhaust temperature sensor (2) with conventional tools .
- Feed out and remove the exhaust temperature sensor (2) from the diesel particulate filter (3).

45 – Remove the exhaust temperature sensor on the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

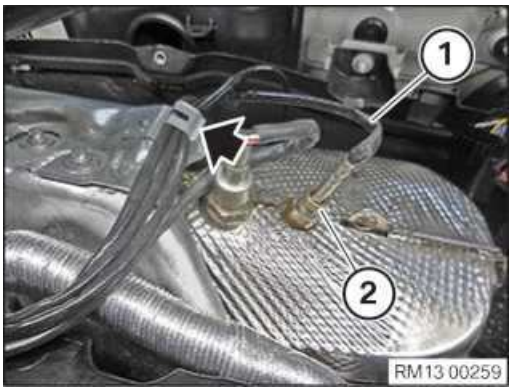
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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- Unlock and disconnect connector (1).
- Put the cable of the exhaust temperature sensor to one side.



- Guide cable (1) of the exhaust temperature sensor out of the clamp (arrow) and remove it.
- Loosen exhaust temperature sensor (2).
- Feed out and remove exhaust temperature sensor (2).

46 – Remove the control sensor

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

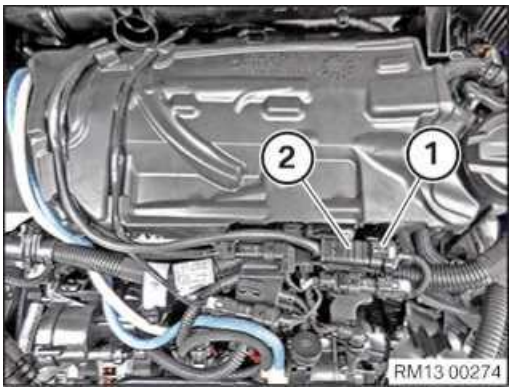
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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- Unlock plug connection (1) and disconnect.
- Detach the connector (2) from the holder .
- Release the front oxygen sensor cable.



- Detach the control sensor (1) with the special tool .
- Feed out and remove the control sensor (1).

47 – Removing the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

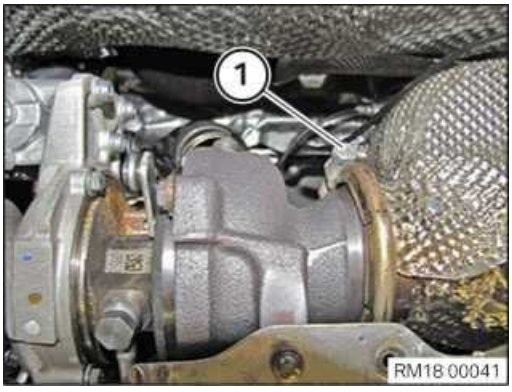
- Perform all work only on components that have cooled down.

CAUTION

Heavy component.

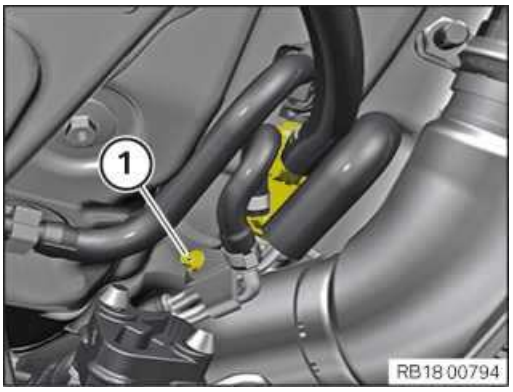
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

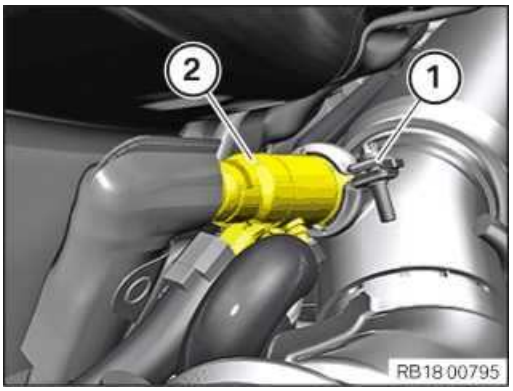


- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.

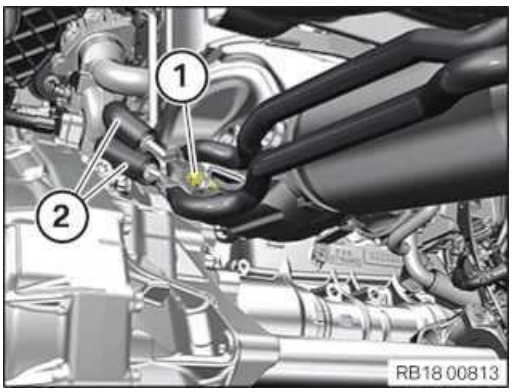
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- Loosen screw (1).



- Loosen V-band clamp (1).
- Remove the SCR metering module (2) and set it aside.



- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.

▸ **Remove differential pressure sensor**

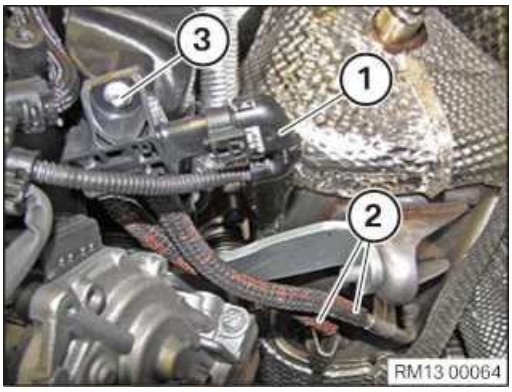
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

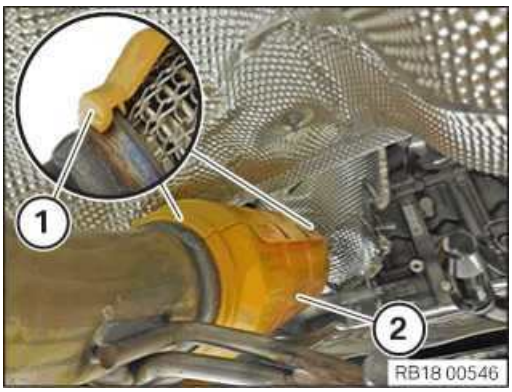
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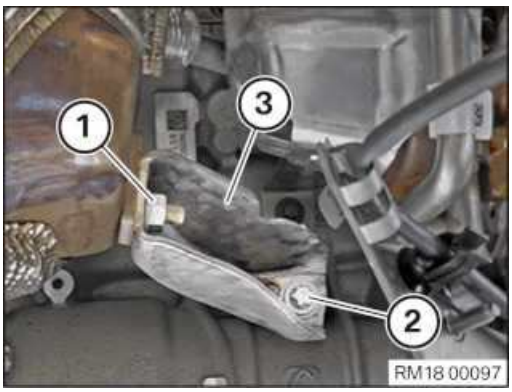
- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.



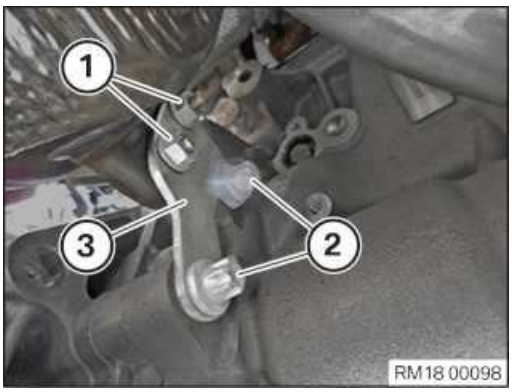
- Loosen nuts (1).



- Mount fitting aid (2).
- Make sure that the fitting aid is correctly position on the edges (1) of the flexible tube.

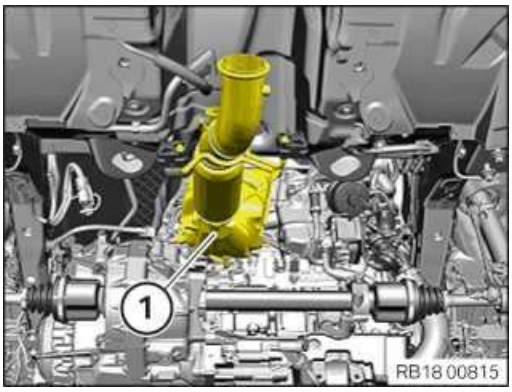


- Unfasten nut (1).
- Loosen screw (2).
- Remove holder (3).



- Loosen nuts (1).
- Loosen screws (2).
- Remove holder (3).

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- Feed out diesel particulate filter (1) toward the bottom and remove.

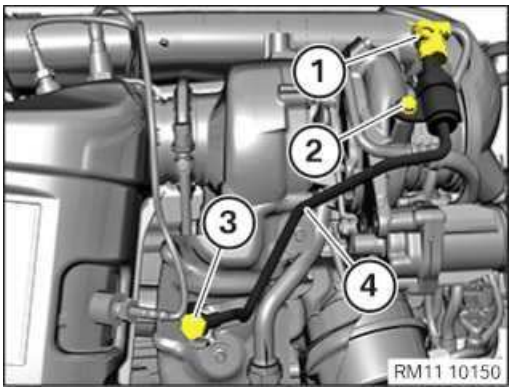
48 – Remove the heat shield from the exhaust turbocharger at the bottom

WARNING

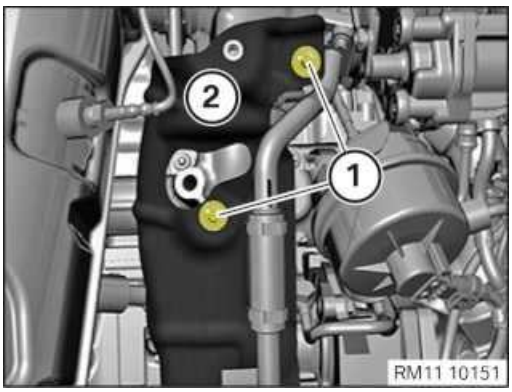
Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Unlock and disconnect connector (1).
- Unscrew the banjo bolt (3).
- The seals of the banjo bolt (3) must be renewed.
- Loosen screw (2).
- Remove the exhaust gas pressure pipe (4).



- Unscrew the bolts (1) on the heat shield .
- Feed out and remove the heat shield (2).

MAIN WORK

49 – Removing the low-pressure stage turbocharger

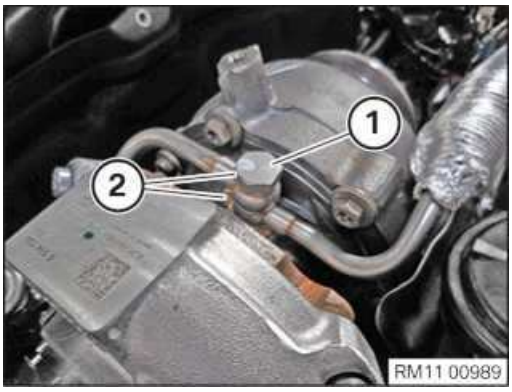
WARNING

Hot surfaces.

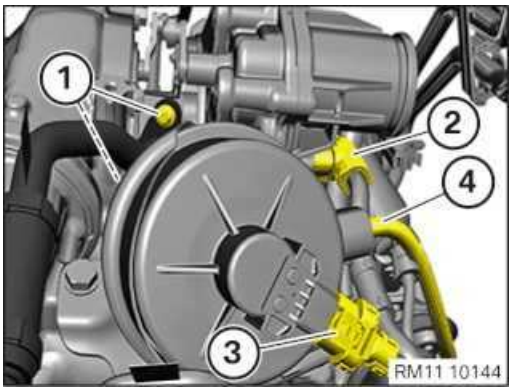
Risk of burning!

- Perform all work only on components that have cooled down.

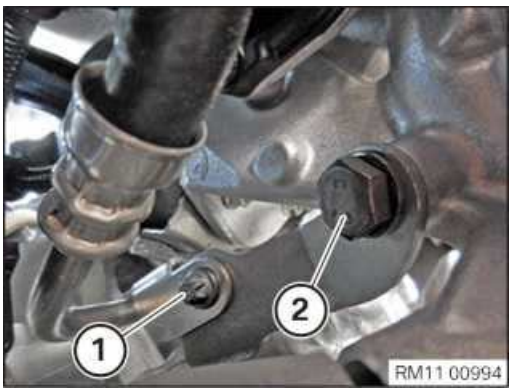
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- Release the banjo bolt (1) of the oil feed lines.
- Remove sealing rings (2).
- Place oil feed lines to one side.



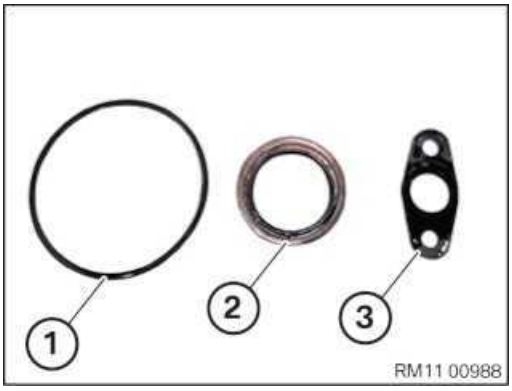
- Release the screws (1) of the oil return line.
- Unlock and disconnect the plug connections (2) and (3).
- Pull off the vacuum hose (4) carefully.



- Undo the bolt (1) of the oil feed line.
- Loosen screw (2).

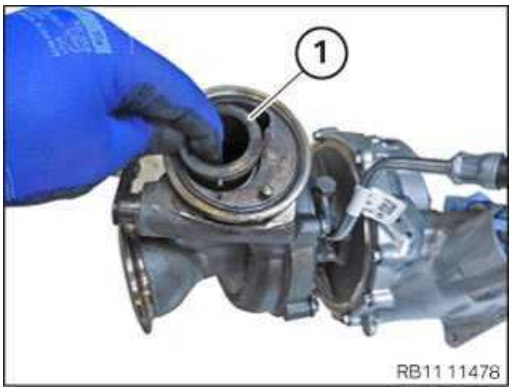


- Loosen screw (1).
- Remove the V hose clamp.
- Guide the low-pressure stage turbocharger out towards the top and remove.



- Remove seals (1), (2) and (3).

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- Remove the spacer ring (1).

50 – When replacing the exhaust turbocharger

TECHNICAL INFORMATION

- It is imperative to perform certain test steps to prevent subsequent damage in the event of exhaust turbocharger damage. See further information.

51 – Prepare for the installation of the exhaust turbocharger

- Check the oil feed lines and the oil return lines for contamination or obstruction, clean or renew if necessary.
- If the oil feed lines and/or oil return lines are heavily contaminated, we recommend changing the engine oil and the oil filter.
- If installed: Check the coolant feed lines and the coolant return lines for the exhaust turbocharger for contamination or obstruction, clean or renew if necessary.
- Check that the screw connections and the plug connections of all the lines are correct.
- Check air cleaner for contamination and clean or renew as needed.
- Check correct functioning of crankcase ventilation.
- Replace all gaskets.

  Parts: Seals

52 – Installing the low-pressure stage turbocharger

RISK OF DAMAGE

Damage to the surface.

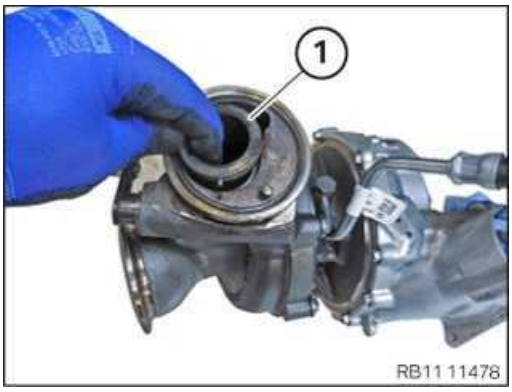
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

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- Check the spacer plug (1) for damage, renew if necessary.

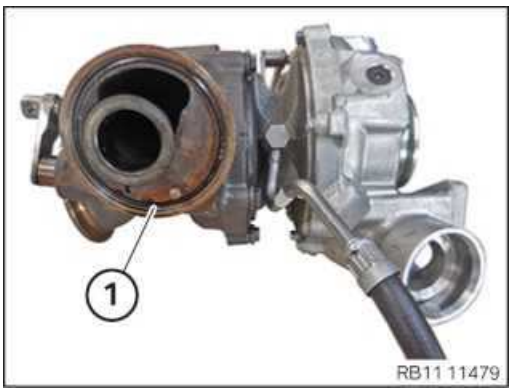
  Parts: Spacer ring
- Insert and install the spacer ring (1).
- Position spacer ring (1) correctly.



- Renew gasket (1).

  Parts: Gasket
- Position the seal (1).
- Renew the sleeve(2).

  Parts: Holding sleeve



- Renew sealing ring (1).

  Parts: Sealing ring
- Affix the sealing rings on the exhaust turbocharger.

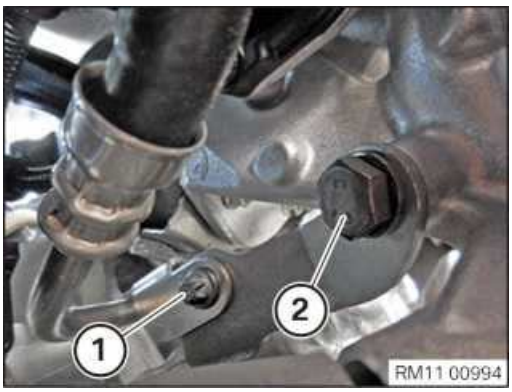


- Insert and install the low-pressure stage exhaust turbocharger on the exhaust manifold .
- Feed in and install V-band clamp .
- Tighten V-band clamp (2).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Screw in nut (1) with 2 **revolutions**.



- Tighten down screw (1).

Oil feed line to bracket

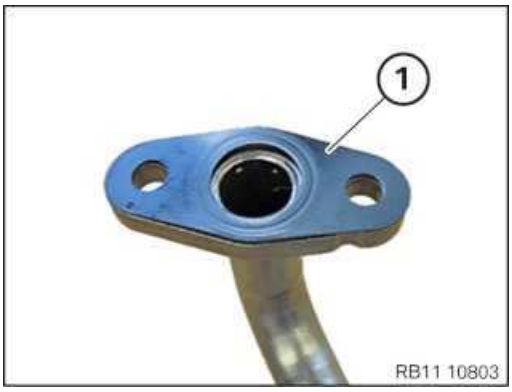
Torx screw M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

Holder to exhaust turbocharger and crankcase

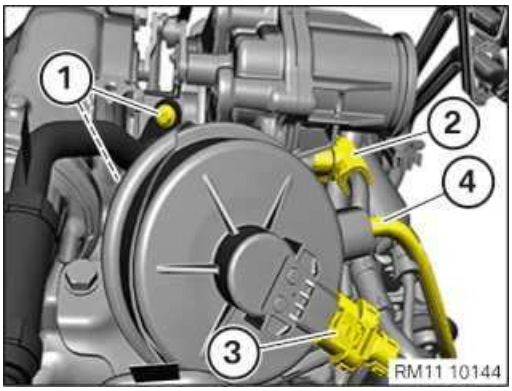
M8x16		Tightening torque	22 Nm

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- Renew seal (1) on the oil return line.

  Parts: Gasket



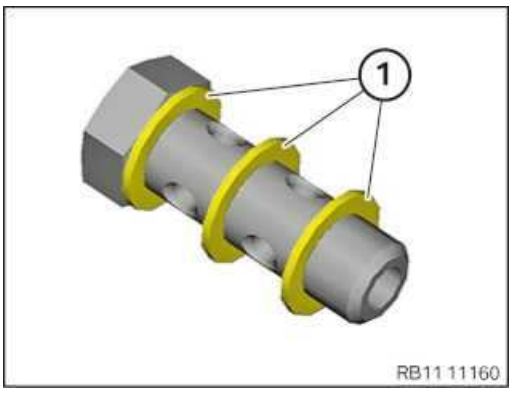
- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

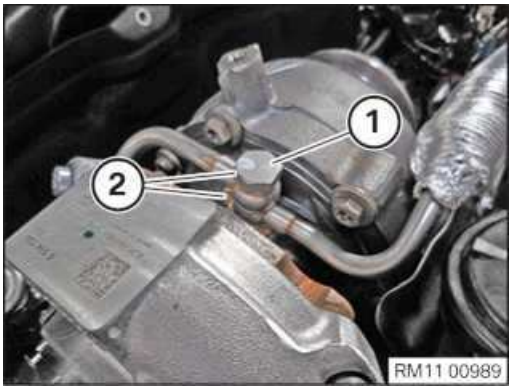
M6x12		Tightening torque	8 Nm

- Connect and lock connectors (2) and (3).

  The locks must engage audibly.
- Connect vacuum hose (4).



- Renew banjo bolt and sealing rings (1).
- **Parts:** Banjo bolt, sealing rings



- Install sealing rings (1).
- Tighten the banjo bolt (1).
- Ensure that the lines do not rest against the adjacent components.

POSTPROCESSES

53 – Installing heat shield on exhaust turbocharger at bottom

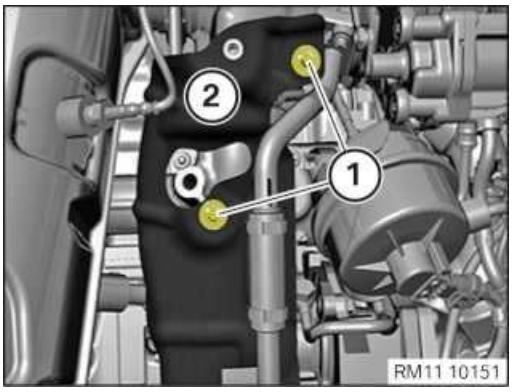
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

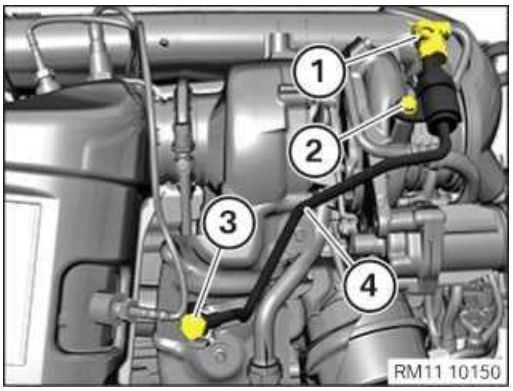
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- Feed in and install the heat shield (2).
- Tighten the bolts (1) on the heat shield .

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm



- Position the exhaust gas pressure pipe (4).
- Hand-tighten the bolt (2).
- Renew sealing rings on the banjo bolt (3).

  Parts: Sealing ring
- Tighten the banjo bolt (3).

Banjo bolt for exhaust pressure pipe to exhaust manifold

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

- Tighten down screw (2).

Standard screw connection M6

M6		8 Nm

- Connect connectors (1) and lock.

  Lock must audibly engage.

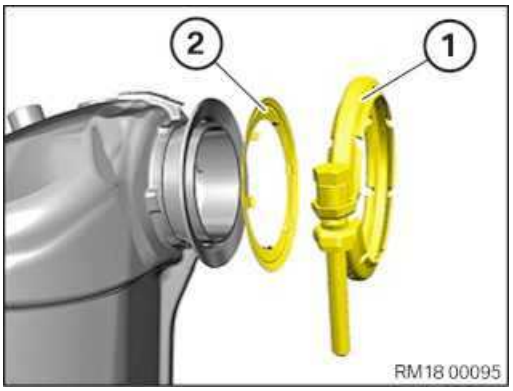
54 – Installing the diesel particulate filter

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Renew the V-clip (1).

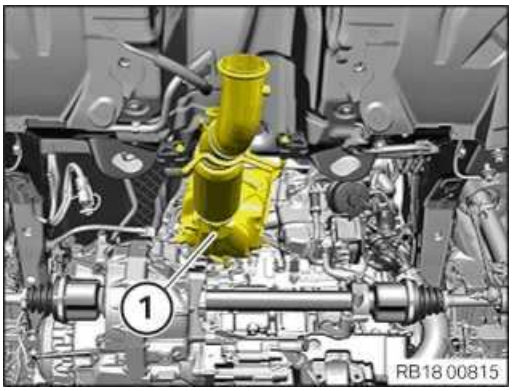
  Parts: V-band clamp
- Renew the gasket (2).

  Parts: Gasket

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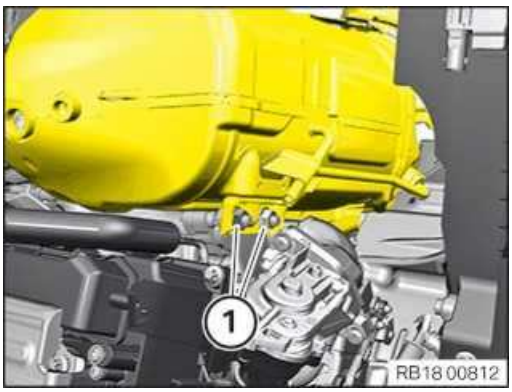
- Before installing the diesel particulate filter: Mount fitting aid (1) for the flexible tube.



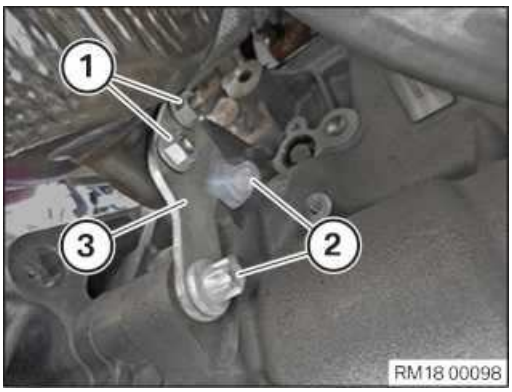
- Carefully insert and install the diesel particulate filter (1).



- Feed in and install V-band clamp (1).
- Make sure that the seal between the diesel particulate filter and the exhaust turbocharger is installed correctly.
- Align the diesel particulate filter on the exhaust turbocharger.
- Position V-clip (1).
- Hand-tighten the V-clip (1).

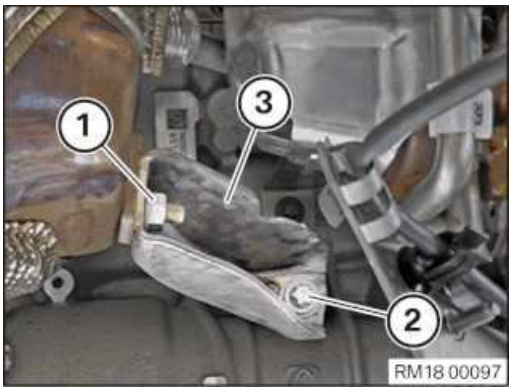


- Tighten nuts (1) by hand.



- Install holder (3).
- Hand-tighten the bolts (2).
- Tighten nuts (1) by hand.

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- Install holder (3).
- Tighten the nut (1) hand-tight.
- Hand-tighten the bolt (2).



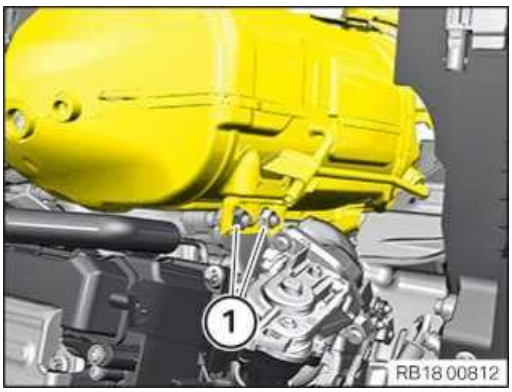
- Remove fitting aid (1) for the flexible tube.



- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

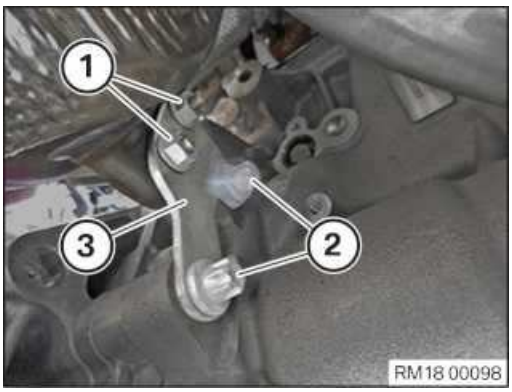
V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm



- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screws (2).

Diesel particulate filter holder to gearbox

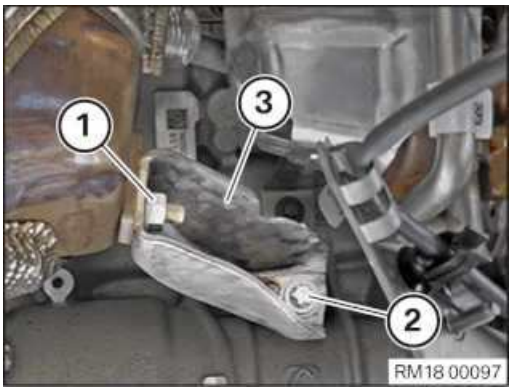
M12x75		Tightening torque	66 Nm

- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm

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- Tighten down screw (2).

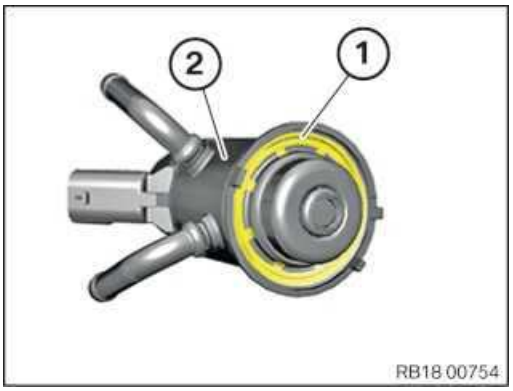
Diesel particulate filter bracket to crankcase

M10x35		Tightening torque	38 Nm

- Tighten nut (1).

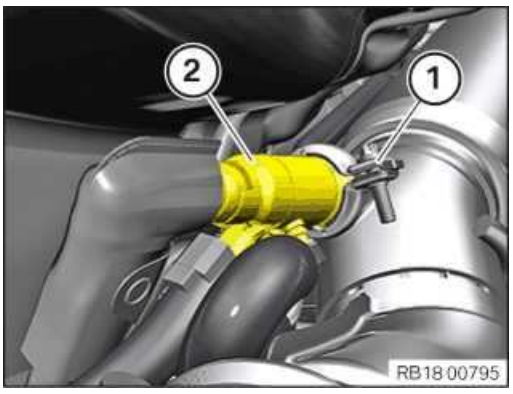
Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Renew sealing ring (1) of the SCR metering module (2).

  Parts: Sealing ring

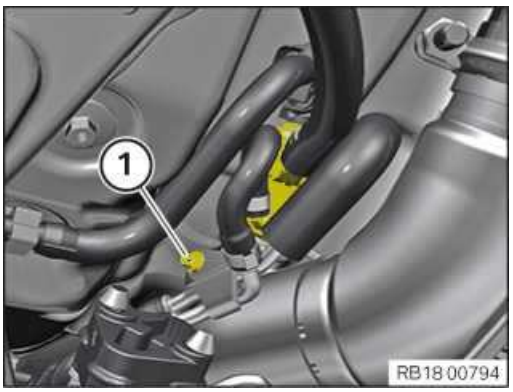


- Insert and install the SCR metering module (2).
- Renew the V-clip (1).

  Parts: V-band clamp
- Tighten V-band clamp (1).

SCR metering module V-clip to exhaust system

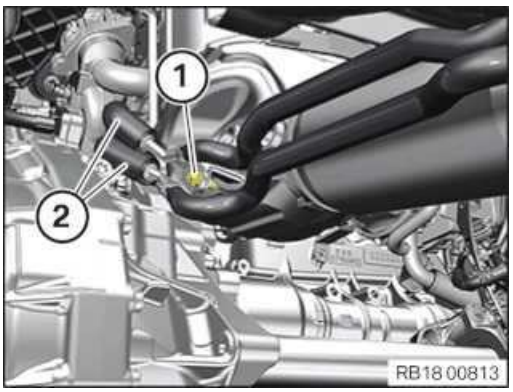
V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm



- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm



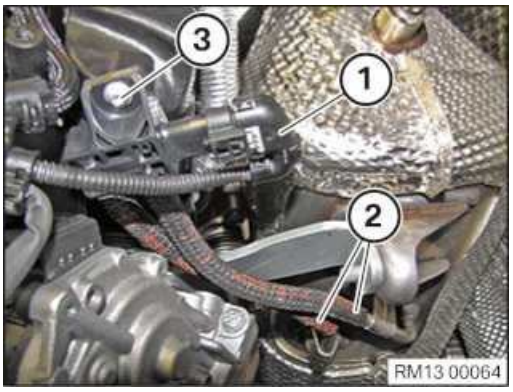
- Thread in and install coolant line (2) of the SCR metering module.
- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm

▸ **Installing differential pressure sensor**

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- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

55 – Install the control sensor

TECHNICAL INFORMATION

New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue



- Feed in front oxygen sensor (1) and install.
- Tighten front oxygen sensor (1) using special tool .

Control sensor

Control sensor		Tightening torque	50 Nm

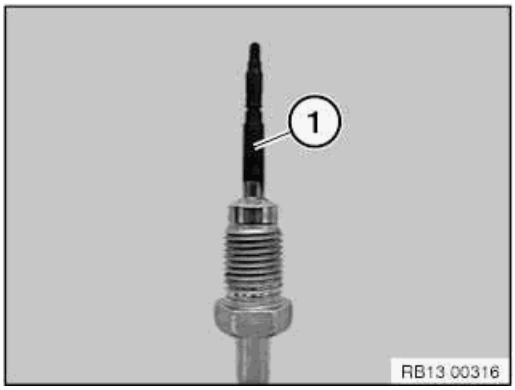


- Lay and secure cable of oxygen control sensor.
- Secure the connector (2) to the holder.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

56 – Install the exhaust-gas temperature sensor on the diesel particulate filter

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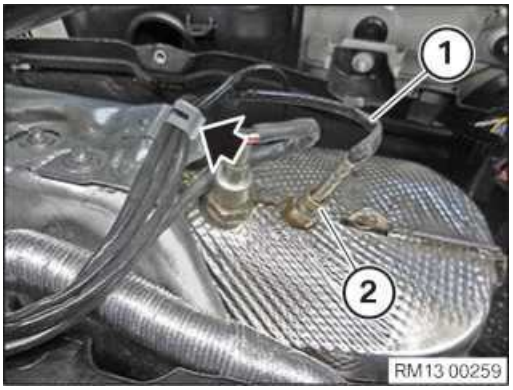
RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

- Check the gauge tip (1) for damage and renew the exhaust temperature sensor as needed.



- Feed in and install the exhaust temperature sensor (2).
- Tighten the exhaust temperature sensor (2).

Exhaust temperature sensor to diesel particulate filter

Exhaust-gas temperature sensor		Tightening torque	28 Nm



- Insert and install cable (1) of the exhaust temperature sensor in the clamp (arrow).
- Lay and fasten the cable of the exhaust gas temperature sensor.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

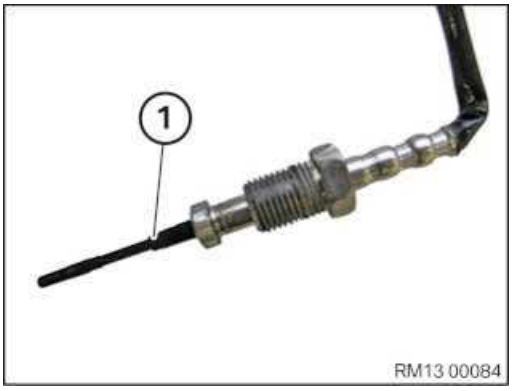
57 – Installing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

RISK OF DAMAGE

Damage of exhaust temperature sensor.

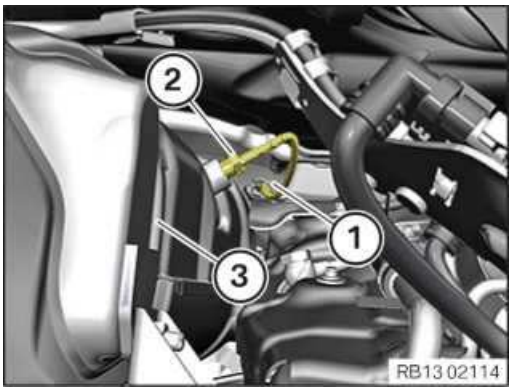
Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.



- Make sure the gauge tip (1) is not damaged during installation.

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- Guide the exhaust temperature sensor (2) into diesel particulate filter (3) and install.
- Tighten the exhaust temperature sensor (2) with conventional tools .

Exhaust temperature sensor to diesel particulate filter

Exhaust-gas temperature sensor		Tightening torque	28 Nm

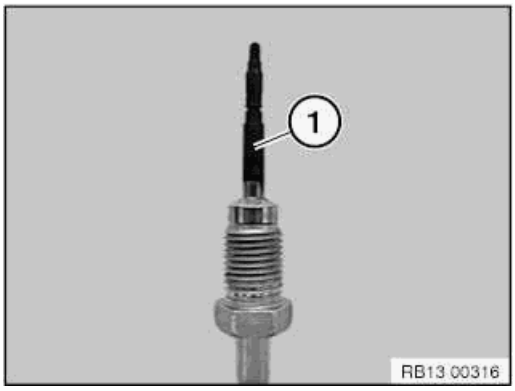
- Insert and install the cable of the exhaust temperature sensor (2) in the clamps (1).



- Lay and fasten the cable of the exhaust gas temperature sensor.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

58 – Installing exhaust temperature sensor on catalytic converter



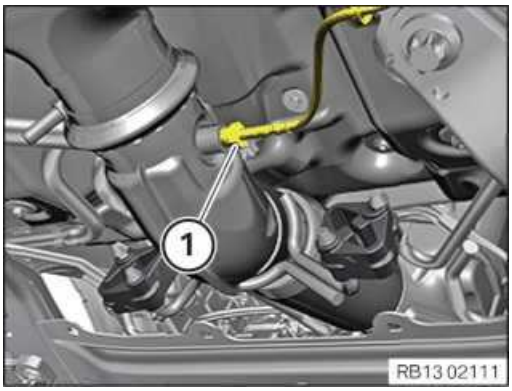
RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

- Check the gauge tip (1) for damage and replace the exhaust temperature sensor as needed.



- Feed in and install the exhaust temperature sensor (1).
- Tighten the exhaust temperature sensor (1).

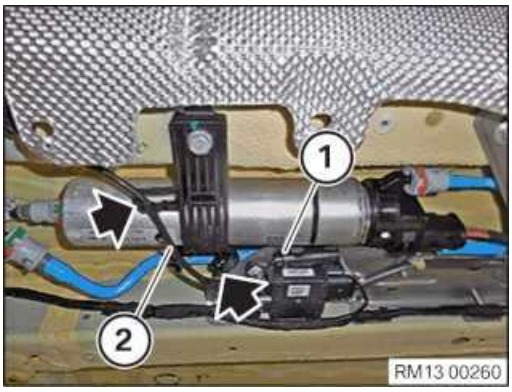
Exhaust-gas temperature sensor to exhaust system

Exhaust-gas temperature sensor		Tightening torque	28 Nm



- Secure the cable clips (1).

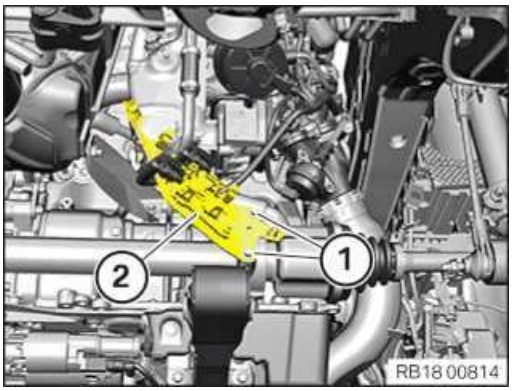
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- Feed cable (2) from exhaust temperature sensor into the clamps (arrows) and install.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

59 – Install holder for oxygen sensor

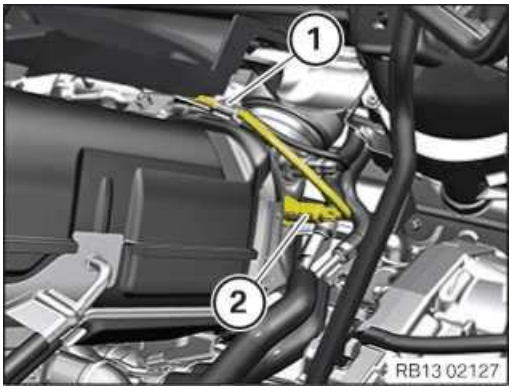


- Insert and install the holder (2).
- Tighten the screws (1).

Oxygen sensor holder to intermediate shaft

Hexagon screw M6x16		Tightening torque	8 Nm

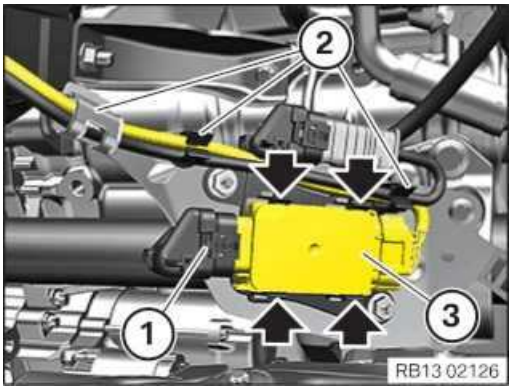
60 – Installing the nitrogen oxide sensor before SCR catalytic converter



- Insert nitrogen oxide sensor before the SCR catalytic converter (2) and install.
- Tighten the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

Nitrogen oxide sensor before SCR catalytic converter

Sensor		Tightening torque	50 Nm



- Install and lock the evaluation electronics for the nitrogen oxide sensor (3) (arrows).
- Insert the evaluation electronics cable for the nitrogen oxide sensor (3) into the clamps (2) and install.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

61 – Install the monitoring sensor

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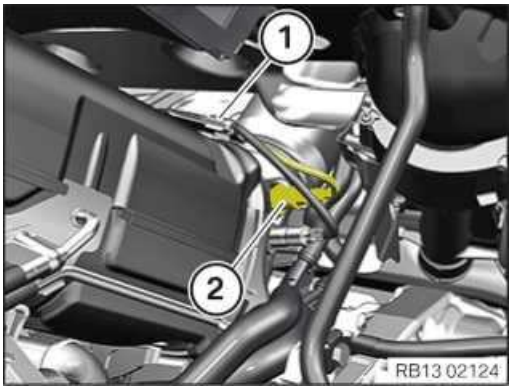
TECHNICAL INFORMATION

New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

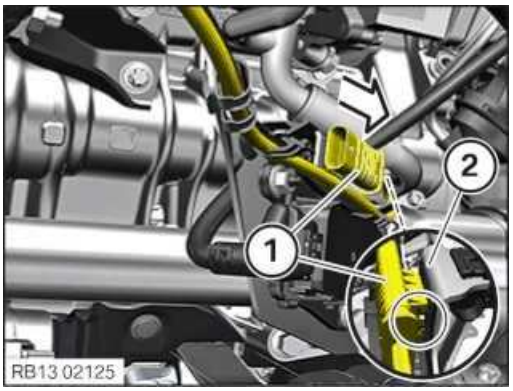


- Feed in the monitoring oxygen sensor (2) and install.
- Tighten the monitoring oxygen sensor (2) with special tool **0 491 074 (11 7 020)**.

Monitoring sensor

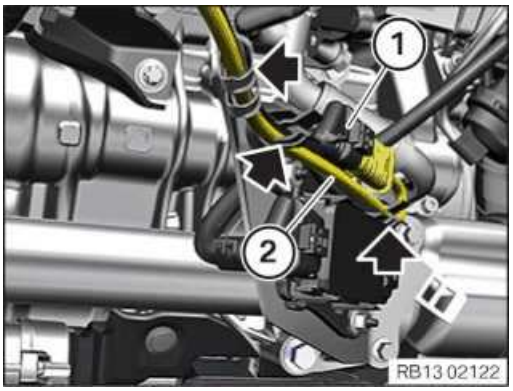
Sensor		Tightening torque	50 Nm

- Insert the cable of the monitoring oxygen sensor (2) into the clamp (1) and secure it.



- Connect the connector (1) with the bracket (2) in the direction of arrow.
- Make sure that the connector (1) is locked correctly in the marked area.

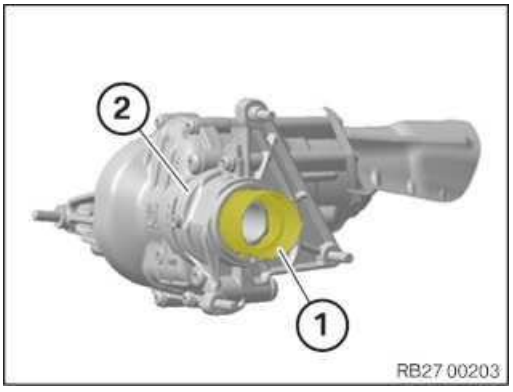
  The connector (1) must engage audibly.



- Insert and attach the cable of the monitoring oxygen sensor (2) to the clamps (arrows).
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

62 – Install the transfer box (VTG)



- If intermediate shaft (1) gets caught on transfer box (VTG) (2), renew intermediate shaft (1) and the radial shaft seals in the automatic or manual transmission.

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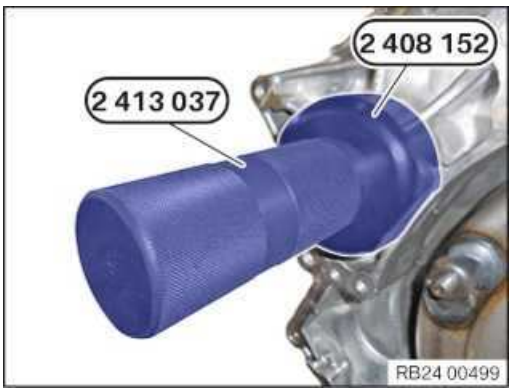
- Screw special tool **2 409 025** into the outer radial shaft seal.
- Turn the screw on the special tool **2 409 025** until the outer radial shaft seal has been pulled out.



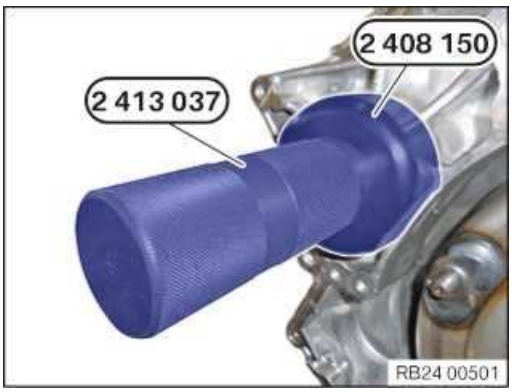
- Insert special tool **2 411 739** into the inner radial shaft seal.



- Screw special tool **2 411 739** into the inner radial shaft seal.
- Turn the screw on the special tool **2 411 739** until the inner radial shaft seal has been pulled out.

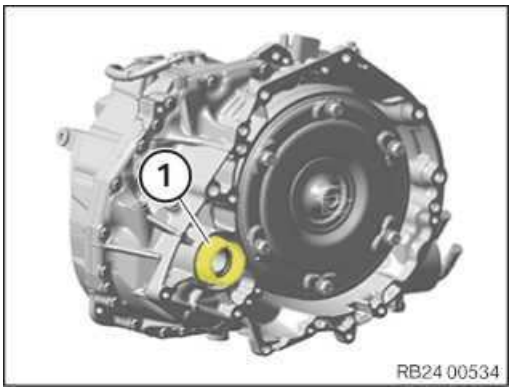


- Drive in the inner radial shaft seal using special tools **2 408 152** and **2 413 037** up to the limit position.



- Drive in the outer radial shaft seal using special tools **2 413 037** and **2 408 150** up to the limit position.

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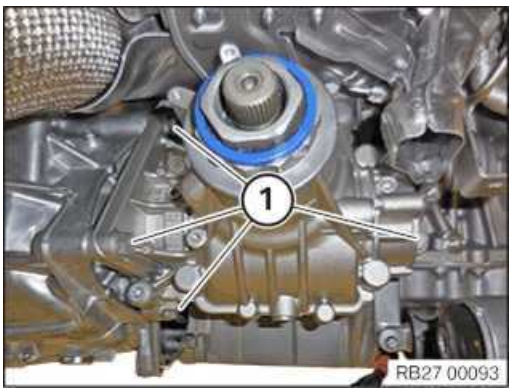
- If necessary, connect the new intermediate shaft (1) to the output flange of the automatic transmission or manual transmission.



- Coat the inside of the output flange (arrows) evenly with approx. 5 g of grease.

Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the transfer box (VTG).
- Tighten the screws (1).

Transfer box to transmission

M10		Tightening torque	56 Nm



- Install heat shield.
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Heat shield to transfer box

M6	Renew screws.	Tightening torque	6 Nm

▸ **Check the transfer box oil level**

RISK OF DAMAGE

Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.

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- Check transfer case oil level, correct:
- Open the oil filler plug (1).
- Check transfer box oil level.
- If necessary, top up transmission oil up to the lower edge of the oil filler plug opening (1).

Transmission oil

Technically suitable transfer box and electrical transmission oils	

Main group 27

- Tighten the oil filler plug (1).

Oil filler plug on transfer box (VTG)

M18x1.5		Tightening torque	35 Nm

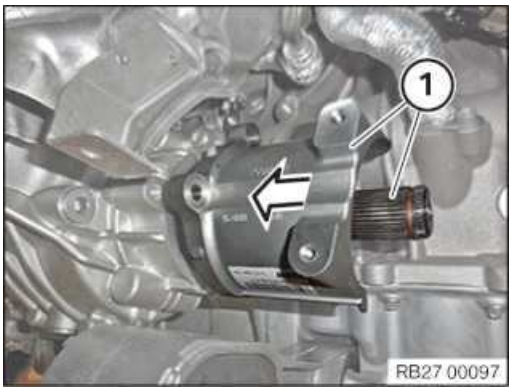
63 – Install the intermediate shaft with the support tube



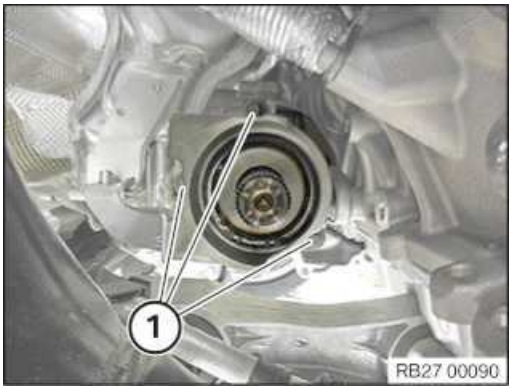
- Coat gearing of the intermediate shaft uniformly with 5 g of grease.

Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the intermediate shaft with support tube (1) in the transfer box.



- Position screws (1).

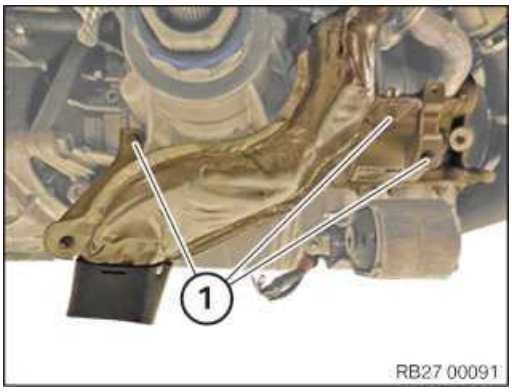
Note: Check for correct screw length! Bolt M8x35 8.8

- Tighten the screws (1).

Intermediate shaft to transfer box

M8x35		Tightening torque	19 Nm

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- If installed: Install air duct.
- Tighten the screws (1).

64 – Installing starter motor

CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.



- Insert and install the starter motor .
- Tighten the screws (1).

Starter motor to transmission

M8x45		Tightening torque	19 Nm



- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

Battery positive lead to starter

M8		Tightening torque	13,5 Nm



- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.

65 – Installing right output shaft partially

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- Renew the circlip (1).

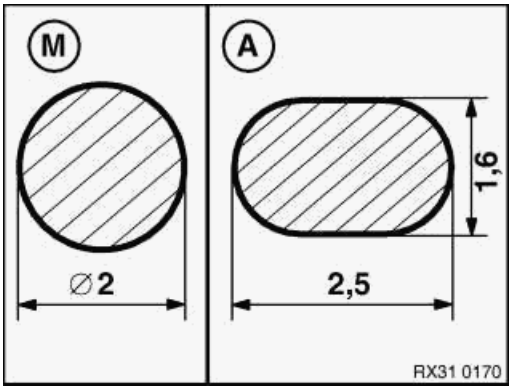
  Parts: Circlip
- Slide output shaft into the transmission as far as the limit position.
- Check for secure seat by levering.

66 – Partially installing the left output shaft



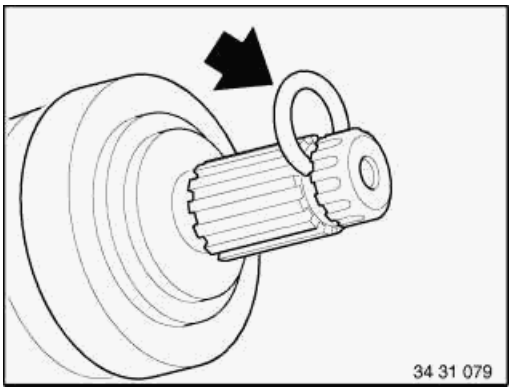
- **With automatic transmission only:**
- Lever out O-ring (1).
- Renew O-ring (1).

  Parts: O-ring
- Insert new O-ring (1).

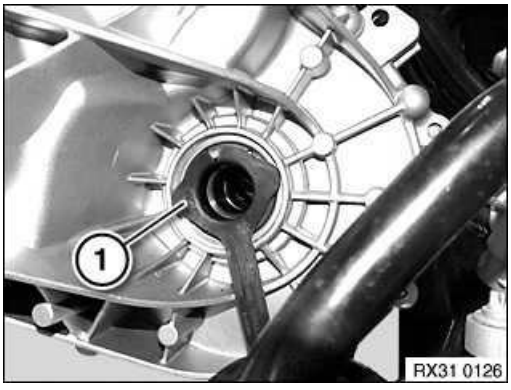


- Do not mix up circlips.

  Different types of output shafts fitted:
  - M: Manual transmission
  - A: Automatic transmission

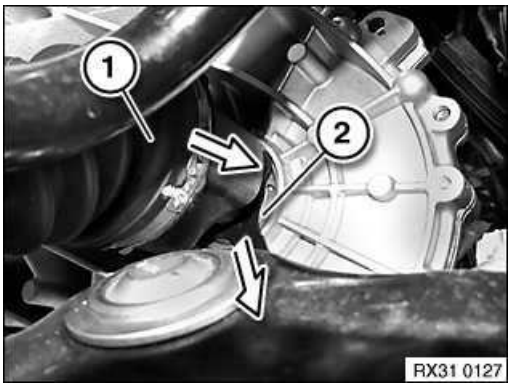


- Renew circlip (arrow).



- Insert installation protection ring (1) into the radial shaft seal.
- Make sure the tool fits over the lip of the radial shaft seal so there is no damage to sealing ring when the output shaft is inserted.

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- Insert output shaft (1) into transmission.
- **Manual gearbox only:** Pull on the handle to remove the installation protection ring (2) and dispose of it.
- Slide output shaft (1) into the transmission as far as the limit position.

  The output shaft (1) must engage audibly.
- Check for secure seat by levering.

67 – Install propeller shaft.

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

RISK OF DAMAGE

Damage to the propeller shaft during installation.

Non-observance of the installation guidelines for the propeller shaft on the rear axle differential may cause severe damage.

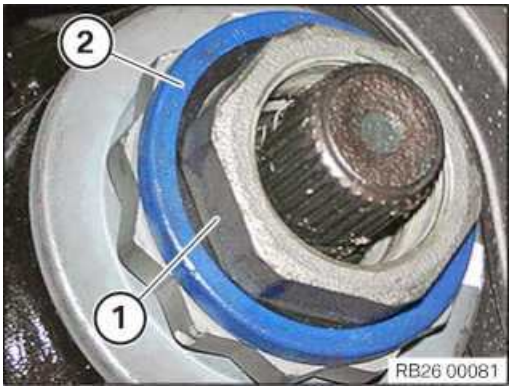
- Always renew the recessed nut on the rear axle differential. Screw locking must be available.
- Strictly observe a minimum hardening time of two hours after having screwed in the recessed nut. The hardening time may be longer at lower temperatures.

RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.



- Renew recessed nut (1).

  Parts: Insert nut
- Renew the retaining clip (2) and the seal.

  Parts: Retaining clip, seal
- Insert the seal with the recessed nut (1) and install.
- Insert the retaining clip (2) and install.
- Make sure that recessed nut (1) is screwed in within 5 min.
- Make sure that the hardening time of **minimum** 2 h for the recessed nut is observed.

  The hardening time must be extended at lower temperatures.

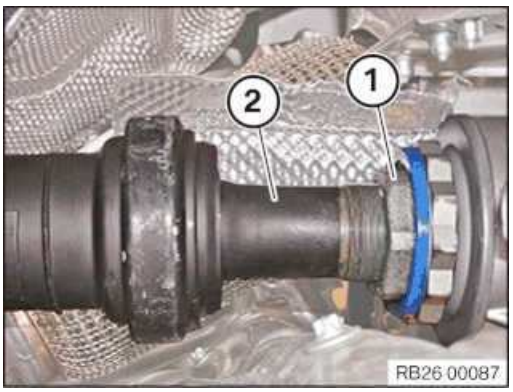
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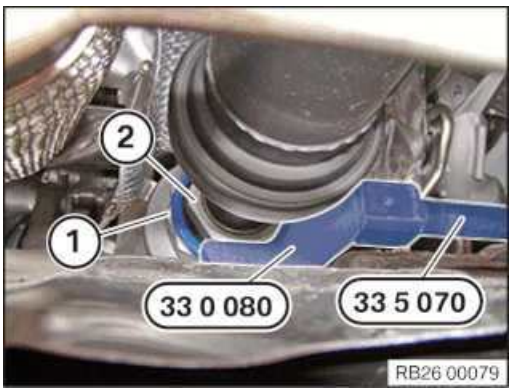
- Insert the propeller shaft (1) and install.
- Always support the propeller shaft (1) with a conventional jack.



- Hand-tighten the bolts (1).



- Push the propeller shaft (2) against the recessed nut (1) up to the limit position.
- Screw the propeller shaft (2) at least 2 thread starts onto the recessed nut (1) by hand.



RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

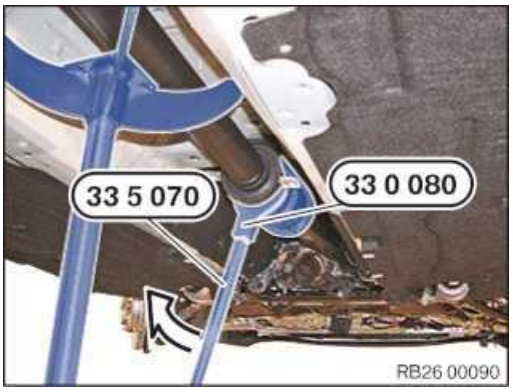
- Do not use the double hexagon head flange nut as counter support.

- Protect the recessed nut (2) on the transfer box from twisting with the special tools **0 495 554 (33 5 070)** and .

  The recessed nut (2) on the transfer box must **not** be used to tighten the propeller shaft.

  The double hexagon flange nut (1) must **not** be used for counter support.

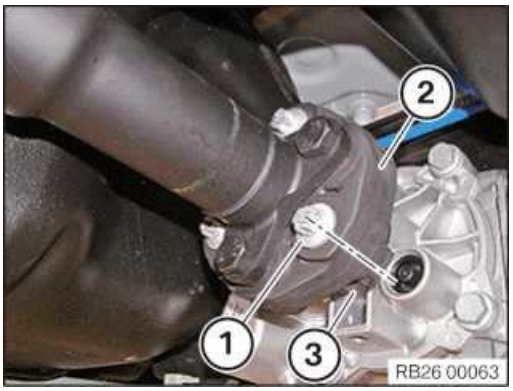
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- Tighten the front propeller shaft with the special tools **0 495 554 (33 5 070)** and in the direction of the arrow.

Propeller shaft to transfer box

		Tightening torque	80 Nm



TECHNICAL INFORMATION

Compliance with the following instructions is required to avoid a humming noise from the propeller shaft after refitting the propeller shaft.

- Assemble the screw connection (1) of the flexible disc (2) and the three-hole flange (3) according to the mark.
- Renew screws (1).

  Parts: Bolts
- Hand-tighten the bolts (1).



- Protect the propeller shaft (1) with the special tools **0 495 554 (33 5 070)** and from twisting.



- Tighten the bolts with the special tools **0 490 504 (00 9 120)** and .

Flexible disc to rear axle final drive

M12x1.5	Renew screws.	Tightening torque	55 Nm 90 °



- Tighten the screws (1).

Centre mount to body

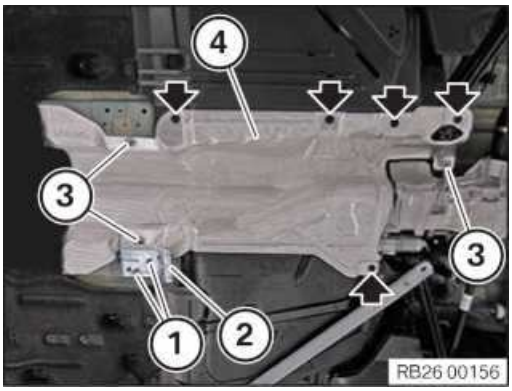
M8		Tightening torque	19 Nm

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- Guide the special too l out between the front and rear propeller shaft and remove.

68 – Installing the rear heat shield



- Insert and install the heat shield (4).
- Tighten screws (arrows).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

- Tighten nuts (3).

Heat shield to body

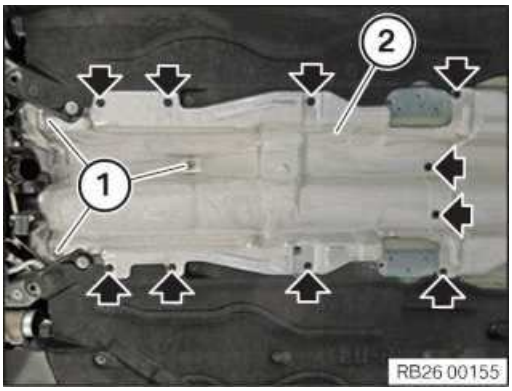
Bolts/nut		Tightening torque	3 Nm

- Insert and install the holder (2).
- Tighten the screws (1).

Bracket to body

M8		Tightening torque	21 Nm

69 – Install the front heat shield



- Insert and install the heat shield (2).
- Tighten screws (arrows).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

- Tighten nuts (1).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

70 – Install exhaust system

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

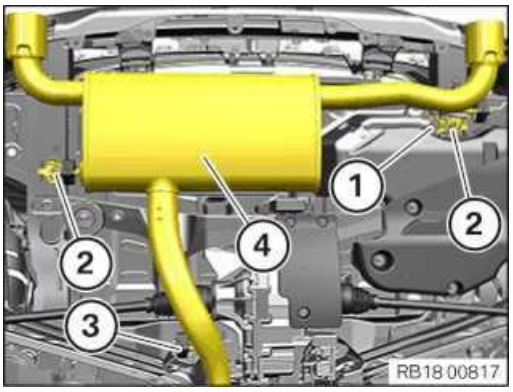
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CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Feed in and install the exhaust system (4) with a second person.
- Renew nuts (2).

  Parts: Nuts
- Tighten nuts (2).

Exhaust system to body

M8	Replace nuts.	Tightening torque	19 Nm

- Tighten down screw (1).

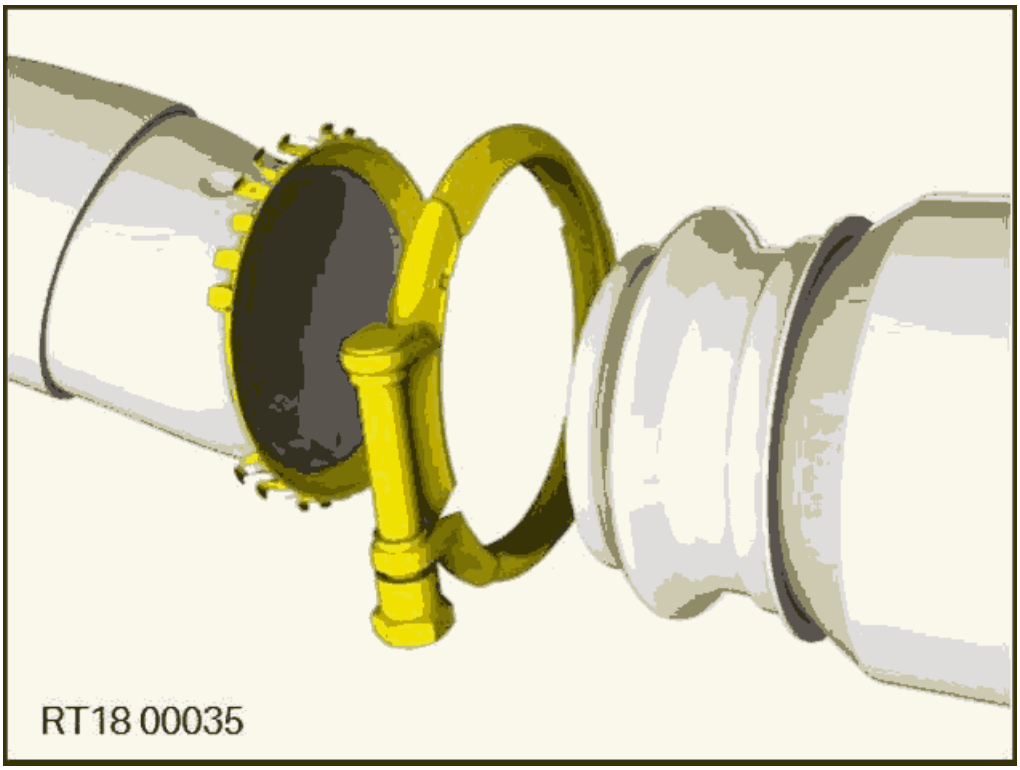
Exhaust bracket on body

Hexagon screw M8x30		Tightening torque	19 Nm

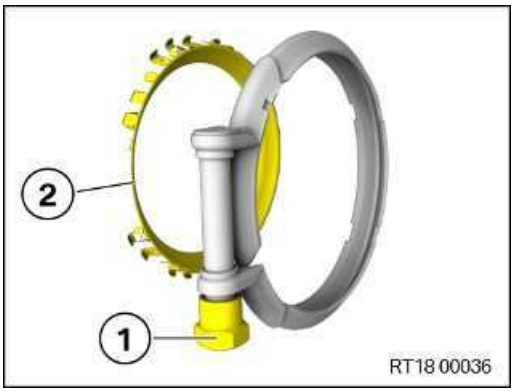
- Check the rubber mount (3) for damage and renew as needed.
- Mount rubber mount (3) on the exhaust system (4).

▸ **Install the V-clip**

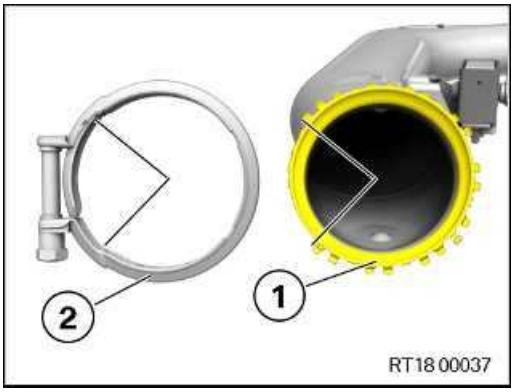
V-band clamp



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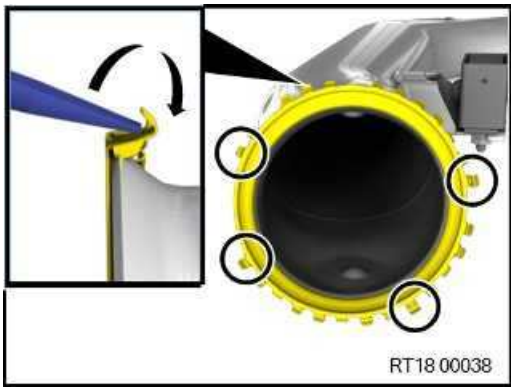


- Unscrew the nut (1) and remove the sealing ring (2).

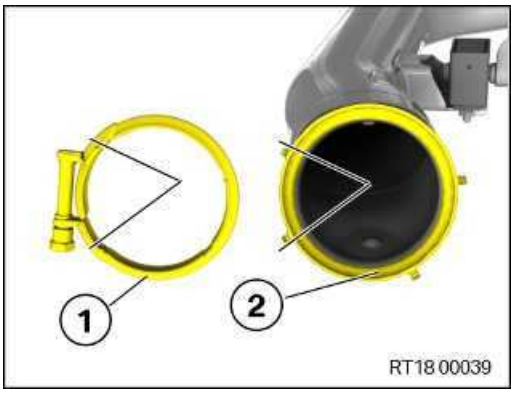


- Renew the V-clip (2).

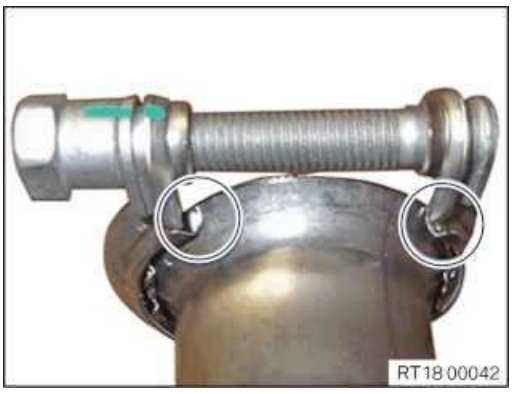
  Parts: V-band clamp
- Mount the sealing ring (1) on the exhaust system.
- Ensure that the sealing ring (1) for the V-clip (2) is positioned correctly.



- Bend all sheet metal tabs over with a suitable tool, except those in the marked areas.

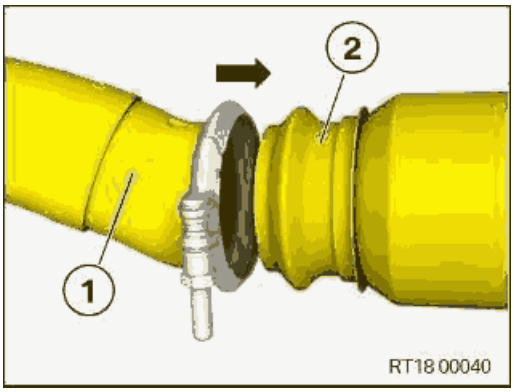


- Mount the V-clip (1) on the sealing ring (2).
- Make sure that the V-clip (1) is positioned correctly on the sealing ring (2).

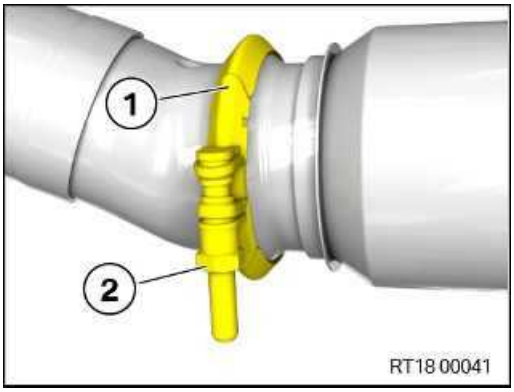


- Make sure that the V-clip rests against the sheet metal tabs after mounting (marks).

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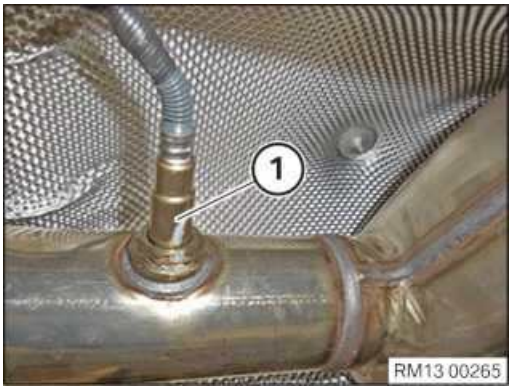
- Connect the exhaust system (1) with the catalytic converter (2) and position correctly.



- Make sure that V-clip (1) is fitted correctly.
- Tighten down screw (2).

V-clip to catalytic converter

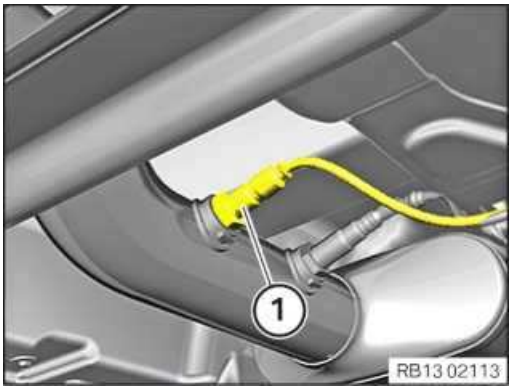
V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm



- Feed in, install and tighten diesel particulate sensor (1).

Diesel particulate sensor to exhaust system

Sensor		Tightening torque	50 Nm



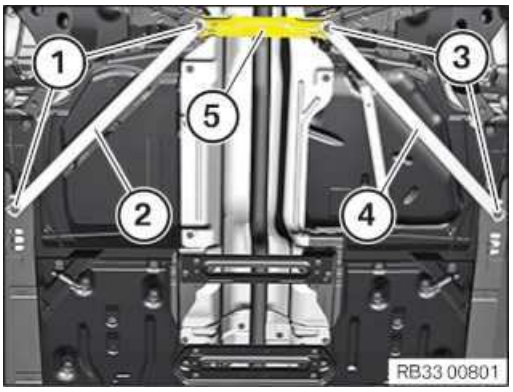
- Feed in, install and tighten nitrogen oxide sensor (1).

Nitrogen oxide sensor downstream of SCR catalytic converter

Sensor		Tightening torque	50 Nm

71 – Install the cross-member with torsion struts

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- Insert and install the cross-member (5).
- Thread in torsion strut (4) at right and install.
- Renew screws (3).

  Parts: Bolts
- Tighten down screws (3).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

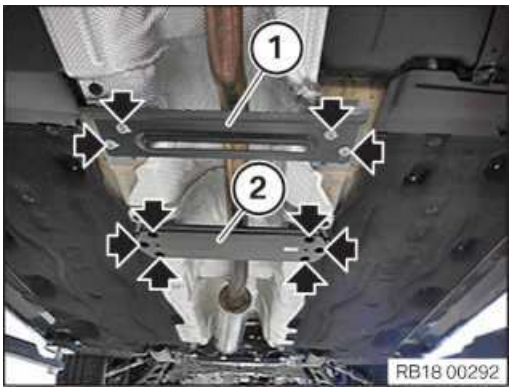
- Guide in and install the left torsion strut (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

72 – Install the connecting support on the tunnel in front and back



- Insert and install connecting supports (2).
- Tighten the screws (arrows) from the connecting support (2).

Front connection carrier to body

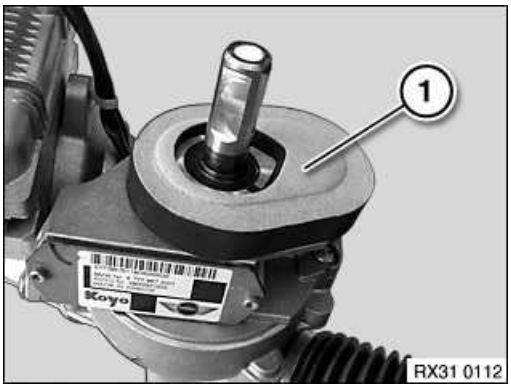
M10x18		Tightening torque	56 Nm

- Insert and install connecting supports (1).
- Tighten the screws (arrows) from the connecting support (1).

Rear connection carrier to body

M8x18		Tightening torque	28 Nm

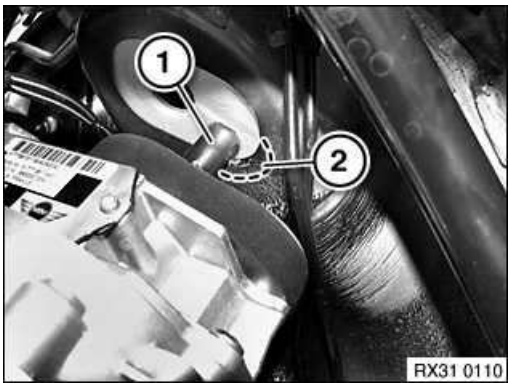
73 – Mount and secure the complete front axle



- Remove the seal (1).
- Clean surface on steering gear.
- Renew gasket (1).

  Parts: Gasket
- Position the seal (1) and glue it on.

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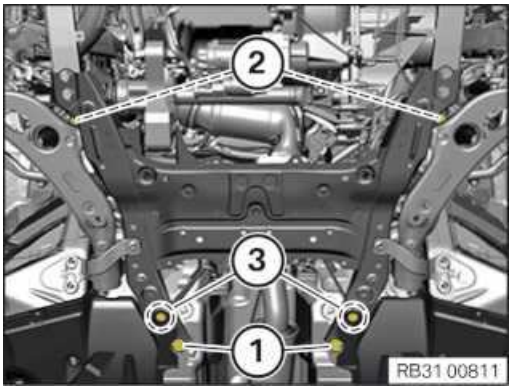


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- Position front axle support.
- Bend underbody panellings in the areas (3) to one side.
- Raise front axle support.
- When raising, insert charge air cooler into the rubber mount of the charge air cooler on cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

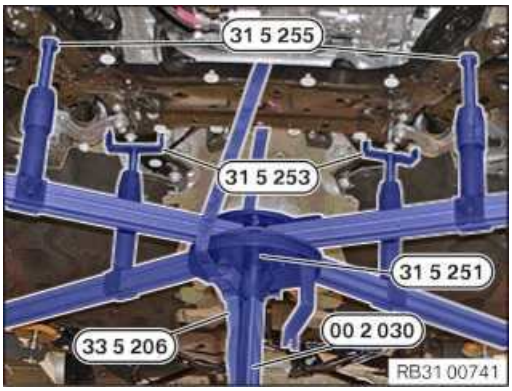
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

- If necessary, tighten the screws in the areas (3).

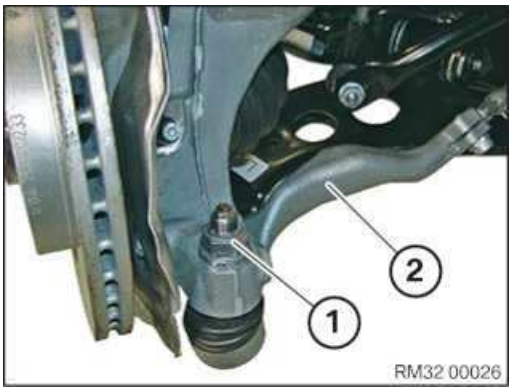
Underbody protection to body

Screw		Tightening torque	3 Nm



- Remove special tool from special tool .
- Lower universal jack **0 490 133 (00 2 030)** with the special tool and place it to the side.

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NOTICE

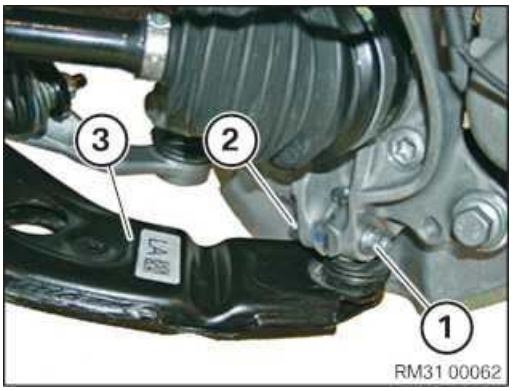
Perform the operations on the left and right side.

- Position the track rod (2) on the swivel bearing .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Track rod end to swivel bearing

M14	Renew nut.	Tightening torque	175 Nm



NOTICE

Perform the operations on the left and right side.

- Position the wishbone (3) on the swivel bearing .
- Renew the bolt (2) and the nut (1).

  Parts: Bolt, nut
- Insert screw (2).
- Tighten nut (1).

Wishbone to swivel bearing

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

74 – Install the mounted parts on the front axle support



NOTICE

Perform the operations on the left and right side.

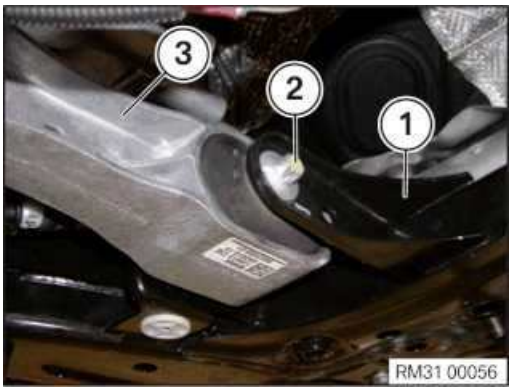
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Holder, wishbone rubber mount, to body

M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °

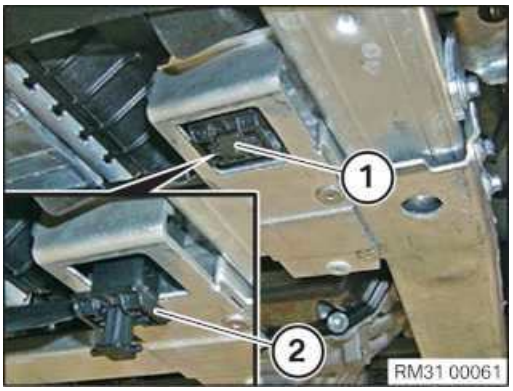
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- Position the engine support (3) on the front axle support (1).
- Tighten down screw (2).

Holder with rubber mount to front axle support

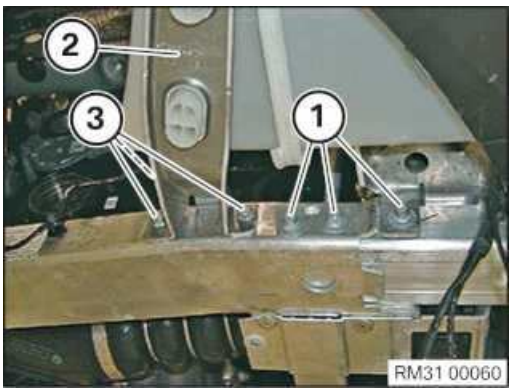
M12 screw		100 Nm



NOTICE

Perform the operations on the left and right side.

- Position the lock (2).
- Lock the bracket (1) of the lock (2) of the holder for the charge air cooler.



- **Only on right side:** Position the holder for the washer fluid reservoir (2).
- Tighten down screws (3).

Washer fluid reservoir holder to front axle support adapter plate

		Tightening torque	10 Nm

NOTICE

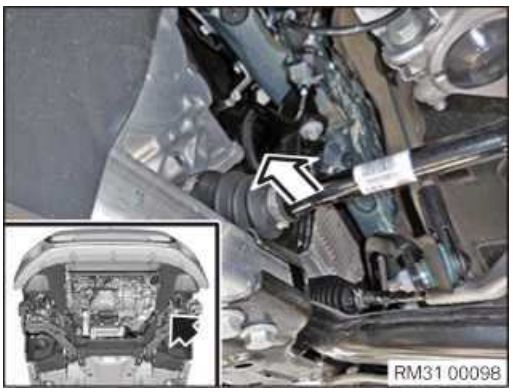
Perform the operations on the left and right side.

- Tighten the screws (1).

Deformation element, bottom, to adapter plate, front axle carrier

		Tightening torque	11,8 Nm

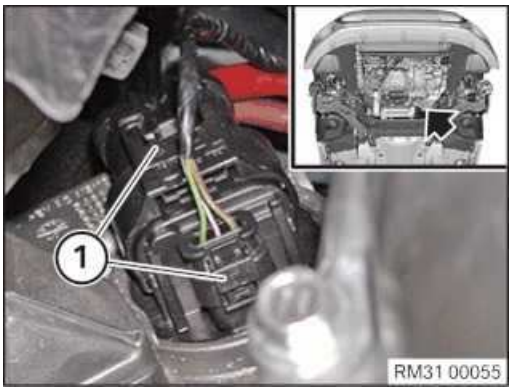
75 – Attaching connector at steering gear



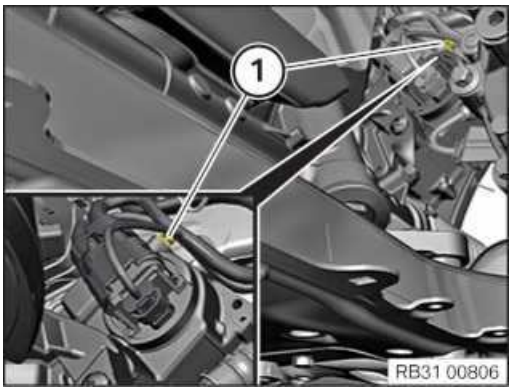
- To connect the connector (see the following step): Connect the connector with the right hand.

  The connectors can be accessed via the left output shaft.

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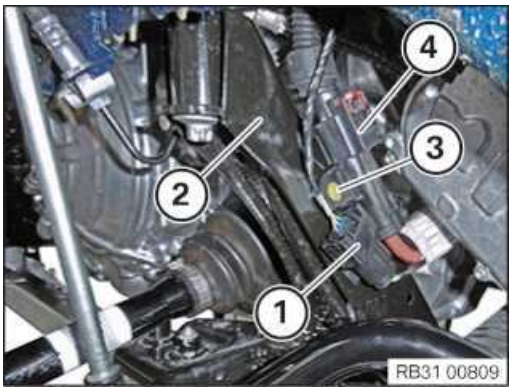


- Connect and lock connector (arrow) (1) with the steering gear.



- Fasten the wiring harness (1) on the steering gear.

▶ **If installed: Fasten the plug connections at the front axle support**



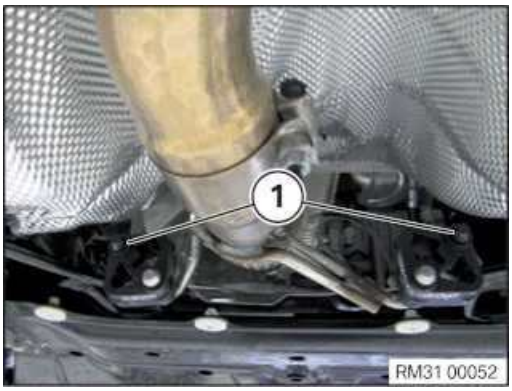
- Position the plug connection (4) at the front axle support (2).
- Tighten down screw (3).

Holder to front axle support

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

- Fasten the plug connection (1) at the front axle support (2).

76 – Securing rubber mount on front axle support



- Check rubber mount (1), replace if necessary.

  Parts: Rubber mount
- Spray rubber mount (1) with lubricant and slide onto holder on front axle support.

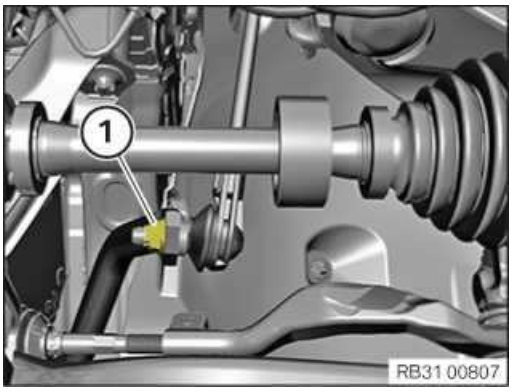
77 – Securing anti-roll bar on left and right on the anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▶ **Fastening anti-roll bar on the anti-roll bar link**

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- Position the anti-roll bar link on the anti-roll bar .
- Renew nut (1).

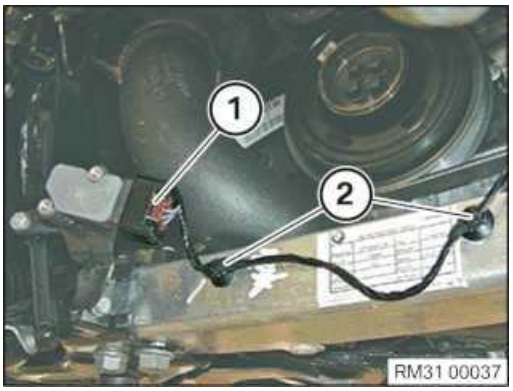
  Parts: Nut
- Tighten nut (1).

Note: Use the Torx socket for counter support.

Anti-roll bar link to anti-roll bar

M10	Renew nut.	Tightening torque	56 Nm

78 – With right installation: Securing the cable for the ride height sensor



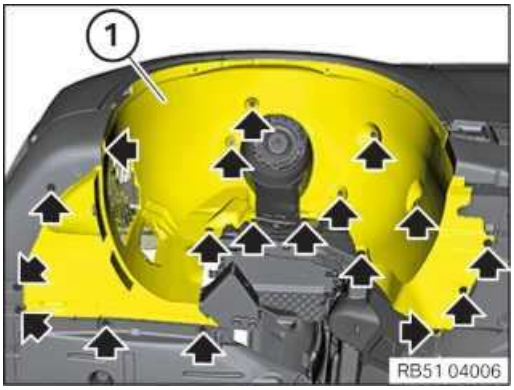
- Secure the cable clip (2) on the adapter of the deformation element.
- Connect connectors (1) and lock.

79 – Installing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

▸ **Installing the front wheel arch cover**



- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Plastic nut		Tightening torque	2,6 Nm
Screw		Tightening torque	2,6 Nm

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

▸ **Installing front wheel arch trim**

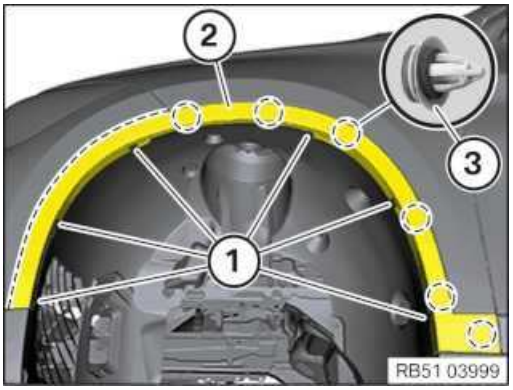
NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

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NOTICE

Description is for left component only. Procedure on the right side is identical.



- Check the clips (3) for damage and renew where required.

  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

80 – Installing both front wheels

▶ **Mounting the wheel**

▷ **Clean the contact surfaces between the brake disc and the wheel rim**



TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

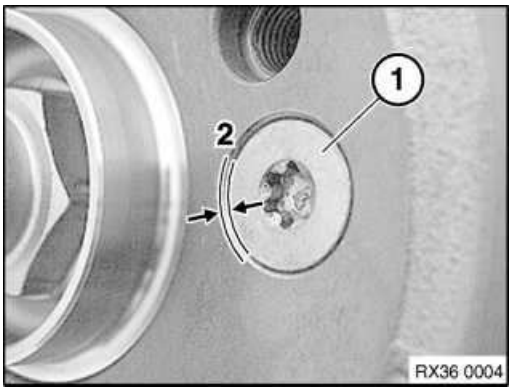
  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue in the area of the wheel bolt holes, remove and clean the brake disc.



- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

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- Renew mounting bolt (1).

  Parts: Mounting bolt

- Check that the mounting bolt (1) for the brake disc is securely seated.

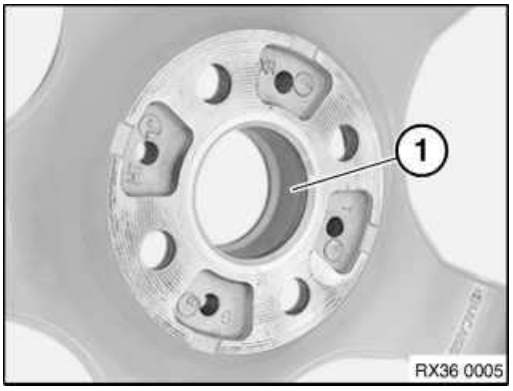
  The mounting bolt (1) for the brake disc may not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to rear wheel hub

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub

M8	Renew screw.	Tightening torque	16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring (1).

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

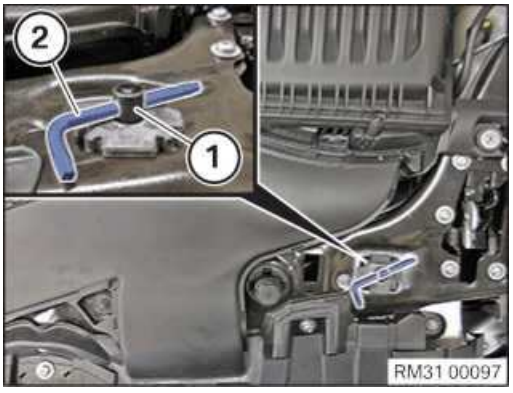
  Parts: Wheel bolts
- Clean the wheel bolts.
- Check the wheel bolts and threads for damage, renew the wheel bolts if necessary.
- Join and tighten the wheel bolts (arrows).

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

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81 – Removing fastener for left and right radiator



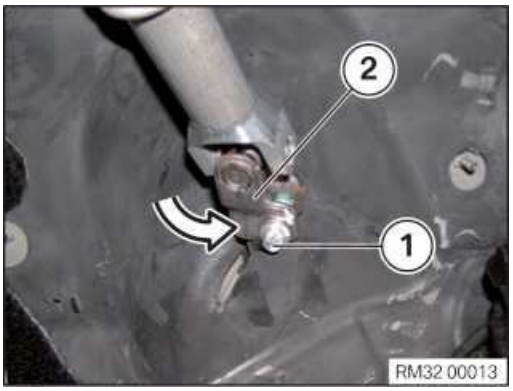
NOTICE

Perform the operations on the left and right side.

- Remove suitable tool (2) from the centering pin (1).

82 – Secure the steering shaft at the bottom on the steering gear

82 – Secure the steering shaft at the bottom on the steering gear



- Clean the screw lock residue from the screw thread in the universal joint (2).
- Pivot the universal joint (2) in the direction of the arrow to the steering gear.
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Lower steering shaft to steering gear

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

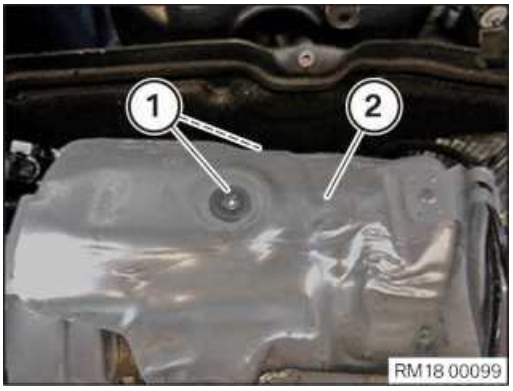


- **If installed:**
- Position the cover on the steering column (2).
- Tighten nuts (1).

Steering column cover to bulkhead

Plastic nut		Tightening torque	3 Nm

83 – Install the heat shield on the exhaust turbocharger



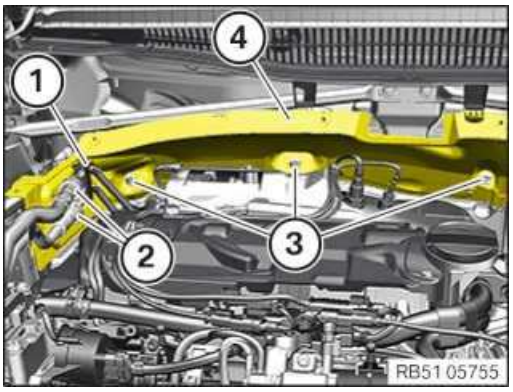
- Feed in and install the heat shield (2).
- Tighten the screws (1) at the top and bottom of the heat shield.

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Fasten the cable at the clips .

84 – Installing rear bulkhead upper part



- Feed in and install the rear bulkhead upper part (4).
- Tighten down screws (3).

Rear bulkhead upper part to lower section of bulkhead

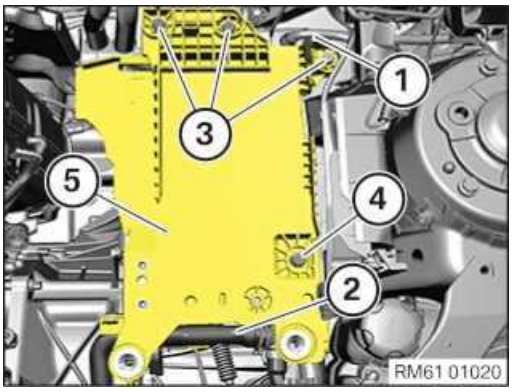
Oval-head screw		Tightening torque	5 Nm

- Feed the fuel line (2) into the holder (1) and install.
- Connect and lock the holder (1).

  The holder (1) must engage audibly.

85 – Install the battery holder

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- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

86 – Install electronics box

Prerequisite

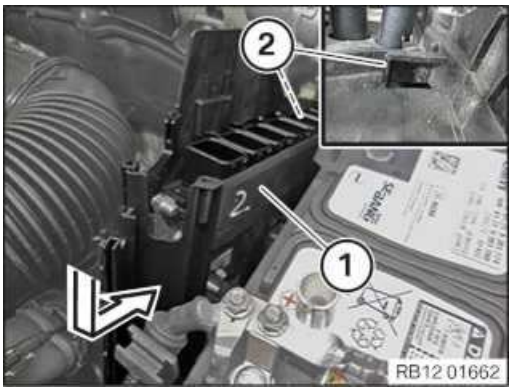
Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.

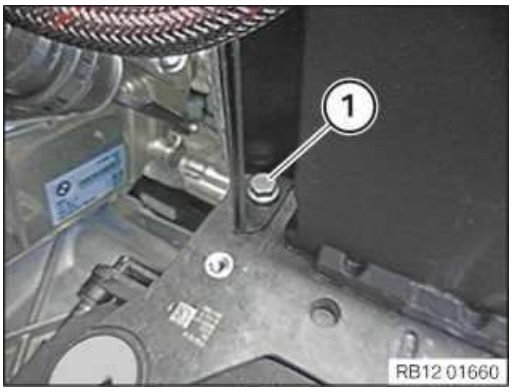


- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.



- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).

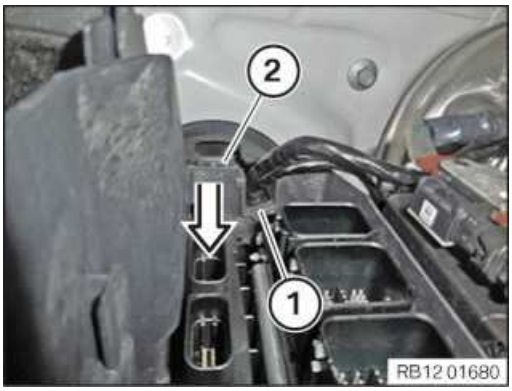
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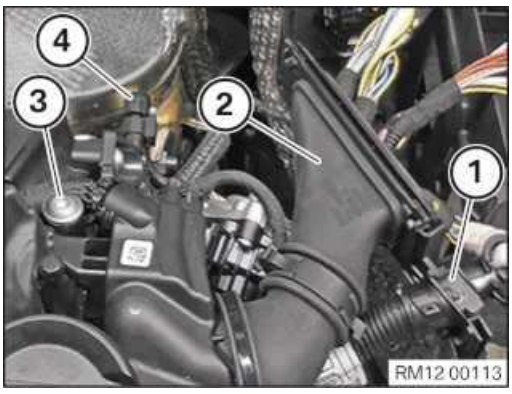
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.

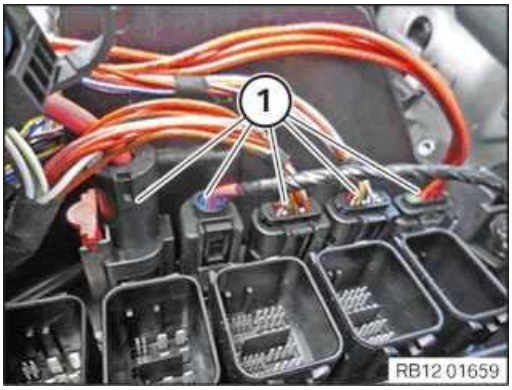


- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

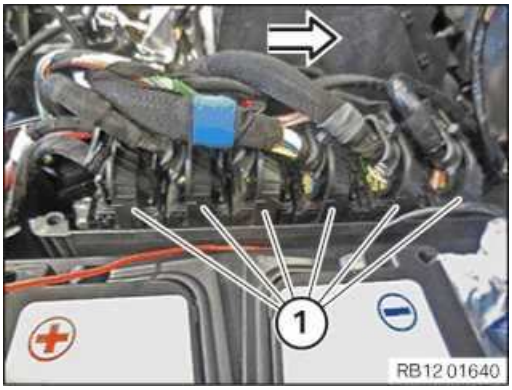
Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.

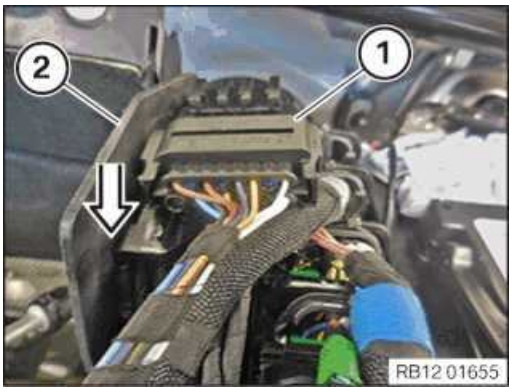


- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.

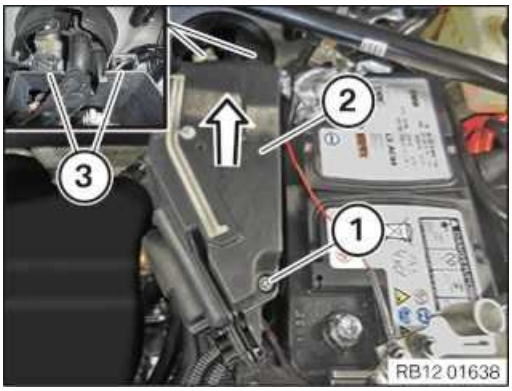


- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.

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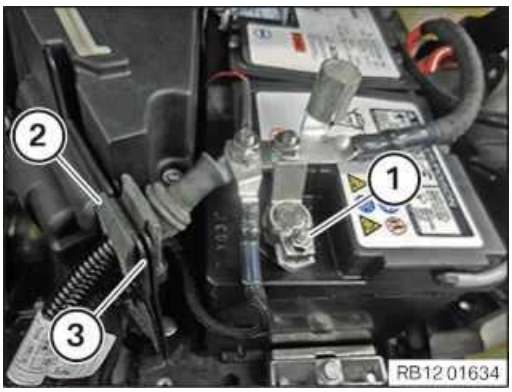
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

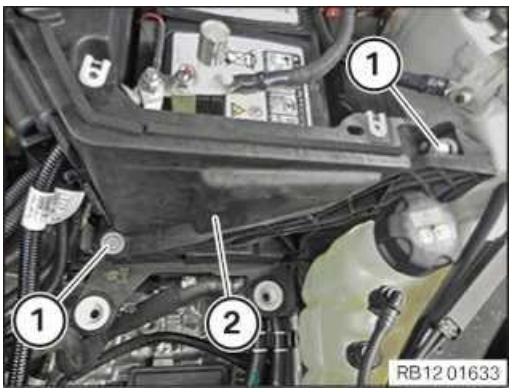
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

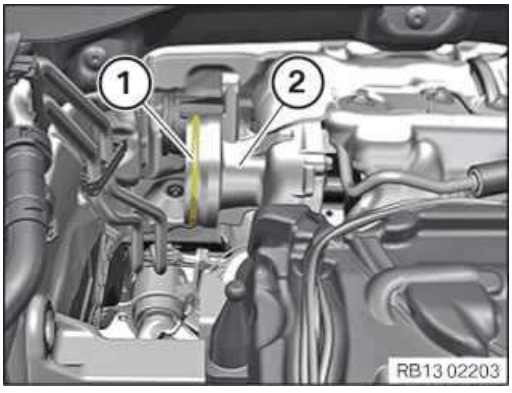


- Feed in and install tension strut (2).
- Tighten the screws (1).

Tension strut to spring strut dome/battery tray

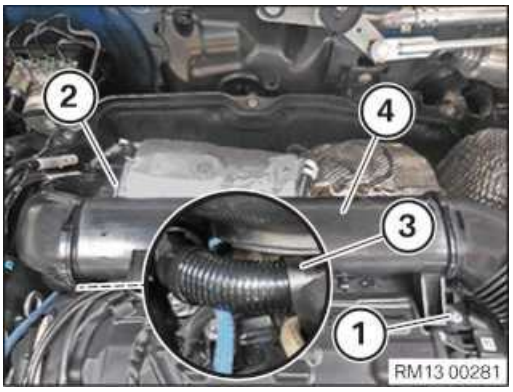
M8		Tightening torque	19 Nm

87 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.

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- Feed in clean air pipe and install.
- Connect clean air pipe to the exhaust turbocharger and lock audibly in the clamps (2).
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Connect ventilation line (3) to the cylinder head cover and lock audibly.

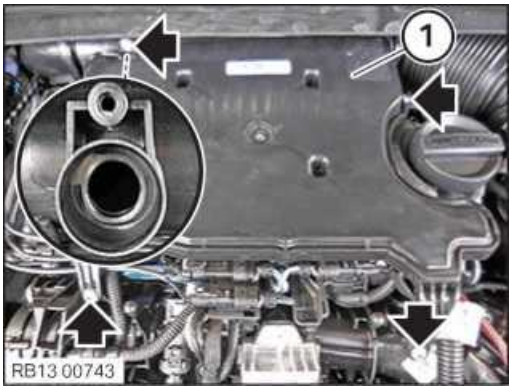


- Mount clean air pipe onto the intake filter housing.
- Tighten clamp (1) on the clean air pipe.

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

88 – Install resonator



- Insert and install the resonator (1).
- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

89 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

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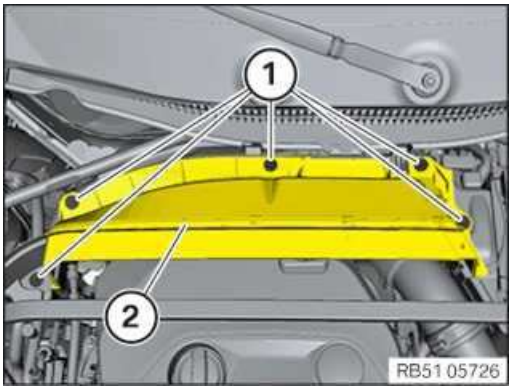


- Check for correct installation of all rubber mounts in the acoustic cover (1).



- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

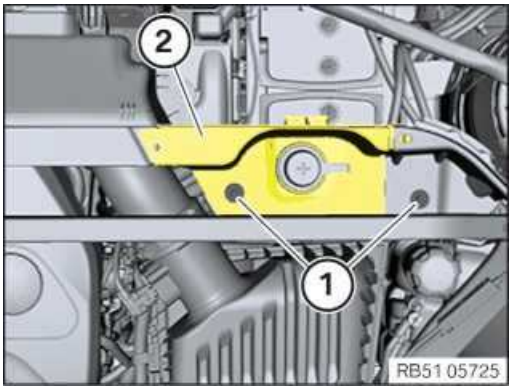
90 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Cover of top bulkhead

Screw		Tightening torque	2,6 Nm



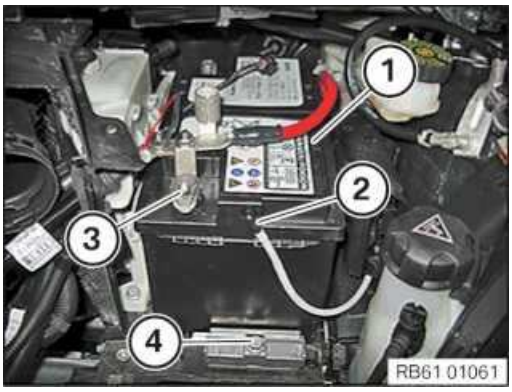
- Guide in and install cover (2).
- Tighten down screw (1).

Cover of remote positive terminal

Screw		Tightening torque	2,6 Nm

91 – Install vehicle battery

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- Install vehicle battery (1).
- Position the bracket and tighten with the screw (4) .

Battery terminal rail to battery tray

M8		19 Nm

- Position the vent hose (2) and clip it in.
- Position the positive battery terminal and tighten with the nut (3) .

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

▸ **Check the vent holes of the battery**

WARNING

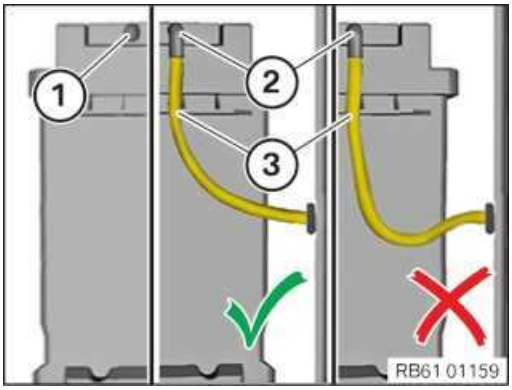
Gas emission.

Danger of injury! Danger of explosion!

- Assign the vent holes correctly.
- Route the vent hose correctly.

TECHNICAL INFORMATION

The battery has two vent holes, opposite:
One vent hole (1) must be closed correctly with a dummy plug.
The vent hose (3) must be correctly connected and routed at the other vent hole (2).



Check

- Check if the vent hole (1) is correctly closed with a dummy plug.

Result

» No dummy plug.

Measure

- Close the vent hole (1) correctly with a dummy plug.

Check

- Check if the vent hole (2) has a correctly connected vent hose (3).

Result

» The vent hose (3) is not correctly connected.

Measure

- At the vent hole (2), connect the vent hose (3) correctly.

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Check

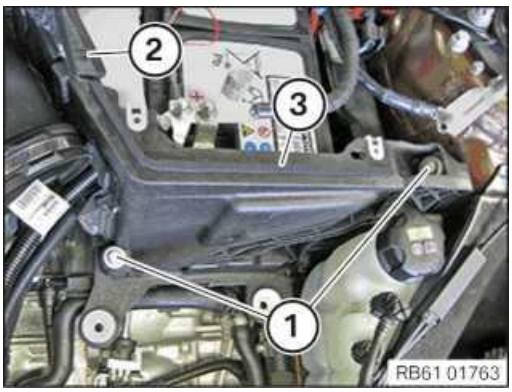
- Check if the vent hose (3) is routed to the outside with a downhill gradient (**no siphon formation!**).

Result

» The vent hose (3) is not correctly routed as shown in the image on the right.

Measure

- Route the vent hose (3) correctly as shown in the centre image.



- Insert tension strut (3) and tighten with screws (1).

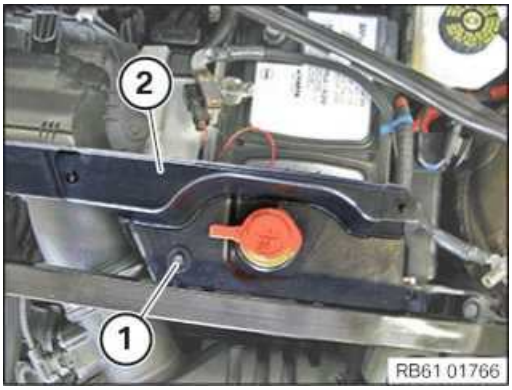
Trailing link

M8		Tightening torque	19 Nm

- Tighten down screw (2).

Battery cover

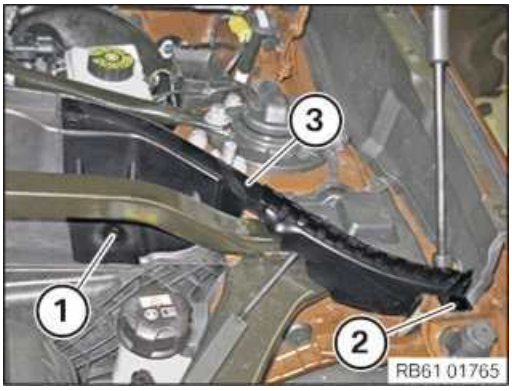
M8		2,8 Nm



- Position the cover (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm

92 – Connecting the battery earth lead

TECHNICAL INFORMATION

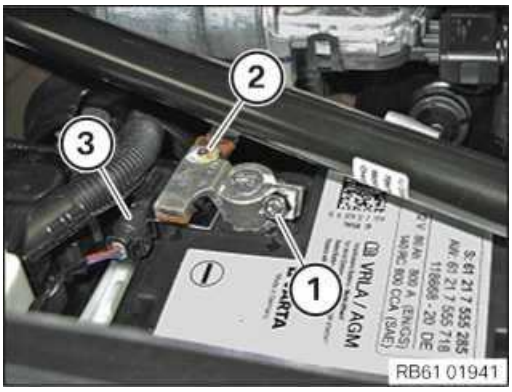
For additional information see:

61 00 ... Safety information on handling the vehicle battery

61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery

61 12 ... Notes on the intelligent battery sensor (IBS)

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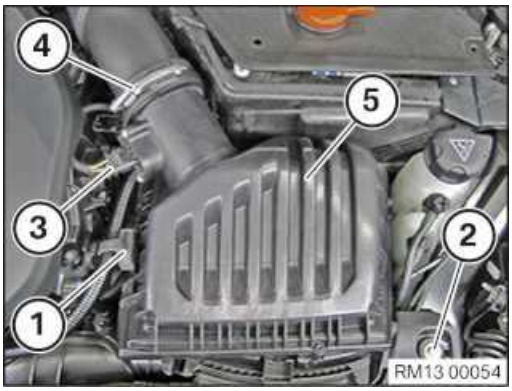
- Remove the protective cover of the positive battery terminal.
- Position the battery earth lead (2).
- Tighten nut (1).

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

- If required, connect the connector (3).

93 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.

  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

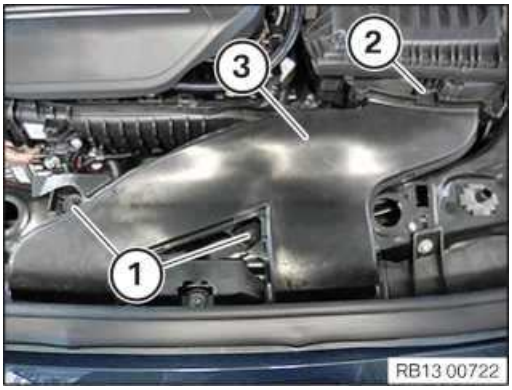
Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Insert and install the holder (1).

94 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

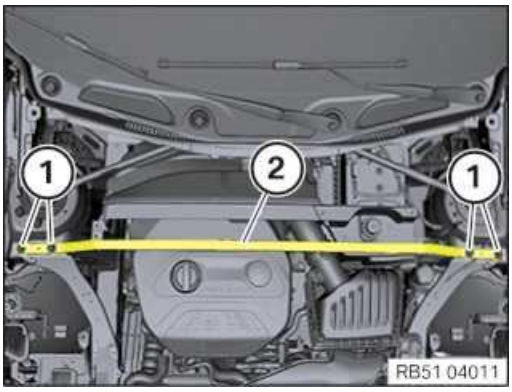
M6		Tightening torque	8 Nm

95 – Install strut brace

TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.

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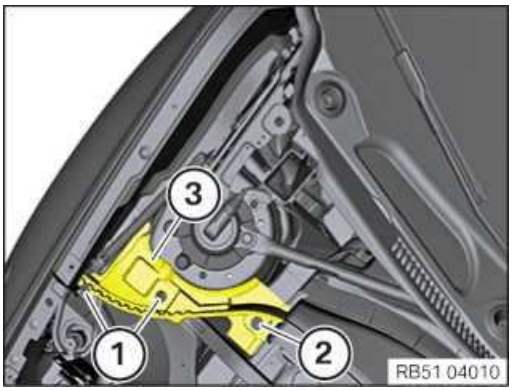


- Install the strut brace (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-brace to spring strut dome

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °



NOTICE

Description is for right component only. The procedure on the left side is identical.

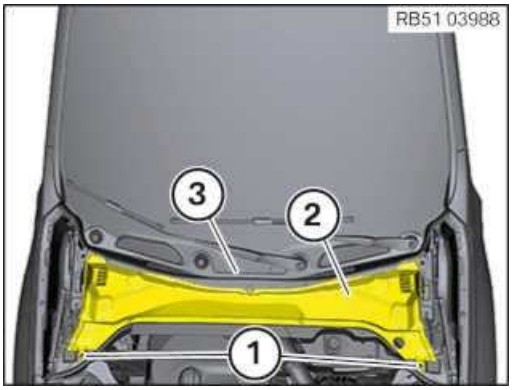
- Install the cover (3).
- Tighten down screw (2).

Cover on body

Hexagon screw		Tightening torque	3 Nm

- Install the expanding rivet (1).

96 – Installing front cowl panel cover

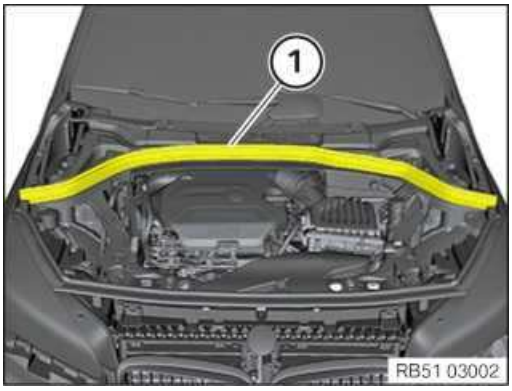


- Insert and install cowl panel cover at front (2) into cowl panel cover at rear (3).
- Check cowl panel cover at front is correctly seated (2).
- Secure expanding rivet (1).

97 – Install the seal for the bonnet

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

98 – Checking/topping up oil level in automatic gearbox (AISIN GA8G45)

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Prerequisite

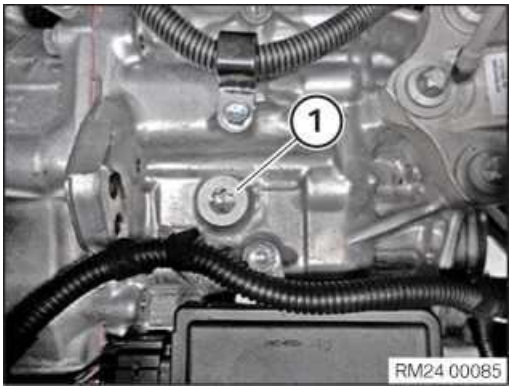
Vehicle in horizontal position.

CAUTION

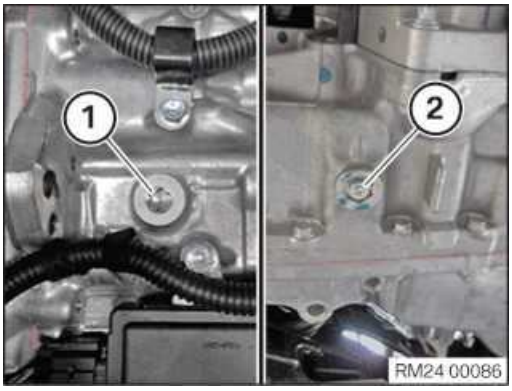
Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.



- Move the selector lever to the "P" position.
- Secure vehicle to prevent it rolling.
- Connect diagnosis system.
- Release the oil filler plug (1) using the Torx T55 .



- **Topping up the automatic transmission fluid (the automatic transmission fluid was drained):**
- Release oil filler plug (1) from engine compartment.
- Loosen the overflow plug (2) below at the transmission.
- Top up automatic transmission fluid at oil filler plug (1) until oil emerges at overflow plug (2).
- Start engine and run at idle speed.
- Check whether the automatic transmission fluid is leaking at the overflow plug (2) .
- If there is no automatic transmission fluid leaking at the overflow plug (2) , fill in the automatic transmission fluid to the oil filler plug (1) .
- Press the footbrake and, when idle, shift through all the gears from "P" to "D" 2 times for more than 2 seconds .
- Move the selector lever to the "P" position.
- Check again whether the automatic transmission fluid is leaking at the overflow plug(2) .
- Read the temperature of the automatic transmission fluid with the diagnosis system.
- Increase temperature of automatic transmission fluid to 35 °C to 45 °C.
- Top up automatic transmission fluid until it flows over.
- Renew sealing rings.

  Parts: Sealing ring
- Screw in and fasten oil filler plug (1) and overflow plug (2).

Oil filler plug to transmission housing

M14	Renew the sealing ring.	Tightening torque	45 Nm

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Overflow screw in oil drain plug

M6	Renew the sealing ring.		8 Nm

- **Check oil level (transmission oil temperature must be between** 35 °C **and** 45 °C **):**
- Open the oil filler plug (1).
- Slacken overflow plug (2).
- Start engine and run at idle speed.
- Unscrew and remove overflow plug (2).
- Check whether the automatic transmission fluid is leaking at the overflow plug (2) .
- If there is no automatic transmission fluid leaking at the overflow plug (2) , fill in the automatic transmission fluid to the oil filler plug (1) .
- Top up the automatic transmission fluid until it overflows at the overflow plug (2) .
- Press the footbrake and, when idle, shift through all the gears from "P" to "D" 2 times for more than 2 seconds .
- Move the selector lever to the "P" position.
- Check the oil level again.
- Renew sealing rings.

  Parts: Sealing ring
- If the oil escapes slightly from the overflow plug (2) , tighten the overflow plug (2) and the oil filler plug (1) .

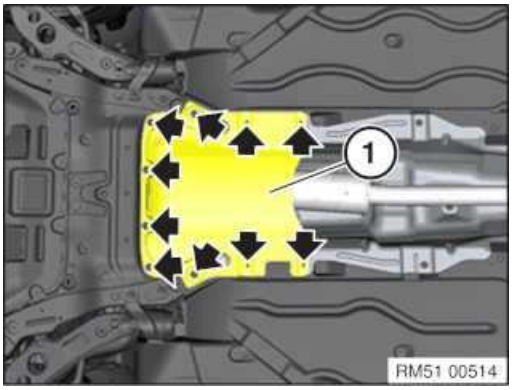
Overflow screw in oil drain plug

M6	Renew the sealing ring.		8 Nm

Oil filler plug to transmission housing

M14	Renew the sealing ring.	Tightening torque	45 Nm

99 – If installed: Installing underbody protection at rear

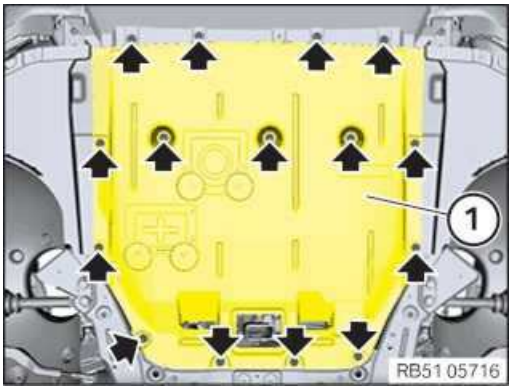


- Position rear underbody protection (1).
- Tighten screws (arrows).

Underbody protection to body

Screw		Tightening torque	3 Nm

100 – Installing the front underbody protection

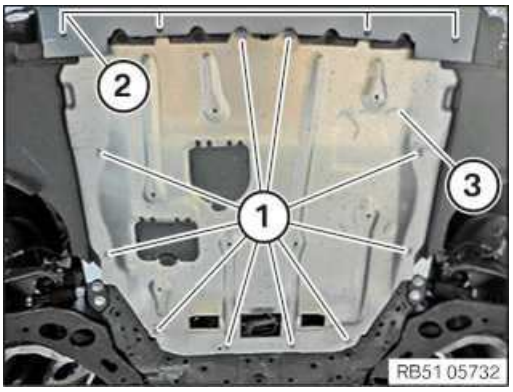


- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

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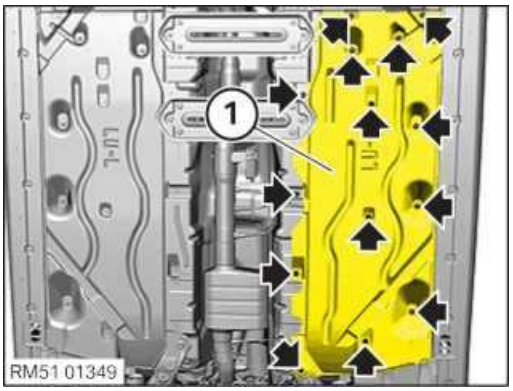


- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

101 – Installing underbody panelling , right



- Correctly position the underbody panelling (1).
- Tighten all bolts and nuts (arrows).

Underbody panelling, side

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side

Plastic nut		Tightening torque	2,6 Nm

Additional Information

Overview of Tightening Torques

Exhaust turbocharger to exhaust manifold Used in step 52

V-band clamp		Tightening torque	19 Nm

Oil feed line to bracket Used in step 52

Torx screw M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase Used in step 52

M8x16		Tightening torque	22 Nm

Oil return line to turbocharger Used in step 52

M6x12		Tightening torque	8 Nm

Heat shield for exhaust turbocharger Used in step 53

Torx screw BM 6x12		Tightening torque	10 Nm

Banjo bolt for exhaust pressure pipe to exhaust manifold Used in step 53

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

Standard screw connection M6 Used in step 53

M6			8 Nm

Diesel particulate filter V-clip to exhaust turbocharger Used in step 54

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

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Diesel particle filter to holder — Used in step 54

M8 hexagon nut		Tightening torque	19 Nm

Diesel particulate filter holder to gearbox — Used in step 54

M12x75		Tightening torque	66 Nm

Diesel particulate filter bracket to crankcase — Used in step 54

M10x35		Tightening torque	38 Nm

SCR metering module V-clip to exhaust system — Used in step 54

V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm

Holder for coolant lines to diesel particulate filter — Used in step 54

Torx bolt BM6x16		Tightening torque	8 Nm

Differential pressure sensor to holder — Used in step 54

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor — Used in step 54

Clamp 15–19mm		Tightening torque	3 Nm

Control sensor — Used in step 55

Control sensor		Tightening torque	50 Nm

Exhaust temperature sensor to diesel particulate filter — Used in step 56 57

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Exhaust-gas temperature sensor to exhaust system — Used in step 58

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Oxygen sensor holder to intermediate shaft — Used in step 59

Hexagon screw M6x16		Tightening torque	8 Nm

Nitrogen oxide sensor before SCR catalytic converter — Used in step 60

Sensor		Tightening torque	50 Nm

Monitoring sensor — Used in step 61

Sensor		Tightening torque	50 Nm

Transfer box to transmission — Used in step 62

M10		Tightening torque	56 Nm

Heat shield to transfer box — Used in step 62

M6	Renew screws.	Tightening torque	6 Nm

Oil filler plug on transfer box (VTG) — Used in step 62

M18x1.5		Tightening torque	35 Nm

Intermediate shaft to transfer box — Used in step 63

M8x35		Tightening torque	19 Nm

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Starter motor to transmission

Used in step 64

M8x45		Tightening torque	19 Nm

Battery positive lead to starter

Used in step 64

M8		Tightening torque	13,5 Nm

Propeller shaft to transfer box

Used in step 67

		Tightening torque	80 Nm

Flexible disc to rear axle final drive

Used in step 67

M12x1.5	Renew screws.	Tightening torque	55 Nm 90 °

Centre mount to body

Used in step 67

M8		Tightening torque	19 Nm

Heat shield to body

Used in step 68 69

Bolts/nut		Tightening torque	3 Nm

Bracket to body

Used in step 68

M8		Tightening torque	21 Nm

Exhaust system to body

Used in step 70

M8	Replace nuts.	Tightening torque	19 Nm

Exhaust bracket on body

Used in step 70

Hexagon screw M8x30		Tightening torque	19 Nm

V-clip to catalytic converter

Used in step 70

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

Diesel particulate sensor to exhaust system

Used in step 70

Sensor		Tightening torque	50 Nm

Nitrogen oxide sensor downstream of SCR catalytic converter

Used in step 70

Sensor		Tightening torque	50 Nm

Cross-member/torsion strut to axle support and mounting

Used in step 71

M12x48	Renew screws.	Jointing torque Angle of rotation	100 Nm 90 °

Front connection carrier to body

Used in step 72

M10x18		Tightening torque	56 Nm

Rear connection carrier to body

Used in step 72

M8x18		Tightening torque	28 Nm

Rear end of front axle support to body

Used in step 73

M14 screw	Renew screw.	Tightening torque	175 Nm

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Front axle support, front to body

Used in step 73

M12 screw	Renew screw.	Tightening torque	108 Nm

Underbody protection to body

Used in step 73 99

Screw		Tightening torque	3 Nm

Track rod end to swivel bearing

Used in step 73

M14	Renew nut.	Tightening torque	175 Nm

Wishbone to swivel bearing

Used in step 73

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

Holder, wishbone rubber mount, to body

Used in step 74

M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °

Holder with rubber mount to front axle support

Used in step 74

M12 screw			100 Nm

Washer fluid reservoir holder to front axle support adapter plate

Used in step 74

		Tightening torque	10 Nm

Deformation element, bottom, to adapter plate, front axle carrier

Used in step 74

		Tightening torque	11,8 Nm

Holder to front axle support

Used in step 75

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

Anti-roll bar link to anti-roll bar

Used in step 77

M10	Renew nut.	Tightening torque	56 Nm

Wheel arch cover to body

Used in step 79

Plastic nut		Tightening torque	2,6 Nm
Screw		Tightening torque	2,6 Nm

Wheel arch cover to body

Used in step 79

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Used in step 79

Plastic nut		Tightening torque	3 Nm

Brake disc to rear wheel hub

Used in step 80

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub

Used in step 80

M8	Renew screw.	Tightening torque	16 Nm

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Wheel bolts

Used in step 80

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Lower steering shaft to steering gear

Used in step 82

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

Steering column cover to bulkhead

Used in step 82

Plastic nut		Tightening torque	3 Nm

Heat shield for exhaust turbocharger

Used in step 83

Torx screw BM 6x12		Tightening torque	10 Nm

Rear bulkhead upper part to lower section of bulkhead

Used in step 84

Oval-head screw		Tightening torque	5 Nm

Battery holder to engine support

Used in step 85

Hexagon screw M8x30		Tightening torque	19 Nm

Electronics box to battery tray

Used in step 86

M8X16		Tightening torque	15 Nm

Wiring harness to cylinder head cover

Used in step 86

TS5x20		Tightening torque	3,5 Nm

Cover to electronics box

Used in step 86

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery

Used in step 86

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray

Used in step 86

M8		Tightening torque	19 Nm

Clean air pipe to cylinder head cover

Used in step 87

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing

Used in step 87 93

Clamp		Tightening torque	3 Nm

Resonator to manifold and clean air pipe

Used in step 88

Screw TS6	Renew screw.	Tightening torque	5 Nm

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Cover of top bulkhead — Used in step 90

Screw		Tightening torque	2,6 Nm

Cover of remote positive terminal — Used in step 90

Screw		Tightening torque	2,6 Nm

Battery terminal rail to battery tray — Used in step 91

M8			19 Nm

Battery terminal with IBS positive battery terminal / negative battery terminal — Used in step 91 92

NutM6			5 Nm

Trailing link — Used in step 91

M8		Tightening torque	19 Nm

Battery cover — Used in step 91

M8			2,8 Nm

Intake silencer housing to lock bridge — Used in step 93

M6X30		Tightening torque	8 Nm

Intake neck to cross connection — Used in step 94

M6		Tightening torque	8 Nm

Cross-brace to spring strut dome — Used in step 95

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

Cover on body — Used in step 95

Hexagon screw		Tightening torque	3 Nm

Oil filler plug to transmission housing — Used in step 98

M14	Renew the sealing ring.	Tightening torque	45 Nm

Overflow screw in oil drain plug — Used in step 98

M6	Renew the sealing ring.		8 Nm

Underbody protection front — Used in step 100

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Underbody panelling, side — Used in step 101

Hexagon screw		Tightening torque	2,6 Nm

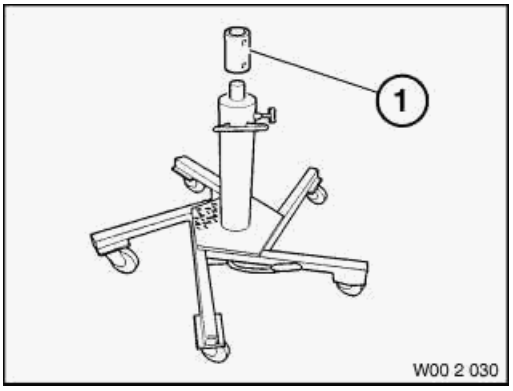
Underbody panelling, side — Used in step 101

Plastic nut		Tightening torque	2,6 Nm

Overview of Special Tools

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0 490 133 (00 2 030) Device



Common

Used in step 28 73

Usage	(universal hydraulic lifter base unit) Chassis and hydraulic lifter - For removing and installing rear axle supports and gearboxes. Also for soft top mounts. Is replaced by 81 22 2 219 012
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 90 (207)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 490 134 (00 2 031)		**Adapter** (adapter for gearbox holder) Model series: E30, E31, E32, E34, E36	

0 495 554 (33 5 070) Extension



Common

Used in step 34 67

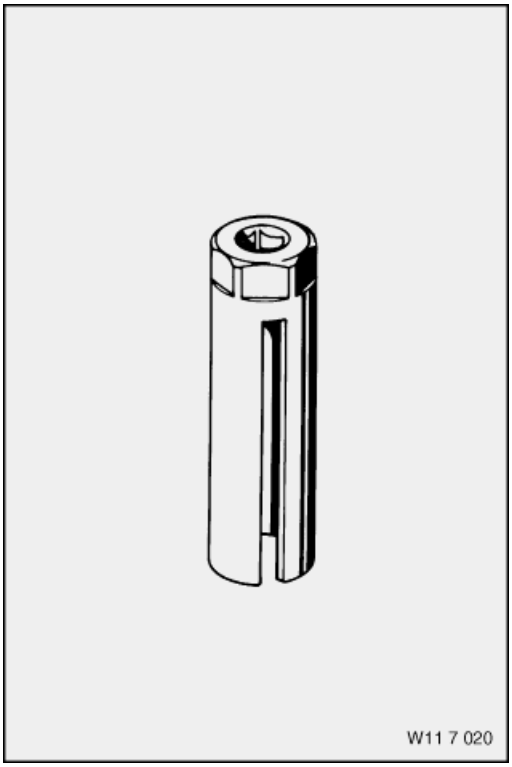
Usage	Pull-out extension for 33 5 040, 33 5 050, 33 5 060.
Included in the tool or work	
Storage location	A18
Replaced by	
In connection with	
SI-Number	01 21 06 (300)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 592 (33 5 071)		**Extension** (Extension (1 item)) discontinued, can only be ordered using complete tool	

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0 491 074 (11 7 020) Socket wrench insert



Common

Used in step 40 41 61

Usage	(Socket wrench insert 22 mm) For loosening and tightening the oxygen sensor
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	

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2 409 025 Puller



Common	Used in step 62
Usage	For disassembly of the outer radial shaft seal of the transmission output shaft, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A76
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 411 739 Puller



Common	Used in step 62
Usage	For disassembly of the inner radial shaft seal of the output, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C78
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 408 152 Striking element



Common	Used in step 62
Usage	For installation of the right radial shaft seal transmission output shaft (inner). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

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2 413 037 Handle



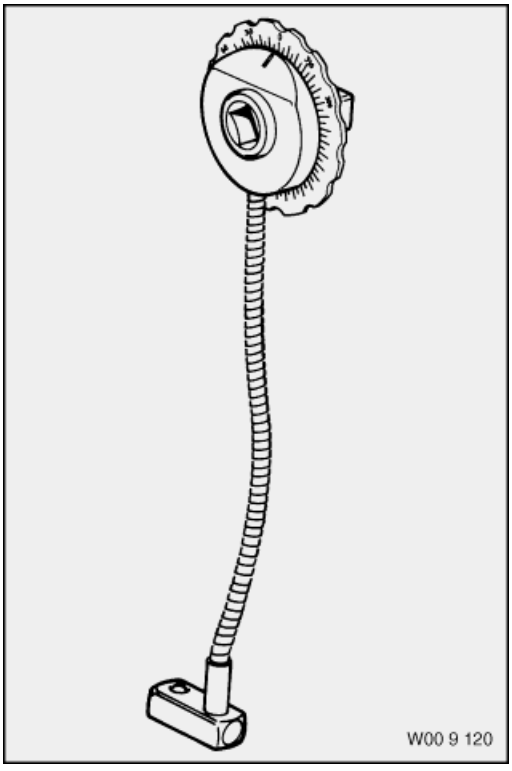
Common	Used in step 62
Usage	Universal drift handle. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C77
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 408 150 Striking element



Common	Used in step 62
Usage	For installing the right radial shaft seal transmission output shaft (outer). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

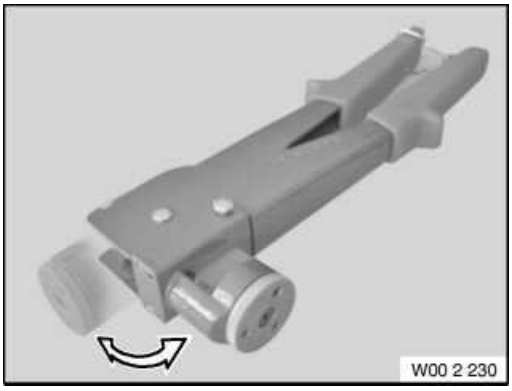
0 490 504 (00 9 120) Torque angle measuring dial



Common	Used in step 67
Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

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0 496 521 (00 2 230) Pliers



Common	Used in step 79
Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

2 344 011 Tool



Common	Used in step 80
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

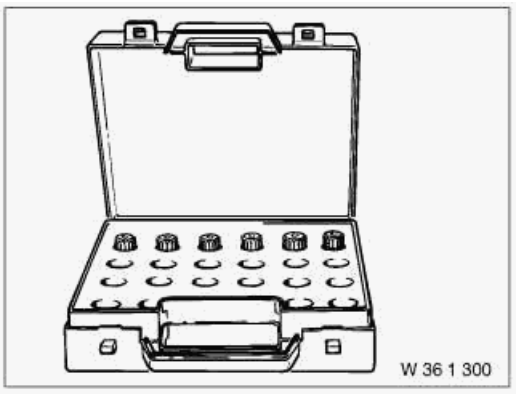
0 495 221 (36 1 323) Wheel stud



Common	Used in step 18
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 224 (36 1 326) Wheel stud



Common	Used in step 18
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud



Common	Used in step 18
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

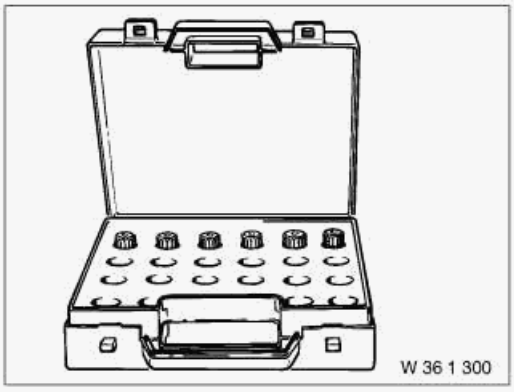
0 495 226 (36 1 328) Wheel stud



Common	Used in step 18
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 227 (36 1 329) Wheel stud



Common	Used in step 18
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud



Common	Used in step 18
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 229 (36 1 332) Wheel stud



Common	Used in step 18
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud



Common	Used in step 18
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Links

Functional descriptions	Used in step

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Troubleshooting on the exhaust turbocharger	50

General repair instructions	Used in step
61 20 ... Notes on AGM battery	92
61 12 ... Notes on intelligent battery sensor (IBS)	92
61 00 ... Notes for disconnecting and connecting battery	92
61 00 ... Safety information for handling vehicle battery	

Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	12 40 41 43 44 45 46 47
11 65 ... Test steps for exhaust turbocharger damage	50
11 65 020 Turbocharger damage due to blocked oil supply lines	50

Operating materials	Used in step
2.0 Grease for wheel centring	80
14.0 Automatic transmission fluid for ZF-transmission GA8HP45Z / GA8HP50Z / GA8HP70Z / GA8HP90Z / GA8P70H / GA8P75H / GA8HP75Z	98

Operating materials	Used in step

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11 65 002 Replacing the connecting pipe with bypass flap

WARNING

Vehicle may slip off the vehicle hoist if the vehicle hoist is handled incorrectly.

Danger! Life-threatening injuries!

- Observe safety information on raising the vehicle using a vehicle hoist.
- For additional information see: 00 ... Raising the vehicle using a vehicle hoist.

WARNING

Motor vehicle may slip off the vehicle hoist where components are supported.

Danger! Life-threatening injuries!

- Secure the vehicle hoist against lowering and lifting.

WARNING

Motor vehicle may slip off the vehicle hoist if the weight is distributed unevenly.

Danger! Life-threatening injuries!

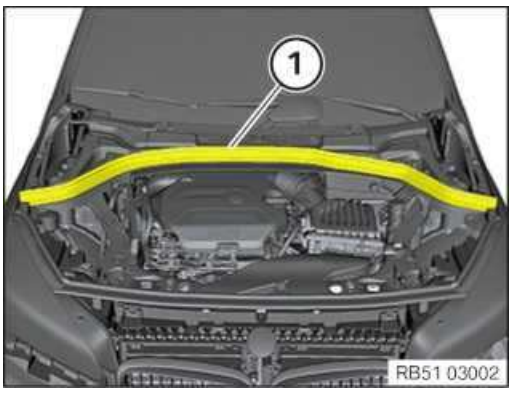
- Ensure there is a specific weight compensation on the motor vehicle.

PRELIMINARY WORK

1 – Remove the seal for the rear bonnet

NOTICE

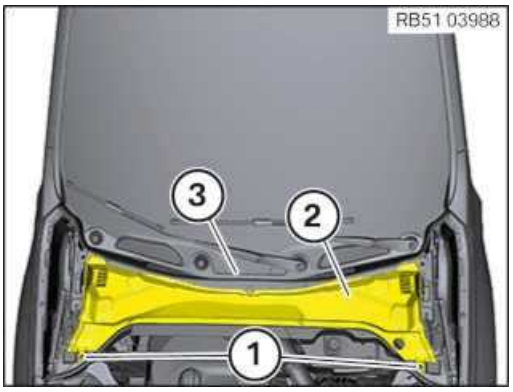
Schematic diagram is for example purposes. Some parts may differ in certain details.



- Pull off rear bonnet seal (1) towards the top and remove.

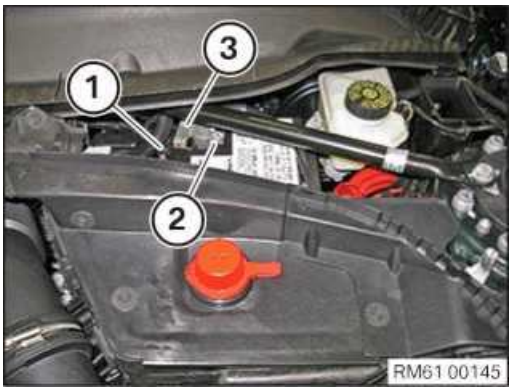
2 – Removing front cowl panel cover

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- Loosen the expanding rivet (1).
- Feed out and remove front cowl panel cover (2) from the rear cowl panel cover(3).

3 – Disconnecting the battery earth lead

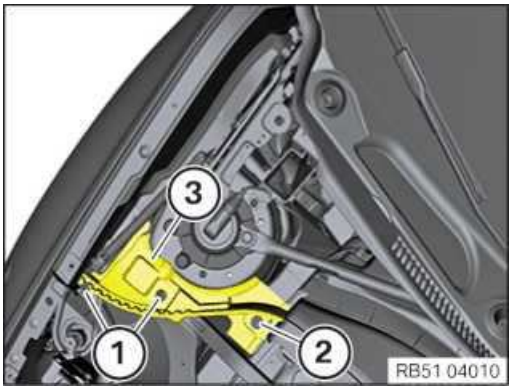


- Unlock plug connection (1) and disconnect.
- Unfasten nut (2).
- Remove the battery earth lead (3) and secure to one side.

4 – Remove suspension cross-brace

TECHNICAL INFORMATION

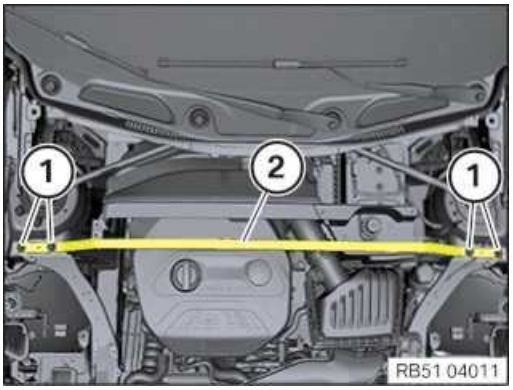
Driving without the strut brace/front end or tension strut is not permitted.



NOTICE

Description is for right component only. The procedure on the left side is identical.

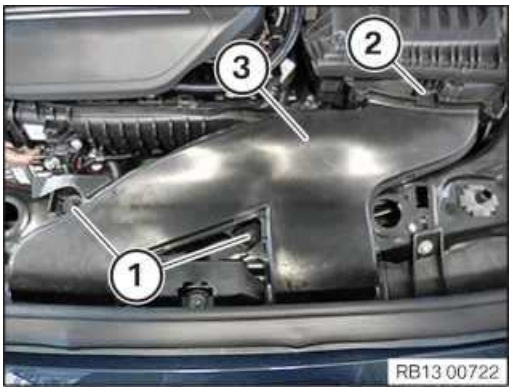
- Loosen expanding rivet (1).
- Loosen screw (2).
- Remove the cover (3).



- Loosen screws (1).
- Remove strut brace (2).

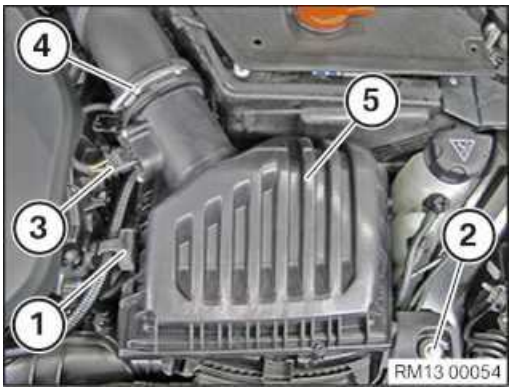
5 – Remove the intake neck for intake silencer housing

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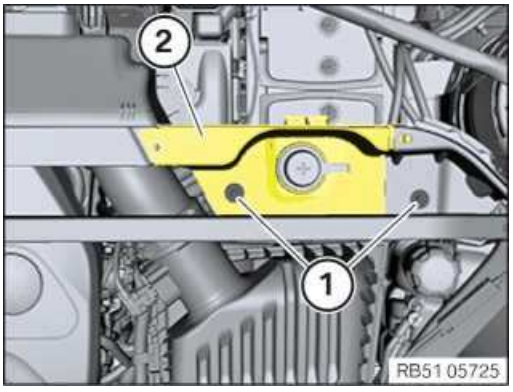
- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

6 – Removing intake silencer housing

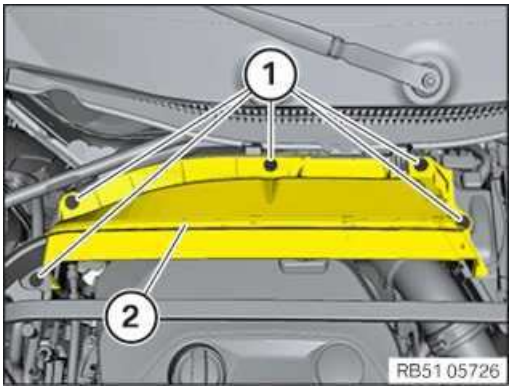


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

7 – Removing the upper bulkhead cover



- Loosen screws (1).
- Guide out and remove the cover (2).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

8 – Remove vehicle battery

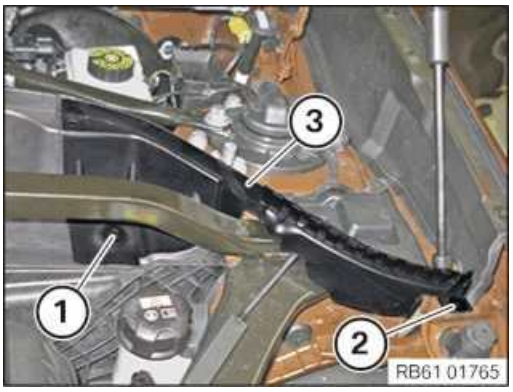
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WARNING

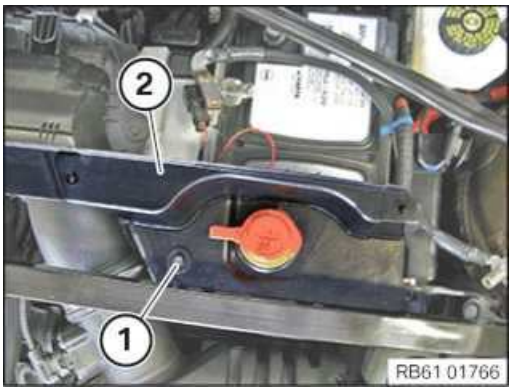
Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

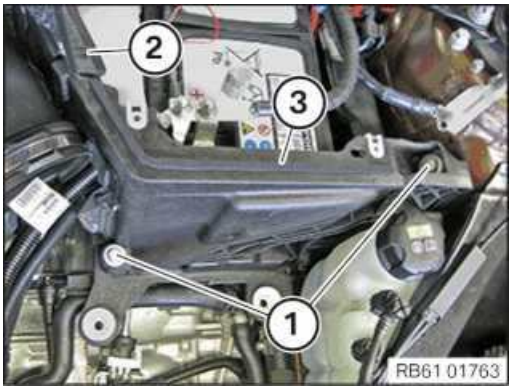
- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.



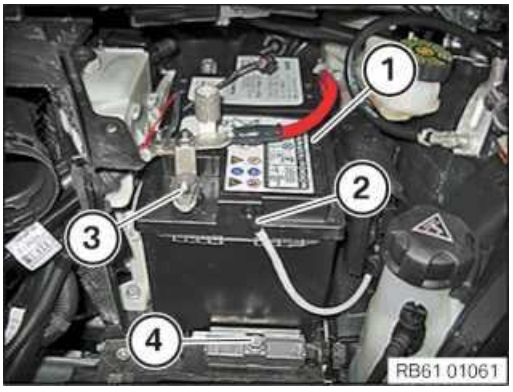
- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).



- Loosen screw (1).
- Remove the cover (2).



- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.



- Pull off the vent hose (2).
- Slacken the nut (3) on the positive battery terminal and remove the positive battery terminal.

WARNING

Unprotected battery terminals.

Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

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9 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

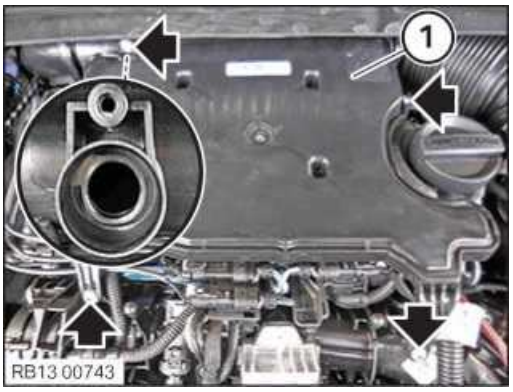
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

10 – Remove resonator



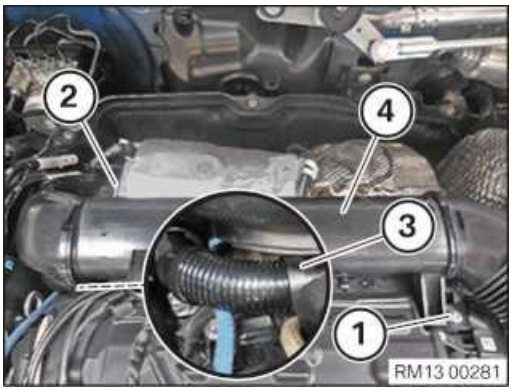
- Remove screws (arrows).
- Guide out and remove the resonator (1).

11 – Removing clean air pipe



- Detach clamp (1) on the clean air pipe.
- Pull off the clean air pipe from the intake silencer housing.

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- Loosen screw (1).
- Loosen clamp (2).
- Unlock the ventilation line (3) and pull it off the cylinder head cover.
- Feed out clean air pipe and remove.

12 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

TECHNICAL INFORMATION

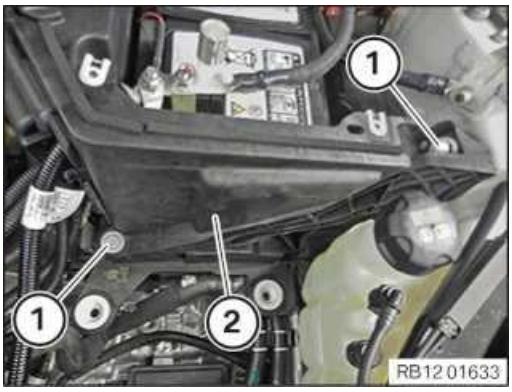
Follow instructions for removing and installing control units.

For additional information see: 12 00 ... Notes on removal and installation of control units

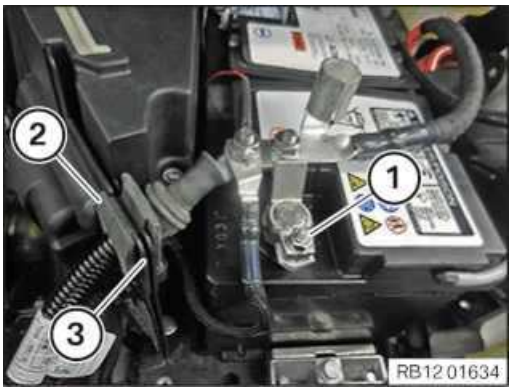
TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.

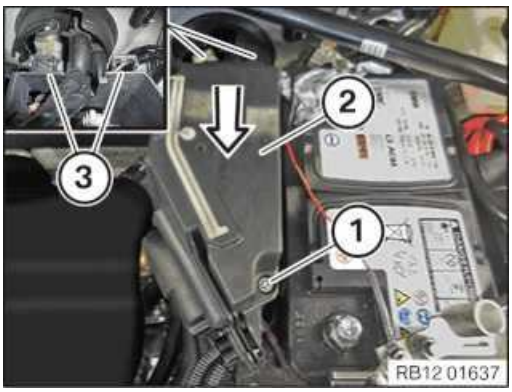
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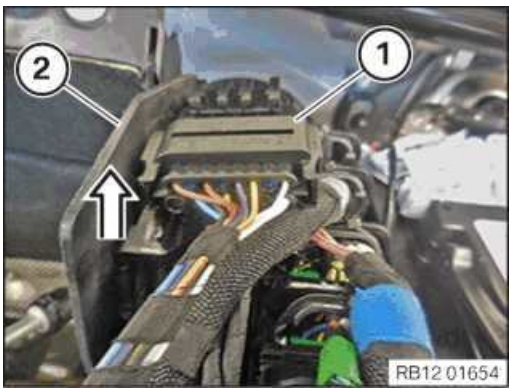
- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.



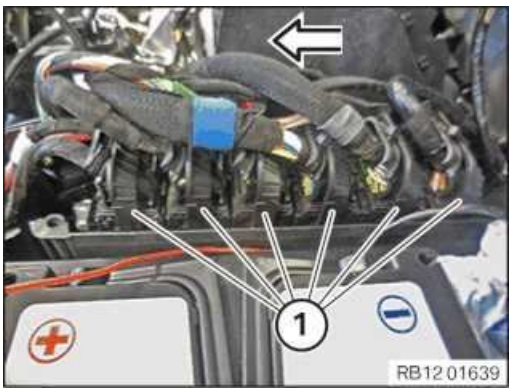
- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).

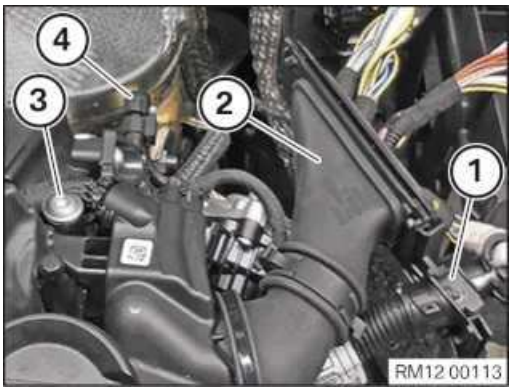


- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

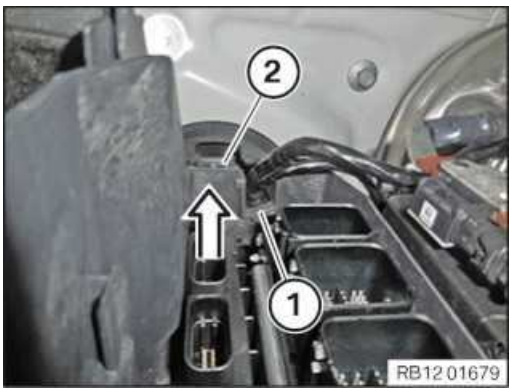
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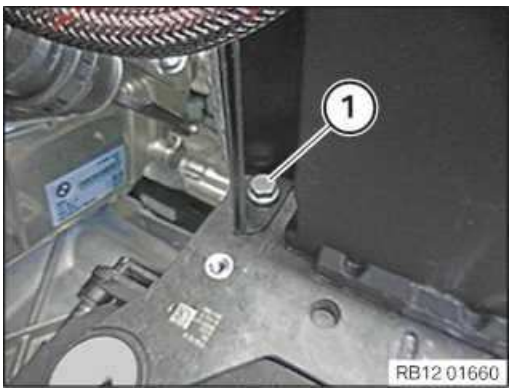
- Unlock and loosen connector (1).



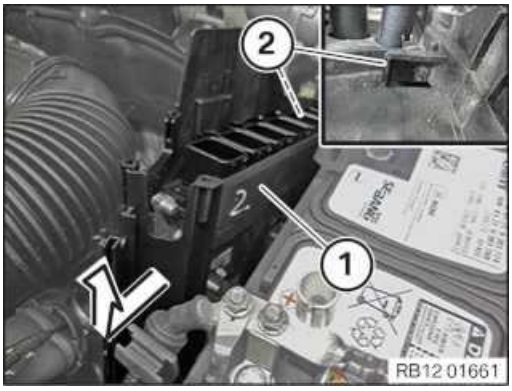
- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.



- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.



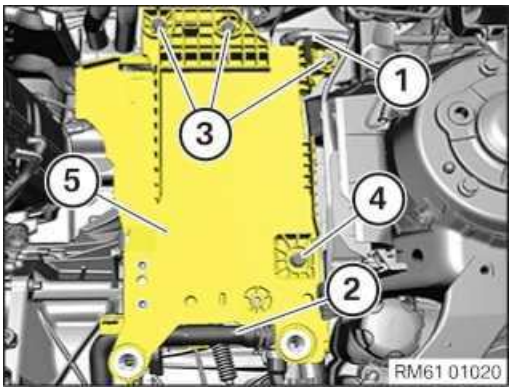
- Loosen screw (1).



- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

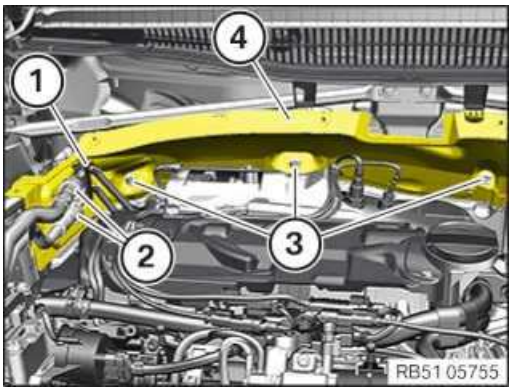
13 – Remove battery holder

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- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

14 – Remove the rear bulkhead upper part



- Unlock the holder (1) and disconnect.
- Guide out and remove the fuel lines (2).
- Loosen screws (3).
- Guide out the rear bulkhead upper part (4) and remove.

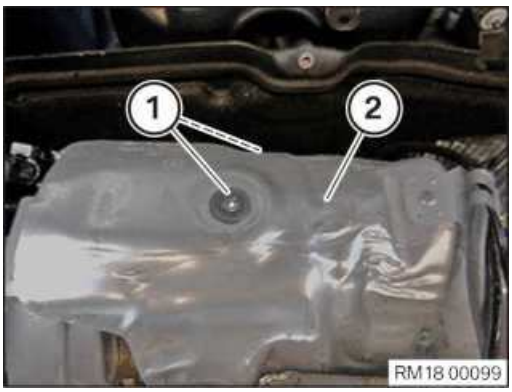
15 – Removing heat shield from top exhaust turbocharger

WARNING

Hot surfaces.

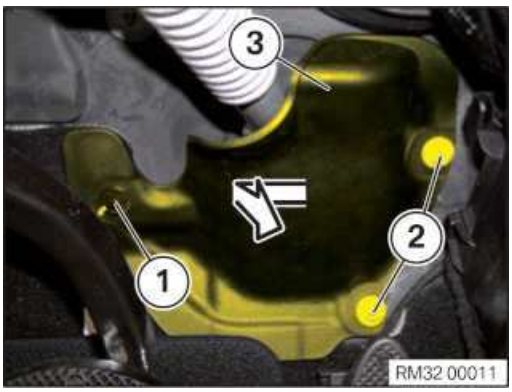
Risk of burning!

- Perform all work only on components that have cooled down.



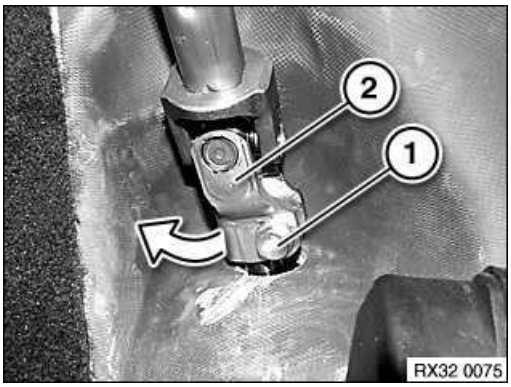
- Release cable from holders.
- Release the screws (1) at the top and bottom of the heat shield.
- Feed out and remove the heat shield (2).

16 – Releasing lower steering shaft from steering gear



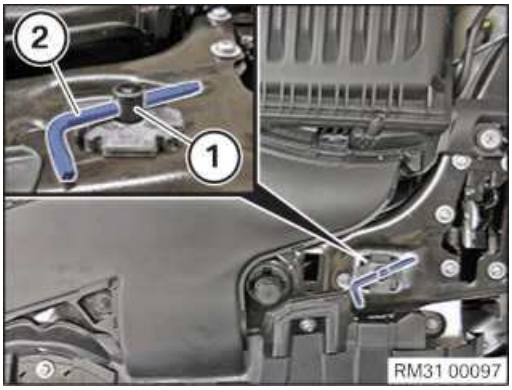
- **If installed:**
- Unfasten nut (1).
- Unscrew the nuts (2) by 1 rotation.
  Do not remove the nuts (2) !
- Remove the cover (3) on the steering column in the direction of the arrow.
  The side footwell trim must not be disassembled!

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- Loosen screw (1).
- Swivel out the universal joint (2) of the bottom steering shaft from the steering gear in the direction of the arrow.

17 – Securing radiator on left and right



NOTICE

Perform the operations on the left and right side.

- Fasten radiator at centring pin (1) with suitable tool (2).

18 – Removing both front wheels

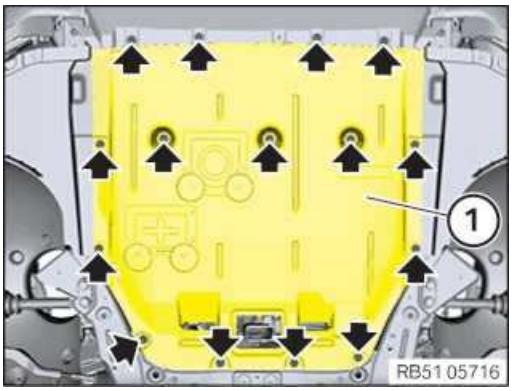
▸ **Removing the wheel**



- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Unscrew the wheel bolts (arrows) and remove the wheel.

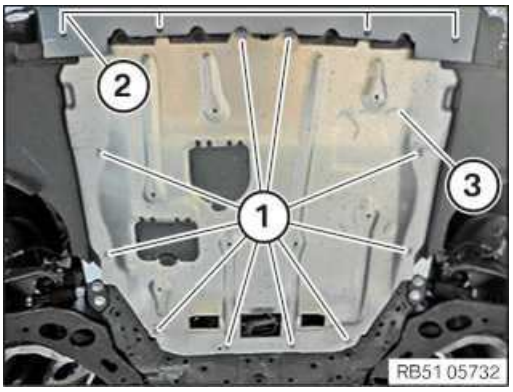
  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

19 – Removing the front underbody protection



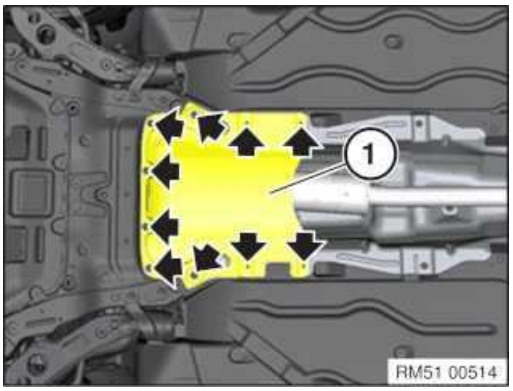
- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.

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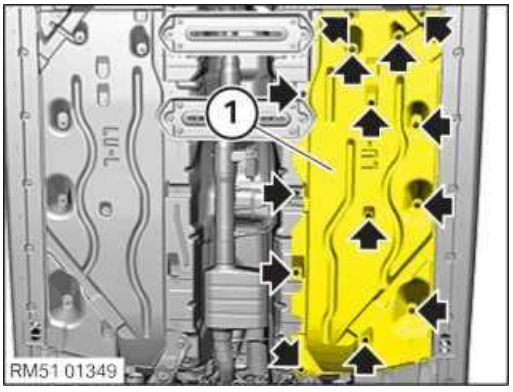
- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

20 – If installed: Removing rear underbody protection



- Remove screws (arrows).
- Remove the rear underbody protection (1).

21 – Removing right underbody panelling



- Unscrew all bolts and nuts (arrows).
- Remove the underbody panelling (1).

22 – Removing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

▸ **Remove the front wheel arch trim**

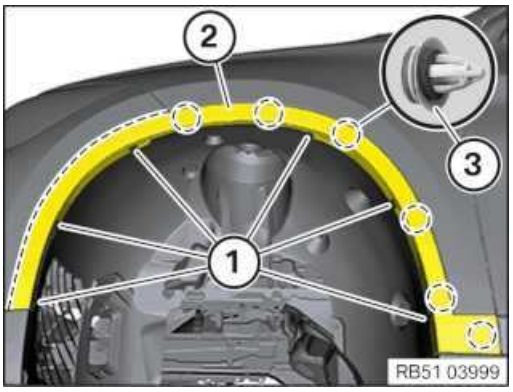
NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

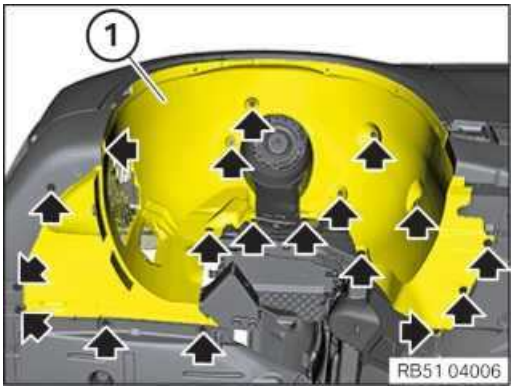
Description is for left component only. Procedure on the right side is identical.

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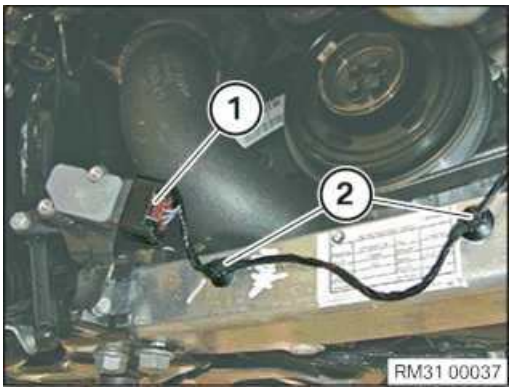
- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.

▶ **Remove front wheel arch cover**



- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

23 – With right installation: Detaching ride height sensor cable



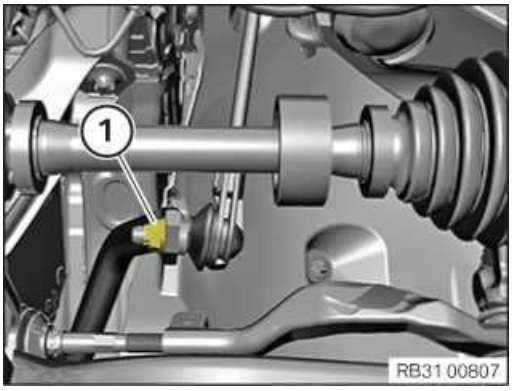
- Unlock plug connection (1) and disconnect.
- Release cable clip (2) from deformation element adapter.

24 – Releasing anti-roll bar on left and right from anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▶ **Detach the anti-roll bar from the anti-roll bar link**



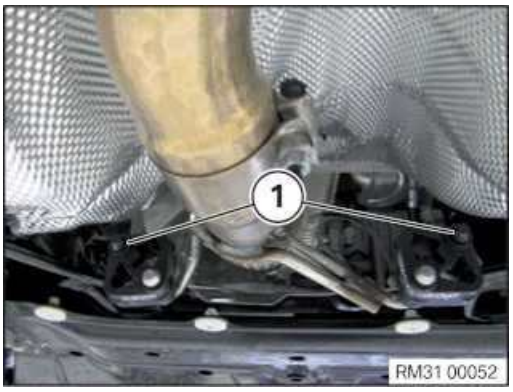
- Unfasten nut (1).

Note: Use the Torx socket for counter support.

- Loosen the anti-roll bar link from the anti-roll bar .

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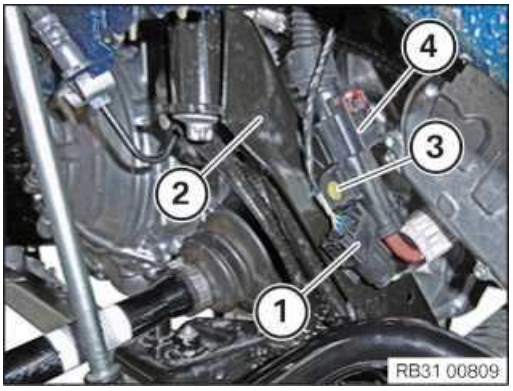
25 – Detaching rubber mount from front axle support



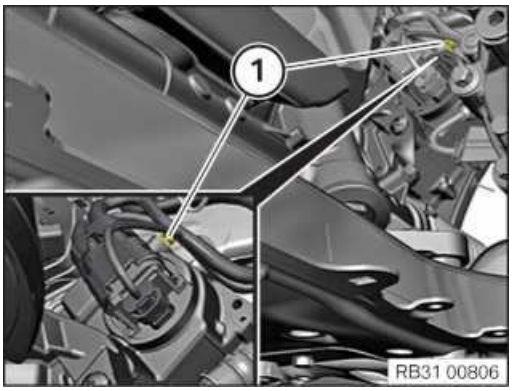
- Spray rubber mount (1) with lubricant and release from holder on front axle support.

26 – Disconnecting plug connections from steering gear

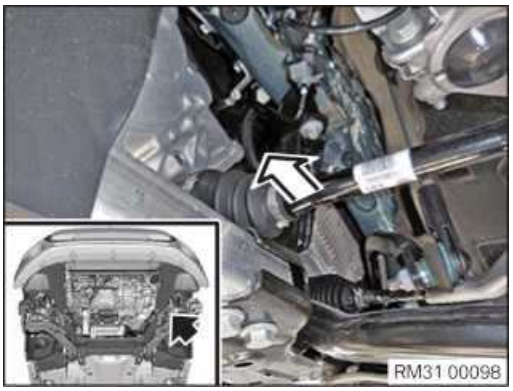
▸ **If installed: Detach connectors from the front axle carrier**



- Release the plug connection (1) from the front axle support (2).
- Loosen screw (3).
- Release the plug connection (4) from the front axle support (2).



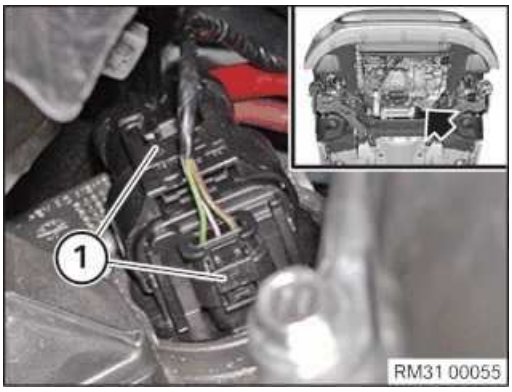
- Disconnect wiring harness (1) from steering gear.



- To unlock the plug connections (see the following work step): unlock plug connections (arrow) with the right hand.

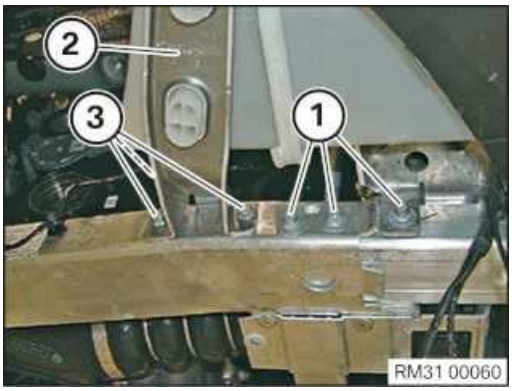
  The plug connections can be reached via the left-hand output shaft.

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- Unlock plug connections (arrow) (1)and disconnect from the steering gear.
- Make sure when lowering the front axle that the cables are not damaged!

27 – Releasing the mounted part from the front axle support

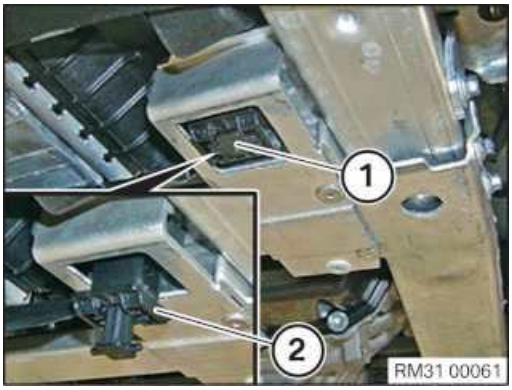


- **Only on right side:** Loosen screws (3) and remove holder for washer fluid reservoir (2).

NOTICE

Perform the operations on the left and right side.

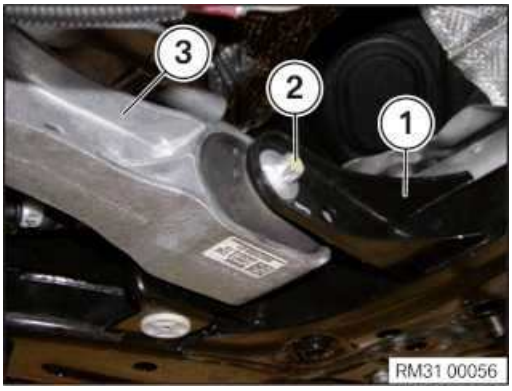
- Loosen screws (1).



NOTICE

Perform the operations on the left and right side.

- Unlock safety catch (1) of the lock (2) from the holder for the charge air cooler.
- Completely remove locks (2).



- Loosen screw (2) of the engine support (3) on the front axle (1).



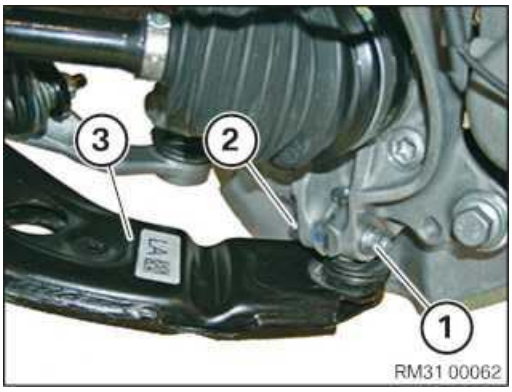
NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

28 – Detaching and removing front axle completely

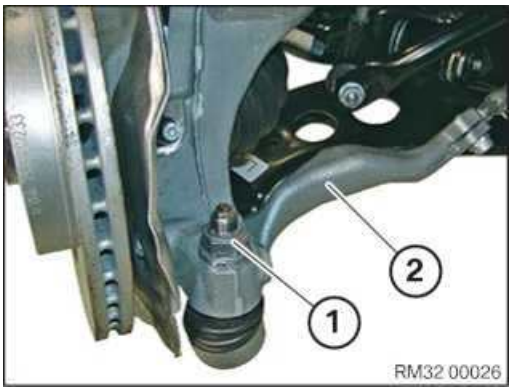
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NOTICE

Perform the operations on the left and right side.

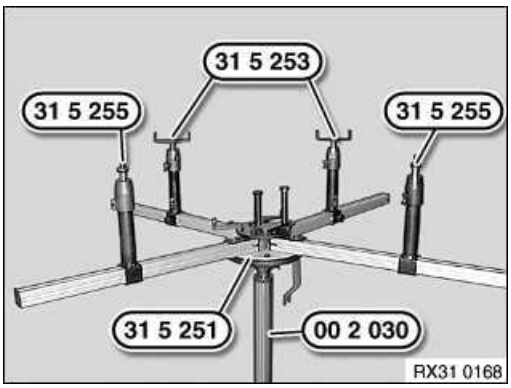
- Unfasten nut (1).
- (2)Pull out screw.
- Detach the wishbone (3) from the swivel bearing .



NOTICE

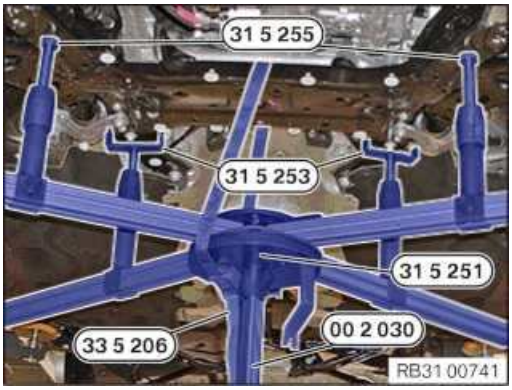
Perform the operations on the left and right side.

- Unfasten nut (1).
- Detach the track rod (2) from the swivel bearing.



- Fit the special tool completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools in telescopic supports of a profile rail pair.
- Insert special tools in telescopic supports of other profile rail pair.

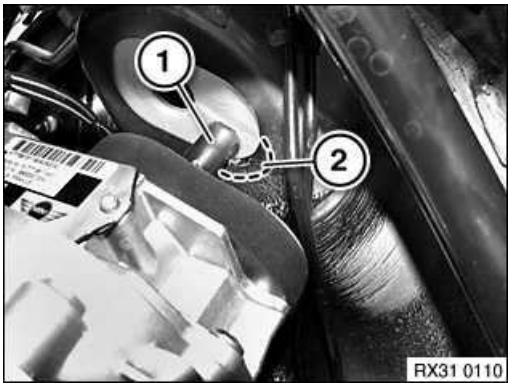
Note: In a profile rail pair, two profile rails are connected to one another by gearing.



- Align special tools and to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool to special tool .



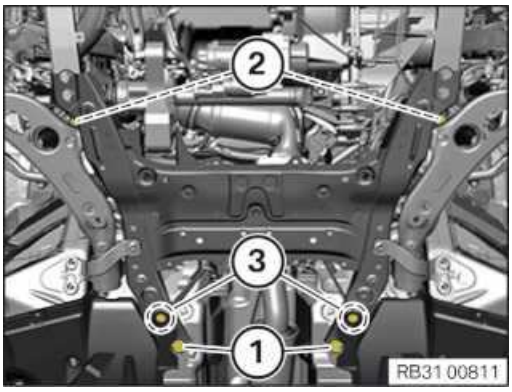
TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!

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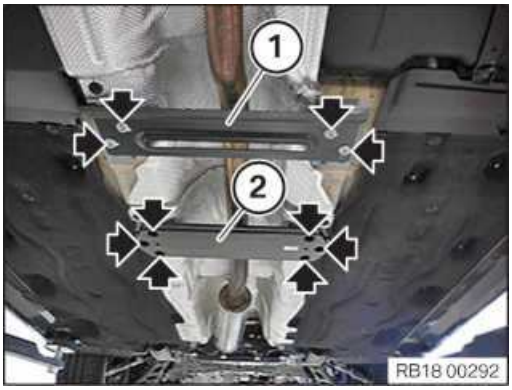
- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and remove the front axle.

TECHNICAL INFORMATION

Note the information on thread repairs using Helicoil thread inserts.
For more information see: 41 00 ... Notes on repairing threads

- Check threads for damage; if necessary, repair with Helicoil thread inserts.

29 – Removing the connecting support from the tunnel in front and back

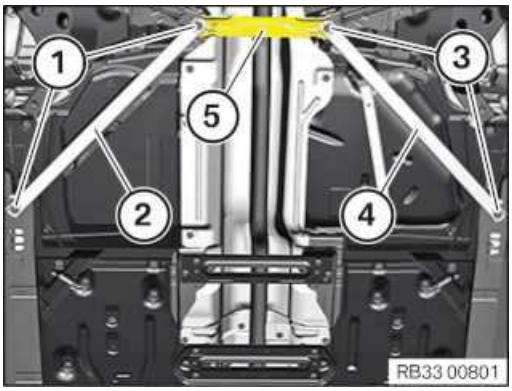


- Unscrew the bolts (arrows) from the connecting support (1).
- Feed out and remove the crossbeam (1).
- Unscrew the bolts (arrows) from the connecting support (2).
- Feed out and remove the crossbeam (2).

30 – Remove the cross strut with the torsion strut

TECHNICAL INFORMATION

Driving without a torsion strut is not permitted.



- Loosen screws (1).
- Thread out torsion strut (2) at left and remove.
- Loosen screws (3).
- Thread out torsion strut (4) at right and remove.
- Feed out and remove the cross-member (5).

31 – Remove exhaust system

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WARNING

Hot surfaces.

Risk of burning!

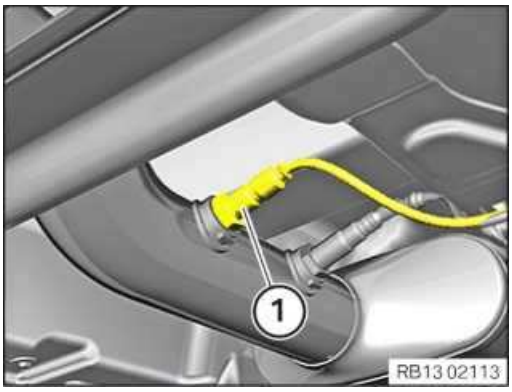
- Perform all work only on components that have cooled down.

CAUTION

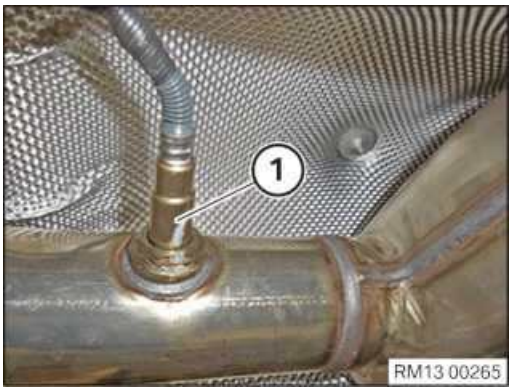
Heavy component.

Heavy components can lead to injury or damage.

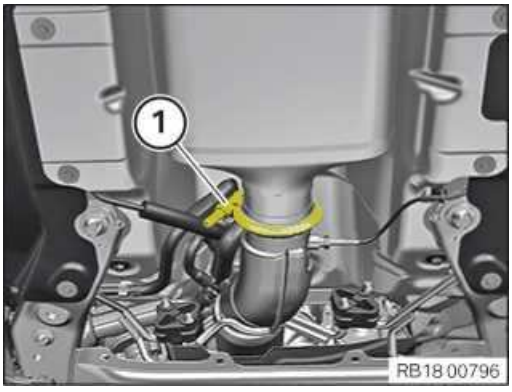
- Remove and install heavy components with the aid of another person/other persons.



- Release the nitrogen oxide sensor (1) downstream of the SCR catalytic converter, guide it out and set it aside.

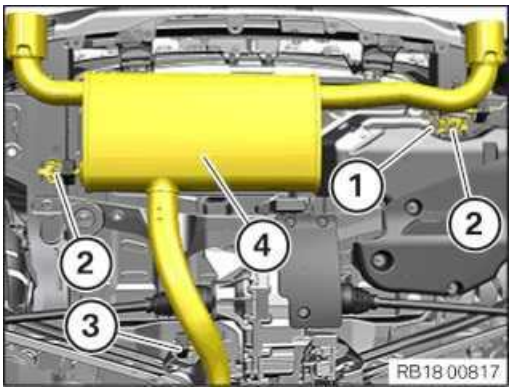


- Release the diesel particulate sensor (1), guide it out and set it aside.



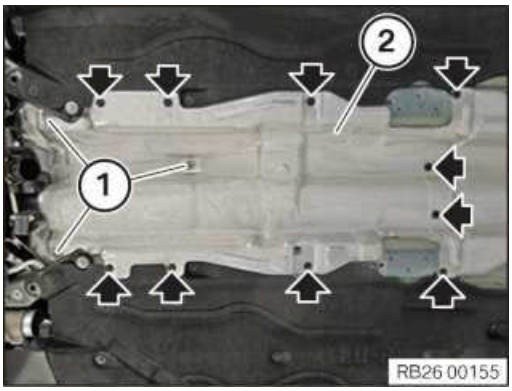
- Loosen V-band clamp (1).

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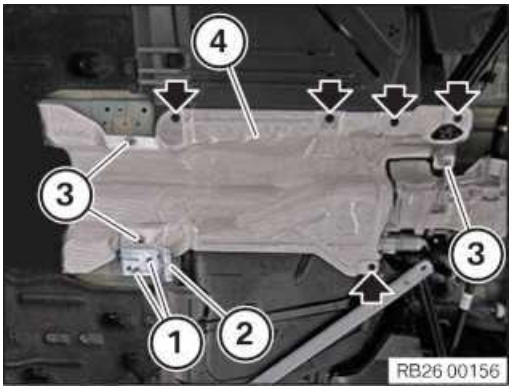
- Loosen screw (1).
- Loosen nuts (2).
- Release the rubber mount (3) of the exhaust system (4).
- Lower and guide out the exhaust system (4) with assistance of a second person and remove it.

32 – Remove front heat shield



- Remove screws (arrows).
- Loosen nuts (1).
- Guide the heat shield (2) out and remove it.

33 – Remove heat shield at rear.



- Loosen screws (1).
- Guide out and remove holder (2).
- Remove screws (arrows).
- Loosen nuts (3).
- Guide the heat shield (4) out and remove it.

34 – Remove propeller shaft

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

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RISK OF DAMAGE

Damage to propeller shaft during removal.

Non-observance of the removal guidelines for the propeller shaft on the rear axle differential may cause severe damage.

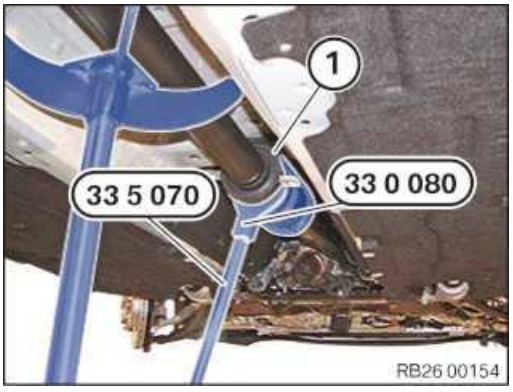
- Do not disassemble the three-hole flange, flexible disc and propeller shaft. The three-hole flange to the rear axle differential is balanced with the flexible disc and propeller shaft.
- Loosen the recessed nut against the direction of travel in clockwise direction. The propeller shaft must be loosened on the recessed nut only and exclusively in the direction of rotation otherwise the anti-twist lock of the bi-hexagonal flange nut is damaged.
- In the event of a damaged anti-twist lock on the bi-hexagonal flange nut: Replace the rear axle differential.



- Install the special too l between the front and rear propeller shaft.
- Make sure that the arrows on the special tool point forward in the direction of travel.



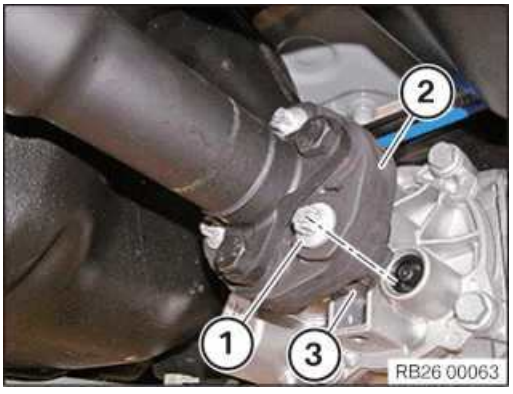
- Always support the propeller shaft (1) with a conventional jack.



- Protect the propeller shaft (1) with the special tools **0 495 554 (33 5 070)** and from twisting.

TECHNICAL INFORMATION

Compliance with the following instructions is required to avoid a humming noise from the propeller shaft after refitting the propeller shaft.

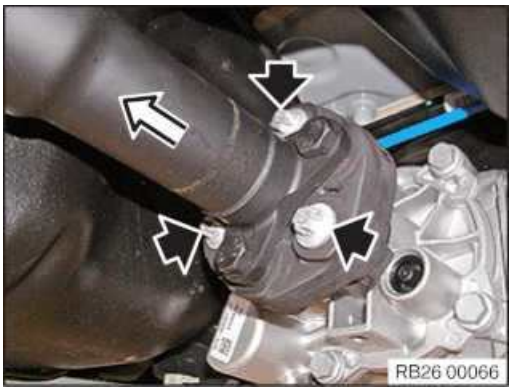


- Mark the installation position of the screw connection (1), the flexible disc (2) and the three-hole flange (3) on the same level.
- Loosen the screw connection (1).

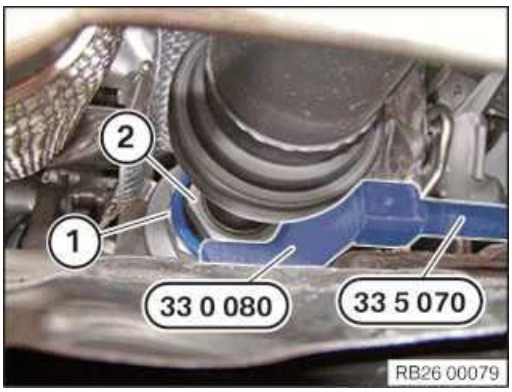
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- Loosen screws (1).



- Remove screws (arrows).
- Guide the propeller shaft out in the direction of the arrow and set it aside.



RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.

- Protect the recessed nut (2) on the transfer box from twisting with the special tools **0 495 554 (33 5 070)** and .

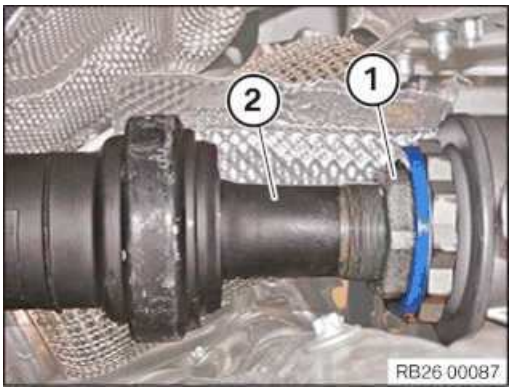
  The recessed nut (2) on the transfer box must **not** be used to detach the propeller shaft.

  The double hexagon flange nut (1) must **not** be used for counter support.

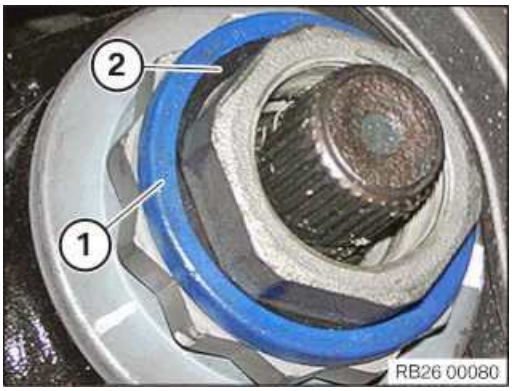


- Release the front propeller shaft with the special tools **0 495 554 (33 5 070)** and in the direction of the arrow.

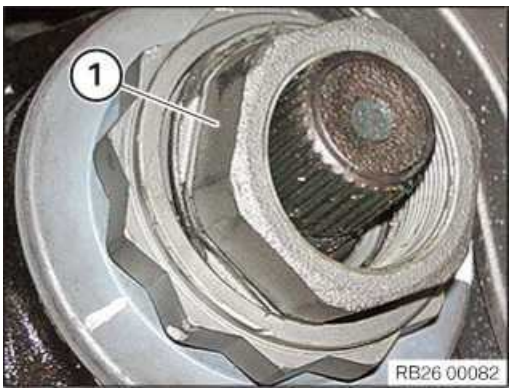
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- Thread the propeller shaft (2) out of the recessed nut (1) and remove.



- Thread the retaining clip (1) and the seal (2) out and remove.



- Thread out and remove the recessed nut (1).

35 – Removing starter motor

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and loosen connector (1).
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).



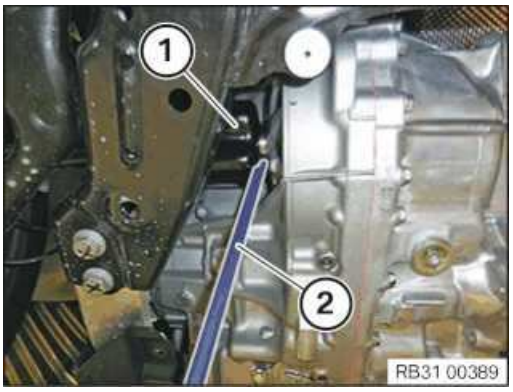
- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.



- Loosen screws (1).
- Feed out starter motor and remove.

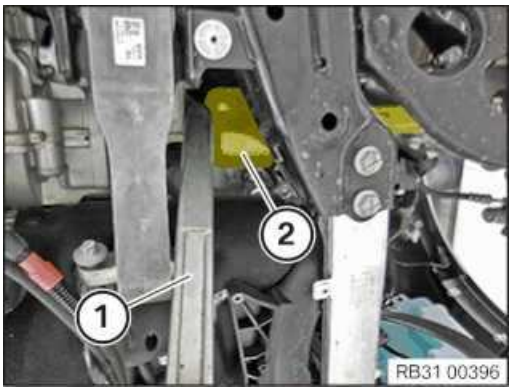
36 – Partially removing the left output shaft

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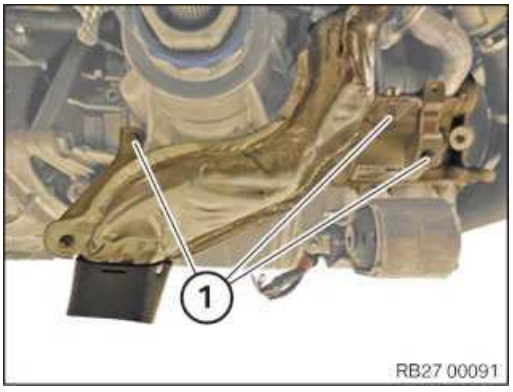
- Protect the output shaft (1) from falling.
- Lever out the output shaft (1) with a mounting lever (2) from the transmission.
- Tie up output shaft (1).

37 – Partially removing right output shaft

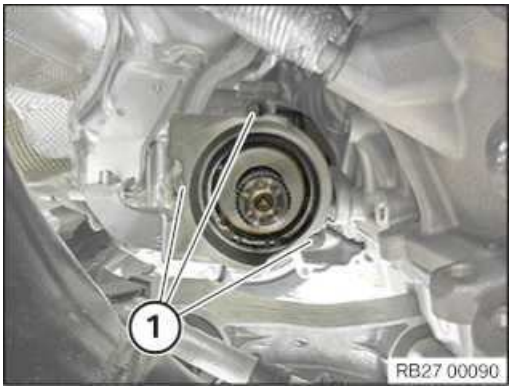


- Lever out the output shaft (2) with a mounting lever (1).
- Tie up output shaft (1).

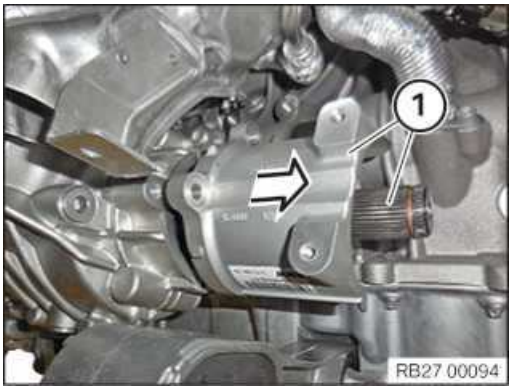
38 – Remove the intermediate shaft with the support tube



- With air duct installation: Loosen screws (1).
- Remove air duct



- Loosen screws (1).



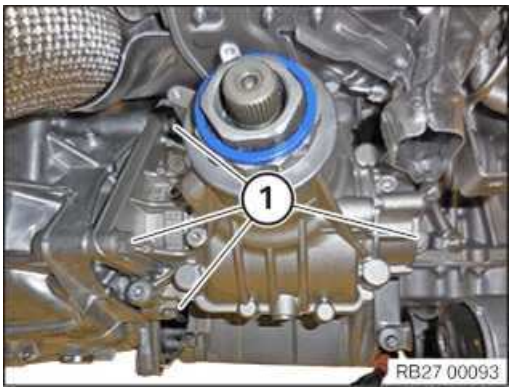
- Pull the intermediate shaft with the support tube (1) out of the transfer box.

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39 – Remove transfer box (VTG)



- Loosen screws (1).
- Remove heat shield.



- Loosen screws (1).
- Remove the transfer box (VTG).

40 – Remove the monitoring oxygen sensor

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

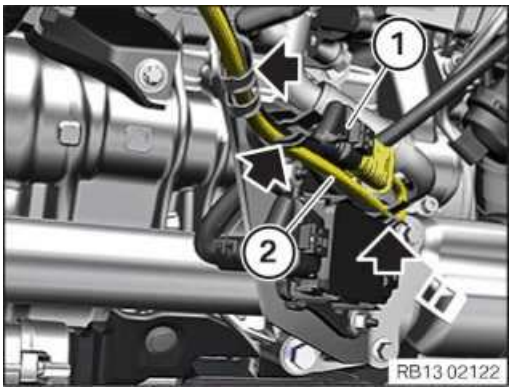
RISK OF DAMAGE

Electrostatic discharge.

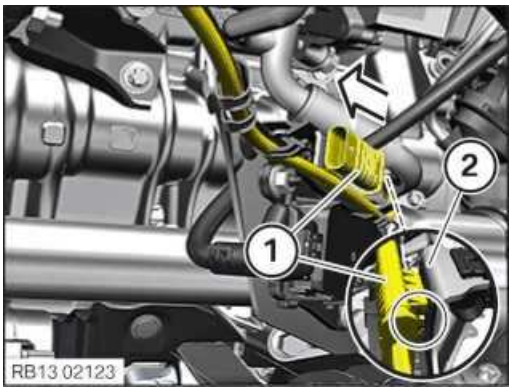
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

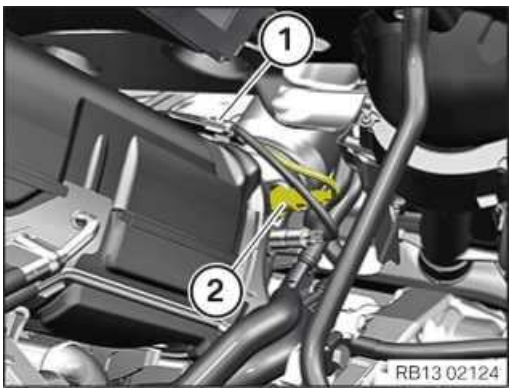
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- Unlock plug connection (1) and disconnect.
- Feed oxygen monitor sensor cable (1) out of the clamps (arrows).



- Unlock the connector (1) in the marked area and disconnect it from the holder (2) in the direction of arrow.



- Guide the cable of the monitoring oxygen sensor (2) out of the clamp (1).
- Release the monitoring oxygen sensor (2) using special tool **0 491 074 (11 7 020)**.
- Remove the monitoring oxygen sensor (2).

41 – Removing the nitrogen oxide sensor before SCR catalytic converter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

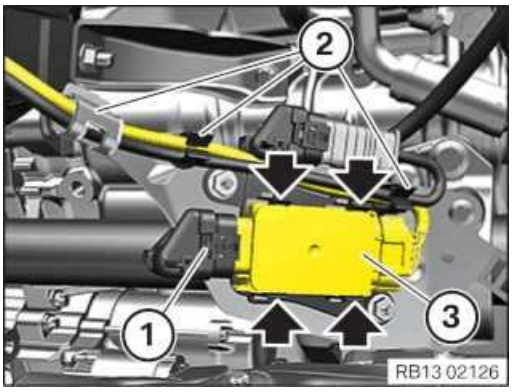
RISK OF DAMAGE

Electrostatic discharge.

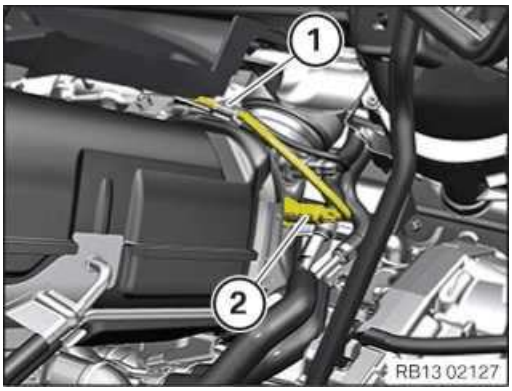
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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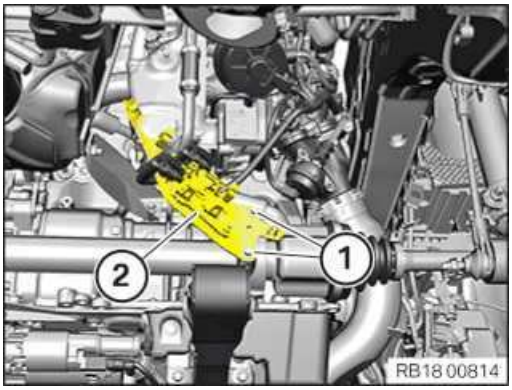


- Unlock plug connection (1) and disconnect.
- Slide the cable of the nitrogen oxide sensor evaluation electronics (3) out of the clamps (2) and remove.
- Unlock (arrows) and remove the evaluation electronics for the nitrogen oxide sensor (3).



- Slide the cable of the nitrogen oxide sensor before the SCR catalytic converter (2) out of the clamps (1) and remove.
- Detach the nitrogen oxide sensor before the SCR catalytic converter (2) using the special tool **0 491 074 (11 7 020)**.
- Guide out and remove the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

42 – Remove holder for oxygen sensor



- Loosen screws (1).
- Thread out the holder (2) for the oxygen sensor and remove.

43 – Remove the exhaust temperature sensor on the catalytic converter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

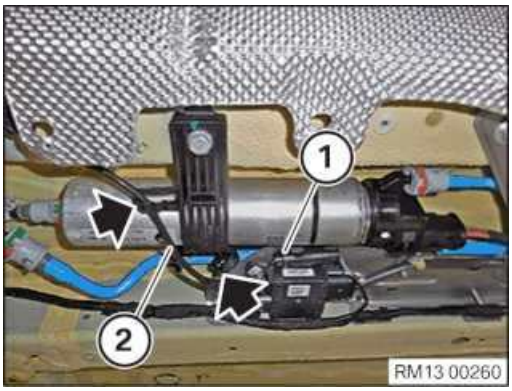
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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

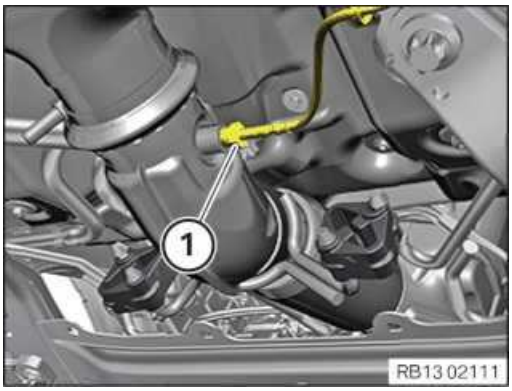
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and loosen connector (1).
- Feed out the cable (2) of the exhaust temperature sensor from the clamps (arrows) and remove.



- Loosen the cable clip (1).



- Loosen exhaust temperature sensor (1).
- Feed out and remove exhaust temperature sensor (1).

44 – Removing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

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WARNING

Hot surfaces.

Risk of burning!

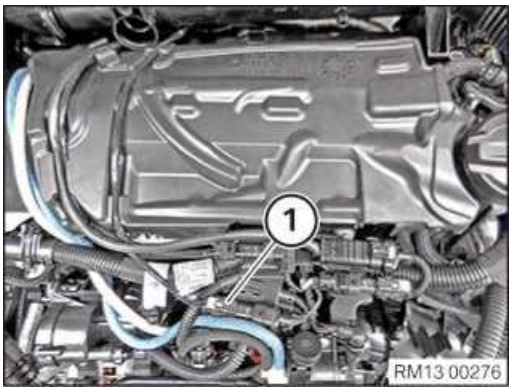
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

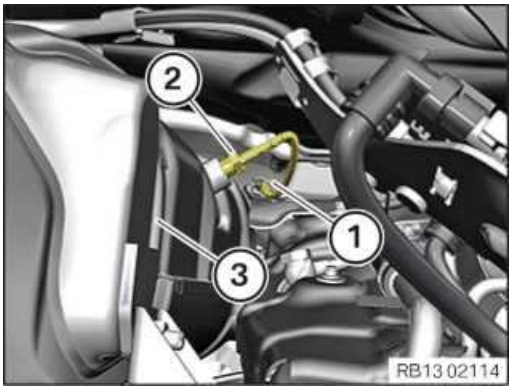
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and loosen connector (1).
- Uncover the exhaust temperature sensor cable.



- Guide the exhaust temperature sensor cable (2) out of the clamp (1) and place it to one side.
- Release the exhaust temperature sensor (2) with conventional tools .
- Feed out and remove the exhaust temperature sensor (2) from the diesel particulate filter (3).

45 – Remove the exhaust temperature sensor on the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

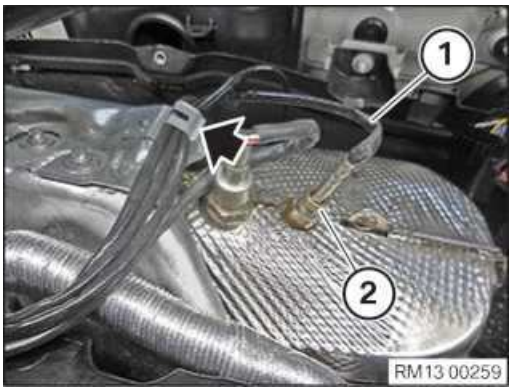
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect connector (1).
- Put the cable of the exhaust temperature sensor to one side.



- Guide cable (1) of the exhaust temperature sensor out of the clamp (arrow) and remove it.
- Loosen exhaust temperature sensor (2).
- Feed out and remove exhaust temperature sensor (2).

46 – Remove the control sensor

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock plug connection (1) and disconnect.
- Detach the connector (2) from the holder .
- Release the front oxygen sensor cable.



- Detach the control sensor (1) with the special tool .
- Feed out and remove the control sensor (1).

47 – Removing the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

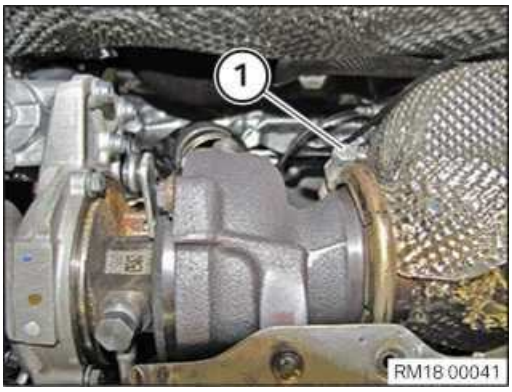
CAUTION

Heavy component.

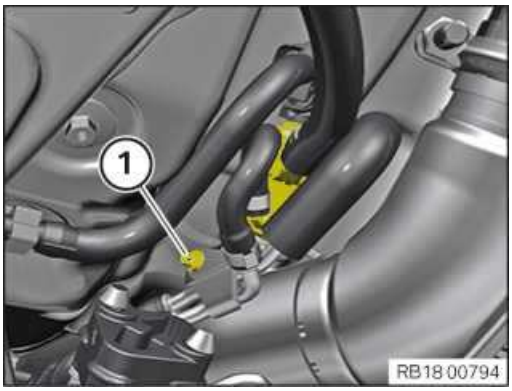
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

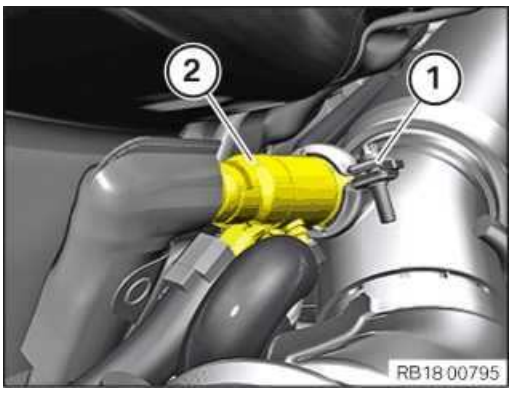
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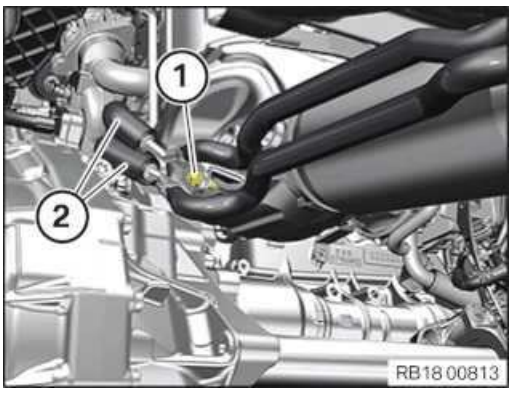
- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.



- Loosen screw (1).



- Loosen V-band clamp (1).
- Remove the SCR metering module (2) and set it aside.



- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.

▸ **Remove differential pressure sensor**

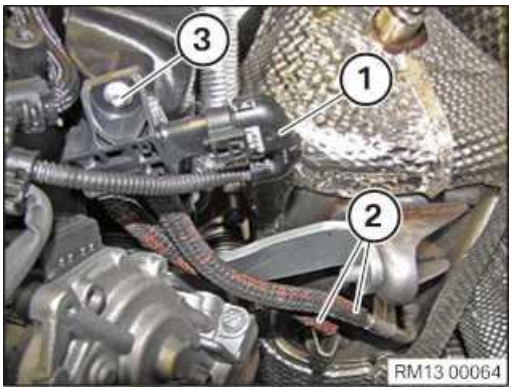
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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

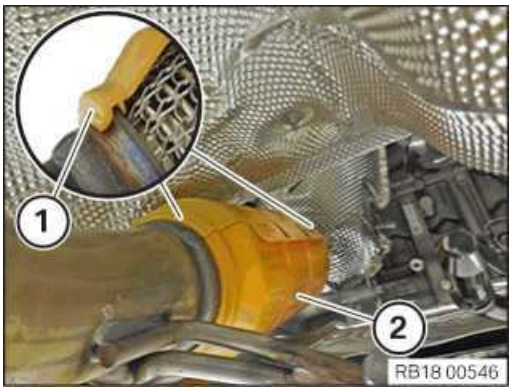
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



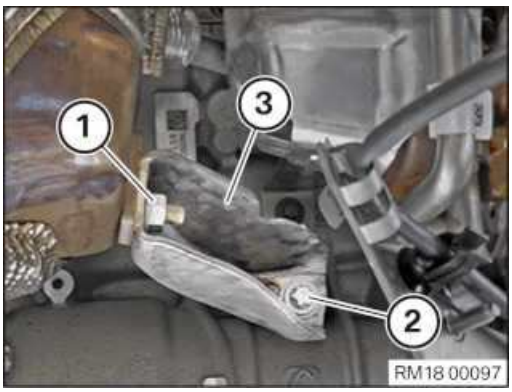
- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.



- Loosen nuts (1).

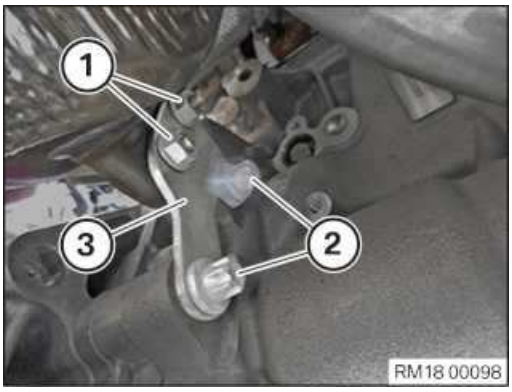


- Mount fitting aid (2).
- Make sure that the fitting aid is correctly position on the edges (1) of the flexible tube.

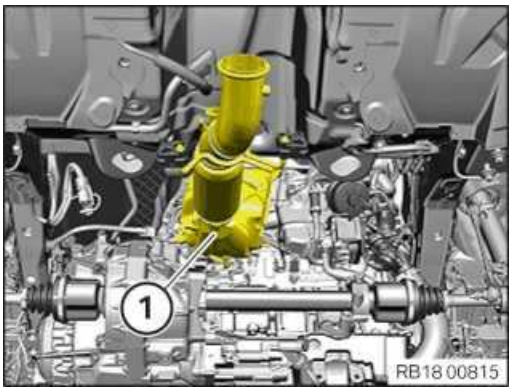


- Unfasten nut (1).
- Loosen screw (2).
- Remove holder (3).

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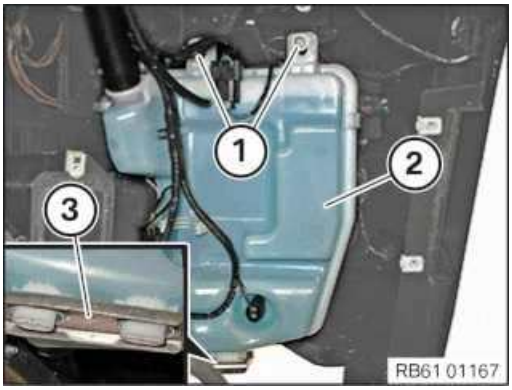


- Loosen nuts (1).
- Loosen screws (2).
- Remove holder (3).



- Feed out diesel particulate filter (1) toward the bottom and remove.

48 – Remove the washer fluid reservoir from the fixture



- Loosen screws (1).
- Guide the washer fluid reservoir (2) up and out of the fixture (3) and set it aside.

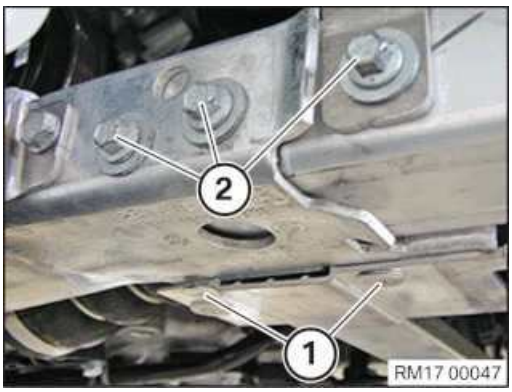
49 – Removing the right charge air duct between the exhaust turbocharger and the charge air cooler

WARNING

Hot surfaces.

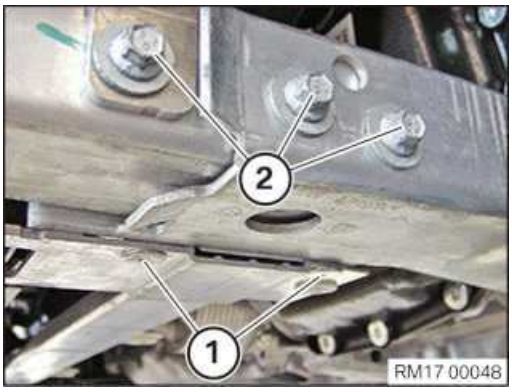
Risk of burning!

- Perform all work only on components that have cooled down.

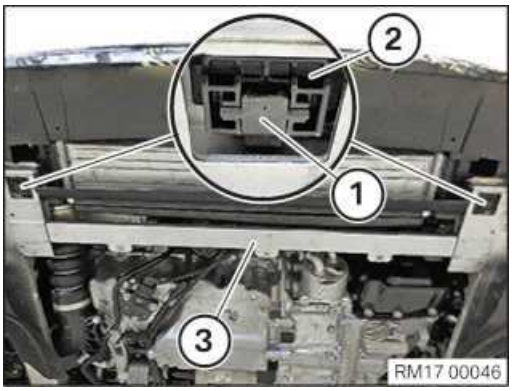


- Undo screws (2) at front left.
- Drill out blind rivets (1) at front left.

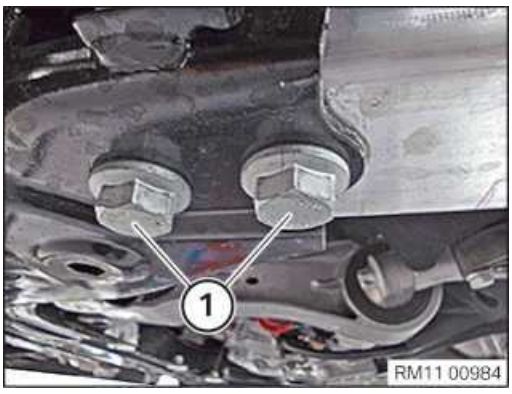
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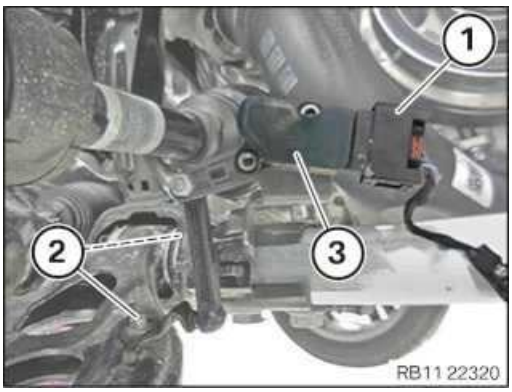
- Undo screws (2) at front right.
- Drill out blind rivets (1) at front right.



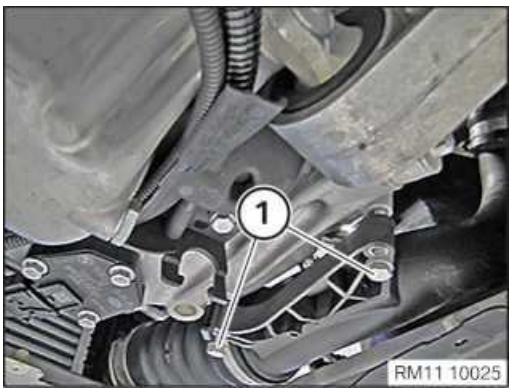
- Unlock locking pins (1).
- Thread out and remove locks (2).
- Thread out and remove cross connection (3).



- Release the screws (1) on the right front axle support.

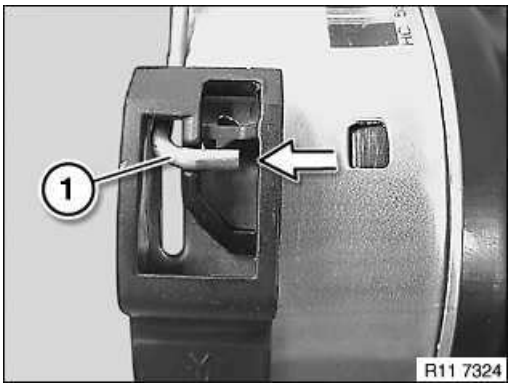


- **If installed:**
- Unlock and release plug connection (1).
- Loosen screws (2).
- Feed out the ride height sensor (3) and remove.



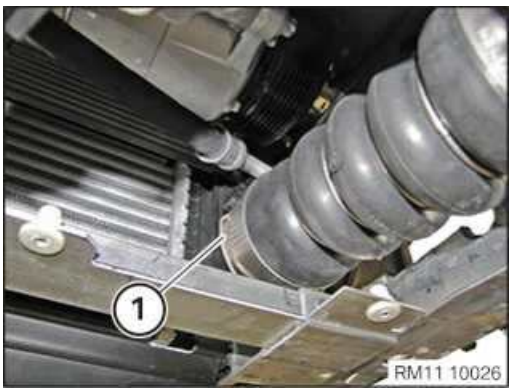
- Release screws (1) of charge air duct on right oil sump.

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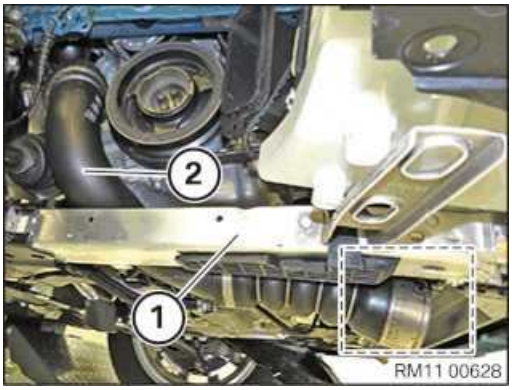


- Unlock lock (1).

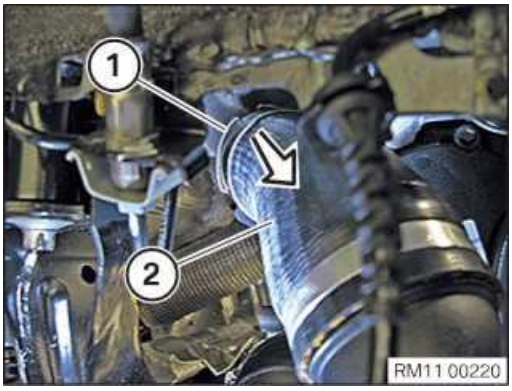
  The lock (1) must engage in the bracket during unlocking (arrow).



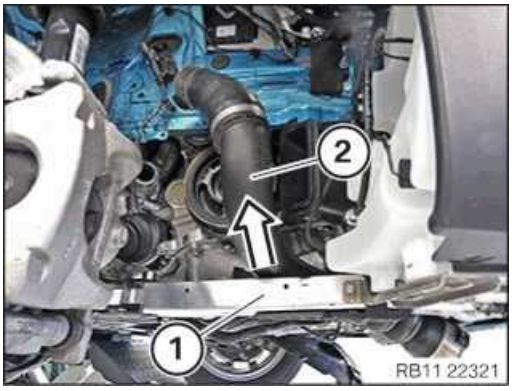
- Unlock and release the charge air duct (1) on the charge air cooler.



- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed out the charge air duct (2) in the **marked** area towards the bottom and set it aside.



- Unlock and detach the locks (1) on both sides.
- Feed out the charge air duct (2) on the exhaust turbocharger in the direction of the arrow and set it aside.



- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed out the charge air duct (1) in the direction of arrow between the side member and the deformation element and remove.

50 – Remove the heat shield from the exhaust turbocharger at the bottom

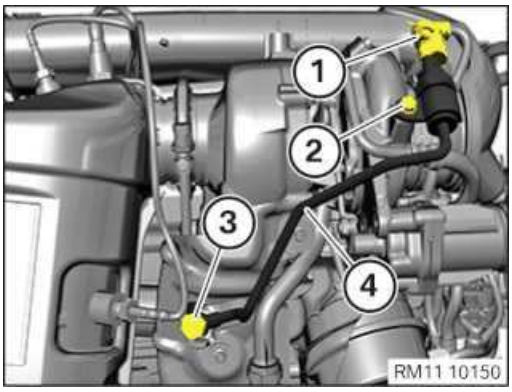
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WARNING

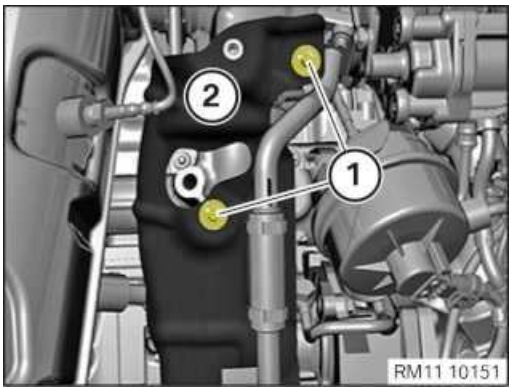
Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Unlock and disconnect connector (1).
- Unscrew the banjo bolt (3).
- The seals of the banjo bolt (3) must be renewed.
- Loosen screw (2).
- Remove the exhaust gas pressure pipe (4).



- Unscrew the bolts (1) on the heat shield .
- Feed out and remove the heat shield (2).

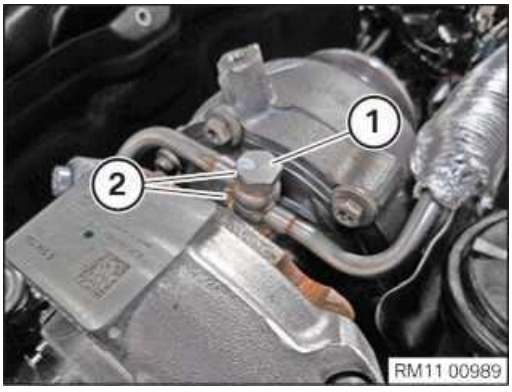
51 – Removing the low-pressure stage turbocharger

WARNING

Hot surfaces.

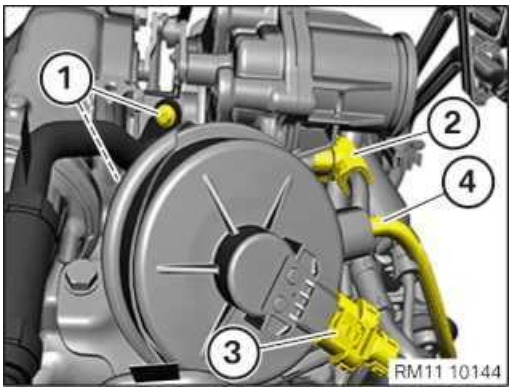
Risk of burning!

- Perform all work only on components that have cooled down.

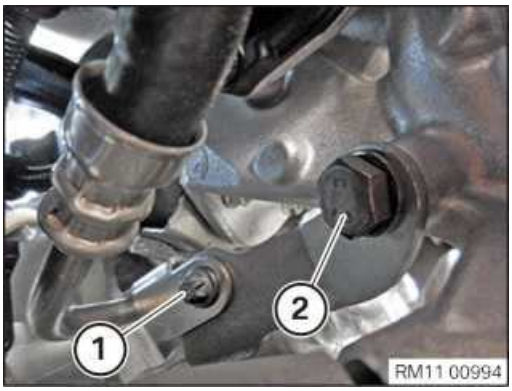


- Release the banjo bolt (1) of the oil feed lines.
- Remove sealing rings (2).
- Place oil feed lines to one side.

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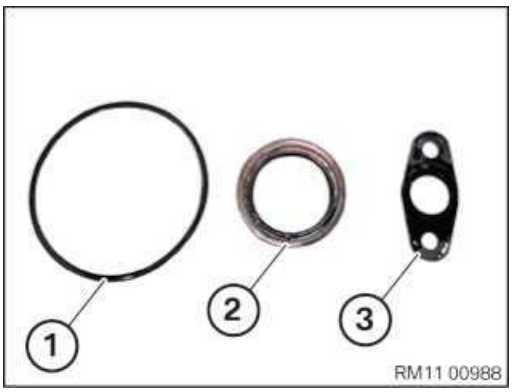
- Release the screws (1) of the oil return line.
- Unlock and disconnect the plug connections (2) and (3).
- Pull off the vacuum hose (4) carefully.



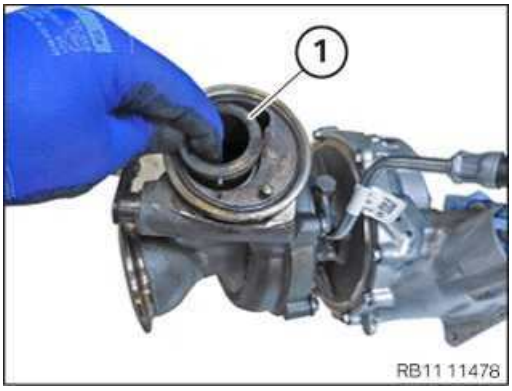
- Undo the bolt (1) of the oil feed line.
- Loosen screw (2).



- Loosen screw (1).
- Remove the V hose clamp.
- Guide the low-pressure stage turbocharger out towards the top and remove.



- Remove seals (1), (2) and (3).



- Remove the spacer ring (1).

52 – Removing the high-pressure stage exhaust turbocharger

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WARNING

Hot surfaces.

Risk of burning!

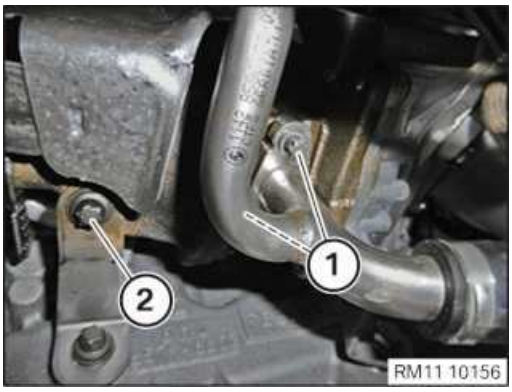
- Perform all work only on components that have cooled down.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

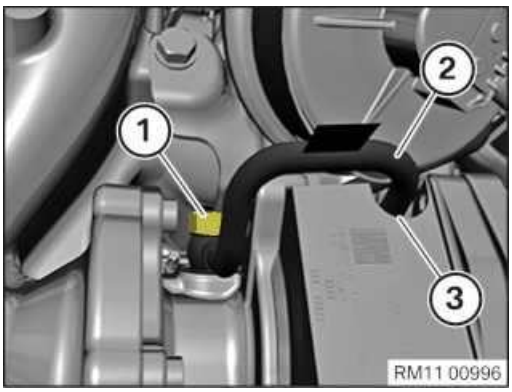
- Remove and install heavy components with the aid of another person/other persons.



- Unscrew the bolts (1) on the oil return line .
- Loosen screw (2).

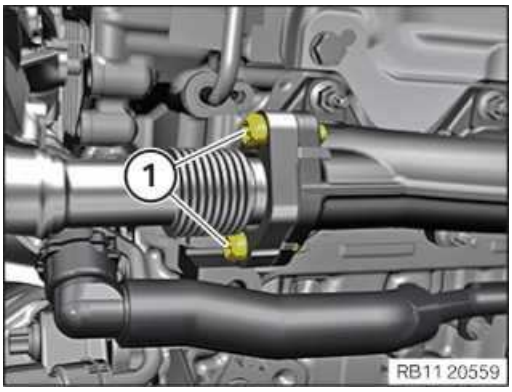


- Release screw (1) from the right wheel arch.

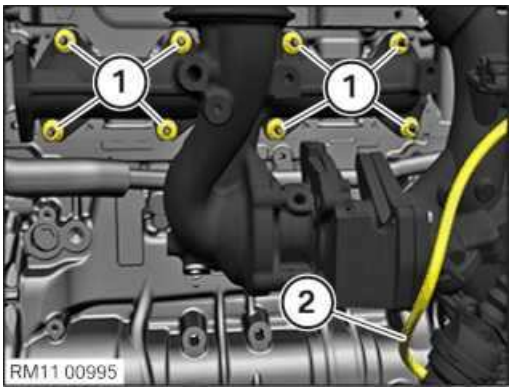


- Unscrew the banjo bolt (1).
- Guide out oil feed line (2) from holder (3).

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- Loosen screws (1).



- Pull off the vacuum hose (2).
- Loosen nuts (1).
- Guide out the exhaust manifold and the high-pressure stage exhaust turbocharger to the top and remove them.

MAIN WORK

POSTPROCESSES

53 – Installing the high-pressure stage exhaust turbocharger

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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RISK OF DAMAGE

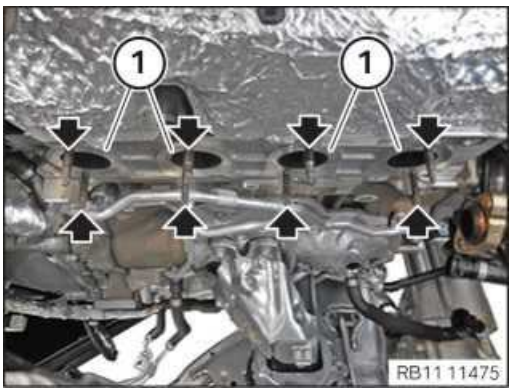
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

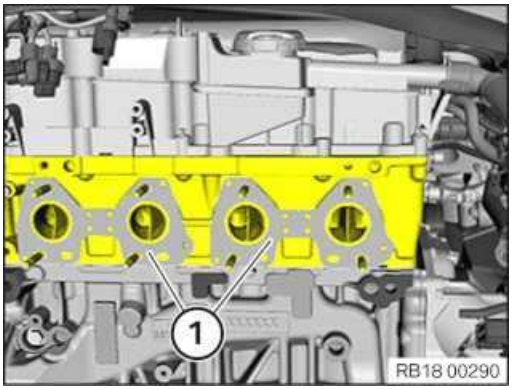
The sealing surfaces must be free from oils, grease and cleaning agents.



- Clean the sealing surfaces (1) on the cylinder head using special tool **0 495 102 (11 4 470)**.
- Check the stud bolts (arrows) on the cylinder head for correct fit.



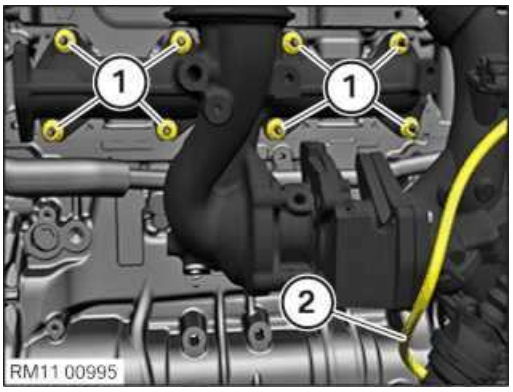
- Clean the sealing surfaces on the exhaust manifold using special tool **0 495 102 (11 4 470)**.



- Renew gasket (1).

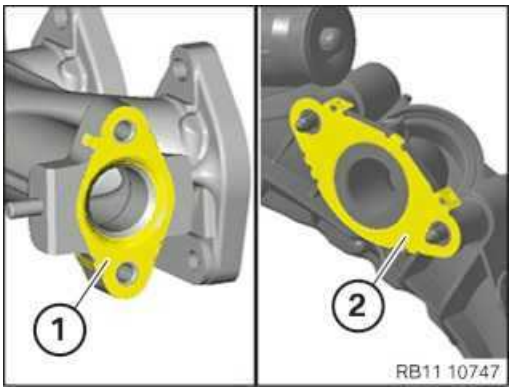
  Parts: Gasket
- Install new gasket (1).

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- Feed in and install the exhaust manifold and the high-pressure stage exhaust turbocharger.
- Tighten nuts (1).

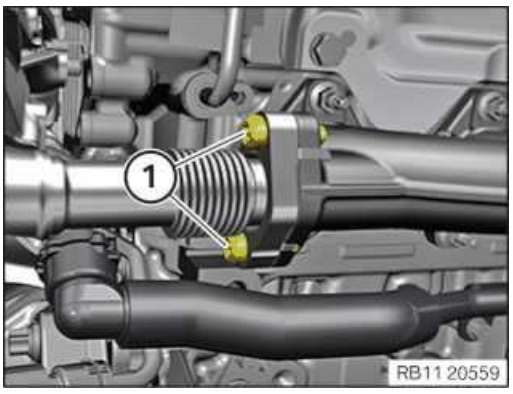
  Parts: Nuts
- Connect vacuum hose(2).



- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket
- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

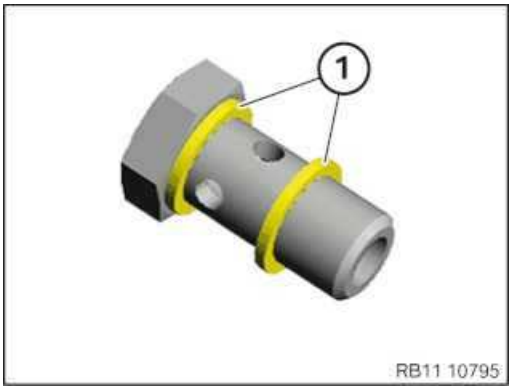
  Parts: Gasket



- Tighten the screws (1).

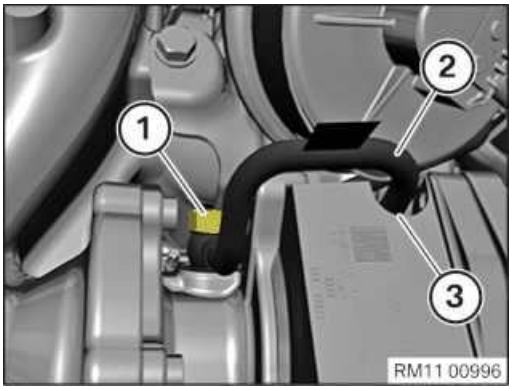
Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm



- Renew sealing rings (1) of banjo bolt.

  Parts: Sealing ring

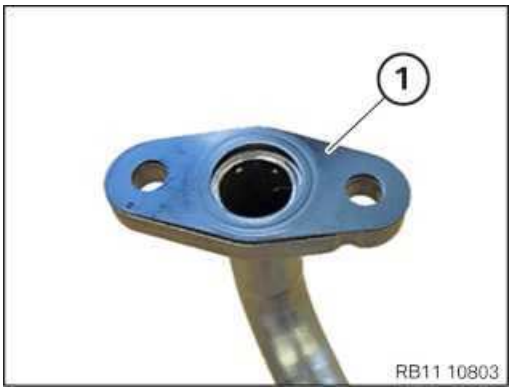


- Guide the oil feed line into the holder (3) and install it.
- Tighten down screw (1).

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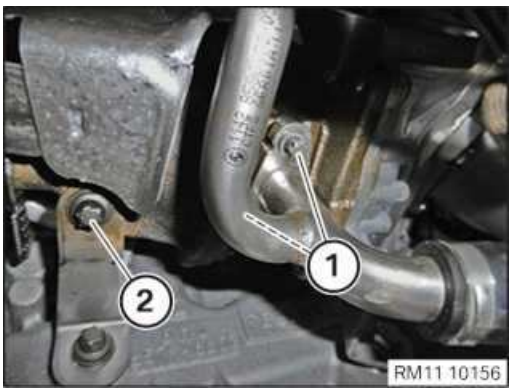


- Tighten bolt (1) from the right wheel arch.



- Renew seal (1) of oil return line.

  Parts: Gasket



- Position the oil return line with the seal.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

54 – When replacing the exhaust turbocharger

TECHNICAL INFORMATION

- It is imperative to perform certain test steps to prevent subsequent damage in the event of exhaust turbocharger damage. See further information.

55 – Prepare for the installation of the exhaust turbocharger

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- Check the oil feed lines and the oil return lines for contamination or obstruction, clean or renew if necessary.
- If the oil feed lines and/or oil return lines are heavily contaminated, we recommend changing the engine oil and the oil filter.
- If installed: Check the coolant feed lines and the coolant return lines for the exhaust turbocharger for contamination or obstruction, clean or renew if necessary.
- Check that the screw connections and the plug connections of all the lines are correct.
- Check air cleaner for contamination and clean or renew as needed.
- Check correct functioning of crankcase ventilation.
- Replace all gaskets.

  Parts: Seals

56 – Installing the low-pressure stage turbocharger

RISK OF DAMAGE

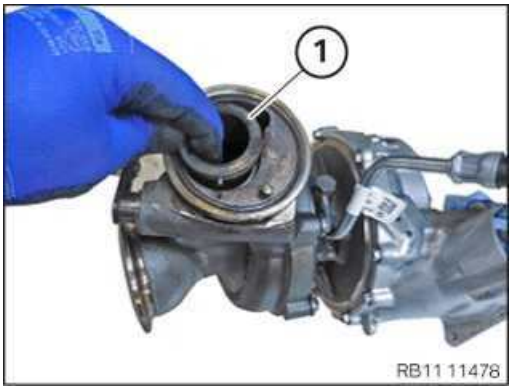
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

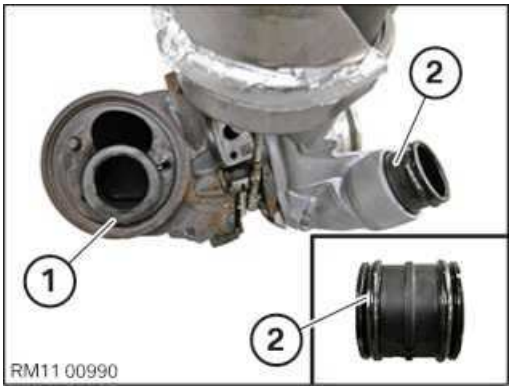
TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.



- Check the spacer plug (1) for damage, renew if necessary.

  Parts: Spacer ring
- Insert and install the spacer ring (1).
- Position spacer ring (1) correctly.

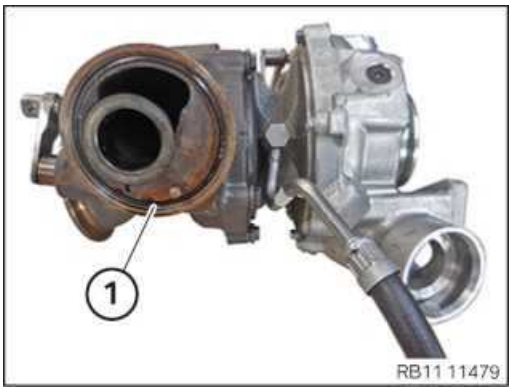


- Renew gasket (1).

  Parts: Gasket
- Position the seal (1).
- Renew the sleeve(2).

  Parts: Holding sleeve

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- Renew sealing ring (1).

  Parts: Sealing ring
- Affix the sealing rings on the exhaust turbocharger.

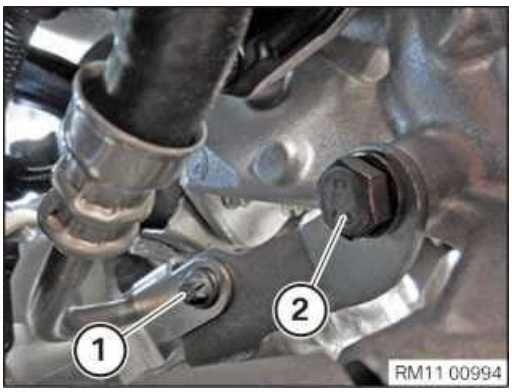


- Insert and install the low-pressure stage exhaust turbocharger on the exhaust manifold .
- Feed in and install V-band clamp .
- Tighten V-band clamp (2).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Screw in nut (1) with 2 **revolutions**.



- Tighten down screw (1).

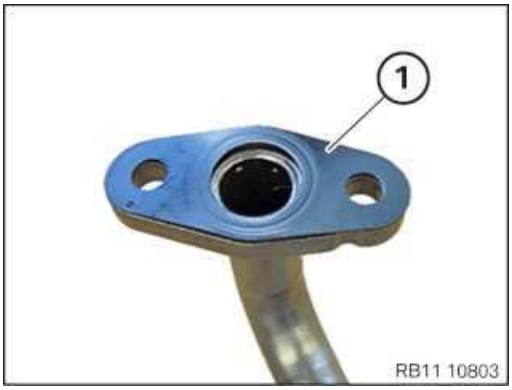
Oil feed line to bracket

Torx screw M6x12		Tightening torque	8 Nm

- Tighten down screw (2).

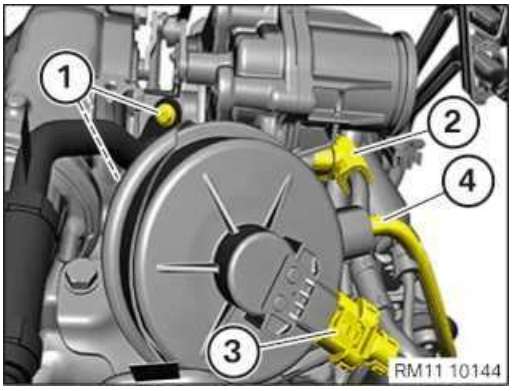
Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm



- Renew seal (1) on the oil return line.

  Parts: Gasket



- Position the oil return line with the seal.
- Tighten the screws (1).

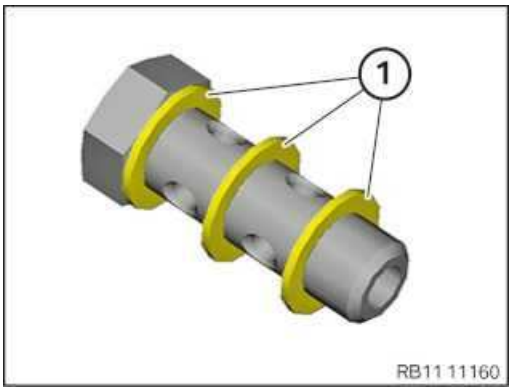
Oil return line to turbocharger

M6x12		Tightening torque	8 Nm

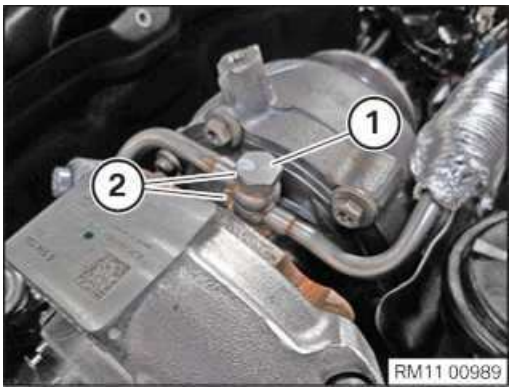
- Connect and lock connectors (2) and (3).

  The locks must engage audibly.
- Connect vacuum hose (4).

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- Renew banjo bolt and sealing rings (1).
- **Parts:** Banjo bolt, sealing rings



- Install sealing rings (1).
- Tighten the banjo bolt (1).
- Ensure that the lines do not rest against the adjacent components.

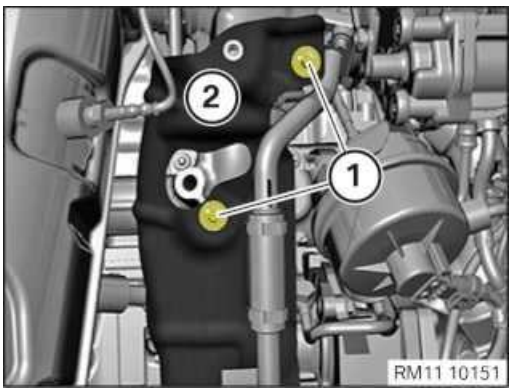
57 – Installing heat shield on exhaust turbocharger at bottom

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

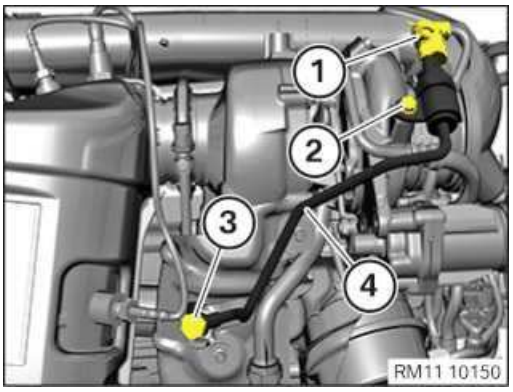


- Feed in and install the heat shield (2).
- Tighten the bolts (1) on the heat shield .

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

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- Position the exhaust gas pressure pipe (4).
- Hand-tighten the bolt (2).
- Renew sealing rings on the banjo bolt (3).

  Parts: Sealing ring
- Tighten the banjo bolt (3).

Banjo bolt for exhaust pressure pipe to exhaust manifold

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

- Tighten down screw (2).

Standard screw connection M6

M6		8 Nm

- Connect connectors (1) and lock.

  Lock must audibly engage.

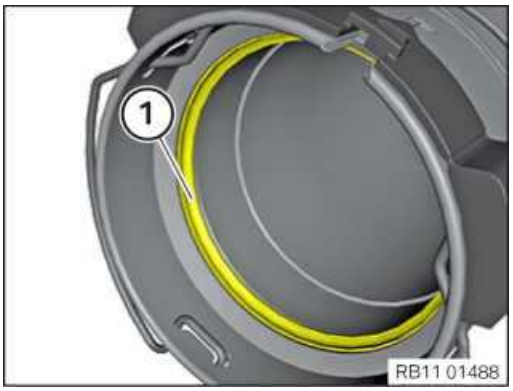
58 – Installing the right charge air duct between the exhaust turbocharger and the charge air cooler

RISK OF DAMAGE

Damage to the exhaust turbocharger.

A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.



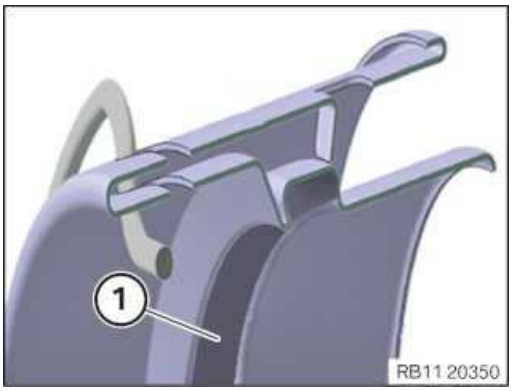
- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Gasket

▸ **Replace damaged gasket**

TECHNICAL INFORMATION

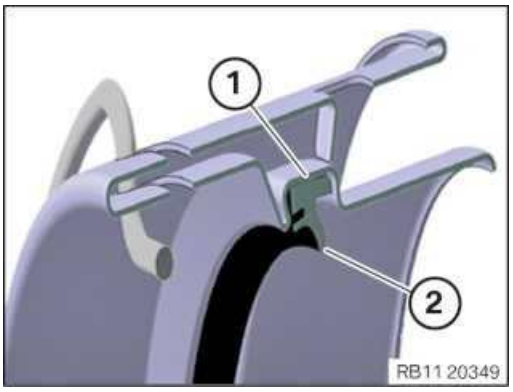
Do not use pointed or sharp-edged tools for the installation and/or removal.



- Remove damaged seal.
- Clean gasket groove (1) with a dry towel.

  The gasket groove (1) must be clean.

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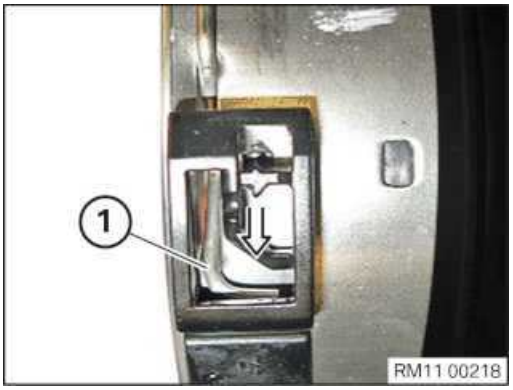
- Renew gasket.

  Parts: Gasket
- Install seal dry without lubricant or mounting agent.

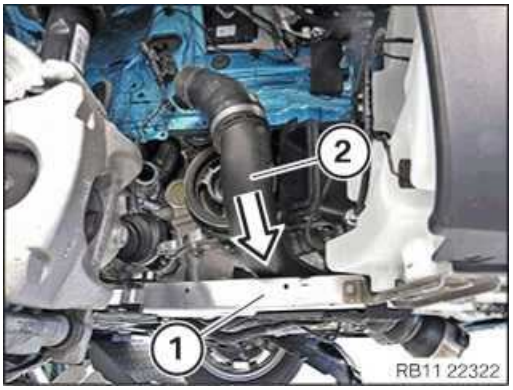
TECHNICAL INFORMATION

Incorrect assembly is possible. Ensure correct installation position.

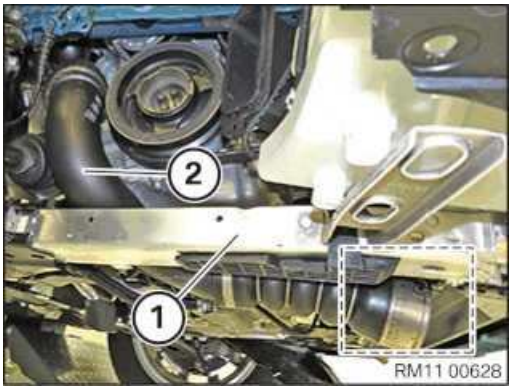
- Feed in and install the seal.
- Make sure the seal is correctly installed in the gasket groove (1).
- Make sure that the sealing lip (2) is pointing downwards (see figure).



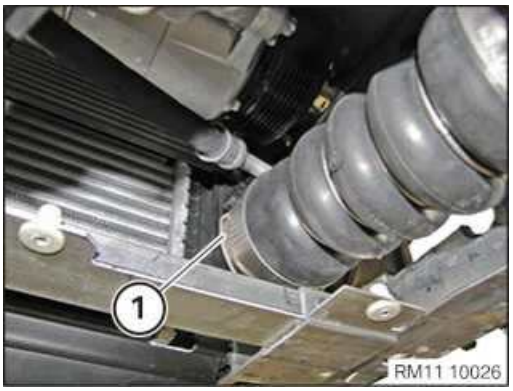
- Detach the locks (1) in the direction of the arrow from the brackets.
- Ensure that the locks (1) engage audibly.



- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed in the charge air duct (1) in the **direction** of arrow between the side member and the deformation element and position.

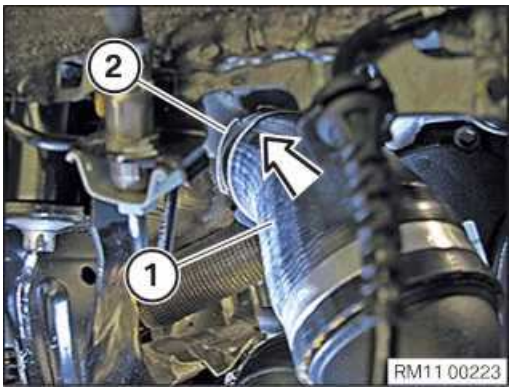


- Pull the adapter of the front axle support (1) downwards to the front right.
- Position the charge air duct (2) in **marked** area on the charge air cooler.



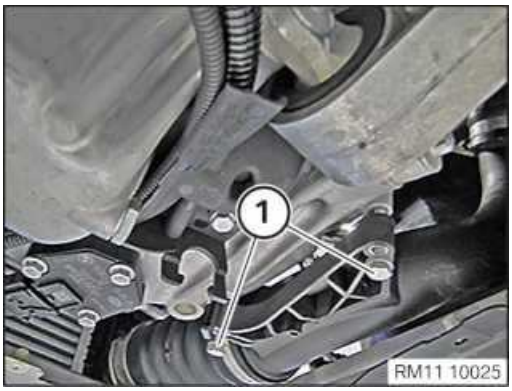
- Feed in and install the charge air duct (1) on the charge air cooler .
- Make sure the charge air duct (1) engages audibly on the charge air cooler.

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- Feed in and install charge air duct (1) in the **direction** of the arrow on exhaust turbocharger.

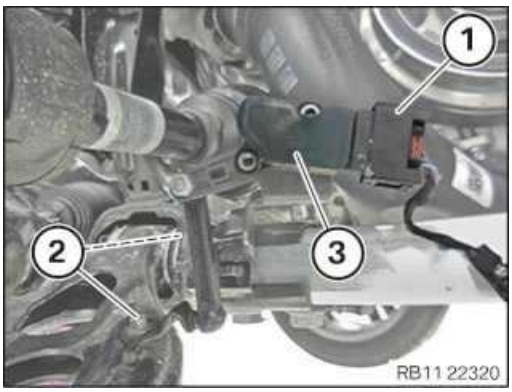
  The locks (2) must engage audibly.



- Tighten the screws (1).

Charge air duct to oil sump

M6		Tightening torque	8 Nm



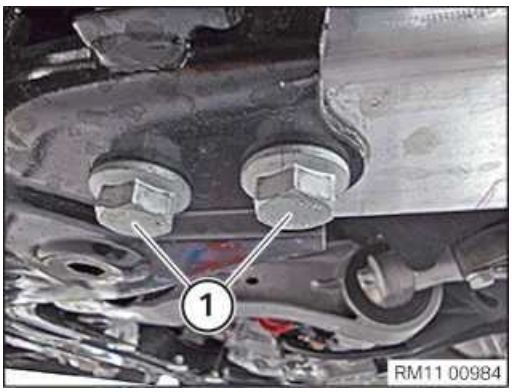
- **If installed:**
- Feed in and install the ride height sensor (3).
- Tighten the screws (2).

Ride height sensor holder to front axle support

M6		Tightening torque	8 Nm

- Connect and lock the connector (1).

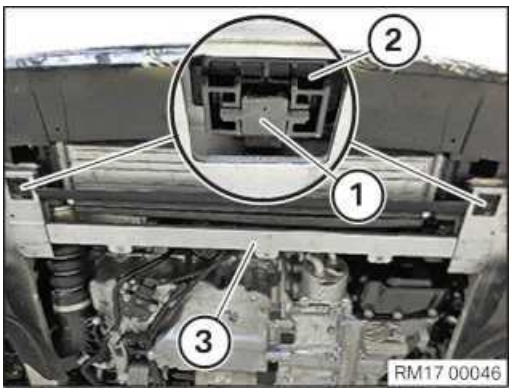
  The connector (1) must engage audibly.



- Tighten the screws (1) on the adapter of the front axle support.

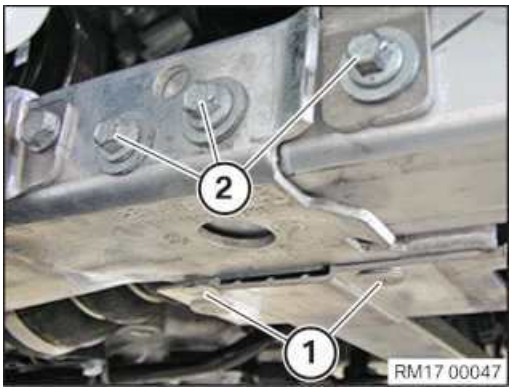
Adapter, front axle support to front axle support

		Tightening torque	100 Nm



- Guide in cross connection (3) and install.
- Guide in locks (2) and install.
- Lock the locking pins (1).
- Ensure that the locking pins (1) audibly engage.

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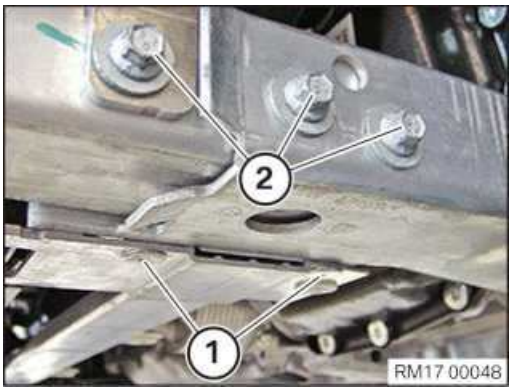
- Tighten the bolts (2) at the front left.

Cross connection to front axle support

M6		Tightening torque	12 Nm

- Renew the blind rivet (1).

  Parts: Blind rivet
- Mount the blind rivets (1) at the front left.



- Tighten the bolts (2) at the front right.

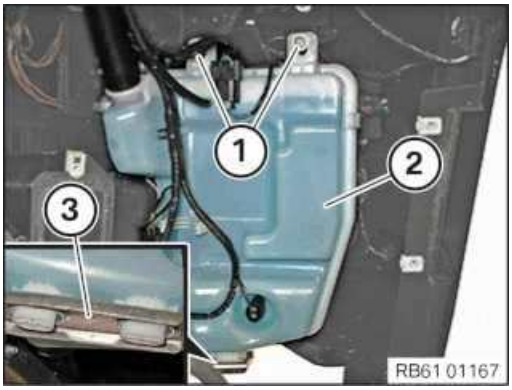
Cross connection to front axle support

M6		Tightening torque	12 Nm

- Renew the blind rivet (1).

  Parts: Blind rivet
- Mount the blind rivets (1) at the front right.

59 – Install the washer fluid reservoir in the fixture



- Feed washer fluid reservoir (2) into the mounting (3) and install.
- Tighten the screws (1).

Washer fluid reservoir to body

M6x20		Tightening torque	8 Nm

60 – Installing the diesel particulate filter

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Renew the V-clip (1).

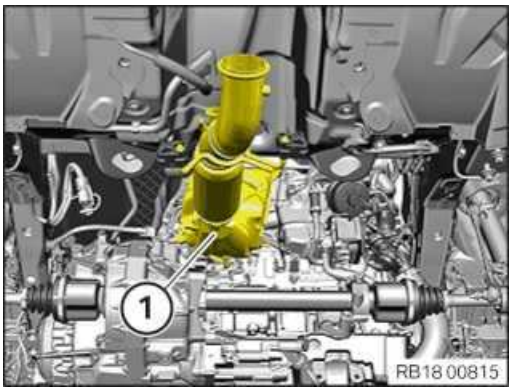
  Parts: V-band clamp
- Renew the gasket (2).

  Parts: Gasket

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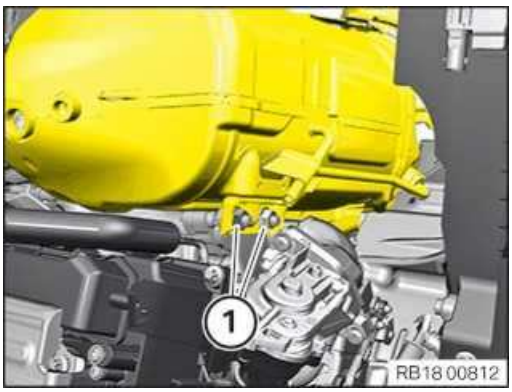
- Before installing the diesel particulate filter: Mount fitting aid (1) for the flexible tube.



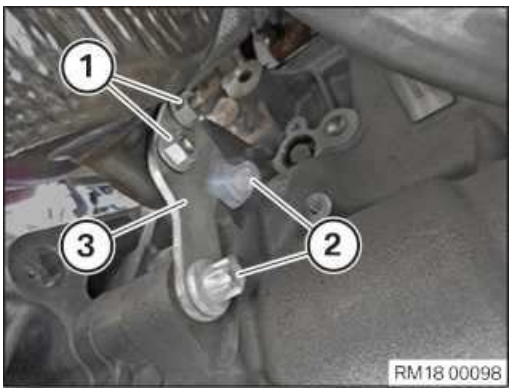
- Carefully insert and install the diesel particulate filter (1).



- Feed in and install V-band clamp (1).
- Make sure that the seal between the diesel particulate filter and the exhaust turbocharger is installed correctly.
- Align the diesel particulate filter on the exhaust turbocharger.
- Position V-clip (1).
- Hand-tighten the V-clip (1).

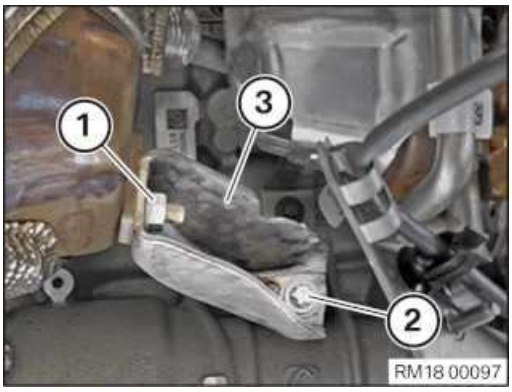


- Tighten nuts (1) by hand.



- Install holder (3).
- Hand-tighten the bolts (2).
- Tighten nuts (1) by hand.

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- Install holder (3).
- Tighten the nut (1) hand-tight.
- Hand-tighten the bolt (2).



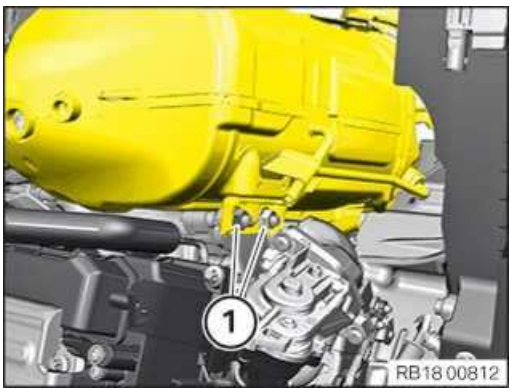
- Remove fitting aid (1) for the flexible tube.



- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

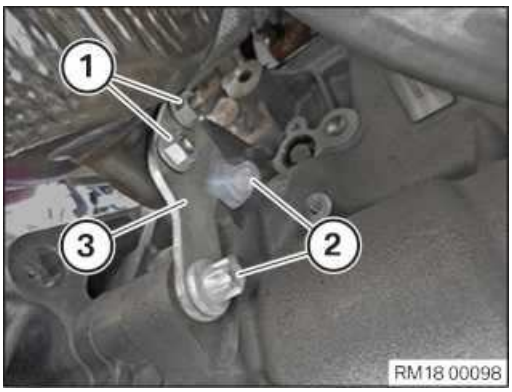
V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm



- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten down screws (2).

Diesel particulate filter holder to gearbox

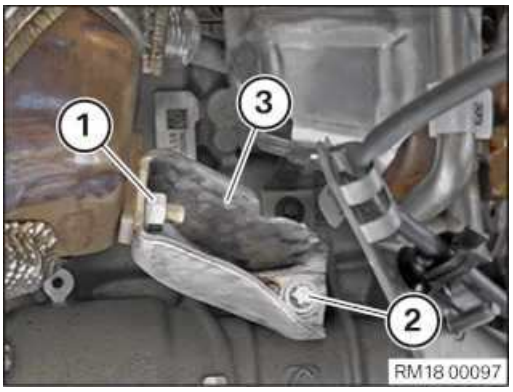
M12x75		Tightening torque	66 Nm

- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm

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- Tighten down screw (2).

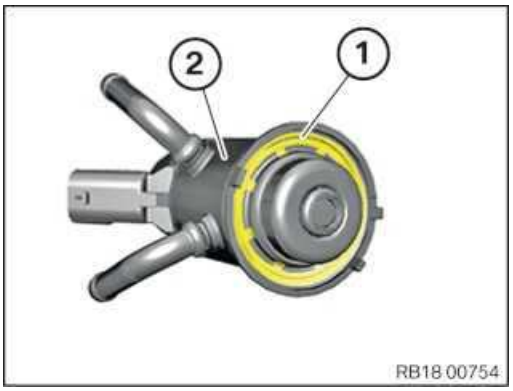
Diesel particulate filter bracket to crankcase

M10x35		Tightening torque	38 Nm

- Tighten nut (1).

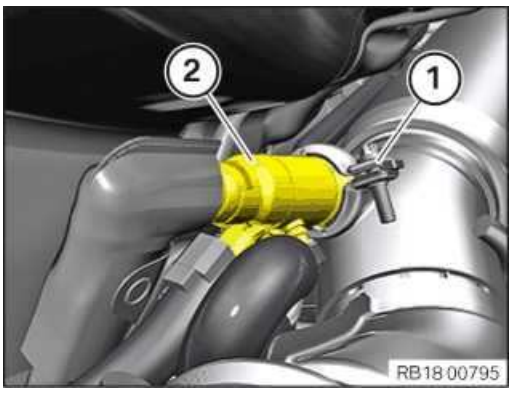
Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Renew sealing ring (1) of the SCR metering module (2).

  Parts: Sealing ring

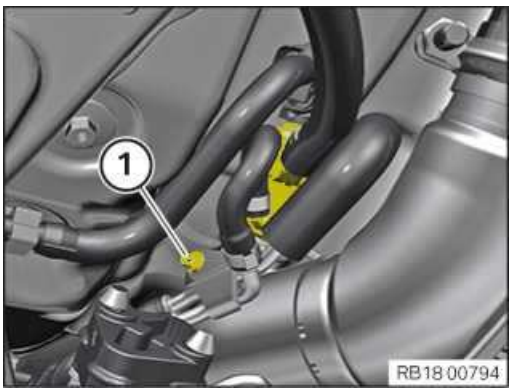


- Insert and install the SCR metering module (2).
- Renew the V-clip (1).

  Parts: V-band clamp
- Tighten V-band clamp (1).

SCR metering module V-clip to exhaust system

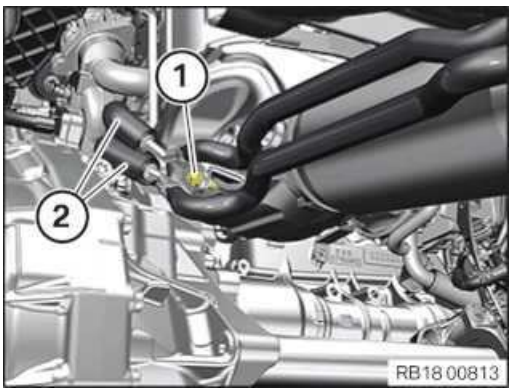
V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm



- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm



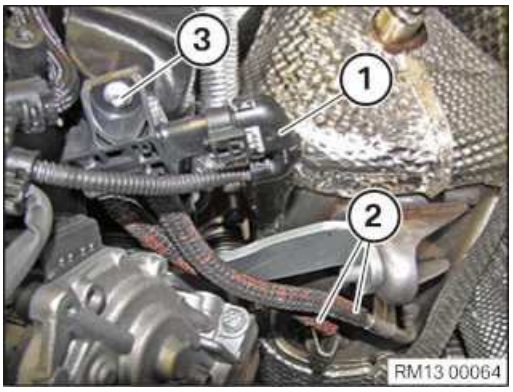
- Thread in and install coolant line (2) of the SCR metering module.
- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm

▸ **Installing differential pressure sensor**

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- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

61 – Install the control sensor

TECHNICAL INFORMATION

New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue



- Feed in front oxygen sensor (1) and install.
- Tighten front oxygen sensor (1) using special tool .

Control sensor

Control sensor		Tightening torque	50 Nm

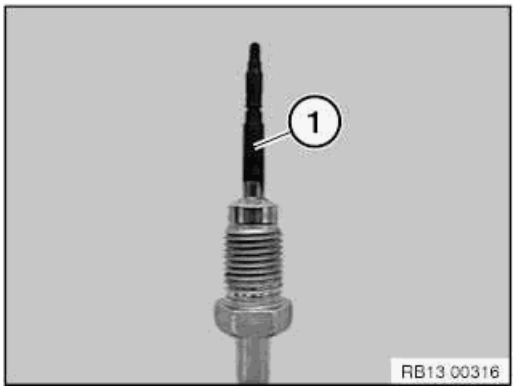


- Lay and secure cable of oxygen control sensor.
- Secure the connector (2) to the holder.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

62 – Install the exhaust-gas temperature sensor on the diesel particulate filter

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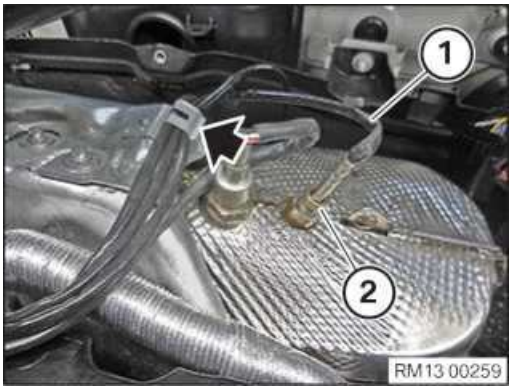
RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

- Check the gauge tip (1) for damage and renew the exhaust temperature sensor as needed.



- Feed in and install the exhaust temperature sensor (2).
- Tighten the exhaust temperature sensor (2).

Exhaust temperature sensor to diesel particulate filter

Exhaust-gas temperature sensor		Tightening torque	28 Nm

- Insert and install cable (1) of the exhaust temperature sensor in the clamp (arrow).



- Lay and fasten the cable of the exhaust gas temperature sensor.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

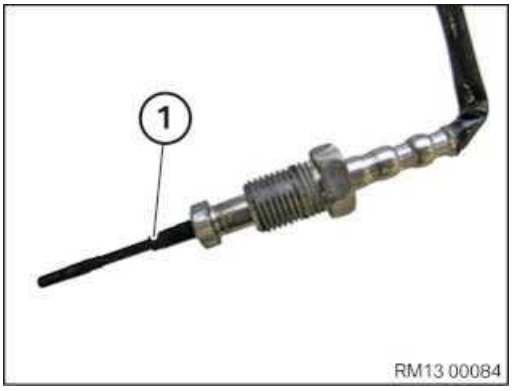
63 – Installing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

RISK OF DAMAGE

Damage of exhaust temperature sensor.

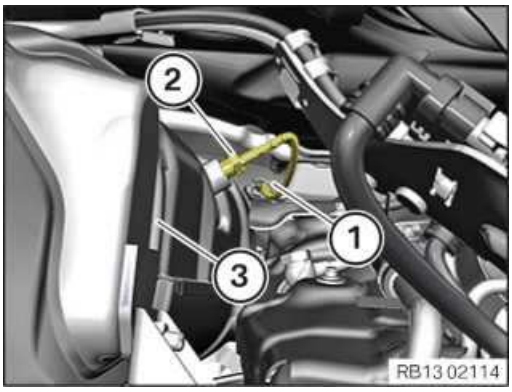
Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.



- Make sure the gauge tip (1) is not damaged during installation.

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- Guide the exhaust temperature sensor (2) into diesel particulate filter (3) and install.
- Tighten the exhaust temperature sensor (2) with conventional tools .

Exhaust temperature sensor to diesel particulate filter

Exhaust-gas temperature sensor		Tightening torque	28 Nm

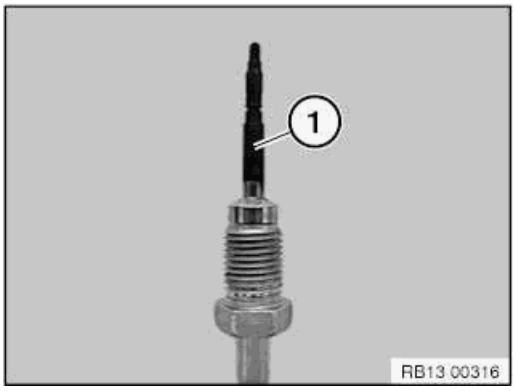
- Insert and install the cable of the exhaust temperature sensor (2) in the clamps (1).



- Lay and fasten the cable of the exhaust gas temperature sensor.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

64 – Installing exhaust temperature sensor on catalytic converter



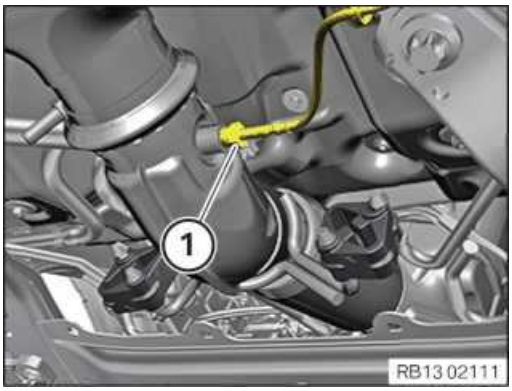
RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

- Check the gauge tip (1) for damage and replace the exhaust temperature sensor as needed.



- Feed in and install the exhaust temperature sensor (1).
- Tighten the exhaust temperature sensor (1).

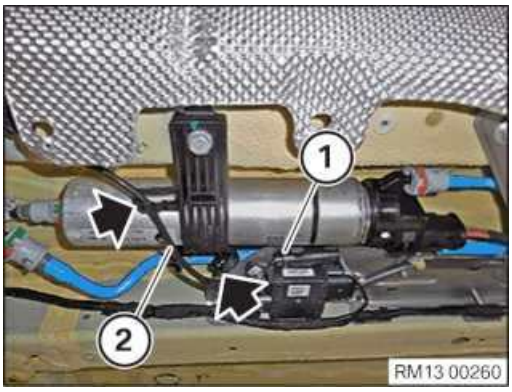
Exhaust-gas temperature sensor to exhaust system

Exhaust-gas temperature sensor		Tightening torque	28 Nm



- Secure the cable clips (1).

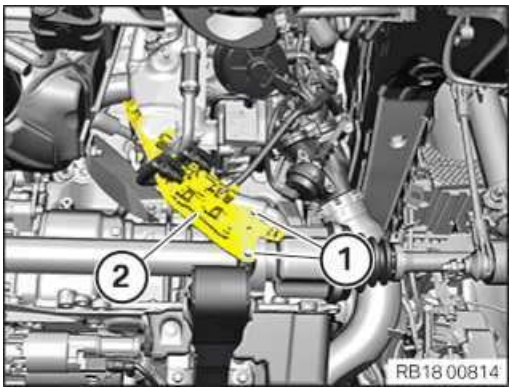
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- Feed cable (2) from exhaust temperature sensor into the clamps (arrows) and install.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

65 – Install holder for oxygen sensor

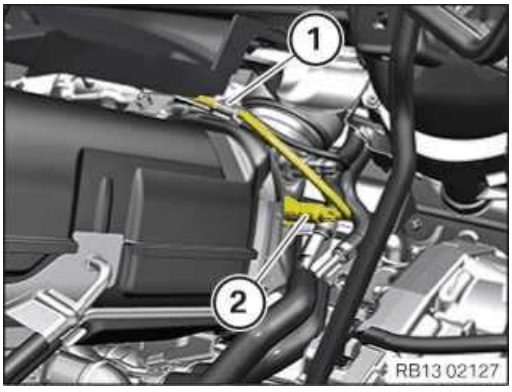


- Insert and install the holder (2).
- Tighten the screws (1).

Oxygen sensor holder to intermediate shaft

Hexagon screw M6x16		Tightening torque	8 Nm

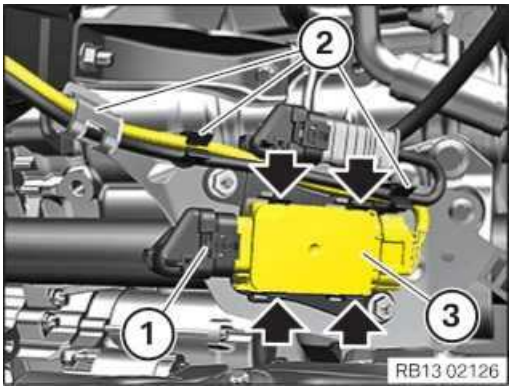
66 – Installing the nitrogen oxide sensor before SCR catalytic converter



- Insert nitrogen oxide sensor before the SCR catalytic converter (2) and install.
- Tighten the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

Nitrogen oxide sensor before SCR catalytic converter

Sensor		Tightening torque	50 Nm



- Install and lock the evaluation electronics for the nitrogen oxide sensor (3) (arrows).
- Insert the evaluation electronics cable for the nitrogen oxide sensor (3) into the clamps (2) and install.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

67 – Install the monitoring sensor

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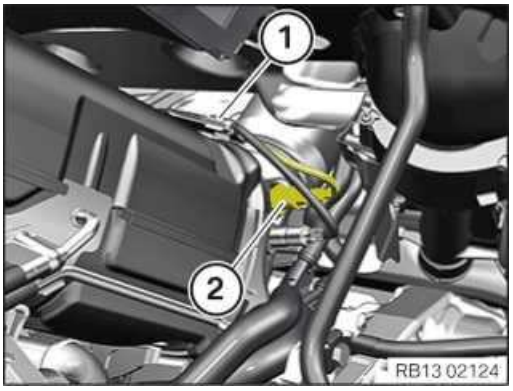
TECHNICAL INFORMATION

New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

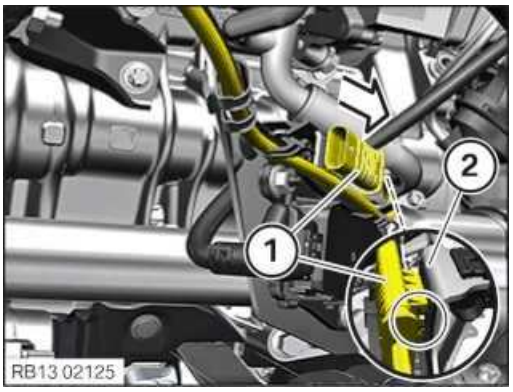


- Feed in the monitoring oxygen sensor (2) and install.
- Tighten the monitoring oxygen sensor (2) with special tool **0 491 074 (11 7 020)**.

Monitoring sensor

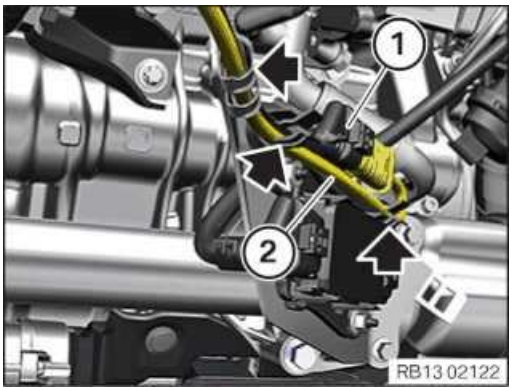
Sensor		Tightening torque	50 Nm

- Insert the cable of the monitoring oxygen sensor (2) into the clamp (1) and secure it.



- Connect the connector (1) with the bracket (2) in the direction of arrow.
- Make sure that the connector (1) is locked correctly in the marked area.

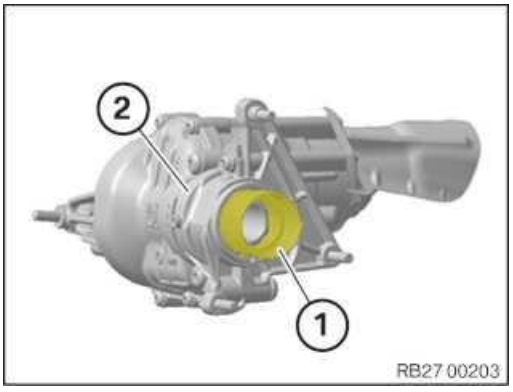
  The connector (1) must engage audibly.



- Insert and attach the cable of the monitoring oxygen sensor (2) to the clamps (arrows).
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

68 – Install the transfer box (VTG)



- If intermediate shaft (1) gets caught on transfer box (VTG) (2), renew intermediate shaft (1) and the radial shaft seals in the automatic or manual transmission.

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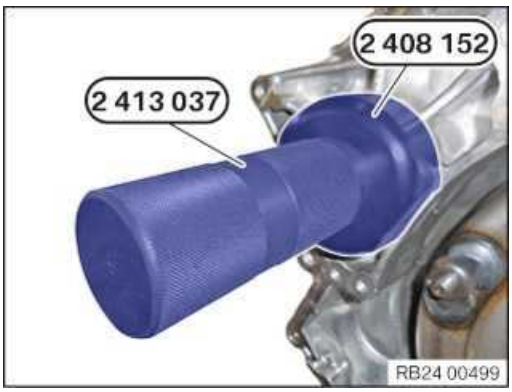
- Screw special tool **2 409 025** into the outer radial shaft seal.
- Turn the screw on the special tool **2 409 025** until the outer radial shaft seal has been pulled out.



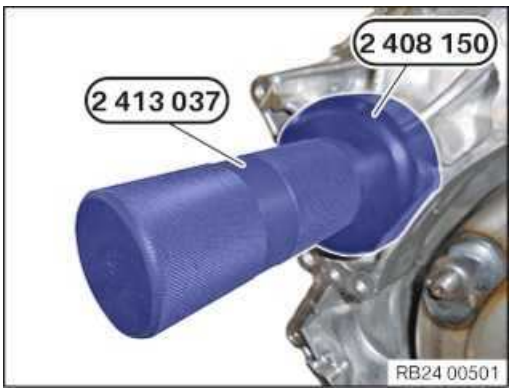
- Insert special tool **2 411 739** into the inner radial shaft seal.



- Screw special tool **2 411 739** into the inner radial shaft seal.
- Turn the screw on the special tool **2 411 739** until the inner radial shaft seal has been pulled out.

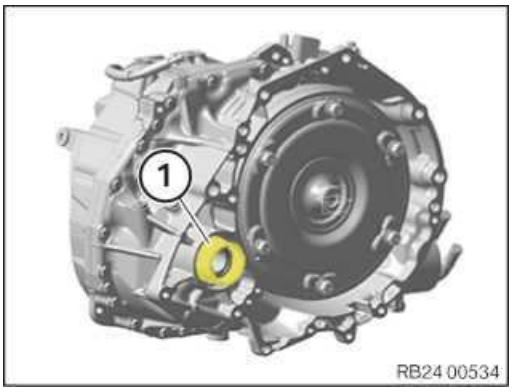


- Drive in the inner radial shaft seal using special tools **2 408 152** and **2 413 037** up to the limit position.



- Drive in the outer radial shaft seal using special tools **2 413 037** and **2 408 150** up to the limit position.

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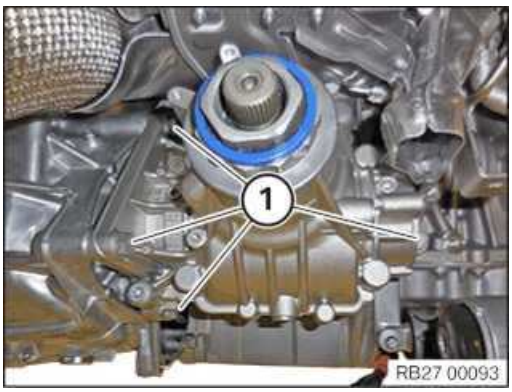
- If necessary, connect the new intermediate shaft (1) to the output flange of the automatic transmission or manual transmission.



- Coat the inside of the output flange (arrows) evenly with approx. 5 g of grease.

Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the transfer box (VTG).
- Tighten the screws (1).

Transfer box to transmission

M10		Tightening torque	56 Nm



- Install heat shield.
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Heat shield to transfer box

M6	Renew screws.	Tightening torque	6 Nm

▸ **Check the transfer box oil level**

RISK OF DAMAGE

Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.

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- Check transfer case oil level, correct:
- Open the oil filler plug (1).
- Check transfer box oil level.
- If necessary, top up transmission oil up to the lower edge of the oil filler plug opening (1).

Transmission oil

Technically suitable transfer box and electrical transmission oils	

Main group 27

- Tighten the oil filler plug (1).

Oil filler plug on transfer box (VTG)

M18x1.5		Tightening torque	35 Nm

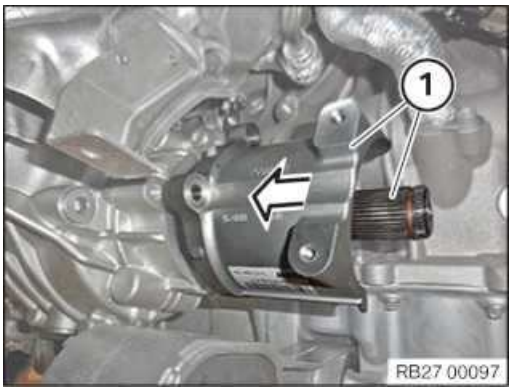
69 – Install the intermediate shaft with the support tube



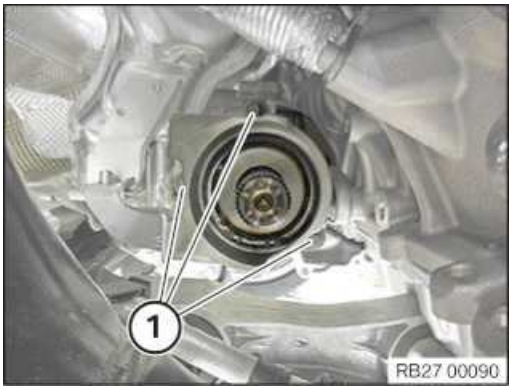
- Coat gearing of the intermediate shaft uniformly with 5 g of grease.

Expendable materials

Lubricating grease Optitemp HT 1 LF	50 g, Tube	83230417754



- Install the intermediate shaft with support tube (1) in the transfer box.



- Position screws (1).

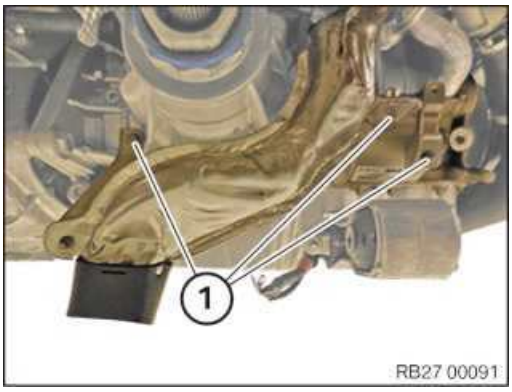
Note: Check for correct screw length! Bolt M8x35 8.8

- Tighten the screws (1).

Intermediate shaft to transfer box

M8x35		Tightening torque	19 Nm

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- If installed: Install air duct.
- Tighten the screws (1).

70 – Installing starter motor

CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.



- Insert and install the starter motor .
- Tighten the screws (1).

Starter motor to transmission

M8x45		Tightening torque	19 Nm



- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

Battery positive lead to starter

M8		Tightening torque	13,5 Nm



- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.

71 – Installing right output shaft partially

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- Renew the circlip (1).

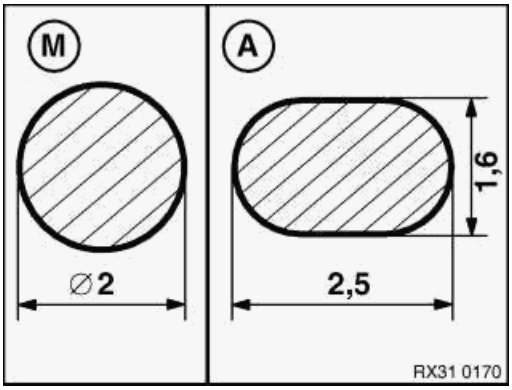
  Parts: Circlip
- Slide output shaft into the transmission as far as the limit position.
- Check for secure seat by levering.

72 – Partially installing the left output shaft



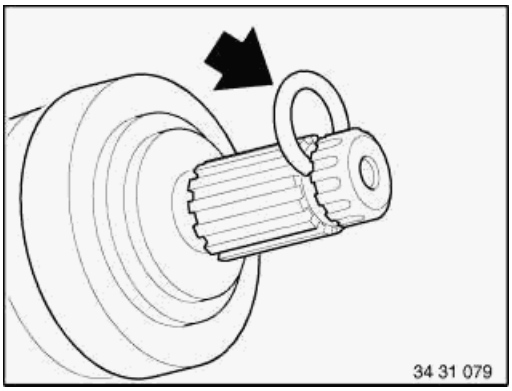
- **With automatic transmission only:**
- Lever out O-ring (1).
- Renew O-ring (1).

  Parts: O-ring
- Insert new O-ring (1).

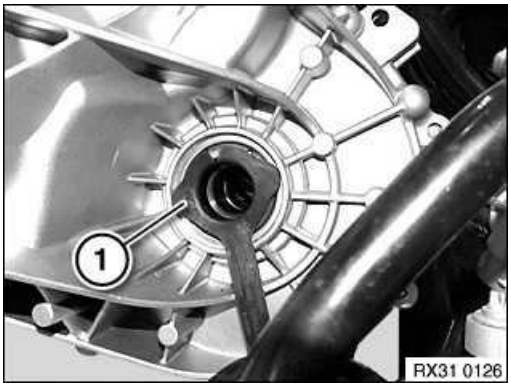


- Do not mix up circlips.

  Different types of output shafts fitted:
  - M: Manual transmission
  - A: Automatic transmission

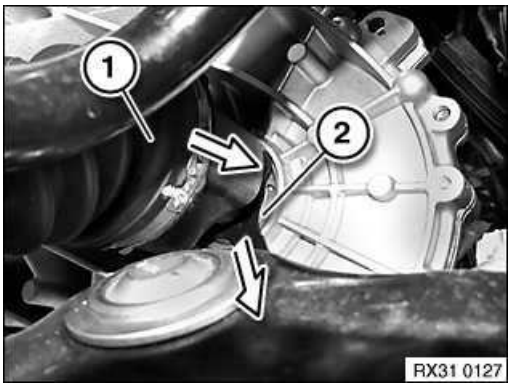


- Renew circlip (arrow).



- Insert installation protection ring (1) into the radial shaft seal.
- Make sure the tool fits over the lip of the radial shaft seal so there is no damage to sealing ring when the output shaft is inserted.

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- Insert output shaft (1) into transmission.
- **Manual gearbox only:** Pull on the handle to remove the installation protection ring (2) and dispose of it.
- Slide output shaft (1) into the transmission as far as the limit position.

  The output shaft (1) must engage audibly.
- Check for secure seat by levering.

73 – Install propeller shaft.

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

RISK OF DAMAGE

Damage to the propeller shaft during installation.

Non-observance of the installation guidelines for the propeller shaft on the rear axle differential may cause severe damage.

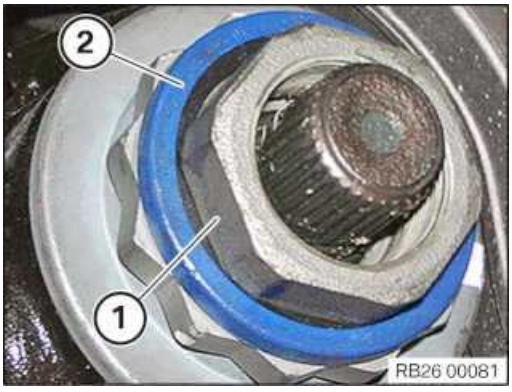
- Always renew the recessed nut on the rear axle differential. Screw locking must be available.
- Strictly observe a minimum hardening time of two hours after having screwed in the recessed nut. The hardening time may be longer at lower temperatures.

RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

- Do not use the double hexagon head flange nut as counter support.



- Renew recessed nut (1).

  Parts: Insert nut
- Renew the retaining clip (2) and the seal.

  Parts: Retaining clip, seal
- Insert the seal with the recessed nut (1) and install.
- Insert the retaining clip (2) and install.
- Make sure that recessed nut (1) is screwed in within 5 min.
- Make sure that the hardening time of **minimum** 2 h for the recessed nut is observed.

  The hardening time must be extended at lower temperatures.

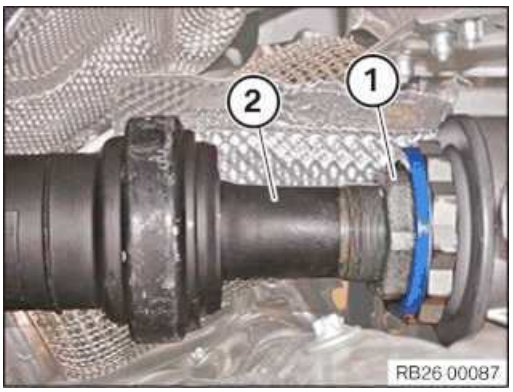
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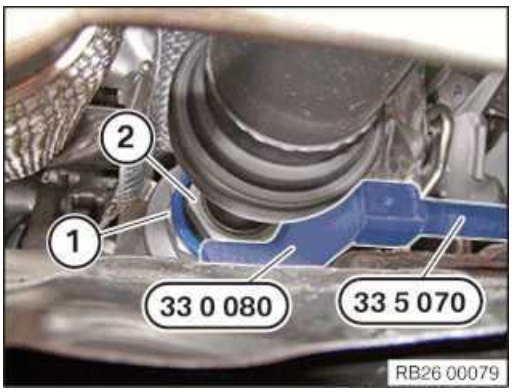
- Insert the propeller shaft (1) and install.
- Always support the propeller shaft (1) with a conventional jack.



- Hand-tighten the bolts (1).



- Push the propeller shaft (2) against the recessed nut (1) up to the limit position.
- Screw the propeller shaft (2) at least 2 thread starts onto the recessed nut (1) by hand.



RISK OF DAMAGE

Damage to the transfer box.

Non-observance of the removal and installation guidelines may cause severe damage to the transfer box.

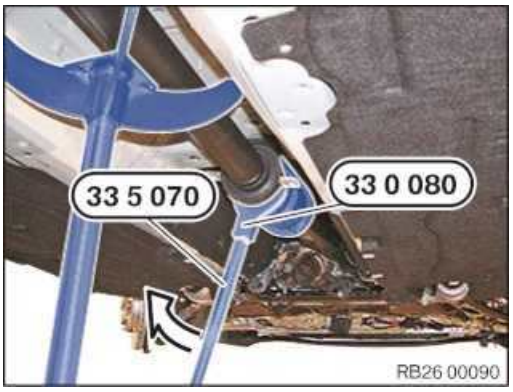
- Do not use the double hexagon head flange nut as counter support.

- Protect the recessed nut (2) on the transfer box from twisting with the special tools **0 495 554 (33 5 070)** and .

  The recessed nut (2) on the transfer box must **not** be used to tighten the propeller shaft.

  The double hexagon flange nut (1) must **not** be used for counter support.

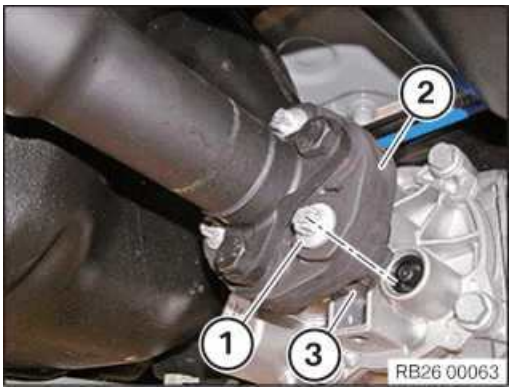
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- Tighten the front propeller shaft with the special tools **0 495 554 (33 5 070)** and in the direction of the arrow.

Propeller shaft to transfer box

		Tightening torque	80 Nm



TECHNICAL INFORMATION

Compliance with the following instructions is required to avoid a humming noise from the propeller shaft after refitting the propeller shaft.

- Assemble the screw connection (1) of the flexible disc (2) and the three-hole flange (3) according to the mark.
- Renew screws (1).

  Parts: Bolts
- Hand-tighten the bolts (1).



- Protect the propeller shaft (1) with the special tools **0 495 554 (33 5 070)** and from twisting.



- Tighten the bolts with the special tools **0 490 504 (00 9 120)** and .

Flexible disc to rear axle final drive

M12x1.5	Renew screws.	Tightening torque	55 Nm 90 °



- Tighten the screws (1).

Centre mount to body

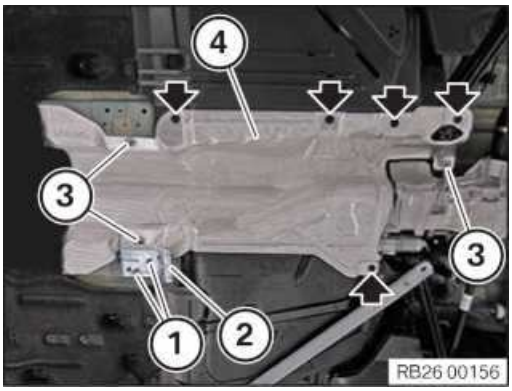
M8		Tightening torque	19 Nm

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- Guide the special too l out between the front and rear propeller shaft and remove.

74 – Installing the rear heat shield



- Insert and install the heat shield (4).
- Tighten screws (arrows).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

- Tighten nuts (3).

Heat shield to body

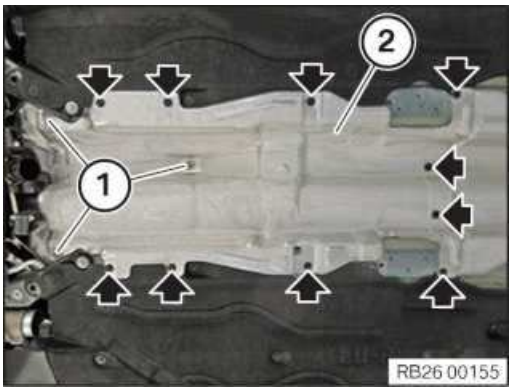
Bolts/nut		Tightening torque	3 Nm

- Insert and install the holder (2).
- Tighten the screws (1).

Bracket to body

M8		Tightening torque	21 Nm

75 – Install the front heat shield



- Insert and install the heat shield (2).
- Tighten screws (arrows).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

- Tighten nuts (1).

Heat shield to body

Bolts/nut		Tightening torque	3 Nm

76 – Install exhaust system

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

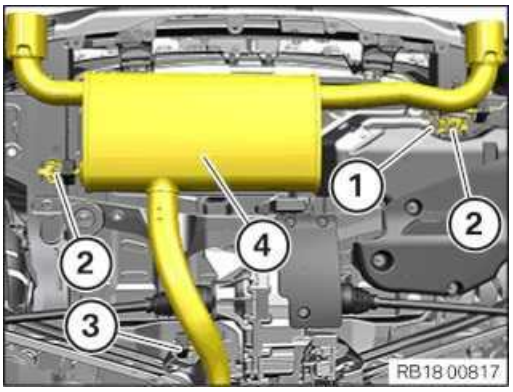
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CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Feed in and install the exhaust system (4) with a second person.
- Renew nuts (2).

  Parts: Nuts
- Tighten nuts (2).

Exhaust system to body

M8	Replace nuts.	Tightening torque	19 Nm

- Tighten down screw (1).

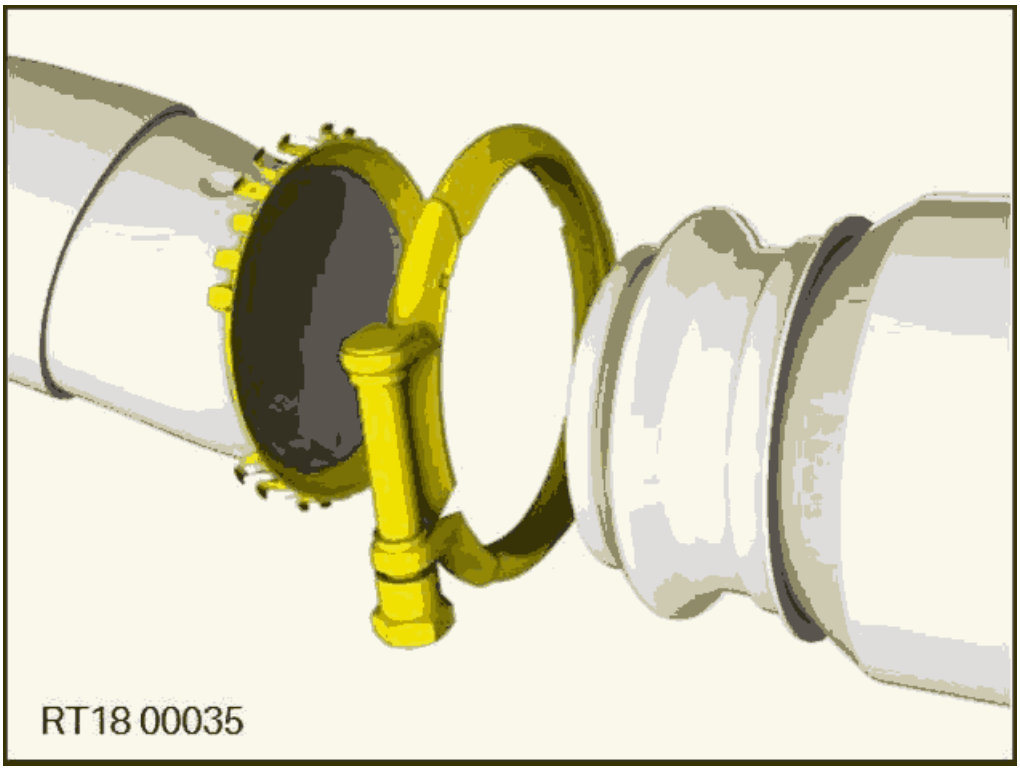
Exhaust bracket on body

Hexagon screw M8x30		Tightening torque	19 Nm

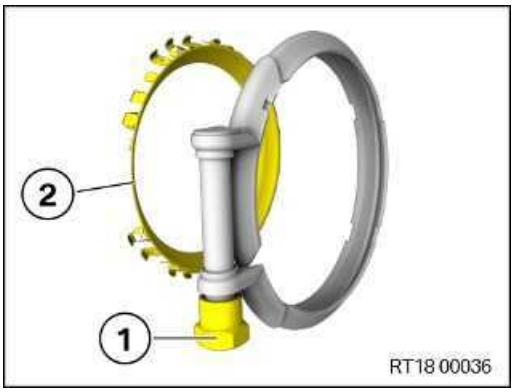
- Check the rubber mount (3) for damage and renew as needed.
- Mount rubber mount (3) on the exhaust system (4).

▸ **Install the V-clip**

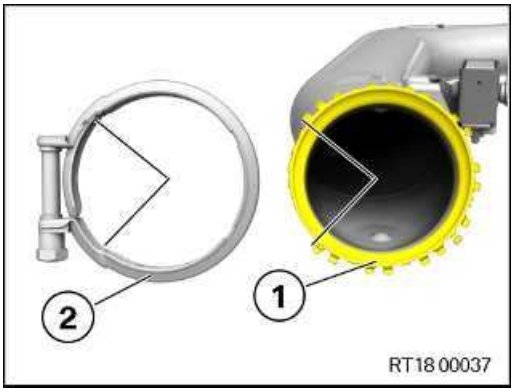
V-band clamp



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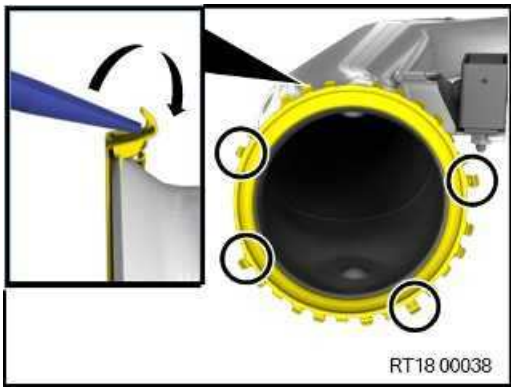


- Unscrew the nut (1) and remove the sealing ring (2).

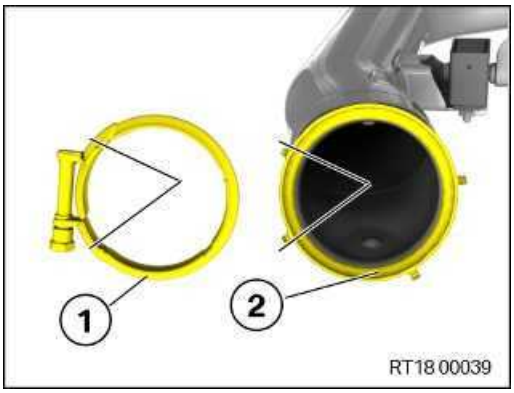


- Renew the V-clip (2).

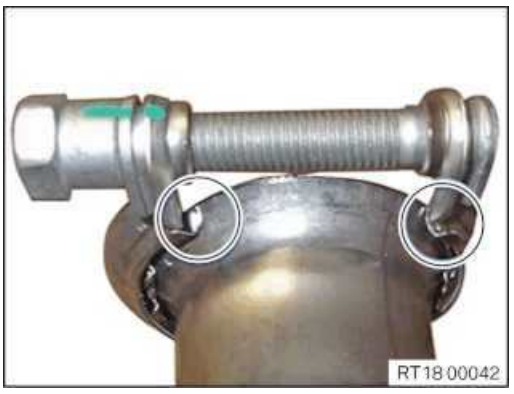
  Parts: V-band clamp
- Mount the sealing ring (1) on the exhaust system.
- Ensure that the sealing ring (1) for the V-clip (2) is positioned correctly.



- Bend all sheet metal tabs over with a suitable tool, except those in the marked areas.

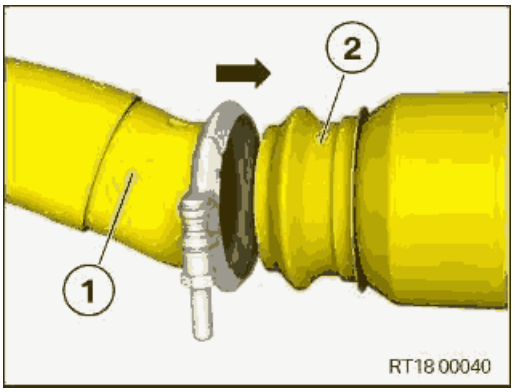


- Mount the V-clip (1) on the sealing ring (2).
- Make sure that the V-clip (1) is positioned correctly on the sealing ring (2).

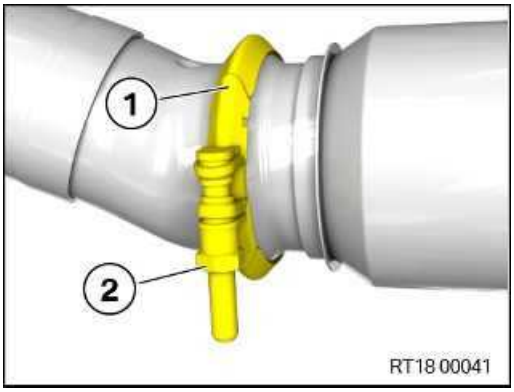


- Make sure that the V-clip rests against the sheet metal tabs after mounting (marks).

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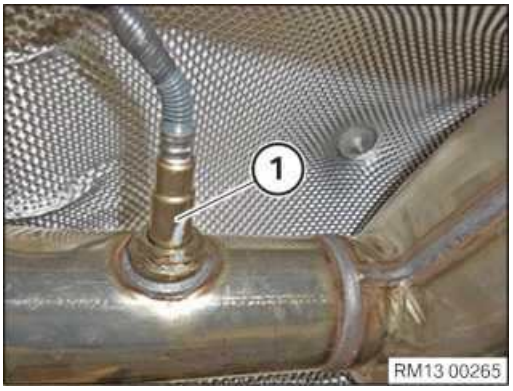
- Connect the exhaust system (1) with the catalytic converter (2) and position correctly.



- Make sure that V-clip (1) is fitted correctly.
- Tighten down screw (2).

V-clip to catalytic converter

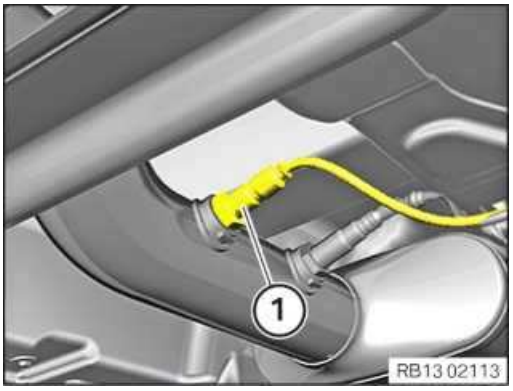
V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm



- Feed in, install and tighten diesel particulate sensor (1).

Diesel particulate sensor to exhaust system

Sensor		Tightening torque	50 Nm



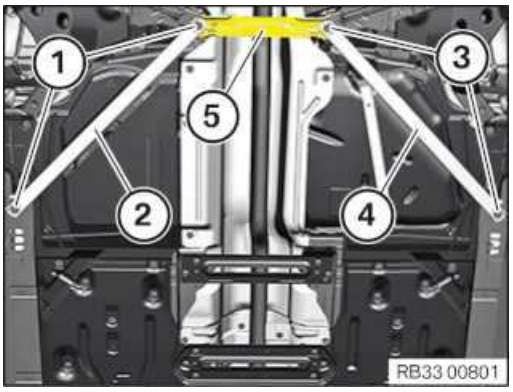
- Feed in, install and tighten nitrogen oxide sensor (1).

Nitrogen oxide sensor downstream of SCR catalytic converter

Sensor		Tightening torque	50 Nm

77 – Install the cross-member with torsion struts

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- Insert and install the cross-member (5).
- Thread in torsion strut (4) at right and install.
- Renew screws (3).

  Parts: Bolts
- Tighten down screws (3).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

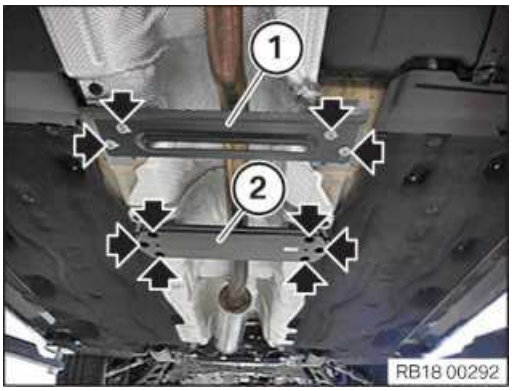
- Guide in and install the left torsion strut (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

78 – Install the connecting support on the tunnel in front and back



- Insert and install connecting supports (2).
- Tighten the screws (arrows) from the connecting support (2).

Front connection carrier to body

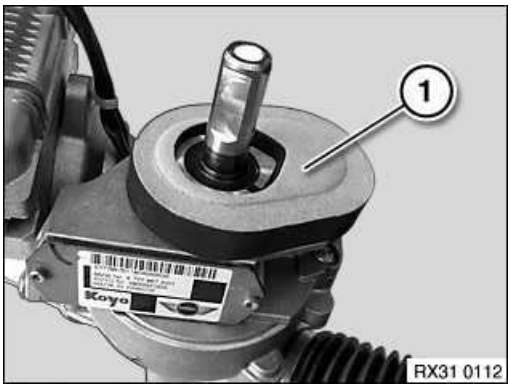
M10x18		Tightening torque	56 Nm

- Insert and install connecting supports (1).
- Tighten the screws (arrows) from the connecting support (1).

Rear connection carrier to body

M8x18		Tightening torque	28 Nm

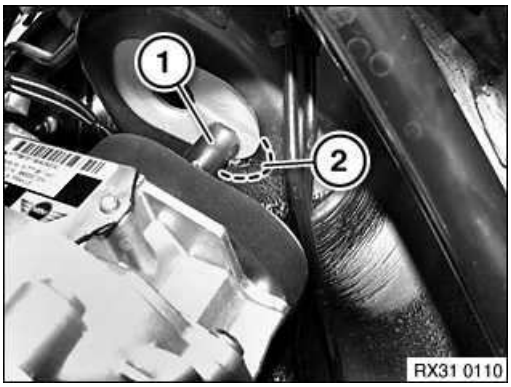
79 – Mount and secure the complete front axle



- Remove the seal (1).
- Clean surface on steering gear.
- Renew gasket (1).

  Parts: Gasket
- Position the seal (1) and glue it on.

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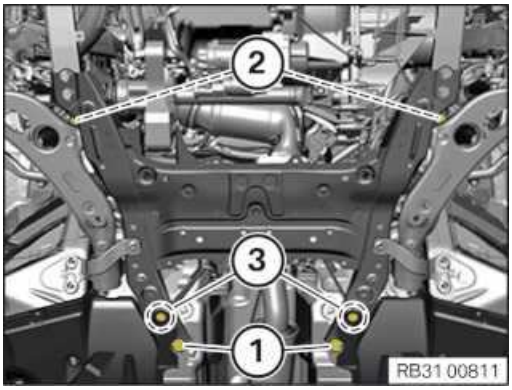


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- Position front axle support.
- Bend underbody panellings in the areas (3) to one side.
- Raise front axle support.
- When raising, insert charge air cooler into the rubber mount of the charge air cooler on cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

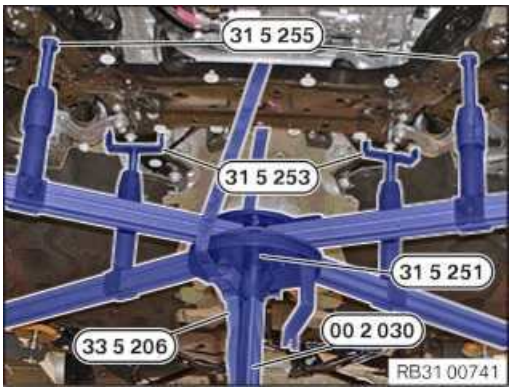
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

- If necessary, tighten the screws in the areas (3).

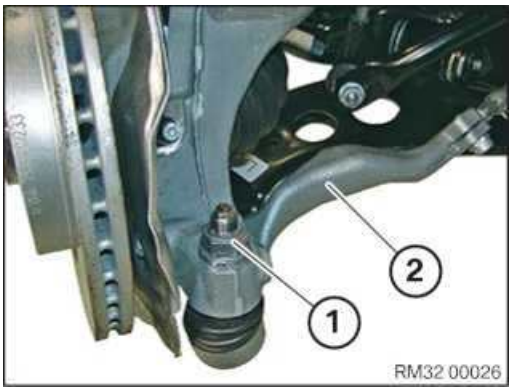
Underbody protection to body

Screw		Tightening torque	3 Nm



- Remove special tool from special tool .
- Lower universal jack **0 490 133 (00 2 030)** with the special tool and place it to the side.

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NOTICE

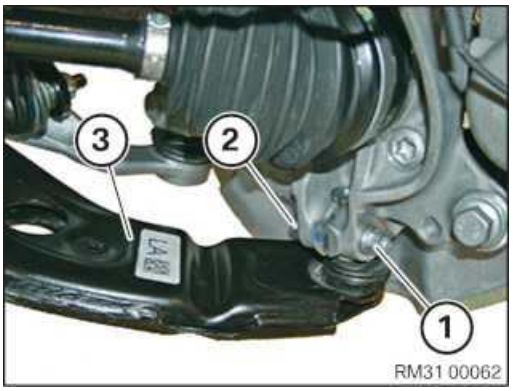
Perform the operations on the left and right side.

- Position the track rod (2) on the swivel bearing .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Track rod end to swivel bearing

M14	Renew nut.	Tightening torque	175 Nm



NOTICE

Perform the operations on the left and right side.

- Position the wishbone (3) on the swivel bearing .
- Renew the bolt (2) and the nut (1).

  Parts: Bolt, nut
- Insert screw (2).
- Tighten nut (1).

Wishbone to swivel bearing

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

80 – Install the mounted parts on the front axle support



NOTICE

Perform the operations on the left and right side.

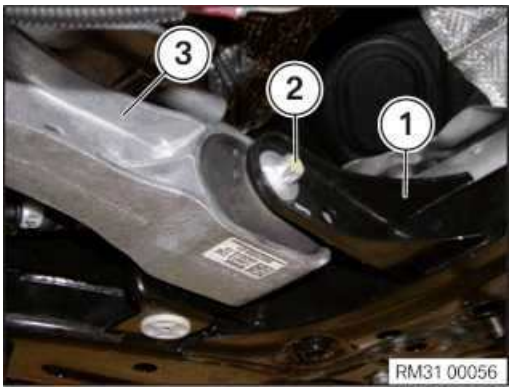
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Holder, wishbone rubber mount, to body

M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °

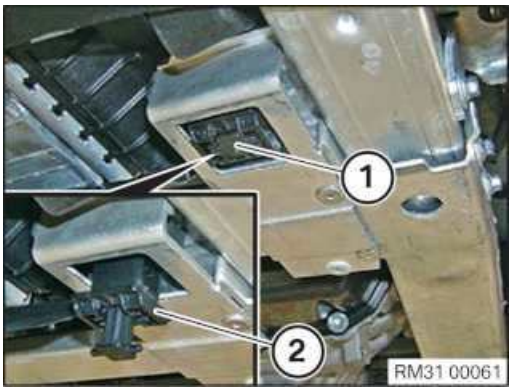
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- Position the engine support (3) on the front axle support (1).
- Tighten down screw (2).

Holder with rubber mount to front axle support

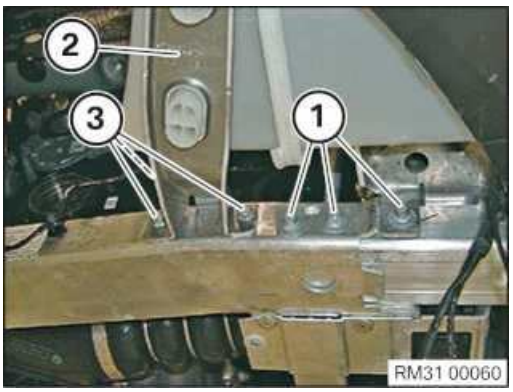
M12 screw		100 Nm



NOTICE

Perform the operations on the left and right side.

- Position the lock (2).
- Lock the bracket (1) of the lock (2) of the holder for the charge air cooler.



- **Only on right side:** Position the holder for the washer fluid reservoir (2).
- Tighten down screws (3).

Washer fluid reservoir holder to front axle support adapter plate

		Tightening torque	10 Nm

NOTICE

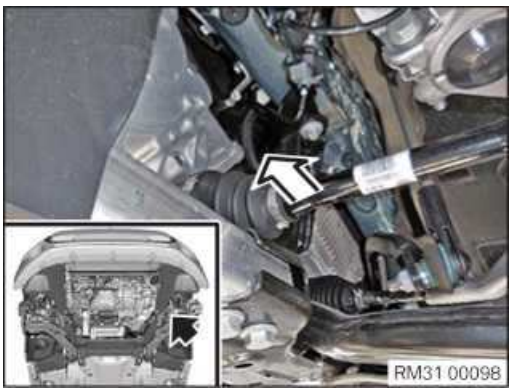
Perform the operations on the left and right side.

- Tighten the screws (1).

Deformation element, bottom, to adapter plate, front axle carrier

		Tightening torque	11,8 Nm

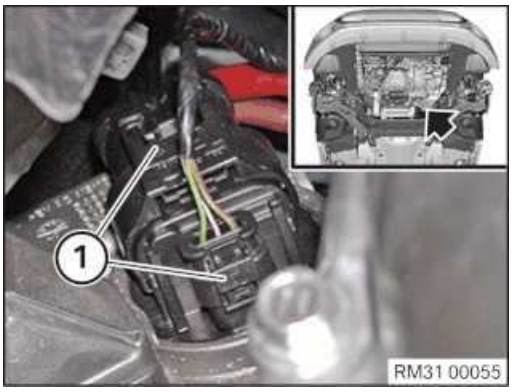
81 – Attaching connector at steering gear



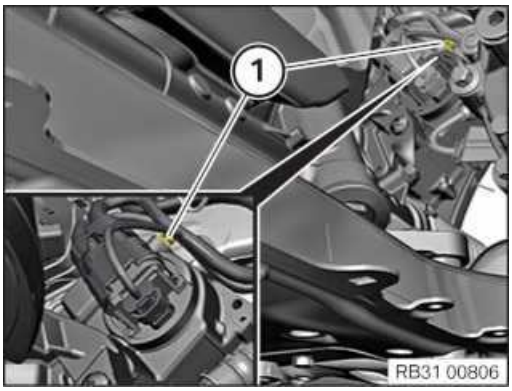
- To connect the connector (see the following step): Connect the connector with the right hand.

  The connectors can be accessed via the left output shaft.

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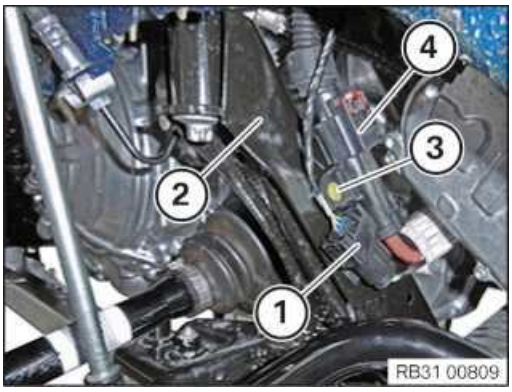


- Connect and lock connector (arrow) (1) with the steering gear.



- Fasten the wiring harness (1) on the steering gear.

▶ **If installed: Fasten the plug connections at the front axle support**



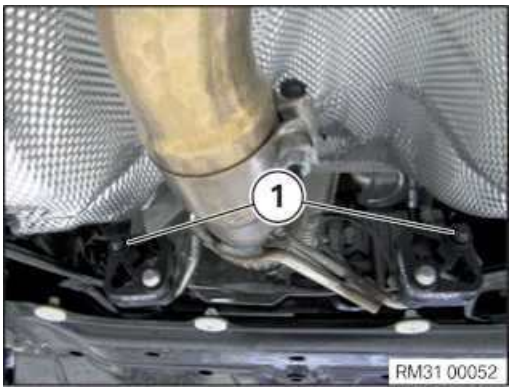
- Position the plug connection (4) at the front axle support (2).
- Tighten down screw (3).

Holder to front axle support

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

- Fasten the plug connection (1) at the front axle support (2).

82 – Securing rubber mount on front axle support



- Check rubber mount (1), replace if necessary.

  Parts: Rubber mount
- Spray rubber mount (1) with lubricant and slide onto holder on front axle support.

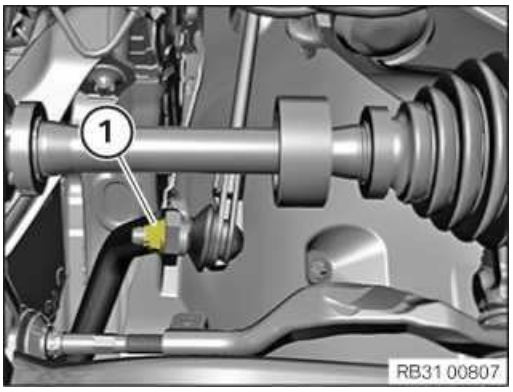
83 – Securing anti-roll bar on left and right on the anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▶ **Fastening anti-roll bar on the anti-roll bar link**

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- Position the anti-roll bar link on the anti-roll bar .
- Renew nut (1).

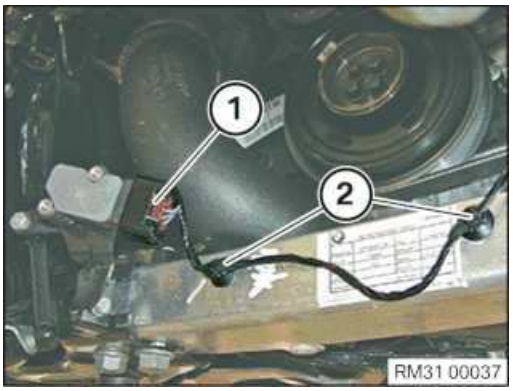
  Parts: Nut
- Tighten nut (1).

Note: Use the Torx socket for counter support.

Anti-roll bar link to anti-roll bar

M10	Renew nut.	Tightening torque	56 Nm

84 – With right installation: Securing the cable for the ride height sensor



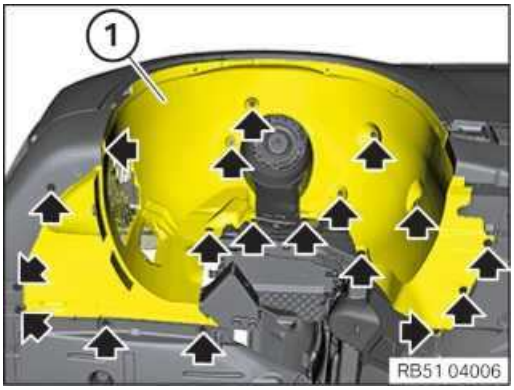
- Secure the cable clip (2) on the adapter of the deformation element.
- Connect connectors (1) and lock.

85 – Installing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

▸ **Installing the front wheel arch cover**



- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Plastic nut		Tightening torque	2,6 Nm
Screw		Tightening torque	2,6 Nm

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

▸ **Installing front wheel arch trim**

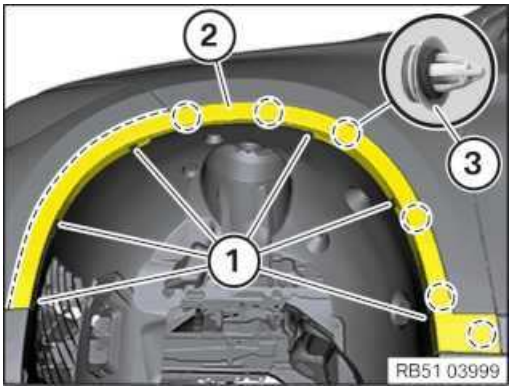
NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

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NOTICE

Description is for left component only. Procedure on the right side is identical.



- Check the clips (3) for damage and renew where required.

  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

86 – Installing both front wheels

▶ **Mounting the wheel**

▷ **Clean the contact surfaces between the brake disc and the wheel rim**



TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

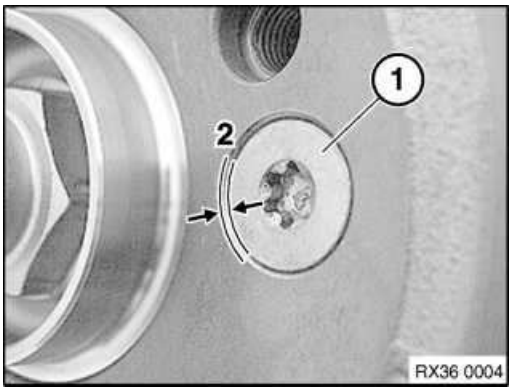
  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue in the area of the wheel bolt holes, remove and clean the brake disc.



- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

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- Renew mounting bolt (1).

  Parts: Mounting bolt

- Check that the mounting bolt (1) for the brake disc is securely seated.

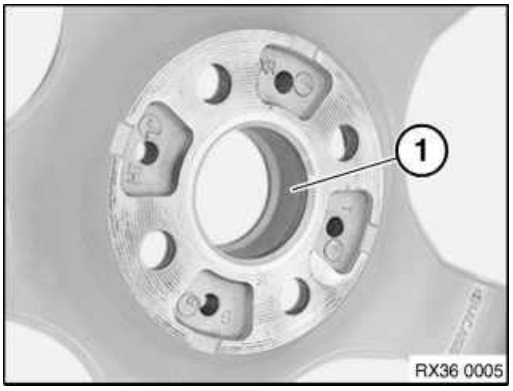
  The mounting bolt (1) for the brake disc may not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to rear wheel hub

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub

M8	Renew screw.	Tightening torque	16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring (1).

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

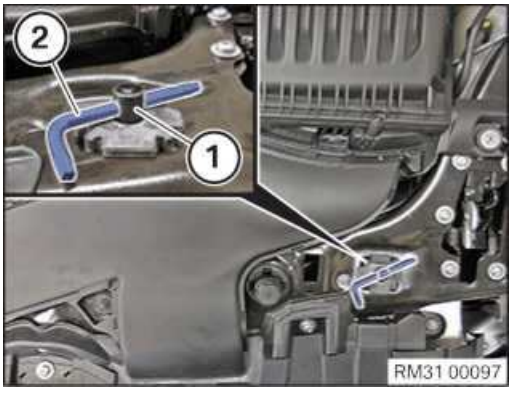
  Parts: Wheel bolts
- Clean the wheel bolts.
- Check the wheel bolts and threads for damage, renew the wheel bolts if necessary.
- Join and tighten the wheel bolts (arrows).

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

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87 – Removing fastener for left and right radiator



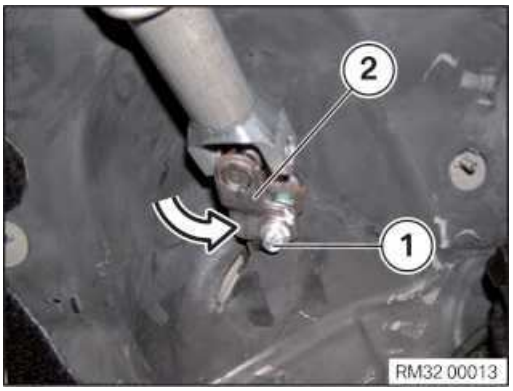
NOTICE

Perform the operations on the left and right side.

- Remove suitable tool (2) from the centering pin (1).

88 – Secure the steering shaft at the bottom on the steering gear

88 – Secure the steering shaft at the bottom on the steering gear



- Clean the screw lock residue from the screw thread in the universal joint (2).
- Pivot the universal joint (2) in the direction of the arrow to the steering gear.
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Lower steering shaft to steering gear

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

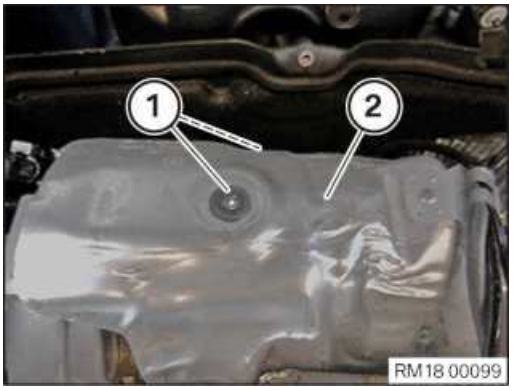


- **If installed:**
- Position the cover on the steering column (2).
- Tighten nuts (1).

Steering column cover to bulkhead

Plastic nut		Tightening torque	3 Nm

89 – Install the heat shield on the exhaust turbocharger



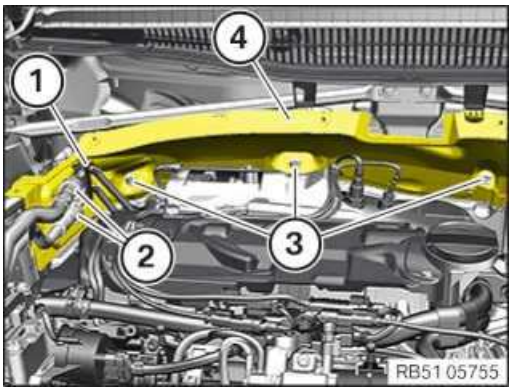
- Feed in and install the heat shield (2).
- Tighten the screws (1) at the top and bottom of the heat shield.

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Fasten the cable at the clips .

90 – Installing rear bulkhead upper part



- Feed in and install the rear bulkhead upper part (4).
- Tighten down screws (3).

Rear bulkhead upper part to lower section of bulkhead

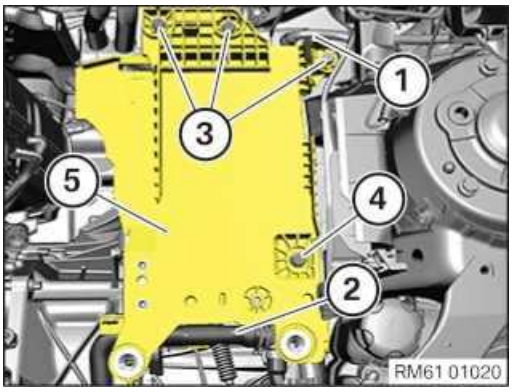
Oval-head screw		Tightening torque	5 Nm

- Feed the fuel line (2) into the holder (1) and install.
- Connect and lock the holder (1).

  The holder (1) must engage audibly.

91 – Install the battery holder

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- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

92 – Install electronics box

Prerequisite

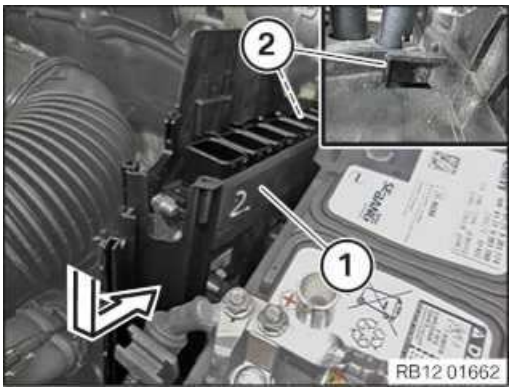
Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.

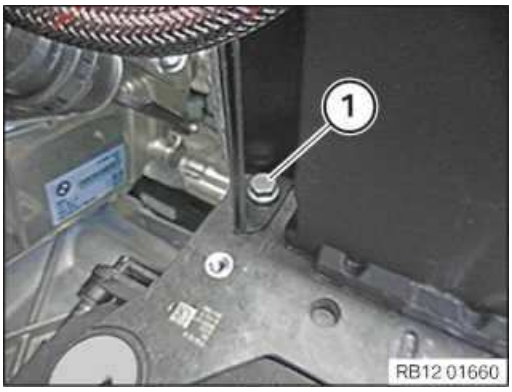


- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.



- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).

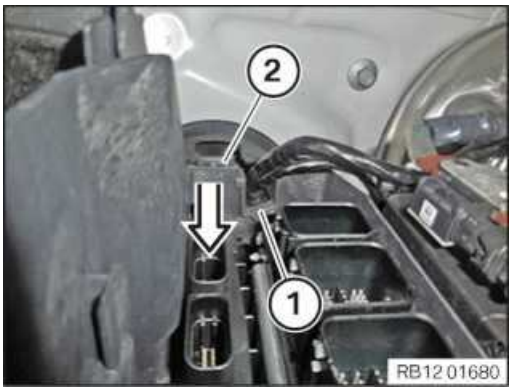
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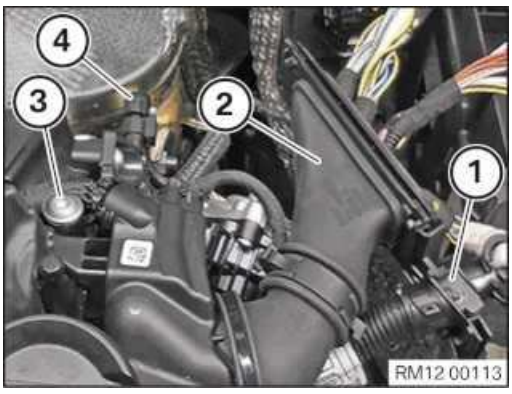
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.

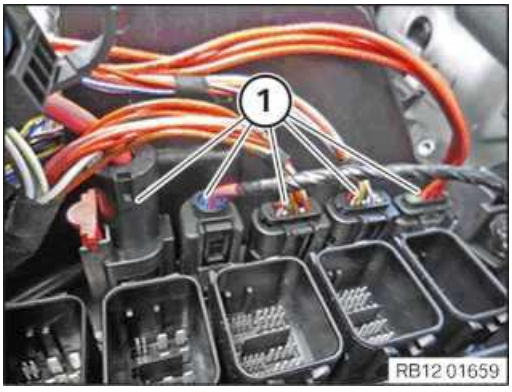


- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

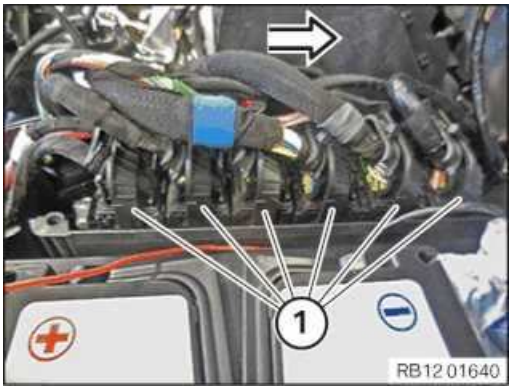
Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.

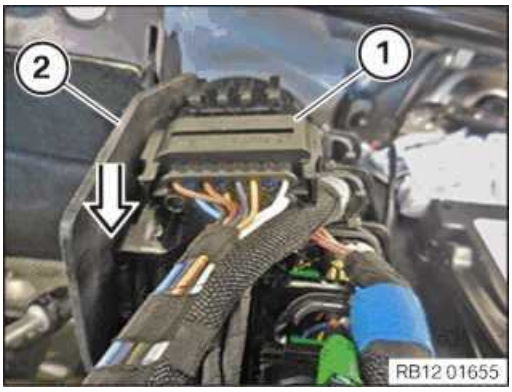


- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.

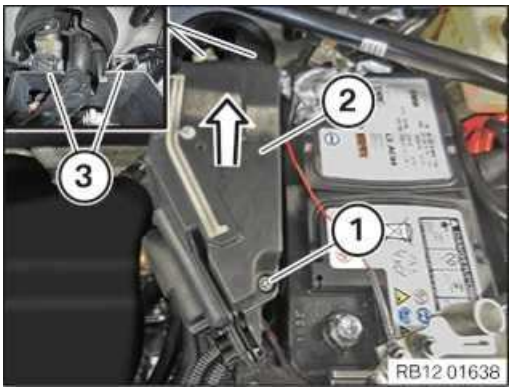


- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.

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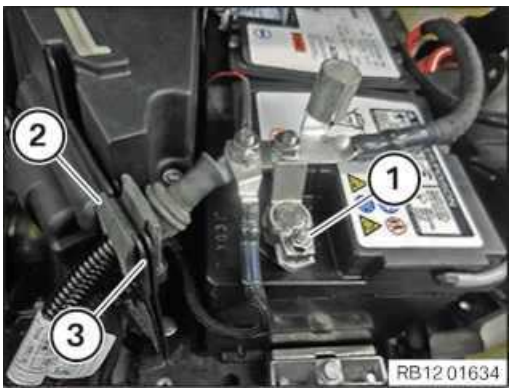
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

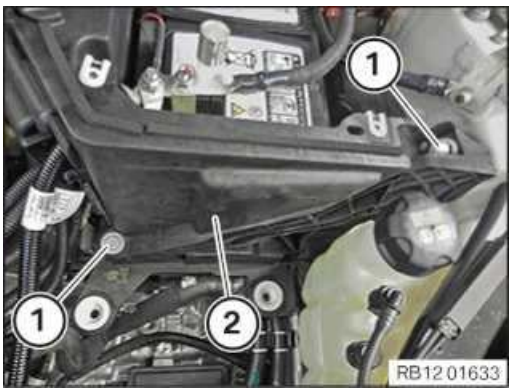
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

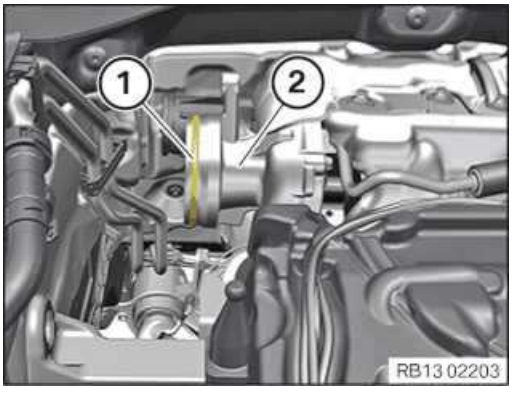


- Feed in and install tension strut (2).
- Tighten the screws (1).

Tension strut to spring strut dome/battery tray

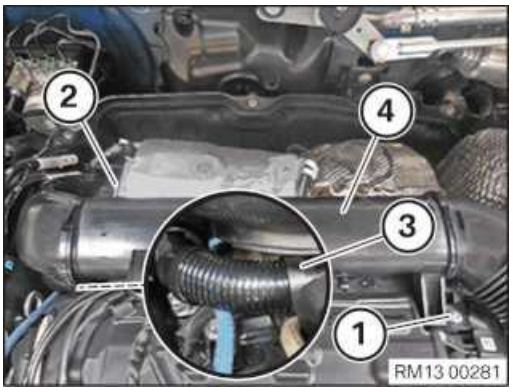
M8		Tightening torque	19 Nm

93 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.

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- Feed in clean air pipe and install.
- Connect clean air pipe to the exhaust turbocharger and lock audibly in the clamps (2).
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Connect ventilation line (3) to the cylinder head cover and lock audibly.

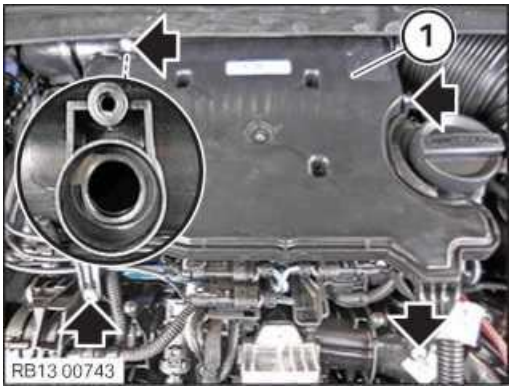


- Mount clean air pipe onto the intake filter housing.
- Tighten clamp (1) on the clean air pipe.

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

94 – Install resonator



- Insert and install the resonator (1).
- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

95 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

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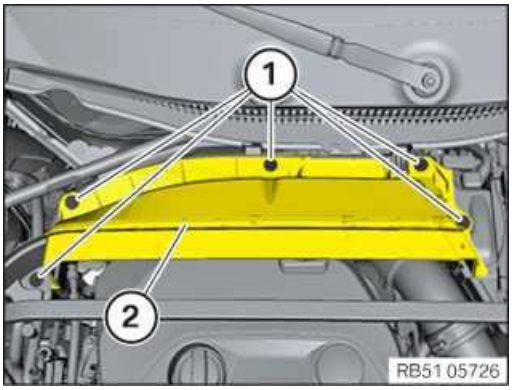


- Check for correct installation of all rubber mounts in the acoustic cover (1).



- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

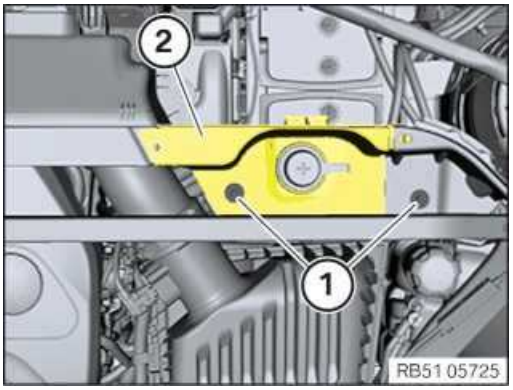
96 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Cover of top bulkhead

Screw		Tightening torque	2,6 Nm



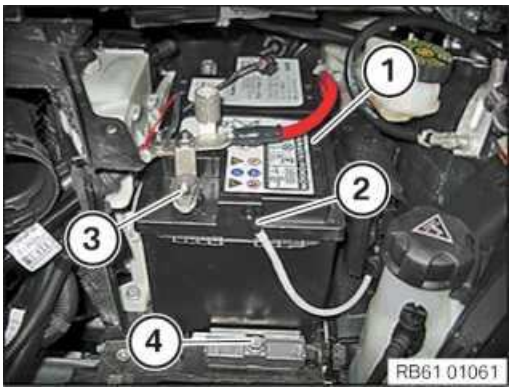
- Guide in and install cover (2).
- Tighten down screw (1).

Cover of remote positive terminal

Screw		Tightening torque	2,6 Nm

97 – Install vehicle battery

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- Install vehicle battery (1).
- Position the bracket and tighten with the screw (4) .

Battery terminal rail to battery tray

M8		19 Nm

- Position the vent hose (2) and clip it in.
- Position the positive battery terminal and tighten with the nut (3) .

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

▸ **Check the vent holes of the battery**

WARNING

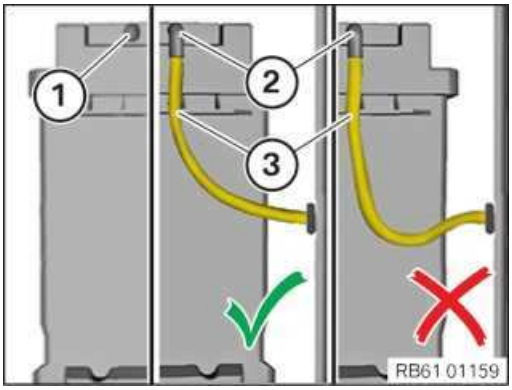
Gas emission.

Danger of injury! Danger of explosion!

- Assign the vent holes correctly.
- Route the vent hose correctly.

TECHNICAL INFORMATION

The battery has two vent holes, opposite:
One vent hole (1) must be closed correctly with a dummy plug.
The vent hose (3) must be correctly connected and routed at the other vent hole (2).



Check

- Check if the vent hole (1) is correctly closed with a dummy plug.

Result

» No dummy plug.

Measure

- Close the vent hole (1) correctly with a dummy plug.

Check

- Check if the vent hole (2) has a correctly connected vent hose (3).

Result

» The vent hose (3) is not correctly connected.

Measure

- At the vent hole (2), connect the vent hose (3) correctly.

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Check

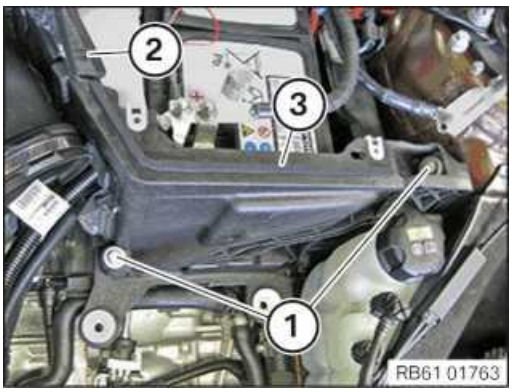
- Check if the vent hose (3) is routed to the outside with a downhill gradient (**no siphon formation!**).

Result

» The vent hose (3) is not correctly routed as shown in the image on the right.

Measure

- Route the vent hose (3) correctly as shown in the centre image.



- Insert tension strut (3) and tighten with screws (1).

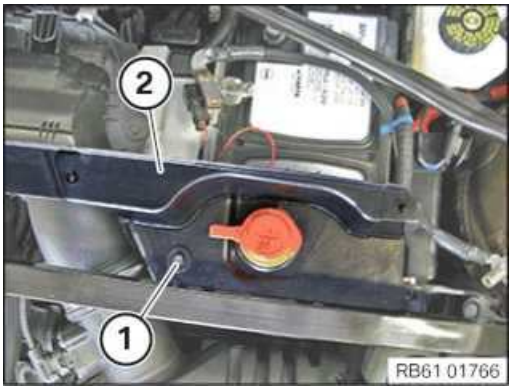
Trailing link

M8		Tightening torque	19 Nm

- Tighten down screw (2).

Battery cover

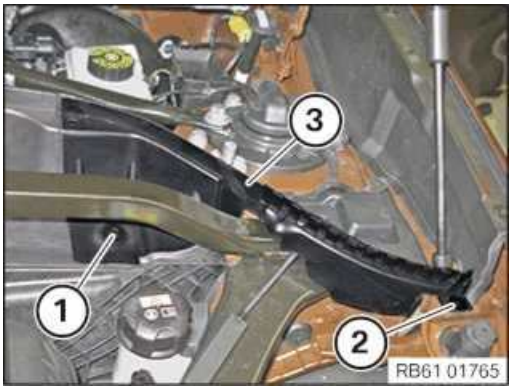
M8		2,8 Nm



- Position the cover (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm

98 – Connecting the battery earth lead

TECHNICAL INFORMATION

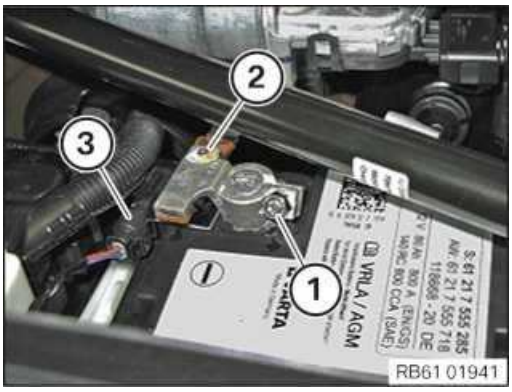
For additional information see:

61 00 ... Safety information on handling the vehicle battery

61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery

61 12 ... Notes on the intelligent battery sensor (IBS)

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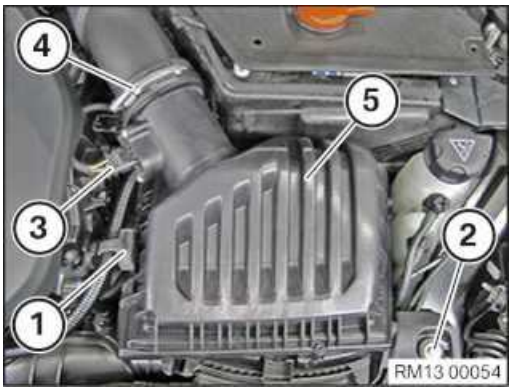
- Remove the protective cover of the positive battery terminal.
- Position the battery earth lead (2).
- Tighten nut (1).

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6			5 Nm

- If required, connect the connector (3).

99 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.

  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

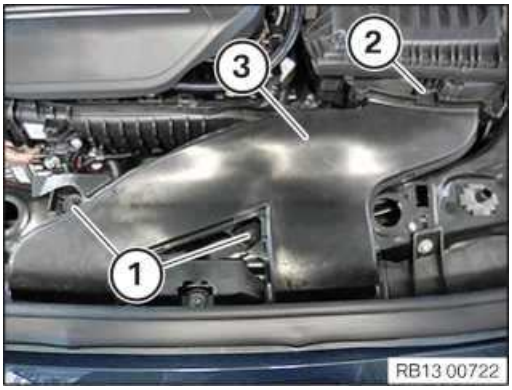
Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Insert and install the holder (1).

100 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

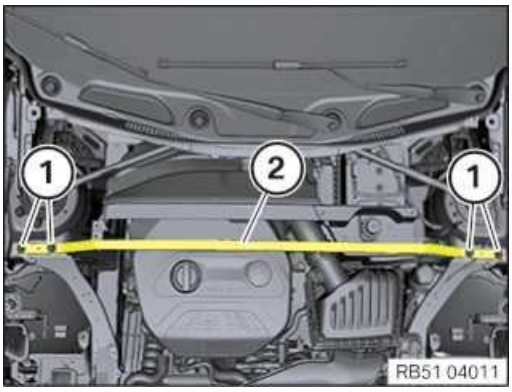
M6		Tightening torque	8 Nm

101 – Install strut brace

TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.

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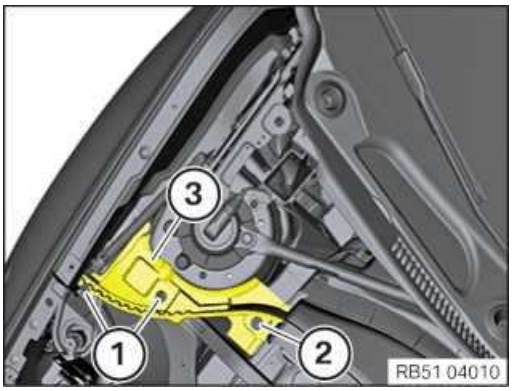


- Install the strut brace (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-brace to spring strut dome

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °



NOTICE

Description is for right component only. The procedure on the left side is identical.

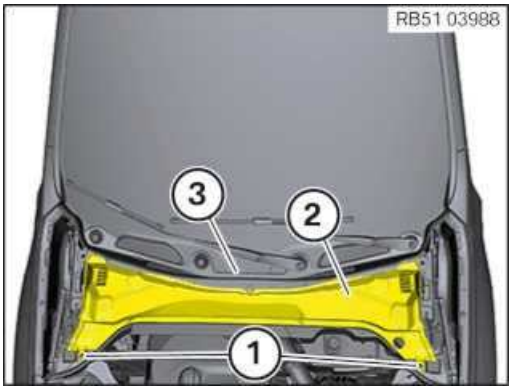
- Install the cover (3).
- Tighten down screw (2).

Cover on body

Hexagon screw		Tightening torque	3 Nm

- Install the expanding rivet (1).

102 – Installing front cowl panel cover

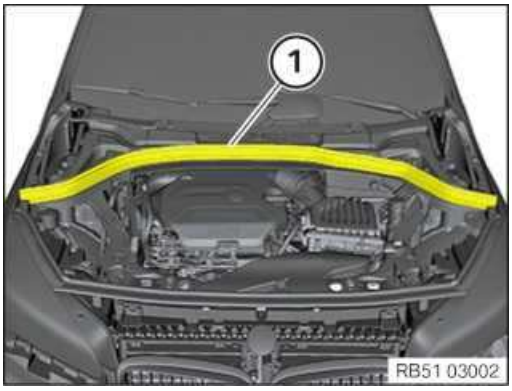


- Insert and install cowl panel cover at front (2) into cowl panel cover at rear (3).
- Check cowl panel cover at front is correctly seated (2).
- Secure expanding rivet (1).

103 – Install the seal for the bonnet

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

104 – Checking/topping up oil level in automatic gearbox (AISIN GA8G45)

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Prerequisite

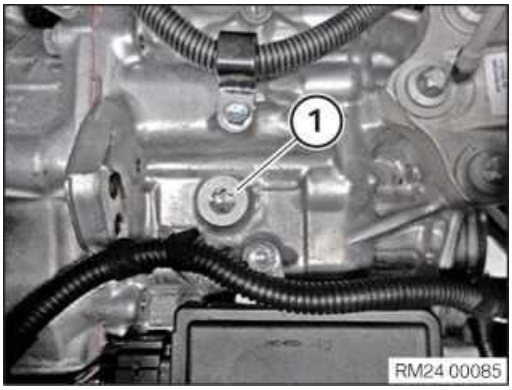
Vehicle in horizontal position.

CAUTION

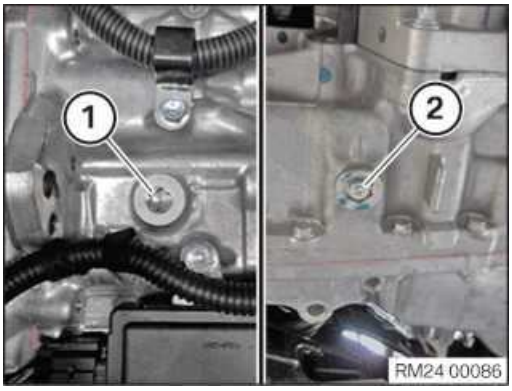
Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.



- Move the selector lever to the "P" position.
- Secure vehicle to prevent it rolling.
- Connect diagnosis system.
- Release the oil filler plug (1) using the Torx T55 .



- **Topping up the automatic transmission fluid (the automatic transmission fluid was drained):**
- Release oil filler plug (1) from engine compartment.
- Loosen the overflow plug (2) below at the transmission.
- Top up automatic transmission fluid at oil filler plug (1) until oil emerges at overflow plug (2).
- Start engine and run at idle speed.
- Check whether the automatic transmission fluid is leaking at the overflow plug (2) .
- If there is no automatic transmission fluid leaking at the overflow plug (2) , fill in the automatic transmission fluid to the oil filler plug (1) .
- Press the footbrake and, when idle, shift through all the gears from "P" to "D" 2 times for more than 2 seconds .
- Move the selector lever to the "P" position.
- Check again whether the automatic transmission fluid is leaking at the overflow plug(2) .
- Read the temperature of the automatic transmission fluid with the diagnosis system.
- Increase temperature of automatic transmission fluid to 35 °C to 45 °C.
- Top up automatic transmission fluid until it flows over.
- Renew sealing rings.

  Parts: Sealing ring
- Screw in and fasten oil filler plug (1) and overflow plug (2).

Oil filler plug to transmission housing

M14	Renew the sealing ring.	Tightening torque	45 Nm

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Overflow screw in oil drain plug

M6	Renew the sealing ring.		8 Nm

- **Check oil level (transmission oil temperature must be between** 35 °C **and** 45 °C **):**
- Open the oil filler plug (1).
- Slacken overflow plug (2).
- Start engine and run at idle speed.
- Unscrew and remove overflow plug (2).
- Check whether the automatic transmission fluid is leaking at the overflow plug (2) .
- If there is no automatic transmission fluid leaking at the overflow plug (2) , fill in the automatic transmission fluid to the oil filler plug (1) .
- Top up the automatic transmission fluid until it overflows at the overflow plug (2) .
- Press the footbrake and, when idle, shift through all the gears from "P" to "D" 2 times for more than 2 seconds .
- Move the selector lever to the "P" position.
- Check the oil level again.
- Renew sealing rings.

  Parts: Sealing ring
- If the oil escapes slightly from the overflow plug (2) , tighten the overflow plug (2) and the oil filler plug (1) .

Overflow screw in oil drain plug

M6	Renew the sealing ring.		8 Nm

Oil filler plug to transmission housing

M14	Renew the sealing ring.	Tightening torque	45 Nm

105 – Topping up oil level in the manual gearbox (GS6X60DA)

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

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TECHNICAL INFORMATION

Make sure during removal of the filling/level control screw to note the installed filling/level control screw variant.

It is **mandatory** to use variant 1 in transmissions up to production date 08/2015.

It is **mandatory** to use variant 2 in transmissions from production date 08/2015.

Failure to observe will result in a leak on the transmission.

- Variant 1 **until** production date 08/2015.
- Variant 2 **from** production date 08/2015.



- Unscrew filling/level control screw (1) and fill the transmission until the oil overflows.

Transmission oil capacity

Transmission oil GS6-60DA, GS6X60DA/Owner's Handbook	2,2 l

Transmission oil: Technically suitable manual gearbox oil

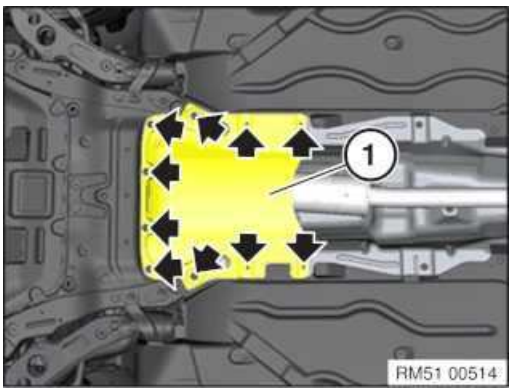
- Allow surplus oil to drain off.
- Renew the filling/level control screw (1).

  Parts: Filling/level control screw
- Tighten filling/level control screw (1).

Oil drain plug / oil filler plug

Hexagon socket		Tightening torque	43 Nm

106 – If installed: Installing underbody protection at rear

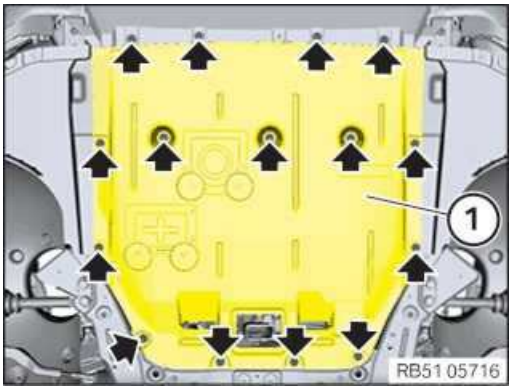


- Position rear underbody protection (1).
- Tighten screws (arrows).

Underbody protection to body

Screw		Tightening torque	3 Nm

107 – Installing the front underbody protection

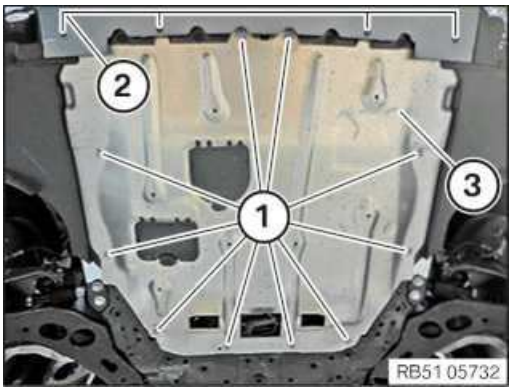


- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

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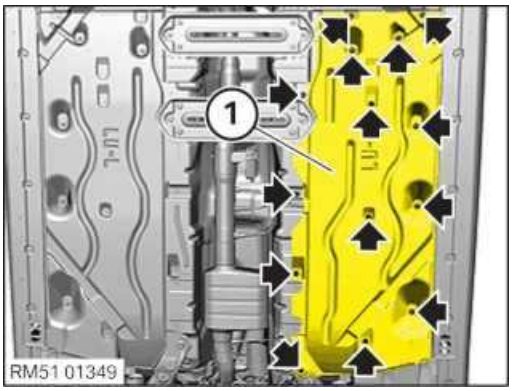


- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

108 – Installing underbody panelling , right



- Correctly position the underbody panelling (1).
- Tighten all bolts and nuts (arrows).

Underbody panelling, side

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side

Plastic nut		Tightening torque	2,6 Nm

Additional Information

Overview of Tightening Torques

Exhaust-gas recirculation cooler to exhaust manifold — Used in step 53

M8x28	Replace screws	Tightening torque	32 Nm

Oil return line to turbocharger — Used in step 53 56

M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase — Used in step 53

M8x16		Tightening torque	22 Nm

Exhaust turbocharger to exhaust manifold — Used in step 56

V-band clamp		Tightening torque	19 Nm

Oil feed line to bracket — Used in step 56

Torx screw M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase — Used in step 56

M8x16		Tightening torque	22 Nm

Heat shield for exhaust turbocharger — Used in step 57

Torx screw BM 6x12		Tightening torque	10 Nm

Banjo bolt for exhaust pressure pipe to exhaust manifold — Used in step 57

Hollow bolt	Renew sealing rings.	Tightening torque	30 Nm

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Standard screw connection M6

Used in step 57

M6			8 Nm

Charge air duct to oil sump

Used in step 58

M6		Tightening torque	8 Nm

Ride height sensor holder to front axle support

Used in step 58

M6		Tightening torque	8 Nm

Adapter, front axle support to front axle support

Used in step 58

		Tightening torque	100 Nm

Cross connection to front axle support

Used in step 58

M6		Tightening torque	12 Nm

Washer fluid reservoir to body

Used in step 59

M6x20		Tightening torque	8 Nm

Diesel particulate filter V-clip to exhaust turbocharger

Used in step 60

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Diesel particle filter to holder

Used in step 60

M8 hexagon nut		Tightening torque	19 Nm

Diesel particulate filter holder to gearbox

Used in step 60

M12x75		Tightening torque	66 Nm

Diesel particulate filter bracket to crankcase

Used in step 60

M10x35		Tightening torque	38 Nm

SCR metering module V-clip to exhaust system

Used in step 60

V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm

Holder for coolant lines to diesel particulate filter

Used in step 60

Torx bolt BM6x16		Tightening torque	8 Nm

Differential pressure sensor to holder

Used in step 60

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor

Used in step 60

Clamp 15–19mm		Tightening torque	3 Nm

Control sensor

Used in step 61

Control sensor		Tightening torque	50 Nm

Exhaust temperature sensor to diesel particulate filter

Used in step 62 63

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Exhaust-gas temperature sensor to exhaust system

Used in step 64

Exhaust-gas temperature sensor		Tightening torque	28 Nm

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Oxygen sensor holder to intermediate shaft

Used in step 65

Hexagon screw M6x16		Tightening torque	8 Nm

Nitrogen oxide sensor before SCR catalytic converter

Used in step 66

Sensor		Tightening torque	50 Nm

Monitoring sensor

Used in step 67

Sensor		Tightening torque	50 Nm

Transfer box to transmission

Used in step 68

M10		Tightening torque	56 Nm

Heat shield to transfer box

Used in step 68

M6	Renew screws.	Tightening torque	6 Nm

Oil filler plug on transfer box (VTG)

Used in step 68

M18x1.5		Tightening torque	35 Nm

Intermediate shaft to transfer box

Used in step 69

M8x35		Tightening torque	19 Nm

Starter motor to transmission

Used in step 70

M8x45		Tightening torque	19 Nm

Battery positive lead to starter

Used in step 70

M8		Tightening torque	13,5 Nm

Propeller shaft to transfer box

Used in step 73

		Tightening torque	80 Nm

Flexible disc to rear axle final drive

Used in step 73

M12x1.5	Renew screws.	Tightening torque	55 Nm 90 °

Centre mount to body

Used in step 73

M8		Tightening torque	19 Nm

Heat shield to body

Used in step 74 75

Bolts/nut		Tightening torque	3 Nm

Bracket to body

Used in step 74

M8		Tightening torque	21 Nm

Exhaust system to body

Used in step 76

M8	Replace nuts.	Tightening torque	19 Nm

Exhaust bracket on body

Used in step 76

Hexagon screw M8x30		Tightening torque	19 Nm

V-clip to catalytic converter

Used in step 76

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

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Diesel particulate sensor to exhaust system

Used in step 76

Sensor		Tightening torque	50 Nm

Nitrogen oxide sensor downstream of SCR catalytic converter

Used in step 76

Sensor		Tightening torque	50 Nm

Cross-member/torsion strut to axle support and mounting

Used in step 77

M12x48	Renew screws.	Jointing torque Angle of rotation	100 Nm 90 °

Front connection carrier to body

Used in step 78

M10x18		Tightening torque	56 Nm

Rear connection carrier to body

Used in step 78

M8x18		Tightening torque	28 Nm

Rear end of front axle support to body

Used in step 79

M14 screw	Renew screw.	Tightening torque	175 Nm

Front axle support, front to body

Used in step 79

M12 screw	Renew screw.	Tightening torque	108 Nm

Underbody protection to body

Used in step 79 106

Screw		Tightening torque	3 Nm

Track rod end to swivel bearing

Used in step 79

M14	Renew nut.	Tightening torque	175 Nm

Wishbone to swivel bearing

Used in step 79

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

Holder, wishbone rubber mount, to body

Used in step 80

M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °

Holder with rubber mount to front axle support

Used in step 80

M12 screw			100 Nm

Washer fluid reservoir holder to front axle support adapter plate

Used in step 80

		Tightening torque	10 Nm

Deformation element, bottom, to adapter plate, front axle carrier

Used in step 80

		Tightening torque	11,8 Nm

Holder to front axle support

Used in step 81

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

Anti-roll bar link to anti-roll bar

Used in step 83

M10	Renew nut.	Tightening torque	56 Nm

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Wheel arch cover to body

Used in step 85

Plastic nut		Tightening torque	2,6 Nm
Screw		Tightening torque	2,6 Nm

Wheel arch cover to body

Used in step 85

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Used in step 85

Plastic nut		Tightening torque	3 Nm

Brake disc to rear wheel hub

Used in step 86

M8	Renew screw.	Tightening torque	16 Nm

Brake disc to front wheel hub

Used in step 86

M8	Renew screw.	Tightening torque	16 Nm

Wheel bolts

Used in step 86

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Lower steering shaft to steering gear

Used in step 88

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

Steering column cover to bulkhead

Used in step 88

Plastic nut		Tightening torque	3 Nm

Heat shield for exhaust turbocharger

Used in step 89

Torx screw BM 6x12		Tightening torque	10 Nm

Rear bulkhead upper part to lower section of bulkhead

Used in step 90

Oval-head screw		Tightening torque	5 Nm

Battery holder to engine support

Used in step 91

Hexagon screw M8x30		Tightening torque	19 Nm

Electronics box to battery tray

Used in step 92

M8X16		Tightening torque	15 Nm

Wiring harness to cylinder head cover

Used in step 92

TS5x20		Tightening torque	3,5 Nm

Cover to electronics box

Used in step 92

RF5x26.5		Tightening torque	2,5 Nm

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Positive battery terminal to battery

Used in step 92

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray

Used in step 92

M8		Tightening torque	19 Nm

Clean air pipe to cylinder head cover

Used in step 93

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing

Used in step 93 99

Clamp		Tightening torque	3 Nm

Resonator to manifold and clean air pipe

Used in step 94

Screw TS6	Renew screw.	Tightening torque	5 Nm

Cover of top bulkhead

Used in step 96

Screw		Tightening torque	2,6 Nm

Cover of remote positive terminal

Used in step 96

Screw		Tightening torque	2,6 Nm

Battery terminal rail to battery tray

Used in step 97

M8			19 Nm

Battery terminal with IBS positive battery terminal / negative battery terminal

Used in step 97 98

NutM6			5 Nm

Trailing link

Used in step 97

M8		Tightening torque	19 Nm

Battery cover

Used in step 97

M8			2,8 Nm

Intake silencer housing to lock bridge

Used in step 99

M6X30		Tightening torque	8 Nm

Intake neck to cross connection

Used in step 100

M6		Tightening torque	8 Nm

Cross-brace to spring strut dome

Used in step 101

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

Cover on body

Used in step 101

Hexagon screw		Tightening torque	3 Nm

Oil filler plug to transmission housing

Used in step 104

M14	Renew the sealing ring.	Tightening torque	45 Nm

Overflow screw in oil drain plug

Used in step 104

M6	Renew the sealing ring.		8 Nm

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Oil drain plug / oil filler plug

Used in step 105

Hexagon socket		Tightening torque	43 Nm

Underbody protection front

Used in step 107

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Underbody panelling, side

Used in step 108

Hexagon screw		Tightening torque	2,6 Nm

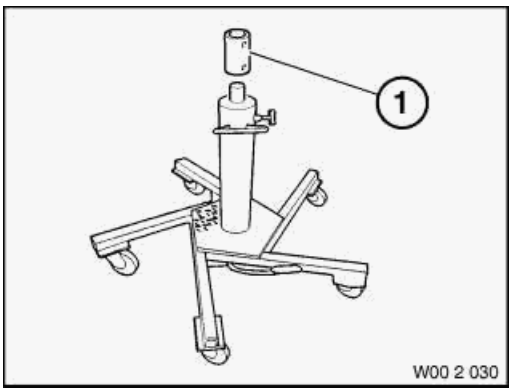
Underbody panelling, side

Used in step 108

Plastic nut		Tightening torque	2,6 Nm

Overview of Special Tools

0 490 133 (00 2 030) Device



Common

Used in step 28 79

Usage	(universal hydraulic lifter base unit) Chassis and hydraulic lifter - For removing and installing rear axle supports and gearboxes. Also for soft top mounts. Is replaced by 81 22 2 219 012
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 90 (207)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 490 134 (00 2 031)		**Adapter** (adapter for gearbox holder) Model series: E30, E31, E32, E34, E36	

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0 495 554 (33 5 070) Extension



Common

Used in step 34 73

Usage	Pull-out extension for 33 5 040, 33 5 050, 33 5 060.
Included in the tool or work	
Storage location	A18
Replaced by	
In connection with	
SI-Number	01 21 06 (300)

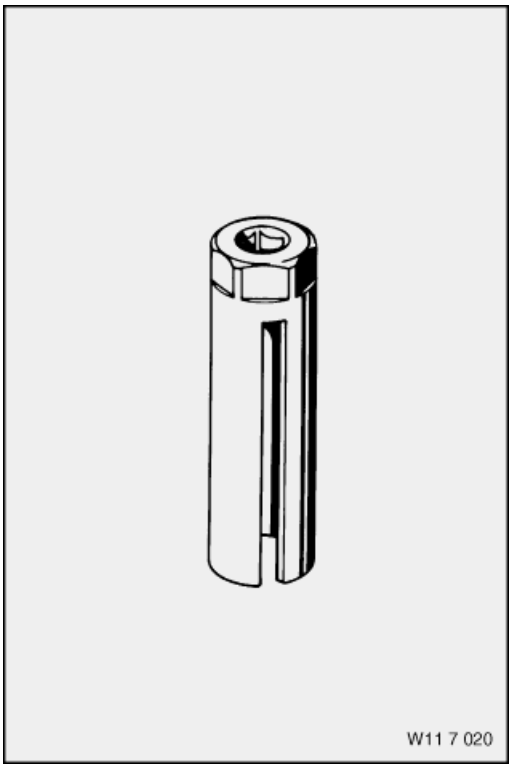
Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 592 (33 5 071)		**Extension** (Extension (1 item)) discontinued, can only be ordered using complete tool	

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0 491 074 (11 7 020) Socket wrench insert

Used in step 40 41 67

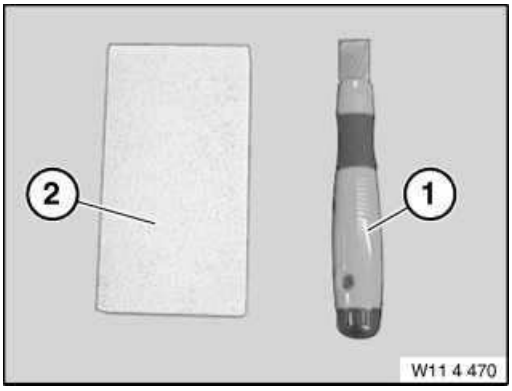


Common

Usage	(Socket wrench insert 22 mm) For loosening and tightening the oxygen sensor
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	

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0 495 102 (11 4 470) Tool



Common

Used in step 53

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

2 409 025 Puller



Common

Used in step 68

Usage	For disassembly of the outer radial shaft seal of the transmission output shaft, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A76
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

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2 411 739 Puller



Common	Used in step 68
Usage	For disassembly of the inner radial shaft seal of the output, right. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C78
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

2 408 152 Striking element



Common	Used in step 68
Usage	For installation of the right radial shaft seal transmission output shaft (inner). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

2 413 037 Handle



Common	Used in step 68
Usage	Universal drift handle. Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C77
Replaced by	
In connection with	
SI-Number	01 53 14 (211)

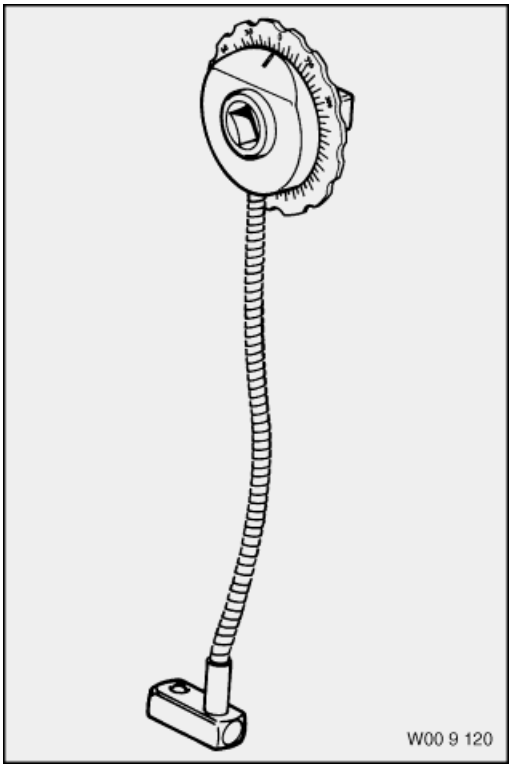
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2 408 150 Striking element



Common	Used in step 68
Usage	For installing the right radial shaft seal transmission output shaft (outer). Contour-graphic silhouette foil is included in the delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	B78
Replaced by	
In connection with	2413037
SI-Number	01 53 14 (211)

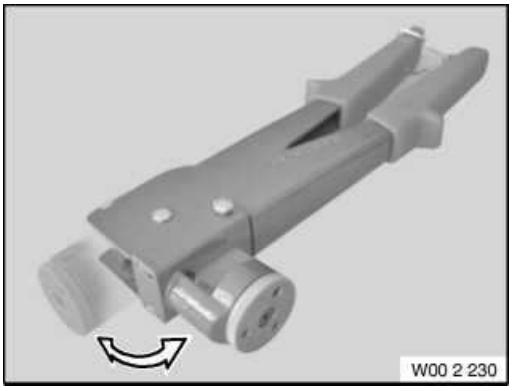
0 490 504 (00 9 120) Torque angle measuring dial



Common	Used in step 73
Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

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0 496 521 (00 2 230) Pliers



Common	Used in step 85
Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

2 344 011 Tool



Common	Used in step 86
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

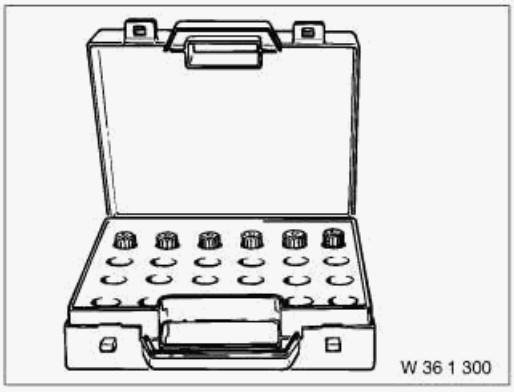
0 495 221 (36 1 323) Wheel stud



Common	Used in step 18
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 224 (36 1 326) Wheel stud



Common	Used in step 18
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud



Common	Used in step 18
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

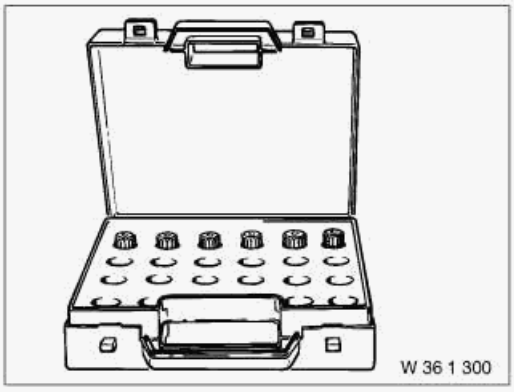
0 495 226 (36 1 328) Wheel stud



Common	Used in step 18
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 227 (36 1 329) Wheel stud



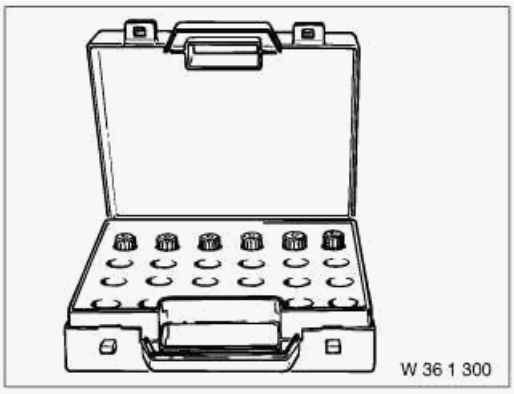
Common	Used in step 18
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud



Common	Used in step 18
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 229 (36 1 332) Wheel stud



Common	Used in step 18
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud



Common	Used in step 18
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

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Transmission oil capacity	Used in step 105
Transmission oil GS6-60DA, GS6X60DA/Owner's Handbook	2,2 l
Transmission oil: Technically suitable manual gearbox oil	

Links

Functional descriptions	Used in step
Troubleshooting on the exhaust turbocharger	54

General repair instructions	Used in step
61 20 ... Notes on AGM battery	98
61 12 ... Notes on intelligent battery sensor (IBS)	98
61 00 ... Notes for disconnecting and connecting battery	98
41 00 ... Notes on repairing threads	
61 00 ... Safety information for handling vehicle battery	

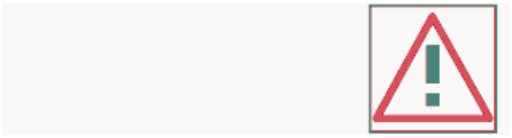
Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	12 40 41 43 44 45 46 47
11 65 ... Test steps in the event of turbocharger damage	54
11 65 020 Turbocharger damage due to blocked oil supply lines	54
00 .. ... Raising the vehicle using a vehicle hoist	

Operating materials	Used in step
2.0 Grease for wheel centring	86
14.0 Automatic transmission fluid for ZF-transmission GA8HP45Z / GA8HP50Z / GA8HP70Z / GA8HP90Z / GA8P70H / GA8P75H / GA8HP75Z	104

Operating materials	Used in step

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11 65 ... Test steps in the event of turbocharger damage



Attention!

The following components must always be checked for foreign bodies, damage and function before installing the new turbocharger.

- Pressure pipe and hoses
- Charge air cooler
- Intake plenum
- If the oil return line is exchanged, then the connecting pipe to the oil sump must ALWAYS be cleaned, as this can even coke!

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11 66 006 Removing and installing / replacing non-return valve

TECHNICAL INFORMATION

- When the engine is stopped after the end of the journey, it may be necessary to run the electric fan. In rare cases, operation of the electric fan can last up to 11 min. This protects the components. In this case, replacing the electric fan will not remedy the problem!

PRELIMINARY WORK

1 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

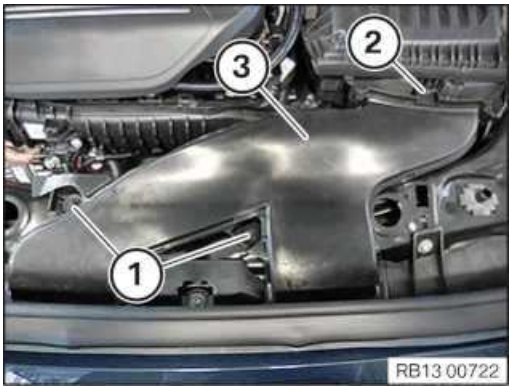
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

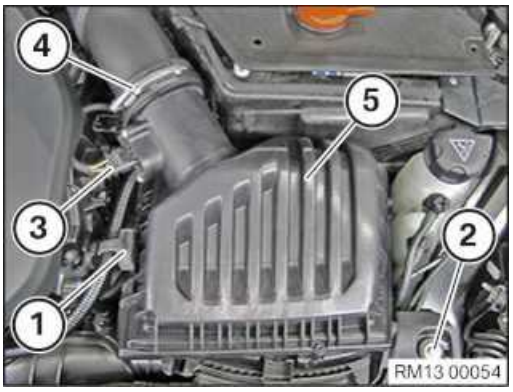
2 – Remove the intake neck for intake silencer housing



- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

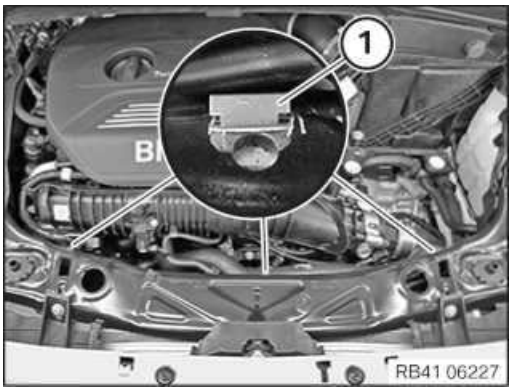
3 – Removing intake silencer housing

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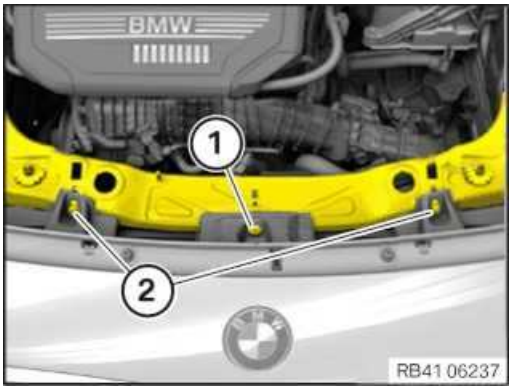


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

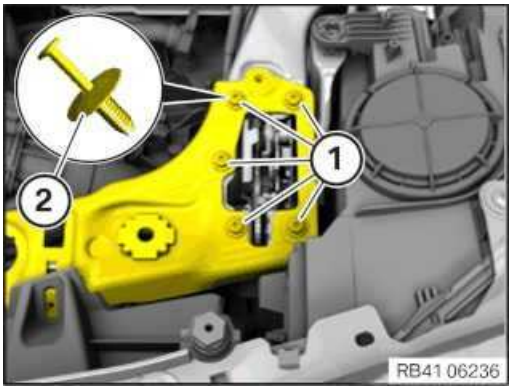
4 – Remove front cross connection



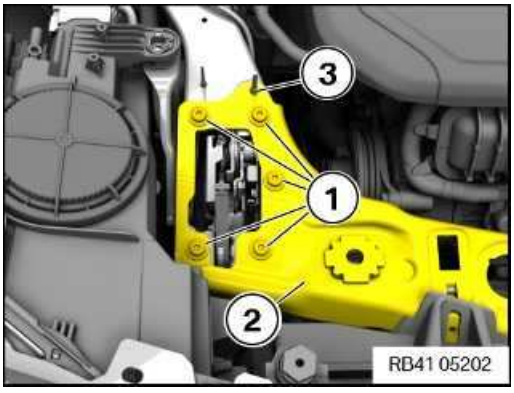
- Detach the clamps (1) for the Bowden cable of the bonnet locks from the cross connection.



- Loosen screw (1).
- Loosen screws (2).



- Loosen screws (1).
- Lever out expanding rivet (2).



- Loosen screws (1).
- Unclip the front cross connection (2) from the rubber retainer (3) and remove it upward.

5 – Removing the fan cowl with electric fan

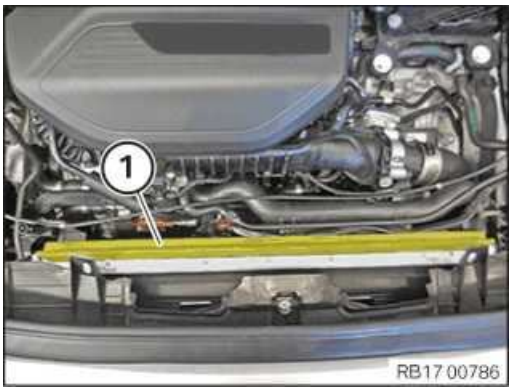
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WARNING

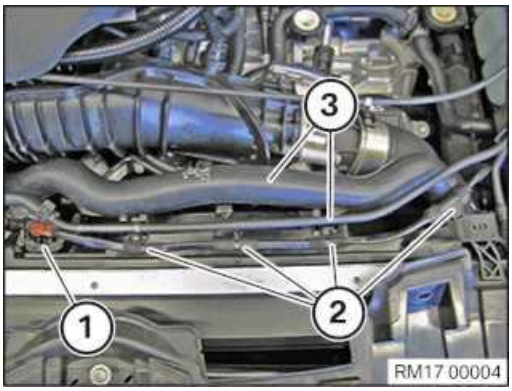
Hot surfaces.

Risk of burning!

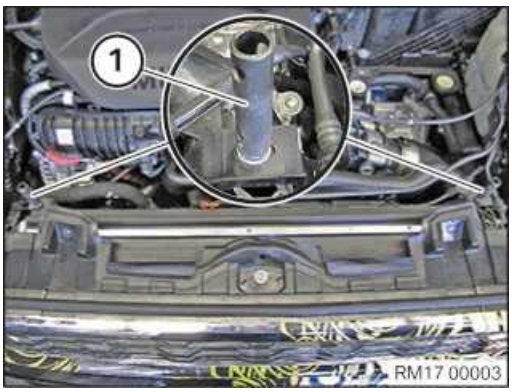
- Perform all work only on components that have cooled down.



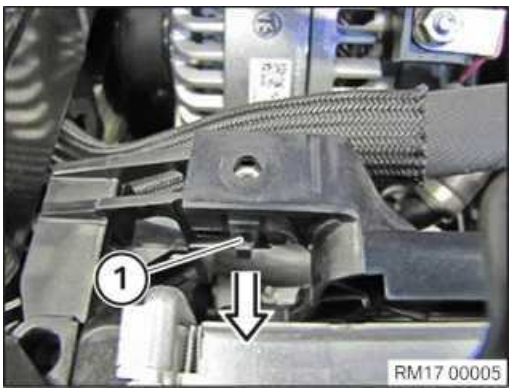
- Feed out and remove the sealing (1) from the radiator.



- Unlock plug connection (1) and disconnect.
- Unlock and loosen the clamps (2).
- Feed out connector (1) and place to one side.
- Thread off coolant line (3) and place to the side.

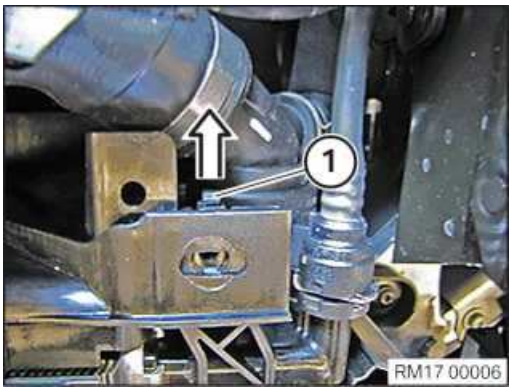


- Loosen screws (1).

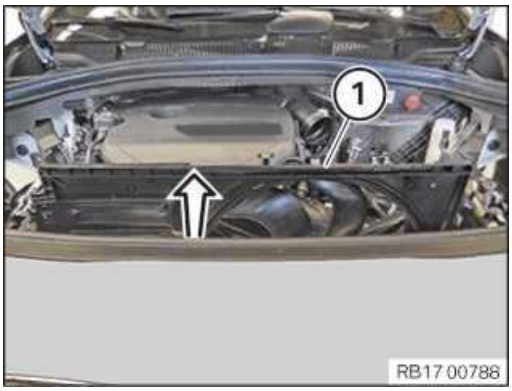


- Unlock the right lock (1) on the fan cowl in the direction of the arrow.

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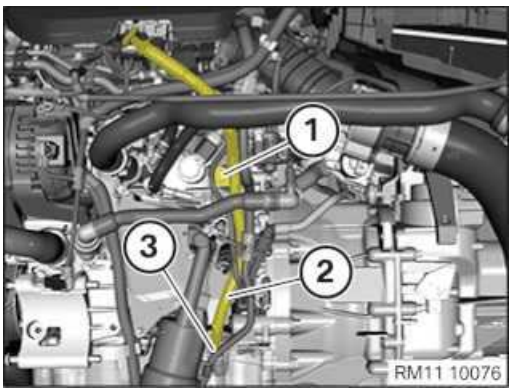


- Unlock the left lock (1) on the fan cowl in the direction of the arrow.



- Guide out fan cowl (1) in direction of arrow and remove.

6 – Removing the guide tube for the oil dipstick



- Unscrew the bolt (1) in the marked area.
- Disconnect the guide tube (2) for the oil dipstick toward the top from the oil sump and remove it.
- Remove sealing ring (3) from oil sump if necessary.

MAIN WORK

7 – Remove non-return valve

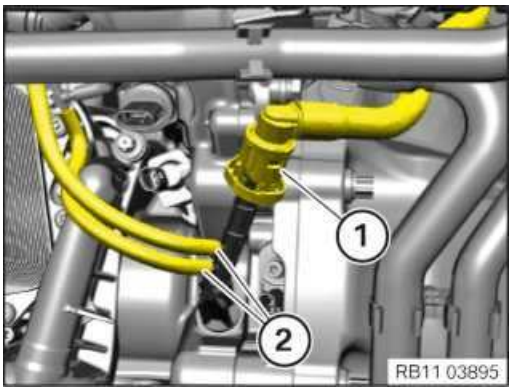
RISK OF DAMAGE

Contaminant or foreign body.

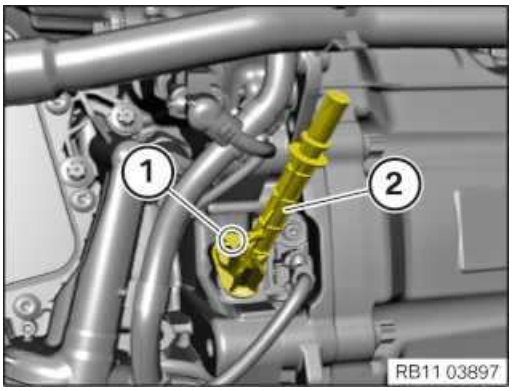
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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- Unlock and pull off the vacuum line (1).
- Pull off the vacuum hoses (2).



- Loosen screw (1).
- Feed out the non-return valve (2) and remove.

8 – Installing the non-return valve



- Renew gasket (1) using special tool **0 496 714 (00 9 030)**.

  Parts: Gasket

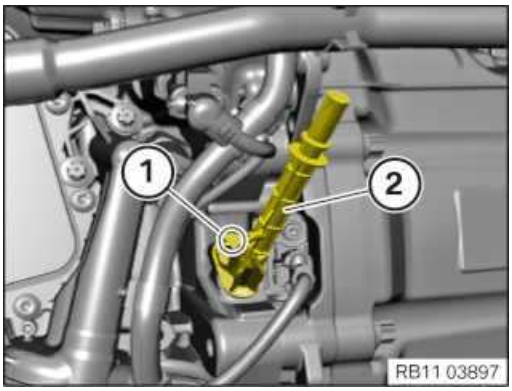


RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.
- Clean sealing surface.

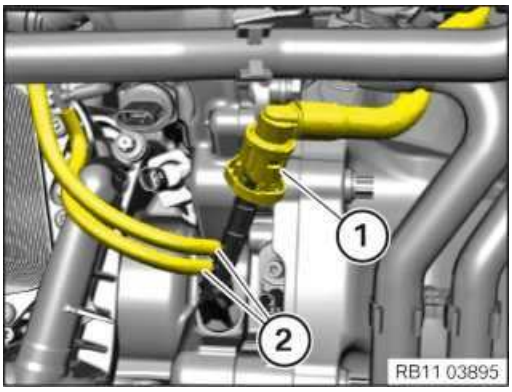


- Feed in and install the non-return valve (2).
- Tighten down screw (1).

Vacuum line for oil vacuum pump to crankcase

M6x22		Tightening torque	8 Nm

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TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect the vacuum line (1) and lock it audibly.
- Connect vacuum hoses (2).

POSTPROCESSES

9 – Installing guide tube for oil dipstick

RISK OF DAMAGE

Contaminant or foreign body.

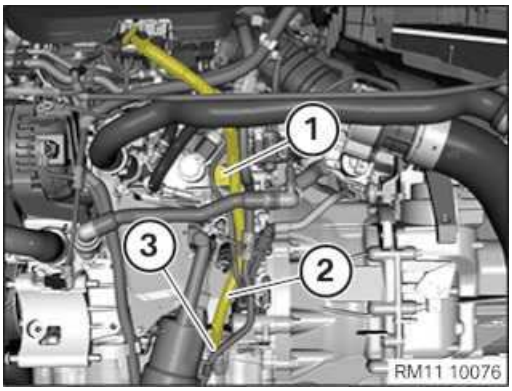
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Renew O-ring (1).

  Parts: O-ring



- Guide in guide tube (2) for oil dipstick and slide it into the oil sump.
- Make sure the sealing ring (3) is positioned correctly in the oil sump.
- Tighten down screw (1).

Guide tube for oil dipstick on engine

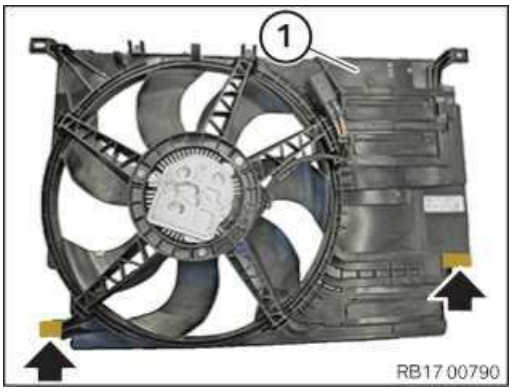
M8x16		Tightening torque	19 Nm

10 – Installing fan cowl with electric fan

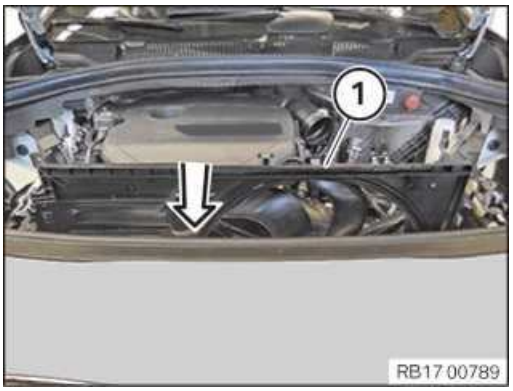
TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

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- Feed the guides (arrows) of the fan cowl (1) into the charge air cooler.



- Feed in and install the fan cowl (1) in the direction of the arrow.



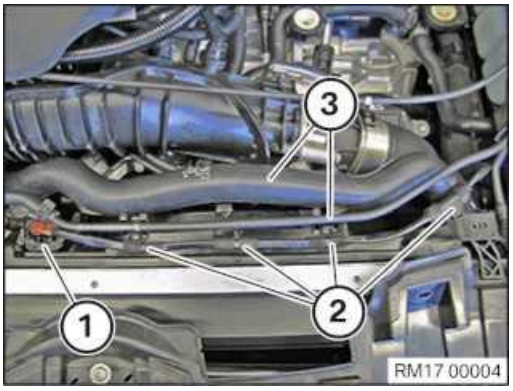
- Lock the left and right locks (arrows).



- Tighten the screws (1).

Fan cowl on radiator

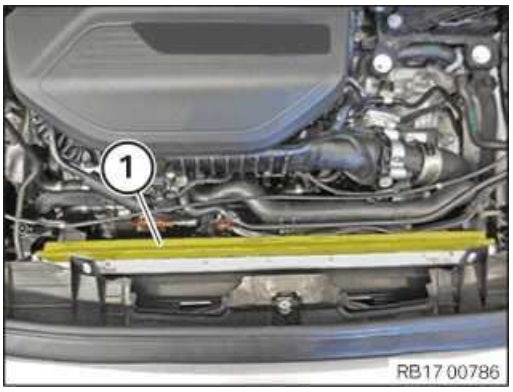
M6X12		Tightening torque	6 Nm



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.
- Secure clamps (2).
- Thread in and install coolant line (3).

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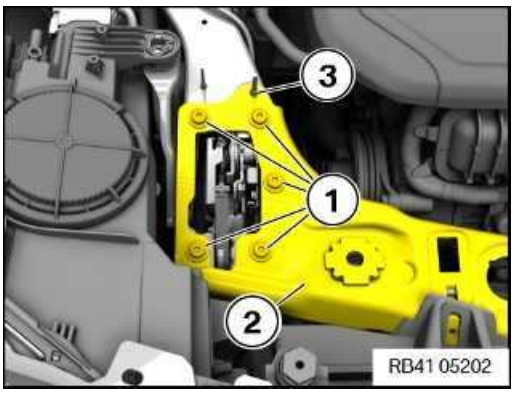


- Guide the sealing (1) on the radiator in and install it.

11 – Install front cross connection



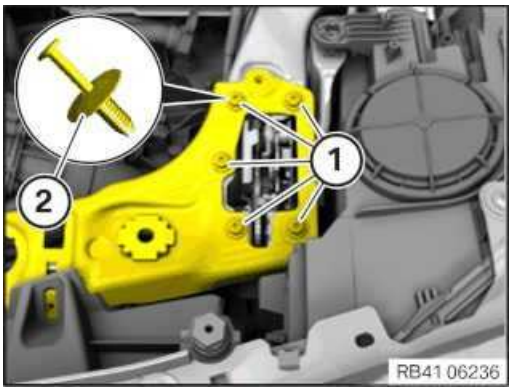
- Right side of vehicle only: Secure spray guard (1) on the cross connection (2) as pictured.



- Position front cross connection (2) and clip front cross connection (2) into the rubber retainer (3) at the same time.
- Tighten the screws (1).

Cross connection to carrier support

Screws M6x20		Tightening torque	11,8 Nm

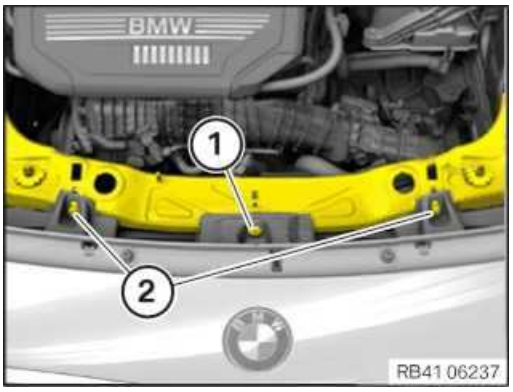


- Tighten the screws (1).

Cross connection to carrier support

Screws M6x20		Tightening torque	11,8 Nm

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- Position screws (3) on the rubber mounts for the radiator and tighten.

Screw connection for rubber mount of coolant radiator to coolant radiator

Bolt to rubber mount		Tightening torque	8 Nm

- Tighten down screws (2).

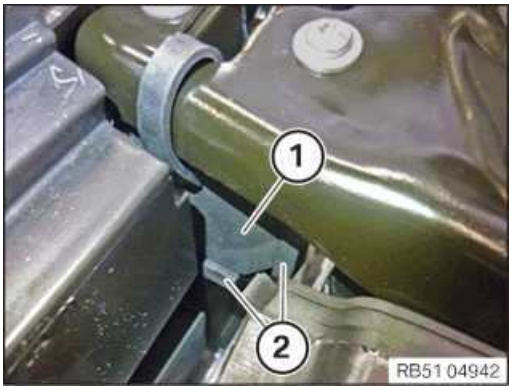
Air duct to upper connection

M6x20 screw		Tightening torque	11,8 Nm

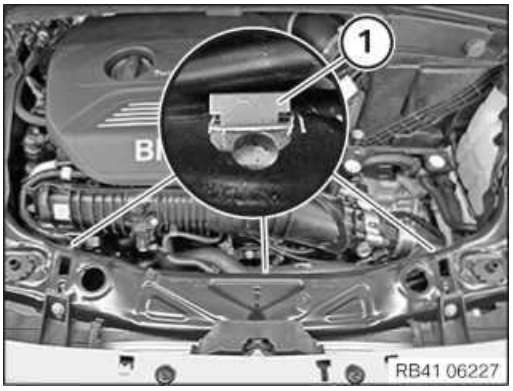
- Tighten down screw (1).

Bracing strut to upper connection

M8x20 screw		Tightening torque	28 Nm

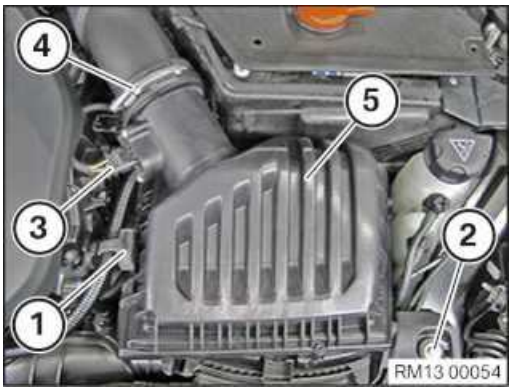


- Right side of vehicle only: Properly mount spray guard (1) to prevent corrosion.
- Secure spray guard (1) to the bridge with retaining tabs (2).



- Fasten the clamps (1) from the Bowden cable of the bonnet lock on the cross connection.

12 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.

  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

Clean air pipe to intake silencer housing

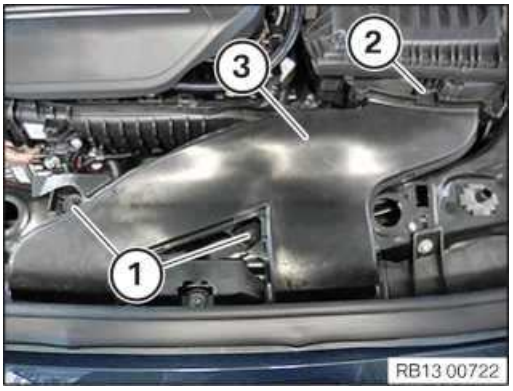
Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Insert and install the holder (1).

13 – Install the intake neck for the intake filter housing

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- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

14 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Check for correct installation of all rubber mounts in the acoustic cover (1).



- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

Additional Information

Overview of Tightening Torques

Vacuum line for oil vacuum pump to crankcase Used in step 8

M6x22		Tightening torque	8 Nm

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Guide tube for oil dipstick on engine			Used in step 9
M8x16		Tightening torque	19 Nm

Fan cowl on radiator			Used in step 10
M6X12		Tightening torque	6 Nm

Cross connection to carrier support			Used in step 11
Screws M6x20		Tightening torque	11,8 Nm

Screw connection for rubber mount of coolant radiator to coolant radiator			Used in step 11
Bolt to rubber mount		Tightening torque	8 Nm

Air duct to upper connection			Used in step 11
M6x20 screw		Tightening torque	11,8 Nm

Bracing strut to upper connection			Used in step 11
M8x20 screw		Tightening torque	28 Nm

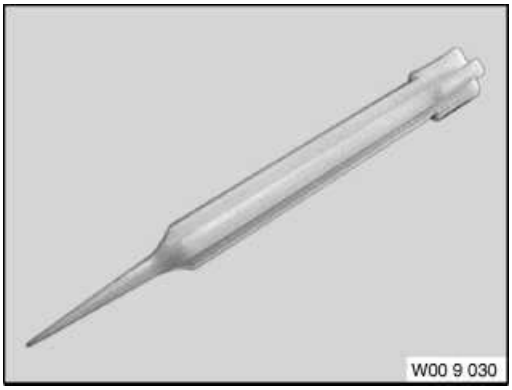
Intake silencer housing to lock bridge			Used in step 12
M6X30		Tightening torque	8 Nm

Clean air pipe to intake silencer housing			Used in step 12
Clamp		Tightening torque	3 Nm

Intake neck to cross connection			Used in step 13
M6		Tightening torque	8 Nm

Overview of Special Tools

0 496 714 (00 9 030) Wedge



Common	Used in step 8
Usage	For dismantling O-rings, gaskets and trim panels. This special tool replaces special tool 00 9 316.
Included in the tool or work	
Storage location	A50
Replaced by	
In connection with	
SI-Number	01 20 09 (581)

Links

Functional descriptions	Used in step
Oil supply	9

Parts

Parts required

Designation	Used in step

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Seal of vacuum line for oil vacuum pump to crankcase	8
Seal, guide tube for oil dipstick on oil sump	9

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11 41 000 Removing and installing or replacing oil/vacuum pump (B47)

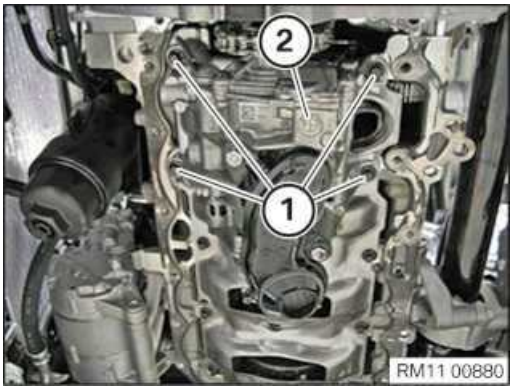
Important!

It is possible to remove and install the oil/vacuum pump **without** removing the gearbox.

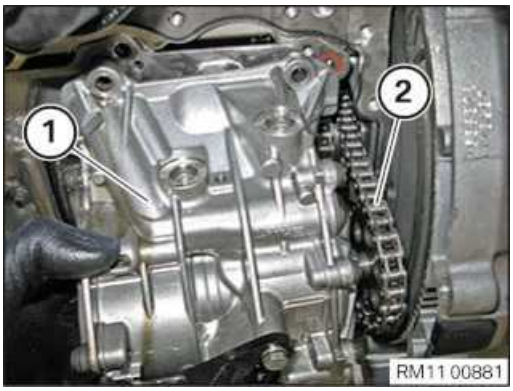
Necessary preliminary tasks:

- Remove oil sump

REMOVAL:

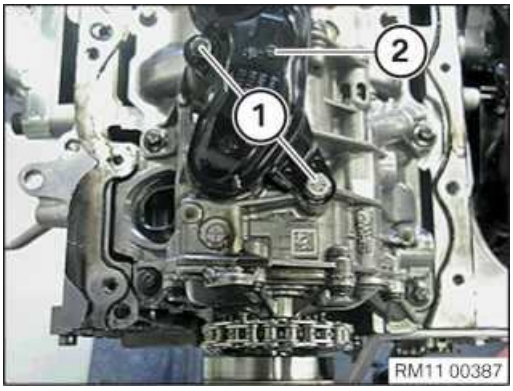


Release screws (1) of oil/vacuum pump (2).



Remove oil/vacuum pump (1) and feed out of drive chain (2).

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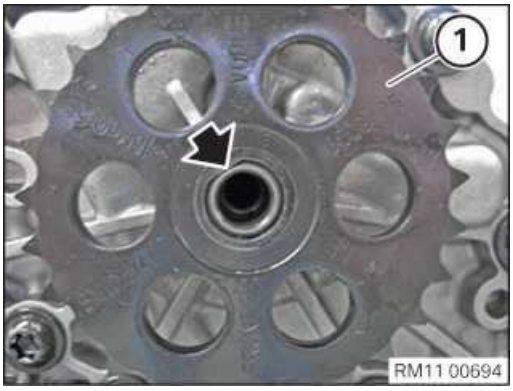


Replacement:

Release screws (1). Remount intake pipe (2).

Tighten down screws (1).

Tightening torque: 11 41 1AZ.



Replacement: Important!

Pay attention to mounting flats on oil pump (see arrow).

Labelling "Front" on the camshaft sprocket (1) needs to be visible.



Replacement:

Important!

Screw (1) has left-hand thread.

"Front" needs to be legible on the camshaft sprocket.

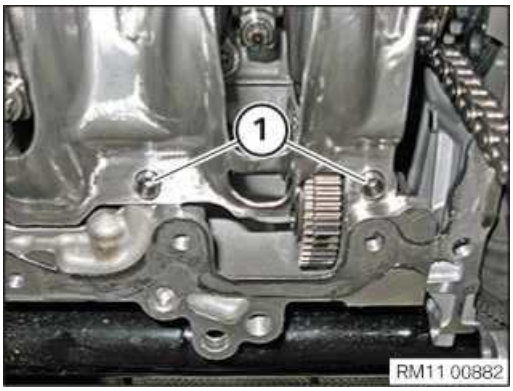
Hold down camshaft sprocket (2) with a suitable tool. Release screw (1). Remount camshaft sprocket.

Parts: Replace screw (1).

Mount camshaft sprocket (2) and hold down with a suitable tool. Tighten screw (1).

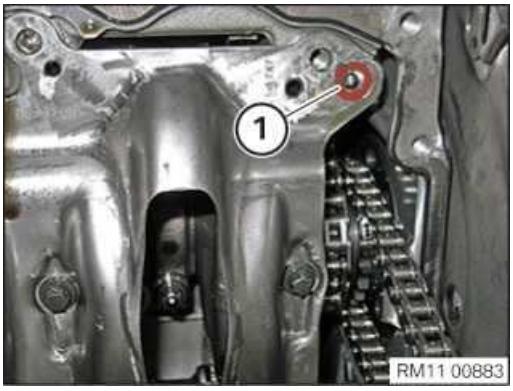
Tightening torque: 11 41 5AZ.

INSTALLATION:

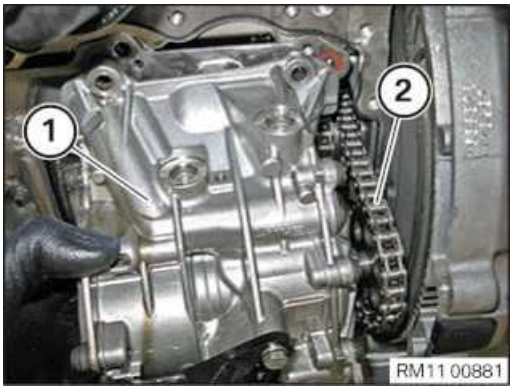


Check centring bushes (1) for damage, replace if necessary.

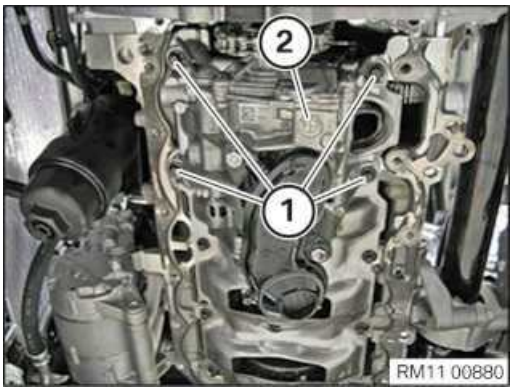
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Note:
Sealing ring (1) must not be damaged or missing.



Feed oil/vacuum pump (1) into drive chain (2).



Tighten down screws (1) of oil/vacuum pump (2).
Tightening torque: 11 41 2AZ.

Required follow-up work:

- Install oil sump
- Check engine for tightness

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11 66 000 Removing and installing or replacing oil/vacuum pump (B47)

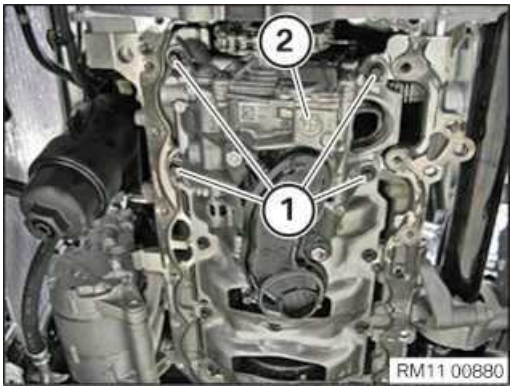
Important!

It is possible to remove and install the oil/vacuum pump **without** removing the gearbox.

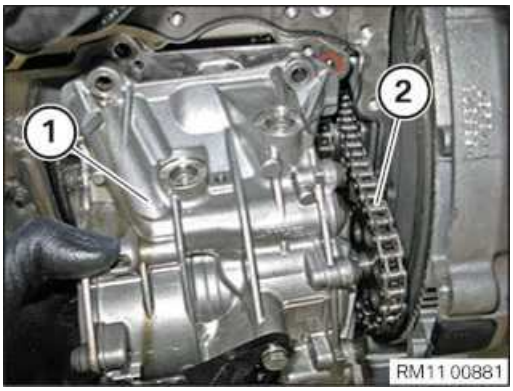
Necessary preliminary tasks:

- Remove oil sump

REMOVAL:

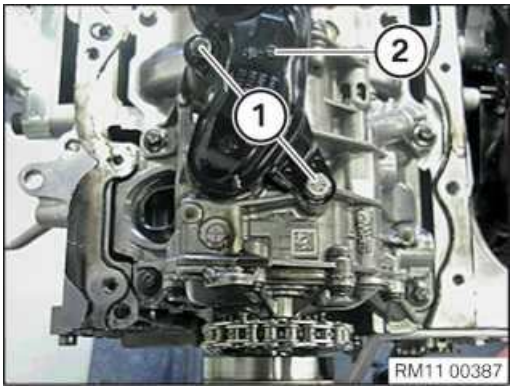


Release screws (1) of oil/vacuum pump (2).



Remove oil/vacuum pump (1) and feed out of drive chain (2).

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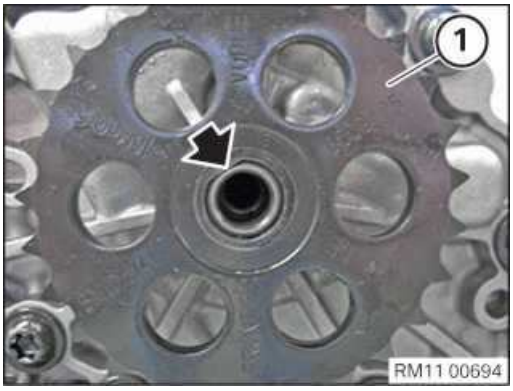


Replacement:

Release screws (1). Remount intake pipe (2).

Tighten down screws (1).

Tightening torque: 11 41 1AZ.



Replacement: Important!

Pay attention to mounting flats on oil pump (see arrow).

Labelling "Front" on the camshaft sprocket (1) needs to be visible.



Replacement:

Important!

Screw (1) has left-hand thread.

"Front" needs to be legible on the camshaft sprocket.

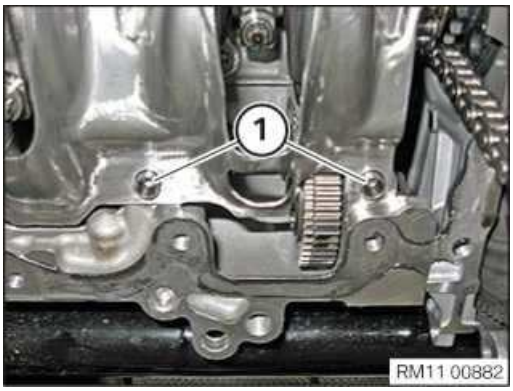
Hold down camshaft sprocket (2) with a suitable tool. Release screw (1). Remount camshaft sprocket.

Parts: Replace screw (1).

Mount camshaft sprocket (2) and hold down with a suitable tool. Tighten screw (1).

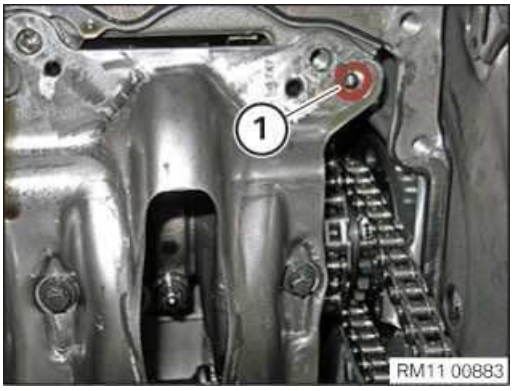
Tightening torque: 11 41 5AZ.

INSTALLATION:

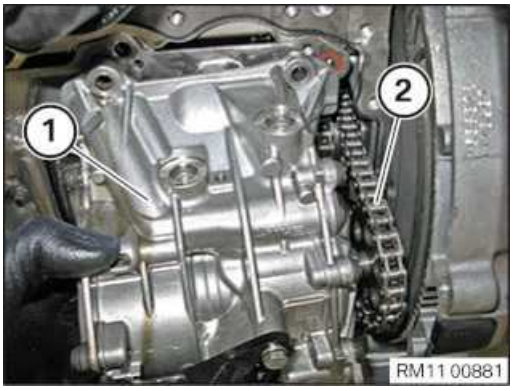


Check centring bushes (1) for damage, replace if necessary.

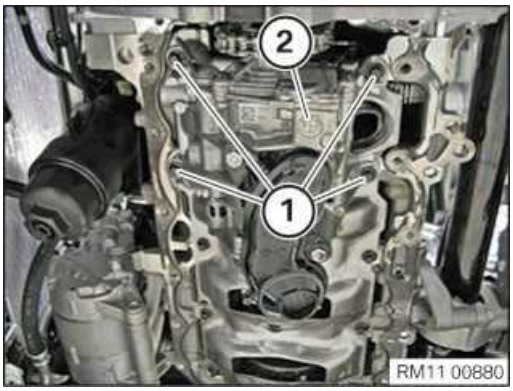
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Note:
Sealing ring (1) must not be damaged or missing.



Feed oil/vacuum pump (1) into drive chain (2).



Tighten down screws (1) of oil/vacuum pump (2).
Tightening torque: 11 41 2AZ.

Required follow-up work:

- Install oil sump
- Check engine for tightness

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This documentation refers to special tools that were not yet available when going to press.

11 66 000 Removing and installing/replacing vacuum pump

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Engine damage caused by excessively filling the engine with engine oil.

Filling an excessive quantity of engine oil may cause engine damage.

- Observe the exact engine oil filling capacity.
- Drain the engine oil.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

PRELIMINARY WORK

1 – Disconnecting all battery earth leads

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- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



RISK OF DAMAGE

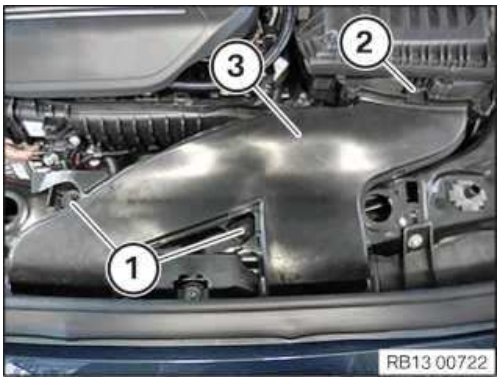
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

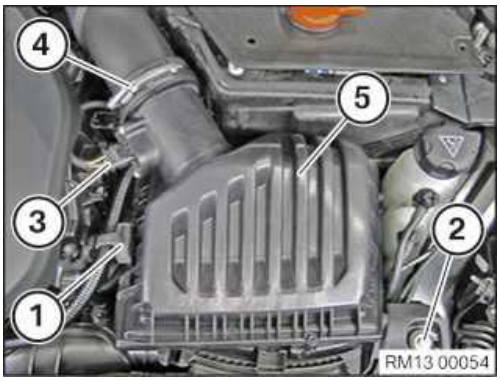
3 – Remove the intake neck for intake silencer housing



- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

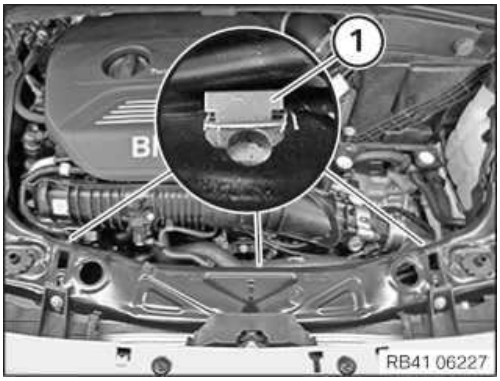
4 – Removing intake silencer housing

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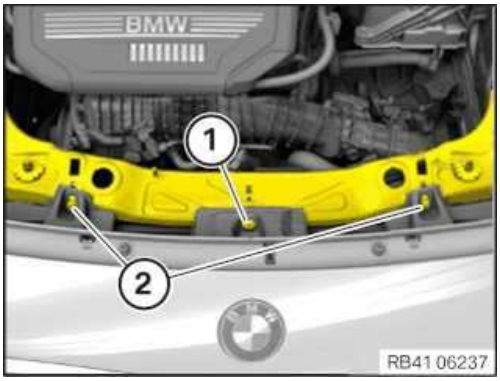


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

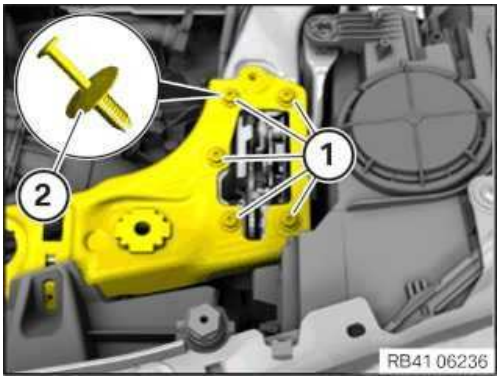
5 – Remove front cross connection



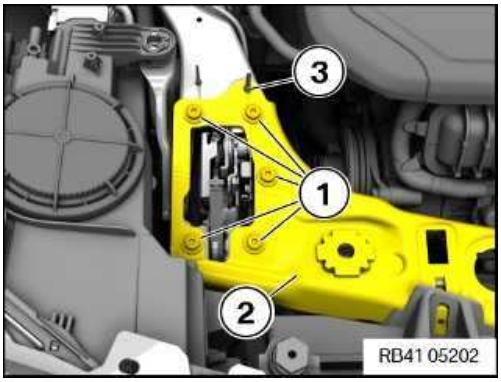
- Detach the clamps (1) for the Bowden cable of the bonnet locks from the cross connection.



- Loosen screw (1).
- Loosen screws (2).



- Loosen screws (1).
- Lever out expanding rivet (2).



- Loosen screws (1).
- Unclip the front cross connection (2) from the rubber retainer (3) and remove it upward.

6 – Removing the fan cowl with electric fan

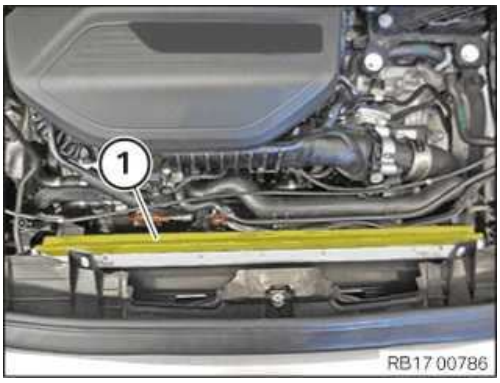
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WARNING

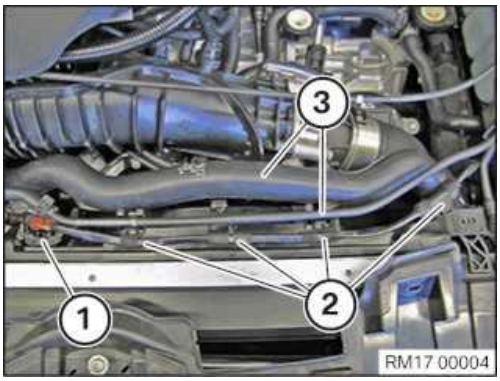
Hot surfaces.

Risk of burning!

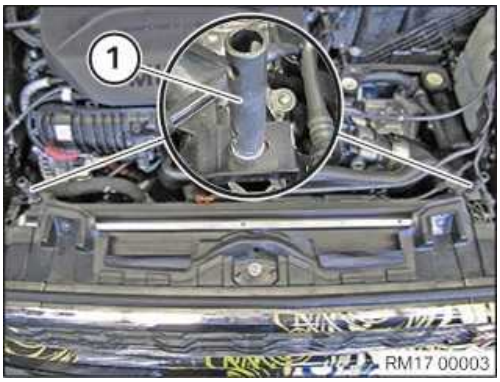
- Perform all work only on components that have cooled down.



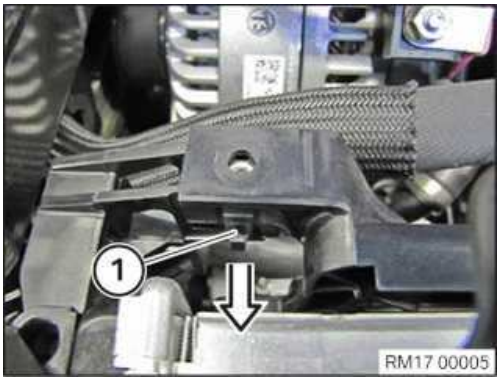
- Feed out and remove the sealing (1) from the radiator.



- Unlock plug connection (1) and disconnect.
- Unlock and loosen the clamps (2).
- Feed out connector (1) and place to one side.
- Thread off coolant line (3) and place to the side.

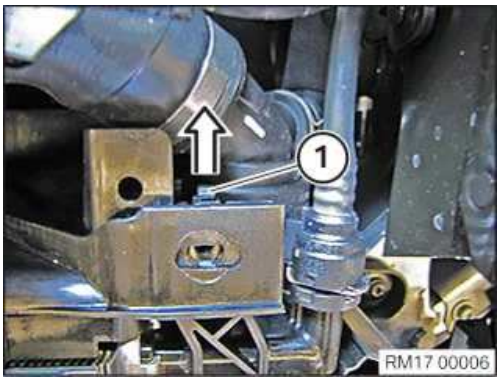


- Loosen screws (1).

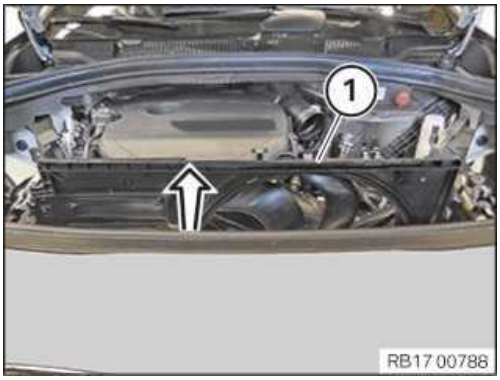


- Unlock the right lock (1) on the fan cowl in the direction of the arrow.

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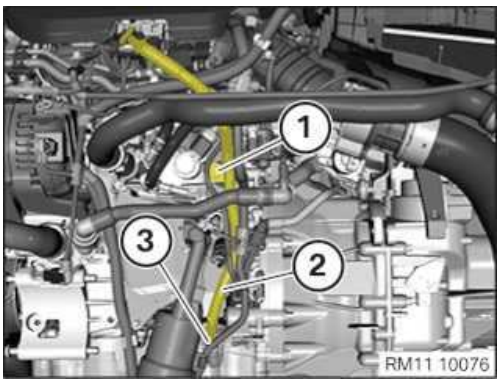


- Unlock the left lock (1) on the fan cowl in the direction of the arrow.



- Guide out fan cowl (1) in direction of arrow and remove.

7 – Removing the guide tube for the oil dipstick



- Unscrew the bolt (1) in the marked area.
- Disconnect the guide tube (2) for the oil dipstick toward the top from the oil sump and remove it.
- Remove sealing ring (3) from oil sump if necessary.

8 – Removing the oil filler cap



- Open oil filler cap (1).

9 – Remove front right wheel

TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

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TECHNICAL INFORMATION

Strictly observe the specified procedure to prevent clamping errors and imbalance.



- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

10 – Removing the front right wheel arch cover

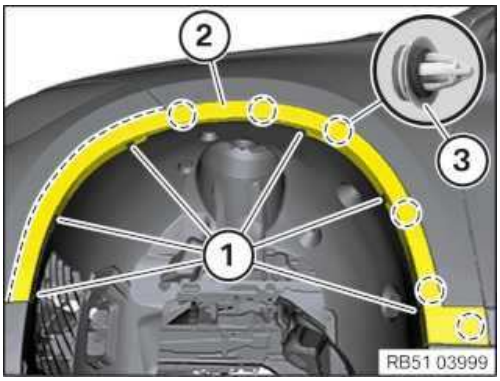
▶ **Remove the front wheel arch trim**

NOTICE

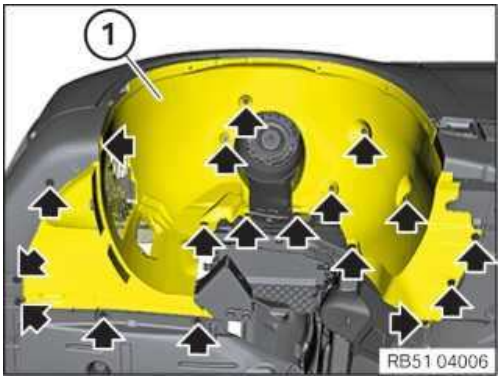
To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.



NOTICE

Description is for left component only. Procedure on the right side is identical.

- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (1) out.

11 – Partially remove the front wheel arch cover

▶ **Partially removing the front wheel arch trim**

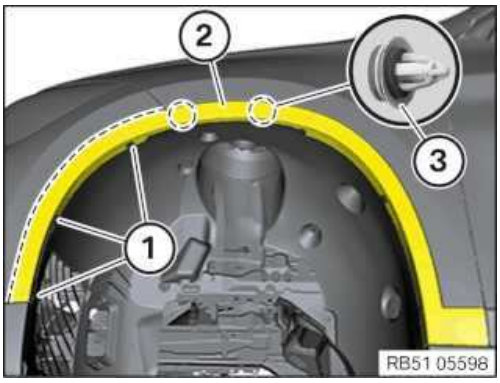
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NOTICE

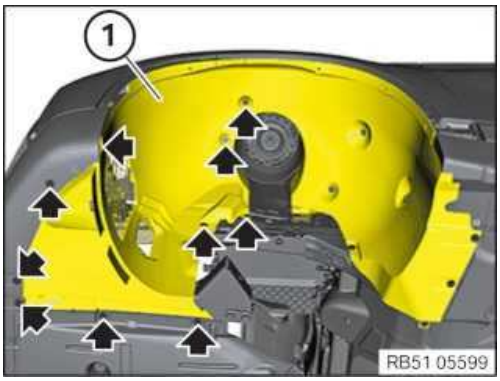
To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Remove the blind rivets (1).
- Release the wheel arch trim (2) in the area of the side panel from the clips (3).
- Release the wheel arch trim (2) from the latch mechanisms on the bumper and remove.

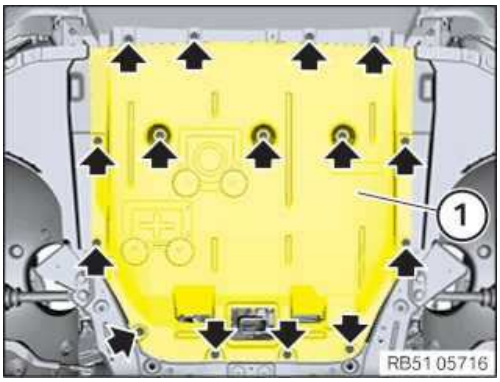


NOTICE

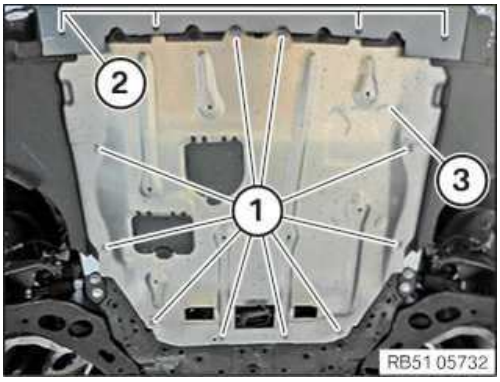
Description is for left component only. Procedure on the right side is identical.

- Unscrew all bolts and nuts (arrows).
- Guide the wheel arch cover (2) out.

12 – Removing the front underbody protection



- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.



- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

13 – Releasing the oil drain plug

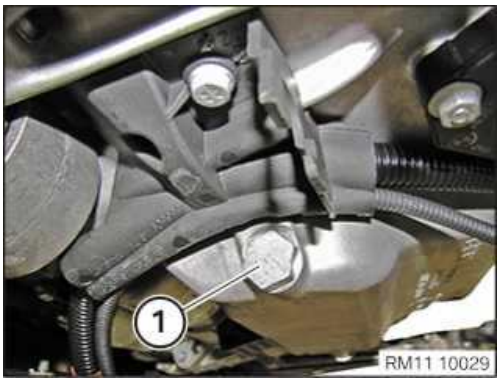
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WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

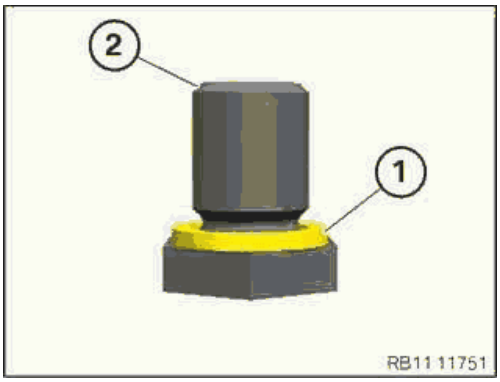


TECHNICAL INFORMATION

Catch and dispose of drained engine oil in a suitable collecting vessel. Observe country-specific waste disposal regulations.

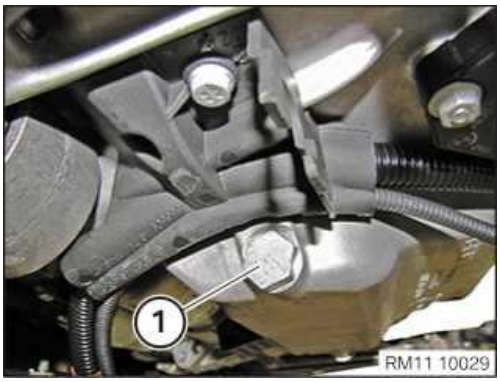
- Release oil drain plug (1).
- Drain engine oil.

14 – Tightening the oil drain plug



- Renew sealing ring (1) on the oil drain plug (2).

  Parts: Sealing ring
- Guide in the sealing ring (1) on the oil drain plug (2) and install.



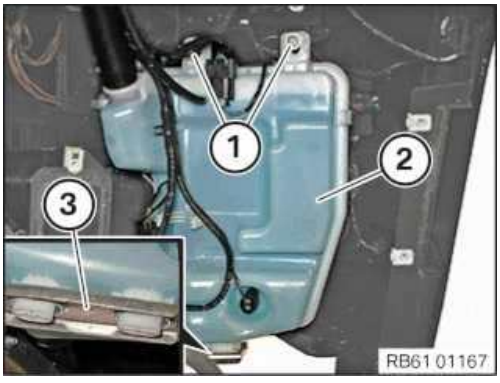
- Renew the sealing ring.

  Parts: Sealing ring
- Position oil drain plug (1) on the oil sump and tighten.

Oil drain plug on oil sump

M12x1.5	Renew the sealing ring.	Tightening torque	25 Nm

15 – Remove the washer fluid reservoir from the fixture



- Loosen screws (1).
- Guide the washer fluid reservoir (2) up and out of the fixture (3) and set it aside.

16 – Removing the right charge air duct between the exhaust turbocharger and the charge air cooler

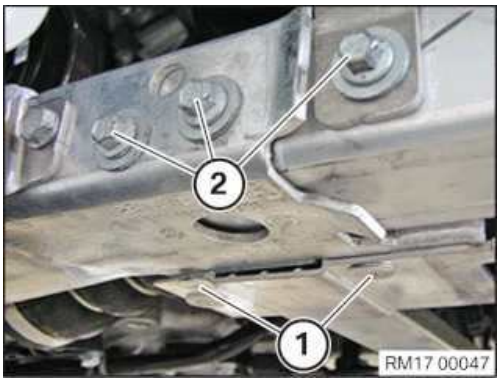
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WARNING

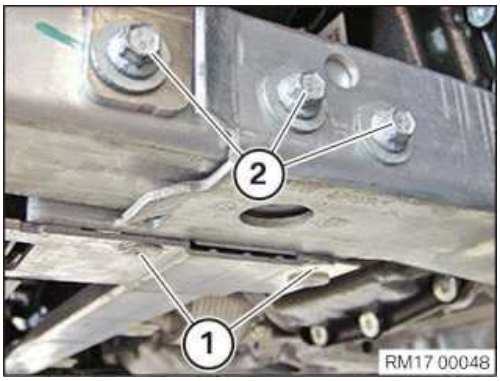
Hot surfaces.

Risk of burning!

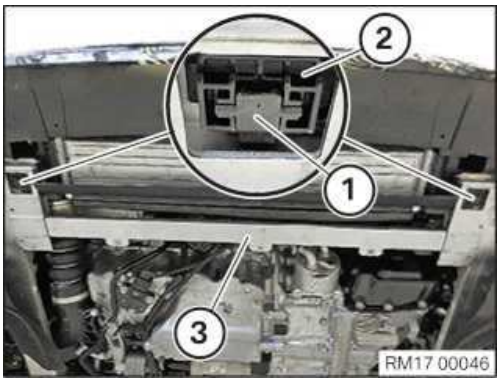
- Perform all work only on components that have cooled down.



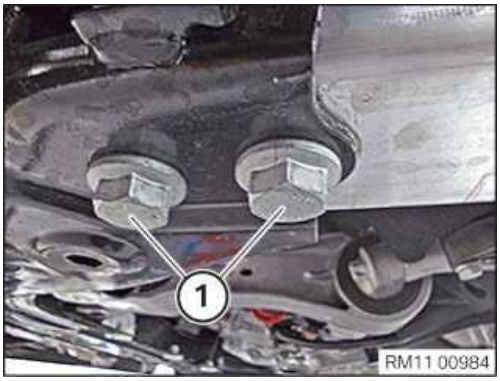
- Undo screws (2) at front left.
- Drill out blind rivets (1) at front left.



- Undo screws (2) at front right.
- Drill out blind rivets (1) at front right.

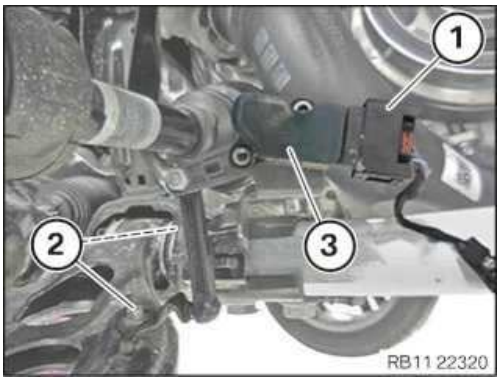


- Unlock locking pins (1).
- Thread out and remove locks (2).
- Thread out and remove cross connection (3).

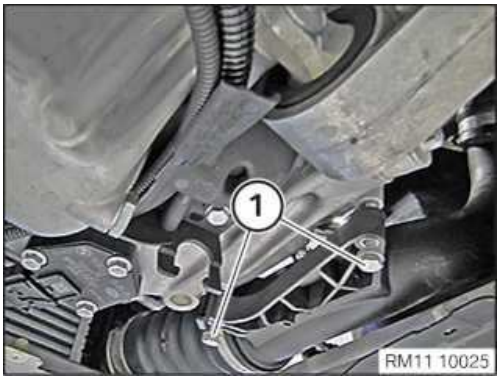


- Release the screws (1) on the right front axle support.

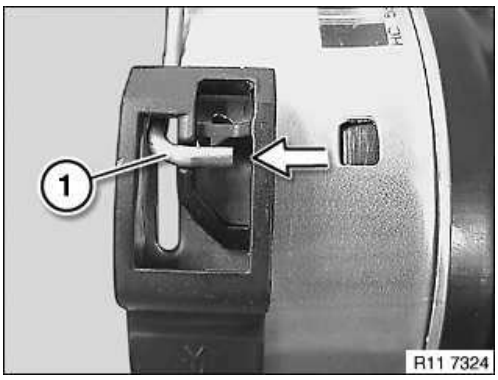
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- **If installed:**
- Unlock and release plug connection (1).
- Loosen screws (2).
- Feed out the ride height sensor (3) and remove.

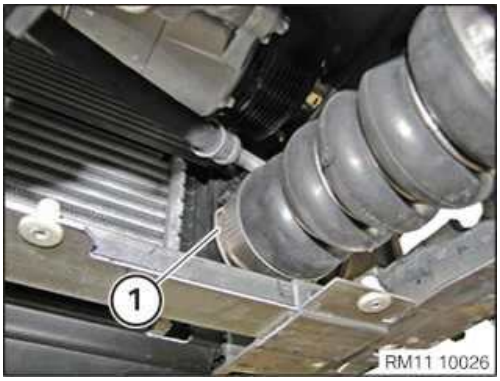


- Release screws (1) of charge air duct on right oil sump.

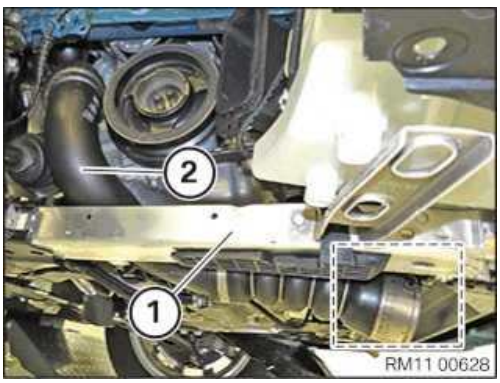


- Unlock lock (1).

  The lock (1) must engage in the bracket during unlocking (arrow).

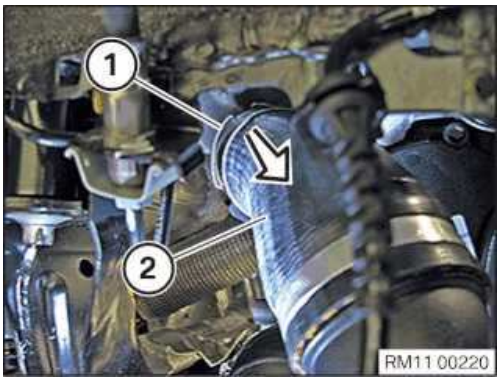


- Unlock and release the charge air duct (1) on the charge air cooler.

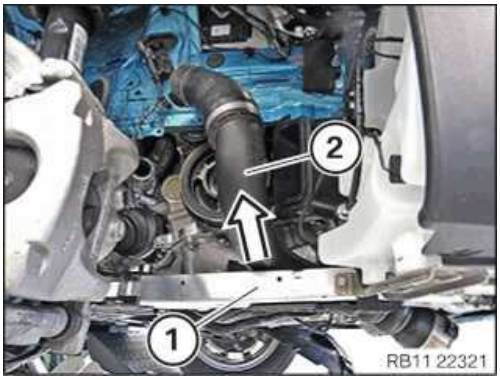


- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed out the charge air duct (2) in the **marked** area towards the bottom and set it aside.

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- Unlock and detach the locks (1) on both sides.
- Feed out the charge air duct (2) on the exhaust turbocharger in the direction of the arrow and set it aside.



- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed out the charge air duct (1) in the direction of arrow between the side member and the deformation element and remove.

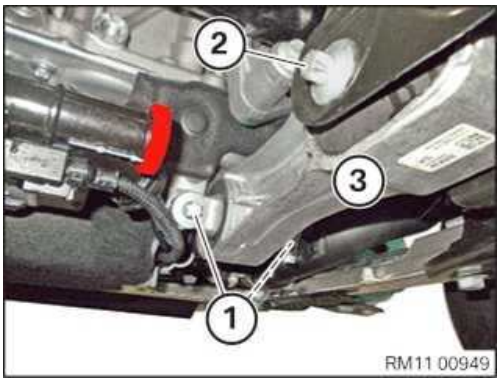
17 – Remove bracket with rubber mount

WARNING

Motor vehicle may slip off the vehicle hoist where components are supported.

Danger! Life-threatening injuries!

- Secure the vehicle hoist against lowering and lifting.



- Support the engine with the jack at a suitable point.
- Loosen screws (1) and (2).
- Guide out and remove holder (3).

18 – Removing the acoustic cover of the oil sump

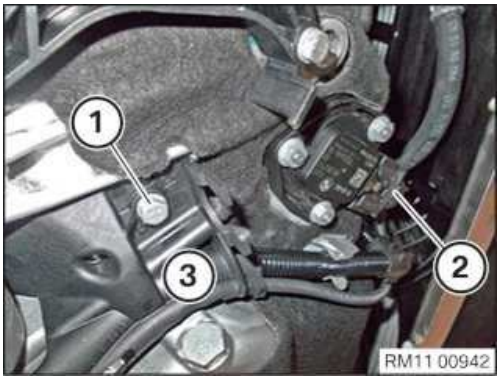


- Unlock connector (1) and pull off.
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).

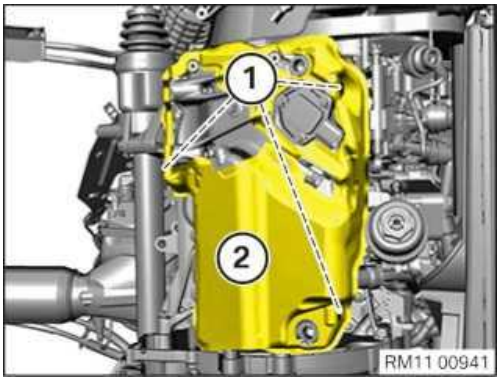
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- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.



- Unscrew the screw (1) on the wiring harness to the oil sump.
- Unlock and pull off connector (2) on the oil-level sensor.
- Place wiring harness (3) to one side.



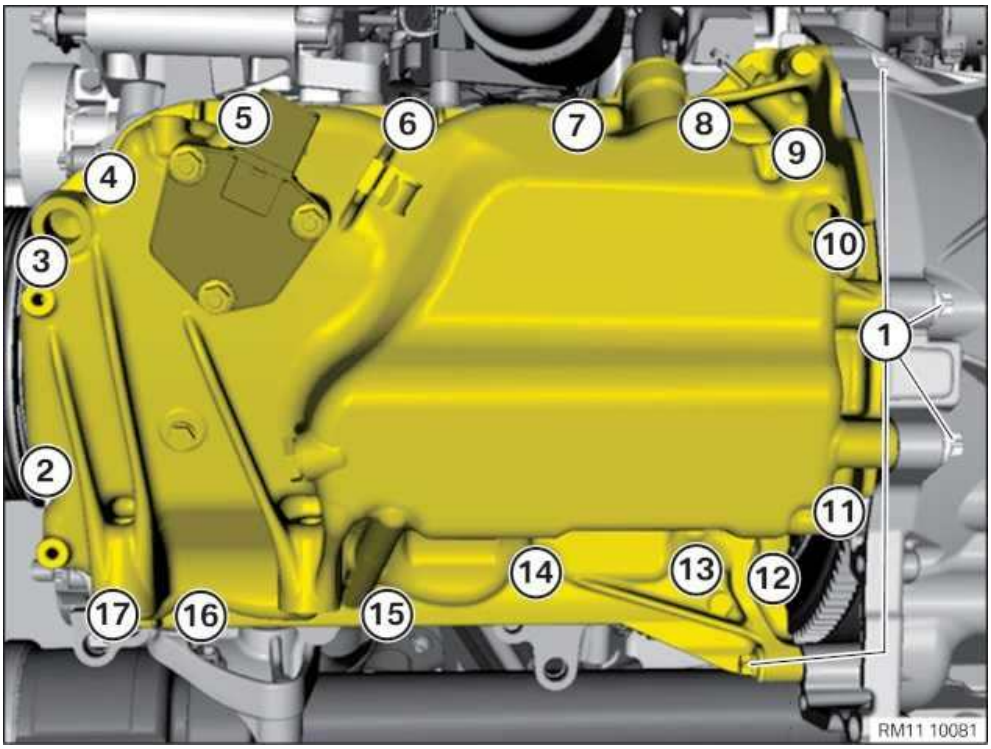
- Remove the expanding rivets (1) on both sides of the acoustic cover.
- Feed out and remove the acoustic cover (2).

19 – Remove oil sump

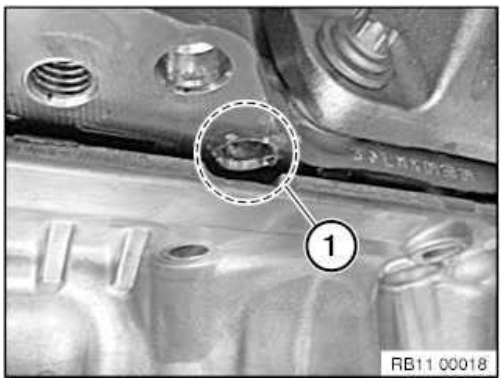


- Loosen screws (1).
- Feed out starter motor and remove.

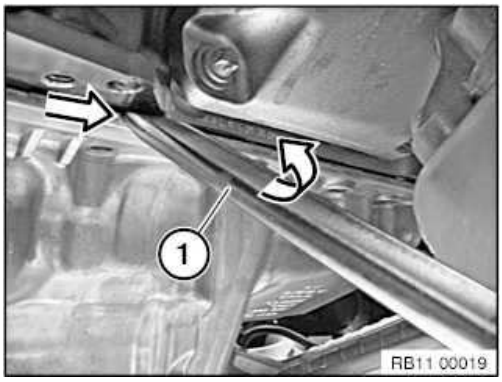
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- Release transmission bolts (1) on the oil sump.
- Loosen screws (2) to (17).



- Release the oil sump only in area (1).



- Release the oil sump carefully using a suitable mounting lever (1) at the appropriate position in the direction of the arrow.
- Secure the oil sump to prevent it from falling.

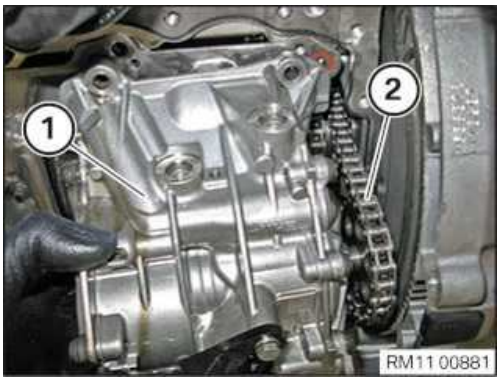
MAIN WORK

20 – Remove the oil vacuum pump



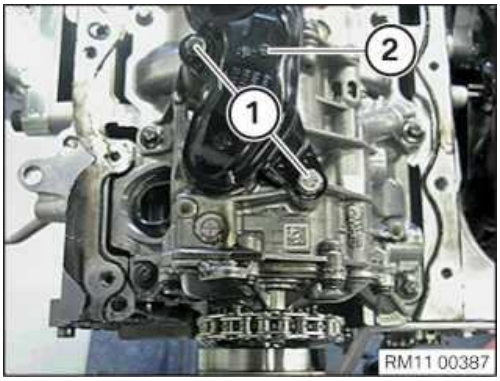
- Loosen screws (1) of the oil vacuum pump (2).

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- Remove oil vacuum pump (1) and remove from the drive chain (2).

21 – Replacing the oil vacuum pump: Remount components

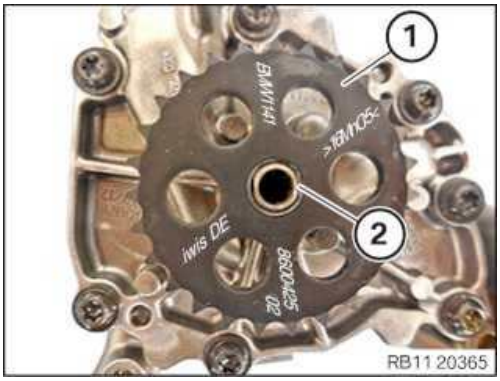


- Loosen screws (1).
- Renew the oil vacuum pump.

  Parts: Oil vacuum pump
- Remount the intake pipe (2).
- Tighten the screws (1).

Intake pipe to oil vacuum pump

M6x25		Tightening torque	8 Nm



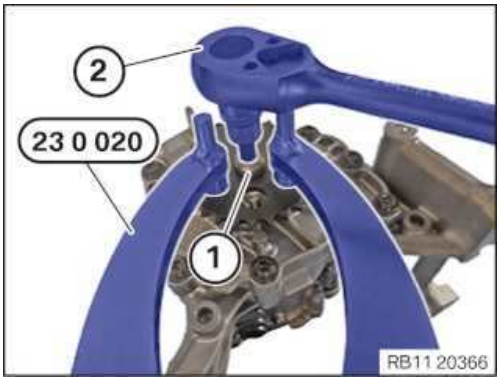
- Counterhold the camshaft sprocket with the special tool **(23 0 020)**.

TECHNICAL INFORMATION

The thread is a left-hand thread.

- Release the screw on the camshaft sprocket (1) and remove the camshaft sprocket.
- Position the camshaft sprocket on the new oil vacuum pump.

  The Front labelling on the camshaft sprocket must be legible.



- Counterhold the camshaft sprocket with the special tool **(23 0 020)**.
- Renew screw.

  Parts: Screw
- Tighten the screw (1) using a commercially available tool (2).

Camshaft sprocket to oil vacuum pump

M8x35 Left-hand thread	*Renew screws.*	Jointing torque	5 Nm
		Angle of rotation	90 °

22 – Install the oil vacuum pump

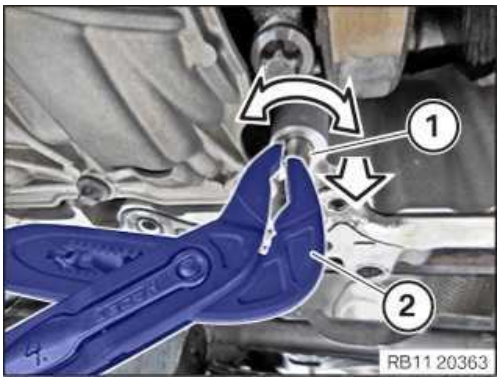
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

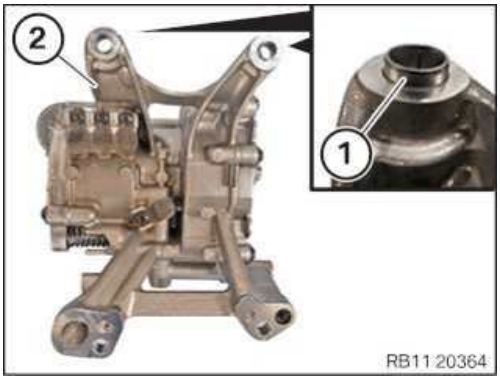
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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- Remove centering sleeves from the crankcase (1) using a standard tool (2).
- Renew the centring sleeves (1).

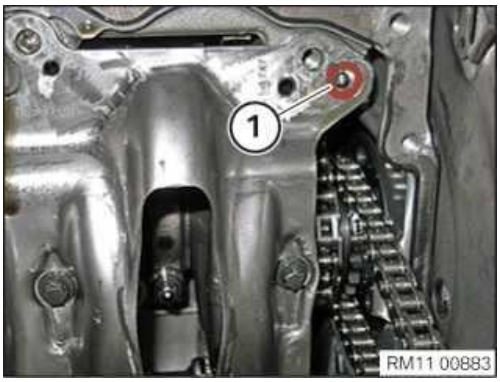
  Parts: Centring sleeves



- Install centering sleeves (1) in the oil vacuum pump (2).

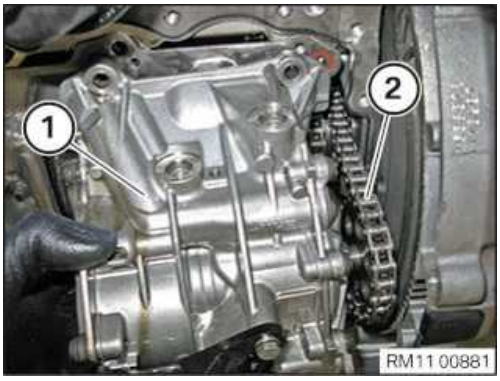


- Check the sealing ring (1) for damage and renew where required.
- Make sure the sealing ring (1) is installed correctly.



- Check sealing ring (1) for damage and replace oil deflector if necessary.

  Parts: Oil deflector



- Insert oil vacuum pump (1) into the drive chain (2).

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- Renew screws (1).

  Parts: Bolts

- Tighten the screws (1) of the oil vacuum pump (2).

Oil vacuum pump to crankcaseB47

M8x35		Tightening torque	19 Nm

POSTPROCESSES

23 – Refitting sump



TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove fine sealing remains on the sealing surface (1)and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.
- Clean sealing surface (1) with brake cleaner.

Expendable materials

Brake cleaner2.0	500 ml, Spray can	83192365214
	20 , Canister	83192365215



TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove coarse sealing remains on the sealing surface (1)and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.
- Clean sealing surface (1) with brake cleaner.

Expendable materials

Brake cleaner2.0	500 ml, Spray can	83192365214
	20 , Canister	83192365215



- Have the special tool ready.

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TECHNICAL INFORMATION

For more information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

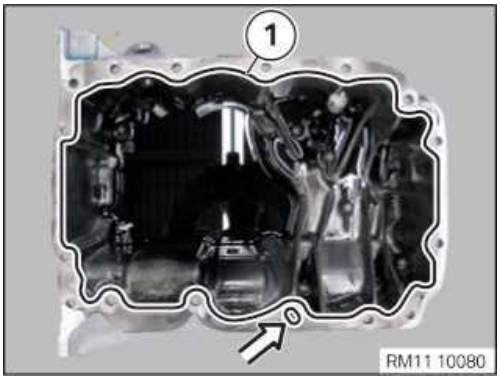
- Position the sealing compound (1) on special tool as shown.

  Parts: Sealing compound

Sealing compound

Loctite 5970 liquid sealing compound	50 ml, Cartridge	83190404517

Overview of consumables (Electronic Parts Catalogue)



TECHNICAL INFORMATION

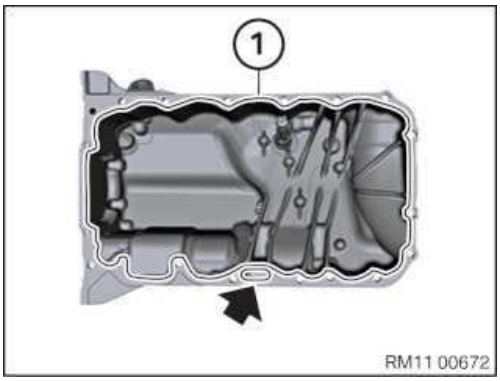
The sealing surfaces must be free from oils, grease and cleaning agents.

TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- The height of the sealing compound must be approx. between **2.0 mm** and **2.5 mm**.
- Apply the sealing bead along the inner edge (1) of the oil sump.
- Completely surround the oil return orifice (arrow) with the sealing compound.

  No sealing compound may enter the oil return orifice.
- Fix oil sump within the prescribed application time of the sealing compound.

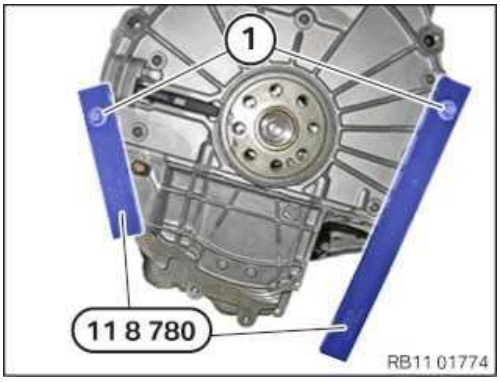


TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- Apply the sealing compound along the line (1) with a thickness of 2 mm to 2.5 mm.

  The sealing compound must be applied along the inner edge.
- Completely encircle the oil return orifice (arrow) with the sealing compound.

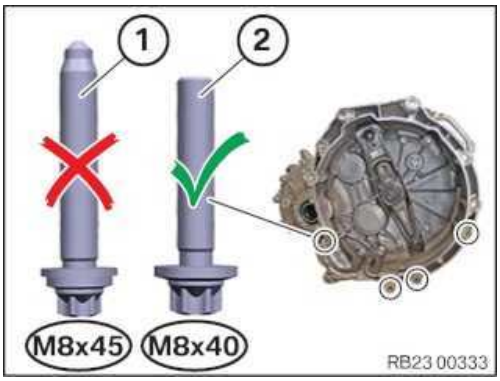


TECHNICAL INFORMATION

The special tool 11 8 780 is only required when the transmission is removed.

- Position the special tool **0 496 120 (11 8 780)** with the transmission bolts (1) so that the oil sump is exactly flush with engine block.
- Renew the fitting sleeves if required.

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RISK OF DAMAGE

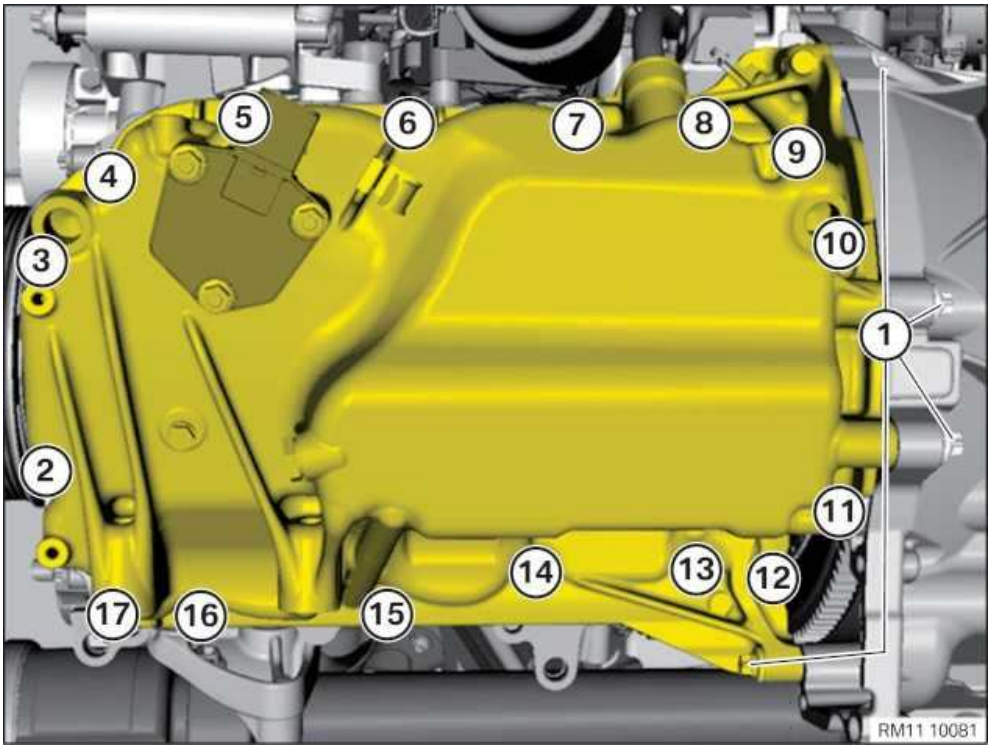
Component damage caused by incorrect screw length.

The use of screws with the incorrect screw length can damage the component.

- Check for correct screw length.
- Re-install screws that correspond to the original screw length.

- Ensure that the **correct** screw (2) (M8x40) is used for mounting the oil sump on the transmission.

  The screw (1) (mounting bolt of the starter motor) may **never** be used for mounting the oil sump.



- Position and install the oil sump.
- Tighten screws (2) to (17) **hand-tight**, do **not** tighten fully.
- Join transmission bolts (1) with 5 Nm.
- Tighten screws (2) to (17) on the oil sump.

Oil sump to crankcase

M8x30		Tightening torque	2 Nr
M8x110		Tightening torque	2 Nr

- Tighten the transmission bolts (1) on the oil sump.

Transmission to oil sump

M8		Tightening torque	1 Nr



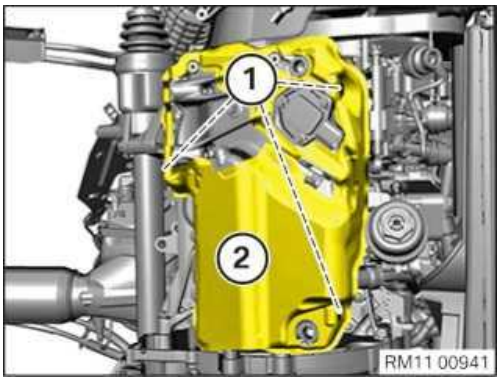
- Insert and install the starter motor .
- Tighten the screws (1).

Starter motor to transmission

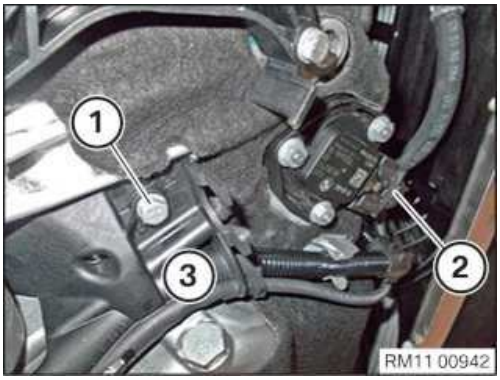
M8x45		Tightening torque	19 Nm

24 – Installing the acoustic cover for the oil sump

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- Thread in and position the acoustic cover (2).
- Install the expanding rivet (1).



- Position wiring harness (3).
- Tighten down screw (1).

Bracket to oil sump

M6		Tightening torque	8 Nm

- Connect and lock the connector (2) on the oil-level sensor.

  The connector must lock audibly.



CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

Battery positive lead to starter

M8		Tightening torque	13,5 Nm

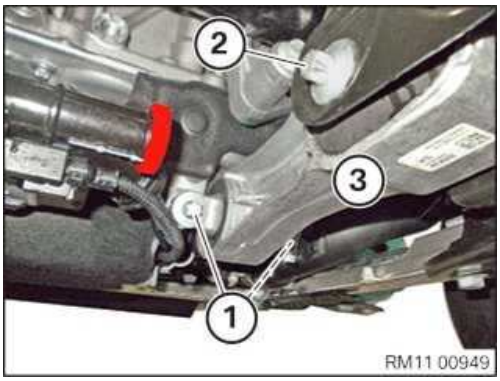


- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).

  The connector must engage audibly.

25 – Install the holder with the rubber mount

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- Insert and install the holder (3).
- Tighten the screws (1) and (2) hand-tight.
- Release jack.
- Tighten down screw (2).

Holder to front axle support

M12		Tightening torque	100 Nm

- Tighten the screws (1).

Bracket to oil sump

M12		Tightening torque	100 Nm

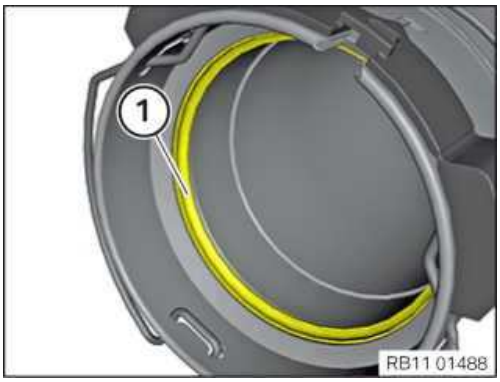
26 – Installing the right charge air duct between the exhaust turbocharger and the charge air cooler

RISK OF DAMAGE

Damage to the exhaust turbocharger.

A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.



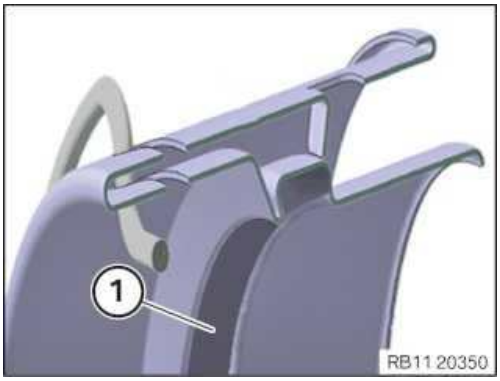
- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Gasket

▶ **Replace damaged gasket**

TECHNICAL INFORMATION

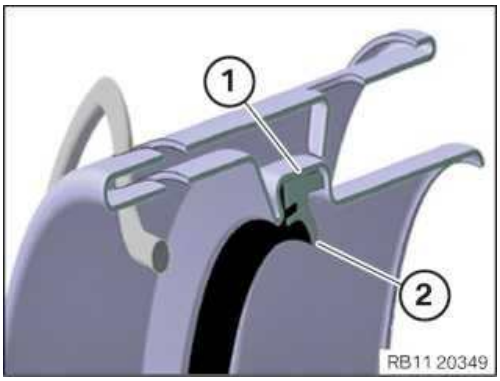
Do not use pointed or sharp-edged tools for the installation and/or removal.



- Remove damaged seal.
- Clean gasket groove (1) with a dry towel.

  The gasket groove (1) must be clean.

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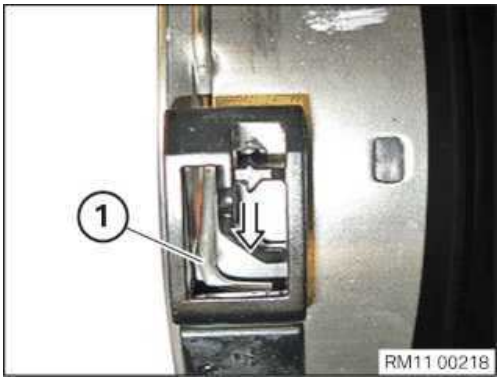
- Renew gasket.

  Parts: Gasket
- Install seal dry without lubricant or mounting agent.

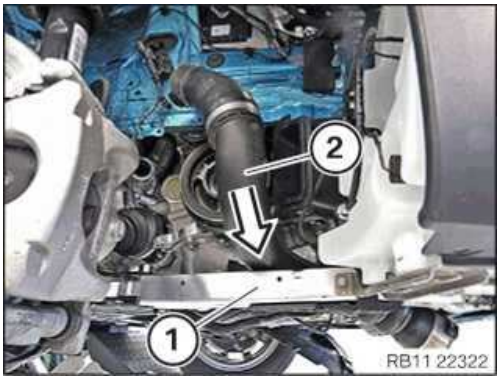
TECHNICAL INFORMATION

Incorrect assembly is possible. Ensure correct installation position.

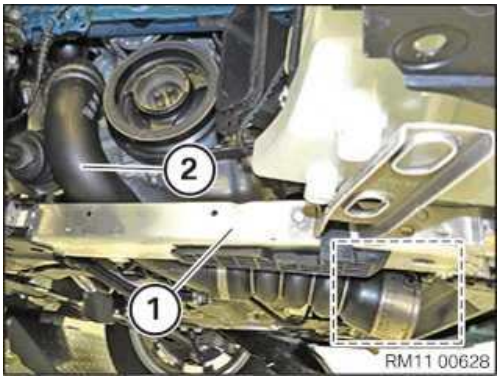
- Feed in and install the seal.
- Make sure the seal is correctly installed in the gasket groove (1).
- Make sure that the sealing lip (2) is pointing downwards (see figure).



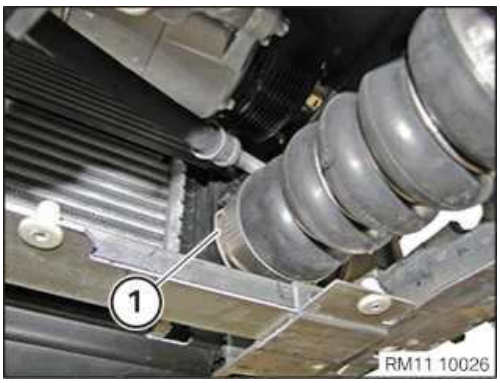
- Detach the locks (1) in the direction of the arrow from the brackets.
- Ensure that the locks (1) engage audibly.



- Pull the adapter of the front axle support (1) downwards to the front right.
- Feed in the charge air duct (1) in the **direction** of arrow between the side member and the deformation element and position.

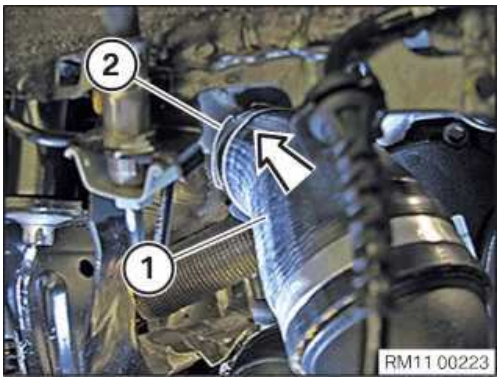


- Pull the adapter of the front axle support (1) downwards to the front right.
- Position the charge air duct (2) in **marked** area on the charge air cooler.



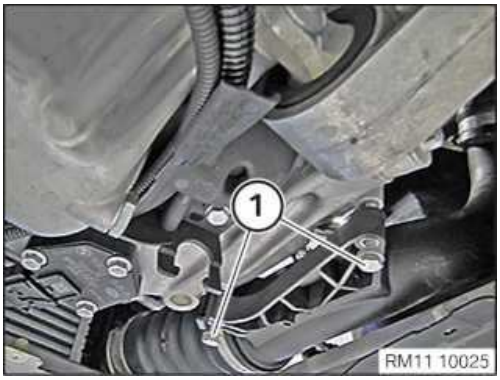
- Feed in and install the charge air duct (1) on the charge air cooler .
- Make sure the charge air duct (1) engages audibly on the charge air cooler.

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- Feed in and install charge air duct (1) in the **direction** of the arrow on exhaust turbocharger.

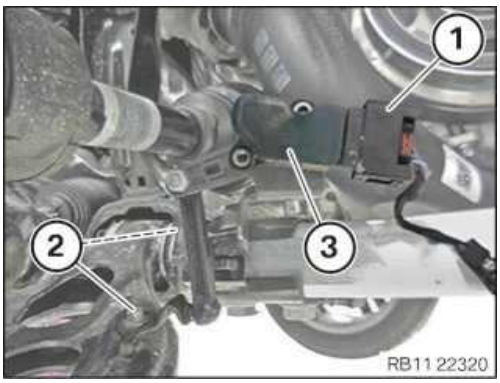
  The locks (2) must engage audibly.



- Tighten the screws (1).

Charge air duct to oil sump

M6		Tightening torque	8 Nm



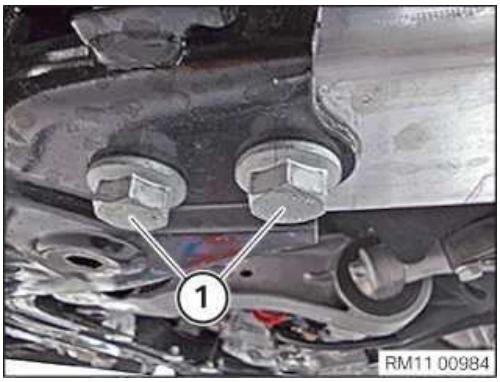
- **If installed:**
- Feed in and install the ride height sensor (3).
- Tighten the screws (2).

Ride height sensor holder to front axle support

M6		Tightening torque	8 Nm

- Connect and lock the connector (1).

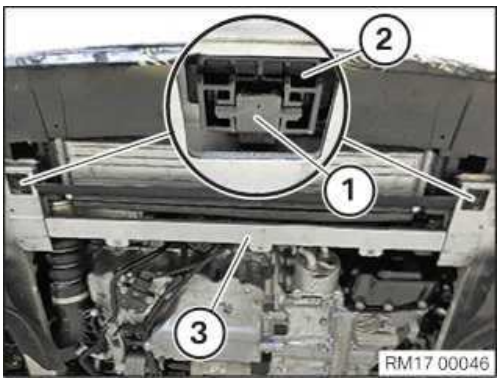
  The connector (1) must engage audibly.



- Tighten the screws (1) on the adapter of the front axle support.

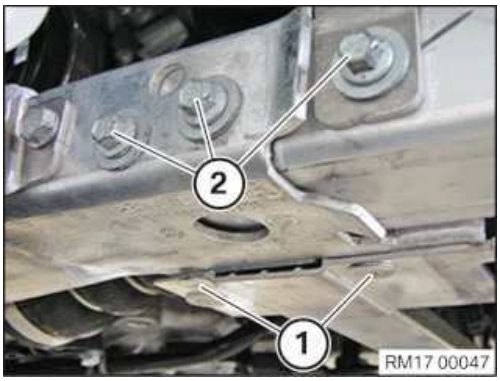
Adapter, front axle support to front axle support

		Tightening torque	100 Nm



- Guide in cross connection (3) and install.
- Guide in locks (2) and install.
- Lock the locking pins (1).
- Ensure that the locking pins (1) audibly engage.

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- Tighten the bolts (2) at the front left.

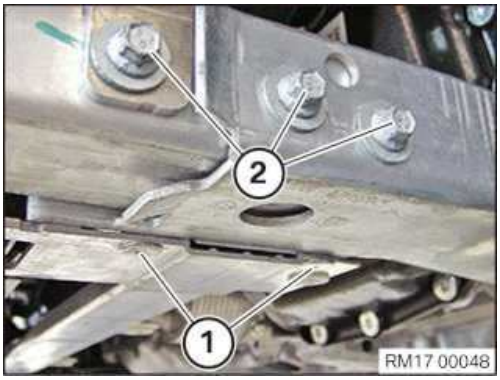
Cross connection to front axle support

M6		Tightening torque	12 Nm

- Renew the blind rivet (1).

  Parts: Blind rivet

- Mount the blind rivets (1) at the front left.



- Tighten the bolts (2) at the front right.

Cross connection to front axle support

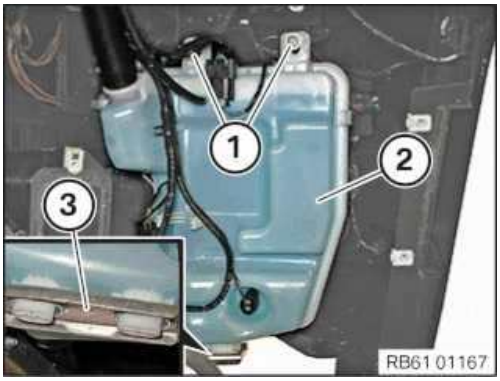
M6		Tightening torque	12 Nm

- Renew the blind rivet (1).

  Parts: Blind rivet

- Mount the blind rivets (1) at the front right.

27 – Install the washer fluid reservoir in the fixture



- Feed washer fluid reservoir (2) into the mounting (3) and install.
- Tighten the screws (1).

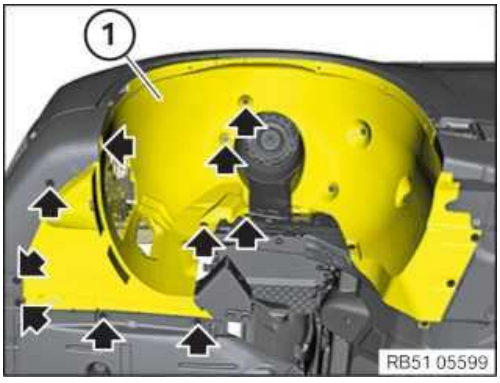
Washer fluid reservoir to body

M6x20		Tightening torque	8 Nm

28 – Partially install the front wheel arch cover

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

▸ **Partly install the front wheel arch trim**

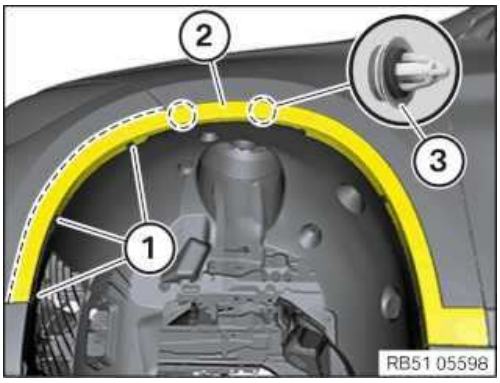
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NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.

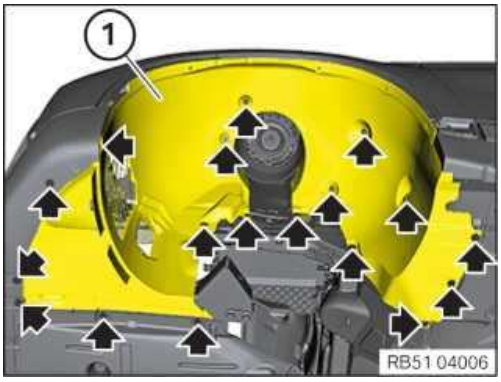


- Check the clips (3) for damage and renew where required.
  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

29 – Installing the front right wheel arch cover

NOTICE

Description is for left component only. Procedure on the right side is identical.



- Guide the wheel arch cover (1) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

▸ **Installing front wheel arch trim**

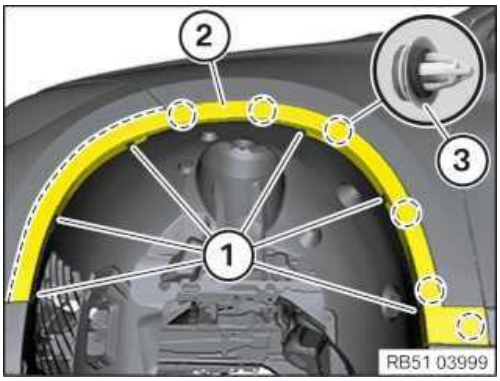
NOTICE

To provide a better overview: Schematic diagram with partially hidden components.

NOTICE

Description is for left component only. Procedure on the right side is identical.

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- Check the clips (3) for damage and renew where required.

  The clips (3) must not be damaged or missing.
- Feed in wheel arch trim (2) and engage on the clips (3).
- Engage wheel arch trim (2) into the latch mechanisms on the bumper panel.
- Mount blind rivet (1) using the special tool **0 496 521 (00 2 230)**.

30 – Installing the front right wheel

▸ **Clean the contact surfaces between the brake disc and the wheel rim**



TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

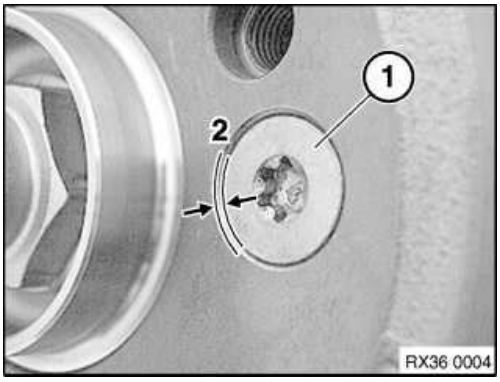
- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.



- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).



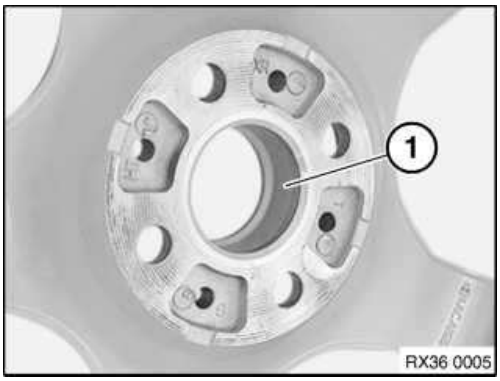
- Check the mounting bolt for the brake disc (1) for secure fit.

  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm

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- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.



TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

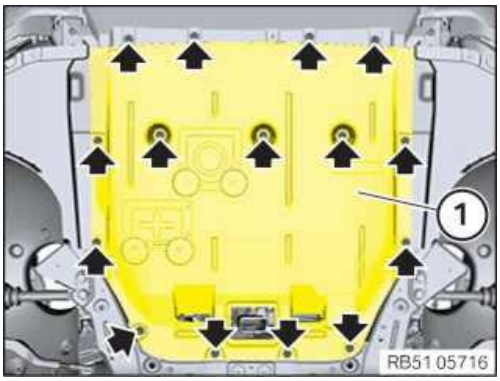
- Renew corroded wheel bolts.

  Parts: Wheel bolts
- Clean the wheel bolts and check the threads for damage. Renew the wheel bolts as needed.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

31 – Installing the front underbody protection

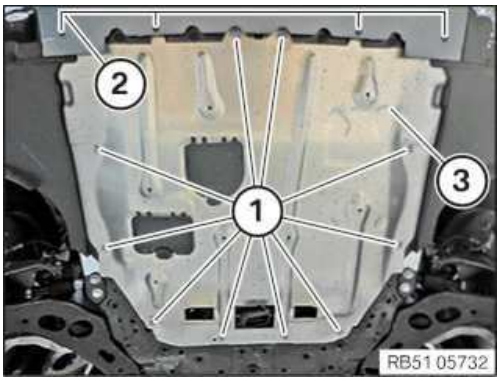


- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

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- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

32 – Installing guide tube for oil dipstick

RISK OF DAMAGE

Contaminant or foreign body.

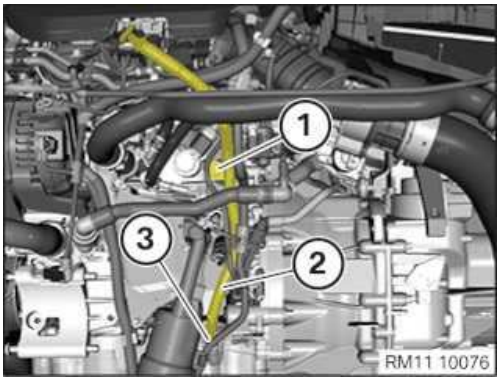
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Renew O-ring (1).

  Parts: O-ring



- Guide in guide tube (2) for oil dipstick and slide it into the oil sump.
- Make sure the sealing ring (3) is positioned correctly in the oil sump.
- Tighten down screw (1).

Guide tube for oil dipstick on engine

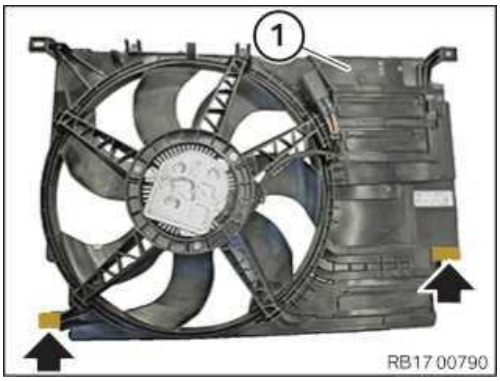
M8x16		Tightening torque	19 Nm

33 – Installing fan cowl with electric fan

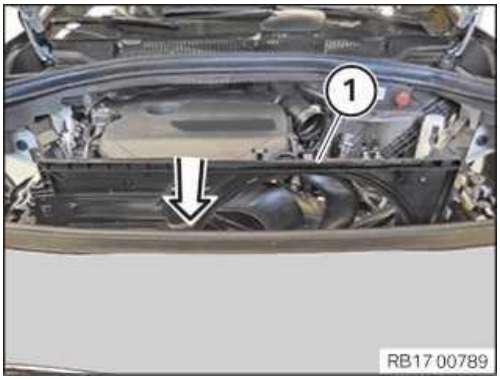
TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

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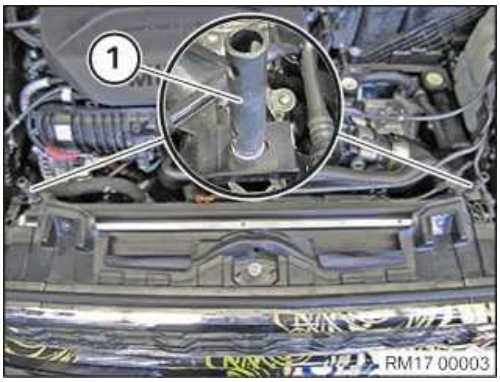
- Feed the guides (arrows) of the fan cowl (1) into the charge air cooler.



- Feed in and install the fan cowl (1) in the direction of the arrow.



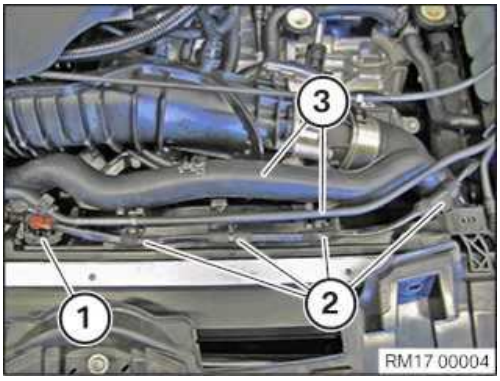
- Lock the left and right locks (arrows).



- Tighten the screws (1).

Fan cowl on radiator

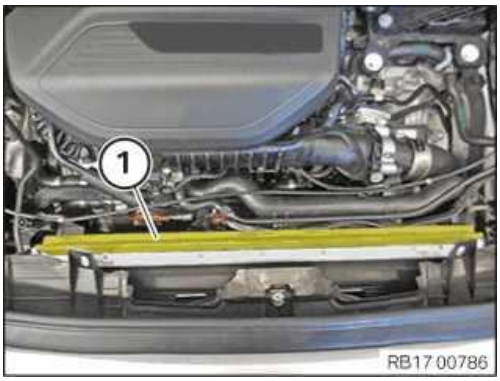
M6X12		Tightening torque	6 Nm



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.
- Secure clamps (2).
- Thread in and install coolant line (3).

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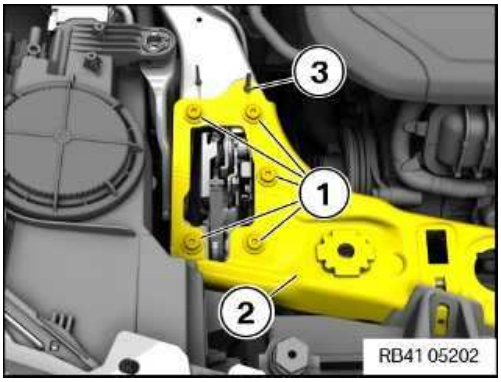


- Guide the sealing (1) on the radiator in and install it.

34 – Install front cross connection



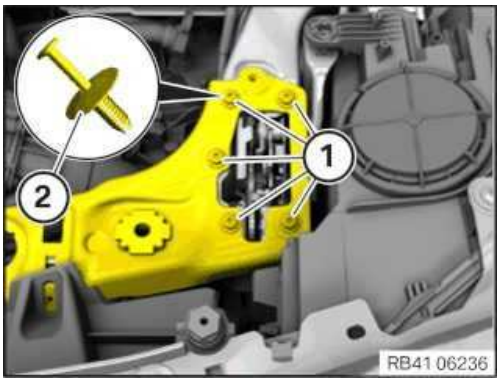
- Right side of vehicle only: Secure spray guard (1) on the cross connection (2) as pictured.



- Position front cross connection (2) and clip front cross connection (2) into the rubber retainer (3) at the same time.
- Tighten the screws (1).

Cross connection to carrier support

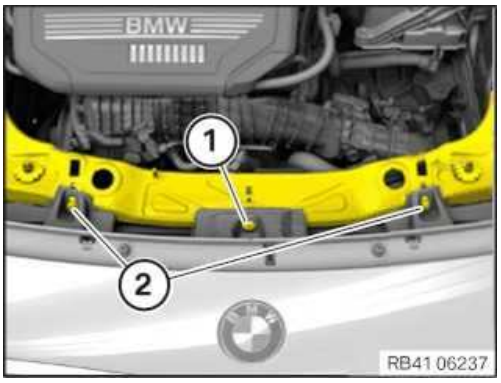
Screws M6x20		Tightening torque	11,8 Nm



- Tighten the screws (1).

Cross connection to carrier support

Screws M6x20		Tightening torque	11,8 Nm



- Position screws (3) on the rubber mounts for the radiator and tighten.

Screw connection for rubber mount of coolant radiator to coolant radiator

Bolt to rubber mount		Tightening torque	8 Nm

- Tighten down screws (2).

Air duct to upper connection

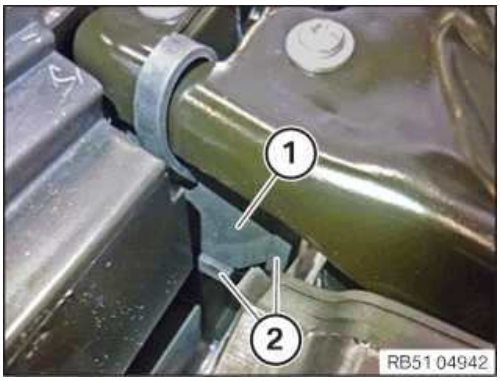
M6x20 screw		Tightening torque	11,8 Nm

- Tighten down screw (1).

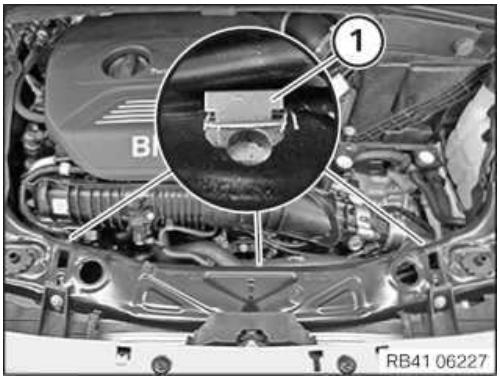
Bracing strut to upper connection

M8x20 screw		Tightening torque	28 Nm

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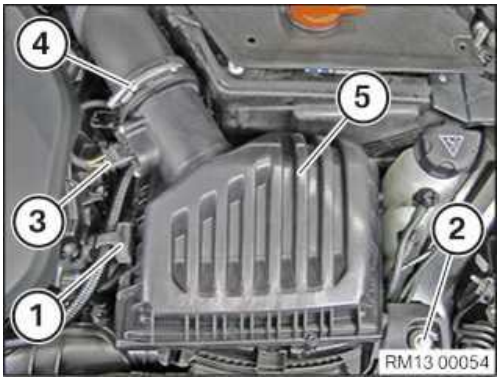


- Right side of vehicle only: Properly mount spray guard (1) to prevent corrosion.
- Secure spray guard (1) to the bridge with retaining tabs (2).



- Fasten the clamps (1) from the Bowden cable of the bonnet lock on the cross connection.

35 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.

  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

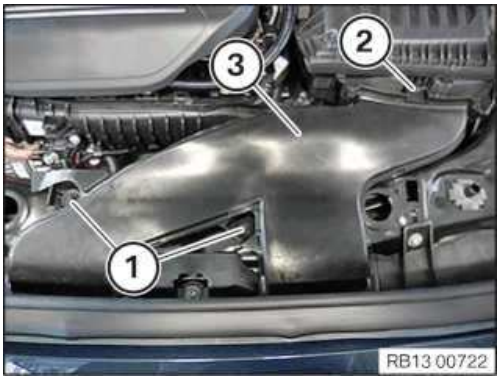
Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Insert and install the holder (1).

36 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

37 – Disconnecting all battery earth leads

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- See additional information.

38 – Topping up the engine oil

RISK OF DAMAGE

Damage to the petrol particulate filter.

Vehicles equipped with a petrol particulate filter must be operated with low-ash engine oil only.

- Use BMW Longlife-04 , BMW Longlife-12 FE or BMW Longlife-17 FE+ engine oils or engine oils approved by BMW matching the same specifications only.
- For additional information see: Overview of approved engine oils for BMW Group engines.

RISK OF DAMAGE

Engine damage caused by excessively filling the engine with engine oil.

Filling an excessive quantity of engine oil may cause engine damage.

- Observe the exact engine oil filling capacity.
- Drain the engine oil.

- Pour in engine oil.

Engine oilB47TÜ1

Capacity of engine oil	5,5 l

Engine oil: Technically suitable engine oils for BMW Group engines

39 – Installing the oil filler cap



- Close oil filler cap (1).

40 – Check engine oil level

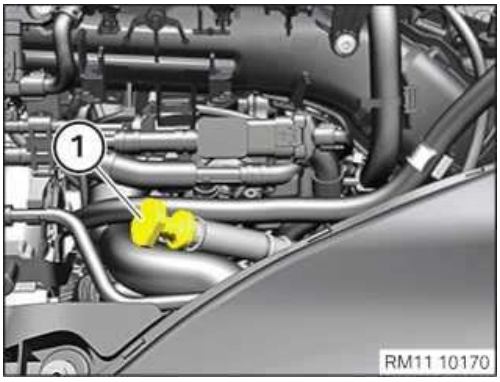
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- Park vehicle on a horizontal surface.
- In the case of automatic transmission, shift to selector lever position N or P.
- Accelerator pedal is not pressed.
- Engine is running and is at operating temperature.
- Read off the engine oil level in the instrument cluster (KOMBI) or on the control display.
- Top up engine oil if necessary.

▶ **Check engine oil level**

TECHNICAL INFORMATION

Always check the engine oil level when the engine is at operating temperature (engine oil temperature > 70°C).

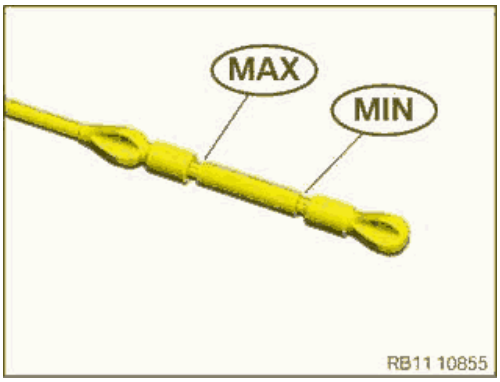


- Park vehicle on a horizontal surface.
- Stop the engine and wait for 5 minutes.
- Pull out the oil dipstick (1) and wipe off using a lint-free cloth.

TECHNICAL INFORMATION

Do not pull out or insert the oil dipstick into the guide tube too quickly or slowly.

- Push the oil dipstick (1) into the guide tube up to the limit position and pull it out again.



TECHNICAL INFORMATION

The engine oil level must be between the minimum mark and the maximum mark of the oil dipstick.

- Read the engine oil level on the oil dipstick.
- Top up engine oil if necessary.

41 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

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- Check for correct installation of all rubber mounts in the acoustic cover (1).



- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

Additional Information

Overview of Tightening Torques

Oil drain plug on oil sump — Used in step 14

M12x1.5	Renew the sealing ring.	Tightening torque	25 Nm

Intake pipe to oil vacuum pump — Used in step 21

M6x25		Tightening torque	8 Nm

Camshaft sprocket to oil vacuum pump — Used in step 21

M8x35 Left-hand thread	*Renew screws.*	Jointing torque	5 Nm
		Angle of rotation	90 °

Oil vacuum pump to crankcaseB47 — Used in step 22

M8x35		Tightening torque	19 Nm

Oil sump to crankcase — Used in step 23

M8x30		Tightening torque	24 Nm
M8x110		Tightening torque	24 Nm

Transmission to oil sump — Used in step 23

M8		Tightening torque	19 Nm

Starter motor to transmission — Used in step 23

M8x45		Tightening torque	19 Nm

Bracket to oil sump — Used in step 24

M6		Tightening torque	8 Nm

Battery positive lead to starter — Used in step 24

M8		Tightening torque	13,5 Nm

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Holder to front axle support

Used in step 25

M12		Tightening torque	100 Nm

Bracket to oil sump

Used in step 25

M12		Tightening torque	100 Nm

Charge air duct to oil sump

Used in step 26

M6		Tightening torque	8 Nm

Ride height sensor holder to front axle support

Used in step 26

M6		Tightening torque	8 Nm

Adapter, front axle support to front axle support

Used in step 26

		Tightening torque	100 Nm

Cross connection to front axle support

Used in step 26

M6		Tightening torque	12 Nm

Washer fluid reservoir to body

Used in step 27

M6x20		Tightening torque	8 Nm

Wheel arch cover to body

Used in step 28 29

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Used in step 28 29

Plastic nut		Tightening torque	3 Nm

Brake disc to front wheel hub

Used in step 30

M8	Renew screw.		16 Nm

Wheel bolts

Used in step 30

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Underbody protection front

Used in step 31

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Guide tube for oil dipstick on engine

Used in step 32

M8x16		Tightening torque	19 Nm

Fan cowl on radiator

Used in step 33

M6X12		Tightening torque	6 Nm

Cross connection to carrier support

Used in step 34

Screws M6x20		Tightening torque	11,8 Nm

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Screw connection for rubber mount of coolant radiator to coolant radiator			Used in step 34
Bolt to rubber mount		Tightening torque	8 Nm

Air duct to upper connection			Used in step 34
M6x20 screw		Tightening torque	11,8 Nm

Bracing strut to upper connection			Used in step 34
M8x20 screw		Tightening torque	28 Nm

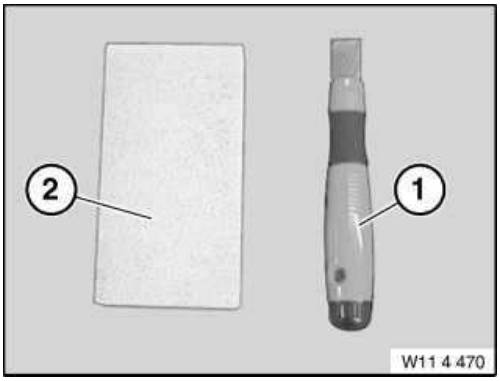
Intake silencer housing to lock bridge			Used in step 35
M6X30		Tightening torque	8 Nm

Clean air pipe to intake silencer housing			Used in step 35
Clamp		Tightening torque	3 Nm

Intake neck to cross connection			Used in step 36
M6		Tightening torque	8 Nm

Overview of Special Tools

0 495 102 (11 4 470) Tool



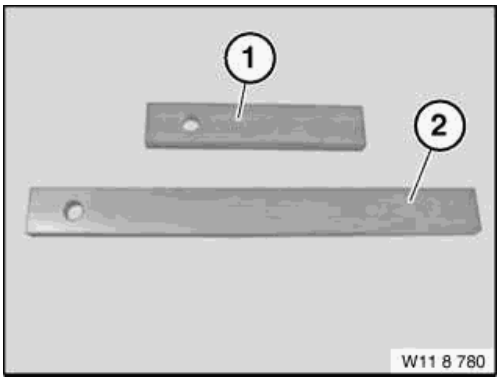
Common	Used in step 23
Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

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0 496 120 (11 8 780) Plate



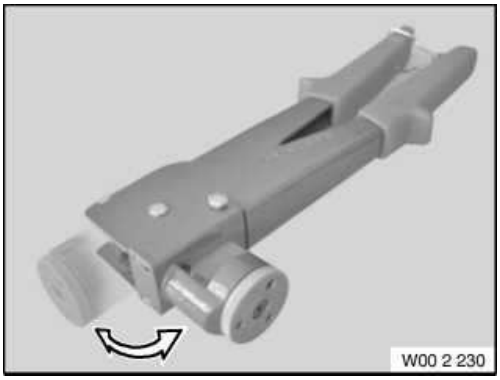
Common Used in step 23

Usage	(Mounting plates) For securing transmission oil sump when gearbox is removed.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 121 (11 8 781)		**Plate** (Mounting plate, short)Discontinued; only available via set 11 8 780 = 0496120.	
2	0 496 122 (11 8 782)		**Plate** (Mounting plate, long) Discontinued; only available via set 11 8 780 = 0496120.	

0 496 521 (00 2 230) Pliers



Common Used in step 28 29

Usage	(Blind rivet pliers for plastic rivets) For shaft diameters of 3.5 mm, 3.9 mm and 4.5 mm
Included in the tool or work	
Storage location	C25
Replaced by	
In connection with	
SI-Number	01 17 08 (478)

2 344 011 Tool



Common Used in step 30

Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

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0 495 221 (36 1 323) Wheel stud



Common	Used in step 9
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud



Common	Used in step 9
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud



Common	Used in step 9
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 226 (36 1 328) Wheel stud



Common	Used in step 9
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud



Common	Used in step 9
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud



Common	Used in step 9
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 229 (36 1 332) Wheel stud



Common	Used in step 9
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud



Common	Used in step 9
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Engine oilB47TÜ1	Used in step 38
Capacity of engine oil	5,5 l

Engine oil: Technically suitable engine oils for BMW Group engines

Links

Functional descriptions	Used in step
Oil supply	32

General repair instructions	Used in step
11 00 ... Overview of consumables (Electronic Parts Catalogue)	23

Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	1 37
61 20 900 Disconnecting and connecting battery earth lead	1 37
61 20 900 Disconnecting and connecting battery earth lead	1 37

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61 20 900 Disconnecting and connecting battery earth lead	1 37
61 20 900 Disconnecting and connecting battery earth lead	1 37
61 20 900 Disconnecting and connecting battery earth lead	1 37
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 37
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 37
61 20 900 Disconnecting and connecting battery earth lead	1 37
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 37
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	1 37
61 20 900 Disconnecting and connecting battery earth lead	1 37
61 20 900 Disconnecting and connecting battery earth lead	1 37
61 20 900 Disconnecting and connecting battery earth lead	1 37
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61 20 900 Disconnecting and connecting battery earth lead	1 37

Operating materials	Used in step
2.0 Grease for wheel centring	30
3.0 Technically appropriate engine oils for BMW Group engines	38

Parts

Parts required

Designation	Used in step
Seal, guide tube for oil dipstick on oil sump	32

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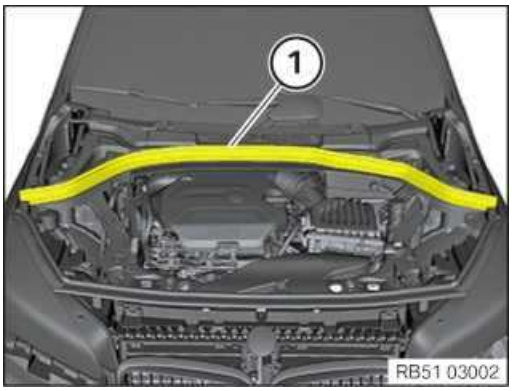
11 71 100 Remove and install/replace the exhaust-gas recirculation cooler

PRELIMINARY WORK

1 – Remove the seal for the rear bonnet

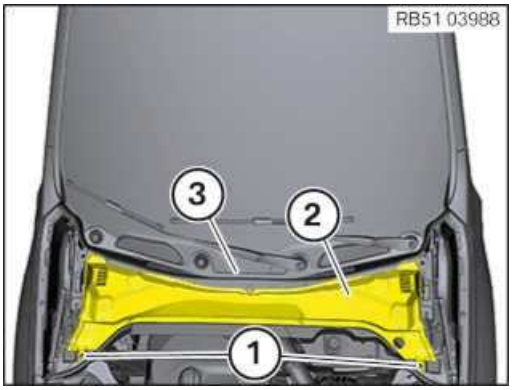
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



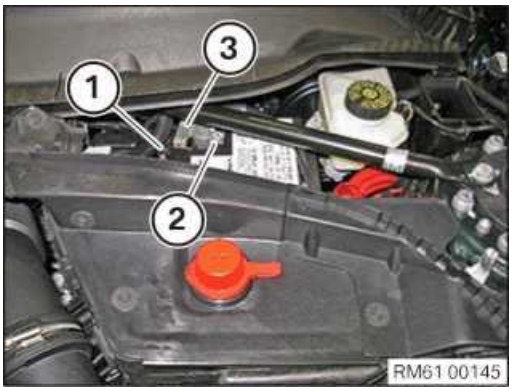
- Pull off rear bonnet seal (1) towards the top and remove.

2 – Removing front cowl panel cover



- Loosen the expanding rivet (1).
- Feed out and remove front cowl panel cover (2) from the rear cowl panel cover(3).

3 – Disconnecting the battery earth lead



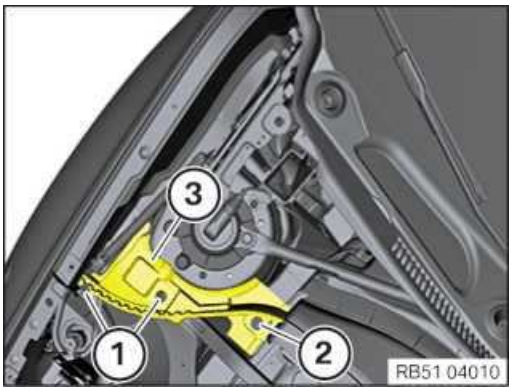
- Unlock plug connection (1) and disconnect.
- Unfasten nut (2).
- Remove the battery earth lead (3) and secure to one side.

4 – Remove suspension cross-brace

TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.

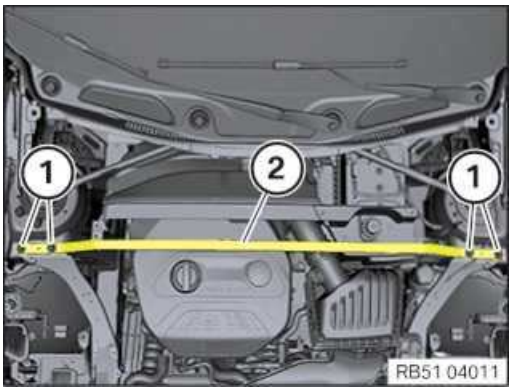
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NOTICE

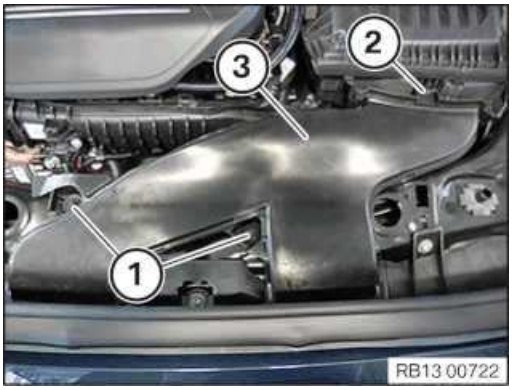
Description is for right component only. The procedure on the left side is identical.

- Loosen expanding rivet (1).
- Loosen screw (2).
- Remove the cover (3).



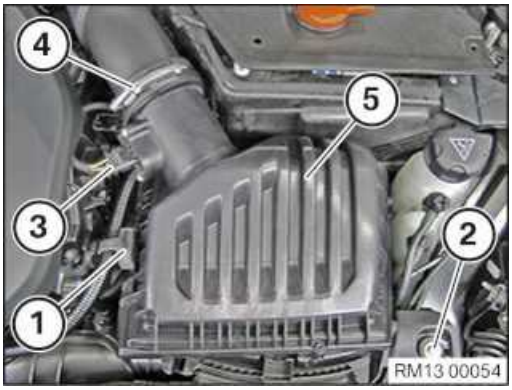
- Loosen screws (1).
- Remove strut brace (2).

5 – Remove the intake neck for intake silencer housing



- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

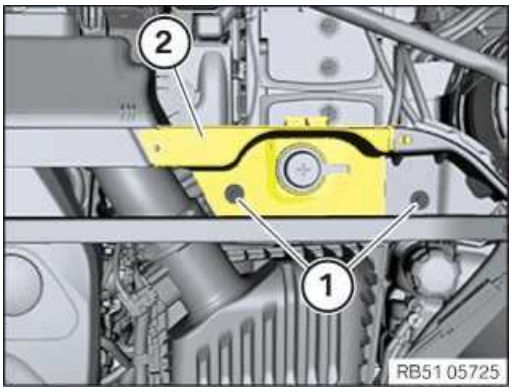
6 – Removing intake silencer housing



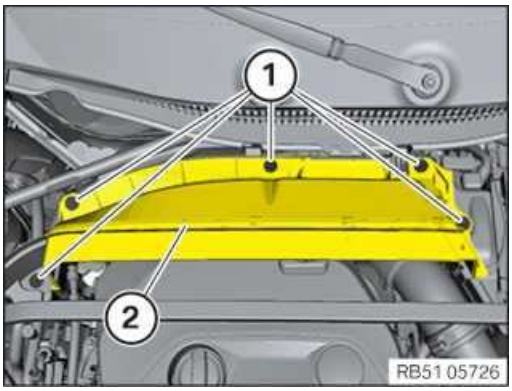
- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

7 – Removing the upper bulkhead cover

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- Loosen screws (1).
- Guide out and remove the cover (2).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

8 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

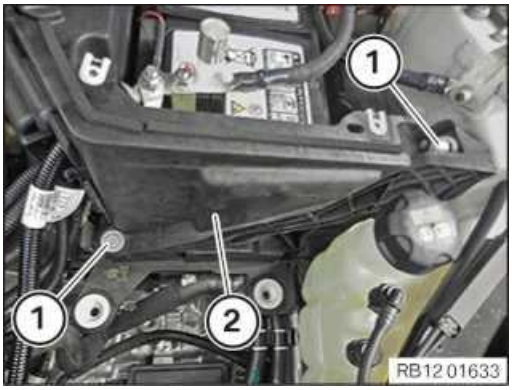
TECHNICAL INFORMATION

Follow instructions for removing and installing control units.
For additional information see: 12 00 ... Notes on removal and installation of control units

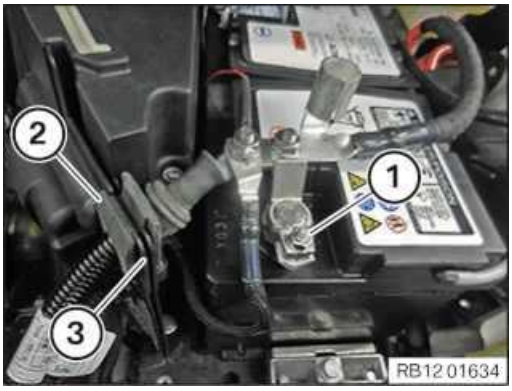
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TECHNICAL INFORMATION

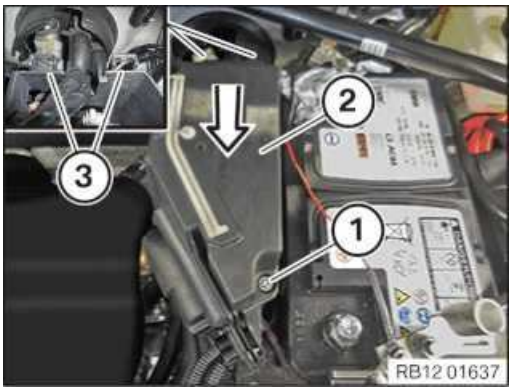
Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.



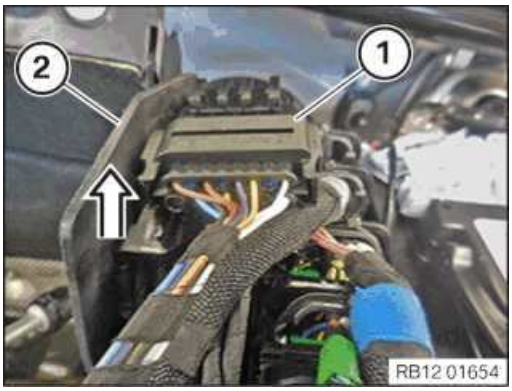
- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.



- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

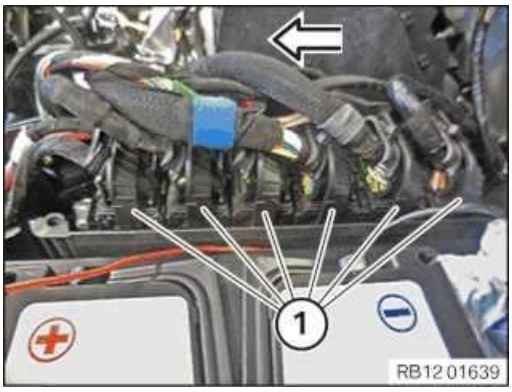


- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.

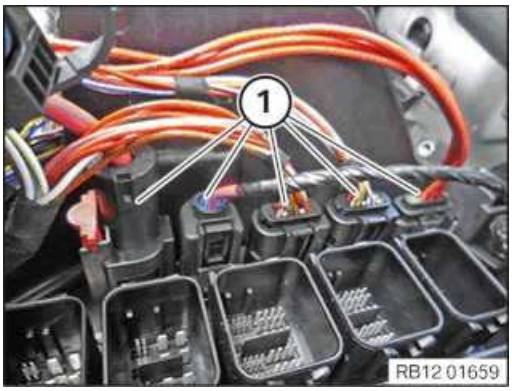


- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).

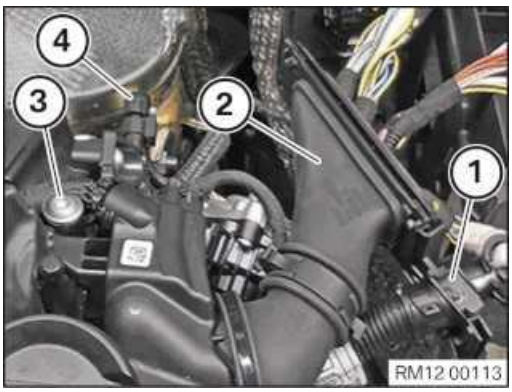
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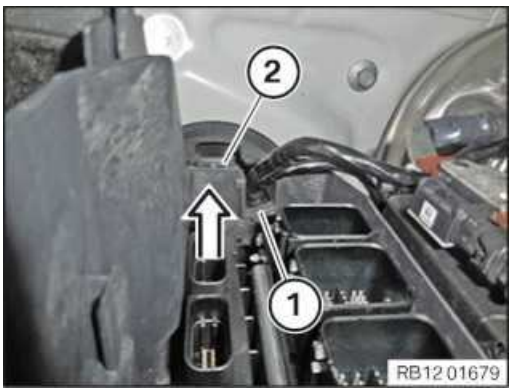
- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



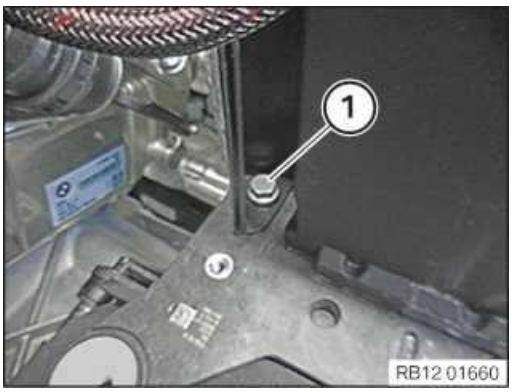
- Unlock and loosen connector (1).



- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.

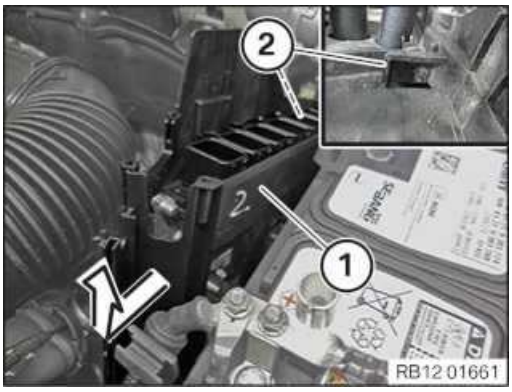


- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.



- Loosen screw (1).

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- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

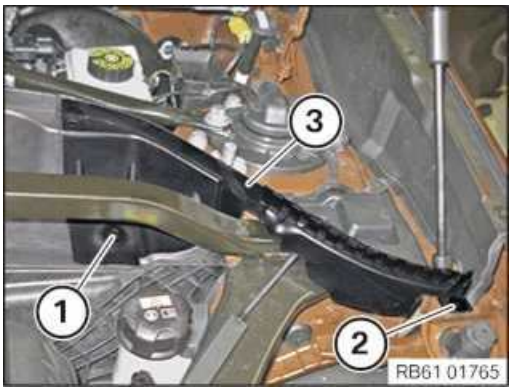
9 – Remove vehicle battery

WARNING

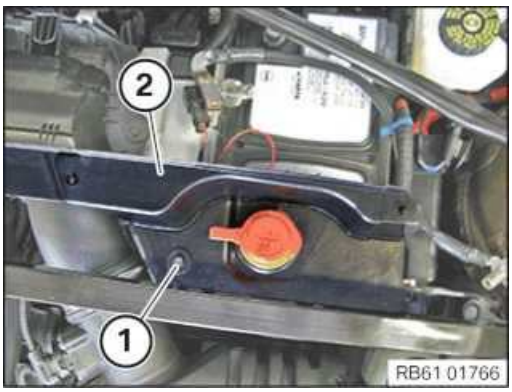
Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

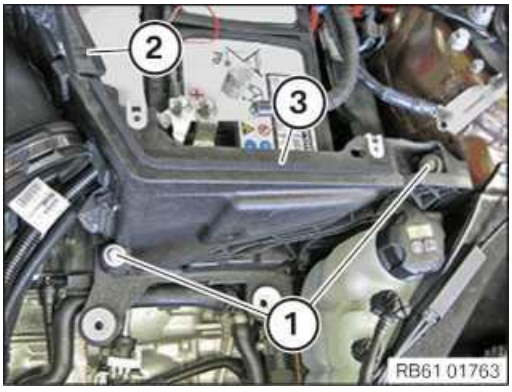
- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.



- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

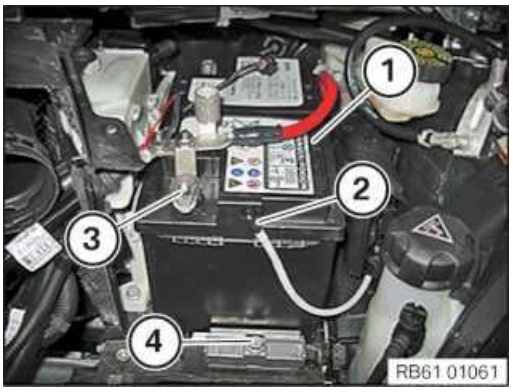


- Loosen screw (1).
- Remove the cover (2).



- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.

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- Pull off the vent hose (2).
- Slacken the nut (3) on the positive battery terminal and remove the positive battery terminal.

WARNING

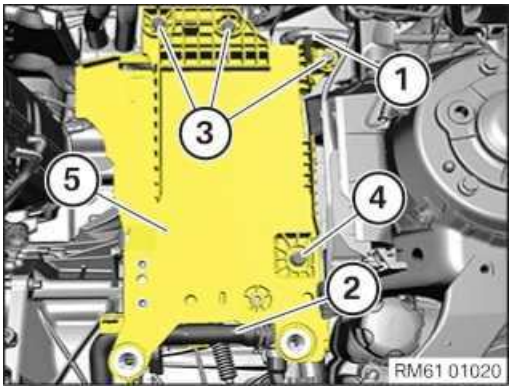
Unprotected battery terminals.

Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

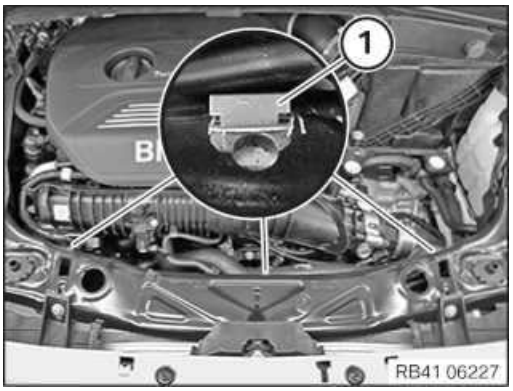
- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

10 – Remove battery holder

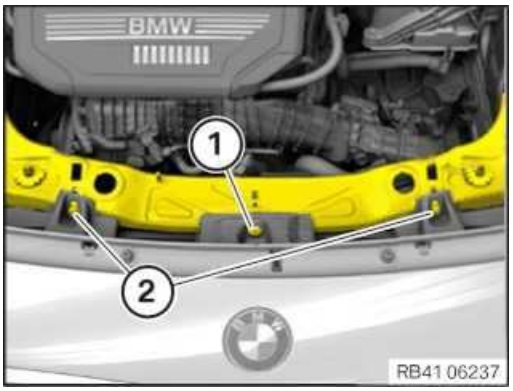


- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

11 – Remove front cross connection

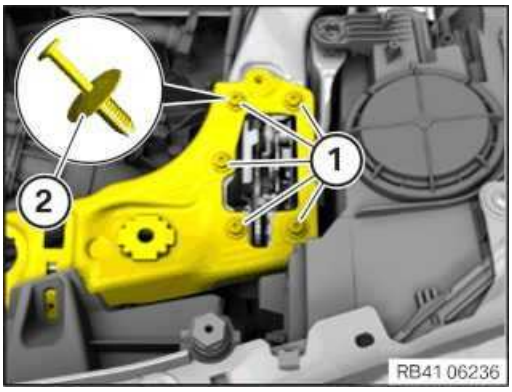


- Detach the clamps (1) for the Bowden cable of the bonnet locks from the cross connection.

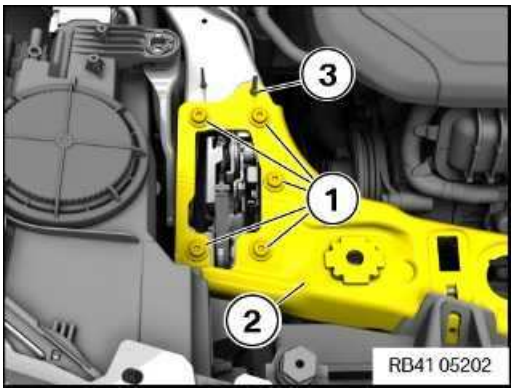


- Loosen screw (1).
- Loosen screws (2).

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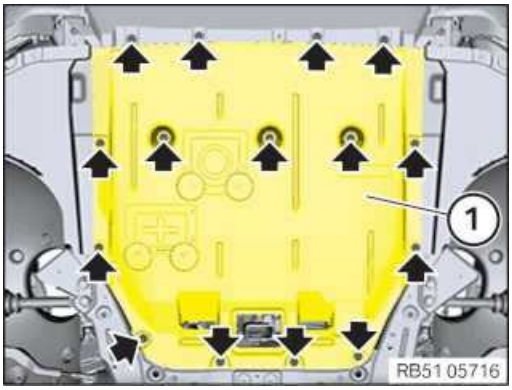


- Loosen screws (1).
- Lever out expanding rivet (2).

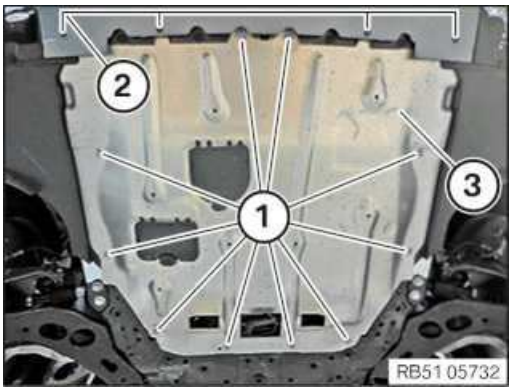


- Loosen screws (1).
- Unclip the front cross connection (2) from the rubber retainer (3) and remove it upward.

12 – Removing the front underbody protection



- Remove screws (arrows).
- Thread out and remove the front underbody protection (1) from the bumper panel.



- **Equipment specification with metal underride protection:**
- Loosen screws (1) and (2).
- Thread out and remove the underride protection (3).

13 – Draining coolant

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

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TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

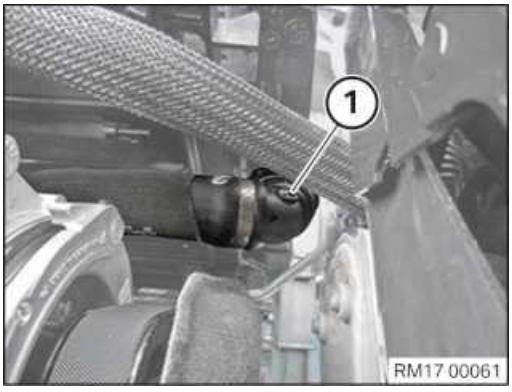
In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

TECHNICAL INFORMATION

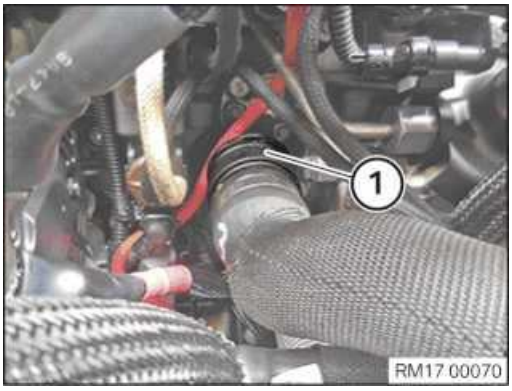
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Loosen sealing cap (1).



- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.



- Unlock the coolant line (1) and pull it off the connecting branch.
- Catch and dispose of escaping coolant.

MAIN WORK

14 – Removing the exhaust-gas recirculation cooler

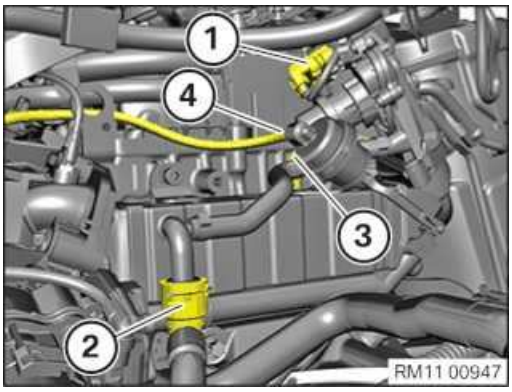
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WARNING

Hot surfaces.

Risk of burning!

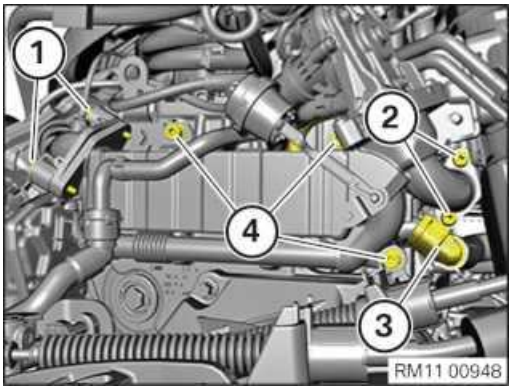
- Perform all work only on components that have cooled down.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.

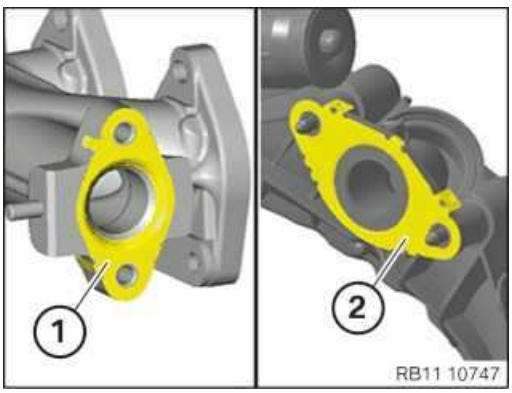
15 – Installing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

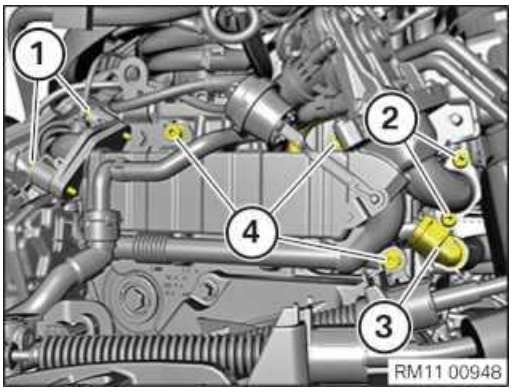


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket
- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket

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- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts
- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm

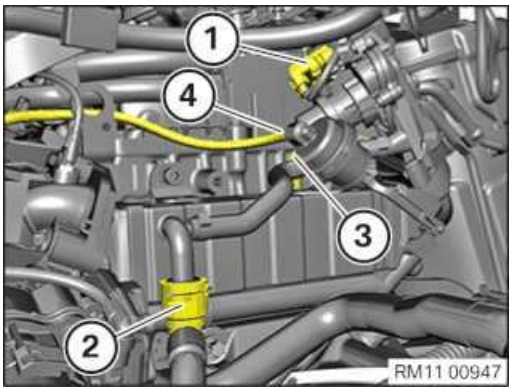
- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.
- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm

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TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

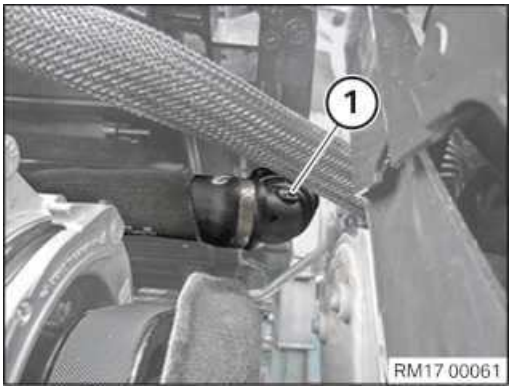
  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

POSTPROCESSES

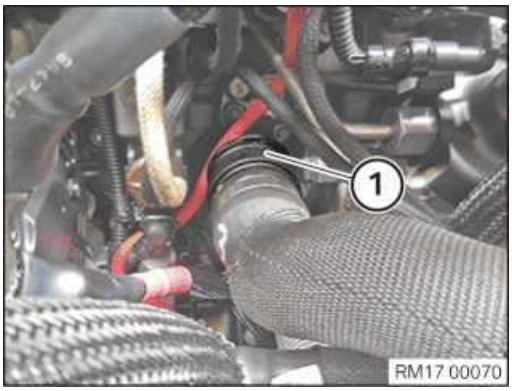
16 – Connect the coolant line

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Connect the right coolant line (1) to the radiator and lock audibly.



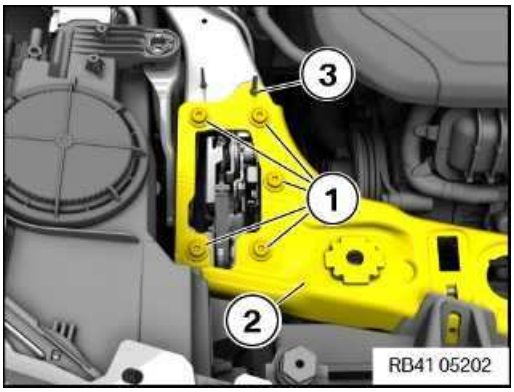
- Connect the coolant line (1) to the connecting branch and lock audibly.

17 – Install front cross connection

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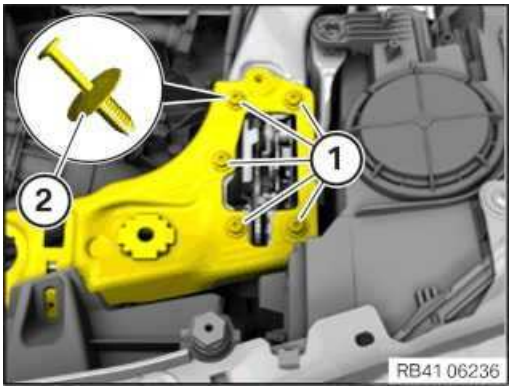
- Right side of vehicle only: Secure spray guard (1) on the cross connection (2) as pictured.



- Position front cross connection (2) and clip front cross connection (2) into the rubber retainer (3) at the same time.
- Tighten the screws (1).

Cross connection to carrier support

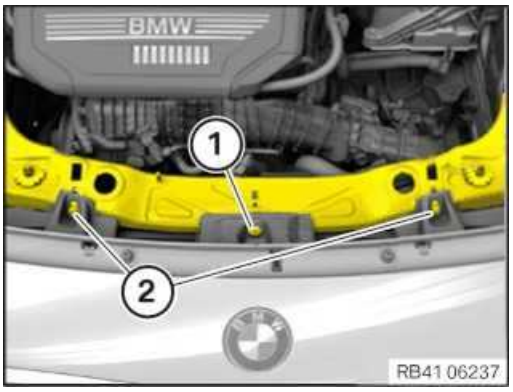
Screws M6x20		Tightening torque	11,8 Nm



- Tighten the screws (1).

Cross connection to carrier support

Screws M6x20		Tightening torque	11,8 Nm



- Position screws (3) on the rubber mounts for the radiator and tighten.

Screw connection for rubber mount of coolant radiator to coolant radiator

Bolt to rubber mount		Tightening torque	8 Nm

- Tighten down screws (2).

Air duct to upper connection

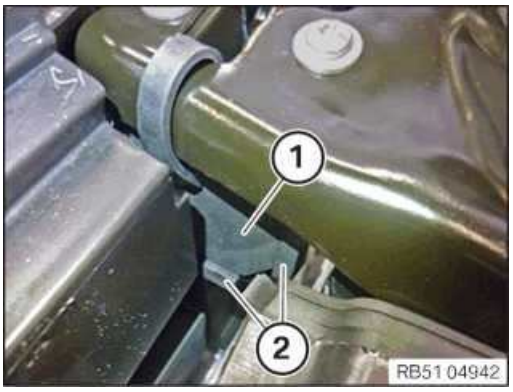
M6x20 screw		Tightening torque	11,8 Nm

- Tighten down screw (1).

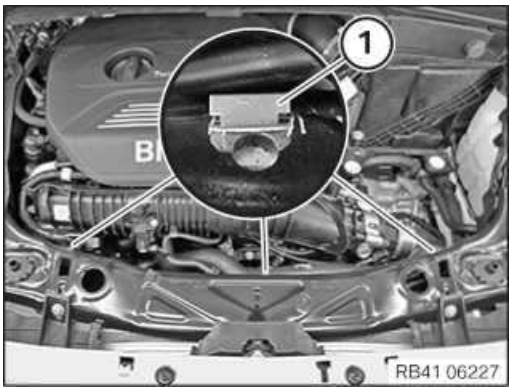
Bracing strut to upper connection

M8x20 screw		Tightening torque	28 Nm

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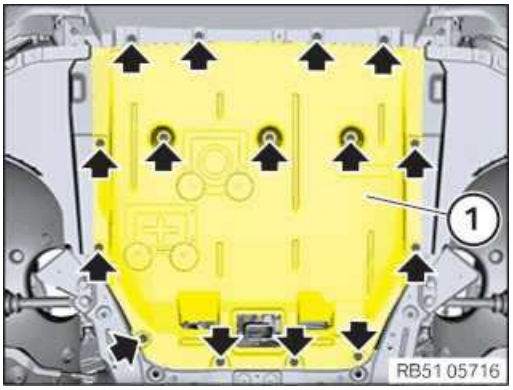


- Right side of vehicle only: Properly mount spray guard (1) to prevent corrosion.
- Secure spray guard (1) to the bridge with retaining tabs (2).



- Fasten the clamps (1) from the Bowden cable of the bonnet lock on the cross connection.

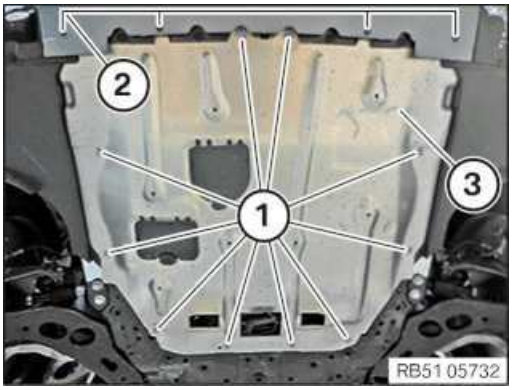
18 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm



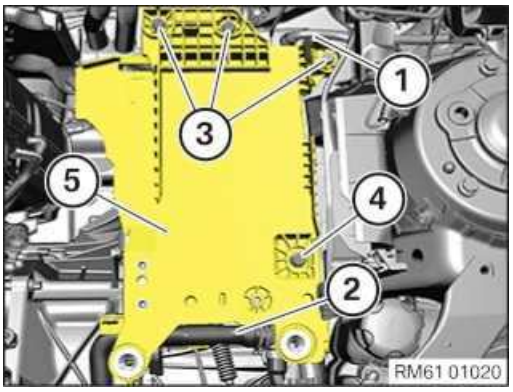
- **Equipment specification with metal underride guard:**
- Guide in and attach the underride guard (3).
- Tighten down screws (1) and (2).

Underbody protection front

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

19 – Install the battery holder

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- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

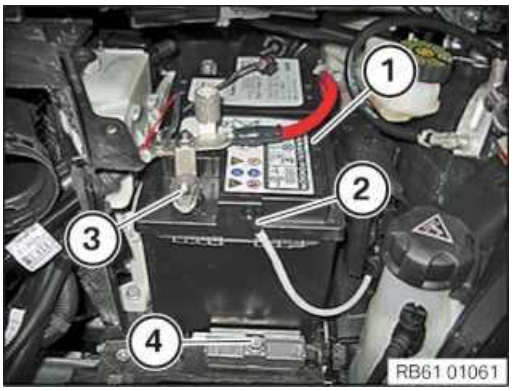
- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

20 – Install vehicle battery



- Install vehicle battery (1).
- Position the bracket and tighten with the screw (4) .

Battery terminal rail to battery tray

M8		19 Nm

- Position the vent hose (2) and clip it in.
- Position the positive battery terminal and tighten with the nut (3) .

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

▸ **Check the vent holes of the battery**

WARNING

Gas emission.

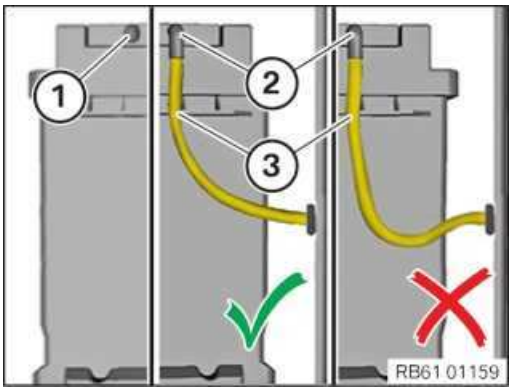
Danger of injury! Danger of explosion!

- Assign the vent holes correctly.
- Route the vent hose correctly.

TECHNICAL INFORMATION

The battery has two vent holes, opposite:
One vent hole (1) must be closed correctly with a dummy plug.
The vent hose (3) must be correctly connected and routed at the other vent hole (2).

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Check

- Check if the vent hole (1) is correctly closed with a dummy plug.

Result

» No dummy plug.

Measure

- Close the vent hole (1) correctly with a dummy plug.

Check

- Check if the vent hole (2) has a correctly connected vent hose (3).

Result

» The vent hose (3) is not correctly connected.

Measure

- At the vent hole (2), connect the vent hose (3) correctly.

Check

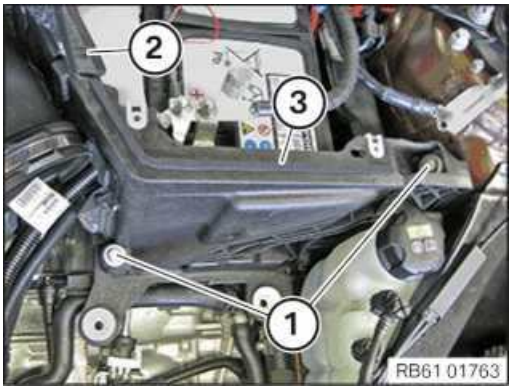
- Check if the vent hose (3) is routed to the outside with a downhill gradient (**no siphon formation!**).

Result

» The vent hose (3) is not correctly routed as shown in the image on the right.

Measure

- Route the vent hose (3) correctly as shown in the centre image.



- Insert tension strut (3) and tighten with screws (1).

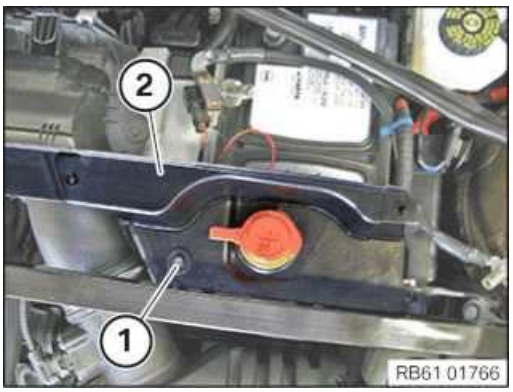
Trailing link

M8		Tightening torque	19 Nm

- Tighten down screw (2).

Battery cover

M8		2,8 Nm

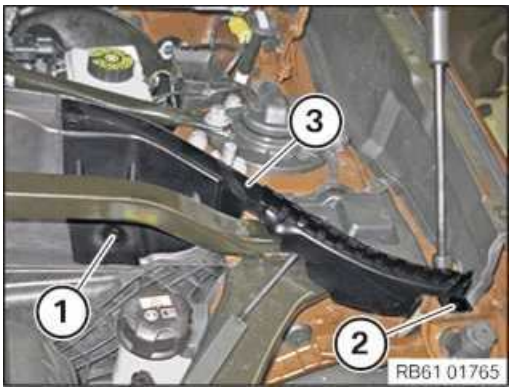


- Position the cover (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm

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- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

M8		2,8 Nm

21 – Install electronics box

Prerequisite

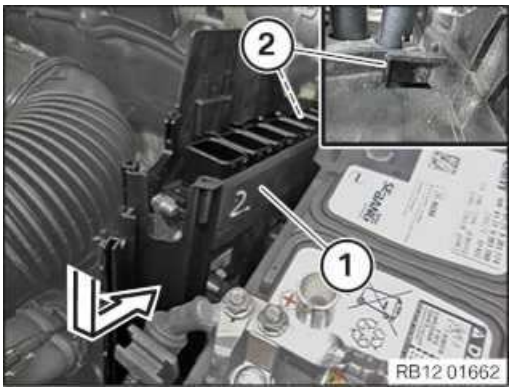
Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

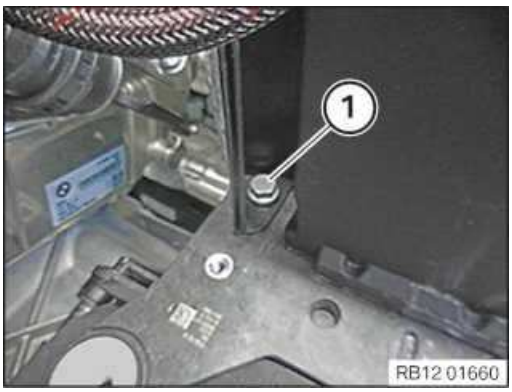
- Route all cables without abrasions, do not trap and crush.



- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.



- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).

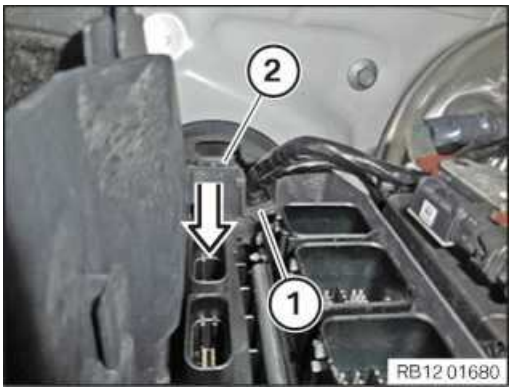


- Tighten down screw (1).

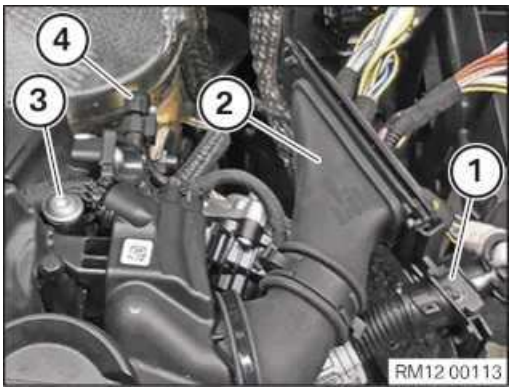
Electronics box to battery tray

M8X16		Tightening torque	15 Nm

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- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.

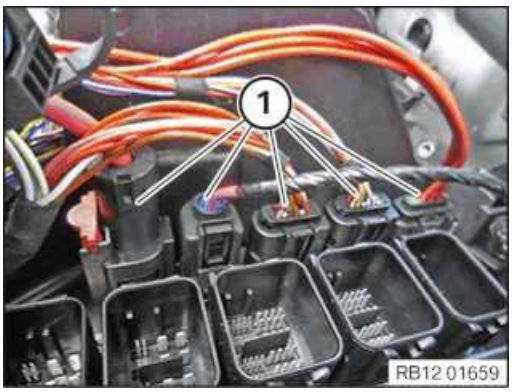


- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

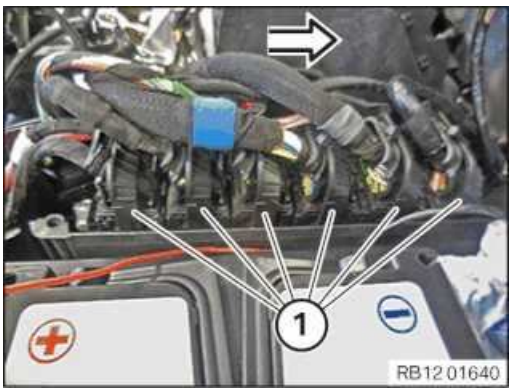
Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

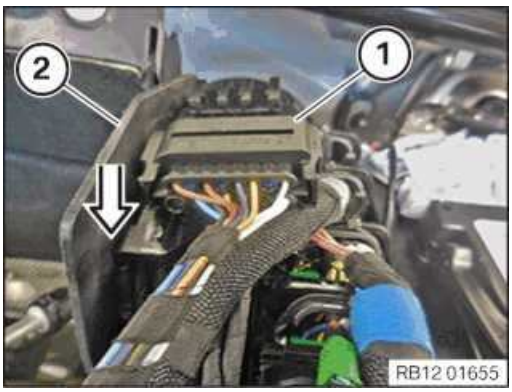
- Attach connector (4) to the differential pressure sensor and lock it audibly.



- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.

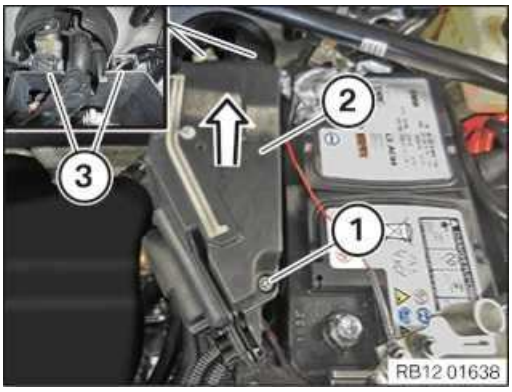


- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.

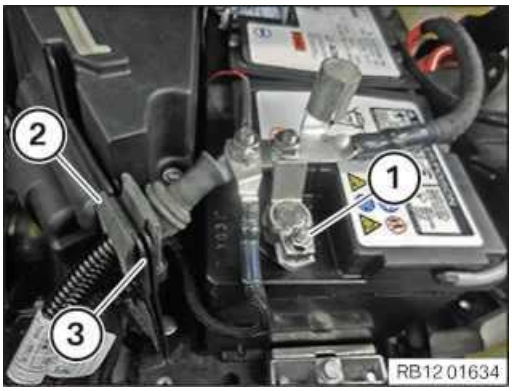
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- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

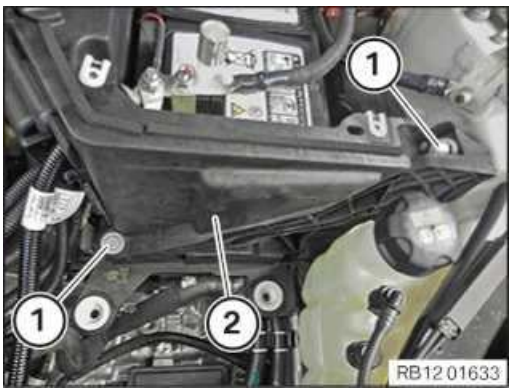
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

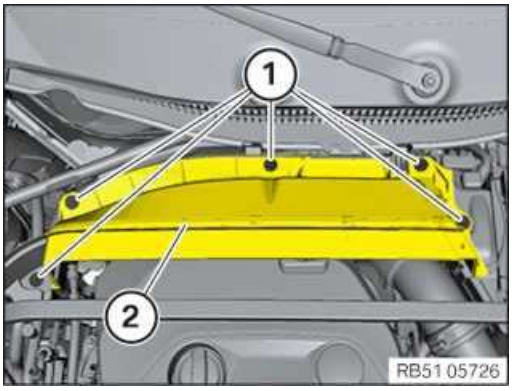


- Feed in and install tension strut (2).
- Tighten the screws (1).

Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

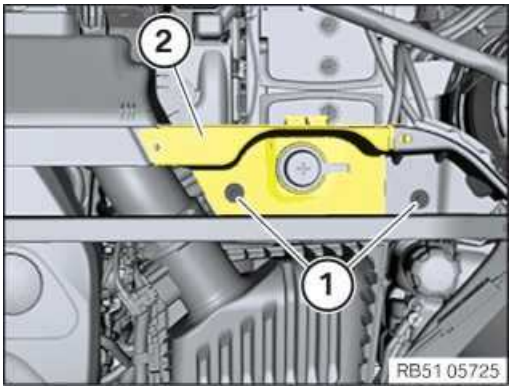
22 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Cover of top bulkhead

Screw		Tightening torque	2,6 Nm



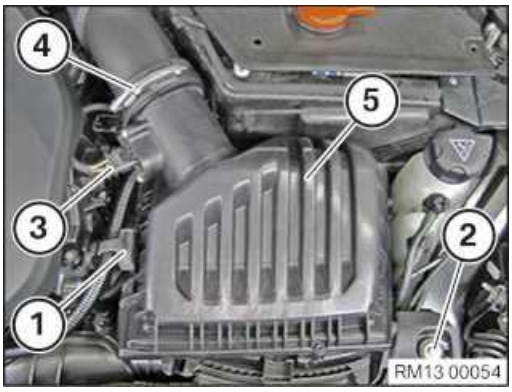
- Guide in and install cover (2).
- Tighten down screw (1).

Cover of remote positive terminal

Screw		Tightening torque	2,6 Nm

23 – Installing intake silencer housing

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- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

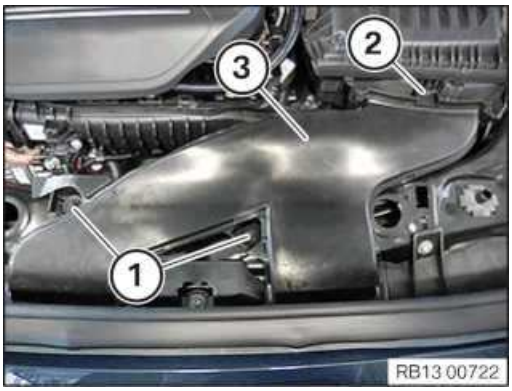
- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

24 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).
  The lock (2) must audibly engage.
- Tighten nuts (1).

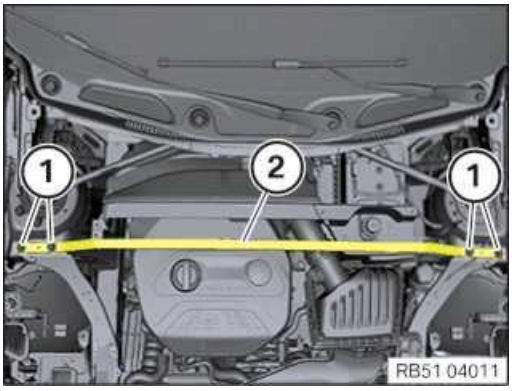
Intake neck to cross connection

M6		Tightening torque	8 Nm

25 – Install strut brace

TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.

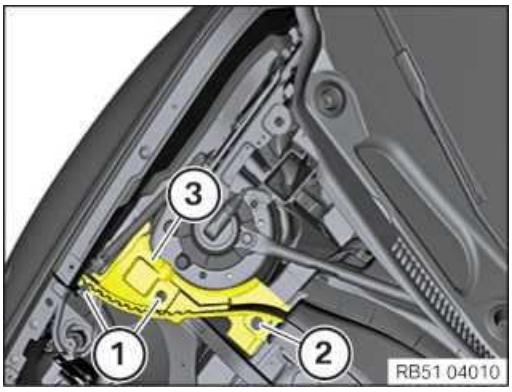


- Install the strut brace (2).
- Renew screws (1).
  Parts: Bolts
- Tighten the screws (1).

Cross-brace to spring strut dome

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

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NOTICE

Description is for right component only. The procedure on the left side is identical.

- Install the cover (3).
- Tighten down screw (2).

Cover on body

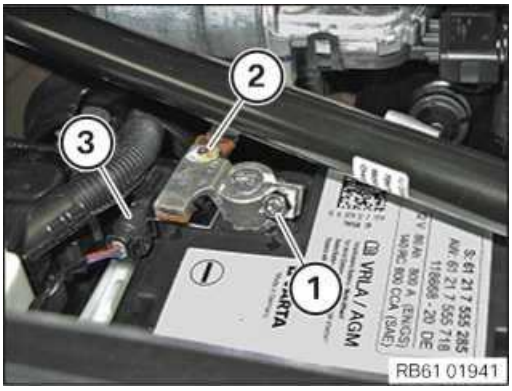
Hexagon screw		Tightening torque	3 Nm

- Install the expanding rivet (1).

26 – Connecting the battery earth lead

TECHNICAL INFORMATION

For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)



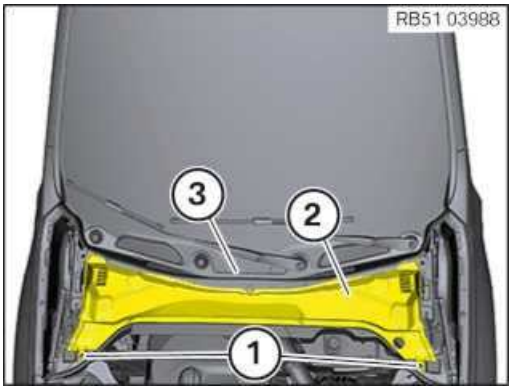
- Remove the protective cover of the positive battery terminal.
- Position the battery earth lead (2).
- Tighten nut (1).

Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6			5 Nm

- If required, connect the connector (3).

27 – Installing front cowl panel cover



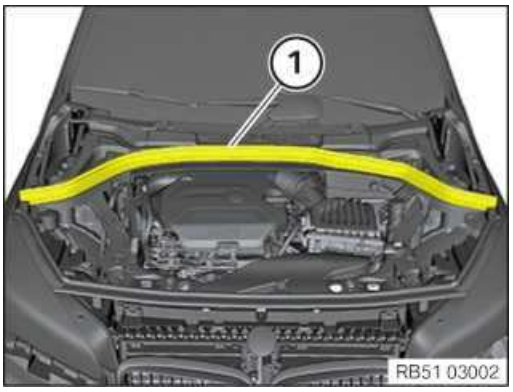
- Insert and install cowl panel cover at front (2) into cowl panel cover at rear (3).
- Check cowl panel cover at front is correctly seated (2).
- Secure expanding rivet (1).

28 – Install the seal for the bonnet

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

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- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

29 – Filling and bleed the high-temperature coolant circuit



- See additional information.

30 – If a new exhaust-gas recirculation valve is installed: Delete adaptations

Check

- Check if a new exhaust-gas recirculation valve is already installed on the new exhaust-gas recirculation cooler.

Result

» A new exhaust-gas recirculation valve is installed.

Measure

- Delete adaptations.

▶ **Delete adaptations**



- Connect diagnosis system.
  - Power train
  - Digital diesel electronics (DDE)
  - Reset adaptations
  - Delete adaptations

Additional Information

Overview of Tightening Torques

Exhaust-gas recirculation cooler to cylinder head Used in step 15

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler Used in step 15

M6		Tightening torque	11 Nm

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Exhaust-gas recirculation cooler to exhaust manifold

Used in step 15

M8x28	Replace screws	Tightening torque	32 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 15

M8x20		Tightening torque	19 Nm

Cross connection to carrier support

Used in step 17

Screws M6x20		Tightening torque	11,8 Nm

Screw connection for rubber mount of coolant radiator to coolant radiator

Used in step 17

Bolt to rubber mount		Tightening torque	8 Nm

Air duct to upper connection

Used in step 17

M6x20 screw		Tightening torque	11,8 Nm

Bracing strut to upper connection

Used in step 17

M8x20 screw		Tightening torque	28 Nm

Underbody protection front

Used in step 18

Screw for thermoplastic plastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Battery holder to engine support

Used in step 19

Hexagon screw M8x30		Tightening torque	19 Nm

Battery terminal rail to battery tray

Used in step 20

M8			19 Nm

Battery terminal with IBS positive battery terminal / negative battery terminal

Used in step 20 26

NutM6			5 Nm

Trailing link

Used in step 20

M8		Tightening torque	19 Nm

Battery cover

Used in step 20

M8			2,8 Nm

Electronics box to battery tray

Used in step 21

M8X16		Tightening torque	15 Nm

Wiring harness to cylinder head cover

Used in step 21

TS5x20		Tightening torque	3,5 Nm

Cover to electronics box

Used in step 21

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery

Used in step 21

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray

Used in step 21

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M8		Tightening torque	19 Nm

Cover of top bulkhead Used in step 22

Screw		Tightening torque	2,6 Nm

Cover of remote positive terminal Used in step 22

Screw		Tightening torque	2,6 Nm

Intake silencer housing to lock bridge Used in step 23

M6X30		Tightening torque	8 Nm

Clean air pipe to intake silencer housing Used in step 23

Clamp		Tightening torque	3 Nm

Intake neck to cross connection Used in step 24

M6		Tightening torque	8 Nm

Cross-brace to spring strut dome Used in step 25

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

Cover on body Used in step 25

Hexagon screw		Tightening torque	3 Nm

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	14 15
EGR controller	14 15
Reset adaptations	30

General repair instructions	Used in step
61 20 ... Notes on AGM battery	26
61 12 ... Notes on intelligent battery sensor (IBS)	26
61 00 ... Notes for disconnecting and connecting battery	26
61 00 ... Safety information for handling vehicle battery	
61 20 ... Battery replacement information	

Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	8
17 00 008 Draining and topping up coolant for high-temperature circuit	29
17 00 008 Draining and topping up coolant for high-temperature circuit	29
17 00 008 Draining and topping up coolant for high-temperature circuit	29
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	29
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	29
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	29
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17 00 039 Bleed the cooling system and check it for watertightness with the special tool	29
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	29
17 00 039 Bleed the cooling system and check for watertightness with the special tool (coolant circuit for low temperature)	29
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	29
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	29
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	29
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	29
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	29
17 00 039 Bleeding the cooling system (B36, B38, B46, B48)	29
17 00 039 Bleeding cooling system (B37, B47)	29
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	29
17 00 039 Filling and bleeding the high-temperature cooling system vacuum filler device (B48)	29
17 00 008 Draining and topping up the high-temperature coolant circuit	29
17 00 008 Draining and topping up the high-temperature coolant circuit	29
17 00 016 Draining and topping up coolant circuit for Range Extender \PREMIUM	29
17 00 008 Draining and topping up the high-temperature coolant circuit	29
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	29
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	29
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	29
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	29
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	29

Parts

Parts required

Designation	Used in step
Exhaust-gas recirculation cooler seal on exhaust manifold	15
Exhaust-gas recirculation cooler seal on intake plenum	15

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11 71 501 Removing and installing/replacing exhaust-gas recirculation valve (B47)

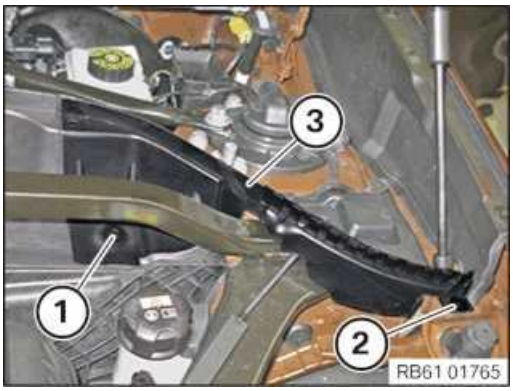
Attention!

Read and comply with notes on protection against electrostatic damage (ESD protection).

Necessary preliminary work:

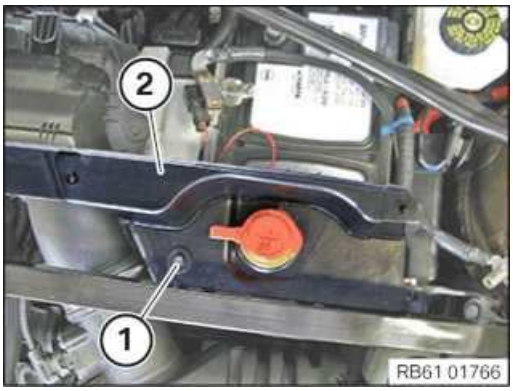
- Remove intake silencer housing
- Remove clean air pipe
- Remove resonator
- Disconnect battery negative cable

Removal:



Release screw (1) and expanding rivet (2).

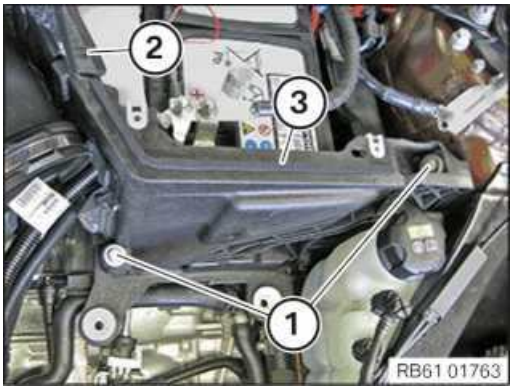
Remove the mounting for the gasket (3).



Release screw (1).

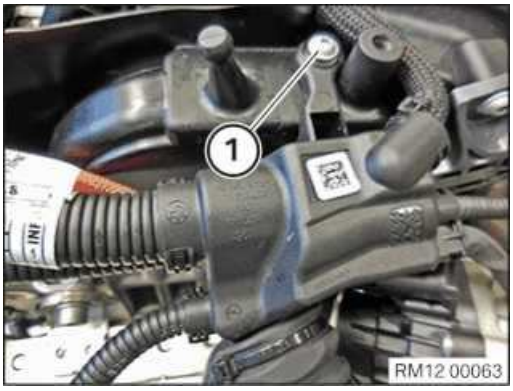
Remove cover (2).

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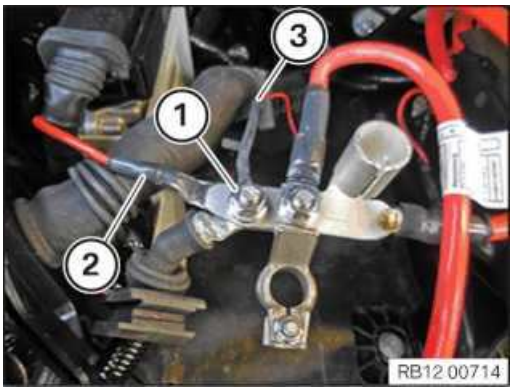


Release screws (1).

Lift cover (2) slightly and feed out tension strut (3).

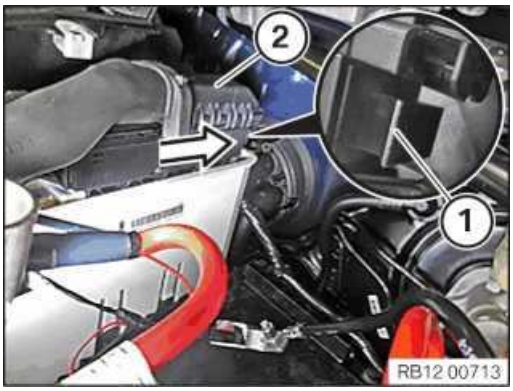


Release screw (1). Remove the wiring harness from the cylinder head cover.



Slacken nut (1).

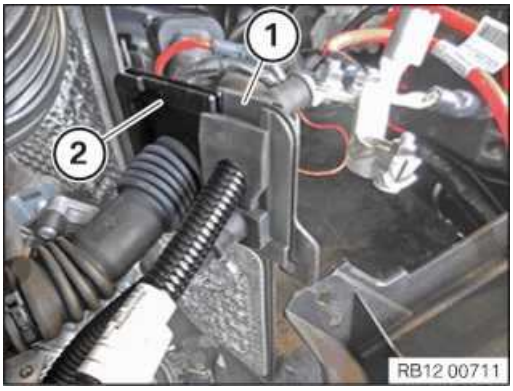
Feed out cables (2) and (3) and lay to one side.



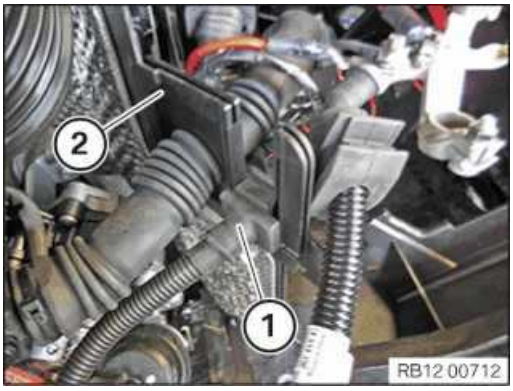
Undo lock (1) as shown by arrow.

Remove connector (2).

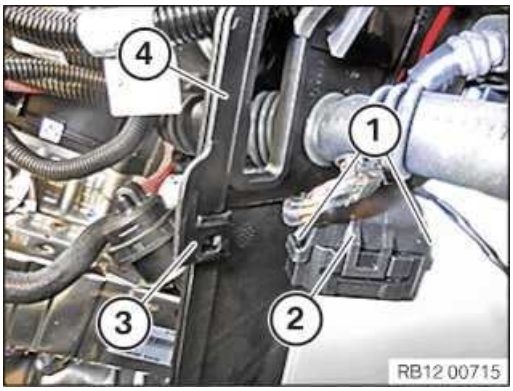
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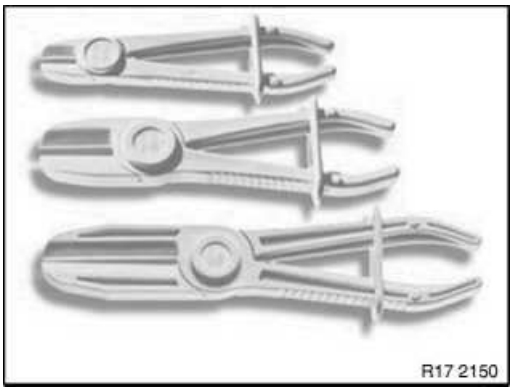
Remove cable (1) from cable clip (2).



Remove cable (1) from cable clip (2).

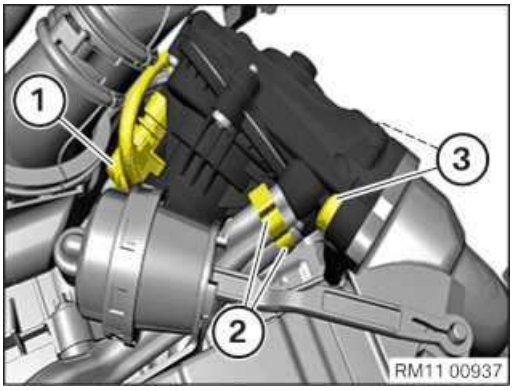


Release lock (1).
Remove connector (2).
Release lock (3).
Remove cable clip (4) with connector.



Use commercially available pinch-off tools to pinch off the coolant hoses.

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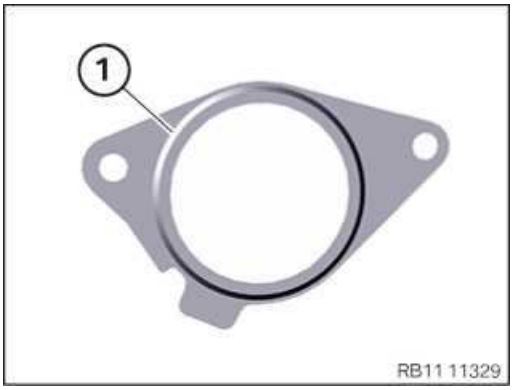
Unlock connector (1) and pull off.

Loosen screws (3).

Loosen hose clamps (2) and pull off coolant lines.

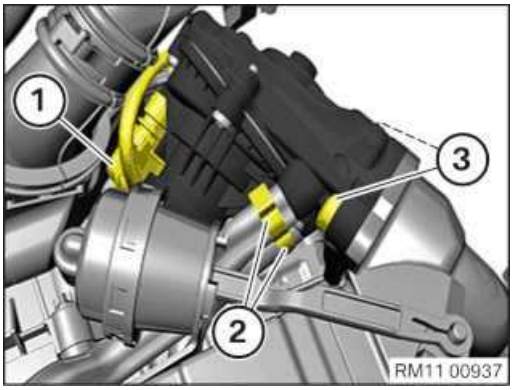
Remove the exhaust-gas recirculation valve .

Installation:



Replace gasket (1).

Parts: Gasket



Renew the hose clamps of the coolant lines (2).

Parts: Hose clamps.

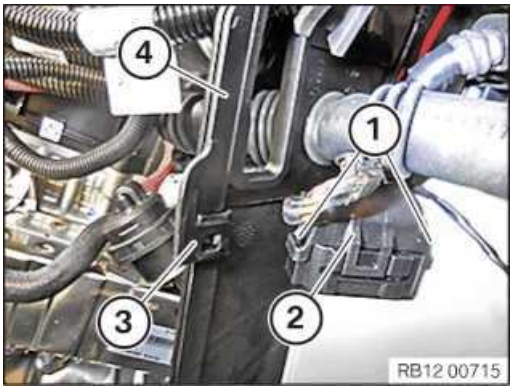
Slide coolant lines with hose clamps (2) onto the exhaust-gas recirculation valve.

Make sure the coolant lines are not mounted twisted.

Mount hose clamps (2).

Position exhaust-gas recirculation valve with new seal.

Screw-in screws (3) by **one turn**.



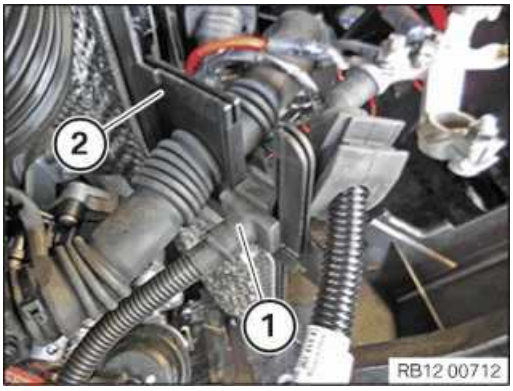
Connect connector (2) and lock.

Lock (1) must snap audibly into place.

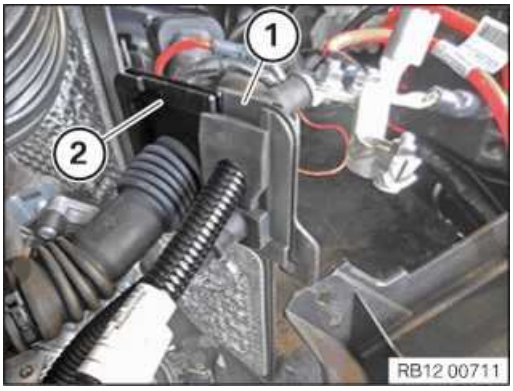
Install cable clip (4) with connector.

Lock (3) must snap audibly into place.

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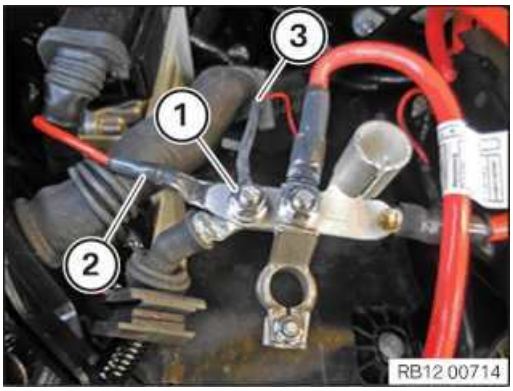
Feed in and install cable (1) into the cable clip (2).



Feed cable (1) into the cable clip (2) and install.

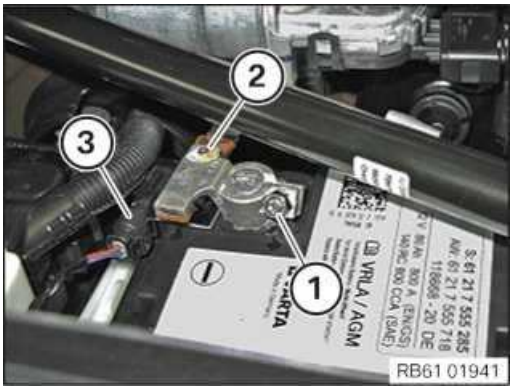


Fit connector (2).
Engage the lock (1) as shown by arrow.
Lock (1) must snap audibly into place.



Feed in and install cables (2) and (3).
Tighten nut (1).
Tightening torque 12 52 6AZ

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Connect negative battery cable (2).

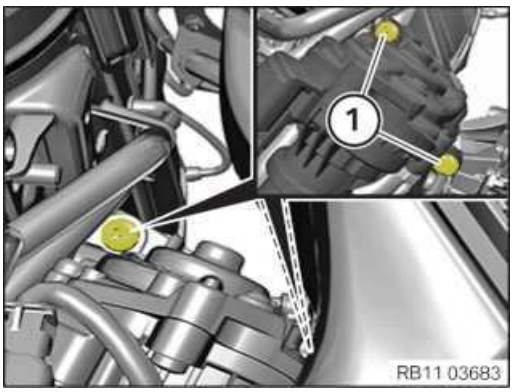
Tighten nut (1).

Tightening torque 61 21 2AZ.

Connect the connector (3) and audibly lock it.

Connect diagnosis system, Service function: Carry out "Setting the exhaust-gas recirculation valve installation position".

Diagnosis path: 01 Drive - Digital diesel electronics - Exchanging the exhaust-gas recirculation valve - Exhaust-gas recirculation valve installation position



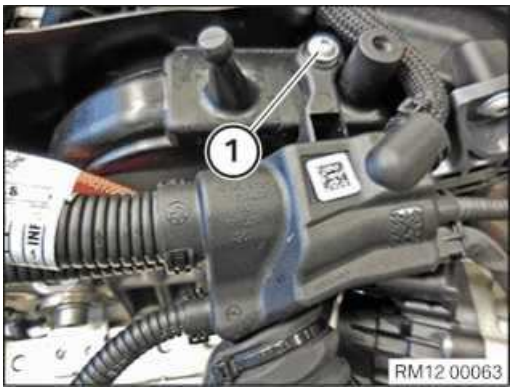
Tighten down screws (1).

Tightening torque: 11 71 3 AZ .

Replacement.

Resetting adaptations.

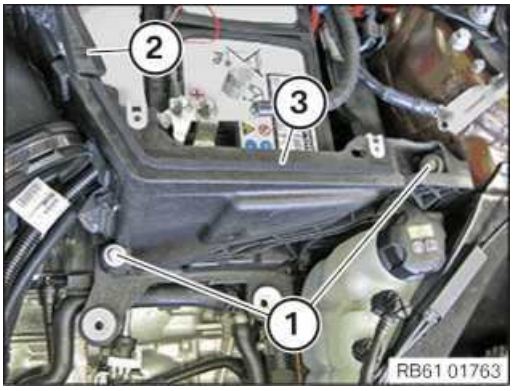
Diagnosis path: 01 Drive - DDE - Reset adaptation - Delete adaptations.



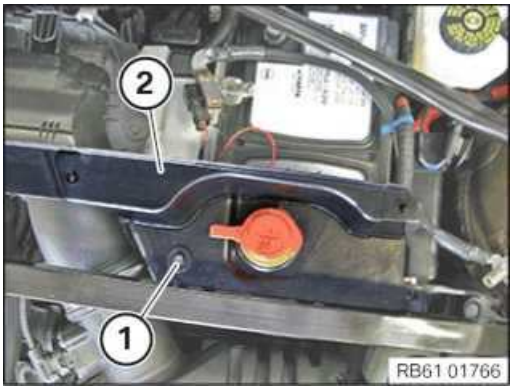
Install wiring harness on cylinder head cover.

Tighten screw (1).

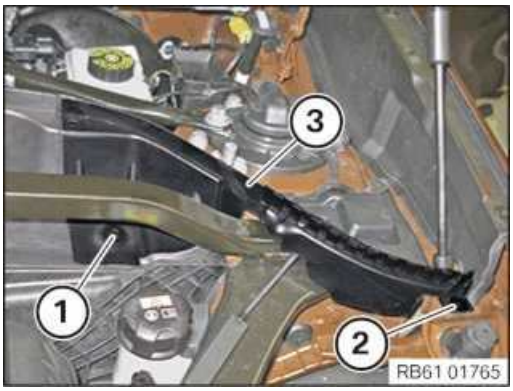
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Lift cover (2) slightly and install the tension strut (3).
Tighten screws (1).
Tightening torque 61 21 2AZ.



Install cover (2).
Tighten screw (1).



Install the mounting for the seal (3).
Tighten screw (1).
Install expanding rivet (2).

Required follow-up work:

- Install intake silencer housing
- Install clean air pipe
- Install resonator
- Add coolant
- Delete fault memory

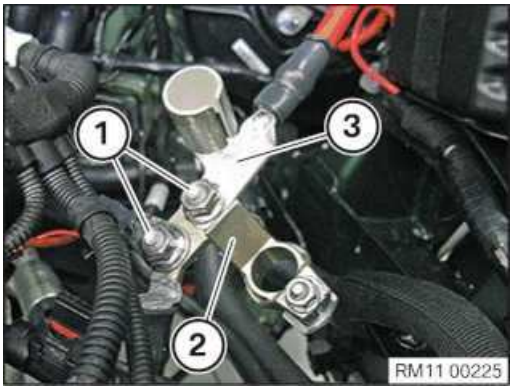
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11 71 100 Removing and installing/replacing exhaust-gas recirculation cooler (B47)

Necessary preliminary work:

- Remove acoustic cover
- Remove battery
- Remove cowl panel
- Remove suspension cross-brace
- Drain coolant
- When replacing the exhaust-gas recirculation cooler, check the part number and clear adaptations
- Remove DDE control unit

Removal:



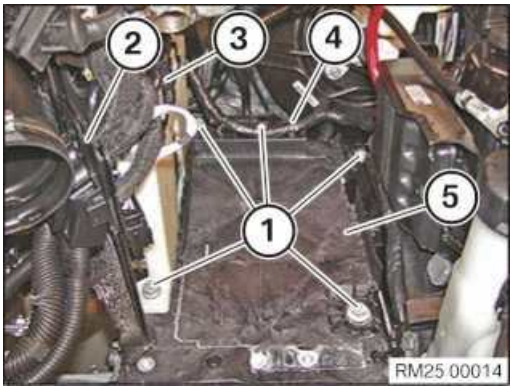
Unscrew nuts (1).

Disconnect positive battery terminal (2) and positive battery connection point (3).

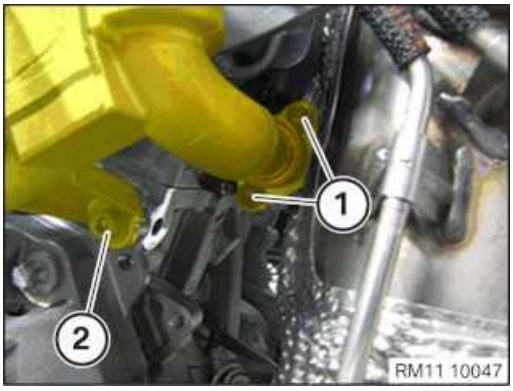


Disengage wiring harness from holder (1).

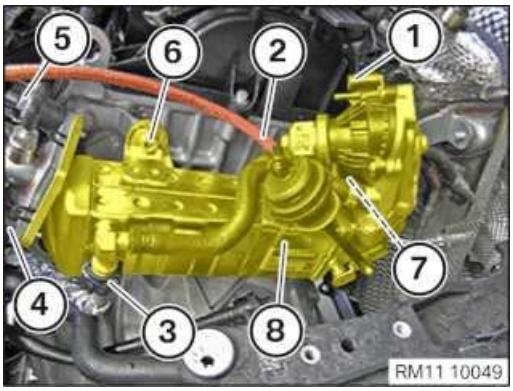
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Release screws (1).
Release bulkhead (2) from bracket and remove.
Release control unit (3) from bracket.
Detach wiring harness (4) from battery tray (5).
Remove battery tray (5).



Loosen screws (1) on exhaust manifold.
Release screw (2).



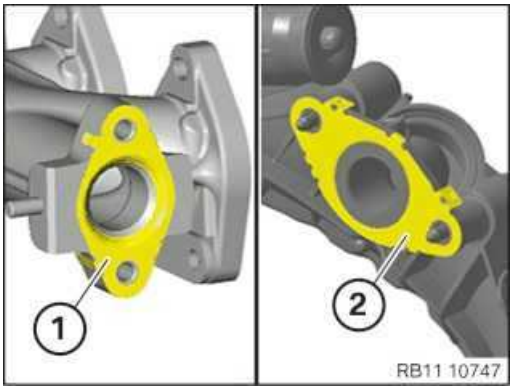
Unlock plug connection (1) and disconnect.
Pull off vacuum line (2).
Unlock coolant line (3) and pull off.
Release screws (4 and 5).
Release screws (6 and 7).
Remove exhaust-gas recirculation cooler (8) upwards.

Installation:



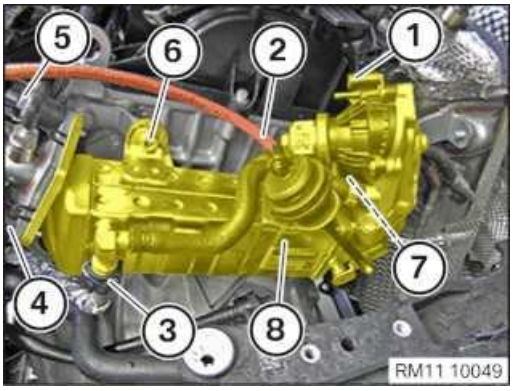
Install pipe neck (1).
Part: Replace pipe neck.

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Renew the beaded metal gaskets (1) and (2).

Parts: Beaded metal gasket.



Installation note:
Make sure that the pipe neck (8) is correctly fitted in the cylinder head.

Tighten all screw connection.

Join screws (7 and 6).

Join screws (4 and 5).

Tighten screws (7 and 6).

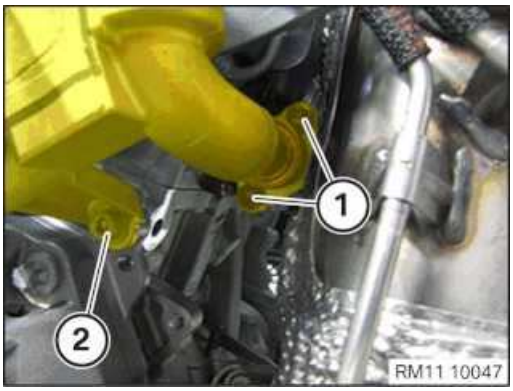
Tightening torque: 11 71 2AZ.

Tighten screws (4 and 5).

Tightening torque: 11 61 2AZ.

Connect vacuum line (2).

Connect and lock coolant line (3).



Installation note:
Renew screws (1) and seal.

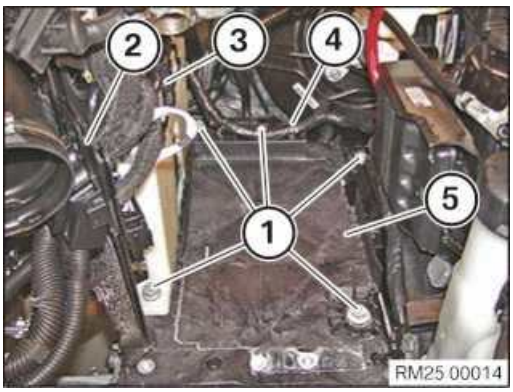
Grease screw thread (1) with assembly paste 4.2.

Tighten screws (1) on exhaust manifold.

Tightening torque: 11 71 1AZ.

Tighten screw (2).

Tightening torque: 11 71 2AZ.



Install battery tray (5).

Insert bulkhead (2) into bracket.

Tighten screws (1).

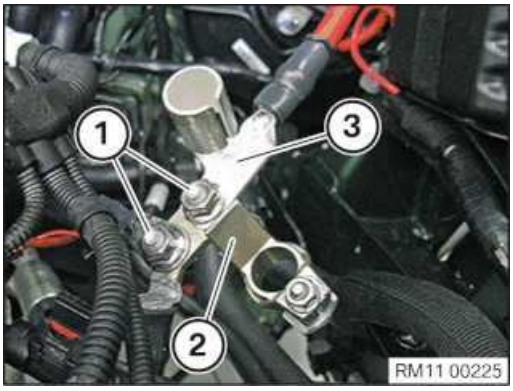
Install wiring harness (4) on battery tray (5).

Insert control unit (3) in bracket.

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Install the engine wiring harness in the bulkhead (1).



Connect positive battery terminal (2) and positive battery connection point (3).

Tighten down nuts (1).

Required reworking.

- Install cowl panel
- Install the strut brace
- Add coolant
- Install DDE control unit
- Install battery
- Install acoustic cover
- Read fault memory of DDE control unit
- Delete fault memory

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11 71 501 Replacing the exhaust-gas recirculation valve

PRELIMINARY WORK

1 – Disconnecting all battery earth leads

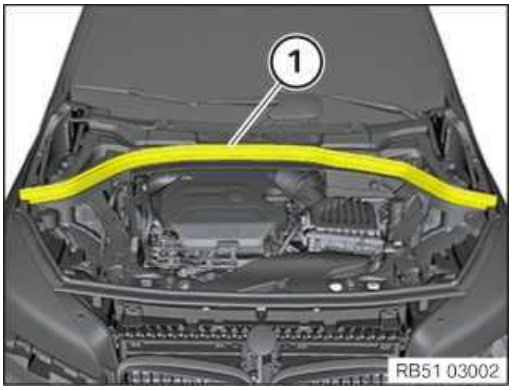


- See additional information.

2 – Remove the seal for the rear bonnet

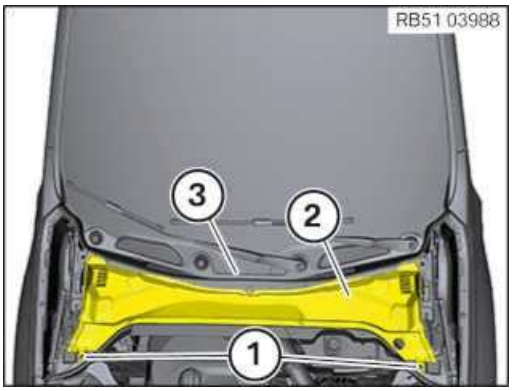
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Pull off rear bonnet seal (1) towards the top and remove.

3 – Removing front cowl panel cover



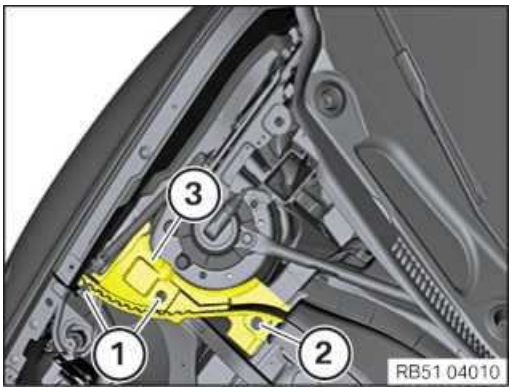
- Loosen the expanding rivet (1).
- Feed out and remove front cowl panel cover (2) from the rear cowl panel cover(3).

4 – Remove suspension cross-brace

TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.

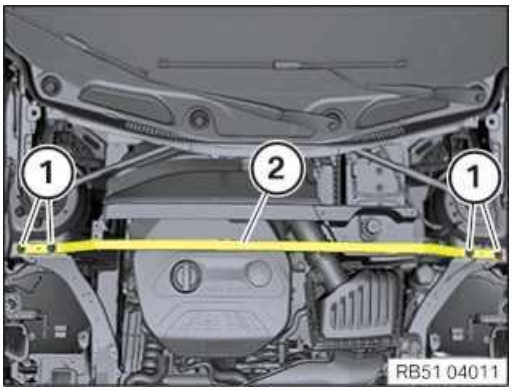
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NOTICE

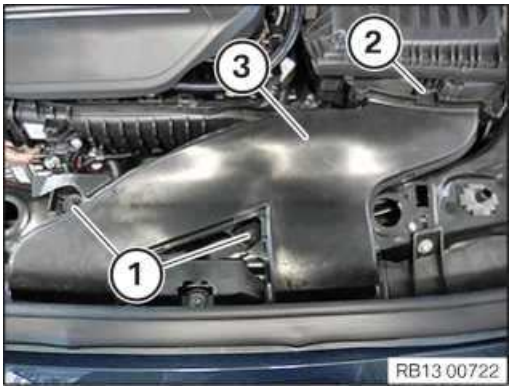
Description is for right component only. The procedure on the left side is identical.

- Loosen expanding rivet (1).
- Loosen screw (2).
- Remove the cover (3).



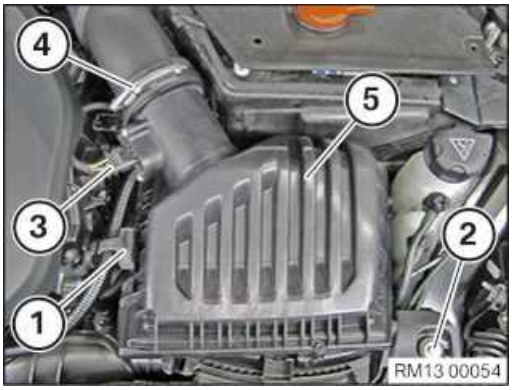
- Loosen screws (1).
- Remove strut brace (2).

5 – Remove the intake neck for intake silencer housing



- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

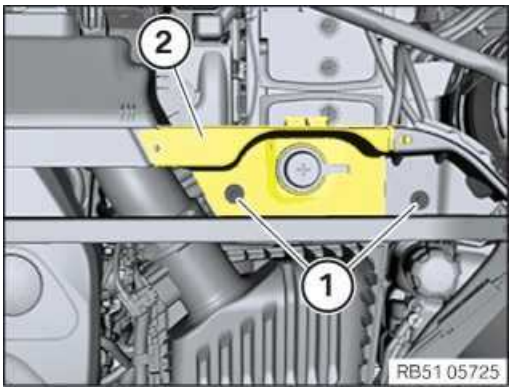
6 – Removing intake silencer housing



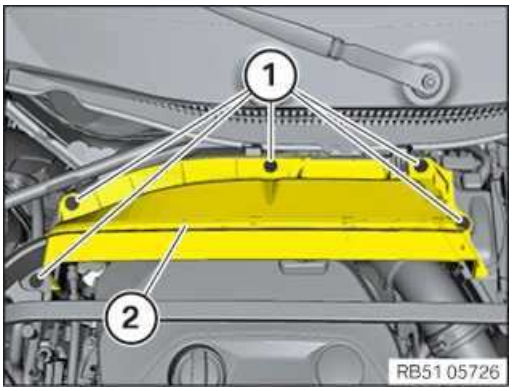
- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

7 – Removing the upper bulkhead cover

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- Loosen screws (1).
- Guide out and remove the cover (2).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

8 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

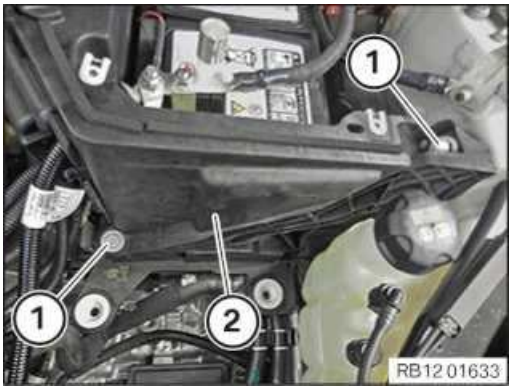
TECHNICAL INFORMATION

Follow instructions for removing and installing control units.
For additional information see: 12 00 ... Notes on removal and installation of control units

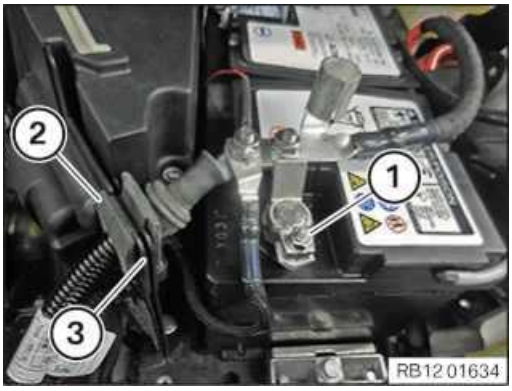
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TECHNICAL INFORMATION

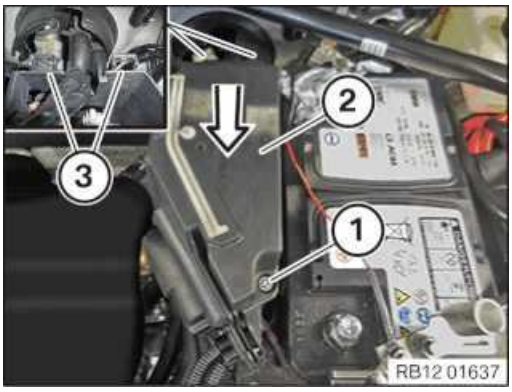
Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.



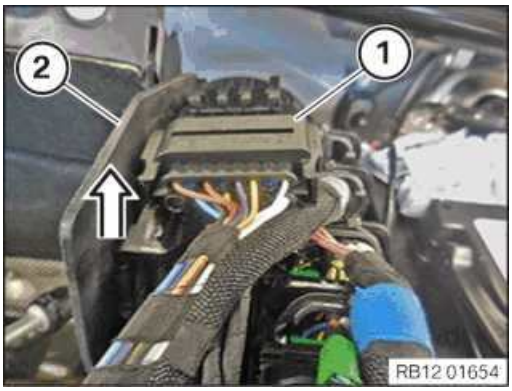
- Loosen screws (1).
- Guide out the tension strut (2) toward the top and remove it.



- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

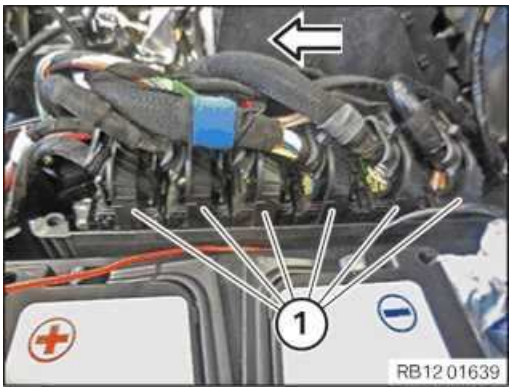


- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.

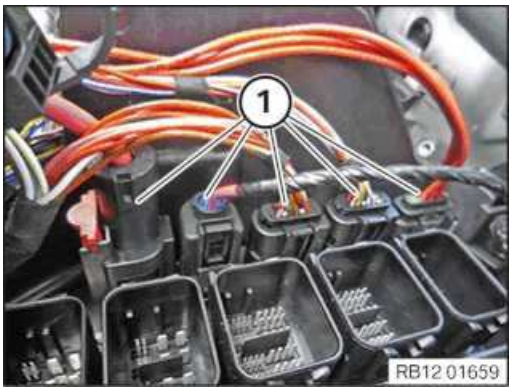


- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).

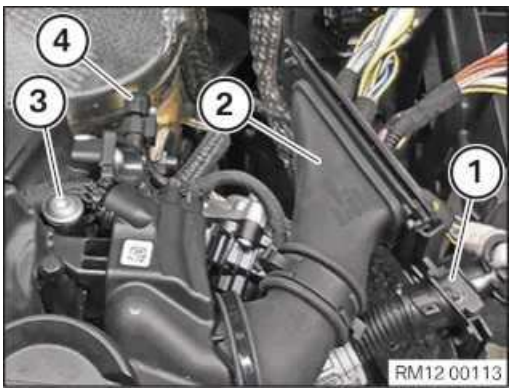
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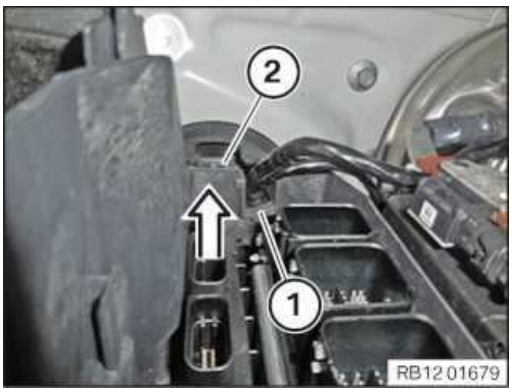
- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



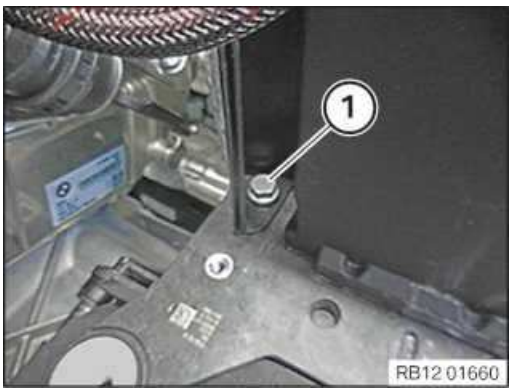
- Unlock and loosen connector (1).



- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.

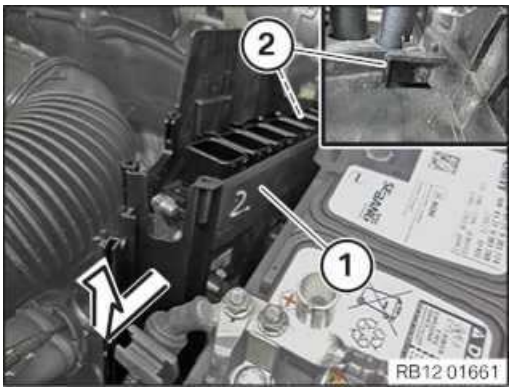


- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.



- Loosen screw (1).

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- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

MAIN WORK

9 – Removing the exhaust-gas recirculation valve

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

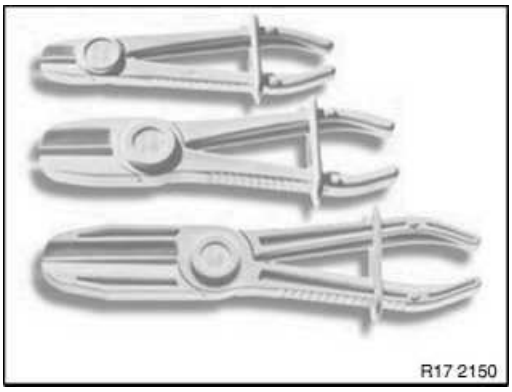
TECHNICAL INFORMATION

Use commercially available pinch-off tools to pinch off the coolant hoses.

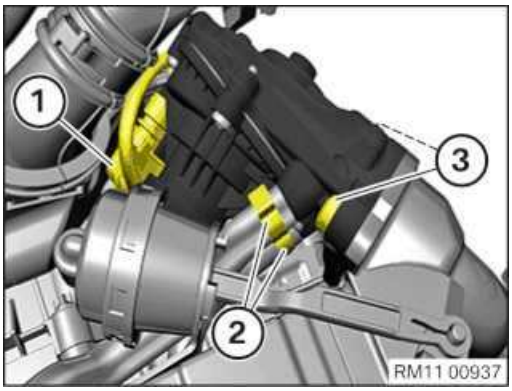
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

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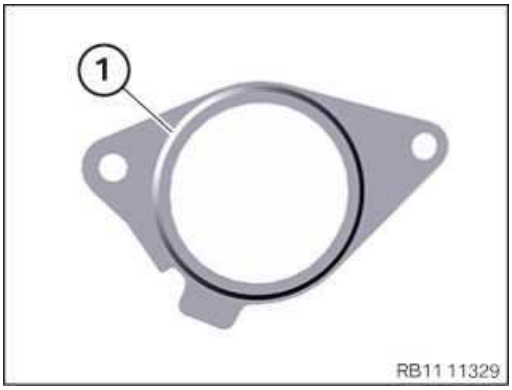


- Use commercially available disconnection tools to pinch off the coolant lines.



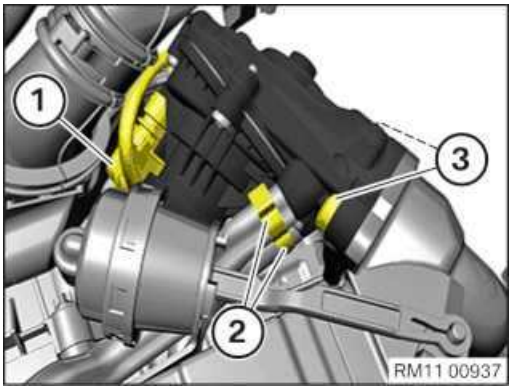
- Unlock and disconnect the plug connection (1).
- Loosen screws (3).
- Unfasten hose clamps (2).
- Detach coolant hoses.
- Remove the exhaust-gas recirculation valve .

10 – Installing the exhaust-gas recirculation valve



- Renew the gasket (1).

  Parts: Gasket
- Insert seal (1) on exhaust-gas recirculation cooler and install.

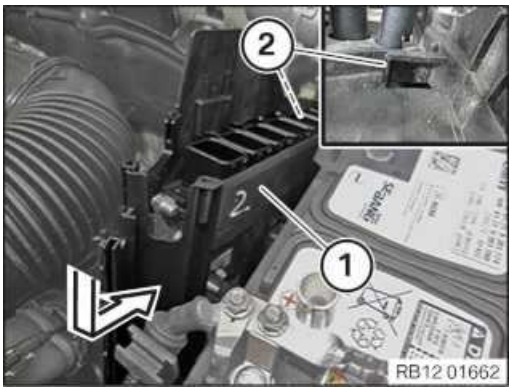


- Replace hose clamps.

  Parts: Hose clamps
- Slide coolant hoses (2) with hose clamps onto the exhaust-gas recirculation valve.
- Make sure that the coolant hoses (2) are not mounted twisted.
- Secure hose clamps.
- Ensure correct fitting of the seal on the exhaust-gas recirculation valve and on the exhaust-gas recirculation cooler.
- Install the exhaust-gas recirculation valve .
- Insert screws (3) by one turn.
- Connect and lock the connector (1).

  The connector must lock audibly.

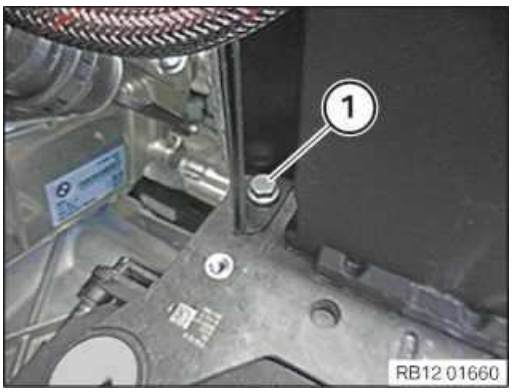
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- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.



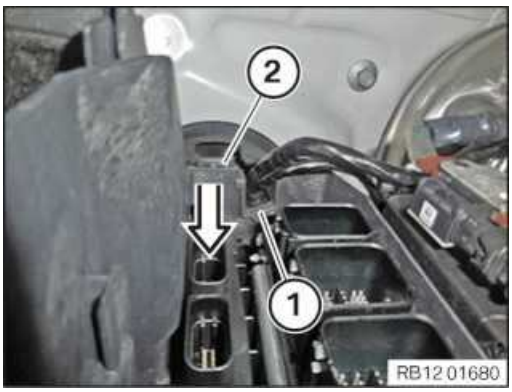
- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).



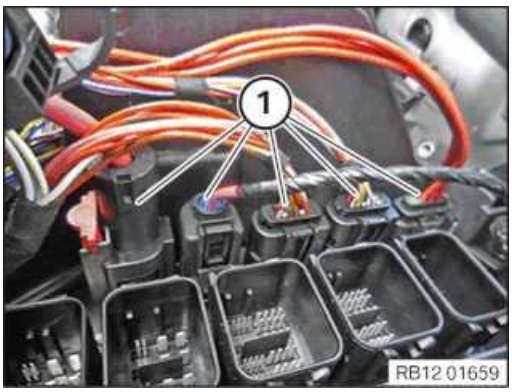
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm

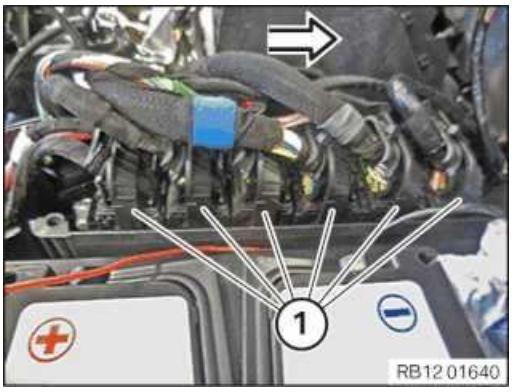


- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.

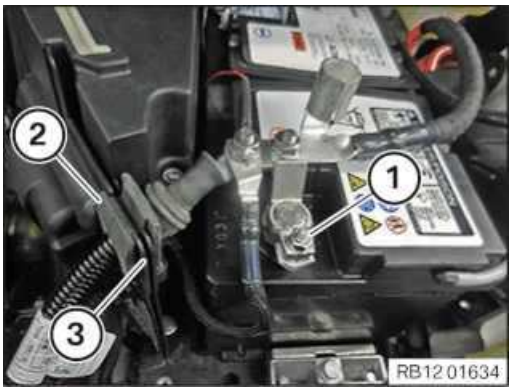


- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.

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- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

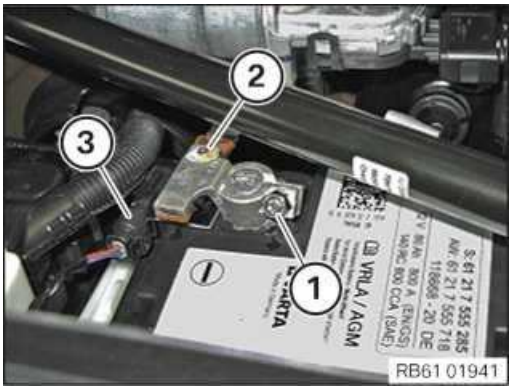
Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

▸ **Connecting the battery earth lead**

TECHNICAL INFORMATION

For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)



- Remove the protective cover of the positive battery terminal.
- Position the battery earth lead (2).
- Tighten nut (1).

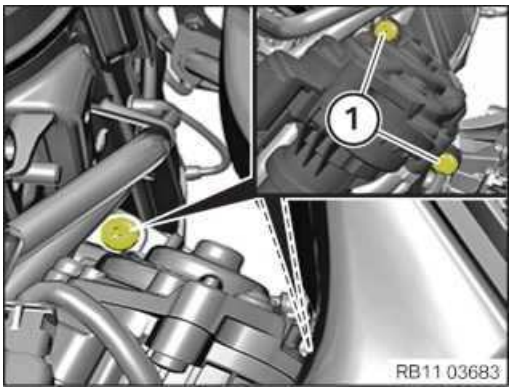
Battery terminal with IBS positive battery terminal / negative battery terminal

NutM6		5 Nm

- If required, connect the connector (3).

- Connect diagnosis system.
- Carry out the service function "Setting the exhaust-gas recirculation valve installation position":
  - Power train
  - Digital Diesel Electronics
  - Exchange the exhaust-gas recirculation valve
  - Exhaust-gas recirculation valve installation position

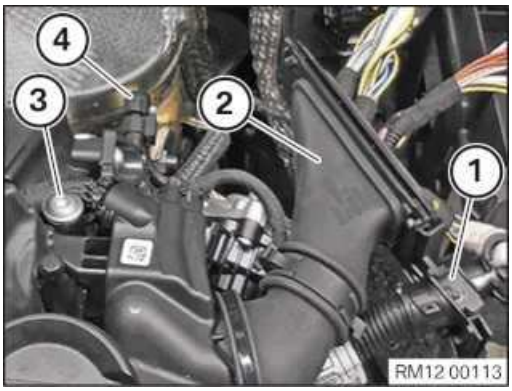
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- Tighten the bolts (1) with conventional tools.
-

Exhaust-gas recirculation valve to exhaust-gas recirculation cooler

M6			10 Nm

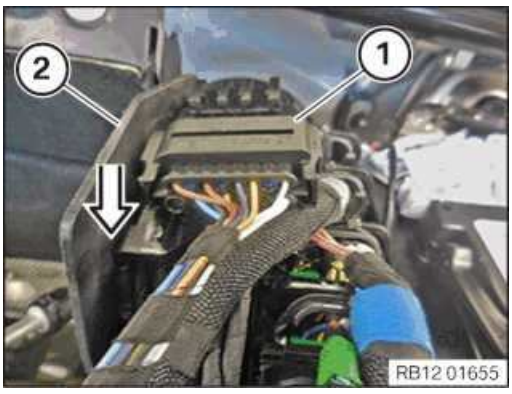


- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

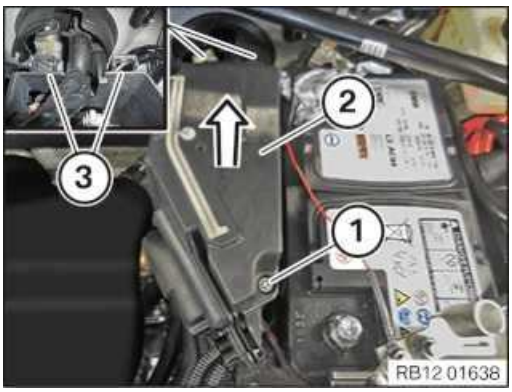
Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.



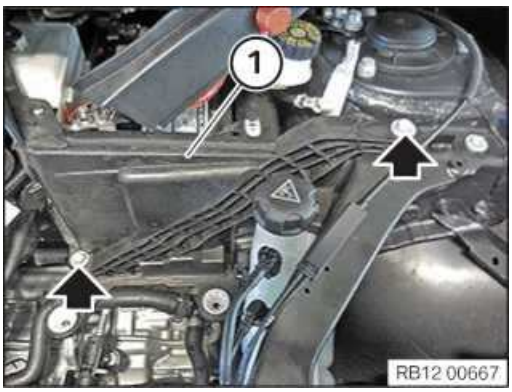
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides in the direction of arrow (3) and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

RF5x26.5		Tightening torque	2,5 Nm



- Feed in and install tension strut (1).
- Tighten screws (arrows).

Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

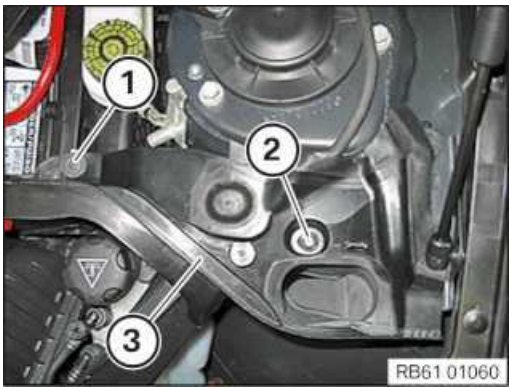
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- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

		Tightening torque	3 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

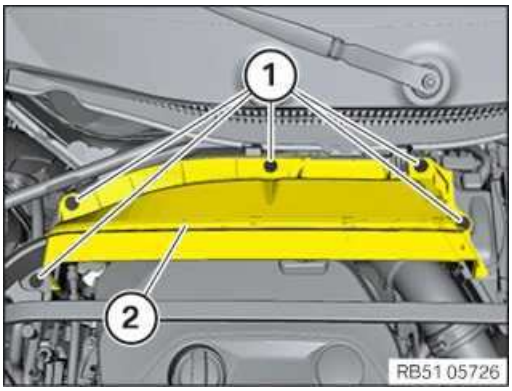
▸ **Delete adaptations**



- Connect diagnosis system.
  - Power train
  - Digital Diesel Electronics
  - Reset adaptations
  - Delete adaptations

POSTPROCESSES

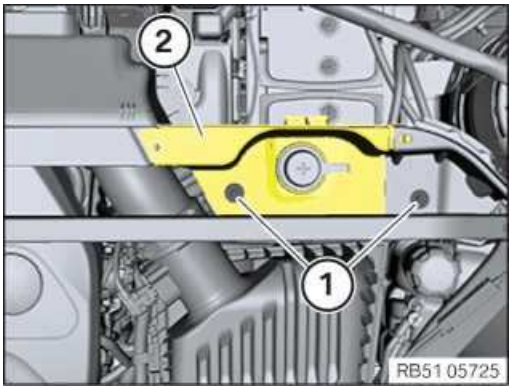
11 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Cover of top bulkhead

Screw		Tightening torque	2,6 Nm



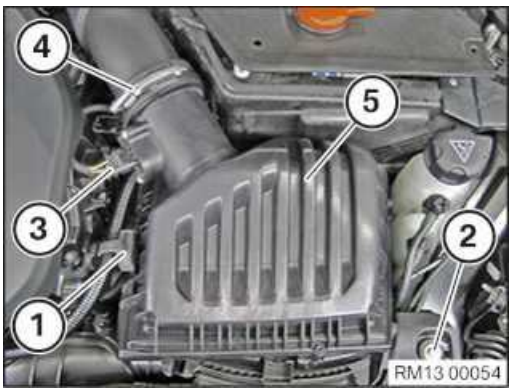
- Guide in and install cover (2).
- Tighten down screw (1).

Cover of remote positive terminal

Screw		Tightening torque	2,6 Nm

12 – Installing intake silencer housing

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- Insert the intake silencer housing (5) into the rubber mounts and install it.

  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

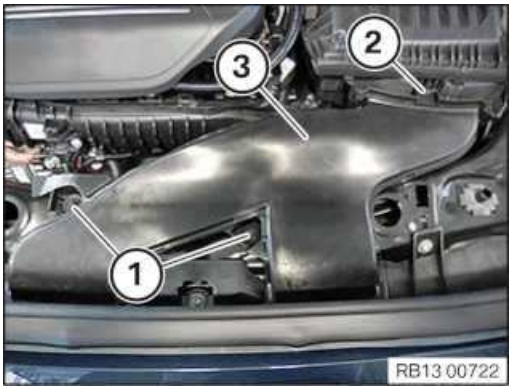
Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Insert and install the holder (1).

13 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

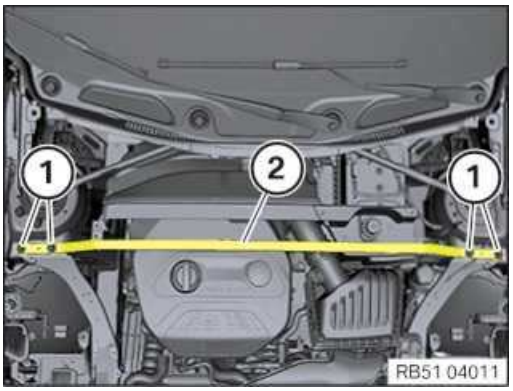
Intake neck to cross connection

M6		Tightening torque	8 Nm

14 – Install strut brace

TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.



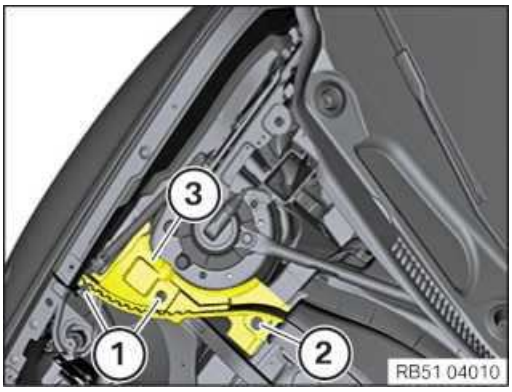
- Install the strut brace (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-brace to spring strut dome

	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

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NOTICE

Description is for right component only. The procedure on the left side is identical.

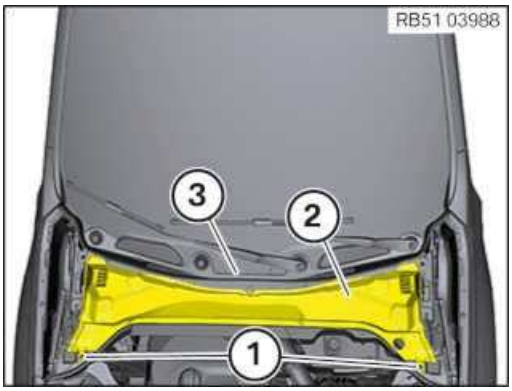
- Install the cover (3).
- Tighten down screw (2).

Cover on body

Hexagon screw		Tightening torque	3 Nm

- Install the expanding rivet (1).

15 – Installing front cowl panel cover

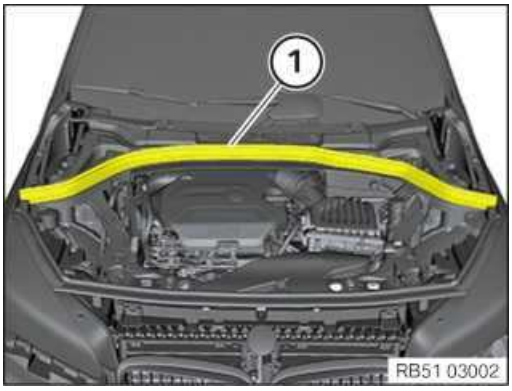


- Insert and install cowl panel cover at front (2) into cowl panel cover at rear (3).
- Check cowl panel cover at front is correctly seated (2).
- Secure expanding rivet (1).

16 – Install the seal for the bonnet

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

17 – Checking coolant level and topping up if needed

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

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TECHNICAL INFORMATION

Follow notes for repair work on the cooling system.

For additional information see:

Main group 17

17 00 ... Notes for working on the cooling system

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Check coolant level in coolant expansion tank (1) and adjust to the maximum if needed.

18 – Delete fault memory



- Connect diagnosis system:
  - Reading out the fault memory
  - Delete fault memory

Additional Information

Overview of Tightening Torques

Electronics box to battery tray — Used in step 10

M8X16		Tightening torque	15 Nm

Positive battery terminal to battery — Used in step 10

NutM6		Tightening torque	5 Nm

Battery terminal with IBS positive battery terminal / negative battery terminal — Used in step 10

NutM6		5 Nm

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Exhaust-gas recirculation valve to exhaust-gas recirculation cooler			Used in step 10
M6			10 Nm

Wiring harness to cylinder head cover			Used in step 10
TS5x20		Tightening torque	3,5 Nm

Cover to electronics box			Used in step 10
RF5x26.5		Tightening torque	2,5 Nm

Tension strut to spring strut dome/battery tray			Used in step 10
M8		Tightening torque	19 Nm

Positive battery connection point cover to engine compartment partition wall			Used in step 10
		Tightening torque	3 Nm

Cover of top bulkhead			Used in step 11
Screw		Tightening torque	2,6 Nm

Cover of remote positive terminal			Used in step 11
Screw		Tightening torque	2,6 Nm

Intake silencer housing to lock bridge			Used in step 12
M6X30		Tightening torque	8 Nm

Clean air pipe to intake silencer housing			Used in step 12
Clamp		Tightening torque	3 Nm

Intake neck to cross connection			Used in step 13
M6		Tightening torque	8 Nm

Cross-brace to spring strut dome			Used in step 14
	Renew screw.	Jointing torque	28 Nm
		Angle of rotation	180 °

Cover on body			Used in step 14
Hexagon screw		Tightening torque	3 Nm

Links

Functional descriptions	Used in step
Reset adaptations	10

General repair instructions	Used in step
61 20 ... Notes on AGM battery	10
61 12 ... Notes on intelligent battery sensor (IBS)	10
61 00 ... Notes for disconnecting and connecting battery	10
61 00 ... Safety information for handling vehicle battery	

Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	1

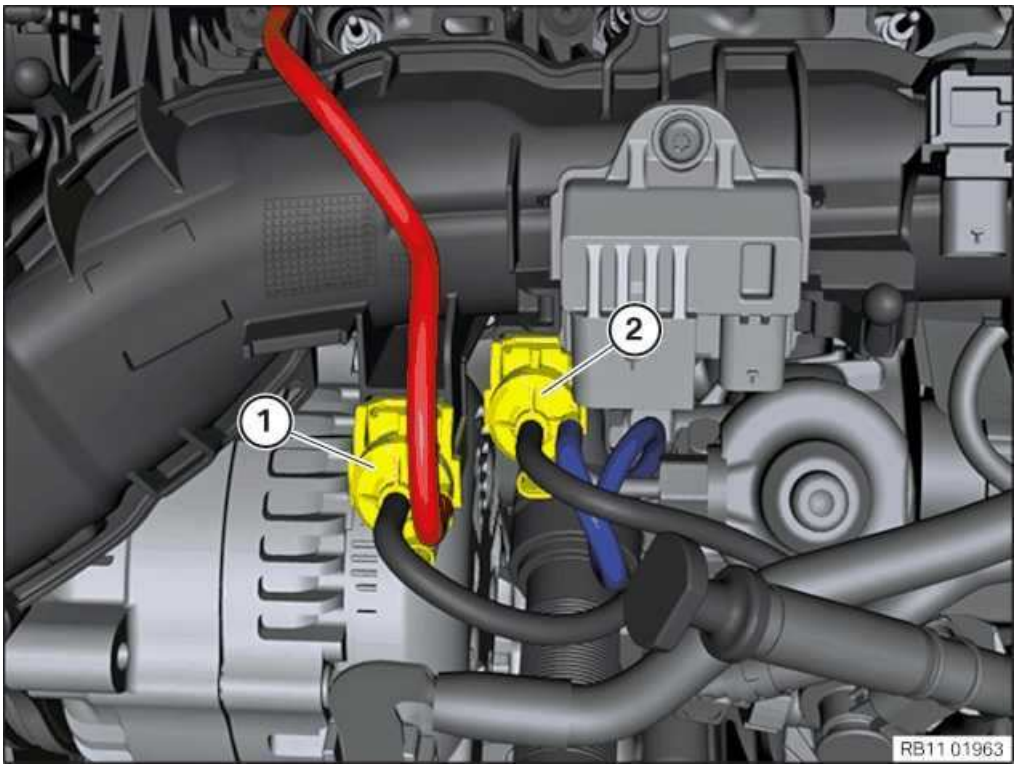
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61 20 900 Disconnecting and connecting battery earth lead	1
61 20 900 Disconnecting and connecting battery earth lead	1
61 20 900 Disconnecting and connecting battery earth lead	1
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61 20 900 Disconnecting and connecting battery earth lead	1
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1
61 20 900 Disconnecting and connecting battery earth lead	1
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	1
61 20 900 Disconnecting and connecting battery earth lead	1
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61 20 900 Disconnecting and connecting battery earth lead	1
61 20 900 Disconnecting and connecting battery earth lead	1
61 20 900 Disconnecting and connecting battery earth lead	1
61 35 ... Notes on ESD protection (Electro Static Discharge)	8
61 35 ... Notes on ESD protection (Electro Static Discharge)	9
17 00 ... Instructions for working on cooling system	17

Operating materials	Used in step
Main group 17	17

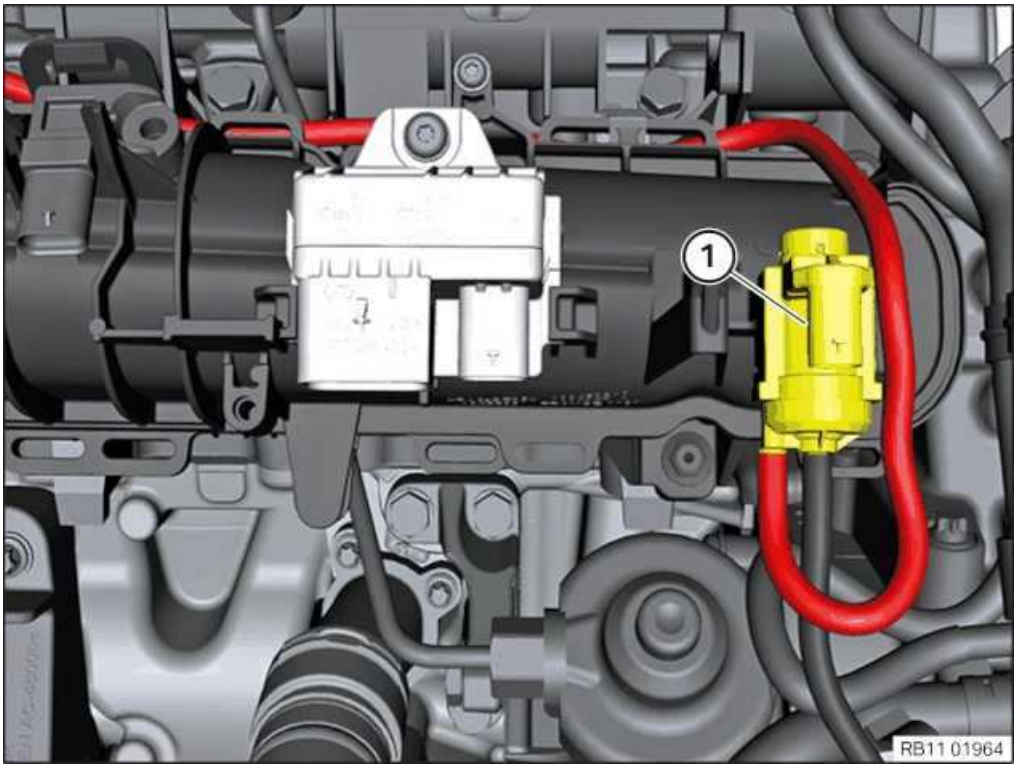
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11 74 ... Overview of the B37/B47 vacuum system



B37 K/U F2x:

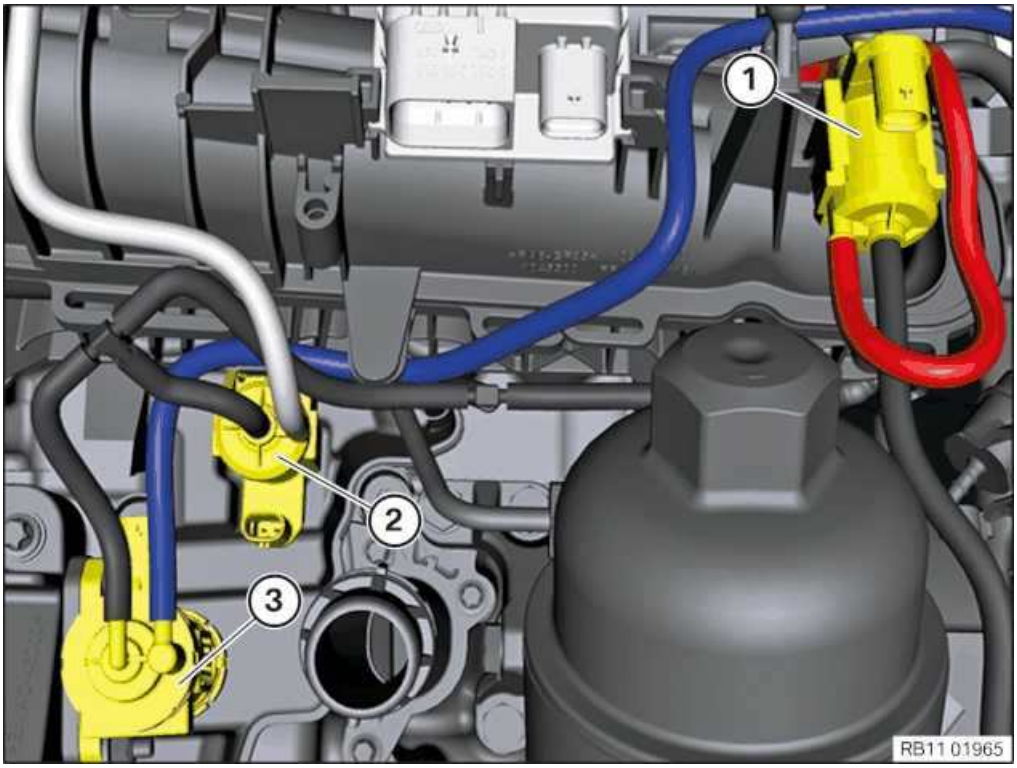
1. Electric changeover valve, EGR
2. Electric changeover valve for engine mounts



B47 K/U/O F2x/F3x:

1. Electric changeover valve, EGR

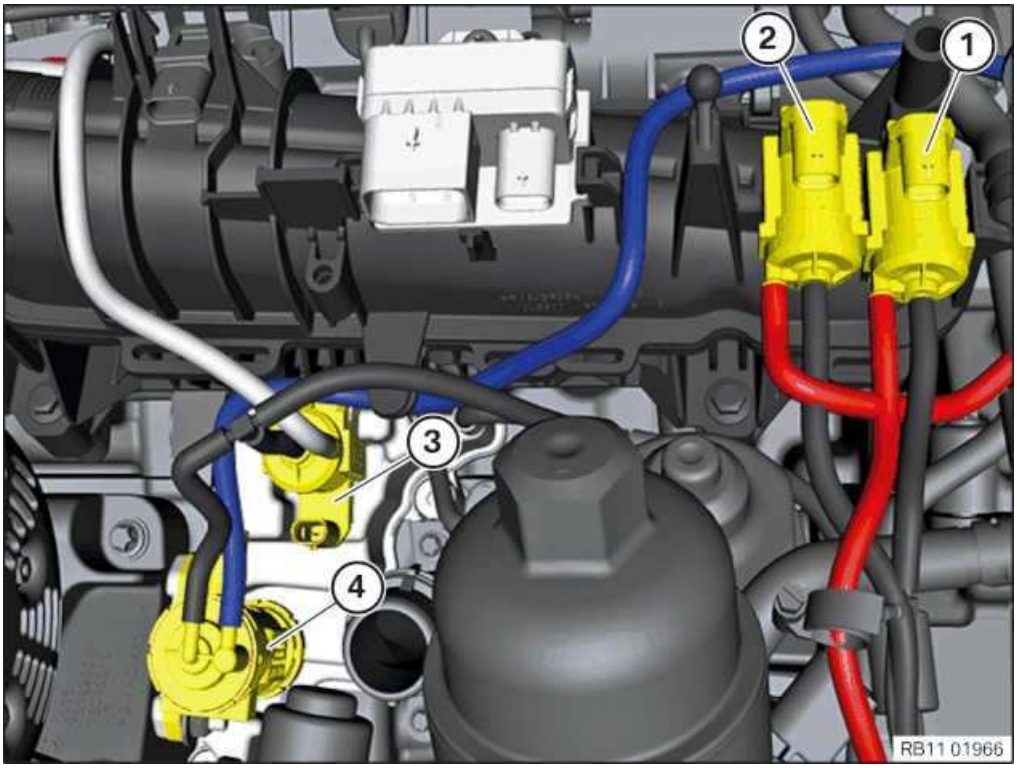
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B47 T F2x/F3x:

1. Electric changeover valve, EGR
2. Electric changeover valve, compressor bypass plate
3. Pressure converter, turbine control flap

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B47 T F1x:

1. Electric changeover valve for engine mounts
2. Electric changeover valve, EGR
3. Electric changeover valve, compressor bypass plate
4. Pressure converter, turbine control flap

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11 . . . . . Equipment recoding special tool number of the transverse member for fixing the engine in the installation location

Equipment recoding from 00 0 200 to 00 6 0 000

Designation	Special tool new	Special tool previous
Cross-member, previous	---	00 0 200
Cross-member, new	00 6 000	---
Mounting bridge	00 6 001	00 0 201
Spindle with hook	00 6 002	00 0 202
Extension	00 6 003	00 0 203
Adapter support	00 6 004	00 0 204
Extension	00 6 005	00 0 205
Chain with hook	00 6 006	00 0 209
Set of supports	00 6 010	00 0 206
Set of supports	00 6 020	00 0 207
Set of supports	00 6 030	00 0 208
Connector	00 6 031	---
Profile strip (2 x)	00 6 032	---
Supports (4 x)	00 6 033	---
Set of supports	00 6 040	---
Profile strip	00 6 041	00 0 451
Supports (2 x)	00 6 042	00 0 452
Supports, short (2 x)	00 6 043	---
Set of supports	00 6 050	---
Profile strip (2 x)	00 6 051	---
Supports, short (2 x)	00 6 052	---
Supports, long (2 x)	00 6 053	---
Support, long	00 6 060	---
Supports (2 x)	00 6 070	---

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00 11 229 Oil change in manual gearbox GS6-60DA, GS6X60BA/DA

Recycling:

Catch and dispose of escaping transmission oil.

Observe country-specific waste disposal regulations

Note:

Gearbox is at normal operation temperature.

Attention!
Use only the approved transmission oil.

Failure to comply with this instruction will result in serious damage to the transmission.

Capacity, see BMW operating fluid.

The vehicle must be parked on a level surface in the workshop during transmission oil filling.



Unscrew oil drain plug (1) and allow oil to flow out completely.

Clean oil drain plug and reinstall.

Tightening torque 23 00 2AZ.

Attention!

Make sure during removal of the filling/level control screw to note the installed filling/level control screw variant.

It is **mandatory** to use variant 1 in transmissions up to production date 08/2015.

It is **mandatory** to use variant 2 in transmissions from production date 08/2015.

Failure to comply with this instruction will result in leaks on the transmission.



Variant 1 **until** production date 08/2015.

Variant 2 **from** production date 08/2015.

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Unscrew filler/fluid level monitoring connector (1) and fill the transmission until the oil overflows.

Allow surplus oil to drain off.

Screw in the filling/level control screw (1).

Parts: Renew the filling/level control screw (1).

Tightening torque 23 00 2AZ.

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11 00 670 Secure engine in installation position

Special tools required:

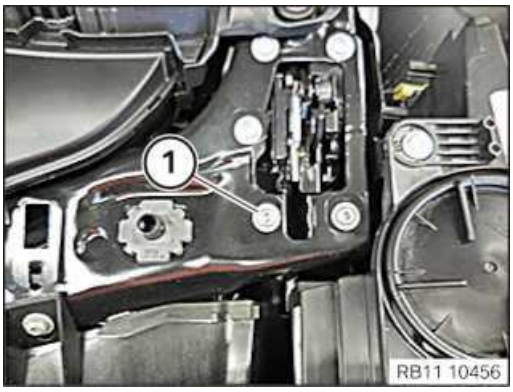
- 00 6 100
- 00 6 130
- 2 365 070
- 00 6 052
- 11 0 000
- 00 0 490

Warning!

Danger of injury!

Observe following instructions relating to special tool:

1. Prior to each use, check the special tools for defects, modifications and operational reliability.
2. Damaged/modified special tools must not be used!
3. No changes or modifications may be made to the special tools!
4. Keep special tools dry, clean and free of grease.

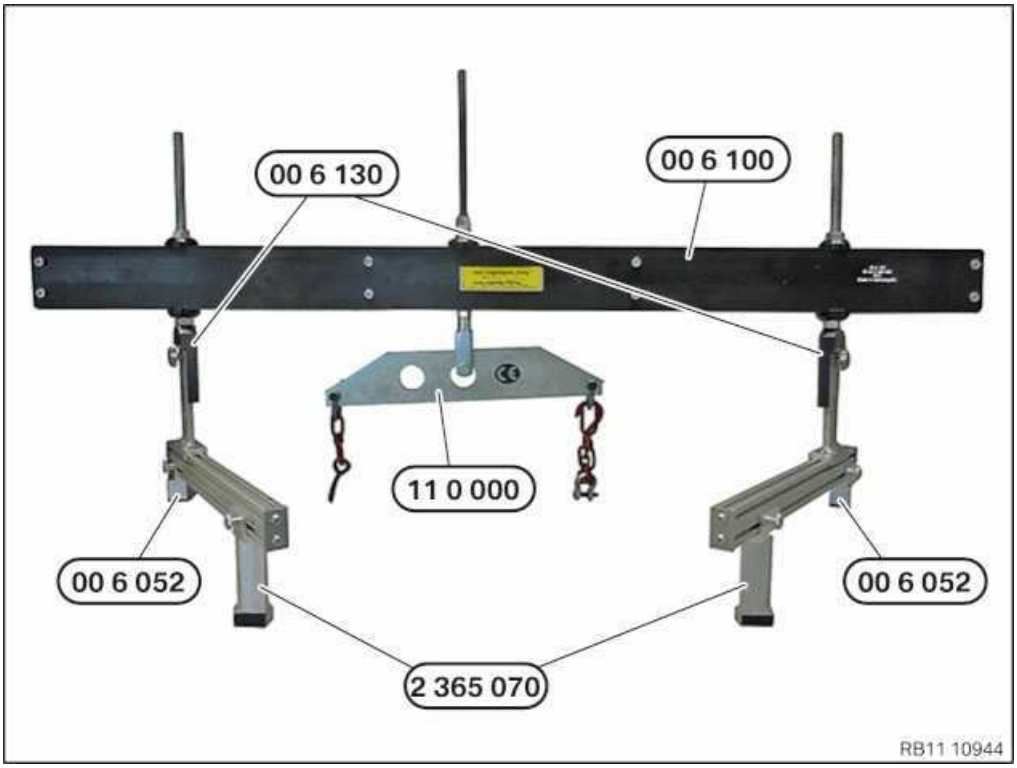


Release screw (1) from left engine compartment lock.



Release screw (1) from right engine compartment lock.

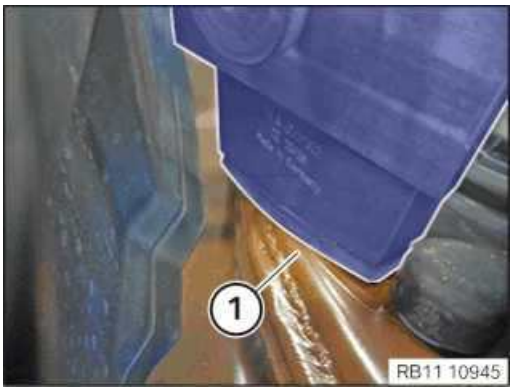
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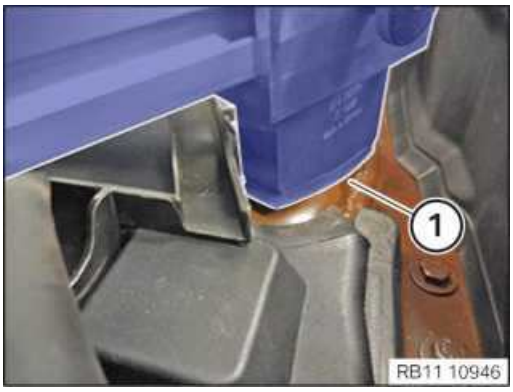
Modify the engine bridge 00 6 100 using special tools 00 6 130 , 2 365 070 , 00 6 052 and 11 0 000 to match the motor vehicle.

With the help of an assistant, fit the entire cross-member 00 6 100 onto the vehicle.

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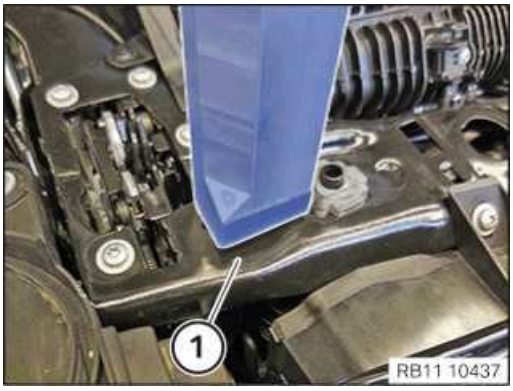


(1) = rear right support point.

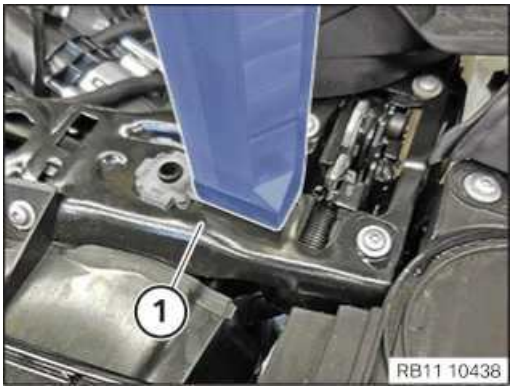


(1) = rear left support point.

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(1) = front right support point.



(1) = front left support point.



Attach the chains to the engine.

Slightly pretension the spindle (1) of the engine support beam.

Warning!
Danger of injury!

Tighten down all adjusting screws, knurled screws and nuts on cross-member 00 6 100 and on special tool 00 0 490 .

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Important!

Avoid a change of engine position in the transverse or longitudinal direction!

Always make sure there is sufficient clearance between the engine (or its add-on parts) and the body.

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